APPENDIX 3.3-A: AIR QUALITY AND GLOBAL CLIMATE CHANGE TECHNICAL REPORT

California High-Speed Rail Authority

San Jose to Merced Project Section

Air Quality and Greenhouse Gases Technical Report

September 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.

TABLE OF CONTENTS

Tables

Figures

Appendices

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
μg/m^3	micrograms per cubic meter
μm	microns
AAQA	ambient air quality analysis
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACE	Altamont Corridor Express
AMBAG	Association of Monterey Bay Area Governments
APA	applicant-preferred alternative
APCD	air pollution control district
ATC	automatic train control
Authority	California High-Speed Rail Authority
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
Bay Area	San Francisco Bay Area
C.F.R.	Code of Federal Regulations
CAA	Clean Air Act
CAAQS	California ambient air quality standards
CAFE	Corporate Average Fuel Economy
Cal. Health and Safety Code	California Health and Safety Code
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CAP	climate action plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CEMOF	Centralized Equipment Maintenance and Operations Facility
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CH_4	methane
CIPH	cast-in-place and hardware
CMP	congestion management program
CO	carbon monoxide
CO_2	carbon dioxide

CO_2e	carbon dioxide equivalent
CP	Control Point
DPM	diesel particulate matter
EIR	environmental impact report
EIS	environmental impact statement
EMFAC	EMission FACtors
EMMA	Environmental Mitigation Management and Assessment
EMU	electric multiple unit
EO	California Executive Order
Fed. Reg.	*Federal Register*
FHWA	Federal Highway Administration
Foundation	Bay Area Clean Air Foundation
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
g/L	grams per liter
GAMAQI	Guide for Assessing and Mitigating Air Quality Impacts
GEA	Grasslands Ecological Area
GHG	greenhouse gas
GIS	geographic information system
GWP	Global Warming Potential
HAP	hazardous air pollutants
HRA	health risk assessment
Hot Spots Act	Air Toxics “Hot Spots” Information and Assessment Act of 1987
HSR	high-speed rail
I-	Interstate
IAMF	impact avoidance and minimization features
kV	kilovolt
kWh	kilowatt-hour
LBP	lead-based paint
LOS	level-of-service
MBARD	Monterey Bay Air Resources District
MCAG	Merced County Association of Governments
mg	milligrams
MOWS	maintenance of way siding
MOU	memorandum of understanding
MOWF	maintenance of way facility
mph	miles per hour

MSAT	mobile source air toxics
MT	mainline track
MTC	Metropolitan Transportation Commission
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NCCAB	North Central Coast Air Basin
NEPA	National Environmental Policy Act
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NO_X	nitrogen oxides
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PCJPB	Peninsula Corridor Joint Powers Board
PG&E	Pacific Gas and Electric Company
PM	particulate matter
PM_{10}	particulate matter 10 microns in diameter or less
$PM_{2.5}$	particulate matter 2.5 microns in diameter or less
project extent, project	San Jose to Central Valley Wye Project Extent
Project Section	San Jose to Merced Project Section
PTC	positive train control
ROG	reactive organic gases
RSA	resource study area
RTP	regional transportation plan
San Benito COG	Council of San Benito County Governments
SB	Senate Bill
SCS	sustainable communities strategy
SF_6	sulfur hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SIL	significant impact level
SIP	state implementation plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide

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*
t	metric ton
TAC	toxic air contaminant
TAMC	Transportation Agency for Monterey County
Tanner Act	Toxic Air Contaminant Identification and Control Act
TIP	transportation improvement program
TPSS	traction power substation
U.S.C.	United States Code
UPRR	Union Pacific Railroad
USEO	U.S. Presidential Executive Order
USEPA	U.S. Environmental Protection Agency
VERA	Voluntary Emission Reduction Agreement
VMT	vehicle miles traveled
VOC	volatile organic compound
VTA	(Santa Clara) Valley Transportation Authority

EXECUTIVE SUMMARY

The California High-Speed Rail Authority (Authority) has prepared this *San Jose to Merced Project Section Air Quality and Greenhouse Gases Technical Report* to support the *San Jose to Merced Project Section Environmental Impact Report/Environmental Impact Statement*. This technical report characterizes existing conditions and analyzes air quality and greenhouse gas (GHG) effects of four project alternatives.

Air quality and GHG are important considerations because of their effect on human health and global climate change. This technical report addresses effects resulting from construction and operation of the San Jose to Merced Project Section (Project Section), focusing on the portion of the Project Section between San Jose and Carlucci Road (San Jose to Central Valley Wye Project Extent, or simply project). It describes relevant federal, state, regional, and local regulations and requirements; methods used for the analysis of effects; the affected environment; impact avoidance and minimization features (IAMF) that would avoid or minimize effects; and the potential effects on air quality and GHGs in the project resource study area (RSA) that could result from construction and operation of the project alternatives. Emissions and impacts under all four project alternatives are analyzed at an equal level of detail to support the project-level environmental document prepared pursuant to the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA).

Summary of Effects

Air Quality

Construction of all four project alternatives would result in reactive organic gases (ROG)[1] and nitrogen oxide (NO_X) emissions that would exceed the Bay Area Air Quality Management District's (BAAQMD) CEQA thresholds. Construction emissions of NO_X, carbon monoxide (CO), and particulate matter (PM) less than 10 microns in diameter (PM_{10}) would also exceed the San Joaquin Valley Air Pollution Control District's (SJVAPCD) annual CEQA thresholds. Construction emissions of Alternatives 1, 2, and 4 would exceed the Monterey Bay Air Resources District's (MBARD) PM_{10} CEQA threshold. Construction of all project alternatives would also exceed the general conformity *de minimis* NO_X thresholds in the San Francisco Bay Area Air Basin (SFBAAB) and San Joaquin Valley Air Basin (SJVAB).

The project would be built with all feasible on-site control measures to reduce emissions and minimize effects on air quality. Fugitive dust emissions would be reduced through implementation of a dust control plan (AQ-IAMF#1: Fugitive Dust Emissions) and best management practices at new concrete batch plants (AQ-IAMF#6: Concrete Batch Plants). The contractor would utilize low-volatile organic compound (VOC) paints to limit the emissions of VOCs, which contribute to ozone (O_3) formation (AQ-IAMF#2: Selection of Coatings). Exhaust-related pollutants would be reduced through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3: Renewable Diesel, AQ-IAMF#4: Off-Road Equipment, and AQ-IAMF#5: On-Road Vehicles. However, even with application of IAMFs, exceedances of air district and general conformity thresholds would still occur. The Authority would implement mitigation measures to offset the remaining construction impact on air quality resources. Specifically, AQ-MM#1: Offset Project Construction Emissions in the San Francisco Bay Area Air Basin and AQ-MM#2: Offset Project Construction Emissions in the North Central Coast Air Basin would offset ROG, NO_X, and PM_{10} emissions, as applicable, to below BAAQMD and MBARD thresholds or net zero (as required by the General Conformity regulation). AQ-MM#3: Offset Project Construction Emissions in the San Joaquin Valley Air Basin would fully offset (i.e., to net zero) all emissions of ROG, NOx, and PM within the SJVAPCD, pursuant to the Authority's Memorandum of Understanding (MOU) with the air district for the HSR subsections within the SJVAB. Pursuant to SJVAPCD's Guide for Assessing and Mitigating Air Quality Impacts, emissions offsets procured through AQ-MM#3 could not be used to mitigate CO effects.

[1] ROG is synonymous with volatile organic compounds (VOC); both terms are used in this document depending on the emissions source.

Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold even after implementation of all feasible mitigation.

Within the BAAQMD, Alternatives 2 and 4 would result in comparable levels of total emissions and Alternatives 1 and 3 would result in comparable levels of total emissions. Alternatives 2 and 4 would result in the greatest emissions primarily because of embankment activities in the Morgan Hill and Gilroy Subsection, in contrast to viaduct construction under Alternatives 1 and 3, which requires less earthmoving and equipment and vehicles. Maximum daily ROG and NO_X emissions in excess of BAAQMD thresholds would be generated between 2023 and 2025, with the greatest emissions occurring in 2025 under all project alternatives. Daily ROG and NO_X emissions would be highest in 2025 due to concurrent construction activities in the Morgan Hill and Gilroy Subsection and ballast hauling. Construction and emissions intensity declines after 2025 once earthmoving and other equipment-intensive activities are complete.

Within the MBARD, total annual construction emissions are highest under Alternatives 2 and 4 because of embankment activities in the Morgan Hill and Gilroy Subsection and more movement of ballast through the North Central Coast Air Basin (NCCAB). Embankment construction generally requires more equipment and vehicles than viaduct construction, resulting in greater emissions. In addition, berm and embankment construction requires more ballast, which results in more ballast hauling and associated emissions. In general, emissions under all alternatives would be highest during the first few years of construction when earthmoving and other emissions-intensive activities would occur. Emissions would peak again in 2027 and 2028 due to ballast hauling through the NCCAB.

Within the SJVAPCD, all project alternatives would result in the same amount of emissions because construction activities would be identical. Similar amounts of annual emissions would be generated during each year of construction between 2022 and 2027. Emissions would decline in 2028 once tunneling and other emissions-intensive activities are completed.

Construction activities would not generate emissions in excess of applicable local air district health risk thresholds. Construction of all alternatives would lead to new violations of the PM_{10} and PM less than 2.5 microns in diameter ($PM_{2.5}$) national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS), as well as potentially contribute to existing PM_{10} and $PM_{2.5}$ violations through exceedances of the significant impact levels. Alternatives 1, 2, and 4 would also violate the 1-hour nitrogen dioxide NAAQS and CAAQS. Project features would minimize air quality effects (AQ-IAMF#1 through AQ-IAMF#6), although emissions would still violate the ambient air quality standards. These project design features represent all best available on-site controls to reduce construction emissions, and no mitigation is available.

Long-term operation of the project would result in a decrease in all criteria pollutant emissions when compared to 2015 existing and 2029 and 2040 No Project conditions. These patterns apply to all ridership scenarios and alternatives and would be beneficial to the SFBAAB, NCCAB, and SJVAB in meeting their criteria pollutant attainment goals. Regionally and locally, additional vehicle traffic at new and expanded transit stations and maintenance facilities would not result in CO or PM hot spots. Similarly, displaced vehicle miles traveled would reduce regional mobile source air toxics (MSAT) throughout the RSA. While localized MSATs near stations and maintenance facilities may slightly increase as a result of additional passenger traffic, long-term emissions would be substantially reduced because of implementation of state and national vehicle and fuel regulations.

The project would reposition existing Union Pacific Railroad tracks under all four alternatives. Redistributing or moving existing freight traffic would increase long-term toxic air contaminant (TAC) concentrations at certain receptor locations and would result in corresponding decreases at other locations. Likewise, additional generators at the stations and maintenance facilities proposed under all four project alternatives, new bus service at the East Gilroy Station under Alternative 3, and maintenance operations at the Gilroy maintenance of way facility (MOWF) under all four project alternatives would increase long-term TAC concentrations. Analysis of TAC concentrations from relocated freight service, additional generators, East Gilroy bus service, and

MOWF operations indicates that these sources would not result in long-term cancer or noncancer health risks in excess of established thresholds.

The project alignment within the SFBAAB would be in an area that can contain naturally occurring asbestos (NOA). However, the design-build contractor would prepare a congestion management program (CMP) that outlines practices for avoiding and minimizing NOA. Construction contractors would also be required to comply with the BAAQMD's Asbestos Airborne Toxic Control Measure for Construction and Grading Operations, which requires implementation of dust control measures to limit the potential for airborne asbestos. Asbestos-containing materials and lead-based paint may be found during demolition activities, although all four project alternatives would comply with all *National Emission Standards for Hazardous Air Pollutants* regulations. Similarly, implementation of all feasible dust control measures (AQ-IAMF#1) would minimize receptor exposure to Coccidioides immitis fungus spores, if present in the soil during earthmoving activities. While odors may be generated during construction and operation, they would not be substantial and are not expected to result in nuisance complaints.

Greenhouse Gases

Long-term operation of the project would result in a net reduction of regional and statewide GHG emissions when compared to 2015 Existing and 2029 and 2040 No Project conditions. Construction-related emissions would be less than 0.35 percent of the total annual statewide GHG emissions. Total amortized GHG construction emissions for the project are estimated to be between 14,784 and 19,908 metric tons carbon dioxide equivalent per year, with Alternative 4 generating the most emissions, and Alternative 1 generating the least. The increase in GHG emissions generated during construction would be offset in approximately 8 to 14 months by net GHG reductions during operations because of reduced car and aircraft trips in Northern California and statewide. Accordingly, implementation of the project would result in a net decrease in GHG emissions that would be beneficial to the RSA and State of California and would help meet local and statewide GHG reduction goals.

1 INTRODUCTION

This report presents the air quality and greenhouse gas (GHG) technical evaluation for the California High-Speed Rail (HSR) San Jose to Merced Project Section (Project Section), focusing on the portion of the Project Section between San Jose and Carlucci Road (San Jose to Central Valley Wye Project Extent, or project), 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). After completion of the first-tier programmatic environmental documents,[2] the Authority and FRA 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 Extent, of this analysis provides details of the project and the four alternatives under consideration.

1.2 Purpose of this Technical Report

This report supports the San Jose to Merced Project Section EIR/EIS. The resource assessment presented in this analysis is consistent with the Authority and FRA's *California High Speed Rail Project EIR/EIS Environmental Methodology Guidelines Version 5.09,* adopted in April 2017 (Authority and FRA 2017), as well as the following technical guidance manuals:

- Bay Area Air Quality Management District's (BAAQMD) *California Environmental Quality Act Air Quality Guidelines* (BAAQMD 2017a)
- Federal Highway Administration's (FHWA) Memorandum*: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2016)
- Office of Environmental Health Hazard Assessment's (OEHHA) *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA 2015)
- Monterey Bay Air Resources District's (MBARD) *CEQA Air Quality Guidelines* (MBUAPCD 2008)
- San Joaquin Valley Air Pollution Control District's (SJVAPCD) *Guidance for Assessing and Mitigating Air Quality Impacts* (SJVAPCD 2015a)

[2] Two program-level environmental documents were prepared: the Final Program EIR/EIS for the Proposed California High-Speed Train System (Authority and FRA 2005) and the Bay Area to Central Valley High-Speed Train Final Program EIR/EIS (Authority and FRA 2008). These documents evaluated the impacts of proposed HSR corridors and selected the HSR sections constituting the California HSR System.

1.3 Organization of this Technical Report

This technical report includes the following chapters in addition to this introductory chapter:

- Chapter 2, Description of the San Jose to Central Valley Wye Project, describes the alternatives as currently proposed.
- Chapter 3, Laws, Regulations, and Orders, introduces federal, state, and local laws, regulations, and policies relevant to air quality and GHGs.
- Chapter 4, Pollutants of Concern, describes the key criteria pollutants, toxic air contaminants (TAC), and GHGs of concern for the project.
- Chapter 5, Affected Environment, discusses existing conditions, including air quality and global climate change in the resource study area (RSA).
- Chapter 6, Methods for Evaluating Effects, describes the analytical methods and assumptions used to determine the effects of the project on air quality and GHG.
- Chapter 7, Air Quality Effects Analysis, assesses potential effects of construction and operations of the project alternatives on ambient air quality and human health.
- Chapter 8, Global Climate Change Effects Analysis, assesses the potential effects of construction and operations of the project alternatives on GHGs and climate change.
- Chapter 9, Mitigation Measures, presents mitigation measures to reduce air quality effects.
- Chapter 10, Cumulative Effects, assesses the potential for construction and operations of the project alternatives, in combination with past, present, and reasonably foreseeable projects, to result in cumulative air quality or GHG effects.
- Chapter 11, Conformity Analysis, presents the general conformity determination for the applicant-preferred alternative consistent with Clean Air Act (CAA) 40 Code of Federal Regulations (C.F.R.) Section 93.158(c).
- Chapter 12, References, provides complete reference information for the published, online, agency, institutional, and individual sources consulted in preparation of this report.
- Chapter 13, Preparer Qualifications, presents the credentials of the staff who oversaw the preparation of this report.
- Supporting information is provided in the following appendices:
  - Appendix A, CalEEMod Outputs for Station and Maintenance Facility Operation, MOWF Calculations, and East Gilroy Transit Calculations, provides the California Emissions Estimator Model (CalEEMod) output files for the local analysis of criteria pollutants and GHG emissions from operation of the stations and maintenance facilities. Assumptions and spreadsheets for the maintenance of way facility (MOWF) and East Gilroy transit calculations are also provided.
  - Appendix B, CALINE4 Outputs for CO Hot-Spot Analysis, provides the CALINE4 output files for the localized carbon monoxide (CO) hot-spot analysis.
  - Appendix C, Construction Emission Assumptions, provides the construction inventory and emission factor assumptions for the analysis of criteria pollutants and GHG emissions from construction of the project.
  - Appendix D, Ballast Hauling Memorandum, describes quarry selection process and scenario analysis performed for the ballast-hauling assessment.
  - Appendix E, Localized Impacts from Construction, describes air dispersion modeling methods for evaluating localized air quality effects.
  - Appendix F, Potential Impact from Induced Winds, provides calculations and analysis details for the induced wind analysis.

- Appendix G, Council on Environmental Quality Provisions Covering Incomplete or Unavailable Information, describes incomplete or unavailable information for mobile source air toxics (MSAT).

2 DESCRIPTION OF THE SAN JOSE TO CENTRAL VALLEY WYE PROJECT

The Project Section would provide HSR service between Diridon Station in downtown San Jose and a station in downtown Merced, with a Gilroy station either in downtown Gilroy or east of Gilroy. The Project 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.[3] The Project Section follows existing transportation corridors to the extent feasible, as directed by Proposition 1A.[4]

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 2012a) and the *Merced to Fresno Section: Central Valley Wye Supplemental EIR/EIS* (Authority 2019a), the analysis in this document focuses on the project extent between Scott Boulevard and Carlucci Road (the project).

[3] 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)).

[4] 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 2019b

JUNE 2019

Figure 2-1 Proposed San Jose to Merced Project Section

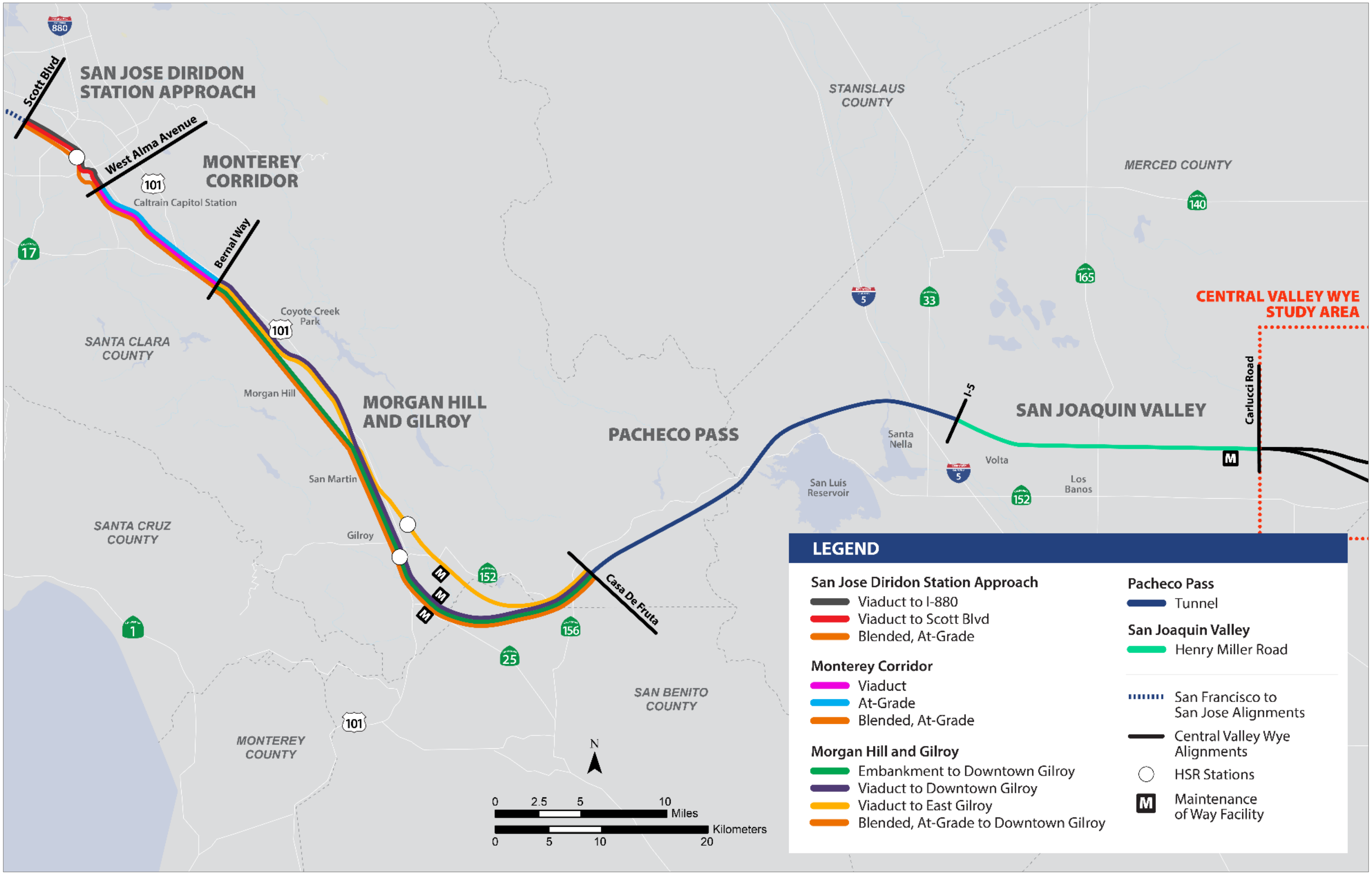
2.1 Summary of Design Features

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[5] 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) near 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.[6] 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.

---

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

6 *South Bay* refers to Santa Clara County.



Source: Authority 2019b

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

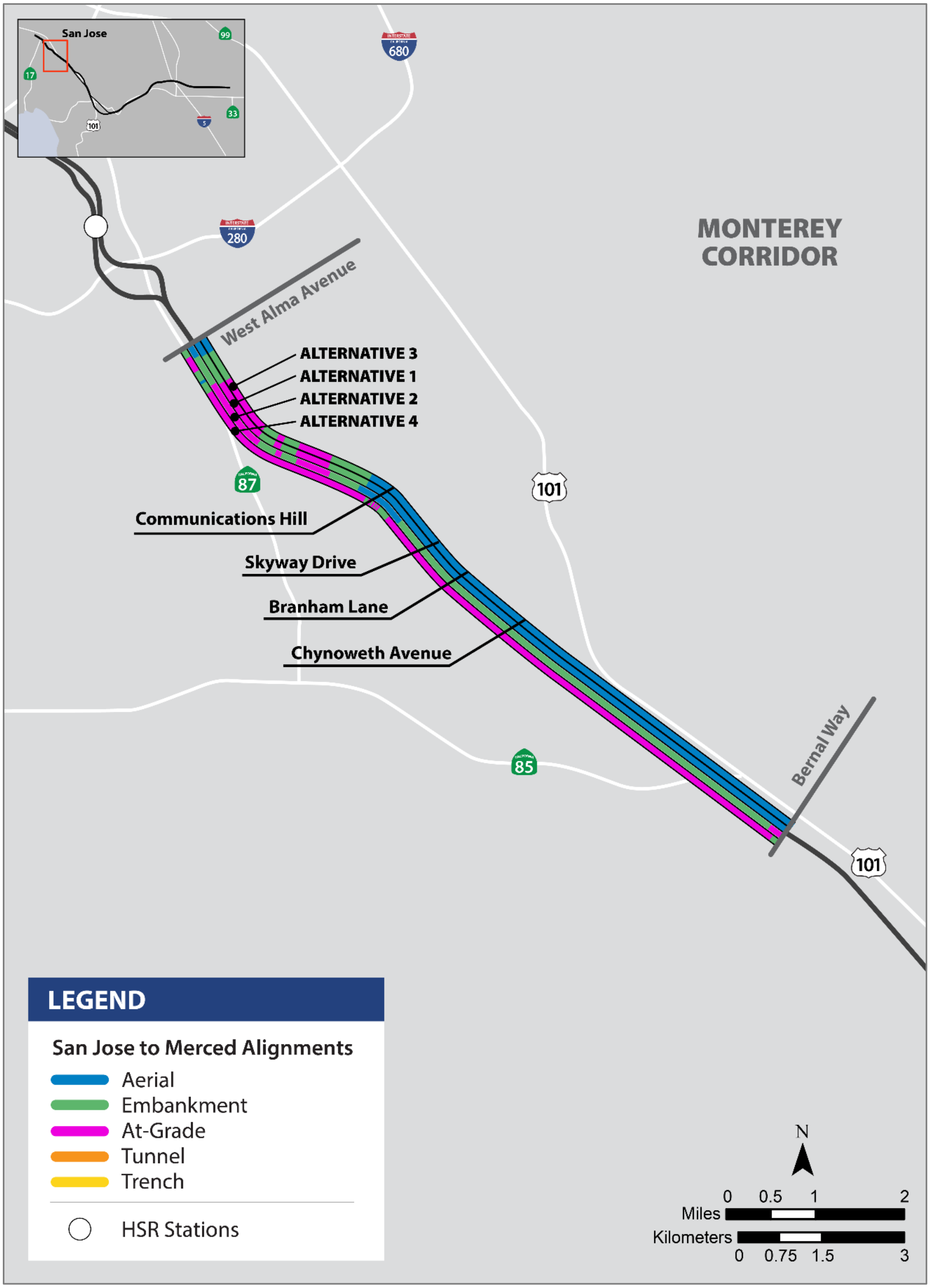
Source: Authority 2019b

Source: Authority 2019b

JUNE 2019

CEMOF = Centralized Equipment Maintenance and Operation Facility

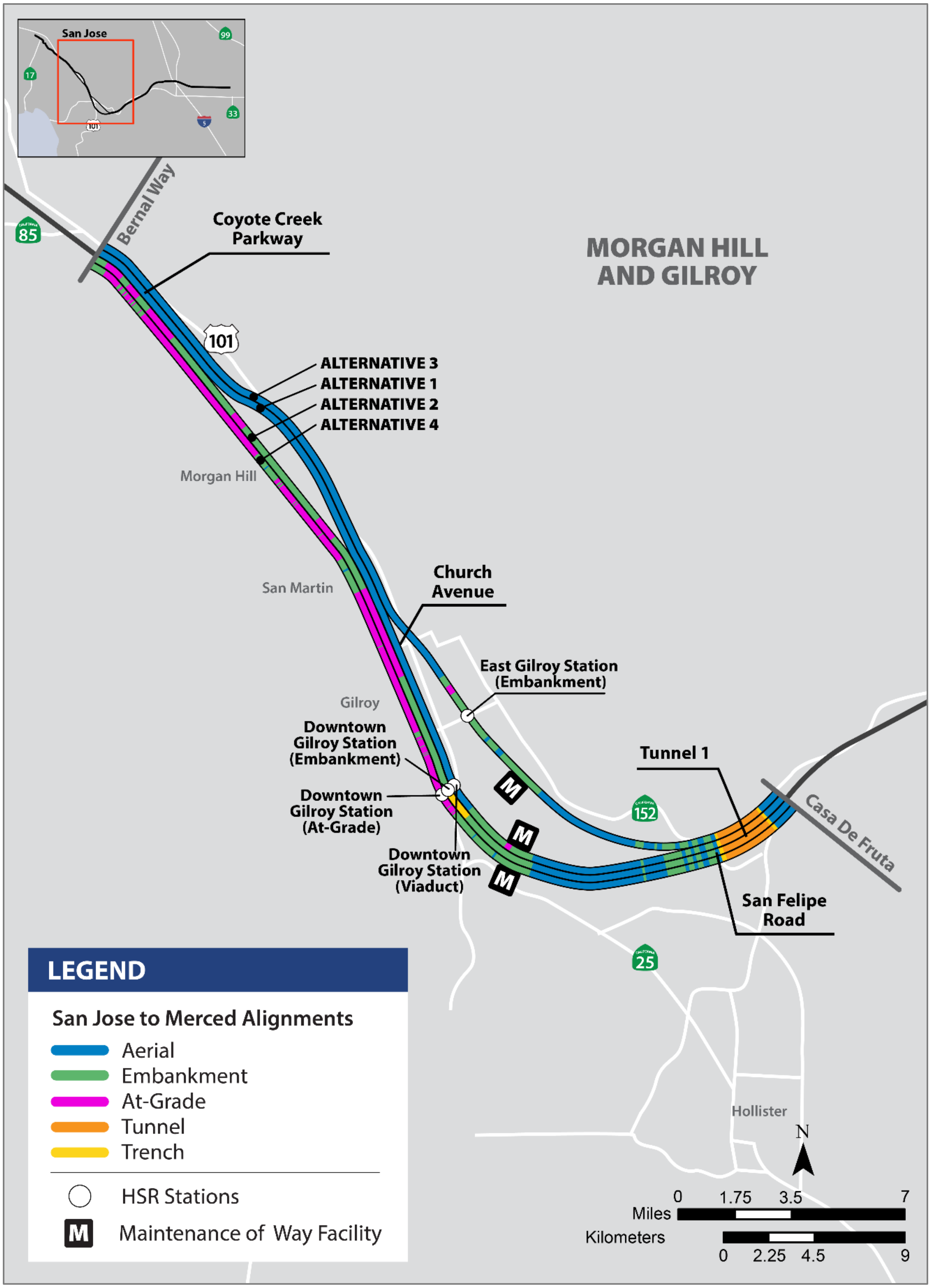
Figure 2-3 San Jose Diridon Station Approach Subsection



Source: Authority 2019b

JUNE 2019

Figure 2-4 Monterey Corridor Subsection



Source: Authority 2019b

JUNE 2019

Figure 2-5 Morgan Hill and Gilroy Subsection

Source: Authority 2019b

JUNE 2019

Figure 2-6 Pacheco Pass Subsection

Source: Authority 2019b

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

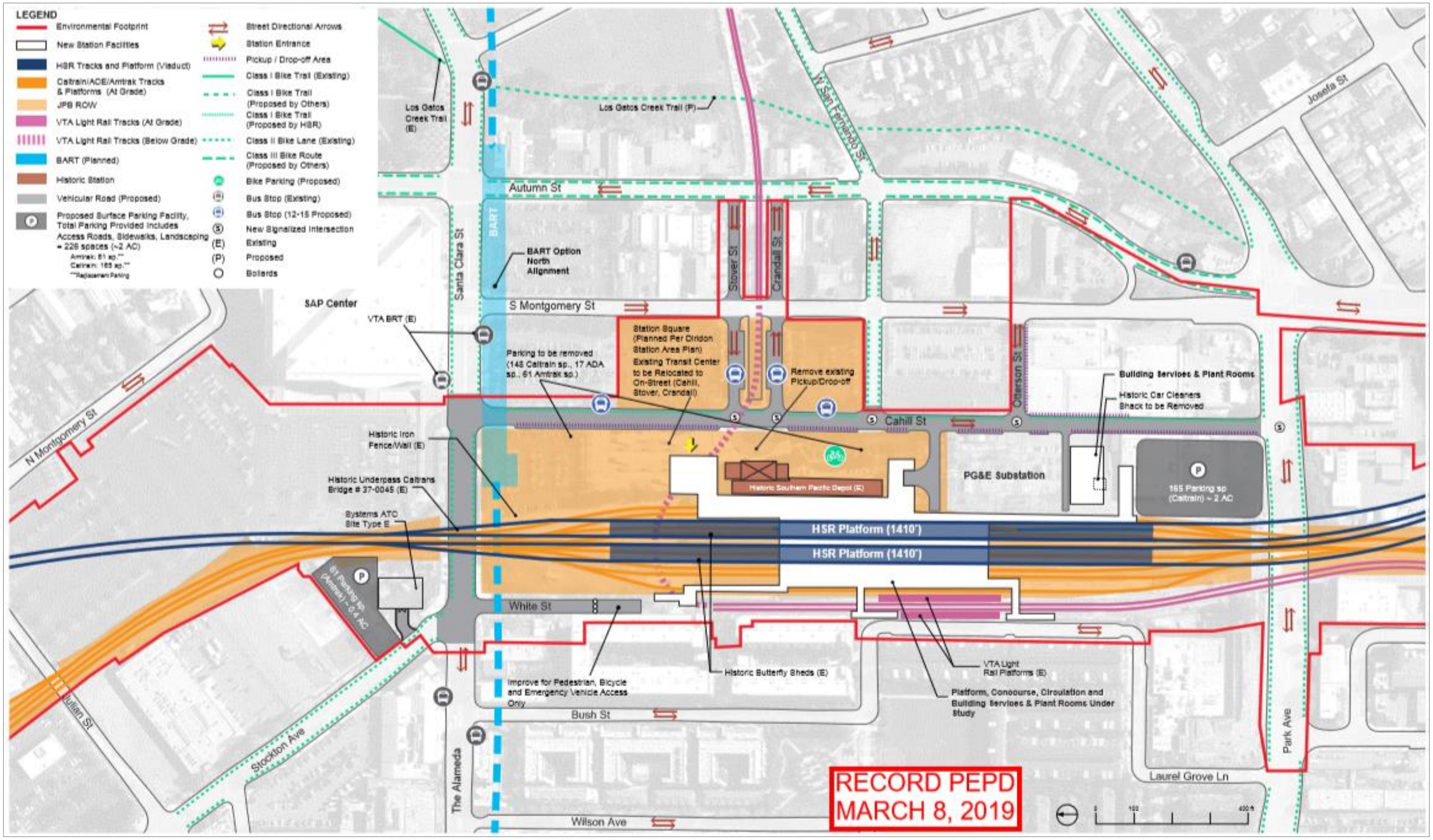
There would be no wildlife crossings in this subsection.

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.

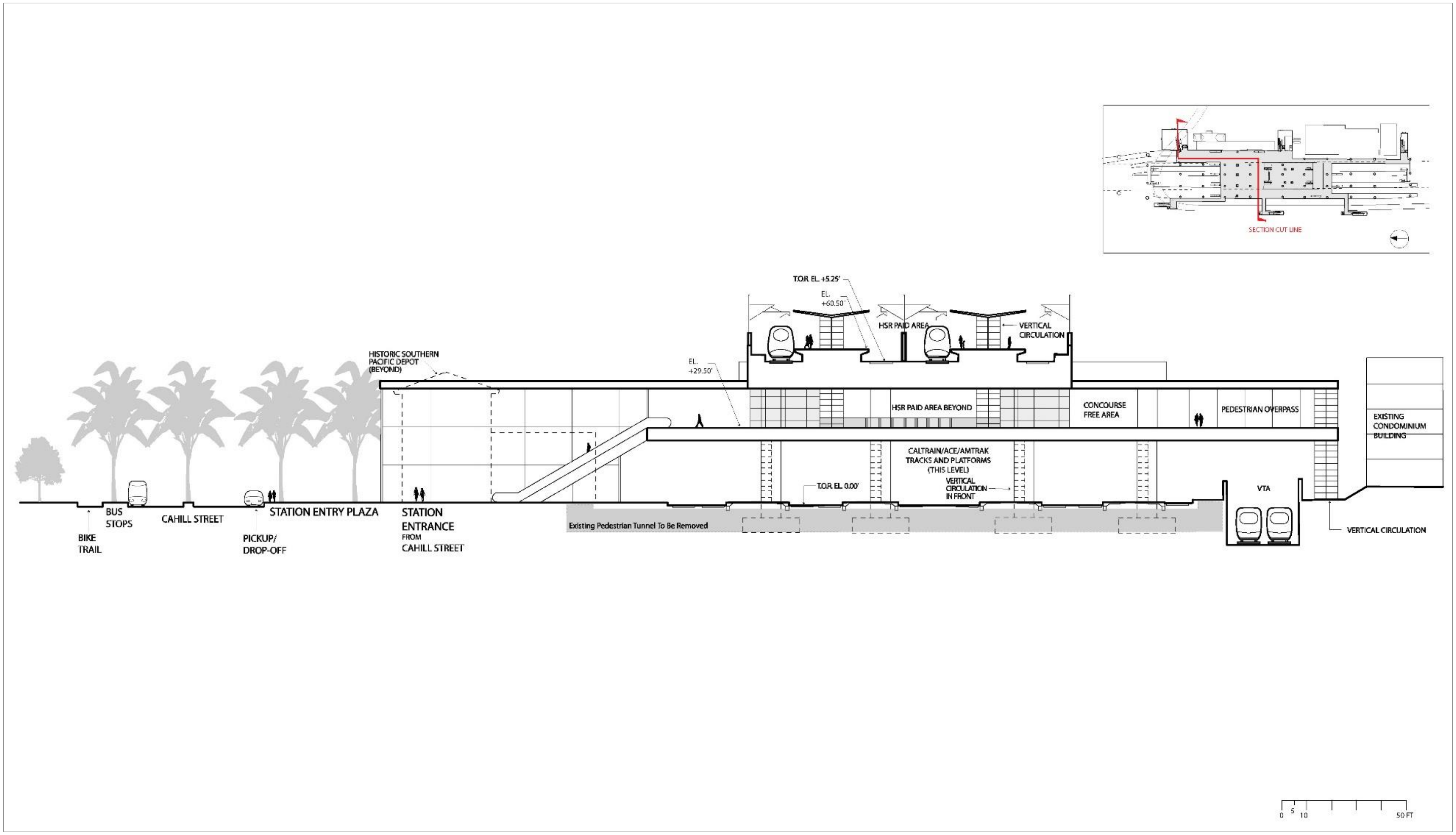
Existing underutilized parking capacity at and around the station would be used to meet the estimated HSR parking demand until a station area parking policy and program are implemented. The Authority would rely on commercially available parking to meet HSR parking demand, provided and priced in accordance 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 2019b

JUNE 2019

Figure 2-8 Conceptual Diridon Aerial Station Plan



Source: Authority 2019b

JUNE 2019

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

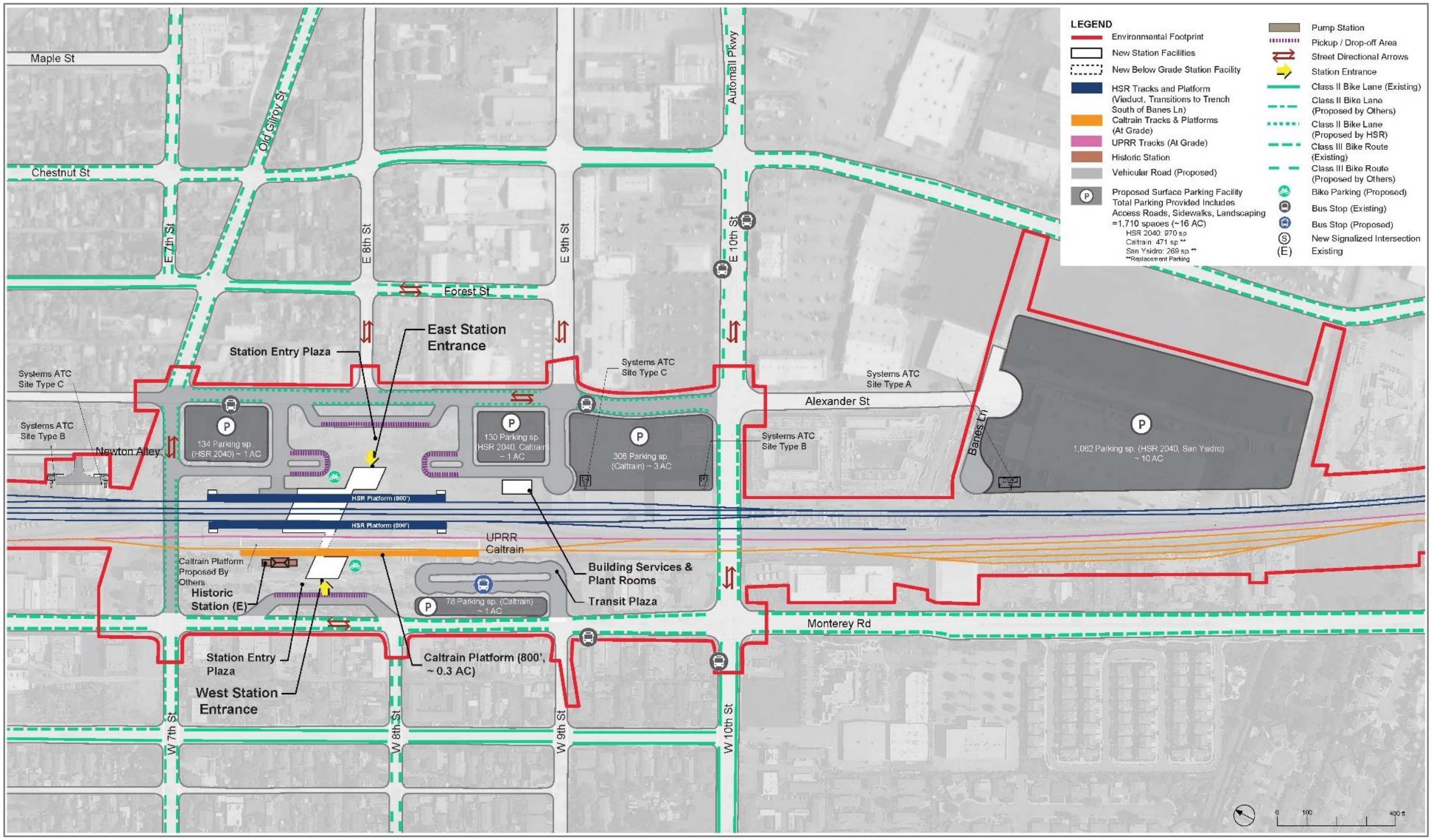
Three wildlife crossings would be provided at the base of Tulare Hill north of the Metcalf Substation connecting to Coyote Creek. The existing culvert under Monterey Road at Fisher Creek would be realigned and replaced with a larger box culvert to improve wildlife movement under Monterey Road and the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

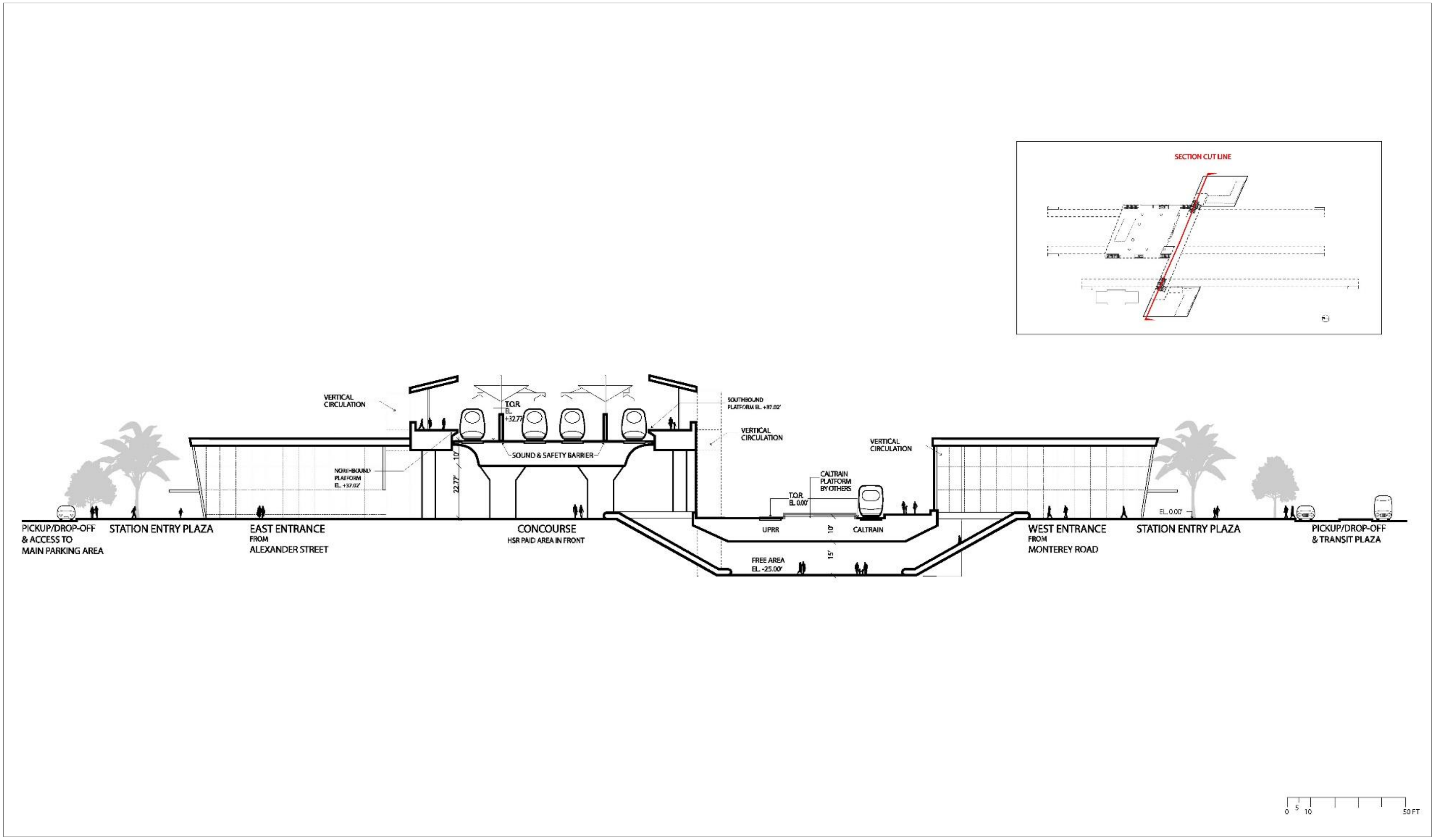
A total of eight bus bays would be provided. Street improvements would include realignment of Old Gilroy Street at East 7th Street; existing grade crossings would remain unchanged. A 4,000-square-foot bicycle facility would be constructed. Class II bike lanes would be provided on 7th and Alexander Streets.



Source: Authority 2019b

JUNE 2019

Figure 2-10 Conceptual Downtown Gilroy Aerial Station Plan



Source: Authority 2019b

JUNE 2019

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.

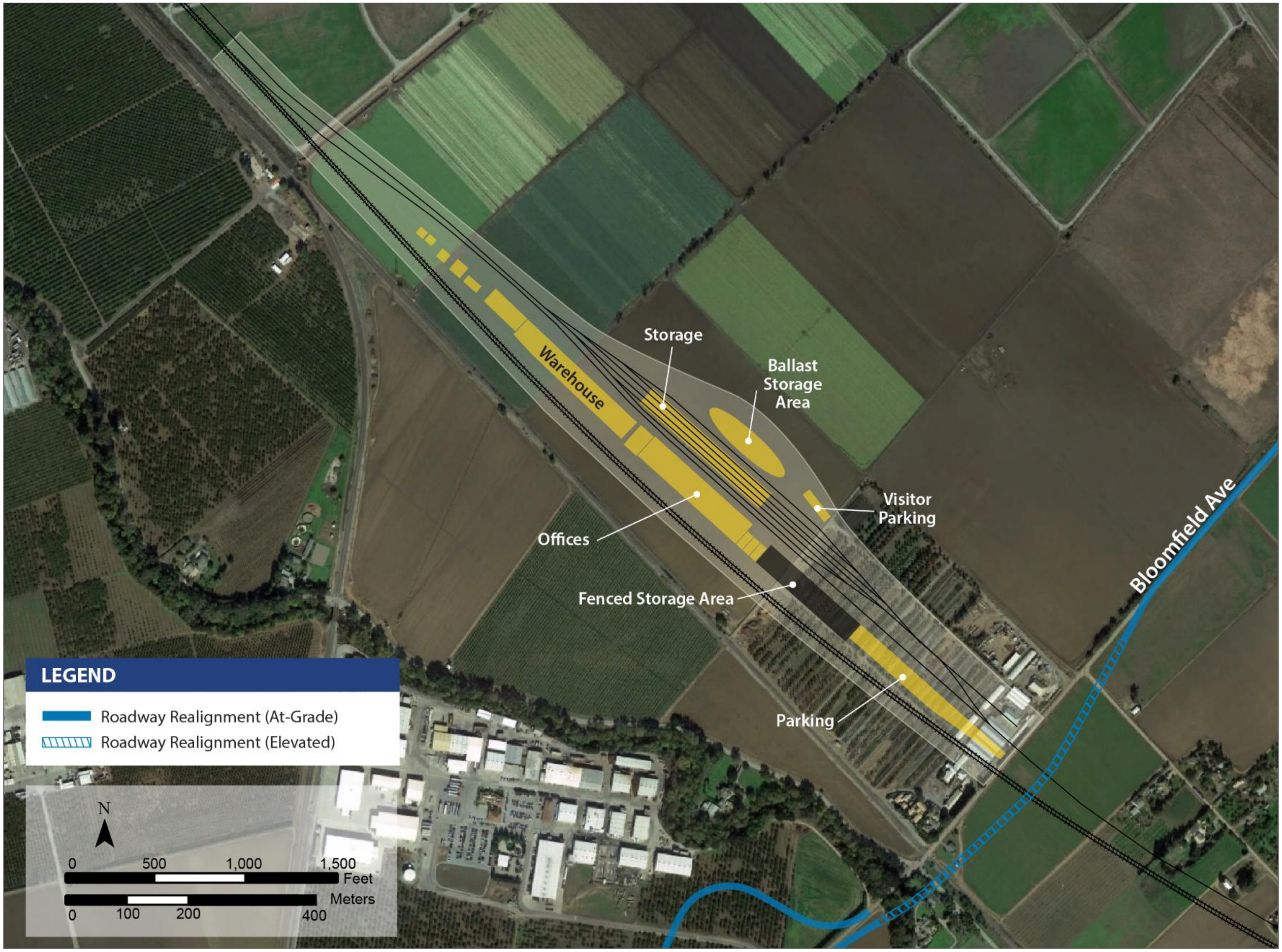
From the eastern limit of the Morgan Hill and Gilroy Subsection, the guideway would transition from aerial structure to embankment along the southern boundary of Casa de Fruta. This stretch of embankment would be on fill or in excavated hillside cuts to accommodate a level HSR guideway profile over varied 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 SR 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 2019b

JUNE 2019

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 Facilities

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

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

Train Control and Communication Facilities

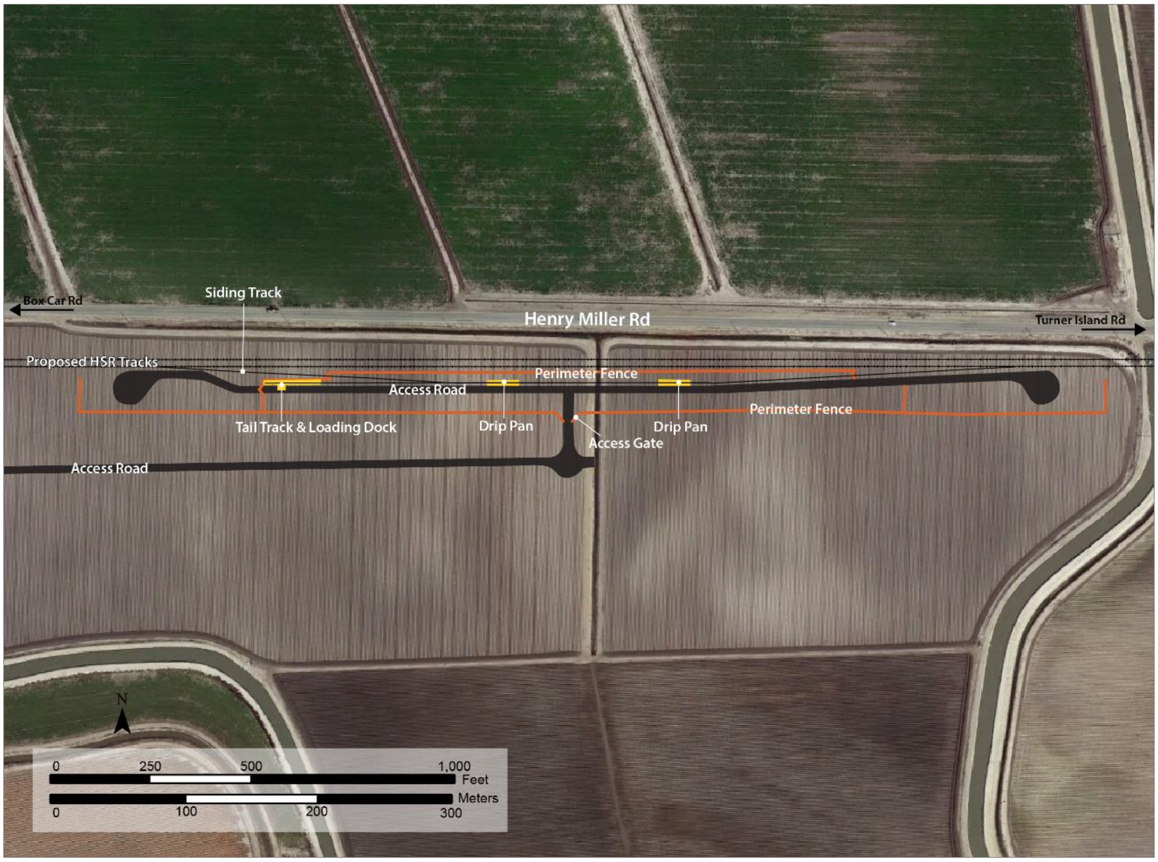
Four ATC sites would be constructed in the San Joaquin Valley Subsection:

- 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 2019b JUNE 2019

Figure 2-13 Maintenance of Way 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

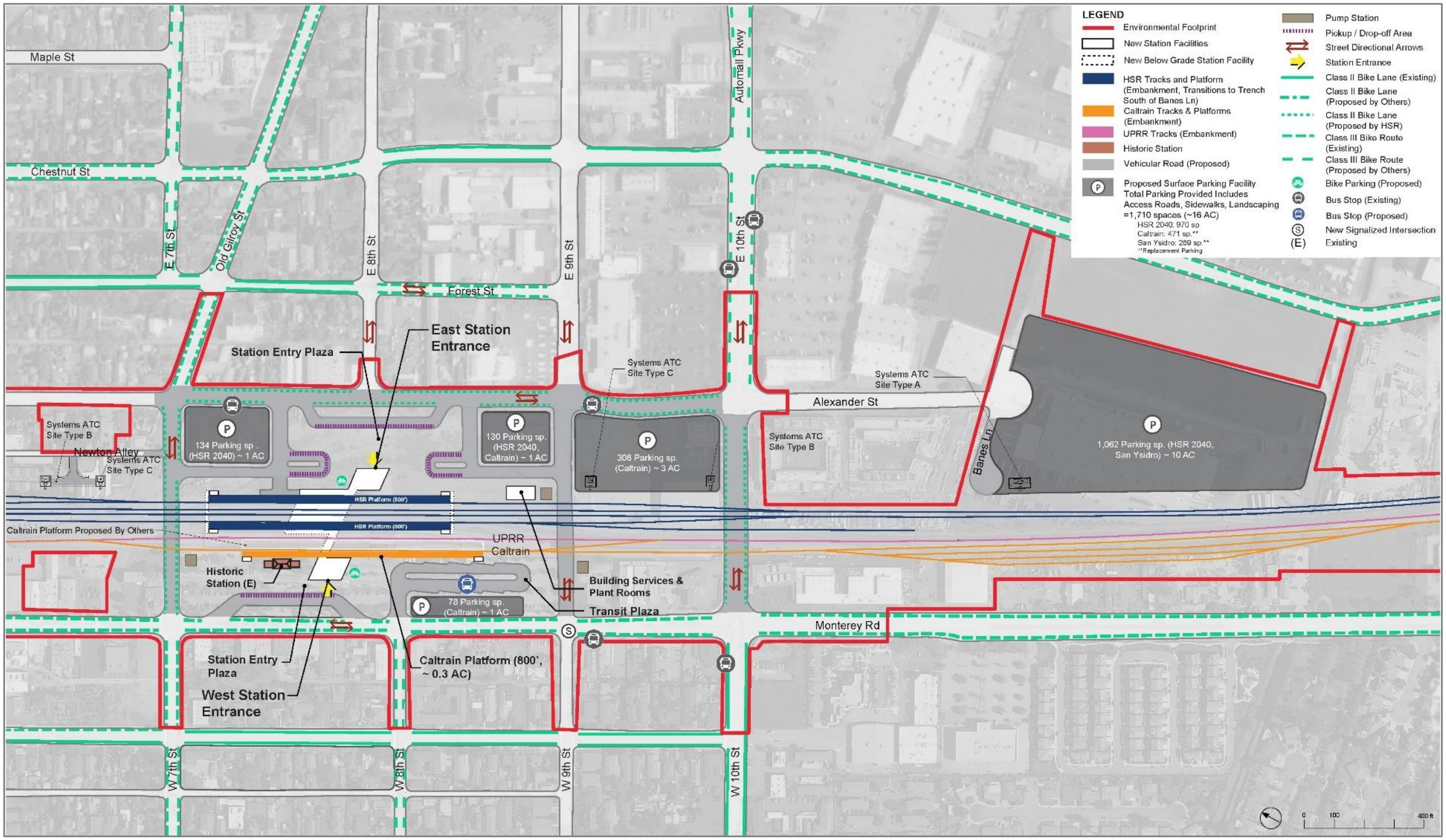
Alternative 2 would enter the Downtown Gilroy Station on embankment (Figures 2-14 and 2-15). The station layout and configuration would be similar to that described for Alternative 1, except that UPRR and Caltrain would be elevated to the same height as HSR on the embankment. The embankment station would 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.

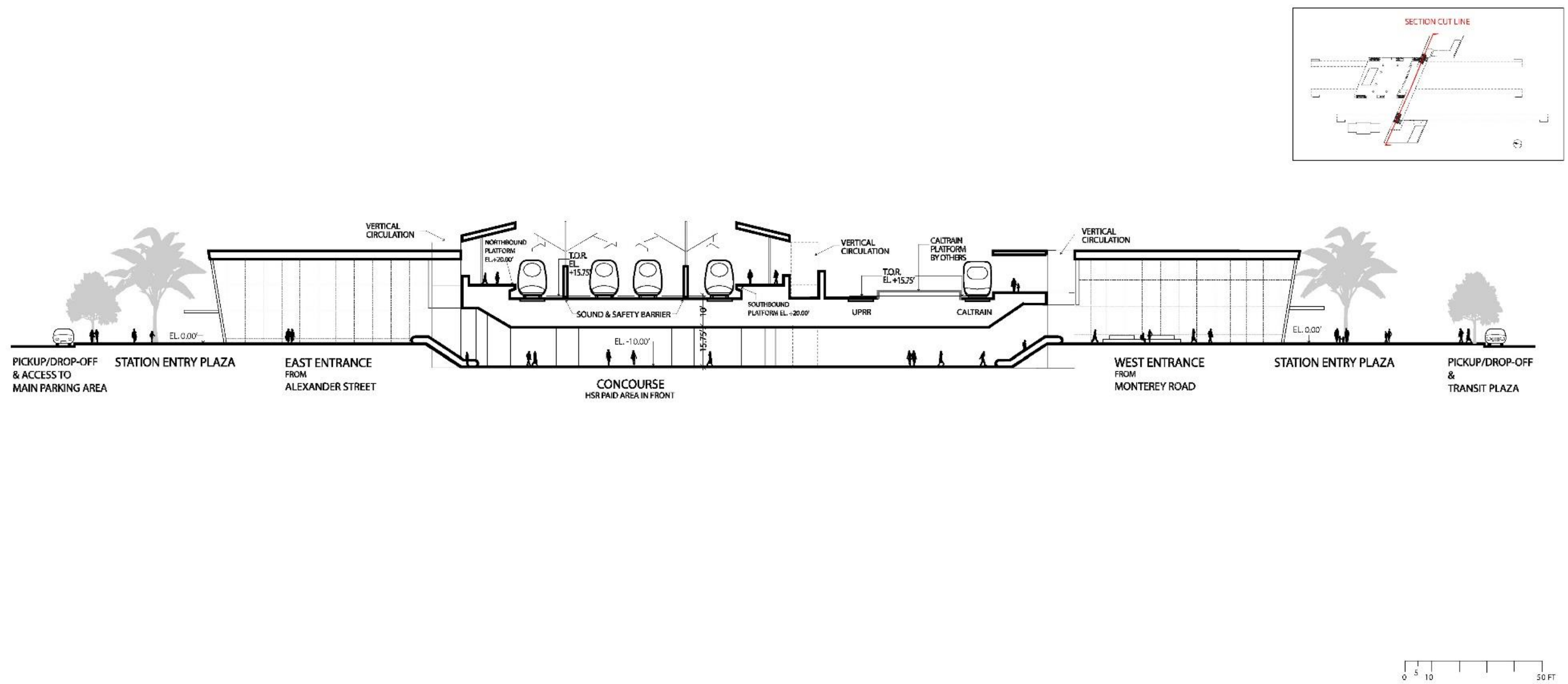
A traction power switching station would be constructed east of the HSR alignment at a location north of Paquita Espana Court or north of Palm Avenue.



Source: Authority 2019b

JUNE 2019

Figure 2-14 Conceptual Downtown Gilroy Embankment Station Plan



Source: Authority 2019b

JUNE 2019

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 MOWS would be constructed near 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:

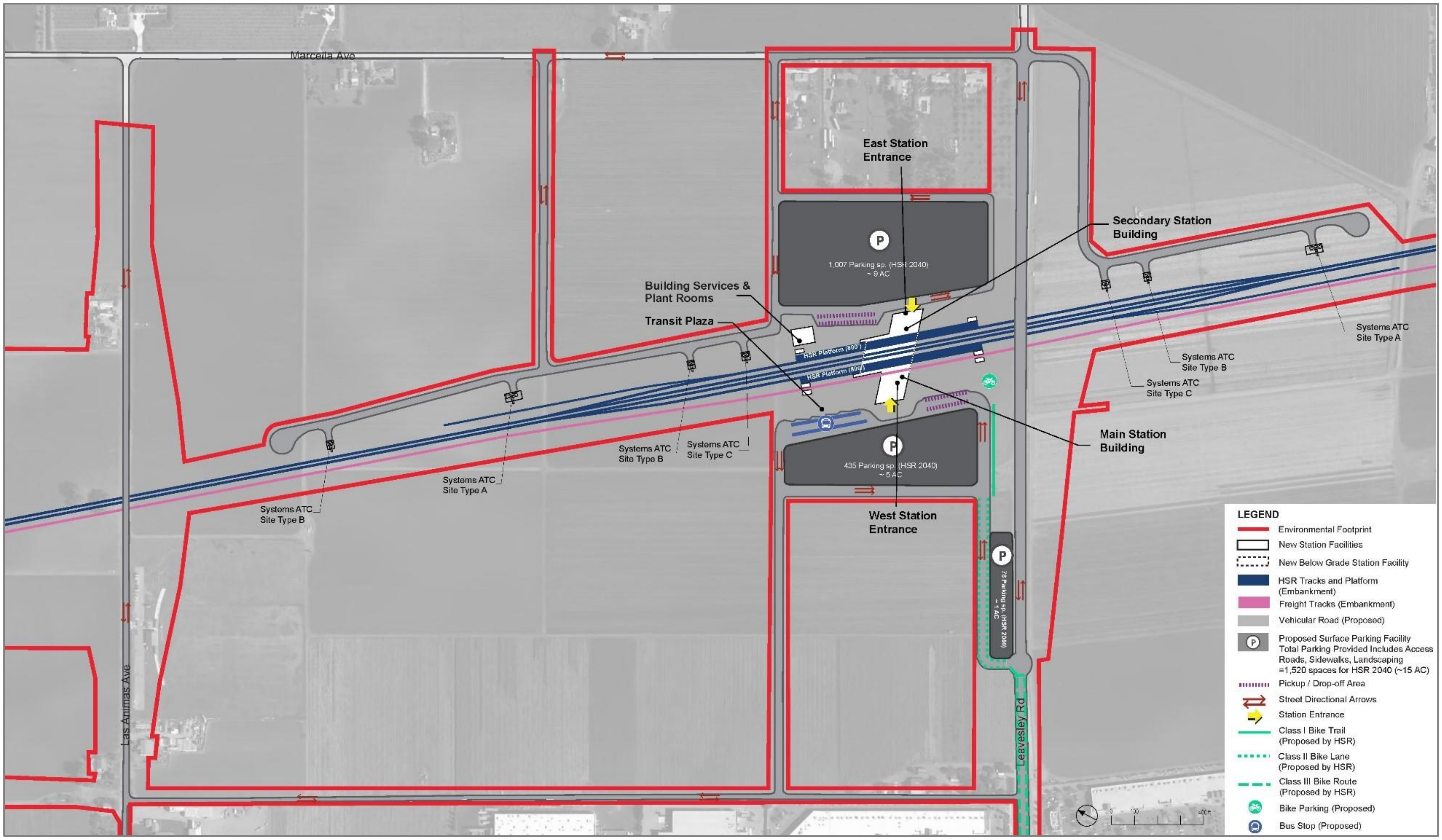
- South of the alignment, located either south of Diana Avenue or at the intersection of San Pedro Avenue and Walnut Grove Drive (like Alternative 1)
- Either at the northwest or southeast corner of the HSR crossing of Masten Avenue
- South of Gilroy at one of three site options: on Lake Road north of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

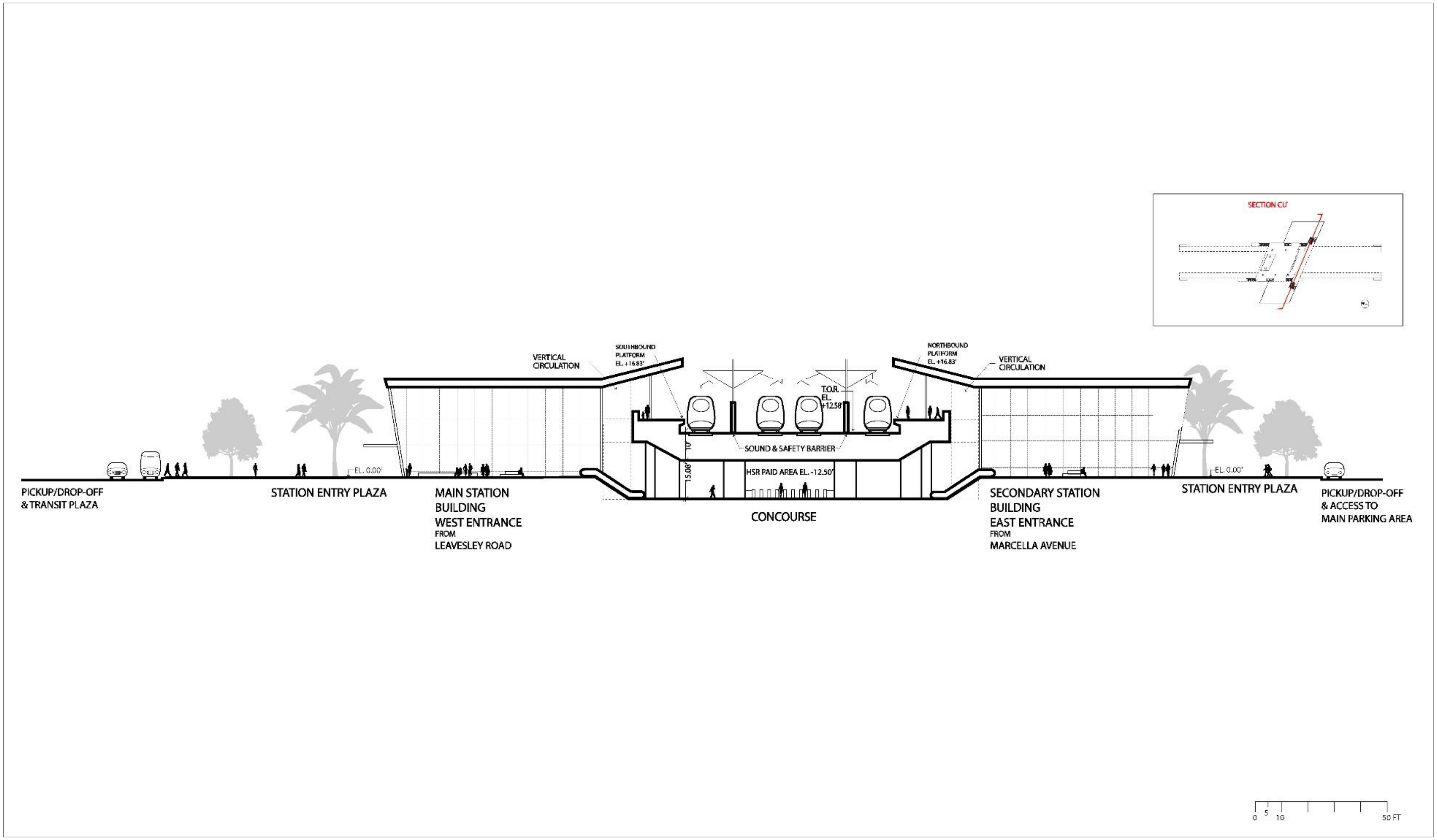
- One site east of Monterey Road near Palm Avenue (two site options)
- One site near East Middle Avenue (two site options)
- Two sites near Cohansey Way
- Four sites between Las Animas Avenue and Leavesley Road
- Three sites south of Leavesley Road
- Four sites north of SR 152, east of Gilroy
- Two sites within the MOWF
- Three sites north of Bloomfield Avenue
- One site near Lake Road (two site options)



Source: Authority 2019b

JUNE 2019

Figure 2-16 Conceptual East Gilroy Station Plan



Source: Authority 2019b

JUNE 2019

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.

