2.2 PHYSICAL ENVIRONMENT

2.2.1 HYDROLOGY AND FLOODPLAIN

REGULATORY SETTING

Executive Order (EO) 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. The Federal Highway Administration requirements for compliance are outlined in 23 Code of Federal Regulations (CFR) 650 Subpart A.

To comply, the following must be analyzed:

- The practicability of alternatives to any longitudinal encroachments.
- Risks of the action.
- Impacts on natural and beneficial floodplain values.
- Support of incompatible floodplain development.
- Measures to minimize floodplain impacts and to preserve/restore any beneficial floodplain values affected by the project.

The base floodplain is defined as "the area subject to flooding by the flood or tide having a one percent chance of being exceeded in any given year." An encroachment is defined as "an action within the limits of the base floodplain."

AFFECTED ENVIRONMENT

Hydrology and Floodplains (hydrologic) information for this section is provided in the Location Hydraulic Study prepared for the project (Caltrans, 2014j). The Location Hydraulic Study Report incorporates information from the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Maps (FIRM) for Solano County. The Location Hydraulic Study also incorporates information from United States Geological Survey (USGS) topographic maps, aerial photographs, and a site visit conducted in April 2013.

The hydrologic study area includes floodplains and watersheds within which the Build Alternative improvements would be located, as well as the receiving waterways, marshes, and wetlands that intersect and/or are adjacent to the I-80 corridor, within the project limits.

The West Segment portion of the Build Alternative, from west of Red Top Road to Air Base Parkway, would convert approximately eight miles of existing HOV lanes into express lanes. Work would comprise mostly of foundation installation for poles and gantries where new signs would be installed and foundation pad and trenching for electrical conduits. Since the work for the

West Segment does not constitute any encroachment on existing floodplains and waterways, no flood risks or adverse effects to the hydrology of the area would occur. As such, this analysis focuses on the Build Alternative's potential affects to the hydrology of the East Segment. The conditions of the West Segment are not discussed further.

Floodplains

Floodplains were defined using FEMA FIRMs, which categorize these floodplains into different Special Flood Hazard Areas:

- *Zone AE.* Floodplains identified as Zone AE represent areas with a one percent annual chance of flooding, where base flood elevations[1] have been determined. Within a Zone AE floodplain, there are also regulatory floodway areas. A regulatory floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment, so that the one percent annual chance flood can be carried without substantial increases in flood heights.

- *Zone A.* Floodplains identified as Zone A represent areas with a one percent annual chance of flood inundation, where no base flood elevations have been determined.

- *Zone AO*. Floodplains identified as Zone AO represent areas within the one percent annual chance of flood inundation, with an average depth ranging from 1 foot to 3 feet.

- *Zone AH.* Floodplains identified as Zone AH represent areas within the one percent annual chance of flood inundation, with flood depths of 1 to 3 feet and base flood elevations determined.

According to the FIRMs, various portions of the hydrologic study area are identified as being within Zone X (shaded), which may represent areas of the 0.2 percent annual chance flood or one percent annual chance flood with a depth less than 1 foot. Zone X (shaded) is not considered a Special Flood Hazard Area; however areas of one percent annual chance flood with a depth less than 1 foot are still areas of one percent annual chance flood or base flood areas.

Table 2.2-1 presents information on the ten floodplains within the hydrologic study area of the East Segment, each of which is associated with a waterway crossing. The majority of the I-80 corridor is at a higher elevation than the surrounding floodplains, and as such, is not considered to be within a Special Flood Hazard Area, and/or is not inundated during 100-year flood events. The FIRM identifying the floodplain of Horse Creek and Middle Branch Horse Creek at I-80 shows the flow from the floodplain overtopping I-80 during a 100-year flood event; however, the flood profiles show the base flood elevation as being below the I-80 roadway elevation. **Figures 2.2-1a** through **2.2-1c** include the maps identifying the FEMA floodplains for the East Segment, with Zones AE and A representing the 100-year floodplain.

[1] Base flood is the regulatory standard for a flood having a one percent change of being equaled or exceeded in a given year. The base flood elevation is the computed elevation to which floodwater is anticipated to rise during the base flood. The base flood elevation is the regulatory requirement for the elevation or floodproofing of structures.

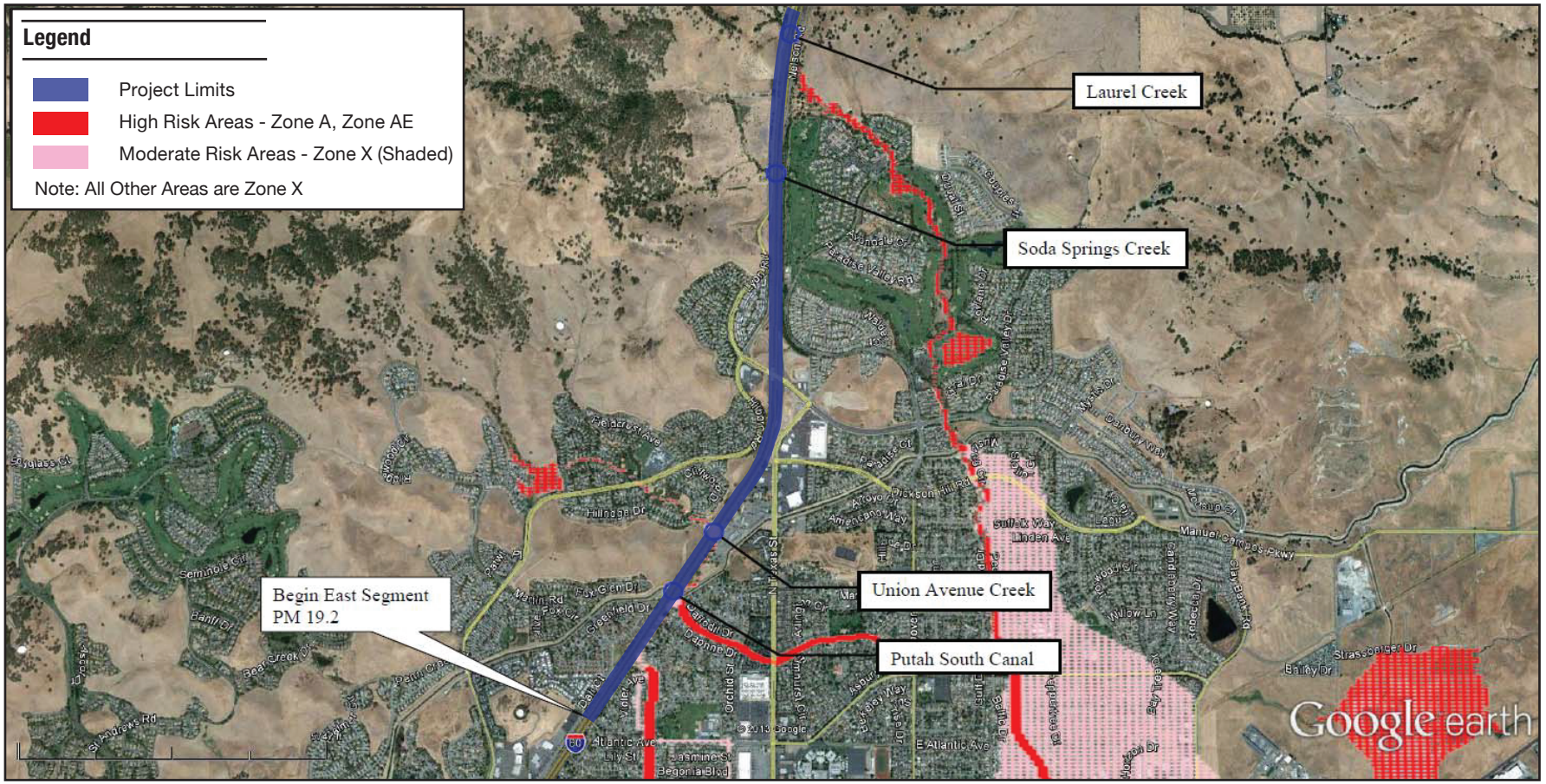
Table 2.2-1 Floodplain Information (East Segment)

Approximate Post Mile Location	Flood Source	FIRM Panel(s)	Flood Zone	Inundates Freeway
20.30	Union Avenue Creek	06095C0266E; 06095C0267E	AE, X, X[1]	No
21.66	Soda Springs Creek	06095C0266E	X[1]	No
22.14	Laurel Creek	06095C0266E	A, X	No
24.26	Lagoon Drain	06095C0259E	AE, A, X	No
24.45	Laguna Creek	06095C0259E	AE, X, X[1]	No
25.03	Alamo Creek	06095C0259E; 06095C0257E	AE, A, X, X[1]	No
26.61	Ulatis Creek	06095C0276E	AE, X, X[1]	No
28.32	Pine Tree Creek	06095C0277E	X	No
28.57	Horse Creek	06095C0164E	X	No
29.25	Horse Creek/Middle Branch Horse Creek	06095C0164E	AE, A, X[1]	No

Note: SFHA = Significant Flood Hazard Area
X[1] = Zone X (shaded)
Source: Caltrans, 2014j

Natural and Beneficial Floodplain Values

Beneficial floodplain values include habitat for fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and ground water recharge. The floodplains in the hydrologic study area have many of these values, including wildlife habitat and plants. Several creeks are identified as potential habitat for special-status fish species. In addition, wetlands and marshes along the banks of the creeks provide habitat for federally and state-listed endangered animals. A complete description of the sensitive plant and animal habitats known to occur within the hydrologic study area is included in **Section 2.3, Biological Environment**. See **Section 2.2.2, Water Quality and Storm Water Runoff**, where **Table 2.2-5** summarizes the beneficial uses for these water bodies.



