CALIFORNIA HIGH-SPEED TRAIN

Technical Report

DRAFT

Fresno to Bakersfield Section

Air Quality Technical Report

August 2011

CALIFORNIA
High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration

CALIFORNIA HIGH-SPEED TRAIN PROJECT
ENVIRONMENTAL IMPACT REPORT/
ENVIRONMENTAL IMPACT STATEMENT

Fresno to Bakersfield Section
Air Quality Technical Report

Prepared For:

California High-Speed Rail Authority

And

U.S. Department of Transportation
Federal Railroad Administration

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August 2011

Table of Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

$\mu g/m^3$	microgram(s) per cubic meter
°F	degree(s) Fahrenheit
AB	Assembly Bill
APCD	Air Pollution Control District
AQMD	Air Quality Management District
ARRA	American Recovery and Reinvestment Act
Authority	California High-Speed Rail Authority
BACT	best available control technology
BNSF	BNSF Railway
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy
Cal/EPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act
CDMG	California Department of Conservation, Division of Mines and Geology
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COG	Council of Fresno County Governments; see also Fresno COG
DE	diesel exhaust
DPM	diesel particulate matter
DTSC	Department of Toxic Substances Control
E.O.	Executive Order
EDMS	Emissions and Dispersion Modeling System
EIR	environmental impact report
EIS	environmental impact statement
EMU	electric multiple unit
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FR	Federal Regulations
FRA	Federal Railroad Administration
Fresno COG	Council of Fresno County Governments; see also COG
FTA	Federal Transit Authority
FTIP	Federal Transportation Improvement Program
GAMAQI	Guide for Assessing and Mitigating Air Quality Impacts
GC	general conformity *de minimis*
GHG	greenhouse gas

GWh	gigawatt-hour(s)
GWP	Global Warming Potential
HAP	hazardous air pollutant
HC	hydrocarbon
HCFC	hydrochlorofluorocarbon
HEI	Health Effects Institute
HFC	hydrofluorocarbon
HFE	hydrofluorinated ether
HHRAP	Human Health Risk Assessment Protocol
HMF	heavy maintenance facility
HMM	Hatch Mott MacDonald
hp	horsepower
HSC	Health and Safety Code
HST	(California) high-speed train
ìm	micrometer(s)
IRIS	Integrated Risk Information System
ISR	Indirect Source Review
KCAG	Kings County Association of Governments
Kern COG	Kern Council of Governments
LOS	Level of Service
LTO	landing and takeoff
MMT CO_2e	million metric tons of CO_2 equivalent
MOWF	maintenance-of-way facility
mph	mile(s) per hour
MPO	Metropolitan Planning Organization
MSAT	mobile source air toxic
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NF_3	nitrogen trifluoride
NHTSA	National Highway Traffic Safety Administration
NO	nitric oxide
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxides
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PFC	perfluorocarbon
PM	particulate matter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
POM	polycyclic organic matter
ppm	part(s) per million

PTO	Permit to Operate
RCM	Sacramento Roadway Construction Model
REL	Reference Exposure Limit
RfC	reference dose concentration
ROD	Record of Decision
ROG	reactive organic gases
RTAC	Regional Targets Advisory Committee
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agency
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategies
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	sulfur dioxide
SO_X	sulfur oxide
SR	State Route
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TCAG	Tulare County Association of Governments
TOG	total organic gas
TPSS	traction power supply station
tpy	ton(s) per year
ULSD	ultra-low sulfur diesel (fuel)
VMT	vehicle miles traveled
VOC	volatile organic compound

1.0 Introduction

The purpose of this report is to provide a detailed technical description of the analysis conducted for the air quality section of the environmental impact report (EIR)/environmental impact statement (EIS) for the Fresno to Bakersfield Section of the California High-Speed Train (HST) Project. The report presents the following:

- A description of the project.
- A discussion of the regulatory framework, including identification of federal, state, and local agencies concerned with air quality and climate change, and their pertinent statutes and regulations.
- Identification of air pollutants of concern for this project, including criteria pollutants (i.e., pollutants for which National Ambient Air Quality Standards [NAAQS] have been established by the U.S. Environmental Protection Agency [EPA]), mobile source air toxics, asbestos, and greenhouse gases.
- A summary of the existing conditions, including regional climate and meteorology, air quality monitoring data, the area's attainment status with respect to criteria air pollutants, the current regional air quality management and transportation improvement plans, status of conformity with federal air quality regulations, and the most recent emission inventory information.
- A description of the analytical methodologies and assumptions used for this study as well as the results of these analyses, air quality impacts expected and proposed mitigation measures.
- A discussion of the Fresno to Bakersfield Section with respect to the EPA General Conformity Rule.

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2.0 Project Description and Study Area

2.1 Project Introduction

The Fresno to Bakersfield Section of the HST project would be approximately 114 miles long, varying in length by only a few miles based on the route alternatives selected. To comply with the California High-Speed Rail Authority's (Authority's) guidance to use existing transportation corridors when feasible, the Fresno to Bakersfield HST Section would be primarily located adjacent to the existing BNSF Railway (BNSF) right-of-way. Alternative alignments are being considered where engineering constraints require deviation from the existing railroad corridor, and to avoid environmental impacts.

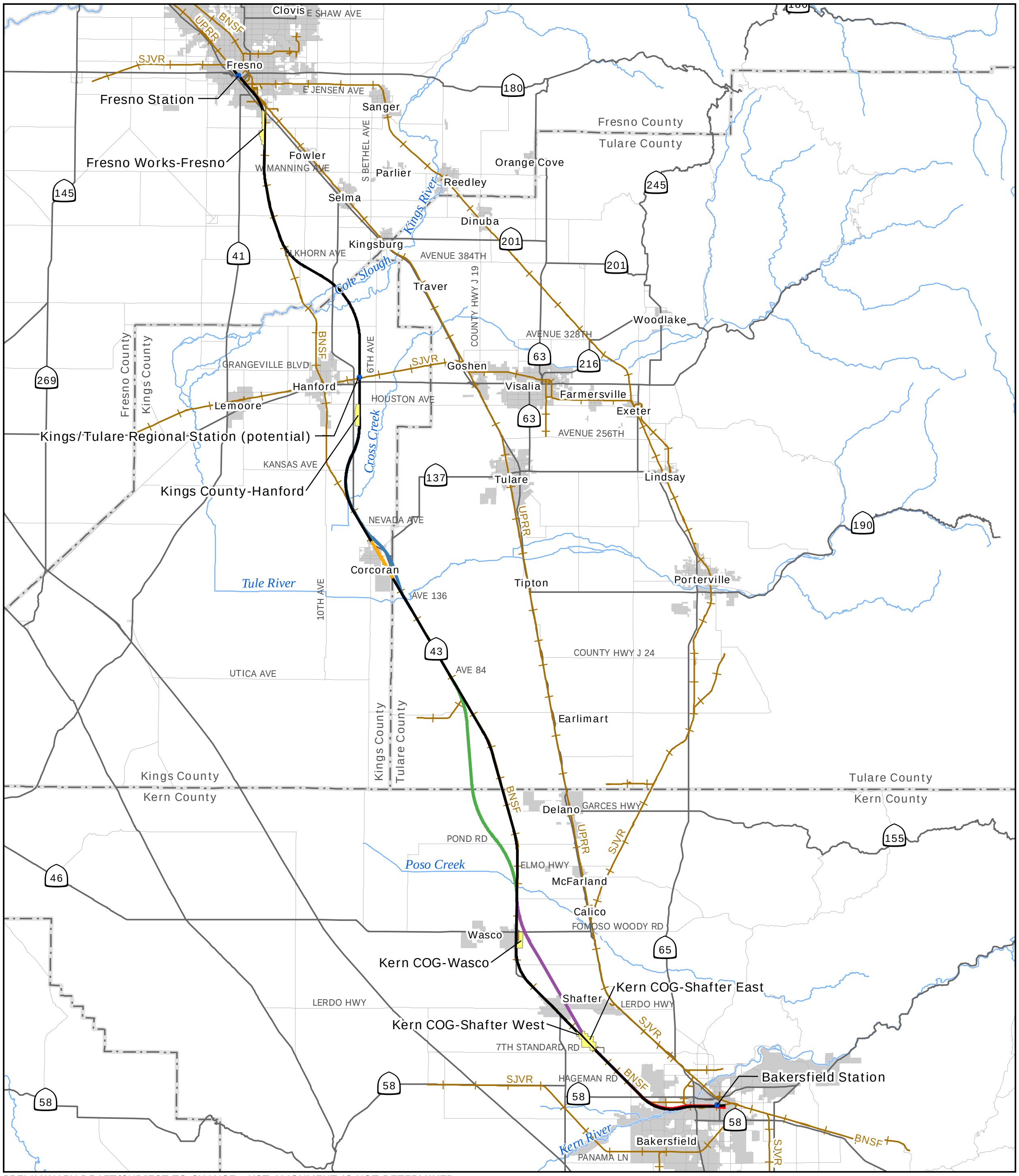
The Fresno to Bakersfield HST Section would cross both urban and rural lands and include a station in both Fresno and Bakersfield, a potential Kings/Tulare Regional Station in the vicinity of Hanford, a potential heavy maintenance facility (HMF), and power substations along the alignment. The HST alignment would be entirely grade-separated, meaning that crossings with roads, railroads, and other transport facilities would be located at different heights (overpasses or underpasses) so that the HST would not interrupt nor interface with other modes of transport. The HST right-of-way would also be fenced to prohibit public or automobile access. The project footprint would consist primarily of the train right-of-way, which would include both a northbound and southbound track in an area typically 100 feet wide. Additional right-of-way would be required to accommodate stations, multiple track at stations, maintenance facilities, and power substations.

The Fresno to Bakersfield Section would include at-grade, below-grade, and elevated track segments. The at-grade track would be laid on an earthen rail bed topped with rock ballast approximately 6 feet off of the ground; fill and ballast for the rail bed would be obtained from permitted borrow sites and quarries. Below-grade track would be laid in an open or covered trench at a depth which would allow roadway and other grade-level uses above the track. Elevated track segments would span long sections of urban development or aerial roadway structures and consist of steel truss aerial structures with cast in place reinforced-concrete columns supporting the box girders and platforms. The height of elevated track sections would depend on the height of existing structures below, and would range from 40 to 80 feet. Columns would be spaced 60 feet to 120 feet apart.

2.2 Project Alternatives

2.2.1 Alignment Alternatives

This section describes the Fresno to Bakersfield HST Section project alternatives, including the No Project Alternative. The project EIR/EIS for the Fresno to Bakersfield HST Section examines alternative alignments, stations, and HMF sites within the general BNSF Railway corridor. Discussion of the HST project alternatives begins with a single continuous alignment (the BNSF Alternative) from Fresno to Bakersfield. This alternative most closely aligns with the preferred alignment identified in the Record of Decision (ROD) for the Statewide Program EIR/EIS.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

June 30, 2011

Source: URS, 2011

BNSF Alternative

Corcoran Elevated

Corcoran Bypass

Allensworth Bypass

Wasco-Shafter Bypass

Bakersfield South

Station location

Alternative heavy maintenance facility (HMF)

Stream

Existing rail line

Community/Urban area

County boundary

N

0 5 10
Miles

0 10 20
Kilometers

Figure 2.2-1
Fresno to Bakersfield HST alignments

Descriptions of the additional five alternative alignments that deviate from the BNSF Alternative for portions of the route then follow. The alternative alignments that deviate from the BNSF Alternative were selected to avoid environmental, land use, or community issues identified for portions of the BNSF Alternative (Figure 2.2-1).

A. No Project Alternative

Under the No Project Alternative, the HST System would not be built. The No Project Alternative represents the condition of the Fresno to Bakersfield Section as it existed in 2009 (when the Notice of Preparation was issued), and as it would exist without the HST project at the planning horizon (2035). To assess future conditions, it was assumed that all currently known programmed and funded improvements to the intercity transportation system (highway, rail, and transit), and reasonably foreseeable local development projects (with funding sources identified), would be developed by 2035. The No Project Alternative is based on a review of Regional Transportation Plans (RTPs) for all modes of travel, the State of California Office of Planning and Research CEQAnet Database, the Federal Aviation Administration Air Carrier Activity Information System and Airport Improvement Plan grant data, the State Transportation Improvement Program, airport master plans and interviews with airport officials, intercity passenger rail plans, and city and county general plans and interviews with planning officials.

B. BNSF Alternative Alignment

The BNSF Alternative Alignment would extend approximately 114 miles from Fresno to Bakersfield and would lie adjacent to the BNSF Railway route to the extent feasible (Figure 2.2-1). Minor deviations from the BNSF Railway corridor would be necessary to accommodate engineering constraints, namely wider curves necessary to accommodate the HST (as compared with the existing lower-speed freight line track alignment). The largest of these deviations occurs between approximately Elk Avenue in Fresno County and Nevada Avenue in Kings County. This segment of the BNSF Alternative would depart from BNSF Railway corridor and instead curve to the east on the northern side of the Kings River and away from Hanford, and would rejoin the BNSF Railway corridor north of Corcoran.

Although the majority of the alignment would be at-grade, the BNSF Alternative would include aerial structures in all of the four counties through which it travels. In Fresno County, an aerial structure would carry the alignment over Golden State Boulevard and State Route (SR) 99 and a second would cross over the BNSF Railway tracks in the vicinity of East Conejo Avenue. The alignment would be at-grade with bridges where it crosses Cole Slough and the Kings River into Kings County.

In Kings County, the BNSF Alternative would be elevated east of Hanford where the alignment would pass over the San Joaquin Valley Railroad and SR 198. The alignment would also be elevated over Cross Creek, and again at the southern end of the city of Corcoran to avoid a BNSF Railway spur. In Tulare County, the BNSF Alternative would be elevated at the crossing of the Tule River and at the crossing of the Alpaugh railroad spur that runs west from the BNSF Railway mainline. In Kern County, the BNSF Alternative would be elevated over Poso Creek and through the cities of Wasco, Shafter, and Bakersfield. The BNSF Alternative would be at-grade through the rural areas between these cities.

The BNSF Alternative Alignment would provide wildlife crossing opportunities by means of a variety of engineered structures. Dedicated wildlife crossing structures would be provided from approximately Cross Creek (Kings County) south to Poso Creek (Kern County) in at-grade portions of the railroad embankment at approximately 0.3-mile intervals. In addition to those structures, wildlife crossing opportunities would be available at elevated portions of the alignment, bridges over riparian corridors, road overcrossings and undercrossings, and drainage facilities (i.e., large diameter [60 to 120 inches] culverts and paired 30-inch culverts). Where bridges, aerial structures, and road crossings coincide with proposed dedicated wildlife crossing structures, such features would serve the function of, and supersede the need for, dedicated wildlife crossing structures.

The preliminary wildlife crossing structure design consists of a modified culvert in the embankment that would support the HST tracks. The typical culvert would be 72 feet long from end to end (crossing structure distance), would span a width of approximately 8 feet (crossing structure width), and would provide 4 feet of vertical clearance (crossing structure height). Additional wildlife crossing structure designs could include circular or elliptical pipe culverts, and larger (longer) culverts with crossing structure distances of up to 100 feet. The design of the wildlife crossing structures may change depending on site-specific conditions and engineering considerations.

C. Corcoran Elevated Alternative Alignment

The Corcoran Elevated Alternative Alignment would be the same as the corresponding section of the BNSF Alternative Alignment from approximately Idaho Avenue south of Hanford to Avenue 136, except that it would pass through the city of Corcoran on the eastern side of the BNSF Railway right-of-way on an aerial structure. The aerial structure begins at Niles Avenue and returns to grade at 4th Avenue. Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of both the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43 and pass over several local roads on an aerial structure. Santa Fe Avenue would be closed at the HST right-of-way.

D. Corcoran Bypass Alternative Alignment

The Corcoran Bypass Alternative Alignment would run parallel to the BNSF Alternative Alignment from approximately Idaho Avenue south of Hanford, to approximately Nevada Avenue north of Corcoran. The Corcoran Bypass Alternative would then diverge from the BNSF Alternative and swing east of Corcoran, rejoining the BNSF Railway route at Avenue 136. The total length of the Corcoran Bypass would be approximately 21 miles.

Similar to the corresponding section of the BNSF Alternative, most of the Corcoran Bypass Alternative would be at-grade. However, one elevated structure would carry the HST over Cross Creek, and another would travel over SR 43, the BNSF Railway, and the Tule River. Dedicated wildlife crossing structures would be provided from approximately Cross Creek south to Avenue 136 in at-grade portions of the railroad embankment at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of each of the Cross Creek and Tule River crossings.

This alternative alignment would cross SR 43, Whitley Avenue/SR 137, and several local roads. SR 43, Waukena Avenue, and Whitley Avenue would be grade-separated from the HST with an overcrossing/undercrossing; other roads would be closed at the HST right-of-way.

E. Allensworth Bypass Alternative Alignment

The Allensworth Bypass Alternative Alignment would pass west of the BNSF Alternative, avoiding Allensworth Ecological Reserve and the Allensworth State Historic Park. This alignment was refined over the course of environmental studies to reduce impacts to wetlands and orchards. The total length of the Allensworth Bypass Alternative Alignment would be approximately 19 miles, beginning at Avenue 84 and rejoining the BNSF Alternative at Elmo Highway.

The Allensworth Bypass Alternative would be constructed on an elevated structure only where the alignment crosses the Alpaugh railroad spur and Deer Creek. The alignment would pass through Tulare County mostly at-grade. Dedicated wildlife crossing structures would be provided from approximately Avenue 84 to Poso Creek at intervals of approximately 0.3 mile. Dedicated wildlife crossing structures would also be placed between 100 and 500 feet to the north and south of both the Deer Creek and Poso Creek crossings.

The Allensworth Bypass would cross County Road J22, Scofield Avenue, Garces Highway, Woollomes Avenue, Magnolia Avenue, Palm Avenue, Pond Road, Peterson Road, and Elmo Highway. Woollomes Avenue and Elmo Highway would be closed at the HST right-of-way, while the other roads would be realigned and/or grade-separated from the HST with overcrossings.

The Allensworth Bypass Alternative includes an option to relocate the existing BNSF Railway tracks to be adjacent to the HST right-of-way for the length of this alignment. The possibility of relocating the BNSF Railway tracks along this alignment has not yet been discussed with BNSF Railway; however, if this option is selected, it is assumed that the existing BNSF Railway right-of-way would be abandoned between Avenue 84 and Elmo Highway, and the relocated BNSF Railway right-of-way would be 100 feet wide and adjacent to the eastern side of the Allensworth Bypass Alternative right-of-way.

F. Wasco-Shafter Bypass Alternative Alignment

The Wasco-Shafter Bypass Alternative Alignment would diverge from the BNSF Alternative between Sherwood Avenue and Fresno Avenue, crossing over to the eastern side of the BNSF Railway tracks and bypassing Wasco and Shafter to the east. The Wasco-Shafter Bypass Alternative would be at grade except where it travels over 7th Standard Road and the BNSF Railway to rejoin the BNSF Alternative. The total length of the alternative alignment would be approximately 24 miles.

The Wasco-Shafter Bypass was refined to avoid the Occidental Petroleum tank farm as well as a historic property potentially eligible for listing on the National Register of Historic Places. The Wasco-Shafter Bypass would cross SR 43, SR 46, East Lerdo Highway, and several local roads. SR 46, Kimberlina Road, Shafter Avenue, Beech Avenue, Cherry Avenue, and Kratzmeyer Road would be grade-separated from the HST with overcrossings/undercrossings; other roads would be closed at the HST right-of-way.

G. Bakersfield South Alternative Alignment

From the Rosedale Highway (SR 58) in Bakersfield, the Bakersfield South Alternative Alignment would run parallel to the BNSF Alternative Alignment at varying distances to the north. At Chester Avenue, the Bakersfield South Alternative curves south, and runs parallel to California Avenue. As with the BNSF Alternative, the Bakersfield South Alternative would begin at grade and become elevated starting at Palm Avenue through Bakersfield to its terminus at the southern end of the Bakersfield station tracks. The elevated section would range in height from 50 to 70 feet. Dedicated wildlife crossing structures would be placed between 100 and 500 feet to the north and south of the Kern River.

The Bakersfield South Alternative would be approximately 9 miles long and would cross the same roads as the BNSF Alternative. This alternative includes the Bakersfield Station–South Alternative.

2.2.2 Station Alternatives

The Fresno to Bakersfield HST Section would include a new station in Fresno and a new station in Bakersfield. An optional third station, the Kings/Tulare Regional Station, is under consideration.

Stations would be designed to address the purpose of the HST, particularly to allow for intercity travel and connection to local transit, airports, and highways. Stations would include the station platforms, a station building and associated access structure, as well as lengths of bypass tracks to accommodate local and express service at the stations. All stations would contain the following elements:

- Passenger boarding and alighting platforms.
- Station head house with ticketing, waiting areas, passenger amenities, vertical circulation, administration and employee areas, and baggage and freight-handling service.
- Vehicle parking (short-term and long-term) and “kiss and ride[1]”.
- Motorcycle/scooter parking.
- Bicycle parking.
- Waiting areas and queuing space for taxis and shuttle buses.
- Pedestrian walkway connections.

A. Fresno Station Alternatives

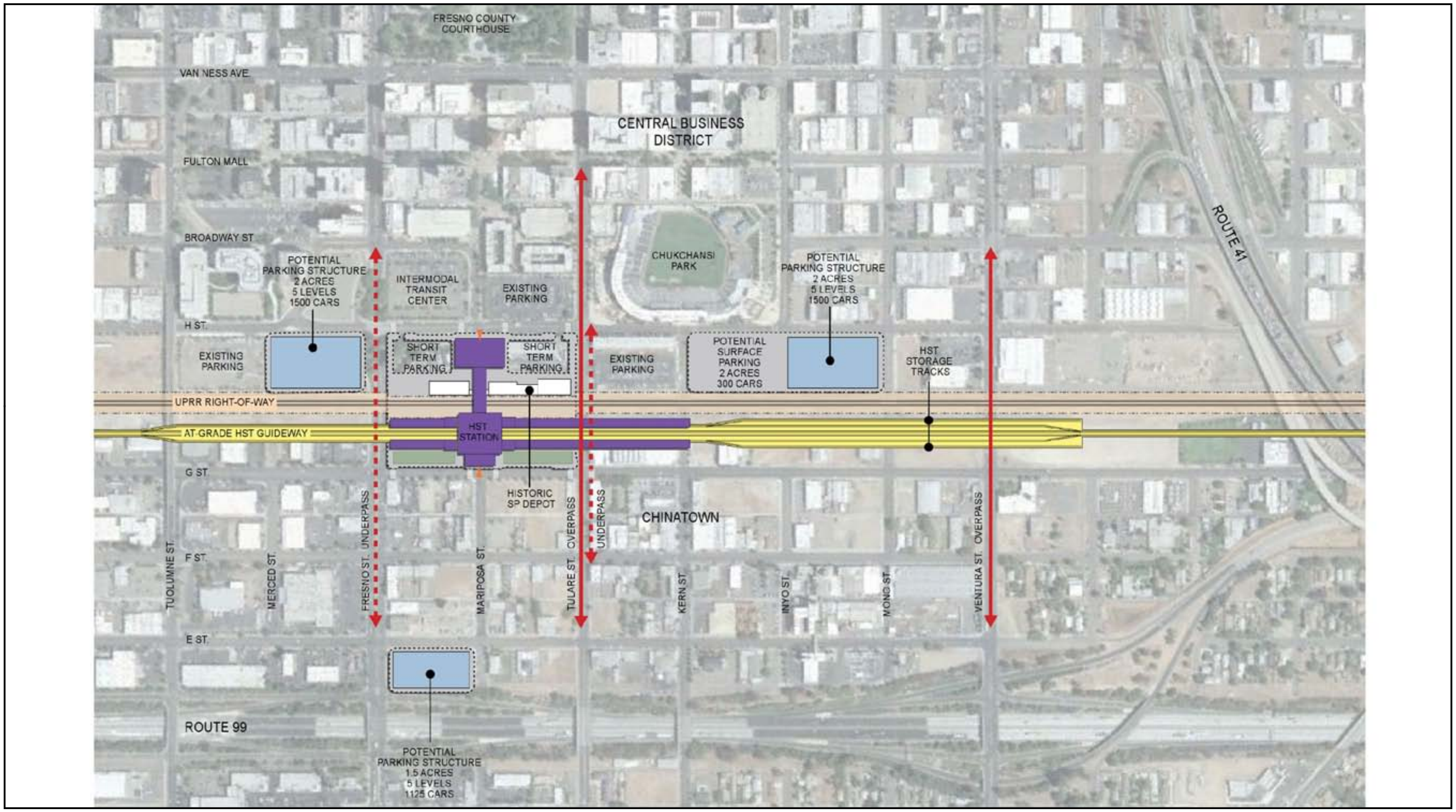
Two alternative sites are under consideration for the Fresno Station.

Fresno Station–Mariposa Alternative

The Fresno Station–Mariposa Alternative would be in downtown Fresno, less than 0.5 mile east of SR 99 on the BNSF Alternative. The station would be centered on Mariposa Street and bordered by Fresno Street on the north, Tulare Street on the south, H Street on the east, and G Street on the west. The station building would be approximately 75,000 square feet, with a maximum height of approximately 64 feet.

The two-level station would be at-grade; with passenger access provided both east and west of the HST guideway and the UPRR tracks, which would run parallel with one another adjacent to the station. The first level would contain the public concourse, passenger service areas, and station and operation offices. The second level would include the mezzanine, a pedestrian overcrossing above the HST guideway and the UPRR tracks, and an additional public concourse area. Entrances would be located at both G and H streets. A conceptual site plan of the Fresno Station–Mariposa Alternative is provided in Figure 2.2-2.

[1] “Kiss and ride” refers to the station area where riders may be dropped off or picked up before or after riding the HST.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 22, 2011

STATION ENTRANCE

KEY PEDESTRIAN LINKAGE

OPEN SPACE

STATION CAMPUS BOUNDARY

RIGHT-OF-WAY BOUNDARY

ROADWAY MODIFICATION

NOT TO SCALE

Figure 2.2-2
Fresno Station-Mariposa Alternative

The majority of station facilities would be east of the UPRR tracks. The station and associated facilities would occupy approximately 20.5 acres, including 13 acres dedicated to the station, short term parking, and kiss-and-ride accommodations. A new intermodal facility, not a part of this proposed undertaking, would be located on the parcel bordered by Fresno Street to the north, Mariposa Street to the south, Broadway Street to the east, and H Street to the west (designated "Intermodal Transit Center" in Figure 2.2-2). Among other uses, the intermodal facility would accommodate the Greyhound facilities and services that would be relocated from the northwestern corner of Tulare and H streets.

The site proposal includes the potential for up to three parking structures occupying a total of approximately 5.5 acres. Two of the three potential parking structures would each sit on 2 acres, and each would have a capacity of approximately 1,500 cars. The third parking structure would be slightly smaller in footprint (1.5 acres), with five levels and a capacity of approximately 1,100 cars. An additional 2-acre surface parking lot would provide approximately 300 parking spaces.

Under this alternative, the historic Southern Pacific Railroad depot and associated Pullman Sheds would remain intact. While these structures could be used for station-related purposes, they are not assumed to be functionally required for the HST project and are thus, not proposed to be physically altered as part of the project. The Mariposa station building footprint has been configured to preserve views of the historic railroad depot and associated sheds.

Fresno Station–Kern Alternative

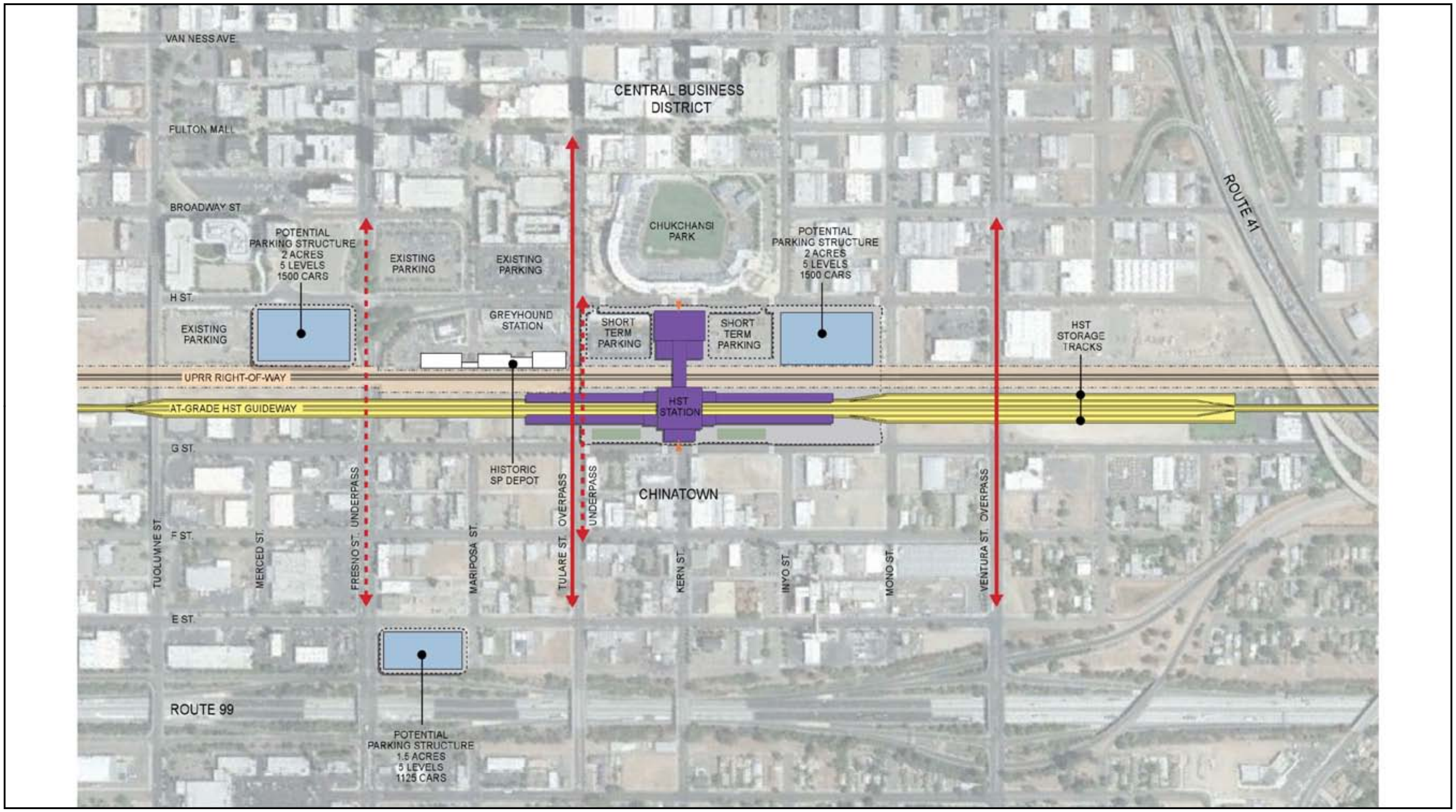
The Fresno Station–Kern Alternative would be similarly situated in downtown Fresno and would be located on the BNSF Alternative, centered on Kern Street between Tulare Street and Inyo Street (Figure 2.2-3). This station would include the same components as the Fresno Station–Mariposa Alternative, but under this alternative, the station would not encroach on the historic Southern Pacific Railroad depot just north of Tulare Street and would not require relocation of existing Greyhound facilities.

The station building would be approximately 75,000 square feet, with a maximum height of approximately 64 feet. The station building would have two levels housing the same facilities as the Fresno Station–Mariposa Alternative (UPRR tracks, HST tracks, mezzanine, and station office). The approximately 18.5-acre site would include 13 acres dedicated to the station, bus transit center, short term parking, and kiss-and-ride accommodations.

Two of the three potential parking structures would each sit on 2 acres, and each would have a capacity of approximately 1,500 cars. The third structure would be slightly smaller in footprint (1.5 acres) and have a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 600 additional parking spaces. Like the Fresno Station–Mariposa Alternative, the majority of station facilities under the Kern Alternative would be sited east of the HST tracks.

B. Kings/Tulare Regional Station

The potential Kings/Tulare Regional Station would be located east of SR 43 (Avenue 8) and north of the Cross Valley Rail Line (San Joaquin Valley Railroad) (Figure 2.2-4). The station building would be approximately 40,000 square feet with a maximum height of approximately 75 feet. The entire site would be approximately 27 acres, including 8 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride. An additional approximately 19 acres would support a surface parking lot with approximately 1,600 spaces.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 22, 2011

STATION ENTRANCE

KEY PEDESTRIAN LINKAGE

OPEN SPACE

STATION CAMPUS BOUNDARY

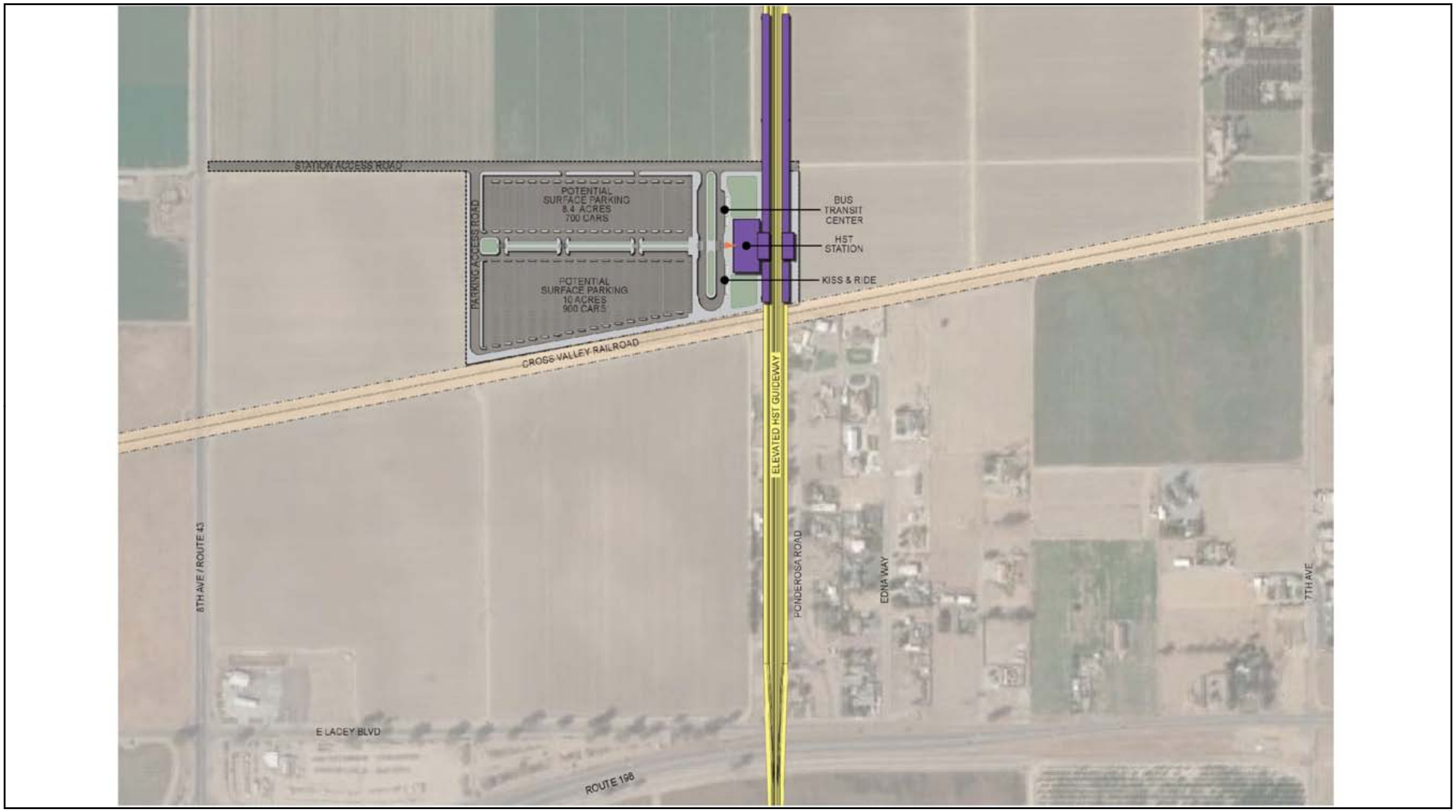
RIGHT-OF-WAY BOUNDARY

ROADWAY MODIFICATION

N

NOT TO SCALE

Figure 2.2-3
Fresno Station-Kern Alternative



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 22, 2011

N

NOT TO SCALE

Figure 2.2-4
Kings/Tulare Regional Station (potential)

C. Bakersfield Station Alternatives

Two options are under consideration for the Bakersfield Station.

Bakersfield Station–North Alternative

The Bakersfield Station–North Alternative would be located at the corner of Truxtun and Union Avenue/SR 204 along the BNSF Alternative Alignment (Figure 2.2-5). The three-level station building would be 52,000 square feet, with a maximum height of approximately 95 feet. The first level would house station operation

offices and would also accommodate trains running along the BNSF Railway line. The second level would include the mezzanine; the HST platforms and guideway would pass through the third level. Under this alternative, the station building would be located at the western end of the parcel footprint. Two new boulevards would be constructed to access the station and the supporting facilities.

The 19-acre site would designate 11.5 acres for the station, bus transit center, short-term parking, and kiss-and-ride. An additional 7.5 acres would house two parking structures that together would accommodate approximately 4,500 cars. The bus transit center and the smaller of the two parking structures (2.5 acres) would be located north of the HST tracks. The BNSF Railway line would run through the station at-grade, with the HST alignment running on an elevated guideway.

Bakersfield Station–South Alternative

The Bakersfield Station–South Alternative would be would be similarly located in downtown Bakersfield, but situated on the Bakersfield South Alternative Alignment along Union and California avenues, just south of the BNSF Railway right-of-way (Figure 2.2-6). The two-level station building would be 51,000 square feet, with a maximum height of approximately 95 feet. The first floor would house the concourse, and the platforms and the guideway would be on the second floor. Access to the site would be from two new boulevards, one branching off from California Avenue and the other from Union Avenue.

The entire site would be 20 acres, with 15 acres designated for the station, bus transit center, short-term parking, and kiss-and-ride. An additional 5 acres would support one six-level parking structure with a capacity of approximately 4,500 cars. Unlike the Bakersfield Station–North Alternative, this station site would be located entirely south of the BNSF Railway right-of-way.

PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 29, 2011

STATION ENTRANCE

KEY PEDESTRIAN LINKAGE

OPEN SPACE

STATION CAMPUS BOUNDARY

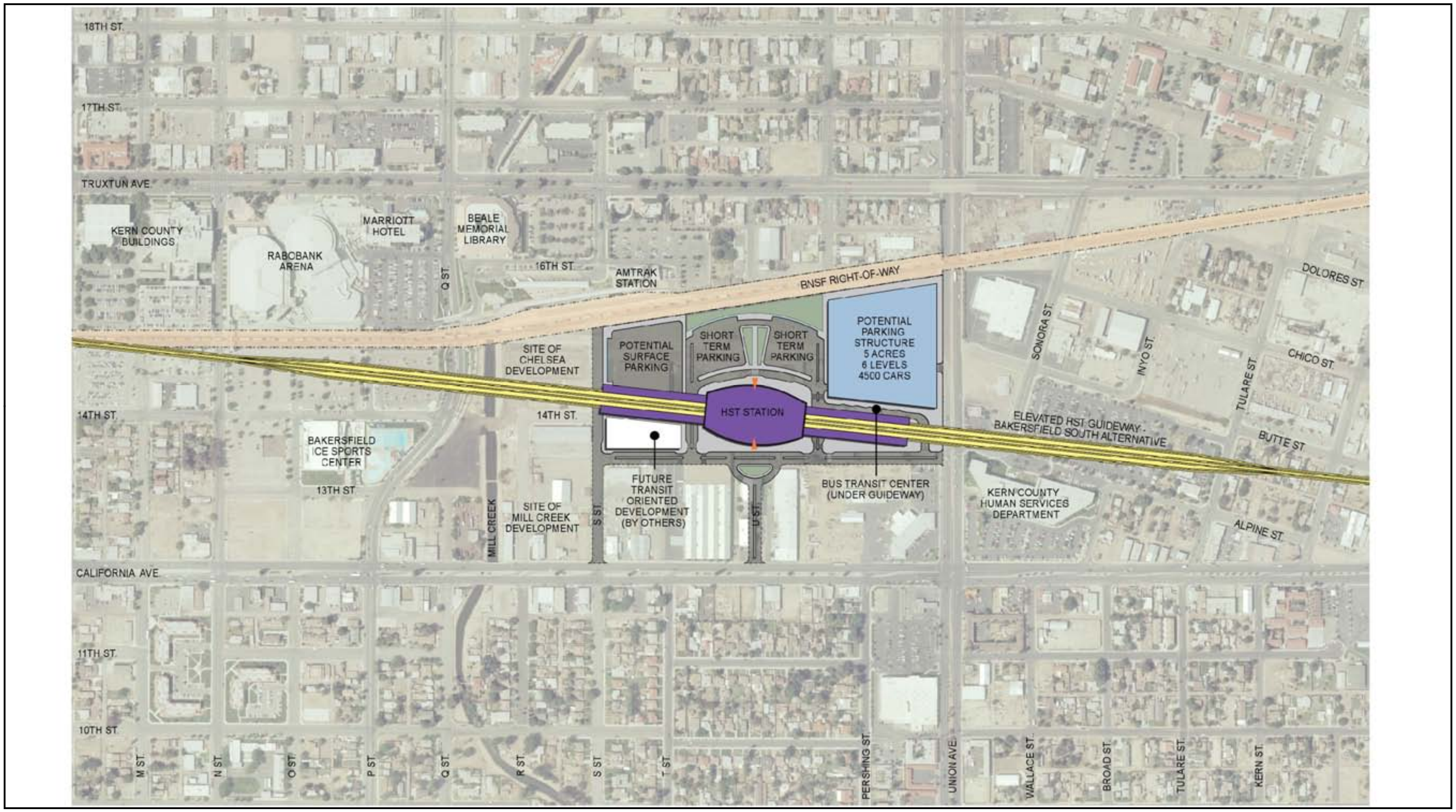
RIGHT-OF-WAY BOUNDARY

ROADWAY MODIFICATION

N

NOT TO SCALE

Figure 2.2-5
Bakersfield Station-North Alternative



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 22, 2011

STATION ENTRANCE

KEY PEDESTRIAN LINKAGE

OPEN SPACE

STATION CAMPUS BOUNDARY

RIGHT-OF-WAY BOUNDARY

ROADWAY MODIFICATION

N

NOT TO SCALE

Figure 2.2-6
Bakersfield Station-South Alternative

2.2.3 Heavy Maintenance Facility

One HST heavy vehicle maintenance and layover facility would be sited along either the Merced to Fresno or Fresno to Bakersfield HST section. Before the startup of initial operations, the HMF would support the assembly, testing, commissioning, and acceptance of high-speed rolling stock. During regular operations, the HMF would provide maintenance and repair functions, activation of new rolling stock, and train storage. The HMF concept plan indicates that the site would encompass approximately 150 acres to accommodate shops, tracks, parking, administration, roadways, power substation, and storage areas. The HMF would include tracks that allow trains to enter and leave under their own electric power or under tow. The HMF would also have management, administrative, and employee support facilities. Up to 1,500 employees could work at the HMF during any 24-hour period.