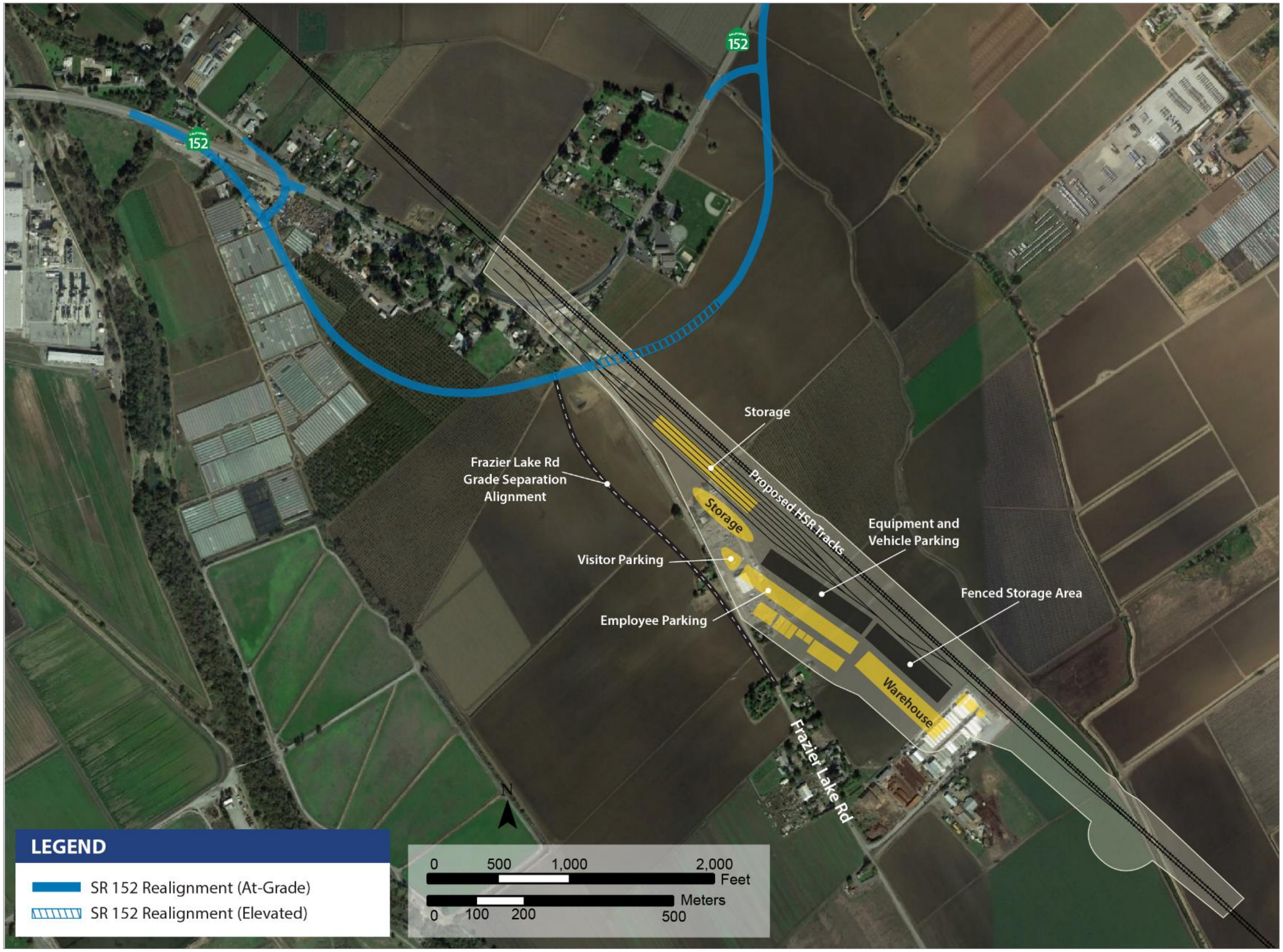
Traction Power Facilities

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.

.



Source: Authority 2019b

JUNE 2019

Figure 2-18 East Gilroy Maintenance of Way Facility

Maintenance Facilities

An MOWS would be constructed near 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.

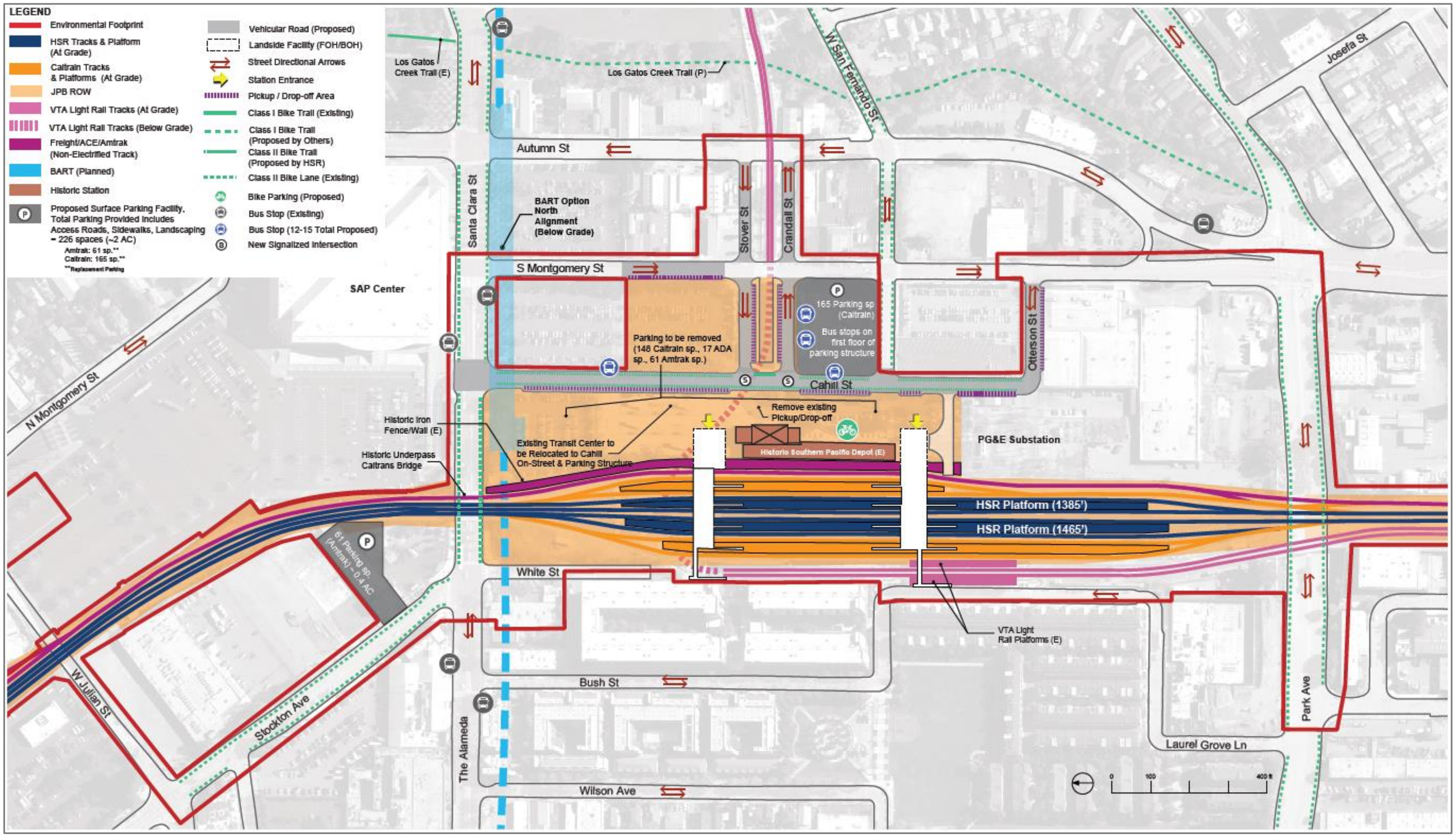
Development of Alternative 4 was intended to extend blended electric-powered passenger railroad infrastructure from the southern limit of the Caltrain Peninsula Corridor Electrification Project through Gilroy. South and east of Gilroy, HSR would operate in a dedicated guideway similar to Alternatives 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 2019b

JUNE 2019

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. 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.

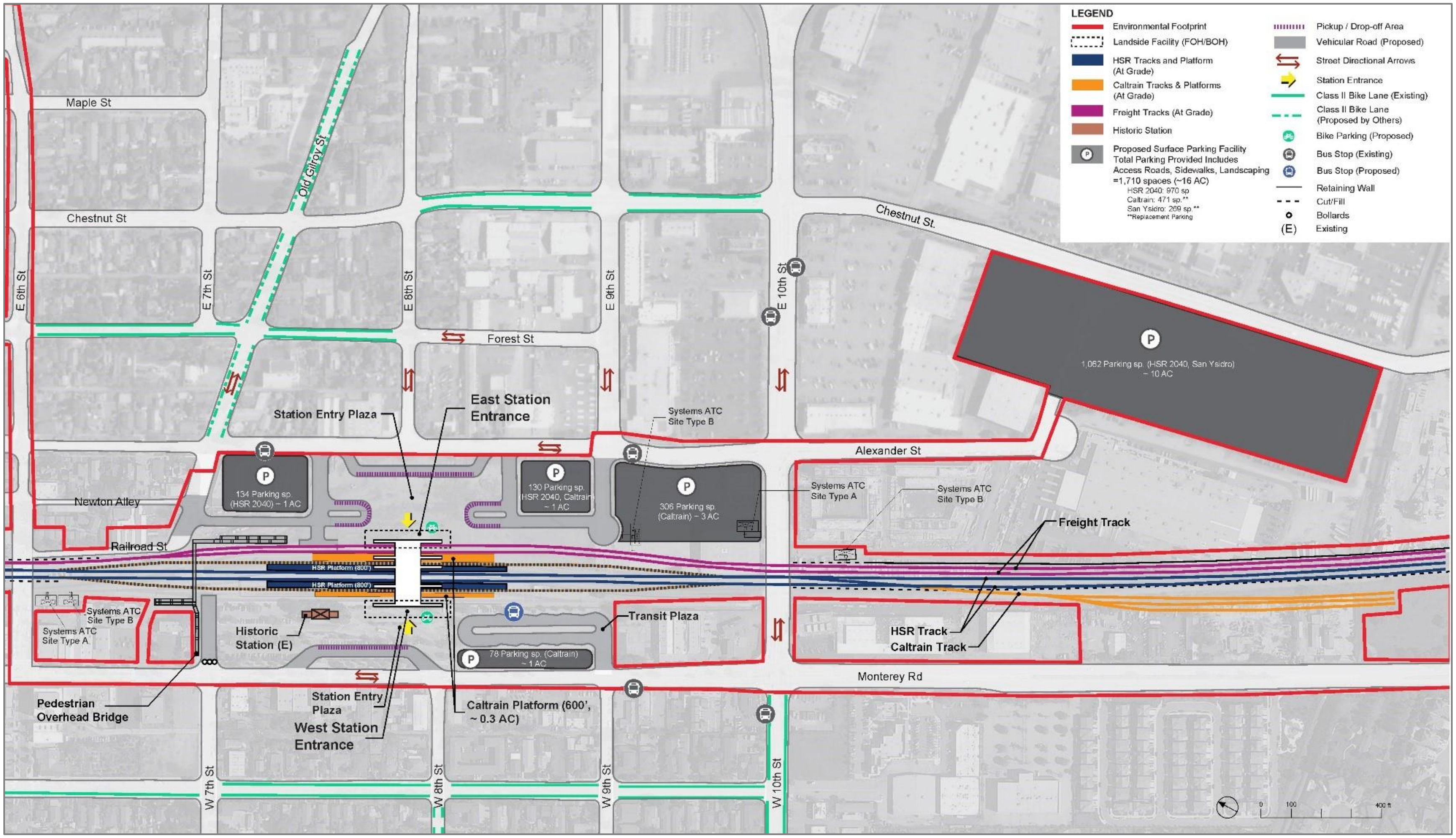
The existing 489 Caltrain parking spaces on the west side of the station would be replaced 1:1 in parking lots on the east and west sides of the alignment. The existing 269 parking spaces at the San Ysidro housing development would be replaced 1:1 with new surface parking at the south end of Alexander 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 2019b

JUNE 2019

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

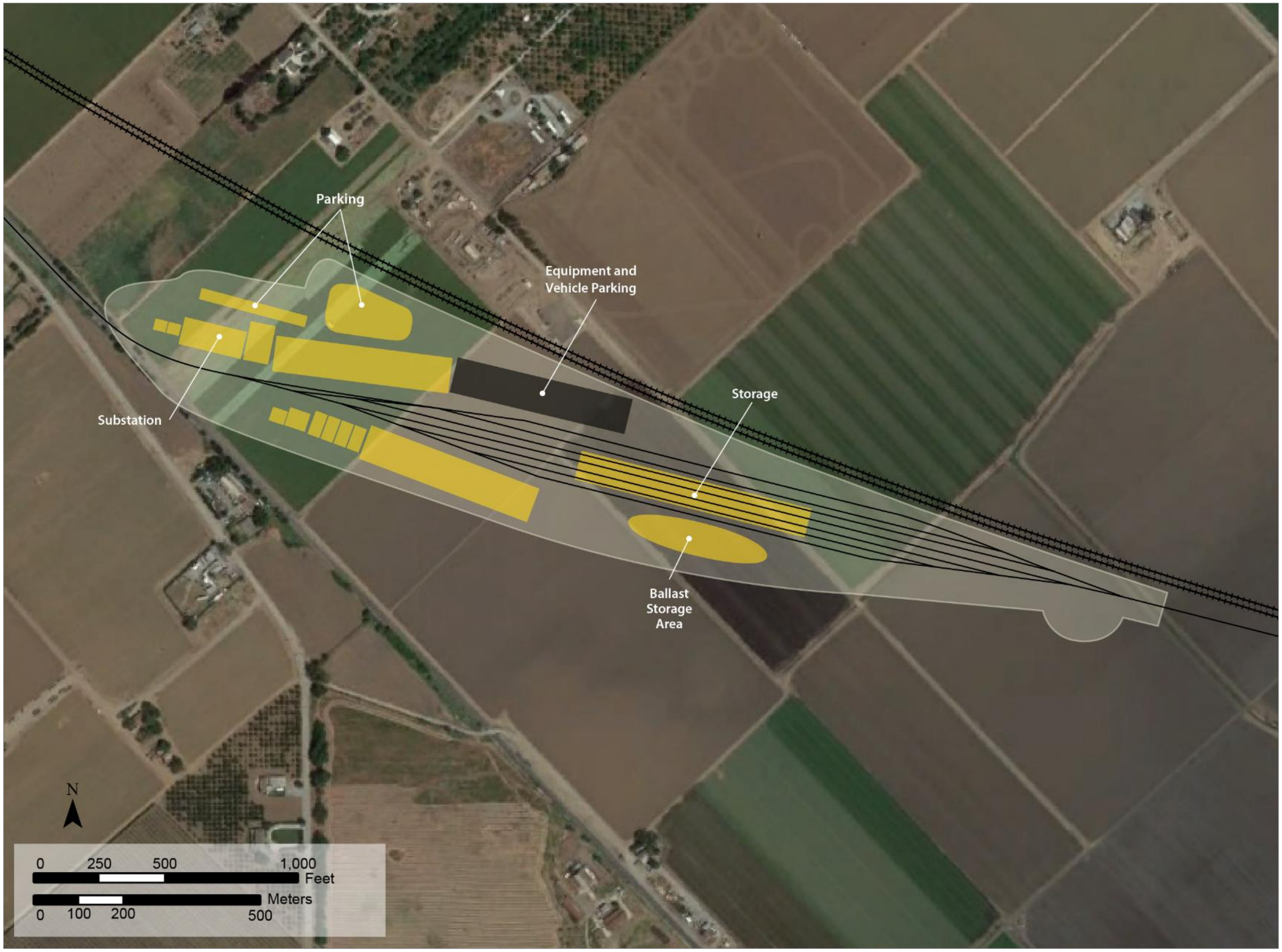
Traction power facilities of Alternative 4 would be as described for Alternatives 1–3.

Train Control and Communication Facilities

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

Maintenance Facilities

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



Source: Authority 2019b

JUNE 2019

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

2.3 Impact Avoidance and Minimization Features

The Authority has developed impact avoidance and minimization features (IAMF) that would avoid or minimize potential effects. IAMFs are standard practices, actions, and design features that are incorporated into the project to avoid or minimize environmental or community effects. The description of each IAMF details the means and effectiveness of the feature in avoiding or minimizing effects, as well as the environmental benefits of implementing the measure. Table 2-2 shows complete descriptions of all IAMFs that the Authority and FRA would implement to address potential effects related to air quality and GHGs.

Table 2-2 Summary of Air Quality and Greenhouse Gas Impact Avoidance and Minimization Features

IAMF	Description
AQ-IAMF#1: Fugitive Dust Emissions	This action reduces construction-related air quality emissions by requiring the preparation of a fugitive dust control plan. This plan identifies the minimum features that would be implemented during ground-disturbing activities. Examples of these include covering all materials (truck beds) transported on public roads, watering exposed graded surfaces, limiting vehicle speed on the construction site, suspending operations during high wind events, stabilizing all disturbed graded areas, wetting exterior surfaces of structures during demolition, and removing any accumulation of mud or dirt from adjacent public streets. These types of construction best management practices are proven methods of minimizing fugitive dust generation associated with ground-disturbing and demolition construction activities. Each air district traversed by the HSR has adopted rules and/or regulations requiring dust control plans for construction activities. These dust control plans are a part of each district's overall strategy for compliance with federal and state air quality standards.
AQ-IAMF#2: Selection of Coatings	This commitment reduces overall construction emissions by limiting the type of paint to those containing VOC of less than 10 percent (low) to be used during construction. Using paint that releases fewer organic compounds into the air after application is an air quality management measure effective in reducing construction emissions and achieving federal and state air quality standards.

IAMF	Description
AQ-IAMF#3: Renewable Diesel	This commitment requires the contractor to use renewable diesel fuel to minimize and control exhaust emissions from all heavy-duty off-road diesel-fueled construction diesel equipment and on-road diesel trucks. Renewable diesel must meet the most recent ASTM D975 specification for Ultra Low Sulfur Diesel and have a carbon intensity no greater than 50 percent of diesel with the lowest carbon intensity among petroleum diesel fuels sold in California. Using renewable diesel releases less carbon dioxide into the atmosphere, thereby helping reduce greenhouse gas emissions.
AQ-IAMF#4: Reduce Criteria Exhaust Emissions from Construction Equipment	This commitment would be effective in reducing criteria pollutant emissions from off-road equipment. This construction contract requirement would involve utilizing equipment that meets USEPA Tier 4 emission standards, instead of a mix of equipment meeting various engine tiers.
AQ-IAMF#5: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment	This commitment would be effective in reducing criteria pollutant emissions from on-road equipment. This construction contract requirement would involve utilizing model year 2010 or newer on-road engines, instead of a mix of vehicles with various engine model years.
AQ-IAMF#6: Reduce the Potential Impact of Concrete Batch Plants	This measure requires documentation of concrete batch plant location and design requirements. Concrete batch plants would be sited at least 1,000 feet from sensitive receptors. Batch plant technology would include typical control measures to reduce fugitive dust in a manner equivalent to the USEPA AP-42 controlled emissions factors for concrete batch plants. Proper location and utilization of typical control measures would be effective in reducing fugitive dust and health risk during concrete batching.

Source: Authority and FRA 2019
HSR = high-speed rail
VOC = volatile organic compound
USEPA = U.S. Environmental Protection Agency

3 LAWS, REGULATIONS, AND ORDERS

This chapter provides a summary of federal, state, and local laws, regulations, and orders that regulate air quality and GHG and that apply to the project.

Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Air pollutants degrade the atmosphere by reducing visibility, damaging property, and combining to form smog. Air pollutants result in effects on humans by reducing the productivity or vigor of crops or natural vegetation, and by reducing human or animal health. *Air quality* describes the amount of air pollution to which the public is exposed.

The U.S. Environmental Protection Agency (USEPA) is responsible for establishing the national ambient air quality standards (NAAQS), enforcing the CAA (42 United States Code [U.S.C.] § 7401), and regulating transportation-related emission sources, such as aircraft, ships, and certain types of locomotives, under the exclusive authority of the federal government. The USEPA also establishes vehicular emission standards, including those for vehicles sold in states other than California. Automobiles sold in California must meet stricter emission standards established by the California Air Resources Board (CARB).

3.1 Federal

3.1.1 Clean Air Act (42 U.S.C. § 7401) and National Ambient Air Quality Standards

The CAA defines nonattainment areas as geographic regions designated as not meeting one or more of the NAAQS, which are standards that the USEPA has established for six major air pollutants, known as criteria pollutants. It requires that a state implementation plan (SIP) be prepared for each nonattainment area and a maintenance plan be prepared for each former nonattainment area that subsequently demonstrates compliance with the standards. A SIP is a compilation of a state's air quality control plans and rules, approved by the USEPA. Section 176(c) of the CAA provides that federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or approving any project unless the project conforms to the applicable SIP. The state's and USEPA's goals are to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of these standards.

The six major criteria pollutants subject to the NAAQS are ozone (O_3), particulate matter (PM) (PM_{10} is PM 10 microns in diameter or less, and $PM_{2.5}$ is PM 2.5 microns in diameter or less), CO, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb) (Table 3-1). The California ambient air quality standards (CAAQS) are statewide standards established by the CARB that are generally more stringent than the NAAQS and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. California's regulations are discussed in more detail in Section 3.2, State.

Table 3-1 summarizes state and federal standards by pollutant. Chapter 4 also shows the standards for each pollutant by averaging time and the method of measurement. The primary standards are intended to protect public health. The secondary standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

Table 3-1 State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 µg/m³)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m³)		0.070 ppm (137 µg/m³)		
Respirable Particulate Matter (PM_{10})[9]	24 Hour	50 µg/m³	Gravimetric or Beta Attenuation	150 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m³		—		
Fine Particulate Matter ($PM_{2.5}$)[9]	24 Hour	—	—	35 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m³	Gravimetric or Beta Attenuation	12.0 µg/m³	15 µg/m³	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m³)	Non-Dispersive Infrared Photometry	35 ppm (40 mg/m³)	—	Non-Dispersive Infrared Photometry
	8 Hour	9.0 ppm (10 mg/m³)		9 ppm (10 mg/m³)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m³)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 µg/m³)	Gas Phase Chemiluminescence	100 ppb (188 µg/m³)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m³)		0.053 ppm (100 µg/m³)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 µg/m³)	Ultraviolet Fluorescence	75 ppb (196 µg/m³)	—	Ultraviolet Fluorescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m³)	
	24 Hour	0.04 ppm (105 µg/m3)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	

<table>
<tr><th rowspan="2">Pollutant</th><th rowspan="2">Averaging Time</th><th colspan="2">California Standards [1]</th><th colspan="3">National Standards [2]</th></tr>
<tr><th>Concentration [3]</th><th>Method [4]</th><th>Primary [3,5]</th><th>Secondary [3,6]</th><th>Method [7]</th></tr>
<tr><td rowspan="3">Lead (Pb)[12,13]</td><td>30 Day Average</td><td>1.5 µg/m³</td><td rowspan="3">Atomic Absorption</td><td>—</td><td>—</td><td rowspan="3">High Volume Sampler and Atomic Absorption</td></tr>
<tr><td>Calendar Quarter</td><td>—</td><td>1.5 µg/m³ (for certain areas)[12]</td><td rowspan="2">Same as Primary Standard</td></tr>
<tr><td>Rolling 3-Month Average</td><td>—</td><td>0.15 µg/m³</td></tr>
<tr><td>Visibility-Reducing Particles[14]</td><td>8 Hour</td><td>See footnote 14</td><td>Beta Attenuation and Transmittance through Filter Tape</td><td colspan="3" rowspan="4">No National Standards</td></tr>
<tr><td>Sulfates</td><td>24 Hour</td><td>25 µg/m³</td><td>Ion Chromatography</td></tr>
<tr><td>Hydrogen Sulfide</td><td>1 Hour</td><td>0.03 ppm (42 µg/m³)</td><td>Ultraviolet Fluorescence</td></tr>
<tr><td>Vinyl Chloride[12]</td><td>24 Hour</td><td>0.01 ppm (26 µg/m³)</td><td>Gas Chromatography</td></tr>
</table>

Source: CARB 2016
°C = degrees Celsius
CAAQS = California ambient air quality standards
CARB = California Air Resources Board
CO = carbon monoxide
NAAQS = national ambient air quality standards
mg/m³ = milligrams per cubic meter
NO_2 = nitrogen dioxide
O_3 = ozone
Pb = lead
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
ppb = parts per billion
ppm = parts per million
SO_2 = sulfur dioxide
TAC = toxic air contaminants
USEPA = U.S. Environmental Protection Agency
> = greater than
N/A = not applicable or there was insufficient or no data available to determine the value
µg/m³ = micrograms per cubic meter of air
— = no standard

[1] California standards for O_3, CO (except 8-hour Lake Tahoe), SO_2 (1 and 24 hour), NO_2, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility-reducing particles) are values that are not to be exceeded. All others are not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations

[2] National standards (other than O_3, PM, and those based on annual arithmetic mean) are not to be exceeded more than once per year. The O_3 standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the USEPA for further clarification and current national policies.

[3] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Any equivalent measurement method which can be shown to the satisfaction of the CARB to give equivalent results at or near the level of the air quality standard may be used.
[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated effects of a pollutant.
[7] Reference method as described by the USEPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the USEPA.
[8] On October 1, 2015, the national 8-hour O_3 primary and secondary standards were lowered from 0.075 to 0.070 ppm.
[9] On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m^3 to 12.0 µg/m^3. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 µg/m^3, as was the annual secondary standard of 15 µg/m^3. The existing 24-hour PM_{10} standards (primary and secondary) of 150 µg/m^3 also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.
[10] To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of ppb. California standards are in units of ppm. To directly compare the national 1-hour standard to the California standards, the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.
[11] On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved. Note that the 1-hour national standard is in units of ppb. California standards are in units of ppm. To directly compare the 1-hour national standard to the California standard, the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
[12] The CARB has identified Pb and vinyl chloride as TAC with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
[13] The national standard for Pb was revised on October 15, 2008, to a rolling 3-month average. The 1978 Pb standard (1.5 µg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
[14] In 1989, the CARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

3.1.2 Conformity Rule

Pursuant to CAA Section 176(c) requirements, the USEPA promulgated 40 C.F.R. Part 51, Subpart W and 40 C.F.R. Part 93B, Determining Conformity of General Federal Actions to State or Federal Implementation Plans (§ 63214) (November 30, 1993) as amended; 75 *Federal Register* (Fed. Reg.) 17253 (April 5, 2010). These regulations, commonly referred to as the General Conformity Rule, apply to all federal actions, including FRA actions on the HSR System. Federal actions that are excluded from review (e.g., stationary emission sources that hold permits under the federal New Source Review program) or related to transportation plans, programs, and projects under the Federal Highway Act (Title 23 U.S.C.) or the Federal Transit Act (Title 49 U.S.C.) are not subject to General Conformity. Transportation actions under Title 23 or Title 49 are subject to transportation conformity (40 C.F.R. Part 51T and 40 C.F.R. Part 93A). 40 C.F.R. Part 51, Subpart W, applies in states that have an approved SIP revision adopting the General Conformity Rule.

The General Conformity Rule is used to determine if federal actions meet the requirements of the CAA and the applicable SIP so that air emissions related to the action do not result in the following outcomes:

- Cause or contribute to new violations of an NAAQS
- Increase the frequency or severity of any existing violation of an NAAQS
- Delay timely attainment of an NAAQS or interim emission reduction

A conformity determination under the General Conformity Rule is required if the federal agency determines that all of the following criteria apply:

- The action will occur in a nonattainment or maintenance area
- One or more specific exemptions do not apply to the action
- The action is not included in the federal agency's "presumed to conform" list
- The emissions from the proposed action are not within the approved emissions budget for an applicable facility
- The total direct and indirect emissions of a pollutant (or its precursors) are at or above the *de minimis* levels established in the General Conformity Rule (75 Fed. Reg. 17255)

Conformity regulatory criteria are listed in 40 C.F.R. Section 93.158. An action would be determined to conform to the applicable SIP if, for each pollutant that exceeds the *de minimis* emissions level in 40 C.F.R. Section 93.153(b), or otherwise requires a conformity determination because of the total of direct and indirect emissions from the action, the action meets the requirements of 40 C.F.R. Section 93.158(c).

In addition, federal activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions toward attainment. The project is subject to review under the USEPA General Conformity Rule.

3.1.3 Mobile Source Air Toxics/Hazardous Air Pollutants

In addition to the NAAQS criteria pollutants, the USEPA regulates MSATs. MSATs are compounds emitted from highway vehicles and nonroad equipment that are known or suspected to cause cancer or other serious health and environmental effects. In February 2007, the USEPA finalized a rule (Control of Hazardous Air Pollutants from Mobile Sources, February 9, 2007) to reduce hazardous air pollutants (HAP) from mobile sources. The rule limits the benzene content of gasoline and reduces toxic emissions from passenger vehicles and gas cans. The USEPA estimates that in 2030 this rule would reduce total emissions of MSATs by 330,000 tons and volatile organic compound (VOC) emissions (precursors to O_3 and $PM_{2.5}$) by more than 1 million tons. The latest revision to this rule, which added specific benzene control technologies, occurred in October 2008. No NAAQS or CAAQS exist for MSATs. Specifically, the USEPA has not established NAAQS or provided ambient standards for HAPs.

On October 18, 2016, the FHWA released *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents,* which superseded the February 2006 interim guidelines. The FHWA's guidance advises when and how to analyze MSATs in the NEPA environmental review process for highways and other transportation-related projects. This guidance was followed to define the MSAT analysis for the project.

By 2010, the USEPA's existing programs had reduced MSATs by more than 1 million tons from 1999 levels (USEPA 2015a). In addition to controlling pollutants such as hydrocarbons, PM, and nitrogen oxides (NO_X), recent USEPA regulations controlling emissions from highway vehicles and nonroad equipment will result in large reductions in toxic emissions to the air. The USEPA is developing programs that would provide additional benefits (further controls) for small non-road gasoline engines, diesel locomotives, and marine engines. Several USEPA programs reduce risk in communities. These programs include Clean School Bus USA, the Voluntary Diesel Retrofit Program, Best Workplaces for Commuters, and the National Clean Diesel Campaign.

3.1.4 Federal Greenhouse Gas Regulations and Guidance

Climate change and GHG emission reductions are a concern at the federal level. Laws, regulations, plans, and policies address global climate change issues. This section summarizes key federal regulations relevant to the proposed project.

In *Massachusetts v. U.S. Environmental Protection Agency, et al.*, 549 U.S. 497 (2007), the United States Supreme Court ruled that GHGs fit within the CAA's definition of air pollutants and that the USEPA has the authority to regulate GHGs.

On September 22, 2009, the USEPA published the Final Rule that requires mandatory reporting of GHG emissions from large sources in the U.S. The rule amends CAA Regulations under 40 C.F.R. Parts 86, 87, 89, 90, and 94 and provides a new section, Part 98. The USEPA uses the reports to collect accurate and comprehensive emissions data that can inform future policy decisions. Facilities that emit 25,000 metric tons or more per year of GHG emissions must submit annual reports to the USEPA under Subpart C of the final rule. The final rule covers the GHGs carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (SF_6), and other fluorinated gases, including nitrogen trifluoride and hydrofluorinated ethers. This is not a transportation-related regulation. However, the methodology developed as part of this regulation is helpful in identifying potential GHG emissions.

On October 5, 2009, President Obama signed U.S. Presidential Executive Order (USEO) 13514; *Federal Leadership in Environmental, Energy, and Economic Performance*. USEO 13514 requires federal agencies to set a 2020 GHG emission-reduction target within 90 days, increase energy efficiency, reduce fleet petroleum consumption, conserve water, reduce waste, support sustainable communities, and leverage federal purchasing power to promote environmentally responsible products and technologies. On December 7, 2009, the *Final Endangerment and Cause or Contribute Findings for Greenhouse Gases* under Section 202(a) of the CAA went into effect. The endangerment finding states that current and projected concentrations of the six key well-mixed GHGs in the atmosphere—CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and SF_6—threaten the public health and welfare of current and future generations. Furthermore, it states that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare (USEPA 2015b).

Based on the endangerment finding, the USEPA revised vehicle emission standards under the CAA. The USEPA and the National Highway Traffic Safety Administration (NHTSA) issued a joint final rulemaking to update the Corporate Average Fuel Economy (CAFE) fuel standards on October 15, 2012 (77 Fed. Reg. 62623), requiring substantial improvements in fuel economy and reductions in GHG emissions for all light-duty vehicles sold in the U.S. The new standards apply to new passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2017–2025. The USEPA GHG standards require that these vehicles meet an estimated combined average emissions level of 163 grams of CO_2 per mile in model year 2025, which would be equivalent to 54.5 miles per gallon if the automotive industry were to meet this CO_2 level entirely through fuel economy improvements.

On September 15, 2011, the USEPA and NHTSA issued a final rule of *Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles* (76 Fed. Reg. 7106). This final rule is tailored to each of three regulatory categories of heavy-duty vehicles—combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles—and applies to model years 2014–2018. The USEPA and NHTSA estimated that the new standards in this rule will reduce CO_2 emissions by approximately 270 million metric tons (MT) and save 530 million barrels of oil over the life of vehicles sold during the 2014–2018 model years. The USEPA and NHTSA signed Phase 2 of these standards on August 16, 2016, which apply to model years 2019–2027 medium- and heavy-duty vehicles. The USEPA and NHTSA have determined that the Phase 2 standards would lower CO_2 emissions by approximately 1.1 billion metric tons and save up to 2 billion barrels of oil over the life of vehicles regulated under the program (USEPA 2016a).

On October 15, 2012, the USEPA and the NHTSA issued CAFE standards for model years 2017 and beyond; these standards will reduce GHG emissions by increasing the fuel economy of light-duty vehicles to 54.5 miles per gallon by model year 2025. To further California's support of the national program to regulate emissions, the CARB submitted a proposal that would allow automobile manufacturer compliance with the USEPA's requirements to show compliance with California's requirements for the same model years. The Final Rulemaking Package was filed on December 6, 2012, and the final rulemaking became effective December 31, 2012. In July 2016, the USEPA, NHTSA, and CARB released a mid-term evaluation of the October 2012 final rule in a draft technical assessment report (USEPA et al. 2016). The draft technical assessment report makes the following conclusions:

- A wider range of technologies exists for manufacturers to meet the model year 2022–2025 standards, and at costs that are similar or lower, than those projected in the 2012 rule.
- Advanced gasoline vehicle technologies will continue to be the predominant technologies, with modest levels of strong hybridization and very low levels of full electrification (plug-in vehicles) needed to meet the standards.
- The car/truck mix reflects updated consumer trends that are informed by a range of factors including economic growth, gasoline prices, and other macro-economic trends. However, as the standards were designed to yield improvements across the light-duty vehicle fleet, irrespective of consumer choice, updated trends are fully accommodated by the footprint-based standards.

On August 2, 2018, the NHTSA and USEPA proposed to amend the fuel efficiency standards for passenger cars and light trucks and establish new standards covering model years 2021 through 2026 by maintaining the current model year 2020 standards through 2026; the rule has not yet been finalized (as of January 2019) (NHTSA 2018).

On February 18, 2010, the White House Council on Environmental Quality (CEQ) released draft guidance regarding the consideration of GHG in NEPA documents for federal actions. The CEQ issued revised draft guidance in December 2014 and final guidance in August 2016 (CEQ 2016). On April 25,2017, CEQ withdrew the guidance pursuant to USEO 13783, but noted "the withdrawal of the guidance does not change any law, regulation, or other legally binding requirement (82 Fed. Reg. 16576)." The CEQ released new draft guidance on June 26, 2019, which if finalized would replace the withdrawn August 2016 guidance. The June 2019 guidance requires federal agencies to analyze the direct, indirect, and cumulative impacts of a proposed action's GHG emissions, as well as consider the impacts of climate change on the project.

3.2 State

3.2.1 California Clean Air Act and California Ambient Air Quality Standards

The California Clean Air Act requires that nonattainment areas achieve and maintain the health-based CAAQS by the earliest practicable date. The act is administered by the CARB at the state level and by local air quality management districts at the regional level. The air districts are required to develop plans and control programs for attaining the state standards.

The CARB is responsible for implementation of the California Clean Air Act, meeting state requirements of the federal CAA, and establishing the CAAQS. The CARB is also responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. The CARB also establishes passenger vehicle fuel specifications.

3.2.2 Mobile Source Air Toxics/Toxic Air Contaminates

California regulates TACs (equivalent to the federal HAPs) primarily through the Toxic Air Contaminant Identification and Control Act (Tanner Act) and the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (Hot Spots Act). The Tanner Act created California's program to reduce exposure to air toxics. The Hot Spots Act supplements the Tanner Act by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks.

In August 1998, the CARB identified diesel particulate matter (DPM) from diesel-fueled engines as a TAC. In September 2000, the CARB approved a comprehensive Diesel Risk Reduction Plan to reduce emissions from both new and existing diesel-fueled engines and vehicles. The goal of the plan was to reduce DPM (respirable particulate matter) emissions and the associated health risk by 75 percent in 2010 and by 85 percent by 2020. The plan identifies 14 measures that target new and existing on-road vehicles (e.g., heavy-duty trucks and buses), off-road equipment (e.g., graders, tractors, forklifts, sweepers, and boats), portable equipment (e.g., pumps), and stationary engines (e.g., stand-by power generators).

The CARB has adopted regulations to reduce emissions from both on-road and off-road heavy-duty diesel vehicles (e.g., equipment used in construction). These regulations, known as Airborne Toxic Control Measures, reduce the idling of school buses and other commercial vehicles, control DPM, and limit the emissions of ocean-going vessels in California waters. The regulations also include measures to control emissions of air toxics from stationary sources. The California Toxics Inventory, developed by interpolating from CARB estimates of total organic gases and PM, provides emissions estimates by stationary, area-wide, on-road mobile, off-road mobile, and natural sources (CARB 2015a).

3.2.3 California Greenhouse Gas Regulations and Guidance

California has taken proactive steps, briefly described in this section, to address the issues associated with GHG emissions and climate change.

3.2.3.1 Assembly Bill 1493

With the passage of Assembly Bill (AB) 1493 in 2002, California launched an innovative and proactive approach to dealing with GHG emissions and climate change at the state level. AB 1493 requires the CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions. These stricter emissions standards were designed to apply to automobiles and light trucks beginning with the model year 2009. Although litigation challenged these regulations and the USEPA initially denied California's related request for a waiver, the waiver request was granted (CARB 2015b).

3.2.3.2 Executive Order S-3-05

On June 1, 2005, Governor Arnold Schwarzenegger signed California Executive Order (EO) S-3-05. The goal of this EO was to reduce California's GHG emissions to (1) 2000 levels by 2010; (2) 1990 levels by 2020; and (3) 80 percent below the 1990 levels by 2050. EO S-3-05 also calls for the California Environmental Protection Agency to prepare biennial science reports on the potential impact of continued global warming on certain sectors of the California economy. As a result of the scientific analysis presented in these biennial reports, a comprehensive Climate Adaptation Strategy was released in December 2009 following extensive interagency coordination and stakeholder input. The latest of these reports, Climate Action Team Biennial Report, was published in December 2010 (Cal-EPA 2010).

3.2.3.3 Assembly Bill 32

One goal of EO S-03-05 was further reinforced by AB 32 (Chapter 488, Statutes of 2006), the Global Warming Solutions Act of 2006, which requires the state to reduce GHG emissions to 1990 levels by 2020. AB 32 mandates that the CARB create a plan that includes market mechanisms and implement rules to achieve “real, quantifiable, cost-effective reductions of GHGs.” Separately, Governor Schwarzenegger signed EO S-20-06, which directs state agencies to begin implementing AB 32, including the recommendations made by the State’s Climate Action Team.

The following are specific requirements of AB 32:

- The CARB will prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions from sources or categories of sources of GHGs by 2020 (Cal. Health and Safety Code § 38561). The scoping plan, approved by the CARB on December 12, 2008, and updated in 2014 and 2017, provides the outline for future actions to reduce GHG emissions in California via regulations, market mechanisms, and other measures. The scoping plan includes the implementation of the HSR system as a GHG reduction measure, estimating a 2020 reduction of 1 million metric tons (t) of CO_2 equivalent (CO_2e).
- The CARB will identify the statewide level of GHG in 1990 to serve as the emissions limit to be achieved by 2020 (Cal. Health and Safety Code § 38550). In December 2007, the CARB approved the 2020 emission limit of 427 million metric tons of CO_2e of GHG.
- The CARB will adopt a regulation requiring the mandatory reporting of GHG emissions (Cal. Health and Safety Code § 38530). In December 2007, the CARB adopted a regulation requiring the largest industrial sources to report and verify their GHG emissions. The reporting regulation serves as a solid foundation to determine GHG emissions and track future changes in emission levels.

As of July 2016, California is on track to meet or exceed the target of reducing GHG to 1990 levels by 2020, which was previously established in the California Global Warming Solutions Act of 2006 (AB 32).

3.2.3.4 Executive Order S-01-07

With EO S-01-07, Governor Schwarzenegger set forth the low carbon fuel standard for California in 2007. Under this EO, the carbon intensity of California’s transportation fuels is to be reduced by at least 10 percent by 2020.

3.2.3.5 California Environmental Quality Act Guidelines Amendments to Address Greenhouse Gas Emissions

The State CEQA Guidelines amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project, and to consider feasible means to mitigate the significant effects of GHG emissions. The following provisions of the State CEQA Guidelines amendments pertain to addressing GHG emissions (CNRA 2009):

- A lead agency may consider the following when assessing the significance of effects from GHG emissions:
  - The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting

   - Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project
   - The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions
- When an agency makes a statement of overriding considerations, the agency may consider adverse environmental effects in the context of region wide or statewide environmental benefits.
- Lead agencies will consider feasible means of mitigating GHG emissions that may include, but not be limited to, the following:
   - Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision.
   - Reductions in emissions resulting from a project through implementation of project features, project design, or other measures.
   - Off-site measures, including offsets.
   - Measures that sequester GHGs.
- In the case of the adoption of a plan (e.g., general plan, long-range development plan, or GHG reduction plan), mitigation may include specific measures that may be implemented on a project-by-project basis. Mitigation may also incorporate specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

3.2.3.6 Senate Bill 375

SB 375, signed into law by Governor Schwarzenegger on September 30, 2008, became effective January 1, 2009. This law requires the state's 18 metropolitan planning organizations to develop the sustainable communities strategies (SCS) as part of their regional transportation plans (RTP) through integrated land use and transportation planning, and to demonstrate an ability to attain the GHG emissions reduction targets that the CARB established for the region by 2020 and 2035. This would be accomplished through either the financially constrained SCS as part of the RTP or an unconstrained alternative planning strategy. If regions develop integrated land use, housing, and transportation plans that meet the SB 375 targets, new projects in these regions can be relieved of certain CEQA review requirements.

In accordance with SB 375, the CARB appointed the Regional Targets Advisory Committee on January 23, 2009, to provide recommendations on factors to be considered and methodologies to be used in the CARB's target setting process. The Regional Targets Advisory Committee was required to provide its recommendations in a report to the CARB by September 30, 2009, to include any relevant issues such as data needs, modeling techniques, growth forecasts, jobs-housing balance, interregional travel, various land use/transportation issues affecting GHG emissions, and overall issues relating to setting these targets. The CARB adopted final targets on September 23, 2010. The CARB must update the regional targets every 8 years (or 4 years if it so chooses) consistent with each metropolitan planning organization's update of its RTP. The targets were last revised in March 2018.

3.2.3.7 Executive Order B-30-15

Governor Jerry Brown signed EO B-30-15 on April 29, 2015. EO B-30-15 established a medium-term goal for 2030 of reducing GHG emissions by 40 percent below 1990 levels and requires the CARB to update its current AB 32 Scoping Plan to identify measures to meet the 2030 target. The EO B-30-15 supports EO S-3-05 but is only binding on state agencies.

3.2.3.8 Senate Bill 32 and Assembly Bill 197

Senate Bill (SB) 32 requires the CARB to verify that statewide GHG emissions are reduced to at least 40 percent below the 1990 level by 2030, consistent with the target set forth in EO B-30-15. AB 197 creates requirements to form the Joint Legislative Committee on Climate Change

Policies, requires the CARB to prioritize direct emission reductions and consider social costs when adopting regulations to reduce GHG emissions beyond the 2020 statewide limit, requires the CARB to prepare reports on sources of GHGs and other pollutants, establishes 6-year terms for voting members of the CARB, and adds two legislators as nonvoting members of the CARB. Both bills were signed by Governor Brown on September 8, 2016.

3.2.3.9 Senate Bill 100

The state's existing renewables portfolio standard requires all retail sellers to procure a minimum quantity of electricity products from eligible renewable energy resources so that the total kilowatt hours of those products sold to their retail end-use customers achieve 25 percent of retail sales by December 31, 2016 (achieved), 33 percent by December 31, 2020, 40 percent by December 31, 2024, 45 percent by December 31, 2027, and 50 percent by December 31, 2030. SB 100 revises and extends these renewable resource targets to 50 percent by December 31, 2026, 60 percent December 31, 2030, and 100 percent by December 31, 2045.

3.2.3.10 Executive Order B-55-18

EO B-55-18 acknowledges the environmental, community, and public health risks posed by future climate change. It further recognizes the climate stabilization goal adopted by 194 states and the European Union under the Paris Agreement. While the United States was not party to the agreement, California is committed to meeting the Paris Agreement goals and going beyond them wherever possible. Based on the worldwide scientific agreement that carbon neutrality must be achieved by midcentury, EO B-55-18 establishes a new state goal to achieve carbon neutrality as soon as possible, and no later than 2045, and to achieve and maintain net negative emissions thereafter. The EO charges the CARB with developing a framework for implementing and tracking progress towards these goals. This EO extends EO S-3-05, but is only binding on state agencies.

3.2.3.11 Innovative Clean Transit Regulation

The CARB approved the Innovative Clean Transit Regulation on December 14, 2018. The regulation sets a statewide goal for public transit agencies to gradually transition to 100 percent zero-emission bus fleets by 2040. Transiting bus fleets to zero-emissions vehicles is expected to reduce GHG emissions by 19 million metric tons CO_2e between 2020 and 2050 (CARB 2018a).

3.2.4 California Asbestos Control Measures

The CARB has adopted two airborne toxic control measures for controlling naturally occurring asbestos (NOA): the *Asbestos Airborne Toxic Control Measure for Surfacing Applications* (BAAQMD 2015) and the *Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations* (BAAQMD 2002). While the USEPA is responsible for enforcing regulations relating to asbestos renovations and demolitions, it can delegate this authority to state and local agencies. The CARB and local air districts have been delegated authority to enforce the Federal National Emission Standards for HAPs regulations for asbestos.

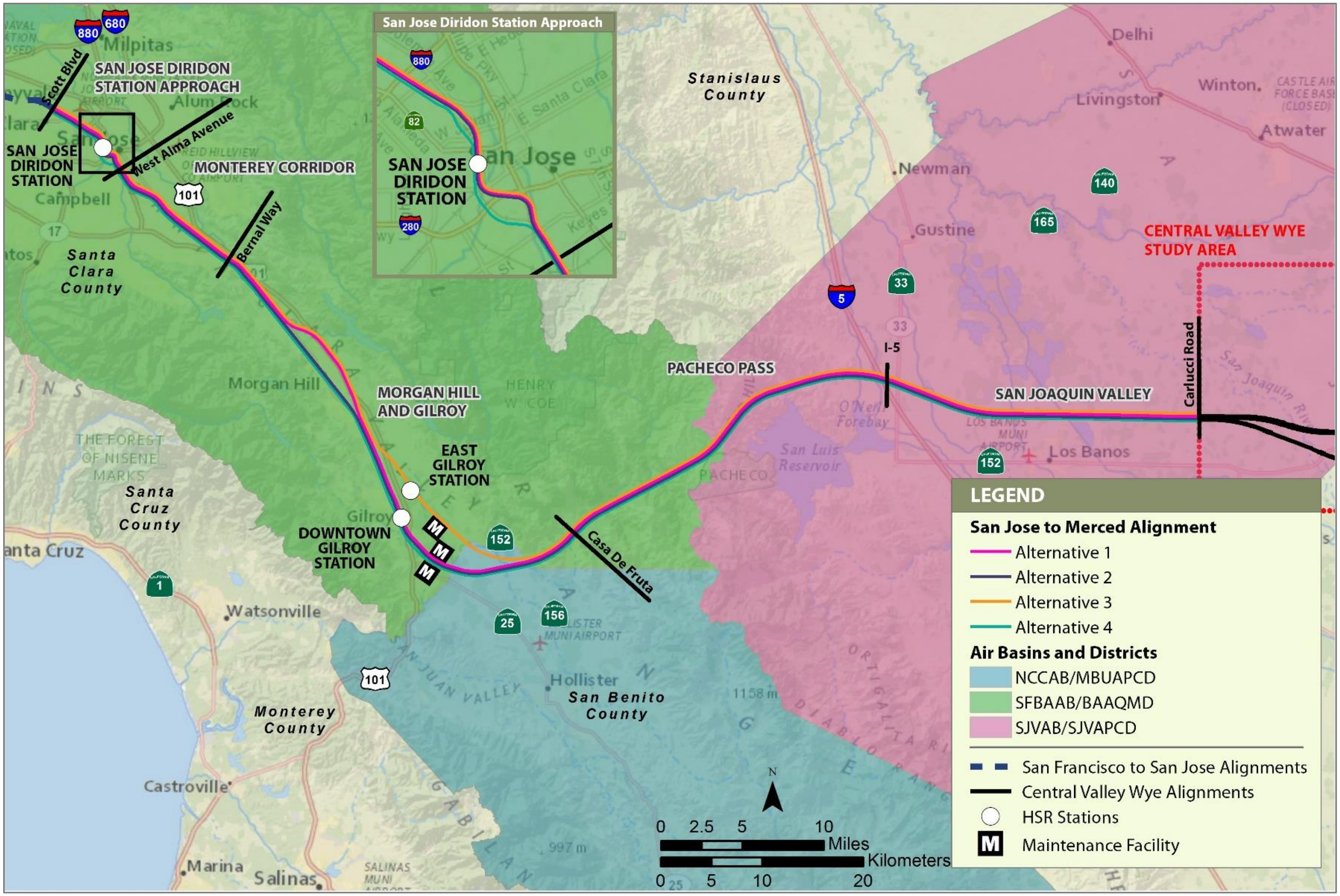
3.3 Regional and Local

3.3.1 Air Quality Management Districts

The project crosses three air basins—San Francisco Bay Area Air Basin (SFBAAB), North Central Coast Air Basin (NCCAB), and San Joaquin Valley Air Basin (SJVAB)—and falls under the jurisdiction of three air districts—BAAQMD, MBARD, and SJVAPCD (see Figure 3-1). The BAAQMD, MBARD, and SJVAPCD are responsible for the following actions:

- Implementing air quality regulations, including developing plans and control measures for stationary sources of air pollution to meet the NAAQS and CAAQS.
- Implementing permit programs for the construction, modification, and operation of sources of air pollution.

- Coordinating with local transportation planning agencies on mobile emissions inventory development, transportation control measure development and implementation, and transportation conformity.
- Enforcing air pollution statutes and regulations governing stationary sources. With CARB oversight, the air districts also administer local regulations.



Source: Authority 2019b; CARB 2012

JANUARY 2020

Figure 3-1 Air Basins and Air Districts in the Resource Study Area

3.3.1.1 Bay Area Air Quality Management District

The BAAQMD has local air quality jurisdiction over projects in the SFBAAB including Santa Clara County. BAAQMD has adopted advisory emission thresholds to assist CEQA lead agencies in determining the level of significance of a project's emissions, which are outlined in its *California Environmental Quality Act Air Quality Guidelines* (CEQA Guidelines) (BAAQMD 2017a). The BAAQMD CEQA Guidelines outline advisory thresholds for stationary source and land use development projects. BAAQMD has also adopted air quality plans to improve air quality, protect public health, and protect the climate.

The project may be subject to the following district rules. This list of rules may not be all-encompassing because additional BAAQMD rules may apply to the project as specific components are identified. There are also local city and county policies that pertain to air quality and climate change. The policies of the general plans focus on managing sources of air pollutants through mixed-use and transit- and pedestrian-friendly neighborhoods.[7]

- **Regulation 2, Rule 2 (New Source Review)**—This regulation contains requirements for Best Available Control Technology and emission offsets.
- **Regulation 2, Rule 5 (New Source Review of Toxic Air Contaminates)**—This regulation outlines guidance for evaluating TAC emissions and their potential health risks.
- **Regulation 6, Rule 1 (Particulate Matter)**—This regulation restricts emissions of PM darker than No. 1 on the Ringlemann Chart to less than 3 minutes in any 1 hour.
- **Regulation 7 (Odorous Substances)**—This regulation establishes general odor limitations on odorous substances and specific emission limitations on certain odorous compounds.
- **Regulation 8, Rule 3 (Architectural Coatings)**—This regulation limits the quantity of reactive organic gases (ROG) in architectural coatings.
- **Regulation 9, Rule 6 (Nitrogen Oxides Emission from Natural Gas–Fired Boilers and Water Heaters)**—This regulation limits emissions of NO_X generated by natural gas–fired boilers.
- **Regulation 9, Rule 8 (Stationary Internal Combustion Engines)—**This regulation limits emissions of NO_X and CO from stationary internal combustion engines of more than 50 horsepower.
- **Regulation 11, Rule 2 (Asbestos Demolition, Renovation, and Manufacturing)**—This rule controls emissions of asbestos to the atmosphere during demolition, renovation, milling, and manufacturing and establishes appropriate waste disposal procedures.

3.3.1.2 Monterey Bay Air Resources District

The MBARD has local air quality jurisdiction over projects in the NCCAB, including San Benito County. The MBARD has adopted CEQA emission thresholds in its *CEQA Air Quality Guidelines* (MBUAPCD 2008) to determine the level of significance of project-related emissions. Emissions that exceed the designated threshold levels are considered potentially significant and should be mitigated.

Through the attainment planning process, the MBARD has developed rules and regulations to regulate sources of air pollution. All projects located in San Benito County are subject to the MBARD regulations in effect at the time of construction. Specific regulations applicable to the project may involve diesel construction equipment emissions, fugitive dust, on-road haul truck

---

[7] Additional details regarding the applicable rules can be found at the BAAQMD website, http://www.baaqmd.gov/rules-and-compliance/current-rules.

emissions, and general permit requirements. The following list provides descriptions of MBARD rules that would be applicable to the project.[8]

- **Rule 200 (Permits)**—This rule identifies when permits are required and issued. It is anticipated the project would require an Authority to Construct and Permit to Operate, although additional permits may be needed.
- **Rule 207 (Review of New or Modified Sources)**—This rule provides for the review of new and modified stationary air pollution sources to meet provisions of the federal CAA.
- **Rule 400 (Visible Emissions)**—This rule provides limits for the visible emissions from sources within the district.
- **Rule 402 (Nuisances)—**This rule provides an explicit prohibition against sources creating public nuisances while operating within the district.
- **Rule 403 (Particulate Matter)**—This rule provides PM emission limits for sources operating within the district.
- **Rule 404 (Sulfur Compounds and Nitrogen Oxides)**—This rule provides limits for the emissions of sulfur compounds, NO_X, and NO_2 from sources within the district.
- **Rule 424 (National Emission Standards for Hazardous Air Pollutants)—**This rule provides clarity on the district's enforcement authority for the National Emission Standards for Hazardous Air Pollutants by incorporating those provisions of Parts 61 and 63, Chapter I, Title 40 of the C.F.R. into the rule by reference.
- **Rule 425 (Use of Cutback Asphalt)**—This rule limits the emissions of vapors of organic compounds from the use of cutback and emulsified asphalts.
- **Rule 426 (Architectural Coatings)**—This rule limits the emissions of ROGs from the use of architectural coatings.

3.3.1.3 San Joaquin Valley Air Pollution Control District

The SJVAPCD has local air quality jurisdiction over projects in the SJVAB including Merced County. The SJVAPCD prepared the *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI) to assist lead agencies and project applicants in evaluating the potential air quality impacts of projects in the SJVAB (SJVAPCD 2015a). The GAMAQI provides SJVAPCD-recommended procedures for evaluating potential air quality impacts during the CEQA environmental review process.

SJVAPCD has specific air quality–related planning documents, rules, and regulations. The following regulations may be applicable to the project in Merced County.[9]

- **Rule 2010 (Permits Required)—**This rule requires any person constructing, altering, replacing or operating any source operation which emits, may emit, or may reduce emissions to obtain an Authority to Construct or a Permit to Operate.
- **Rule 2201 (New and Modified Stationary Source Review)—**This rule requires that sources not increase emissions above the specified thresholds.
- **Rule 2280 (Portable Equipment Registration)**—This rule requires portable equipment used at project sites for less than 6 consecutive months be registered with the SJVAPCD.
- **Rule 4002 (National Emission Standards for Hazardous Air Pollutants)**—This rule incorporates by reference the National Emission Standards for Hazardous Air Pollutants from

---

[8] Additional details regarding the applicable rules can be found at the MBARD website, http://mbard.org/programs-resources/permitting-engineering/rules-regulations/.

[9] Additional details regarding the applicable rules can be found at the SJVAPCD website, www.valleyair.org/rules/1ruleslist.htm.

40 C.F.R., Part 61, Chapter I, Subchapter C and the National Emission Standards for Hazardous Air Pollutants for Source Categories from 40 C.F.R., Part 63, Chapter I, Subchapter C.

- **Rule 4102 (Nuisance)**—This rule prohibits discharge from any source whatsoever such quantities of air contaminants or other materials which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health, or safety of any such person or the public or which cause or have a natural tendency to cause injury or damage to business or property.
- **Rule 4201 and Rule 4202 (Particulate Matter Concentration and Emission Rates)**—These rules provide PM emission limits for sources operating within the district.
- **Rule 4301 (Fuel-Burning Equipment)**—This rule limits the emissions from fuel-burning equipment whose primary purpose is to produce heat or power by indirect heat transfer.
- **Rule 4601 (Architectural Coatings)**—This rule limits VOC emissions from architectural coatings.
- **Rule 4641 (Cutback, Slow Cure, and Emulsified Asphalt, Paving, and Maintenance Operations)**—This rule limits VOC emissions by restricting the application and manufacturing of certain types of asphalt for paving and maintenance operations.
- **Rule 8011 (General Requirements—Fugitive Dust Emission Sources)**—This rule outlines requirements for implementation of control measures for fugitive dust emission sources.
- **Rule 9510 (Indirect Source Review)**—This rule outlines mitigation requirements for construction and operations emissions that exceed certain thresholds. The rule applies to any transportation project in which construction emissions equal or exceed 2 tons of NO_X or PM_{10} per year. Projects subject to Rule 9510 must submit an Air Impact Assessment application to the SJVAPCD prior to construction.

3.3.2 Metropolitan Transportation Commission

The Metropolitan Transportation Commission (MTC) serves as both the state-designated regional transportation agency and as the federally designated metropolitan planning organization for the Bay Area. Thus, it is responsible for regularly updating the RTP, a comprehensive blueprint for the development of mass transit, highway, airport, seaport, railroad, bicycle and pedestrian facilities. The MTC also screens requests from local agencies for state and federal grants for transportation projects to determine their compatibility with the plan.

3.3.3 Association of Bay Area Governments

The Association of Bay Area Governments (ABAG) serves as a regional planning body for the Bay Area. ABAG, MTC, and BAAQMD work closely to develop long-range plans that improve the environment and standard of living through a series of measures that link land use, transportation, and air quality. ABAG is responsible for maintaining the state-mandated SCS which links land use, transportation planning, and state funding. ABAG also develops demographic, economic, and project analyses for the region. ABAG also develops earthquake preparedness plans and green business development strategies and leads the San Francisco Bay Trail planning program and the San Francisco Estuary Project.

3.3.4 Association of Monterey Bay Area Governments

The Association of Monterey Bay Area Governments (AMBAG) serves as both a federally designated metropolitan planning organization and regional planning body for the North Central Coast. AMBAG performs metropolitan level transportation planning on behalf of the region. Among its many duties, AMBAG manages the region's transportation demand model and prepares regional housing, population, and employment forecasts that are utilized in a variety of regional plans.

3.3.5 Council of San Benito County Governments

The Council of San Benito County Governments (San Benito COG) is San Benito County's regional transportation planning agency. San Benito COG plans for the long-term safety and transportation needs of San Benito County residents by improving highways, streets, roads, bicycle paths, bus service, and walkways. San Benito COG works closely with the County, the Cities of Hollister and San Juan Bautista, the California Department of Transportation (Caltrans), AMBAG, and other agencies to help improve travel in the region.

3.3.6 Merced County Association of Governments

The Merced County Association of Governments (MCAG) is the federally designated metropolitan planning organization for Merced County. MCAG comprises representatives from Merced County and the Cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced. As a regional transportation planning agency and metropolitan planning organization, MCAG is the primary transportation facilitator in Merced County.

3.3.7 Air Quality Plans

3.3.7.1 State Implementation Plan

Federal clean air laws require areas with unhealthy levels of O_3, inhalable PM, CO, NO_2, and SO_2 to develop plans, known as SIPs. SIPs are comprehensive plans that describe how an area will attain NAAQS. The 1990 amendments to the federal CAA set deadlines for attainment based on the severity of an area's air pollution problem.

SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, or permitting), district rules, state regulations, and federal controls. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel regulations, and limits on emissions from consumer products. State law makes the CARB the lead agency for all purposes related to SIPs. Local air districts and other agencies, such as the Bureau of Automotive Repair and the Department of Pesticide Regulation, prepare SIP elements and submit them to the CARB for review and approval. The CARB forwards SIP revisions to the USEPA for approval and publication in the Fed. Reg. 40 C.F.R. Chapter I, Part 52, Subpart F, Section 52.220 lists all of the items that are included in the California SIP. At any one time, several California submittals are pending USEPA approval.

The following are the relevant regional SIP and air quality plans for the SFBAAB:

- 2001 San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard (BAAQMD 2001)
- 2017 Clean Air Plan: Spare the Air, Cool the Climate (BAAQMD 2017b)

The following are the relevant regional SIP and air quality plans for the NCCAB:

- 2005 Report on Attainment of the California Particulate Matter Standards in the Monterey Bay Region (MBUAPCD 2005)
- 2007 Federal Maintenance Plan for Maintaining the National Ozone Standard in the Monterey Bay Region (MBUAPCD 2007)
- 2012–2015 Air Quality Management Plan (MBUAPCD 2017)

The following are the relevant regional SIP and air quality plans for the SJVAB:

- 2007 PM_{10} Maintenance Plan and Request for Redesignation (SJVAPCD 2007a)
- 2007 Ozone Plan (SJVAPCD 2007b)
- 2013 Plan for the Revoked 1-Hour Ozone Standard (SJVAPCD 2013)
- 2015 Plan for the 1997 $PM_{2.5}$ Standard (SJVAPCD 2015b)

- 2016 Moderate Area Plan for the 2012 $PM_{2.5}$ Standard (SJVAPCD 2016a)
- 2016 Plan for the 2008 8-Hour Ozone Standard (SJVAPCD 2016b)
- 2018 Plan for the 1997, 2006, and 2012 $PM_{2.5}$ Standards (SJVAPCD 2018)

3.3.7.2 Transportation Plans and Programs

An RTP is a long-range plan that includes both long- and short-range strategies and actions that lead to the development of an integrated multimodal transportation system to address future transportation demand. Projects subject to transportation conformity are analyzed for air quality conformity with the SIP as components of RTPs and transportation improvement programs (TIP). RTPs address a region's growth, transportation goals, objectives, and policies for the next 25 years and identify the actions necessary to achieve those goals. TIPs provide a comprehensive listing of all surface transportation projects that are to receive federal funding, are subject to a federally required action, or are considered regionally significant for air quality conformity purposes. RTPs and TIPs relevant to the project are discussed in this section.

San Francisco Bay Area

In the Bay Area, the MTC is responsible for preparing RTPs and TIPs. On July 26, 2017, the MTC adopted the latest RTP for the area, *Plan Bay Area 2040*, which specifies how approximately $303 billion in anticipated federal, state, and local transportation funds will be spent in the nine-county Bay Area during the next 25 years (ABAG and MTC 2017).

The TIP includes improvements for transit; local roadway, state highway, bicycle, and pedestrian facilities; and other regionally significant, locally funded transportation projects in the nine-county Bay Area. The MTC prepares and adopts the TIP every 2 years. The current 2019 TIP covers fiscal years 2018–19 through 2021–22. It contains 500 projects totaling about $13.2 billion over a 4-year period.

The MTC prepares a transportation air quality conformity analysis when it amends or updates its long-range RTP or adds or deletes regionally significant nonexempt projects into the TIP. In 2018, a conformity analysis was finalized for the *Plan Bay Area 2040* and the 2019 TIP in accordance with USEPA transportation conformity regulations and the Bay Area Conformity SIP (Bay Area Air Quality Conformity Protocol).

San Benito County

The San Benito COG prepares a county-wide RTP every 4 years to set forth transportation policy over the next 20 years. The current RTP, *2040 San Benito Regional Transportation Plan*, was adopted June 21, 2018. The plan identifies nearly $1.8 billion in estimated transportation funding for projects and programs.

The San Benito COG also prepares the financially constrained TIP for San Benito County. The current *2016 Regional Transportation Improvement Program* was adopted on February 26, 2016. The conformity analysis for the 2018 RTP and 2016 TIP (revised) in accordance with USEPA transportation conformity regulations and the applicable SIPs was finalized in 2018.

Merced County

MCAG is responsible for preparing the RTP and TIP for transportation projects in Merced County. MCAG adopted the *2018 Regional Transportation Plan* on August 16, 2018, and adopted the *2018 Regional Improvement Program* on November 16, 2017. The final conformity assessment was adopted in August 2018.

3.3.7.3 Regional and Local Air Quality Policies

Table 3-2 outlines the policies related to air quality and GHG from regional and local plans that were considered in the preparation of this analysis. Relevant policies from some of the RTPs are included in this table.

Table 3-2 Regional and Local Plans and Policies

Plans and Policies	Summary
Regional	
Plan Bay Area (ABAG and MTC 2017)	The ABAG and the MTC adopted Plan Bay Area 2040 as the Bay Area's long-term regional transportation and land use blueprint in 2017. The following goals and objectives are relevant to the project: ▪ Target #1: Reduce per-capita CO_2 emissions from cars and light-duty trucks by 15 percent. ▪ Target #3: Reduce adverse health impacts associated with air quality, road safety and physical inactivity by 10%.
San Joaquin Valley Blueprint Planning Process Summary Report (2010)	The *San Joaquin Valley Blueprint Planning Process Summary Report* was prepared in 2010. The following goal is relevant to the project: ▪ Principle 12: Support actions that encourage environmental resource management.
Moving Forward 2035 Monterey Bay (2017)	The Association of Monterey Bay Area Governments adopted *Moving Forward 2035 Monterey Bay* as the region's long-term RTP in 2014 and amended it in 2017. The following policy is relevant to the project: ▪ Policy 3: Environment – Promote environmental sustainability and protect the natural environment.
2018 Regional Transportation Plan (2018)	The Merced County Association of Governments adopted the *2018 Regional Transportation Plan* as the County's long-term RTP in 2018. The following goals and objectives are relevant to the project: ▪ 8.1. Coordinate transportation planning with air quality planning at the technical and policy level.
Santa Clara County	
Santa Clara County General Plan (1994)	The *Santa Clara County General Plan* was adopted in 1994. The following goals and policies are relevant to the project: ▪ Policy C-TR 11 Santa Clara County shall participate in updating and implementing the Congestion Management Plan, the provisions of which as set forth by law: a. establish priority for air quality goals and objectives and development of alternatives to automobile travel; and b. allow additional road capacity to be created only when all feasible automobile travel demand measures have been implemented. ▪ Policy C-RC 80 Sub-regional/countywide planning for Santa Clara County should place major emphasis on the inter-related goals, strategies and policies for improving energy efficiency in transportation, air quality, and reducing traffic congestion.

Plans and Policies	Summary
City of Santa Clara	
City of Santa Clara 2010–2035 General Plan (2010)	The *City of Santa Clara 2010–2035 General Plan* was adopted in November 2010. The following goals and policies are relevant to the project: ▪ 5.10.2-P1 Support alternative transportation modes and efficient parking mechanisms to improve air quality. ▪ 5.10.2-P2 Encourage development patterns that reduce vehicle miles traveled and air pollution. ▪ 5.10.2-P3 Encourage implementation of technological advances that minimize public health hazards and reduce the generation of air pollutants. ▪ 5.10.2-P4 Encourage measures to reduce greenhouse gas emissions to reach 30 percent below 1990 levels by 2020. ▪ 5.10.2-P6 Require “Best Management Practices” for construction dust abatement. ▪ 5.8.1-P4 Expand transportation options and improve alternate modes that reduce greenhouse gas emissions. ▪ 5.10.3-P15 Explore opportunities for alternative energy “fueling stations” and promote participation in shuttle services that use new technology vehicles to reduce greenhouse gas emissions.
City of San Jose	
Envision: San José 2040 General Plan (2011)	The *Envision: San José 2040 General Plan* was adopted in 2011. The following goals and policies are relevant to the project: ▪ MS-1.7 Encourage retrofits for existing buildings throughout San José to use green building principles in order to mitigate the environmental, economic, and social impact of those buildings, to achieve greenhouse gas reductions, and to improve air and water quality. ▪ MS-4.1 Promote the use of building materials that maintain healthful indoor air quality in an effort to reduce irritation and exposure to toxins and allergens for building occupants. ▪ MS-4.2 Encourage construction and pre-occupancy practices to improve indoor air quality upon occupancy of the structure. ▪ MS-10.1 Assess projected air emissions from new development in conformance with the Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines and relative to state and federal standards. Identify and implement feasible air emission reduction measures. ▪ MS-10.2 Consider the cumulative air quality impacts from proposed developments for proposed land use designation changes and new development, consistent with the region’s Clean Air Plan and State law. ▪ MS-10.3 Promote the expansion and improvement of public transportation services and facilities, where appropriate, to both encourage energy conservation and reduce air pollution. ▪ MS-10.4 Encourage effective regulation of mobile and stationary sources of air pollution, both inside and outside of San José. In particular, support Federal and State regulations to improve automobile emission controls. ▪ MS-10.7 Encourage regional and statewide air pollutant emission reduction through energy conservation to improve air quality.