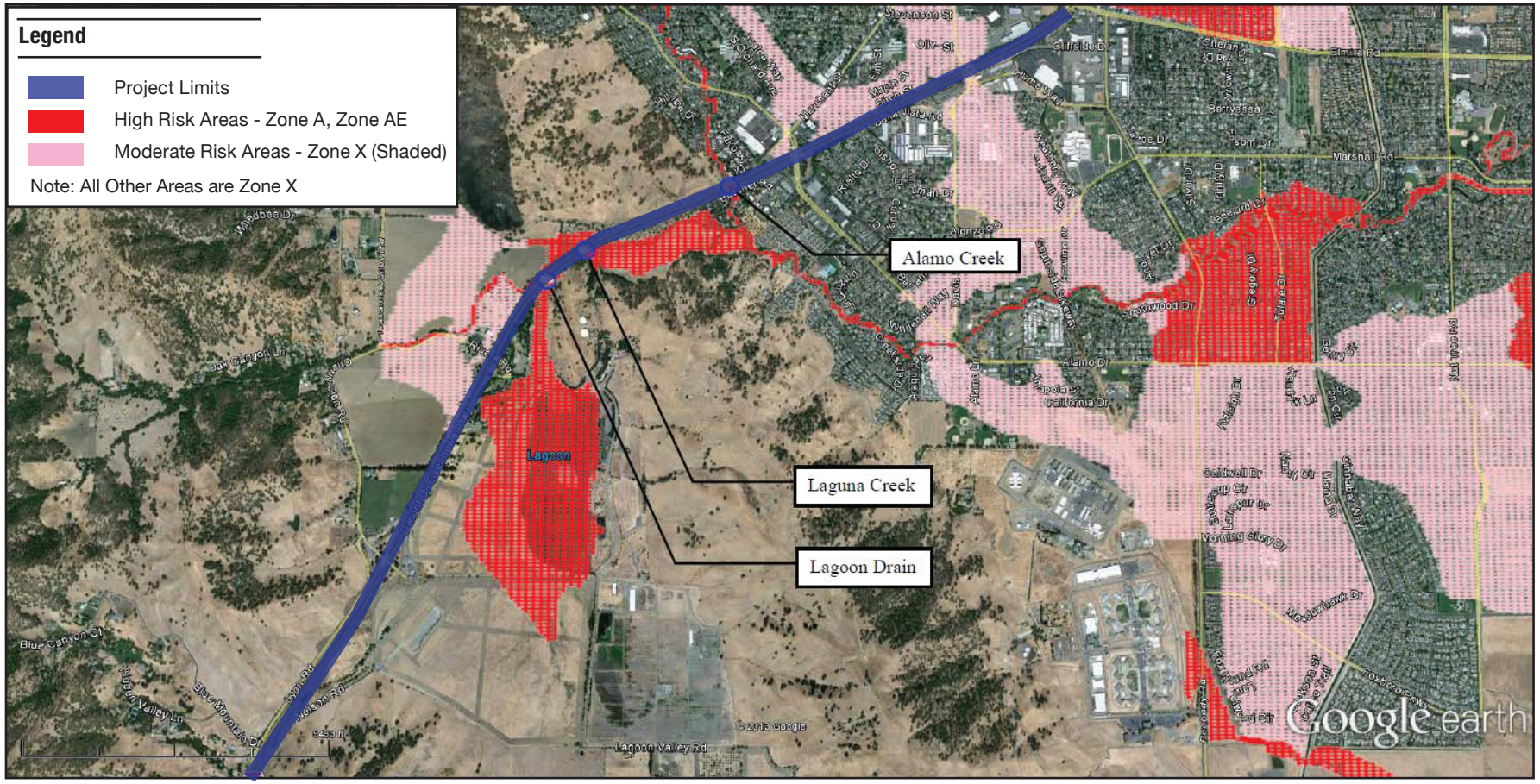
NOT TO SCALE

N

Floodplain Map - East Segment

Figure 2.2-1a

Source: Caltrans, 2014j



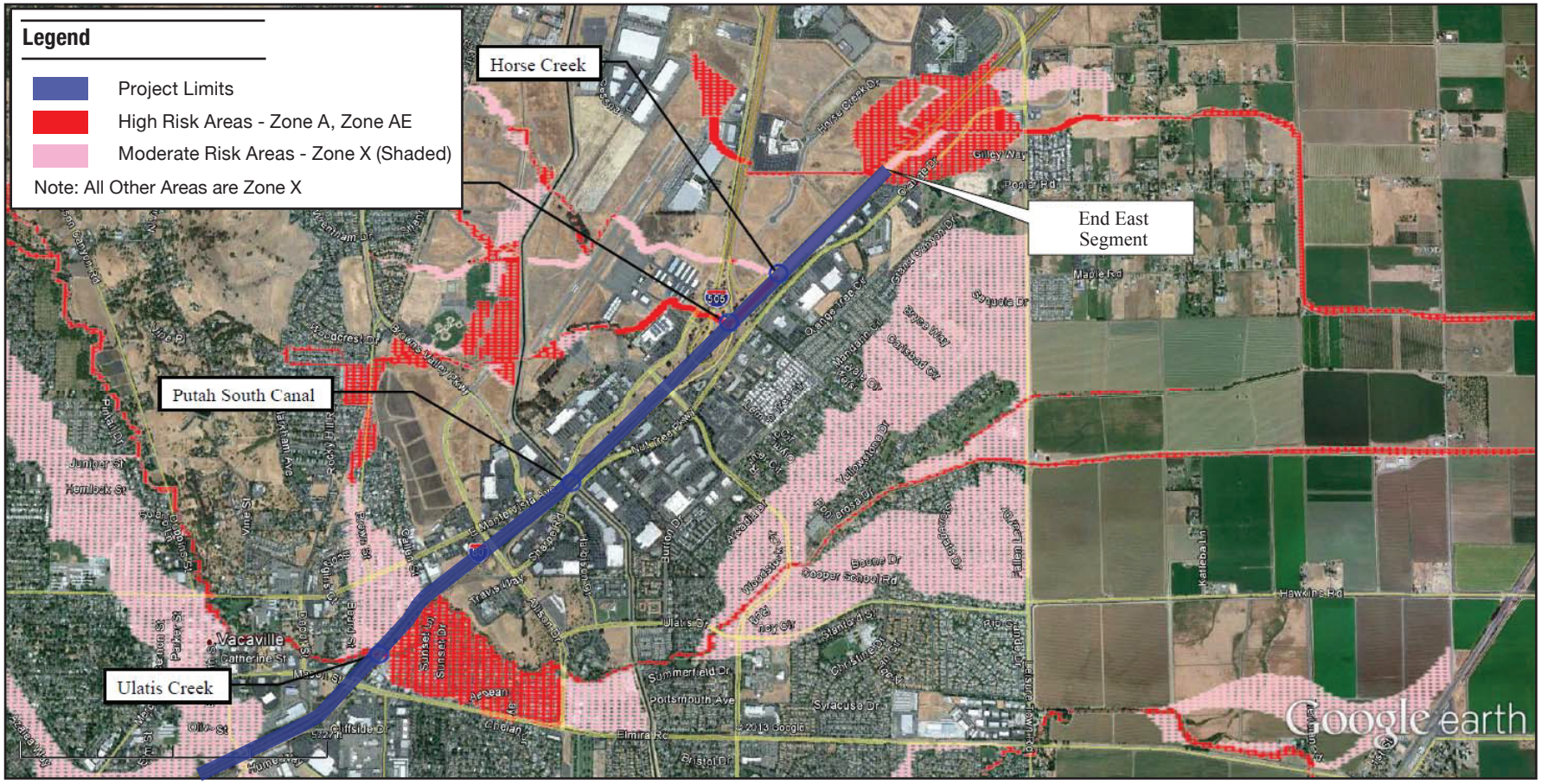
NOT TO SCALE

N

Floodplain Map - East Segment

Figure **2.2-1b**

Source: Caltrans, 2014j



NOT TO SCALE

N

Floodplain Map - East Segment

Figure 2.2-1c

Source: Caltrans, 2014j

Tsunamis

A tsunami is a series of waves generated in a body of water by a rapid disturbance that vertically displaces the water. These changes can be caused by an underwater fault rupture (that generates an earthquake) or underwater landslides (typically triggered by earthquakes). Based upon the tsunami inundation map for Solano County, the project limits are not located in a tsunami inundation area.[2]

ENVIRONMENTAL CONSEQUENCES

A "significant encroachment" as defined in 23 CFR 650.105 is a highway encroachment and any direct support of likely base floodplain development that would involve one or more of the following construction or flood-related impacts:

- A significant risk (to life or property)
- A significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route
- A significant adverse impact on natural and beneficial floodplain values

Build Alternative

As previously discussed, freeway lane conversion associated with the West Segment of the Build Alternative does not constitute any encroachment on existing floodplains and waterways, no flood risks or adverse effects to the hydrology of the area would occur. As such, this analysis focuses on the Build Alternative's potential effects to the hydrology of the East Segment.

Floodplain Encroachment and Risk of Action

Longitudinal Encroachment

As defined by the FHWA, a longitudinal encroachment is an action within the limits of the base floodplain that is parallel to the direction of the flow. No longitudinal encroachments have been identified as part of the Build Alternative, as the floodplains within the hydrologic study area in the East Segment run perpendicular to the I-80 corridor.

Risk of Action

The potential flood risks associated with implementation of the Build Alternative includes: 1) change in land use, 2) fill inside the floodplain, or 3) change in the 100-year water surface elevation. **Table 2.2-2** below presents the risk to the floodplains within the East Segment under the Build Alternative.

[2] California Department of Conservation, 2013. Solano County Tsunami Inundation Map. Available at: http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/Solano/Pages/Solano.aspx; Last Accessed: January 23, 2014.

No 100-year floodplains exist at the Putah South Canal, Soda Springs Creek, Pine Tree Creek, and Horse Creek (westbound I-80) crossings. Therefore, there is no potential flood risk in constructing the East Segment of the Build Alternative at these waterway crossings.

The Build Alternative proposes widening of I-80, within the East Segment which would increase impervious surfaces and result in an increase in the storm water runoff/flow. However, this increase in storm water runoff would be insignificant when compared with the overall size of the watershed (less than 0.04 percent). Additionally, the proposed widening would not significantly raise the grade of I-80, thereby avoiding potential risks associated with redirected flood flows.

Table 2.2-2 Summary of Base Floodplain Effects

Approximate Post Mile Location	Flood Source	Fill Required as part of Build Alternative	Estimated Volume of Fill (cubic yards)	Added Impervious Area	Percent (%) Added	Level of Risk
20.30	Union Avenue Creek	No	n/a	Yes	0.15%	Low
22.14	Laurel Creek	No	n/a	Yes	0.07%	Low
24.26	Lagoon Drain	No	n/a	Yes	0.17%	Low
24.45	Laguna Creek	No	n/a	Yes	0.02%	Low
25.03	Alamo Creek	No	n/a	Yes	0.03%	Low
26.61	Ulatis Creek[1]	Yes	20	Yes	0.03%	Low
29.25	Horse Creek/Middle Branch Horse Creek	No	n/a	Yes	0.060%	Minimal

Note: 1) Ulatis Creek widening will require widened bridge piers, which would raise the water surface elevation upstream of I-80; this does not however increase the level of risk.
Source: Caltrans, 2014j

The Build Alternative would widen I-80 at several locations within the hydrologic study area floodplains of several creek crossings. With the exception of the Ulatis Creek bridge, the widening would be accommodated on top of the existing culvert crossings under I-80 and no modification to the culverts/creeks would be necessary. In these locations, no fill would be constructed within the floodplains.

To achieve the widening at Ulatis Creek, new bridge piers will be placed within the creek, which will result in an estimated 20 cubic yards of fill within the creek's floodplain. The estimated fill is insignificant compared to the overall storage volume of the floodplain (0.2 percent). The added fill associated with the creek work would be offset by removing material from other area within this

floodplain. Potential locations for fill removal include, but are not limited to, the channel banks upstream and downstream of this creek crossing. The locations for the fill removal would be determined in the final design phase for the project.

The piers being added to achieve the inside widening at Ulatis Creek bridge will be aligned with the existing piers, but will be 20 to 24 inches wider. Modeling indicates that the wider piers would increase the water surface elevation upstream of I-80 by 7.2 inches. However, these base floodplain impacts appear to be contained within the existing channel and therefore would not increase risk.

Based on the above conditions, the potential flood risks as a result of the Build Alternative are low at all locations within the East Segment.

Floodplain Development

As defined by the FHWA, the support of incompatible floodplain development will encourage, allow, serve, or otherwise facilitate incompatible base floodplain development, such as commercial development or urban growth. By improving access and highway capacity, the Build Alternative could indirectly result in the development and intensification of land uses in cities surrounding the project limits. This development intensification would most likely occur in areas already planned for growth by the surrounding cities, and would therefore not have a substantial effect on growth. The Build Alternative would add capacity to the I-80 corridor, within the East Segment. However, this additional capacity is needed to accommodate existing and anticipated traffic demand that would occur with or without the project. As a result, the Build Alternative would not directly encourage growth, nor would it promote local development or growth beyond that which is already planned. The Build Alternative would therefore not encourage incompatible floodplain development. A complete discussion of the Build Alternative's potential effects on regional growth is included in **Section 2.1.3, Growth**.

The Build Alternative would not result in the interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route in the event of a flood. The Build Alternative could improve access for emergency vehicles and evacuation by addressing existing and future traffic congestion through the addition of capacity on I-80 within the East Segment.

Natural and Beneficial Floodplain Values

The Build Alternative would adversely affect wetlands and other waters in the hydrologic study area that provide natural beneficial floodplain values (i.e., wildlife and plant habitat, natural moderation of floods, water quality maintenance, and groundwater discharge). Direct effects would occur as a result of the physical displacement of existing wetlands and other waters from the construction of the proposed improvements. Indirect effects could also occur from potential fluid leaks from the construction equipment that is parked in close proximity to sensitive wetland habitat. In addition, erosion during construction work that involves grading and other earth moving activities can contribute large amounts of sediment and silt to storm water runoff, which can deteriorate the water quality of the wetlands and other waters that receive storm water runoff from the study area.

Section 2.2.2, Water Quality and Storm Water Runoff, addresses potential adverse effects to water quality anticipated from the implementation of the proposed improvements. **Section 2.3.2, Wetlands and Other Waters,** addresses potential adverse effects to wetlands and other waters within the hydrologic study area that provide natural beneficial floodplain values. Implementation of the avoidance, minimization, and mitigation measures identified in these later sections would reduce effects on natural and beneficial floodplain values within the hydrologic study area.