The Authority has determined that one HMF would be located between Merced and Bakersfield; however, the specific location has not yet been finalized. Five HMF sites are under consideration in the Fresno to Bakersfield Section (Figure 2.2-1):

- The Fresno Works–Fresno HMF site lies within the southern limits of the city of Fresno and county of Fresno next to the BNSF Railway right-of-way between SR 99 and Adams Avenue. Up to 590 acres are available for the facility at this site.
- The Kings County–Hanford HMF site lies southeast of the city of Hanford, adjacent to and east of SR 43, between Houston and Idaho Avenues. Up to 510 acres are available at the site.
- The Kern Council of Governments–Wasco HMF site lies directly east of Wasco between SR 46 and Filburn Street. Up to 420 acres are available for the facility at this site.
- The Kern Council of Governments–Shafter East HMF site lies in the city of Shafter between Burbank Street and 7th Standard Road to the east of the BNSF Railway right-of-way. This site has up to 490 acres available for the facility.
- The Kern Council of Governments–Shafter West HMF site lies in the city of Shafter between Burbank Street and 7th Standard Road to the west of the BNSF Railway right-of-way. This site has up to 480 acres available for the facility.

2.3 Power

To provide power for the HST, high-voltage electricity at 115 kV and above would be drawn from the utility grid and transformed down to 25,000 volts. The voltage would then be distributed to the trains via an overhead catenary system. The project would not include the construction of a separate power source, although it would include the extension of power lines to a series of power substations positioned along the HST corridor. The transformation and distribution of electricity would occur in three types of stations:

- Traction power supply stations (TPSSs) transform high-voltage electricity supplied by public utilities to the train operating voltage. TPSSs would be sited adjacent to existing utility transmission lines and the HST right-of-way, and would be located approximately every 30 miles along the route. Each TPSS would be 200 feet by 160 feet.

- Switching stations connect and balance the electrical load between tracks, and switch power on or off to tracks in the event of a power outage or emergency. Switching stations would be located midway between, and approximately 15 miles from, the nearest TPSS. Each switching station would be 120 feet by 80 feet and located adjacent to the HST right-of-way.

- Paralleling stations, or autotransformer stations, provide voltage stabilization and equalize current flow. Paralleling stations would be located every 5 miles between the TPSSs and the switching stations. Each paralleling station would be 100 feet by 80 feet and located adjacent to the HST right-of-way.

2.4 Project Construction

The construction plan developed by the Authority and described below would maintain eligibility for eligibility for federal American Recovery and Reinvestment Act (ARRA) funding. For the Fresno to Bakersfield Section, specific construction elements would include at-grade, below-grade, and elevated track, track work, grade crossings, and installation of a positive train control system. At-grade track sections would be built using conventional railroad construction techniques. A typical sequence includes clearing, grubbing, grading, and compacting of the rail bed; application of crushed rock ballast; laying of track; and installation of electrical and communications systems.

The precast segmental construction method is proposed for elevated track sections. In this construction method, large concrete bridge segments would be mass-produced at an onsite temporary casting yard. Precast segments would then be transported atop the already completed portions of the elevated track and installed using a special gantry crane positioned on the aerial structure. Although the precast segmental method is the favored technique for aerial structure construction, other methods may be used, including cast-in-place, box girder, or precast span-by-span techniques.

Pre-construction activities would be conducted during final design and include geotechnical investigations, identification of staging areas, initiation of site preparation and demolition, relocation of utilities, and implementation of temporary, long-term, and permanent road closures. Additional studies and investigations to develop construction requirements and worksite traffic control plans would be conducted as needed.

Major construction activities for the Fresno to Bakersfield Section would include earthwork and excavation support systems construction, bridge and aerial structure construction, railroad systems construction (including trackwork, traction electrification, signaling, and communications), and station construction. 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 will vary depending on the activities being performed.

The Authority intends to build the project using sustainable methods that:

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

The overall schedule for construction is provided in Table 2-1.

Table 2-1
Construction Schedule

Activity	Tasks	Duration
Mobilization	Safety devices and special construction equipment mobilization	March–October 2013
Site Preparation	Utilities relocation; clearing/grubbing right-of-way; establishment of detours and haul routes; preparation of construction equipment yards, stockpile materials, and precast concrete segment casting yard	April–August 2013
Earthmoving	Excavation and earth support structures	August 2013–August 2015
Construction of Road Crossings	Surface street modifications, grade separations	June 2013–December 2017
Construction of Elevated Structures	Elevated structure and bridge foundations, substructure, and superstructure	June 2013–December 2017
Track Laying	Includes backfilling operations and drainage facilities	January 2014–August 2017
Systems	Train control systems, overhead contact system, communication system, signaling equipment	July 2016–November 2018
Demobilization	Includes site cleanup	August 2017–December 2019
HMF Phase 1[a]	Test track assembly and storage	August–November 2017
Maintenance-of-Way Facility	Potentially co-located with HMF[a]	January–December 2018
HMF Phase 2[a]	Test track light maintenance facility	June–December 2018
HMF Phase 3[a]	Heavy Maintenance Facility	January–July 2021
HST Stations	Demolition, site preparation, foundations, structural frame, electrical and mechanical systems, finishes	Fresno: December 2014–October 2019 Kings/Tulare Regional: TBD[b] Bakersfield: January 2015–November 2019

Notes:
a The HMF would be sited along either the Merced to Fresno or Fresno to Bakersfield section.
b ROW would be acquired for the Kings/Tulare Regional Station; however, the station itself would not be part of initial construction.
Acronym: TBD = to be determined

2.5 Study Area

2.5.1 Statewide

A statewide study area was identified to evaluate potential changes in air quality from large-scale, non-localized impacts, such as HST power requirements, changes in air traffic, and project conformance with the State Implementation Plan (SIP).

2.5.2 Regional

The regional study area for this analysis is the San Joaquin Valley Air Basin (SJVAB), in which the entire Fresno to Bakersfield Section of the California HST System is located. Figure 2.5-1 shows the

SJVAB, which includes all of Fresno, Kings, and Tulare counties and a portion of Kern County where this section of the HST project is located. The Fresno to Bakersfield Section is approximately 114 miles long and would be serviced by one HST station in Fresno and one in Bakersfield. A proposed station in the Hanford area is also being considered. The Fresno to Bakersfield Section would pass through the urbanized areas of Fresno and Bakersfield and the more rural area between the two cities. Figure 2.2-1 shows the proposed route and station locations for this portion of the project. The Fresno to Bakersfield Section of the HST alignment is shown in red in Figure 2.5-1.

The SJVAB, which is approximately 250 miles long and 35 miles wide, is the second-largest air basin in the state. Air pollution, especially the dispersion of air pollutants, is directly related to a region's topographic features. The SJVAB is defined by the Sierra Nevada in the east (8,000 to 14,000 feet in elevation), the Coast Range to the west (averaging 3,000 feet in elevation), and the Tehachapi Mountains to the south (6,000 to 8,000 feet in elevation). To the north, the San Joaquin Valley opens to the sea at Carquinez Strait, where the Sacramento–San Joaquin River Delta empties into San Francisco Bay.

2.5.3 Local Study Areas

Local study areas, in this context, are areas of potential major air emission activities along the HST alignment, including areas near construction activities and major traffic pattern changes. Local study areas are generally defined as areas within 1,000 feet of the proposed stations, major intersections, and the HMF[2]. Analyses performed by the California Air Resources Board (CARB) indicate that providing a separation of 1,000 feet or more from diesel sources and high-traffic areas would substantially reduce diesel particulate matter (DPM) concentrations, public exposure to pollutants, and asthma symptoms in children (CARB 2005). As a result, potential impacts on sensitive receptors within 1,000 feet of the project were evaluated, as well as the potential for local hot spots[3] associated with changes in concentrations of carbon monoxide (CO), particulate matter smaller than or equal to 2.5 micrometers (ìm) in diameter ($PM_{2.5}$), and particulate matter smaller than or equal to 10 ìm in diameter (PM_{10}); these impacts would result from changes in traffic patterns for intersections operating at Level of Service (LOS) D or worse.

[2] Localized health risk modeling might look at areas beyond 1,000 feet if cancer risks are expected to occur at distances greater than 1,000 feet.

[3] A hot-spot analysis is an estimation of likely future localized PM_{10} and $PM_{2.5}$ pollutant concentrations and a comparison of those concentrations to the NAAQS (40 CFR Part 93.101).

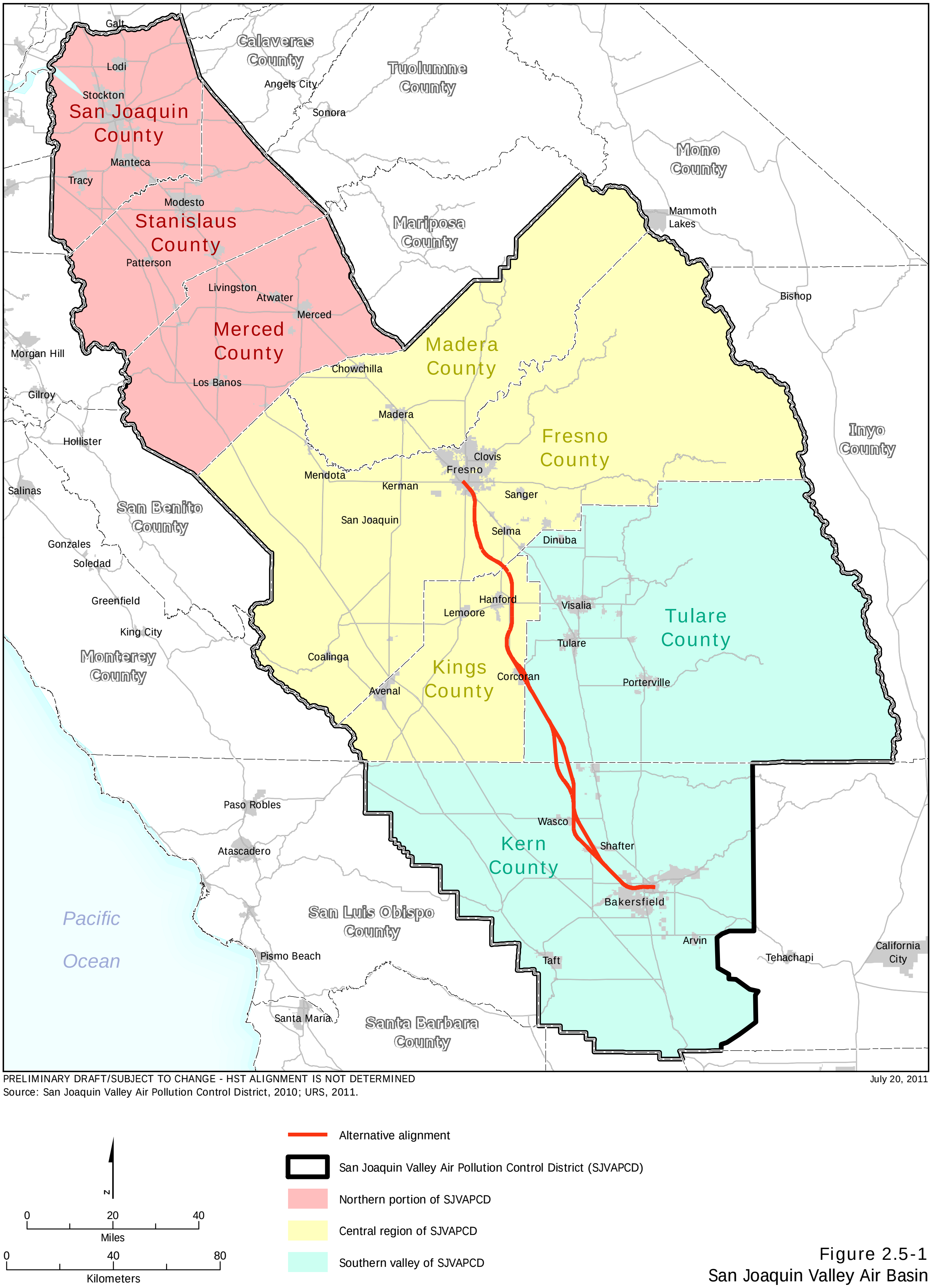


Figure 2.5-1
San Joaquin Valley Air Basin

3.0 Regulatory Framework

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, combining to form "smog," reducing the productivity or vigor of crops or natural vegetation, and reducing human or animal health. *Air quality* describes the amount of air pollution to which the public is exposed.

Air quality in the United States is governed by the federal Clean Air Act (CAA), which is administered by EPA. Air quality in California is also governed by the California Clean Air Act (CCAA), which is administered by CARB.

The CCAA, as amended in 1992, delegates local enforcement of air quality regulations to air districts in the state, and requires them to endeavor to achieve and maintain state ambient air quality standards.

3.1 Regulatory Agencies

3.1.1 Federal

A. U.S. Environmental Protection Agency

EPA is responsible for establishing the NAAQS, enforcing the CAA, and regulating transportation-related emission sources, (e.g., aircraft, ships, and certain types of locomotives) under the exclusive authority of the federal government. EPA also has jurisdiction over emission sources outside of state waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including standards for vehicles sold in states other than California. Automobiles sold in California must meet stricter emission standards established by CARB. For additional information about EPA, the reader can contact EPA's general internet address found at www.epa.gov. Additional information on the activities of EPA Region 9 (Pacific Southwest), which includes California, can be found at www.epa.gov/region9.

3.1.2 State

A. California Environmental Protection Agency

The California Environmental Protection Agency (Cal/EPA) is a state agency that includes CARB, the State Water Resources Control Board (SWRCB), nine Regional Water Quality Control Boards (RWQCBs), the Integrated Waste Management Board, the Department of Toxic Substances Control (DTSC), the Office of Environmental Health Hazard Assessment (OEHHA), and the Department of Pesticide Regulation. The mission of Cal/EPA is to restore, protect, and enhance the environment and to ensure public health, environmental quality, and economic vitality. The internet address for Cal/EPA is www.calepa.ca.gov.

B. California Air Resources Board

CARB is responsible for implementing the CCAA, meeting state requirements of the federal CAA, establishing the California Ambient Air Quality Standards (CAAQS), and regulating mobile sources of air pollution. 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. In addition, CARB establishes passenger vehicle fuel specifications and also identifies toxic air contaminants (Health and Safety Code Section 39650 et seq.).

CARB administers the CCAA at the state level. Local air pollution control districts and air quality management districts administer CCAA at the regional level. CARB oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality activities for controlling stationary emission sources at the regional and county levels. The internet address for CARB is www.arb.ca.gov.

3.1.3 Local

A. San Joaquin Valley Air Pollution Control District

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is responsible for (1) implementing air quality regulations, including developing plans and control measures for stationary sources of air pollution to meet the NAAQS and CAAQS, (2) implementing permit programs for the construction, modification, and operation of sources of air pollution, and (3) enforcing air pollution statutes and regulations governing stationary sources. With CARB oversight, the SJVAPCD administers local regulations.

The SJVAPCD also coordinates transportation and air quality planning activities with the eight San Joaquin Valley transportation planning agencies. The SJVAPCD and the transportation planning agencies coordinate on mobile emissions inventory development, transportation control measure development and implementation, and transportation conformity issues.

B. Association of Governments

There are 25 local planning agencies within California. The local planning agencies in the Fresno to Bakersfield Section include the Council of Fresno County Governments (COG), the Kings County Association of Governments (KCAG), the Tulare County Association of Governments (TCAG), and the Kern Council of Governments (Kern COG). Members of the COG include Fresno County and the cities of Clovis, Mendota, Coalinga, Orange Cove, Firebaugh, Parlier, Fowler, Reedley, Fresno, San Joaquin, Huron, Sanger, Kerman, Selma, and Kingsburg (COG 2010a). The KCAG comprises representatives from Kings County and the cities of Avenal, Corcoran, Hanford, and Lemoore (KCAG 2010a). The TCAG represents the cities of Dinuba, Exeter, Farmersville, Lindsay, Porterville, Tulare, Visalia, Woodlake, Tulare County, the Tule River Indian Tribe, and tribal communities in the transportation planning process (TCAG 2010). The Kern COG addresses regional transportation issues in the County of Kern and the 11 incorporated cities within Kern County: Arvin, California City, Maricopa, Ridgecrest, Taft, Wasco, Bakersfield, Delano, McFarland, Shafter, and Tehachapi (Kern COG 2010a).

Each planning agency is the joint power of authority of member agencies and is responsible for establishing the long-range priorities for the regional transportation system through the development of the 20-year RTPs and transportation improvement program, as required by state law. These plans identify improvements across the entire system, including the road and highway network, bus and rail transit systems, freight transportation, the environment, and advanced technologies. The current plans of the responsible planning agencies in the Fresno to Bakersfield Section are discussed in the following sections.

3.2 Applicable Regulations

3.2.1 Clean Air Act and Conformity Rule

The CAA defines nonattainment areas as geographic regions designated as not meeting one or more of the NAAQS. It requires that an SIP be prepared for each nonattainment area, and a maintenance plan be prepared for each former nonattainment area that subsequently demonstrated compliance with the standards. A SIP is a compilation of a state's air quality control plans and rules, approved by EPA. 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 and U.S. EPAs' goals are to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of these standards.

Pursuant to CAA Section 176(c) requirements, EPA promulgated Title 40 of the Code of Federal Regulations Part 51 (40 Code of Federal Regulations [CFR] 51) Subpart W and 40 CFR Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (see 58 Federal Register [FR] 63214, [November 30, 1993], as amended, 75 FR 17253 [April 5, 2010]). These regulations, commonly referred to as the General Conformity Rule, apply to all federal actions except for those federal actions which are excluded from review (e.g., stationary source emissions) or related to transportation plans, programs, and projects under Title 23 U.S. Code or the Federal Transit Act, which are subject to Transportation Conformity. The General Conformity Rule applies to all federal actions not addressed by the Transportation Conformity Rule.

40 CFR Part 51, Subpart W, applies in states where the state has an approved SIP revision adopting General Conformity regulations; 40 CFR Part 93, Subpart B, applies in states where the state does not have an approved SIP revision adopting General Conformity regulations.

The General Conformity Rule is used to determine if federal actions meet the requirements of the CAA and the applicable SIP by ensuring that air emissions related to the action do not:

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

A conformity determination under the General Conformity Rule is required if the federal agency determines: the action will occur in a nonattainment or maintenance area; that 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; and 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 regulations (75 FR 17255).

Conformity regulatory criteria are listed in 40 CFR 93.158. An action will be determined to conform to the applicable SIP if, for each pollutant that exceeds the *de minimis* emissions level in 40 CFR 93.153(b), or otherwise requires a conformity determination due to the total of direct and indirect emissions from the action, the action meets the requirements of 40 CFR 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 proposed project is subject to review under the EPA General Conformity Rule. However, there may be some smaller highway elements of the project that will be dealt with through case-by-case modification of the RTP consistent with transportation conformity.

3.2.2 National and State Ambient Air Quality Standards

As required by the CAA, EPA has established NAAQS for six major air pollutants, known as *criteria pollutants*. The criteria pollutants are ozone (O_3); particulate matter (PM) (i.e., PM_{10} and $PM_{2.5}$); CO; nitrogen dioxide (NO_2); sulfur dioxide (SO_2); and lead (Pb). California has also established ambient air quality standards, known as the CAAQS, which are generally more stringent than the corresponding federal standards, and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles.

Both state and federal standards are summarized in Table 3.2-1. 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.

3.2.3 Mobile Source Air Toxics

In addition to the NAAQS criteria pollutants, EPA also regulates mobile source air toxics (MSATs). In February 2007, EPA finalized a rule (Control of Hazardous Air Pollutants from Mobile Sources) to reduce hazardous air pollutant (HAP) emissions from mobile sources. The rule limits the benzene content of gasoline and reduces toxic emissions from passenger vehicles and gas cans. EPA 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 occurred in October of 2008. This revision added additional specific benzene control technologies that the previous rule did not include.

By 2010, EPA's existing programs will reduce MSATs by more than 1 million tons from 1999 levels (EPA 2011a) In addition to controlling pollutants, such as hydrocarbons, PM, and nitrogen oxides (NO_x), recent EPA regulations controlling emissions from highway vehicles and non-road equipment will result in large reductions in toxic emissions. Furthermore, EPA has programs under development that would provide additional benefits (further controls) for small non-road gasoline engines, diesel locomotive and marine engines. A variety of EPA 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.

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 various measures to control emissions of air toxics from stationary sources. The California Toxics Inventory, developed by speciating CARB estimates of total organic gas (TOG) and PM, provides emissions estimates by stationary, area-wide, on-road mobile, off-road mobile, and natural sources (CARB 2011a).

No federal or California ambient standards exist for MSATs. Specifically, EPA has not established NAAQS or provided standards for hazardous air pollutants.

Table 3.2-1
State and Federal Ambient Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	53 ppb (100 µg/m^3) (see footnote 8)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		100 ppb (188 µg/m^3) (see footnote 8)	None	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence	—	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)[9]
	3 Hour	—		—	0.5 ppm (1300 µg/m^3) (see footnote 9)	
	1 Hour	0.25 ppm (655 µg/m^3)		75 ppb (196 µg/m^3) (see footnote 9)	—	
Lead[10]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[11]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page …

For more information please call ARB-PIO at (916) 322-2990

California Air Resources Board (09/08/10)

Table 3.2-1
State and Federal Ambient Air Quality Standards (Continued)

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal 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 procedure which can be shown to the satisfaction of the ARB 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 adverse effects of a pollutant.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010). Note that the EPA standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, the U.S. EPA established a new 1-hour SO_2 standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. EPA also proposed a new automated Federal Reference Method (FRM) using ultraviolet technology, but will retain the older pararosaniline methods until the new FRM have adequately permeated State monitoring networks. The EPA also revoked both the existing 24-hour SO_2 standard of 0.14 ppm and the annual primary SO_2 standard of 0.030 ppm, effective August 23, 2010. The secondary SO_2 standard was not revised at that time; however, the secondary standard is undergoing a separate review by EPA. Note that the new standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the new primary 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.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' 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.

11. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (09/08/10)**

Source: CARB 2010a.

3.2.4 Federal Greenhouse Gas Regulations

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

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

On September 22, 2009, EPA published the final rule that requires mandatory reporting of GHG emissions from large sources in the United States. The rule amends CAA Regulations under 40 CFR Parts 86, 87, 89 90 and 94 and provides a new section, Part 98. EPA 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 EPA under Subpart C of the final rule. The gases covered by the final rule are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and other fluorinated gases including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFEs). This is not a transportation-related regulation. This will affect electrical generation sources that contribute to the California electrical grid, and it may affect the state SIP and does not directly apply to the HST system. (EPA 2010a)

On October 5, 2009, , President Obama signed Executive Order (E.O.) 13514; *Federal Leadership in Environmental, Energy, and Economic Performance*;. E.O. 13514 requires Federal agencies to set a 2020 greenhouse gas emissions 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 (endangerment finding), 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, HFCs, PFCs, 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 which threatens public health and welfare (EPA 2010b).

Under the endangerment finding, EPA is developing vehicle emission standards under the CAA. EPA and the Department of Transportation's National Highway Traffic Safety Administration have issued a joint proposal to establish a national program that includes standards that will reduce GHG emissions and improve fuel economy for light-duty vehicles in model years 2012 through 2016. This proposal marks the first GHG standards proposed by the EPA under the CAA as a result of the endangerment and cause or contribute findings (EPA 2009a).

On February 18, 2010, the White House Council on Environmental Quality (CEQ) released draft guidance regarding the consideration of GHG in National Environmental Policy Act (NEPA) documents for federal actions. The draft guidelines include a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent (CO_2e) emissions from a proposed action to trigger a quantitative analysis. CEQ has not established when GHG emissions are "significant" for NEPA purposes; rather, it poses the question to the public (CEQ 2010).

3.2.5 California Environmental Quality Act

The California Environmental Quality Act (CEQA) [Section 21000 et seq.] and CEQA Guidelines [Section 15000 et seq.] require state and local agencies to identify the significant environmental impacts of their actions, including potential significant air quality and climate change impacts, and to avoid or mitigate those impacts, when feasible. The CEQA amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental impacts caused by a project and to consider feasible means to mitigate the significant impacts of GHG emissions.

3.2.6 California Greenhouse Gas Regulations

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

A. Assembly Bill 1493

With the passage of Assembly Bill (AB) 1493 in 2020, California launched an innovative and pro-active approach for dealing with GHG emissions and climate change at the state level. AB 1493 requires CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions. These stricter emissions standards apply to automobiles and light trucks beginning with the 2009-model year. Although litigation was filed challenging these regulations and EPA initially denied California's related request for a waiver, the waiver request has now been granted (CARB 2009a).

B. Executive Order S-3-05

On June 1, 2005, Governor Schwarzenegger signed E.O. S-3-05. The goal of E.O. S-3-05 is to reduce California's GHG emissions to (1) year 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80% below the 1990 levels by 2050. E.O. S-3-05 also calls for Cal/EPA to prepare biennial science reports regarding the potential impact of continued global warming on certain sectors of the state economy. As a result of the thorough scientific analysis collected in these biennial reports, the comprehensive Climate Adaptation Strategy was released in December 2009 after extensive interagency coordination and stakeholder input. The latest of these reports, *Climate Action Team Report to Governor Schwarzenegger and the California Legislature*, was published in December 2010 (Cal/EPA 2010).

C. Assembly Bill 32

The goal of E.O. S-03-05 is further reinforced by AB 32, the Global Warming Solutions Act of 2006. AB 32 sets overall GHG emissions reduction goals and mandates that CARB create a plan that includes market mechanisms and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." E.O. S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team (CARB 2009b).

The following are specific requirements of AB 32:

- *CARB shall prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions from sources or categories of sources of greenhouse gases by 2020* (Health and Safety Code [HSC] Section

38561). The scoping plan, approved by CARB on December 12, 2008, provides an outline for future actions to reduce GHG emissions in California by implementing regulations, market mechanisms and other measures. The scoping plan includes the implementation of an HST system as a GHG reduction measure, estimating a 2020 reduction of 1 million metric tons of CO_2 equivalent (MMT CO_2e).

- *Identify the statewide level of greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020* (HSC Section 38550). In December 2007, CARB approved the 2020 emission limit of 427 MMT CO_2e of GHG.

- *Adopt a regulation requiring the mandatory reporting of greenhouse gas emissions* (HSC Section 38530). In December 2007, 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.

D. Executive Order S-01-07

With E.O. S-01-07, Governor Schwarzenegger set forth the low-carbon fuel standard for California. Under this executive order, the carbon intensity of California's transportation fuels is to be reduced by at least 10% by 2020 (Office of the Governor 2007).

E. California Environmental Quality Act

California Environmental Quality Act (CEQA) [Section 21000 et seq.] and the CEQA Guidelines [Section 15000 et seq.] require that state and local agencies identify the significant environmental impacts of their actions, including potential significant air quality and climate change impacts, and to avoid or mitigate those impacts, when feasible. The CEQA 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 emission (California Natural Resources Agency 2011).

Provisions of the CEQA amendments include the following (Office of Planning and Research 2009):

- A lead agency may consider the following when assessing the significance of impacts from GHG emissions:

  (1) The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting;

  (2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project;

  (3) 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 greenhouse gas emissions …

- When an agency makes a statement of overriding considerations, the agency may consider adverse environmental effects in the context of regionwide or statewide environmental benefits.

- Lead agencies shall consider feasible means of mitigating greenhouse gas emissions that may include, but not be limited to:

  (1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;

  (2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures;

  (3) Offsite measures, including offsets;

  (4) Measures that sequester greenhouse gases;

  (5) In the case of the adoption of a plan, such as a general plan, long-range development plan, or greenhouse gas reduction plan, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

F. Senate Bill 375

Senate Bill (SB) 375, signed into law by the Governor Schwarzenegger on September 30, 2008, became effective January 1, 2009. This law requires CARB to develop regional reduction targets for GHG emissions, and prompts the creation of regional plans to reduce emissions from passenger vehicle use throughout the state. The targets apply to the regions in the state covered by the California's 18 Metropolitan Planning Organizations (MPOs). The 18 MPOs have been tasked with creating Sustainable Communities Strategies (SCS). The MPOs are required to develop the SCS through integrated land use and transportation planning and to demonstrate an ability to attain the proposed reduction targets by 2020 and 2035. This would be accomplished through either the financially constrained Sustainable Communities Strategy as part of their RTP or an unconstrained alternative planning strategy. If regions develop integrated land use and housing and transportation plans that meet the SB 375 targets, new projects in these regions can be relieved of certain review requirements of the CEQA.

Per SB 375, CARB appointed a Regional Targets Advisory Committee (RTAC) on January 23, 2009, to provide recommendations on factors to be considered and methodologies to be used in CARB's target-setting process. The RTAC was required to provide its recommendations in a report to 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 impacting GHG emissions, and overall issues relating to setting these targets. CARB proposed draft targets on June 30, 2010, and was required to adopt final targets by September 30, 2010. CARB must update the regional targets every 8 years (or 4 years if it so chooses) consistent with each MPO update of its RTP.

G. Governor's Executive Order S-13-08

On November 14, 2008, the Governor signed an E.O. to address the risk of sea level rise resulting from global climate change. It requires that all state agencies that are planning construction projects in the areas vulnerable to sea level rise consider a range of sea level rise scenarios to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise.

3.2.7 Asbestos Control Measures

CARB has adopted two airborne toxic control measures for controlling naturally occurring asbestos: the Asbestos Airborne Toxic Control Measure for Surfacing Applications and the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations. Also, EPA is responsible for enforcing regulations relating to asbestos renovations and demolitions; however, EPA can delegate this authority to state and local agencies. CARB and local air districts have been delegated authority to enforce the Federal National Emission Standards for Hazardous Air Pollutants regulations for asbestos.

3.2.8 Local Air Quality Management District Regulations

SJVAPCD has specific air-quality-related planning documents, rules, and regulations. This section summarizes the local planning documents and regulations that may be applicable to the project as administered by SJVAPCD with CARB oversight. 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. Additional details regarding the applicable rules can be found at the SJVAPCD web site: http://www.valleyair.org/rules/1ruleslist.htm.

A. SJVAPCD Rule 2201, New and Modified Stationary Source Review

Rule 2201 applies to new or modified stationary sources and requires that sources not increase emissions above the specified thresholds. If the post-project stationary source potential to emit equals or exceeds the offset threshold levels, offsets will be required (SJVAPCD 2008a).

Stationary sources at the station (such as natural gas heaters) would need to be permitted by the SJVAPCD and would have to comply with best available control technology (BACT) requirements. Many stationary sources would be associated with HMF activities, such as exterior washing, welding, material storage, cleaning solvents abrasive blasting, painting, oil/water separation, and wastewater treatment and combustion. Permits would need to be obtained for equipment associated with these activities from the SJVAPCD and would need to comply with BACT requirements.

B. SJVAPCD Rule 2280, Portable Equipment Registration

Portable equipment used at project sites for less than 6 consecutive months must be registered with SJVAPCD. The district will issue the registrations 30 days after the receipt of the application (SJVAPCD 1996).

C. SJVAPCD Rule 2303, Mobile Source Emission Reduction Credits

The project may qualify for SJVAPCD vehicle emission reduction credits if it meets the specific requirements of Rule 2303 for any of the following categories (SJVAPCD 1994):

- Low-Emission Transit Buses.
- Zero-Emission Vehicles.
- Retrofit Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles.
- Retrofit Heavy-Duty Vehicles.

D. SJVAPCD Rule 4201 and Rule 4202, Particulate Matter Concentration and Emission Rates

Rule 4201 and Rule 4202 apply to operations that emit or may emit dust, fumes, or total suspended particulate matter. Particulate emissions from the project must be less than the specified emissions limit (SJVAPCD 1992a, 1992b).

E. SJVAPCD Rule 4301, Fuel Burning Equipment

Rule 4301 limits the emissions from fuel-burning equipment whose primary purpose is to produce heat or power by indirect heat transfer. The project will comply with the emission limits (SJVAPCD 1992c).

F. SJVAPCD Rule 8011, General Requirements–Fugitive Dust Emission Sources

Fugitive dust regulations are applicable to outdoor fugitive dust sources. Operations, including construction operations, must control fugitive dust emissions in accordance with SJVAPCD Regulation VIII (SJVAPCD 2004).

According to Rule 8011, the SJVAPCD requires the implementation of control measures for fugitive dust emission sources. The project would also implement the mandatory control measures listed in Table 6-2 in the *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI) (SJVAPCD 2002) to reduce fugitive dust emissions. These measures are not considered mitigation measures because they are required by law.

Many of the control measures required by the SJVAPCD are the same or similar to the control measures listed in the Statewide Program EIR/EIS. The SJVAPCD Rule 8011 requirements are listed below:

- All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, will be effectively stabilized of dust emissions using water or a chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover.

- All onsite unpaved roads and offsite unpaved access roads will be effectively stabilized of dust emissions using water or a chemical stabilizer/suppressant.

- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled of fugitive dust emissions by utilizing an application of water or by presoaking.

- With the demolition of buildings up to six stories in height, all exterior surfaces of the building will be wetted during demolition.

- When materials are transported offsite, all material will be covered or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.

- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.

- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles will be effectively stabilized of fugitive dust emissions utilizing sufficient water or a chemical stabilizer/suppressant.

- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.

- Any site with 150 or more vehicle trips per day will prevent carryout and trackout.

G. SJVAPCD Rule 9510, Indirect Source Review

In December 2005, the SJVAPCD adopted the Indirect Source Rule (Rule 9510) to meet the SJVAPCD's emission reduction commitments in the PM_{10} and Ozone Attainment Plans (SJVAPCD 2005). Indirect Source Review (ISR) regulation applies to any transportation project in which construction emissions equal or exceed 2 tons of NO_x or PM_{10} per year. The HST F-B alignment will be subject to ISR and will have to submit an Air Impact Assessment application to the SJVAPCD with commitments to reduce construction exhaust NO_x and PM_{10} emissions by 20% and 45% respectively. If the project is unable to achieve the reductions as required by ISR, the project will pay the required offsite mitigation fees.

H. SJVAPCD CEQA Guidelines

The SJVAPCD prepared the GAMAQI to assist lead agencies and project applicants in evaluating the potential air quality impacts of projects in the SJVAB (SJVAPCD 2002). The GAMAQI provides SJVAPCD-recommended procedures for evaluating potential air quality impacts during the CEQA environmental review process. The GAMAQI provides guidance on evaluating short-term (construction) and long-term (operational) air emissions. The GAMAQI is currently being updated, but the most recent version (2002) was used in this evaluation and contains guidance on the following:

- Criteria and thresholds for determining whether a project may have a significant adverse air quality impact.

- Specific procedures and modeling protocols for quantifying and analyzing air quality impacts.

- Methods to mitigate air quality impacts.

- Information for use in air quality assessments and environmental documents that will be updated more frequently, such as air quality data, regulatory setting, climate, and topography.

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4.0 Pollutants of Concern

4.1 Criteria Pollutants

Pollutants that have established national standards are referred to as *criteria pollutants*. For these pollutants, federal and state ambient air quality standards have been established to protect public health and welfare. The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably. A brief description of each pollutant is provided in the following sections:

4.1.1 Ozone

O_3 is a colorless toxic gas. As shown on Figure 4.1-1, 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. In the lower atmosphere, O_3 is man-made. Although O_3 is not directly emitted, it forms in the lower atmosphere through a chemical reaction between certain hydrocarbons (HCs), referred to as VOCs, and NO_x, which are emitted from industrial sources and from automobiles. HCs are compounds comprised primarily of atoms of hydrogen and carbon. TOG and reactive organic gases (ROG) are the two classes of HCs that are inventoried by CARB. ROGs have relatively high photochemical reactivity. The principal nonreactive HC is CH_4, which is also a GHG (refer to Section 4.3.). The major source of ROGs is the incomplete combustion of fossil fuels in internal combustion engines. Other sources of ROGs include the evaporative emissions associated with paints and solvents, the application of asphalt paving, and household consumer products. Adverse effects on human health are not caused directly by ROGs, but rather by reactions of ROG 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 term "ROG" is used by CARB for air quality analysis, and is defined the same as the federal term "VOC." In this report, ROG is assumed to be equivalent to VOC.

Substantial O_3 formations generally require a stable atmosphere with strong sunlight; therefore,, high levels of O_3 are generally a concern in the summer. O_3 is the main ingredient of smog. O_3 enters the bloodstream through the respiratory system and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen. O_3 also damages vegetation by inhibiting its growth. The effects of changes in VOC and NOx emissions for the proposed project are examined on a regional and statewide level.

Source: Ozone NY.

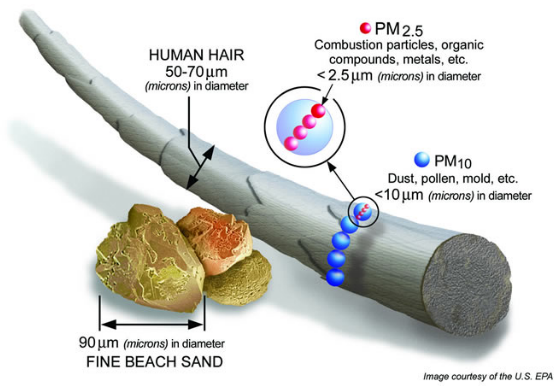
Figure 4.1-1
Ozone in the atmosphere

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, particulate pollution can include dust, soot, and smoke; these can be irritating but usually are not poisonous. However, PM pollution also can be substances that are highly toxic. Of particular concern are those particles that are smaller than, or equal to, 10 microns (PM_{10}) or 2.5 microns ($PM_{2.5}$) in size.

As noted above, PM_{10} refers to particulate matter less than or equal to 10 microns in diameter, about 1/7th the thickness of a human hair (refer to Figure 4.1-2). PM pollution consists of very small liquid and solid particles floating in the air, and can include smoke, soot, dust, salts, acids, and metals. PM can forms when gases emitted from motor vehicles undergo chemical reactions in the atmosphere.

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.



Source: EPA Office of Air and Radiation.

Figure 4.1-2
Relative particulate matter size

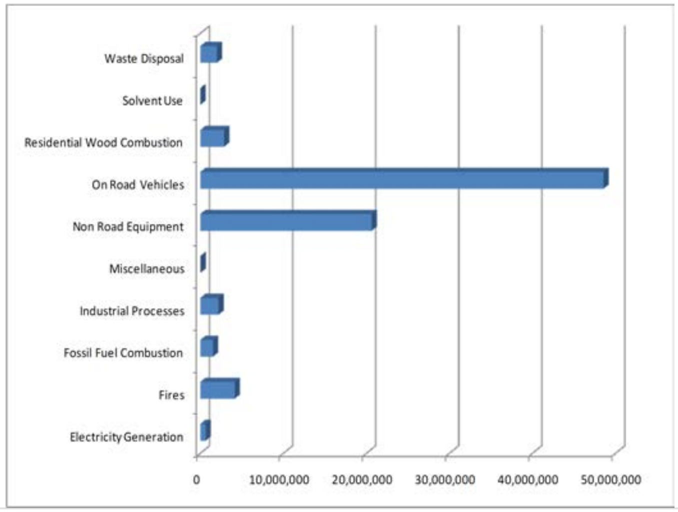
Data collected during numerous nationwide studies indicate that most of the PM_{10} comes from the following sources:

- Fugitive dust
- Wind erosion
- Agricultural and forestry sources

A small portion of PM is the product of fuel combustion processes. However, the combustion of fossil fuels accounts for a significant portion of $PM_{2.5}$ pollution. The main health effect of airborne PM is on the respiratory system. $PM_{2.5}$ refers to particulates that are 2.5 microns or less in diameter, approximately 1/28th the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (from motor vehicles, power generation, and industrial facilities), 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. Like PM_{10}, $PM_{2.5}$ can penetrate the human respiratory system's natural defenses and damage the respiratory tract when inhaled. Whereas particles 2.5 to 10 microns in diameter tend to collect in the upper portion of the respiratory system, particles 2.5 microns or less 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.

4.1.3 Carbon Monoxide

CO is a colorless gas that interferes with the transfer of oxygen to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. As shown on Figure 4.1-3, on-road motor vehicle exhaust is the primary source of CO. In cities, 85% to 95% 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 of the year when inversion conditions (i.e., warmer air traps colder air near the ground) are more frequent.