Plans and Policies	Summary
	▪ MS-10.8 Minimize vegetation removal required for fire prevention. Require alternatives to discing, such as mowing, to the extent feasible. Where vegetation removal is required for property maintenance purposes, encourage alternatives that limit the exposure of bare soil. ▪ MS-10.9 Foster educational programs about air pollution problems and solutions. ▪ MS-11.2 For projects that emit toxic air contaminants, require project proponents to prepare health risk assessments in accordance with BAAQMD-recommended procedures as part of environmental review and employ effective mitigation to reduce possible health risks to a less than significant level. Alternatively, require new projects (such as, but not limited to, industrial, manufacturing, and processing facilities) that are sources of TACs to be located an adequate distance from residential areas and other sensitive receptors. ▪ MS-11.3 Review projects generating significant heavy duty truck traffic to designate truck routes that minimize exposure of sensitive receptors to TACs and particulate matter. ▪ MS-11.4 Encourage the installation of appropriate air filtration at existing schools, residences, and other sensitive receptor uses adversely affected by pollution sources. ▪ MS-11.5 Encourage the use of pollution absorbing trees and vegetation in buffer areas between substantial sources of TACs and sensitive land uses. ▪ MS-13.1 Include dust, particulate matter, and construction equipment exhaust control measures as conditions of approval for subdivision maps, site development and planned development permits, grading permits, and demolition permits. At minimum, conditions shall conform to construction mitigation measures recommended in the current BAAQMD CEQA Guidelines for the relevant project size and type. ▪ MS-13.2 Construction and/or demolition projects that have the potential to disturb asbestos (from soil or building material) shall comply with all the requirements of the California Air Resources Board's air toxics control measures (ATCMs) for Construction, Grading, Quarrying, and Surface Mining Operations. ▪ MS-13.3 Require subdivision designs and site planning to minimize grading and use landform grading in hillside areas. ▪ EC-7.7 Determine for any development or redevelopment site that is within 1,000 feet of a known, suspected, or likely geographic ultramafic rock unit (as identified in maps developed by the Department of Conservation – Division of Mines and Geology) or any other known or suspected locations of serpentine or naturally occurring asbestos, if naturally occurring asbestos exists and, if so, comply with the Bay Area Air Quality Management District's Asbestos Air Toxic Control Measure requirements. ▪ TR-1.8 Actively coordinate with regional transportation, land use planning, and transit agencies to develop a transportation network with complementary land uses that encourage travel by bicycling, walking and transit, and ensure that regional greenhouse gas emission standards are met.
Midtown Specific Plan (1992)	The *Midtown Specific Plan* was adopted in 1992. The following goals and policies are relevant to the project: ▪ Policy 4.3: Future development should incorporate energy-conserving devices to promote conservation.
Diridon Station Area Plan (2014)	The *Diridon Station Area Plan* was adopted in 2014. No goals and policies are directly relevant to the air quality or greenhouse gas analysis of the project.

Plans and Policies	Summary
Communications Hill Specific Plan (1992)	The *Communications Hill Specific Plan* was adopted in 1992. The following goals and policies are relevant to the project: ▪ Minimize the potential adverse impacts of the Communication Hill area development on the immediate surrounding neighborhood.
City of Morgan Hill	
Morgan Hill 2035 General Plan (2016)	The *Morgan Hill 2035 General Plan* was adopted in 2016. The following goals and policies are relevant to the project: ▪ Policy NRE-10.1 Regional and Subregional Cooperation. Cooperate with regional agencies in developing and implementing air quality management plans. Support subregional coordination with other cities, counties, and agencies in the Santa Clara Valley and adjacent areas to address land use, jobs/housing balance, and transportation planning issues as a means of improving air quality. ▪ Policy NRE-10.2 State and Federal Regulation. Encourage effective regulation of mobile and stationary sources of air pollution and support State and federal regulations to improve automobile emission controls. ▪ Policy NRE-10.3 Automobile Emissions. Encourage the use of and infrastructure for alternative fuel, hybrid, and electric vehicles. Encourage new and existing public and private development to include electric vehicle charging stations. ▪ Policy NRE-10.4 Reduced Automobile Use. To reduce air pollution the frequency and length of automobile trips and the amount of traffic congestion by controlling sprawl, promoting infill development, and encouraging mixed uses and higher density development near transit. Support the expansion and improvement of alternative modes of transportation. Encourage development project designs that protect and improve air quality and minimize direct and indirect air pollutant emissions by including components that reduce vehicle trips. ▪ Policy NRE-11.2 TACs and Existing Sensitive Uses. Encourage the installation of appropriate air filtration mechanisms at existing schools, residences, and other sensitive receptors adversely affected by existing or proposed pollution sources. ▪ Policy NRE-11.3 Health Risk Assessments. For proposed development that emits toxic air contaminants, require project proponents to prepare health risk assessments in accordance with Bay Area Air Quality Management District procedures as part of environmental review and implement effective mitigation measures to reduce potential health risks to less-than-significant levels. Alternatively, require these projects to be located an adequate distance from residences and other sensitive receptors to avoid health risks. Consult with the Bay Area Air Quality Management District to identify stationary and mobile toxic air contaminant sources and determine the need for and requirements of a health risk assessment for proposed developments. ▪ Policy NRE-11.4 Truck Routes. For development projects generating significant heavy duty truck traffic, designate truck routes that minimize exposure of sensitive receptors to toxic air contaminants and particulate matter. ▪ Policy NRE-11.5 Truck Idling. For development projects generating significant truck traffic, require signage to remind drivers that the State truck idling law limits truck idling to five (5) minutes. ▪ Policy NRE-11.5 Truck Idling. For development projects generating significant truck traffic, require signage to remind drivers that the State truck idling law limits truck idling to five (5) minutes. ▪ Policy NRE-11.6 Vegetation Buffers. Encourage the use of pollution-absorbing trees and vegetation in buffer areas between substantial sources of toxic air contaminants and sensitive receptors.

Plans and Policies	Summary
	▪ Policy NRE-12.1 Best Practices. Requirement that development projects implement best management practices to reduce air pollutant emissions associated with construction and operation of the project. ▪ Policy NRE-12.2 Conditions of Approvals. Include dust, particulate matter, and construction equipment exhaust control measures as conditions of approval for subdivision maps, site development and planned development permits, grading permits, and demolition permits. At a minimum, conditions shall conform to construction mitigation measures recommended in the current Bay Area Air Quality Management District CEQA Guidelines. ▪ Policy NRE-12.3 Control Measures. Require construction and demolition projects that have the potential to disturb asbestos (from soil or building material) to comply with all the requirements of the California Air Resource Board's air toxics control measures (ATCMs) for Construction, Grading, Quarrying, and Surface Mining Operations. ▪ Policy NRE-12.4 Grading. Require subdivision designs and site planning to minimize grading and use landform grading in hillside areas. ▪ Policy NRE-15.1 Greenhouse Gas Emission Reduction Targets. Maintain a greenhouse gas reduction trajectory that is consistent with the greenhouse gas reduction targets of Executive Orders B-30-15 (40 percent below 1990 levels by 2030) and S-03-05 (80 percent below 1990 levels by 2050) to ensure the City is consistent with statewide efforts to reduce greenhouse gas emissions. ▪ Policy NRE-15.2 Linking Land Use and Transportation. Encourage land use and transportation patterns that reduce dependence on automobiles. ▪ Policy NRE-15.3 Climate Action Plan. Utilize policies in this General Plan denoted with the green leaf symbol as the City's greenhouse gas emissions reduction strategy. ▪ Policy NRE-15.4 Sustainable Land Use. Promote land use patterns that reduce the number and length of motor vehicle trips. ▪ Policy NRE-15.10 VMT Reduction. Continue to work with the Santa Clara Valley Transportation Authority on regional transportation solutions that will reduce vehicle miles traveled and greenhouse gas emissions.
City of Gilroy	
City of Gilroy 2002–2020 General Plan (2002)	The *City of Gilroy 2002–2020 General Plan* was adopted in 2002. The following goals and policies are relevant to the project: ▪ Policy 21.01 "Sensitive Receptors." Use land use planning and project siting to separate air pollution sources (such as freeways, arterials, industrial sites, etc.) from residential areas and other "sensitive receptors" (such as schools, hospital, and nursing homes) that would be adversely affected by close proximity to air pollutants. ▪ Policy 21.02 Landscaping to Reduce Pollutants. Promote the use of trees and plants in landscaping to reduce air pollutant levels. ▪ Policy 21.04 Regional Collaboration. Cooperate with the Bay Area Air Quality Management District and other agencies that deal with issues related to air quality (e.g., the Metropolitan Transportation Commission and the Association of Bay Area Governments) to develop and implement regional air quality strategies. Also, support subregional coordination with other cities, counties and agencies in Santa Clara Valley and adjacent areas to address land use, jobs/housing balance, and transportation planning issues as a means of improving air quality. ▪ Policy 21.05 Air Quality Impacts from Construction Activity. Reduce the air quality impacts associated with construction activity by reducing the exhaust emissions through appropriate mitigation actions.

Plans and Policies	Summary
	▪ Policy 21.06 Traffic Control Measures. Implement the Transportation Control Measures recommended by the Bay Area Air Quality Management District in the 2000 Clean Air Plan to reduce pollutant emissions. ▪ Policy 12.09 LOS and Air Quality. Maintain the City's Standard Level of Service whenever feasible to minimize traffic congestion and thereby minimize exposure to carbon monoxide, since vehicles generate less air pollutant emissions at higher speed. ▪ Policy 14.01 Non-Auto Modes of Travel. Emphasize non-auto travel modes of transportation as a key strategy for achieving air quality goals. For example, encourage bicycle riding to school from an early age by providing safer bikeways between residential areas and schools and encourage the schools to provide secured bike racks and/or lockers.
Downtown Gilroy Specific Plan (2005)	The *Downtown Gilroy Specific Plan* was adopted in 2005. No goals and policies are directly relevant to the air quality or greenhouse gas analysis of the project.
San Benito County	
San Benito County 2035 General Plan (2015)	The *San Benito County 2035 General Plan* was adopted in 2015. The following goals and policies are relevant to the project: ▪ HS-5.1 New Development. The County shall use the CEQA process to ensure development projects incorporate feasible mitigation measures to reduce construction and operational air quality emissions, and consult with the Monterey Bay Unified Air Pollution Control District early in the development review process. ▪ HS-5.2 Sensitive Land Use Locations. The County shall ensure adequate distances between sensitive land uses and facilities or operations that may produce toxic or hazardous air pollutants or substantial odors. ▪ HS-5.3 Early Coordination with the Air Quality Control District. The County shall notify and coordinate with the Monterey Bay Unified Air Pollution Control District when industrial developments are proposed within the county to ensure applicants comply with applicable air quality regulations and incorporate design features and technologies to reduce air emissions. ▪ HS-5.4 PM10 Emissions from Construction. The County shall require developers to reduce particulate matter emissions from construction (e.g., grading, excavation, and demolition) consistent with standards established by the Monterey Bay Unified Air Pollution Control District. ▪ HS-5.6 New Construction Mitigation. The County shall work in coordination with the Monterey Bay Unified Air Pollution Control District to minimize air emissions from construction activities associated with proposed development. ▪ HS-5.7 Greenhouse Gas Emission Reductions. The County shall promote greenhouse gas emission reductions by supporting carbon efficient farming methods (e.g., methane capture systems, no-till farming, crop rotation, cover cropping); supporting the installation of renewable energy technologies; and protecting grasslands, open space, oak woodlands, riparian forest and farmlands from conversion to urban uses. ▪ HS-5.8 GHG Reduction Targets. The County acknowledges that the state endeavors to achieve 1990 greenhouse gas (GHG) emission levels, and establish a long-term goal to reduce GHG emissions by 80 percent below 1990 levels by 2050. The County will encourage projects that support these goals, recognizing that these goals can be met only if the state succeeds in decarbonizing its fuel supply. ▪ AD-2.5 Air Quality Management Coordination. The County shall continue to coordinate with the Monterey Bay Unified Air Pollution Control District (MBUAPCD) and affected agencies and neighboring jurisdictions in the North Central Coast Air

<table>
<tr><th>Plans and Policies</th><th>Summary</th></tr>
<tr><td></td><td>Basin to ensure regional cooperation on cross-jurisdictional and regional transportation and air quality issues, and to establish parallel air quality programs and implementation measures.
▪ PFS-2.1 Efficient Operations. The County shall maintain facilities and service standards and conduct operations in a manner that meets community needs in an efficient manner, conserves resources, and reduces the County's contribution to greenhouse gas emissions.</td></tr>
<tr><td colspan="2">Merced County</td></tr>
<tr><td>2030 Merced County General Plan (2013)</td><td>The 2030 Merced County General Plan was adopted in 2013. The following goals and policies are relevant to the project:
▪ Policy ED-1.7: Improving Merced County's Quality of Life (SO/PI). Economic development efforts shall include consideration of improving air quality, developing an educated workforce, promoting safe/crime-free communities, protecting water quality, and increasing recreational opportunities as a means to improve the quality of life for residents and workers and to attract new industries to the County.
▪ Policy LU-10.9: Air Quality Management Coordination (IGC). Coordinate with the San Joaquin Valley Air Pollution Control District and affected agencies and neighboring jurisdictions in the San Joaquin Valley Air Basin to ensure regional cooperation on cross-jurisdictional and regional transportation and air quality issues, and to establish parallel air quality programs and implementation measures, such as trip reduction ordinances and indirect source programs.
▪ Policy LU-10.10: San Joaquin Valley Air Pollution Control District Consultation (IGC). Consult with the San Joaquin Valley Air Pollution Control District during CEQA review for discretionary projects that have the potential for causing adverse air quality impacts. Ensure that development projects are submitted to the District for CEQA comments and review of air quality analysis.
▪ Policy CIR-1.3: Transportation Efficiency (RDR). Encourage transportation programs that result in more efficient energy use, reduce greenhouse gas emissions and noise levels, and improve air quality.
▪ Policy AQ-1.1: Energy Consumption Reduction (RDR). Encourage new residential, commercial, and industrial development to reduce air quality impacts from energy consumption.
▪ Policy AQ-1.6: Air Quality Improvement (SO). Support and implement programs to improve air quality throughout the County by reducing emissions related to vehicular travel and agricultural practices.
▪ Policy AQ-2.1: Air Quality Plan Compliance (RDR). Require all development projects to comply with applicable regional air quality plans and policies.
▪ Policy AQ-2.3: Cumulative Impacts (RDR). Encourage the reduction of cumulative air quality impacts produced by projects that are not significant by themselves, but result in cumulatively significant impacts in combination with other development.
▪ Policy AQ-2.4: Mitigation (RDR). Require that local and regional air quality impacts identified during CEQA review for projects reviewed and approved by the County are consistently and fairly mitigated.
▪ Policy AQ-2.5: Innovative Mitigation Measures (RDR, IGC, JP). Encourage innovative mitigation measures and project redesign to reduce air quality impacts by coordinating with the San Joaquin Valley Air Pollution Control District, project applicants, and other interested parties.
▪ Air Quality Element Goal AQ-3. Improve air quality through improved public facilities and operations and to serve as a model for the private sector.</td></tr>
</table>

Plans and Policies	Summary
	▪ Policy AQ-4.6: Non-Motorized Transportation (RDR). Encourage non-motorized transportation corridors within and between communities. ▪ Policy AQ-4.7: Planning Integration (RDR). Require land use, transportation, and air quality planning to be integrated for the most efficient use of resources and a healthier environment. ▪ Policy AQ-5.1: Residential Buffers (RDR). Require effective buffers between residential and other sensitive land uses, and nonresidential land uses that generate hazardous air emissions such as highways (e.g., I-5 and SR-99), trucking centers, gasoline dispensing facilities, and dry cleaners. Effective buffers shall be determined by requiring consultation with the SJVAPCD for any project that may have a health risk impact, including those projects that would otherwise appear to be exempt from CEQA requirements.

Sources: ABAG and MTC 2017; AMBAG 2017; San Joaquin Valley Regional Planning Agencies 2010; City of Gilroy 2002, 2005; City of Morgan Hill 2016; City of San Jose 1992a, 1992b, 2011, 2014; City of Santa Clara 2010; County of Santa Clara 1994; County of San Benito 2015; County of Merced 2013; MCAG 2016
ABAG = Association of Bay Area Governments
MTC = Metropolitan Transportation Commission
RTP = regional transportation plan

3.3.8 Climate Action Plans

A number of cities in the RSA have adopted or are in the process of developing climate action plans (CAP), GHG reduction plans, or equivalent documents aimed at reducing local GHG emissions. Jurisdictions with adopted or in-development CAPs or GHG reduction plans for either municipal operations, community activities, or both include Santa Clara County and the Cities of Santa Clara, San Jose, Gilroy, and Morgan Hill. These plans all call for reductions in GHG emissions below current levels and actions to reduce vehicle miles traveled (VMT) and associated transportation emissions. All plans include increased transit service as a key strategy in reducing local GHG emissions.

4 POLLUTANTS OF CONCERN

Three general classes of air pollutants are of concern for the project—criteria pollutants, TACs, and GHGs. Criteria pollutants are those pollutants for which the USEPA and the State of California have set ambient air quality standards. (For analysis purposes, these pollutants include chemical precursors of compounds for which ambient standards have been set.) TACs of concern for the project are nine MSATs identified by the USEPA as having significant contributions from mobile sources—acetaldehyde, acrolein, benzene, 1,3-butadiene, DPM and diesel exhaust organic gases, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. GHGs are gaseous compounds that limit the transmission of radiated heat from the Earth's surface to the atmosphere. GHGs include CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, SF_6, and other fluorinated gases, including nitrogen trifluoride and hydrofluoroether.

4.1 Criteria Pollutants

Criteria pollutants are pollutants for which federal and state ambient air quality standards have been established to protect public health and welfare (Chapter 3). The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably. The following sections provide a brief description of each criteria pollutant.

4.1.1 Ozone

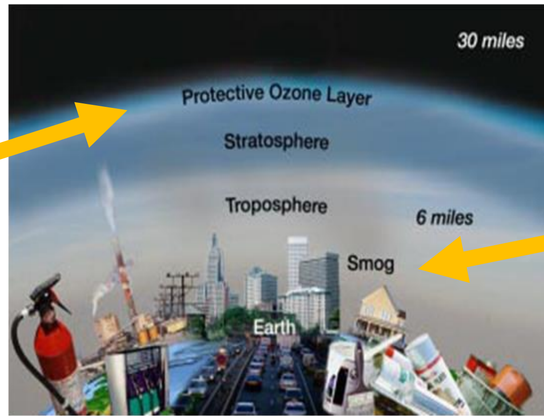
Definition of O_3

O_3 is a colorless toxic gas found in the Earth's upper and lower atmospheric levels. In the upper atmosphere, O_3 is naturally occurring and helps to prevent the sun's harmful ultraviolet rays from reaching the earth. In the lower atmosphere, O_3 is human-made. Although O_3 is not directly emitted, it forms in the lower atmosphere through a chemical reaction between hydrocarbons and oxides of nitrogen, also referred to as VOC and NO_X, which are emitted from industrial sources and from automobiles.

O_3 is a colorless toxic gas. As illustrated on Figure 4-1, O_3 is found in both the Earth's upper and lower atmosphere. In the upper atmosphere, O_3 is a naturally occurring gas that helps to prevent the sun's harmful ultraviolet rays from reaching the Earth. Substantial O_3 formation generally requires a stable atmosphere with strong sunlight; therefore, high levels of O_3 are generally a concern in the summer.

In the lower atmosphere, O_3 is largely human generated. Although O_3 is not directly emitted, it forms in the lower atmosphere through a chemical reaction between certain hydrocarbons, referred to as VOCs and NO_X that are emitted from industrial sources and motor vehicles. Hydrocarbons are compounds composed primarily of hydrogen and carbon atoms. Total organic gas and ROGs are the two classes of hydrocarbons that the CARB inventories. ROGs have relatively high photochemical reactivity. The major source of ROGs is the incomplete combustion of fossil fuel in internal combustion engines. Other sources of ROGs include evaporative emissions associated with paints and solvents, application of asphalt paving, and household consumer products. ROGs do not directly cause effects on human health, but they cause effects by reactions of ROGs to form secondary pollutants. ROGs are also transformed into organic aerosols in the atmosphere, contributing to higher levels of fine PM and lower visibility. The CARB uses the term *ROG* for air quality analysis and defines it the same as the federal term *VOC*. In this analysis, ROG is assumed to be equivalent to VOC.

Too little ozone there… Many popular consumer products like air conditioners and refrigerators involve chlorofluorocarbons or halons during either manufacture or use. Over time, these chemicals damage the earth's protective ozone layer.



Too much ozone here... Cars, trucks, power plants, and factories all emit air pollution that forms ground-level ozone, a primary component of smog.

Source: USEPA 2003

Figure 4-1 Ozone in the Atmosphere

O_3 is the main ingredient of smog. Ground-level O_3 causes health problems because it irritates the mucous membranes, damages lung tissue, reduces lung function, and sensitizes the lungs to other irritants. O_3-related health effects also include respiratory symptoms, aggravation of asthma, increased hospital and emergency room visits, increased asthma medication usage, and a variety of other respiratory-related effects. There is also evidence that short-term exposure to O_3 directly or indirectly contributes to cardiopulmonary-related mortality. In addition, O_3 can damage vegetation by inhibiting its growth. Because O_3 is not directly emitted, potential O_3 effects are assessed by examining the changes in VOC and NO_X emissions for the project on regional and statewide levels.

4.1.2 Particulate Matter

PM pollution is composed of solid particles or liquid droplets that are small enough to remain suspended in the air. In general, PM pollution can include dust, soot, and smoke, which can be irritating, but usually are not toxic. It can also include salts, acids, and metals. However, PM pollution can include substances that are highly toxic. Of particular concern are those particles that have diameters equal to or smaller than 10 microns (µm) (PM_{10})—about 1/7 the thickness of a human hair—or 2.5 µm ($PM_{2.5}$), approximately 1/28 the thickness of a human hair (Figure 4-2). PM can be emitted directly from a source or can form when gases emitted undergo chemical reactions in the atmosphere.

Definition of PM_{10} and $PM_{2.5}$

PM_{10} refers to PM less than 10 microns in diameter, about 1/7th the thickness of a human hair. PM pollution consists of small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals.

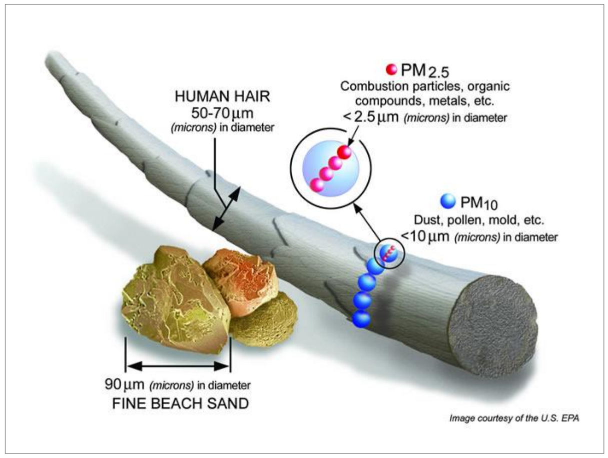
PM also forms when gases emitted from motor vehicles undergo chemical reactions in the atmosphere.

$PM_{2.5}$ is a subset of PM_{10} and refers to particulates that are 2.5 microns or less in diameter, roughly 1/28th the diameter of a human hair.

Major sources of PM_{10} include motor vehicles; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. These suspended particulates produce haze and reduce visibility.

A small portion of PM is the product of fuel combustion processes. However, the combustion of fossil fuels (by motor vehicles, power generation, and industrial facilities) accounts for a significant portion of $PM_{2.5}$ pollution. $PM_{2.5}$ also results from fuel combustion in residential fireplaces and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as SO_2, NO_X, and VOCs.

The main health effect of airborne PM is on the respiratory system. Both PM_{10} and $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Both tend to collect in the upper portion of the respiratory system, but $PM_{2.5}$ or smaller particles can penetrate deeper into the lungs and damage lung tissues. The effects of PM_{10} and $PM_{2.5}$ emissions for the project are examined on a localized (i.e., microscale) basis, on a regional basis, and on a statewide basis.



Source: USEPA 2015c

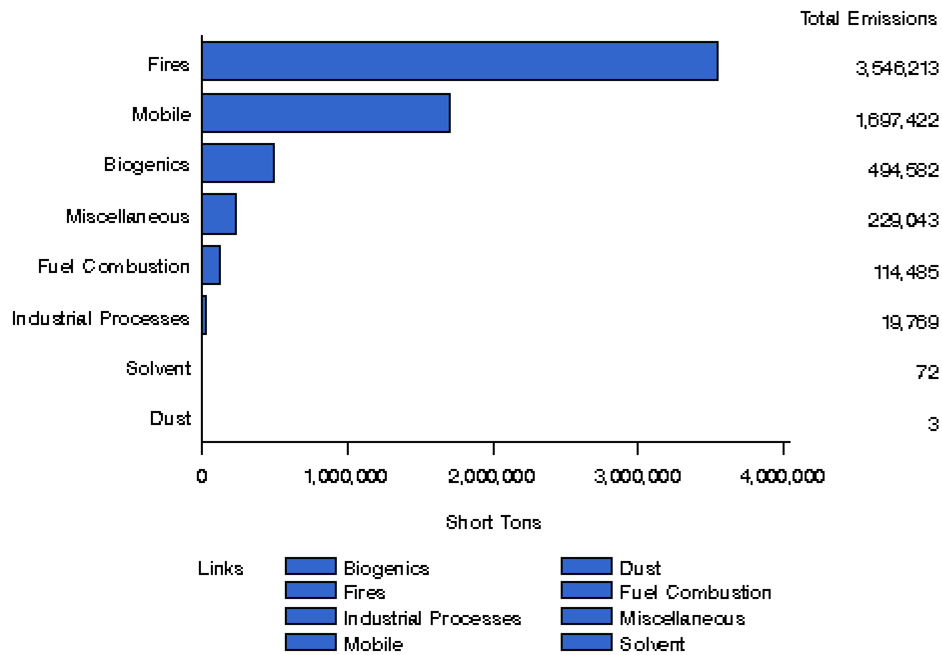
Figure 4-2
Relative Particulate Matter Size

4.1.3 Carbon Monoxide

Definition of CO

CO is a colorless gas that interferes with the transfer of oxygen to the brain. CO emits almost exclusively from the incomplete combustion of fossil fuels. On-road motor-vehicle exhaust is the primary source of CO.

CO is a colorless gas that interferes with the transfer of oxygen in the bloodstream to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. As illustrated on Figure 4-3, on-road motor-vehicle exhaust is the primary source of CO in California. In cities, 85 to 95 percent of all CO emissions may come from motor-vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, and heart disease. CO levels are generally highest in the colder months when inversion conditions (i.e., warmer air traps colder air near the ground) are more frequent. CO concentrations can vary greatly over relatively short distances. Relatively high concentrations of CO are typically found near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban street canyon conditions. The effects of CO emissions for the project are examined on a localized (i.e., microscale) basis, on a regional basis, and on a statewide basis.



Source: USEPA 2017

Figure 4-3 Sources of Carbon Monoxide in California (2014)

4.1.4 Nitrogen Dioxide

NO_2 is a brownish gas that irritates the lungs. It can cause breathing difficulties at high concentrations. NO_2 is one of a group of highly reactive gases known as oxides of nitrogen, or nitrogen oxides. NO_2 can be emitted directly or formed through a reaction between nitric oxide emissions and atmospheric oxygen. NO_2 also contributes to the formation of PM_{10}. At atmospheric concentrations, NO_2 is only potentially irritating. At high concentrations, the result is a brownish-red cast to the atmosphere and reduced visibility. There is some indication of a relationship between NO_2 and chronic (long-term) pulmonary fibrosis. Localized effects of NO_2 are analyzed relevant to the NAAQS and CAAQS.

4.1.5 Lead

Pb is a stable element that persists and accumulates in the environment and in animals. Its principal effects on humans are on the blood-forming, nervous, and renal systems. Pb levels from mobile sources in the urban environment have decreased significantly because of the federally mandated switch to Pb-free gasoline, and they are expected to continue to decrease. An analysis of the effects of Pb emissions from transportation projects is therefore not warranted and has not been conducted for the project.

4.1.6 Sulfur Dioxide

SO_2 is a gas produced by combustion of high-sulfur fuels. The main sources of SO_2 are coal and oil used in power stations, industry, and domestic heating. Industrial chemical manufacturing is another source of SO_2. SO_2 is an irritant that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. SO_2 can also cause plant leaves to turn yellow and can corrode iron and steel. Although heavy-duty diesel vehicles emit SO_2, USEPA regulations have greatly decreased the sulfur content of diesel fuel and gasoline in recent years. Transportation sources contribute only a small fraction of total SO_2 emissions, and the USEPA and other regulatory agencies do not consider transportation sources to be significant sources of this pollutant. Nevertheless, consistent with applicable air district guidance, the effects of changes in SO_2 emissions for the project are examined on regional and statewide levels.

4.2 Toxic and Noncriteria Pollutants

A TAC is defined by California law as an air pollutant that “may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.” The USEPA uses the term HAP in a similar sense. Controlling air toxic emissions became a national priority with the passage of the CAA, in which Congress mandated that the USEPA regulate 188 air toxics, also known as HAPs. TACs can be emitted from stationary and mobile sources. The effects of TACs and other noncriteria pollutants for the project are examined on a local level.

4.2.1 Asbestos

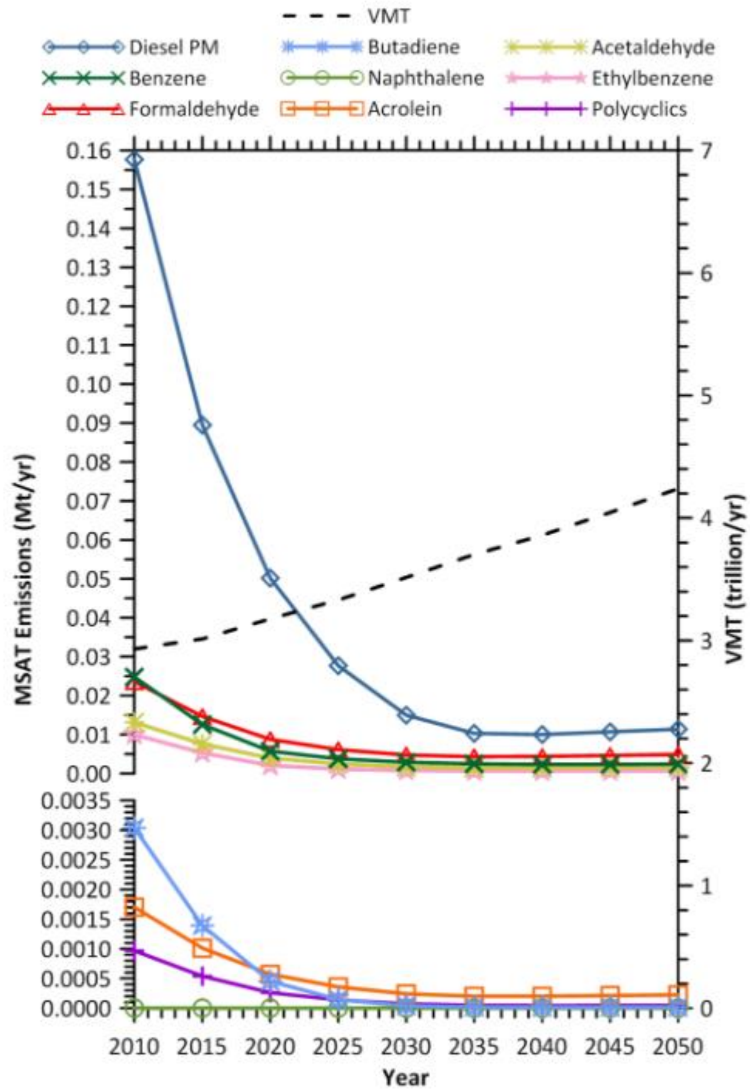
Asbestos deposits from brake wear may be present on surfaces and in the ambient air along the HSR alignment. In addition, asbestos-containing materials may have been used in constructing buildings that would be demolished. Asbestos minerals occur in rocks and soil (known as NOA) as the result of natural geologic processes, often in veins near earthquake faults in the coastal ranges and foothills of the Sierra Nevada and in other areas of California. NOA most commonly occurs in ultramafic rock (i.e., igneous and metamorphic rock with low silica content) that has undergone partial or complete alteration to serpentine rock (or serpentinite) and often contains chrysotile asbestos. In addition, another form of asbestos, tremolite, is associated with ultramafic rock, particularly near geologic faults.

Natural weathering or human disturbance can break NOA down to microscopic fibers, easily suspended in air. When inhaled, these thin fibers irritate tissues and resist the body’s natural defenses. Chronic inhalation exposure to asbestos in humans can lead to asbestosis, which is a diffuse fibrous scarring of the lungs. Symptoms of asbestosis include shortness of breath, difficulty in breathing, and coughing. Asbestosis is a progressive disease (i.e., the severity of symptoms tends to increase with time, even after the exposure has stopped). In severe cases, this disease can lead to death caused by impairment of respiratory function. A large number of occupational studies have reported that exposure to asbestos by inhalation can cause lung cancer and mesothelioma, which is a rare cancer of the membranes lining the abdominal cavity and surrounding internal organs. The USEPA considers asbestos to be a human carcinogen (i.e., cancer-causing agent) (USEPA 2000). The effects of asbestos for the project are examined on regional and local levels.

4.2.2 Mobile Source Air Toxics

The USEPA has assessed an expansive list of air toxics in its 2007 Rule on the Control of Hazardous Air Pollutants from Mobile Sources and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System.

Under the 2007 rule, the USEPA sets standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. Using USEPA’s MOVES2014a model, as shown on Figure 4-4, the FHWA estimates that even if VMT increases by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same period.



Source: FHWA 2016

Trends for specific locations may be different, depending on locally derived information representing vehicle miles traveled, vehicle speeds, vehicle mix, fuels, emission-control programs, meteorology, and other factors.

Figure 4-4 Projected National Mobile Source Air Toxics Emission Trends (2010–2050) for Vehicles Operating on Roadways, Based on USEPA's MOVES2014a Model Assessment (USEPA 2015d)

The USEPA identified nine compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its National Air Toxics Assessment (USEPA 2015d). These are acrolein, benzene, 1,3-butadiene, acetaldehyde, DPM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the FHWA considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future USEPA rules. The effects of MSATs for the project are examined on a regional and local level. The following paragraphs describe these MSATs (Authority and FRA 2012b).

Acrolein is a colorless-to-yellow liquid that burns easily, is readily volatilized, and has a disagreeable odor. It is present as a product of incomplete combustion in the exhausts of stationary equipment (e.g., boilers and heaters) and mobile sources. It is also a secondary pollutant formed through the photochemical reaction of VOCs and NO_X in the atmosphere.

Acrolein is considered to have high acute toxicity, and it causes upper respiratory tract irritation and congestion in humans. The major effects from chronic (long-term) inhalation exposure to acrolein in humans consist of general respiratory congestion and eye, nose, and throat irritation. No information is available on the reproductive, developmental, or carcinogenic effects of acrolein in humans. The USEPA considers acrolein data inadequate for an assessment of human carcinogenic potential.

Benzene is a volatile, colorless, highly flammable liquid with a sweet odor. Most of the benzene in ambient air is from incomplete combustion of fossil fuels and evaporation from gasoline service stations. Acute inhalation exposure to benzene causes neurological symptoms, such as drowsiness, dizziness, headaches, and unconsciousness in humans. Chronic inhalation of certain levels of benzene causes disorders in the blood in humans. Benzene specifically affects bone marrow (the tissues that produce blood cells). Aplastic anemia, excessive bleeding, and damage to the immune system (by changes in blood levels of antibodies and loss of white blood cells) may develop. Available human data on the developmental effects of benzene are inconclusive because of concomitant exposure to other chemicals, inadequate sample size, and lack of quantitative exposure data. The USEPA has classified benzene as a known human carcinogen by inhalation.

1,3-Butadiene is a colorless gas with a mild gasoline-like odor. Sources of 1,3-butadiene released into the air include motor vehicle exhaust, manufacturing and processing facilities, forest fires or other combustion, and cigarette smoke. Acute exposure to 1,3-butadiene by inhalation in humans results in irritation of the eyes, nasal passages, throat, and lungs. Neurological effects, such as blurred vision, fatigue, headache, and vertigo, have also been reported at very high exposure levels. One epidemiological study reported that chronic exposure to 1,3-butadiene by inhalation resulted in an increase in cardiovascular diseases, such as rheumatic and arteriosclerotic heart diseases. Other human studies have reported effects on blood (ATSDR 2012). No information is available on reproductive or developmental effects of 1,3-butadiene in humans. The USEPA has classified 1,3-butadiene as a probable human carcinogen by inhalation.

Acetaldehyde is mainly used as an intermediate in the synthesis of other chemicals. It is may be formed in the body from the breakdown of ethanol. Acute (short-term) exposure to acetaldehyde results in effects including irritation of the eyes, skin, and respiratory tract. Symptoms of chronic (long-term) intoxication of acetaldehyde resemble those of alcoholism. Acetaldehyde is considered a probable human carcinogen.

DPM/Diesel Exhaust Organic Gases are a complex mixture of hundreds of constituents in either gaseous or particle form. Gaseous components of diesel exhaust include CO_2, oxygen, nitrogen, water vapor, CO, nitrogen compounds, sulfur compounds, and numerous low-molecular-weight hydrocarbons. Among the gaseous hydrocarbon components of diesel exhaust that are individually known to be of toxicological relevance are several carbonyls (e.g., formaldehyde, acetaldehyde, acrolein), benzene, 1,3-butadiene, and polycyclic aromatic hydrocarbons (PAH) and nitro-PAHs. DPM is composed of a center core of elemental carbon and adsorbed organic compounds, as well as small amounts of sulfate, nitrate, metals, and other trace elements. DPM consists primarily of $PM_{2.5}$, including a subgroup with a large number of particles having a diameter less than 0.1 µm. Collectively, these particles have a large surface area, which makes them an excellent medium for adsorbing organic compounds. Also, their small size makes them highly respirable and able to reach the deep lung. Several potentially toxicologically relevant organic compounds, including PAHs, nitro-PAHs, and oxidized PAH derivatives, are on the particles. Diesel exhaust is emitted from on-road mobile sources such as automobiles and trucks and from off-road mobile sources (e.g., diesel locomotives, marine vessels, and construction equipment). DPM is directly emitted from diesel engines (primary PM) and can be formed from the gaseous compounds emitted by diesel engines (secondary PM).

Acute or short-term (e.g., episodic) exposure to diesel exhaust can cause acute irritation (e.g., eye, throat, and bronchial), neurophysiological symptoms (e.g., lightheadedness and nausea), and respiratory symptoms (e.g., cough and phlegm). Evidence also exists for an exacerbation of allergenic responses to known allergens and asthma-like symptoms (USEPA 2002). Information from the available human studies is inadequate for a definitive evaluation of possible noncancer health effects from chronic exposure to diesel exhaust. However, on the basis of extensive animal evidence, diesel exhaust is judged to pose a chronic respiratory hazard to humans. The USEPA has determined that diesel exhaust is “likely to be carcinogenic to humans by inhalation” and that this hazard applies to environmental exposures (USEPA 2002).

Ethylbenzene is mainly used in the manufacture of styrene. Acute (short-term) exposure to ethylbenzene results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness. Chronic (long-term) exposure to ethylbenzene by inhalation has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethylbenzene.

Formaldehyde is a colorless gas with a pungent, suffocating odor at room temperature. The major emission sources of formaldehyde appear to be power plants, manufacturing facilities, incinerators, and automobile exhaust. However, most of the formaldehyde in ambient air is a result of secondary formation through photochemical reactions of VOCs and NO_X. The major toxic effects caused by acute formaldehyde exposure by inhalation are eye, nose, and throat irritation and effects on the nasal cavity. Other effects from exposure to high levels of formaldehyde in humans are coughing, wheezing, chest pains, and bronchitis. Chronic exposure to formaldehyde by inhalation in humans has been associated with respiratory symptoms and eye, nose, and throat irritation. The USEPA considers formaldehyde to be a probable human carcinogen.

Naphthalene is used in mothballs and in the production of phthalic anhydride, a chemical compound used in industrial processes that can cause health effects in humans. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported in workers acutely exposed to naphthalene by inhalation and ingestion. Chronic (long-term) exposure of workers and rodents to naphthalene reportedly causes cataracts and damage to the retina. Hemolytic anemia has been reported in infants born to mothers who sniffed and ingested naphthalene (as mothballs) during pregnancy. Available data are inadequate to establish a causal relationship between exposure to naphthalene and cancer in humans. The USEPA has classified naphthalene as a possible human carcinogen.

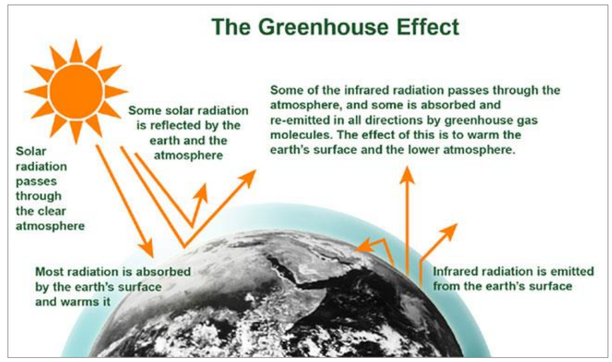
Polycyclic Organic Matter defines a broad class of compounds that includes PAHs, of which benzo[a]pyrene is a member. Polycyclic organic matter compounds are formed primarily by combustion and are present in the atmosphere in particulate form. Sources of air emissions are diverse and include cigarette smoke, vehicle exhaust, home heating, laying tar, and grilling meat. Cancer is the major concern from exposure to polycyclic organic matter. Epidemiologic studies have reported an increase in lung cancer in humans exposed to coke oven emissions, roofing tar emissions, and cigarette smoke; all of these mixtures contain polycyclic organic matter compounds (USEPA 2016b). Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and forestomach tumors, leukemia, and lung tumors from oral exposure to benzo[a]pyrene. The USEPA has classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as probable human carcinogens.

4.3 Valley Fever

Valley fever is not an air pollutant, but is a disease caused by inhaling *Coccidioides immitis* (C. immitis) fungus spores. The spores are found in certain types of soil and become airborne when the soil is disturbed. While C. immitis is not typically found in the Bay Area, the fungus is endemic to the Central Valley (California Department of Public Health 2017). However, the presence of C. immitis in the RSA does not guarantee that construction activities would result in increased incidence of Valley fever. Propagation of C. immitis is dependent on climatic conditions, with the potential for growth and surface exposure highest following early seasonal rains and long dry spells. C. immitis spores can be released when filaments are disturbed by earthmoving activities, although receptors must be exposed to and inhale the spores to be at increased risk of developing Valley fever. Moreover, exposure to C. immitis does not guarantee that an individual will become ill—approximately 60 percent of people exposed to the fungal spores are asymptomatic and show no signs of an infection (USGS 2000).

4.4 Greenhouse Gases

Gases that trap heat in the atmosphere, or GHGs, are necessary to life, because they keep the planet's surface warmer than it otherwise would be. This is referred to as the *greenhouse effect* (Figure 4-5). As concentrations of GHGs increase, however, the Earth's temperature increases. According to National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration data, the Earth's average surface (land and ocean) temperature has increased by 1.6 degrees Fahrenheit (°F) in the last 100 years (NOAA 2018). According to the USEPA, eight of the top 10 warmest years on record for the United States have occurred since 1998, and 2012 and 2015 were the two warmest years on record. Most of the warming in recent decades is very likely the result of human activities. Other aspects of the climate are also changing, such as rainfall patterns, snow and ice cover, and sea level (USEPA 2016c).



Source: USEPA 2015f *MARCH 2019*

Figure 4-5 The Greenhouse Effect

Some GHGs, such as CO_2, occur naturally and are emitted into the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. GHGs differ in their ability to trap heat. For example, 1 ton of emissions of CO_2 has a different effect than 1 ton of emissions of CH_4. To compare emissions of different GHGs, a weighting factor called Global Warming Potential (GWP) is used. To use a GWP, the heat-trapping ability of 1 metric ton (1,000 kilograms) of CO_2 is taken as the standard, and emissions are expressed in terms of CO_2e. The GWP of CO_2 is 1, the GWP of CH_4 is 25, the GWP of N_2O is 298, and the GWP for SF_6 is 22,800 (CARB 2018a). The following are the principal GHGs that enter the atmosphere because of human activities.

- **CO_2**—CO_2 enters the atmosphere from the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees, and wood products and also as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.
- **CH_4**—CH_4 is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and other agricultural practices and from the decay of organic waste in municipal solid waste landfills.
- **N_2O**—N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- **Fluorinated gases**—Hydrofluorocarbons, perfluorocarbons, and SF_6 are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for O_3-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). These gases are typically emitted in smaller quantities, but, because they are potent GHGs, they are sometimes referred to as high GWP gases.

Because of the global nature of GHG emissions, GHGs are examined for the project on the statewide and regional level. Effects of locally emitted GHGs are felt cumulatively and worldwide.

5 AFFECTED ENVIRONMENT

This chapter summarizes existing air quality and GHG conditions along the project corridor. Air quality is affected by both the rate and location of pollutant emissions and by meteorological conditions that influence movement and dispersal of pollutants. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and air quality.

5.1 Meteorology and Climate

California is divided into 15 air basins based on geographic features that create distinctive regional climates. The project would cross the SFBAAB, NCCAB, and SJVAB. Accordingly, local meteorological conditions vary greatly along the length of the project because of topography and elevation, as well as proximity to local waterbodies. This section discusses climate and meteorological information associated with the three project air basins.

5.1.1 San Francisco Bay Area Air Basin (Santa Clara Valley Subregion)

Climate within the SFBAAB is divided into 11 climatological subregions. The portion of the project in the SFBAAB crosses the Santa Clara Valley region, which is bounded by San Francisco Bay to the north and by mountains to the east, south, and west. Temperatures are warm on summer days and cool on summer nights, and winter temperatures are mild. At the northern end of the valley, mean maximum temperatures are 79°F to 82°F during the summer and 55°F to 59°F during the winter, and mean minimum temperatures range from 55°F to 59°F in the summer and 39°F to 43°F in the winter. Further inland, where the moderating effect of the bay is not as strong, temperature extremes are greater. For example, in San Martin, located 27 miles south of San Jose International Airport, temperatures can be more than 10°F warmer on summer afternoons and more than 10°F cooler on winter nights.

Winds in the valley are greatly influenced by the terrain, resulting in a prevailing flow that roughly parallels the valley's northwest-southeast axis. A north-northwesterly sea breeze flows through the valley during the afternoon and early evening, and a light south-southeasterly drainage flow occurs during the late evening and early morning. In the summer, the southern end of the valley sometimes becomes a convergence zone, when air flowing from Monterey Bay is channeled northward into the southern end of the valley and meets the prevailing north-northwesterly winds. Wind speeds are greatest in the spring and summer and weakest in the fall and winter. Nighttime and early morning hours frequently have calm winds in all seasons, while summer afternoons and evenings are quite breezy. Strong winds are rare, associated mostly with the occasional winter storm.

The air pollution potential of the Santa Clara Valley is high. High summer temperatures, stable air, and mountains surrounding the valley combine to promote O_3 formation. In addition to the many local sources of pollution, O_3 precursors from San Francisco, San Mateo, and Alameda Counties are carried by prevailing winds to the Santa Clara Valley. The valley tends to channel pollutants to the southeast. On summer days with low-level inversions, O_3 can be recirculated by southerly drainage flows in the late evening and early morning and by prevailing northwesterlies in the afternoon. A similar recirculation pattern occurs in the winter, affecting levels of CO and PM. This movement of the air up and down the valley significantly increases the effects of pollutants (BAAQMD 2017a).

5.1.2 North Central Coast Air Basin

The NCCAB is comprised of Monterey, Santa Cruz, and San Benito Counties. The basin lies along the central coast of California and covers an area of 5,159 square miles. The semi-permanent high-pressure cell in the eastern Pacific, known as the Pacific High, is the basic controlling factor in the climate of the air basin. In the summer, the high-pressure cell is dominant and causes persistent west and northwest winds over the entire California coast. Air descends in the Pacific High, forming a stable temperature inversion of hot air over a cool coastal layer of air. The onshore air currents pass over cool ocean waters to bring fog and relatively cool air into the coastal valleys. The warmer air above acts as a lid to inhibit vertical air movement.

The generally northwest-southeast orientation of mountainous ridges tends to restrict and channel the summer onshore air currents. Surface heating in the interior portion of the Salinas and San Benito Valleys creates a weak low-pressure system that intensifies the onshore air flow during the afternoon and evening.

In the fall, the surface winds become weak, and the marine layer grows shallow, dissipating altogether on some days. The air flow is occasionally reversed in a weak offshore movement, and the relatively stationary air mass is held in place by the Pacific High, which allows pollutants to build up over a period of a few days. It is most often during this season that north or east winds develop and transport pollutants from the Bay Area or Central Valley into the NCCAB.

During the winter, the Pacific High migrates southward and has less influence on the air basin. Air frequently flows in a southeasterly direction out of the Salinas and San Benito Valleys, especially during night and morning hours. Northwest winds are nevertheless still dominant in winter, but easterly flow is more frequent. The general absence of deep, persistent inversions and the occasional storm systems usually result in good air quality for the basin in winter and early spring.

The northern end of the San Benito Valley experiences west winds nearly one-third of the time. The prevailing air flow during the summer months probably originates in the Monterey Bay area and enters the northern end of the San Benito Valley through the air gap through the Gabilan Range occupied by the Pajaro River. In addition, a northwesterly air flow frequently transports pollutants into the San Benito Valley from the Santa Clara Valley (MBUAPCD 2008).

5.1.3 San Joaquin Valley Air Basin

The SJVAB is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, and the Tehachapi Mountains to the south. The SJVAB contains all of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties, as well as a portion of Kern County.

The area has an inland Mediterranean climate that is characterized by warm, dry summers and cool winters. Summer high temperatures often exceed 100°F, averaging in the low 90s in the northern valley and high 90s in the southern portion.

Although marine air generally flows into the basin from the Delta, the surrounding mountain ranges restrict air movement through and out of the valley. Wind speed and direction influence the dispersion and transportation of pollutants—the more wind flow, the less accumulation.

The vertical dispersion of air pollutants in the SJVAB is limited by the presence of persistent temperature inversion. Because of differences in air density, the air above and below the inversion do not mix. Air pollutants tend to collect under an inversion, leading to higher concentrations of emitted pollutants.

Precipitation and fog tend to reduce pollutant concentrations. O_3 needs sunlight for its formation, and clouds and fog block the required radiation. Precipitation in the San Joaquin Valley decreases from north to south, with approximately 20 inches in the north, 10 inches in the middle, and less than 6 inches in the south (SJVAPCD 2015a).

5.2 Ambient Air Quality

The existing air quality conditions in the project vicinity can be characterized by regional monitoring data. The CARB and various air districts operate air quality monitoring stations throughout California to monitor pollutant concentrations. For the purposes of this analysis, three stations, one in each air basin, were selected to represent conditions along the corridor: San Jose—Jackson Street (SFBAAB), Hollister—Fairview Road (NCCAB), and Merced—South Coffee Avenue (SJVAB).

Table 5-1 shows the results of ambient monitoring at the three stations, where available, for the most recent 3 years of available data (CARB 2018b; USEPA 2018a). Figure 5-1 shows the locations of the monitoring stations relative to the project footprint. Between 2015 and 2017, monitored CO and NO_2 concentrations did not exceed any federal or state standards at any of the three monitoring locations. However, the state and federal standards for O_3 and $PM_{2.5}$ and the state standard for PM_{10} were exceeded. Using violations of the ambient air quality standards as a proxy for air quality, conditions tend to be poorest in the eastern portion of the project in Merced County, with improving air quality as the project moves westward to the SFBAAB.

5.3 Attainment Status

Local monitoring data (Table 5-1) are used to designate areas as nonattainment, maintenance, attainment, or unclassified for the NAAQS and CAAQS. The four designations are further defined as follows:

- **Nonattainment**—Assigned to areas where monitored pollutant concentrations consistently violate the standard in question.
- **Maintenance**—Assigned to areas where monitored pollutant concentrations exceeded the standard in question in the past, but are no longer in violation of that standard.
- **Attainment**—Assigned to areas where pollutant concentrations meet the standard in question over a designated period of time.
- **Unclassified**—Assigned to areas where data are insufficient to determine whether a pollutant is violating the standard in question.

Table 5-2 shows the attainment status of the project in the SFBAAB, NCCAB, and SJVAB with regard to the NAAQS and CAAQS.

Table 5-1 Ambient Criteria Pollutant Concentrations at Air Quality Monitoring Stations in the Project Vicinity

Pollutant and Standards	San Jose-Jackson Street			Hollister-Fairview Road			Merced-S. Coffee Avenue		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Ozone (O_3)[1]									
Maximum 1-hour concentration (ppm)	0.094	0.087	0.121	0.079	0.073	0.078	0.102	0.097	0.093
Maximum 8-hour concentration (ppm)	0.081	0.066	0.088	0.065	0.060	0.072	0.089	0.086	0.084
Number of days standard exceeded[1]									
CAAQS 1-hour (>0.09 ppm)	0	0	3	0	0	0	2	2	0
NAAQS 8-hour (>0.070 ppm)	2	0	4	0	0	1	29	28	16
CAAQS 8-hour (>0.070 ppm)	2	0	4	0	0	1	34	29	17
Carbon Monoxide (CO)[2]									
Maximum 8-hour concentration (ppm)	1.8	1.4	1.8	N/A	N/A	N/A	N/A	N/A	N/A
Maximum 1-hour concentration (ppm)	2.4	1.9	2.1	N/A	N/A	N/A	N/A	N/A	N/A
Number of days standard exceeded[1]									
NAAQS 8-hour (≥9 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
CAAQS 8-hour (≥9.0 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
NAAQS 1-hour (≥35 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
CAAQS 1-hour (≥20 ppm)	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Nitrogen Dioxide (NO_2)[1]									
National maximum 1-hour concentration (ppm)	49.3	51.1	67.5	N/A	N/A	N/A	35.0	35.4	38.9
State maximum 1-hour concentration (ppm)	49	51	67	N/A	N/A	N/A	35	35	38
State annual average concentration (ppm)	12	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of days standard exceeded									
NAAQS 1-hour (98th Percentile>0.100 ppm)	0	0	0	N/A	N/A	N/A	0	0	0
CAAQS 1-hour (0.18 ppm)	0	0	0	N/A	N/A	N/A	0	0	0

Pollutant and Standards	San Jose-Jackson Street			Hollister-Fairview Road			Merced-S. Coffee Avenue		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Annual standard exceeded?									
NAAQS Annual (>0.053 ppm)	No	No	No	N/A	N/A	N/A	No	No	No
CAAQS Annual (>0.030 ppm)	No	No	No	N/A	N/A	N/A	No	No	No
Particulate Matter (PM_{10})[1, 2]									
National[3] maximum 24-hour concentration (μg/m³)	58.8	40.0	69.4	65.8	44.3	80.9	N/A	N/A	N/A
National[3] second-highest 24-hour concentration (μg/m³)	47.2	35.2	67.3	52.5	43.2	74.7	N/A	N/A	N/A
State[4] maximum 24-hour concentration (μg/m³)	58.0	41.0	69.8	N/A	N/A	N/A	N/A	N/A	N/A
State[4] second-highest 24-hour concentration (μg/m³)	49.3	37.5	67.6	N/A	N/A	N/A	N/A	N/A	N/A
National annual average concentration (μg/m³)	21.3	17.5	20.7	17.4	16.5	19.6	NA	NA	NA
State annual average concentration (μg/m³)[5]	21.9	18.3	21.3	N/A	N/A	N/A	N/A	N/A	N/A
Number of days standard exceeded[1]									
NAAQS 24-hour (>150 μg/m³)[6]	0	0	0	0	0	0	N/A	N/A	N/A
CAAQS 24-hour (>50 μg/m³)[6]	3	0	19	N/A	N/A	N/A	N/A	N/A	N/A
Annual standard exceeded?									
CAAQS Annual (>20 μg/m³)	Yes	No	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Particulate Matter ($PM_{2.5}$)[1]									
National[3] maximum 24-hour concentration (μg/m³)	49.4	22.6	49.7	18.6	20.4	42.0	61.2	43.0	48.2
National[3] second-highest 24-hour concentration (μg/m³)	37.0	21.8	46.5	14.6	17.2	34.3	55.7	43.0	47.4
State[4] maximum 24-hour concentration (μg/m³)	49.4	22.7	49.7	18.6	20.4	42.0	61.2	43.0	48.2
State[4] second-highest 24-hour concentration (μg/m³)	37.0	21.8	46.5	14.6	17.2	34.3	55.7	43.0	47.4
National annual average concentration (μg/m³)	9.9	8.3	9.5	4.2	4.3	5.0	12.7	11.9	N/A
State annual average concentration (μg/m³)[5]	10.6	8.4	N/A	4.3	N/A	5.1	N/A	N/A	11.9
Number of days standard exceeded[1]									
NAAQS 24-hour (>35 μg/m³)	2	0	6	0	0	1	16	5	N/A

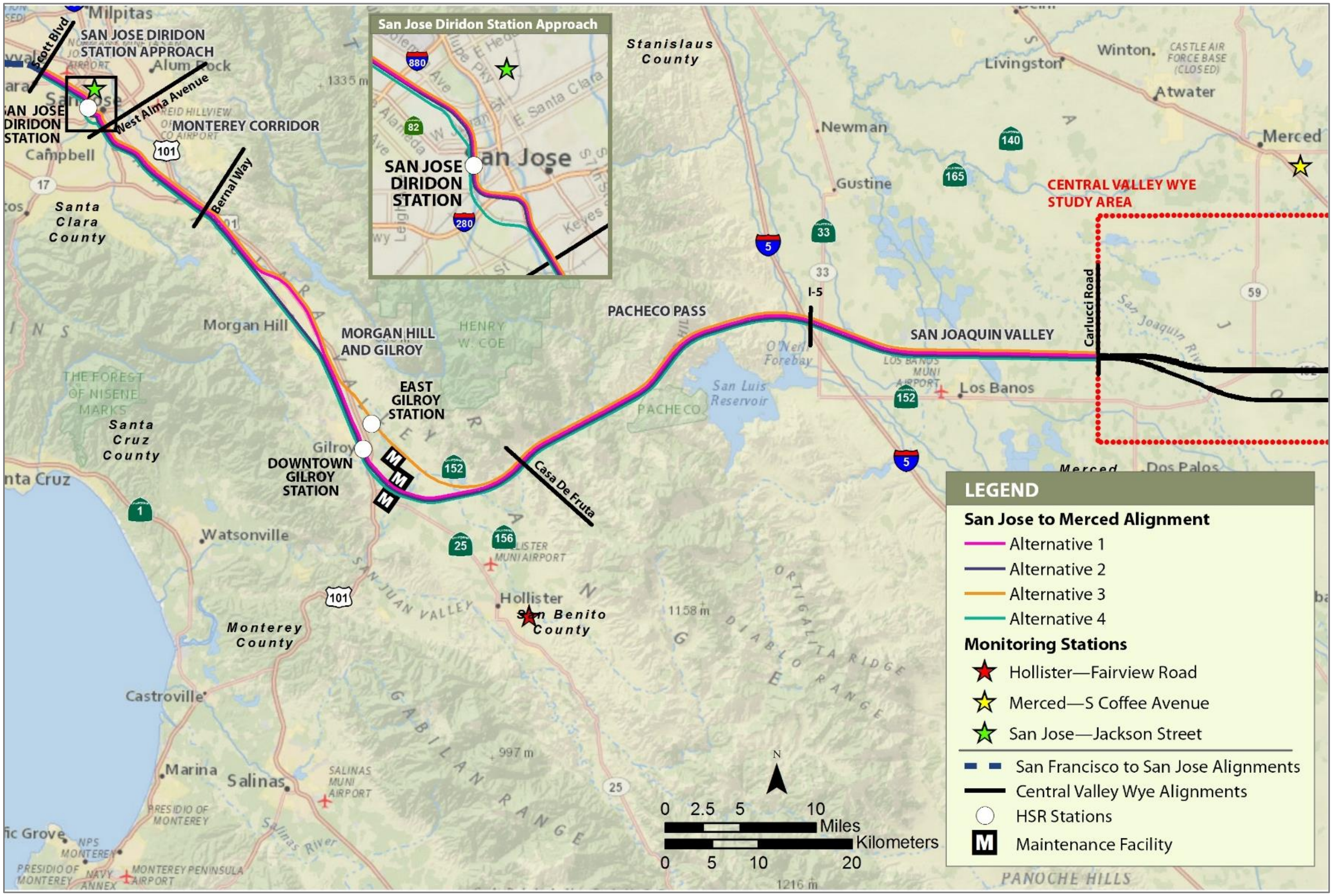
Pollutant and Standards	San Jose-Jackson Street			Hollister-Fairview Road			Merced-S. Coffee Avenue		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Annual standard exceeded?									
NAAQS Annual (>12.0 μg/m³)	No	No	No	No	No	No	No	No	N/A
CAAQS Annual (>12 μg/m³)	No	No	No	No	No	No	No	N/A	No
Sulfur Dioxide (SO_2)									
No data available	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sources: CARB 2018b; USEPA 2018a
CAAQS = California ambient air quality standards
CO = carbon monoxide
NAAQS = national ambient air quality standards
μg/m³ = micrograms per cubic meter
O_3 = ozone
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
ppm = parts per million
SO_2 = sulfur dioxide
> = greater than
N/A = not applicable or there was insufficient or no data available to determine the value
[1] An exceedance of a standard is not necessarily a violation because of the regulatory definition of a violation.
[2] National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.
[3] State statistics are based on local conditions data.
[4] Measurements usually are collected every 6 days.
[5] State criteria for data sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
[6] Mathematical estimate of how many days' concentrations would have been measured as higher than the level of the standard had each day been monitored. Values have been rounded.

Table 5-2 Federal and State Attainment Status of the Project

Pollutant	SFBAAB		NCCAB		SJVAB	
	Federal	State	Federal	State	Federal	State
Ozone (O_3)	Nonattainment (marginal)	Nonattainment	Attainment/ Unclassified	Nonattainment	Nonattainment (extreme)	Nonattainment
Particulate Matter (PM_{10})	Attainment/ Unclassified	Nonattainment	Attainment/ Unclassified	Nonattainment	Maintenance (serious)	Nonattainment
Particulate Matter ($PM_{2.5}$)	Nonattainment (moderate)	Nonattainment	Attainment/ Unclassified	Attainment	Nonattainment (serious/moderate)	Nonattainment
Carbon Monoxide (CO)	Attainment	Attainment	Attainment	Attainment/ Unclassified	Attainment	Unclassified
Nitrogen Dioxide (NO_2)	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment
Sulfur Dioxide (SO_2)	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment	Attainment/ Unclassified	Attainment

Source: CARB 2018c; USEPA 2018b
CO = carbon monoxide
NCCAB = North Central Coast Air Basin
NO_2 = nitrogen dioxide
O_3 = ozone
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SFBAAB = San Francisco Bay Area Air Basin
SJVAB = San Joaquin Valley Air Basin
SO_2 = sulfur dioxide



Source: Authority 2019b; CARB 2018b

JANUARY 2020

Figure 5-1 Monitoring Station Locations

5.4 Emissions Inventory

An emissions inventory is an accounting of the total emissions from all sources in a particular geographic area over a specified period. Emission inventories are used in air quality planning and can provide a general indication of existing air quality in an area.

5.4.1 Criteria Pollutants

The CARB maintains an annual emission inventory for each county and air basin in the state. The inventories for Santa Clara, San Benito, and Merced Counties are composed of data submitted to the CARB by the local air districts, plus estimates for certain source categories, which are provided by CARB staff.

The 2012 air pollutant inventory data for Santa Clara, San Benito, and Merced Counties is shown in Table 5-3. With the exception of San Benito County, mobile source emissions represent the majority of ROG, NO_X, and CO emissions. In San Benito County, area sources represent the majority of ROG emissions, and mobile source emissions represent the majority of NO_X and CO. Area sources represent the majority of PM_{10} and $PM_{2.5}$ emissions in all three counties.

Table 5-3 Estimated Annual Average Emissions for Santa Clara, San Benito, and Merced Counties (2012 data published in 2017) (tons per day)

Source Category	Santa Clara County						San Benito County						Merced County					
	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	ROG	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Stationary Sources																		
Fuel combustion	1	7	10	3	1	1	<1	<1	1	0	<1	<1	<1	2	2	<1	<1	<1
Waste disposal	1	<1	<1	<1	<1	<1	<1	0	0	0	0	0	2	<1	<1	<1	0	0
Cleaning and surface coatings	7	0	0	0	0	0	<1	0	0	0	<1	<1	1	0	0	0	<1	<1
Petroleum production & marketing	2	0	0	0	0	0	<1	0	0	0	0	0	<1	0	0	0	0	0
Industrial processes	2	<1	1	<1	1	1	<1	<1	<1	0	1	<1	2	<1	<1	<1	1	<1
Area-Wide Sources																		
Solvent evaporation	15	0	0	0	0	0	1	0	0	0	0	0	4	0	0	0	0	0
Miscellaneous processes	2	15	3	<1	14	4	1	2	<1	<1	6	1	18	5	1	<1	26	5
Mobile Sources																		
On-road motor vehicles	17	133	34	<1	3	1	1	8	5	0	<1	<1	4	30	18	<1	1	1
Other mobile sources	9	81	12	<1	1	1	<1	3	1	0	<1	<1	2	12	8	<1	<1	<1
Total (all sources)	**55**	**238**	**61**	**3**	**20**	**7**	**4**	**13**	**6**	**0**	**8**	**1**	**32**	**48**	**29**	**<1**	**29**	**6**

Source: CARB 2017
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
ROG = reactive organic gases
SO_X = sulfur oxide

5.4.2 Statewide Greenhouse Gas Emissions

The CARB maintains a statewide emissions inventory of GHGs. The most recent inventory (2016) is shown in Table 5-4. In 2016, the largest contributor to GHG emissions was the transportation sector (41 percent). This sector includes emissions from on-road vehicles, intrastate aviation, waterborne vessels, and rail operations. The next largest contributor to emissions was the industrial sector (23 percent), followed by electricity generations (in-state and imports) (16 percent).

Table 5-4 California Greenhouse Gas Inventory (2016)

Sector	Emissions (million metric tons CO_2e)	Percent of Inventory
Transportation	174	41%
Industrial	100	23%
Electricity generation (in-state)	43	10%
Electricity generation (imports)	26	6%
Agriculture & forestry	34	8%
Residential	28	7%
Commercial	23	5%
Not specified	1	<1%
Total	429	100%

Source: CARB 2018d
CO_2e = carbon dioxide equivalent
< = less than

5.5 Sensitive Receptors

Sensitive receptors are people that have an increased sensitivity to air pollution or environmental contaminants. Sensitive receptor locations include schools, parks and playgrounds, day care centers, nursing homes, and hospitals. Residential dwellings are also considered sensitive land uses because people can be exposed to pollutants for extended periods. Recreational areas are considered moderately sensitive to poor air quality because vigorous exercise associated with recreation places a high demand on the human respiratory function.

Analyses performed by the CARB indicate that providing a separation of at least 1,000 feet from diesel sources and high-traffic areas would reduce exposure to air contaminants and decrease asthma symptoms in children (CARB 2005). Sensitive receptors located within 1,000 feet of the San Jose Diridon Station, Downtown Gilroy Station, East Gilroy Station, and East Gilroy MOWF are shown in Table 5-5 and on Figures 5-2 through 5-5. There are no receptors within 1,000 feet of the South Gilroy MOWF. In the RSA, residential land uses are the most common. Other sensitive receptors in the RSA include childcare/schools, elder care facilities, and parks/recreational facilities.