Summary

As the proposed improvements would generally maintain the existing roadway profile of I-80, the Build Alternative's effects to the floodplains would be minimal with regard to storm water runoff and changes in the 100-year water surface elevations. The Build Alternative would not encourage floodplain development in the surrounding areas. Therefore, no significant floodplain encroachment would occur under the Build Alternative.

West Segment – Fundable First Phase

As previously discussed, work associated with the West Segment portion of the Build Alternative does not constitute any encroachment on existing floodplains and waterways. No flood risks or adverse effects to the hydrology of the area would occur within the West Segment.

No-Build Alternative

The No-Build Alternative assumes that I-80 would remain in its existing condition and no further action of improvements would occur. Under this alternative, the existing route would remain unchanged except for planned and programmed improvements including ramp metering, traffic operating systems (TOS), and pavement rehabilitation. The No-Build Alternative would therefore not affect the hydrology or result in incomplete floodplain development.

AVOIDANCE, MINIMIZATION, AND /OR MITIGATION MEASURES

Build Alternative

The potential flood risk as a result of the Build Alternative is anticipated to be low at all locations within the hydrologic study area. As such, no avoidance, minimization, or mitigation measures are proposed related to flooding hazards.

However, the Build Alternative would adversely affect wetlands and other waters in the hydrologic study area that provide natural beneficial floodplain values. See to **Section 2.2.2, Water Quality and Storm Water Runoff**, and **Section 2.3.2, Wetlands and Other Waters**, for a detailed description of the measures that shall be taken to protect water quality and the natural and beneficial floodplain values that would be affected by the Build Alternative.

HYDR-1: Construction of the Build Alternative will be planned so as to avoid adverse effects to the natural and beneficial floodplain values to the maximum extent practicable. Any impacts to the natural and beneficial floodplain values would be reduced with re-vegetation, storm water treatment, or other requirements as designated by the relevant permits.

West Segment – Fundable First Phase

No avoidance, minimization, or mitigation measures specific to West Segment would be required beyond the one's described above under the Build Alternative.

2.2.2 WATER QUALITY AND STORM WATER RUNOFF

REGULATORY SETTING

Federal Requirements: Clean Water Act

In 1972, Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the United States (U.S.) from any point source [3] unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. This act and its amendments are known today as the Clean Water Act (CWA). Congress has amended the act several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the NPDES permit scheme. The following are important CWA sections:

- Sections 303 and 304 require states to issue water quality standards, criteria, and guidelines.
- Section 401 requires an applicant for a federal license or permit to conduct any activity that may result in a discharge to waters of the U.S. to obtain certification from the state that the discharge will comply with other provisions of the act. This is always required in tandem with a Section 404 permit request (see below).
- Section 402 establishes the NPDES, a permitting system for the discharges (except for dredge or fill material) of any pollutant into waters of the U.S. Regional Water Quality Control Boards (RWQCB) administer this permitting program in California. Section 402(p) requires permits for discharges of storm water from industrial/construction and municipal separate storm sewer systems (MS4s).
- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the United States. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The goal of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

The USACE issues two types of 404 permits: General and Standard permits. There are two types of General permits: Regional permits and Nationwide permits. Regional permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to allow a variety of minor project activities with no more than minimal effects.

[3] A point source is any discrete conveyance such as a pipe or a man-made ditch.

Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of the USACE's Standard permits. There are two types of Standard permits: Individual permits and Letters of Permission. For Standard permits, the USACE decision to approve is based on compliance with U.S. Environmental Protection Agency's Section 404 (b)(1) Guidelines (U.S. EPA Code of Federal Regulations [CFR] 40 Part 230), and whether the permit approval is in the public interest. The Section 404(b)(1) Guidelines (Guidelines) were developed by the U.S. EPA in conjunction with the USACE, and allow the discharge of dredged or fill material into the aquatic system (waters of the U.S.) only if there is no practicable alternative which would have less adverse effects. The Guidelines state that the USACE may not issue a permit if there is a least environmentally damaging practicable alternative (LEDPA) to the proposed discharge that would have lesser effects on waters of the U.S. and not have any other significant adverse environmental consequences. According to the Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures has been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent [4] standards, jeopardize the continued existence of listed species, violate marine sanctuary protections, or cause "significant degradation" to waters of the U.S. In addition, every permit from the USACE, even if not subject to the Section 404(b)(1) Guidelines, must meet general requirements. See 33 CFR 320.4. A discussion of the LEDPA determination, if any, for the document is included in the Wetlands and Other Waters section.

State Requirements: Porter-Cologne Water Quality Control Act

California's Porter-Cologne Act, enacted in 1969, provides the legal basis for water quality regulation within California. This act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or gaseous) to land or surface waters that may impair beneficial uses for surface and/or groundwater of the state. It predates the CWA and regulates discharges to waters of the state. Waters of the state include more than just waters of the U.S., like groundwater and surface waters not considered waters of the U.S. Additionally, it prohibits discharges of "waste" as defined, and this definition is broader than the CWA definition of "pollutant." Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA.

The State Water Resources Control Board (SWRCB) and RWQCBs are responsible for establishing the water quality standards (objectives and beneficial uses) required by the CWA and regulating discharges to ensure compliance with the water quality standards. Details about water quality standards in a project area are included in the applicable RWQCB Basin Plan. In California, Regional Boards designate beneficial uses for all water body segments in their jurisdictions and then set criteria necessary to protect these uses. As a result, the water quality standards developed for particular water segments are based on the designated use and vary depending on that use. In addition, the SWRCB identifies waters failing to meet standards for specific pollutants. These waters are then state-listed in accordance with CWA Section 303(d). If a state determines that waters are impaired for one or more constituents and the standards cannot be met through point

[4] The U.S. EPA defines "effluent" as "wastewater, treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall."

source or non-point source controls (NPDES permits or WDRs), the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). TMDLs specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed.

State Water Resources Control Board and Regional Water Quality Control Boards

The SWRCB administers water rights, sets water pollution control policy, and issues water board orders on matters of statewide application, and oversees water quality functions throughout the state by approving Basin Plans, TMDLs, and NPDES permits. RWCQBs are responsible for protecting beneficial uses of water resources within their regional jurisdiction using planning, permitting, and enforcement authorities to meet this responsibility.

National Pollutant Discharge Elimination System (NPDES) Program

Municipal Separate Storm Sewer Systems (MS4)

Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of storm water discharges, including Municipal Separate Storm Sewer Systems (MS4s). An MS4 is defined as "any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a state, city, town, county, or other public body having jurisdiction over storm water, that is designed or used for collecting or conveying storm water." The SWRCB has identified the Department as an owner/operator of an MS4 under federal regulations. The Department's MS4 permit covers all Department rights-of-way, properties, facilities, and activities in the state. The SWRCB or the RWQCB issues NPDES permits for five years, and permit requirements remain active until a new permit has been adopted.

The Department's MS4 Permit (Order No. 2012-0011-DWQ) was adopted on September 19, 2012 and became effective on July 1, 2013. The permit has three basic requirements:

1. The Department must comply with the requirements of the Construction General Permit (see below);

2. The Department must implement a year-round program in all parts of the State to effectively control storm water and non-storm water discharges; and

3. The Department storm water discharges must meet water quality standards through implementation of permanent and temporary (construction) Best Management Practices (BMPs), to the Maximum Extent Practicable, and other measures as the SWRCB determines to be necessary to meet the water quality standards.

To comply with the permit, the Department developed the Statewide Storm Water Management Plan (SWMP) to address storm water pollution controls related to highway planning, design, construction, and maintenance activities throughout California. The SWMP assigns responsibilities within the Department for implementing storm water management procedures and practices as well as training, public education and participation, monitoring and research, program evaluation, and reporting activities. The SWMP describes the minimum procedures and practices the

Department uses to reduce pollutants in storm water and non-storm water discharges. It outlines procedures and responsibilities for protecting water quality, including the selection and implementation of Best Management Practices (BMPs). The proposed project will be programmed to follow the guidelines and procedures outlined in the latest SWMP to address storm water runoff.

Construction General Permit

Construction General Permit (Order No. 2009-009-DWQ), adopted on September 2, 2009, became effective on July 1, 2010. The permit regulates storm water discharges from construction sites that result in a Disturbed Soil Area (DSA) of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation result in soil disturbance of at least one acre must comply with the provisions of the General Construction Permit. Construction activity that results in soil disturbances of less than one acre is subject to this Construction General Permit if there is potential for significant water quality impairment resulting from the activity as determined by the RWQCB. Operators of regulated construction sites are required to develop storm water pollution prevention plans; to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under the Construction General Permit.

The 2009 Construction General Permit separates projects into Risk Levels 1, 2, or 3. Risk levels are determined during the planning and design phases, and are based on potential erosion and transport to receiving waters. Requirements apply according to the Risk Level determined. For example, a Risk Level 3 (highest risk) project would require compulsory storm water runoff pH and turbidity monitoring, and before construction and after construction aquatic biological assessments during specified seasonal windows. For all projects subject to the permit, applicants are required to develop and implement an effective Storm Water Pollution Prevention Plan (SWPPP). In accordance with the Department's Standard Specifications, a Water Pollution Control Plan (WPCP) is necessary for projects with DSA less than one acre.

Section 401 Permitting

Under Section 401 of the CWA, any project requiring a federal license or permit that may result in a discharge to a water of the United States must obtain a 401 Certification, which certifies that the project will be in compliance with state water quality standards. The most common federal permits triggering 401 Certification are CWA Section 404 permits issued by the USACE. The 401 permit certifications are obtained from the appropriate RWQCB, dependent on the project location, and are required before the USACE issues a 404 permit.

In some cases, the RWQCB may have specific concerns with discharges associated with a project. As a result, the RWQCB may issue a set of requirements known as Waste Discharge Requirements (WDRs) under the State Water Code (Porter-Cologne Act) that define activities, such as the inclusion of specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. WDRs can be issued to address both permanent and temporary discharges of a project.

AFFECTED ENVIRONMENT

This analysis is based on the information provided in the Water Quality Assessment Report prepared for the project (Caltrans, 2014s). The analysis focuses on potential adverse effects to the water quality of the hydrologic study area, as defined in **Section 2.2.1, Hydrology and Floodplain**.

Regional Hydrology

The majority of the project limits are within the San Francisco Bay RWQCB jurisdiction, including the entire West Segment, and approximately two-thirds of the East Segment, from Air Base Parkway [post mile (PM 19.5)] to the Fairfield city limit (PM 22.5). From this point to the end of the East Segment, the project limits fall within the Central Valley RWQCB jurisdiction.

Table 2.2-3 summarizes the RWQCBs regions and hydrologic planning areas. The project limits cross three hydrologic units, each with their own respective planning watersheds.

Table 2.2-3 Hydrologic Planning Areas within the Project Limits

I-80 Post Mile	Hydrologic Sub-area	Hydrologic Sub-area Number
West Segment PM R10.4/PM 19.5 East Segment PM 19.5/PM 22.0	Suisun Slough	207.23
East Segment PM 22.0/PM 25.0	Upper Elmira	560.10
East Segment PM 25.0/PM 30.2	Valley Putah-Cache	511.10

Source: Caltrans, 2014s

The regional hydrology generally follows the topography of the land, which gradually slopes to the south toward Suisun Bay. The area is composed of relatively flat grazing plains and rural open space with gently sloping hills adjacent to the I-80/I-680/SR12 interchange. The Vaca Mountains lie to the north of Suisun Valley and Fairfield.

Historically, agriculture has impacted runoff patterns in the areas adjacent to the I-80 corridor in West Segment of the project limits. Along the East Segment of the project limits, runoff patterns are affected by the urban development.

Climate

The climate of Solano County is characterized by the two well-defined seasons of winter and summer. Winters are mild with frequent rain, and summers are warm to hot with infrequent precipitation. Normal annual precipitation ranges from approximately 17 to 31 inches within Solano County, particularly between November and April. The mean temperature varies from 45

degrees Fahrenheit in January to 70 degrees in July. In the valley floor areas (Vacaville-Dixon vicinity), the temperature may reach or exceed 100 degrees Fahrenheit for extended periods during the summer, and often falls below freezing during winter nights.