Source: EPA 2011b.

Figure 4.1-3
Sources of CO

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. Consequently, CO concentrations must be predicted on a microscale basis.

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," "nitrogen oxides," or "NO_x." As with O_3, NO_2 can be formed through a reaction between nitric oxide (NO) 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-tern) pulmonary fibrosis. An increase in bronchitis in children (2 and 3 years old) has also been observed at concentrations below 0.3 part per million (ppm).

4.1.5 Lead

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

4.1.6 Sulfur Dioxide

SO2 is a product of high-sulfur fuel combustion. The main sources of SO2 are coal and oil used in power stations, industry, and domestic heating. Industrial chemical manufacturing is another source of SO2. SO2 is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. SO2 can also cause plant leaves to turn yellow and corrode iron and steel. Although heavy duty diesel vehicles emit SO2, transportation sources are not considered by EPA (or other regulatory agencies) to be significant sources of this pollutant. Therefore, an analysis of the impacts of SO2 emissions from transportation projects is not warranted and is not conducted for this project. However, an analysis of the impacts of SO2 emissions was conducted for this project.

4.2 Toxic and Non-Criteria Pollutants

A toxic air contaminant (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." EPA uses the term *hazardous air pollutant* in a similar sense. Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA), whereby Congress mandated that EPA regulate 188 air toxics, also known as HAPs. TACs can be emitted from stationary and mobile sources.

4.2.1 Asbestos

Asbestos deposits from brake wear may be present on surfaces and in the ambient air along the HST alignment. In addition, asbestos-containing materials may have been used in constructing buildings that will be demolished. Chronic inhalation exposure to asbestos in humans can lead to a lung disease called 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, due to impairment of respiratory function. A large number of occupational studies have reported that exposure to asbestos by inhalation can cause lung cancer and mesothelioma (a rare cancer of the membranes lining the abdominal cavity and surrounding internal organs). EPA considers asbestos to be a human carcinogen (cancer-causing agent).

4.2.2 Air Toxics

Stationary sources of TACs from HST operations will include use of solvent-based materials (cleaners and coatings) and combustion of fossil fuel in boilers, heaters, and ovens at maintenance facilities. Although the trains will not emit TACs, MSATs will be associated with the project chiefly through motor vehicle traffic to and from the HST stations.

EPA has assessed this expansive list in their latest 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 their Integrated Risk Information System. EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (EPA 1999). These are acrolein, benzene, 1,3-butadiene, DPM plus diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter (POM). This list is subject to change and may be adjusted in consideration of future EPA rules. Following is a brief description of these MSATs:

Acrolein is a water-white or 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 nitrogen oxides (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. EPA considers acrolein data to be 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. EPA 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 1992). No information is available on reproductive or developmental effects of 1,3-butadiene in humans. EPA has classified 1,3-butadiene as a probable human carcinogen by inhalation.

DPM / Diesel Exhaust Organic Gases are a complex mixture of hundreds of constituents in either a gaseous or particle form. Gaseous components of diesel exhaust (DE) include CO_2, oxygen, nitrogen, water vapor, CO, nitrogen compounds, sulfur compounds, and numerous low-molecular-weight HCs. Among the gaseous HC components of DE 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 (PAHs) 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. DE 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-powered 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 DE can cause acute irritation (e.g., eye, throat, bronchial), neurophysiological symptoms (e.g., lightheadedness, nausea), and respiratory symptoms (e.g., cough, phlegm). Evidence also exists for an exacerbation of allergenic responses to known allergens and asthma-like symptoms. Information from the available human studies is inadequate for a definitive evaluation of possible noncancer health effects from chronic exposure to DE. However, on the basis of extensive animal evidence, DE is judged to pose a chronic respiratory hazard to humans. EPA has determined that DE is "likely to be carcinogenic to humans by inhalation" and that this hazard applies to environmental exposures.

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 reaction 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. EPA considers formaldehyde to be a probable human carcinogen.

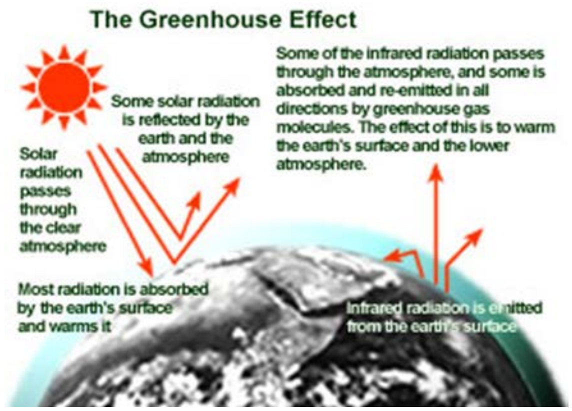
Naphthalene is used in the production of phthalic anhydride; it is also used in mothballs. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, and dermal contact is associated with hemolytic anemia, damage to the liver, and neurological damage. Cataracts have also been reported 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. EPA has classified naphthalene as a Group C, possible human carcinogen.

Polycyclic Organic Matter defines a broad class of compounds that includes PAHs, of which benzo[a]pyrene is a member. POM 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 POM. 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 POM compounds. Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and for stomach tumors, leukemia, and lung tumors from oral exposure to benzo[a]pyrene. EPA 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 Group B2, probable human carcinogens.

4.3 Greenhouse Gases

Gases that trap heat in the atmosphere, which are often referred to as 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 (refer to Figure 4.1-4). As concentrations of greenhouse gases increase, however, the Earth's temperature increases. According to National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) data, the Earth's average surface temperature has increased by 1.2ºF to 1.4ºF in the last 100 years. Eleven of the last 12 years rank among the 12 warmest years on record (since 1850), with the warmest 2 years being 1998 and

2005. 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.



Source: EPA.

Figure 4.1-4
The greenhouse effect

Some GHGs, such as CO_2, occur naturally and are emitted to 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, inventory compilers use a weighting factor called a Global Warming Potential (GWP) 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_2 equivalent (i.e., CO_2e), but can also be expressed in terms of carbon equivalent; therefore, the GWP of CO_2 is 1. The GWP of CH_4 is 21, whereas the GWP of N_2O is 310.

The principal GHGs that enter the atmosphere because of human activities are described below.

CO_2. Carbon dioxide enters the atmosphere via 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. Methane 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. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

Fluorinated Gases. HFCs, PFCs, and SF_6 are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFCs], hydrochlorofluorocarbons [HCFCs], 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.

Due to the global nature of GHG emissions and the nature of the electrical grid system, GHGs will be examined on a statewide level and regional level.

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5.0 Existing Conditions

Three general classes of air pollutants are of concern for this project: criteria pollutants, TACs, and GHGs. Criteria pollutants are those for which EPA and the State of California have set ambient air quality standards or that are chemical precursors to compounds for which ambient standards have been set. The principal TACs of concern for the proposed project are seven MSATs: acrolein; benzene; 1,3-butadiene; DPM/diesel exhaust organic gases; formaldehyde; naphthalene; and POM. The presence of GHGs limits the transmission of radiated heat from the earth's surface to the atmosphere.

5.1 Meteorology and Climate

Air quality is affected by both the rate and location of pollutant emissions, and by meteorological conditions that influence movement and dispersal of pollutants in the atmosphere. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and local air quality levels.

Elevation and topography can affect localized air quality. The project is located in the SJVAB, which encompasses the southern two-thirds of California's Central Valley. The SJVAB is approximately 250 miles long and is shaped like a narrow bowl. The sides and southern boundary of the bowl are bordered by mountain ranges. The valley's weather conditions include frequent temperature inversions; long, hot summers; and stagnant, foggy winters, all of which are conducive to the formation and retention of air pollutants (SJVAPCD 2009a).

The SJVAB is typically arid in the summer months with cool temperatures and prevalent tule fog (i.e., a dense ground fog) in the winter and fall. The average high temperature in the summer months is in the mid-90s and the average low in the winter is in the high 40s. January is typically the wettest month of the year with an average of about 2 inches of rain. Wind direction is typically from the northwest with speeds around 30 miles per hour (mph) (Western Regional Climate Center 2009).

5.2 Ambient Air Quality in the Study Area

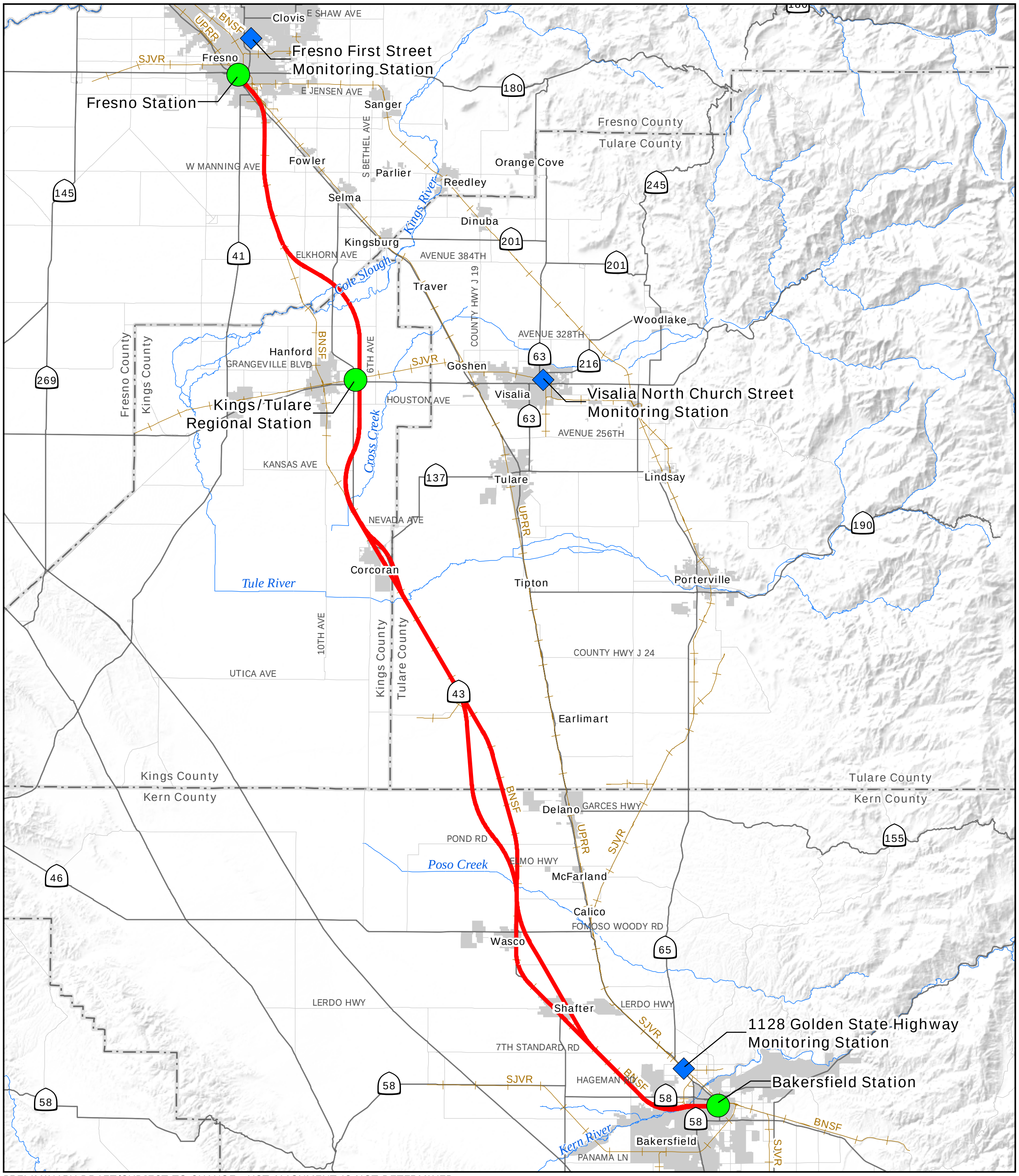
CARB maintains ambient air monitoring stations for criteria pollutants throughout California. The stations closest to the HST alignment alternatives are the 3425 North First Street in Fresno, 310 North Church Street in Visalia, and 1128 Golden State Highway in Bakersfield. These stations monitor NO_2, O_3, PM_{10}, CO, $PM_{2.5}$ and SO_2. The land uses in the region range from urban and residential to rural and agricultural, and these stations represent these land use types. Air quality standards, primarily for O_3 and PM, have been exceeded in the SJVAB because of existing industrial and agricultural sources. Monitoring station locations are shown on Figure 5.2-1. Table 5.2-1 summarizes the results of ambient monitoring at the three stations from 2007 through 2009. A brief summary of the monitoring data includes the following:

- Monitored data from 2007 through 2009 do not exceed either the state or federal standards for CO or NO_2.
- O_3 values for the region exceed the state and the national 8-hour O_3 standards for all stations for years 2007 through 2009. O_3 values for the region also exceed the state 1-hour O_3 standard for all stations for every year in the past 3 years (EPA 2009b).

- The PM_{10} values for the region exceed the state 24-hour PM_{10} standard for all stations for years 2007 through 2009. The national 24-hour PM_{10} standard was only exceeded at the Bakersfield monitoring station in 2008. The state annual PM_{10} standard was exceeded at the Fresno and Visalia monitoring stations multiple times for years 2007 through 2009.

- The $PM_{2.5}$ values for the region exceed the national 24-hour $PM_{2.5}$ for all three monitoring stations over the last 3 years. The national annual standard was exceeded at all monitoring stations for all years 2007 through 2009. The state annual standard was exceeded at the Fresno and Visalia stations for all years 2007 through 2009; while the standard was exceeded at the Bakersfield station only in 2007.

- SO_2 values were only monitored at the Fresno station and does not exceed the 24-hour SO_2 CAAQS. No otherSO_2 values were monitored at the other monitoring stations.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 22, 2011

Source: URS, 2011

N

0 5 10
Miles

0 10 20
Kilometers

Alternative alignments
Existing rail line
County boundary
Air quality monitoring site
Station
Community/Urban area

Figure 5.2-1
Air quality monitoring stations closest to project

Table 5.2-1

Ambient Criteria Pollutant Concentration Data at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/Exceedance	3425 N. First Street, Fresno			310 N. Church Street, Visalia			1128 Golden State Hwy, Bakersfield		
		2007	2008	2009	2007	2008	2009	2007	2008	2009
Carbon Monoxide (CO)	Year Coverage	98%	96%	97%	NM	NM	NM	96%	88%	94%
	Max. 1-hour Concentration (ppm)	3.4	3.1	NM	NM	NM	NM	2.8	3.5	NM
	Max. 8-hour Concentration (ppm)	2.60	2.34	2.07	NM	NM	NM	1.97	2.17	1.51
	# Days>Federal 1-hour Std. of >35 ppm	0	0	0	NM	NM	NM	0	0	0
	# Days>Federal 8-hour Std. of >9 ppm	0	0	0	NM	NM	NM	0	0	0
	# Days>California 8-hour Std. of >9 ppm	0	0	0	NM	NM	NM	0	0	0
Ozone (O_3)	Year Coverage[a]	98%	98%	99%	99%	98%	99%	98%	91%	87%
	Max. 1-hour Concentration (ppm)	0.119	0.157	0.121	0.107	0.130	0.120	0.127	0.115	0.096
	Max. 8-hour Concentration (ppm)	0.102*	0.132*	0.104*	0.100*	0.122*	0.093*	0.103*	0.106*	0.085*
	# Days>Federal 8-hour Std. of >0.075 ppm	37	62	51	31	60	48	14	21	4
	# Days>California 1-hour Std. of >0.09 ppm	14	44	36	11	44	23	1	9	1
	# Days>California 8-hour Std. of >0.07 ppm	62	86	73	56	94	68	26	36	24
Nitrogen Dioxide (NO_2)	Year Coverage	99%	95%	99%	98%	99%	100%	95%	95%	89%
	Max. 1-hour Concentration (ppm)	0.086	0.070	0.068	0.071	0.077	0.068	0.073	0.075	0.073
	Annual Average (ppm)	0.017	0.016	0.014	0.015	0.014	0.015	0.020	0.019	0.018
	# Days>California 1-hour Std. of >0.18 ppm	0	0	0	0	0	0	0	0	0
Sulfur Dioxide (SO_2)	Year Coverage	89%	98%	99%	NM	NM	NM	NM	NM	NM
	Max. 24-hour Concentration (ppm)	0.007	0.003	0.005	NM	NM	NM	NM	NM	NM
	Annual Average (ppm)	NM	NM	NM	NM	NM	NM	NM	NM	NM
	# Days>California 24-hour Std. of >0.04 ppm	NM	NM	NM	NM	NM	NM	NM	NM	NM

Table 5.2-1
Ambient Criteria Pollutant Concentration Data at Air Quality Monitoring Stations Closest to the Project

Air Pollutant	Standard/Exceedance	3425 N. First Street, Fresno			310 N. Church Street, Visalia			1128 Golden State Hwy, Bakersfield		
		2007	2008	2009	2007	2008	2009	2007	2008	2009
Respirable Particulate Matter (PM_{10})	Year Coverage	97%	100%	99%	100%	94%	100%	96%	81%	93%
	Max. 24-hour Concentration (μg/m^3)	107.0	78.3	75.3	99.0	104.7	93.2	135.0	266.8*	139.5
	#Days>Fed. 24-hour Std. of >150 μg/m^3	0	0	0	0	0	0	0	1	0
	#Days>California 24-hour Std. of >50 μg/m^3	9	15	8	15	26	20	28	31	31
	Annual Average (μg/m^3)	32.4	35.1	30.9	42.3	47.1	41.8	NM	NM	NM
Fine Particulate Matter ($PM_{2.5}$)	Year Coverage	98%	99%	98%	92%	97%	100%	88%	90%	37%
	Max. 24-hour Concentration (μg/m^3)	103.8*	93.0*	82.3*	73.3*	88.5*	74.5*	154.0*	88.7*	71.5*
	State Annual Average (μg/m^3)	22.3	21.2	15.1	22.5	19.8	16.6	25.2	NM	NM
	#Days>Fed. 24-hour Std. of >35 μg/m^3	64	50	35	60.4	52.3	23.9	17	13	6
	Annual Average (μg/m^3)	18.8*	17.3*	15.1*	20.3*	19.8*	16.0*	19.9*	17.8*	15.1*

Sources: CARB 2010b; EPA 2010c.

Note:
[a] Coverage is for 8-hour standard.
Acronyms and Abbreviations:

>	greater than
*	Exceeds annual NAAQS
μg/m^3	micrograms per cubic meter
NM	not monitored
N/A	not available
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter
ppm	part(s) per million

5.3 Attainment Status of the Study Area

EPA and CARB designate each county (or portions of counties) within California as attainment, maintenance, or nonattainment based on the area's ability to meet ambient air quality standards. Regions are designated as attainment for a criteria pollutant when the concentration of that pollutant is below the ambient air standards. If a criteria pollutant concentration is above the ambient air standards, the area is in nonattainment for that pollutant. Areas previously designated as nonattainment that subsequently demonstrated compliance with the ambient air quality standards are designated as a maintenance area. Table 5.3-1 summarizes the federal (under NAAQS) and state (under CAAQS) attainment status for the air basin.

Under the federal criteria, the SJVAB is currently designated as nonattainment for 8-hour O_3, the 1997 annual $PM_{2.5}$ standard (annual standard of 15 micrograms per cubic meter [$\mu g/m^3$]) and 24-hour standard of 65 $\mu g/m^3$), and the 2006 24-hour $PM_{2.5}$ standard (35 $\mu g/m^3$). The SJVAB is a maintenance area for the PM_{10} NAAQS, and the Fresno and Bakersfield urbanized areas are designated a maintenance area for the CO NAAQS. The SJVAB is in attainment for the NO_2 and SO_2 NAAQS. The SJVAB is unclassified for the Pb NAAQS.

Under the state criteria, the SJVAB is currently designated as nonattainment for 1-hour O_3, 8-hour O_3, PM_{10}, and $PM_{2.5}$. The SJVAB is an attainment/unclassified area for the state CO standard and an attainment area for the state NO_2, SO_2 and Pb standards. The SJVAB is an unclassified area for the state hydrogen sulfide standard and the visibility-reducing particle standard, and is classified as an attainment area for sulfates and vinyl chloride.

Table 5.3-1
Federal and State Attainment Status for SJVAB

Pollutants	Federal Classification	State Classification
O_3	Nonattainment	Nonattainment
PM_{10}	Maintenance	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
CO	Urban portion of Fresno County and Kern County: Maintenance Remaining Basin: Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment

Sources: EPA 2010d; CARB 2010c.
Acronyms:
CO carbon monoxide
NO_2 nitrogen dioxide
O_3 ozone
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SJVAB San Joaquin Valley Air Board
SO_2 sulfur dioxide

5.4 State Implementation Plan and Transportation Improvement Program Status

5.4.1 State Implementation Plan

Planning documents for pollutants for which the study area is classified as a federal nonattainment or maintenance area are developed by SJVAPCD and CARB and approved by EPA. The SJVAB is presently guided by the California SIP (CARB 2011b) and other planning documents. The following lists the relevant SIP documents for the SJVAB:

- 2007 Ozone Plan (SJVAPCD 2010).
- 2004 Extreme Ozone Attainment Demonstration Plan (SJVAPCD 2010).
- 2008 $PM_{2.5}$ Plan (SJVAPCD 2009b).
- 2004 Revision to the California State Implementation Plan for Carbon Monoxide (CARB 2004).
- 2007 PM_{10} Maintenance Plan and Request for Redesignation (SJVAPCD 2009c).

A. 2007 Ozone Plan

On May 5, 2010, EPA reclassified the 8-hour O_3 nonattainment of the San Joaquin Valley from "serious" to "extreme." The reclassification requires the State of California to incorporate more stringent requirements, such as lower permitting thresholds and implementing reasonably available control technologies at more sources (EPA 2010e).

The 2007 Ozone Attainment Plan contained a comprehensive list of regulatory and incentive-based measures to reduce emissions of O_3 and PM precursors throughout the San Joaquin Valley. On December 18, 2007, the SJVAPCD Governing Board adopted the plan with an amendment to extend the rule adoption schedule for organic waste operations. On January 8, 2009, EPA found that the motor vehicle budgets for 2008, 2020, and 2030 from the 2007 8-hour Ozone Plan were not adequate for transportation conformity purposes (SJVAPCD 2010).

B. 2004 Extreme Ozone attainment demonstration Plan

Although EPA subsequently revoked the 1-hour O_3 standard effective on June 15, 2005, the requirement for SJVAPCD to submit a plan for that standard remains in effect for the San Joaquin Valley (EPA 2008). On March 8, 2010, EPA approved San Joaquin Valley's 2004 Extreme Ozone Attainment Demonstration Plan for 1-hour O_3. However, effective June 15, 2005, EPA revoked the federal 1-hour O_3 standard for certain areas, including the SJVAB (SJVAPCD 2010).

C. 2008 $PM_{2.5}$ Plan

The SJVAPCD Governing Board adopted the 2008 $PM_{2.5}$ Plan following a public hearing on April 30, 2008. On May 22, 2008, CARB adopted the plan and subsequently submitted the plan to EPA as a revision to California's SIP (CARB 2008a). This far-reaching plan provides measures designed to reduce emissions such that the valley will attain all the $PM_{2.5}$ standards, the 1997 federal standards, the 2006 federal standards, and the state standard, as soon as possible. EPA designated the SJVAB nonattainment under the new $PM_{2.5}$ national standard on October 8, 2009, and SIPs for the 2006 $PM_{2.5}$ standards will be due to EPA within 3 years of final designation (SJVAPCD 2009b).

D. 2004 revision to California State Implementation Plan for Carbon Monoxide

On July 22, 2004, CARB approved an update to the SIP that shows how 10 areas, including the SJVAB, will maintain the CO standard through 2018; revises emission estimates; and establishes new on-road motor vehicle emission budgets for transportation conformity purposes (CARB 2004). On November 30, 2005, EPA approved and promulgated the *Implementation Plans and Designation of Areas for Air Quality Purposes* (EPA 2005a). This revision provides a 10-year update to the CO maintenance plan and establishes new CO motor-vehicle emissions budgets for the purposes of determining transportation conformity. The on-road motor-vehicle CO emissions budget in the approved CO SIP for the project region is included in Table 5.4-1.

Table 5.4-1
On-Road Motor Vehicle CO Emissions Budget

CO Maintenance Area	Area Included in Inventory	2010 CO Winter Seasonal Emissions (tons per day)	2018 CO Winter Seasonal Emissions (tons per day)
Bakersfield	Western Kern County	180	180
Fresno	Fresno County	240	240
Modesto	Stanislaus County	130	130
Stockton	San Joaquin County	170	170

Source: EPA 2009c.
Acronym:
CO carbon monoxide

E. 2007 PM_{10} Maintenance Plan and Request for Redesignation

CARB approved SJVAPCD's 2007 PM_{10} Maintenance Plan and Request for Redesignation with modifications to the transportation conformity budgets. On September 25, 2008, EPA redesignated the San Joaquin Valley as in attainment for the PM_{10} NAAQS and approved the PM_{10} Maintenance Plan (SJVAPCD 2009c).

5.4.2 Transportation Plans and Programs

Regional Transportation Planning Agencies (RTPAs) and MPOs within the SJVAB and the study area (i.e., the COG, the KCAG, the TCAG, and the Kern COG) are responsible for preparing RTPs. The RTP addresses a region's transportation goals, objectives, and policies for the next 20 to 25 years and identifies the actions necessary to achieve those goals. MPOs prepare Federal Transportation Improvement Programs (FTIPs), which are 5-year programs of proposed projects that incrementally develop the RTP and contain a listing of proposed transportation projects for which funding has been committed. Transportation projects are analyzed for air quality conformity with the SIP as components of RTPs and FTIPs.

The Fresno COG adopted the 2011 RTP and associated conformity determination in July 2010. The Fresno COG's Final RTP supports the high-speed rail and corridor alignment option that provides service to major population centers within the Central Valley (Kern COG 2010a). However, the HST project is not included in the unconstrained project list in Appendix D of the Fresno COG's 2011 RTP, or the 2011 FTIP and is therefore not included in the conformity determination (Kern COG 2010b).

The KCAG and TCAG adopted their respective 2011 RTPs, the 2011 FTIPs, and final associated conformity analyses in July 2010. The KCAG and TCAG 2011 RTP both discuss the background and purpose of the high-speed train through the Central Valley. However, the HST project is not included in the unconstrained projects listed in Appendix II of the KCAG 2011 RTP (KCAG 2010a) or in

Appendix D of the KCAG 2011 FTIP (KCAG 2010b) and is therefore not part of the air conformity analysis. In addition, the TCAG air conformity analysis, Appendix B (Transportation Project Listing), did not list the HST project, and therefore the HST project was not considered in the TCAG air conformity analysis (TCAG 2010).

The Kern COG adopted the 2011 RTP, the 2011 FTIP, and the air conformity determination in July 2010. The Fresno to Bakersfield Section of the HST and the HMF are included in the constrained program of projects in the Kern COG 2011 RTP, Table 4.1 (Kern COG 2010a). However, neither the HST project nor the HMF are listed in the mass transportation list of projects in the Kern COG 2011 FTIP or in the projects listed in the air conformity determination, Appendix B (Kern COG 2010b). This means that the project was not considered in the Kern COG 2011 air conformity analysis.

Although the HST project is not currently included in the Fresno COG, KCAG, TCAG, or Kern COG transportation conformity determination, it is anticipated that the next revision of the Fresno COG, KCAG, TCAG, or Kern COG RTPs will include the operation of the HST and that the associated conformity determination will include the HST project.

5.5 Emission Inventory

5.5.1 Criteria Pollutants

CARB maintains an annual emission inventory for each county and air basin in the State. The inventory for the SJVAB comprises of data submitted to CARB by the SJVAPCD plus estimates for certain source categories, which are provided by CARB staff. The most recent published inventory data for the SJVAB is summarized in Table 5.5-1.

In the SJVAPCD, mobile source emissions account for over 60% of the basin's CO and NO_x emission inventory. Area sources account for over 80% and over 50% of the basin’s particulate and total VOC emissions, respectively, and stationary sources account for over 70% of the basin’s sulfur oxide (SO_X) emissions.

Table 5.5-1
2010 Estimated Annual Average Emissions for the SJVAB
(tons per day)

Source Category	TOG	ROG	CO	NO_x	SO_x	PM	PM_{10}	$PM_{2.5}$
Stationary Sources								
Fuel Combustion	27.4	6.0	35.6	45.0	6.7	5.9	5.7	5.7
Waste Disposal	72.7	9.2	1.1	2.0	0.5	1.2	0.7	0.3
Cleaning and Surface Coatings	48.3	39.2	0.1	0.1	0.0	0.5	0.5	0.5
Petroleum Production and Marketing	38.1	33.1	8.9	4.3	6.2	4.0	2.6	2.2
Industrial Processes	21.4	19.5	2.4	4.6	2.7	24.0	14.4	6.7

Table 5.5-1
2010 Estimated Annual Average Emissions for the SJVAB
(tons per day)

Source Category	TOG	ROG	CO	NO_x	SO_x	PM	PM_{10}	$PM_{2.5}$
Total Stationary Sources	208.0	107.0	48.1	56.0	16.1	35.6	24.0	15.4
Stationary Sources Percentage of Total	22.1	15.3	1.4	6.8	40.8	6.8	8.0	13.3
Area-wide Sources								
Solvent Evaporation	145.6	127.1	--	--	--	--	--	--
Miscellaneous Processes	88.7	15.5	111.3	25.8	0.9	424.4	214.9	52.1
Total Area-wide Sources	234.3	142.6	111.3	25.8	0.9	424.5	214.9	52.1
Area-wide Sources Percentage of Total	24.9	20.4	3.3	3.1	2.3	81.4	71.9	44.9
Mobile Sources								
On-road Motor Vehicles	231.8	210.8	2,115.8	450.3	2.1	25.2	24.9	17.9
Other Mobile Sources	165.5	150.8	974.2	287.8	18.9	19.1	18.5	16.4
Total Mobile Sources	397.3	361.6	3,090.0	738.2	21.0	44.3	43.4	34.4
Mobile Sources Percentage of Total	42.3	51.8	90.5	89.5	53.2	8.5	14.5	29.7
Natural (Nonanthropogenic) Sources								
Natural Sources	100.6	86.5	164.2	5.0	1.5	17.3	16.6	14.1
Total Natural (Nonanthropogenic Sources)	100.6	86.5	164.2	5.0	1.5	17.3	16.6	14.1
Natural Sources Percentage of Total	10.7	12.4	4.8	0.6	3.8	3.3	5.5	12.2
Grand Total	940.1	697.7	3,413.5	825.0	39.5	521.7	298.9	115.9

Source: CARB 2011c.
Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
PM particulate matter
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gas
SO_x sulfur oxide
TOG total organic gas

5.5.2 Statewide Greenhouse Gas

As a part of AB 32, CARB established an emissions inventory for 1990 and a projected limit for 2020. Because climate change is a global and not a regional issue, specific inventories have not been prepared for the individual air basins. The statewide 2020 limit was approved on December 6, 2007, and is not sector-specific. The statewide 2020 limit is based on the total 1990 GHG emissions inventory and is 427 MMT CO_2e (CARB 2009c). The largest source of emissions in the state is the energy sector, which includes energy and manufacturing industries, the agricultural and forestry sector, emissions from fuels, and the transportation sector. The transportation sector accounts for about 37% of the statewide GHG emissions inventory. The electric power sector accounts for about 24% of the total statewide GHG emissions inventory (CARB 2010d). A summary of the 2008 statewide emissions inventory is included in Table 5.5-2.

Table 5.5-1

2008 California Statewide Greenhouse Gas Emissions Inventory

Emission Category	2008 (MMT CO_2e)
Transportation	174.99
Electric power	116.35
Commercial and residential	43.13
Industrial	92.66
Recycling and waste	6.71
High GWP	15.65
Agriculture	28.06
Forestry	0.19
Total California emissions	477.74

Source: CARB 2010d.
Acronyms:
GWP Global Warming Potential
MMT CO_2e million metric tons of CO_2 equivalent

5.6 Sensitive Receptors

Some locations are considered more sensitive to adverse effects from air pollution than others. These locations are termed *sensitive receptors,* and include schools, daycare facilities, elderly care establishments, medical facilities, and other areas that are populated with people considered more vulnerable to the effects of poor air quality. Analyses performed by CARB indicate that providing a separation of 1,000 feet from diesel sources and high-traffic areas would substantially reduce the exposure to air contaminants and decrease asthma symptoms in children (CARB 2005). Sensitive receptors located in close proximity to the project footprint are shown in Figures 5.6-1 through 5.6-6.

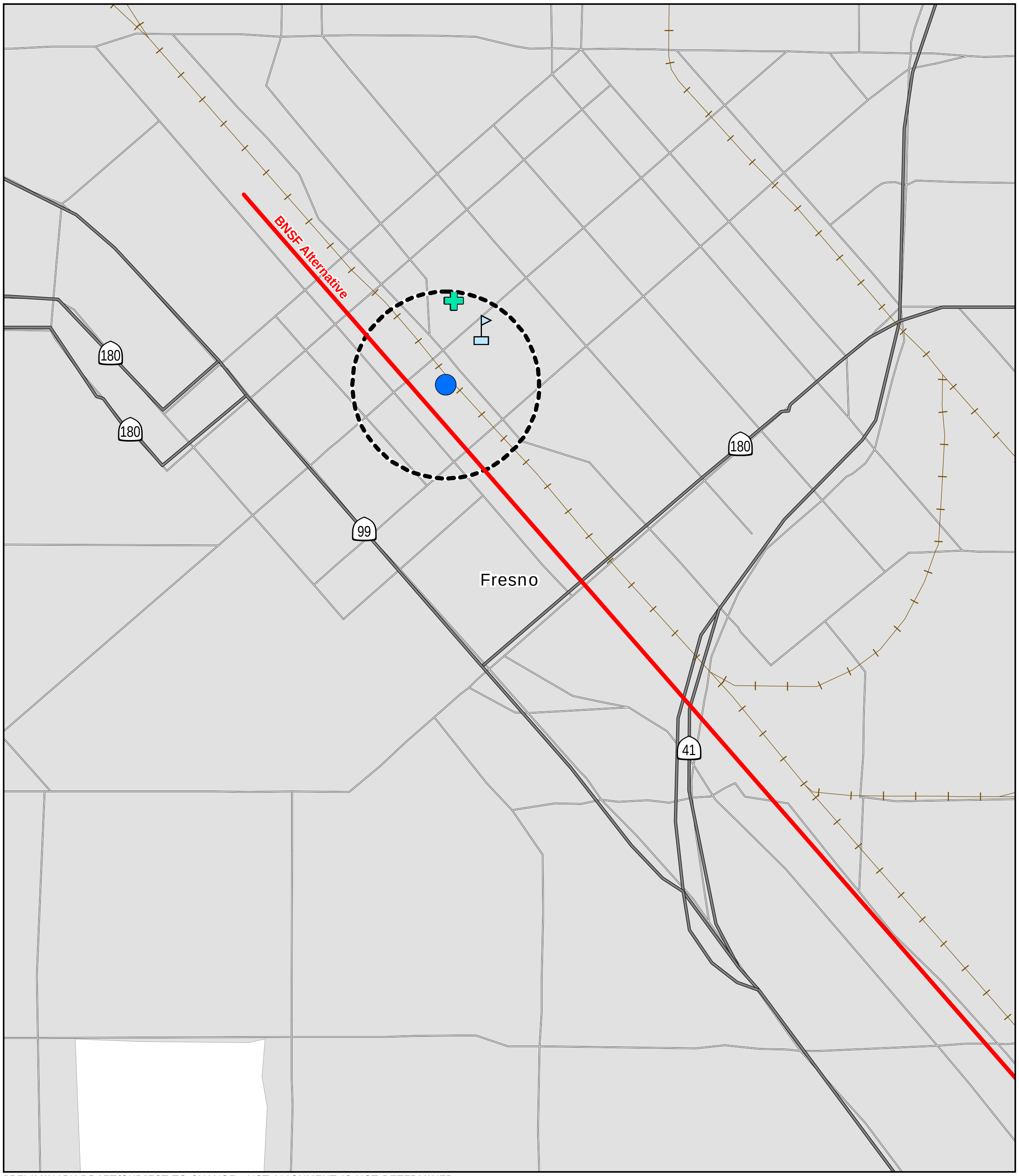
Table 5.6-1 summarizes the distance between each sensitive receptor and each project component. The Fresno Station is the only project component (not including the HMF sites) that has sensitive receptors within 1,000 feet (Figure 5.6-1). All HMF sites have sensitive receptors located in close proximity (Figure 5.6-2 through 5.6-6). Only the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites have multiple sensitive receptors at a close distance, whereas the other HMF sites (the Kings County–Hanford, the Kern Council of Governments–Shafter East, and the

Kern Council of Governments–Shafter West sites) have isolated sensitive receptors near the site. Sensitive receptors around the HMF sites were analyzed at a distance of 1,300 feet from the site boundary based on the results of the health risk assessment (Appendix B). The maintenance-of-way facility (MOWF) would be co-located with the HMF, and the sensitive receptors analyzed will be the same as for the HMF.