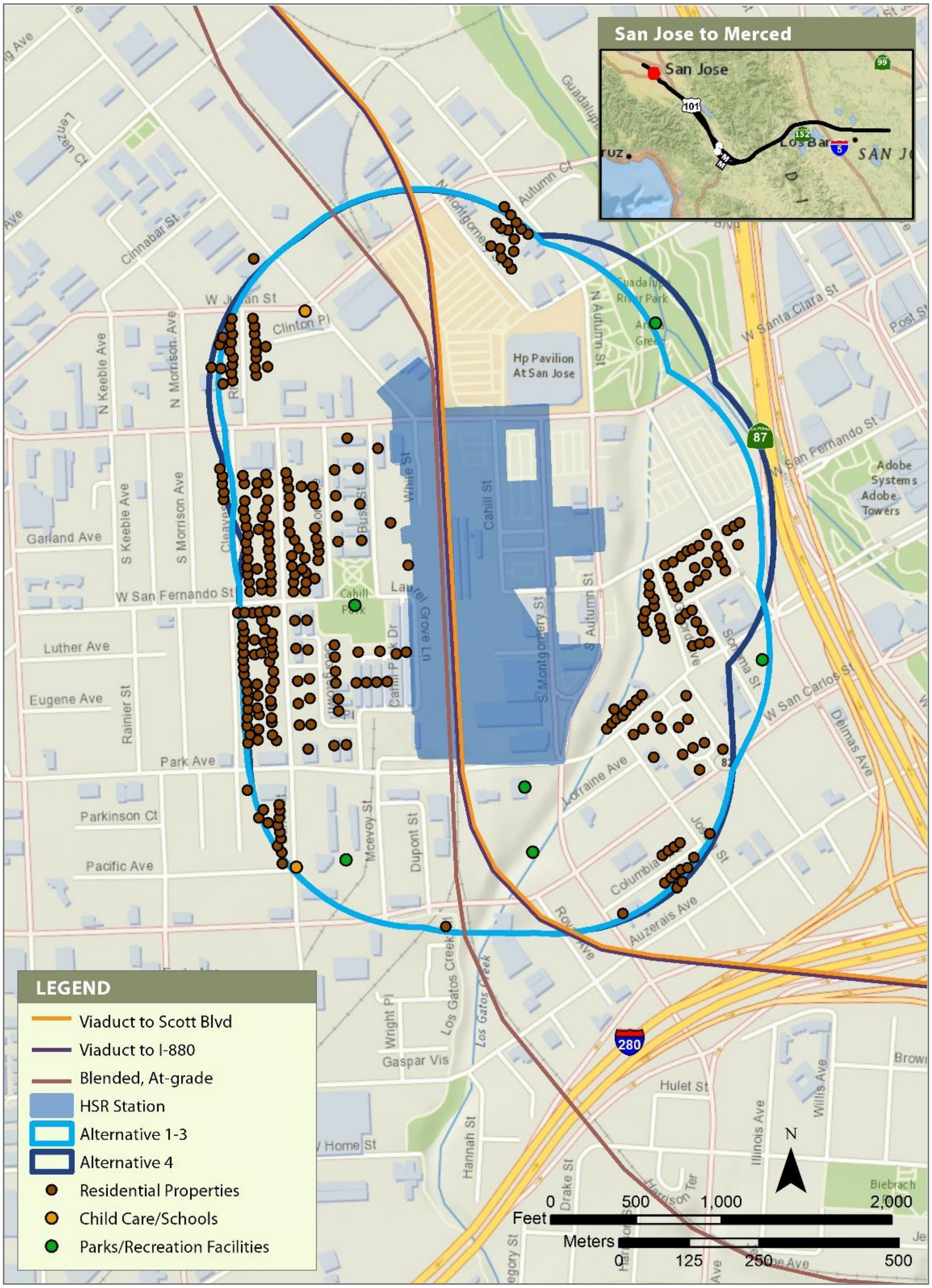
Table 5-5 Sensitive Receptors within 1,000 Feet of the San Jose Diridon and Gilroy Stations and East Gilroy MOWF

Station and Receptor	Distance from Station (feet)[1]	
San Jose Diridon Station	**Alternatives 1, 2, and 3**	**Alternative 4**
Nearest residential receptor	33	36
Arena Green Park	-	802
Cahill Park	325	326
Planned community park	144	144
Discovery Dog Park	957	-
Los Gatos Creek Trail	527	527
Sunol Community Day School play area (school is closed but grass and blacktop remain)	745	745
Downtown Gilroy Station	**Alternatives 1 and 2**	**Alternative 4**
Nearest residential receptor	17	41
Elliot Elementary School (play area)	839	939
Forest Street Park	244	362
Wheeler Tot Lot	826	816
Elliot Elementary School	953	-
Miranda's Residential Care Home	934	971
East Gilroy Station	**Alternative 3**	
Nearest residential receptor	21	
East Gilroy Maintenance of Way Facility[2]	**Alternative 3**	
Nearest residential receptor	90	
Anchor Point Christian School play yard	775	
Anchor Point Christian School	883	

Sources: Authority 2019b; CPAD 2016;

[1] Distance measured from the receptor to the closest edge of the temporary construction areas associated with the stations, as shown in Figures 3.3-3 through 3.3-5.

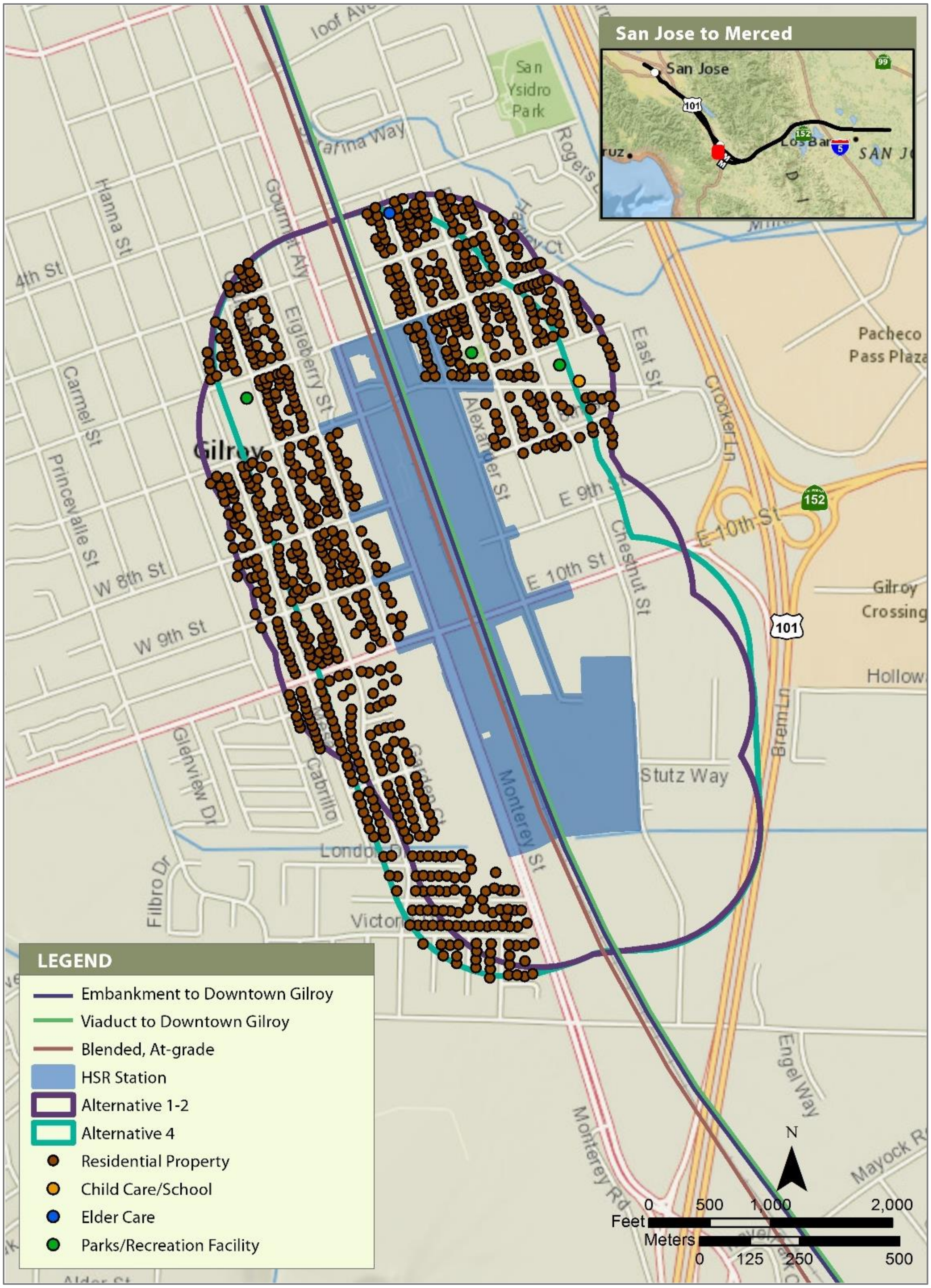
[2] There are no sensitive receptors within 1,000 feet of the South Gilroy MOWF.



Sources: Authority 2019b; CPAD 2016; Google Inc. 2018;

JANUARY 2020

Figure 5-2 Sensitive Receptors within 1,000 Feet of the San Jose Diridon Station



Sources: Authority 2019b; CPAD 2016; Google Inc. 2018;

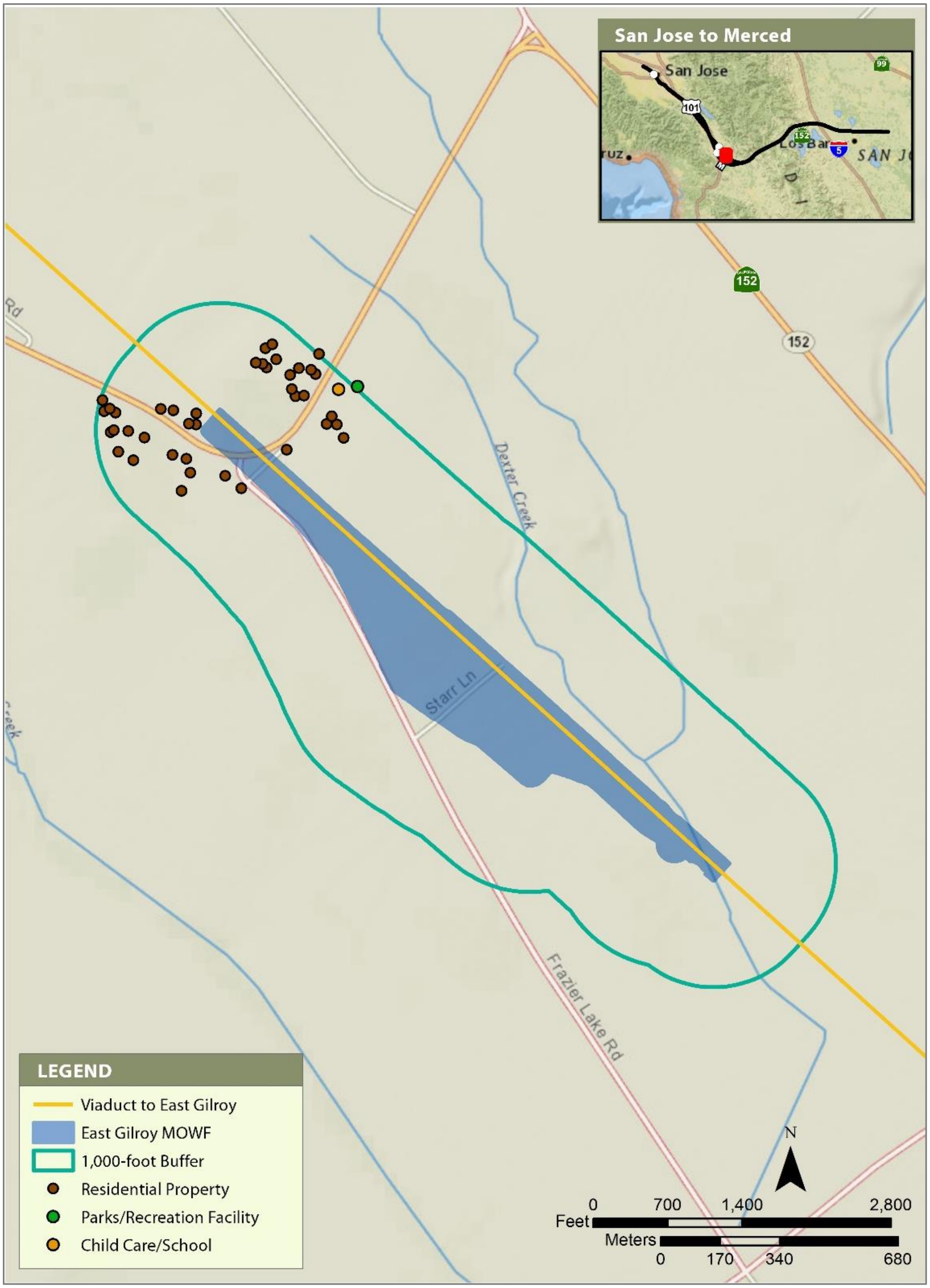
JANUARY 2020

Figure 5-3 Sensitive Receptors within 1,000 Feet of the Downtown Gilroy Station

Sources: Authority 2019b; CPAD 2016; Google Inc. 2018;

JANUARY 2020

Figure 5-4 Sensitive Receptors within 1,000 Feet of the East Gilroy Station



Sources: Authority 2019b; CPAD 2016; Google Inc. 2018;

JANUARY 2020

Figure 5-5 Sensitive Receptors within 1,000 Feet of the East Gilroy Maintenance of Way Facility

6 METHODS FOR EVALUATING EFFECTS

This chapter discusses the methods used to determine the air quality and global climate change effects of the construction and operations of the project. The discussion includes the existing physical conditions that were assumed in the analysis.

Air quality analysts used the year 2015 to represent existing conditions for this analysis (2015 Existing Conditions). The project would be constructed and in operation by 2029, and the full Phase 1 of the statewide HSR system would be operational by 2040. The existing background conditions (e.g., background traffic volumes, trip distribution, and vehicle emissions) of 2015 would change over the 25-year span to full operations in 2040. Changes to the transportation network over the next 25 years will result from funded transportation projects programmed to be constructed by 2040. The buildout of local development plans will affect background traffic volumes. Changes in vehicle emissions over the next 25 years will result from application of updated and more stringent vehicle emissions standards, as well as changing background traffic and VMT. Given these anticipated changes in background conditions over the life of the project from 2015 Existing conditions, the project's air quality operations effects are evaluated against both existing (2015) conditions and background (i.e., No Project) conditions as they are expected to be in 2029 and 2040 (when the full Phase 1 of the statewide HSR system is in operation).

Temporary transportation-related effects, such as those from temporary road closures during construction, are evaluated only against existing conditions. Construction of the project alone could reconfigure the existing roadway network, permanently redirecting existing traffic and causing traffic effects at intersections and road segments that receive the redirected traffic. The 2015 Existing Conditions are particularly helpful for evaluating these effects, and mitigation based on these conditions would be appropriate.

6.1 Definition of Resource Study Area

The RSA is the area in which all environmental investigations specific to air quality and global climate change are conducted to determine the resource characteristics and potential effects of the project. The RSA for air quality and global climate change comprises the state, the regional air districts (SFBAAB, NCCAB, and SJVAB), and the local study areas (areas immediately adjacent to construction activities). Each of these components of the RSA is described in the following subsections.

6.1.1 Statewide

Analysts identified a statewide RSA to evaluate potential changes in GHG/global climate change and air quality from large-scale, nonlocalized factors. Such factors include HSR power requirements, changes in air traffic, and project conformance with the SIP.

6.1.2 Regional

The project would potentially affect regional air pollutant concentrations in the Santa Clara County portion of the SFBAAB, the San Benito County portion of the NCCAB, and the Merced County portion of the SJVAB. Figure 3-1 in Chapter 3 highlights the three air basins in the RSA.

6.1.3 Local

Local RSAs are areas of potential major air emission activities, including areas where construction would occur along the project alignment and near construction staging areas. Local RSAs are generally defined as areas within 1,000 feet of the project footprints or construction staging areas. CARB analyses indicate that providing a separation of 1,000 feet from diesel sources and high-traffic areas substantially reduces DPM concentrations, public exposure, and asthma symptoms in children (CARB 2005). Accordingly, 1,000 feet from the project right-of-way is defined as the local RSA.

6.2 Statewide and Regional Operations Emissions Calculations

The emission burden analysis of a project determines a project's overall effect on air quality levels. The project would affect long-distance, city-to-city travel along freeways and highways throughout the state, as well as long-distance, city-to-city aircraft takeoffs and landings. The HSR system would also affect electrical demand throughout the state. Analysts calculated criteria pollutant and GHG operations emissions for two ridership scenarios: a medium ridership scenario of the Silicon Valley to Central Valley line (from San Francisco to north of Bakersfield) and a high ridership scenario of the same distance. Analysts developed these two scenarios for three different years: 2015 Existing Conditions, 2029 Plus Project conditions (opening), and 2040 Plus Project conditions (Phase 1 of the HSR system horizon 2040). Both scenarios are based on the level of ridership as presented in *Connecting and Transforming California, 2016 Business Plan* (2016 Business Plan) (Authority 2016).[10, 11] These scenarios assume different background conditions. For example, forecast trends in demographics and travel costs can influence ridership for any HSR scenario. The medium scenario was developed using the "most likely" values of all inputs to the HSR ridership forecasting model, while the high scenario used inputs that were set at values that result in ridership at the 75th percentile of the range considered in the ridership risk analysis. The 2016 Business Plan provides additional detail on the travel forecasts and risk analysis. The tables in the effects analysis therefore present two values for operational emissions for each pollutant, corresponding to these two scenarios.

6.2.1 On-Road Vehicles

Analysts evaluated on-road vehicle emissions using average daily VMT estimates and associated average daily speed estimates for each affected county. Analysts estimated emission factors using the CARB emission factor program, EMission FACtors (EMFAC) 2017, which accounts for existing regulations that would reduce emissions, such as the Pavley Clean Car Standards. Parameters were set in the program for each county to reflect conditions within each county and statewide parameters to reflect travel through each county. The analysis was conducted for the following modeling years:

- Existing Year (2015)
- Opening Year (2029)
- Horizon Year (2040)

To determine overall pollutant burdens generated by on-road vehicles, analysts multiplied the estimated VMT by the applicable pollutant's emission factors, which are based on speed, vehicle mix, and analysis year. The difference between emissions with the project and without the project represents the effects of the project.

6.2.2 Trains

The entire HSR system, including the project, would use electric multiple-unit (EMU) trains, with the power distributed through the overhead contact system. Accordingly, the HSR system would not produce direct emissions from combustion of fossil fuels and associated emissions. However, trains traveling at high velocities, such as those associated with the HSR system, create sideways turbulence and rear wake, which resuspend particulates from the surface surrounding

---

[10] As described in Appendix 3.3-C, Changes to Project Benefits Based on 2018 Business Plan, to the EIR/EIS, the Authority Board adopted the 2018 Business Plan on May 15, 2018. The 2018 Business Plan assumes an opening year of 2033 for Phase 1 and presents different ridership forecasts for 2029 and 2040 than were assumed in this technical report. Under the 2018 Business Plan ridership forecasts, the HSR project would achieve the same benefits described in this section, but they would occur at different times and may be less than presented in Chapter 7, Air Quality Effects Analysis, and Chapter 8, Global Climate Change Effects Analysis. Nonetheless, HSR ultimately affords a more energy-efficient choice for personal travel that would help alleviate highway congestion, provide greater capacity for goods movement, and reduce criteria pollutant and GHG emissions.

[11] As described in the *San Jose to Merced Project Section Transportation Technical Report*, the project would result in a 6.5 percent increase in Caltrain ridership (Authority 2019c). VMT reductions and corresponding emissions benefits from this additional ridership have not been accounted for in this analysis. Accordingly, the long-term benefits reported in this study are likely conservative.

the track, resulting in fugitive dust. Analysts used the USEPA (2006a) method for estimating emissions from wind erosion. They assumed a friction velocity of 0.62 foot per second to resuspend soils and that a HSR train passing at 220 mph could resuspend soil particles out to approximately 10 feet from the train (Watson 1996).

6.2.3 Aircraft

Analysts used the Federal Aviation Administration's Aviation Environmental Design Tool to estimate aircraft emissions. This tool estimates the emissions generated from specified numbers of landing and take-off cycles. Along with emissions from the aircraft, emissions generated from associated ground-maintenance requirements are included. Analysts calculated aircraft emissions by using the fuel consumption factors and emission factors from the CARB's 2000–2014 *Greenhouse Gas Emissions Inventory Technical Support Document* and the accompanying appendix. The emission factor includes both landing and take-off and cruise operations (formula: aircraft emissions per flight = fuel consumption × emission factor; aircraft emissions = flights removed × aircraft emissions per flight). Analysts calculated average aircraft emissions based on the profile of intrastate aircraft currently servicing the San Francisco to Los Angeles corridor. Analysts estimated the number of air trips removed attributable to the project through the travel demand modeling analysis conducted for the project, based on the ridership estimates presented in the 2016 Business Plan (Authority 2016).

6.2.4 Power Plants

Analysts conservatively estimated the electrical demands caused by propulsion of the trains and the trains at terminal stations and in storage depots and maintenance facilities as part of the project design. Analysts derived average emission factors for each kilowatt-hour (kWh) required from CARB statewide emission inventories of electrical and cogeneration facilities data along with USEPA eGRID2016 (released February 2018) electrical generation data. The energy estimates used in this analysis for the propulsion of the HSR include the use of regenerative brake power.

The HSR system is currently analyzed as if it would be powered by the state's current electric grid. This is a conservative assumption because of the state requirement that an increasing fraction of electricity (60 percent by 2030) generated for the state's power portfolio come from renewable energy sources. As such, the emissions generated for the HSR system are expected to be lower in the future than the emissions estimated for this analysis. Furthermore, under the 2013 Policy Directive POLI-PLAN-03, the Authority has adopted a goal to purchase 100 percent of the HSR system's power from renewable energy sources.

6.3 Local Operations Emissions Calculations

Operation of the project traction power, switching, and paralleling stations would not result in appreciable air pollutants because site visits would be infrequent, and power usage would be limited. Therefore, emissions from these stations were not quantified.

The following sections discuss the methods used to estimate operational emissions from the train stations, maintenance facilities, and additional SF_6 circuit breakers installed during reconductoring activities and evaluate the project's effect on ambient air quality conditions and human health. The health risk assessment (HRA) focuses on the key localized pollutants of concern, which are CO, PM, and MSATs.

6.3.1 Stations

The project includes an expanded San Jose Diridon Station and either an expanded Downtown Gilroy Station or a new East Gilroy Station.[12] The stations would provide drop-off facilities, an entry plaza, a station house area for ticketing and support services, an indoor station room where passengers wait to access the HSR, and parking facilities. Emissions associated with the operation of the stations would primarily result from area and stationary sources, electricity and

[12] The project section terminates at the Merced Station, which is discussed in the Merced to Fresno Final EIR/EIS and is not included in this analysis.

water consumption, waste generation, emergency generator testing, and vehicle traffic. The methods used to evaluate each of these sources is described in the following subsections.

Since the San Jose Diridon and Downtown Gilroy Stations are existing facilities, emissions were analyzed under both existing and project conditions. The difference between existing and project conditions represents the net effect of the project analyzed. Since the East Gilroy Station would be constructed as part of the project, existing emissions were assumed to be zero.

6.3.1.1 Area Sources

Analysts calculated the criteria pollutant and GHG emissions from area sources using CalEEMod. Emissions were based on the land use data, entered as the size of the station buildings (square feet). The CalEEMod output files and the activity data details used to perform the estimations are summarized in Appendix A.

6.3.1.2 Natural Gas

Analysts calculated criteria pollutant and GHG emissions from natural gas consumption for water and space heating based on the building square footage, existing gas consumption rates, and CalEEMod. The San Jose Diridon Station consumed 1,022 therms of gas in 2016, resulting in a consumption rate of 0.05 therms/square foot/year (McGuire 2017–2018). The Downtown Gilroy Station is currently a platform and does not consume gas. Accordingly, the existing gas rate (0.05 therms/square foot/year) for the San Jose Diridon Station was assumed representative of the future stations at San Jose Diridon and in Gilroy. This assumption is conservative, since the stations would be LEED Platinum certified, which would reduce gas consumption per square foot relative to the existing rate.

6.3.1.3 Indirect Electricity

The San Jose Diridon and Gilroy stations would generate indirect emissions from purchased electricity consumed for facility lighting. It is expected that the power used by HSR stations would be much less than the power used by train operations; however, the indirect emissions from power consumption have been included in the overall emission estimates.

Analysts calculated indirect GHG emissions from purchased electricity consumed by HSR stations based on the building square footage, existing electricity consumption rates, and CalEEMod. The San Jose Diridon and Downtown Gilroy Stations consumed 623,763 and 5,041 kWh of electricity in 2016, resulting in a consumption rate of 28 kWh/square foot/year and 2 kWh/square foot/year, respectively (McGuire 2017–2018). Since the Downtown Gilroy Station is currently a platform, the existing electricity rate (28 kWh/square foot/year) for the San Jose Diridon Station was assumed representative of future project stations at Diridon and in Gilroy. This assumption is conservative, since the project stations would be LEED Platinum certified, which would reduce electricity consumption per square foot relative to the existing stations.

6.3.1.4 Indirect Water and Wastewater

The San Jose Diridon Station, Downtown Gilroy Station, and East Gilroy Station would generate indirect GHG emissions from purchased water consumed for facility restrooms, drinking fountains, landscaping, and other miscellaneous uses. Analysts calculated indirect GHG emissions from purchased water consumed by the HSR stations based on the building square footage, existing water consumption rates, and CalEEMod. The San Jose Diridon and Downtown Gilroy Stations consumed 1.9 million and 130,000 gallons of water per year, resulting in a consumption rate of 89 gallons/square foot/year and 49 gallons/square foot/year, respectively (McGuire 2017–2018). Since the Downtown Gilroy Station is currently a platform, the existing water rate (89 gallons/square foot/year) for the San Jose Diridon Station was assumed representative of the future project stations at San Jose Diridon and in Gilroy. This assumption is conservative, since the project stations would be LEED Platinum certified, which would reduce water consumption per square foot relative to the existing stations.

6.3.1.5 Indirect Solid Waste

The San Jose Diridon and Gilroy stations would generate indirect GHG emissions from solid waste disposal. Waste generation at the existing San Jose Diridon and Gilroy stations was not available. Accordingly, analysts calculated indirect GHGs from solid waste generation using CalEEMod defaults.

6.3.1.6 Emergency Generators

The San Jose Diridon and Gilroy stations would have emergency generators that would be used in the event of a power outage. Analysts assumed that the emergency generators would be Tier 4, 800-kilowatt generators. Usage of each of the proposed emergency generators would occur for up to 50 hours per year for periodic testing, consistent with CARB's Airborne Toxic Control Measure for Stationary Compression Ignition Engines and Section 330.3 of BAAQMD Regulation 9, Rule 8. Analysts modeled emissions using CalEEMod.

6.3.1.7 Vehicle Traffic

Passengers

Mobile source emissions would occur from passenger commutes. Passengers would be expected to arrive at the San Jose Diridon and Gilroy stations by car, shuttle, and bus/rail.[13] The numbers of daily passengers visiting the San Jose Diridon and Gilroy stations are shown in Table 6-1. As a conservative estimate, passenger traffic was expected to occur 7 days per week.

Analysts estimated vehicular exhaust emissions from passengers arriving by car using CalEEMod assuming a mix of light-duty automobiles and light-duty trucks. Connecting bus/shuttle service would primarily be provided by the Santa Clara Valley Transportation Authority (VTA). Connecting rail service includes Caltrain, Bay Area Rapid Transit, and VTA light rail. Connecting transit service to the passenger rail terminals is not part of the project. The Authority assumes that bus service levels are constant into the future given that no operator has a funding plan to deliver more service. Routing buses to the new East Gilroy Station would be the responsibility of VTA as part of their long-range expansion plans, which would outline anticipated service and vehicle needs commensurate with the expected East Gilroy demand. Accordingly, mass emissions generated by connecting transit are not included in the air quality or GHG assessment for the project.

Employees

Analysts calculated emissions from employee traffic using CalEEMod based on weighted average vehicle emission factors for light-duty automobiles and light-duty trucks. As a conservative estimate, employee traffic was expected to occur 7 days per week. It was assumed that each employee would make one round trip per day. There would be a total of 36 daily employee round trips at the San Jose Diridon Station and 29 daily employee roundtrips at the Downtown Gilroy or East Gilroy Station (Burton 2017c).

6.3.2 Maintenance Facilities

Two maintenance facilities would be required for the project. A MOWF would be constructed either south of Gilroy (Alternatives 1, 2, and 4) or east of Gilroy (Alternative 3), and a MOWS would be built near Turner Island Road (Alternatives 1, 2, 3, and 4). Activities performed at the MOWF would consist of planning maintenance work, storing and dispatching rail mounted equipment, inspecting and maintaining rail mounted equipment, and transporting right-of-way equipment. The purpose of the MOWS is to support the MOWF activities by providing temporary storage of materials and other resources.

---

[13] Biking and walking trips have been excluded from the table and analysis since there would be no emissions.

Table 6-1 Daily Passengers at HSR Stations

Mode of Access	San Jose Diridon	Downtown Gilroy	East Gilroy
By car			
Existing			
Without HSR	2,400	190	0
With HSR	3,860	2,470	2,470
Future without HSR			
2029	3,380	270	0
2040	4,280	340	0
Future with HSR			
2029	4,840	3,300	4,080
2040	9,940	7,100	8,000
By shuttle (with and without HSR)[1]			
2029	1,800	940	1,500[2]
2040	4,300	2,000	3,800[2]
By bus/rail (with and without HSR)[1]			
2029	5,800	1,100	260[2]
2040	12,300	2,300	560[2]

Sources: Burton 2017a, 2017b, 2018
HSR = high-speed rail
[1] The with HSR conditions are the same as the No Project condition. The Authority assumes that bus service levels are constant into the future given that no operator has a funding plan to deliver more service.
[2] While bus service levels are assumed to be the same under with and without project conditions, the East Gilroy Station would be an entirely new transit stop with HSR conditions. Localized emissions and potential health risks from exposure to diesel-exhaust under this specific project-induced change are assessed in Section 7.3.1, Station Sites and Maintenance Facilities.

Analysts used CalEEMod to estimate building operation emissions, assuming default conditions for the *general light industrial* land use category (Appendix A). It was assumed that there would be an average of 20 truck deliveries to the MOWF and MOWS per day and that the trucks would travel 120 miles round trip. Truck deliveries would include supplies of materials and chemicals, as well as remove refuse from the site. There would be a total of 450 daily employee trips at the MOWF (Burton 2017c).[14] One emergency generator was assumed to operate 50 hours per year at each facility. The emission outputs are provided in Appendix A.

Emissions from maintenance equipment, vehicle, and rail movement at the MOWF were estimated using a combination of emission factors and methodologies from CalEEMod, EMFAC2017, and the USEPA (2009). Daily and annual equipment, vehicle, and locomotive operating activity were obtained from the Authority (Newson 2018). Rail mounted equipment would include track treatment machinery, right-of-way inspection/maintenance machinery, and hi-rail specialist equipment. Vehicles would primarily include hi-rail trucks, SUVs, and section trucks. Locomotives would be used to support maintenance, grinding, milling, inspection, welding, and other activities.

Prior to operation in 2029, new equipment will be purchased for the MOWF that, at a minimum, conforms to Tier 4 emission standards. EPA and CARB phased-in Tier 4 emission standards over

[14] The MOWS would require six employees per day, all of whom would arrive by rail (Burton 2017c).

the period of 2008 to 2015. Accordingly, all newly purchased or remanufactured off-road equipment and locomotives after 2015 must meet Tier 4 emission standards. It is possible more stringent emission standards will be introduced and effective by the time new equipment is purchased for the MOWF. However, because Tier 4 is the standard currently required for new and remanufactured equipment, this analysis conservatively assumes all off-road equipment and locomotives operating at the MOWF meet Tier 4 emissions standards. If more stringent standards are adopted prior to new equipment purchase, emissions and health risks would be lower than presented in this analysis. The emission calculations are provided in Appendix A.

6.3.3 Sulfur Hexafluoride Circuit Breakers

Operations and maintenance activities required for the reconductored Spring to Llagas and Green Valley to Llagas power lines would not change from those currently required for the existing system; thus, no additional operations-related criteria pollutants would occur. However, the project would require the installation of electrical equipment, including up to 12 power circuit breakers with SF_6-gas-insulated switchgear. Potential SF_6 emissions from the additional breakers were estimated based on the mass of each breaker (230 pounds) and an assumed 0.5 percent by mass annual leak rate, per PG&E standard specifications.

6.3.4 Microscale Carbon Monoxide Hot Spot Analysis

Traffic around the San Jose Diridon and Gilroy stations and affected by grade crossings (Alternative 4 only) may contribute to localized increases in CO, known as CO “hot spots”. The BAAQMD has adopted screening criteria that provide a conservative indication of whether project-generated traffic would cause a potential CO hot spot. The air district establishes that if the screening criteria are not met, a quantitative analysis through site-specific dispersion modeling of project-related CO concentrations would not be necessary, and the project would not cause localized exceedances of CO CAAQS. BAAQMD’s screening criteria were developed based on local modeling and provide a conservative estimate for the maximum number of vehicles that can be added to an intersection without an exceedance of the CO CAAQS. BAAQMD CO screening criteria are as follows:

1. Project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour.
2. Project traffic would not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway).
3. The project is consistent with an applicable CMP established by the county congestion management agency for designated roads or highways, RTP, and local congestion management agency plans.

Traffic data provided by Fehr & Peers (Burton 2017d) indicate that no intersections in the local RSA would exceed 24,000 vehicles per hour. The intersection analysis included all intersections affected by station traffic and near grade crossings. Up to 20 intersections, depending on the alternative, would violate the established LOS standard in the applicable CMP under 2040 Plus Project conditions. Analysts performed a microscale CO hot-spot analysis at five of these locations near stations and one at-grade crossing (Alternative 4) to verify that project traffic would not cause or contribute to a violation of the CO CAAQS. The potential for CO hot spots was evaluated using the Caltrans Institute of Transportation Studies *Transportation Project-Level Carbon Monoxide Protocol* (CO Protocol) (Garza et al. 1997). The CO Protocol details a step-by-step procedure to determine whether project-related CO concentrations have a potential to generate new air quality violations, worsen existing violations, or delay attainment of CAAQS or NAAQS for CO. Additional details of the modeling are described in the following subsections.

6.3.4.1 Intersection Selection

Analysts ranked the 20 intersections that would violate the established CMP LOS standards by their total peak-hour traffic volumes and anticipated delay. The five intersections with the highest station traffic volumes and worst congestion were selected for CO modeling. Analyzing these intersections provides a worst-case assessment of potential CO effects because CO concentrations at all other intersections would be lower than those estimated for the selected intersections. The following intersections were selected for the analysis:

- The Alameda (SR 82)/Taylor Street-Naglee Avenue
- Autumn Street (SR 82)/West Santa Clara Street (SR 82)
- Coleman Avenue/I-880 Northbound Ramps
- Monterey Road (SR 82)/Blossom Hill Road Westbound Ramps (SR 82/County Route G10)
- US 101 Southbound Ramps/Blossom Hill Road

In addition to these locations, the intersection of Monterey Road and Skyway Drive was analyzed under Alternative 4. The traffic analysis indicates that this intersection would have the highest traffic volumes and worst congestion of the locations analyzed with at-grade crossings (Burton 2017d).

6.3.4.2 Receptor Locations

Receptors for the intersection analyses were identified in accordance with CO Protocol (Garza et al. 1997). All receptors were located at a height of 6 feet. Receptors for the intersection analysis were located 10 feet from the roadway so they were not within the mixing zone of the travel lanes and were spaced at 0, 82, and 164 feet from the intersection for both the 1-hour and 8-hour analyses (Garza et al. 1997). Analysts assumed that the public could access these locations whether or not sidewalks exist at the receptor location.

6.3.4.3 Emission Model

Analysts estimated vehicular emissions using EMFAC2017, which is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. Consistent with the traffic analysis and the anticipated design year of the project, CO emission factors are based on 2029 and 2040 vehicle mixes for projected conditions in Santa Clara County. The CARB designed EMFAC2017 to address a wide variety of air pollution modeling needs, and the program incorporates fleet-specific emission rates, realistic driving patterns, separation of start and running emissions, correction factors for engine deterioration, and annual fleet compositions.

6.3.4.4 Dispersion Model

Mobile source dispersion models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that constitute the various models attempt to describe as closely as possible a complex physical phenomenon. Analysts used Caltrans' CALINE4 dispersion model to estimate pollutant concentrations near roadway intersections.

CALINE4 is a Gaussian model recommended in the Caltrans CO Protocol. Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution around the center of the pollution source. The model is described in *CALINE4 – A Dispersion Model for Predicting Air Pollutant Concentration near Roadways, FHWA/CA/TL-84/15*. The analysis of roadway CO effects followed the CO Protocol (Garza et al. 1997). The CALINE4 output files are provided in Appendix B.

6.3.4.5 Meteorological Conditions

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the temperature profile of the atmosphere. Analysts chose the values for these parameters to maximize pollutant concentrations at each prediction site (i.e., to establish a conservative worst-case situation).

- **Wind direction**—Maximum CO concentrations are normally found when the wind is assumed to blow approximately parallel to a single roadway adjacent to the receptor location.

However, at complex intersections, it is difficult to predict which wind angle would result in maximum concentrations. Therefore, at each receptor location, the approximate wind angle that would result in maximum pollutant concentrations was used in the analysis. All wind angles from 0° to 360° were considered.

- **Wind speed**—CO concentrations are greatest at low wind speeds. A conservative wind speed of 1 mph was used to predict CO concentrations during peak traffic periods.
- **Temperature and profile of the atmosphere**—Analysts chose an ambient temperature based on the CO Protocol (Garza et al. 1997) recommendation for the local RSA, a mixing height (the height in the atmosphere to which pollutants rise) of 1,000 feet. Neutral atmospheric stability (stability class G) conditions was used in estimating microscale CO concentrations. Winter low temperatures of 41°F were assumed based on the average temperature in December over an approximately 30-year period (based on Western Regional Climate Center data accessed in February 2017). The stability class G was chosen, as recommended in Table B.11 of the CO Protocol.

Analysts based the selection of these meteorological parameters on recommendations from the CO Protocol (Garza et al. 1997) and the USEPA (1992) guidelines. These data were found to be the most representative of the conditions in the RSA.

6.3.4.6 Persistence Factor

Analysts obtained peak 8-hour concentrations of CO by multiplying the highest peak-hour CO estimates by a persistence factor. The persistence factor accounts for the following characteristics:

- Over an 8-hour period (as distinct from a single hour), vehicle volumes fluctuate downward from the peak hour.
- Vehicle speeds may vary over an 8-hour period compared to a single hour.
- Meteorological conditions, including wind speed and wind direction, vary compared with the conservative assumptions used for the single hour.
- Analysts used a persistence factor of 0.7 in this analysis, which is recommended in the CO Protocol (Garza et al. 1997).

6.3.4.7 Background Concentrations

Analysts added background CO concentrations based on local air quality monitoring data (2015 to 2017) to project-level results to account for sources of CO not included in the modeling. Background concentrations for 2029 and 2040 No Project conditions were assumed to be the same as those for the current year. Actual 1- and 8-hour background concentrations in future years would likely be lower than concentrations used in the CO modeling analysis because the CO emissions and concentrations are decreasing because of continuing improvements in engine technology and the retirement of older, higher-emitting vehicles.

6.3.4.8 Traffic Information

Analysts derived traffic data for the air quality analysis from traffic counts and other information developed as part of an overall traffic analysis for the project (Burton 2017d). The microscale CO analysis was performed based on data from this analysis for the afternoon-evening (p.m.) peak traffic period. This is the period when maximum traffic volumes occur on local streets and the greatest traffic and air quality effects of the project are expected.

6.3.5 Particulate Matter (PM_{10} and $PM_{2.5}$) Hot-Spot Analysis

PM hot spots may be created by localized increases in vehicle or rail traffic, particularly when that traffic consists of a significant number of diesel-powered vehicles. Redistributing or moving vehicle or rail traffic would also increase PM concentrations at certain locations and result in corresponding decreases in other locations. This section discusses methods for evaluating potential PM hot spots from changes in on-road vehicle and freight rail traffic.

6.3.5.1 On-Road Vehicles

Although the project is not subject to transportation conformity, portions of the local RSA are classified as nonattainment or maintenance for the federal PM_{10} or $PM_{2.5}$ standards. Consequently, analysts conducted a hot-spot analysis following the USEPA's 2015 *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (USEPA 2015e). The analysis focused on potential air quality concerns under NEPA from the project's effects on roads and followed the recommended practice in the USEPA's Final Rule regarding the localized or hot-spot analysis of $PM_{2.5}$ and PM_{10} (40 C.F.R. Part 93, issued March 10, 2006)

The USEPA specifies in 40 C.F.R. Section 93.123(b)(1) that only "projects of air quality concern" are required to undergo a $PM_{2.5}$ and PM_{10} hot-spot analysis. The USEPA defines projects of air quality concern as certain highway and transit projects that involve significant levels of diesel traffic, or any other project identified by the $PM_{2.5}$ SIP as a localized air quality concern. Table 6-2 shows project types that require a $PM_{2.5}$ or PM_{10} hot-spot analysis, as defined by Section 93.123(b)(1) of the Conformity Rule.

Table 6-2 Projects of Air Quality Concerns as Defined by Section 93.123(b)(1) of the Transportation Conformity Rule

Section 93.123(b)(1) Subsection	Type of Project
i	New highway projects that have a significant number of diesel vehicles and expanded highway projects that have a significant increase in the number of diesel vehicles.
ii	Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project.
iii	New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
iv	Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location.
v	Projects in or affecting locations, areas, or categories of sites that are identified in the $PM_{2.5}$ or PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

Source: 40 C.F.R. Section 93.123(b)(1)
LOS = level-of-service
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter

The following projects are examples of what would be classified as projects of air quality concern, as defined by 40 C.F.R. Section 93.123(b)(1).

- A project on a new highway or expressway that serves a significant volume of diesel truck traffic, such as facilities with greater than 125,000 annual average daily traffic where 8 percent or more of such annual average daily traffic is diesel truck traffic.
- New exit ramps and other highway facility improvements to connect a highway or expressway to a major freight, bus, or intermodal terminal.
- Expansion of an existing highway or other facility that affects a congested intersection (operating at LOS D, E, or F) that has a significant increase in the number of diesel trucks.

- Similar highway projects that involve a significant increase in the number of diesel transit buses or diesel trucks.
- A major new bus or intermodal terminal that is considered to be a "regionally significant project" under 40 C.F.R. Section 93.101.[15]
- An existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses increases by 50 percent or more, as measured by bus arrivals.

6.3.5.2 Freight Rail

Neither UPRR service nor associated emissions from locomotive operation would be affected by the proposed freight relocation, relative to existing conditions. While the source of PM emissions would shift commensurate with the lateral track shift, the amount of emissions, and therefore the potential for the project to result in new or worsened PM hot spots, would not change. Accordingly, analysts did not conduct a PM hot-spot analysis for the relocated freight service because there would be no effect under the USEPA definition of projects of air quality concern. Potential changes in receptor exposure to DPM and $PM_{2.5}$ are analyzed further, as described in Section 6.3.7.1, Freight Relocation.

6.3.6 Mobile Source Air Toxics Analysis

On February 3, 2006, the FHWA released Interim Guidance on Air Toxic Analysis in NEPA Documents. This guidance was superseded on September 30, 2009, by the FHWA's Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents (Interim Guidance), and was most recently updated on October 18, 2016 (FHWA 2016). The updated Interim Guidance advises on when and how to analyze MSATs in the NEPA process for highway projects. This guidance is interim because MSAT science is still evolving, but is used in the analysis of potential effects based on guidance provided by the Authority. As the science progresses, the FHWA is expected to update the guidance.

A qualitative analysis provides a basis for identifying and comparing the potential differences in MSAT emissions, if any, among the project alternatives. The Interim Guidance groups projects into the following tier categories:

- **Tier 1**—No analysis for projects without any potential for meaningful MSAT effects
- **Tier 2**—Qualitative analysis for projects with low potential MSAT effects
- **Tier 3**—Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects

The project would reduce regional VMT, traffic congestion, and aircraft operations, resulting in a reduction in MSAT emissions. The level of effects from regional MSAT emissions therefore corresponds to FHWA's Tier 1. Accordingly, analysts noted changes to regional MSAT emissions but did not perform quantitative or qualitative analyses of the project alternatives, consistent with FHWA's Interim Guidance.

Changes in vehicle activity could result in localized MSAT increases. The potential level of effects from these circumstances corresponds to FHWA's Tier 2. Accordingly, analysts used a qualitative analysis to provide a basis for identifying and comparing the potential differences in local MSAT emissions, if any, among the project alternatives. The qualitative assessment is derived, in part, from *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives* (FHWA 2011).

---

[15] 40 C.F.R. Section 93.101 defines a "regionally significant project" as "a transportation project (other than an exempt project) that is on a facility which serves regional transportation needs (such as access to and from the area outside of the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network, including at a minimum all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel."

6.3.7 Operations Health Risk Assessment

6.3.7.1 Freight Relocation

Construction of the project would reposition existing UPRR tracks. Redistributing or moving existing freight traffic would increase TAC concentrations at certain receptor locations and would result in corresponding decreases at other locations. Because diesel-related exhaust, specifically DPM, is considered a carcinogenic TAC by the CARB, a human HRA was conducted to assess the risk (i.e., cancer risks and chronic acute risks) associated with changes in operational freight activity. Table 6-3 shows the relocated track segments included in the analysis and summarizes the distances to the nearest receptor under existing conditions and with the track relocation.

Table 6-3 Relocated Freight Tracks and Distances to Nearest Sensitive Receptors

General Location	Description of Maximum Track Shift Relative to Receptor Locations	Distance to Nearest Receptor			Reduction in Distance
		Receptor #	Existing Alignment	Relocated Alignment	
Repositions under Alternatives 1 through 3					
Near Monterey Road and Blanchard Road	The relocated track would be approximately 14 feet closer to an existing residential receptor near Monterey Road and Blanchard Road. After this point, the tracks would be shifted up to about 80 feet to the south of the existing line, but there are no receptors within 1,000 feet of the track.	1	61 feet	47 feet	14 feet
Between Monterey Road and Crowner Avenue	The relocated track would require demolition of structures between the existing tracks and Crowner Ave. Receptors west of Crowner Ave would be approximately 110 feet closer to the relocated track than the existing track.	2	230 feet	120 feet	110 feet
Near Monterey Road and California Avenue	The relocated track would be approximately 69 feet closer to an existing residential receptor.	3	164 feet	95 feet	69 feet
Near Monterey Road and Ronan Avenue	The relocated track would be approximately 61 feet closer to New Hope Community Church.	4	359 feet	298 feet	61 feet
Near Monterey Road and Leavesley Road	The relocated track would be approximately 213 feet closer to homes along Swanston Lane.	5	621 feet	408 feet	213 feet
Near Monterey Road and 1st Street	The relocated track would be approximately 129 feet closer to a football field.	6	193 feet	64 feet	129 feet
Near Monterey Road and W 10th Street	The VTA yard would be relocated approximately 2,500 feet south of its existing location. The nearest receptor to the relocated yard is approximately 309 feet to the west under Alternatives 1 and 2 (this receptor is approximately 398 feet from the existing track).	7	398 feet	309 feet	89 feet
Repositions under Alternative 3 Only					
Near Pacheco Court and Frazier Lake Road	Under Alternative 3, the track south of Church Avenue would be relocated eastward to join with the MOWF. The receptor furthest from the existing track and closest to the relocated track (i.e., the receptor with the greatest potential change in health risk) is off Pacheco Court.	8	9,749 feet	56 feet	9,693 feet
Repositions under Alternative 4 Only					
Near Chestnut Street and Asbury St	The relocated track would shift eastward between Emory St and Diridon Station. Most of this area is dominated by commercial uses. The greatest shift near existing receptors is approximately 20 feet.	9	290 feet	270 feet	20 feet

General Location	Description of Maximum Track Shift Relative to Receptor Locations	Distance to Nearest Receptor			Reduction in Distance
		Receptor #	Existing Alignment	Relocated Alignment	
Near Harrison Street and Fuller Ave	The relocated track would swing further south between I-280 and SR 87. The greatest shift near existing receptors is approximately 29 feet.	10	83 feet	54 feet	29 feet
Near Cross Way and Northern Road	Additional storage tracks would be added to Michael Yard (between W Alma and Almaden Rd). The new tracks would be approximately 16 feet closer to existing single-family homes.	11	322 feet	306 feet	16 feet
End of Promme Court	The tracks would be shifted east from just south of Almaden Expressway to south of Communications Hill. The greatest shift near existing receptors is approximately 7 feet.	12	81 feet	74 feet	7 feet
Near Prindiville Road and Urshan Way	The tracks would be shifted east between Monterey Road and Tulare Hill. There are residential subdivisions along this alignment. The greatest shift near existing receptors is approximately 10 feet.	13	160 feet	150 feet	10 feet
Near Madrone Ave and Dougherty Ave	South of Blanchard Rd until Bailey Rd, there would be a new UPRR siding track east of the existing tracks. The track would continue south shifted to the east until just south of the Gilroy Station. There are receptors throughout this area; the greatest shift would be approximately 65 feet closer to an apartment complex.	14	1025 feet	960 feet	65 feet
Near Butterfield Blvd and E Dunne Ave	The Redwood lumber industry spur would be realigned on the west side of the alignment. The tracks would move approximately 10 feet closer to existing single-family homes.	15	70 feet	60 feet	10 feet
End of Sister City Way	Additional storage tracks would be added to the west side of the alignment just south of Gilroy Station. The new tracks would be 90 feet closer to existing single-family homes.	16	395 feet	305 feet	90 feet
Near Garlic Farms Dr and Trave Park Cir	The tracks would be shifted southwest just east of US 101 and would be approximately 100 feet closer to an existing mobile home community.	17	475 feet	375 feet	100 feet
Near Bolsa Rd	The UPRR Hollister track would be realigned southwest of Carnadero Ave. to provide freight access to the MOWF. The track would be approximately 545 feet closer to an existing single-family home.	18	1320 feet	775 feet	545 feet

Source: McGuire 2017–2018
VTA = Santa Clara Valley Transportation Authority
MOWF = maintenance of way facility
I- = Interstate
SR = State Route
UPRR = Union Pacific Railroad
US = U.S. Highway

The BAAQMD maintains an inventory of health risks associated with stationary sources, roadway, and rail sources within the SFBAAB (Winkel 2018). The inventory was used to characterize the net effect of health risks associated with moving operations-related diesel engine locomotive emissions closer to existing sensitive receptors located near the new and shifted tracks. BAAQMD's inventory is based on rail volumes and emission factors in 2015. There were approximately four freight trips per day between Gilroy and San Jose Diridon in 2015, and freight volumes are anticipated to grow by 4 percent per annum (PCJPB 2015). Conversely, locomotive emission factors are anticipated to decrease as a function of time because of natural fleet turnover. Emission rates specific to UPRR are not available; however, data from the USEPA (2009) indicate that national average freight emissions of PM_{10} are expected to decline by 41 percent between 2015 and 2022, which is the first year full operation on the relocated lines could occur. Analysts used the annual growth in freight and decrease in PM_{10} emissions to adjust the 2015 risks from BAAQMD's inventory to be representative of conditions in 2022.

6.3.7.2 Diesel Buses

The San Jose Diridon and Gilroy stations would be served by diesel-powered buses, which generate TACs at idle while loading and unloading passengers. Improved bus service to the passenger rail terminals is not part of the project. The Authority assumes that bus service levels are constant into the future given that no operator has a funding plan to deliver more service. Buses operated by VTA are a mix of diesel- and diesel-electric-powered. The agency also has five fully electric buses. Pursuant to the Innovative Clean Transit Regulation, VTA's bus fleet will be comprised of only zero-emission vehicles by 2040. Thus, diesel bus emissions associated with the San Jose Diridon and Gilroy Stations are expected to decline relative to existing emissions levels as electric buses are integrated into the fleets over time.

While bus service levels are assumed to be the same with and without the project, the East Gilroy Station would be an entirely new transit stop with HSR. Analysts evaluated potential health risks from exposure to diesel exhaust under this specific project-induced change based on the anticipated number of daily shuttle and bus trips at the station (Burton 2019). Analysts assumed each bus would idle for a maximum of 5 minutes for passenger loading/unloading.[16] Analysts quantified running exhaust emissions along the 1,000-foot approach and departure route and station idling emissions using EMFAC2017. Analysts conservatively assumed all buses in 2029 would be diesel powered (VTA operates a mix of diesel-, diesel-electric, and fully-electric buses). Analysts quantified health risks using the USEPA's AERMOD dispersion model and EMFAC emissions results.

6.3.7.3 Emergency Generators

The San Jose Diridon and Gilroy stations and the MOWS and MOWF would have emergency generators that would be used in the event of a power outage. Section 2.3.1 from the BAAQMD's Permit Handbook indicates that "typically any stationary diesel engines over 50 horsepower will require a risk screening analysis" (BAAQMD 2016). Explicitly, BAAQMD Regulation 2, Rule 5, Section 302 specifies that an Authority to Construct permit or Permit to Operate from the BAAQMD will be denied if any new and modified sources of TAC (which includes generators) in excess of 50 horsepower would result in health risks in excess of 10.0 in one million or a hazard index of 1.0. BAAQMD Regulation 2, Rule 5, Section 302 is cited as the evidence in support of BAAQMD's health risk thresholds.

The generators associated with the project would be subject to the permitting requirements specified in BAAQMD Regulation 2, Rule 5, Section 302. Based on these permitting requirements, the emergency generators would not receive a permit from the BAAQMD and would not be allowed to operate at the stations or maintenance facilities if they would result in cancer or acute hazard effects in excess of the BAAQMD's health risk thresholds of significance. However, Regulation 2, Rule 5 does not address $PM_{2.5}$ concentrations or permit

---

16 Pursuant to California's Commercial Vehicle Idling Regulation, idling for more than 5 minutes at a single location is prohibited for vehicles of 10,000 pounds or heavier.

restrictions for facilities with emissions more than the BAAQMD's threshold of 0.3 micrograms per cubic meter ($\mu g/m^3$). Accordingly, $PM_{2.5}$ exhaust concentrations from emergency generator testing were estimated using the USEPA's AERMOD dispersion model and emission data from CalEEMod.

6.3.7.4 Maintenance of Way Facility Maintenance Activities

The MOWF would use diesel-powered off-road equipment, vehicles, and locomotives to support maintenance and repair activities. Cancer and noncancer health risks, as well as $PM_{2.5}$ concentrations, were modeled using the USEPA's AERMOD dispersion model. The analysis was conducted using the same general method and guidance as the construction HRA. Refer to Section 6.4.9, Construction Health Risk Assessment, for additional detail.

6.4 Construction Emissions Calculations

Analysts assessed and quantified air quality effects associated with construction of the project using industry standard and accepted software tools, techniques, and emission factors. This section provides a summary of the methods. Appendix C provides a full list of assumptions.

6.4.1 Construction Activities

Analysts quantitatively estimated construction emissions for the earthwork and major civil construction activity during construction of the following components of the project:

- Viaduct
- Embankment
- At grade
- Trench
- Tunnel
- Cut and fill

Construction activities associated with each component include demolition, excavation, utilities, roadwork, concrete forming, and other rail work. Each of these activities was taken into account to evaluate the regional and localized air quality effects during the construction phase. Analysts also quantified emissions from reconductoring approximately 11.1 miles of the existing single-circuit Spring to Llagas and Green Valley to Llagas 115-kV power lines.

6.4.2 Construction Approach

Construction would proceed south to north, from Carlucci Road to San Jose Diridon Station, although construction would likely proceed in all subsections concurrently. Construction would occur over multiple phases between 2022 and 2028. Tunneling activities would occur up to 7 days per week with up to 24-hour days. All other construction would occur 5 days per week with 10-hour days (250 days per year) (Scholz 2018).

Major construction activities include earthworks and excavation support; tunnel, bridge, and aerial structure construction; station construction; track work; railway systems construction (including traction electrification, signaling, and communications); and testing and commissioning. During peak construction periods, work is envisioned to be underway at several locations along the route, with overlapping construction of various project elements. Working hours and workers present at any time would vary, depending on the activities being performed. Pursuant to its adopted sustainability policy (Policy Directive POLI-PLAN-03), the Authority intends to build the project using sustainable methods that:

- Minimize the use of nonrenewable resources
- Minimize the effects on the natural environment
- Protect environmental diversity
- Emphasize the use of renewable resources in a sustainable manner

6.4.3 Models and Methods for Mass Emissions Modeling

Construction of the project would generate emissions of ROG, NO_X, CO, SO_X, PM_{10}, $PM_{2.5}$, CO_2, CH_4, and N_2O that could result in short-term air quality and GHG effects. Emissions would originate from off-road equipment exhaust, employee and haul truck vehicle exhaust (on-road vehicles), site grading and earth movement, concrete batching, demolition, paving, architectural coating, electricity consumption, and helicopters (for reconductoring work). These emissions would be temporary (i.e., limited to the construction period) and would cease when construction activities are complete.

Combustion exhaust, fugitive dust (PM_{10} and $PM_{2.5}$), and fugitive off-gassing (ROG) were estimated using a combination of emission factors and methods from CalEEMod, version 2016.3.2; the CARB's EMFAC2017 model; and the USEPA's AP-42 Compilation of Air Pollutant Emission Factors based on project-specific construction data (e.g., schedule, equipment, truck volumes) provided by the project engineering team (Scholz 2018). Appendix C provides a complete list of construction assumptions, including equipment, vehicles, and quantities and the construction schedule.

- **Off-road equipment**—Emission factors for off-road construction equipment (e.g., loaders, graders, bulldozers) were obtained from the CalEEMod (version 2016.3.2) User's Guide appendix, which provides values per unit of activity (in grams per horsepower-hour) by calendar year (Trinity Consultants 2016). Analysts estimated criteria pollutants by multiplying the CalEEMod emission factors by the equipment inventory provided by the project engineering team (Scholz 2018).
- **On-road vehicles**—On-road vehicles (e.g., pickup trucks, flatbed trucks) would be required for material and equipment hauling, on-site crew and material movement, and employee commuting. Analysis estimated exhaust emissions from on-road vehicles using the EMFAC2017 emissions model and activity data (miles traveled per day) provided by the project engineering team (Scholz 2018). Emission factors for haul trucks are based on aggregated-speed emission rates for EMFAC's T7 Single vehicle category. Factors for on-site dump, water, boom, and concrete trucks were based on 5 mph emission rates for the T6 Heavy category. Factors for employee commute vehicles were based on a weighted average for all vehicle speeds for EMFAC's light-duty automobile/light-duty truck vehicle categories. Fugitive re-entrained road dust emissions were estimated using the USEPA's *Compilation of Air Pollutant Emission Factors* (AP-42), Sections 13.2.1 and 13.2.2 (USEPA 2006b, 2011).
- **Site grading and earth movement**—Fugitive dust emissions from earth movement (e.g., site grading, bulldozing, and truck loading) were quantified using emission factors from CalEEMod and USEPA (1998) AP-42. Data on the total graded acreage and quantity of cut-and-fill material were provided by the project engineering team (Scholz 2018).
- **Onsite concrete batch plants**—Fugitive dust emissions from concrete batching at the three new temporary batch plants were quantified using emission factors from BAAQMD's (2016) Permit Handbook and USEPA's AP-42. Daily and annual batch quantities (cubic yards) were provided by the project engineering team (Scholz 2018). Emissions generated by material transport and operation of yard equipment and electricity consumption at onsite batch plants are accounted for in the on-road vehicles, off-road equipment, and electricity consumption analyses discussed in this section.
- **Demolition**—Fugitive dust emissions from building demolition were based on the anticipated amount of square feet to be demolished and calculation methods from the CalEEMod User's Guide (Trinity Consultants 2016).
- **Paving**—Fugitive ROG emissions associated with paving were calculated using activity data (e.g., square feet paved) provided by the project engineer and the CalEEMod default emission factor of 2.62 pounds of ROG per acre paved (Scholz 2018; Trinity Consultants 2016).

- **Architectural coating**—Fugitive ROG emissions associated with architectural coatings of the stations were calculated using activity data (e.g., square feet coated) provided by the project engineering team and methods in the CalEEMod User's Guide (Scholz 2018; Trinity Consultants 2016). Emissions calculations assume a ROG content of 150 grams per liter (g/L), consistent with BAAQMD's Regulation 8, Rule 3, Section 301.
- **Electricity consumption—**GHG emissions generated by electricity used to power tunnel-boring equipment and temporary batch plants were quantified using activity data (e.g., megawatt hours) provided by the project engineering team and the statewide grid average emission factors (Scholz 2018; USEPA 2018c).
- **Helicopters—**Helicopters would be required for the reconductoring work. Exhaust emissions were calculated using emission factors and assumptions derived from a review of guidance manuals published by USEPA (1978) and The Climate Registry (2018).

6.4.4 Ballast and Subballast Hauling

Ballast and subballast materials could be transported from multiple quarry locations throughout Northern California and the Central Valley. Analysts estimated emissions from ballast and subballast material hauling by trucks and locomotives based on the travel distances and transportation method (by rail or by truck) from the locations where ballast materials would be available. Analysts used heavy-duty truck emission factors (T7 Single) from EMFAC2017 to estimate emissions from haul trucks and rail emission factors from the USEPA (2009) to estimate the locomotive emissions.

Analysts identified up to 11 potential quarries that could provide ballast material. All quarries are within the SFBAAB, MBARD, and SJVAPCD, with the furthest quarry located 37 rail miles and 89 highway miles from the project footprint. Ballast and subballast quantities for the project were provided by the project engineering team and distributed equally among the identified quarries (Scholz 2018). Analysts estimated emissions under two hauling scenarios: Scenario 1 assumed ballast and subballast would be hauled to the project footprint using a combination of trucks and locomotives, and Scenario 2 assumed ballast and subballast would be hauled to the project footprint using only trucks. Appendix D provides details of the emission estimates, quarry selection process, and scenario analyses.

6.4.5 Daily and Annual Emissions Estimates

Up to six components (viaduct, embankment, at grade, trench, tunnel, and cut and fill) would be constructed, depending on the subsection and project alternative. Each component would be constructed over multiple phases between 2022 and 2028. Daily criteria pollutant and GHG emissions generated by construction of each phase were quantified using the methods described above. The daily estimates were converted to annual totals based on the detailed construction schedule for each project alternative, which was developed by the project engineering team (Scholz 2018). Maximum daily emissions, based on concurrent construction activity, were also quantified within the BAAQMD and MBARD, consistent with air district requirements (BAAQMD 2017a; MBUAPCD 2008). The highest daily emissions in each construction year were selected as the peak day for analysis purposes. This approach is meant to convey a worst-case scenario based on available information and, therefore, is not necessarily representative of actual emissions that would be incurred on a daily basis throughout the construction period.

6.4.6 Emissions by Air District and Basin

The project falls under the jurisdiction of three air districts—BAAQMD, MBARD, and SJVAPCD—all of which have adopted their own distinct local thresholds of significance. To compare emissions to the federal and state thresholds, activities occurring within each air district were quantified and analyzed separately.[17]

Emissions generated by construction of subsections that would occur exclusively within one air district (e.g., the San Jose Diridon Station Approach Subsection in the BAAQMD) were wholly assigned to that air district. Emissions estimates for alternatives that span more than one air district were apportioned based on the location of construction activity. For example, construction of the Pacheco Pass Subsection would occur in both the BAAQMD and SJVAPCD. Accordingly, the emissions estimates were apportioned to the BAAQMD and SJVAPCD based on the number of rail miles constructed within each air district. Table 6-4 summarizes the location of each subsection and the air district scaling factors used in the analysis, as appropriate. All reconductoring work would occur in the BAAQMD.

[17] The CARB acknowledges that air basins, in particular the SJVAB, are both contributors and receptors of pollutant transport throughout the state. While technical documents have been published analyzing the transport relationship among California air basins, quantifying the effects of pollutant transport as a result of the project would require detailed projections of future climatic and meteorological conditions. Air districts in the RSA have adopted thresholds and mitigation requirements that are commensurate with expected criteria air pollutant contributions from upwind air basins (CARB 2011).

Table 6-4 Track Miles and Construction Scaling Factors by Air District

Subsection	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
	BAAQMD	MBARD	SJVAPCD	BAAQMD	MBARD	SJVAPCD	BAAQMD	MBARD	SJVAPCD	BAAQMD	MBARD	SJVAPCD
Constructed Rail Miles												
San Jose Diridon Station Approach	3	0	0	3	0	0	3	0	0	3	0	0
Monterey Corridor	4	0	0	4	0	0	4	0	0	4	0	0
Morgan Hill and Gilroy	14	2	0	14	2	0	13	2	0	14	2	0
Pacheco Pass	5	0	7	5	0	7	5	0	7	5	0	7
San Joaquin Valley	0	0	9	0	0	9	0	0	9	0	0	9
Emission Scaling Factors												
San Jose Diridon Station Approach	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%
Monterey Corridor	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%
Morgan Hill and Gilroy	85%	15%	0%	85%	15%	0%	87%	13%	0%	85%	15%	0%
Pacheco Pass	43%	0%	57%	43%	0%	57%	43%	0%	57%	43%	0%	57%
San Joaquin Valley	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%

Source: Authority 2019b; CARB 2012
BAAQMD = Bay Area Air Quality Management District
MBARD = Monterey Bay Air Resources District
SJVAPCD = San Joaquin Valley Air Pollution Control District

6.4.7 Project Design Features

As discussed in Section 2.3, Impact Avoidance and Minimization Features, the Authority has developed IAMFs that would avoid or minimize potential air quality effects. Because IAMFs are included as part of the project design, they are not considered mitigation, and are included as part of the project construction emissions estimate. Specifically, the following emissions benefits achieved by AQ-IAMF#1 through AQ-IAMF#6 were assumed in the modeling.

- Fugitive dust reductions from earthmoving best management practices (AQ-IAMF#1) (Western Governors' Association 2006).
  - PM from ground disturbance (i.e., scraping and grading activities), 61 percent
  - PM from unpaved vehicle travel (i.e., re-entrained road dust), 55 percent[18]
  - PM from demolition, 36 percent
- VOC reductions (93 percent) from application of architectural coatings (AQ-IAMF#2).[19]
- Criteria pollutant and GHG reductions from use of renewable diesel (AQ-IAMF#3) in all off-road diesel-powered engines (Lovegrove and Tadross 2017)
  - CO, 10 percent (Tier 2 tunneling equipment)
  - NO_X, 10 percent (Tier 2 tunneling equipment)
  - PM, 30 percent (all engines)
  - CO_2e, 99 percent (all engines)
- Criteria pollutant and GHG reductions from use of Tier 4 off-road engines (AQ-IAMF#4). Emissions reductions vary by pollutant and equipment type. Emissions were modeled using Tier 4 emission rates from CalEEMod.
- Criteria pollutant and GHG reductions from use of model year 2010 or newer on-road engines in heavy-duty, diesel powered trucks (AQ-IAMF#5). Emissions reductions vary by pollutant, analysis year, and air basin. Emissions were modeled using emission rates derived from the CARB's EMFAC2017 model.
- Fugitive dust reductions from implementation of typical control measures at new concrete batch plants, such as water sprays, enclosures, and hoods (AQ-IAMF#6). Emissions were modeled using USEPA AP-42 controlled emission factors for concrete batch plants.

6.4.8 Regulatory Control Measures

Many of the control measures required by BAAQMD, MBARD, and SJVAPCD rules and regulations are the same or similar to AQ-IAMF#1 and AQ-IAMF#2. Accordingly, no additional reductions from compliance with air district rules were assumed in the emissions modeling.

6.4.9 Construction Health Risk Assessment

Analysts conducted the HRA using the guidelines provided by the OEHHA (2015) for the *Air Toxics Hot Spots Program* and the HRA guidelines developed by the California Air Pollution Control Officers Association (CAPCOA) (2009).The HRA consists of three parts: (1) PM emissions inventory (2) air dispersion modeling to evaluate off-site concentrations of DPM emissions, and (3) assessment of risks associated with predicted concentrations. The following subsections provide descriptions of each component. The quantitative HRA was only performed for construction of the HSR facilities (e.g., alignment, stations and batch plants). The PG&E reconductoring work would be spread throughout the 11.1-mile corridor and would only occur at individual pole locations on a short-term (i.e., few weeks) and temporary basis.

---

[18] The IAMF requires watering unpaved roads three times daily, which may achieve greater reductions. The 55 percent efficacy is based on twice-daily watering (Countess Environmental 2006).

[19] Assumes an uncontrolled ROG content of 150 g/L per BAAQMD Regulation 8, Rule 3, Section 301 and a controlled ROG content of 10 g/L per AQ-IAMF#2.

6.4.9.1 Particulate Matter Emissions Inventory

The emissions inventory includes PM emissions generated by heavy-duty equipment and vehicle exhaust, as well as fugitive dust from site grading and soil movement. The particulate constituent analyzed depends on the emission location and associated air district guidance. The BAAQMD (2017a) has adopted cancer and noncancer risk thresholds for DPM, as well as a separate threshold for localized $PM_{2.5}$ emissions. While DPM is a complex mixture of gases and fine particles that includes more than 40 substances listed by the USEPA and CARB as HAPs, OEHHA guidance indicates that the cancer potency factor developed to evaluate cancer risks was based on total (gas and PM) diesel exhaust (OEHHA 2001). The BAAQMD considers DPM as the surrogate for total diesel exhaust, with its guidance requiring that diesel $PM_{2.5}$ emissions serve as the basis for the cancer and noncancer risk calculations in the SFBAAB (Kirk 2016). SJVAPCD (2015a) has adopted slightly different guidance, and requires that diesel PM_{10} emissions serve as the basis for the risk calculations in the SJVAB. Accordingly, the HRA uses $PM_{2.5}$ as a surrogate for DPM in the BAAQMD and PM_{10} as a surrogate for DPM in the SJVAPCD, consistent with air district guidance.

BAAQMD guidance indicates that localized $PM_{2.5}$ risks should be evaluated using total $PM_{2.5}$ exhaust emissions (i.e., emissions from both diesel- and gasoline-powered equipment). SJVAPCD has not adopted a localized $PM_{2.5}$ threshold.