Groundwater Hydrology

There are four groundwater basins within the Solano County as defined by the State Department of Water Resources: the Napa-Sonoma Lowlands subbasin within the Napa-Sonoma Valley basin, the Suisun-Fairfield Valley basin, and the Solano and Yolo Valley subbasins within the Sacramento Valley Basin (see **Table 2.2-4**).

Table 2.2-4 Groundwater Basins within the Project Limits

Groundwater Basin Name	Groundwater Sub-Basin	Basin Number	Size (acres)
Napa-Sonoma Valley Lowlands	Napa-Sonoma Lowlands	2-2.03	40,455
Suisun-Fairfield Valley	n/a	2-3	133,600
Sacramento Valley	Solano	5-51.66	425,000
Sacramento Valley	Yolo	5-21.67	256,000

Source: Caltrans, 2014p

The largest groundwater basin underlies the northeastern part of Solano County. This groundwater basin starts from the foothills above Vacaville and goes to the Sacramento River. The groundwater basin goes from the north boundary with Putah Creek to the south boundary of Fairfield. There are two basic levels to the groundwater basin. The shallower aquifer provides agricultural water and local domestic supplies. The shallower aquifer is underlain by the Tehama Formation aquifer. This aquifer is quite deep (over 1,000 feet) under Vacaville, but surfaces in the English Hills area north and west of Vacaville.

The depth of ground water within the project limits ranges from 3.3 feet to 20 feet. The groundwater is anticipated to vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, and the change in the water level in the nearby creeks.

Local Hydrology

Table 2.2-5 identifies the creek and canal crossings within the project limits. The Putah South Canal starts at Putah Diversion Dam and runs easterly from the dam, eventually turning southward to follow the edge of the foothills, until its terminus near Cordelia. Union Avenue Creek, Springs Creek, and Laurel Creek originate from the Vaca Mountains, generally flowing in a southerly direction before being conveyed under I-80. After crossing I-80, these creeks continue southerly, ultimately discharging to the Suisun Slough. Lagoon Drain, Alamo Creek, and Ulatis Creek also originate from the Vaca Mountains, but generally flow in a southeasterly direction before being conveyed under I-80. After crossing I-80, these creeks continue easterly, ultimately discharging to

Cache Slough. Pine Tree and Horse Creek originate from the English Hills, and generally flow in an easterly direction before being conveyed under I-80. After crossing I-80, these creeks continue southeast and join Ulatis Creek.

Beneficial Uses

As previously discussed in **Section 2.2.1, Hydrology and Floodplain**, the water bodies within the hydrologic study area have many of natural beneficial values, including wildlife habitat and plants. Several creeks are identified as potential habitat for special-status fish species. In addition, wetlands and marshes along the banks of the creeks provide habitat for federally and state-listed endangered animals. The RWQCB Basin Plan lists beneficial uses for creeks and stream crossings within the project limits. **Table 2.2-5** summarizes the beneficial uses for these water bodies. A complete description of the sensitive plant and animal habitats known to occur within the hydrologic study area is included in **Section 2.3, Biological Environment**. There are no *Areas Of Special Biological Significance*, as designated by the SWRCB, within the study area.

Table 2.2-5 Waterway Crossings within the Project Limits

Stream Name	Beneficial Uses
West Segment	
Jameson Canyon Creek	None listed
Green Valley Creek	FRSH, COLD, MIGR, RARE, SPWN, WARM, WILD, REC-1, REC-2
Dan Wilson Creek	COLD, WARM, WILD, REC-1, REC-2
Suisun Creek	FRSH, COLD, MIGR, RARE, SPWN, WARM, WILD, REC-1, REC-2
Raines Drain	None listed
Alonzo Drain	None listed
Ledgewood Creek	FRSH, COLD, MIGR, RARE, SPWN, WARM, WILD, REC-1, REC-2
Pennsylvania Avenue Creek	None listed
East Segment	
Union Avenue Creek	None listed
Soda Springs Creek	None listed
Laurel Creek	FRSH, COLD, MIGR, SPWN, WARM, WILD, REC-1, REC-2
Lagoon Drain	None listed
Laguna Creek	None listed
Alamo Creek	None listed
Ulatis Creek	None listed
Putah South Canal	None listed

Stream Name	Beneficial Uses
Pine Tree Creek	None listed
Horse Creek	None listed

Notes:
Existing beneficial uses: FRSH—Freshwater Replenishment; COLD—Cold Freshwater Habitat; MIGR—Fish Migration; SPWN—Fish Spawning; REC-1—Water Contact Recreation; REC-2—Non-contact Water Recreation; WARM—Warm Freshwater Habitat; WILD—Wildlife Habitat

Source: Caltrans, 2014s

Clean Water Act 303(d) lists several of the waterways and receiving bodies within the project limits and are included on the California Water Act (CWA) 303(d) List of Water Quality Limited Segments. Such segments do not meet state water quality standards and are subject to TMDL requirements. **Table 2.2-6** lists the waterways are on the 303(d) list and the TMDL requirements.

Table 2.2-6 Clean Water Act 303(d) List

Waterway/ Receiving Water	Impairment/Source	TMDL
West Segment		
Suisun Creek	low dissolved oxygen from habitat modification, streambank modification/destabilization, and removal of riparian vegetation	Scheduled 2021
Ledgewood Creek	Diazinon from agricultural runoff	Scheduled 2021
Suisun Bay	chlordane, dichlorodiphenyltrichloroethane (DDT), and dieldrin from non-point sources	Scheduled 2013[A]
	Dioxin compound and furan compound potentially contributed from atmospheric depression	Scheduled 2019
	mercury pollutant from atmospheric depression, industrial point sources, natural source, nonpoint source, and resource extraction	Scheduled 2008[A]
	PCB pollutants from unknown point source	Scheduled 2010[A]
East Segment		
Ulatis Creek	chlorpyrifos and diazinon from agricultural runoff	Scheduled 2021

Note:
A. No updates have been provided for the scheduled TMDL requirements from past years. However, an updated 303(d) listing process and TMDL requirements are anticipated as part of the 2016 Integrated Report (CWA Section 303(d) List / 305(b) Report), which will consist of data for the San Francisco Bay region.

Source: Caltrans, 2014p

ENVIRONMENTAL CONSEQUENCES

Build Alternative

Effect to Receiving Waters

Temporary Construction Related Effects

Construction would involve substantial grading and earth moving activities, stockpiling of soils, and the loading, unloading, and transport of excavated and fill material. Rainfall could carry loose soils into adjacent waterways, resulting in increased sedimentation and adverse effects to water quality. Concentrated flow due to grading in some areas will increase the potential for erosion and potentially increase sediment transport into the adjacent areas. Construction equipment debris and fuel could also further degrade the quality of storm water runoff if fueling activity and maintenance products are not handled properly. This contamination could impact nearby waterways, including the mapped creeks and wetlands in the hydrologic study area.

Work within waterways can result in changes in creek characteristics at the crossing and upstream and downstream of the crossings through widening and replacement of existing culverts and bridges. Although the goal of the project design would be to maintain existing drainage structures, the proposed road widening and modifications to the existing freeway and ramps could also result in modifications or removal of the exiting drainage structures. Temporary drainage facilities may be required during construction to redirect runoff from work areas.

Permanent Operation Related Effects

The Build Alternative would add approximately 28.1 acres of new impervious area, the bulk of which would be added in the East Segment (approximately 19.1 acres) through road widening and modifications to the existing roadway and ramps. The proposed widening and modifications to the existing freeway and ramps are expected to result in the fill or removal of existing ditches, modification or relocation of existing longitudinal drainage structures, and construction of new drainage structures. The goal of the Build Alternative's drainage design would be to maintain existing drainage patterns. The disturbed soil area and existing added and reworked impervious area values for the Built Alternative are shown in **Table 2.2-7**.

Table 2.2-7 Disturbed Soil and Impervious Area

Project Segment	Disturbed Soil (acres)	Impervious Area (acres)			
		Existing	Added	Reworked	Removed
West Segment	4.1	244	0.30	0.9	-
East Segment	135.0	174	27.8	50.9	(2.4)
Total	139.1	418	28.1	51.8	(2.4)

Source: Caltrans, 2014p

Additional impervious area prevents runoff from naturally dispersing and infiltrating into the ground, resulting in increased concentrated flow. The additional flow has the potential to transport an increased amount of sediment and pollutants to waterways and water resources, plus create increased erosion resulting from changes to waterway hydrographs (flow versus time) pre- and post-construction. This phenomenon is termed hydromodification.

Hydromodification would occur in areas that drain to unlined channels. Areas that may drain to hardened channels or culvert systems, or areas that discharge to tidally influenced waterways are not subject to hydromodification. Based on the natural conditions waterway crossings within the project limits, all of the waterways, with the exception of Soda Springs Creek, were determined to have a "low" susceptibility for hydromodification as a result of the impervious surfaces added with the construction of the Build Alternative. Soda Springs Creek was determined to have a "moderate" risk for hydromodification.

The additional paved roadway surfaces that would be created under the Build Alternative would allow for an increased area for deposition of sediment and other pollutants from vehicular traffic that could be discharged from I-80 within the hydrologic study area, adversely affecting water quality in the area.

The Build Alternative proposes work within and near water bodies that are identified as Waters of the State and Waters of the U.S.; therefore, a 404 Permit from the U.S. Army Corps of Engineers and a 401 Water Quality Certification from the San Francisco Bay RWQCB will be required. Additional permits for the Build Alternative may include, but are not limited to, a 1602 Streambed Alteration Agreement from the California Department of Fish and Wildlife, and a Biological Opinion from the U.S. Fish and Wildlife Services. Each of the permits or agreements will detail specific temporary and permanent impacts to the appropriate jurisdiction, required actions to be used to avoid or minimize impacts to water resources, including special-status species associated with those resources, and detail specific mitigation efforts to enhance or restore these areas. Any impacts to the special-status species associated with the waterways within the hydrologic study area would be mitigated with re-vegetation, storm water treatment, or other requirements as designated by the relevant permits. See to **Section 2.3.2, Wetlands and Other Waters**, and **Section 2.3.4, Animal Species**, for a detailed description of the measures that shall be taken to protect water quality with respect to the special-status species would be affected by the Build Alternative.

Effects to Groundwater

Temporary Construction Related Effects

The groundwater depth beneath the study area ranges from shallow and close to the surface to a depth of 20 feet. Construction activities, such as excavation, could intrude into the groundwater table. If exposed, rainfall could carry loose soils and pollutants into the groundwater table, resulting in increased sedimentation and adverse effects to groundwater quality. Contamination of the groundwater could also occur during construction activities that require dewatering (the

removal of water from the subsurface prior to construction work). Temporary measures related to the protection of groundwater during construction activities are described below in **Measure WQ-1: Temporary Construction Best Management Practices (BMPs)**.

Permanent Operations Related Effects

As previously discussed, this Build Alternative would result in the addition of impervious area and reduce the available unpaved area that previously allowed runoff to infiltrate into the native soils. The reduction of runoff infiltrating through native soils has the potential to result in loss in volume or amount of water that previously recharged localized aquifers and reduce regional groundwater volumes. However, the increase in impervious area associated with the Build Alternative would not result in a measurable change to groundwater recharge, when compared to the overall size of the watersheds (see **Table 2.2-7**).

West Segment –Fundable First Phase

Construction of the West Segment would add 0.3 acres of new impervious surface. This is a very small amount (a 0.12 percent increase) in comparison to the existing impervious area of more than 200 acres. The added impervious area is not significant enough to change the drainage flow rate or impact to the groundwater. All storm water runoff will be properly conveyed through pipe, ditches, and bioretention swales.

Under the Build Alternative, the existing drainage patterns in the West Segment would not be altered. The existing flow rate is not expected to increase. There would be no effect to the groundwater and/or aquifer recharge. No dewatering is anticipated to be necessary during the construction of the West Segment.

No-Build Alternative

The No-Build Alternative assumes that I-80 would remain in its existing condition and no further action of improvements would occur. Under this alternative, the existing route would remain unchanged except for planned and programmed improvements including ramp metering, traffic operating systems (TOS), and pavement rehabilitation. The No-Build Alternative would therefore not affect the water quality conditions within the study area.