Table 5.6-1
Sensitive Receptors within 1,000 Feet of the Fresno Station and the HMF Site Alternatives

Sensitive Receptors[a]	Distance (feet)					
	Fresno Station	Fresno Works–Fresno HMF Site[c]	Kings County–Hanford HMF Site[c]	Kern Council of Governments–Wasco HMF Site[c]	Kern Council of Governments–Shafter East HMF Site[c]	Kern Council of Governments–Shafter West HMF Site[c]
Fulton Special Education[a]	711	—	—	—	—	—
Masten Towers[b]	904	—	—	—	—	—
Closest residence	—	47	100	150	110	790

Notes:
[a] Receptor type: Youth cultural and educational facility
[b] Receptor type: Health-care facility
[c] The MOWF is co-located with the HMF.
HMF = heavy maintenance facility
MOWF = maintenance-of-way facility



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED
Source: URS, 2011

July 21, 2011

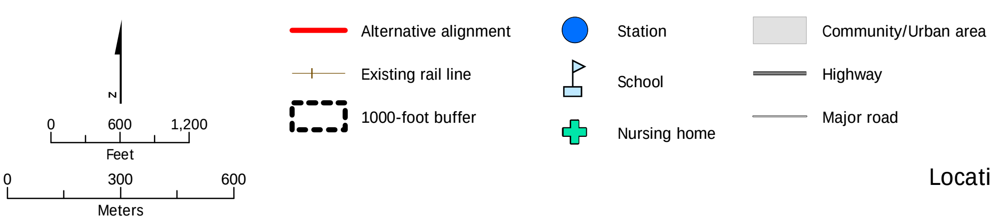
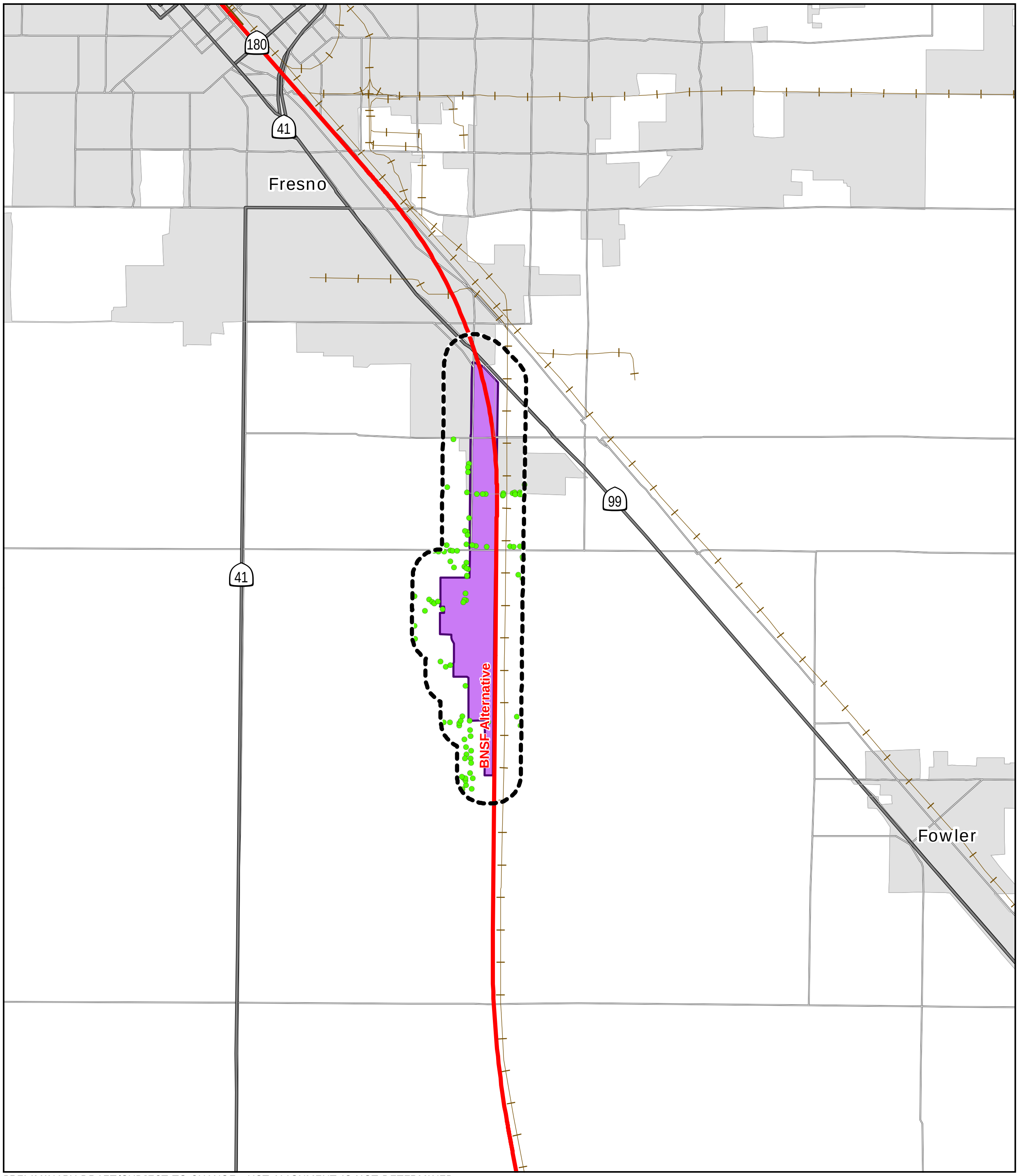


Figure 5.6-1
Location of sensitive receptors
near Fresno Station



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 21, 2011

Source: URS, 2011

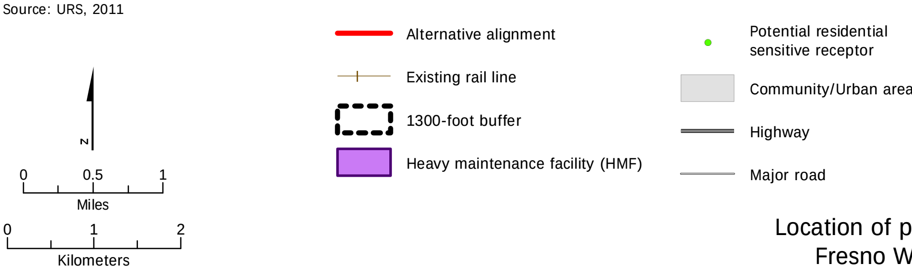
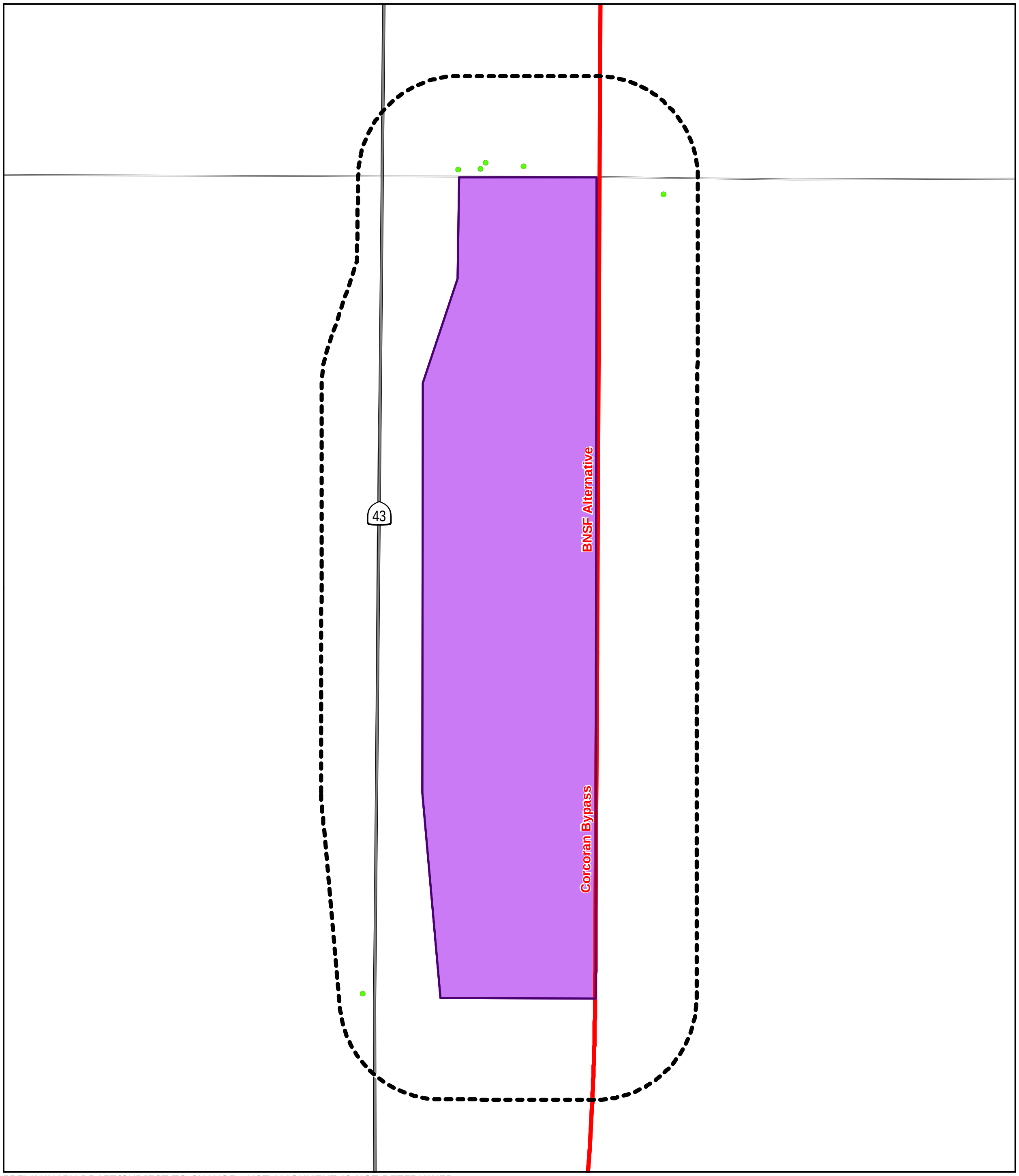


Figure 5.6-2
Location of potential sensitive receptors near Fresno Works - Fresno HMF site footprint



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 21, 2011

Source: URS, 2011

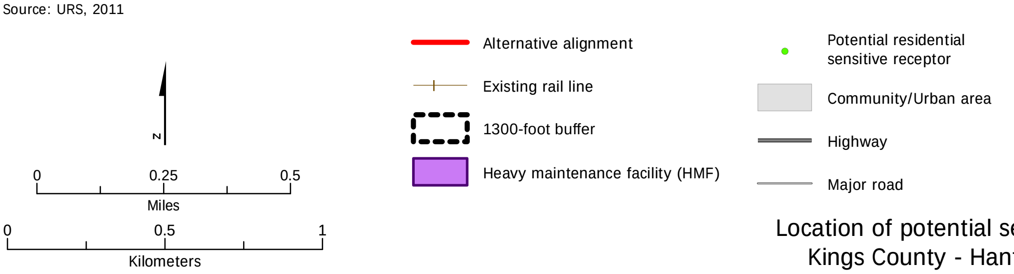
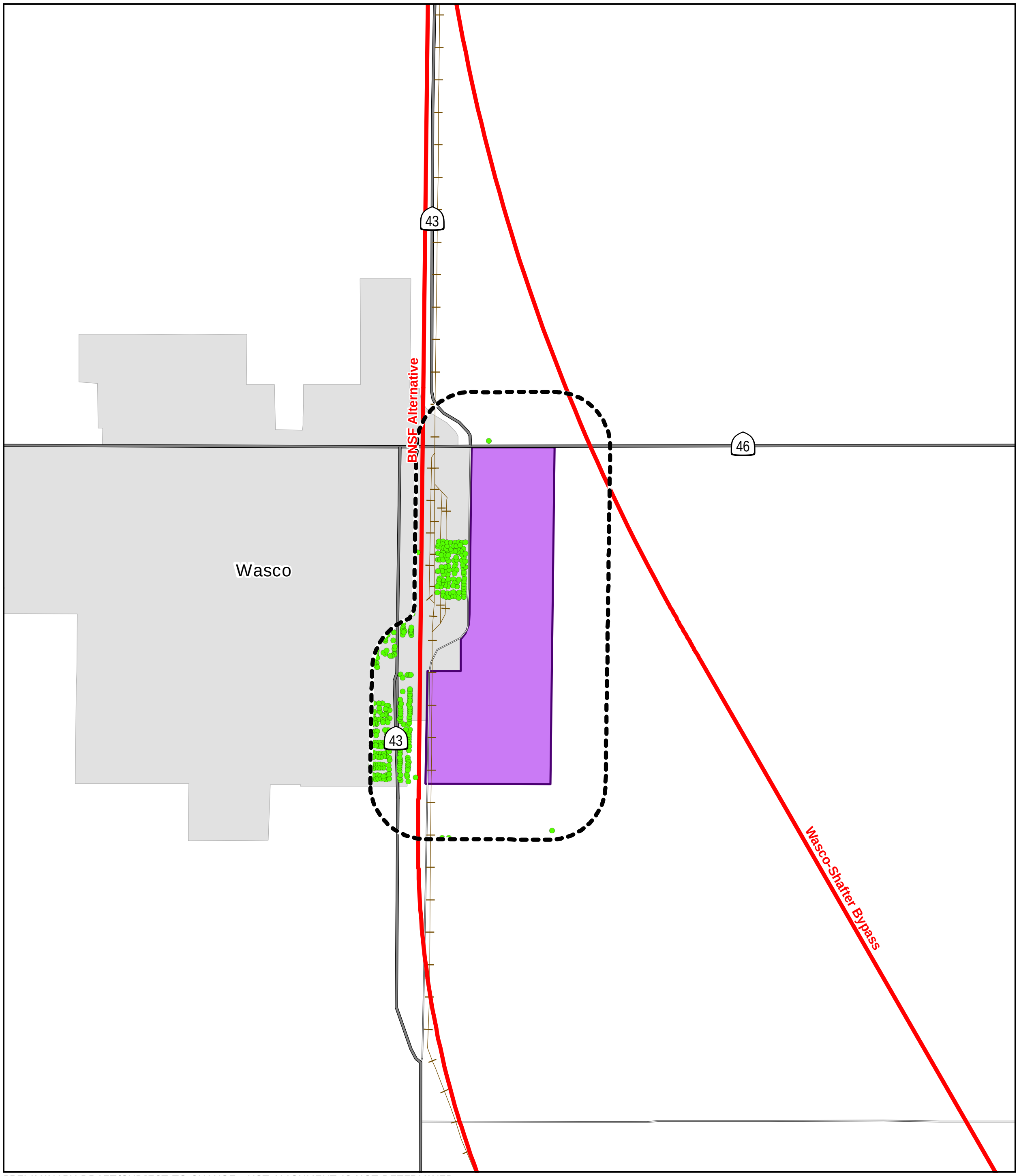


Figure 5.6-3
Location of potential sensitive receptors near Kings County - Hanford HMF site footprint



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

Source: URS, 2011

July 21, 2011

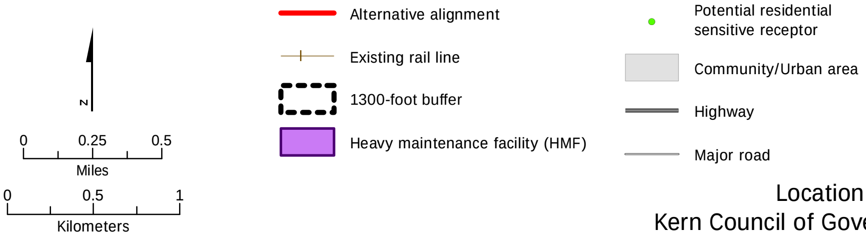
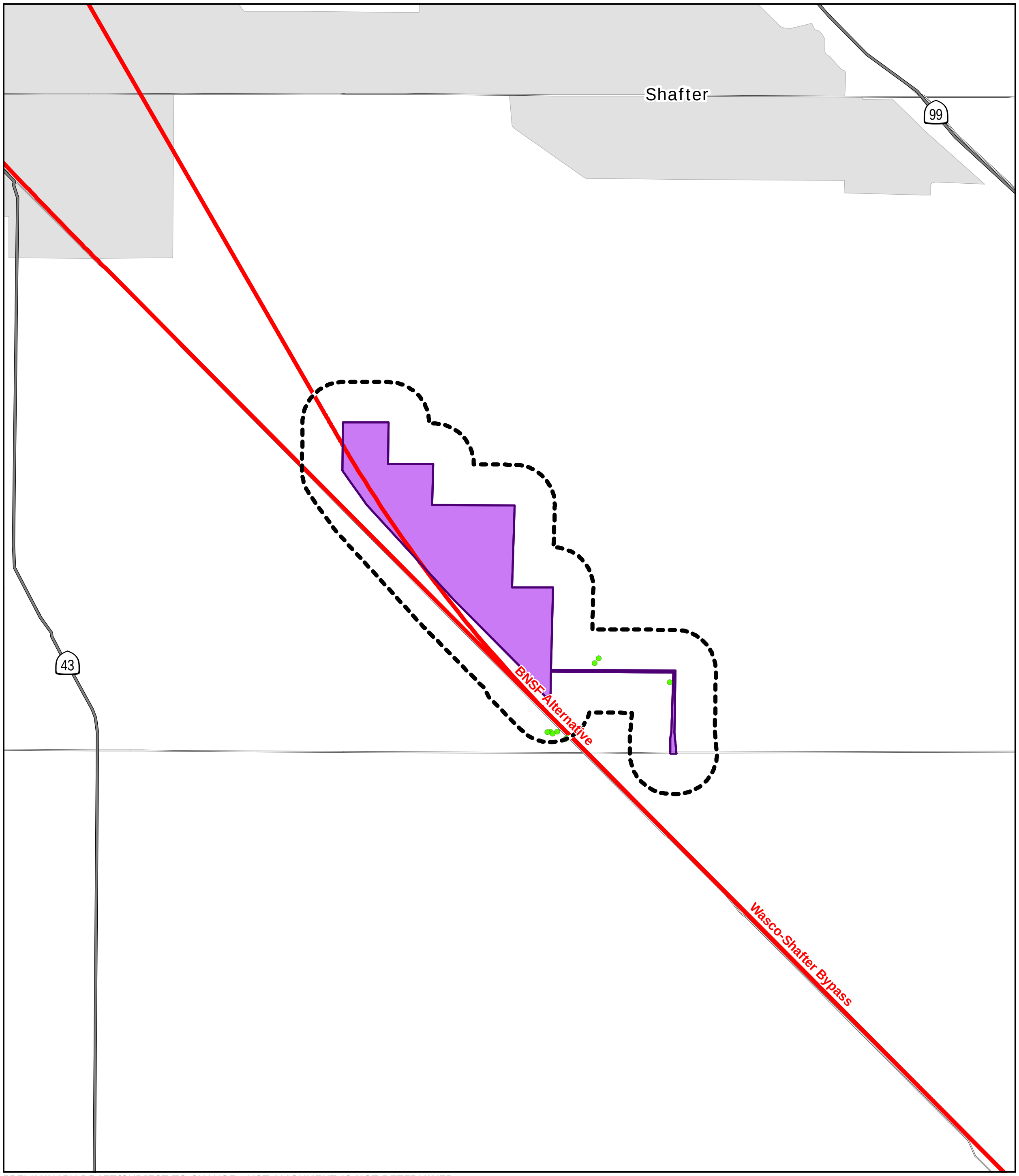


Figure 5.6-4
Location of potential sensitive receptors near
Kern Council of Governments - Wasco HMF site footprint



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 21, 2011

Source: URS, 2011

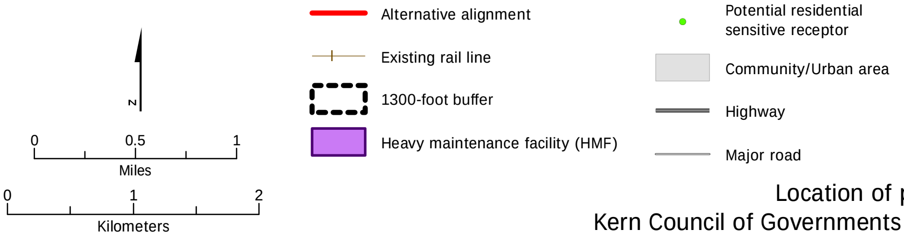
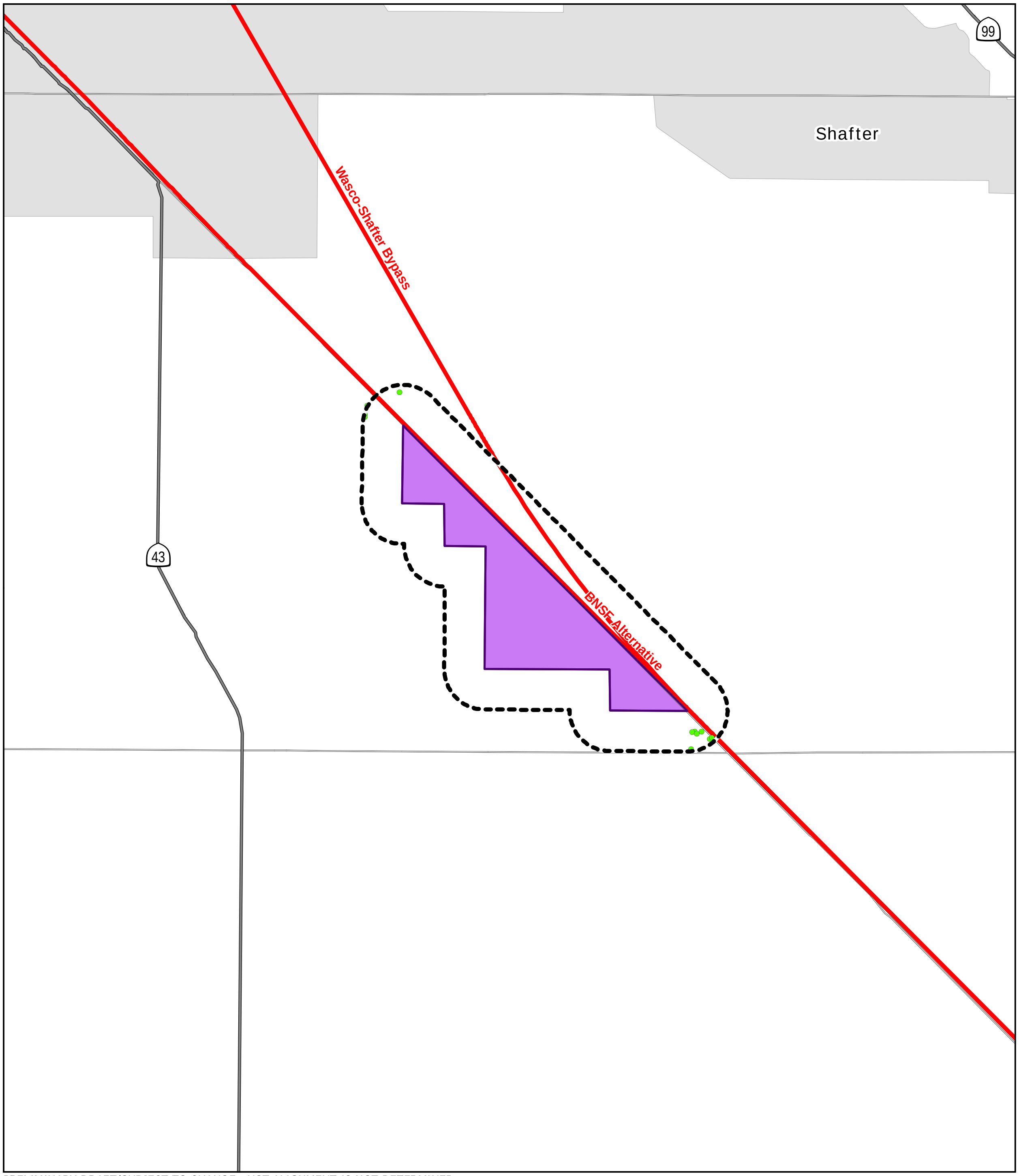


Figure 5.6-5
Location of potential sensitive receptors near
Kern Council of Governments - Shafter East HMF site footprint



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 21, 2011

Source: URS, 2011

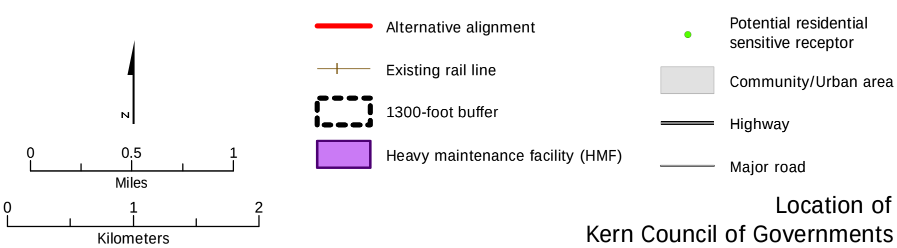


Figure 5.6-6
Location of potential sensitive receptors near
Kern Council of Governments - Shafter West HMF site footprint

6.0 Analysis Methodology

The methods for evaluating impacts are intended to satisfy the federal and state requirements, including NEPA, CEQA, and general conformity. In accordance with CEQA requirements, an EIR must include a description of the existing physical environmental conditions in the vicinity of the project. Those conditions, in turn, "will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant" (CEQA Guidelines Section 15125[a]).

For a project such as the HST project that would not commence operation for almost 10 years and would not reach full operation for almost 25 years, use of only existing conditions as a baseline for air quality impacts would be misleading. It is more likely that existing background traffic volumes (and background roadway changes from other programmed traffic improvement projects) and vehicle emission factors would change between today and 2020/2035 than it is that existing conditions would remain unchanged over the next 10 to 25 years. For example, RTPs include funded transportation projects that are programmed to be constructed by 2035. To ignore the possibility that these projects would be in place before the HST project reaches maturity (i.e., the point/year at which HST-related traffic emissions reach their maximum), and to evaluate the HST project's air quality impacts without factoring in that these RTP improvements would change the underlying background conditions to which HST project traffic would be added, would be misleading because it would represent a hypothetical comparison.

Therefore, the air quality analysis uses a dual baseline approach. That is, the HST project's air quality impacts are evaluated both against existing conditions and against background (i.e., No Project) conditions as they are expected to be in 2035. This approach complies with CEQA (see *Woodwark Park Homeowners Assn. v. City of Fresno* [2007], 150 Cal.App.4th 683, 707, and *Sunnyvale West Neighborhood Assn. v. City of Sunnyvale* [2010], 190 Cal.App.4th 1351). Results for both baselines are presented. The results comparing the project with the future expected baseline are presented in detail in the main text of this section. The results comparing the project with existing conditions are presented in the main text in summary format; details (including mitigation) are presented in the existing plus project conditions analysis presented in Appendix E.

6.1 Statewide and Regional Emission Calculations

The emission burden analysis of a project determines a project's overall impact on air quality levels. The proposed HST project will 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 project will also affect electrical demand throughout the state.

6.1.1 On-Road Vehicles

An on-road vehicle emission analysis was conducted using average daily vehicle miles traveled (VMT) estimates and associated average daily speed estimates for each affected county. Emission factors were obtained from the CARB emission factor program, EMFAC2007. Parameters were set in the program for each individual county to reflect conditions within each county, and statewide parameters to reflect travel through each county.

The analysis was conducted for the following scenarios:

- Existing (Year 2009).
- Existing plus project (Year 2009).
- Future No Project (Year 2035).
- Future Dedicated HST (Year 2035).

To determine overall pollutant burdens generated by on-road vehicles, estimated VMTs were multiplied by applicable pollutant's emission factors, which are based on speed, vehicle mix, and analysis year. It should be noted that, according to the current version of EMFAC2007, the future fuel economy factors are forecast to improve only slightly between the year 2009 and 2035. However, this conclusion is an artifact of the current version of EMFAC2007, which does not consider recent regulatory actions for mandated improvements in vehicle fuel economy. Although the estimated on-road emissions would be lower if the recent regulatory actions were incorporated into the emission factors, the overall conclusions of this report would not change.

6.1.2 Airport Emissions

The Federal Aviation Administration's (FAA's) Emissions and Dispersion Modeling System (EDMS) Version 5.1.2 was used to estimate airport emissions. The EDMS estimates the emissions generated from specified numbers of landing and takeoff (LTO) cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are included. Average plane emissions were calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips removed due to the HST was estimated using the results of the travel demand modeling analyses conducted for the project.

6.1.3 Power Plant Emissions

The electrical demands due to propulsion of the trains and the trains at terminal stations and in storage depots and maintenance facilities were calculated as part of the project design. Average emission factors for each kilowatt hour required were derived from CARB statewide emission inventories of electrical and cogeneration facilities data along with EPA eGRID electrical generation data.

The HST system will be powered by the state's electric grid. Because no dedicated generating facilities are proposed for this project, no specific source facilities can be identified. Emission changes from power generation can therefore be predicted only on a statewide level. In addition, because of the state requirement that an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio come from renewable energy sources, the emissions generated for the HST system are expected to be lower in the future as compared to emissions estimated for this analysis, which are based on the state's current power portfolio. In addition, the Authority has adopted a goal to purchase the HST system's power from renewable energy sources.

6.2 Analysis of Local Operational Emission Sources

Operation of the Fresno to Bakersfield Section HST stations and the HMF would affect emissions of criteria pollutants and GHGs. The operation of the traction power, switching, and paralleling stations would not result in appreciable air pollutants as site visits would be infrequent and power usage would be limited. Therefore, emissions from these stations were not quantified. Sections 6.2.1, 6.2.2, and 6.2.3 discuss the methodology used to estimate operational air emissions from the train stations, the HMF, and local mobile sources, respectively. Project information used for the operation emission estimates is presented in Appendix B. Detailed emission calculations are also provided in Appendix B.

6.2.1 HST Stations

Emissions associated with the operation of the Fresno and Bakersfield HST stations as well as the potential Kings/Tulare Regional HST station would primarily result from space heating and facility landscaping, energy consumption for facility lighting, CO emissions from the parking structures (refer to Section 6.3.2), and employee and passenger traffic (refer to Section 6.2.3). Deliveries to the HST stations are considered negligible.

Emissions of criteria pollutants and GHGs were estimated for operation of Fresno and Bakersfield HST stations as well as the potential Kings/Tulare Regional Station for the design year of 2035.

A. Area and Stationary Sources

Emissions from area and stationary sources, including natural gas consumption for space heating and landscaping equipment, were calculated using URBEMIS2007. Emissions were based on the land use data, entered as the size of the station buildings (square feet). The parking structures were excluded from the land use as they would not require heating and would require minimal landscaping. The URBEMIS2007 output files, the emissions estimated for each operational activity, and the activity data details used to perform the estimations are summarized in Appendix B.

B. Indirect Electricity

The Fresno and Bakersfield HST stations as well as the potential Kings/Tulare Regional Station would generate indirect emissions from purchased electricity consumed for facility lighting. It is expected that the power used by the HST stations would be much less than the power used by train operations; however, the indirect emissions from power consumption have been included in overall emission estimates.

Indirect emissions from purchased electricity consumed by the HST stations were calculated based on the building square footage, electricity consumption rates provided by the South Coast Air Quality Management District (SCAQMD) (SCAQMD 1993), and emission factors from eGRID (EPA 2011c). The retail consumption rate of 13.55 kilowatt-hours/square foot/year was assumed to be representative for the HST stations. The emission factors used were for the California region (CAMX-WECC California) and are for 2007, the most recent year for which data were available.

6.2.2 Heavy Maintenance Facility

The HST project would include a heavy maintenance facility that would service and repair the train cars and locomotives. The facility would include locomotives, heavy-duty equipment (e.g., cranes, backhoes, loaders, emergency generators), heavy-duty delivery trucks, and a spray booth for painting the trains. Although measures would be incorporated to minimize atmospheric emissions from these sources, such as the use of electric yard trains to move train cars and electric locomotives around the site and the use of diesel-retrofits on heavy-duty diesel engines, the activities at the HMF site would potentially generate emissions that could affect sensitive receptors.. Dispersion modeling analysis was conducted for the HMF emissions to evaluate the impacts on air quality. In addition, a health risk analysis was conducted to evaluate the cancer risk impacts on sensitive receptors near the HMF. The major sources of HMF emissions include:

- Switch locomotive activities associated with MOWF operations.
- Spray booth painting operations.
- Diesel equipment.[4]
- Diesel trucks.

A. HMF Locations

Five locations are being considered for the HMF site: the Fresno Works–Fresno, Kings County–Hanford, Kern Council of Governments–Wasco, Kern Council of Governments–Shafter East, and Kern Council of Governments–Shafter West sites. The HMF site may have a co-located MOWF. The final location of the HMF has not been selected. Therefore, an air quality analysis was conducted for a prototypical facility (using the current facility design and anticipated activities) to determine whether HMF/MOWF operations have the potential to significantly affect nearby sensitive receptors..

B. Pollutants of Concern

Both criteria and non-criteria TACs were considered in the health risk analysis. The criteria pollutants considered are:

- NO_2 from diesel locomotives, diesel equipment, and trucks.
- PM_{10} and $PM_{2.5}$ from both diesel engines and spray booth operations.

The TACs considered are the contaminants identified in the *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA 2003) that may be emitted from HMF operations, including diesel engines and spray booth activities. Of these, DPM has the likelihood of contributing the most to the potential health effects of HMF operations because of the type of activities that would occur at these facilities. OEHHA has identified DPM as a TAC based on its potential to cause cancer and other adverse health problems, including respiratory illnesses and an increased risk of heart disease. Also, a number of other toxic pollutants of different toxicities that are either carcinogenic or non-carcinogenic can be potentially released from spray booth operations and diesel vehicular exhaust. Analyses were therefore conducted for DPM and applicable TACs that considered both chronic (long-term) carcinogenic and non-carcinogenic and acute (short-term) health risks.

In addition to the above pollutants, CO, VOC, SO_2, and GHG emissions from HMF/MOWF operations were estimated. CO, SO_2, and GHGs are not expected to cause localized air quality impacts due to the relatively low CO background concentrations and the global nature of GHG impacts. VOC emissions would be evaluated in terms of speciated toxics in the analysis. Therefore, the CO, VOCs, SO_2, and GHGs from HMF/MOWF operations are only included in the regional air quality impact discussion.

C. HMF/MOWF Emission Factors and Rates

Emission factors from the diesel-powered engines and spray booth operations were estimated as follows:

- PM_{10} emission factors were conservatively used to represent DPM emission factors. Most DPM emissions, however, are made up of $PM_{2.5}$, which are estimated to be 92% of PM_{10} values.

[4] The diesel equipment includes non-road diesel engines such as internal combustion engines (not including motor vehicle engines) and stationary engines.

- DPM (PM_{10}), $PM_{2.5}$, NO_2, VOC, and CO emissions from switch locomotives were estimated using EPA Tier 4 emission standards (which are also adopted by CARB) applicable for newly manufactured (after 2015) locomotives (40 CFR Part 89) that use stringent control technologies and use ultra-low sulfur diesel fuel (ULSD). This assumption is reasonable because the HMF will be operational by 2021.

- All new locomotives after 2015 must meet these standards. To enable catalytic after-treatment methods at the Tier 4 stage, EPA requires the use of low-sulfur diesel fuel for all on-road and off-road engines after 2015. A sulfur limit of 500 ppm has been in effect since June 2007; after June 2012, this limit will become 15 ppm. In 2006, California also adopted regulations lowering the sulfur content of diesel fuel to less than 15 ppm. Refineries in California are already making low-sulfur diesel, so it is available where needed, and transit agencies in California have been required to use ULSD fuel since July 2002.

- Locomotive emission rates were also estimated based on locomotive type and on assumptions regarding notch setting, activity time, and duration.

- The assumption that all switch locomotives would be diesel-powered might be conservative, because some or all of these vehicles may be electrically powered (or duel-fueled) and therefore have no (or less) onsite generated emissions.

- CO_2 emissions from moving and idling locomotives were estimated using a standard diesel fuel density, carbon content, and consumption rate per brake-horsepower (hp)-hour (EPA 2009d).

- It was conservatively assumed that all the NO_x released from the diesel engines (which are generally composed of only a small percentage of NO_2) would be converted in the atmosphere to NO_2 by the time they reached the site boundary even though a lower conversion rate would likely occur.

- SO_2 emissions from moving and idling locomotives were estimated using a standard diesel-fuel density, a sulfur content of ULSD (which was assumed to be 15 ppm), and a consumption rate per brake-hp-hour (EPA 2009d).

- For other diesel equipment, EPA's Tier 4 emission standards for non-road diesel engines were used (69 FR 38957-39273 [June 29, 2004]) to estimate DPM (PM_{10}, $PM_{2.5}$), NO_2, VOC, and CO emissions. In the absence of a VOC-specific emission factor, VOC emissions were represented using the non-methane hydrocarbon Tier 4 emission standard.

- CO_2 emissions from other diesel equipment were estimated using the CARB's OFFROAD 2007, for 200-hp, model-year 2017 equipment belonging to the Other General Industrial Equipment category.

- SO_2 emissions from diesel equipment were estimated using Santa Barbara County Air Pollution Control District's *Technical Information and References: Construction Equipment Emission Facts*, "Table 2, Construction Equipment Controlled Emission Factors" (SBCAPCD 1997).

- On-road diesel truck PM (PM_{10}), $PM_{2.5}$, and NO_2, VOC, CO, SO_2, and CO_2 emissions were estimated using EMFAC2007 emissions factors for Heavy-Heavy Duty Trucks running at 10 miles per hour for the year 2017, which is a conservative assumption because the HMF will only be operational by 2021.

- VOCs from paint booth emissions were estimated using conservative volatility rates (i.e., 620 pounds of VOC per gallon of paint even though values as low as 360 pounds per gallon are available) and paint usage projections.

- VOCs from paint booth emissions were also estimated and based on paint booths being equipped with conventional filters with 90% control efficiency even though equipment with higher-control efficiencies is available.

- Speciated TAC emissions from paint booth operations were estimated using CARB's "Organic Speciation Profile for Surface Coating Operations," found in *Organic Chemical Profiles for Source Categories* (CARB 2011d).

- Emissions of metal compounds, which are bonded to DPM from diesel combustion, were calculated by using CARB's "PM Speciation Profile for Diesel Vehicle Exhaust," found in *PM Speciation Profile for Source Categories* (CARB 2011e).

- Emissions of organic compounds from diesel combustion were estimated using CARB's "Organic Speciation Profile for Diesel Light and Heavy Equipment," found in *Organic Chemical Profiles for Source Categories* (CARB 2011d).

- Emission rates for diesel combustion equipment were estimated based on the following HMF/MOWF operating scenario, which was supplied by the project's design engineers:

- Two switch locomotives (for MOWF operations) and six pieces of diesel-fueled equipment would operate at the HMF.

- Two MOWF locomotives, which are assumed to be 2,000 hp each, would idle for 2 hours and move around the HMF site for 2 hours over a 24-hour period, and the locomotives would go through all notches (gears) when moving.

- The diesel equipment, which is assumed to be 200 hp each, would operate for 8 hours over a 24-hour period.

- Twenty diesel trucks would operate on the site for 8 hours over each 24-hour time period.

Details of the estimated emission factors and emission rates for the pollutants evaluated are provided in Appendix F.

D. Detailed Analysis

A detailed dispersion modeling analysis was conducted to estimate the potential impacts of HMF/MOWF emissions on nearby sensitive land uses. The EPA AERMOD model was used to simulate physical conditions and predict pollutant concentrations at specific distances from the boundaries of an HMF site. AERMOD is generally applied to estimate impacts from simple point-source emissions from stacks as well as emissions from volume and area sources. The model accepts actual hourly meteorological observations and directly estimates hourly and average concentrations for various time periods.

A prototypical site layout was used to evaluate the HMF/MOWF operational impacts. Pollutant concentrations were estimated approximately at the site boundary and at approximately 500, 1,000, 1,300, 2,000, 3,000, and 5,000 feet from the site boundary. Receptors were located around the property boundary in increments of approximately 82 feet, as specified in SJVAPCD modeling guidance. Regulatory default options and the rural dispersion algorithm of AERMOD were used in the analysis. The maximum concentrations at any location were compared with NAAQS, CAAQS, and health-related guidelines to determine the level of impacts.

Emissions from expected operations were simulated as one area source spread out over the 140-acre HMF site. Five years of meteorological data (2004 through 2009) from Merced County Airport, as compiled by the San Joaquin Valley Air Pollution Control District, were used. An emissions release height was estimated to be 14.8 feet to approximate the stack heights of the locomotive engines, diesel trucks, and spray booth stack(s).

Maximum DPM and applicable TAC concentrations were used to estimate cumulative cancer risks and the overall noncancer chronic and acute hazard indices associated with HMF/MOWF operations following procedures developed by OEHHA (2003). The cancer risk calculation procedure developed by the California OEHHA was used to estimate increased cancer risks resulting from the HMF/MOWF's DPM and TAC emissions. Details of the risk analysis are provided in Appendix F.

E. Health Risk Methodology

Maximum estimated dispersion modeling concentrations of DPM and other representative TACs were used to calculate the cancer risks, chronic noncancer health risks, and acute health risks associated with HMF/MPWF operations. The pollutant concentrations and dispersion model parameters are presented in Appendix F.

- Cancer Risk: Cancer potency factors (or unit risk factors) were developed for six pollutants (which are considered to be carcinogens by OEHHA) emitted from diesel vehicular exhaust and spray booth operations: DPM, benzene, 1, 3-butadiene, acetaldehyde, formaldehyde, and methylene chloride. The maximum individual cancer risk for each pollutant and total incremental cancer risks associated with these pollutants releases were calculated using procedures developed by OEHHA, together with OEHHA/CARB-approved health values for health risk assessments. The 5-years average AERMOD-estimated concentrations were used for these calculations, as recommended by the SJVAPCD. Metal elements bounded to PM from vehicular exhaust, such as arsenic, cadmium, nickel, and others, were considered as part of the DPM.

- Chronic Noncancer Risk: Calculations for estimating the chronic noncancer hazard index are based on the EPA's Human Health Risk Assessment Protocol (HHRAP) (EPA 2005c) methodology and equations.

- Acute Hazard Risk: Acute hazard index analyses are based on HHRAP methodology and equations (EPA 2005c).

F. CO Hot-Spot Analysis

A CO hot-spot analysis was conducted to evaluate the potential impacts of traffic volume change near the HMF stations. Only the Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites are near a large population and sensitive receptors; therefore, these sites were evaluated in the CO hot-spot analysis. A CO hot-spot analysis was not conducted for the other potential HMF locations because they are located in remote rural areas and are not expected to cause traffic congestion at nearby intersections.

6.2.3 Local Operational Mobile Sources

Local emissions associated with mobile sources would occur from passenger travel, HMF and station employee commutes, and HMF truck deliveries. Vehicular exhaust emissions were estimated using EMFAC2007 with an SJVAB fleet mix. Employee commute and passenger emission factors were estimated using EMCAC2007 for light-duty automobiles and light-duty trucks; and truck deliveries were estimated assuming heavy-duty diesel trucks.

The average local speed of the vehicles was assumed to be 35 mph, which is the average of the speed vehicles travel on the freeway (55 mph) and the speed vehicles travel on city roads (15 mph). The temperature and relative humidity used in EMFAC2007 modeling were taken as the annual averages of the San Joaquin Valley (67°F and 55%) (UCD 2007).

A. Employee Traffic

Emissions from employee traffic were calculated using a passenger vehicle emission factor, assuming that 50% of the employees would use light-duty automobiles (LDA-All) and 50% would use light-duty trucks (assumed an average of LDT1-All and LDT2-All). As a conservative estimate, employee and passenger traffic was expected to occur 7 days per week. In the absence of more-specific data, a round-trip distance of 40 miles was assumed for all employee commute trips. It was assumed that each employee would make one round trip per day and that 20% of all employees would carpool (Authority and FRA 2011a). The projected employee counts for each facility are listed in Table 6.2-1.

Table 6.2-1
Employee Counts

Facility	2035 Employee Count
Fresno Station[a]	44
Kings/Tulare Regional Station (potential)[a]	17
Bakersfield Station[a]	48
HMF	1,500
MOWF	400

Notes:
[a] The Fresno, Kings/Tulare Regional, and Bakersfield station employee counts were not available. As a result, employee counts for the Downtown Merced Station ratios based on daily boarding were used for the Fresno, Kings/Tulare Regional, and Bakersfield stations.

Acronyms:
HMF heavy maintenance facility
MOWF maintenance-of-way facility

B. Truck Deliveries

Truck deliveries for the HST stations would be minimal. For the HMF/MOWF deliveries, it was assumed that there would be an average of 20 deliveries to the site per day and that the trucks would travel 120 miles round trip. Truck deliveries would include supplies of materials and chemicals, as well as the removal of refuse from the site.

C. Passenger Traffic

There would be no passenger traffic at the maintenance facilities. Passengers would be expected to arrive at the Fresno, Kings/Tulare Regional, and Bakersfield stations by car, by shuttle/bus, or by biking or walking. It was assumed that each passenger would make one round trip per day. The daily numbers of passenger trips at the Fresno, Kings/Tulare Regional, and Bakersfield stations are listed in Table 6.2-2 by their mode of transportation.

Table 6.2-2
Daily Passenger Trips

Mode of Transportation	2035 Fresno Station Passenger Trips	2035 Kings/Tulare Regional Station Passenger Trips	2035 Bakersfield Station Passenger Trips
By shuttle/bus	700	300	900
By car	4,300	1,700	4,500
By biking/walking	400	200	500
Total	**5,400**	**2,200**	**5,900**

Source: Parsons Brinkerhoff/Project Management Team 2010.

For travel by shuttle/bus, emissions were calculated using the urban buses (UBUS-All) emission factors. It was assumed that each bus would hold 30 people traveling to the train stations. As a result, the bus trips per day were the total number of passengers traveling by shuttle/bus divided by 30. For 2035 operations, the emission factors were determined using only 2023 through 2035 model years based on a 12-year usable lifespan for city buses (FTA 2007). No emissions are anticipated from travel by biking or walking.

6.3 Microscale CO Analysis

CO hot-spot analyses were conducted to evaluate the potential air quality impacts of HST-related changes in traffic conditions along heavily traveled roadways, congested intersections, and areas near train station parking structures. CO modeling was performed using the CALINE4 air quality dispersion model to estimate existing (2009), existing plus project (2009), future (2035) No Project Alternative, and future project (2035) CO concentrations at selected locations. The CO modeling results for 2009 and 2035 are presented in Appendix C.