6.4.9.2 Air Dispersion Modeling

The USEPA's AERMOD dispersion model was used to quantify annual average DPM concentrations at nearby receptor locations for each subsection. The modeling approach follows, where applicable, the OEHHA and CAPCOA methodology, but is also consistent with SJVAPCD and BAAQMD methods, as provided in their guidance documents and based on staff consultation (SJVAPCD 2015a; BAAQMD 2012a)[20]

Meteorological Data

Analysts used three representative meteorological datasets, which broadly cover the different meteorological conditions found in the RSA, in the analysis. Table 6-5 shows the assignment for the three datasets. Five recent years of data for each station were used to conduct the analysis within the BAAQMD and MBARD (San Jose, 2009–2013 and San Martin, 2010–2014). Within the SJVAPCD the meteorological modeled derived dataset for Los Banos, 2004–2008 was used in the analysis. Locations north of Gilroy used urban modeling options, whereas all other locations used default rural settings. Appendix E provides additional details on how these datasets were developed.

[20] BAAQMD's conservative modeling guidance was followed for the portion of the project that traverses the MBARD.

Table 6-5 Meteorological Datasets by Subsection

Subsection	San Jose	San Martin	Los Banos
San Jose Diridon Station Approach	X		
Monterey Corridor	X		
Morgan Hill and Gilroy		X	
Pacheco Pass[1]		X	X
San Joaquin Valley			X
Stations			
San Jose Diridon	X		
Downtown Gilroy		X	
East Gilroy		X	

Source: SJVAPCD n.d.
AERMOD ready meteorological files for San Jose International Airport (WBAN# 29293) for 2009-2013 were prepared by BAAQMD and are available from the CARB website at: www.arb.ca.gov/toxics/harp/metfiles2.htm
BAAQMD (November, 2016); San Martin meteorological tower data
[1] San Martin station used in Santa Clara County and Los Banos in Merced County

Source Parameters

Analysts assumed eight types of construction work areas characterize construction activities and emissions. Further details on how each type of source was modeled are shown in Tables 6-6 and 6-7. Off-site activity, such as long-distance haul trucks for spoils removal and ballast delivery, were modeled as area sources located on both sides of the on-site segment with a width of 12 feet.

Table 6-6 AERMOD Source Parameters (Bay Area Air Quality Management District and Monterey Bay Air Resources District)

Construction Work Area	Source Type	Size of Modeled Area[1]	Release Height (meters)
At grade/berm (on-site)	Area	Actual length x 171 feet	3 (exhaust), 0 (dust)[2]
At grade/berm (off-site)	Area	Actual length x 12 feet	3 (exhaust), 0 (dust)[2]
Aerial (on-site)	Area	Actual length x 171 feet	3 (exhaust), 0 (dust)[2]
Aerial (off-site)	Area	Actual length x 12 feet	3 (exhaust), 0 (dust)[2]
Trench[3]	Open Pit	Actual length x 46 feet x (varying depths)	3 (exhaust), 0 (dust)[2]
Tunnel[4]	Horizontal & Capped Point	Effective diameter[5]	1 (exhaust)
Cut and fill (on-site)	Area	Actual length x 492 feet	3 (exhaust), 0 (dust)[2]
Concrete batch plant	Area	Tunnel 1 West Portal—27.1 acres, Tunnel 2 West Portal—26.4 acres	10

Source: Kirk 2016
m = meter
[1] Sizes of modeled areas are shown as dimensions of length and width of the work area
[2] Initial vertical dimension 1 meter
[3] Trench construction was conservatively modeled with the 10-foot mid-depth excavation where exhaust plume is nearest to the receptor height.
[4] Portals as horizontal sources and ventilation shafts as capped points
[5] Based on tunnel opening size at portals and 4-foot-diameter ventilation shaft(s) with minimum flow rate of 30 feet per minute

Table 6-7 AERMOD Source Parameters (San Joaquin Valley Air Pollution Control District)

Construction Work Area	Source Type	Size of Modeled Area[1]	Release Height (meters)
At grade/berm (on-site)	Area	Actual length x 171 feet	3 (exhaust), 0 (dust)[2]
At grade/berm (off-site)	Area	Actual length x 12 feet	3 (exhaust), 0 (dust)[2]
Aerial (on-site)	Area	Actual length x 492 feet	3 (exhaust), 0 (dust)[2]
Aerial (off-site)	Area	Actual length x 12 feet	3 (exhaust), 0 (dust)[2]
Tunnel[3]	Horizontal & Capped Point	Effective Diameter[5]	1 (exhaust)
Cut and fill (on-site)	Area	Actual length x 492 feet	3 (exhaust), 0 (dust)[2]
Concrete batch plant	Area	Tunnel 2 East Portal—15.0 acres.	10

Source: SJVAPCD 2014
[1] Sizes of modeled areas are shown as dimensions of length and width where the modeled work area is a rectangular shape.
[2] Initial vertical dimension 1 meter
[3] Trench construction was conservatively modeled with the 10-foot mid-depth excavation where exhaust plume is nearest to the receptor height.
[4] Portals as horizontal sources and ventilation shafts as capped points
[5] Based on tunnel opening size at portals and 4-foot-diameter ventilation shaft(s) with minimum flow rate of 30 feet per minute

Not all subsections would have all types of construction activity, Table 6-8 shows the types of activities within each subsection. In all cases, at least one construction type was modeled for each project alternative.

Table 6-8 Construction Work Areas by Subsection and Project Alternative

Subsection/Element	At Grade /Berm[1]	Aerial	Trench	Tunnel	Cut and Fill
San Jose Diridon Station Approach					
Viaduct to Scott Blvd	X	X			
Viaduct to I-880	X	X			
Blended, at grade	X				
Monterey Corridor					
Viaduct	X	X			
At grade	X	X			
Blended, at grade	X				
Morgan Hill and Gilroy					
Embankment to downtown Gilroy	X	X	X	X[2]	X
Viaduct to downtown Gilroy	X	X		X[2]	X
Viaduct to east Gilroy	X	X		X[2]	X
Blended, at grade to downtown Gilroy	X	X	X	X[2]	X
Pacheco Pass					
Pacheco Pass	X	X		X[3]	X

Subsection/Element	At Grade /Berm[1]	Aerial	Trench	Tunnel	Cut and Fill
San Joaquin Valley					
Henry Miller Road	X	X			X

I- = Interstate
OSHA = Occupational Safety and Health Administration
[1] Air quality modeling for the berm and at-grade sources are modeled with similar emission source characteristics. The maximum model effects are reported in Section 7.11, Other Localized Construction Effects.
[2] The one tunnel in this subsection had a calculated effective diameter of 167 meters based on twin bore tunnel, length between 0.6 and 2.2 miles and a rail design speed of 250 mph and compliance with minimum OSHA ventilation flow rate of 30 feet/minute.
[3] Two tunnels were modeled in this subsection with a calculated effective diameter of 512 and 472 feet based on twin bore tunnel with a length between 3.1 and 4.7 miles (shorter tunnel) and > 6.2 miles for the longer tunnel with a rail design speed of 250 miles per hour and compliance with minimum OSHA ventilation flow rate of 30 feet/minute. The longer tunnel also included the modeling of emissions from two 4-foot-diameter ventilation shafts with a rain cap cover.

Receptors

Analysts spaced receptors along the edge of each subsection within the BAAQMD and MBARD, with two exceptions: (1) for the trench, an additional 20–30-meter setback distance was allowed based on their limited location, and (2) at the tunnel openings where staging would occur, a 500-foot safety setback distance was used. Per SJVAPCD direction for the rural subsections within San Joaquin County, a 25-meter setback distance was used. Receptor heights were all set to 1.2 meters, consistent with OEHHA (2015) guidance.

6.4.9.3 Risk Calculations

Consistent with the USEPA, CARB, and air district regulatory guidance, the HRA examines cancer and noncancer (chronic)[21] exposure to the surrounding community and uses OEHHA's guidance on risk calculations (OEHHA 2015).

Cancer Risk

Cancer risk is defined as the lifetime probability (chance) of developing cancer from exposure to a carcinogen, typically expressed as the increased chance in 1 million. The default cancer risk calculation for residents and workers is based on the 95th percentile breathing rate, as recommended by the OEHHA. It also accounts for varying sensitivities to exposure based on age. This includes a higher age sensitivity factor for the first 16 years of life, 95th percentile as a breathing rate as a function of age, exposure duration, and adjustment for time spent at home.

The cancer risk occurs exclusively through the inhalation pathway and was calculated using the following equation.

$$\mathbf{Risk} = \frac{C_{air} \times DBR \times ED \times EF \times Conv_1}{AT} \times CPF \times ASF \times Conv_2$$

Where

Risk	=	DPM cancer risk (per million)
C_{air}	=	Concentration in the air (µg/m^3), annual average from AERMOD
DBR	=	Daily breathing rate (liters per kilogram [L/kg] body weight-day)
ED	=	Exposure duration (years)
EF	=	Exposure frequency (days/year)
$Conv_1$	=	Micrograms to milligrams (mg), liters to cubic meters ([mg/µg] * [m^3/L])

[21] Note that the OEHHA, CARB, BAAQMD, and SJVAPCD have not identified acute health effects from diesel exhaust. Therefore, acute health effects are not included in this analysis.

AT = Averaging time (days)

CPF = Cancer potency factor (mg per kilogram per day [mg/kg-day]$^{-1}$)

ASF = Average age sensitivity factor for resident (unitless)

$Conv_2$ = Risk per million people

Note that the cancer potency factor incorporates worst-case, health-protective assumptions. It was established using data from animal and epidemiological exposure studies and represents the increased chance or probability of developing cancer, assuming continuous lifetime exposure.

Chronic Noncancer Risk

Analysts calculated the noncancer chronic inhalation effects by dividing the annual average concentration by the reference exposure level for DPM. The reference exposure level is defined as the concentration at which no noncancer health effects are anticipated. Consistent with OEHHA (2015) guidance, a reference exposure level of 5 µg/m^3 was assumed in the calculation.

6.4.10 Other Localized Construction Effects

Analysts used the same general approach and guidance as for the HRA (Section 6.4.9) to evaluate localized criteria pollutant effects during construction. The analysis considers both acute (less than 24 hours) and annual emissions effects of all criteria pollutants, as applicable based on the established NAAQS and CAAQS. Note that the quantitative ambient air quality analysis (AAQA) was only performed for construction of the HSR facilities (e.g., alignment, batch plants, stations).

6.4.10.1 Annual Air Quality Effects

The pollutants of concern with established annual standards are NO_2,[22] PM_{10}, and $PM_{2.5}$. Analysts modeled off-site concentrations of these pollutants using the annual mass emissions inventory and the AERMOD dispersion model. NO_X emissions were converted to NO_2, using the Tier 2 ARM2 approach—now the USEPA-preferred approach using the default conversions of minimum of 50 percent as NO_2 at high NO_X concentrations and 90 percent as NO_2 at low concentration levels of NO_X.

6.4.10.2 Acute Air Quality Effects

The following pollutants of concern have established standards based on hourly or daily exposure:

- CO (1 hour and 8 hours)
- PM_{10} and $PM_{2.5}$ (24 hours)
- NO_2 (1 hour) (atmospheric conversion of NO_X to NO_2 is estimated using USEPA's regulatory default Tier 2 ARM2 approach with minimum of 20 percent as NO_2 at high NO_X concentrations and 90 percent as NO_2 at low concentration levels of NO_X)
- SO_2 (1 hour and 24 hours)

The approach to modeling the hourly and daily emissions is similar to the annual approach, but it requires an emissions inventory that represents at least a peak-hour emission rate and activities that may overlap in location and time.

---

22 NO_X is both a regional and localized pollutant. Regional effects (i.e., O_3 formation) take place over long distances and time scales and are not analyzed through a localized ambient air quality analysis. Likewise, since ROG is a regional pollutant, it is not addressed in the localized analysis. Rather, O_3 effects (through NO_X and ROG emissions) are addressed through a comparison of project emissions to the air district and federal *de minimis* thresholds (Section 7.9, Construction Mass Emissions Analysis). Localized effects can occur from the conversion of NO_X to NO_2, and these effects are assessed through the localized NO_2 analysis to confirm emissions would not exceed the CAAQS or NAAQS.

Analysts developed a representative maximum emission scenario for air quality hourly and daily effects for each subsection based on maximum activity levels that could take place simultaneously. Up to six types of features were modeled (berm, aerial, at grade, trenching, tunnel, and cut and fill) within each subsection to determine the maximum hourly and daily effect. This section describes each of the major features and their concurrent major elements. The same widths for each construction feature as used in the annual modeling were assumed. However, each construction crew was assumed active over a length of 1,000 feet within a single day.

Berm

The following activities could occur concurrently:

- Excavation (including utility relocation)
- Concrete + retaining walls
- Formwork + earthwork
- Ballast

Both the emissions associated with excavation and concrete + retaining walls can take place on the same day in two adjacent 1,000-foot sections. Formwork + earthwork activity cannot start until retaining walls are complete, so this major element is only modeled as concurrently taking place with the ballast in two adjacent 1,000-foot sections.

Aerial

The following activities could occur concurrently:

- Excavation + cast-in-place and hardware (CIPH)
- Concrete + formwork

These two major elements, excavation + CIPH and concrete + formwork, can take place adjacent to each section, but not in the same section. Thus, the aerial feature modeled only a single scenario with two major elements, excavation + CIPH and concrete + formwork, as two adjacent 1,000-foot sections.

At Grade

The following activities could occur concurrently:

- Utility relocation + demolition + removal
- Track subgrade + track ballast

These major elements, utility + demolition + removal and track subgrade + ballast, were modeled as taking place on the same day in two adjacent 1,000-foot sections. Similarly, track subgrade and ballast were modeled as taking place on the same day in two adjacent 1,000-foot sections.

Trenching

The following activities could occur concurrently:

- Utility relocation + demolition + CIPH + removal of contaminated material
- Excavation for slurry wall
- Excavation for trench + gravel base + rat slab
- Formwork + concrete pour

These four major elements could take place in adjacent 1,000-foot sections under three scenarios on the same day: (1) utility relocation + demolition + CIPH + removal of contaminated material and excavation for slurry wall; (2) excavation for slurry wall and excavation for trench + gravel base + rat slab, and (3) excavation for trench + gravel base + rat slab and formwork + concrete pour. All three scenarios were modeled to determine maximum hourly and daily effects.

Cut and Fill

The following activities could occur concurrently:

- Excavation
- Compact fill and slope finish

These two major elements could take place concurrently on the same day: excavation and compact fill and slope finish. Thus, the large cut-and-fill features were modeled with only a single scenario with two major elements, excavation and compact fill + slope finish, taking place in two adjacent 1,000-foot sections.

Tunnel

The following activities could occur concurrently:

- Form interior walls/upper walls/track bed construction
- Pour interior walls/floor/upper walls/track bed construction

These two major elements were modeled as taking place on the same day in two adjacent 1,000-foot sections within the tunnel.

6.5 Asbestos, Lead-Based Paint, Valley Fever, and Odors

Asbestos causes cancers of the lung and the lining of internal organs, as well as asbestosis and pleural disease, which inhibit lung function. The USEPA is addressing concerns about potential effects of NOA in a number of areas in California. Analysts used the *San Jose to Merced Project Section Geology, Soils, and Seismicity Technical Report* to determine if NOA occurs within the local RSA (Authority 2019d).

Lead-based paint (LBP) may have been used during construction of existing structures throughout the RSA. Analysts considered whether demolition would occur and whether the project would comply with applicable standards for appropriate disposal. The Valley fever and odor analyses are likewise qualitative and considered the potential for receptors to be exposed to C. immitis fungus spores and nuisance odors.

7 AIR QUALITY EFFECTS ANALYSIS

Using the methods described in Chapter 6, this chapter evaluates and discusses the effects of the project on emissions of criteria pollutants, TACs, MSATs, odors, and asbestos generated during operations and construction. This analysis does not identify NEPA and CEQA impacts and significance conclusions; that information is provided in the Draft EIR/EIS, Section 3.3, Air Quality and Greenhouse Gases.

7.1 No Project Alternative

Tables 7-1 and 7-2 show estimated emissions under No Project conditions in 2015, 2029, and 2040 under the medium and high ridership scenarios, respectively. As shown in the tables, total emissions for some pollutants would decrease from 2015 to 2040 (VOC, CO, and NO_X). For other pollutants (SO_2, PM_{10}, and $PM_{2.5}$), total emissions would increase from 2015 to 2040. The increase in PM is primarily because of higher VMT, aircraft, and electricity demand brought about by population and economic growth. The increase in SO_2 is primarily related to growth in air travel and power plant production. The decrease in other pollutants are from expected improvements in on-road vehicle engine technology, fuel efficiency, and turnover in older, more heavily polluting vehicles, which would offset emissions increases from higher on-road VMT and aircraft and power plant activity.

Table 7-1 Estimated Statewide Emissions without the Project—Medium Ridership Scenario

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2015						
On-road vehicles	7,839	324,144	33,370	767	22,981	6,242
Aircraft	338	2,888	2,779	299	84	84
Power plants	1,893	25,767	13,476	1,609	3,189	2,880
Total statewide emissions	10,070	352,800	49,624	2,675	26,254	9,206
2029						
On-road vehicles	1,712	125,365	9,783	577	26,322	6,998
Aircraft	411	3,445	3,391	367	103	102
Power plants	2,310	34,760	14,890	1,936	3,807	3,442
Total statewide emissions	4,434	163,570	28,064	2,880	30,232	10,542
2040						
On-road vehicles	1,059	91,121	6,688	534	28,262	7,383
Aircraft	474	3,968	3,908	423	118	118
Power plants	2,579	39,173	16,080	2,104	4,082	3,686
Total statewide emissions	4,112	134,261	26,676	3,062	32,463	11,187

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Table 7-2 Estimated Statewide Emissions without the Project—High Ridership Scenario

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2015						
On-road vehicles	7,800	322,534	33,204	763	22,867	6,211
Aircraft	315	2,692	2,589	279	78	78
Power plants	1,893	25,767	13,476	1,609	3,189	2,880
Total statewide emissions	10,008	350,993	49,269	2,651	26,134	9,170
2029						
On-road vehicles	1,725	126,531	9,983	590	26,898	7,147
Aircraft	341	2,856	2,811	304	85	85
Power plants	2,310	34,760	14,890	1,936	3,807	3,442
Total statewide emissions	4,377	164,146	27,684	2,830	30,789	10,674
2040						
On-road vehicles	1,093	94,097	6,907	552	29,185	7,625
Aircraft	520	4,348	4,282	464	129	129
Power plants	2,579	39,173	16,080	2,104	4,082	3,686
Total statewide emissions	4,192	137,618	27,269	3,120	33,397	11,440

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

7.2 Statewide and Regional Operational Emissions Analysis

Tables 7-3 and 7-4 show estimated statewide emissions for the medium ridership scenario and the high ridership scenario, respectively, with the project operating in 2015, 2029, and 2040. As shown in the tables, total emissions for some pollutants (VOC, CO, and NO_X) would decrease from 2015 to 2040. For other pollutants (SO_2, PM_{10}, $PM_{2.5}$), total emissions would increase from 2015 to 2040. The estimated statewide emissions burdens with the project would be the same under all project alternatives because the ridership scenarios do not vary by alternative.

Table 7-3 Estimated Statewide Emissions with the Project—Medium Ridership Scenario

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2015						
On-road vehicles	7,708	318,720	32,811	754	22,596	6,138
Aircraft	237	2,027	1,949	210	59	59
Power plants	1,908	25,983	13,584	1,622	3,215	2,904
Total statewide net emissions	9,853	346,729	48,344	2,586	25,870	9,100

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2029						
On-road vehicles	1,696	124,183	9,691	571	26,074	6,932
Aircraft	346	2,900	2,855	309	86	86
Power plants	2,323	34,944	14,982	1,947	3,829	3,462
Total statewide net emissions	4,366	162,027	27,527	2,827	29,989	10,480
2040						
On-road vehicles	1,052	90,518	6,573	525	27,749	7,251
Aircraft	335	2,805	2,763	299	84	83
Power plants	2,594	39,388	16,188	2,117	4,108	3,710
Total statewide net emissions	3,981	132,711	25,523	2,941	31,941	11,044

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Table 7-4 Estimated Statewide Emissions with the Project—High Ridership Scenario

Emission Source	VOC (tons/yr)	CO (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2015						
On-road vehicles	7,620	315,076	32,436	745	22,338	6,067
Aircraft	218	1,863	1,792	193	54	54
Power plants	1,910	26,004	13,594	1,624	3,218	2,906
Total statewide net emissions	9,747	342,942	47,822	2,562	25,610	9,028
2029						
On-road vehicles	1,728	126,496	9,872	582	26,560	7,061
Aircraft	269	2,253	2,218	240	67	67
Power plants	2,325	34,962	14,991	1,948	3,831	3,464
Total statewide net emissions	4,322	163,711	27,080	2,770	30,458	10,592
2040						
On-road vehicles	1,067	91,810	6,739	538	28,476	7,439
Aircraft	386	3,230	3,181	345	96	96
Power plants	2,596	39,409	16,198	2,118	4,111	3,712
Total statewide net emissions	4,049	134,450	26,118	3,001	32,683	11,247

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Comparing Tables 7-1 and 7-2 with Tables 7-3 and 7-4 shows that emissions with the project would follow the same general trends as emissions without the project. Emissions from some pollutant sources would decrease by a small percentage despite population and economic growth in California because of advances in engine technology. Emissions from power plants would increase due to the additional project electrical demand.

Table 7-5 summarizes the net change in emissions between the two ridership scenarios with the project (absolute emissions shown in Tables 7-3 and 7-4) and without the project (absolute emissions shown in Tables 7-1 and 7-2) for the 2015 Existing conditions, as well as the 2029 and 2040 No Project conditions. The net change represents the incremental change in emissions because of the project. As shown in Table 7-5, the project is predicted to have a beneficial effect on (i.e., it would reduce) statewide emissions of all pollutants under both ridership scenarios for the 2015 Existing and 2029 and 2040 No Project conditions.

7.2.1 On-Road Vehicles

As shown in Table 7-6 and Table 7-7, the project is predicted to reduce regional VMT and on-road emissions, respectively, as compared to the 2015 Existing conditions, as well as the 2029 and 2040 No Project conditions, under both ridership scenarios, resulting in a beneficial effect on regional air quality. The change in emissions would be the same under all four project alternatives because the ridership is assumed to be the same.

The HSR system is predicted to reduce statewide and regional criteria pollutant emissions associated with roadways because travelers would use HSR rather than drive. The on-road vehicle emission analysis is based on VMT changes and associated average daily speed estimates calculated for Santa Clara, San Benito, and Merced Counties. Analysts obtained emission factors from EMFAC2017, using statewide parameters.

For the project, some vehicles may need to travel additional distances to cross the HSR track on new roadway overheads. On average, roadway overpasses would be provided approximately every 2 miles along the track. It is estimated that vehicles would not have to travel more than 1 mile out of direction to cross the HSR tracks. The width of the roadway overheads would accommodate both farm equipment and school buses traveling in opposite lanes. Because of the number of roadway overheads, it is expected that additional distances vehicles would travel to cross the HSR tracks would be negligible relative to regional VMT reductions; therefore, this is not discussed further in the analysis.

7.2.2 Trains

The project would use EMU trains, with the power distributed through the overhead contact system. The HSR system would not produce direct emissions from combustion of fossil fuels and associated emissions. However, trains traveling at high velocities, such as those associated with the HSR system, create sideways turbulence and rear wake, which resuspend particulates from the surface surrounding the track, resulting in fugitive dust emissions. Assuming a friction velocity of 0.62 foot per second to resuspend soils in the RSA, an HSR train passing at 220 mph could resuspend soil particles out to approximately 10 feet from the train (Watson 1996). Based on the USEPA method for estimating emissions from wind erosion (USEPA 2006a), the project would generate approximately 8 to 18 tons per year of PM_{10} and 1 to 3 tons per year of $PM_{2.5}$, depending on the alternative (Section 7.2.5, Regional Operations Criteria Pollutants). Details of the analysis and calculations are provided in Appendix F.

The SFBAAB, NCCAB, and SJVAB regions have high rates of asthma in adults and children. Because the HSR system is electrically powered, it would not generate direct combustion emissions along its route that would cause substantial health concerns such as asthma or other respiratory diseases. Appendix F provides a detailed analysis of wind-induced fugitive dust emissions from HSR travel. Based on this analysis, fugitive dust emissions from HSR travel are not expected to result in amounts of dust to cause health concerns.

Table 7-5 Estimated Changes in Statewide Emissions, Project vs. No Project (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr) Medium	VOC (tons/yr) High	CO (tons/yr) Medium	CO (tons/yr) High	NO_X (tons/yr) Medium	NO_X (tons/yr) High	SO_2 (tons/yr) Medium	SO_2 (tons/yr) High	PM_{10} (tons/yr) Medium	PM_{10} (tons/yr) High	$PM_{2.5}$ (tons/yr) Medium	$PM_{2.5}$ (tons/yr) High
Existing Plus Project Emissions Relative to 2015 Existing Conditions												
On-road vehicles	-131	-180	-5,425	-7,458	-558	-768	-13	-18	-385	-529	-104	-144
Aircraft	-101	-97	-862	-829	-829	-798	-89	-86	-25	-24	-25	-24
Power plants	15	17	215	237	108	118	13	14	26	29	23	26
Total statewide net emissions	-217	-260	-6,071	-8,051	-1,280	-1,447	-89	-89	-384	-524	-106	-142
2029 Plus Project Emissions Relative to 2029 No Project Conditions												
On-road vehicles	-16	3	-1,182	-35	-92	-111	-5	-8	-248	-338	-66	-86
Aircraft	-65	-72	-545	-602	-536	-593	-58	-64	-16	-18	-16	-18
Power plants	13	14	184	202	92	101	11	12	22	24	20	22
Total statewide net emissions	-68	-55	-1,543	-435	-537	-603	-52	-59	-242	-332	-62	-82
2040 Plus Project Emissions Relative to 2040 No Project Conditions												
On-road vehicles	-7	-27	-603	-2,287	-115	-168	-10	-13	-513	-709	-132	-185
Aircraft	-139	-134	-1,162	-1,118	-1,145	-1,101	-124	-119	-35	-33	-35	-33
Power plants	15	17	215	237	108	118	13	14	26	29	23	26
Total statewide net emissions	-131	-143	-1,550	-3,168	-1,152	-1,151	-121	-118	-522	-714	-143	-193

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

Table 7-6 On-Road Vehicle Miles Traveled, Project vs. No Project (Medium and High Ridership Scenarios)

Location	No Project VMT Total Annual Traffic		Plus Project VMT Total Annual Traffic	
	Medium	High	Medium	High
2015				
Santa Clara	10,312,374,118	10,283,778,970	10,146,971,563	10,060,102,631
San Benito	620,032,419	613,186,473	497,463,094	444,285,228
Merced	1,239,904,084	1,217,771,426	1,095,973,335	1,023,513,300
Regional Total	12,172,310,621	12,114,736,869	11,740,407,991	11,527,901,159
2029				
Santa Clara	12,185,576,908	12,342,515,217	12,054,792,646	12,166,524,907
San Benito	732,687,590	832,309,817	644,576,543	712,361,522
Merced	1,506,540,248	1,649,405,517	1,392,147,947	1,495,480,175
Regional Total	14,424,804,746	14,824,230,551	14,091,517,136	14,374,366,604
2040				
Santa Clara	13,201,830,628	13,445,805,858	12,971,953,362	13,134,939,406
San Benito	845,964,786	938,659,865	675,617,348	703,920,103
Merced	1,842,074,869	2,205,535,193	1,642,039,221	1,935,554,314
Regional Total	15,889,870,283	16,590,000,916	15,289,609,930	15,774,413,823

Source: Authority 2019e
Totals may not add up exactly because of rounding.
VMT = vehicle miles traveled

Table 7-7 On-Road Vehicle Emission Changes, Project vs. No Project (Medium and High Ridership Scenarios)

Location	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions												
Santa Clara	-7	-9	-272	-367	-27	-37	-1	-1	-19	-25	-5	-7
San Benito	-4	-6	-162	-224	-21	-28	<0	-1	-14	-19	-4	-5
Merced	-5	-7	-197	-266	-25	-33	-1	-1	-16	-22	-4	-6
Total regional net emissions	-17	-23	-632	-858	-72	-98	-2	-2	-48	-66	-13	-18
2029 Plus Project Emissions Relative to 2029 No Project Conditions												
Santa Clara	-1	-1	-73	-98	-5	-7	<0	<0	-14	-19	-4	-5
San Benito	-1	-1	-36	-49	-4	-5	<0	<0	-10	-13	-3	-3
Merced	-1	-1	-49	-65	-5	-6	<0	<0	-12	-17	-3	-4
Total regional net emissions	-2	-3	-157	-212	-14	-18	-1	-1	-36	-49	-10	-13
2040 Plus Project Emissions Relative to 2040 No Project Conditions												
Santa Clara	-1	-2	-89	-121	-6	-8	<0	-1	-25	-34	-7	-9
San Benito	-1	-1	-43	-60	-4	-6	<0	<0	-18	-25	-5	-7
Merced	-1	-1	-59	-66	-5	-6	<0	-1	-22	-23	-6	-6
Total regional net emissions	-3	-3	-191	-247	-15	-20	-1	-2	-66	-83	-17	-21

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

7.2.3 Aircraft

The implementation of the project and the HSR system is predicted to reduce the number of aircraft flights at the regional airports in Northern California. Using the methods described in Section 6.2.3, Aircraft, analysts estimated emissions from aircraft takeoff and landing cycles as well as associated ground maintenance requirements. Table 7-8 shows the total number of flights with and without the project in 2015, 2029, and 2040 for both ridership scenarios.

As shown in Table 7-9, the project is predicted to reduce regional and statewide aircraft emissions compared to the 2015 Existing conditions, as well as the 2029 and 2040 No Project conditions, under both ridership scenarios, resulting in a beneficial effect on regional air quality. The effect on emissions would be the same under all four project alternatives because ridership is assumed the same.

7.2.4 Power Plants

The project would increase electrical requirements compared to the 2015 Existing conditions and 2029 and 2040 No Project conditions because the trains would be powered by electricity. Analysts conservatively estimated the statewide electrical demands from propulsion of the trains and the operation of the trains at terminal stations and in storage depots and maintenance facilities. No one-generation source for the electrical power requirements can be identified, because the state's electrical grid would power the HSR system.

Table 7-10 shows the pollutant emissions relative to the 2015 Existing and 2029 and 2040 No Project conditions and indicates the direct effect of the project by comparing the emissions with the project to the emissions that would occur without the project. The effect on emissions would be the same under all four project alternatives because ridership is assumed the same.

As previously noted, the state requires an increasing fraction (60 percent by 2030) of electricity generated for the state's power portfolio to come from renewable energy sources, and the Authority has a policy goal to use 100 percent renewable energy to power the HSR system. However, this analysis conservatively estimates power plant emissions based on the state's existing power portfolio and renewable energy mix. Accordingly, the emissions generated for powering the HSR system are expected to be lower in the future compared to emission estimates used in this analysis.

Table 7-8 Aircraft Flights, Project vs. No Project (Medium and High Ridership Scenarios)

Location	Total No Project Number of Flights (per year)		Total Project Number of Flights (per year)	
	Medium	High	Medium	High
2015				
Regional (Bay Area)	91,124	85,065	59,462	54,762
Statewide total	268,567	250,276	188,430	173,177
2029				
Regional (Bay Area)	110,664	93,895	90,004	71,250
Statewide total	329,614	273,240	277,475	215,599
2040				
Regional (Bay Area)	125,946	137,732	81,942	95,616
Statewide total	380,189	416,659	268,814	309,505

Source: Authority 2019e

Table 7-9 Aircraft Emission Changes, Project vs. No Project (Medium and High Ridership Scenarios)

Location	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
2015 Plus Project Emissions Relative to 2015 Existing Conditions												
Regional (Bay Area)	(40)	(38)	(341)	(326)	(328)	(314)	(35)	(34)	(10)	(9)	(10)	(9)
Total statewide net emissions	(101)	(97)	(862)	(829)	(829)	(798)	(89)	(86)	(25)	(24)	(25)	(24)
2029 Plus Project Emissions Relative to 2029 No Project Conditions												
Regional (Bay Area)	(26)	(28)	(216)	(237)	(213)	(233)	(23)	(25)	(6)	(7)	(6)	(7)
Total statewide net emissions	(65)	(72)	(545)	(602)	(536)	(593)	(58)	(64)	(16)	(18)	(16)	(18)
2040 Plus Project Emissions Relative to the 2040 No Project Conditions												
Regional (Bay Area)	(55)	(53)	(459)	(440)	(452)	(433)	(49)	(47)	(14)	(13)	(14)	(13)
Total statewide net emissions	(139)	(134)	(1,162)	(1,118)	(1,145)	(1,101)	(124)	(119)	(35)	(33)	(35)	(33)

Source: Authority 2019e
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
VOC = volatile organic compound
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
yr = year

Table 7-10 Power Plant Emission Changes, Project vs. No Project (Medium and High Ridership Scenarios)

Location	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
2015 Project Emissions Relative to 2015 Existing Conditions												
Regional (Bay Area)	2	2	24	26	12	13	1	2	3	3	3	3
Statewide	15	17	215	237	108	118	13	14	26	29	23	26
2029 Plus Project Emissions Relative to 2029 No Project Conditions												
Regional (Bay Area)	1	2	20	22	10	11	1	1	2	3	2	2
Statewide	13	14	184	202	92	101	11	12	22	24	20	22
2040 Plus Project Emissions Relative to 2040 No Project Conditions												
Regional (Bay Area)	2	2	24	26	12	13	1	2	3	3	3	3
Statewide	15	17	215	237	108	118	13	14	26	29	23	26

Source: Authority 2019e
CO = carbon monoxide
HSR = high-speed rail
MWh/yr = megawatt hours per year
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year

7.2.5 Regional Operations Criteria Pollutant Emissions Summary

Table 7-11 through Table 7-13 show the total emission changes from project operations under the medium and high ridership scenarios for the 2015 Existing conditions (Table 7-11) and 2029 and 2040 No Project conditions (Tables 7-12 and 7-13). Results include indirect emissions from regional vehicle travel, aircraft, and power plants and direct operations emissions from HSR train movement.

As shown in the tables, all four project alternatives would result in a net regional decrease in emissions of all criteria pollutants. These decreases would be beneficial to the SFBAAB, NCCAB, and SJVAB and help the basins meet their attainment goals for O_3 and other criteria pollutants. Lower ridership would result in fewer regional benefits, although it would still constitute a net benefit. Direct emissions of fugitive dust (PM_{10} and $PM_{2.5}$) from train movement would only occur within the project footprint; however, as discussed, these emissions would be distributed along the entire track length and are not expected to result in substantial concentrations in any one localized area.

The beneficial effects from a reduction in regional operations criteria pollutant emissions would be approximately the same under all four project alternatives. The decrease in indirect emissions associated with regional vehicle travel, aircraft, and power plants would be equal under all four project alternatives because ridership would not vary by alternative. Direct emissions, which do not depend on ridership, would vary slightly by alternative associated with $PM_{2.5}$ and PM_{10} emissions from HSR train movement, although the effect on overall emissions is negligible. Emissions of the other criteria pollutants would be the same under all four alternatives.

Table 7-11 Regional Criteria Pollutant Emissions Changes, Project Compared to 2015 Existing Conditions (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Indirect Emissions												
On-road vehicles	(17)	(23)	(632)	(858)	(72)	(98)	(2)	(2)	(48)	(66)	(13)	(18)
Aircraft	(40)	(38)	(341)	(326)	(328)	(314)	(35)	(34)	(10)	(9)	(10)	(9)
Power plants	2	2	24	26	12	13	1	2	3	3	3	3
Direct Emissions (Fugitive dust from train movement)[1]												
Alternative 1									8		1	
Alternative 2									16		2	
Alternative 3									9		1	
Alternative 4									18		3	
Total Emissions[2]												
Alternative 1	(55)	(59)	(948)	(1,158)	(388)	(398)	(35)	(34)	(47)	(64)	(19)	(23)
Alternative 2	(55)	(59)	(948)	(1,158)	(388)	(398)	(35)	(34)	(40)	(56)	(18)	(22)
Alternative 3	(55)	(59)	(948)	(1,158)	(388)	(398)	(35)	(34)	(47)	(64)	(19)	(23)
Alternative 4	(55)	(59)	(948)	(1,158)	(388)	(398)	(35)	(34)	(38)	(72)	(18)	(25)

Source: Authority 2019e; Watson 1996; USEPA 2006a
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year
[1] Direct dust emissions from train movement do not depend on ridership; emissions are the same for both scenarios.
[2] Total includes indirect and direct emissions.

Table 7-12 Regional Criteria Pollutant Emissions Changes, Project Compared to 2029 No Project Conditions (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Indirect Emissions												
On-road vehicles	(2)	(3)	(157)	(212)	(14)	(18)	(1)	(1)	(36)	(49)	(10)	(13)
Aircraft	(26)	(28)	(216)	(237)	(213)	(233)	(23)	(25)	(6)	(7)	(6)	(7)
Power plants	1	2	20	22	10	11	1	1	2	3	2	2
Direct Emissions (Fugitive dust from train movement)[1]												
Alternative 1									8		1	
Alternative 2									16		2	
Alternative 3									9		1	
Alternative 4									18		3	
Total Emissions[2]												
Alternative 1	(27)	(30)	(353)	(427)	(216)	(240)	(23)	(25)	(32)	(45)	(13)	(16)
Alternative 2	(27)	(30)	(353)	(427)	(216)	(240)	(23)	(25)	(25)	(38)	(12)	(15)
Alternative 3	(27)	(30)	(353)	(427)	(216)	(240)	(23)	(25)	(32)	(45)	(13)	(16)
Alternative 4	(27)	(30)	(353)	(427)	(216)	(240)	(23)	(25)	(23)	(54)	(11)	(18)

Source: Authority 2019e; Watson 1996; USEPA 2006a
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year
[1] Direct dust emissions from train movement do not depend on ridership; emissions are the same for both scenarios.
[2] Total includes indirect and direct emissions.

Table 7-13 Regional Criteria Pollutant Emissions Changes, Project Compared to 2040 No Project Conditions (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High	Medium	High
Indirect Emissions												
On-road vehicles	(3)	(3)	(191)	(247)	(15)	(20)	(1)	(2)	(66)	(83)	(17)	(21)
Aircraft	(55)	(53)	(459)	(440)	(452)	(433)	(49)	(47)	(14)	(13)	(14)	(13)
Power plants	2	2	24	26	12	13	1	2	3	3	3	3
Direct Emissions (Fugitive dust from train movement)[1]												
Alternative 1									8		1	
Alternative 2									16		2	
Alternative 3									9		1	
Alternative 4									18		3	
Total Emissions[2]												
Alternative 1	(56)	(54)	(626)	(660)	(456)	(440)	(49)	(47)	(69)	(84)	(27)	(30)
Alternative 2	(56)	(54)	(626)	(660)	(456)	(440)	(49)	(47)	(61)	(77)	(26)	(29)
Alternative 3	(56)	(54)	(626)	(660)	(456)	(440)	(49)	(47)	(69)	(84)	(27)	(30)
Alternative 4	(56)	(54)	(626)	(660)	(456)	(440)	(49)	(47)	(59)	(93)	(26)	(32)

Source: Authority 2019e, Watson 1996, USEPA 2006a
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year
[1] Direct dust emissions from train movement do not depend on ridership; emissions are the same for both scenarios.
[2] Total includes indirect and direct emissions.

7.3 Local Operation Emission Sources

Operation of the San Jose Diridon, Downtown Gilroy, and East Gilroy Stations and the maintenance facilities would produce criteria pollutant emissions. The operation of the power traction, switching, and paralleling stations would not result in appreciable quantities of air pollutants because site visits would be infrequent, and power usage would be limited. Therefore, emissions from the power traction, switching, and paralleling stations were not quantified.

7.3.1 Station Sites and Maintenance Facilities

Emissions associated with operation of the stations and maintenance facilities are expected because of combustion sources used primarily for space heating and facility landscaping, energy consumption for facility lighting, minor solvent and paint usage for periodic application of architectural coatings, and employee and passenger traffic. Analysts used CalEEMod to estimate these emissions from the stations and maintenance facilities, based on the square footage of the buildings and assumptions described in Chapter 6. Operation of the MOWF would also generate emissions from vehicles, equipment, and locomotives used for maintenance activities. Analysts estimated the criteria pollutant emissions for 2015, 2029, and 2040 conditions and they are included in Table 7-14. Station and maintenance facility emissions would be similar among all four alternatives, but slightly higher under Alternative 3, which includes the East Gilroy Station. Since the East Gilroy Station is entirely new, net emissions are greater than the Downtown Gilroy Station since emissions under existing conditions are zero.

Table 7-14 Station and Maintenance Facility Operations Emissions (tons per year)

Project Component	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$
2015 Existing[1]						
San Jose Diridon Station	1	15	2	<1	3	1
Downtown Gilroy Station	<1	1	<1	<1	<1	<1
2015 Existing Plus Project						
San Jose Diridon Station[2]	2	24	3	<1	5	1
Downtown Gilroy Station[3]	2	16	2	<1	3	1
East Gilroy Station	1	16	2	<1	3	1
MOWF[4]	1	12	5	<1	1	<1
MOWS	1	1	7	<1	<1	<1
PROJECT CHANGE—Alternatives 1, 2, and 4	**5**	**38**	**15**	**1**	**6**	**2**
PROJECT CHANGE—Alternative 3	**5**	**39**	**15**	**1**	**6**	**2**
2029 No Project[1]						
San Jose Diridon Station	1	7	1	<1	4	1
Downtown Gilroy Station	<1	1	<1	<1	<1	<1
2029 Plus Project						
San Jose Diridon Station[2]	1	11	1	<1	6	2
Downtown Gilroy Station[3]	1	7	1	<1	4	1
East Gilroy Station	1	9	1	<1	5	1
MOWF[4]	1	9	5	<1	1	<1
MOWS	1	1	2	<1	<1	<1

Project Component	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$
PROJECT CHANGE—Alternatives 1, 2, and 4	**3**	**20**	**8**	**0**	**7**	**2**
PROJECT CHANGE—Alternative 3	**4**	**23**	**8**	**0**	**8**	**2**
2040 No Project[1]						
San Jose Diridon Station	1	6	1	<1	5	1
Downtown Gilroy Station	<1	1	<1	<1	<1	<1
2040 Plus Project						
San Jose Diridon Station[2]	2	15	2	<1	12	3
Downtown Gilroy Station[3]	1	11	1	<1	8	2
East Gilroy Station	1	12	1	<1	9	2
MOWF[4]	1	9	4	<1	1	<1
MOWS	1	1	2	<1	<1	<1
PROJECT CHANGE—Alternatives 1, 2, and 4	**4**	**29**	**8**	**1**	**16**	**4**
PROJECT CHANGE—Alternative 3	**4**	**31**	**8**	**1**	**17**	**5**

Sources: Trinity Consultants 2016; Newson 2018; USEPA 2009; Burton 2017a, 2017b, , 2017c, 2018; McGuire 2017–2018
CO = carbon monoxide
CO_2 = carbon dioxide
MOWF = light maintenance facility
MOWS = maintenance of way siding
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
tons/yr = tons per year
VOC = volatile organic compound
[1] Represents emissions from the existing facilities prior to HSR improvements. The East Gilroy Station, MOWF, and MOWS do not exist under existing conditions, and existing emissions are assumed to be zero.
[2] There would be no difference in operational emissions between the aerial and at-grade options.
[3] There would be no difference in operational emissions between the aerial and embankment options.
[4] There would be no difference in operational emissions between the south and east Gilroy options.

7.4 Total Operations Emissions

Tables 7-15 through 7-17 show a summary of the total emission changes because of HSR operation for the medium and high ridership scenarios, including the indirect emissions from regional vehicle travel, aircraft, and power plants and direct project operational emissions from HSR stations, maintenance facilities, and train movements. The project would result in a net regional decrease in emissions of criteria pollutants. These decreases would be beneficial to the SFBAAB, NCCAB, and SJVAB and help the basins meet their attainment goals for O_3 and particulates (PM_{10} and $PM_{2.5}$). Lower ridership would result in fewer regional benefits, although even with lower ridership, there would be a net benefit.

All four project alternatives would result in a net reduction in operations emissions from the 2015 Existing and 2029 and 2040 No Project conditions, although there would be slight differences in the total emission changes by alternative. Indirect emissions from vehicle travel, aircraft, and power plants are based on ridership, which would not differ by alternative. Direct emissions, including stations, maintenance facilities, and train movement, would vary by alternative although the overall difference is small.

Table 7-15 Total Regional Criteria Pollutant Emissions Changes, Project Compared to 2015 Existing Conditions (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Indirect Emissions												
On-road vehicles	(17)	(23)	(632)	(858)	(72)	(98)	(2)	(2)	(48)	(66)	(13)	(18)
Aircraft	(40)	(38)	(341)	(326)	(328)	(314)	(35)	(34)	(10)	(9)	(10)	(9)
Power plants	2	2	24	26	12	13	1	2	3	3	3	3
Direct Emissions[1]												
Alternative 1												
Stations[2]	2		24		3		<1		4		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									8		1	
Alternative 2												
Stations[2]	2		24		3		<1		4		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									16		2	
Alternative 3												
Stations[2]	3		25		3		<1		5		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									9		1	
Alternative 4												
Stations[2]	2		24		3		<1		4		1	
Maintenance facilities	2		14		12		<1		2		1	
Train movement[3]									18		3	
Total Emissions[4]												
Alternative 1	(50)	(54)	(911)	(1,120)	(372)	(383)	(35)	(34)	(48)	(65)	(19)	(23)
Alternative 2	(50)	(54)	(911)	(1,120)	(372)	(383)	(35)	(34)	(47)	(64)	(19)	(23)
Alternative 3	(50)	(54)	(910)	(1,119)	(372)	(383)	(35)	(34)	(47)	(63)	(19)	(23)
Alternative 4	(50)	(54)	(911)	(1,120)	(372)	(383)	(35)	(34)	(47)	(63)	(19)	(23)

Sources: Authority 2019e; Watson 1996; USEPA 2006a; Trinity Consultants 2016; Newson 2018; USEPA 2009; Burton 2017a, 2017b, 2017c, 2018 ; McGuire 2017–2018
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year
[1] Direct emissions do not depend on ridership; emissions are the same for both scenarios.
[2] Represents the net emissions effect of the project (i.e., the difference in station operating emissions between Existing and Existing Plus Project conditions)
[3] Train movement would only generate fugitive dust emissions.
[4] Total includes indirect and direct emissions.

Table 7-16 Total Regional Criteria Pollutant Emissions Changes, Project Compared to 2029 No Project Conditions (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Indirect Emissions												
On(road vehicles	(2)	(3)	(157)	(212)	(14)	(18)	(1)	(1)	(36)	(49)	(10)	(13)
Aircraft	(26)	(28)	(216)	(237)	(213)	(233)	(23)	(25)	(6)	(7)	(6)	(7)
Power plants	1	2	20	22	10	11	1	1	2	3	2	2
Direct Emissions[1]												
Alternative 1												
Stations[2]	1		10		1		<1		5		1	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									8		1	
Alternative 2												
Stations[2]	1		10		1		<1		5		1	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									16		2	
Alternative 3												
Stations[2]	2		12		1		<1		7		2	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									9		1	
Alternative 4												
Stations[2]	1		10		1		<1		5		1	
Maintenance facilities	2		11		7		<1		1		<1	
Train movement[3]									18		3	
Total Emissions[4]												
Alternative 1	(23)	(26)	(332)	(406)	(208)	(232)	(22)	(24)	(34)	(47)	(12)	(16)
Alternative 2	(23)	(26)	(332)	(406)	(208)	(232)	(22)	(24)	(34)	(47)	(12)	(16)
Alternative 3	(23)	(26)	(330)	(404)	(208)	(232)	(22)	(24)	(32)	(46)	(12)	(15)
Alternative 4	(23)	(26)	(332)	(406)	(208)	(232)	(22)	(24)	(34)	(47)	(12)	(16)

Sources: Authority 2019e; Watson 1996; USEPA 2006a; Trinity Consultants 2016; Newson 2018; USEPA 2009; Burton 2017a, 2017b, 2017c, 2018; McGuire 2017–2018
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year
[1] Direct emissions do not depend on ridership; emissions are the same for both scenarios.
[2] Represents the net emissions effect of the project (i.e., the difference in station operating emissions between 2029 No Project and Project conditions)
[3] Train movement would only generate fugitive dust emissions.
[4] Total includes indirect and direct emissions.

Table 7-17 Total Regional Criteria Pollutant Emissions Changes, Project Compared to 2040 No Project Conditions (Medium and High Ridership Scenarios)

Emission Source	VOC (tons/yr)		CO (tons/yr)		NO_X (tons/yr)		SO_2 (tons/yr)		PM_{10} (tons/yr)		$PM_{2.5}$ (tons/yr)	
	M	H	M	H	M	H	M	H	M	H	M	H
Indirect Emissions												
On-road vehicles	(3)	(3)	(191)	(247)	(15)	(20)	(1)	(2)	(66)	(83)	(17)	(21)
Aircraft	(55)	(53)	(459)	(440)	(452)	(433)	(49)	(47)	(14)	(13)	(14)	(13)
Power plants	2	2	24	26	12	13	1	2	3	3	3	3
Direct Emissions[1]												
Alternative 1												
Stations[2]	2		19		2		<1		14		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									8		1	
Alternative 2												
Stations[2]	2		19		2		<1		14		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									16		2	
Alternative 3												
Stations[2]	2		21		2		<1		16		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									9		1	
Alternative 4												
Stations[2]	2		19		2		<1		14		4	
Maintenance facilities	2		10		6		<1		1		<1	
Train movement[3]									18		3	
Total Emissions[4]												
Alternative 1	(52)	(50)	(597)	(631)	(447)	(432)	(48)	(46)	(61)	(77)	(24)	(27)
Alternative 2	(52)	(50)	(597)	(631)	(447)	(432)	(48)	(46)	(61)	(77)	(24)	(27)
Alternative 3	(52)	(50)	(596)	(629)	(447)	(432)	(48)	(46)	(60)	(76)	(24)	(27)
Alternative 4	(52)	(50)	(597)	(631)	(447)	(432)	(48)	(46)	(61)	(77)	(24)	(27)

Sources: Authority 2019e; Watson 1996; USEPA 2006a; Trinity Consultants 2016; Newson 2018; Burton 2017a, 2017b, 2017c, 2018; McGuire 2017–2018
(Parentheses) indicate negative values
CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compound
yr = year
[1] Direct emissions do not depend on ridership; emissions are the same for both scenarios.
[2] Represents the net emissions effect of the project (i.e., the difference in station operating emissions between 2040 No Project and Project conditions)
[3] Train movement would only generate fugitive dust emissions.
[4] Total includes indirect and direct emissions.

7.5 Microscale Carbon Monoxide Hot-Spot Analysis

Analysts modeled CO concentrations at five intersections covered by covered by congestion management plans identified in the traffic analysis as having the highest station traffic volumes and the worst levels of congestion/delay. In addition to these locations, the intersection of Monterey Road and Skyway Drive was analyzed under Alternative 4, which would require an at-grade crossing. Alternatives 1 through 3 would not worsen traffic conditions at this or other intersections along the alignment because the alignment and roadways would be grade separated.

The modeled CO concentrations were combined with CO background concentrations and compared with air quality standards. Table 7-18 shows the CO hot-spot analysis results and indicates that CO concentrations are not anticipated to exceed the 1- or 8-hour NAAQS and CAAQS. Traffic volumes would not differ significantly among the project alternatives at the five station intersections; consequently, the results presented in Table 7-18 are representative of all four project alternatives. The results for Monterey Road/Skyway Drive are only applicable to Alternative 4.

Table 7-18 Carbon Monoxide Modeling Concentration Results (Parts per Million)

Intersection	Rec.[1]	1-Hour Concentration[2]						8-Hour Concentration[3]					
		Existing (2015)		Future (2029)		Future (2040)		Existing (2015)		Future (2029)		Future (2040)	
		No Project	Plus Project	No Project	Plus Project	No Project	Plus Project	No Project	Plus Project	No Project	Plus Project	No Project	Plus Project
The Alameda (SR 82)/Taylor Street-Naglee Avenue	1	3.7	3.7	2.9	2.9	2.9	2.9	2.8	2.8	2.2	2.2	2.2	2.2
	2	3.7	3.7	2.8	2.8	2.8	2.9	2.8	2.8	2.2	2.2	2.2	2.2
	3	4.0	4.0	2.9	2.9	2.9	2.9	3.0	3.0	2.2	2.2	2.2	2.2
	4	3.6	3.6	2.8	2.8	2.9	2.9	2.7	2.7	2.2	2.2	2.2	2.2
Autumn Street (SR 82)/West Santa Clara Street (SR 82)	5	3.1	3.2	2.7	2.7	2.8	2.8	2.4	2.4	2.1	2.1	2.2	2.2
	6	3.2	3.2	2.7	2.8	2.7	2.8	2.4	2.4	2.1	2.2	2.1	2.2
	7	2.9	3.0	2.6	2.7	2.8	2.9	2.2	2.3	2.0	2.1	2.2	2.2
	8	3.1	3.2	2.7	2.7	2.8	2.9	2.4	2.4	2.1	2.1	2.2	2.2
Coleman Avenue/I-880 Northbound Ramps	9	3.8	3.9	2.8	2.8	2.8	2.8	2.9	2.9	2.2	2.2	2.2	2.2
	10	4.2	4.3	2.9	3.0	2.9	3.0	3.1	3.2	2.2	2.3	2.2	2.3
	11	4.0	4.0	2.8	2.9	2.9	2.9	3.0	3.0	2.2	2.2	2.2	2.2
	12	4.4	4.5	3.0	3.0	3.0	3.0	3.3	3.3	2.3	2.3	2.3	2.3
Monterey Road (SR 82)/Blossom Hill Road Westbound Ramps (SR 82/CR G10)	13	3.6	3.6	2.8	2.7	2.6	2.9	2.7	2.7	2.2	2.1	2.0	2.2
	14	3.7	3.7	2.9	2.8	2.7	2.9	2.8	2.8	2.2	2.2	2.1	2.2
	15	3.7	3.8	2.9	2.7	2.5	2.9	2.8	2.9	2.2	2.1	1.9	2.2
	16	3.8	3.8	2.9	2.8	2.8	2.9	2.9	2.9	2.2	2.2	2.2	2.2
US 101 Southbound Ramps/Blossom Hill Road	17	4.7	4.6	3.0	3.0	3.0	3.0	3.5	3.4	2.3	2.3	2.3	2.3
	18	5.0	5.1	3.2	3.2	3.2	3.2	3.7	3.8	2.4	2.4	2.4	2.4
	19	4.2	4.3	2.9	2.9	2.9	2.9	3.1	3.2	2.2	2.2	2.2	2.2
	20	4.2	4.3	2.9	2.9	2.9	2.9	3.1	3.2	2.2	2.2	2.2	2.2
Monterey Road/Skyway Drive (Alternative 4 only)	21	3.7	3.7	2.8	2.8	2.8	2.8	2.8	2.8	2.2	2.2	2.2	2.2
	22	4.4	4.4	3.0	3.0	3.0	3.0	3.3	3.3	2.3	2.3	2.3	2.3
	23	3.8	3.8	2.8	2.8	2.8	2.8	2.9	2.9	2.2	2.2	2.2	2.2
	24	4.5	4.5	3.0	3.0	3.0	3.0	3.3	3.3	2.3	2.3	2.3	2.3
State Standard (ppm)		20	20	20	20	20	20	9	9	9	9	9	9
Federal Standard (ppm)		35	35	35	35	35	35	9	9	9	9	9	9

Sources: Garza et al. 1997; Burton 2017d
CO = carbon monoxide
CR = county road
ppm = parts per million
SR = State Route
US = U.S. Highway
Caltrans = California Department of Transportation
[1] Consistent with Caltrans CO Protocol, receptors are located at 3 meters from the intersection, at each of the four corners to represent the nearest location in which a receptor could potentially be located adjacent to a traveled roadway. The modeled receptors indicated are not representative of the actual sensitive receptors. Receptor locations are theoretical and are not reflective of actual locations show on Figure 5-2.
[2] Average 1-hour background concentration between 2015 and 2017 was 2.13 ppm (USEPA 2018a).
[3] Average 8-hour background concentration between 2015 and 2017 was 1.67 ppm (USEPA 2018c).

7.6 Particulate Matter (PM_{10} and $PM_{2.5}$) Hot-Spot Analysis

Compared to the No Project Condition, the project would reduce VMT under all analysis years (2015, 2029, and 2040), resulting in PM_{10} and $PM_{2.5}$ reductions (Table 7-5 and Table 7-6). To identify and evaluate potential effects, analysts prepared a hot-spot analysis because the SFBAAB and SJVAPCD portions of the local RSA are designated nonattainment for the $PM_{2.5}$ NAAQS and maintenance for the PM_{10} NAAQS (SJVAPCD only), and the project is subject to a localized PM_{10} and $PM_{2.5}$ hot-spot analysis. The project alternatives would not differ in PM emissions because the regional change in VMT would be the same for all alternatives.

In November 2015, the USEPA updated its *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (USEPA 2015e), which was used for this analysis. Although this analysis is normally associated with the Transportation Conformity Rule, the HSR system is subject to the General Conformity Rule. Notwithstanding the decision to use this analytical structure, additional analysis or associated activities required to comply with transportation conformity would be carried out only if discrete project elements become subject to those requirements. In accordance with this guidance, if a project meets one of the following criteria, it is considered a project of air quality concern, and a quantitative PM_{10}/$PM_{2.5}$ analysis is required.

- **New or expanded highway projects that have a significant number of or significant increase in number of diesel vehicles**—The project is not a new highway project, nor would it expand an existing highway beyond its current capacity. The HSR system would be electrically powered. While the project would affect traffic conditions on roadways near the stations, it would not measurably affect truck volumes on the affected roadways. Most vehicle trips entering and leaving the station location would be passenger vehicles, which are typically not diesel-powered, except for delivery truck trips to support station activities. Furthermore, the project would improve regional traffic conditions by reducing traffic congestion and regional VMT within the RSA and increasing vehicle speeds.
- **Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles or those that will degrade to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project**—The project would not change the existing traffic mix at signalized intersections. Although the maintenance facilities would use diesel vehicles, daily deliveries are not expected to exceed 20 trips. In some cases, the LOS of intersections near the HSR stations or at at-grade crossings (Alternative 4 only) would be degraded to LOS F under the project alternatives. However, the traffic volume increases at the affected intersections would be primarily from passenger cars and transit buses used for transporting people to or from the stations. Passenger cars would be gasoline-powered. Buses operated by VTA are a mix of diesel- and diesel-electric-powered. Pursuant to the Innovative Clean Transit Regulation, VTA's bus fleet will be comprised of only zero-emission vehicles by 2040. While diesel-powered buses would still operate as part of VTA's future vehicle fleet until this time, they would not represent a significant (i.e., less than 5 percent) portion of local traffic.
- **New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location**—The trains used for the project would be EMUs, powered by electricity, not diesel fuel. Most vehicle trips entering and leaving the stations would be passenger vehicles, which are not typically diesel-powered.[23]

  Alternatives 1, 2, and 4 would not have new or expanded bus or rail passenger terminals or transfer points that would significantly increase the number of diesel vehicles congregating at a single location. Improved bus service at the Diridon and Downtown Gilroy stations is not part of the HSR system. The Authority assumes that bus service levels at these locations are

[23] While not a bus or rail terminal, the maintenance facilities would also have diesel vehicles, but these would be limited to 20 or fewer haul vehicles per day. Likewise, locomotives used to support maintenance activities at the MOWF would be used between 24 and 210 hours per year, depending on function.

constant into the future given that no operator has a funding plan to deliver more service. VTA will transition to a zero-emissions bus fleet, which will reduce emissions over time.

While bus service levels are assumed to be the same with and without the project, the East Gilroy Station under Alternative 3 would be an entirely new transit stop with HSR. The project would generate approximately 107 shuttle/bus trips per day at the East Gilroy Station in 2029. These trips would be made by a combination of diesel, diesel-electric, and fully electric buses. While the diesel-powered buses would generate DPM along the bus access route (Leavesley Road) and during passenger loading/unloading, the emissions would be minor, totaling less than 0.0012 pounds of PM_{10} per day (refer to Appendix C). The 107 additional bus trips would represent less than 1.5 percent of average daily traffic on Leavesley Road (Burton 2019). Accordingly, the East Gilroy Station would not significantly increase the number of diesel vehicles congregating at a single location in the near term. By 2040, all transit buses at the East Gilroy Station would be zero-emissions vehicles, pursuant to the Innovative Clean Transit Regulation.

- **Projects in or affecting locations, areas, or categories of sites that are identified in the $PM_{2.5}$- or PM_{10}-applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation**—The RSA is not in an area identified as a site of violation or possible violation in the USEPA-approved SIP.

For these reasons, the project would not be considered a project of air quality concern as defined by 40 C.F.R. Section 93.123(b)(1) and would not likely cause violations of the PM_{10}/$PM_{2.5}$ NAAQS during its operation. Therefore, quantitative $PM_{2.5}$ and PM_{10} hot-spot evaluations are not required. CAA 40 C.F.R. Section 93.116 requirements are therefore met without a quantitative hot-spot analysis. The project would not likely cause an effect on air quality for PM_{10}/$PM_{2.5}$ standards because, based on these criteria, it is not a project of air quality concern.

7.7 Mobile Source Air Toxics

In accordance with the FHWA's *Interim Guidance Update on Air Toxic Analysis in NEPA Documents,* released September 30, 2009 and updated on October 18, 2016 (FHWA 2016)*,* the qualitative assessment presented in the following subsections is derived, in part, from an FHWA study, *A Methodology for Evaluating Mobile Source Air Toxic Emissions among Transportation Project Alternatives* (FHWA 2011). It is provided as a basis for identifying and comparing the potential differences in MSAT emissions, if any, among the project alternatives.

MSAT emissions would not differ among the project alternatives because the regional change in vehicle emissions would be the same for all alternatives. Therefore, this analysis compares the project to the 2015 Existing Conditions and 2029 and 2040 No Project conditions.

7.7.1 Regional Mobile Source Air Toxics

Under the project, the HSR system would use EMUs, with the power distributed to each train car via the overhead contact system. Operation of the EMUs would not generate combustion emissions; therefore, no toxic emissions would be expected from operation of the project.

The project would decrease regional VMT and MSAT emissions relative to the 2029 and 2040 No Project conditions. The availability of the HSR system would reduce the number of individual vehicle trips on a regional basis. Because the project would not substantially change the regional traffic mix, the amount of MSATs emitted from highways and other roadways within the RSA would be proportional to the VMT. Because the regional VMT estimated for the project would be less than the anticipated VMT in 2029 and 2040 without the project, MSAT emissions from regional vehicle traffic would be less for the project.

The project would also result in reduced traffic congestion and increased vehicle speed when compared to the 2029 and 2040 No Project conditions because more people would use the HSR system instead of driving. According to USEPA's Motor Vehicle Emission Simulator (MOVES) 2014a model, emissions of all priority MSATs, except DPM, decrease as speed increases.

Therefore, the project would result in decreases in MSAT emissions as traffic congestion declines.

Even without the project, emissions in 2029 and 2040 would likely be lower than present levels because of the USEPA's national control programs, which are projected to reduce annual MSAT emissions by 90 percent between 2010 and 2050. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the USEPA-projected reductions is so great (even after accounting for VMT growth relative to existing conditions) that MSAT emissions in the RSA are likely to be lower in the future in nearly all cases.

7.7.2 Local Mobile Source Air Toxics

The potential MSAT emission sources directly related to project operation would be from vehicles used at maintenance facilities and passenger vehicles traveling to and from the train stations. Localized increases in MSAT emissions could occur near the stations because of passenger commutes. Consistent with FHWA's MSAT guidance, the magnitude and the duration of potential changes in localized MSATs cannot be reliably quantified because of incomplete or unavailable information in forecasting project-specific health effects. Even though there may be differences among the project alternatives with respect to localized MSATs, USEPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial MSAT reductions over time, thereby offsetting the increase in localized traffic associated with the project.

7.7.3 Mobile Source Air Toxics Research and Incomplete Information

Air toxics analysis is an ongoing area of research. While much work has been done to assess the overall health risk of TACs, many questions remain unanswered. In particular, considerable uncertainties are associated with the existing estimates of MSAT toxicity, as well as the acceptable risk levels. Because of these and other limitations, technical tools are not available to predict the project-specific health effects of the emission changes associated with each project alternative. Because of these limitations, Appendix G is included in this analysis in accordance with CEQ regulations (40 C.F.R. § 1502.22(b)) regarding incomplete or unavailable information.

7.8 Operations Health Risk Assessment

7.8.1 Freight Relocation

Relocated freight service because of the project has the potential to create increased inhalation health risks and exposure to $PM_{2.5}$, which may exceed local significance thresholds for cancer and noncancer hazards at receptor locations adjacent to the relocated track. Health risks to the closest receptors along the relocated track sections were estimated using the BAAQMD's rail inventory tool and the methods described in Section 6.3.7.1. Table 7-19 shows estimated cancer risk, chronic health hazard, and $PM_{2.5}$ concentrations associated with the freight relocation at the analyzed receptor locations.

Table 7-20 shows the incremental change in health risks between the project and existing and No Project conditions and compares those risks to BAAQMD's thresholds. As discussed in Section 6.3.7.1, the analysis assumes the freight relocation would be complete in 2022. Accordingly, emissions exposure under the relocated freight scenario and No Project conditions was assumed to begin in 2022. Existing conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2015.

As shown in Table 7-20, relocated freight service would generally result in decreased cancer and noncancer health risks, relative to existing conditions. These decreases are primarily because of advancements in locomotive emissions technology and the retirement of older, higher-emitting engines, which reduce future DPM emission rates. The reduction in future locomotive emission rates is enough to offset the increased risk associated with relocating freight service closer to existing receptors.

The comparison of relocated risks to No Project conditions normalizes locomotive emission rates since both conditions assume exposure begins in 2022. Accordingly, the comparison reflects the incremental project effect, exclusive of background trends. As shown in Table 7-20, relative to no project conditions, relocated freight service would result in minor increases in cancer and noncancer health risks at modeled receptor locations. These increases would not exceed BAAQMD thresholds.

Table 7-20 only evaluates locations where freight would be moved closer to receptors. In many of these locations, receptors on the other side of the track would observe a corresponding health benefit as freight would be moved further away from these receptors.

Table 7-19 Cancer and Noncancer Health Risks from Freight Operation under Existing, No Project, and the Freight Relocation (Project) Scenarios

General Location	Cancer Risk (per million)			Chronic HI			$PM_{2.5}$ Concentration (µg/m³)		
	Existing[1]	No Project[2]	Project[3]	Existing[1]	No Project[2]	Project[3]	Existing[1]	No Project[2]	Project[3]
Repositions under Alternatives 1 through 3									
Near Monterey Road and Blanchard Rd	14.6	10.6	10.6	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
Between Monterey Road and Crowner Ave	7.2	5.3	7.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Monterey Road and California Ave	9.0	6.6	10.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Monterey Road and Ronan Ave	4.0	3.0	3.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Monterey Road and Leavesley Rd	3.0	2.2	3.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Monterey Road and 1st St	5.6	4.1	7.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Monterey Road and W 10th St	4.0	2.9	5.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Repositions under Alternative 3 Only									
Near Pacheco Court and Frazier Lake Rd	0.4	0.3	5.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Repositions under Alternative 4 Only									
Near Chestnut Street and Asbury St	82.9	60.5	65.7	<0.1	<0.1	<0.1	0.1	0.1	0.1
Near Harrison Street and Fuller Ave	35.2	25.7	31.3	<0.1	<0.1	<0.1	0.1	<0.1	0.1
Near Cross Way and Northern Road	9.4	6.8	7.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
End of Promme Court	15.3	11.2	12.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Prindiville Road and Urshan Way	10.9	8.0	10.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Madrone Ave and Dougherty Ave	7.6	5.6	7.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Butterfield Blvd and E Dunne Ave	2.8	2.0	2.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
End of Sister City Way	3.7	2.7	3.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Garlic Farms Dr and Trave Park Cir	2.4	1.8	2.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Near Bolsa Rd	2.7	2.0	3.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Sources: McGuire 2017–2018; Winkel 2018; PCJPB 2015; USEPA 2009
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m³ = micrograms per cubic meter
[1] Existing conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2015.
[2] No Project conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2022.
[3] Project conditions reflects the risks that would occur if the freight tracks were relocated and exposure to emissions began in 2022.