AVOIDANCE, MINIMIZATION, AND/ OR MITIGATION MEASURES

Build Alternative

Construction activities and operation of the roadway improvements would be regulated under the applicable Caltrans' NPDES permits and Storm Water Management Plan (SWMP) The features to address adverse effects to water quality are a condition of Caltrans' NPDES permit, Construction General Permit, and other regulatory agency requirements.

Implementation of details for these design features or BMPs would be developed and incorporated into the Build Alternative during the final design phase. Preliminary design of the storm water treatment areas for the Build Alternative is complete, as described in **Chapter 1.0,**

Proposed Project. The measures below outline the temporary and permanent BMPs to be implemented, at a minimum, but also incorporate project-specific requirements for the protection of the natural values of the waterways, and the special status species present within and adjacent to the project limits (see **Section 2.3, Biological Environment**).

To eliminate run-off of sediment from the proposed work area during and after construction, the Caltrans Storm Water Quality Handbooks – Project Planning and Design Guidelines would be used to determine the Best Management Practices (BMPs) that are appropriate to install. The potential for adverse effects to water quality will be avoided by implementing temporary and permanent BMPs outlined in Sections 13 and 21 of the Caltrans' Standard Specifications.

Measure WQ-1: Temporary Construction Best Management Practices (BMPs)

Pursuant to the Construction General Permit, A Storm Water Pollution Prevention Program (SWPPP) would be developed for the project and would comply with the Caltrans SWMP which includes guidance for Design staff to include special provisions in construction contracts to include measures to protect sensitive areas and to prevent and minimize storm water and non-storm water discharges.

The SWPPP would reference the Caltrans Construction Site BMPs Manual. This manual is comprehensive and includes many other protective measures and guidance to prevent and minimize pollutant discharges. **Table 2.2-8** outlines temporary BMPs to be implemented, at a minimum. Further evaluation of the BMPs necessary for the Build Alternative to comply with the permits and other regulatory agency requirements would be detailed during the final design phase.

Table 2.2-8 Temporary BMPs

Temporary BMP	Purpose
Soil Stabilization	
Move-In/Move-Out	Mobilization locations where permanent erosion control or revegetation to sustain slopes is required within the projects limits.
Temporary Cover	Plastic covers for stockpiles
Temporary Fence (Type ESA)	High visibility fence to designate areas off-limits to the contractor
Sediment Control	
Temporary Fiber Rolls	Degradable fibers rolled tightly and placed on the toe and face of slopes to intercept runoff
Temporary Silt Fence	Linear, permeable fabric barriers to intercept sediment-laden sheet flow. Placed downslope of exposed soil areas, along channels and project perimeter.
Temporary Gravel Bag Berm	Single row of gravel bags installed end to end to form a barrier across a slope to intercept runoff. Can be used to divert or detain moderately concentrated flows.
Temporary Check Dams	Small constructed device of rock or other product placed across a channel or ditch to reduce flow velocity.

Temporary BMP	Purpose
Temporary Drainage Inlet Protection	Runoff detainment devices used at storm drain inlets that is subject to runoff from construction activities
Hydraulic Mulch (Bonded Fiber Matrix)	Consists of applying a water-based mixture of wood or paper fiber and stabilizing emulsion with hydro-mulching equipment. This will protect disturbed soil from erosion by raindrop impact or wind.
Tracking Control	
Temporary construction entrances/exits	Points of entrance/exit to a construction site that are stabilized to reduce the tracking of mud and dirt onto public roads.
Street Sweeping	Removal of tracked sediment to prevent them entering a storm drain or watercourse.
Non-Storm water Management	
Temporary Creek Diversion	For work within live creeks. Prevents sediment and water from disrupting construction activities.
All other anticipated non-storm water management measures are covered under Job Site Management.	
Waste Management and Materials Pollution Control	
Temporary Concrete Washout Facilities	Specified vehicle washing areas to contain concrete waste materials.
All other anticipated waste management and materials pollution control measures are covered under Job Site Management.	
General measures covered under job site management includes: spill prevention and control materials management stockpile management waste management hazardous waste management contaminated soil concrete waste sanitary and septic waste and liquid waste Miscellaneous job site management includes: training of employees and subcontractors proper selection, deployment and repair of construction site BMPs	Non-storm water management consists of: water control and conservation illegal connection and discharge detection and reporting vehicle and equipment cleaning - No discharge of pollutants are allowed into the storm drain or watercourses vehicle and equipment fueling and maintenance – must be at least 50 feet away from water courses material and equipment used over water structure removal over or adjacent to water paving, sealing, saw cutting and grinding operations thermoplastic striping and pavement markers concrete curing and concrete finishing - concrete wastes is collected and disposed of and not allowed into watercourses.

Source: Caltrans, 2014s

Permanent BMPs

The design features to address water quality impacts are a condition of Caltrans' NPDES permit and other regulatory agency requirements. Implementation of details for these design features or BMPs would be developed and incorporated into the Build Alternative design prior to project construction.

Measure WQ-2: Design Pollution Prevention BMPs

The drainage and landscape elements listed below can be utilized as design pollution prevention BMPs for the Build Alternative, as specified by the Design Engineer. The following elements would be considered during the final design phase:

- *Consideration of downstream effects related to potentially increased flow*: The Build Alternative would discharge into unlined ditches; therefore, necessary erosion control would be applied to the ditches to minimize erosion downstream from potentially increased discharge.

- *Preservation of existing vegetation*: Preserving existing vegetation is beneficial. The Build Alternative would avoid any disturbance beyond what will be necessary to widen the existing transportation facilities.

- *Concentrated flow conveyance systems*: The Build Alternative has the potential to create water gullies, create and modify existing ditches, dikes, and berms, and require the concentration of surface flows. If necessary, flow attenuating devices would be implemented (e.g., flared-end-section, outlet protection/velocity dissipation devices).

- *Slope/Surface Protection Systems*: The Build Alternative would create or modify existing slopes. Necessary erosion control features would be incorporated for work along steep grades. When practicable, slope stability and erosion concerns would be reduced by maintaining or matching existing slopes.

- *Hydromodification*: In order to manage hydromodification, volume-reduction elements may be proposed during the design phase to match, or closely match, the pre- and post-construction hydrographs. Measures to address hydromodification impacts can include structural measures, such as underground detention, and non-structural measures, through the modification of proposed treatment BMPs (see **Measure WQ-3**). The proposed measures must be designed to show that storm water runoff discharge rates and durations match the pre-project conditions within a certain percentage of the peak flow rates during storm events.

  All creek crossings along the project limits were determined to have a "low risk" for hydromodification, with the exception of Soda Springs Creek, which was determined to have a "moderate risk" for hydromodification. Measures to address hydromodification should be prioritized at Soda Springs Creek, and considered at all the low risk receiving waters. If hydromodification measures are difficult to implement, and the receiving water

bodies are "low risk," then an exemption may be granted, at the discretion of the RWQCBs. A complete hydromodification susceptibility assessment and negotiation with the RWQCBs will be conducted during the final design phase.

Measure WQ-3: Treatment BMPs

Typical permanent treatment BMPs may include infiltration device such as vegetated basins and/or swales along the roadways that collect storm water runoff. The basins allow pollutants to settle and filter out prior to the storm water entering the drainage systems. Caltrans has an approved list treatment BMPs that have been studied and verified to remove targeted design constituents and provide general pollutant removal. In addition, the San Francisco RWQCB suggests the use of both infiltration and retention devices for pollutant removal or reduction while promoting the effort to mimic predevelopment hydrology by reducing flow rates and velocity and allowing for groundwater recharge. Although retention devices are not currently approved Caltrans BMP devices, the feasibility and determination of preferred treatment BMP type would be coordinated to ensure both Caltrans and regional requirements are met.

West Segment – Fundable First Phase

As previously discussed, under the Build Alternative, the existing drainage patterns in the West Segment would not be altered. The small amount of added impervious area (0.3 acre) is not significant enough to change the drainage flow rate or impact to the groundwater. There would be no effect to the groundwater and/or aquifer recharge within the West Segment. As such, the West Segment would be required to provide design pollution BMPs. Storm water will be treated to the maximum extent practicable. The project anticipates treating a total of 1.2 acres (0.3 acre of net added impervious surface and 0.9 acre of reworked area) of surface runoff with the proposed bioretention swale.

Because the West Segment would result in the disturbance of more than one acre of soil, it would have to comply with the NPDES construction General Permit. All temporary treatment BMP measures applicable to the Built Alternative would apply to the West Segment.

The Build Alternative would result in permanent and temporary effects to wetland and water features within the Caltrans right-of-way. A Section 404 permit would be required for the Build Alternative. Because the Build Alternative would require a 404 permit, a 401 Water Quality Certification from RWQCB would also be required. No work resulting in the alteration of a stream or lake is anticipated within the West Segment of the Build Alternative. Therefore, a Section 1602 Lake or Streambed Alteration Agreement with CDFW is not necessary for the West Segment.

2.2.3 GEOLOGY/SOILS/SEISMIC/TOPOGRAPHY

REGULATORY SETTING

For geologic and topographic features, the key federal law is the Historic Sites Act of 1935, which establishes a national registry of natural landmarks and protects "outstanding examples of major

geological features." Topographic and geologic features are also protected under the California Environmental Quality Act (CEQA).

This section also discusses geology, soils, and seismic concerns as they relate to public safety and project design. Earthquakes are prime considerations in the design and retrofit of structures. The Department's Office of Earthquake Engineering is responsible for assessing the seismic hazard for Department projects. Structures are designed using the Department's Seismic Design Criteria (SDC). The SDC provides the minimum seismic requirements for highway bridges designed in California. A bridge's category and classification will determine its seismic performance level and which methods are used for estimating the seismic demands and structural capabilities. For more information, please see the Department's Division of Engineering Services, Office of Earthquake Engineering, Seismic Design Criteria.

AFFECTED ENVIRONMENT

The evaluation of the geologic conditions within the project limits was conducted separately for the East and West Segments. Information presented in this section for the East Segment is based on a Preliminary Geologic Report (PGR) prepared for the project in 2014 (Caltrans, 2014o). The geologic conditions of the West Segment were evaluated in a 2006 PGR (Caltrans, 2006) and 2008 Geotechnical Design Report (Caltrans, 2008) previously prepared as part of the environmental review and final design of the I-80 HOV Lanes project. The 2006 and 2008 geotechnical evaluations cover the same limits along I-80 (Red Top Road to Airbase Parkway, PM R10.4 to PM 19.5) as the proposed West Segment of I-80 Express Lanes project, except for two overhead signs currently planned 1 mile and 0.5-mile west of where the express lanes would begin. Because the West Segment of I-80 Express Lanes project does not include any freeway pavement widening or bridge structure modifications, but rather primarily involves installation of tolling equipment and overhead signs, the subsurface conditions identified in the 2006 and 2008 geotechnical evaluations were used as the basis for the West Segment analysis. A technical memo was prepared to address the new geotechnical guidelines that were established after the 2006 and 2008 reports were approved, with minor additions and modifications to the information within the reports (Caltrans, 2013). Information presented in this section for the West Segment is based on the modified 2006 and 2008 geotechnical evaluations, along with supplemental information from the 2014 PGR prepared for the East Segment. Other resources used include geologic maps from California Geological Survey (CGS), soil surveys from the United States Department of Agriculture (USDA), and earthquake and hazards information from the Association of Bay Area Governments (ABAG).

The geologic study area represents the physical extent of all Build Alternative improvements, including construction activities and staging areas. The geologic study area includes various geologic features such as subsurface soils, topography, hydrogeology, geologic hazards, seismic hazards, and mineral resources that intersect and/or are adjacent to the I-80 corridor.

Topography and Hydrogeology

The geologic study area is found near the western margin of the Great Valley Geomorphic Province and eastern margin of the Coast Range Geomorphic Province, characterized by gently rolling foothills on the eastern side of the Diablo Mountain Range. The elevation of areas east of I-505 and I-80 interchange is approximately 57 feet above mean sea level (msl). The elevation then rises to 209 feet above msl in the area between Rivera Road and Lincoln Highway.