6.3.1 Intersection Microscale Analysis

A. Site Selection and Receptor Locations

Traffic conditions at affected intersections were evaluated to identify which intersections in the study area would have the potential to cause CO hot spots. Intersections within the study area were screened based on changes in intersection volume, delay, and LOS between the existing condition, the No Project Alternative, and the HST alternatives. Intersections were considered to have the potential to cause CO hot spots if the LOS decreased from D or better to D or worse under any of the HST alternatives. Intersections that were already below LOS D were considered to have the potential to cause CO hot spots if their LOS, delays, and/or volume would increase over the existing condition and the No Project Alternative with any of the HST alternatives. Using this criterion, intersections were ranked according to LOS, increased delay, and total traffic volume of the HST alternative relative to these factors for the existing condition and the No Project Alternative. The three intersections with the worst LOS, delay, and/or traffic volume were included in the CO hot-spot modeling.

Receptors for the intersection analyses were located in accordance with University of California, Davis, CO Protocol (Caltrans 1997). All receptors used were located at a height of 5.9 feet. Receptors for the intersection analysis were located 9.8 feet from the roadway so they were not within the mixing zone of the travel lanes and were spaced at 9.8, 82, and 164 feet from the intersection for both the 1-hour and 8-hour analyses (EPA 1993). Although sidewalks do not exist around all the intersections, it was assumed that the public could access these locations.

B. Emission Model

Vehicular emissions were estimated using EMFAC2007, which is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. EMFAC2007 (the latest in the EMFAC series) was designed by CARB to address a wide variety of air pollution modeling needs, and incorporates updated information on basic emission rates, more-realistic driving patterns, separation of start and running emissions, improved correction factors, and changing fleet composition. The EMFAC2007 output files are provided in Appendix C.

C. 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 an extremely complex physical phenomenon. The dispersion modeling program used in this study for estimating pollutant concentrations near roadway intersections is the CALINE4 dispersion model developed by the California Department of Transportation (Caltrans).

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. A complete description of the model can be found in the *CALINE4A Dispersion Model for Predicting Air Pollutant Concentration near Roadways, FHWA/CA/TL-84/15*. The analysis of roadway CO impacts followed the CO protocol (Caltrans 1997). It is also consistent with procedures identified in the SJVAPCD CEQA guidance (SJVAPCD 2002).

D. 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. The values for these parameters were chosen 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, however, it is difficult to predict which wind angle will result in maximum concentrations. At each receptor location, therefore, 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 2.2 mph was used to predict CO concentrations during peak traffic periods.

- **Temperature and Profile of the Atmosphere**. An ambient temperature was chosen based on the CO protocol recommendation for the study area, a “mixing” height (the height in the atmosphere to which pollutants rise) of 3,280.8 feet; neutral atmospheric stability (stability class G) conditions will be used in estimating microscale CO concentrations. The ambient temperatures were determined to be 5°F above the lowest January average minimum temperature over a representative 3-year period (based on Table B.7 of the CO Protocol [Caltrans 1997]). The stability class G was chosen, as recommended in Table B.11 of the CO Protocol.

The selection of these meteorological parameters was based on recommendations from the CEQA Air Quality Handbook, Caltrans’ CO Protocol, and EPA’s Guidelines. These data were found to be the most representative of the conditions existing in the project area.

E. Persistence Factor

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

- Over an 8-hour period (as distinct from a single hour), vehicle volumes will fluctuate downward from the peak hour.

- Vehicle speeds may vary.

- Meteorological conditions, including wind speed and wind direction, will vary compared with the conservative assumptions used for the single hour.

- A persistence factor of 0.7 was used in this analysis, which is recommended in the CO Protocol (Caltrans 1997).

F. Background Concentrations

Microscale modeling is used to predict CO concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the locations at which predictions are being made. A CO background level must be added to this value to account for CO entering the area from other sources upwind of the receptors. CO background levels were obtained from data collected at a monitoring station located away from the influence of local traffic congestion. For this study area, background data collected at the Fresno First Street monitoring station for the Fresno Station, the Fresno–Drummond monitoring station for the potential Kings/Tulare Regional Station, and the Bakersfield Golden State Highway monitoring station for the Bakersfield Station were used.

The use of these monitors is conservative because, while they are the closest monitors to the general study area and have a neighborhood spatial scale, they are influenced by traffic-related emissions. The second-highest monitored value was used as a background concentration. In addition, future CO background levels are anticipated to be lower than existing levels because of mandated emission-source reductions.

The second-highest monitored values were used as background concentrations. The second-highest monitored 1-hour CO concentration based on the latest 3 years of available data was 3.1 ppm for the Fresno First Street monitoring station, 3.50 ppm at the Fresno–Drummond monitoring station, and 2.8 ppm for the Bakersfield Golden State Highway monitoring station. The second-highest 8-hour average was 2.34 ppm for the Fresno First Street monitoring station, 2.14 ppm for the Fresno–Drummond monitoring station, and 2.13 ppm for the Bakersfield Golden State Highway monitoring station.

G. Traffic Information

Traffic data for the air quality analysis were derived from traffic counts and other information developed as part of an overall traffic analysis for the project. Output from the "Synchro6" signal-timing traffic model was used to obtain signal-timing parameters. The microscale CO analysis was performed based on data from this analysis for the AM and PM peak traffic periods. These are the periods when maximum traffic volumes occur on local streets and when the greatest traffic and air quality effects of the proposed project are expected.

H. Analysis Years

CO concentrations were predicted for the existing conditions (2009) and the project's design year (2035).

6.3.2 Parking Structure Microscale CO Analysis

The Fresno, Kings/Tulare Regional, and Bakersfield station parking structure locations were also modeled for potential CO hot spots because of the potential increase in the number of idling cars in one location. The microscale CO analysis for the station parking structures used the same methodology as was used in the intersections CO modeling. Receptors were located 9.84 feet from the parking structure at each corner and at the entrance of the structure. To estimate CO emissions, all station parking structures were evaluated based on the total number of parking spaces. The emission factors were based on the assumed travel speed of 10 mph. As a conservative estimate, emissions were estimated based on the total capacity of the parking structures.

6.4 Particulate Matter (PM_{10}/$PM_{2.5}$) Hot-Spot Analysis

Although the HST portion of the project is subject to the general conformity guidelines rather than the transportation conformity guidelines, the project area is classified as a nonattainment area for $PM_{2.5}$ and a federal maintenance area for PM_{10}, so a PM_{10} and $PM_{2.5}$ qualitative hot-spot analysis following EPA's 2010 guidance *Transportation Conformity Guidance for Qualitative Hot-spot Analyses* *in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA 2010f) was conducted, as recommended in EPA's Final Rule regarding the localized or "hot-spot" analysis of $PM_{2.5}$ and PM_{10} (40 CFR Part 93, issued March 10, 2006).

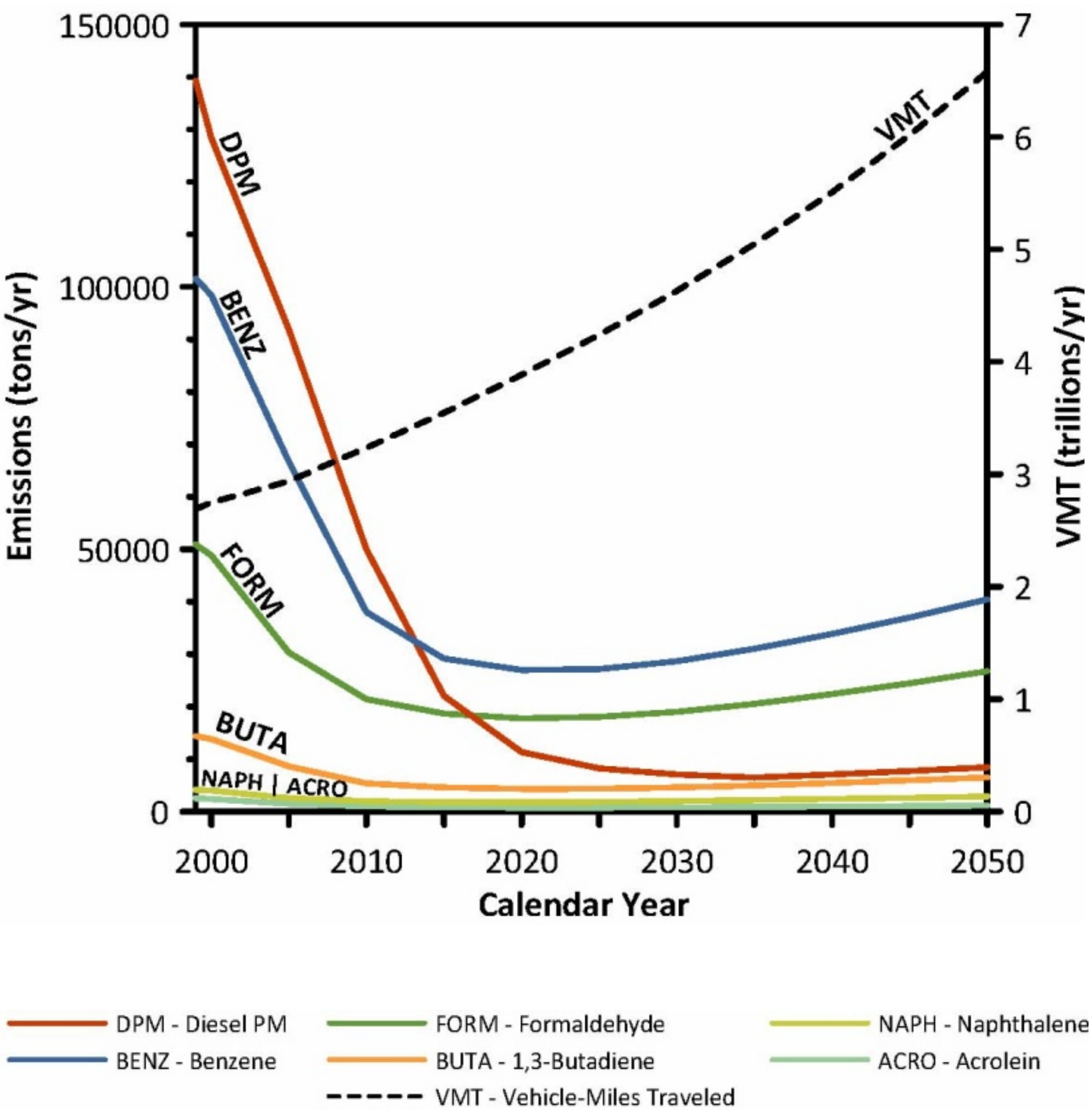
EPA specifies in 40 CFR Part 93.123(b)(1) that only "projects of air quality concern" are required to undergo a $PM_{2.5}$ and PM_{10} hot-spot analysis. EPA defines projects of air quality concern as certain highway and transit projects that involve significant levels of diesel traffic or any other project identified by the $PM_{2.5}$ SIP as a localized air quality concern. Projects of air quality concern, as defined by 40 CFR Part 93.123(b)(1), are the following:

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.
- 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 the significant number of diesel vehicles related to the project.
- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location.
- 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.

6.5 Mobile Source Air Toxics Analysis

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that EPA regulate 188 air toxics, also known as HAPs. EPA assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (*Federal Register*, Vol. 72, No. 37, page 8430 [February 26, 2007]) and identified 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System (EPA 2011e). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer-risk drivers from its 1999 National Air Toxics Assessment (EPA 1999). These seven compounds are acrolein, benzene, 1,3-butadiene, DPM plus diesel-exhaust organic gases, formaldehyde, naphthalene, and POM.

Under the 2007 rule, EPA sets standards on fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers. The new standards are estimated to reduce total emissions of MSATs by 330,000 tons in 2030, including 61,000 tons of benzene. Concurrently, total emissions of VOCs will be reduced by over 1.1 million tons in 2030 as a result of adopting these standards. Future emissions would likely be lower than present levels as a result of the EPA's national control programs that are projected to reduce MSAT emissions by 72% from 1999 to 2050, even if VMT increases by 145%, as shown in Figure 6.5-1.



Source: EPA 2009e.

Notes:

[a] Annual emissions of polycyclic organic matter are projected to be 561 tons/yr for 1999, decreasing to 373 tons/yr for 2050.

[b] 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 6.5-1
National MSAT emission trends (1999–2050) for vehicles operating on roadways using EPA's Mobile6.2 model

On February 3, 2006, the Federal Highway Administration (FHWA) released *Interim Guidance on Air Toxic Analysis in NEPA Documents* (FHWA 2006). This guidance was superseded on September 30, 2009, by FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2009). FHWA's guidance advises on when and how to analyze MSATs in the NEPA process for highways. This guidance is interim because MSAT science is still evolving. As the science progresses, FHWA will update the guidance.

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

- No analysis for projects without any potential for meaningful MSAT effects.
- Qualitative analysis for projects with low potential MSAT effects.
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.

This project has a low potential for MSAT effects. Accordingly, a qualitative analysis was used to provide a basis for identifying and comparing the potential differences in MSAT emissions, if any, among the HST alternatives. The qualitative assessment is derived, in part, from a study conducted by the FHWA titled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* (FHWA 2010).

6.6 Asbestos

Asbestos minerals occur in rocks and soil as the result of natural geologic processes, often in veins near earthquake faults in the coastal ranges and the foothills of the Sierra Nevada and in other areas of California. Naturally occurring asbestos (NOA) takes the form of long, thin, flexible, separable fibers. 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. In addition, asbestos-containing materials may have been used in constructing buildings that would be demolished.

Asbestos is a known human carcinogen. It causes cancers of the lung and the lining of internal organs, as well as asbestosis and pleural disease, which inhibit lung function. EPA is addressing concerns about potential effects of NOA in a number of areas in California.

The California Geological Survey identified ultramafic rocks in California to be the source of NOA, and in August 2000, , the California Department of Conservation, Division of Mines and Geology (CDMG) published a report, *A General Location Guide for Ultramafic Rocks in California Areas More Likely to Contain Naturally Occurring Asbestos* (CDMG 2000). This study was used to determine if NOA would be located within the project area.

6.7 Greenhouse Gases Analysis

As discussed in Section 6-1, the proposed project would reduce 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 project will also affect electricity demand throughout the state. These elements will affect GHG emissions on both a statewide and regional study area level. The methodology for estimating GHG emissions associated with operation of the HST project is discussed below.

The methodology for estimating GHG emissions associated with construction is included in Section 6.8.

6.7.1 On-Road Vehicles

The on-road vehicle GHG emission analysis was conducted using average daily VMT estimates and associated average daily speed estimates calculated for each affected county. GHG emission factors were estimated from EMFAC2007, using parameters set within the program for each individual county to reflect travel within each county and using statewide parameters to reflect travel through each county.

The analysis was conducted for the following scenarios:

- Existing (Year 2009).
- Existing plus project (Year 2009).
- Future No Project (Year 2035).
- Future Dedicated HST (Year 2035).

To determine overall GHG burdens generated by on-road vehicles, estimated VMTs are multiplied by appropriate GHG emission factors, which are based on speed, vehicle mix, and analysis year. It According to EMFAC2007, fuel economy factors are forecast to improve only slightly between the year 2009 and year 2035. However, this conclusion does not consider recent regulatory actions that will likely result in substantial future improvements in fuel economy and CO_2 emission factors:

- The State of California has enacted legislation requiring dramatic improvements in vehicle fuel economy for all vehicles sold in California.

- EPA and National Highway Traffic Safety Administration (NHTSA) updated the Corporate Average Fuel Economy (CAFE) fuel standards on May 7, 2010, (75 FR 25324), which require substantial improvements in fuel economy for all vehicles sold in the United States starting with model years 2012 through 2016.

6.7.2 Airport Emissions

FAA's EDMS Version 5.1.2 was used to estimate airplane-related GHG emissions. EDMS estimates the emissions generated from a specified number of LTO cycles. Along with the emissions from the planes themselves, GHG emissions generated from associated ground maintenance requirements are included. Average plane GHG emissions are calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips removed due to the HST was estimated through the travel demand modeling analysis conducted for the project.

6.7.3 Power Plant Emissions

The electrical demands due to propulsion of the trains, the trains at terminal stations, and in storage depots and in maintenance facilities are calculated as part of the project design. Average GHG emission factors for each kilowatt hour required are derived from CARB statewide GHG emission inventories of electrical and cogeneration facilities data along with EPA eGRID electrical generation data.

The HST system will be powered by the state's electric grid. Because no dedicated generating facilities are proposed for this project, no specific source facilities can be identified. GHG emission changes from power generation were therefore predicted on a statewide level. In addition, because of the state requirement that an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio come from renewable energy sources, the emissions generated for the HST system are expected to be lower in the future when compared to emissions estimated for this analysis, which are based on the state's current power portfolio.

6.8 Construction Phase

Construction phase emissions were quantitatively estimated for the earthwork and major civil construction activity during construction of the following components of the proposed project:

- At-grade rail segments.
- Elevated rail segments.
- Retained fill rail segments.
- Electrical substations.
- Train stations.
- HMF and MOWF.
- Roadways and roadway overpasses.

These major construction activities would account for the vast majority of earthwork, the largest amount of diesel-powered off-road construction equipment, and the majority of material to be hauled along public streets compared with the other minor construction activities of the project. Therefore, the regional emissions and localized emissions from these major activities would account for the vast majority of construction emissions that would be generated by construction of the proposed project. The estimated construction emissions from these major activities were used to evaluate the regional air quality impacts and the localized air quality impacts during the construction phase. Project-specific information was analyzed when available. Default emission rates for activities, such as demolition, , station and parking structure construction and architectural coating, were used if project-specific information was not available. The project information used for the construction emission estimates and details of the construction emission calculations are provided in Appendix A.

6.8.1 Models Used for Construction Emissions

Criteria pollutant and GHG emissions from regional building demolition and construction of the at-grade rail segments, elevated rail segments, retained fill rail segments, traction power substations, and industrial buildings at the HMF/MOWF and HST stations (including parking garages and platform facilities) were calculated using the URBEMIS2007 model Version 9.2.4 (URBEMIS2007). URBEMIS2007 employs emission factor data for off-road equipment using OFFROAD2007 and EMFAC2007. The URBEMIS model was chosen over the Sacramento Roadway Construction Model (RCM) because the URBEMIS model uses statewide off-road emission factors, county- or air-basin-specific on-road emission factors; allows for overlapping construction phases; and provides emission rates on an annual basis. Also, it is appropriate to use URBEMIS for linear construction projects, such as the construction of the HST, when project-specific construction phasing and equipment are known. An analysis of the advantages of the URBEMIS model over the RCM is presented in Appendix H.

URBEMIS2007 allows the user to specify the square footages of each category of building to be constructed at the facility, and allows the user to specify what types of fugitive dust control and tailpipe emission control measures will be used. The control measures that the construction contractors will be required to implement are outlined in the Statewide Program EIR/EIS; they include watering unpaved access roads three times daily, watering disturbed areas twice daily, promptly replacing ground cover over disturbed areas, and using SJVAPCD regulatory control measures. These measures are collectively referred to in the analysis and results as "programmatic" emissions reductions measures.

Project-specific data, including construction equipment lists and the construction schedule, were used for construction associated with the alignment/guideway. Project-specific data were not available for the non-linear construction associated with the station and HMF buildings, and therefore the URBEMIS 2007 default settings were used in these instances only. Calculations were performed for each year of construction.

Mobile source emission burdens from worker trips and truck trips were calculated using VMT estimates and appropriate emission factors from EMFAC.

6.8.2 General Assumptions and Methodologies

A. Assumptions and Methodologies

This section discusses the model assumptions and methodologies used to estimate construction emissions from demolition activities and construction of the Fresno, Kings/Tulare Regional, and Bakersfield stations, the HMF (co-located with the MOWF), the traction power supply stations, switching stations and paralleling stations, rail alignment, roadways, and roadway overpasses. Activities associated with these sources may include site grading, asphalt paving, operation of construction equipment, architectural coating, laying rail, operation of a concrete plant, worker and vendor trips, and material hauling. The assumptions used for the construction emission calculations are based on the following and discussed throughout this document:

- Structures and utilities would be prioritized as early-action construction items.
- Local roads/highways would be the main access points to the construction sites.
- Rail construction would be performed in a linear fashion between structures.
- Plant-welded rail would be delivered to the alignment in 1,000-foot strings.
- The HMF guideway would be built independently from the line construction.
- The HMF buildings and guideway/systems would be built concurrently.
- Components of the HST system would be built to support testing and commissioning and would be built just before opening year.

The information required for URBEMIS2007 to calculate construction emissions from the stations and other facilities includes areas (in square feet) and land use type (i.e., light industrial for HST stations and power substations and heavy industrial for maintenance facilities). Project-specific data, including construction equipment lists and the construction schedule, were used when available. Project-specific equipment lists were used in URBEMIS2007 to estimate emissions from land grubbing (part of site preparation), the remaining earthmoving activities (mass site grading, trenching, and cutting and filling), project mobilization, project demobilization, and alignment construction. 13 staging areas and negligible dust disturbance from off-road travel were assumed for the project mobilization and demobilization.

The BNSF Alternative was used as the proxy alignment to estimate air quality emissions for all the other alternatives because the lengths of the alignments that deviate from the BNSF Alternative are comparable to the lengths of the equivalent sections of the BNSF Alternative. Therefore, construction emissions from the construction of the BNSF Alternative are expected to be similar to the construction emissions for the other alternatives. The Corcoran Elevated Alternative, the Corcoran Bypass Alternative, the Allensworth Bypass Alternative, and the Bakersfield South Alternative are each the same length as the corresponding section of the BNSF Alternative. The Wasco-Shafter Bypass Alternative is approximately 5% shorter than the corresponding section of the BNSF Alternative.

The following default assumptions from URBEMIS2007 were used unless otherwise specified:

- The work schedule is 5 days per week.
- The number and type of construction equipment are based on the size of the construction area and land use type.
- Worker trip emissions assume the number of workers equals 125% of the number of pieces of construction equipment used and a trip distance of approximately 10.6 miles each way.
- A vendor trip is approximately 5.8 miles each way.
- Haul trucks would be required during building demolition to remove materials from the construction site to the nearest landfill. The number of haul trips per day and VMT per day assume a truck capacity of 20 cubic yards and a round trip distance of 30 miles.
- For building construction, the total number of acres required to be graded is twice the size of the building area. The maximum number of acres graded daily is equal to 25% of the total acres to be graded.

Emissions from the exhaust of trucks used to haul material to the construction site were calculated using the heavy-duty truck emission factors from EMFAC2007 and the anticipated travel distances of the haul trucks. Ballast materials would be potentially transported from locations outside the SJVAB. For the regional emission analysis, emissions from ballast material hauling were calculated using the distance traveled within the SJVAB. Emissions from ballast material hauling by trucks and locomotives outside the SJVAB were also estimated based on the travel distances and transportation method (by rail or by truck) from the locations where ballast materials would be available. Rail emission factors from the EPA document *Emission Factors for Locomotives* (EPA 2009d) were used to estimate the locomotive emissions. Other construction materials would likely be delivered from supply facilities within the SJVAB.

B. Statewide EIR/EIS Programmatic Control Measures

The project design incorporates the following design elements from the Statewide Program EIR/EIS mitigation strategies to reduce air quality impacts associated with construction and operation of the HST System. Because the Statewide Program EIR/EIS includes these measures, they are not considered mitigation but are calculated as part of the project construction emissions before mitigation. The effectiveness of these measures was not included in the mitigated emissions calculations but was included in the unmitigated emission estimates. The programmatic measures and their corresponding emissions reductions include:

- Replacing ground cover in disturbed areas (PM, 5%).

- Watering exposed surfaces twice daily (PM, 55%).
- Watering unpaved access roads three times daily (PM, 61%).
- Reducing speed on unpaved roads to 15 miles per hour (PM, 45%).
- Ensuring that trucks hauling loose materials would be covered (PM, 69%). (This percent reduction was selected based on the equipment loading and unloading procedures detailed in the SCAQMD guidance [SCAQMD 2007]).

C. Regulatory Control Measures

Many of the control measures required by the SJVAPCD Regulation VII are the same or similar to the control measures listed in the Statewide Program EIR/EIS. The emission reductions associated with SJVAPCD Regulation VII are the same as the emission reductions associated with the Statewide Program EIR/EIS (Authority and FRA 2008) listed above.

6.8.3 Construction Activities

A. Mobilization

Mobilization would take approximately 8 months, beginning in March 2013. Emissions associated with mobilization were calculated using URBEMIS2007 for a site-specific land use category with properties similar to those of an industrial park. The size of the construction area entered into URBEMIS2007 was conservatively based on the BNSF alignment footprint (approximately 1,263 acres). While the construction emissions were estimated using a mass site grading phase, fugitive dust emissions from mobilization were presumed to be negligible because of the minimal disturbance to the construction site.

Construction equipment is assumed to be built or rebuilt in the year 2005 and operating with a load factor of 0.65.

B. Site Preparation

<u>Demolition</u>

Demolition of existing structures along the HST alignment and HST stations would take approximately 5 months in 2013. Demolition emissions were calculated using URBEMIS2007. In addition to the fugitive dust emissions resulting from the destruction of existing buildings, emissions were estimated for worker trips, construction equipment exhaust, and truck-hauling exhaust. Activity data for the demolition of buildings were based on site surveys for the BNSF Alternative (Authority and FRA 2011c).

The General Heavy-Industry land use category in URBEMIS was used to model the demolition activities. The length and width of the buildings to be demolished were derived from the total area to be demolished. In the absence of project-specific data, the height of all buildings was assumed to be 40 feet. This is a conservative estimate based on the average heights of city buildings as presented in *Building Height Characteristics in Three U.S. Cities* (Burian et al. 2002). All other demolition data parameters were based on the URBEMIS2007 default options. The maximum daily volume of buildings to be demolished was estimated using the total area provided and the approximate duration of construction activities. Table 6.8-1 summarizes the land use sizes of the demolition activities.

Table 6.8-1
Area of Demolition Activities

Alternative	Total Area (square feet)	Length and Width Dimensions (feet)	Maximum Daily Length and Width Dimensions (feet)
BNSF	16,045,00	4,005.6	327.1
HMF[a]	100,000	316.2	57.7

Note:
[a] The total area for the Kern Council of Governments–Wasco HMF site is used to estimate the demolition emissions for the HMF site alternatives, because this HMF site presents the worst-case demolition scenario for the HMF site alternatives.
Acronym:
HMF heavy maintenance facility

Land Grubbing

Land grubbing refers to the site preparation activities for the HST alignment construction and would coincide with demolition activities. Emissions from land grubbing were estimated using the URBEMIS2007 default parameters for the Light-Industry land use category and the mass site grading option as well as a site-specific equipment list.

The construction area used in URBEMIS2007 was the total area to be cleared based on the total construction footprint (approximately 1,263 acres). The URBEMIS2007 default fugitive dust emission factor for grading (20 pounds per acre per day) was used to estimate fugitive dust emissions from land-grubbing activities.

The methodology used for calculating the site preparation emissions from the HST guideway associated with the HMF is included in the discussion of construction of the HMF building.

C. Earthmoving

The earthmoving activities include grading, trenching, and cut-and-fill activities for the alignment construction. Earthmoving would occur between 2013 and 2015. The emissions associated with the earthmoving activities were estimated using URMBEMIS2007 default parameters for the Light-Industry land use category as well as a site-specific equipment list.

The construction area used in URBEMIS2007 was the total area to be cleared based on total construction footprint (approximately 1,263 acres). The default fugitive dust emissions from cut-and-fill activities were estimated based on the total quantity of cut-and-fill material of the onsite excavation and offsite hauling.

The methodology for calculating the site preparation emissions from the HMF alignment section is included in the discussion of construction of the HMF building.

D. HST Alignment Construction

The HST alignment construction is expected to occur from 2013 to 2017, and includes the following construction phases and operation of a concrete batch plant:

- Constructing structures for the elevated rail, which would begin 6 months before alignment construction.
- Laying elevated rail, laying at-grade rail.
- Laying retained fill rail.

Rail Type and Alignment Alternatives

Three rail types (elevated, at-grade, and retained fill) for the BNSF Alternative and the HMF track were considered in this analysis. The length of the alignment for alternatives that deviate from the BNSF Alternative is comparable to the length of the equivalent section of the BNSF Alternative. Therefore, construction emissions from construction of the BNSF Alternative are expected to be similar to the construction emissions for the other alternatives. The BNSF Alternative is the only alignment analyzed for construction emissions and all alternatives are assumed to have the same construction emissions as the BNSF Alternative (refer to Section 6.8.2 for discussion of the comparable length of the other alternatives and the corresponding length of the BNSF Alternative).

Table 6.8-2 summarizes the lengths of at-grade rail and elevated rail (including retained-fill rail) for each alignment alternative. The emissions of each alternative/operation were taken as the sum of the at-grade, elevated, and retained-fill emissions.

Table 6.8-2

HST Alternative Alignment Lengths

Alternative	Total Length (miles)[a]	At-Grade Length (miles)[a]	Elevated Length, including Retained Fill (miles)[a]
BNSF Alternative	114	91	23
HMF access guideway[b]	9	—	—
MOWF access guideway[c]	1	—	—

Source: Parsons Brinckerhoff/Project Management Team 2009.

Notes:
[a] Values are rounded to the nearest significant digit.

[b] The total length of the HMF access guideway was based on 36 different track sections at the HMF at a length of 1,312 feet (0.24 mile) for a total length of 47,232 feet (about 9 miles).

[c] The total length of the MOWF facility access guideway was based on 6 different track sections at the MOWF at a length of 656 feet (0.12 mile) for a total length of 3,936 feet (about 1 mile).

Acronyms:
HMF heavy maintenance facility
MOWF maintenance-of-way facility

Track Construction

Emissions from the track construction included exhaust emissions from construction equipment, hauling trucks, and workers' commute. Paving activities were not included because the alignment would be concrete and steel. Architectural coatings were also excluded.

Emissions from construction of the track were modeled using URBEMIS2007. The elevated rail, including retained fill, and at-grade rail construction, were modeled separately using a unit construction activity of building 1,000 linear feet of rail per year. The resulting emissions were scaled to the actual length of the elevated (including retained fill), and at-grade rail of each alignment alternative.

The construction area was estimated to be approximately 1,263 acres. Project-specific equipment lists for at-grade and elevated rail construction were used in URBEMIS2007. The elevated rail construction list includes equipment for constructing elevated structures and laying rail. The retained-fill rail construction was assumed to use the same equipment as the elevated rail construction and was included in the elevated rail construction calculations.

Since the track construction will last for several years, the equipment fleet mix of 2013, the first year of construction, was used to be conservative. The default URBEMIS2007 load factors were used for all equipment. Daily hours of equipment operation were adjusted from an assumed 8-hour workday to reflect the project-specific usage estimates. Rail-specific equipment not included in the default URBEMIS2007 equipment list was accounted for as "Other General Industrial Equipment."

The equipment counts, horsepower, hours of operation, and load factors used in the URBEMIS modeling are included in Appendix A.

Concrete Batch Plants

Concrete would be required for construction of bridges used to support the elevated sections of the alignment and for construction of the station platform. To provide enough onsite concrete, three batch plants would be needed during construction of the elevated structures and station platform. Concrete batch plant operation would begin approximately 7 months prior to laying the elevated rail and cease approximately 4 months after the rail has been completed.

Because the locations of the concrete batch plants are unknown, fugitive dust emissions associated with the plants were estimated based on the total amount of concrete required (independent of the number of concrete batch plants) and emission factors from Chapter 11.12 of AP-42 (EPA 2006a). The material composition of cement was based on the Bay Area Air Quality Management District's guidance (BAAQMD 2006).

Emissions from on-road truck trips associated with transporting material to and from the concrete batch plants were included in the analysis and are discussed below.

Material Hauling within the SJVAB

Materials for construction of the alignment, such as sand, gravel, and cement needed to make concrete; reinforcing and structural steel; excavation; sub-ballast; ballast; and excavation/fill materials, would be delivered from supply facilities within the SJVAB. The rail would be delivered by train car through railroads near the project site within the existing railroad operation capacity. Therefore, the associated emissions were not included in the analysis. Therefore, the associated emissions of rail delivery were not included in the analysis. Ballast and sub-ballast materials could potentially be delivered from outside of SJVAB by rail, and then transported to project site by a combination of rail and trucks. The amount of material needed for alignment construction is provided in Table 6.8-3 in Section 6.8.4. The emissions for material hauling were estimated for each construction phase and summed on an annual basis; the details of the emissions estimates are included in Appendix A.

Haul truck emission factors were estimated using EMFAC2007 Version 2.3. Exhaust emissions from material hauling trucks were calculated using the heavy-duty truck emission factors, the anticipated distance to material suppliers, and an estimated number of truck trips.

To estimate the miles traveled by each haul truck, distances were assumed based on likely locations of material suppliers:

- Emissions from ballast and sub-ballast material hauling were calculated using the distance traveled within the San Joaquin Valley, extending up to 160 miles from the construction site for the regional emission analysis. (The emissions associated with hauling this material from outside the air basin are discussed below.)
- The reinforcing and structural steel would likely be from suppliers located approximately 82 to 98 miles , from the construction site
- The excavation/fill material would likely be from suppliers located approximately 20 miles, on average, from the construction site.
- The concrete rail ties would be precast at a shop located approximately 95 miles, on average, from the construction site.
- The concrete would be from the onsite concrete batch plant; however, it was assumed that the concrete might be transported approximately 7 miles from one site location to another along the alignment.
- The sand, gravel, and cement used to make the concrete would likely be from suppliers located up to 150 miles from the construction site.

The number of trucks required to haul the material was determined by using an estimated truck capacity and the quantity of materials required for the alignment construction. The truck capacities assumed were 20 cubic yards for soil, sub-ballast, ballast and concrete; 30 tons for cement, sand, and gravel; and 35,000 pounds for reinforcing and structural steel as well as for the concrete railway ties. The total material quantities were determined based on the alignment profile (i.e., rail length, rail width, and at-grade, elevated, or retained-fill rail type).

Ballast and sub-ballast materials could potentially be hauled by rail within the air basin. Rail emission factors from the EPA document *Emission Factors for Locomotives* (EPA 2009d) and the travel distance by rail within the SJVAB were used to estimate rail emissions. Emissions from trucks used to haul material to the construction site were calculated using the heavy-duty truck emission factors from EMFAC2007 and the anticipated travel distances of trucks within the SJVAB.

Material Hauling outside the SJVAB

Ballast and sub-ballast materials would be potentially transported from locations outside of the SJVAB. For the regional emission analysis, emissions from the hauling of ballast material were calculated using the distance traveled within the SJVAB. Emissions from the hauling of ballast material by trucks and locomotives outside the SJVAB were also estimated based on the travel distances and the transportation method (by rail or by truck) from the locations where ballast materials would be available. Rail emission factors from EPA guidance (EPA 2009d) were used to estimate the locomotive emissions.

Five potential quarries that provide ballast material were identified. Of these, three quarries, including Napa Quarry, Lake Herman Quarry, and San Rafael Rock Quarry were included in the evaluation because of their proximity to the project construction site. These three quarries are all located within 70 miles of the SJVAB border and would have material available for the project construction. The Bangor Rock Quarry Site A was included in the evaluation because it is located within 100 miles of the SJVAB border. In addition, this quarry would have material available for the project needs in quantities that exceed the material quantities available at the closest quarries. The other quarry, Kaiser Eagle Mountain Quarry, which is located 350 miles by rail (250 miles by road) from the border of the SJVAB, was analyzed because the annual production rate at this quarry was sufficient to meet construction material requirements.

The analysis was based on the largest amount of ballast needed for the project for a worst-case year. It was assumed that the material would be transferred either by diesel truck from the quarry to rail (if there was no rail head onsite) and then by rail to the border of SJVAB, entirely by rail to the border of the SJVAB (if there was a rail head onsite), or by diesel truck from the quarry to the border of the SJVAB. Emissions could potentially occur in several air basins and air districts outside the SJVAB.

Five scenarios were analyzed:

1. All ballast and sub-ballast are transported by rail from Kaiser Eagle Mountain Quarry.

2. Ballast and sub-ballast are transported by truck and rail from the closest quarries (Napa Quarry, Lake Herman Quarry, and San Rafael Quarry) until production limits are reached, and the rest from Kaiser Eagle Mountain Quarry.

3. Ballast and sub-ballast are transported by truck and rail from the closest quarries (Napa Quarry, Lake Herman Quarry, and San Rafael Quarry) and from Bangor Rock Quarry – Site A until production limits are reached, and the rest from Kaiser Eagle Mountain Quarry.

4. Ballast and sub-ballast are transported by truck-only from the closest quarries (Napa Quarry, Lake Herman Quarry, and San Rafael Quarry) and from Bangor Rock Quarry – Site A until production limits are reached, and the rest from Kaiser Eagle Mountain Quarry.

5. Ballast and sub-ballast are transported by truck-only from the closest quarries (Napa Quarry, Lake Herman Quarry, and San Rafael Quarry) until production limits are reached, and the rest from Kaiser Eagle Mountain Quarry.

Details of the emission estimates for material hauling outside the SJVAB are summarized in Appendix G.

E. Train Station Construction

Emissions from HST station construction would be a result of mass site grading, building construction, and architectural coatings. Where applicable, emissions resulting from worker trips, vendor trips, and construction equipment exhaust were also analyzed as part of each construction phase. Paving activities were not considered because surface parking lots are not expected as part of the construction; only parking structures with emissions captured during the building construction phase were included.

Construction of the HST stations would begin at the end of 2014 and be completed by the end of 2019. URBEMIS2007 was used to estimate emissions from construction phases of the HST stations. The Light-Industry land use category in URBEMIS was used for construction of the station buildings, parking structure, platforms, bridges, and columns. Site-specific modeling parameters such as the station acreage were used for the Fresno Station (20 acres) and Bakersfield Station (20 acres). However, since the Kings/Tulare Regional Station is only a potential station, no construction information for this station was available and construction emissions were not estimated. However, the Kings/Tulare Regional Station is expected to be the same size as the Fresno and Bakersfield stations; therefore construction emissions associated with this station would be similar to construction emissions for the other stations.

For the building construction, the default assumptions of 0.38 vendor trip per 1,000 square feet of building and 0.42 worker trip per 1,000 square feet of building were used to estimate worker and vendor trip emissions. For the architectural coating, the URBEMIS2007 default assumption used in the analysis was that there are no vendor trips and that worker trips are equal to 20% of the worker trips required for the building construction.

F. Maintenance-of-Way Facility Construction

Emissions associated with construction of the MOWF are expected as a result of mass site grading, asphalt paving, building construction, and architectural coatings. Emissions would also result from construction of the at-grade MOWF Access Guideway rail.

Construction of the MOWF would begin in 2018 and be completed by the end of 2018. URBEMIS2007 was used to estimate emissions from constructing the MOWF. The General Heavy-Industry land use category was assumed in URBEMIS2007 modeling to estimate the emissions from the MOWF construction.

Unless noted below, the URBEMIS2007 default parameters were applied to the MOWF construction. For mass site grading and asphalt paving, the total area to be graded and paved used in URBEMIS2007 was 0.7 acre. The URBEMIS2007 default fugitive dust emission factor for grading (20 pounds per acre per day) was used to estimate fugitive dust emissions from grading activities. For the building construction, the default assumptions of 0.38 vendor trip per 1,000 square feet of building and 0.42 worker trip per 1,000 square feet of building were used to estimate worker and vendor trip emissions. For the architectural coating, the URBEMIS2007 default assumption used in the analysis was that there are no vendor trips and that worker trips are equal to 20% of the worker trips required for the building construction.

Emissions from track construction were estimated using the same approach described for the HST alignment construction. The length of track related to MOWF operations is presented in Table 6.8-2.

G. Heavy Maintenance Facility Construction

Emissions associated with construction of the HMF are expected as a result of mass site grading, asphalt paving, building construction, and architectural coatings. Emissions would also result from construction of the HMF Access Guideway rail. The General Heavy-Industry land use category was assumed in URBEMIS2007 modeling to estimate the emissions from HMF construction.

HMF construction activities were divided into three construction phases (Phases 1, 2, and 3), as described below. Unless noted below, the URBEMIS2007 default parameters were applied to the HMF construction. Phase 2 construction activities associated with the test track light-maintenance facility, are not considered for the Fresno to Bakersfield Section, since the light-maintenance facility is only found at terminals, which are not present along the Fresno to Bakersfield Section. Therefore, only construction activities for Phases 1 and 3 are presented in the following sections:

Phase 1

Phase 1 includes grading of the entire HMF footprint and is expected to last approximately 4 months, beginning in August 2017. The mass site grading default settings of URBEMIS2007 were used to model this phase. The total area graded would be 154 acres.

Phase 3

Phase 3 includes paving, building construction, and architectural coating of the HMF, as well as construction of the track related to HMF operation. Phase 3 is expected to last approximately 7 months, beginning in January 2021. As a conservative estimate, the total area to be paved was assumed equal to the total area to be cleared minus the size of the HMF buildings to be constructed minus the total area cleared for the overnight layover/servicing facility. The area used in URBEMIS2007 was the total building construction area (approximately 728,000 square feet).

Track construction would include laying at-grade rail. As with the MOWF Access Guideway construction, Phase 3 emissions from track construction were estimated using the same approach described for the HST alignment construction. The length of track related to HMF operation is presented in Table 6.8-2.

H. Power distribution Station Construction

Emissions associated with construction of the traction power substations, switching stations, and paralleling stations would be from mass site grading, building construction, and architectural coatings. Paving activities were not considered because these stations would not have paved areas, and access roads would be covered with gravel.