Table 7-20 Summary of Changes in Cancer and Noncancer Health Risks from Freight Relocation Relative to Existing and No Project Conditions

General Location	Change in Exposure with the Freight Relocation relative to Exposure under Existing Conditions[1]			Change in Exposure with the Freight Relocation relative to Exposure under No Project Conditions[2]		
	Cancer	Chronic HI	$PM_{2.5}$ (µg/m³)	Cancer	Chronic HI	$PM_{2.5}$ (µg/m³)
Repositions under Alternatives 1 through 3						
Near Monterey Road and Blanchard Rd	(3.9)	<0.0	<0.0	<0.1	<0.1	<0.1
Between Monterey Road and Crowner Ave	(0.1)	<0.0	<0.0	1.8	<0.1	<0.1
Near Monterey Road and California Ave	1.2	<0.1	<0.1	3.7	<0.1	<0.1
Near Monterey Road and Ronan Ave	(0.2)	<0.0	<0.0	0.9	<0.1	<0.1
Near Monterey Road and Leavesley Rd	0.0	<0.0	<0.0	0.8	<0.1	<0.1
Near Monterey Road and 1st St	1.8	<0.1	<0.1	3.3	<0.1	<0.1
Near Monterey Road and W 10th St	1.3	<0.1	<0.1	2.3	<0.1	<0.1
Repositions under Alternative 3 Only						
Near Pacheco Court and Frazier Lake Rd	4.9	<0.1	<0.1	5.0	<0.1	<0.1
Repositions under Alternative 4 Only						
Near Chestnut Street and Asbury St	(17.2)	<0.0	<0.0	5.2	<0.1	<0.1
Near Harrison Street and Fuller Ave	(3.9)	<0.0	<0.0	5.6	<0.1	<0.1
Near Cross Way and Northern Road	(1.9)	<0.0	<0.0	0.6	<0.1	<0.1
End of Promme Court	(3.4)	<0.0	<0.0	0.8	<0.1	<0.1
Near Prindiville Road and Urshan Way	(0.6)	<0.0	<0.0	2.4	<0.1	<0.1
Near Madrone Ave and Dougherty Ave	(0.2)	<0.0	<0.0	1.9	<0.1	<0.1
Near Butterfield Blvd and E Dunne Ave	(0.7)	<0.0	<0.0	0.1	<0.1	<0.1
End of Sister City Way	(0.6)	<0.0	<0.0	0.4	<0.1	<0.1
Near Garlic Farms Dr and Trave Park Cir	(0.3)	<0.0	<0.0	0.4	<0.1	<0.1
Near Bolsa Rd	0.4	<0.1	<0.1	1.1	<0.1	<0.1
Threshold	**10.0**	**1.0**	**0.3**	**10.0**	**1.0**	**0.3**

Sources: McGuire 2017–2018; Winkel 2018; PCJPB 2015; USEPA 2009
(Parentheses) indicate negative values
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m³ = micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
[1] Existing conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2015.
[2] No Project conditions reflects the risks that would occur if the freight tracks were not relocated and exposure to emissions began in 2022.

7.8.2 Stations and Maintenance Facilities

The Downtown Gilroy and San Jose Diridon Stations would have emergency generators for use in the event of a power outage. The generators would comply with the permitting requirements specified in BAAQMD Regulation 2, Rule 5 and SJVAPCD Rule 2201, which prohibit their operation if cancer or acute hazards exceed air district thresholds. Regulation 2, Rule 5 does not establish any permit restrictions on $PM_{2.5}$ concentrations in the BAAQMD. Accordingly, analysts only estimated $PM_{2.5}$ exhaust concentrations from emergency generator testing because cancer and hazards would be below air district thresholds.

The East Gilroy Station would also operate an emergency generator and would serve diesel-powered buses under 2029 conditions (by 2040, all buses will be net zero emissions per state regulation). Health risks from transit buses are not subject to permit restrictions, and as such, the analysis of health risks at the East Gilroy Station evaluates cancer risk, hazards, and $PM_{2.5}$ concentrations.

The MOWF would operate an emergency generator and use diesel-powered off-road equipment, vehicles, and locomotives to support maintenance and repair activities. The analysis of cancer and noncancer health risks, as well as $PM_{2.5}$ concentrations, at the MOWF includes emissions from all these sources.

Table 7-21 shows the results of health risks analysis at the project stations and the East Gilroy MOWF.[24,25] Health risks and maximum $PM_{2.5}$ concentrations would be less than BAAQMD's health risk thresholds of significance under all alternatives.

---

[24] The Los Banos MOWS is not analyzed as this facility would be located within the SJVAPCD and the SJVAPCD does not have a $PM_{2.5}$ threshold. SJVAPCD does not issue permits for projects that create a significant cancer or noncancer health risk (SJVAPCD Rule 2201). Accordingly, cancer and noncancer health risks from generator operation at the Los Banos MOWS would be less than SJVAPCD's health risk thresholds.

[25] There are no receptors within 1,000 feet of the South Gilroy MOWF. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.

Table 7-21 Maximum Health Risks and $PM_{2.5}$ Concentrations from Project Station and MOWF Operation[1]

Location/Condition	Cancer	Chronic HI	Maximum $PM_{2.5}$ Concentration (μg/m³)
2015 Existing/2029 and 2040 No Project[2]			
San Jose Diridon Station	<10	<1.0	<0.1
Downtown Gilroy Station	<10	<1.0	<0.1
2029/2040 Plus Project[3]			
San Jose Diridon Station (Alternatives 1, 2, 3, 4)[4]	<10	<1.0	<0.1
Downtown Gilroy Station (Alternatives 1, 2, 4)[5]	<10	<1.0	<0.1
East Gilroy Station (Alternative 3)	<1	<0.1	<0.1
East Gilroy MOWF (Alternative 3)[7]	3	<0.1	<0.1
Project vs. Existing and No Project Conditions[6]			
San Jose Diridon Station (Alternatives 1, 2, 3, 4)[4]	<10	<1.0	<0.1
Downtown Gilroy Station (Alternatives 1, 2, 4)[5]	<10	<1.0	<0.1
East Gilroy Station (Alternative 3)	<1	<0.1	<0.1
East Gilroy MOWF (Alternative 3)[7]	3	<0.1	<0.1
Threshold	**10**	**1.0**	**0.3**

Source: AERMOD version 18081; HARP 2 version 18159; OEHHA 2015; McGuire 2017–2018, Burton 2019 pers. comm.
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
μg/m³ = micrograms per cubic meter
MOWF = maintenance of way facility
MOWS = maintenance of way siding
SJVAPCD = San Joaquin Valley Air Pollution Control District
[1] The Los Banos MOWS is not analyzed because this facility would be located within the SJVAPCD and the SJVAPCD does not have a $PM_{2.5}$ threshold. SJVAPCD does not issue permits for projects that create a significant cancer or non-cancer health risk.
[2] The San Jose Diridon and Downtown Gilroy Stations were assumed to operate one emergency generator under existing conditions. The East Gilroy Station does not exist under existing conditions and, as such, existing emissions are assumed to be zero.
[3] The expanded San Jose Diridon Station were assumed to operate three emergency generators with implementation of the project. The Downtown Gilroy Station was assumed to operate two emergency generators under project conditions. The East Gilroy Station and MOWF were assumed to operate one generator under project conditions.
[4] There would be no difference in operational emissions or health risk between the aerial and at-grade options.
[5] There would be no difference in operational emissions or health risk between the aerial and embankment options.
[6] Represents the net concentration effect of the project (i.e., the difference in between the existing/no project and the project condition)
[7] There are no receptors within 1,000 feet of the South Gilroy MOWF. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.

7.9 Construction Mass Emissions Analysis

7.9.1 Total Emissions

Construction activities associated with the project would result in criteria pollutant emissions. This section quantifies and analyzes mass emissions generated by construction.

Construction activities expected to occur during the same calendar year are summarized based on the construction schedule presented in Appendix C. Analysts compared project emissions to the General Conformity *de minimis* emission thresholds on a calendar-year basis; consequently, emissions can exceed thresholds for any calendar year in which emissions occur. No future natural growth or other non-HSR-related improvements are included in project construction effects. Construction emissions for the project alternatives over the entire construction period are shown in Table 7-22. The following sections present detailed tables of emissions by year for each project alternative.

Table 7-22 Total Construction-Related Project Criteria Pollutant Emissions[1]

Alternative/Location	Total Tons									
	VOC	NO_X	CO	SO_2	PM_{10}			$PM_{2.5}$		
					Exhaust	Dust	Total[2]	Exhaust	Dust	Total[2]
Alternative 1										
BAAQMD	28	403	964	3	3	486	489	3	103	106
MBARD	2	29	88	<1	<1	39	39	<1	8	9
SJVAPCD	31	313	1,075	3	3	254	257	3	55	58
Total emissions	*62*	*745*	*2,127*	*6*	*6*	*779*	*785*	*6*	*166*	*173*
Alternative 2										
BAAQMD	37	600	1,230	4	4	702	706	4	154	157
MBARD	4	59	131	<1	<1	71	71	<1	16	16
SJVAPCD	31	313	1,075	3	3	254	257	3	55	58
Total emissions	*71*	*972*	*2,436*	*7*	*7*	*1,027*	*1,034*	*7*	*224*	*232*
Alternative 3										
BAAQMD	33	432	1,142	3	3	504	508	3	108	111
MBARD	3	30	101	<1	<1	36	37	<1	8	8
SJVAPCD	31	313	1,075	3	3	254	257	3	55	58
Total emissions	*67*	*775*	*2,318*	*6*	*7*	*795*	*801*	*7*	*171*	*177*
Alternative 4										
BAAQMD	34	644	1,118	4	4	793	797	4	176	180
MBARD	4	68	118	<1	<1	91	91	<1	21	21
SJVAPCD	31	313	1,075	3	3	254	257	3	55	58
Total emissions	*69*	*1,025*	*2,311*	*7*	*7*	*1,138*	*1,145*	*7*	*252*	*259*

Sources: Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

BAAQMD = Bay Area Air Quality Management District
CO = carbon monoxide
MBARD = Monterey Bay Air Resources District
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound

[1] Table presents total emissions in tons over the course of complete construction (2022–2028). Emissions results include implementation of AQ-IAMF#1 through AQ-IAMF#6, as described in Section 2.3.

[2] Total PM_{10} and $PM_{2.5}$ emissions consist of exhaust and fugitive dust emissions.

7.9.2 Alternative 1 Yearly and Daily Emissions

Table 7-23, Table 7-24, and Table 7-25 show emissions from Alternative 1 in the BAAQMD, MBARD, and SJVAPCD regions, respectively, in tons per year and pounds per day. Emissions are shown for each year that construction would occur and include the major construction activities discussed in Section 6.4, Construction Emission Calculations. The tables also show applicable General Conformity and CEQA thresholds within the BAAQMD, MBARD, and SJVAPCD, respectively, and indicate whether project construction emissions would exceed these General Conformity and CEQA thresholds.

Table 7-23 Construction-Related Criteria Pollutant Emissions under Alternative 1 in the Bay Area Air Quality Management District[1]

	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
Activities	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
2022																				
Emissions	4	50	144	<1	<1	61	61	<1	13	13	42	624	1,396	5	4	675	679	4	145	148
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2023																				
Emissions	6	79	200	1	1	101	102	1	22	22	63	967	2,214	7	6	1,310	1,316	6	283	289
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2024																				
Emissions	7	106	245	1	1	144	145	1	31	32	61	961	2,151	7	6	1,291	1,297	6	279	285
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2025																				
Emissions	6	85	205	1	1	107	108	1	22	23	64	1,158	2,022	7	10	1,195	1,200	10	249	255
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2026																				
Emissions	3	36	89	<1	<1	39	39	<1	8	8	32	369	1,145	3	3	428	431	3	91	93
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2027																				
Emissions	2	35	52	<1	<1	27	27	<1	5	6	41	330	545	8	12	268	272	12	56	60
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2028																				
Emissions	1	11	28	<1	<1	7	8	<1	2	2	33	330	706	7	10	250	254	10	53	57
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

BAAQMD = Bay Area Air Quality Management District
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SFBAAB = San Francisco Bay Area Air Basin
SO_2 = sulfur dioxide
USEPA = U.S. Environmental Protection Agency
VOC = volatile organic compound
O_3 = ozone
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SFBAAB. The project vicinity is considered a marginal nonattainment area for the O_3 NAAQS and a moderate nonattainment area for the $PM_{2.5}$ NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.

Table 7-24 Construction-Related Criteria Pollutant Emissions under Alternative 1 in Monterey Bay Air Resources District[1]

Activities	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-
2022																				
Emissions	1	7	17	<1	<1	9	9	<1	2	2	5	93	176	1	1	101	102	1	21	22
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2023																				
Emissions	1	6	18	<1	<1	8	9	<1	2	2	4	66	157	<1	<1	86	86	<1	18	18
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2024																				
Emissions	<1	5	18	<1	<1	8	8	<1	2	2	4	43	148	<1	<1	67	67	<1	15	15
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2025																				
Emissions	<1	4	15	<1	<1	6	6	<1	1	1	4	54	136	<1	<1	62	62	<1	14	14
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2026																				
Emissions	<1	2	10	<1	<1	4	4	<1	1	1	3	28	105	<1	<1	45	45	<1	10	10
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2027																				
Emissions	<1	3	6	<1	<1	3	3	<1	1	1	2	69	67	<1	<1	36	36	<1	8	9
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2028																				
Emissions	<1	1	3	<1	<1	1	1	<1	<1	<1	3	48	94	<1	<1	36	36	<1	8	8
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; MBUAPCD 2008; Scholz 2018

CEQA = California Environmental Quality Act
CO = carbon monoxide
MBARD = Monterey Bay Air Resources District
NCCAB = North Central Coast Air Basin
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
NO_X = nitrogen oxide
ROG = reactive organic gases
SO_2 = sulfur dioxide
VOC = volatile organic compound
O_3 = ozone
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The NCCAB is considered attainment for all criteria pollutants. As such, a general conformity analysis is not required, and there are no applicable *de minimis* thresholds.
[5] According to the MBARD CEQA guidelines, construction projects that temporarily emit precursors of ozone (i.e., ROG or NO_X) are accommodated in the emission inventories of state- and federally required air plans and would not have a significant impact on the attainment and maintenance of state or federal O_3 ambient air quality standards (MBUAPCD 2008).

Table 7-25 Construction-Related Criteria Pollutant Emissions under Alternative 1 in San Joaquin Valley Air Pollution Control District[1]

	Tons per year										Average Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
Activities	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	10	10	-	100	-	-	100	-	-	100	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100[5]	100[5]	100[5]	100[5]	-	-	100[5]	-	-	100[5]
2022																				
Emissions	6	42	218	1	1	39	40	1	9	10	51	348	1,789	4	4	323	327	4	76	81
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2023																				
Emissions	6	55	226	1	1	49	50	1	11	11	51	442	1,807	4	5	392	397	5	86	90
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2024																				
Emissions	6	56	220	1	1	48	48	1	10	11	50	450	1,762	4	4	381	386	4	82	87
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2025																				
Emissions	6	54	209	1	1	42	43	1	9	10	47	428	1,673	4	4	337	341	4	72	76
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2026																				
Emissions	4	45	131	<1	<1	35	36	<1	7	8	30	361	1,048	3	3	281	284	3	58	62
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2027																				
Emissions	2	50	48	<1	<1	35	35	<1	7	7	14	400	388	1	3	280	283	3	55	58
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2028																				
Emissions	1	10	22	<1	<1	6	6	<1	1	1	8	114	244	<1	2	61	63	2	14	16
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	No	-	-	No	No	Yes	Yes	-	-	-	No	-	-	No

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; SJVAPCD 2015a; Scholz 2018

AAQA = ambient air quality analysis
CAAQS = California Ambient Air Quality Standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = National Ambient Air Quality Standards
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound
- = no threshold
O_3 = ozone

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the average emissions estimate during a single day of construction in each year. Average emissions are presented in SJVAPCD (rather than maximum emissions), consistent with (SJVAPCD 2015a) guidance for correct application of its 100-pound-per-day AAQA screening criteria.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SJVAB. The project vicinity is considered an extreme nonattainment area for the O_3 NAAQS, a serious/moderate nonattainment area for the $PM_{2.5}$ NAAQS, and a serious maintenance area for the PM_{10} NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.
[5] The 100-pound-per-day threshold is a screening-level threshold to help determine whether increased emissions from a project will cause or contribute to a violation of CAAQS or NAAQS. Projects with emissions below the threshold will not be in violation of CAAQS or NAAQS. Projects with emissions above the threshold would require an AAQA to confirm this conclusion (SJVAPCD 2015a).

The emissions results demonstrated that construction of Alternative 1 would result in ROG and NO_X emissions that would exceed the BAAQMD's CEQA thresholds, as well as the MBARD's PM_{10} CEQA threshold and SJVAPCD's annual CEQA thresholds for NO_X, CO, and PM_{10}. Construction of Alternative 1 would also exceed the general conformity *de minimis* NO_X thresholds in the SFBAAB and SJVAB.

Construction emissions would also exceed SJVAPCD's daily AAQA screening trigger for NO_X, CO, and PM_{10}. Localized effects from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Section 7.11 presents the modeled ambient air concentrations relative to the NAAQS and CAAQS.

Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize air quality effects through application of all best available on-site controls to reduce construction emissions. However, even with these measures, exceedances of air district and general conformity *de minimis* thresholds would still occur. ROG, NO_X, and PM_{10} emissions would be offset in the BAAQMD and MBARD, as applicable, through the purchase of offsets (AQ-MM#1: Offset Project Construction Emissions in the San Francisco Bay Area Air Basin and AQ-MM#2: Offset Project Construction Emissions in the North Central Coast Air Basin) to below BAAQMD and MBARD thresholds or net zero (as required by the General Conformity regulation). ROG, NO_X, and PM emissions would be fully offset (i.e., to net zero) within the SJVAPCD, pursuant to the Authority's MOU with the air district for the HSR subsections within the SJVAB (AQ-MM#3: Offset Project Construction Emissions in the San Joaquin Valley Air Basin). Pursuant to SJVAPCD's GAMAQI, emissions offsets procured through AQ-MM#3 cannot be used to mitigate CO impacts. Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold even after implementation of all feasible mitigation.

7.9.3 Alternative 2 Yearly and Daily Emissions

Table 7-26, Table 7-27, and Table 7-28 show yearly emissions from Alternative 2 in the BAAQMD, MBARD, and SJVAPCD, respectively, in tons per year and pounds per day. Emissions are shown for each year that construction would occur and include the major construction activities discussed in Section 6.4. The tables also show applicable General Conformity and CEQA thresholds within the BAAQMD, MBARD, and SJVAPCD, respectively, and indicate whether project construction emissions would exceed these General Conformity and CEQA thresholds.

Table 7-26 Construction-Related Criteria Pollutant Emissions under Alternative 2 in the Bay Area Air Quality Management District[1]

Activities	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
2022																				
Emissions	6	76	192	1	1	88	88	1	20	20	54	773	1,770	5	5	902	907	5	200	205
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2023																				
Emissions	7	118	255	1	1	145	145	1	32	33	77	1,334	2,628	8	7	1,705	1,713	7	380	387
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2024																				
Emissions	9	155	304	1	1	201	202	1	44	45	75	1,325	2,555	8	7	1,683	1,690	7	375	381
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2025																				
Emissions	7	112	240	1	1	136	137	1	30	30	76	1,334	2,363	8	10	1,579	1,585	9	346	352
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2026																				
Emissions	4	56	125	<1	<1	61	61	<1	13	14	42	564	1,494	4	4	640	644	4	142	146
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2027																				
Emissions	3	69	76	<1	<1	61	62	<1	12	12	50	750	805	9	13	614	610	13	121	130
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2028																				
Emissions	1	14	38	<1	<1	10	11	<1	2	2	35	711	1,050	8	10	628	634	10	127	132
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-

Source: Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

NO_X = nitrogen oxide
O_3 = ozone
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
NAAQS = national ambient air quality standards
PM_{10} = particulate matter 10 microns or less in diameter
SFBAAB = San Francisco Bay Area Air Basin
SO_2 = sulfur dioxide
VOC = volatile organic compound
- = no threshold
BAAQMD = Bay Area Air Quality Management District
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SFBAAB. The project vicinity is considered a marginal nonattainment area for the O_3 NAAQS and a moderate nonattainment area for the $PM_{2.5}$ NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.

Table 7-27 Construction-Related Criteria Pollutant Emissions under Alternative 2 in Monterey Bay Air Resources District[1]

Activities	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-
2022																				
Emissions	1	12	26	<1	<1	14	14	<1	3	3	8	121	244	1	1	142	143	1	31	32
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2023																				
Emissions	1	11	26	<1	<1	14	14	<1	3	3	7	107	225	1	1	130	131	1	29	29
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2024																				
Emissions	1	10	24	<1	<1	13	13	<1	3	3	6	81	201	1	1	107	108	1	25	25
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2025																				
Emissions	1	9	22	<1	<1	12	12	<1	3	3	5	96	185	1	1	103	103	1	24	24
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2026																				
Emissions	<1	6	16	<1	<1	8	8	<1	2	2	5	64	170	<1	<1	83	84	<1	19	20
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2027																				
Emissions	<1	11	11	<1	<1	9	10	<1	2	2	4	179	111	1	1	113	114	1	24	25
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2028																				
Emissions	<1	1	5	<1	<1	1	1	<1	<1	<1	5	132	157	1	1	109	110	1	22	23
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; MBUAPCD 2008; Scholz 2018

CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
MBARD = Monterey Bay Air Resources District
NCCAB = North Central Coast Air Basin
NO_X = nitrogen oxide
O_3 = ozone
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
ROG = reactive organic gases
SO_2 = sulfur dioxide
VOC = volatile organic compound
- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The NCCAB is considered attainment for all criteria pollutants. As such, a general conformity analysis is not required, and there are no applicable *de minimis* thresholds.
[5] According to the MBARD CEQA guidelines, construction projects that temporarily emit precursors of O_3 (i.e., ROG or NO_X) are accommodated in the emission inventories of state- and federally required air plans and would not have a significant impact on the attainment and maintenance of state or federal O_3 ambient air quality standards (MBUAPCD 2008).

Table 7-28 Construction-Related Criteria Pollutant Emissions under Alternative 2 in San Joaquin Valley Air Pollution Control District[1]

Activities	Tons per year										Average Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	10	10	-	100	-	-	100	-	-	100	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100[5]	100[5]	100[5]	100[5]	-	-	100[5]	-	-	100[5]
2022																				
Emissions	6	42	218	1	1	39	40	1	9	10	51	348	1,789	4	4	323	327	4	76	81
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2023																				
Emissions	6	55	226	1	1	49	50	1	11	11	51	442	1,807	4	5	392	397	5	86	90
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2024																				
Emissions	6	56	220	1	1	48	48	1	10	11	50	450	1,762	4	4	381	386	4	82	87
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2025																				
Emissions	6	54	209	1	1	42	43	1	9	10	47	428	1,673	4	4	337	341	4	72	76
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2026																				
Emissions	4	45	131	<1	<1	35	36	<1	7	8	30	361	1,048	3	3	281	284	3	58	62
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2027																				
Emissions	2	50	48	<1	<1	35	35	<1	7	7	14	400	388	1	3	280	283	3	55	58
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2028																				
Emissions	1	10	22	<1	<1	6	6	<1	1	1	8	114	244	<1	2	61	63	2	14	16
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	No	-	-	No	No	Yes	Yes	-	-	-	No	-	-	No

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; SJVAPCD 2015a; Scholz 2018

AAQA = ambient air quality analysis
CAAQS = California Ambient Air Quality Standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = National Ambient Air Quality Standards
NO_X = nitrogen oxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the average emissions estimate during a single day of construction in each year. Average emissions are presented in SJVAPCD (rather than maximum emissions), consistent with (SJVAPCD 2015a) guidance for correct application of its 100-pound-per-day AAQA screening criteria.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SJVAB. The project vicinity is considered an extreme nonattainment area for the O_3 NAAQS, a serious/moderate nonattainment area for the $PM_{2.5}$ NAAQS, and a serious maintenance area for the PM_{10} NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.
[5] The 100-pound-per-day threshold is a screening-level threshold to help determine whether increased emissions from a project will cause or contribute to a violation of CAAQS or NAAQS. Projects with emissions below the threshold will not be in violation of CAAQS or NAAQS. Projects with emissions above the threshold would require an AAQA to confirm this conclusion (SJVAPCD 2015a).

The emissions results demonstrated that construction of Alternative 2 would result in ROG and NO_X emissions that would exceed the BAAQMD's CEQA thresholds, as well as the MBARD's PM_{10} CEQA threshold and SJVAPCD's annual CEQA thresholds for NO_X, CO, and PM_{10}. Construction of Alternative 2 would also exceed the general conformity *de minimis* NO_X thresholds in the SFBAAB and SJVAB.

Construction emissions would also exceed SJVAPCD's daily AAQA screening trigger for NO_X, CO, and PM_{10}. Localized effects from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Section 7.11 presents the modeled ambient air concentrations relative to the NAAQS and CAAQS.

Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize air quality effects through application of all best available on-site controls to reduce construction emissions. However, even with these measures, exceedances of air district and general conformity *de minimis* thresholds would still occur. ROG, NO_X, and PM_{10} emissions would be offset in the BAAQMD and MBARD, as applicable, through the purchase of offsets (AQ-MM#1, AQ-MM#2) to below BAAQMD and MBARD thresholds or net zero (as required by the General Conformity regulation). ROG, NO_X, and PM emissions would be fully offset (i.e., to net zero) within the SJVAPCD, pursuant to the Authority's MOU with the air district for the HSR subsections within the SJVAB (AQ-MM#3). Pursuant to SJVAPCD's GAMAQI, emissions offsets procured through AQ-MM#3 cannot be used to mitigate CO effects. Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold even after implementation of all feasible mitigation.

7.9.4 Alternative 3 Yearly and Daily Emissions

Table 7-29, Table 7-30, and Table 7-31 show yearly emissions from Alternative 3 in the BAAQMD, MBARD, and SJVAPCD, respectively, in tons per year and pounds per day. Emissions are shown for each year that construction would occur and include the major construction activities discussed in Section 6.4. The tables also show applicable General Conformity and CEQA thresholds within the BAAQMD, MBARD, and SJVAPCD, respectively, and indicate whether project construction emissions would exceed these General Conformity and CEQA thresholds.

Table 7-29 Construction-Related Criteria Pollutant Emissions under Alternative 3 in the Bay Area Air Quality Management District[1]

	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
Activities	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
2022																				
Emissions	5	51	173	<1	<1	58	58	<1	12	13	46	514	1,602	4	4	608	612	4	130	134
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2023																				
Emissions	7	89	244	1	1	109	110	1	24	24	73	1,021	2,584	8	7	1,371	1,377	7	298	305
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2024																				
Emissions	8	114	292	1	1	152	153	1	33	34	71	1,012	2,508	8	7	1,344	1,351	6	292	298
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2025																				
Emissions	7	85	233	1	1	104	105	1	22	23	73	1,064	2,373	7	9	1,239	1,245	9	261	267
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2026																				
Emissions	3	41	116	<1	<1	41	41	<1	9	9	39	415	1,405	4	4	448	452	4	95	99
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2027																				
Emissions	2	41	54	<1	<1	32	33	<1	6	7	42	444	572	8	12	306	309	12	62	72
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2028																				
Emissions	1	12	30	<1	<1	8	8	<1	2	2	33	426	775	8	10	340	344	10	70	74
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-

Source: Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

BAAQMD = Bay Area Air Quality Management District
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
SFBAAB = San Francisco Bay Area Air Basin
SO_2 = sulfur dioxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
USEPA = U.S. Environmental Protection Agency
VOC = volatile organic compound
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.

[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities

[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.

[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SFBAAB. The project vicinity is considered a marginal nonattainment area for the O_3 NAAQS and a moderate nonattainment area for the $PM_{2.5}$ NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.

Table 7-30 Construction-Related Criteria Pollutant Emissions under Alternative 3 in Monterey Bay Air Resources District[1]

	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
Activities	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-
2022																				
Emissions	1	6	19	<1	<1	7	7	<1	2	2	5	63	181	1	<1	76	77	<1	16	17
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2023																				
Emissions	1	6	22	<1	<1	8	8	<1	2	2	5	63	177	1	<1	75	76	<1	16	16
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2024																				
Emissions	1	5	21	<1	<1	7	8	<1	2	2	5	46	169	<1	<1	61	61	<1	13	14
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2025																				
Emissions	<1	5	18	<1	<1	6	6	<1	1	1	4	59	161	1	<1	58	59	<1	13	13
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2026																				
Emissions	<1	3	12	<1	<1	4	4	<1	1	1	4	32	132	<1	<1	42	42	<1	9	10
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2027																				
Emissions	<1	4	6	<1	<1	3	3	<1	1	1	2	101	64	<1	1	52	52	<1	12	12
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-
2028																				
Emissions	<1	1	3	<1	<1	1	1	<1	<1	<1	3	66	92	<1	<1	47	48	<1	10	11
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	-	-	-

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; MBUAPCD 2008; Scholz 2018

CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NCCAB = North Central Coast Air Basin
MBARD = Monterey Bay Air Resources District
NO_X = nitrogen oxide
O_3 = ozone
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
ROG = SO_2 = sulfur dioxide
VOC = volatile organic compound
- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The NCCAB is considered attainment for all criteria pollutants. As such, a general conformity analysis is not required. and there are no applicable *de minimis* thresholds.
[5] According to the MBARD CEQA guidelines, construction projects that temporarily emit precursors of O_3 (i.e., ROG or NO_X) are accommodated in the emission inventories of state- and federally required air plans and would not have a significant impact on the attainment and maintenance of state or federal ozone ambient air quality standards (MBUAPCD 2008).

Table 7-31 Construction-Related Criteria Pollutant Emissions under Alternative 3 in San Joaquin Valley Air Pollution Control District[1]

Activities	Tons per year										Average Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	10	10	-	100	-	-	100	-	-	100	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100[5]	100[5]	100[5]	100[5]	-	-	100[5]	-	-	100[5]
2022																				
Emissions	6	42	218	1	1	39	40	1	9	10	51	348	1,789	4	4	323	327	4	76	81
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2023																				
Emissions	6	55	226	1	1	49	50	1	11	11	51	442	1,807	4	5	392	397	5	86	90
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2024																				
Emissions	6	56	220	1	1	48	48	1	10	11	50	450	1,762	4	4	381	386	4	82	87
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2025																				
Emissions	6	54	209	1	1	42	43	1	9	10	47	428	1,673	4	4	337	341	4	72	76
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2026																				
Emissions	4	45	131	<1	<1	35	36	<1	7	8	30	361	1,048	3	3	281	284	3	58	62
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2027																				
Emissions	2	50	48	<1	<1	35	35	<1	7	7	14	400	388	1	3	280	283	3	55	58
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2028																				
Emissions	1	10	22	<1	<1	6	6	<1	1	1	8	114	244	<1	2	61	63	2	14	16
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	No	-	-	No	No	Yes	Yes	-	-	-	No	-	-	No

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; SJVAPCD 2015a; Scholz 2018

AAQA = ambient air quality analysis
CAAQS = California ambient air quality standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound
- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the average emissions estimate during a single day of construction in each year. Average emissions are presented in SJVAPCD (rather than maximum emissions), consistent with (SJVAPCD 2015a) guidance for correct application of its 100-pound-per-AAQA screening criteria.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SJVAB. The project vicinity is considered an extreme nonattainment area for the O_3 NAAQS, a serious/moderate nonattainment area for the $PM_{2.5}$ NAAQS, and a serious maintenance area for the PM_{10} NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.
[5] The 100-pound-per-day threshold is a screening-level threshold to help determine whether increased emissions from a project will cause or contribute to a violation of CAAQS or NAAQS. Projects with emissions below the threshold will not be in violation of CAAQS or NAAQS. Projects with emissions above the threshold would require an AAQA to confirm this conclusion (SJVAPCD 2015a).

The emissions results demonstrated that construction of Alternative 3 would result in ROG and NO_X emissions that would exceed the BAAQMD's CEQA thresholds, and NO_X, CO, and PM_{10} emissions that would exceed SJVAPCD's annual CEQA thresholds. Construction of Alternative 3 would also exceed the general conformity *de minimis* NO_X thresholds in the SFBAAB and SJVAB.

Construction emissions would also exceed SJVAPCD's daily AAQA screening trigger for NO_X, CO, and PM_{10}. Localized effects from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Section 7.11 presents the modeled ambient air concentrations relative to the NAAQS and CAAQS.

Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize air quality effects through application of all best available on-site controls to reduce construction emissions. However, even with these measures, exceedances of air district and general conformity *de minimis* thresholds would still occur. ROG and NO_X emissions would be offset in the BAAQMD through the purchase of offsets (AQ-MM#1) to below BAAQMD thresholds or net zero (as required by the General Conformity regulation. ROG, NO_X, and PM emissions would be fully offset (i.e., to net zero) within the SJVAPCD, pursuant to the Authority's MOU with the air district for the HSR subsections within the SJVAB (AQ-MM#3). Pursuant to SJVAPCD's GAMAQI, emissions offsets procured through AQ-MM#3 cannot be used to mitigate CO effects. Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold even after implementation of all feasible mitigation.

7.9.5 Alternative 4 Yearly and Daily Emissions

Table 7-32, Table 7-33, and Table 7-34 show yearly emissions from Alternative 4 in the BAAQMD, MBARD, and SJVAPCD, respectively, in tons per year and pounds per day. Emissions are shown for each year that construction would occur and include the major construction activities discussed in Section 6.4. The tables also show applicable General Conformity and CEQA thresholds within the BAAQMD, MBARD, and SJVAPCD, respectively, and indicate whether project construction emissions would exceed these General Conformity and CEQA thresholds.

Table 7-32 Construction-Related Criteria Pollutant Emissions under Alternative 4 in the Bay Area Air Quality Management District[1]

	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
Activities	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	100	100	-	100	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-
BAAQMD CEQA threshold	-	-	-	-	-	-	-	-	-	-	54	54	-	-	82	-	-	54	-	-
2022																				
Emissions	5	77	176	1	<1	102	102	<1	23	24	52	787	1,691	5	4	1,059	1,063	4	239	244
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2023																				
Emissions	7	113	222	1	1	151	151	1	34	35	64	1,191	2,135	7	6	1,582	1,588	6	361	366
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2024																				
Emissions	8	156	272	1	1	205	206	1	46	47	74	1,363	2,355	8	7	1,785	1,792	7	399	406
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2025																				
Emissions	7	139	240	1	1	171	172	1	38	39	74	1,731	2,216	9	13	1,737	1,743	12	386	393
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	Yes	Yes	-	-	No	-	-	No	-	-
2026																				
Emissions	3	62	109	<1	<1	72	73	<1	16	16	42	686	1,440	4	4	845	849	4	190	194
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2027																				
Emissions	3	84	70	<1	<1	79	80	<1	15	16	45	899	994	9	12	824	829	12	161	166
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-
2028																				
Emissions	1	13	29	<1	<1	12	12	<1	3	3	31	754	741	7	10	744	746	10	145	148
Exceeds General Conformity threshold?	No	No	-	No	-	-	-	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	No	Yes	-	-	No	-	-	No	-	-

Source: Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Schotz 2018

BAAQMD = Bay Area Air Quality Management District
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
SFBAAB = San Francisco Bay Area Air Basin
SO_2 = sulfur dioxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
USEPA = U.S. Environmental Protection Agency
VOC = volatile organic compound
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SFBAAB. The project vicinity is considered a marginal nonattainment area for the O_3 NAAQS and a moderate nonattainment area for the $PM_{2.5}$ NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.

Table 7-33 Construction-Related Criteria Pollutant Emissions under Alternative 4 in Monterey Bay Air Resources District[1]

Activities	Tons per year										Maximum Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBARD CEQA threshold	-	-	-	-	-	-	-	-	-	-	-[5]	-[5]	-	-	-	-	82	-	-	-
2022																				
Emissions	1	12	23	<1	<1	16	16	<1	4	4	7	123	229	1	1	170	170	1	38	39
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2023																				
Emissions	1	12	24	<1	<1	18	18	<1	4	4	6	118	212	1	1	162	163	1	37	37
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2024																				
Emissions	1	11	23	<1	<1	17	17	<1	4	4	6	96	190	1	1	138	139	1	33	33
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2025																				
Emissions	1	11	21	<1	<1	16	16	<1	4	4	5	111	174	1	1	135	135	1	32	32
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2026																				
Emissions	<1	7	13	<1	<1	10	10	<1	2	2	4	84	152	<1	<1	119	120	<1	28	28
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2027																				
Emissions	<1	14	9	<1	<1	13	13	<1	3	3	5	200	149	1	1	146	146	1	30	31
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-
2028																				
Emissions	<1	1	4	<1	<1	2	2	<1	<1	<1	3	171	102	1	1	138	138	1	28	28
Exceeds General Conformity threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes	-	-	-

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; MBUAPCD 2008; Scholz 2018

CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NCCAB = North Central Coast Air Basin
MBARD = Monterey Bay Air Resources District
NO_X = nitrogen oxide
O_3 = ozone
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
ROG = SO_2 = sulfur dioxide
VOC = volatile organic compound
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.
[2] Presents the highest emissions estimate during a single day of construction in each year, based on concurrent construction activities.
[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.
[4] The NCCAB is considered attainment for all criteria pollutants. As such, a general conformity analysis is not required. and there are no applicable *de minimis* thresholds.
[5] According to the MBARD CEQA guidelines, construction projects that temporarily emit precursors of O_3 (i.e., ROG or NO_X) are accommodated in the emission inventories of state- and federally required air plans and would not have a significant impact on the attainment and maintenance of state or federal ozone ambient air quality standards (MBUAPCD 2008).

Table 7-34 Construction-Related Criteria Pollutant Emissions under Alternative 4 in San Joaquin Valley Air Pollution Control District[1]

Activities	Tons per year										Average Pounds per day[2]									
					PM_{10}			$PM_{2.5}$							PM_{10}			$PM_{2.5}$		
	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]	VOC	NO_X	CO	SO_2	Exhaust	Dust	Total[3]	Exhaust	Dust	Total[3]
Applicable *de minimis* level[4]	10	10	-	100	-	-	100	-	-	100	-	-	-	-	-	-	-	-	-	-
SJVAPCD CEQA threshold	10	10	100	27	-	-	15	-	-	15	100[5]	100[5]	100[5]	100[5]	-	-	100[5]	-	-	100[5]
2022																				
Emissions	6	42	218	1	1	39	40	1	9	10	51	348	1,789	4	4	323	327	4	76	81
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2023																				
Emissions	6	55	226	1	1	49	50	1	11	11	51	442	1,807	4	5	392	397	5	86	90
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2024																				
Emissions	6	56	220	1	1	48	48	1	10	11	50	450	1,762	4	4	381	386	4	82	87
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2025																				
Emissions	6	54	209	1	1	42	43	1	9	10	47	428	1,673	4	4	337	341	4	72	76
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2026																				
Emissions	4	45	131	<1	<1	35	36	<1	7	8	30	361	1,048	3	3	281	284	3	58	62
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	Yes	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2027																				
Emissions	2	50	48	<1	<1	35	35	<1	7	7	14	400	388	1	3	280	283	3	55	58
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	Yes	-	-	No	No	Yes	Yes	-	-	-	Yes	-	-	No
2028																				
Emissions	1	10	22	<1	<1	6	6	<1	1	1	8	114	244	<1	2	61	63	2	14	16
Exceeds General Conformity threshold?	No	Yes	-	No	-	-	No	-	-	No	-	-	-	-	-	-	-	-	-	-
Exceeds CEQA threshold?	No	Yes	No	No	-	-	No	-	-	No	No	Yes	Yes	-	-	-	No	-	-	No

Sources: Trinity Consultants 2016; USEPA 1998, 2006b, 2009, 2011; SJVAPCD 2015a; Scholz 2018

AAQA = ambient air quality analysis
CAAQS = California ambient air quality standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
IAMF = impact avoidance and minimization feature
NAAQS = national ambient air quality standards
NO_X = nitrogen oxide
O_3 = ozone
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound
\- = no threshold

[1] Emissions results include implementation of air quality IAMFs, as described in Section 2.3.

[2] Presents the average emissions estimate during a single day of construction in each year. Average emissions are presented in SJVAPCD (rather than maximum emissions), consistent with (SJVAPCD 2015a) guidance for correct application of its 100-pound-per-AAQA screening criteria.

[3] Total PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions. Annual values may not add due to rounding. Daily results may not add because the table presents maximum emissions results for each individual pollutant component. For example, the maximum PM exhaust emissions may not occur on the same day as the maximum total dust emissions.

[4] The General Conformity *de minimis* thresholds for criteria pollutants are based on the federal attainment status of the project vicinity in the SJVAB. The project vicinity is considered an extreme nonattainment area for the O_3 NAAQS, a serious/moderate nonattainment area for the $PM_{2.5}$ NAAQS, and a serious maintenance area for the PM_{10} NAAQS. Although the project vicinity is in attainment for SO_2, because SO_2 is a precursor for $PM_{2.5}$, the $PM_{2.5}$ General Conformity *de minimis* thresholds are used.

[5] The 100-pound-per-day threshold is a screening-level threshold to help determine whether increased emissions from a project will cause or contribute to a violation of CAAQS or NAAQS. Projects with emissions below the threshold will not be in violation of CAAQS or NAAQS. Projects with emissions above the threshold would require an AAQA to confirm this conclusion (SJVAPCD 2015a).

The emissions results demonstrated that construction of Alternative 4 would result in ROG and NO_X emissions that would exceed the BAAQMD's CEQA thresholds, as well as the MBARD's PM_{10} CEQA threshold and SJVAPCD's annual CEQA thresholds for NO_X, CO, and PM_{10}. Construction of Alternative 4 would also exceed the general conformity *de minimis* NO_X thresholds in the SFBAAB and SJVAB.

Construction emissions would also exceed SJVAPCD's daily AAQA screening trigger for NO_X, CO, and PM_{10}. Localized effects from these pollutants are evaluated based on the air dispersion modeling of ambient air concentrations. Section 7.11 presents the modeled ambient air concentrations relative to the NAAQS and CAAQS.

Project features (AQ-IAMF#1 through AQ-IAMF#6) would minimize air quality effects through application of all best available on-site controls to reduce construction emissions. However, even with these measures, exceedances of air district and general conformity *de minimis* thresholds would still occur. ROG, NO_X, and PM_{10} emissions would be offset in the BAAQMD and MBARD, as applicable, through the purchase of offsets (AQ-MM#1, AQ-MM#2) to below BAAQMD and MBARD thresholds or net zero (as required by the General Conformity regulation). ROG, NO_X, and PM emissions would be fully offset (i.e., to net zero) within the SJVAPCD, pursuant to the Authority's MOU with the air district for the HSR subsections within the SJVAB (AQ-MM#3). Pursuant to SJVAPCD's GAMAQI, emissions offsets procured through AQ-MM#3 cannot be used to mitigate CO effects. Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold even after implementation of all feasible mitigation.

7.10 Construction Health Risk Assessment

During construction, sensitive receptors (e.g., schools, residences, and health care facilities) could be exposed to increased concentrations of TAC, such as DPM, that may present increased cancer risks and other health hazards. This section reports and identifies the health risk from the emissions generated by construction.

The analysis considers both acute and chronic noncancer health hazards and increased cancer risk for each project alternative and subsection. Acute risks are based on the maximum daily emissions that could occur across all calendar years. Chronic health risks are based on the maximum annual emissions from all calendar years. Cancer risk is defined as the predicted risk of cancer (unitless) over a lifetime and is expressed as chances per million persons exposed.

DPM is the primary TAC released from construction activities. The modeled DPM concentrations were used in determining the total exposure dose and associated health effect. Specific details of the air dispersion modeling and HRA are provided in Appendix E.

Tables 7-35 through 7-37 present the results of the HRA within the BAAQMD, MBARD, and SJVAPCD, respectively. Maximum predicted risks for each subsection are compared to the local air district significance criteria and indicate no air district risk criteria would be exceeded for any of the four project alternatives. The results represent the highest modeled risk at a receptor location from combined construction of all features (e.g., at grade, viaduct). Consistent with BAAQMD guidance, Table 7-35 also presents the maximum incremental $PM_{2.5}$ concentration generated by project construction. The tables include implementation of AQ-IAMF#1 through AQ-IAMF#6.

Table 7-35 Cancer, Noncancer, and $PM_{2.5}$ Concentration Health Risks Associated with Construction of Alternatives 1, 2, 3, and 4 in the Bay Area Air Quality Management District[1]

Alternative/Subsection	Cancer (per million)[2]	Chronic HI[3]	Acute HI[3]	$PM_{2.5}$ ($\mu g/m^3$)
Alternative 1				
San Jose Diridon Station Approach	3.8	<0.1	0.2	<0.1
Monterey Corridor	4.8	<0.1	0.1	<0.1
Morgan Hill and Gilroy	2.7	<0.1	0.4	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Alternative 2				
San Jose Diridon Station Approach	3.9	<0.1	0.2	<0.1
Monterey Corridor	5.0	<0.1	0.1	<0.1
Morgan Hill and Gilroy	4.6	<0.1	0.3	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Alternative 3				
San Jose Diridon Station Approach	3.9	<0.1	0.2	<0.1
Monterey Corridor	2.7	<0.1	0.4	<0.1
Morgan Hill and Gilroy	9.4	<0.1	0.1	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Alternative 4				
San Jose Diridon Station Approach	5.5	<0.1	0.1	<0.1
Monterey Corridor	6.1	<0.1	0.2	<0.1
Morgan Hill and Gilroy	2.6	<0.1	0.4	<0.1
Pacheco Pass	0.6	<0.1	0.4	<0.1
Threshold	**10.0**	**1.0**	**1.0**	**0.3**

Sources: AERMOD version 18081; OEHHA 2015; HARP 2 version 18159

HI = Hazard Indices

$\mu g/m^3$ = micrograms per cubic meter

NO_X = nitrogen oxide

$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter

NO_2 = nitrogen dioxide

[1] Only the highest modeled off-site risk is presented for each subsection. The reported risk includes effects from combined construction of all features (e.g., at grade, viaduct, concrete batch plants) in each subsection. Refer to Appendix E for individual risk contributions.

[2] Cancer risk represents the incremental increase in the number of cancers in a population of one million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.

[3] HI are shown by pollutant contributions to the most affected organ system (respiratory). All NO_2 risks assume an 80% ambient ratio to NO_X concentrations.

Table 7-36 Cancer and Noncancer Health Risks Associated with Construction of Alternatives 1, 2, 3, and 4 in the Monterey Bay Air Resources District[1]

Alternative/Subsection	Cancer (per million)[2]	Chronic HI[3]	Acute HI[3]
Alternative 1			
Morgan Hill and Gilroy	2.7	<0.1	0.4
Alternative 2			
Morgan Hill and Gilroy	4.6	<0.1	0.3
Alternative 3			
Morgan Hill and Gilroy	9.4	<0.1	0.1
Alternative 4			
Morgan Hill and Gilroy	2.6	<0.1	0.4
Threshold	**10.0**	**1.0**	**1.0**

Sources: AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
HI = Hazard Indices
μg/m³ = micrograms per cubic meter
NO_2 = nitrogen dioxide
NO_X = nitrogen oxide
[1] Only the highest modeled off-site risk is presented for each subsection. The reported risk includes effects from combined construction of all features (e.g., at grade, viaduct, concrete batch plants) in each subsection. Refer to Appendix E for individual risk contributions.
[2] Cancer risk represents the incremental increase in the number of cancers in a population of one million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.
[3] HI are shown by pollutant contributions to the most affected organ system (respiratory). All NO_2 risks assume an 80% ambient ratio to NO_X concentrations.

Table 7-37 Excess Cancer and Noncancer Health Risks Associated with Construction of Alternatives 1, 2, 3, and 4 in the San Joaquin Valley Air Pollution Control District[1]

Alternative/Subsection	Cancer (per million)[2]	Chronic HI[3]	Acute HI[3]
Alternative 1			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Alternative 2			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Alternative 3			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Alternative 4			
Pacheco Pass	0.6	<0.1	0.4
San Joaquin Valley	5.0	<0.1	0.1
Threshold	**20.0**	**1.0**	**1.0**

Sources: AERMOD version 18081; OEHHA 2015; HARP 2 version 18159

HI = Hazard Indices

$\mu g/m^3$ = micrograms per cubic meter

NO_2 = nitrogen dioxide

NO_X = nitrogen oxide

[1] Only the highest modeled off-site risk is presented for each subsection. The reported risk includes effects from combined construction of all features (e.g., at grade, viaduct) in each subsection. Refer to Appendix E for individual risk contributions.

[2] Cancer risk represents the incremental increase in the number of cancers in a population of one million. Risks are cumulative of inhalation, dermal, soil, mother's milk, and crop pathways.

[3] HI are shown by pollutant contributions to the most affected organ system (respiratory). All NO_2 risks assume an 80% ambient ratio to NO_X concentrations.

7.11 Other Localized Construction Effects

Construction emissions have the potential to cause elevated criteria pollutant concentrations. These elevated concentrations may cause or contribute to exceedances of the NAAQS and CAAQS. This section reports and identifies the criteria air pollutant concentrations from the emissions generated by construction.

Background pollutant concentrations vary by location along the alignment. Table 7-38 reports the background concentrations by pollutant and applicable averaging period for three locations within the RSA. The ambient air quality standards are provided for reference. Existing violations of the standards are shown in bold.

Tables 7-39 through 7-46 present the estimated maximum hourly (< 24 hours) and daily concentrations relative to the CAAQS and NAAQS for Alternatives 1, 2, 3, and 4. Tables 7-47 through 7-50 present the estimated maximum annual concentrations. The tables present both the incremental project and total pollutant concentration; only the total pollutant concentration, which reflects the incremental project contribution plus the background concentration, is compared with the CAAQS and NAAQS to determine if construction would cause an ambient air quality violation.[26]

As shown in Table 7-38, background concentrations of PM_{10} and $PM_{2.5}$ along most of the project already exceed hourly, daily, and annual $PM_{2.5}$ and PM_{10} ambient air quality standards. Table 7-51 compares the incremental project increase in PM concentrations within these areas with the applicable USEPA significant impact levels (SIL)[27] to analyze the potential for the project to worsen existing $PM_{2.5}$ and PM_{10} violations.

All tables include implementation of AQ-IAMF#1 through AQ-IAMF#6.

---

[26] Project construction does not include any sources that would generate Pb. Pb would be emitted by the three new temporary batch plants, although concentrations would not exceed 1.96E-08 µg/m^3 for the quarterly standard, 6.72E-07 µg/m^3 for the 1-hour standard, 1.09E-07 µg/m^3 for the 8-hour standard, nor 6.14E-08 µg/m^3 for the 24-hour standard which are well below the NAAQS and CAAQS. Accordingly, a detailed analysis of Pb-related emissions was not conducted.

[27] While the $PM_{2.5}$ SILs have not been officially approved by the USEPA or the SJVAPCD, the air districts suggest that, for illustrative purposes, the analysis consider the USEPA's proposed SILs.

Table 7-38 Existing Background Air Quality Concentration in the Resource Study Area (μg/m³)

Pollutant	San Jose-Jackson Street		Hollister-Fairview		Merced-S Coffee Avenue	
	NAAQS	CAAQS	NAAQS	CAAQS	NAAQS	CAAQS
$PM_{2.5}$						
24-hour	31.0	N/A	14.7	N/A	**39.3**	N/A
Standard	*35*	N/A	*35*	N/A	*35*	N/A
Annual mean	9.6	10.6	4.6	5.1	12.6	13.3
Standard	*12.0*	*12*	*12.0*	*12*	*12.0*	*12*
PM_{10}						
24-hour	49.7	69.0	56.3	80.0	73.3	146.0[2]
Standard	*150*	*50*	*150*	*50*	*150*	*50*
Annual mean	19.8	21.9	17.8	19.6[1]	31.8	35.8[2]
Standard	*N/A*	*20*	*N/A*	*20*	*N/A*	*20*
NO_2						
1-hour	85.2	127.8	49.5	62.0	61.4	73.3
Standard	*188*	*339*	*188*	*339*	*188*	*339*
Annual mean	22.8	24.1	8.4[3]	8.6[3]	13.1	13.4
Standard	*100*	*57*	*100*	*57*	*100*	*57*
CO						
1-hour	2,329	2,749	2,215[3]	4,812[3]	3,475[4]	6,644[4]
Standard	*23,000*	*23,000*	*23,000*	*23,000*	*23,000*	*23,000*
8-hour	1,757	2,062	992.9	1031	1,222[4]	3,551[4]
Standard	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*

Pollutant	San Jose-Jackson Street		Hollister-Fairview		Merced-S Coffee Avenue	
	NAAQS	CAAQS	NAAQS	CAAQS	NAAQS	CAAQS
SO_2						
1-hour	6.1	9.4	6.1[5]	9.4[5]	15.7[6]	28.3[6]
Standard	*196*	*655*	*196*	*655*	*196*	*655*
24-hour	N/A	2.9	N/A	2.9[5]	N/A	6.3[6]
Standard	*N/A*	*105*	*N/A*	*105*	*N/A*	*105*

Sources: CARB 2018b; USEPA 2018a
NAAQS = national ambient air quality standards
CAAQS = California ambient air quality standards
CO = carbon monoxide
SO_2 = sulfur dioxide
PM_{10} = particulate matter 10 microns or less in diameter
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
N/A = No applicable standard
[1] National mean used as no CAAQS mean available
[2] Data Site: M St, Merced
[3] Data Site: E. Laurel Dr., Salinas
[4] Data Site: Rd 29 ½, Madera
[5] Data Site: Use San Jose – Jackson
[6] Data Site: N First St., Fresno

Table 7-39 Hourly and Daily California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 1 (µg/m³)[1]

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
San Jose Diridon Station Approach												
Aerial	104	2,853	50	2,112	22	150	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Berm	267	3,016	128	2,190	106	233			1	11	<1	3
At grade	78	2,828	41	2,103	38	166			<1	10	<1	3
Diridon Station	45	2,795	19	2,081	13	141			<1	10	<1	3
Combined[9]	267	3,016	147	2,209	119	246			1	11	<1	3
Monterey Corridor												
Aerial	61	2,810	34	2,096	16	144	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Berm	69	2,818	39	2,101	32	159			<1	10	<1	3
At grade	80	2,829	45	2,107	56	184			<1	10	<1	3
Combined[9]	80	2,829	45	2,107	56	184			<1	10	<1	3
Morgan Hill and Gilroy												
Aerial	76	4,887	20	2,082	178	306	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Cut and fill	473	5,285	121	2,183	19	147			1	10	<1	3
At grade	291	5,102	73	2,135	178	306			2	11	<1	3
Tunnel	90	4,902	15	2,077	74	202			<1	10	<1	3
Gilroy Station	57	4,869	15	2,077	12	140			<1	10	<1	3
MOWF	132	4,943	28	2,090	56	184			<1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	605	5,417	149	2,211	234	362			2	12	<1	3

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
Pacheco Pass												
Aerial	202	5,013	33	1,064	69	131	Incremental concentration assessed in Table 7-51.[10]		1	10	<1	3
Tunnel	525	5,337	85	1,116	180	242			<1	10	<1	3
Cut and Fill	466	5,277	76	1,107	36	98			1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	525	5,337	85	1,116	180	242			1	10	<1	3
San Joaquin Valley												
Aerial	132	6,908	24	3,575	17	91	Incremental concentration assessed in Table 7-51.[10]		<1	28	<1	6
Berm	263	6,908	51	3,603	60	133			1	29	<1	6
Cut and fill	501	7,146	107	3,658	23	97			1	29	<1	6
MOWS	401	7,045	83	3,635	110	183			1	29	<1	6
Combined[9]	902	7,546	190	3,741	170	243			1	30	<1	6
CAAQS (µg/m³)	**-**	**23,000**	**-**	**10,000**	**-**	**339**	**-**	**50**	**-**	**655**	**-**	**105**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006a, 2006bb, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
µg/m³ = micrograms per cubic meter of air
N/A = Not applicable. Batch plants only have particulate matter emissions

[1] Only the highest modeled concentration is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.

[2] Represents the maximum incremental off-site concentration from project construction.

[3] A background 1-hour CO concentration of 2,749, 4,812, and 6,644. µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.

[4] A background 8-hour CO concentration of 2,062, 1,031, and 3,551 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.

[5] A background 1-hour NO_2 concentration of 127.84, 62.04, and 73.32 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[6] A background 24-hour PM_{10} concentration of 69, 80, and 146 µg/m³ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.

[7] A background 1-hour SO_2 concentration of 9.43 and 28.30 µg/m³ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.

[8] A background 24-hour SO_2 concentration of 2.88 and 6.29 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[9] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

[10] Background concentration exceeds the AAQS.

Table 7-40 Hourly and Daily National Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 1 ($\mu g/m^3$)[1]

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
San Jose Diridon Station Approach												
Aerial	93	2,422	43	1,800	15	100	2	33	14	64	<1	6
Berm	241	2,571	117	1,774	75	160	12	<u>43*</u>	69	118	1	7
At grade	76	2,406	37	1,793	33	119	3	34	22	71	<1	6
Diridon Station	44	2,373	17	1,774	6	91	1	32	3	53	<1	6
Combined[9]	286	2,617	134	1,891	81	167	13	<u>44*</u>	72	122	1	7
Monterey Corridor												
Aerial	60	2,390	29	1,785	13	98	1	32	11	60	<1	6
Berm	68	2,398	33	1,789	25	110	2	33	17	67	<1	6
At grade	79	2,408	38	1,794	44	129	2	33	20	70	<1	6
Combined[9]	79	2,408	38	1,794	44	129	2	33	20	70	<1	6
Morgan Hill and Gilroy												
Aerial	62	2,391	18	1,775	7	93	1	32	6	63	<1	6
Cut and fill	355	2,685	112	1,868	12	98	1	32	4	60	1	7
At grade	211	2,540	65	1,822	115	<u>200*</u>	8	<u>39*</u>	38	94	1	7
Tunnel	89	2,418	14	1,771	21	106	1	32	3	59	<1	6
Gilroy Station	46	2,372	13	1,769	5	91	1	32	2	59	<1	6
MOWF	84	2,413	23	1,780	24	109	1	32	9	65	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	1	32	3	59	N/A	N/A
Combined[9]	439	2,769	135	1,892	138	<u>223*</u>	10	<u>41*</u>	47	103	1	7

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
Pacheco Pass												
Aerial	185	2,400	28	1,021	15	64	1	16	7	63	<1	6
Tunnel	401	2,615	79	1,072	96	145	2	16	11	67	<1	6
Cut and fill	421	2,636	64	1,057	8	57	<1	15	2	58	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	<1	<u>15*</u>	3	59	N/A	N/A
Combined[9]	421	2,636	79	1,072	96	145	2	16	11	67	<1	6
San Joaquin Valley												
Aerial	121	3,596	22	1,244	11	72	Incremental concentration assessed in Table 7-51.[10]		5	78	<1	16
Berm	241	3,716	44	1,266	36	97			12	86	<1	16
Cut and fill	430	3,905	105	1,327	15	76			3	76	<1	16
MOWS	373	3,848	77	1,299	46	107			28	101	<1	16
Combined[9]	803	4,278	182	1,404	81	143			40	113	1	16
NAAQS (µg/m³)	**-**	**40,000**	**-**	**10,000**	**-**	**188**	**-**	**35**	**-**	**150**	**-**	**196**

Source(s): AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
µg/m³ = micrograms per cubic meter of air

* Not applicable. Batch plants only have particulate matter emissions
[1] Only the highest modeled concentration in the form of the standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in <u>underline with an asterisk (*)</u> actually violate the standard.
[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.
[3] A background 1-hour CO concentration of 2,329, 2,215, and 3,475 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[4] A background 8-hour CO concentration of 1,757, 992.85, and 1222 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[5] A background 1-hour NO_2 concentration of 85.23, 49.51, and 61.41 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background 24-hour $PM_{2.5}$ concentration in the form of the standard of 31.0, 14.67, and 39.33 µg/m³ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[7] A background 24-hour PM_{10} concentration of 49.678, 56.33, and 73.33 µg/m³ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[8] A background 1-hour SO_2 concentration of 6.11 and 15.72 µg/m³ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.
[9] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[10] Background concentration exceeds the NAAQS. USEPA Office of Air Quality Planning and Standards, August, 2016.

Table 7-41 Hourly and Daily California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 2 ($\mu g/m^3$)[1]

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
San Jose Diridon Station Approach												
Aerial	80	2,830	52	2,114	15	142	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Berm	272	3,031	127	2,189	106	234			1	11	<1	3
At grade	99	2,849	52	2,114	47	175			<1	10	<1	3
Diridon Station	45	2,795	19	2,081	13	141			<1	10	<1	3
Combined[9]	317	3,066	147	2,209	119	247			1	11	<1	3
Monterey Corridor												
Aerial	155	2,905	78	2,140	57	184	Incremental concentration assessed in Table 7-51.[10]		1	10	<1	3
Berm	68	2,818	38	2,100	32	160			<1	10	<1	3
At grade	72	2,821	40	2,102	51	179			<1	10	<1	3
Trench	582	3,331	218	2,280	233	361*			2	11	<1	3
Combined[9]	582	3,331	218	2,280	233	361*			2	11	<1	3
Morgan Hill and Gilroy												
Aerial	440	5,251	115	2,177	50	178	Incremental concentration assessed in Table 7-51.[10]		1	10	<1	3
Berm	123	4,935	32	2,094	28	156			<1	10	<1	3
At grade	226	5,038	58	2,120	50	178			1	10	<1	3
Cut and fill	480	5,291	120	2,183	23	151			1	10	<1	3
Trench	458	5,270	125	2,187	145	273			1	11	<1	3
Tunnel	90	4,902	15	2,077	74	201			<1	11	<1	3
Gilroy Station	57	4,869	15	2,077	12	140			<1	10	<1	3
MOWF	132	4,943	28	2,090	56	183			<1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	611	5,423	152	2,215	201	329			1	11	<1	3

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
Pacheco Pass												
Aerial	202	5,013	33	1,064	69	131	Incremental concentration assessed in Table 7-51.[10]		1	10	<1	3
Tunnel	525	5,337	85	1,116	180	242			<1	10	<1	3
Cut and fill	466	5,277	76	1,107	36	98			1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	525	5,337	85	1,116	180	242			1	10	<1	3
San Joaquin Valley												
Aerial	132	6,908	24	3,575	17	91	Incremental concentration assessed in Table 7-51.[10]		<1	28	<1	6
Berm	263	6,908	51	3,603	60	133			1	29	<1	6
Cut and fill	501	7,146	107	3,658	23	96			1	29	<1	6
MOWS	401	7,045	83	3,635	110	183			1	29	<1	6
Combined[9]	902	7,546	190	3,741	170	243			1	30	<1	6
CAAQS ($\mu g/m^3$)	**-**	**23,000**	**-**	**10,000**	**-**	**339**	**-**	**50**	**-**	**655**	**-**	**105**

Source: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
NAAQS = national ambient air quality standards
PM_{10} = particulate matter 10 microns or less in diameter
MOWF = maintenance of way facility
NO_2 = nitrogen oxide
SIL = significant impact level
MOWS = maintenance of way siding
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
$\mu g/m^3$ = micrograms per cubic meter of air
N/A = Not Applicable batch plants only have particulate matter emissions

[1] Only the highest modeled concentration is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] A background 1-hour CO concentration of 2,749, 4,812, and 6,644. $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[4] A background 8-hour CO concentration of 2,062, 1,031, and 3,551 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[5] A background 1-hour NO_2 concentration of 127.84, 62.04, and 73.32 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background 24-hour PM_{10} concentration of 69, 80, and 146 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[7] A background 1-hour SO_2 concentration of 9.43 and 28.30 $\mu g/m^3$ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.
[8] A background 24-hour SO_2 concentration of 2.88 and 6.29 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
"Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[10] Background concentration exceeds the CAAQS.

Table 7-42 Hourly and Daily National Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 2 ($\mu g/m^3$)[1]

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
San Jose Diridon Station Approach												
Aerial	69	2,398	33	1,790	10	96	2	33	13	62	<1	6
Berm	242	2,572	118	1,875	73	158	13	44*	69	118	1	7
At grade	98	2,427	47	1,803	42	127	4	35	29	78	<1	6
Diridon Station	44	2,373	17	1,774	6	91	1	32	3	53	<1	6
Combined[9]	286	2,626	135	1,892	79	164	13	44*	72	122	1	7
Monterey Corridor												
Aerial	144	2,473	71	1,828	44	130	4	35	1	71	<1	7
Berm	68	2,397	32	1,789	25	110	3	34	17	67	<1	6
At grade	71	2,400	34	1,790	40	125	3	34	19	68	<1	6
Trench	527	2,857	201	1,958	129	214*	17	48*	93	142	1	7
Combined[9]	527	2,857	201	1,958	129	214*	17	48*	93	142	1	7
Morgan Hill and Gilroy												
Aerial	349	2,678	102	1,858	57	142	9	40*	45	101	1	7
Berm	95	2,425	28	1,785	19	104	3	34	13	69	<1	6
At grade	172	2,502	52	1,808	34	119	5	36*	24	80	<1	6
Cut and fill	358	2,688	21	1,777	17	102	1	32	4	60	1	7
Trench	372	2,701	108	1,865	87	172	7	37*	39	95	1	7
Tunnel	89	2,418	14	1,771	21	106	1	32	3	59	<1	6
Gilroy Station	46	2,375	13	1,769	5	91	1	32	2	59	<1	6
MOWF	84	2,413	23	1,780	24	109	1	32	9	65	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	1	32	3	59	N/A	N/A
Combined[9]	456	2,785	135	1,891	111	196*	11	42*	54	110	1	7

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
Pacheco Pass												
Aerial	185	2,400	28	1,021	15	64	1	16	7	63	<1	6
Tunnel	401	2,615	79	1,072	96	145	2	16	11	67	<1	6
Cut and fill	421	2,636	64	1,057	8	57	0	15	2	58	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	<1	15*	3	59	N/A	N/A
Combined[9]	421	2,636	79	1,072	96	145	2	16	11	67	<1	6
San Joaquin Valley												
Aerial	121	3,596	22	1,244	11	72	Incremental concentration assessed in Table 7-51.[10]		5	78	<1	16
Berm	251	3,516	44	1,266	36	97			12	86	<1	16
Cut and fill	430	3,905	105	1,327	15	76			3	76	<1	16
MOWS	373	3,848	77	1,299	46	107			28	101	<1	16
Combined[9]	803	4,278	182	1,404	81	143			40	113	1	16
NAAQS (μg/m³)	**-**	**40,000**	**-**	**10,000**	**-**	**188**	**-**	**35**	**-**	**150**	**-**	**196**

Source: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
N/A = Not Applicable. Batch plants only have particulate matter emissions
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
μg/m³ = micrograms per cubic meter of air

[1] Only the highest modeled concentration in the form of the standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.
[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.
[3] A background 1-hour CO concentration of 2,329, 2,215, and 3,475 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[4] A background 8-hour CO concentration of 1,757, 992.85, and 1222 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[5] A background 1-hour NO_2 concentration of 85.23, 49.51, and 61.41 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background 24-hour $PM_{2.5}$ concentration in the form of the standard of 31.0, 14.67, and 39.33 μg/m³ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[7] A background 24-hour PM_{10} concentration of 49.678, 56.33, and 73.33 μg/m³ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[8] A background 1-hour SO_2 concentration of 6.11 and 15.72 μg/m³ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.
[9] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[10] Background concentration exceeds the NAAQS. USEPA Office of Air Quality Planning and Standards, August, 2016.

Table 7-43 Hourly and Daily California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 3 ($\mu g/m^3$)[1]

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
San Jose Diridon Station Approach												
Aerial	80	2,830	52	2,114	15	142	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Berm	272	3,031	127	2,189	106	234			1	11	<1	3
At grade	99	2,849	52	2,114	47	175			<1	10	<1	3
Diridon Station	45	2,795	19	2,081	13	141			<1	10	<1	3
Combined[9]	317	3,066	147	2,209	119	247			1	11	<1	3
Monterey Corridor												
Aerial	61	2,810	34	2,096	16	144	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Berm	69	2,818	39	2,101	32	159			<1	10	<1	3
At grade	80	2,829	45	2,107	56	184			<1	10	<1	3
Combined[9]	80	2,829	45	2,107	56	184			<1	10	<1	3
Morgan Hill and Gilroy												
Aerial	76	4,888	20	2,082	15	143	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
Cut and fill	473	5,285	121	2,183	33	161			1	10	<1	3
At grade	94	4,906	25	2,087	48	176			<1	10	<1	3
Tunnel	90	4,902	15	2,077	74	201			<1	11	<1	3
Gilroy Station	57	4,869	15	2,077	13	141			<1	10	<1	3
MOWF	133	4,945	27	2,089	52	180			<1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	606	5,418	148	2,210	101	229			1	10	<1	3

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
Pacheco Pass												
Aerial	202	5,013	33	1,064	69	131	Incremental concentration assessed in Table 7-51.[10]		1	10	<1	3
Tunnel	525	5,337	85	1,116	180	242			<1	10	<1	3
Cut and fill	466	5,277	76	1,107	36	98			1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	525	5,337	85	1,116	180	242			1	10	<1	3
San Joaquin Valley												
Aerial	132	6,908	24	3,575	17	91	Incremental concentration assessed in Table 7-51.[10]		<1	28	<1	6
Berm	263	6,908	51	3,603	60	133			1	29	<1	6
Cut and fill	501	7,146	107	3,658	23	96			1	29	<1	6
MOWS	401	7,045	83	3,635	110	183			1	29	<1	6
Combined[9]	902	7,546	190	3,741	170	243			1	30	<1	6
CAAQS ($\mu g/m^3$)	**-**	**23,000**	**-**	**10,000**	**-**	**339**	**-**	**50**	**-**	**655**	**-**	**105**

Source: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
N/A = Not Applicable. Batch plants only have particulate matter emissions
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
$\mu g/m^3$ = micrograms per cubic meter of air

[1] Only the highest modeled concentration is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in <u>underline with an asterisk (*)</u> actually violate the standard.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] A background 1-hour CO concentration of 2749., 4812. and 6644. $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[4] A background 8-hour CO concentration of 2,062, 1,031, and 3,551 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[5] A background 1-hour NO_2 concentration of 127.84, 62.04, and 73.32 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background 24-hour PM_{10} concentration of 69, 80, and 146 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[7] A background 1-hour SO_2 concentration of 9.43 and 28.30 $\mu g/m^3$ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.
[8] A background 24-hour SO_2 concentration of 2.88 and 6.29 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[9] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[10] Background concentration exceeds the CAAQS.