Based on review of recent groundwater data located near the study area (Caltrans, 2014s), groundwater within the project limits is encountered between 10 feet and 45 feet below ground surface within the East Segment, and between 3 feet and 20 feet within the West Segment. Groundwater elevations vary due to the amount of precipitation in a year. Subsurface and surface water from the study area generally follows the local topography and flows into Alamo Creek, Ulatis Creek, Horse Creek, and their associated tributaries. These waterways eventually flow into Suisun Bay, located approximately 8 miles southeast of the study area. See to **Section 2.2.1, Hydrology and Floodplains,** and **Section 2.2.2, Water Quality and Storm water Runoff,** for detailed information about hydrology throughout the project limits.

Geology and Subsurface Soils

No natural landmarks or other examples of major geologic features (such as scenic rock outcroppings) occur within the geologic study area. The geologic units encountered within the geologic study area can be grouped into the eight general categories summarized in **Table 2.2-9.**

Table 2.2-9 Geologic Units Encountered Within Project Limits

Geologic Time Scale	Type of Deposit
Holocene	Alluvial Fan Deposit. Alluvial fan deposits containing poorly sorted sand, gravel, silt, and clay. Deposits have been moved by streams coming from mountain drainages onto alluvial valleys. Found on fans, terraces, or basins.
Latest Pleistocene to Holocene	Alluvium. Conglomeration and various fragments of sand, silt, and clay deposits that form flat, consistent fans, terraces, and basins.
Late Pleistocene to Holocene	Alluvial fan deposits. Deposits contain sand, gravel, silt, and clay that is mapped on gently sloping, fan shaped semi-consistent alluvial surfaces.

Geologic Time Scale	Type of Deposit
Late Pleistocene	Fan Deposits. Moderately to poorly sorted and bedded gravel, sand, silt, and clay.
Eocene	Markley Sandstone. Massive, grayish-to yellowish-brown, medium to coarse-grained. Can easily break apart with water and is extremely susceptible to slope failure.
Late Cretaceous Age	Thick bedded, laminated fine to medium-grained sandstone with fairly thick beds of siltstone.
Late Cretaceous Age	Guinda Formation. Thick bedded, fine to medium grained sandstone with thick beds of siltstone.

Source: Caltrans, 2014o

The sediments within the Great Valley range from 5 to 10 kilometers in thickness and were mostly derived from erosion of the Sierra Nevada mountain range to the east. A portion of the Great Valley sediments originate from the Coast Ranges to the west. Narrow valleys and the large alluvial plain located north of the Delta and west of the Vaca Mountains are underlain primarily by unconsolidated Quaternary alluvium (sand, gravel, silt, and clay) and sedimentary rock.

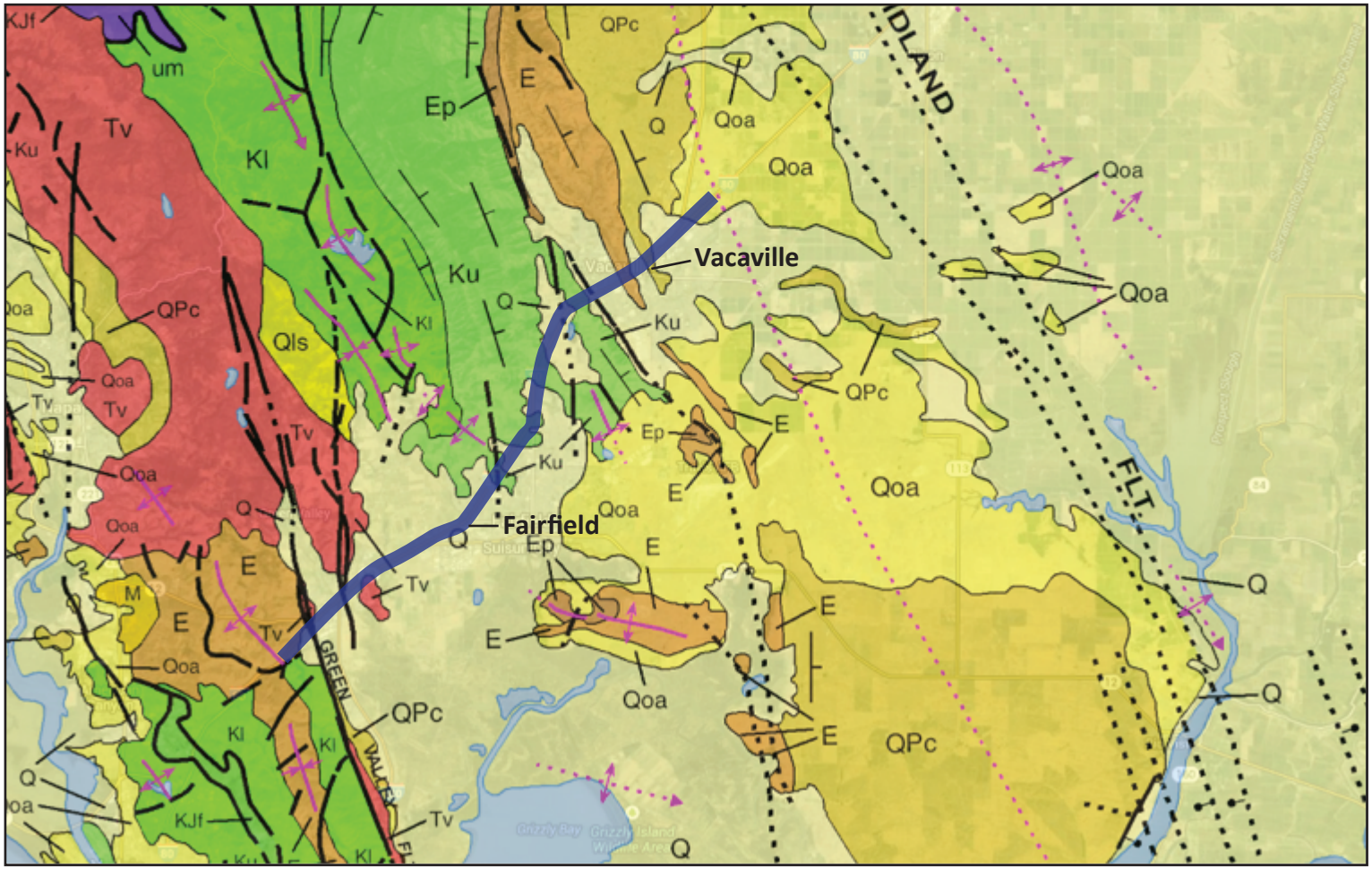
Generally, the subsurface soils within the project limits consist of medium to hard clayey silt/silt clay. However, portions of the project limits contain occasional pockets of soft silt/clay and or loose clayey sand, underlain by dense to very dense sand or weathered shale/claystone/siltstone/sandstone. **Table 2.2-10,** summarizes subsurface soil conditions found close to various bridge structures throughout the project limits. Additionally, **Figures 2.2-2a-2.2-2c**depicts the existing underlying bedrock of the geologic study area.

Table 2.2-10 Summary of Subsurface Soils

Bridge Structure Name	Subsurface Soil Conditions (From As-built Boring Logs)
N. Texas Street OC	Stiff to hard lean Clay or loose clayey Sand, underlain by weathered Sandstone and weathered Shale.
Cherry Glen Road Overcrossing	Loose Sand, underlain by very stiff to hard Clay, underlain by weathered Shale.
Rivera Road Overcrossing (Old Pleasanton Valley Overcrossing)	Very soft clayey Silt/sandy lean Clay with intermittent layer of loose clayey Sand, underlain by medium stiff to stiff sandy.

Bridge Structure Name	Subsurface Soil Conditions (From As-built Boring Logs)
Alamo Creek Bridge	Very stiff sandy clayey Silt, underlain by medium stiff silty Clay and/or medium dense silty Sand, underlain by weathered Shale.
Davis Street Overhead	Medium stiff silty Clay, underlain by soft silty Clay/clayey Silt with occasional pocket/lens of loose silty Sand, underlain by dense sand, underlain by Claystone.
Mason Street Overhead	Medium stiff to hard silty Clay/sandy lean Clay with intermittent layers of soft sandy lean Clay/clayey Silt or medium dense Gravel, underlain by very dense Sand, underlain by weathered Siltstone/Sandstone/Claystone.
Ulatis Creek Bridge	Very stiff to hard clayey Silt/silty Clay with intermittent layers of soft Silt/Clay and/or loose to medium dense silty Sand, underlain by dense to very dense Sand.
E-80-N505 Connector Separation	Stiff silty Clay, underlain by medium dense to very dense clayey Sand/silty Sand.
Horse Creek Bridge	Soft Silt and/or medium dense Sand, underlain by hard silty/sandy Clay and/or dense to very dense Sand.

Source: Caltrans, 2014o



NOT TO SCALE

Legend*

Project Limits

Quaternary Deposits: Qs, Q, Qls, Qg, Qoa, QPc

Quaternary Volcanic Rocks: Qrv, Qrv[p], Qv, Qv[p]

Tertiary Sedimentary Rocks: Tc, P, M, Mc, Ob, Obc, E, Ec, Ep

Tertiary Volcanic Rocks: Tv, Tv[p], Tl

Tertiary Plutonic Rocks: gr[x]

Mesozoic Sedimentary and Metasedimentary Rocks: TK, K, Ku, Kl, KJf, KJf[m], KJf[s], J, Tr, sch, ls

Mesozoic Mixed Rocks: gr-m

Mesozoic Metavolcanic Rocks: Mzv, mv

Mesozoic Plutonic Rocks: gr[ks], um, gb, gr

Paleozoic Sedimentary and Metasedimentary Rocks: Pz, Pm, C, D, SO, c

Paleozoic Mixed Rocks: m

Paleozoic Metavolcanic Rocks: Pzv

Paleozoic Plutonic Rocks: gr[k]

Pre-Cambrian Rocks: pC, pPC, gr[pC]

SYMBOLS

Geologic boundary

Fault traces - solid where well located, dashed where approximately located or inferred, dotted where concealed, and queried where continuation or existence is uncertain. Ball and bar on downthrown side (relative or apparent). Arrows indicate direction of lateral movement (relative or apparent).

Thrust fault (barbs on upper plate).

Regional strike and dip of stratified rocks.

Regional strike and dip of stratified rocks (overturned).

Anticlinal fold.

Synclinal fold.

Monoclinal fold.