The emissions from power distribution station construction were calculated using default parameters in URBEMIS2007 with the Light-Industry land use category. 4 traction power substations, 3 switching stations, and 12 paralleling stations would be included for the Fresno to Bakersfield Section. For simplicity, only one of each station type was modeled in URBEMIS2007; the resulting emissions were multiplied by the number of stations to be constructed. Construction of all power stations is expected to occur concurrently, beginning in 2016 and ending in 2018.

The URBEMIS2007 default number of construction equipment items was based on the total acres of building construction. The URBEMIS2007 default equipment list was used for the traction power substations and for the switching and paralleling stations.

I. Roadway Crossing Construction

The HST alternatives would include construction easement, easement for columns within a state facility, or modification of overcrossings or interchanges. The URBEMIS2007 model was used to estimate exhaust emissions from these construction activities using site-specific equipment lists and default input parameters for worker and vendor trips. Roadway crossing construction would begin in 2013 and last for a total of 55 months. Construction equipment is assumed to be built or rebuilt in the year 2005 and operating at a load factor of 0.65. It was assumed that there were 0.42 worker trips per 1,000 square feet and 0.38 vendor trips per 1,000 square feet. Construction activities were assumed to occur 280 days per year.

J. Demobilization

Demobilization would take approximately 29 months, beginning in August 2017. Emissions associated with demobilization were calculated using URBEMIS2007, using a site-specific land use category with properties similar to an industrial park. The land use area entered into URBEMIS2007 was conservatively estimated based on the BNSF alignment footprint (approximately 1,263 acres). While the construction activities were represented using a mass site grading phase, fugitive dust emissions during demobilization were presumed negligible because of the minimal surface disturbance associated with this activity.

Construction equipment is assumed to be built or rebuilt in the year 2005, and operating at a load factor of 0.65.

6.8.4 Construction Quantities and Construction Schedule

Construction quantities and schedules for the HST project were estimated by consultation with project engineers. For purposes of calculating emissions, the overall construction project was then categorized into the "unit operations" listed in Table 6.8-3. Construction quantities (e.g., cubic yards of exported soil, cubic yards of concrete, and square feet of buildings) were estimated for each unit operation. Estimates of the type and number of off-road construction equipment required for each unit operation were then derived.

The currently available draft construction schedule has been used for this analysis. Regional building demolition and/or site preparation is expected to begin in 2013, and the major construction activity for the other project elements is expected to occur from 2013 through 2021. No construction activity is expected in 2020. The specific breakdown of individual construction activities and the construction schedule used to estimate emissions are provided in Appendix A.

Table 6.8-3
Construction Unit Operations for Construction Emission Calculations

Unit No.	Construction Unit Name	Unit Quantity BNSF Alternative[a]	Units
Building Demolition [b]		16,145,000	square feet
At-Grade Rail Segments			
A-1	Mainline Clear and Grub	1,008	acres
A-2	Mainline Select Cut and Fill	9,020,175	cubic yard
A-3	Mainline Ballast	834,167	cubic yard
A-4	Mainline Sub-Ballast	834,167	cubic yard
A-5	Railway Ties (Concrete)	522,851	ties
A-6	Rail	2,075,439	feet
A-7	Mainline Track Laying	480,480	feet
Elevated Rail (including Retained Fill) Segments			
E-1	Mainline Clear and Grub	255	acres
E-2	Mainline Select Cut and Fill	2,279,825	cubic yard
E-3	Mainline Ballast	210,833	cubic yard

Table 6.8-3
Construction Unit Operations for Construction Emission Calculations

Unit No.	Construction Unit Name	Unit Quantity BNSF Alternative[a]	Units
E-4	Mainline Sub-Ballast	210,833	cubic yard
E-5	Railway Ties (Concrete)	132,149	ties
E-6	Rail	524,561	feet
E-7	Reinforced Steel	156,000	tons
E-8	Structural Steel	21,000	tons
E-9	Concrete	1,760,000	cubic yards
E-10	Cement	432,080	tons
E-11	Sand	1,256,640	tons
E-12	Aggregate	1,641,200	tons
E-13	Mainline Track Laying	121,440	feet
Maintenance Yard[c]			
MY-1	Maintenance Yard Track (At-Grade)	51,168	feet
MY-2	Maintenance Buildings	760,176	square feet
MY-3	Maintenance Clear and Grub	6,708,267	square feet
HST Stations[d]			
S-1	Fresno Station Buildings	871,203	square feet
S-2	Kings/Tulare Regional Station Buildings	1,219,685	square feet
S-3	Bakersfield Station Buildings	871,203	square feet
Traction Power Substations			
PS-1	Traction Power Supply Stations	114,999	square feet
PS-2	Switching Stations[e]	27,443	square feet
PS-3	Paralleling Stations[e]	146,362	square feet

Notes:
[a] The values presented represent the scenario for the BNSF Alternative. The BNSF Alternative is used as the proxy alignment to estimate air quality emissions for all the other alternatives because the lengths of the alignments that deviate from the BNSF Alternative are comparable to the lengths of the equivalent sections of the BNSF Alternative.

[b] Includes building demolition for the BNSF Alternative and the Kern Council of Governments–Wasco HMF site.

[c] Includes heavy maintenance facility and maintenance-of-way facility.

[d] Includes parking structures.

[e] The Fresno to Bakersfield Section will require 12 parallel power stations; 3 switching power stations will be required for the Fresno to Bakersfield Section; 4 traction power stations will be required for the BNSF Alignment.

6.8.5 Construction Impact Analysis

Air quality impacts of HST project construction would be evaluated under NEPA and CEQA contexts. Although the following criteria are discussed for construction impact analysis, the same criteria also apply to operational impact analysis.

Pursuant to NEPA regulations (40 CFR 1500–1508), project effects are evaluated based on the criteria of context and intensity. Context means the affected environment in which a proposed project occurs. Intensity refers to the severity of the effect, which is examined in terms of the type, quality, and sensitivity of the resource involved, location and extent of the effect, duration of the effect (short or long term), and other considerations of context. Beneficial effects are identified and described. When there is no measurable effect, impact is found not to occur. The intensity of the adverse effects is summarized as the degree or magnitude of a potential adverse effect, where the adverse effect is thus determined to be negligible, moderate, or substantial. It is possible that a significant adverse effect may still exist when on balance the impact is negligible or even beneficial.

Per NEPA regulations, the regional project emissions are compared with the general conformity *de minimis* (GC) thresholds on a calendar-year basis. If the GC thresholds are exceeded for any calendar year in which emissions occur, a GC determination is required. In addition, the project emissions may not cause new violations or exacerbate an existing violation of NAAQS. Table 6.8-4 presents the *de minimis* thresholds for the project.

Table 6.8-4
General Conformity *de minimis* Thresholds

Pollutant	Federal Attainment Status	Threshold Values (tpy)[a]
NO_2	Attainment	N/A
Ozone precursor (NO_x)[b]	Nonattainment: Extreme	10
Ozone precursor (VOCs)[b]	Nonattainment: Extreme	10
CO[c]	Maintenance	100
SO_x	Attainment	N/A
$PM_{2.5}$	Nonattainment	100
$PM_{2.5}$ precursor (SO_2)[d]	Nonattainment	100
PM_{10}	Maintenance	100
Pb	No designation	N/A

Source: SJVAPCD 2010; EPA 2011d.

Notes:
[a] Thresholds from 40 CFR Parts 51 and 93.
[b] Ozone reclassifications were made by EPA on May 5, 2010.
[c] Only the urban portion of Fresno County is a maintenance area for CO.
[d] SO_2 has a GC threshold of 100 tpy. Due to the stringent requirement of using ultra-low sulfur content diesel in California, emissions of SO_2 anticipated from the project are expected to be negligible compared to the threshold. Therefore, no further analysis or evaluation is included for SO_2 in this report.

Acronyms:
CO carbon monoxide
N/A not applicable
NO_2 nitrogen dioxide
NO_x nitrogen oxide
Pb lead
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide
SO_x sulfur oxide
tpy ton(s) per year
VOC volatile organic compound

Pursuant to CEQA Guidelines, impacts on air quality would be considered significant if the project would:

- Conflict with or obstruct implementation of the applicable air quality plan.

- Exceed or contribute to an exceedance of any air quality standard or contribute substantially to an existing or projected air quality violation.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for O_3 precursors).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.
- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with an applicable plan, policy, or regulation adopted for reducing the emissions of GHG.

The SJVAPCD GAMAQI (SJVAPCD 2002) contains the emissions thresholds used to evaluate the significance of a project's emissions with regard to air quality standards. If a project's emissions are below the significance thresholds as listed in Table 6.8-5, the impact would be considered less than significant and would not lead to a violation of an ambient air quality standard or conflict with an air quality plan. If either the construction- or operational-phase emissions are greater than these values, impacts for that phase would be considered potentially significant. Additionally, as per the SJVAPCD GAMAQI, if a project is individually significant, it is also considered cumulatively significant; therefore, the thresholds listed in Table 6.8-5 are also the cumulative significance thresholds for the project.

Table 6.8-5

SJVAPCD CEQA Construction and Operational Thresholds of Significance

Pollutant	Thresholds (tpy)
NO_x	10
ROG	10
PM_{10}	15
$PM_{2.5}$	15

Sources: SJVAPCD 2002; Willis 2010, personal communication; Barber 2010, personal communication.

Acronyms:

CEQA	California Environmental Quality Act
NO_x	nitrogen oxide
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter
ROG	reactive organic gas
SJVAPCD	San Joaquin Valley Air Pollution Control District
tpy	ton(s) per year

SJVAPCD does not have a quantitative SO_2 emission threshold, and SO_2 is not expected to be a pollutant of concern given the low background concentrations of the area and the type of project proposed. Therefore, impacts from SO_2 emissions would be negligible and less than significant because emissions would not cause or contribute to an exceedance of an air quality standard or contribute substantially to an existing or projected air quality violation. However, SO_2 emissions are presented in this analysis.

The SJVAPCD does not have construction or operation emission thresholds for CO for CEQA. CO impacts during operation will be considered significant if the projected CO concentrations at potential hot-spot locations exceed NAAQS or CAAQS.

7.0 Impact Analysis

Using the methodologies described in Section 6, the impacts of the proposed project were evaluated and are discussed in the following sections.

7.1 Statewide and Regional Emission Analysis

Table 7.1-1 summarizes estimated statewide emission burden changes due to the project in 2035. As shown in Table 7.1-1, the project is predicted to have a beneficial effect on (i.e., reduce) statewide emissions of all applicable pollutants. The analysis estimated the emission changes due to projected reductions of on-road VMT and intrastate plane travel, and increases in electrical demand (required to power the HST). In the existing conditions and existing plus project scenario, the project is also predicted to have a beneficial effect on (i.e., reduce) statewide emissions of all applicable pollutants, as compared to the existing scenario (refer to Appendix E).

Table 7.1-1
2035 Estimated Statewide Emission Burden Changes due to the HST

Project Element	HC (tons/day)	CO (tons/day)	NO_x (tons/day)	SO_2 (tons/day)	PM_{10} (tons/day)	$PM_{2.5}$ (tons/day)
Roadways	-1.44	-28.96	-7.60	-0.15	-1.47	-0.88
Planes	-0.65	-5.90	-7.90	-0.55	-0.06	-0.06
Energy (power plants)	0.10	1.03	0.69	0.09	0.14	0.13
Total	-1.98	-33.68	-14.79	-0.61	-1.40	-0.82

Note**:** Totals may not add up exactly due to rounding.
Acronyms:
CO carbon monoxide
HC hydrocarbon
HST high-speed train
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide

7.1.1 On-Road Vehicles

As shown in Table 7.1-2, the HST is predicted to reduce daily roadway VMT by over 30 million as a result of travelers using use the HST rather than driving. The on-road vehicle emission analysis is based on VMT changes and associated average daily speed estimates, calculated for each affected county. Emission factors were obtained from EMFAC2007, using parameters set within the program for each individual county to reflect travel within each county and statewide parameters to reflect travel through each county. As shown in Table 7.1-2, the proposed project is predicted to have either no measurable effect or slightly reduce regional emissions, as compared to the No Project Alternative. These reductions are demonstrated on both a county and statewide level.

In the existing and existing plus project analysis, it is estimated that the project will reduce daily VMT in every county and by over 17 million miles a day statewide. As such, it is predicted to reduce roadway emissions by approximately 2% when compared with the existing scenario due to travelers choosing to use the HST rather than drive (refer to Appendix E).

Table 7.1-2
2035 On-Road Vehicle Emission Changes due to HST

County	No Build VMT Total Traffic	Build VMT Total Traffic	Change in Emissions with HST (tons/day)					
			VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Alameda	44,195,495	43,551,929	-0.04	-0.67	-0.18	-0.01	-0.03	-0.02
Alpine	1,403,945	1,401,217	0.00	0.00	0.00	0.00	0.00	0.00
Amador	4,661,019	4,646,828	0.00	-0.01	0.00	0.00	0.00	0.00
Calaveras	1,414,871	1,383,696	0.00	-0.03	-0.01	0.00	0.00	0.00
Contra Costa	27,867,886	27,667,001	-0.01	-0.21	-0.05	0.00	-0.01	-0.01
El Dorado	9,405,356	9,379,731	0.00	-0.02	-0.01	0.00	0.00	0.00
Fresno	27,367,949	24,364,285	-0.13	-2.65	-0.71	-0.01	-0.14	-0.08
Imperial	12,187,692	12,170,172	0.00	-0.02	-0.01	0.00	0.00	0.00
Inyo	5,178,956	5,158,901	0.00	-0.02	0.00	0.00	0.00	0.00
Kern	39,240,101	35,149,202	-0.18	-3.65	-0.98	-0.02	-0.18	-0.11
Kings	3,136,720	2,663,113	-0.02	-0.41	-0.11	0.00	-0.02	-0.01
Los Angeles	265,560,319	259,698,490	-0.27	-5.64	-1.38	-0.03	-0.28	-0.17
Madera	8,532,552	8,256,392	-0.01	-0.24	-0.07	0.00	-0.01	-0.01
Marin	7,961,630	7,866,736	-0.01	-0.10	-0.03	0.00	0.00	0.00
Mariposa	873,461	846,009	0.00	-0.02	-0.01	0.00	0.00	0.00
Merced	13,534,370	12,018,453	-0.07	-1.31	-0.36	-0.01	-0.07	-0.04
Mono	1,378,612	1,365,352	0.00	-0.01	0.00	0.00	0.00	0.00
Monterey	13,864,584	13,123,028	-0.03	-0.65	-0.17	0.00	-0.03	-0.02
Napa	4,838,702	4,792,647	0.00	-0.05	-0.01	0.00	0.00	0.00
Nevada	7,648,230	7,575,684	0.00	-0.06	-0.02	0.00	0.00	0.00
Orange	94,555,953	92,699,029	-0.08	-1.76	-0.42	-0.01	-0.09	-0.05
Placer	12,357,969	12,212,333	-0.01	-0.14	-0.04	0.00	-0.01	0.00
Riverside	101,286,914	99,801,479	-0.07	-1.45	-0.41	-0.01	-0.07	-0.05
Sacramento	33,432,730	32,754,592	-0.03	-0.61	-0.16	0.00	-0.03	-0.02
San Benito	3,361,404	2,968,595	-0.02	-0.34	-0.09	0.00	-0.02	-0.01
San Bernardino	96,726,005	95,709,159	-0.05	-0.96	-0.31	-0.01	-0.05	-0.03
San Diego	158,273,980	156,278,290	-0.10	-1.96	-0.52	-0.01	-0.10	-0.06
San Francisco	10,557,241	10,413,805	-0.01	-0.15	-0.04	0.00	-0.01	0.00
San Joaquin	22,717,713	21,198,249	-0.07	-1.31	-0.36	-0.01	-0.07	-0.04
San Luis Obispo	8,411,244	7,940,789	-0.02	-0.41	-0.11	0.00	-0.02	-0.01
San Mateo	24,218,646	23,804,290	-0.02	-0.39	-0.07	0.00	-0.02	-0.01
Santa Barbara	8,094,082	7,592,558	-0.02	-0.44	-0.12	0.00	-0.02	-0.01
Santa Clara	50,863,603	49,956,147	-0.05	-0.92	-0.23	-0.01	-0.05	-0.03
Santa Cruz	2,600,612	2,564,302	0.00	-0.03	-0.01	0.00	0.00	0.00
Solano	16,101,043	15,928,916	-0.01	-0.17	-0.05	0.00	-0.01	-0.01

Table 7.1-2 (continued)
2035 On-Road Vehicle Emission Changes Due to HST

County	No Build VMT Total Traffic	Build VMT Total Traffic	Change in Emissions with HST (Tons/Day)					
			VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Sonoma	12,738,505	12,651,479	0.00	-0.09	-0.02	0.00	0.00	0.00
Stanislaus	11,477,980	10,480,727	-0.04	-0.89	-0.24	-0.01	-0.05	-0.03
Sutter	3,878,420	3,828,474	0.00	-0.04	-0.01	0.00	0.00	0.00
Tulare	10,112,011	9,648,380	-0.02	-0.40	-0.11	0.00	-0.02	-0.01
Tuolumne	1,766,709	1,734,529	0.00	-0.03	-0.01	0.00	0.00	0.00
Ventura	26,635,805	26,352,804	-0.01	-0.28	-0.06	0.00	-0.01	-0.01
Yolo	7,858,254	7,661,590	-0.01	-0.17	-0.05	0.00	-0.01	-0.01
Yuba	2,207,207	2,185,401	0.00	-0.02	-0.01	0.00	0.00	0.00
Rest of CA (North of Bay Area/ Sacramento	34,117,813	33,886,195	-0.01	-0.20	-0.05	0.00	-0.01	-0.01
Statewide Total	**1,254,604,293**	**1,223,330,976**	**-1.44**	**-28.96**	**-7.60**	**-0.15**	**-1.47**	**-0.88**

Acronyms:

CA	California
CO	carbon monoxide
HST	high-speed train
NO_x	nitrogen oxide
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter
SO_2	sulfur dioxide
VMT	vehicle miles traveled
VOC	volatile organic compound

Based on the traffic analysis, all the HST alternatives evaluated would have the same regional VMT and the same regional emissions. Under the HST alternatives design year, the regional VMT would decrease by about 10% compared with the No Project Alternative for Fresno, Kings, Kern, and Tulare counties and about 2% compared with existing conditions. These reductions would result in lower pollutant emissions. The benefits presented depend on ridership. Therefore, lower ridership than those assumed in the design and planning values would result in fewer benefits, while higher ridership would result in more benefits.

7.1.2 Train Movement

The HST project would use electric multiple unit (EMU) trains, with the power distributed through the overhead contact system. Combustion of fossil fuels and associated emissions from the HST would not occur. However, trains traveling at high velocities, such as those associated with the proposed HST, create sideways turbulence and rear wake, which re-suspend particulates from the surface surrounding the track, resulting in fugitive dust emissions. Assuming a friction velocity of 0.19 meters per second (0.62 feet per second) to re-suspend soils in the project region, an HST passing at 220 mph could re-suspend soil particles out to approximately 10 feet from the train (Watson 1996). Based on the EPA methodology for estimating emissions from wind erosion (EPA 2006b), HST operations would generate approximately 29 tons per year (tpy) of PM_{10} and 4.3 tpy of $PM_{2.5}$. Details of the analysis and calculations are included in Appendix D.

7.1.3 Airport Emissions

The HST project could affect travel at four regional airports in the study area: Fresno Yosemite International Airport, Hanford Municipal Airport, Visalia Municipal Airport, and Meadow Fields Airport. The Statewide Program EIR/EIS (Authority and FRA 2005) demonstrated that the long-distance, city-to-city aircraft takeoffs and landings within the Fresno to Bakersfield Section would be reduced by about one flight per day. This would reduce regional airport-related emissions of CO, NO_x, and VOCs relative to the No Project Alternative and existing conditions. As shown in Table 7.1-3, the HST is predicted to reduce the number of plane flights due to travelers using the HST rather than to flying to their destination.

EDMS was used to estimate airplane emission factors. The EDMS estimated the emissions generated from the projected number of LTO cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are also included. Average plane emissions were calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips removed because of the HST was estimated in the travel demand modeling analysis conducted for the project. In the existing and existing plus project analysis, it is estimated that the project will reduce the number of statewide air trips by over 200 flights per day statewide, resulting in an reduction of emissions from planes, when compared with the existing scenario, due to travelers choosing to use the HST rather than flying (refer to Appendix E).

As shown in Table 7.1-3, the proposed project is predicted either to have no measurable effect or to slightly reduce regional emissions due to the HST when compared with the No Project scenario.

Table 7.1-3
2035 Aircraft Emission Changes due to HST

Origin	No. of Flights Removed	Change in Emission Burdens due to HST (tons/day)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Central Coast	-1	0.00	-0.02	-0.02	0.00	0.00	0.00
Far North	-16	-0.03	-0.24	-0.33	-0.02	0.00	0.00
Fresno/Madera	0	0.00	0.00	0.00	0.00	0.00	0.00
Kern	-16	-0.03	-0.24	-0.33	-0.02	0.00	0.00
LA Basin-North	-43	-0.07	-0.66	-0.88	-0.06	-0.01	-0.01
LA Basin-South	-88	-0.15	-1.34	-1.80	-0.13	-0.01	-0.01
Merced	-1	0.00	-0.02	-0.02	0.00	0.00	0.00
Monterey Bay	-16	-0.03	-0.24	-0.33	-0.02	0.00	0.00
Sacramento Region	-16	-0.03	-0.24	-0.33	-0.02	0.00	0.00
San Diego Region	-47	-0.08	-0.72	-0.96	-0.07	-0.01	-0.01
San Joaquin	-7	-0.01	-0.11	-0.14	-0.01	0.00	0.00
SF Bay Area	-130	-0.22	-1.98	-2.65	-0.18	-0.02	-0.02

Table 7.1-3
2035 Aircraft Emission Changes due to HST

Origin	No. of Flights Removed	Change in Emission Burdens due to HST (tons/day)					
		VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
South SJ Valley	0	0.00	0.00	0.00	0.00	0.00	0.00
Stanislaus	-5	-0.01	-0.08	-0.10	-0.01	0.00	0.00
W. Sierra Nevada	-1	0.00	-0.02	-0.02	0.00	0.00	0.00
Statewide Total	-387	-0.65	-5.90	-7.90	-0.55	-0.06	-0.06

Acronyms:
CO carbon monoxide
HST high-speed train
LA Los Angeles
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SF San Francisco
SJ San Joaquin
SO_2 sulfur dioxide
VOC volatile organic compound

7.1.4 Indirect Power Plant Emissions

The HST is expected to increase electrical requirements when compared with the No Project Alternative and existing conditions. Statewide, the electrical demands due to propulsion of the trains and the operation of the trains at terminal stations and in storage depots and maintenance facilities were conservatively estimated to be 8.32 gigawatt-hours (GWh) per day (including transmission losses of approximately 3%) in 2035. To derive the portion of electricity usage required by the Fresno to Bakersfield Section, the alignment distance for the BNSF Alternative was divided by the total HST distance of 830 miles. The result was multiplied by the calculated emissions for the entire HST. Average emission factors (in terms of grams per kilowatt hour) were derived from CARB statewide emission inventories of electrical and cogeneration facilities data along with the California Energy Commission's electrical generation data. As shown in Table 7.1-4, the project is expected to increase emissions. This change is predicted to occur in the 2035 build scenario. The increase in electrical requirements for the existing conditions plus project scenario are presented in Appendix E.

The system would be powered by the state's electrical grid, and therefore no single generation source for the electrical power requirements can be positively identified. Emission changes from power generation can therefore be predicted on a statewide level only. The estimated emission changes shown in Table 7.1-4 are considered to be conservative because they are based on the current electrical profile of the state. The State of California is requiring an increasing fraction (33% by 2020) of electricity generated for the state's power portfolio to come from renewable energy sources. As such, the emissions generated for powering the HST system are expected to be lower in the future when compared with emission estimates used in this analysis based on the existing state power portfolio. In addition, the Authority has adopted a goal to purchase the HST system's power from renewable energy sources, which would further reduce the emissions compared to the existing estimates.

Table 7.1-4
2035 Power Plant Emission Changes due to HST

Electricity required (GWh per day)	Change in Emissions due to HST (tons/day)					
	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
8.32 (Statewide)	0.10	1.03	0.69	0.09	0.14	0.13
1.14 (Regional)	0.01	0.14	0.10	0.01	0.02	0.02

Note: Regional emission changes vary depending on the length of the alternative alignment. Regional emissions in the table represent the emissions corresponding to the longest alignment alternative.
Acronyms:
CO carbon monoxide
GWh gigawatt-hour(s)
HST high-speed train
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide
VOC volatile organic compound

7.2 Local Operational Emission Sources

Operation of the Fresno, Kings/Tulare Regional, and Bakersfield stations, the HMF, and the MOWF would produce criteria pollutant and GHG 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 these power stations were not quantified.

7.2.1 HST Stations

Operation of the Fresno, Kings/Tulare Regional, and Bakersfield stations and associated mobile sources would produce criteria pollutant and GHG emissions.

Emissions associated with the operation of the Fresno, Kings/Tulare Regional, and Bakersfield stations are expected as a result of combustion sources used primarily for space heating and facility landscaping (backup emergency generators), energy consumption for facility lighting, minor solvent and paint usage, and employee and passenger traffic. Deliveries to the train stations are considered to be negligible. URBEMIS2007 was used to estimate these emissions from each station, based on the square footage of the stations. The unmitigated criteria pollutant and GHG emissions were estimated for the design year (2035) and are included in Table 7.2-1.

Table 7.2-1
HST Station Operational Emissions

	Emissions (tons/year)						
Project Component	**VOCs**	**CO[a]**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Operational Year 2035							
Fresno Station	0.55	41.3	3.45	0.25	2.39	1.37	24,530
Kings/Tulare Regional Station	0.24	17.6	1.76	0.09	0.96	0.57	9,314
Bakersfield Station	0.57	43.0	3.78	0.26	2.50	1.43	25,612

Note: The operational emissions do not include CO emissions from traffic congestion in the parking structures.
Acronyms:
CO carbon monoxide
CO_2 carbon dioxide
HST high-speed train
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide
VOC volatile organic compound

7.2.2 Maintenance Facilities

A. Maintenance-of-Way Facility

Maintenance-of-way facilities provide for equipment, materials, and replacement parts storage, and for support quarters and staging areas for the HST system subdivision maintenance personnel. None of these activities or storage requirements would result in the generation of air pollutant emissions in quantities that would limit the location of these maintenance facilities from nearby sensitive receptors. Setback constraints, if any, required for other environmental or land use disciplines (e.g., zoning, aesthetics, noise) should be sufficient to protect existing or future nearby land uses from potentially significant air quality impacts from these maintenance facilities. Emissions from MOWF onsite activities are considered in conjunction with the emissions from HMF onsite activities, since the facilities will be co-located. Emissions from MOWF offsite mobile activities are presented in Table 7.2-2.

B. Heavy Maintenance Facility

HSTs require special facilities to support the commissioning activities, layup/storage, and maintenance program requirements. This section describes the processes related to the HMF along with their associated emissions. The MOWF would be co-located with the HMF.

Site-specific information for all activities at the HMF is not available at this time; however, reasonable assumptions were made based on the type of activities at the facility. If the proposed HMF is built, stationary sources would require permits from the SJVAPCD. The Permit to Operate (PTO) would include detailed emission calculations, permit conditions, and emission controls for these sources.

Table 7.2-2
Maintenance Facility Operational Emissions

Project Component	Emissions (tons/year)[a]						
	VOCs	CO[b]	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Operational Year 2035							
HMF onsite emissions[a]	0.57	8.97	3.50	0.47	0.13	0.12	18,563
HMF offsite mobile source emissions	0.21	11.80	1.58	0.07	0.70	0.40	7,094
MOWF offsite mobile source emissions	0.05	3.75	0.30	0.02	0.22	0.13	2,198

Note: The background monitoring data are based on the highest concentration over the last 3 years at the Merced, Madera, Drummond, and/or Fresno monitoring stations. These are the monitoring stations closest to the prototypical HMF that was used in the refined modeling.
[a] HMF onsite emissions include emissions from locomotives and diesel trucks associated with MOWF activities.
[b] The operational emissions do not include CO emissions from traffic congestion in the parking structures.
Acronyms:
CO carbon monoxide
CO_2 carbon dioxide
HMF heavy maintenance facility
MOWF maintenance-of-way facility
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide
VOC volatile organic compound

HMF Sources with Minimal Air Emissions

The following activities are associated with the maintenance activities that would occur at or near the HMF and are not likely to result in air emissions. These activities are not likely to result in air emissions because they do not involve the type or quantity of materials, chemicals, or activities regulated by federal, state, or local air quality regulatory agencies:

- Daily inspection tests and repair of small parts.
- Replacement of module components, as well as truck change-outs, air brake change-outs, motor/wheel set change-outs, power supplies, batteries, and control groups.
- Overhauls that will remove, inspect, test, perform minor repair, and assemble components from the train car (e.g., power supply, air compressors, batteries, controls group, generators/ alternators).
- Steam-cleaning exteriors and other parts.
- Battery charging and storage rooms.
- Electronic shop.
- Light interior car cleaning and trash removal.

- Toilet servicing.

- Overhead crane and heavy lifting equipment (e.g., forklifts) to facilitate vehicle assembly and disassembly. Based on a conversation with the engineer at Hatch Mott MacDonald (HMM), the cranes and lifts will likely be electric because this is what occurs at other maintenance facilities for HSTs around the world (Earle 2010, personal communication). As a result, there will be minimal emissions from these activities.

HMF Stationary Sources with Potential Permit Requirements

The following activities associated with maintenance at the HMF could be a source of air emissions. These sources would meet federal, state, and local regulatory requirements and may require a permit to operate. The potential types of emissions and their sources are discussed for the following activities:

- Paint Booths: To provide onsite painting of the exterior and parts associated with the train cars, the HMF would have onsite spray booths. The spray booths would be closed areas, which would maximize capture efficiency, and would have explosion-proof lights with ventilation/filtration systems. Train car parts would likely be painted using an air gun in a closed or self-contained spray booth (PSC 2007). VOC and PM emissions are typical from spray booths. Additionally, TACs would likely be released, with the quantity and type depending on the type of paint used. VOC, PM, and TAC emissions are expected from these painting operations. A permit application and a health risk assessment would be required prior to operation of a spray booth.

- Stationary Diesel Engines: Potential diesel engines at the HMF include internal combustion engines and other stationary engines with an engine size of 200 hp. At this time, there is no site-specific information for these stationary sources; however, these sources would require a PTO before the facility could be constructed. Criteria pollutant emissions, such as NOx, VOCs, PM_{10}, and $PM_{2.5}$ would be expected from these stationary sources.

- The emissions calculated for the onsite mobile diesel sources would represent the majority of emissions based on the diesel fuel use data.

HMF Mobile Sources

Typical mobile emissions at the HMF would be associated with employee trips to and from the facility, material and equipment deliveries, switchyard locomotives, and on-site diesel trucks. The main contributor to VOC and NOx emissions would be fuel consumption by onsite mobile sources at the HMF. There would be two switch locomotives (for maintenance-of-way operations) and 20 diesel trucks operating at the site.

The HMF may use some purchased power, but this would likely be small relative to the amount of fuel consumed by sources associated with maintenance activities during operation. Therefore, only GHG emissions associated with the combustion of fuel at the maintenance facilities were quantified.

Table 7.2-2 lists the emissions associated with the HMF and MOWF. Details for the assumptions and the emissions associated with each source are provided in Appendix B.

HMF Air Dispersion Modeling Results

Criteria Pollutants

In general, emissions of criteria pollutants from HMF would not cause exceedances of NO_x NAAQS, CAAQS, or federal and state health guidelines at the property line of the HMF (Table 7.2-3). The PM_{10} and $PM_{2.5}$ concentration increases due to the HMF operation would be minimal. However, ambient values currently monitored at the Merced, Madera, Drummond, and Fresno monitoring stations exceed the $PM_{2.5}$ NAAQS and CAAQS as well as the PM_{10} CAAQS; therefore, the project emissions of PM_{10} or $PM_{2.5}$ may contribute to the exceedance of these standards at the facility boundary where the worst-case ground-level concentration of pollutants from HMF would occur.

Table 7.2-3
Total Estimated Concentrations of Criteria Pollutants at HMF Property Line

Pollutant	Averaging Time Period	CAAQS (µg/m³)	NAAQS (µg/m³)	Estimated Concen-trations (µg/m³)	Background Concen-trations (µg/m³)	Total Estimated Concen-trations (µg/m³)	Exceed CAAQS?	Exceed NAAQS?
NO_2	1-hour	339	188	25.2	81.8	106.9	No	No
	Annual	57	100	2.3	30.1	32.4	No	No
PM_{10}	24-hr	50	150	0.44	99.5	99.9	Yes	No
	Annual	20	—	0.15	40.5	40.7	Yes	—
$PM_{2.5}$	24-hr	—	35	0.25	81.6	81.8	—	Yes
	Annual	12	15	0.08	15.23	15.3	Yes	Yes

Acronyms:

µg/m³	micrograms per cubic meter
CAAQS	California Ambient Air Quality Standards
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter

CO Hot-Spot Analysis

Three of the five HMF sites are in rural areas away from sensitive receptors, but the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites are closer to dense populations of sensitive receptors. Because CO hot spots typically occur in congested areas, they would not occur at most of the HMF locations. As discussed in the microscale CO analysis, intersections near the Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites were evaluated in the CO hot-spot analysis. The intersections modeled were found to have CO concentrations less than NAAQS and CAAQS (refer to Section 7.4.1).

Toxic Air Contaminants

The HMF would be a source of TACs and particulate emissions, and sensitive receptors near the HMF site could be exposed to increased levels of these pollutants because of onsite operations and the increase in truck deliveries congregating around the HMF.

Chronic Noncancer Risk: Chronic noncancer risk was estimated for pollutants listed are those for which the noncancer reference dose concentration (RfC) guideline values are available from EPA's Integrated Risk Information System (IRIS), Prioritized Chronic Dose-Response Values for Screening Risk Assessments (EPA 2007) and the Reference Exposure Limit (REL) values from the Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments (OEHHA 2003), OEHHA/ARB-Approved Health Values for Use in Hot Spot Facility Risk Assessments. The total maximum chronic noncancer hazard index at the HMF property line is estimated to be less than 1 – using both EPA and OEHHA health risk values. As such, potential chronic noncancer risks associated with HMF operations are not considered to be significant. The detailed analysis and chronic noncancer risk results are provided in Appendix F.

Acute Risk: Acute Risk was estimated for pollutants listed are those for which acute inhalation exposure criteria values are available from the Prioritized Chronic Dose-Response Values for Screening Risk Assessments (EPA 2007) and acute REL values from OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA 2003), OEHHA/ARB-Approved Health Values for Use in Hot Spot Facility Risk Assessments. The total maximum acute hazard index at the HMF property line is estimated to be less than 1 – using both EPA and OEHHA health risk values. As such, potential acute health risks associated with HMF operations are not considered to be significant. The detailed analysis and acute risk results are provided in Appendix F.

Cancer Risk: Maximum cancer risks were estimated at various distances from the HMF boundary until impacts were not considered to be significant. Based on the results of these preliminary analyses, it was determined that at a distance of approximately 1,300 feet from the facility boundary, the overall incremental cancer impacts would be below applicable significant thresholds. The maximum cancer risks at various distances from HMF boundary were then computed using procedures recommended by SJVAPCD and OEHHA, which assume continuous exposure over a 70-year lifetime for residences. The calculations at various distances from the facility boundary were performed for DPM and other applicable carcinogenic pollutants (Table 7.2-4). As shown, incremental cancer would decrease to below the 10 in a million (10×10^{-6}) CEQA significance threshold at a distance 1,300 feet from HMF boundary. As such, the estimated cancer risk at distances greater than 1,300 feet from the HMF boundary is considered to be less than significant. All five HMF sites, the Fresno Works–Fresno, Kings County–Hanford, Kern Council of Governments–Wasco, Kern Council of Governments–Shafter East, and Kern Council of Governments–Shafter West HMF sites, may have sensitive receptors located within 1,300 feet, where the cancer risk would exceed 10 in a million. Therefore, there might be impacts from HMF site operations at all five HMF sites.

The detailed risk analyses are presented in Appendix F.

Table 7.2-4

Incremental Cancer Risk Values at Different Distances from HMF

	500 ft		1,000 ft		1,300 ft		2,000 ft		3,000 ft		5,000 ft	
Pollutant[a]	Estimated Conc. **($\mu g/m^3$)**	Cancer Risk **(per million)**	Estimat-ed Conc. **($\mu g/m^3$)**	Cancer Risk **(per million)**	Estimat-ed Conc. **($\mu g/m^3$)**	Cancer Risk **(per million)**	Estimat-ed Conc. **($\mu g/m^3$)**	Cancer Risk **(per million)**	Estimat-ed Conc. **($\mu g/m^3$)**	Cancer Risk **(per million)**	Estimat-ed Conc. **($\mu g/m_3$)**	Cancer Risk **(per million)**
DPM	0.04262	17.669	0.02858	11.846	0.02334	9.674	0.01640	6.797	0.01121	4.645	0.00636	2.637
Benzene	0.00079	0.030	0.00053	0.020	0.00043	0.016	0.00030	0.011	0.00021	0.008	0.00012	0.004
Acetaldehyde	0.00112	0.004	0.00075	0.003	0.00061	0.002	0.00043	0.002	0.00029	0.001	0.00017	0.001
1,3-Butadiene	0.00003	0.007	0.00002	0.004	0.00002	0.004	0.00001	0.003	0.00001	0.002	0.000004	0.001
Formaldehyde	0.00223	0.018	0.00150	0.012	0.00122	0.010	0.00086	0.007	0.00059	0.005	0.00033	0.003
Methylene chloride	0.00346	0.005	0.00232	0.003	0.00189	0.002	0.00133	0.002	0.00091	0.001	0.00052	0.001
Total incremental cancer risk		**17.7**		**11.9**		**9.7**		**6.8**		**4.7**		**2.6**

Note:
[a] Based on the estimated 5-years average (2005–2009) annual ground-level concentrations.
Acronyms and Abbreviations:
Conc. = concentrations
DPM = diesel particulate matter
HMF = heavy maintenance facility
$\mu g/m^3$ = micrograms per cubic meter

7.3 Total Operational Emissions

Table 7.3-1 shows a summary of the total emission changes due to HST operation, including the indirect emissions from regional vehicle travel, aircraft, and power plants, and direct project operational emissions from HST 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 SJVAB and help the basin meet its attainment goals for ozone and particulates (PM_{10} and $PM_{2.5}$). However, lower ridership would result in fewer regional benefits, although even with lower ridership there would be a net benefit.

Table 7.3-1

Summary of Changes in Operational Emissions in Design Year 2035 (tons per year)

Activities	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Indirect Emissions						
Changes in VMT emissions	-128	-2,595	-697	-13	-131	-77
Changes in airplane emissions	-3.7	-40	-51	-3.6	0.00	0.00
Changes in power plant emissions	5.0	52	35	4.5	7.5	6.5
Direct Emissions						
HST Station operations	1.4	102	9.0	0.6	5.9	3.4
HMF onsite emissions[a]	0.56	9.0	3.5	0.47	0.13	0.12
HMF offsite emissions	0.21	12	1.6	0.07	0.70	0.40
MOWF offsite emissions	0.05	4	0.3	0.02	0.2	0.1
Fugitive dust from train operations	N/A	N/A	N/A	N/A	29	4.3
Total[b]	-124	-2,457	-699	-11	-88	-62

Notes:
[a] HMF onsite emissions include emissions from locomotives and diesel trucks associated with MOWF activities.
[b] The total includes the indirect and direct emissions.

Acronyms:

CO	carbon monoxide
HMF	heavy maintenance facility
HST	high-speed train
MOWF	maintenance-of-way facility
N/A	not applicable
NO_x	nitrogen oxide
PM_{10}	particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in diameter
SO_2	sulfur dioxide
VMT	vehicle miles traveled
VOC	volatile organic compound

7.4 Microscale CO Analysis

A CO hot-spot analysis was performed for intersections that could potentially cause a localized CO hot spot and for parking structures associated with the train stations. The modeled CO concentrations were combined with CO background concentrations and compared with the air quality standards. The CO hot-spot analysis results would be the same for all HST alternatives evaluated.