Table 7-44 Hourly and Daily National Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 3 (µg/m³)[1]

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
San Jose Diridon Station Approach												
Aerial	69	2,398	33	1,790	10	96	2	33	13	62	<1	6
Berm	242	2,572	118	1,875	73	158	13	44*	69	118	1	7
At grade	98	2,427	47	1,803	42	127	4	35	29	78	<1	6
Diridon Station	44	2,373	17	1,774	6	91	1	32	3	53	<1	6
Combined[9]	286	2,626	135	1,892	79	164	13	44*	72	122	1	7
Monterey Corridor												
Aerial	60	2,390	29	1,785	13	98	1	32	11	60	<1	6
Berm	68	2,398	33	1,789	25	110	2	33	17	67	<1	6
At grade	79	2,408	38	1,794	44	129	2	33	20	70	<1	6
Combined[9]	79	2,408	38	1,794	44	129	2	33	20	70	<1	6
Morgan Hill and Gilroy												
Aerial	62	2,391	19	1,775	8	93	1	32	6	63	<1	6
Cut and fill	355	2,685	112	1,869	17	102	1	32	4	60	1	7
At grade	77	2,407	23	1,780	25	110	2	33	10	67	<1	6
Tunnel	89	2,418	14	1,771	21	106	1	32	3	59	<1	6
Gilroy Station	46	2,375	13	1,769	5	91	1	32	2	59	<1	6
MOWF	90	2,420	23	1,780	23	107	1	32	9	65	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	1	32	3	59	N/A	N/A
Combined[9]	445	1,775	135	1,892	47	132	3	34	19	75	1	7

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
Pacheco Pass												
Aerial	185	2,400	28	1,021	15	64	1	16	7	63	<1	6
Tunnel	401	2,615	79	1,072	96	145	2	16	11	67	<1	6
Cut and fill	421	2,636	64	1,057	8	57	<1	15	2	58	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	<1	<u>15*</u>	3	59	N/A	N/A
Combined[9]	421	2,636	79	1,072	96	145	2	16	11	78	<1	6
San Joaquin Valley												
Aerial	121	3,596	22	1,244	11	72	Incremental concentration assessed in Table 7-51.[10]		5	78	<1	16
Berm	241	3,716	44	1,266	36	97			12	86	<1	16
Cut and fill	430	3,905	105	1,327	15	76			3	76	<1	16
MOWS	373	3,848	77	1,299	46	107			28	101	<1	16
Combined[9]	803	4,278	182	1,404	81	143			40	113	1	16
NAAQS ($\mu g/m^3$)	**-**	**40,000**	**-**	**10,000**	**-**	**188**	**-**	**35**	**-**	**150**	**-**	**196**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
$\mu g/m^3$ = micrograms per cubic meter of air

* Not Applicable. Batch plants only have particulate matter emissions

[1] Only the highest modeled concentration in the form of the standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in <u>underline with an asterisk (*)</u> actually violate the standard.

[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.

[3] A background 1-hour CO concentration of 2,329, 2,215, and 3,475 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.

[4] A background 8-hour CO concentration of 1,757, 992.85, and 1222 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.

[5] A background 1-hour NO_2 concentration of 85.23, 49.51, and 61.41 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[6] A background 24-hour $PM_{2.5}$ concentration in the form of the standard of 31.0, 14.67, and 39.33 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[7] A background 24-hour PM_{10} concentration of 49.678, 56.33, and 73.33 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.

[8] A background 1-hour SO_2 concentration of 6.11 and 15.72 $\mu g/m^3$ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.

[9] “Combined” conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

[10] Background concentration exceeds the NAAQS.

Table 7-45 Hourly and Daily California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 4 (µg/m³)[1]

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
San Jose Diridon Station Approach												
Berm	173	2,922	92	2,154	68	196	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
At grade	62	2,812	32	2,095	38	166			<1	10	<1	3
Diridon Station	45	2,795	19	2,081	13	141			<1	10	<1	3
Combined[9]	218	2,967	111	2,173	81	209			1	10	<1	3
Monterey Corridor												
Berm	80	2,830	45	2,107	36	164	Incremental concentration assessed in Table 7-51.[10]		<1	10	<1	3
At grade	122	2,871	68	2,130	74	202			<1	10	<1	3
Combined[9]	122	2,871	68	2,130	74	202			<1	10	<1	3
Morgan Hill and Gilroy												
Aerial	1,122	5,934	26	1,188	199	327	Incremental concentration assessed in Table 7-51.[10]		2	12	<1	3
Berm	295	5,007	50	2,112	63	190			<1	10	<1	3
At grade	849	5,661	216	2,278	175	302			2	11	<1	3
Cut and fill	679	5,491	139	2,202	35	163			1	10	<1	3
Tunnel	90	4,902	15	2,077	74	201			<1	11	<1	3
Gilroy Station	57	4,869	15	2,077	13	141			<1	10	<1	3
MOWF	160	4,971	43	2,106	74	202			<1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	1,282	6,094	270	2,332	274	<u>401</u>			2	12	<1	3

Construction Area	CO				NO_2		PM_{10}		SO_2			
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 1-hour[2]	Total 1-hour[7]	Project 24-hour[2]	Total 24-hour[8]
Pacheco Pass												
Aerial	202	5,013	33	1,064	69	131	Incremental concentration assessed in Table 7-51.[10]		1	10	<1	3
Tunnel	525	5,337	85	1,116	180	242			<1	10	<1	3
Cut and fill	466	5,277	76	1,107	36	98			1	10	<1	3
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A
Combined[9]	525	5,337	85	1,116	180	242			1	10	<1	3
San Joaquin Valley												
Aerial	132	6,908	24	3,575	17	91	Incremental concentration assessed in Table 7-51.[10]		<1	28	<1	6
Berm	263	6,908	51	3,603	60	133			1	29	<1	6
Cut and fill	501	7,146	107	3,658	23	96			1	29	<1	6
MOWS	401	7,045	83	3,635	110	183			1	29	<1	6
Combined[9]	902	7,546	190	3,741	170	243			1	30	<1	6
CAAQS ($\mu g/m^3$)	**-**	**23,000**	**-**	**10,000**	**-**	**339**	**-**	**50**	**-**	**655**	**-**	**105**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
N/A = Not Applicable. Batch plants only have particulate matter emissions
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
$\mu g/m^3$ = micrograms per cubic meter of air

[1] Only the highest modeled concentration is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.
[2] Represents the maximum incremental off-site concentration from project construction.
[3] A background 1-hour CO concentration of 2749., 4812. and 6644. $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[4] A background 8-hour CO concentration of 2,062, 1,031, and 3,551 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.
[5] A background 1-hour NO_2 concentration of 127.84, 62.04, and 73.32 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background 24-hour PM_{10} concentration of 69, 80, and 146 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[7] A background 1-hour SO_2 concentration of 9.43 and 28.30 $\mu g/m^3$ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.
[8] A background 24-hour SO_2 concentration of 2.88 and 6.29 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[9] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[10] Background concentration exceeds the CAAQS.

Table 7-46 Hourly and Daily National Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 4 (μg/m³)[1]

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
San Jose Diridon Station Approach												
Berm	138	2,467	66	1,822	51	137	19	<u>50*</u>	44	93	<1	6
At grade	62	2,391	28	1,785	26	112	10	<u>41*</u>	14	63	<1	6
Diridon Station	44	2,373	17	1,774	6	91	1	32	3	53	<1	6
Combined[9]	181	2,511	83	1,840	57	143	20	<u>51*</u>	47	97	<1	7
Monterey Corridor												
Berm	80	2,409	38	1,795	29	114	4	35	20	69	<1	6
At grade	120	2,450	58	1,814	60	145	4	35	28	77	<1	6
Combined[9]	120	2,450	58	1,814	60	145	4	35	28	77	<1	6
Morgan Hill and Gilroy												
Aerial	763	3,092	207	1,963	120	<u>205*</u>	20	<u>51*</u>	118	<u>174*</u>	1	7
Berm	149	2,478	44	1,801	35	121	4	35	22	77	<1	6
At grade	646	2,976	193	1,950	95	180	19	<u>50*</u>	92	148	1	7
Cut and fill	475	2,804	40	1,797	18	104	1	32	5	61	1	7
Tunnel	89	2,418	14	1,771	21	106	1	32	3	59	<1	6
Gilroy Station	46	2,375	13	1,769	5	91	1	32	2	59	<1	6
MOWF	134	2,464	33	1,790	33	118	2	33	13	69	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	1	15	3	59	N/A	N/A
Combined[9]	897	3,227	240	1,996	152	<u>238*</u>	22	<u>53*</u>	130	<u>187*</u>	1	8
Pacheco Pass												
Aerial	185	2,400	28	1,021	15	64	1	16	7	63	<1	6
Tunnel	401	2,615	79	1,072	96	145	2	16	11	67	<1	6

Construction Area	CO				NO_2		$PM_{2.5}$		PM_{10}		SO_2	
	Project 1-hour[2]	Total 1-hour[3]	Project 8-hour[2]	Total 8-hour[4]	Project 1-hour[2]	Total 1-hour[5]	Project 24-hour[2]	Total 24-hour[6]	Project 24-hour[2]	Total 24-hour[7]	Project 1-hour[2]	Total 1-hour[8]
Cut and fill	421	2,636	64	1,057	8	57	<1	15	2	58	<1	6
Batch plant	N/A	N/A	N/A	N/A	N/A	N/A	<1	<u>15*</u>	3	59	N/A	N/A
Combined[9]	421	2,636	79	1,072	96	145	2	16	11	67	<1	6
San Joaquin Valley												
Aerial	121	3,596	22	1,244	11	72	Incremental concentration assessed in Table 7-51.[10]		5	78	<1	16
Berm	241	3,716	44	1,266	36	97			12	86	<1	16
Cut and fill	430	3,905	105	1,327	15	76			3	76	<1	16
MOWS	373	3,848	77	1,299	46	107			28	101	<1	16
Combined[9]	803	4,278	182	1,404	81	143			40	113	1	16
NAAQS ($\mu g/m^3$)	**-**	**40,000**	**-**	**10,000**	**-**	**188**	**-**	**35**	**-**	**150**	**-**	**196**

Source: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
$\mu g/m^3$ = micrograms per cubic meter of air
N/A = Not applicable. Batch plants only have particulate matter emissions

[1] Only the highest modeled concentration in the form of the standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in <u>underline with an asterisk (*)</u> actually violate the standard.

[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.

[3] A background 1-hour CO concentration of 2,329, 2,215, and 3,475 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.

[4] A background 8-hour CO concentration of 1,757, 992.85, and 1222 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Madera – Rd. 29 1/2, respectively) was added to the maximum increment off-site project contribution.

[5] A background 1-hour NO_2 concentration of 85.23, 49.51, and 61.41 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[6] A background 24-hour $PM_{2.5}$ concentration in the form of the standard of 31.0, 14.67, and 39.33 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[7] A background 24-hour PM_{10} concentration of 49.678, 56.33, and 73.33 $\mu g/m^3$ (for the locations of San Jose – Jackson St., Hollister – Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.

[8] A background 1-hour SO_2 concentration of 6.11 and 15.72 $\mu g/m^3$ (for the locations of San Jose – Jackson St and Fresno – N First St, respectively) was added to the maximum increment off-site project contribution.

[9] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

[10] Background concentration exceeds the NAAQS.

Table 7-47 Annual National Ambient Air Quality Standards and California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 1 (μg/m³)[1]

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project Annual[2]	Total Annual[3]	Project Annual[2]	Total Annual[4]	Project Annual[2]	Total Annual[5]	Project Annual[2]	Total Annual[6]	Project Annual[2]	Total Annual[7]
San Jose Diridon Station Approach										
Aerial	2	26	2	24	<1	11	<1	10	Incremental concentration assessed in Table 7-51.[9]	
Berm	2	26	2	25	1	11	1	10		
At grade	5	29	5	28	1	11	1	10		
Diridon Station	0	24	0	23	<1	11	<1	10		
Combined[9]	6	30	5	30	1	12	1	10		
Monterey Corridor										
Aerial	1	25	1	24	<1	11	<1	10	Incremental concentration assessed in Table 7-51.[9]	
Berm	3	27	3	26	1	11	1	10		
At grade	6	30	5	28	1	11	1	10		
Combined[9]	6	30	5	28	1	11	1	10		
Morgan Hill and Gilroy										
Aerial	2	35	2	34	<1	11	<1	10	2	22*
At grade	4	28	4	27	1	12	1	10	5	25*
Tunnel	4	28	3	26	<1	11	<1	10	2	22*
Gilroy Station	<1	24	<1	23	<1	11	<1	10	<1	20*
MOWF	<1	24	<1	23	<1	11	<1	10	<1	20*
Batch plant	N/A	N/A	N/A	N/A	<1	11	<1	10	<1	20*
Combined[9]	5	29	4	27	1	12	1	10	5	25*
Pacheco Pass										
Aerial	4	12	4	12	<1	5	<1	5	Incremental concentration assessed in Table 7-51.[9]	
Tunnel	11	20	10	19	1	6	1	5		

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project Annual[2]	Total Annual[3]	Project Annual[2]	Total Annual[4]	Project Annual[2]	Total Annual[5]	Project Annual[2]	Total Annual[6]	Project Annual[2]	Total Annual[7]
Cut and fill	2	11	2	10	<1	5	<1	5		
Batch Plant	N/A	N/A	N/A	N/A	<1	5*	<1	5*		
Combined[9]	11	20	10	19	1	6	1	5		
San Joaquin Valley										
Aerial	<1	14	<1	13	Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]	
Berm	1	14	1	14						
Cut and fill	1	14	1	14						
MOWS	<1	13	<1	13						
Combined[8]	1	14	1	14						
CAAQS/NAAQS (μg/m³)	**-**	**57**	**-**	**100**	**-**	**12**	**-**	**12**	**-**	**20**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018
CAAQS = California ambient air quality standards
CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
μg/m³ = micrograms per cubic meter of air
N/A = Not applicable. Batch plants only have particulate matter emissions
[1] Only the highest modeled concentration in the form of the applicable standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.
[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.
[3] A background annual NO_2 concentration in the form of the (CAAQS) standard of 24.08, 8.55 and 13.40 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[4] A background annual NO_2 concentration in the form of the (NAAQS) standard of 23.75, 8.39 and 13.12 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[5] A background annual $PM_{2.5}$ concentration in the form of the (CAAQS) standard of 10.60, 5.10 and 13.3 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background annual $PM_{2.5}$ concentration in the form of the (NAAQS) standard of 9.57, 4.57 and 12.63 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[7] A background annual PM_{10} concentration in the form of the (CAAQS) standard off 21.90, 19.6 and 35.8 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[8] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[9] Background concentration exceeds the CAAQS and/or NAAQS.

Table 7-48 Annual National Ambient Air Quality Standards and California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 2 (µg/m^3)[1]

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project Annual[2]	Total Annual[3]	Project Annual[2]	Total Annual[4]	Project Annual[2]	Total Annual[5]	Project Annual[2]	Total Annual[6]	Project Annual[2]	Total Annual[7]
San Jose Diridon Station Approach										
Aerial	2	26	2	24	<1	11	<1	10	Incremental concentration assessed in Table 7-51.[9]	
Berm	2	26	2	25	1	11	1	10		
At grade	5	29	5	28	1	11	1	11		
Diridon Station	<1	24	0	23	<1	11	<1	10		
Combined[9]	6	30	5	28	1	11	1	10		
Monterey Corridor										
Aerial	1	25	1	24	<1	11	<1	10	Incremental concentration assessed in Table 7-51.[9]	
Berm	3	27	3	26	1	11	1	10		
At grade	3	27	2	26	1	11	1	10		
Trench	13	37	12	34	2	12*	2	11		
Combined[9]	13	37	12	34	2	12*	2	11		
Morgan Hill and Gilroy										
Aerial	2	26	2	24	<1	11	<1	10	2	22*
Berm	1	26	1	24	<1	11	<1	10	1	21*
At grade	1	26	1	24	<1	11	<1	10	1	21*
Cut and fill	2	26	2	25	<1	11	<1	10	1	21*
Trench	7	31	7	30	1	12	1	11	6	26*
Tunnel	3	27	3	25	<1	11	<1	10	2	22*
Gilroy Station	<1	24	<1	23	<1	11	<1	10	<1	20*
MOWF	<1	24	<1	23	<1	11	<1	11	<1	20*
Batch plant	N/A	N/A	N/A	N/A	<1	5	<1	5	<1	20*
Combined[9]	8	32	7	30	1	12	1	11	7	27*

Construction Area	NO_2 (CAAQS) Project Annual[2]	NO_2 (CAAQS) Total Annual[3]	NO_2 (NAAQS) Project Annual[2]	NO_2 (NAAQS) Total Annual[4]	$PM_{2.5}$ (CAAQS) Project Annual[2]	$PM_{2.5}$ (CAAQS) Total Annual[5]	$PM_{2.5}$ (NAAQS) Project Annual[2]	$PM_{2.5}$ (NAAQS) Total Annual[6]	PM_{10} (CAAQS) Project Annual[2]	PM_{10} (CAAQS) Total Annual[7]
Pacheco Pass										
Aerial	4	12	4	12	<1	5	<1	5	Incremental concentration assessed in Table 7-51.[9]	
Tunnel	11	20	10	19	1	6	1	5		
Cut and fill	2	11	2	10	<1	5	<1	5		
Batch plant	N/A	N/A	N/A	N/A	<1	<u>13*</u>	<1	<u>13*</u>		
Combined[9]	11	20	10	19	1	6	1	5		
San Joaquin Valley										
Aerial	<1	14	<1	13	Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]	
Berm	1	14	1	14						
Cut and fill	1	14	1	14						
MOWS	<1	13	<1	13						
Combined[8]	1	14	1	14						
CAAQS/NAAQS (μg/m³)	**-**	**57**	**-**	**100**	**-**	**12**	**-**	**12**	**-**	**20**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CAAQS = California ambient air quality standards
CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
N/A Not applicable. Batch plants only have particulate matter emissions
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
μg/m³ = micrograms per cubic meter of air

[1] Only the highest modeled concentration in the form of the applicable standard is presented for each pollutant.
[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in <u>underline with an asterisk (*)</u> actually violate the standard.
[3] A background annual NO_2 concentration in the form of the (CAAQS) standard of 24.08, 8.55 and 13.40 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[4] A background annual NO_2 concentration in the form of the (NAAQS) standard of 23.75, 8.39 and 13.12 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[5] A background annual $PM_{2.5}$ concentration in the form of the (CAAQS) standard of 10.60, 5.10 and 13.3 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background annual $PM_{2.5}$ concentration in the form of the (NAAQS) standard of 9.57, 4.57 and 12.63 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[7] A background annual PM_{10} concentration in the form of the (CAAQS) standard off 21.90, 19.6 and 35.8 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[8] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[9] Background concentration exceeds the CAAQS and/or NAAQS.

Table 7-49 Annual National Ambient Air Quality Standards and California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 3 (μg/m^3)[1]

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project Annual[2]	Total Annual[3]	Project Annual[2]	Total Annual[4]	Project Annual[2]	Total Annual[5]	Project Annual[2]	Total Annual[6]	Project Annual[2]	Total Annual[7]
San Jose Diridon Station Approach										
Aerial	2	26	2	24	<1	11	<1	10	Incremental concentration assessed in Table 7-51.[9]	
Berm	2	26	2	25	1	11	1	10		
At grade	5	29	5	28	1	11	1	11		
Diridon Station	<1	24	<1	23	<1	11	<1	10		
Combined[9]	6	30	5	28	1	11	1	10		
Monterey Corridor										
Aerial	1	25	1	24	<1	11	<1	10	Incremental concentration assessed in Table 7-51.[9]	
Berm	3	27	3	26	1	11	1	10		
At grade	6	30	5	28	1	11	1	10		
Combined[9]	6	30	5	28	1	11	1	10		
Morgan Hill and Gilroy										
Aerial	1	25	1	24	<1	11	<1	10	1	22*
Cut and fill	2	26	2	25	<1	11	<1	10	1	21*
At grade	1	26	1	25	<1	11	<1	10	2	22*
Tunnel	3	27	3	25	<1	11	<1	10	2	22*
Gilroy Station	<1	24	0	23	<1	11	<1	10	<1	20*
MOWF	<1	24	0	23	<1	11	<1	10	<1	20*
Batch plant	N/A	N/A	N/A	N/A	<1	11	<1	10	<1	20*
Combined[9]	2	26	2	25	<1	11	<1	11	2	22*

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project Annual[2]	Total Annual[3]	Project Annual[2]	Total Annual[4]	Project Annual[2]	Total Annual[5]	Project Annual[2]	Total Annual[6]	Project Annual[2]	Total Annual[7]
Pacheco Pass										
Aerial	4	12	4	12	<1	5	<1	5	Incremental concentration assessed in Table 7-51.[9]	
Tunnel	11	20	10	19	1	6	1	5		
Cut and fill	2	11	2	10	<1	5	<1	5		
Batch plant	N/A	N/A	N/A	N/A	<1	13*	<1	13*		
Combined[9]	11	20	10	19	1	6	1	5		
San Joaquin Valley										
Aerial	<1	14	<1	13	Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]	
Berm	1	14	1	14						
Cut and fill	1	14	1	14						
MOWS	<1	13	<1	13						
Combined[8]	1	14	1	14						
CAAQS/NAAQS (μg/m³)	**-**	**57**	**-**	**100**	**-**	**12**	**-**	**12**	**-**	**20**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
μg/m³ = micrograms per cubic meter of air
N/A = Not applicable. Batch plants only have particulate matter emissions

[1] Only the highest modeled concentration in the form of the applicable standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.
[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.
[3] A background annual NO_2 concentration in the form of the (CAAQS) standard of 24.08, 8.55 and 13.40 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[4] A background annual NO_2 concentration in the form of the (NAAQS) standard of 23.75, 8.39 and 13.12 μg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[5] A background annual $PM_{2.5}$ concentration in the form of the (CAAQS) standard of 10.60, 5.10 and 13.3 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[6] A background annual $PM_{2.5}$ concentration in the form of the (NAAQS) standard of 9.57, 4.57 and 12.63 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.
[7] A background annual PM_{10} concentration in the form of the (CAAQS) standard off 21.90, 19.6 and 35.8 μg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.
[8] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.
[9] Background concentration exceeds the CAAQS and/or NAAQS.

Table 7-50 Annual National Ambient Air Quality Standards and California Ambient Air Quality Standards Criteria Pollutant Concentration Effects from Construction of Alternative 4 ($\mu g/m^3$)[1]

Construction Area	NO_2 (CAAQS)		NO_2 (NAAQS)		$PM_{2.5}$ (CAAQS)		$PM_{2.5}$ (NAAQS)		PM_{10} (CAAQS)	
	Project Annual[2]	Total Annual[3]	Project Annual[2]	Total Annual[4]	Project Annual[2]	Total Annual[5]	Project Annual[2]	Total Annual[6]	Project Annual[2]	Total Annual[7]
San Jose Diridon Station Approach										
Berm	6	31	6	29	2	12*	2	11	Incremental concentration assessed in Table 7-51.[9]	
At grade	3	27	3	26	1	11	1	10		
Diridon Station	<1	24	0	23	<1	11	<1	10		
Combined[9]	7	31	6	29	2	12*	2	11		
Monterey Corridor										
Berm	5	29	4	27	1	12	1	10	Incremental concentration assessed in Table 7-51.[9]	
At grade	6	30	6	29	1	11	1	10		
Combined[9]	6	30	6	29	1	12	1	10		
Morgan Hill and Gilroy										
Aerial	1	25	1	23	<1	11	<1	10	<1	20
Berm	3	27	2	25	1	11	1	10	3	23
At grade	1	26	1	24	<1	11	<1	10	2	22
Cut and fill	1	26	1	24	<1	11	<1	10	1	21
Tunnel	3	27	3	25	<1	11	<1	10	2	22
Gilroy Station	<1	24	<1	23	<1	11	<1	10	<1	20
MOWF	<1	24	<1	23	<1	11	<1	10	<1	20
Batch plant	N/A	N/A	N/A	N/A	<1	11	<1	10	<1	20
Combined[9]	3	27	3	26	1	11	1	10	3	23

Construction Area	NO_2 (CAAQS) Project Annual[2]	NO_2 (CAAQS) Total Annual[3]	NO_2 (NAAQS) Project Annual[2]	NO_2 (NAAQS) Total Annual[4]	$PM_{2.5}$ (CAAQS) Project Annual[2]	$PM_{2.5}$ (CAAQS) Total Annual[5]	$PM_{2.5}$ (NAAQS) Project Annual[2]	$PM_{2.5}$ (NAAQS) Total Annual[6]	PM_{10} (CAAQS) Project Annual[2]	PM_{10} (CAAQS) Total Annual[7]
Pacheco Pass										
Aerial	4	12	4	12	<1	5	<1	5	Incremental concentration assessed in Table 7-51.[9]	
Tunnel	11	20	10	19	1	6	1	5		
Cut and fill	2	11	2	10	<1	5	<1	5		
Batch plant	N/A	N/A	N/A	N/A	<1	13*	<1	13*		
Combined[9]	11	20	10	19	1	6	1	5		
San Joaquin Valley										
Aerial	<1	14	<1	13	Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]		Incremental concentration assessed in Table 7-51.[9]	
Berm	1	14	1	14						
Cut and fill	1	14	1	14						
MOWS	<1	13	<1	13						
Combined[8]	1	14	1	14						
CAAQS/NAAQS (µg/m³)	**-**	**57**	**-**	**100**	**-**	**12**	**-**	**12**	**-**	**20**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018

CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
µg/m³ = micrograms per cubic meter of air
N/A = Not applicable. Batch plants only have particulate matter emissions

[1] Only the highest modeled concentration in the form of the applicable standard is presented for each pollutant. Values have been rounded. In some cases, the rounded value may appear to violate the ambient air quality standard. Only those results shown in underline with an asterisk (*) actually violate the standard.

[2] Represents the maximum incremental off-site concentration in the form of the standard from project construction.

[3] A background annual NO_2 concentration in the form of the (CAAQS) standard of 24.08, 8.55 and 13.40 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[4] A background annual NO_2 concentration in the form of the (NAAQS) standard of 23.75, 8.39 and 13.12 µg/m³ (for the locations of San Jose – Jackson St., Salinas – Laurel Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[5] A background annual $PM_{2.5}$ concentration in the form of the (CAAQS) standard of 10.60, 5.10 and 13.3 µg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[6] A background annual $PM_{2.5}$ concentration in the form of the (NAAQS) standard of 9.57, 4.57 and 12.63 µg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – S. Coffee, respectively) was added to the maximum increment off-site project contribution.

[7] A background annual PM_{10} concentration in the form of the (CAAQS) standard off 21.90, 19.6 and 35.8 µg/m³ (for the locations of San Jose – Jackson St., Hollister - Fairview Dr, and Merced – M St, respectively) was added to the maximum increment off-site project contribution.

[8] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

[9] Background concentration exceeds the CAAQS and/or NAAQS.

Table 7-51 Incremental PM_{10} and $PM_{2.5}$ Concentrations from Construction of the Alternatives 1, 2, 3, and 4 in Areas with Background Concentrations in Excess of the AAQS (µg/m³)[1]

Construction Area	24- hour $PM_{2.5}$ (NAAQS)				24- hour PM_{10} (CAAQS)				Annual PM_{10} (CAAQS)				Annual $PM_{2.5}$ (NAAQS/CAAQS)			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
San Jose Diridon Station Approach																
Aerial	Background concentration does not exceed AAQS. Refer to Tables 7-40, 7-42, 7-44, and 7-46 for analysis of total concentrations relative to the NAAQS.				15.5	14.0	14.0	X	3.30	2.06	2.06	X	0.4	0.3	0.3	X
Berm					76.7	76.7	76.7	49.9	4.60	4.80	4.80	7.00	0.8	0.9	0.9	1.7
At grade					24.4	32.1	32.1	18.1	5.40	5.40	5.40	3.10	0.9	0.9	0.9	0.5
Diridon Station					3.7	3.7	3.7	3.7	0.10	0.10	0.10	0.10	<0.1	<0.1	<0.1	<0.1
Combined[1]					80.4	80.4	80.4	53.7	5.50	5.50	5.50	7.00	0.9	0.9	0.9	1.7
Monterey Corridor																
Aerial	Background concentration does not exceed AAQS. Refer to Tables 7-40, 7-42, 7-44, and 7-46 for analysis of total concentrations relative to the NAAQS.				10.5	22.7	10.5	X	1.30	1.20	1.30	X	0.2	0.2	0.2	X
Berm					16.9	17.7	16.9	20.5	2.90	3.10	2.90	4.60	0.6	0.6	0.6	1.0
At grade					20.5	19.5	20.5	29.1	5.70	5.00	5.70	5.50	0.9	0.8	0.9	0.9
Trench					X	122.2	X	X	X	10.30	X	X	X	X	X	X
Combined[1]					20.5	122.2	20.5	29.1	5.70	10.30	5.70	5.50	0.9	0.8	0.9	1.0
Morgan Hill and Gilroy																
Aerial	Background concentration does not exceed AAQS. Refer to Tables 7-40, 7-42, 7-44, and 7-46 for analysis of total concentrations relative to the NAAQS.				7.0	53.1	7.1	121.8	Background concentration does not exceed AAQS. Refer to Tables 7-47 through 7-50 for analysis of total concentrations relative to the CAAQS.				0.2	0.3	0.1	0.1
Berm					4.2	15.6	X	25.1					0.9	0.3	X	0.5
At grade					39.9	28.5	11.5	108.9					0.2	0.2	0.3	0.3
Cut and fill					4.2	4.2	4.2	5.2					0.2	0.2	0.3	0.2
Trench					X	47.8	X	X					X	1.0	X	X
Tunnel					3.4	3.4	3.4	3.4					0.3	0.3	0.3	0.3
Gilroy Station					2.9	2.9	2.9	2.9					<0.1	<0.1	<0.1	<0.1
MOWF					11.0	11.0	10.2	16.2					<0.1	<0.1	<0.1	<0.1
Batch plant					0.6	0.6	0.6	0.6					0.1	0.1	0.1	0.1
Combined[1]					50.9	64.1	21.7	138.0					1.0	0.3	0.3	0.6

Construction Area	24- hour $PM_{2.5}$ (NAAQS)				24- hour PM_{10} (CAAQS)				Annual PM_{10} (CAAQS)				Annual $PM_{2.5}$ (NAAQS/CAAQS)			
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4	Alt 1	Alt 2	Alt 3	Alt 4
Pacheco Pass																
Aerial	Background concentration does not exceed AAQS. Refer to Tables 7-40, 7-42, 7-44, and 7-46 for analysis of total concentrations relative to the NAAQS.				8.4	8.4	8.4	8.4	1.70	1.70	1.70	1.70	0.2	0.2	0.2	0.2
Tunnel					10.9	10.9	10.9	10.9	2.40	2.40	2.40	2.40	0.8	0.8	0.8	0.8
Cut and fill					3.3	3.3	3.3	3.3	1.30	1.30	1.30	1.30	0.2	0.2	0.2	0.2
Batch plant					5.2	5.2	5.2	5.2	0.70	0.70	0.70	0.70	0.1	0.1	0.1	0.1
Combined[1]					10.9	10.9	10.9	10.9	2.40	2.40	2.40	2.40	0.9	0.9	0.9	0.9
San Joaquin Valley																
Aerial	0.8	0.8	0.8	0.8	5.2	5.2	5.2	5.2	0.20	0.20	0.20	0.20	<0.1	<0.1	<0.1	<0.1
Berm	2.7	2.7	2.7	2.7	16.5	16.5	16.5	16.5	0.50	0.50	0.50	0.50	0.1	0.1	0.1	0.1
Cut and fill	0.6	0.6	0.6	0.6	3.3	3.3	3.3	3.3	0.30	0.30	0.30	0.30	0.1	0.1	0.1	0.1
MOWS	3.1	3.1	3.1	3.1	32.8	32.8	32.8	32.8	0.03	0.03	0.03	0.03	<0.1	<0.1	<0.1	<0.1
Combined[1]	5.8	5.8	5.8	5.8	49.3	49.3	49.3	49.3	0.55	0.55	0.55	0.55	0.1	0.1	0.1	0.1
SIL	**1.2**	**1.2**	**1.2**	**1.2**	**10.4**	**10.4**	**10.4**	**10.4**	**2.08**	**2.08**	**2.08**	**2.08**	**0.2**	**0.2**	**0.2**	**0.2**

Sources: AERMOD version 18081, Trinity Consultants 2016; USEPA 1978, 1998, 2006b, 2009, 2011; BAAQMD 2016; The Climate Registry 2018; Scholz 2018
CO = carbon monoxide
MOWF = maintenance of way facility
MOWS = maintenance of way siding
NAAQS = national ambient air quality standards
NO_2 = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
PM_{10} = particulate matter 10 microns or less in diameter
SIL = significant impact level
$\mu g/m^3$ = micrograms per cubic meter of air
X = Profile would not be constructed under the alternative.
[1] "Combined" conservatively estimates the sum of worst-case concentrations from all features that can occur concurrently at one receptor location.

7.12 Asbestos, Lead-Based Paint, Valley Fever, and Odors

7.12.1 Asbestos

NOA could become airborne as a result of excavating (including cuts and drilling deep foundations for aerial structures) or tunneling through ultramafic and metavolcanic bedrock. As noted in Section 6.5, Asbestos, Lead-Based Paint, Valley Fever, and Odors, no ultramafic or metavolcanic bedrock is mapped in the San Jose Diridon Station Approach or San Joaquin Valley Subsections. However, more than half of the alignment in the Pacheco Pass Subsection includes tunneling through bedrock that may contain zones of ultramafic or metavolcanic bedrock. Similarly, ultramafic rock is presented within the Monterey Corridor and Morgan Hill and Gilroy Subsections. While excavation and soil movement in these subsections may disturb NOA, the design-build contractor would prepare a CMP that outlines practices for avoiding and minimizing NOA. Construction contractors would also be required to comply with the BAAQMD's Asbestos Airborne Toxic Control Measure for Construction and Grading Operations, which requires implementation of dust control measures to limit the potential for airborne asbestos.

The demolition of asbestos-containing materials is subject to the limitations of the *National Emission Standards for Hazardous Air Pollutants* regulations and would require an asbestos inspection. The Authority would consult with the BAAQMD, MBARD, and SJVAPCD, as applicable, before demolition activities begin.

7.12.2 Lead-Based Paint

Buildings in the RSA might be contaminated with residual Pb, which was used as a pigment and drying agent in oil-based paint until the Lead-Based Paint Poisoning Prevention Act of 1971 prohibited such use. If encountered during demolitions and relocations for any of the project alternatives, LBP and asbestos would be handled and disposed of in accordance with applicable standards. Section 3.10, Hazardous Materials and Wastes, of the Draft EIR/EIS discusses potential issues of LBP during construction of the project.

7.12.3 Valley Fever

While there are several factors that influence receptor exposure and development of Valley fever, earthmoving activities during construction could release C. immitis spores if filaments are present and other soil chemistry and climatic conditions are conducive to spore development. Receptors adjacent to the construction area may therefore be exposed to increased risk of inhaling C. immitis spores and subsequent development of Valley fever. Dust control measures are the primary defense against infection (USGS 2000). The project includes all best available fugitive dust control measures (see AQ-IAMF#1) that would avoid dusty conditions and reduce the risk of contracting Valley fever through routine watering and other measures.

7.12.4 Odors

Sources of odor during project construction would include diesel exhaust from construction equipment and asphalt paving. All odors would be localized and generally confined to the immediate area surrounding the construction site. The project would use typical construction techniques. The equipment odors would be temporary and localized, and they would cease once construction activities have been completed. The BAAQMD, MBARD, and SJVAPCD have adopted rules that limit the amount of ROG emissions from cutback asphalt (Section 3.3, Regional and Local).

No potentially odorous emissions would be associated with train operation because the trains would be powered from the regional electrical grid. There would be some area source emissions associated with station and maintenance facility operation, such as natural-gas combustion for space and water heating, landscaping equipment emissions, and minor solvent and paint use. The solvent and paint use could be odorous to sensitive receptors. However, the exposure would be less severe than the exposure to odors from other commercial and industrial activities that would occur in these areas under the No Project Alternative.

7.13 Summary of Effects

Project features, including IAMFs, design standards, and compliance with the Authority's project design guideline technical memoranda, would minimize effects of Air Quality. Table 7-52 summarizes the project alternatives' air quality effects.

Construction of all four project alternatives would result in ROG and NO_X emissions that would exceed the BAAQMD's CEQA thresholds, as well as the SJVAPCD's annual CEQA thresholds for NO_X, CO, and PM_{10}. Alternatives 1, 2, and 4 would also exceed the MBARD's PM_{10} CEQA threshold. Construction of all project alternatives would exceed the general conformity *de minimis* NO_X thresholds in the SFBAAB and SJVAB.

The project would be constructed with all feasible on-site control measures to reduce emissions and minimize effects on air quality. Effects associated with fugitive dust emissions would be minimized through implementation of a dust control plan (AQ-IAMF#1) and best management practices at new concrete batch plants (AQ-IAMF#6). The contractor would use low-VOC paints to limit the emissions of VOCs (AQ-IAMF#2). Exhaust-related pollutants would be reduced through use of renewable diesel, Tier 4 off-road engines, and model year 2010 or newer on-road engines, as required by AQ-IAMF#3 through AQ-IAMF#5. However, even with application of IAMFs, exceedances of air district and general conformity thresholds would still occur. The Authority would implement mitigation measures to offset the remaining construction impact on air quality resources. Specifically, ROG, NO_X, and PM_{10} emissions would be offset in the BAAQMD and MBARD, as applicable, to below BAAQMD and MBARD thresholds or net zero (as required by the General Conformity regulation). ROG, NO_X, and PM emissions would be fully offset (i.e., to net zero) within the SJVAPCD, pursuant to the Authority's MOU with the air district for the HSR subsections within the SJVAB. Pursuant to SJVAPCD's GAMAQI, emissions offsets procured through AQ-MM#3 could not be used to mitigate CO effects. Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold even after implementation of all feasible mitigation.

Construction activities would not exceed applicable local air district health risk thresholds or criteria; however, they would exceed state and federal ambient air quality standards. Construction of all alternatives would lead to new violations of the PM_{10} and $PM_{2.5}$ CAAQS and NAAQS, as well as potentially contribute to existing PM violations through exceedances of the SIL. Alternatives 1, 2, and 4 would also violate the 1-hour NO_2 NAAQS and CAAQS.

Table 7-52 Summary of Effects

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Temporary Direct and Indirect Effects on Air Quality within the SFBAAB	Temporary construction activity would generate NO_X emissions in excess of the General Conformity *de minimis* threshold. Emissions would also exceed BAAQMD's ROG and NO_X CEQA thresholds.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Temporary Direct and Indirect Effects on Air Quality within the NCCAB	Construction-related PM_{10} emissions would exceed MBARD's threshold.	Same as Alternative 1.	Temporary construction activity would generate criteria pollutants, but those emissions would not exceed MBARD's PM_{10} threshold.	Same as Alternative 1.
Temporary Direct and Indirect Effects on Air Quality within the SJVAB	Temporary construction activity would generate NO_X emissions in excess of the General Conformity *de minimis* threshold. Emissions would also exceed SJVAPCD's NO_X, CO, and PM_{10} CEQA thresholds.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Temporary Direct Effects on Implementation of an Applicable Air Quality Plan	Construction-related criteria pollutant emissions would exceed adopted air district thresholds in the BAAQMD, MBARD, and SJVAPCD, and the federal *de minimis* NO_X thresholds in the SFBAAB and SJVAB.	Same as Alternative 1.	Construction-related criteria pollutant emissions would exceed adopted air district thresholds in the BAAQMD and SJVAPCD, and the federal *de minimis* NO_X thresholds in the SFBAAB and SJVAB.	Same as Alternative 1.
Temporary Direct Effects on Localized Air Quality—Criteria Pollutants	Temporary construction activity would violate the 1-hour NO_2 CAAQS and NAAQS, annual PM_{10} CAAQS, annual $PM_{2.5}$ CAAQS and NAAQS, and 24-hour $PM_{2.5}$ NAAQS. Emissions concentrations would also exceed the 24-hour and annual PM_{10} SIL and 24-hour and annual $PM_{2.5}$ SIL.	Same as Alternative 1.	Temporary construction activity would violate the annual PM_{10} CAAQS, annual $PM_{2.5}$ CAAQS and NAAQS, and 24-hour $PM_{2.5}$ NAAQS. Emissions concentrations would also exceed the 24-hour and annual PM_{10} SIL and 24-hour and annual $PM_{2.5}$ SIL.	Temporary construction activity would violate the 1-hour NO_2 CAAQS and NAAQS, annual and 24-hour PM_{10} CAAQS, annual $PM_{2.5}$ CAAQS and NAAQS, and 24-hour $PM_{2.5}$ NAAQS. Emissions concentrations would also exceed the 24-hour and annual PM_{10} SIL and 24-hour and annual $PM_{2.5}$ SIL.

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Temporary Direct Effects on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)	Temporary construction activity would not generate DPM or $PM_{2.5}$ concentrations in excess of established health risk thresholds. The maximum increase in potential cancer risk (5.0 per million) would occur in the San Joaquin Valley Subsection.	Temporary construction activity would not generate DPM or $PM_{2.5}$ concentrations in excess of established health risk thresholds. The maximum increase in potential cancer risk (5.0 per million) would occur in the Monterey Corridor and San Joaquin Valley Subsections.	Temporary construction activity would not generate DPM or $PM_{2.5}$ concentrations in excess of established health risk thresholds. The maximum increase in potential cancer risk (9.4 per million) would occur in the Morgan Hill and Gilroy Subsection.	Temporary construction activity would not generate DPM or $PM_{2.5}$ concentrations in excess of established health risk thresholds. The maximum increase in potential cancer risk (6.1 per million) would occur in the Monterey Corridor Subsection.
Temporary Direct Effects on Localized Air Quality—Exposure to Asbestos, Lead-Based Paint, and Valley Fever	Project design and compliance with existing asbestos and LBP handling and disposal standards, as well as fugitive dust control practices, would prevent exposure of sensitive receptors to substantial pollutant concentrations. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 4.4 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 51.5 million cubic yards of soil and disturbance of 813 acres.	Same as Alternative 1. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 6.3 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 60.4 million cubic yards of soil and disturbance of 1,047 acres.	Same as Alternative 1. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 3.9 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 58.7 million cubic yards of soil and disturbance of 870 acres.	Same as Alternative 1. There would be limited potential for exposure of sensitive receptors to asbestos or LBP associated with demolition of 2.2 million square feet. There would be limited potential for exposure of sensitive receptors to Valley fever associated with movement of 52.2 million cubic yards of soil and disturbance of 1,048 acres.

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Temporary Direct Effects on Localized Air Quality—Exposure to Odors	There would be limited potential for odors generated by construction to affect sensitive receptors or result in nuisance complaints.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Continuous Permanent Direct Effects on Air Quality within the SFBAAB, NCCAB, and SJVAB—On-Road Vehicle, Train, Aircraft, Station, and Maintenance Facility Emissions	Long-term operation of the HSR system would reduce criteria pollutant emissions, relative to No Project conditions, resulting in a regional and local air quality benefit. Annual reductions would range from 23 to 54 tons of VOC, 332 to 1,120 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 34 to 77 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.	Same as Alternative 1. Annual reductions would range from 23 to 54 tons of VOC, 332 to 1,120 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 34 to 77 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.	Same as Alternative 1. Annual reductions would range from 23 to 54 tons of VOC, 330 to 1,119 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 32 to 76 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.	Same as Alternative 1. Annual reductions would range from 23 to 54 tons of VOC, 332 to 1,120 tons of CO, 208 to 447 tons of NO_X, 22 to 48 tons of SO_2, 34 to 77 tons of PM_{10}, and 12 to 27 tons of $PM_{2.5}$, depending on the ridership scenario.
Continuous Permanent Direct Effects on Implementation of an Applicable Air Quality Plan	Emissions reductions from project operation would support implementation of air quality plans and attainment of regional air quality goals.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Continuous Permanent Direct Effects on Localized Air Quality—Carbon Monoxide Hot Spots (NAAQS Compliance)	Increased project traffic would not result in localized CO hot spots or exceedances of the CO NAAQS or CAAQS.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

Effect	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Continuous Permanent Direct Effects on Localized Air Quality—Exposure to Mobile Source Air Toxics	Operation of the HSR system would result in a regional MSAT reduction and benefit. Increased station traffic would have a low potential for meaningful localized MSAT impacts.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Continuous Permanent Direct Effects on Localized Air Quality—Particulate Matter Hot Spots (NAAQS Compliance)	The project is not considered to be a project of air quality concern, based on the descriptions as indicated in 40 C.F.R. Section 93.123(b)(1).	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Continuous Permanent Direct Effects on Localized Air Quality—Exposure to Diesel Particulate Matter and $PM_{2.5}$ (Health Risk)	Emissions of DPM and $PM_{2.5}$ from relocated freight service and station and maintenance facility operation would not expose sensitive receptors to pollutant concentrations since health risks would not exceed BAAQMD's thresholds.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Continuous Permanent Direct Effects on Localized Air Quality—Exposure to Odors	Emissions-generated odors would be limited and would not be expected to affect a substantial number of people.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

BAAQMD = Bay Area Air Quality Management District
C.F.R. = Code of Federal Regulations
CAAQS = California ambient air quality standards
CEQA = California Environmental Quality Act
CO = carbon monoxide
DPM = diesel particulate matter
HSR = high-speed rail
LBP = lead-based paint
MBARD = Monterey Bay Air Resources District
MSAT = mobile source air toxics
NAAQS = national ambient air quality standards
NCCAB = North Central Coast Air Basin
NO_2 = nitrogen dioxide
NO_X = nitrogen oxide
$PM_{2.5}$ = particulate matter 2.5 microns in diameter or less
PM_{10} = particulate matter 10 microns in diameter or less
ROG = reactive organic gas
SFBAAB = San Francisco Bay Area Air Basin
SIL = significant impact level
SJVAB = San Joaquin Valley Air Basin
SJVAPCD = San Joaquin Valley Air Pollution Control District
SO_2 = sulfur dioxide
VOC = volatile organic compound

8 GLOBAL CLIMATE CHANGE EFFECTS ANALYSIS

Using the methods described in Chapter 6, this chapter evaluates and discusses the effects of the project pertaining to global climate change and GHG.

8.1 Statewide and Regional Operations Emissions Analysis

Table 8-1 shows the statewide GHG emission changes (expressed in terms of CO_2e) that would result from the project under the medium and high ridership scenarios for the 2015 Existing and 2029 and 2040 No Project conditions. The analysis estimated the emission changes from reduced on-road VMT, reduced intrastate aircraft travel, and increased electrical demand. As Table 8-1 shows, the project is predicted to have a beneficial effect on statewide GHG emissions relative to both the 2015 Existing and 2029 and 2040 No Project conditions because it would result in a net reduction in GHG emissions. The estimated GHG emissions changes would be the same under all four project alternatives because the ridership scenarios do not vary by alternative.

This analysis considers the GHG effects associated with the project beyond 2020, consistent with SB 32 (Section 3.2.3.8, Senate Bill 32 and Assembly Bill 197), by assessing operations emissions for two conditions (2029 and 2040). Table 8-1 shows that the project would result in GHG reductions relative to the 2029 and 2040 No Project conditions and would help the state reach the goal established in SB 32 (40 percent below 1990 levels). Based on the 1990 emissions of 431 million metric tons CO_2e, the state would need to reduce emissions by 172 million metric tons CO_2e to achieve the SB 32 goal. The project would reduce statewide GHG emissions by 1.1–1.6 million metric tons CO_2e in the design year (2040), depending on the ridership scenario. These reductions correspond to an annual reduction of 0.6 to 0.9 percent of the 172 million metric tons CO_2e needed to achieve the SB 32 goal.

Table 8-1 Estimated Statewide Greenhouse Gas Emissions Change from the Project—Medium and High Ridership Scenarios (million metric tons CO_2e per year)

Emission Source	Change in CO_2e Emissions from HSR (million t/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
On(road vehicles	(1.1)	(1.5)
Aircraft	(0.7)	(0.7)
Power plants	0.4	0.4
Total statewide emissions	(1.4)	(1.7)
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
On(road vehicles	(0.4)	(0.3)
Aircraft	(0.5)	(0.5)
Power plants	0.3	0.4
Total statewide emissions	(0.6)	(0.4)
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
On(road vehicles	(0.5)	(1.1)
Aircraft	(1.0)	(0.9)
Power plants	0.4	0.4
Total statewide emissions	(1.1)	(1.6)

Source: Authority 2019e
(Parentheses) indicate negative values
Totals may not add up exactly because of rounding.
CO_2e = carbon dioxide equivalent
HSR = high-speed rail
t = metric tons

Table 8-1 also shows that the net change in emissions for 2015 Existing conditions would be a decrease in GHG emissions. Despite increases in power plant emissions from the project plus all other statewide activity between 2015 and 2040, total statewide GHG emissions in 2040 would be less than the level of GHG emissions in 2015. As evident in Table 8-1, the primary factor for the net decrease in emissions is decreases in on-road vehicle emissions related to advancements in vehicle emissions technology and the retirement of older, higher-emitting vehicles. Statewide growth would increase background aircraft emissions, but the project would reduce emissions relative to the No Project conditions by diverting passengers from aircraft to HSR. Therefore, the project's effect on GHG emissions would be beneficial with respect to both 2015 Existing conditions and the 2029 and 2040 No Project conditions.

8.1.1 On-Road Vehicles

The project would reduce annual roadway VMT compared to 2015 Existing Conditions and the 2029 and 2040 No Project conditions because travelers would use the HSR rather than drive (see Table 7-6 for VMT under No Project and Plus Project conditions). The on-road vehicle emission analysis is based on projected VMT changes and associated average daily speed estimates, calculated based on the ridership estimates presented in the 2016 Business Plan (Authority 2016). Analysts obtained GHG emission factors from EMFAC2017, using statewide parameters.

As shown in Table 8-2, the project is predicted to decrease statewide on-road GHG emissions relative to both 2015 Existing conditions and 2029 and 2040 No Project conditions. On county and regional levels, Table 8-2 also shows the project is predicted to result in a decrease in on-road GHG emissions relative to both conditions, as well. As discussed previously, on-road vehicle emissions are expected to decrease in the future because of advancements in vehicle emissions technology and the retirement of older, higher-emitting vehicles. Therefore, the reduction in GHG emissions from on-road vehicles because of the project is demonstrated on the county, regional, and statewide levels for both conditions. The change in emissions would be the same under all four project alternatives because the ridership is assumed to be the same.

Table 8-2 Regional On-Road Vehicle Greenhouse Gas Emission Changes from the Project—Medium and High Ridership Scenarios (million metric tons CO_2e per year)

Location	Change in CO_2e Emissions from HSR (million t/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
Santa Clara	(0.1)	(0.1)
San Benito	<0.0	(0.1)
Merced	<0.0	(0.1)
Total regional net emissions	(0.1)	(0.2)
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
Santa Clara	<0.0	<0.0
San Benito	<0.0	<0.0
Merced	<0.0	<0.0
Total regional net emissions	(0.1)	(0.1)

Location	Change in CO_2e Emissions from HSR (million t/year)	
	Medium	High
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
Santa Clara	<0.0	(0.1)
San Benito	<0.0	<0.0
Merced	<0.0	(0.1)
Total regional net emissions	(0.1)	(0.2)

Source: Authority 2019e
(Parentheses) indicate negative values
Totals may not add up exactly because of rounding.
CO_2e = carbon dioxide equivalent
t = metric tons
HSR = high-speed rail

8.1.2 Trains

The project would use EMU trains, with the power distributed through the overhead contact system. The HSR system would not produce direct GHG emissions from combustion of fossil fuels and associated emissions. Electricity-related emissions are assessed in Section 8.1.4, Power Plants.

8.1.3 Aircraft

As described in Section 6.2.3, analysts calculated aircraft emissions by using fuel consumption and emission factors, profiles of aircrafts, and number of air trips removed. Refer to Table 7-10 for the number of flights in 2015, 2029, and 2040 with and without the project. As shown in Table 8-3, the project would reduce regional (Bay Area) and statewide emissions relative to 2015 Existing and 2029 and 2040 No Project conditions. The change in emissions would be the same under all four project alternatives because the ridership is assumed to be the same.

Table 8-3 Aircraft Greenhouse Gas Emission Changes from the Project—Medium and High Ridership Scenarios (million metric tons CO_2e per year)

Location	Change in CO_2e Emissions from HSR (million t/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
Regional (Bay Area)	(0.3)	(0.3)
Total statewide net emissions	(0.7)	(0.7)
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
Regional (Bay Area)	(0.2)	(0.2)
Total statewide net emissions	(0.5)	(0.5)
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
Regional (Bay Area)	(0.4)	(0.4)
Total statewide net emissions	(1.0)	(0.9)

Source: Authority 2019e
(Parentheses) indicate negative values
Totals may not add up exactly because of rounding.

CO_2e = carbon dioxide equivalent
HSR = high-speed rail
t = metric tons

8.1.4 Power Plants

The HSR system would increase electrical requirements when compared to both the 2015 Existing and 2029 and 2040 No Project conditions. Analysts conservatively estimated the electrical demands from propulsion of the trains and operation of the trains in storage depots and maintenance facilities. Table 8-4 shows the GHG emissions for both medium and high ridership scenarios relative to the 2015 Existing Conditions and 2029 and 2040 No Project conditions. Emissions would increase under both scenarios.

The state's electrical grid would power the HSR system, and, therefore, no single generation source for the electrical power requirements can be identified. As previously discussed, the state requires an increasing fraction (60 percent by 2030) of electricity generated for the state's power portfolio to come from renewable energy sources, and the Authority has a policy goal to use 100 percent renewable energy to power the HSR system. Accordingly, the GHG emissions generated for powering the HSR system are expected to be lower in the future compared to emission estimates used in this analysis, which assume the current energy mix of California. As shown in Table 8-4, the HSR system's electrical requirements would increase statewide and regional indirect GHG emissions.

Table 8-4 Power Plant Greenhouse Gas Emission Changes from the Project—Medium and High Ridership Scenarios (million metric tons CO_2e per year)

Location	Change in CO_2e Emissions from HSR (million t/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
Regional	<0.1	<0.1
Statewide	0.4	0.4
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
Regional	<0.1	<0.1
Statewide	0.3	0.4
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
Regional	<0.1	<0.1
Statewide	0.4	0.4

Source: Authority 2019e
Totals may not add up exactly because of rounding.
CO_2e = carbon dioxide equivalent
HSR = high-speed rail
t = metric tons

8.1.5 Regional Operations Greenhouse Gas Emissions Summary

A summary of the effects of the project on regional GHG emissions, which include the emissions from vehicles, aircraft, and power plants, is shown in Table 8-5. The project would reduce regional GHG emissions relative to 2015 Existing and 2029 and 2040 No Project conditions. However, this regional assessment does not account for the benefit of emissions reductions in roadway and airplane emissions that would occur statewide. Therefore, the full benefit of the project is not reflected in the emissions at the regional level. However, as shown in Table 8-5, the project would result in a net reduction in GHG emissions statewide for both conditions. Because GHGs circulate globally, an increase at the regional level would not be adverse, given the net reduction at the state level. There would be no difference in emissions among the alternatives because ridership is assumed to be the same.

Table 8-5 Estimated Regional Greenhouse Gas Emissions Change from the Project—Medium and High Ridership Scenarios (million metric tons CO_2e per year)

Emission Source	Change in CO_2e Emissions from HSR (million t/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
On-road vehicles	(0.1)	(0.2)
Aircraft	(0.3)	(0.3)
Power plants	<0.1	<0.1
Total regional emissions	(0.4)	(0.4)
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
On-road vehicles	(0.1)	(0.1)
Aircraft	(0.2)	(0.2)
Power plants	<0.1	<0.1
Total regional emissions	(0.2)	(0.3)
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
On-road vehicles	(0.1)	(0.2)
Aircraft	(0.4)	(0.4)
Power plants	<0.1	<0.1
Total regional emissions	(0.5)	(0.5)

Source: Authority 2019e
(Parentheses) indicate negative values
Totals may not add up exactly because of rounding.
CO_2e = carbon dioxide equivalent
HSR = high-speed rail
t = metric tons

8.2 Local Operations Emissions Sources

Operation of the San Jose Diridon and Gilroy stations and maintenance facilities would produce GHG emissions. Likewise, additional circuit breakers installed as part of the PG&E reconductoring work may result in fugitive SF_6 emissions. The operation of the power traction, switching, and paralleling stations would not result in appreciable quantities of air pollutants because site visits would be infrequent, and power usage would be limited. Therefore, analysts did not quantify emissions from these stations. This section therefore focuses on emissions generated by the station sites, maintenance facilities, and SF_6 circuit breakers.

8.2.1 Station Sites and Maintenance Facilities

Emissions associated with the operation of stations and maintenance facilities are expected because of combustion sources used primarily for space heating and facility landscaping, energy consumption for facility lighting, water usage, waste generation, and employee and passenger traffic. Analysts used CalEEMod to estimate these emissions from the stations and maintenance facilities, based on the square footage of the buildings. Operation of the MOWF would also generate emissions from vehicles, equipment, and locomotives used for maintenance activities. The GHG emissions (expressed in terms of CO_2e) were estimated for the 2015 Existing and 2029 and 2040 No Project conditions and are included in Table 8-6. The only difference in emissions among the alternatives is associated with the Gilroy stations. Since the East Gilroy Station is entirely new, net emissions are greater than the Downtown Gilroy Station since emissions under existing conditions are zero.

Table 8-6 Station and Maintenance Facility Operational Greenhouse Gas Emissions (metric tons CO_2e per year)

Project Component	CO_2e
2015 Existing[1]	
San Jose Diridon Station	2,780
Downtown Gilroy Station	234
Existing Plus Project	
San Jose Diridon Station[3]	4,934
Downtown Gilroy Station[4]	3,180
East Gilroy Station	3,148
MOWF[5]	3,861
MOWS	2,144
PROJECT CHANGE – Alternatives 1, 2, and 4	**11,106**
PROJECT CHANGE – Alternative 3	**11,308**
2029 No Project[1]	
San Jose Diridon Station	2,367
Downtown Gilroy Station	206
2029 Plus Project	
San Jose Diridon Station[3]	3,663
Downtown Gilroy Station[4]	2,494
East Gilroy Station	2,991
MOWF[5]	3,375
MOWS	1,811
PROJECT CHANGE – Alternatives 1, 2, and 4	**8,770**
PROJECT CHANGE – Alternative 3	**9,474**
2040 No Project[1]	
San Jose Diridon Station	2,515
Downtown Gilroy Station	217
2040 Plus Project	
San Jose Diridon Station[3]	6,014
Downtown Gilroy Station[4]	4,279
East Gilroy Station	4,763
MOWF[5]	3,282
MOWS	1,776

Project Component	CO_2e
PROJECT CHANGE – Alternatives 1, 2, and 4	**12,620**
PROJECT CHANGE – Alternative 3	**13,321**

Sources: Trinity Consultants 2016; Newson 2018; USEPA 2009; Burton 2017a, 2017b, 2017c, 2018 ; McGuire 2017–2018
CO_2e = carbon dioxide equivalent
MOWF = maintenance of way facility
MOWS = maintenance of way siting
[1] Represents emissions from the existing facilities prior to HSR improvements. The East Gilroy Station, MOWF, and MOWS do not exist under existing conditions, and, as such, existing emissions are assumed to be zero.
[2] There would be no difference in operational emissions between the aerial and at-grade options.
[3] There would be no difference in operational emissions between the aerial and embankment options.
[4] There would be no difference in operational emissions between the south and east Gilroy options.

8.2.2 Sulfur Hexafluoride Circuit Breakers

PG&E substations and switching stations would require the installation of electrical equipment, including up to 12 power circuit breakers with SF_6 gas-type insulated switchgear. It is assumed that the annual SF_6 leakage rates associated with the 12 additional circuit breakers (up to 230 pounds each) would not exceed 0.5 percent. Based on the GWP of SF_6 (see Section 4.4, Greenhouse Gases), the additional equipment would result in approximately 143 metric tons of CO_2e emissions annually for all four project alternatives.

8.3 Total Operations Emissions

Table 8-7 shows the total GHG emission changes because of project operation for the medium and high ridership scenarios, including the indirect emissions from regional vehicle travel, aircraft, and power plants and direct project operations emissions from HSR stations, maintenance facilities, and SF_6 circuit breakers under the project. The project would result in a net decrease in GHG emissions. These decreases would be beneficial to the SFBAAB, NCCAB, SJVAB, and state and would help meet local and statewide GHG reduction goals. Although lower ridership would result, there would still be a net benefit. The overall change in GHG emissions would be approximately the same under all four project alternatives.

Table 8-7 Summary of Total Statewide Greenhouse Gas Emissions Changes from Operation of the Project—2015 Existing and 2029 and 2040 No Project Conditions (Medium and High Ridership Scenarios) (million metric tons CO_2e per year)

Emission Source	Change in CO_2e Emissions from HSR (Million t/year)	
	Medium	High
Existing Plus Project Emissions Relative to 2015 Existing Conditions		
Indirect emissions		
On(road vehicles	(1.1)	(1.5)
Aircraft	(0.7)	(0.7)
Power plants	0.4	0.4
Direct emissions[1]		
Alternative 1	<0.1	
Alternative 2	<0.1	
Alternative 3	<0.1	
Alternative 4	<0.1	
Total emissions[2]	(1.4)	(1.7)

Emission Source	Change in CO_2e Emissions from HSR (Million t/year)	
	Medium	High
2029 Plus Project Emissions Relative to 2029 No Project Conditions		
Indirect emissions		
On(road vehicles	(0.4)	(0.3)
Aircraft	(0.5)	(0.5)
Power plants	0.3	0.4
Direct emissions[1]		
Alternative 1	<0.1	
Alternative 2	<0.1	
Alternative 3	<0.1	
Alternative 4	<0.1	
Total emissions[2]	(0.6)	(0.4)
2040 Plus Project Emissions Relative to 2040 No Project Conditions		
Indirect emissions		
On(road vehicles	(0.5)	(1.1)
Aircraft	(1.0)	(0.9)
Power plants	0.4	0.4
Direct emissions[1]		
Alternative 1	<0.1	
Alternative 2	<0.1	
Alternative 3	<0.1	
Alternative 4	<0.1	
Total emissions[2]	(1.1)	(1.6)

Sources: Authority 2019e; Trinity Consultants 2016; Newson 2018 ; USEPA 2009; Burton 2017a, 2017b, 2017c, 2018; McGuire 2017–2018
(Parentheses) indicate negative values
CO_2e = carbon dioxide equivalent
HSR = high-speed rail
t = metric tons
SF_6 = sulfur hexafluoride
[1] Sum of station, maintenance facility, and SF_6 circuit breaker emissions. Represents the net emissions effect of the project (i.e., the difference in operating emissions between existing or No Project condition and the project condition).
[2] The total includes the indirect and direct emissions for the alternative (Alternative 3) with the greatest total emissions. Totals may not add up exactly because of rounding.

8.4 Construction Greenhouse Gas Emissions

GHG emissions generated from construction of the project would be short term. However, since the time that CO_2 remains in the atmosphere cannot be definitively quantified because of the wide range of time scales in which carbon reservoirs exchange CO_2 with the atmosphere, there is no single value for the half-life of CO_2 in the atmosphere (IPCC 2007). Therefore, the duration that CO_2 emissions from a short-term project would remain in the atmosphere is unknown.

Tables 8-8 through 8-11 show construction activity emissions from the project. The analysis assumes implementation of AQ-IAMF#1 through AQ-IAMF#6. The total GHG construction emissions of the project (Alternative 4) would be less than 0.12 percent of the total annual statewide GHG emissions.[28]

Tables 8-8 through 8-10 also show the amortized GHG emissions during project construction activities. GHG pollutants such as N_2O can remain in the atmosphere for 120 years (IPCC 2007). A 25-year project life is conservatively assumed (although the actual project life would be much longer). Total amortized GHG construction emissions for the project are estimated to be between 14,784 and 19,908 metric tons CO_2e per year, with Alternative 4 generating the most emissions, and Alternative 1 generating the least. Most emissions would occur in the BAAQMD (58 percent to 69 percent), followed by SJVAPCD (28 percent to 38 percent), and MBARD (4 percent to 7 percent). The increase in GHG emissions generated during construction would be offset in 8 to 14 months, depending on the alternative, during operation by the net GHG reductions in operation (because of car and aircraft trips removed in the RSA), relative to No Project conditions.

[28] A GHG emissions inventory for the regional project vicinity was not available at the time of the release of this document, so the comparison was made to CARB's 2016 emissions inventory, which estimated that the annual CO_2e emissions in California are about 429 million metric tons (CARB 2018d).

Table 8-8 Alternative 1 Carbon Dioxide Equivalent Construction Emissions (metric tons per year)[1, 2]

Year	Air District		
	BAAQMD	MBARD	SJVAPCD
2022	29,969	4,653	14,571
2023	46,811	3,255	28,198
2024	59,544	2,617	28,483
2025	45,359	2,083	25,832
2026	20,512	1,176	22,716
2027	10,910	1,196	17,291
2028	2,283	271	1,876
Total by air district	215,387	15,250	138,967
Construction total	369,604		
Amortized GHG Emissions (averaged over 25 years)			
CO_2e per year by air district	8,615	610	5,559
CO_2e per year for total construction	14,784		
Payback of GHG Emissions (months)[2, 3]			
Payback period (project vs. 2029 no project)	8 to 11		

Sources: Trinity Consultants 2016; USEPA 1978; USEPA 2018c; The Climate Registry 2018; Scholz 2018
BAAQMD = Bay Area Air Quality Management District
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
MBARD = Monterey Bay Air Resources District
SJVAPCD = San Joaquin Valley Air Pollution Control District
< = less than
[1] Project life assumed to be 25 years.
[2] Payback periods were estimated by dividing the GHG emissions during construction by the annual GHG emission reduction during operation. See Table 8-7 for operational GHG emission-reduction data. The range in payback days represents the range of emissions changes based on the medium and high ridership scenarios.
[3] The payback period accounts for all emissions directly and indirectly generated by construction activities for which the Authority has practical control and program responsibility. Emissions generated upstream (e.g., material manufacturing) and downstream (e.g., recycling) of construction, otherwise known as “lifecycle emissions”, are not included in the analysis, consistent with guidance from the California Natural Resources Agency (2018). While the origin of most raw materials is not known, and thus an emissions analysis would be speculative, construction of the project would require concrete from on- and off-site batch plants. Lifecycle emissions for cement and aggregate manufacturing, which is upstream of the concrete batching process, have been studied in various literature. Accordingly, for the purposes of disclosure, analysts quantified upstream CO_2 emissions resulting from cement and aggregate manufacturing using emission factors from Marceau et al. (2007). It was assumed the tunnel segments would require a compression strength of 7,500 pounds per square inch and all other infrastructure would require a compression strength of 5,000 pounds per square inch. The analysis indicates that cement and aggregate manufacturing would generate 1,004,663 metric tons CO_2e. These emissions would be generated upstream of construction and through activities for which the Authority has no practical control. The emissions are therefore disclosed for informational purposes only. Nonetheless, it is worth noting that if the emissions were added to the 369,604 metric tons CO_2e generated by construction of Alternative 1, the combined total emissions would be offset in 2 to 3 years (relative to 2029 No Project conditions).

Table 8-9 Alternative 2 Carbon Dioxide Equivalent Construction Emissions (metric tons per year)[1, 2]

Year	Air District		
	BAAQMD	MBARD	SJVAPCD
2022	41,788	6,809	14,571
2023	64,000	5,435	28,198
2024	79,535	4,367	28,483
2025	55,303	3,890	25,832
2026	27,644	2,460	22,716
2027	24,771	4,229	17,291
2028	3,283	476	1,876
Total by air district	296,323	27,666	138,967
Construction total	462,956		
Amortized GHG Emissions (averaged over 25 years)			
CO_2e per year by air district	11,853	1,107	5,559
CO_2e per year for total construction	18,518		
Payback of GHG Emissions (months)[2, 3]			
Payback period (project vs. 2029 no project)	10 to 13		

Sources: Trinity Consultants 2016; USEPA 1978; USEPA 2018c; The Climate Registry 2018; Scholz 2018
BAAQMD = Bay Area Air Quality Management District
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
MBARD = Monterey Bay Air Resources District
SJVAPCD = San Joaquin Valley Air Pollution Control District
< = less than
[1] Project life assumed to be 25 years.
[2] Payback periods were estimated by dividing the GHG emissions during construction by the annual GHG emission reduction during operation. See Table 8-7 for operational GHG emission-reduction data. The range in payback days represents the range of emissions changes based on the medium and high ridership scenarios.
[3] The payback period accounts for all emissions directly and indirectly generated by construction activities for which the Authority has practical control and program responsibility. Emissions generated upstream (e.g., material manufacturing) and downstream (e.g., recycling) of construction, otherwise known as "lifecycle emissions", are not included in the analysis, consistent with guidance from the California Natural Resources Agency (2018). While the origin of most raw materials is not known, and thus an emissions analysis would be speculative, construction of the project would require concrete from on- and off-site batch plants. Lifecycle emissions for cement and aggregate manufacturing, which is upstream of the concrete batching process, have been studied in various literature. Accordingly, for the purposes of disclosure, analysts quantified upstream CO_2 emissions resulting from cement and aggregate manufacturing using emission factors from Marceau et al. (2007). It was assumed the tunnel segments would require a compression strength of 7,500 pounds per square inch and all other infrastructure would require a compression strength of 5,000 pounds per square inch. The analysis indicates that cement and aggregate manufacturing would generate 1,040,538 metric tons CO_2e. These emissions would be generated upstream of construction and through activities for which the Authority has no practical control. The emissions are therefore disclosed for informational purposes only. Nonetheless, it is worth noting that if the emissions were added to the 462,956 metric tons CO_2e generated by construction of Alternative 2, the combined total emissions would be offset in 3 to 4 years (relative to 2029 No Project conditions).