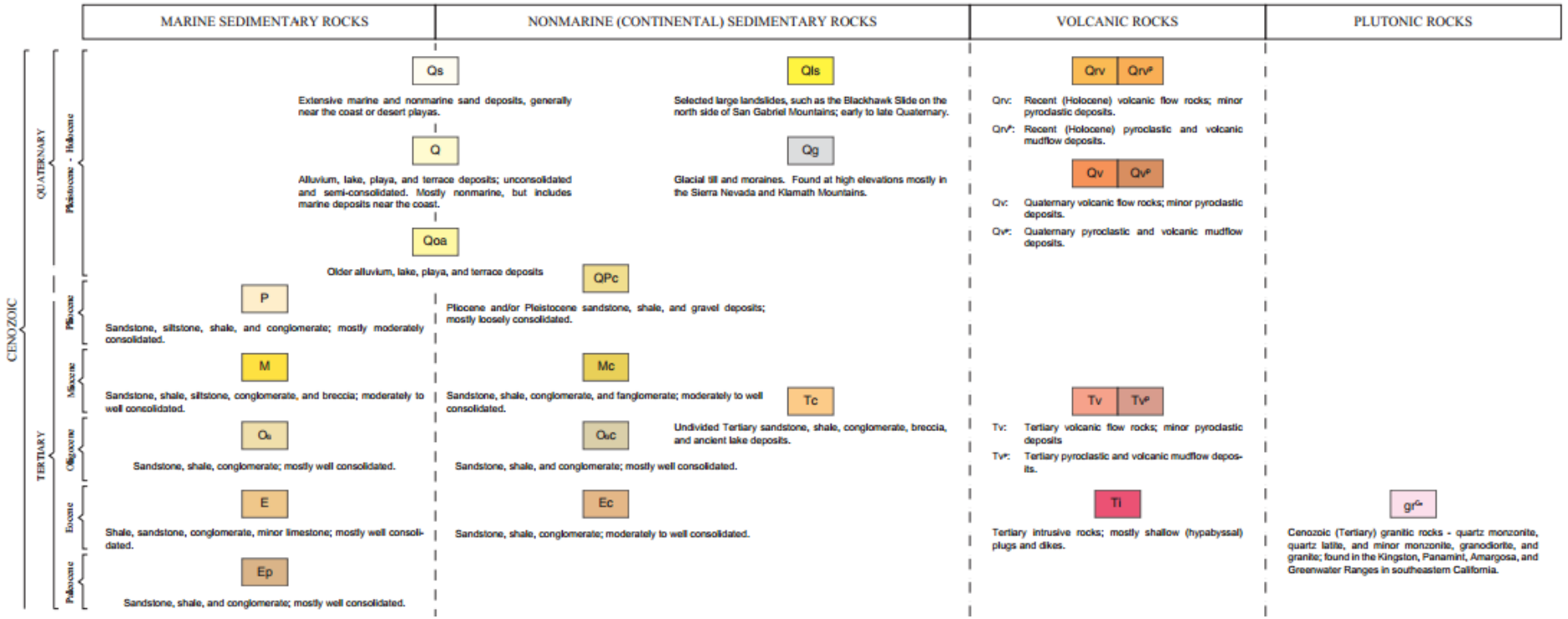
*See 2.2-2b for complete legend

N

Bedrock Geology

Figure 2.2-2a

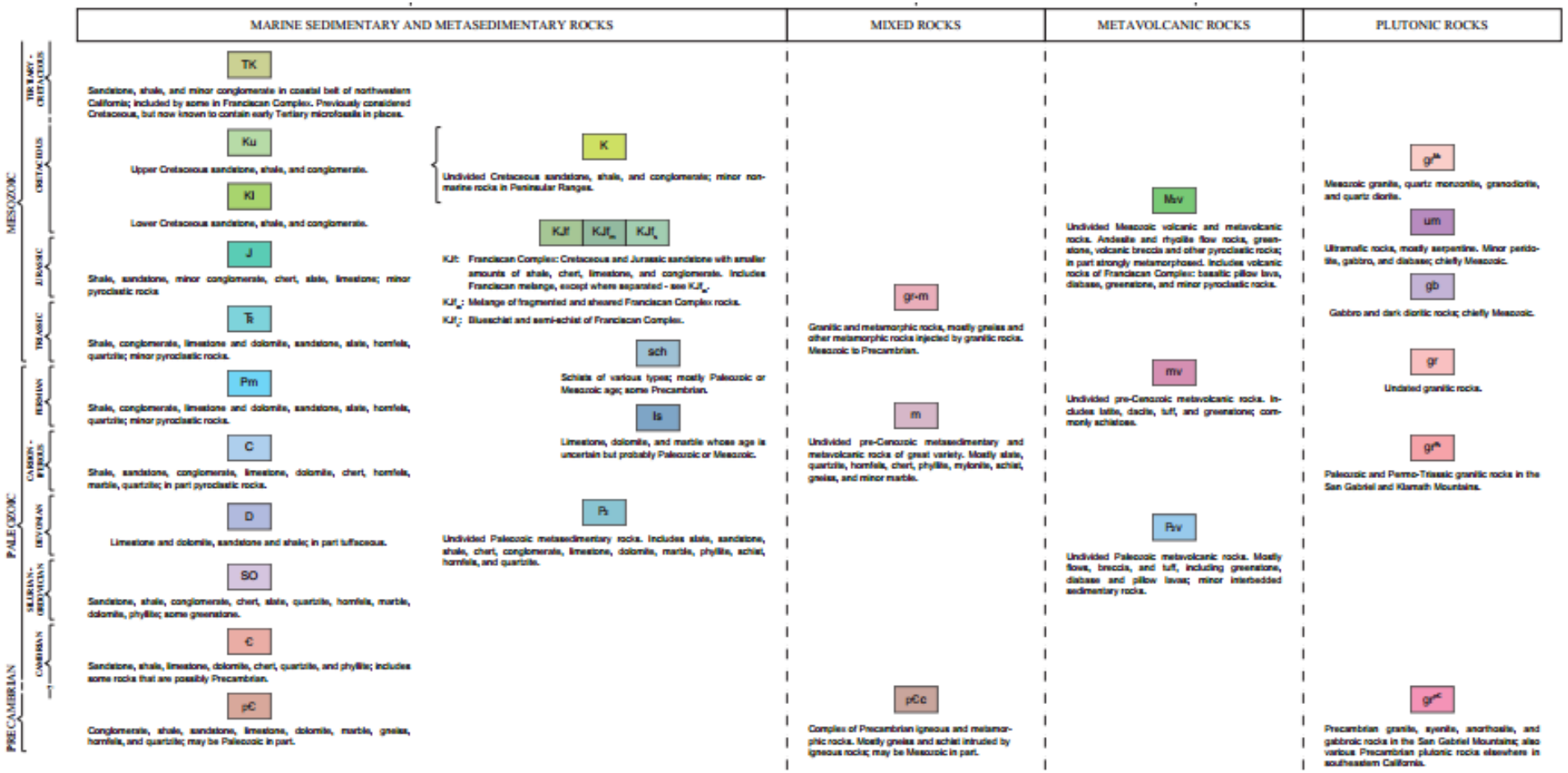
Source: California Department of Conservation, 2014



Bedrock Geology Legend

Figure 2.2-2b

Source: California Department of Conservation, 2014



Bedrock Geology Legend

Figure 2.2-2c

Source: California Department of Conservation, 2014

Geologic Hazards

Geologic hazards include soil erosion, subsidence, expansive soils, and corrosive soils.

Soil Erosion

Erosion is the breaking and movement of soil particles propelled by natural processes, such as wind, water, and ice. The rate in which soil erodes depends on the composition of soil, climate, and local landscape. Soil erosion can also be accelerated by human activities such as construction, vegetation removal, and excavation. Erosion from storm water run-off is the dominant natural erosion process in the project vicinity within the geologic study area. Long-term erosion impacts could include undercutting of roadways by uncontrolled storm water runoff and increased risks of landslides.

Generally**,** soils within the Build Alternative have a slight susceptibility to soil erosion. However, soils with a severe erosion hazard are located between at various locations between Air Force Base Parkway and Cherry Glen Road; and within 3,000 feet south of Alamo Creek Bridge.

Expansive Soils

Expansive soils are characterized by the potential for shrinking and swelling as the moisture content decreases and increases. Expansive soils can cause damage to roads, underground utilities, and other structures if not properly treated. Shrink-swell potential is influenced by the amount and type of clay minerals present and can be measured as a percent change of the soil volume. The geologic study area contains underlying Tehama Formation (Pliocene) (Tpth), which is made up of sand, silt, clay, and volcaniclastic gravel. The clay is a highly expansive soil and can cause structural damage. Such expansive soils are located within the northeast portion of the East Segment, near the Ulatis Creek Bridge and I-505/I-80 interchange.

Seismic Hazards

Primary seismic hazards include ground shaking and surface fault rupture. As a result, secondary hazards can occur in response to these primary hazards, such as liquefaction and landslides. The San Francisco Bay Area is considered one of the most active seismic regions in the United States.

The Vaca Valley Fault traverses the north portion of the project limits, extending along the eastern side of the Sacramento Valley and crossing beneath I-80 at the I-80/Alamo Drive interchange.

Unnamed faults, potentially related to the Vaca Fault, are apparent beneath I-80, approximately 1,500 feet northeast of the Rivera Road and 700 feet northeast of the Davis Street Overhead. The Vaca fault zone and the Great Valley 04b Gordon Valley are two known potentially active faults that intersect the eastern segment, trending in a northwest direction. Cordelia Fault and the Green Valley fault traverse the west segment near the I-680 and I-80 interchange. **Figure 2.2-3** depicts existing faults within the geologic study area and **Table 2.2-11** summarizes existing faults and their relative distance to the project limits.

Table 2.2-11 Existing Faults and Distance to Project Limits

Fault Name	Distance to Project Limits	Maximum Earthquake Potential
Great Valley 04b Gordon Valley Fault	Crosses East Segment near Allison Drive	6.7
Cordelia Fault	Crosses West Segment at I-680/I-80 interchange	6.5
Green Valley Fault	Crosses West Segment near Red Top Road	6.8
Vaca Fault Zone	Crosses East Segment at Alamo Drive	6.4
Great Valley 05 Pittsburg Fault	3 miles from East Segment at North Texas Street	6.6
Los Medanos-Roe Island Fault	8.5 miles from West Segment at Red Top Road	6.8

Source: Caltrans, 2014o

Surface Fault Rupture

Surface rupture occurs when the ground surface is broken due to fault movement during an earthquake. The location of surface rupture generally occurs along active fault trace. The California Geological Survey (CGS) delineates areas susceptible to surface fault rupture. Damages from surface fault rupture could indicate displacement of pavement, damage of underground utilities, and damage to bridge foundations.

The East Segment crosses several traces of active Vaca Fault Zones, while the West Segment crosses two active faults, the Cordelia Fault and Green Valley Fault (See **Table 2.2-11**). Therefore, the potential for surface rupture within these portions of the project limits is considered a moderate hazard.

Seismic Ground Shaking

Seismic ground shaking generally refers to all aspects of motion of the earth's surface resulting from an earthquake, and is generally the major cause of damage during a seismic event. Seismic ground shaking could result in deformation of man-made structures such as the collapse of bridges, the rupturing of underground pipelines, cracking, and distortion of pavement, sidewalks, walls and foundations.

Legend

Project Limits

104	Great Valley 04b Gordon Valley (Mmax=6.7)
106	West Napa fault zone (Browns Valley section) (Mmax=6.6)
107	Cordelia fault (Mmax=6.5)
108	Green Valley 2011 CFM (Mmax=6.8)
109	Vaca fault zone (Mmax=6.4)
111	Great Valley 05 Pittsburg Kirby Hills alt2 (Mmax=6.6)
114	West Napa fault zone (Napa County Airport section) (Mmax=6.6)
117	Contra Costa Shear Zone (connector) 2011 CFM (Mmax=6.5)
120	Los Medanos-Roe Island (Mmax=6.8)

N

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MILES

Fault Map

Figure 2.2-3

Source: Caltrans, 2014o

The extent of ground shaking is controlled by the magnitude and intensity of the earthquake, distance from epicenter and geological conditions. An epicenter is the point on the earth's surface above the focus point where the crust has ruptured. The magnitude of a seismic event is assessed by seismographs that measure the amplitude or seismic waves.

A maximum credible earthquake magnitude (Mmax) represents the largest earthquakes that could occur on any given fault. These predictions are based on the present understanding of the regional tectonic structure and available geological information. Refer to **Table 2.2-12** for the Mmax and **Figure 2.2-3** for the location of the listed faults in the vicinity of the geologic study area.

Table 2.2-12 Maximum Credible Earthquake Magnitude for Faults in the Vicinity of the Study Area

Caltrans Fault No.	Fault Name	Maximum Credible Earthquake Magnitude (Mmax)
104	Great Valley 04b Gordon Valley Fault	6.7
107	Cordelia Fault	6.5
108	Green Valley Fault	6.8
109	Vaca Fault Zone	6.4
111	Great Valley 05 Pittsburg Fault	6.6
120	Los Medanos – Roe Island Fault	6.8

Source Caltrans 2014o

Acceleration Response Spectrum (ARS) gives descriptive influence an earthquake would have on a specific buildings. According to the ARS, the earthquake potential within the project limits is considered high and therefore the project is subject to seismically-induced ground shaking. Peak Ground Acceleration (PGAs) obtains time differences of ground velocity and displacement of the ground. A high PGA equates to increased potential for damage. The Modified Mercalli Intensity scale (MMI) is the most commonly used scale to measure the subjective effects of earthquake intensity in values from I to XII. **Table 2.2-13** summarizes the MMI scale and PGA equivalents**.** The approximate MMI scale for bridge structures within the study area is VIII. The shaking in the West Segment is classified as having very strong to violent ground shaking, and the East Segment is classified as having strong ground shaking.