7.4.1 Intersections

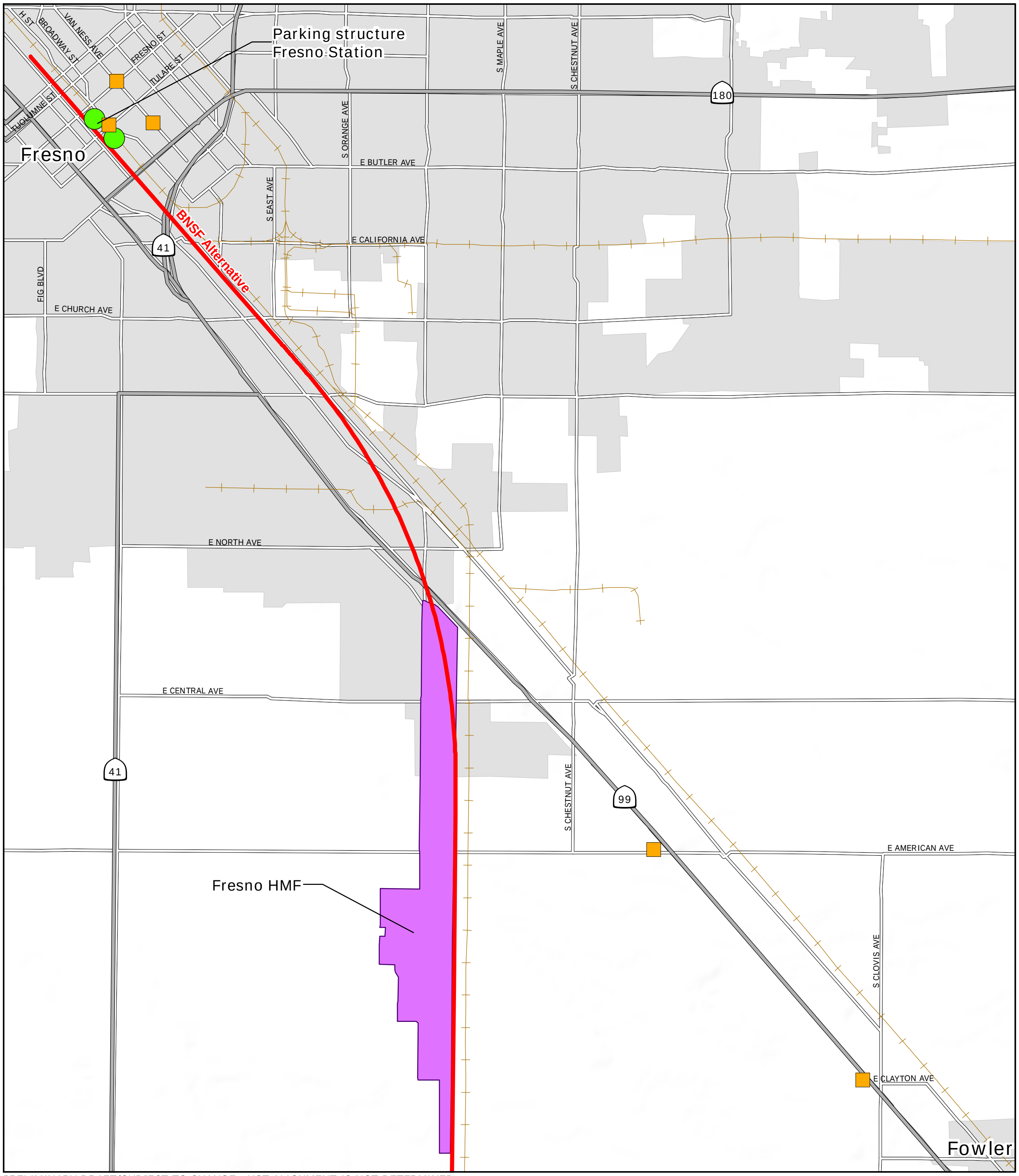
The project would not worsen traffic conditions at intersections along the alignment because the alignment and roadways would be grade-separated. Therefore, the CO analysis did not consider intersections along the alignment; instead, the analysis focused on locations near the HST stations and HMF and on locations that would experience a change in roadway structure or traffic conditions.

CO concentrations were modeled at three intersections near the proposed Fresno, Kings/Tulare Regional, and Bakersfield stations and at two intersections near the proposed Fresno Works–Fresno and proposed Kern Council of Governments–Wasco HMF sites. Figures 7.4-1, 7.4-2, 7.4-3, and 7.4-4 show the locations of the intersections evaluated for CO hot spots near the Fresno Station and the Fresno Works–Fresno HMF site, the Kings/Tulare Regional Station, the Kern Council of Governments–Wasco HMF site, and the Bakersfield Station, respectively.

Intersections modeled near the Fresno Station and the Bakersfield Station are signalized, as traffic volumes at the unsignalized intersections in the study area are less than those at signalized intersections. The intersections around the Kings/Tulare Regional Station and the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites are unsignalized, because these areas did not have signalized intersections affected by the project. Table 7.4-1 summarizes the modeled CO concentrations at the intersections around the proposed Fresno, Kings/Tulare Regional, and Bakersfield stations and around the proposed Fresno Works–Fresno and proposed Kern Council of Governments–Wasco HMF sites.

The results presented in Table 7.4-1 include the HST alternatives as well as the natural growth and other transportation improvement projects in the region, as described in the *Fresno to Bakersfield Section: Transportation Analysis Technical Report* (Authority and FRA 2011b). As shown in the tables, CO concentrations at affected intersections in 2035 for both the No Project and HST alternatives are expected to be lower than those for existing conditions in 2009. HST alternatives would have slightly higher CO concentrations at intersections than would the No Project Alternative in 2035 due to the additional traffic caused by the station or HMF operation. Predicted CO concentrations for all modeled intersections are below the national and state standards and therefore are not expected to cause violations of CO standards during project operation.

In addition to this analysis, a comparison was performed among the HST alternatives, not accounting for natural growth and other transportation improvement projects in the region (i.e., existing conditions plus project) relative to existing conditions. The details of the CO hot-spot analysis that compares the HST alternatives with existing conditions are included in Appendices C and E.



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

Source: URS, 2011

July 20, 2011

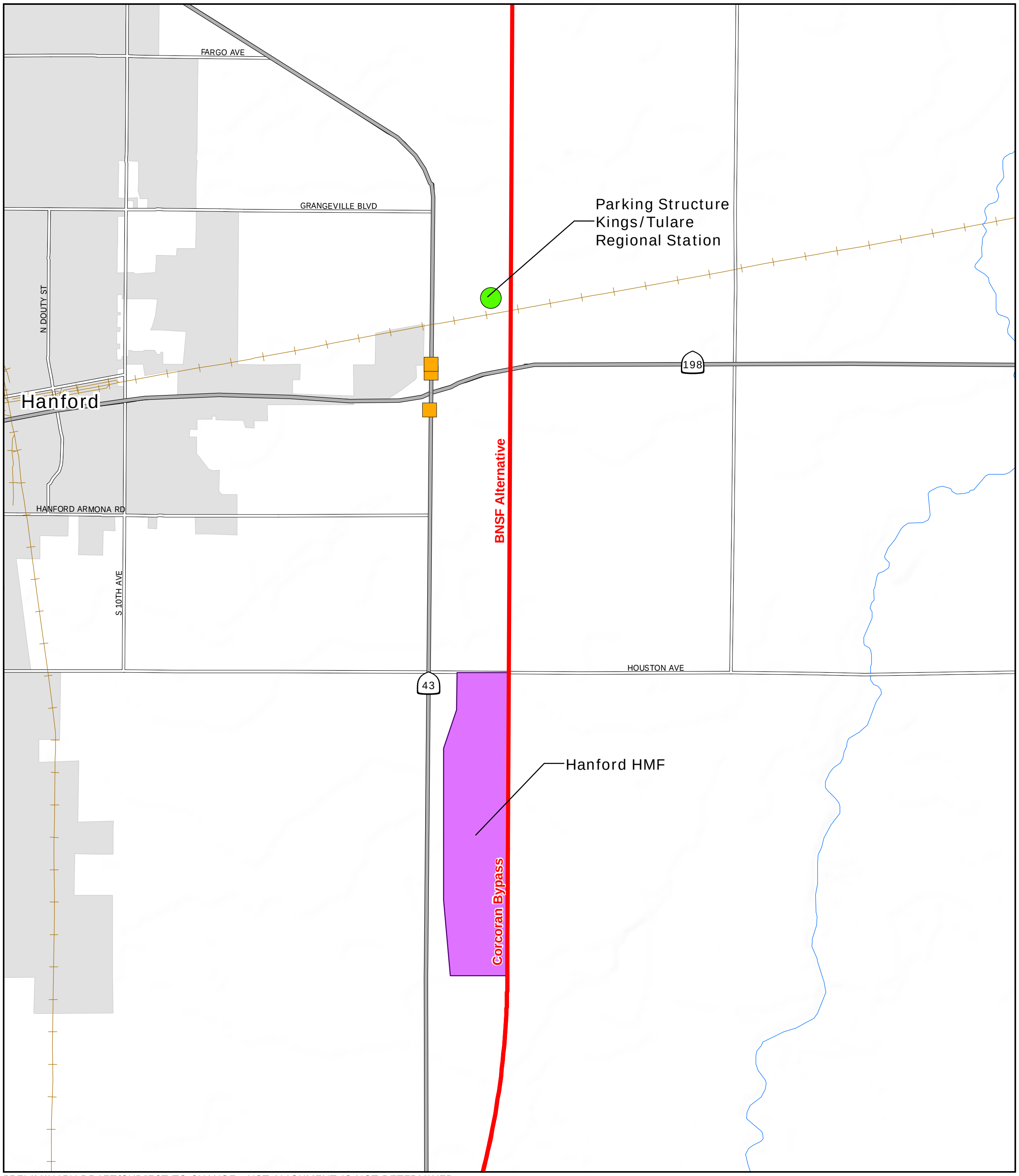
- Alternative alignment
- Existing rail line
- County boundary
- CO hot-spot evaluation location used in modeling analysis
- Parking structure
- Potential heavy maintenance facility
- Community/Urban area

N

0 0.5 1
Miles

0 1 2
Kilometers

Figure 7.4-1
Intersections evaluated for CO hot spots
Fresno Station and Fresno Works - Fresno HMF site



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 20, 2011

Source: URS, 2011

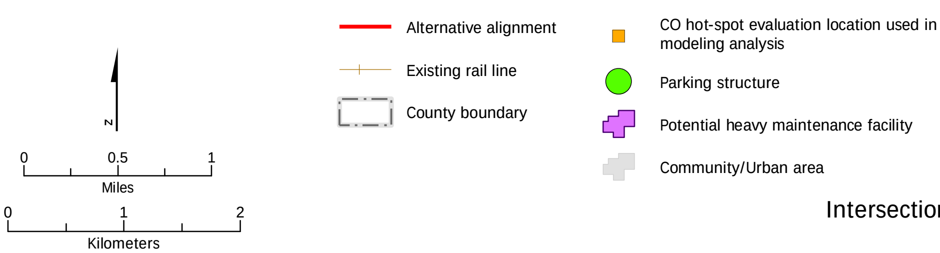


Figure 7.4-2
Intersections evaluated for CO hot spots
Kings/Tulare Regional Station

PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 20, 2011

Source: URS, 2011

N

0 0.5 1
Miles

0 1 2
Kilometers

Alternative alignment

Existing rail line

County boundary

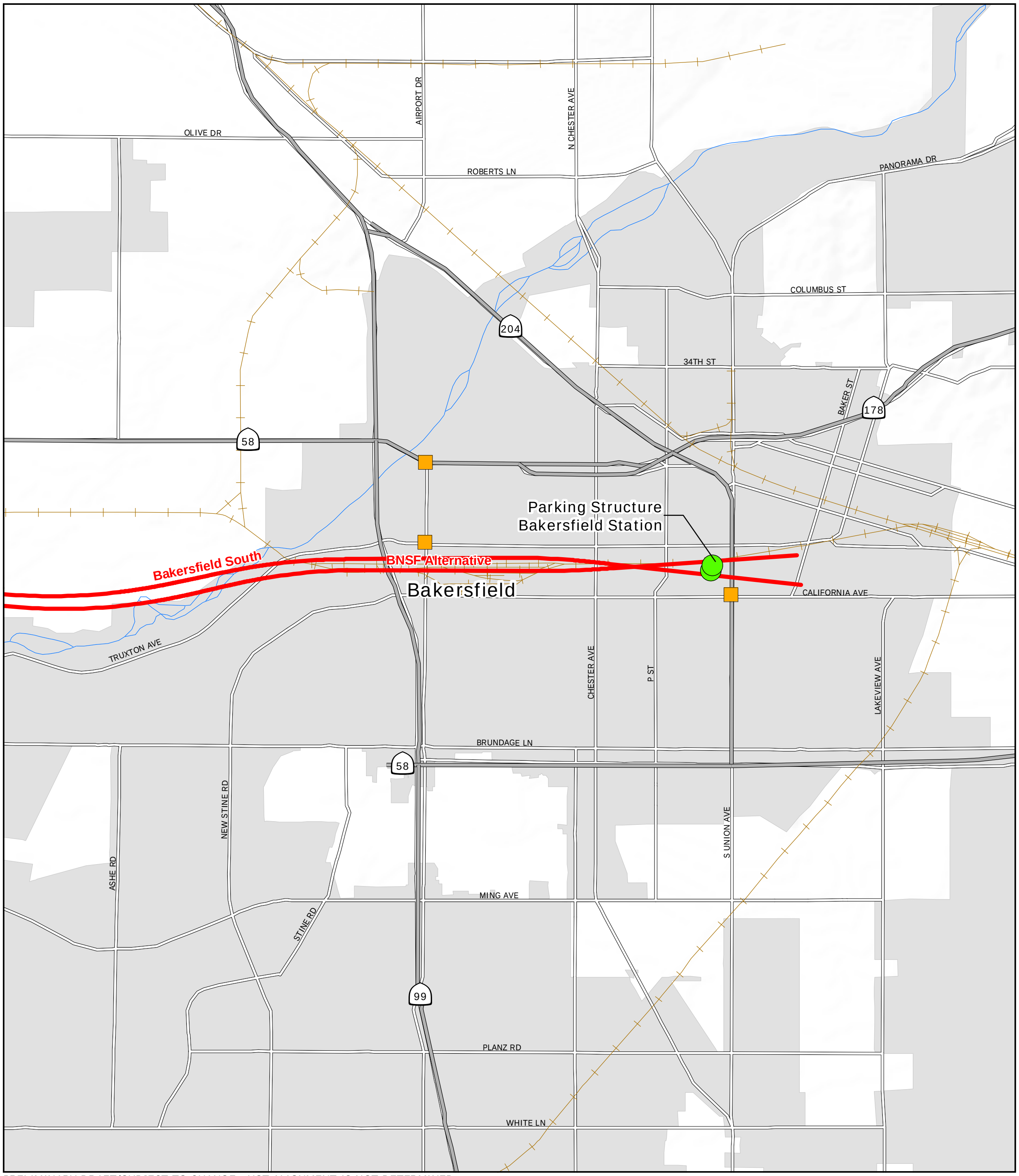
CO hot-spot evaluation location used in modeling analysis

Parking structure

Potential heavy maintenance facility

Community/Urban area

Figure 7.4-3
Intersections evaluated for CO hot spots
Kern Council of Governments - Wasco HMF site



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

July 20, 2011

Source: URS, 2011

Figure 7.4-4
Intersections evaluated for CO hot spots
Bakersfield Station

Table 7.4-1
Maximum Modeled CO Concentrations at Intersections near the Fresno, Kings/Tulare Regional, and Bakersfield Station Areas and near the Fresno Works–Fresno and Kern Council of Governments–Wasco HMF Sites

Intersection	Existing Conditions[a]		2035 No Project/No Action[a]		2035 Project[a]	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour Concentration (ppm)[b]	Max 1-Hour Concentration (ppm)	Max 8-Hour Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]
Fresno Station Area[a]						
Van Ness Street/ Inyo Street	3.5	2.6	3.3	2.5	3.3	2.5
H Street/Tulare Street	3.5	2.6	3.4	2.6	3.4	2.6
Van Ness Avenue/ Fresno Street	3.7	2.8	3.4	2.6	3.5	2.6
Kings/Tulare Regional Station Area[c]						
8th Avenue/SR 198 WB Ramps	3.7	2.3	3.5	2.1	3.5	2.1
8th Avenue/SR 198 EB Ramps	3.7	2.3	3.5	2.1	3.5	2.1
SR 43/Lacey Boulevard	3.8	2.4	3.5	2.1	3.5	2.1
Bakersfield Station Area[d]						
Union Avenue/ California Avenue	4.3	3.2	3.3	2.5	3.4	2.6
Oak Street/ Truxtun Avenue	6.0	4.4	3.4	2.6	3.4	2.6
Oak Street/SR 178	4.8	3.5	3.5	2.6	3.5	2.6
Fresno Works–Fresno HMF Area						
SR 99 Off-Ramp/ E. American Avenue	3.6	2.2	3.5	2.1	3.5	2.1

Table 7.4-1

Maximum Modeled CO Concentrations at Intersections near the Fresno, Kings/Tulare Regional, and Bakersfield Station Areas and near the Fresno Works–Fresno and Kern Council of Governments–Wasco HMF Sites

Intersection	Existing Conditions[a]		2035 No Project/No Action[a]		2035 Project[a]	
	Max 1-Hour CO Concentration (ppm)	Max 8-Hour Concentration (ppm)[b]	Max 1-Hour Concentration (ppm)	Max 8-Hour Concentration (ppm)[b]	Max 1-Hour CO Concentration (ppm)	Max 8-Hour CO Concentration (ppm)[b]
SR 99 SB Off-Ramp/ Clayton Avenue	3.5	2.1	3.5	2.1	3.5	2.1
Kern Council of Governments–Wasco HMF Area						
SR 43 Wasco Avenue/ SR 46	2.8	2.1	2.8	2.1	2.8	2.1
Wasco Avenue – J Street/6th Street	2.8	2.1	2.8	2.1	2.8	2.1
CAAQS	**20**	**9**	**20**	**9**	**20**	**9**
NAAQS	**35**	**9**	**35**	**9**	**35**	**9**

Notes:

[a] Concentrations include a predicted 1-hour background concentration of 3.1 ppm and an 8-hour background concentration of 2.34 ppm, representing the second-highest measured CO concentrations in years 2007–2009 for Fresno station.

[b] A persistence factor of 0.7 was used to estimate the 8-hour CO concentrations based on the generalized persistence factor for urban locations in the CO Protocol (Caltrans 1997).

[c] Concentrations include a predicted 1-hour background concentration of 3.5 ppm and an 8-hour background concentration of 2.14 ppm, representing the second-highest measured CO concentrations in years 2007–2009 for Kings/Tulare Regional Station.

[d] Concentrations include a predicted 1-hour background concentration of 2.8 ppm and an 8-hour background concentration of 2.13 ppm, representing the second-highest measured CO concentrations in years 2007–2009 for Bakersfield Station.

Acronyms:

CAAQS	California Ambient Air Quality Standards
CO	carbon monoxide
EB	eastbound
HMF	heavy maintenance facility
HST	high-speed train
Max	maximum
NAAQS	National Ambient Air Quality Standards
ppm	part(s) per million
SB	southbound
SR	state route
WB	westbound

7.4.2 Parking Structures

A. Fresno Station Parking Structure

Maximum 1-hour and 8-hour CO concentrations were estimated near the Fresno, Kings/Tulare Regional, and Bakersfield HST station parking structures using CALINE4 (Caltrans 1997). Emissions were estimated using 2035 vehicle counts and emission factors.

There are two station locations that are being considered for the Fresno HST station: the Fresno Station–Mariposa Alternative and the Fresno Station–Kern Alternative. The Fresno Station–Mariposa Alternative parking area would consist of up to three parking structures each with five levels: the first parking structure would have a capacity of approximately 1,300 cars, the second parking structure would have a capacity of approximately 1,700 cars and the third parking structure would have a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 800 additional parking spaces. The Fresno Station–Kern Alternative parking area would also consist of up to three parking structures. Two of the three potential parking structures would each would have a capacity of approximately 1,500 cars. The third structure would have a capacity of approximately 1,100 cars. Surface parking lots would provide approximately 600 additional parking spaces.

To be conservative, it was assumed that all of the parking structures were at full capacity and all vehicles departed the parking structures within the same hour of the day. Table 7.4-2 presents the maximum CO concentrations associated with traffic leaving the Fresno station parking structures. The parking structures' CO hot-spot analysis shows that the maximum 1-hour and 8-hour CO concentrations would be much lower than the national and state standards. Therefore, traffic from the Fresno station associated with the HST alternatives would not contribute to a violation of the CO standards.

B. Kings/Tulare Regional Station Parking Structure

The potential Kings/Tulare Regional Station would support a surface parking lot with approximately 1,600 spaces. The methodology used for the Kings/Tulare Regional HST station parking structures was the same as the methodology used for the Fresno HST station parking structures. Table 7.4-2 presents the maximum CO concentrations associated with traffic leaving the Kings/Tulare Regional Station parking structure. The parking structure's CO hot-spot analysis shows that the maximum 1-hour and 8-hour CO concentrations would be much lower than the national and state standards. Therefore, traffic from the Kings/Tulare Regional Station associated with the HST alternatives would not contribute to a violation of the CO standards.

C. Bakersfield Station Parking Structure

Two station locations are being considered for the Bakersfield Station: the Bakersfield Station–North Alternative and the Bakersfield Station–South Alternative. The Bakersfield Station–North Alternative would consist of two parking structures: one with a planned capacity of approximately 1,500 cars and the other with a capacity of approximately 3,000 cars. The Bakersfield Station–South Alternative would support one six-level parking structure with a capacity of approximately 4,500 cars. The methodology used for the Bakersfield Station parking structures was the same as that used for the Fresno Station parking structures. Table 7.4-2 presents the maximum CO concentrations associated with traffic leaving the Bakersfield Station parking structures. The CO hot-spot analysis for the parking structures shows that the maximum 1-hour and 8-hour CO concentrations would be much lower than the national and state standards. Therefore, traffic from the Bakersfield Station associated with the HST alternatives would not contribute to a violation of the CO standards.

Table 7.4-2
Maximum Modeled 2035 CO Concentrations at Fresno, Kings/Tulare Regional, and Bakersfield Station Parking Facilities

Park-and-Ride Station	1-Hour Concentration (ppm)		8-Hour Concentration (ppm)	
	Maximum Modeled Increase[a]	Total Concentration[b]	Maximum Modeled Increase[a]	Total Concentration[b]
Fresno Station–Mariposa Alternative[c]	0.5	3.6	0.35	2.69
Fresno Station–Kern Alternative[c]	0.6	3.7	0.42	2.76
Kings/Tulare Regional Station[d]	0.2	3.7	0.14	2.28
Bakersfield Station–North Alternative[e]	0.5	3.3	0.35	2.48
Bakersfield Station–South Alternative[e]	0.6	3.4	0.42	2.55

Notes:
[a] 8-hour CO concentrations at the parking garages were compared to the federal and state 8-hour CO standard of 9 ppm. 1-hour CO concentrations at the parking garages were compared to the federal 1-hour CO standard of 35 ppm and to the state 1-hour CO standard of 20 ppm. There were no exceedances of any standards due to CO concentrations at parking garages.
[b] 8-hour CO concentrations determined by multiplying the 1-hour modeled concentrations by a persistence factor of 0.7 and adding the 8-hour background concentration.
[c] Background CO data taken from Fresno First Street monitoring station for all Fresno Station parking structures (Fresno Station–Mariposa Alternative and Fresno Station–Kern Alternative) were found to be 3.10 ppm for 1-hour CO concentration and 2.34 ppm for 8-hour CO concentration.
[d] Background CO data taken from Fresno Drummond monitoring station for the Kings/Tulare Regional Station parking structures were found to be 3.50 ppm for 1-hour CO concentration and 2.14 ppm for 8-hour CO concentration.
[e] Background CO data taken from Bakersfield Golden State Highway monitoring station for all the Bakersfield station parking structures (Bakersfield Station–North Alternative and Bakersfield Station–South Alternative) were found to be 2.80 ppm for 1-hour CO concentration and 2.13 ppm for 8-hour CO concentration.

Acronyms:
CO carbon monoxide
ppm part(s) per million

7.5 Particulate Matter Analysis

Based on the PM hot-spot analysis performed and as discussed below, the project would provide regional benefits, reducing the regional VMT by approximately 10% compared to the No Project Alternative and 2% compared to existing conditions, which would reduce PM_{10} and $PM_{2.5}$ emissions from regional vehicle travel proportionally. Because the area where the project is located is designated nonattainment for $PM_{2.5}$ and maintenance for PM_{10}, the project is subject to localized PM_{10} and $PM_{2.5}$ hot-spot analysis. In December 2010, EPA released its *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas* (EPA 2010f). 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 diesel vehicles.* The proposed project is not a new highway project, nor would it expand an existing highway beyond its current capacity. The HST vehicles would be electrically powered. While the project would affect traffic conditions on roadways near the stations, it should 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, with the exception of delivery truck trips to support station activities. Furthermore, the HST project would improve regional traffic conditions by reducing traffic congestion, increasing vehicle speeds, and reducing regional VMT within the project vicinity.

- 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. Generally, the HST project would not change the existing traffic mix at signalized intersections. Although the maintenance facilities would use diesel vehicles, no signalized intersections were identified with LOS D, E, or F for these locations (Authority and FRA 2011b). In some cases, the LOS of intersections near the HST stations would change from LOS E under the No Project Alternative to LOS F under the HST alternatives. However, the traffic volume increases at the affected intersections would be primarily passenger cars and transit buses used for transporting people to or from the stations. Passenger cars would be gasoline-powered. By 2016, transit buses in Fresno would be natural-gas fueled (Shenson 2010, personal communication). Buses in Bakersfield operated by GET (Golden Empire Transit) currently operate compressed natural gas buses (GET 2010) and would likely continue to operate these buses in the future. Therefore, the HST alternatives would not measurably increase the number of diesel vehicles at these affected intersections.

- New or expanded bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location. The project would not have new or expanded bus or rail terminals or transfer points that significantly increase the number of diesel vehicles congregating at a single location. Although the project would include passenger rail terminals, there would not be 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. Most vehicle trips entering and leaving the station would be passenger vehicles, which are not typically diesel-powered. Improved bus service is not part of the HST project. If the local bus service were to be improved to better serve the HST stations, it would be subject to the local transit authority's environmental review. The maintenance facilities may have diesel vehicles such as in-yard diesel locomotives to pull in or pull out the EMUs. However, the number of diesel locomotives and other diesel vehicles used at the maintenance facilities would be limited.

- 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 areas where the transit stations and maintenance facilities are located are not identified as sites of violation or of possible violation in the EPA-approved 2003 SIP, the EPA-approved PM_{10} Maintenance Plan and Request for Redesignation, or the adopted 2008 $PM_{2.5}$ Plan for San Joaquin Valley (SJVAPCD 2007, 2008b).

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

7.6 Odors

7.6.1 General Operations

No potentially odorous emissions would be associated with the train operation because the trains would be powered from the regional electrical grid. There would also be some “area source” emissions associated with station 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 would have the potential to be odorous sources to sensitive receptors in areas where the stations are located.

Nearby sensitive land uses would be exposed daily to some odors when the stations are operational. However, the exposure would be less severe than the exposure to odors from other industrial activities that would occur in these areas under the No Project Alternative.

7.6.2 HMF Operations

HMF operations would be a source of potentially odorous emissions from paints, and fuel combustion. Except at the Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites, the other three HMF sites would likely be far from urbanized areas with residential and business land uses. The HMF would be permitted through the SJVAPCD, with controls on operations generating odorous emissions to meet public-nuisance requirements. Therefore, it is unlikely that it would cause objectionable odors affecting a substantial number of people.

7.7 Mobile Source Air Toxics Analysis

In accordance with FHWA’s *Interim Guidance Update on Air Toxic Analysis in NEPA Documents,* released September 30, 2009 (FHWA 2009), the qualitative assessment presented below is derived in part from a study conducted by FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives* (FHWA 2010). It is provided as a basis for identifying and comparing the potential differences in MSAT emissions, if any, among the alternatives.

There would be no difference in MSAT emissions among the HST alternatives because the regional change in vehicle emissions would be the same. Therefore, this analysis compares the HST alternatives to the existing conditions and the No Project Alternative.

7.7.1 Regional MSAT Impacts

Under the HST alternatives, the proposed HST 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 HSTs.

The HST alternatives would decrease regional VMT and MSAT emissions compared to the existing conditions and No Project Alternative. The availability of the HSTs would reduce the number of individual vehicle trips on a regional basis. Because the HST alternatives would not substantially change the regional traffic mix, the amount of MSATs emitted from highways and other roadways within the study area would be proportional to the VMT. Because the regional VMT estimated for the HST alternatives would be less than the existing conditions and No Action Alternative in 2035, MSAT emissions from regional vehicle traffic would be less for the HST alternatives compared to the existing conditions in 2009 and the No Project Alternative in 2035.

The HST alternatives would also result in reduced traffic congestion and increased vehicle speed as more people use the HSTs instead of driving when compared to the No Project Alternative. According to EPA's MOBILE6.2 model, emissions of all priority MSATs, except for DPM, decrease as speed increases (EPA 2006c). Therefore, the HST alternatives would result in further decreased MSAT emissions due to the decline in traffic congestion.

Regardless of the HST alternatives, emissions will likely be lower than present levels in 2035 as a result of EPA's national control programs, which are projected to reduce annual MSAT emissions by 72% between 1999 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 EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

7.7.2 Local MSAT Impacts

The potential MSAT emission sources directly related to project operation would be from vehicles used at maintenance facilities and passenger vehicles travelling to and from the train stations. Localized increases in MSAT emissions could occur near the stations, due to passenger commutes to and from the stations, and at the new HMF, where diesel vehicles would be used.

The localized increases in MSAT emissions would likely be most pronounced at the HMF, where in-yard diesel-fueled switch locomotives would be used to pull in or pull out the EMU for maintenance. The MSAT impact due to the localized emission increases would be limited by locating the HMF in areas farther away from sensitive receptors. Only the Fresno Works–Fresno and Kern Council of Governments–Wasco HMF sites are near dense populations with sensitive receptors. For the Fresno Works–Fresno HMF site, the sensitive receptors are located east, southeast, and west of the HMF, so locating the in-yard locomotive and diesel mobile equipment in the northern portion of the footprint would limit the effect of MSATs on sensitive receptors near this HMF. For the Kern Council of Governments–Wasco HMF site, the sensitive receptors are located primarily to the east of the footprint, so locating the in-yard locomotive and diesel mobile equipment in the western portion of the footprint would limit the effect of MSATs on sensitive receptors near this HMF. Details of the potential toxic emission impacts from the sources onsite at the HMF are included in Section 7.2.2.

Localized emissions related to the HMF would be substantially reduced due to implementation of EPA's vehicle and fuel regulations. The HST alternatives would decrease regional MSAT emissions compared to the No Project Alternative.

7.7.3 Uncertainties of MSAT Analysis

Because of the lack of a national consensus on an acceptable level of risk, uncertainties about other air quality criteria assumed to protect the public health and welfare, and uncertainties about the reliability of available technical tools, the project-specific health impacts of the emission changes associated with the alternatives evaluated in this assessment cannot be predicted with confidence.

The outcome of such an assessment would be influenced more by the uncertainty introduced into the process by the assumptions made than insight into the actual health impacts from MSAT exposure directly attributable to the proposed action. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22[b]) regarding incomplete or unavailable information.

In FHWA's view, information is incomplete or unavailable to predict the project-specific health impacts due to changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than by insight into the actual health impacts directly attributable to MSAT exposure associated with the proposed action.

EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. It is the lead authority for administering the CAA and its amendments and has specific statutory obligations with respect to HAPs and MSATs. EPA continues to assess human health effects, exposures, and risks posed by air pollutants. EPA maintains the Integrated Risk Information System (i.e., IRIS), which is "a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects" (EPA 2011e). Each report contains assessments of noncancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures, with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in research on and analyses of the human health effects of MSATs, including the Health Effects Institute (HEI). Two HEI studies are summarized in Appendix D of FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents* (FHWA 2009). Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious are the adverse human health effects of MSAT compounds at current environmental concentrations (http://pubs.healtheffects.org/view.php?id=282 [HEI 2007]) or in the future as vehicle emissions substantially decrease (http://pubs.healtheffects.org/view.php?id=306 [HEI 2009]).

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and final determination of health impacts—each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70-year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame inasmuch as such information is unavailable. The results produced by EPA's MOBILE6.2 model, California EPA's EMFAC model, and EPA's Draft MOVES2009 model in forecasting MSAT emissions are inconsistent. For example, indications from the development of the MOVES model are that MOBILE6.2 significantly underestimates DPM emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of EPA's guideline CAL3QHC model was conducted in a National Cooperative Highway Research Program (NCHRP) study (NCHRP 2002), which documents poor model performance at 10 sites across the country: 3 where intensive monitoring was conducted plus 7 with less-intensive monitoring. The study indicates a bias of the

CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with NAAQS for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given the fact that some information needed for estimating 70-year lifetime exposure is unavailable. It is particularly difficult to reliably forecast MSAT exposure near roadways and to determine the portion of time that people are actually exposed at a specific location.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT compounds, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (HEI 2007). As a result, no national consensus exists on the air dose-response values assumed to protect the public health and welfare for MSAT compounds, particularly for DPM. EPA (http://www.epa.gov/risk/basicinformation.htm#g) and HEI (http://pubs.healtheffects.org/getfile.php?u=395) have not established a basis for quantitative risk assessment of DPM in ambient settings.

There is also a lack of a national consensus on an acceptable level of risk. The current context is the process used by EPA, as provided by the CAA, to determine whether more-stringent controls are required to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect from industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires the EPA to determine a "safe" or "acceptable" level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million from source emissions. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could indicate maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA's approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest highway projects would result in levels of risk greater than are deemed to be safe or acceptable.

Because of the limitations in the methodologies for forecasting health impacts described above, any predicted difference in health impacts among alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision-makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities and improving access for emergency response that are better suited for quantitative analysis.

7.8 Asbestos Impacts

The counties of Fresno, Kings, Tulare, and Kern, through which the Fresno to Bakersfield Section, are designated by CDMG would pass, as areas likely to contain NOA. However, the specific areas of the counties through which the alignments would be constructed are designated by the CDMG as areas not likely to contain NOA (CDMG 2000). NOA surveys would be conducted before project construction and NOA would not likely be disturbed during project operation.

7.9 Greenhouse Gas Impacts

The SJVAPCD released a guidance document in December 2009 for addressing GHG impacts within the context of CEQA. For a project to have a less-than-significant impact on an individual and cumulative basis, it must comply with an approved Climate Change Action Plan, demonstrate that it would not impede the State from meeting the statewide 2020 GHG emissions target, adopt the SJVAPCD's Best Performance Standards for stationary sources, or reduce or mitigate GHG emissions by 29% (SJVAPCD 2009d).

The HST project, which is included in the AB 32 scoping plan as Measure #T-9, would help the State meet the 29% reduction in GHG emissions by 2020 (CARB 2008b). Overall, the project operation would have a net beneficial impact on GHG.

Table 7.9-1 summarizes the statewide GHG emission changes (expressed in terms of CO_2) resulting from the project. As shown in Table 7.9-1, the project is predicted to have a beneficial effect on statewide GHG emissions. The analysis estimated the emission changes from reduced on-road VMT, reduced intrastate plane travel, and increased electrical demand.

As compared with existing conditions, the HST alternatives would also reduce GHG emissions due to the reduction in VMT of the HST alternatives compared with existing conditions (see Appendix E).

Table 7.9-1
2035 Estimated Statewide GHG Emission Changes due to the HST

Project Element	Change in CO_2 Emissions due to HST (tons/day)
Roadways	-15,799.12
Planes	-1,453.38
Energy (Power Plants)	2,756.50
Total	-14,476.00

Note: Totals may not add up exactly due to rounding.
Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HST high-speed train

7.9.1 On-Road Vehicles

The HST alternatives would reduce daily roadway VMT by over 30 million miles as a result of travelers using the HST rather than driving (see Table 7.9-2). This equates to approximately 15,800 tons of CO_2 per day, or approximately 33,000 barrels of oil consumed (EPA 2010g). The on-road vehicle emission analysis is based on projected VMT changes and associated average daily speed estimates, calculated for each affected county as part of the project's transportation analysis. GHG emission factors were obtained from EMFAC2007, using parameters set within the program for each individual county to reflect travel within each specific county and statewide parameters to reflect travel through each county in the state. As shown in Table 7.9-2, the proposed project is predicted to reduce GHG emissions when compared to the No Project Alternative. This is demonstrated on both a county and statewide level. In the existing, and existing plus project scenario, it is estimated that the project will reduce daily VMT in every county and daily VMT in every county and by over 17 million miles a day statewide. As such, it is predicted to reduce roadway GHG emissions by approximately

2%, when compared with existing conditions, due to travelers choosing to use the HST rather than driving (see Appendix E).

On a regional basis, under the HST alternatives, Fresno and Kern counties would have some of the larger VMT reductions in the state. Therefore, as shown in Table 7.9-2, on-road vehicle GHG emissions, on an annual basis, would be much lower than the No Project Alternative emissions for the design year (2035) and would greatly contribute to the overall reduction throughout the state. The benefits presented here depend on ridership. Therefore, lower ridership than that assumed in the design and planning values would result in fewer benefits.

Table 7.9-2

2035 On-Road Vehicles GHG Emission Changes Due to the HST

County	No Build VMT Total Traffic	Build VMT Total Traffic	Change in CO_2 Emissions with HST (tons/day)
Alameda	44,195,495	43,551,929	-370.28
Alpine	1,403,945	1,401,217	-1.31
Amador	4,661,019	4,646,828	-6.80
Calaveras	1,414,871	1,383,696	-15.23
Contra Costa	27,867,886	27,667,001	-115.61
El Dorado	9,405,356	9,379,731	-13.06
Fresno	27,367,949	24,364,285	-1432.88
Imperial	12,187,692	12,170,172	-10.86
Inyo	5,178,956	5,158,901	-9.62
Kern	39,240,101	35,149,202	-1970.62
Kings	3,136,720	2,663,113	-228.38
Los Angeles	265,560,319	259,698,490	-3055.74
Madera	8,532,552	8,256,392	-132.42
Marin	7,961,630	7,866,736	-55.85
Mariposa	873,461	846,009	-13.22
Merced	13,534,370	12,018,453	-721.57
Mono	1,378,612	1,365,352	-6.79
Monterey	13,864,584	13,123,028	-352.14
Napa	4,838,702	4,792,647	-28.45
Nevada	7,648,230	7,575,684	-34.61
Orange	94,555,953	92,699,029	-948.82
Placer	12,357,969	12,212,333	-73.31
Riverside	101,286,914	99,801,479	-813.61
Sacramento	33,432,730	32,754,592	-329.90
San Benito	3,361,404	2,968,595	-186.73
San Bernardino	96,726,005	95,709,159	-556.03
San Diego	158,273,980	156,278,290	-1063.34
San Francisco	10,557,241	10,413,805	-87.46
San Joaquin	22,717,713	21,198,249	-724.02
San Luis Obispo	8,411,244	7,940,789	-225.58
San Mateo	24,218,646	23,804,290	-201.26
Santa Barbara	8,094,082	7,592,558	-238.16

Table 7.9-2
2035 On-Road Vehicles GHG Emission Changes Due to the HST

County	No Build VMT Total Traffic	Build VMT Total Traffic	Change in CO_2 Emissions with HST (tons/day)
Santa Clara	50,863,603	49,956,147	-501.46
Santa Cruz	2,600,612	2,564,302	-18.01
Solano	16,101,043	15,928,916	-95.10
Sonoma	12,738,505	12,651,479	-51.22
Stanislaus	11,477,980	10,480,727	-480.54
Sutter	3,878,420	3,828,474	-24.05
Tulare	10,112,011	9,648,380	-220.64
Tuolumne	1,766,709	1,734,529	-17.15
Ventura	26,635,805	26,352,804	-152.23
Yolo	7,858,254	7,661,590	-93.38
Yuba	2,207,207	2,185,401	-10.65
Remaining areas of CA (North of Bay Area/ Sacramento)	34,117,813	33,886,195	-111.03
Statewide Total	**1,254,604,293**	**1,223,330,976**	**-15,799.12**

Acronyms:
CA California
CO_2 carbon dioxide
GHG greenhouse gas
HST high-speed train
VMT vehicle miles traveled

7.9.2 Airport Emissions

As shown in Table 7.9-3, the HST is predicted to reduce the number of plane flights due to travelers using the HST rather than to flying to their destination. Therefore, the proposed project would either have no measurable effect or may reduce regional emissions due to the HST compared to the No Project Alternative. The EDMS was used to estimate an airplane’s GHG emission factors. The EDMS estimated the emissions generated from the projected number of LTO cycles. Along with the emissions from the planes themselves, emissions generated from associated ground maintenance requirements are also included. Average plane GHG emissions are calculated based on the profile of aircraft currently servicing the San Francisco to Los Angeles corridor. The number of air trips removed because of the HST was estimated in the travel demand modeling analysis conducted for the project.

As shown in Table 7.9-3, the proposed project is predicted either to have no measurable effect or to slightly reduce regional emissions, when compared to the No Project Alternative. Because the project is predicted to decrease plane flights in the existing plus project scenario when compared with the existing scenario, the trend illustrated in Table 7.9-3 is predicted to be demonstrated by the existing plus project scenario (for details, see Appendix E).

Table 7.9-3
2035 Aircraft GHG Emission Changes (in terms of CO_2) due to the HST

Origin	No. of Flights Removed	Change in CO_2 Emissions due to HST (tons/day)
Central Coast	-1	-3.76
Far North	-16	-60.09
Fresno/Madera	0	0.00
Kern	-16	-60.09
LA Basin-North	-43	-161.49
LA Basin-South	-88	-330.48
Merced	-1	-3.76
Monterey Bay	-16	-60.09
Sacramento Region	-16	-60.09
San Diego Region	-47	-176.51
San Joaquin	-7	-26.29
SF Bay Area	-130	-488.22
South SJ Valley	0	0.00
Stanislaus	-5	-18.78
W. Sierra Nevada	-1	-3.76
Statewide Total	**-387**	**-1,453.38**

Acronyms:
CO_2 carbon dioxide
HST high-speed train
LA Los Angeles
No. number
SF San Francisco
SJ San Joaquin

7.9.3 Power Plant Emissions

The HST would increase electrical requirements as compared to the No Project Alternative. The electrical demands from propulsion of the trains, the operation of the trains at terminal stations and in storage depots and maintenance facilities were conservatively estimated to be 8.32 GWh per day in design year (2035). As shown in Table 7.9-4, the project would increase GHG emissions. The increase in electrical requirements for the existing conditions plus project scenario are presented in Appendix E.

To derive the portion of electricity usage required by the Fresno to Bakersfield Section of the HST, the alignment distance for the BNSF alternative was divided by the total HST distance of 830 miles. The result was multiplied by the calculated CO_2 emissions for the entire HST. Table 7.9-4 summarizes the regional indirect CO_2 emissions for the Fresno to Bakersfield Section.