Table 8-10 Alternative 3 Carbon Dioxide Equivalent Construction Emissions (metric tons per year)[1, 2]

Year	Air District		
	BAAQMD	MBARD	SJVAPCD
2022	28,824	3,830	14,571
2023	50,197	3,155	28,198
2024	61,752	2,528	28,483
2025	43,885	2,010	25,832
2026	21,181	1,122	22,716
2027	13,142	1,480	17,291
2028	2,478	275	1,876
Total by air district	221,460	14,400	138,967
Construction total	374,826		
Amortized GHG Emissions (averaged over 25 years)			
CO_2e per year by air district	8,858	576	5,559
CO_2e per year for total construction	14,993		
Payback of GHG Emissions (months)[2, 3]			
Payback period (project vs. 2029 no project)	8 to 11		

Sources: Trinity Consultants 2016; USEPA 1978; USEPA 2018c; The Climate Registry 2018; Scholz 2018
BAAQMD = Bay Area Air Quality Management District
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
MBARD = Monterey Bay Air Resources District
SJVAPCD = San Joaquin Valley Air Pollution Control District
< = less than
[1] Project life assumed to be 25 years.
[2] Payback periods were estimated by dividing the GHG emissions during construction by the annual GHG emission reduction during operation. See Table 8-7 for operational GHG emission-reduction data. The range in payback days represents the range of emissions changes based on the medium and high ridership scenarios.
[3] The payback period accounts for all emissions directly and indirectly generated by construction activities for which the Authority has practical control and program responsibility. Emissions generated upstream (e.g., material manufacturing) and downstream (e.g., recycling) of construction, otherwise known as "lifecycle emissions", are not included in the analysis, consistent with guidance from the California Natural Resources Agency (2018). While the origin of most raw materials is not known, and thus an emissions analysis would be speculative, construction of the project would require concrete from on- and off-site batch plants. Lifecycle emissions for cement and aggregate manufacturing, which is upstream of the concrete batching process, have been studied in various literature. Accordingly, for the purposes of disclosure, analysts quantified upstream CO_2 emissions resulting from cement and aggregate manufacturing using emission factors from Marceau et al. (2007). It was assumed the tunnel segments would require a compression strength of 7,500 pounds per square inch and all other infrastructure would require a compression strength of 5,000 pounds per square inch. The analysis indicates that cement and aggregate manufacturing would generate 1,050,040 metric tons CO_2e. These emissions would be generated upstream of construction and through activities for which the Authority has no practical control. The emissions are therefore disclosed for informational purposes only. Nonetheless, it is worth noting that if the emissions were added to the 374,826 metric tons CO_2e generated by construction of Alternative 3, the combined total emissions would be offset in 2 to 3 years (relative to 2029 No Project conditions).

Table 8-11 Alternative 4 Carbon Dioxide Equivalent Construction Emissions (metric tons per year)[1, 2]

Year	Air District		
	BAAQMD	MBARD	SJVAPCD
2022	44,365	7,259	14,571
2023	63,761	6,481	28,198
2024	80,975	5,687	28,483
2025	68,823	5,257	25,832
2026	31,355	3,113	22,716
2027	31,629	5,657	17,291
2028	3,811	567	1,876
Total by air district	324,718	34,021	138,967
Construction total	497,706		
Amortized GHG Emissions (averaged over 25 years)			
CO_2e per year by air district	12,989	1,361	5,559
CO_2e per year for total construction	19,908		
Payback of GHG Emissions (months)[2]			
Payback period (project vs. 2029 no project)	10 to 14		

Sources: Trinity Consultants 2016; USEPA 1978 USEPA 2018c; The Climate Registry 2018; Scholz 2018
BAAQMD = Bay Area Air Quality Management District
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
MBARD = Monterey Bay Air Resources District
SJVAPCD = San Joaquin Valley Air Pollution Control District
< = less than
[1] Project life assumed to be 25 years.
[2] Payback periods were estimated by dividing the GHG emissions during construction by the annual GHG emission reduction during operation. See Table 8-7 for operational GHG emission-reduction data. The range in payback days represents the range of emissions changes based on the medium and high ridership scenarios.
[3] The payback period accounts for all emissions directly and indirectly generated by construction activities for which the Authority has practical control and program responsibility. Emissions generated upstream (e.g., material manufacturing) and downstream (e.g., recycling) of construction, otherwise known as "lifecycle emissions", are not included in the analysis, consistent with guidance from the California Natural Resources Agency (2018). While the origin of most raw materials is not known, and thus an emissions analysis would be speculative, construction of the project would require concrete from on- and off-site batch plants. Lifecycle emissions for cement and aggregate manufacturing, which is upstream of the concrete batching process, have been studied in various literature. Accordingly, for the purposes of disclosure, analysts quantified upstream CO_2 emissions resulting from cement and aggregate manufacturing using emission factors from Marceau et al. (2007). It was assumed the tunnel segments would require a compression strength of 7,500 pounds per square inch and all other infrastructure would require a compression strength of 5,000 pounds per square inch. The analysis indicates that cement and aggregate manufacturing would generate 925,308 metric tons CO_2e. These emissions would be generated upstream of construction and through activities for which the Authority has no practical control. The emissions are therefore disclosed for informational purposes only. Nonetheless, it is worth noting that if the emissions were added to the 497,706 metric tons CO_2e generated by construction of Alternative 4, the combined total emissions would be offset in 2 to 3 years (relative to 2029 No Project conditions).

8.5 Summary of Effects

Project features, including IAMFs, design standards, and compliance with the Authority's project design guideline technical memoranda, would avoid or minimize effects of GHGs. Table 8-12 summarizes the project's effects associated with GHG by alternative. The project would lower GHG emissions overall.

Table 8-12 Summary of Effects

Impacts	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Temporary Direct and Indirect Effects on Global Climate Change—Greenhouse Gas Emissions	GHG emissions generated during temporary construction of 14,784 t CO_2e per year would be offset by reductions achieved through project operation in 8 to 11 months (relative to 2029 No Project conditions).	GHG emissions generated during temporary construction of 18,518 t CO_2e per year would be offset by reductions achieved through project operation in 10 to 13 months (relative to 2029 No Project conditions).	GHG emissions generated during temporary construction of 14,993 t CO_2e per year would be offset by reductions achieved through project operation in 8 to 11 months (relative to 2029 No Project conditions).	GHG emissions generated during temporary construction of 19,908 t CO_2e per year would be offset by reductions achieved through project operation in 10 to 14 months (relative to 2029 No Project conditions).
Continuous Permanent Direct and Indirect Effects on Global Climate Change—Greenhouse Gas Emissions	Long-term operation of the HSR system would reduce GHG emissions, relative to No Project conditions, resulting in a statewide and regional GHG benefit. Annual reductions would range from 1.1 million mt CO_2e to 1.6 million mt CO_2e, depending on the ridership scenario.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

GHG = greenhouse gas
t = metric tons
CO_2e = carbon dioxide equivalent
HSR = high-speed rail

9 MITIGATION MEASURES

This chapter presents mitigation measures the Authority would implement to address effects on air quality.

AQ-MM#1: Offset Project Construction Emissions in the San Francisco Bay Area Air Basin

Prior to issuance of construction contracts, the Authority will enter into a memorandum of understanding (MOU) with the Bay Area Clean Air Foundation (Foundation), a public nonprofit and supporting organization for the BAAQMD, to reduce ROG and NO_X to the required levels. The required levels in the SFBAAB are as follows:

1. For emissions in excess of the General Conformity *de minimis* thresholds (NO_X): **net zero**.
2. For emissions not in excess of *de minimis* thresholds but above the BAAQMD's daily emission thresholds (ROG and NO_X): **below the appropriate CEQA threshold levels**.

The mitigation offset fee amount will be determined at the time of mitigation to fund one or more emissions reduction projects in the SFBAAB. The Foundation will require an additional administrative fee of no less than 5 percent. The mitigation offset fee will be determined by the Authority and the Foundation based on the type of projects available at the time of mitigation. When the CEQA threshold is exceeded, these funds may be spent to reduce either ROG or NO_X emissions ("O_3 precursors"). When the General Conformity threshold is exceeded, these funds may be spent to reduce O_3 precursors, provided this is allowed by the federal CAA provisions addressing General Conformity. This fee is intended to fund emissions reduction projects to achieve reductions, with the estimated tonnage of emissions offsets required starting in 2022. Documentation of payment will be provided to the Authority or its designated representative.

The MOU will include details regarding the annual calculation of required offsets the Authority must achieve, funds to be paid, administrative fee, and the timing of the emissions reductions projects. Acceptance of this fee by the Foundation will serve as an acknowledgment and commitment by the Foundation to undertake the following steps: (1) implement an emissions reduction project(s) within a timeframe to be determined based on the type of project(s) selected after receipt of the mitigation fee designed to achieve the emission reduction objectives; and (2) provide documentation to the Authority or its designated representative describing the project(s) funded by the mitigation fee, including the amount of emissions reduced (tons per year) in the SFBAAB from the emissions reduction project(s). To qualify under this mitigation measure, the specific emissions reduction project(s) must result in emission reductions in the SFBAAB that are real, surplus, quantifiable, enforceable, and will not otherwise be achieved through compliance with existing regulatory requirements or any other legal requirement. Pursuant to 40 C.F.R. Section 93.163(a), the necessary reductions must be achieved (contracted and delivered) by the applicable year in question. Funding will need to be received prior to contracting with participants and should allow enough time to receive and process applications to fund and implement off-site reduction projects prior to commencement of project activities being reduced. This will roughly equate to 1 year prior to the required mitigation; additional lead time may be necessary depending on the level of off-site emission reductions required for a specific year.

AQ-MM#2: Offset Project Construction Emissions in the North Central Coast Air Basin

Prior to issuance of construction contracts, the Authority will enter into an MOU with the MBARD to reduce PM_{10} to the required levels. The required levels in the NCCAB are:

- For emissions above the MBARD's daily emission thresholds (PM_{10}): **below the appropriate CEQA threshold levels**.

The mitigation offset and administrative fee amount will be determined at the time of mitigation. The fee will be determined by the Authority and MBARD and based on the type of projects available at the time of mitigation. This fee is intended to fund emissions reduction projects to achieve reductions with the estimated tonnage of emissions offsets required. Documentation of payment will be provided to the Authority or its designated representative.

The MOU will include details regarding the annul calculation of require offsets, funds to be paid, administrative fee, and the timing of the emissions reductions project. Acceptance of this fee by the MBARD will serve as an acknowledgment and commitment by the MBARD to undertake the following steps: (1) implement an emissions reduction project(s) within a timeframe to be determined based on the type of project(s) selected after receipt of the mitigation fee to achieve the emission reduction objectives; and (2) provide documentation to the Authority or its designated representative describing the project(s) funded by the mitigation fee, including the amount of emissions reduced (tons per year) in the NCCAB from the emissions reduction project(s). To qualify under this mitigation measure, the specific emissions reduction project(s) must result in emission reductions in the NCCAB that are real, surplus, quantifiable, enforceable, and will not otherwise be achieved through compliance with existing regulatory requirements or any other legal requirement. Funding will need to be received prior to contracting with participants and should allow enough time to receive and process applications to fund and implement off-site reduction projects prior to commencement of project activities requiring offset. This will roughly equate to the equivalent of one year prior to the required mitigation; additional lead time may be necessary depending on the level of off-site emission reductions required for a specific year.

AQ-MM#3: Offset Project Construction Emissions in the San Joaquin Valley Air Basin

On June 19, 2014, the SJVAPCD and Authority entered a Memorandum of Understanding (MOU) that establishes the framework for fully mitigating to net zero construction emissions of NO_x, VOC, PM_{10}, and $PM_{2.5}$ from the entire High-Speed Rail Project within the SJVAB. Emissions generated by construction of the portion of the project within the SJVAB are subject to this MOU and therefore must be offset to net zero. Pursuant to the MOU, the Authority and the SJVAPCD will enter into a Voluntary Emissions Reduction Agreement (VERA) to cover the portion of the project approved and funded for construction within the SJVAB. The project-level VERA must be executed prior to commencement of construction and the mitigation fees and offsets delivered and achieved according to the requirements of the VERA and MOU.

10 CUMULATIVE EFFECTS

The RSA for cumulative air quality is the SFBAAB, NCCAB, and SJVAB, and the RSA for global climate change is the state and global atmosphere. Air quality and global climate change are inherently cumulative resources because criteria pollutant and GHG emissions, once emitted, mix into the atmosphere and affect a larger area than an individual project site. Thus, this cumulative analysis does not consider individual cumulative projects near the project; rather, it uses the same thresholds of significance as the project-level analysis (except for health risks in BAAQMD) because of the inherently cumulative nature of these resources.

10.1 Near- and Long-Term Operations

State: Even with the more stringent regulations on GHG emissions expected in the future, projected growth in California may result in cumulative increases in GHG emissions. Increased GHG emissions from past, present, and reasonably foreseeable future projects in the state would result in effects on global climate change. The project's statewide demand for electricity could result in indirect GHG emissions from power generation facilities. Although the Authority has adopted a policy to purchase renewable, clean-power energy sources, it cannot guarantee that only renewable energy is used to power the HSR system because the local power distribution network does not distribute energy based on energy sources. Therefore, GHG emissions may be associated with the provisions of energy to the HSR system. However, the project would decrease overall GHG emissions by reducing vehicle and aircraft trips and would also result in a net reduction in CO_2 emissions, as described in Chapter 8. Global Climate Change Effects Analysis. This reduction in GHG emissions would more than offset the increase in GHG emissions associated with project facilities. Therefore, the project would result in a net decrease in GHG emissions from operations.

Regional: Operation of the HSR system would help the region attain air quality standards and plans by reducing the amount of regional vehicular traffic and providing an alternative mode of transportation. Because the project would help to decrease emissions of criteria pollutants and precursors (e.g., ROG, NO_X), it would result in a net benefit to regional air quality.

Local: Cumulative CO effects would not occur because, as discussed in Section 7.5, Microscale Carbon Monoxide Hot-Spot Analysis, additional traffic created by the project would not result in CO concentrations in excess of the NAAQS or CAAQS.

Multiple sources of cumulative (existing sources and future planned) TAC emissions are located within 1,000 feet of the relocated freight sections and HSR stations, including the following:

- **Existing sources**—Multiple stationary, rail, and roadway sources are currently located along the alignment.
- **Planned land use development**—Land use development in the region would increase traffic levels and result in increased vehicle-related emissions along roadways, although, over time, state and federal regulations would reduce the allowed emission rates for new vehicles. Planned development may also generate additional DPM from emergency generators and truck loading bays, as well as DPM during construction of near-term improvements.
- **Future passenger service expansion**—There are proposals to expand passenger train service from the Transportation Agency for Monterey County (TAMC) to extend rail service from Salinas to Gilroy, from the Capitol Corridor Joint Powers Authority to expand existing service between San Jose and Sacramento, and from the San Joaquin Regional Rail Commission to expand existing Altamont Corridor Express (ACE) service from Stockton and Merced to San Jose. In addition, Facebook and San Mateo Transit District are exploring Dumbarton Rail Corridor service, which in the past has included potential service from the East Bay to San Jose and there have been proposals to add Coast Daylight service from Los Angeles to San Francisco. TAMC's Monterey County Rail Extension project has completed environmental review and is funded to start initial service. Environmental compliance for improvements necessary to facilitate expanded Capitol Corridor, ACE, or Dumbarton Rail service to San Jose has not been completed and funding has not yet been obtained, so they

are not included in the cumulative analysis. Plans and funding for the Coast Daylight service are uncertain, so it has not been included in the cumulative analysis.

- **Freight rail service expansion**—Freight rail service may also expand in the future as the economy expands. The exact amount of freight rail transport is difficult to predict. Freight levels depend on not only the overall level of economic activity but also the specific demand for bulk and oversize commodities that dominate freight carried by rail. As a conservative assessment, analysts assumed that freight would increase in the future at a rate of 3.5 percent per annum (PCJPB 2015) rounded up to 4 percent. This rate is an informal rate that freight operators, such as UPRR, often cite.

A quantitative HRA has not been conducted to estimate future DPM-related health risks to nearby sensitive receptors from cumulative land use development because construction and operations details are not available, and those projects would be responsible for analyzing their contributions. The cumulative HRA, therefore, focuses on ambient concentrations from stationary, rail, and roadway sources.

The BAAQMD has developed Google Earth and geographic information system (GIS) raster files that identify source-specific health risks throughout the SFBAAB. Analysts used these files to screen the relocated freight alignment and select one area per section to analyze cumulative health risks. The selected areas were chosen based on their proximity to residential receptors and the freight alignment, as well as overall density of existing sources. Where appropriate, the BAAQMD's (2012b, 2012c) distance multipliers were used to adjust risks from existing generators and gasoline-dispensing facilities. Total cumulative health risks at the representative location in each freight section were calculated by adding the background health risk sources to the health risk and hazard effects for the net change in health risk from the relocated freight service.

Table 10-1 shows cumulative cancer risk, chronic health hazard, and $PM_{2.5}$ concentrations at representative locations along the relocated freight sections.

Table 10-1 Cumulative Cancer and Noncancer Health Risks from Freight Relocation

General Location	Cancer	Chronic HI	$PM_{2.5}$ (µg/m3)
Near Monterey Road and Blanchard Road (Alternatives 1 through 3)			
Ambient risk	34	<1	0.3
Increment project contribution[1]	(4)	<0	<0.0
Total	30	<1	0.3
Between Monterey Road and Crowner Avenue (Alternatives 1 through 3)			
Ambient risk	14	<1	0.1
Increment project contribution[1]	<0	<0	<0.0
Total	14	<1	0.1
Near Monterey Road and California Avenue (Alternatives 1 through 3)			
Ambient risk	25	<1	0.1
Increment project contribution[1]	1	<0	<0.0
Total	26	<1	0.1
Near Monterey Road and Ronan Avenue (Alternatives 1 through 3)			
Ambient risk	17	<1	0.3
Increment project contribution[1]	<0	<0	<0.0
Total	16	<1	0.3

General Location	Cancer	Chronic HI	$PM_{2.5}$ (µg/m3)
Near Monterey Road and Leavesley Road (Alternatives 1 through 3)			
Ambient risk	14	<1	3.3
Increment project contribution[1]	<0	<0	<0.0
Total	15	<1	3.3
Near Monterey Road and 1st Street (Alternatives 1 through 3)			
Ambient risk	15	<1	0.2
Increment project contribution[1]	2	<0	<0.0
Total	16	<1	0.2
Near Monterey Road and W 10th Street (Alternatives 1 through 3)			
Ambient risk	4	<1	<0.1
Increment project contribution[1]	1	<0	<0.0
Total	5	<1	<0.1
Near Pacheco Court and Frazier Lake Road (Alternative 3 only)			
Ambient risk	<1	<1	<0.1
Increment project contribution[1]	5	<0	<0.0
Total	5	<1	<0.1
Near Chestnut Street and Asbury Street (Alternative 4 only)			
Ambient risk	100	<1	51.7
Increment project contribution[1]	(17)	<0	<0.0
Total	83	<1	51.7
Near Harrison Street and Fuller Ave (Alternative 4 only)			
Ambient risk	61	<1	0.8
Increment project contribution[1]	(4)	<0	<0.0
Total	57	<1	0.8
Near Cross Way and Northern Road (Alternative 4 only)			
Ambient risk	94	<1	2.4
Increment project contribution[1]	(2)	<0	<0.0
Total	96	<1	2.4
End of Promme Court (Alternative 4 only)			
Ambient risk	39	<1	0.5
Increment project contribution[1]	(3)	<0	<0.0
Total	35	<1	0.5
Near Prindiville Road and Urshan Way (Alternative 4 only)			
Ambient risk	31	<1	0.3
Increment project contribution[1]	(1)	<0	<0.0
Total	30	<1	0.3

General Location	Cancer	Chronic HI	$PM_{2.5}$ (µg/m3)
Near Madrone Ave and Dougherty Ave (Alternative 4 only)			
Ambient risk	14	<1	0.1
Increment project contribution[1]	<0	<0	<0.0
Total	14	<1	0.1
Near Butterfield Blvd and E Dunne Ave (Alternative 4 only)			
Ambient risk	12	<1	0.2
Increment project contribution[1]	(1)	<0	<0.0
Total	11	<1	0.2
End of Sister City Way (Alternative 4 only)			
Ambient risk	4	<1	1.2
Increment project increment[1]	(1)	<0	<0.0
Total	4	<1	1.2
Near Garlic Farms Dr and Trave Park Cir (Alternative 4 only)			
Ambient risk	22	<1	0.1
Increment project contribution[1]	0	<0	<0.0
Total	22	<1	<0.1
Near Bolsa Rd (Alternative 4 only)			
Ambient risk	3	<1	0.1
Increment project contribution[1]	<0	<0	<0.0
Total	3	<1	<0.1
Threshold[2]	**100**	**10**	**0.8**

Sources: Winkel 2018; PCJPB 2015; Google Inc. 2018; McGuire 2017–2018; USEPA 2009
(Parentheses) indicate negative values
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m^3 = micrograms per cubic meter
< = less than
[1] Presents the maximum incremental contribution from the relocated freight service, relative to existing conditions (see Table 7-20)
[2] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

The San Jose Diridon and Gilroy stations and the MOWS and MOWF would have emergency generators that would be used in the event of a power outage. The MOWF would also use diesel-powered off-road equipment, vehicles, and locomotives to support maintenance and repair activities. The new East Gilroy Station would serve diesel-powered buses.[29] Table 10-2 shows the maximum cumulative risks and $PM_{2.5}$ concentrations near HSR stations and the MOWF.[30]

[29] Bus service levels at the existing Diridon and Downtown Gilroy Stations are constant into the future given that no operator has a funding plan to deliver more service. Accordingly, there would be no change in risk relative to existing conditions.

[30] There are no receptors within 1,000 feet of the South Gilroy MOWF. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.

Table 10-2 Cumulative Cancer and Noncancer Health Risks from Station and MOWF Operation

Facility	vs. Existing		
	Cancer	Chronic HI	$PM_{2.5}$ ($\mu g/m^3$)
San Jose Diridon Station			
Ambient risk	68	<1	0.5
Increment project contribution[1]	<10[3]	<1[3]	<0.1
Total	*<78*	*<1*	*0.5*
Downtown Gilroy Station			
Ambient risk	18	<1	0.2
Increment project contribution[1]	<10[3]	<1[3]	<0.1
Total	*<28*	*<1*	*0.2*
East Gilroy Station			
Ambient risk	5	<1	0.1
Increment project contribution[1]	<1	<1	<0.1
Total	*<15*	*<1*	*0.1*
MOWF (East Gilroy Location)			
Ambient risk	1	<1	<0.1
Increment project contribution[3]	3	<1	<0.1
Total	4	*<1*	*<0.1*
Threshold[4]	**100**	**10**	**0.8**

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
$\mu g/m^3$ = micrograms per cubic meter
< = less than
[1] Presents the maximum incremental project contribution (see Table 7-21). These risks do not exceed BAAQMD's project-level thresholds.
[2] A project-specific cancer risk and chronic health hazard assessment was not conducted since BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if they would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.
[3] There are no receptors within 1,000 feet of the South Gilroy MOWF. Accordingly, a health risk assessment is not required, consistent with BAAQMD (2017a) guidance.
[4] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

As shown in Table 10-1, total cumulative cancer and noncancer chronic health hazards to sensitive receptors located near the relocated freight service would not exceed the BAAQMD's health risk thresholds. However, cumulative $PM_{2.5}$ exposure at certain locations is above the BAAQMD's threshold of 0.8 $\mu g/m^3$. The exceedances are the result of existing sources located within the vicinity of the freight tracks, as the freight relocation would reduce $PM_{2.5}$ concentrations at these locations relative to existing conditions. As shown in Table 10-2, total cumulative health risks to sensitive receptors located near the HSR stations and the MOWF would not exceed the BAAQMD's health risk thresholds.

10.2 Construction

Air quality construction effects associated with the project would be above the BAAQMD's, MBARD's, and SJVAPCD's significance thresholds.

State: As described in Section 8.4, Construction Greenhouse Gas Emissions, construction of the project would result in a one-time increase in GHG emissions. These emissions are anticipated to be offset in 8 to 14 months of project operations because of reduced passenger vehicle travel on roadways. Based on this short offset time period, the overall GHG effects (construction plus operations) would be negative and would therefore be consistent with AB 32 and SB 32 goals.

Regional: The BAAQMD, MBARD, and SJVAPCD thresholds of significance may be used to evaluate criteria pollutant effects. Projects in excess of these significance thresholds would have a cumulatively considerable effect on air quality in the SFBAAB, NCCAB, and SJVAB because they would not be consistent with the BAAQMD's, MBARD's, and SJVAPCD's attainment strategies and would prevent the BAAQMD, MBARD, and SJVAPCD from achieving attainment of state and federal standards.

As discussed in Chapter 7, construction of Alternatives 1 through 4 would result in ROG and NO_X that would exceed BAAQMD's CEQA thresholds, and NO_X, CO, and PM_{10} emissions that would exceed SJVAPCD's CEQA thresholds. Alternatives 1, 2, and 4 would also exceed MBARD's PM_{10} CEQA threshold. ROG, NO_X, and PM_{10} emissions would be offset in the BAAQMD, MBARD, and SJVAPCD, as applicable, through the purchase of offsets (AQ-MM#1 through AQ-MM#3). Because AQ-MM#1 through AQ-MM#3 would offset ROG, NO_X, and PM emissions to below air district thresholds or net zero, construction of the project would not have a cumulatively considerable effect on ROG, NO_X, and PM.

Pursuant to SJVAPCD's GAMAQI, emissions offsets procured through AQ-MM#3 cannot be used to mitigate CO effects. Accordingly, CO emissions would remain above SJVAPCD's CEQA threshold and cumulatively considerable even after implementation of all feasible mitigation.

Local: Emissions analysis at the local level includes the criteria pollutants PM_{10}, $PM_{2.5}$, NO_2, CO, SO_2, and TACs.

10.2.1 Criteria Pollutants

It is anticipated that construction activities would lead to new violations of the PM_{10} and $PM_{2.5}$ CAAQS and NAAQS, as well as potentially contribute to existing PM_{10} and $PM_{2.5}$ violations through exceedances of the SIL. Alternatives 1, 2, and 4 would also violate the 1-hour NO_2 NAAQS and CAAQS. Project features would minimize air quality impacts (AQ-IAMF#1 through AQ-IAMF#6), although emissions concentrations would still violate the ambient air quality standards and exceed the SIL.

10.2.2 TACs

A cumulative HRA was performed for portions of project construction located within the BAAQMD, consistent with air district requirements. Current MBARD and SJVAPCD guidance is to evaluate the potential risks associated from all project emission sources. Within the NCCAB and SJVAB, emission sources outside the project footprint should not be included in the cumulative assessment. If the project assessment demonstrates that potential health impacts are less than significant, one could conclude that the project would have a less than cumulatively significant impact (Siong 2011; Frisbey 2017). As discussed in Section 7.10, Construction Health Risk Assessment, construction of the project in the NCCAB and SJVAB would not exceed the MBARD's nor SJVAPCD's project-level health risk thresholds.

The construction cumulative HRA in the BAAQMD was performed using the method described in Chapter 6 for near- and long-term operational impacts. The BAAQMD's Google Earth and GIS raster files were used to screen the HSR alignment and select one 1,000-foot area per subsection to analyze cumulative health risks. Note that in some locations, two areas were analyzed to capture the greatest ambient cancer risk and $PM_{2.5}$ concentration, which occur at different locations within the 1,000-foot radius. Total cumulative health risks at the representative location(s) in each subsection were calculated by adding the background health risks sources to the health risk and hazard impacts for project construction. Tables 10-3 through 10-6 summarize the maximum cumulative cancer risk, chronic health hazard, and $PM_{2.5}$ concentrations at the representative locations in the subsections.

Table 10-3 Cumulative Cancer and Noncancer Health Risks from Alternative 1 Construction in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ (µg/m^3)
San Jose Diridon Station Approach			
Ambient risk	51	<1	51.6
HSR construction[1]	4	<1	<0.1
Total	*54*	*<1*	*51.6*
Monterey Corridor			
Ambient risk	198	<1	16.8
HSR construction[1]	5	<1	<0.1
Total	*203*	*<1*	*16.8*
Morgan Hill and Gilroy			
Ambient risk	68	<1	0.4
HSR construction[1]	3	<1	<0.1
Total	*71*	*<1*	*0.4*
Pacheco Pass			
Ambient risk	<1	<1	<0.1
HSR construction[1]	1	<1	<0.1
Total	*1*	*<1*	*<0.1*
Threshold[2]	**100**	**10**	**0.8**

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m^3 = micrograms per cubic meter
HSR = high-speed rail
[1] Presents the maximum health risk from HSR construction (see Table 7-32). These risks do not exceed BAAQMD's project-level thresholds.
[2] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

Table 10-4 Cumulative Cancer and Noncancer Health Risks from Alternative 2 Construction in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ (µg/m^3)
San Jose Diridon Station Approach			
Ambient risk	51	<1	51.6
HSR construction[1]	4	<1	<0.1
Total	*54*	*<1*	*51.6*

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ (μg/m^3)
Monterey Corridor			
Ambient risk	198	<1	16.8
HSR construction[1]	5	<1	<0.1
Total	*203*	*<1*	*16.8*
Morgan Hill and Gilroy			
Ambient risk	68	<1	29.6
HSR construction[1]	5	<1	<0.1
Total	*73*	*<1*	*29.6*
Pacheco Pass			
Ambient risk	<1	<1	<0.1
HSR construction[1]	1	<1	<0.1
Total	*1*	*<1*	*<0.1*
Threshold[2]	**100**	**10**	**0.8**

Sources: Winkel 2018 ; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
μg/m^3 = micrograms per cubic meter
HSR = high-speed rail
[1] Presents the maximum health risk from HSR construction (see Table 7-32). These risks do not exceed BAAQMD's project-level thresholds.
[2] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

Table 10-5 Cumulative Cancer and Noncancer Health Risks from Alternative 3 Construction in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ (μg/m^3)
San Jose Diridon Station Approach			
Ambient risk	51	<1	51.6
HSR construction[1]	4	<1	<0.1
Total	*54*	*<1*	*51.6*
Monterey Corridor			
Ambient risk	198	<1	16.8
HSR construction[1]	3	<1	<0.1
Total	*201*	*<1*	*16.8*
Morgan Hill and Gilroy			
Ambient risk	156	1	0.8
HSR construction[1]	9	<1	<0.1
Total	*166*	*1*	*0.8*

Subsection/Source	Cancer	Chronic HI	PM2.5 (µg/m3)
Pacheco Pass			
Ambient risk	<1	<1	<0.1
HSR construction[1]	1	<1	<0.1
Total	*1*	*<1*	*<0.1*
Threshold[2]	**100**	**10**	**0.8**

Sources: Winkel 2018, Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m³ = micrograms per cubic meter
HSR = high-speed rail
[1] Presents the maximum health risk from HSR construction (see Table 7-32). These risks do not exceed BAAQMD's project-level thresholds.
[2] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

Table 10-6 Cumulative Cancer and Noncancer Health Risks from Alternative 4 Construction in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	PM2.5 (µg/m3)
San Jose Diridon Station Approach			
Ambient risk	51	<1	51.6
HSR construction[1]	5	<1	<0.1
Total	*56*	*<1*	*51.6*
Monterey Corridor			
Ambient risk	198	<1	16.8
HSR construction[1]	6	<1	<0.1
Total	*204*	*<1*	*16.8*
Morgan Hill and Gilroy			
Ambient risk	68	<1	29.6
HSR construction[1]	3	<1	<0.1
Total	*71*	*<1*	*29.6*
Pacheco Pass			
Ambient risk	<1	<1	<0.1
HSR construction[1]	1	<1	<0.1
Total	*1*	*<1*	*<0.1*
Threshold[2]	**100**	**10**	**0.8**

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m³ = micrograms per cubic meter
HSR = high-speed rail
[1] Presents the maximum health risk from HSR construction (see Table 7-32). These risks do not exceed BAAQMD's project-level thresholds.
[2] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis.

The combined effects of the electrified passenger rail service, displacement of VMT and air travel, and motor vehicle and stationary source turnover represent the new emissions paradigm to which receptors would be exposed. Although there are areas of the RSA with greater existing health risks, the addition of HSR service would achieve health risk reductions in the RSA, which also would constitute a localized air quality benefit. Nevertheless, combined total cumulative cancer risks and noncancer impacts on sensitive receptors located near the project footprint would exceed the BAAQMD's thresholds. The exceedances are primarily the result of existing ambient sources, as the project's relative contribution to the exceedances of the screening threshold is less than the BAAQMD's project-level heath thresholds and is minor compared to health risks from existing sources.

10.3 Combined Construction and Operations Cumulative Health Risk Assessment

Individuals currently residing near the project corridor are exposed to a certain amount of pollution (representative of ambient risks described in Tables 10-1 through 10-6). If that individual remains in the same location during and after construction, they would be exposed to project-generated DPM during construction and then any incremental changes in risk from project-generated DPM during operations. Analysts conservatively estimated the potential lifetime risks to long-term residents that may be present during both construction and operations. Tables 10-7 through 10-10 show the results of the analysis and compare the risks to BAAQMD's cumulative thresholds. There would be no freight relocation or station operations in the Pacheco Pass Subsection. Accordingly, there is no potential for combined risk from construction and operations, and as such, the subsection is not included in the tables.

As shown in Tables 10-7 through 10-9, total cumulative health risks during construction and long-term operations would not exceed BAAQMD's thresholds at locations where a single receptor could be located during both construction and operation. Note that these receptors may be in a different location than those analyzed for the construction-only analysis in Tables 10-3 through 10-6. Accordingly, ambient or background risks differ among the analyses. Table 10-10 shows that cumulative $PM_{2.5}$ exposure would exceed BAAQMD's threshold in all subsections under Alternative 4. The exceedances are primarily the result of existing sources in the vicinity of the freight tracks, because the freight relocation would either result in minimal $PM_{2.5}$ (<0.1 µg/m^3) or reduce $PM_{2.5}$ concentrations at these locations relative to existing conditions.

Table 10-7 Cumulative Cancer and Noncancer Health Risks from Combined Alternative 1 Construction and Operations in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ (µg/m³)
San Jose Diridon Station Approach			
Ambient	68	<1	0.5
HSR construction	4	<1	<0.1
Diridon Station operations	<10[2]	<1[2]	<0.1
Total	*<82*	*<1*	*0.5*
Monterey Corridor			
Ambient	34	<1	0.3
HSR construction	5	<1	<0.1
Freight relocation[3]	(4)	<0	<0.0
Total	*35*	*<1*	*0.3*
Morgan Hill and Gilroy			
Ambient	18	<1	0.2
HSR construction	3	<1	<0.1
Downtown Gilroy Station operations	<10[2]	<1[2]	<0.1
Freight relocation[2]	1	<1	<0.1
Total	*<32*	*<1*	*0.2*
Threshold[1]	**100**	**10**	**0.8**

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
(Parentheses) indicate negative values
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m³ = micrograms per cubic meter
HSR = high-speed rail
BAAQMD = Bay Area Air Quality Management District
[1] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis. Note that risks from neither construction nor operations exceed BAAQMD's project-level thresholds.
[2] A project-specific cancer risk and chronic health hazard assessment was not conducted since BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if they would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.
[3] Presents the maximum incremental contribution from the relocated freight service, relative to existing conditions.

Table 10-8 Cumulative Cancer and Noncancer Health Risks from Combined Alternative 2 Construction and Operations in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ ($\mu g/m^3$)
San Jose Diridon Station Approach			
Ambient	68	<1	0.5
HSR construction	4	<1	<0.1
Diridon Station operations	<10[2]	<1[2]	<0.1
Total	*<82*	*<1*	*0.5*
Monterey Corridor			
Ambient	34	<1	0.3
HSR construction	5	<1	<0.1
Freight relocation[3]	(4)	<0	<0.0
Total	*35*	*<1*	*0.3*
Morgan Hill and Gilroy			
Ambient	18	<1	0.2
HSR construction	5	<1	<0.1
Downtown Gilroy Station operations	<10[2]	<1[2]	<0.1
Freight relocation[3]	1	<1	<0.1
Total	*<34*	*<1*	*0.2*
Threshold[1]	**100**	**10**	**0.8**

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
(Parentheses) indicate negative values
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
$\mu g/m^3$ = micrograms per cubic meter
HSR = high-speed rail
BAAQMD = Bay Area Air Quality Management District
[1] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis. Note that risks from neither construction nor operations exceed BAAQMD's project-level thresholds.
[2] A project-specific cancer risk and chronic health hazard assessment was not conducted since BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if they would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.
[3] Presents the maximum incremental contribution from the relocated freight service, relative to existing conditions.

Table 10-9 Cumulative Cancer and Noncancer Health Risks from Combined Alternative 3 Construction and Operations in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ (µg/m³)
San Jose Diridon Station Approach			
Ambient	68	<1	0.5
HSR construction	4	<1	<0.1
Diridon Station operations	<10[2]	<1[2]	<0.1
Total	*<82*	*<1*	*0.5*
Monterey Corridor			
Ambient	34	<1	0.3
HSR construction	3	<1	<0.1
Freight relocation[3]	(4)	<0	<0.0
Total	*33*	*<1*	*0.3*
Morgan Hill and Gilroy			
Ambient	5	<1	0.1
HSR construction	9	<1	<0.1
East Gilroy Station operations	<1	<1	<0.1
Freight relocation[3]	5	<1	<0.1
Total	*19*	*<1*	*0.1*
Ambient	1	<1	<0.1
HSR construction	9	<1	<0.1
East Gilroy MOWF operations	3	<1	<0.1
Freight relocation[3]	5	<1	<0.1
Total	*13*	*<1*	*<0.1*
Threshold[1]	**100**	**10**	**0.8**

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
(Parentheses) indicate negative values
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
µg/m³ = micrograms per cubic meter
HSR = high-speed rail
MOWF = maintenance of way facility
[1] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis. Note that risks from neither construction nor operations exceed BAAQMD's project-level thresholds.
[2] A project-specific cancer risk and chronic health hazard assessment was not conducted since BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if they would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.
[3] Presents the maximum incremental contribution from the relocated freight service, relative to existing conditions.

Table 10-10 Cumulative Cancer and Noncancer Health Risks from Combined Alternative 4 Construction and Operations in the Bay Area Air Quality Management District

Subsection/Source	Cancer	Chronic HI	$PM_{2.5}$ ($\mu g/m^3$)
San Jose Diridon Station Approach			
Location 1 (receptor near construction and freight relocation)			
Ambient	100	<1	51.7
HSR construction	5	<1	<0.1
Freight relocation[2]	-17	<0	<0.0
Total	*88*	*<1*	*51.7*
Location 2 (receptor near construction and Diridon Station)			
Ambient	68	0	0.5
HSR construction	5	<1	<0.1
Diridon Station operations	<10[3]	<1[3]	<0.1
Total	*<83*	*<1*	*0.5*
Monterey Corridor			
Ambient	94	<1	2.4
HSR construction	6	<1	<0.1
Freight relocation[2]	(2)	<0	<0.1
Total	*98*	*<1*	*2.4*
Morgan Hill and Gilroy			
Location 1 (receptor near construction and Downtown Gilroy Station)			
Ambient	18	<1	0.2
HSR construction	3	<1	<0.1
Downtown Gilroy Station operations	<10[3]	<1[3]	<0.1
Total	*<31*	*<1*	*0.2*
Location 2 (receptor near construction and freight relocation)			
Ambient	68	<1	29.6
HSR construction	3	<1	<0.1
Freight relocation[2]	<1	<1	<0.1
Total	*71*	*<1*	*29.7*
Threshold[1]	100	10	0.8

Sources: Winkel 2018; Google Inc. 2018; AERMOD version 18081; OEHHA 2015; HARP 2 version 18159
(Parentheses) indicate negative values
HI = hazard index
$PM_{2.5}$ = particulate matter 2.5 microns or less in diameter
$\mu g/m^3$ = micrograms per cubic meter
HSR = high-speed rail
[1] BAAQMD has adopted both project- and cumulative-level thresholds for health risks. BAAQMD's cumulative thresholds are used in this analysis. Note that risks from neither construction nor operations exceed BAAQMD's project-level thresholds.
[2] Presents the maximum incremental contribution from the relocated freight service, relative to existing conditions.
[3] A project-specific cancer risk and chronic health hazard assessment was not conducted since BAAQMD Regulation 2, Rule 5, Section 302, prohibits generator use if they would result in cancer or acute hazard impacts in excess of BAAQMD's health risk thresholds of significance.

11 CONFORMITY ANALYSIS

Projects requiring approval or funding from federal agencies that are in areas designated as nonattainment or maintenance for the NAAQS may be subject to the USEPA's Conformity Rule. The two types of federal conformity are Transportation Conformity and General Conformity.

Conformity refers to conforming to, or being consistent with, SIP for compliance with the CAA. The USEPA's Conformity Rule requires SIP conformity determinations on transportation plans, programs, and projects before they are approved or adopted (i.e., eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards [40 C.F.R. Part 93]). Federal activities, such as federally sponsored projects, may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emission reductions toward attainment.

Transportation conformity applies to those projects that will have FHWA or Federal Transit Administration (FTA) funding or require FHWA/FTA approval. General Conformity applies to those projects that will have funding or require approval from any federal agency other than the FHWA or FTA.

The FRA and USEPA have determined that General Conformity may be applicable to the project. The federal lead agency for the project is the FRA, and FHWA or FTA involvement is not anticipated other than incidental FHWA or FTA funding for joint-benefit components.

If the FHWA or FTA funds a component of the HSR, or if a minor action is required to approve the project, such as the need for an FHWA-approved grade crossing, it is anticipated that this project element would be added to the affected area's Regional Transportation Improvement Program or RTP for transportation conformity purposes. However, conformity of elements of the overall HSR system is addressed through application of the General Conformity Rule and requirements. Both General Conformity and Transportation Conformity, as they relate to the project, are discussed in this chapter.

11.1 General Conformity

The USEPA has established General Conformity *de minimis* thresholds (in tons per calendar year) for each criteria pollutant to determine whether projects are subject to conformity determination requirements. If the emissions generated by construction or operations of a project (on an area-wide basis) are less than these threshold values, the effects of the project are not considered to be significant, and no additional analyses are required to satisfy General Conformity. If the emissions are greater than these values, compliance with the General Conformity Rule must be demonstrated by one or more of several prescribed methods.

Under federal designations, the RSA is currently designated as extreme and marginal nonattainment for 8-hour O_3 in the SJVAB and SFBAAB, respectively; serious/moderate nonattainment for $PM_{2.5}$ in the SFBAAB and SJVAB; and maintenance for PM_{10} in the SJVAB. As such, the FRA is required to demonstrate project-level compliance with the General Conformity Rule for NO_X and VOC (O_3 precursors), $PM_{2.5}$, PM_{10}, and SO_2 ($PM_{2.5}$ precursor) if project-related emissions of these pollutants in the SFBAAB or SJVAB would exceed the General Conformity *de minimis* thresholds.

As shown in Section 7.4, Total Operations Emissions, the total regional emissions for all of the applicable pollutants would be lower during project operations than under No Project conditions (and would therefore not exceed the *de minimis* emission thresholds). Accordingly, only emissions generated during the construction phase need to be compared to the conformity threshold levels to determine conformity compliance. As shown in Section 7.9, Construction Mass Emissions Analysis, construction emissions, compared to the General Conformity applicability rates, are as follows:

- Annual estimated NO_X emissions in the SJVAB are greater than the applicability rate of 10 tons per year for all years of construction between 2022 and 2028 for all project alternatives with implementation of IAMFs.

- Annual estimated NO_X emissions in the SFBAAB are greater than the applicability rate of 100 tons per year in 2024 under Alternatives 1 and 3 and for all years of construction between 2023 and 2025 under Alternatives 2 and 4 with implementation of IAMFs.
- Annual estimated VOC, SO_2, PM_{10}, and $PM_{2.5}$ emissions are less than the applicability rates in the SFBAAB and SJVAB with implementation of IAMFs.

As such, a General Conformity Determination is required for the project for NO_X for the years during construction when the emissions would exceed the *de minimis* thresholds in the SFBAAB and SJVAB. The General Conformity Determination can be achieved using one of the following methods:

- Demonstrating that the direct and indirect emissions are specifically identified in the relevant implementation plan
- Obtaining a written statement from the entity responsible for the implementation plan that the total indirect and direct emissions from the action, along with other emissions in the area, would not exceed the total implementation plan emission budget
- Fully offsetting the total direct and indirect emissions to net zero by reducing emissions of the same pollutant in the same nonattainment or maintenance area

Compliance with the General Conformity Rule for the APA is required before construction of the project, but may be completed concurrent with EIR/EIS certification. Demonstrating compliance with the General Conformity Rule will not change the results of the analysis described in this report.

Appendix 3.3-B in the Draft EIR/EIS contains the draft General Conformity Determination for the project. The FRA demonstrates in the determination that the emissions of NO_X (a precursor to O_3) caused by the construction of the project would not result in an increase in regional NO_X emissions. This would be achieved by offsetting the NO_X emissions generated by construction of the project in a manner consistent with the General Conformity regulations.

The offsets are anticipated to be accomplished through a MOU with the BAAQMD's Foundation and a VERA between the Authority and the SJVAPCD. The requirement for the MOU and VERA would be implemented as part of the project as described in the mitigation measures identified in Chapter 9.

The FRA is issuing the draft General Conformity Determination for public and agency review as part of the Draft EIR/EIS. Any comments on the draft General Conformity Determination would be addressed in the final General Conformity Determination, which would be included in the Final EIR/EIS for the project.

11.2 Transportation Conformity

Transportation conformity is an analytical process required for all federally funded transportation projects, but it does not apply to the project. Under the 1990 CAA amendments, the U.S. Department of Transportation cannot fund, authorize, or approve federal actions to support programs or projects that are not first found to conform to the SIP for achieving the goals of the CAA requirements. Conformity with the CAA takes place at both the regional and project levels.

The project is not subject to the Transportation Conformity Rule. However, if the project requires future actions that meet the definition of a project element subject to Transportation Conformity, additional determinations and associated analysis would be completed as required.

12 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. T*oxicological Profile for 1,3-Butadiene*. U.S. Department of Health and Human Services, Public Health Service. September 2012. Atlanta, GA.

Association of Bay Area Governments (ABAG) and Metropolitan Transit Commission (MTC). 2017. *Plan Bay Area 2040.* Final. Adopted July 26, 2017. http://2040.planbayarea.org/cdn/ff/buje2Q801oUV3Vpib-FoJ6mkOfWC9S9sgrSgJrwFBgo/1510696833/public/2017-11/Final_Plan_Bay_Area_2040.pdf (accessed July 18, 2019).

Association of Monterey Bay Area Governments (AMBAG). 2017. *Moving Forward Monterey Bay 2035*. Metropolitan Transportation Plan/Sustainable Communities Strategy. Amendment No. 1 January 2017. www.ambag.org/programs-services/planning/metro-transport-plan/Moving-Forward-2035-Monterey-Bay (accessed April 18, 2017).

Bay Area Air Quality Management District (BAAQMD). 2001. *San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard.* October 24, 2001. www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Plans/2001%20Ozone%20Attainment%20Plan/oap_2001.ashx (accessed August 17, 2016).

———. 2002 *Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations*. www.baaqmd.gov/~/media/files/compliance-and-enforcement/policies-and-procedures/inspection_guidelines_012604.pdf (accessed March 4, 2019).

———. 2012a. *Recommended Methods for Screening and Modeling Local Risks and Hazards*. www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en (accessed March 2017).

———. 2012b. *Gasoline Dispensing Facility (GDF) Distance Multiplier Tool.* www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools (accessed January 2017).

———. 2012c. *Diesel Internal Combustion (IC) Engine Distance Multiplier Tool.* www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools (accessed January 2017).

———. 2015. *Asbestos Airborne Toxic Control Measure (ATCM) for Surfacing Applications.* www.arb.ca.gov/toxics/atcm/asbeatcm.htm (accessed January 2017).

———. 2016. *Bay Area Air Quality Management District Permit Handbook.* www.baaqmd.gov/~/media/files/engineering/permit-handbook/baaqmd-permit-handbook.pdf?la=en (accessed March 2017).

———. 2017a. *California Environmental Quality Act Air Quality Guidelines*. May 2017.

———. 2017b. *Spare the Air, Cool the Climate*. Final 2017 Clean Air Plan. Adopted April 19, 2017. www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en (accessed October 19, 2018).

Burton, Bill. 2017a. Senior Associate. Fehr & Peers, Walnut Creek, CA. Email to ICF regarding HSR JM Station/Maintenance Facility Traffic Summary (no project and existing numbers). January 12, 2017

———. 2017b. Senior Associate. Fehr & Peers, Walnut Creek, CA. Email to ICF regarding 2029 Station Trips (existing plus project numbers). October 6, 2017

———. 2017c. Senior Associate. Fehr & Peers, Walnut Creek, CA. Email to ICF regarding confirmation of station and maintenance facility employee trips. December 13, 2017

———. 2017d. Senior Associate. Fehr & Peers, Walnut Creek, CA. Email exchanges with ICF regarding San Jose to Merced peak hour traffic data and LOS. January 19, 2017; February 15, 2017; March 31, 2017; April 11, 2017; August 14, 2017; and January 16, 2019.

———. 2018. Senior Associate. Fehr & Peers, Walnut Creek, CA. Email to ICF regarding confirmation of station with HSR project trips (with-project numbers). September 18, 2018.

———. 2019. Senior Associate. Fehr & Peers, Walnut Creek, CA. Email to ICF regarding transit at east Gilroy. January 30, 2019.

California Air Pollution Control Officers Association (CAPCOA). 2009. *Health Risk Assessments for Proposed Land Use Projects*. www.capcoa.org/wp-content/uploads/2012/03/CAPCOA_HRA_LU_Guidelines_8-6-09.pdf (accessed August 2016).

California Air Resources Board (CARB). 2005. *Air Quality and Land Use Handbook: A Community Health Perspective*. www.arb.ca.gov/ch/handbook.pdf (accessed August 2016).

———. 2011. *Transport*. March 3, 2011. www.arb.ca.gov/aqd/transport/transport.htm (accessed May 2012).

———. 2012. *ARB's Geographical Information System (GIS) Library*. www.arb.ca.gov/ei/gislib/gislib.htm. (accessed March 2017).

———. 2015a. California Toxics Inventory. www.arb.ca.gov/toxics/cti/cti.htm (accessed August 2016).

———. 2015b. *Climate Change Backgrounder: The Greenhouse Effect and California*. Information sheet supporting Assembly Bill 1493 (Pavley). www.arb.ca.gov/cc/factsheets/ccbackground.pdf (accessed August 2016).

———. 2016. *Ambient Air Quality Standards*. www.arb.ca.gov/research/aaqs/aaqs2.pdf (accessed August 2016).

———. 2017. *2012 Base Year Emissions*. January 26, 2017. www.arb.ca.gov/ei/emissiondata.htm (accessed October 2018).

———. 2018a. *California Transition to All-Electric Public Bus Fleets by 2040*. https://ww2.arb.ca.gov/news/california-transitioning-all-electric-public-bus-fleet-2040 (accessed January 2019).

———. 2018b. iADAM: Air Quality Data Statistics. www.arb.ca.gov/adam/topfour/topfour1.php (accessed August 2018).

———. 2018c. Area Designations Maps / State and National. December 28, 2018. www.arb.ca.gov/desig/adm/adm.htm (accessed January 2019).

———. 2018d. *California Greenhouse Gas Emissions Inventory – 2018 Edition*. www.arb.ca.gov/cc/inventory/data/data.htm (accessed August 2018).

California Department of Public Health. *Epidemiological Summary of Coccidioidomycosis in California, 2017*. www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/CocciEpiSummary2017.pdf (accessed October 2018).

California Environmental Protection Agency (Cal-EPA). 2010. *Climate Action Team Report to Governor Schwarzenegger and the California Legislature*. December 2010.

California High Speed Rail Authority (Authority). 2016. *Connecting and Transforming California, 2016 Business Plan.* May 1, 2016. http://hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf (accessed July 28, 2016).

———. 2019a. *Merced to Fresno Section: Central Valley Wye Draft Supplemental Environmental Impact Report/Environmental Impact Statement*. Volume 1: Report. May 2019. Sacramento, CA.

———. 2019b. *San Jose to Merced Project Section, Record Preliminary Engineering for Project Definition*. May 2019. Sacramento, CA.

———. 2019c. *San Jose to Merced Project Section Transportation Technical Report.* Prepared by Fehr & Peers. September 2019. Sacramento, CA.

———. 2019d. *San Jose to Merced Project Section Geology, Soils, and Seismicity Technical Report*. September 2019. Sacramento, CA.

———. 2019e. *California High-Speed Rail Statewide Criteria Pollutant and GHG Analysis Emission Spreadsheets*. Provided by Bryan Porter (via Chris Diwa). October 21, 2019.

California High-Speed Rail Authority (Authority) and Federal Railroad Administration (FRA). 2005. *Final Program Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) for the Proposed California High-Speed Train System*. August 2005. Sacramento, CA and Washington, DC.

———. 2008. *San Francisco Bay Area (Bay Area) to Central Valley High-Speed Train (HST) Program Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS).* May 2008. Sacramento, CA and Washington, DC.

———. 2012a. *Final California High-Speed Train Project Environmental Impact Report/Environmental Impact Statement and Final Section 4(f) Statement and Draft General Conformity Determination—Merced to Fresno Section*. Volume I: Report. April 2012. Sacramento, CA and Washington, DC.

———. 2012b. *Merced to Fresno Section Air Quality Technical Report, California High-Speed Train Final Project EIR/EIS*. Prepared by AECOM and CH2M HILL. April 2012. Sacramento, CA, and Washington, DC.

———. 2017. *California High-Speed Rail Project Environmental Impact Report/Environmental Impact Statement Environmental Methodology Guidelines*, Version 5.09. April 2017. Sacramento, CA, and Washington, DC.

———. 2019. *Statewide Impact Avoidance and Minimization Features Library*. Revision 16. March 11, 2019.

California Natural Resources Agency (CNRA). 2009. *Final Statement of Reasons for Regulatory Action—Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97*. December 2009. http://ceres.ca.gov/ceqa/docs/Adopted_and_Transmitted_Text_of_SB97_CEQA_Guidelines_Amen Thdments.pdf (accessed January 7, 2015).

———. 2018. *Final Statement of Reasons for Regulatory Action—Amendments to the State CEQA Guidelines*. OAL Notice File No. Z-2018-0116-12. November 2018.

California Protected Areas Data Portal (CPAD). 2016. *California Protected Areas Database (CPAD)*. California Protected Areas Data Portal. www.calands.org/about/download/ (accessed March 2017)

City of Gilroy. 2002. *Gilroy 2002–2020 General Plan*. Adopted June 13, 2002. www.cityofgilroy.org/274/2020-General-Plan (accessed June 9, 2016).

———. 2005. *Downtown Gilroy Specific Plan*. Prepared by: RRM Design Group. Adopted November 21, 2005. www.ci.gilroy.ca.us/DocumentCenter/Home/View/1271 (accessed June 9, 2016).

City of Morgan Hill. 2016. *2035 General Plan City of Morgan Hill.* Prepared by: PlaceWorks. Adopted July 27, 2016. http://morganhill2035.org/wp-content/uploads/2016/08/MorganHill2035_GeneralPlan_Adopted1.pdf (accessed March 7, 2017).

City of San Jose. 1992a. *Midtown Specific Plan*. Adopted by the City Council December 8, 1992. www.sanjoseca.gov/DocumentCenter/Home/View/461 (accessed March 6, 2017).

———. 1992b. *Communications Hill Specific Plan.* City of San Jose Planning, Building and Code Enforcement. www.sanjoseca.gov/DocumentCenter/Home/View/456 (accessed March 6, 2017).

———. 2011. *Envision San José 2040 General Plan: Building a City of Great Places.* Adopted November 1, 2011. Revised March 23, 2016. www.sanjoseca.gov/DocumentCenter/Home/View/474 (accessed March 6, 2017).

———. 2014. *Diridon Station Area Plan: Final Plan*. Final. Prepared by: Field Paoli, Dyett and Bhatia, RHAA, Fehr and Peers, ARUP, Perkins and Will, AECOM, WSA, BKF, Sollod and Corson. June 2014. www.sanjoseca.gov/DocumentCenter/View/33057 (accessed March 6, 2017).

City of Santa Clara. 2010. *2010–2035 General Plan.* Adopted November 16, 2010. http://santaclaraca.gov/government/departments/community-development/planning-division/general-plan (accessed March 7, 2017).

Council on Environmental Quality (CEQ). 2016. *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*. August 1, 2016. www.whitehouse.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance.pdf. Issued August 1, 2016.

Western Governors' Association. 2006. *WRAP Fugitive Dust Handbook*. WGA Contract No. 30204-111. Prepared by Countess Environmental, Westlake Village, CA. September 7, 2006. Denver. CO. www.wrapair.org/forums/dejf/fdh/content/FDHandbook_Rev_06.pdf (accessed September 27, 2018).

County of Merced. 2013. *Merced County General Plan*. Adopted December 10, 2013. www.co.merced.ca.us/DocumentCenter/View/6766/2030-General-Plan?bidId= (accessed July 17, 2019).

County of San Benito. 2015. *San Benito County 2035 General Plan.* Adopted July 21, 2015. http://cosb.us/wp-content/uploads/Adopted-2035-GPU.pdf (accessed March 7, 2017).

County of Santa Clara. 1994. *Santa Clara County General Plan: Charting a Course for Santa Clara County's Future 1995–2010.* Adopted December 20, 1994. www.sccgov.org/sites/dpd/PlansOrdinances/GP/Pages/GP.aspx (accessed March 8, 2017).

Federal Highway Administration (FHWA). 2011. *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*. www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msatemissions.cfm (accessed August 2016).

———. 2016. *Updated Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*. www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm (accessed March 2017).

Frisbey, David. 2017. Air Quality Planner II. Monterey Bay Unified Air Pollution Control District, Monterey, CA. Telephone call with ICF regarding MBARD thresholds. March 30, 2017

Garza, V.J., P. Graney, and D. Sperling (Garza et al.). 1997. *The Transportation Project-Level Carbon Monoxide Protocol.* Revised December 1997. University of California, Davis.

Google Inc. 2018. *Google Earth Pro*, Version 4.2, Mountain View, CA. (accessed 2018).

Intergovernmental Panel on Climate Change (IPCC). 2007. *Fourth Assessment Report: Climate Change 2007: Working Group I: The Physical Science Basis*. Section 2.10.2, Direct Global Warming Potentials. www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html (accessed June 2016).

Kirk, Allison. 2016. Senior Planner. Bay Area Air Quality Management District, San Francisco, CA. Telephone conversation with ICF regarding health risk analyses in BAAQMD. December 14, 2016.

Lovegrove, A., and E. Tadross. 2017. Memo to Bryan Porter of the Authority regarding incorporating the use of Tier 4 engines and renewable diesel fuel in environmental documentation. November 9, 2017.

Marceau, M.L., M.A. Nisbet, M., and M.G. VanGeem. 2007. Life Cycle Inventory of Portland Cement Concrete. PCA R&D Serial No. 3007. Portland Cement Association. Skokie, IL.

McGuire, Rosanna. 2017–2018. Environmental Planner/Biologist. HNTB Cooperation, San Francisco, CA. Email exchanges with ICF regarding station utilities. March 2017 and September 2018

Merced County Association of Governments (MCAG). 2016. *Regional Transportation Plan/Sustainable Communities Strategy for Merced County: 2014–2040*. Adopted September 25, 2014. Amendment 1 adopted May 19, 2016. www.mcagov.org/DocumentCenter/View/789/RTP-2014-amendment-1---May-2016?bidId= (accessed March 7, 2019).

Monterey Bay Unified Air Pollution Control District (MBUAPCD). 2005. *Report on Attainment of the California Particulate Matter Standards in the Monterey Bay Region*. December 1, 2005. http://mbard.org/pdf/358%20(1).pdf (accessed August 17, 2016).

———. 2007. *Federal Maintenance Plan for Maintaining the National Ozone Standard in the Monterey Bay Region*. March 21, 2007. http://mbard.org/pdf/451.pdf (accessed August 17, 2016).

———. 2008. *CEQA Air Quality Guidelines.* February 2008.

———. 2017. *2012–2015 Air Quality Management Plan.* Adopted March 15, 2017. Monterey, CA. http://mbard.org/wp-content/uploads/2017/03/2012-2015-AQMP_FINAL.pdf (accessed March 30, 2017).

National Highway Transportation Safety Administration (NHTSA). 2018. C*orporate Average Fuel Economy.* www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy (accessed February 6, 2019).

National Oceanographic and Atmospheric Administration (NOAA). 2018. *Climate at a Glance: Global Mapping*. Centers for Environmental Information. www.ncdc.noaa.gov/cag/ (accessed June 2018).

Newson, Ross. 2018. Lead Maintenance, Standards, and Planning. High-Speed Rail Authority. Sacramento, CA. October 16, 2018—email message to ICF.

Office of Environmental Health Hazard Assessment (OEHHA). 2001. *Health Effects of Diesel Exhaust*. http://oehha.ca.gov/media/downloads/calenviroscreen/indicators/diesel4-02.pdf (accessed August 2016).

———. 2015. *Guidance Manual for Preparation of Health Risk Assessments*. http://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf (accessed August 2016).

Peninsula Corridor Joint Powers Board (PCJPB). 2015. *Peninsula Corridor Electrification Project Final Environmental Impact Report*. January 2015. Prepared by ICF International.

San Joaquin Valley Air Pollution Control District (SJVAPCD). 2007a. *PM10 Maintenance Plan and Request for Redesignation*. September 20, 2007. www.valleyair.org/Air_Quality_Plans/docs/Maintenance%20Plan10-25-07.pdf (accessed January 22, 2015).

———. 2007b. *2007 Ozone Plan*. April 2007. www.valleyair.org/Air_Quality_Plans/AQ_Final_Adopted_Ozone2007.htm (accessed January 22, 2015).

———. 2013. *2013 Plan for the Revoked 1-Hour Ozone Standard*. September 2013. www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/AdoptedPlan.pdf (accessed January 22, 2015)

———. 2014. APR 1925. Policy for District Rule 2201 AAQA Modeling. April 14.

———. 2015a. *Guidance for Assessing and Mitigating Air Quality Impacts*. Adopted March 19, 2015.

———. 2015b. *2015 Plan for the 1997 PM2.5 Standard*. April 16, 2015. www.valleyair.org/Air_Quality_Plans/docs/PM25-2015/2015-PM2.5-Plan-Complete.pdf (accessed May 14, 2015).

———. 2016a. *2016 Moderate Area Plan for the 2012 PM2.5 Standard*. September 15, 2016. www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2016/September/final/05.pdf (accessed November 22, 2016).

———. 2016b. *2016 Plan for the 2008 8-Hour Ozone Standard*. June 16, 2016. www.valleyair.org/Air_Quality_Plans/Ozone-Plan-2016.htm (accessed January 8, 2018).

———. 2018. *Plan for the 1997, 2006, and 2012 PM2.5 Standards*. November 15. www.valleyair.org/pmplans/documents/2018/pm-plan-adopted/PlanCoverPage.pdf (accessed February 6, 2019).

———. n.d. *Air Quality Modeling: Permitting & CEQA*. www.valleyair.org/busind/pto/tox_resources/airqualitymonitoring.htm#met_data (accessed October 2017).

San Joaquin Valley Regional Planning Agencies. 2010. *San Joaquin Valley Blueprint Planning Process Summary Report.* www.valleyblueprint.org/files/SJVBR_Summary_Final_2010-09-22.pdf (accessed: March 7, 2017).

Scholz, Dan. 2018. Construction Manager. AnchorCM. San Francisco, CA. Email to Laura Yoon of ICF transmitting construction assumptions. September through November 2018.

Siong, Patia. 2011. Supervising Air Quality Specialist. San Joaquin Valley Air Pollution Control District, Fresno, CA. Email to ICF regarding construction emission thresholds. May 23, 2011.

The Climate Registry. 2018. *Default GHG Emission Factors*. March 15.

Trinity Consultants. 2016. *California Emissions Estimator Model User's Guide. Version 2016.3.1. Appendix A: Calculation Details*. Prepared for California Air Pollution Control Officers Association (CAPCOA). September 2016.

U.S. Environmental Protection Agency (USEPA). 1978. *Air Pollutant Emission Factors for Military and Civil Aircraft*. EPA-450/3-78-117. October 1978.

———. 1992. *Guideline for Modeling Carbon Monoxide from Roadway Intersections*. EPA 454/R-92-005. November 1992. www3.epa.gov/scram001/guidance/guide/coguide.pdf (accessed January 2019).

———. 1998. *Compilation of Air Pollutant Emission Factors*. Section 11.9, *Western Surface Coal Mining*. www.epa.gov/ttn/chief/ap42/index.html (accessed October 17, 2016).

———. 2000. *Asbestos*. www3.epa.gov/airtoxics/hlthef/asbestos.html (accessed August 2016).

———. 2002. *Health Assessment Document for Diesel Engine Exhaust*. http://nepis.epa.gov/Exe/ZyPDF.cgi/300055PV.PDF?Dockey=300055PV.PDF (accessed August 2016).

———. 2003. *Ozone: Good Up High, Bad Nearby*. EPA-451/K-03-001. Office of Air and Radiation. June 2003. Washington, DC. www.epa.gov/oar/oaqps/gooduphigh/ozone.pdf (accessed August 2016).

———. 2006a. *Compilation of Air Pollutant Emission Factors*, Chapter 13.2.5, *Industrial Wind Erosion*. www.epa.gov/ttn/chief/ap42/index.html (accessed October 2016).

———. 2006b. *Compilation of Air Pollutant Emission Factors*, Chapter 13.2.2, *Unpaved Roads*. www.epa.gov/ttn/chief/ap42/index.html (accessed October 2016).

———. 2009. *Emission Factors for Locomotives*. EPA-420-F-09-025. April.

———. 2011. *Compilation of Air Pollutant Emission Factors,* Chapter 13.2.1, *Paved Roads*. www.epa.gov/ttn/chief/ap42/ch13/bgdocs/b13s0201.pdf. (accessed October 2016).

———. 2015a. *Mobile Source Air Toxics*. www.epa.gov/otaq/toxics.htm (accessed January 2015).

———. 2015b. *Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act*. www.epa.gov/climatechange/endangerment/ (accessed January 2015).

———. 2015c. *Particulate Matter—Basic Information*. www.epa.gov/pm-pollution (accessed August 2016).

———. 2015d. *Motor Vehicle Emission Simulator (MOVES) 2014a User Guide*. Assessment and Standards Division, Office of Transportation and Air Quality. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100NNCY.txt (accessed August 2016).

———. 2015e. *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas.* November 2015.

———. 2016a. *USEPA and NHTSA Adopt Standards to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium- and Heavy-Duty vehicles for Model Year 2018 and Beyond*. www3.epa.gov/otaq/climate/documents/420f16044.pdf (accessed: September 2016).

———. 2016b. *Polycyclic Organic Matter*. www3.epa.gov/airtoxics/hlthef/polycycl.html (accessed August 2016).

———. 2016c. *Climate Change Indicators in the United States*. www3.epa.gov/climatechange/science/indicators/weather-climate/ (accessed August 2016).

———. 2017. *Air Emissions Inventories*. www3.epa.gov/cgi-bin/broker?_service=data&_debug=0&_program=dataprog.state_1.sas&pol=CO&stfips=0 (accessed December 2017).

———. 2018a. *AirData Monitor Values Report*. www3.epa.gov/airdata/ad_rep_mon.html (accessed August 2018).

———. 2018b. *Nonattainment Areas for Criteria Pollutants*. June 30, 2018. www.epa.gov/green-book (accessed August 2018).

———. 2018c. *Emissions & Generation Resource Integrated Database (eGrid)*. February 15, 2018. www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid (accessed October 19, 2018).

U.S. Environmental Protection Agency (USEPA), California Air Resources Board (CARB), and National Highway Transportation Safety Administration (NHTSA) (USEPA et al.). 2016. *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025*. www.nhtsa.gov/staticfiels/rulemaking/pdf/cafe/Draft-TAR-Final.pdf (accessed September 2016).

U.S. Geological Survey (USGS). 2000. *Operational Guidelines (version 1.0) for Geological Fieldwork in Areas Endemic for Coccidioidomycosis (Valley Fever)*. U.S. Geological Survey Open-File Report 00-348. Version 1.0. 2000.

Watson, J. G. 1996. *Effectiveness Demonstration of Fugitive Dust Control Methods for Public Unpaved Roads and Unpaved Shoulders on Paved Roads*. DRI Document No. 685-5200. IF2: August 2, 1996.

Winkel, Jaclyn. 2018. Senior Planner. Bay Area Air Quality Management District, San Francisco, CA. Email communication to ICF regarding health risk analyses in BAAQMD. April 12, 2018.

13 PREPARER QUALIFICATIONS

Project Role	Name, Credential	Qualifications
ICF		
Senior Manager, Air Quality and Climate Change	Laura Yoon	11 years' experience B.A., Environmental Studies, University of Washington, Seattle, Washington M.S., Environmental Management, University of San Francisco, San Francisco, California
Managing Director, Air Quality and Climate Change	Edward Carr, Certified Consulting Meteorologist, 1989, No. 442	35 years' experience B.S., Meteorology, San Jose State University, M.S., Atmospheric Science, University of Washington