The state's electrical grid would power the HST system and, therefore no single generation source for the electrical power requirements can be identified. The estimated emission changes for power plants are considered to be conservative because they are based on the current electrical profile of the state. As previously discussed, the state requires an increasing fraction (33%) 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% renewable energy to power the HST. As such, the GHG emissions generated for powering the HST system are expected to be lower in the future compared to emission estimates used in this analysis.

Table 7.9-4
2035 Power Plant Emission Changes due to the HST

Electricity required (GWh per day)	Change in CO_2 Emissions due to HST (tons/day)
8.32	2,756.50

Acronyms:
CO_2 carbon dioxide
GWh gigawatt-hour(s)
HST high-speed train

7.9.4 HST Stations and HMF Emissions

Operation of the HST would result in GHG emissions from the combustion of fossil fuels through the use of onsite sources and from offsite mobile sources used for employee commutes and passenger trips and from vendor trips to maintenance facilities and the HST stations. No direct GHG emissions would result from the operation of the trains on the alignment because the trains would be electrically powered. Operation of the trains would only result in indirect GHG emissions from energy consumption, as discussed in the power plant analysis. Table 7.9-5 shows a summary of the GHG emissions from HST stations and HMF operation.

Table 7.9-5
2035 HST Stations and Maintenance Facilities GHG Emissions

Emission Source	CO_2 Emissions (metric tons/year)
Fresno Station	22,253
Kings/Tulare Regional Station	8,449
Bakersfield Station	23,234
Train dust wake	—
MOWF	1,994
HMF	23,276
Total	**79,207**

Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HMF heavy maintenance facility
HST high-speed train
MOWF maintenance-of-way facility

7.9.5 Regional GHG Emission from Project Operation

A summary of the regional GHG emissions, which include the emissions from the vehicle, aircraft, power plants, and HST and HMF station operation within the project area, is shown in Table 7.9-6. As shown in the table, the proposed project would reduce regional GHG emissions compared with the

No Project Alternative. Comparisons of the HST GHG emission change against existing conditions are included in Appendix E.

Table 7.9-6
2035 HST Alternative Regional GHG Emissions

Emission Sources	2035 CO_2 Emissions (metric tons/year)
Regional VMT	-1,275,668
Regional Airports (Fresno-Yosemite International, Hanford Municipal Airport, Visalia Municipal Airport, and Meadow Fields Airport)	-8,705
Indirect Regional Power	125,365
HST, MOWF, and HMF Station Operation	79,207
Net Regional Difference	**-1,079,801**

Note: Emission factors for CO_2 do not account for improvements in technology.

Acronyms:
CO_2 carbon dioxide
GHG greenhouse gas
HMF heavy maintenance facility
HST high-speed train
MOWF maintenance-of-way facility
VMT vehicle miles traveled

7.10 Construction Impacts

7.10.1 Summary

A. Construction Emissions

Construction activities associated with the HST Alternatives would result in criteria pollutant and GHG emissions. Construction emissions for the BNSF Alternative are quantified and analyzed in this section. The length of the alignment for alternatives that deviate from the BNSF Alternative is comparable to the length of the equivalent section of the BNSF Alternative. Therefore, construction emissions from construction of the BNSF Alternative are expected to be similar to the construction emissions of the other alternatives. The other project components (HST stations, substations, and HMF) would have the same construction emissions for all HST alternatives.

Project construction activities expected to occur during the same calendar year were summed per the construction schedule presented in Appendix A. The project emissions were compared to the GC *de minimis* emission thresholds on a calendar-year basis; consequently, thresholds can be exceeded for any calendar year in which emissions occur.

There are no future natural growth or other non-HST-related improvements included in the project construction impacts. Therefore, project construction emissions presented in this report were used for impacts compared against both existing conditions and the No Project Alternative.

The summary of the HST construction emissions for the BNSF Alternative, over the entire construction period is shown in Table 7.10-1. The main source of emissions would be rail construction, which contributes approximately 60% of the total construction emissions (see Appendix A).

Demolition of existing structures along the HST alignment and HST station sites would occur before construction. The emissions associated with demolition activities are included in the construction emissions summarized over the construction duration in Table 6.8-1 and for the BNSF Alternative in Tables 7.10-2.

Table 7.10-1
HST Construction Emissions–Total (tons per year)

Alternative	Emissions[a]					
	VOCs	CO	NO_x	SO_2	PM_{10}[b]	$PM_{2.5}$[b]
BNSF Alternative	2,526	11,475	22,218	10	1,705	1,226

Notes:
[a] These emissions present the unmitigated construction emissions within the SJVAB only.
[b] The PM_{10} and $PM_{2.5}$ emissions consist of the exhaust and fugitive dust emissions.
Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide
VOC volatile organic compound

B. Construction Impacts Summary

Construction Impacts within the SJVAB

Details of emissions from the BNSF Alternative from all construction phases of the HST, the regional roadway realignment, and the HMF are presented in the following section. The lengths of the alignments for the alternatives that deviate from the BNSF Alternative are comparable to the lengths of the equivalent sections of the BNSF Alternative. Therefore, construction emissions from the construction of the BNSF Alternative are expected to be similar to the construction emissions of the other alternatives. The Corcoran Elevated Alternative, the Corcoran Bypass Alternative, the Allensworth Bypass Alternative, and the Bakersfield South Alternative are the same lengths as the corresponding section of the BNSF Alternative. The Wasco-Shafter Bypass Alternative is approximately 5% shorter than the corresponding section of the BNSF Alternative. All alternatives would have the same construction emissions for all project components.

During construction, programmatic emission reduction measures would be applied, including watering exposed surfaces twice daily, watering unpaved roads three times daily, reducing vehicle speeds on unpaved roads to 15 mph, and ensuring that haul trucks are covered. With these control measures, and using construction equipment that meets Tier 4 emissions standards, CO, VOCs, and NO_X impacts would be reduced but would remain substantial under NEPA for most of the construction phase. PM10 impacts would be reduced to moderate under NEPA, lowering emissions below the GC threshold with the application of mitigation measures and control measures for all years except 2013, 2014, and 2015 (see Chapter 8). SO_2 impacts would remain negligible under NEPA, and $PM_{2.5}$ impacts would be mitigated to negligible levels under NEPA.

VOC, NO_x, and PM_{10} and $PM_{2.5}$ impacts would be reduced but would remain significant for most of the construction phase under CEQA. There are no CEQA thresholds for CO or SO_2. However, the background concentrations of CO in the SJVAB are low (approximately 12% of the 1-hour standard and 25% of the 8-hour standard); therefore, it is not expected that CO emissions from the proposed project would cause or contribute to an air quality violation or conflict with or obstruct implementation of the CO SIP. Also, with implementation of mitigation measures, SO_2 impacts would be reduced to a less-than-significant level. Local impacts from concrete batch plants would be reduced to negligible and less-than-significant levels by locating these plants at least 1,000 feet from sensitive receptors.

Details of emissions from the BNSF Alternative are presented in the following table (Table 7.10-2). Emissions presented for each alternative include emissions from all construction phases of the HST, the regional roadway realignment, and the HMF.

Table 7.10-2
Programmatic Construction Emissions: BNSF Alternative (tons/year)

Construction Year[a]	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
GC *de minimis* Threshold[b]	**10**	**100**	**10**	**100**	**100**	**100**
CEQA Threshold of Significance[c]	**10**	**N/A**	**10**	**N/A**	**15**	**15**
2013 Emissions	245	884	2,317	0.39	401	184
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	Yes
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2014 Emissions	651	3,150	5,918	2.6	454	314
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	Yes
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2015 Emissions	517	2,608	4,656	2.5	337	251
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	Yes
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2016 Emissions	429	2,260	3,874	2.4	216	201
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	Yes
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2017 Emissions	412	1,816	3,383	1.8	204	188
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	Yes
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes

Table 7.10-2
Programmatic Construction Emissions: BNSF Alternative (tons/year)

Construction Year[a]	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
2018 Emissions	102	281	785	0.31	35	33
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2019 Emissions	101	226	645	0.01	29	28
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2021 Emissions	70	250	640	0.24	29	27
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes

Notes:
[a] Emissions from construction of the HMF are included in the annual totals listed above. Emissions presented in the tables are for construction activities within the SJVAB only.
[b] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.

Acronyms:
CEQA California Environmental Quality Act
CO carbon monoxide
HMF heavy maintenance facility
NEPA National Environmental Policy Act
NO_x nitrogen oxide
SJVAPCD San Joaquin Valley Air Pollution Control District
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter

SO_2 sulfur dioxide
VOC volatile organic compound

Construction Impacts Outside the SJVAB from Material Hauling

Construction emissions included in the regional impacts analysis considered emissions within the SJVAB. Rail would be constructed using 100% ballast and sub-ballast. Material other than the ballast and the sub-ballast would be available within the SJVAB; however, the ballast and sub-ballast material could potentially be transported from areas outside the SJVAB. A preliminary emission evaluation was conducted for transporting ballast materials from outside the SJVAB to the border of the air basin.

The final design could consider approximately 30% ballast and sub-ballast and 70% concrete slabs. This design would result in a significant reduction in air quality emissions associated with hauling the ballast and sub-ballast. The impact conclusions presented for the 100% ballast and sub-ballast case are the most conservative, and impacts are expected to be reduced if the 30% ballast and sub-ballast case is designed.

Tables 7.10-3 and Table 7.10-4 present the programmatic emissions for material hauling outside the air basin for the worst-case scenario (Scenario 1) compared with the GC *de minimis* thresholds and the CEQA thresholds, respectively. Detailed analysis and emission calculations for material hauling outside the SJVAB for all scenarios are provided in Appendix G.

Table 7.10-3
Worst-Case Emissions for Scenario 1 Compared to GC *de minimis* Thresholds

Nonattainment/Maintenance Area (Air Basin)	Emissions (tons per year) Fresno to Bakersfield					
	CO	NOx	$PM_{2.5}$	PM_{10}	SO_2	VOC
Coachella Valley, Riverside County (Mojave Desert)	9.13	46.3*	1.20	1.23	0.03	2.09
GC *de minimis* threshold[a]	100	25	N/A	70	N/A	25
Western San Bernardino/Los Angeles County (Mojave Desert)	3.41	17.3	0.45	0.46	0.01	0.78
GC *de minimis* threshold[a]	100	100	N/A	100	N/A	50
Los Angeles County (South Coast)	6.43	32.6*	0.84	0.87	0.02	1.47
GC *de minimis* threshold[a]	100	10	100	70	100	10
East Kern County (Mojave Desert)	3.54	17.9	0.46	0.48	0.01	0.81
GC *de minimis* threshold[a]	100	100	N/A	70	N/A	50

Notes:
* Exceeds the GC *de minimis* thresholds for that air basin.
[a] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.

Table 7.10-4
Worst-Case Emissions for Scenario 1 Compared to CEQA Annual/Daily Thresholds

Air Quality Management District / Air Pollution Control District (AQMD / APCD)	Emissions (tons per year)						Emissions (pounds per day)					
	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
San Bernardino/Los Angeles County (Mojave Desert AQMD)	3.41	17.3	0.45	0.46	0.01	0.78	65.5	332*	8.60	8.86	0.24	15.01
CEQA Annual Threshold Limits[a]	100	25	15	15	25	25	548	137	82	82	137	137
Los Angeles County/Riverside County (South Coast AQMD)	15.6	78.9	2.04	2.10	0.06	3.56	299	1517*	39.3	40.5	1.08	68.6
CEQA Annual Threshold Limits[a]	N/A	N/A	N/A	N/A	N/A	N/A	550	100	55	150	150	75
East Kern County (Kern County APCD)	3.54	17.9	0.46	0.48	0.01	0.81	68.0	345*	8.92	9.20	0.25	15.58
CEQA Annual Threshold Limits[a]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	137	N/A	N/A	N/A	137

Notes:
* Exceed the CEQA annual/daily thresholds for that AQMD/APCD
[a] N/A indicates that there is no CEQA annual threshold for this pollutant in the AQMD/APCD

The emission results demonstrated that the emissions from all the scenarios would be above the GC thresholds for NO_x in the South Coast Air Basin, and four of five scenarios exceed the GC threshold in the Mojave Desert Air Basin. The emissions for NO_x in the other air basins would be below the GC thresholds for all scenarios. The emissions for all other pollutants would be below the GC thresholds in all air basins.

As discussed in Chapter 8, with mitigation, NO_x emissions from Scenarios 4 and 5 would be reduced to less than GC threshold in all air basins. NO_x emissions from Scenarios 1, 2, and 3 would still exceed the GC thresholds.

NO_x impacts due to material hauling in the Bay Area Air Quality Management District (AQMD) and the East Kern Air Pollution Control District (APCD) would still exceed the CEQA significance thresholds. NO_x emissions would be offset to less than the significance thresholds in the South Coast AQMD and the Mojave Desert AQMD through the mobile source offset program. In addition, the NO_x emissions for all scenarios where material is hauled by truck only would be reduced to a less-than-significant level for all affected AQMDs/APCDs.

7.10.2 Other Localized Construction Impacts

A. Concrete Batch Plant

The emissions generated from operation of concrete batch plants are included in the total regional construction emissions. The concrete batch plants are estimated to generate 36 tpy of PM emissions for the BNSF Alternative. The concrete generated would include concrete for the elevated structures (elevated rail) and retaining wall (retained fill rail).

The concrete batch plants would be located along the alignment. To mitigate localized impacts from the plants, Mitigation Measure AQ-MM#8 would be implemented. This would require concrete batch plants to be at least 1,000 feet from sensitive receptors such as schools and hospitals.

B. Maintenance-of-Way Facility and heavy maintenance facility

Activities associated with construction of the MOWF include mass site grading, asphalt paving, building construction, and architectural coating as well as construction of the MOWF guideway. Construction of the MOWF is expected to last 12 months, beginning in January 2018.

Activities associated with construction of the HMF include mass site grading, asphalt paving, building construction, and architectural coating as well as construction of the HMF guideway. The construction activities are divided into three unique phases: Phase 1 consists of mass site grading; Phase 2 consists of construction of the overnight layover/servicing facility and related track; Phase 3 consists of construction of the HMF and related track. Since there will be no overnight/layover servicing facility along the Fresno to Bakersfield Section, the construction emissions during Phase 2 are not quantified. Therefore, only the emissions estimated for each construction activity for Phase 1 and 3 are included in the regional construction emissions for each alternative. Phase 1 would occur simultaneously with other HST construction activities, but Phase 3 is the only construction activity occurring in 2021. As a result, the 2021 emissions are solely due to HMF construction.

Air emissions associated with construction of the HMF and the potentially co-located MOWF would be small relative to the quantity of emissions from construction of the alignment/guideway. However, unlike construction of the guideway/alignment, which would be spread out over about 115 miles, emissions from HMF/MOWF construction would be concentrated in one area. TACs, mostly DPM exhaust from construction equipment, and criteria pollutants would be emitted during construction of the HMF and potentially during construction of the co-located MOWF. DPM emissions impacts tend to be localized; therefore, sensitive receptors were evaluated for potential exposure to DPM.

The majority of the construction emissions would be DPM from diesel construction equipment used for mass site grading, building construction, and the HMF guideway construction. The main health risk concerns of DPM are cancer and chronic risks. Cancer risk from exposure to carcinogens is typically evaluated based on a long-term (70-year) continuous exposure, and chronic risks are also typically evaluated for long-term exposure. The period of construction for the HMF would be approximately 18 months, spread between August 2017 and July 2021. The construction period for the potentially co-located MOWF would be approximately 12 months, spread between January 2018 and December 2018. This short period of exposure is not expected to increase the cancer risk to sensitive receptors.

7.10.3 Asbestos

The demolition of asbestos-containing materials is subject to the limitations of the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations and would require an asbestos inspection. The SJVAPCD's Compliance Division would be consulted before demolition begins. Strict compliance with existing asbestos regulations would prevent asbestos from being a significant adverse impact (SJVAPCD 2002).

The counties of Fresno, Kings, Tulare, and Kern, through which the Fresno to Bakersfield Section would pass, are designated by CDMG as areas likely to contain NOA. However, the specific areas of the counties through which the alignments would be built are designated as areas not likely to contain NOA (CDMG 2000). Therefore, NOA would not likely be disturbed during construction. Nevertheless, NOA surveys would be conducted before any excavation starts.

7.10.4 Greenhouse Gas Construction Impacts

A. Construction Impacts within the SJVAB

GHG emissions generated from construction of the project would be short-term. However, because the time that CO_2 remains in the atmosphere cannot be definitively quantified due to 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 1997). Therefore, the duration that CO_2 emissions from a short-term project would remain in the atmosphere is unknown.

As shown in Table 7.10-5, because GHG emissions from the construction phase of the BNSF Alternative would be greater than 25,000 metric tons of CO_2e, these GHG emissions were quantified (CEQ 2010). The total GHG construction emissions of the HST project would be less than 0.8% of the annual statewide GHG emissions.[5]

Table 7.10-5 also shows the amortized GHG emissions during project construction. The half-life of CO_2 is not defined, and other GHG pollutants such as N_2O can remain in the atmosphere for 120 years (IPCC 1997). To conservatively estimate the amortized GHG emissions, the HST project life is conservatively assumed to be only 25 years (although the actual project life would be much longer)

[5] A GHG emission inventory for the SJVAPCD was not available at the time of the release of this document, so the comparison was made to the most recent CARB emissions inventory (2008), which estimated the annual CO_2e emissions in California are about 478 million metric tons (CARB 2009b).

(Barber 2010, personal communication). The amortized GHG construction emissions for the BNSF Alternative would be less than 125,000 metric tons CO_2e per year, as shown in Table 7.10-5.

Although the GHG emissions associated with construction and operation of the HST alternatives would be a net increase compared to the No Project Alternative and existing conditions, the GHG construction emissions would be less than 0.8% of the total statewide GHG emissions. In addition, based on the large reduction of GHG emissions from the operational phase, the GHG emissions from construction would be "paid back," meaning they would account for the increases in construction emissions in a little under 3 years of HST system operation for the BNSF Alternative .

Table 7.10-5
HST Alternative GHG Emissions

Total Construction Emissions[a]	BNSF Alternative (Metric Tons/Construction Period)
CO_2	2,972,661
CO_2e[a]	3,121,294
Amortized GHG Emissions	(Metric Tons/Year)
CO_2	118,906
CO_2e[b]	124,852
Payback of GHG Emissions	(Years)
Period	2.8

Source: EPA 2005b.
Notes:
[a] Emission represent GHG emissions associated with construction activities within the SJVAB. Emission factors for CO_2 do not account for improvements in technology.
[b] According to the EPA, emissions of CH_4 and N_2O from passenger vehicles are much lower than emissions of CO_2, contributing in the range of 5% to 6% of the CO_2e emissions. In addition, the URBEMIS2007 model does not estimate CH_4 and N_2O emissions. Therefore, to account for the CH_4 and N_2O emissions, the CO_2 emissions were conservatively increased by 5% to calculate the CO_2e emissions. It was assumed that this approach for passenger vehicles was applicable to emissions sources.
Acronyms:
CO_2 carbon dioxide
CO_2e carbon dioxide equivalent
GHG greenhouse gas
HST high-speed train

B. Material Hauling Outside the SJVAB

The GHG emissions associated with material hauling outside the SJVAB would be short term in nature. As shown in Table 7.10-6, the GHG emissions from the material hauling for the worst-case scenario (Scenario 1) would not be greater than 17,000 metric tons of CO_2e. The total GHG construction emissions for the HST project would be less than 0.1% of the annual statewide GHG emissions.[6] The detailed analysis and the emissions rates for the other scenarios are provided in Appendix G.

[6] A GHG emission inventory for the SJVAPCD was not available at the time of the release of this document, so the comparison was made to the most recent CARB emissions inventory (2008), which estimated the annual CO_2e emissions in California are about 478 million metric tons (CARB 2009b).

Table 7.10-6
GHG Emissions from Material Hauling outside SJVAB

Scenarios	CO_2 (metric tons)	CO_2e (metric tons)[a]
Scenario 1	7,834	8,226
Scenario 2	6,430	6,752
Scenario 3	5,708	5,994
Scenario 4	14,243	14,955
Scenario 5	16,119	16,925

Source: EPA 2005b.
Notes:
[a] According to the EPA, emissions of CH_4 and N_2O from passenger vehicles are much lower than emissions of CO_2, contributing in the range of 5% to 6% of the CO_2e emissions. In addition, the URBEMIS2007 model does not estimate CH_4 and N_2O emissions. Therefore, to account for the CH_4 and N_2O emissions, the CO_2 emissions were conservatively increased by 5% to calculate the CO_2e emissions. It was assumed that this approach for passenger vehicles was applicable to these other mobile emissions sources.
Acronyms:
CO_2 carbon dioxide
CO_2e carbon dioxide equivalent
GHG greenhouse gas

7.11 Cumulative Impacts

The study area for cumulative air quality and greenhouse gas emissions impacts is the SJVAB. The SJVAB is in federal nonattainment for ozone and $PM_{2.5}$, federal maintenance for PM_{10} and CO (urban portions of Fresno and Kern counties only), and state nonattainment for ozone, PM_{10}, and $PM_{2.5}$. As a result, the area is subject to stringent emissions requirements for ozone precursors (VOC/NO_x) and particulate matter. The study area for direct and indirect impacts related to the HST alternatives is described in Chapter 5.

Transportation projects under the No Project Alternative in fiscally constrained regional transportation plans and other local factors were modeled at the regional level and were shown to be consistent with transportation conformity requirements. The transportation conformity analysis takes into account cumulative impacts on the region.

7.11.1 Construction

The SJVAPCD has adopted a cumulative threshold of significance of 10 tons per year for ozone precursors (ROG and NO_x) and 15 tons per year for PM_{10} and $PM_{2.5}$ (see Table 3.2-1). Construction emissions of these pollutants associated with the HST alternatives would exceed these thresholds, even with mitigation. Although construction emissions would be temporary, they would contribute to air quality degradation and impede the region's ability to attain air quality standards. In addition, past, present, and reasonably foreseeable projects would have significant VOC, NO_X, PM_{10}, and $PM_{2.5}$ emissions. Because these projects would be constructed during the same time frame as the HST alternatives, there would be a substantial air quality effect under NEPA and a significant impact under CEQA.

7.11.2 Near- and Long-Term Operations

Long-term operational emissions associated with growth and development in Fresno, Tulare, and Kern counties are expected to exceed the SJVAPCD CEQA significance thresholds. Long-term operational emissions in Kings County are anticipated to be less than significant. On a regional scale, past, present, and foreseeable projects would contribute to congestion associated with long-term growth and worsen air quality. Although there would be significant cumulative impacts in the region, the HST alternatives would help the region attain air quality standards and plans by reducing the amount of regional traffic and providing an alternative mode of transportation. Operation of the project would not exceed the SJVAPCD cumulative thresholds of significance for ozone precursors. Because the operation of the HST alternatives would help the region attain air quality standards, the HST alternatives' contribution to the cumulative impact would be less than cumulatively considerable.

Regulatory agencies continue to pass more stringent GHG emission standards with the goal of reducing the amount of pollutant emissions in the atmosphere. While many of these regulations have not yet been implemented, they are anticipated to be in effect before the project planning horizon of 2035. Even with these regulatory reductions, the expected growth in the region would result in significant cumulative increases in GHG emissions. There is also a possibility that the HST alternatives' demand for electricity would result in indirect GHG emissions impacts from power generation facilities. However, the HST alternatives would decrease GHG emissions by reducing vehicle and aircraft trips, as described in Section 7.1. This reduction in GHG emissions would more than offset the increase in GHG emissions associated with project facilities. Therefore, the HST alternatives would result in a net decrease in GHG emissions and would have a cumulatively beneficial effect on global climate change.

Cumulative carbon monoxide impacts are accounted for in the CO hot-spot analysis, as presented in Section 7.4. The CALINE4 air dispersion modeling evaluation indicated that the HST alternatives would cause a less-than-significant impact for CO emissions. Therefore, project CO effects would be cumulatively negligible under NEPA, and the cumulative impacts would be less than significant under CEQA.

Operations at the HMF may emit HAPs on a local scale. No other past, present, or foreseeable future projects would contribute to HAP emissions. Therefore, there is no cumulative effects on HAP emissions.

As described in the 2005 Statewide Program EIR/EIS and the 2008 Bay Area to Central Valley Program EIR/EIS (Authority and FRA 2005, 2008), the HST system as a whole would have less-than-significant impacts on air quality. The HST system would reduce vehicle miles traveled and result in systemwide air quality benefits. Temporary short-term emissions increases associated with construction activities and localized air pollution increases associated with traffic near proposed HST stations would be substantially reduced by mitigation strategies and design practices.

The HST system would result in beneficial impacts related to GHGs and global climate change. Any additional carbon entering the atmosphere, whether by emissions from the system itself, indirect emissions from electrical power generation, or by removal of carbon sequestering plants (including agricultural crops) would be more than offset by the beneficial reduction of carbon resulting from the project due to its reduction in automobile vehicle miles traveled (mobile sources) and its reduction in the number of airplane trips.

7.11.3 Summary of NEPA/CEQA Impacts

The construction-related cumulative effects of the HST alternatives and other past, present, and reasonably foreseeable projects on air quality would be substantial under NEPA and result in a significant cumulative impact under CEQA because construction of the HST alternatives would increase regional pollutant emissions and would exceed the SJVAPCD CEQA thresholds.

Cumulative air quality effects during operations from the build-out of the projects envisioned by the general plans would be substantial under NEPA and the air quality impact would be significant under CEQA. However, operation of the HST alternatives would reduce regional VMT and consequently reduce ROG, NO_x, and PM_{10} emissions. Therefore, operation of the HST alternatives would reduce regional emissions and have a cumulative air quality benefit.

Increased GHG emissions from past, present, and foreseeable projects in the region would result in significant cumulative effects on global climate change under NEPA and a significant cumulative impact under CEQA. The HST alternatives would result in a net reduction in CO_2 emissions; therefore, the project would have a cumulative beneficial effect on global climate change.

7.11.4 Mitigation

With implementation of mitigation measures for air quality provided in Chapter 8, cumulative impacts on air quality during construction would remain substantial under NEPA and significant and unavoidable under CEQA.

8.0 Mitigation Analysis

Construction of the HST project would increase regional emissions and could cause or exacerbate an exceedance of an air quality standard. As such, mitigation measures designed to minimize potential air quality impacts would focus on the construction phase of the project. These measures would go beyond the control measures listed in the Statewide Program EIR/EIS and the controls required by the SJVAPCD for compliance.

8.1 Mitigation Measures

The HST project would, in general, improve air quality because of the reduction in regional emissions. These mitigation measures are the same regardless of whether the project is compared with existing conditions or the No Project Alternative. Temporary, short-term emission increases associated with construction activities will be substantially reduced with mitigation strategies and design practices. Operation of the HMF will also result in localized emission increases, which will be reduced using mitigated strategies. Typical mitigation measures that may be applied to the project include the following:

AQ-MM#1: Reduce Fugitive Dust by Watering. This mitigation measure will apply to construction of the alternatives, including north-south alignments, HST stations, HMFs, and power substations. During construction activities, exposed surfaces will be watered three times daily, achieving a 61% reduction in PM emissions instead of the 55% reduction achieved under the programmatic measures. This measure will have the secondary impact of requiring an increased demand for water.

AQ-MM#2: Reduce VOC Emissions from Paint. This mitigation measure will apply to the painting of buildings. A low-VOC architectural coating, achieving a 10% reduction in VOC emissions, will be used for painting buildings during construction. This measure will not fully address the exceedance of emissions thresholds during construction.

AQ-MM#3: Reduce Fugitive Dust from Material Hauling. This mitigation measure will apply to the hauling of cut-and-fill material. Trucks will be covered to significantly reduce fugitive dust emissions while hauling soil and other similar material.

AQ-MM#4: Reduce Criteria Exhaust Emissions from Construction Equipment. This mitigation measure will apply to heavy-duty construction equipment used during the construction period. All off-road construction diesel equipment greater than 50 hp will have to meet at least Tier 4 California Emission Standards unless such engines are not available for a particular piece of equipment. In the event that Tier 4 engines are not available for any off-road engine larger than 50 hp, the engine will have tailpipe retrofit controls that reduce exhaust emissions of NO_x and PM to Tier 4 emission levels. Tier 3 engines will be allowed on a case-by-case basis only when the contractor has documented that no Tier 4 equipment or emissions equivalent retrofit equipment is available for a particular equipment type. Documentation will be provided in such instances by the contractors and at least two construction equipment rental companies.

AQ-MM#5: Reduce Criteria Exhaust Emissions from On-road Equipment. This mitigation measure will apply to on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel. Material-hauling trucks will consist of an average fleet mix of equipment model year

2010, or newer. This measure will not fully address the exceedance of emissions thresholds during construction. This measure may have a co-benefit of reducing GHG pollutant emissions.

AQ-MM#6: Reduce the Potential Impact of Toxics. This mitigation measure will apply to the layout of the HMF (all HMF sites). A minimum buffer distance of 1,300 feet from sensitive receptors will be provided for the diesel vehicles, and idling of diesel vehicles will be limited at the facility, or a detailed health-risk assessment showing that the cancer risk is less than 10 in a million will be prepared when the site design is refined.

AQ-MM#7: Reduce the Potential Impact of Stationary Sources. This mitigation measure will apply to criteria pollutant sources at the HMF (the Fresno Works–Fresno and the Kern Council of Governments–Wasco HMF sites only). Large stationary equipment (e.g., combustion equipment, paint booths, wastewater treatment) will be implemented with best industry practices or alternative equipment, to the extent possible, to reduce emissions of criteria pollutants.

AQ-MM#8: Reduce the Potential Impact of Concrete Batch Plants. This mitigation measure will apply to the location of concrete batch plants. Concrete batch plants will be sited at least 1,000 feet from sensitive receptors, such as schools and hospitals.

AQ-MM#9: Purchase Offsets for Emissions Associated with Hauling Ballast Material in Certain Air Districts. This mitigation measure will apply to the scenarios in which the ballast and sub-ballast material is hauled from quarries located outside the SJVAB. NO_x offsets will be purchased from the South Coast AQMD and the Mojave Desert AQMD if offsets are available.

8.2 Mitigation Calculation Methods

8.2.1 Fugitive Dust

Fugitive dust mitigation measures were applied to reduce fugitive dust emissions from cut-and-fill activities during construction of the alignment. The most reductions were achieved by assuming that haul trucks used to move cut-and-fill material to and from the site would be completely covered. A secure cover would reduce offsite fugitive dust emissions from haul trucks by almost 100%. Fugitive dust emissions from onsite activities related to the cut-and-fill activities would also be reduced by watering exposed surfaces three times daily, as part of the programmatic reduction measures.

Fugitive dust emissions from demolition activities would be controlled through water techniques required by the programmatic reduction measures; therefore, additional mitigation measures would not apply to demolition activities.

8.2.2 On-Road Equipment Exhaust

Exhaust mitigation measures were also applied to reduce the emissions from material hauling. Emissions from haul trucks were mitigated by assuming that all trucks used to haul materials for the alignment construction were at least model year 2010 (UCD 2007). By 2010, additional NO_x reduction measures were phased-in, thereby greatly reducing NO_x emission from on-road travel.

8.2.3 Construction Equipment Exhaust

To estimate emissions for off-road diesel construction equipment, mitigation was applied to the exhaust emissions based on the fleet-average tier mix and the required percentage reductions to meet CARB Tier 4 standards (SCAQMD 2010). The URBEMIS model estimates that the construction fleet in the first construction year 2013 would be mixture of Tier 2 and tier 3 equipment. For each piece of equipment, a percentage reduction was calculated, based on the reduction amount required to reduce the URBEMIS2007 emission factors to the Tier 4 standard for each pollutant.

The fleet-average reduction was calculated as the average of reductions required for all construction equipment to meet Tier 4 standards. This average reduction was applied to exhaust emissions from off-road diesel construction equipment. Exhaust emission reductions were only applied to pollutants with Tier 4 standards, as shown in Table 8.1-1. PM reductions were applied equally to both PM_{10} and $PM_{2.5}$ emissions. The details of the averaging analysis are included in Appendix A.

Table 8.1-1
Tier 4 Emissions Standards

Pollutant	Emission Standard (g/bhp-hr)
VOC	0.14
NO_x	0.3
PM	0.015

Acronyms:

g/bhp-hr gram(s) per brake-horsepower hour
NO_x nitrogen oxide
PM particulate matter
VOC volatile organic compound

8.3 Mitigated Impacts: Construction

Table 8.1-2 presents the mitigated construction emissions that would occur during construction activities for the BNSF alternatives, including emissions from construction of the HST alignment, HMF, and roadways. The BNSF Alternative mitigated construction emissions were assumed to the same as the construction emissions of the other HST Alternatives, since the length of the alignment for alternatives that deviate from the BNSF Alternative is comparable to the length of the equivalent section of the BNSF Alternative.

As shown in Table 8.1-2, the mitigated emissions from construction of the BNSF Alternative would still exceed the *de minimis* and SJVAPCD GAMAQI thresholds for VOCs and NO_x for all years of construction. Mitigated CO emissions would still exceed the *de minimis* thresholds for the entire construction phase. Mitigated PM_{10} emissions would still exceed the *de minimis* thresholds for 3 of the 8 construction years and the SJVAPCD GAMAQI thresholds for 5 of the 8 construction years. Mitigated $PM_{2.5}$ emissions would be below the *de minimis* thresholds for all construction years and the SJVAPCD GAMAQI thresholds for 5 of the 8 construction years. SO_2 emissions would continue to be below the *de minimis* thresholds for all construction years

Table 8.1-2
Mitigated Construction Emissions: BNSF Alternative (tons/year)

Construction Year[a]	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
GC *de minimis* Threshold[b]	**10**	**100**	**10**	**100**	**100**	**100**
CEQA Threshold of Significance[c]	**10**	**N/A**	**10**	**N/A**	**15**	**15**
2013 Emissions	102	861	358	0.39	260	67
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2014 Emissions	274	3,109	968	2.6	185	72
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2015 Emissions	219	2,583	776	2.5	112	51
Exceed NEPA Threshold	Yes	Yes	Yes	No	Yes	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2016 Emissions	182	2,240	657	2.4	40	32
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2017 Emissions	175	1,799	571	1.8	40	30
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	Yes	Yes
2018 Emissions	43	267	136	0.30	7.4	6.3
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	No	No
2019 Emissions	42	226	101	0.15	4.5	4.3
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	No	No

Table 8.1-2
Mitigated Construction Emissions: BNSF Alternative (tons/year)

Construction Year[a]	VOCs	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
2021 Emissions	30	245	136	0.24	6.5	5.7
Exceed NEPA Threshold	Yes	Yes	Yes	No	No	No
Exceed CEQA Threshold	Yes	N/A	Yes	N/A	No	No

Notes:
[a] Emissions from construction of the HMF are included in the annual totals listed above.
[b] N/A indicates that the area is in attainment for this pollutant; therefore, the threshold is not applicable.
[c] N/A indicates that the SJVAPCD has not established quantitative CEQA significance thresholds for this pollutant.
Acronyms:
CEQA California Environmental Quality Act
CO carbon monoxide
NEPA National Environmental Policy Act
NO_x nitrogen oxide
PM_{10} particulate matter smaller than or equal to 10 microns in diameter
$PM_{2.5}$ particulate matter smaller than or equal to 2.5 microns in diameter

SO_2 sulfur dioxide
VOC volatile organic compound

8.3.1 Material Hauling Outside SJVAB

Material hauling outside of SJVAB would result in emissions that exceed the NO_x GC thresholds in two air basins and the CEQA significance thresholds in multiple AQMDs and APCDs. Mitigation measures AQ-MM#5 and AQ-MM#9 will be implemented to reduce NO_x emissions in these regions.

For scenarios using rail or a combination of rail and trucks for the material hauling, the emissions after reducing on-road truck exhaust and purchasing NO_x offsets would make the material hauling emissions in the SCAQMD and the Mojave Desert AQMD, where mobile source emission offset programs are available, less than the CEQA significance thresholds. The Bay Area AQMD and the East Kern APCD do not have offset programs for mobile sources to reduce the NO_x impacts. NO_x emissions due to material hauling in Bay Area AQMD and the East Kern APCD would remain, exceeding the CEQA significance thresholds after implementing on-road truck mitigation measures. NO_x emissions for Scenarios 4 and 5, when material is hauled solely by trucks, would be reduced to less than the CEQA significance thresholds for all affected AQMDs/APCDs.

With mitigation, NO_x emissions from Scenarios 4 and 5 would be reduced to less than GC threshold in all air basins. NO_x emissions from Scenarios 1, 2, and 3 would continue to exceed the GC thresholds.

Detailed information about material hauling emissions and comparisons with the GC and CEQA thresholds is provided in Appendix G.

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9.0 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 EPA's Conformity Rule. The two types of federal conformity are transportation conformity and GC.

"Conformity" refers to conforming to, or being consistent with, an SIP for compliance with the CAA. EPA'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 CFR 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.

As noted above, there are two types of project conformity determinations: transportation conformity and general conformity. Transportation conformity applies to those projects that will have FHWA or Federal Transit Authority (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 FHWA/FTA.

The Federal Railroad Administration (FRA) and EPA have determined that GC may be applicable to the California HST project. The lead agency for the project is FRA, and FHWA/FTA involvement is not anticipated other than incidental FHWA or FTA funding for joint-benefit components.

If a component of the HST is funded by FHWA or FTA, or if a minor action is required to approve the HST project, such as the need for an FHWA-approved grade crossing, it is anticipated that this project element will be added to the affected area's Regional Transportation Improvement Program (RTIP) or RTP for transportation conformity purposes. However, conformity of HST projects implementing sections of the overall HST system will be addressed through application of the general conformity rule and requirements.

9.1 General Conformity

To determine whether projects are subject to the GC determination requirements, EPA has established GC threshold values (in tons per calendar year) for each of the criteria pollutants for each type of federally designated nonattainment and maintenance area. If the emissions generated by construction or operation of a project (on an area-wide basis) are less than these threshold values, the impacts of the project are not considered to be significant, the GC rule is not applicable, and no additional analyses are required. If the emissions are greater than these values, compliance with the GC rule must be demonstrated.

GC requirements apply only to federally designated maintenance and nonattainment areas. The HST project study area is in an area federally designated as extreme nonattainment for the 8-hour O_3 standard, nonattainment for $PM_{2.5}$, and maintenance for PM_{10} and CO. The applicability threshold values for this area, according to 40 CFR Part 93, are 10 tpy for VOCs, 10 tpy for NO_x, and 100 tpy for $PM_{2.5}$, PM_{10}, CO, and SO_2.

Because the regional emissions of the applicable pollutants are lower under the operational phase of the HST alternatives than of the No Project Alternative, only emissions generated during the construction phase need to be compared to these threshold values to determine whether the GC Rule is applicable.

The construction-phase emissions are greater than the applicability threshold(s) for:

- VOCs for the entire construction duration (March 2013 to July 2021, except 2020, when there would be no construction activities).
- NO_x for the entire construction duration (March 2013 to July 2021, except 2020, when there would be no construction activities).
- CO for the entire construction duration (March 2013 to July 2021, except 2020, when there would be no construction activities).
- PM_{10} for 5 years (March 2013 to December 2017), $PM_{2.5}$ for 5 years (March 2013 to December 2017).
- In addition, the construction-phase emissions associated with material hauling outside the SJVAB are greater than the applicability threshold(s) for:
- NO_x in the South Coast Air Basin and the Mojave Desert Air Basin for certain hauling scenarios.

As such, the project must demonstrate compliance with the GC Rule before construction begins. Compliance with the GC Rule can be demonstrated in one or more of the following ways:

- By reducing construction-phase emissions to below the GC *de minimis* thresholds.
- By showing that the construction-phase emissions are included in the area's emission budget for the SIP.
- By demonstrating that the State agrees to include the emission increases in the area's SIP without exceeding emission budgets.
- By offsetting the project's construction-phase emissions in each year that the thresholds are exceeded.
- Through an air quality modeling analysis demonstrating that the project would not cause or exacerbate a NAAQS violation; however, this cannot be used for ozone precursors in ozone nonattainment areas.

Compliance with the GC Rule would be demonstrated by the project through one or more of the methods listed above after a full preferred project alternative is selected and more site-specific construction information, including scheduling and equipment, becomes available.

9.2 Transportation Conformity

Transportation conformity is an analytical process required for all federally funded transportation projects. 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 level and the project level.

Regional-level conformity in California is concerned with how well the region is meeting the standards set for CO, NO_2, O_3, and PM. A project could demonstrate compliance with regional conformity requirements by inclusion in a conforming RTP/RTIP. Project-level conformity determination is also required in CO, PM_{10}, and $PM_{2.5}$ nonattainment and maintenance areas. The following criteria are required to demonstrate project-level conformity:

- The project is listed in a conforming RTP and RTIP.
- The design concept and scope that were in place at the time of the conformity finding are maintained through implementation.
- The project design concept and scope must be defined sufficiently to determine emissions at the time of the conformity determination.
- The project must not cause a new local violation of the federal standards for CO, PM_{10}, or $PM_{2.5}$, or exacerbate an existing violation of the federal standards for CO, PM_{10}, or $PM_{2.5}$.

As discussed in previous sections, the HST project in its entirety is not subject to transportation conformity; however, individual roadway projects that are a part of the project are subject to transportation conformity. These individual projects are not currently listed in the Council of Fresno County Governments 2011 RTP but are in the process of being included in the next version of the RTP (COG 2010a).

Based on the microscale CO analysis and PM hot-spot analysis performed for the roadway projects, the HST project would not cause or contribute to a violation of the CO, PM_{10}, or $PM_{2.5}$ federal standards. It is assumed that the project components that are subject to transportation conformity would demonstrate project-level conformity once they are included in the conforming RTP.

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