Table 2.2-13 Description of MMI scale and PGA Equivalent

MMI Scale	PGA (%g)	Potential Damage	Description of Ground Motion Intensity
I	<0.17	None	Not felt except by a very few under especially favorable circumstances.
II	0.17-1.4	None	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing
III	0.17-1.4	None	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	1.4-3.9	None	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	3.9-9.2	Very Light	Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	9.2-18	Light	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight
VII	18-34	Moderate	Everybody runs outdoors. Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	34-65	Moderate/ Heavy	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX	65-124	Heavy	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	>124	Very Heavy	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
XI	>124	Very Heavy	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	>124	Very Heavy	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted.

Source: Caltrans, 2014o

Liquefaction

Liquefaction is the temporary transformation of loose, saturated, granular sediments to a fluid like state as a result of seismic ground shaking. Soils temporarily undergo transient loss of strength, which commonly causes ground displacement such as lateral spreading. Cohesionless sands and silts that are relatively low density are more susceptible to liquefaction. Gravels and clays are more resilient to these types of seismic ground shaking hazards.

Liquefaction potential within the project limits is generally "low" to "moderate"; however, several portions of the project limits have "very high" liquefaction susceptibility. Liquefaction susceptibility in the following areas within the project limits would require additional investigation to determine the extent and magnitude of potential ground failure:

- northeast of Rivera Road to southwest of Laguna Creek
- Alamo Creek Bridge
- Mason Street Overhead
- Ulatis Creek Bridge

Landslides

Landslides can occur as rapid movement of large amounts of soil or unnoticeable slow movement of soils on slopes. The primary factors influencing the stability of a slope are the nature of the underlying soil or bedrock and the geometry of the slope (height and steepness). Landslides are generally triggered by rainfall, excavation, seismic activity, and removal of vegetation from slopes. Main factors that can contribute to landslides include the weather along with the composition of the underlying soil, bedrock, and slope. Expansive soils and weak bedrock are associated with slope failures (landslides) more so than any other factor.

Local topographic, geological, geotechnical, and subsurface groundwater conditions can pose a potential for permanent ground displacement. Within the project limits, areas with such landslide potential include:

- northeast of Greenfield Drive to northeast of Putah South Canal
- north of Manuel Campos Parkway to southwest of Blue Mountain Drive
- southwest of Lagoon Valley Road
- southwest of Alamo Creek
- southwest of Alamo Drive
- southwest of Alamo Drive to North of Alamo Creek

Historic landslides near the project limits appear to be localized and out of Caltrans right-of-way.

Mineral Resources

In compliance with the Surface Mining and Reclamation Act, the State and Mining and Geology Board has designated mineral resources in areas within California subject to irreversible land uses that would prevent mineral extraction. Land has been classified by the State Geologist into Mineral Resource Zones (MRZs) based on geologic and economic factors. MRZs include classification for construction materials, industrial and chemical mineral materials, metallic and rare minerals, and non-fluid mineral fuels. Maps of MRZs are intended to help identify and preserve significant mineral deposits for future use. MRZs are defined as follows:

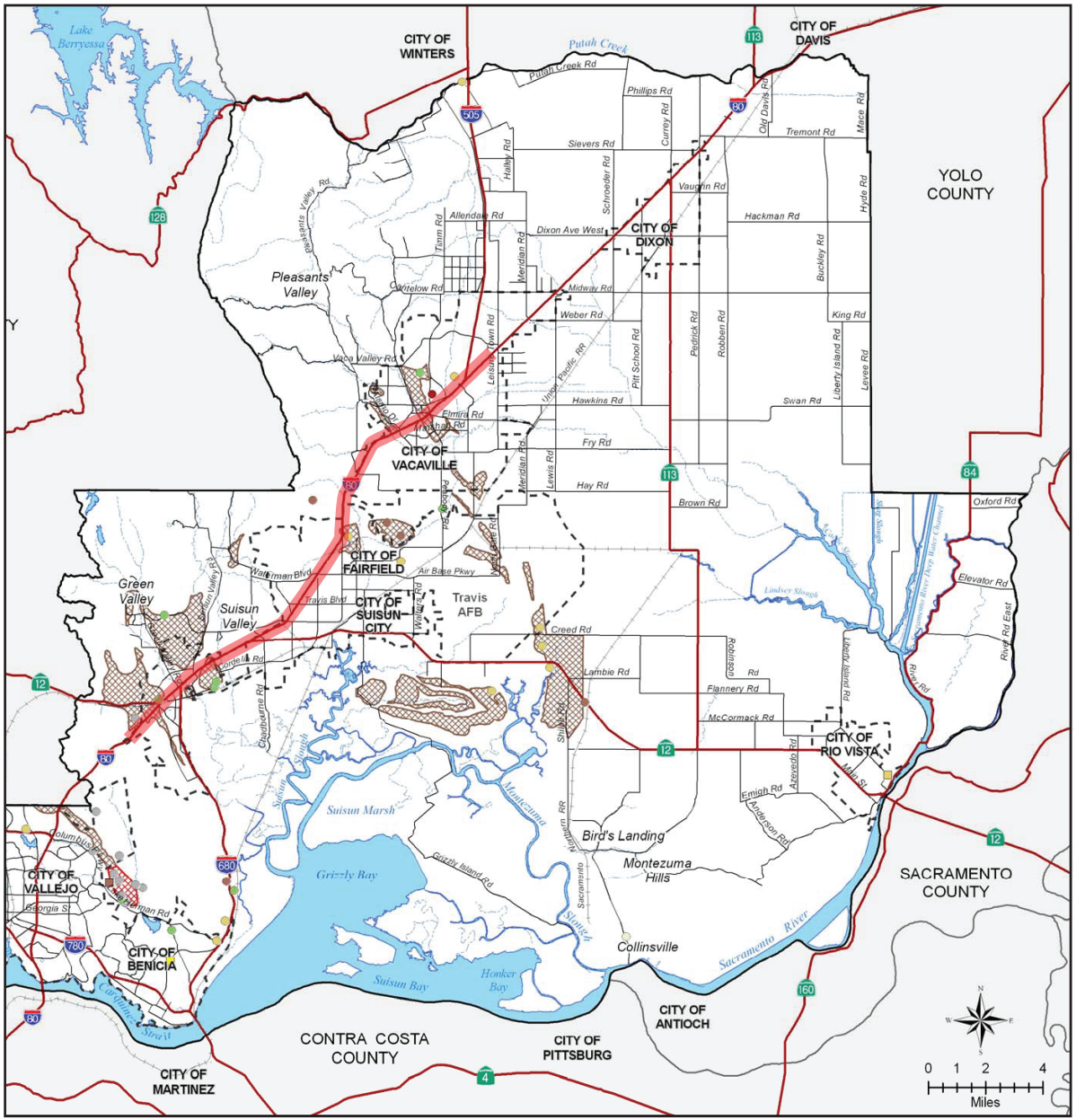
- MRZ-1= Areas where adequate information indicates that no significant mineral deposits are present, or it is judged that little likelihood exists for their presence
- MRZ-2= Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence
- MRZ-3= Areas containing known or inferred mineral deposits of which the significance is undetermined based on available data
- MRZ-4= Areas where available information is inadequate for assignment to any other MRZ zone

According to the Solano County General Plan, the county is rich with nonfuel mineral resources, including mercury, sand, clay, gravel, stone products, calcium, and sulfur. Pockets of such mineral resources are located within the I-80 corridor and are rated MRZ-3. There are three MRZs that cross the I-80 corridor, within the project limits. These three MRZs are located:

- crossing the I-80 between Hillborn Road and Dickson Hill Road within Fairfield's city limits
- intersecting the I-80 northeast of Vacaville approximately two miles southwest of the I-505 and I-80 intersection
- at the end of the West Segment project limit between Lincoln Highway and Cordelia Road and crossing the I-80

Solano County has a variety of stone, gravel, sand, mercury, and clay mines. According to the Mineral Resource Data System, three mines exist within 1 mile of the I-80 corridor. A sand and gravel mine are located east of the I-80 and west of Lincoln Highway in Fairfield. A clay mine is located northwest of I-80 and east of Brown Street in Vacaville. A sand and gravel mine is located west of the I-505 and northwest of the I-80. **Figure 2.2-4** depicts the intersections of MRZs, Active, and Processing plants within the I-80 corridor.

No oil, gas, or geothermal wells are mapped on or adjacent to the geologic study area.



Legend

- Project Limits

Active Mines & Mineral Processing Plants (2003)
- Crushed Stone
- Sand and Gravel
- Sulfur

Mine Locations (Mineral Resources Data System)
- Mercury
- Calcium
- Clay
- Mercury
- Sand and Gravel
- Stone
- Stone - Crushed/Broken
- Stone - Dimension

Mineral Resource Zones (SMARA, SR 146)
- MRZ-2: Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists
- MRZ-3: Areas containing mineral desposits, the significance of which cannot be evaluated from available data

Basemap Layers
- Roadways
- Highways
- Railroads
- Streams and Creeks
- Major Water Features
- Municipal Service Areas
- Adjacent Counties

N

0 1 2 4
MILES

Mineral Resources

Figure 2.2-4

Source: Solano County, 2008

ENVIRONMENTAL CONSEQUENCES

Build Alternative

Temporary Construction Related Effects

Construction activities, such as grading and excavation, could significantly impact the stability of existing soils and increase the overall potential for soil erosion. Road cuts that increase natural slopes can also increase the rate of soil erosion. During construction, erosion could cause sedimentation problems in storm drains, remove top soils, create deeply incised gullies on slopes, and undermine engineered fills beneath foundations or roadways.

Construction workers could be exposed to potential seismic hazards during installation of the proposed improvements since the Build Alternative is located in a seismically active region.

Permanent Operations Related Effects

The Build Alternative is located in a geologically hazardous and seismically active region. Without proper engineering, improvements could pose safety issues to people and structures as a result of soil erosion, subsidence, expansive soils, corrosive soils, surface fault rupture, seismic shaking, liquefaction, and landslides.

Mineral Resources

As shown on **Figure 2.2-4**, there are three areas classified as MRZ-3 with known or suspected significant mineral deposits. These areas have either formerly or are currently being mined for clay, sand, and/or gravel. Since the Build Alternative would be predominantly located within the existing right-of-way, proposed improvements would not substantially intrude on the current mining operations or the potential availability of local and statewide valuable minerals. Therefore, the Build Alternative would have no effect on existing or potential mineral resources.

West Segment -Fundable First Phase

The risks associated with the local geology and seismic conditions described above for the Build Alternative are applicable to the West Segment. There are no conditions or risks specific to West Segment that would change the conclusions of the environmental consequences previously identified.

No-Build Alternative

Under the No-Build Alternative, the freeway travel lanes along the I-80 corridor would remain as they currently exist. No bridge structures would be widened or replaced. Implementation of other planned and approved transportation projects would be subject to the same seismic and geologic hazards as the Build Alternative, since they would occur in the same seismically active region. These projects would be required to comply with Caltrans' standard design and construction guidelines and Occupational Safety and Health Administration (OSHA) requirements regarding seismic and geologic hazards, which would be determined under separate environmental review.

AVOIDANCE, MINIMIZATION, AND/ OR MITIGATION MEASURES

Build Alternative

Under the Build Alternative, any new or modified structures would be constructed in compliance with Caltrans' seismic design standards and construction guidelines. No avoidance, minimization, or mitigation measures would be required beyond the implementation of the Caltrans' standard specifications.

As described in **Section 2.2.2, Water Quality and Storm Water Runoff**, **Measure WQ-1**, erosion control measures would be implemented during construction activities in accordance with the best management practices outlined in the SWPPP. Protective measures would reduce soil erosion and minimize impacts to water quality, including groundwater.

Measure GEO-1: As part of the final design phase, Caltrans requires preparation of the geotechnical design reports that incorporate the results of additional subsurface field work and laboratory testing. Site specific subsurface soil conditions, slope stabilities, and groundwater conditions within the Build Alternative area would be verified during the preparation of these geotechnical design reports. The identification of the site specific soil conditions within the project limits would be used to determine the appropriate final design for the foundations and footings that would support the proposed Build Alternative improvements.

Caltrans' standard design and construction guidelines incorporate engineering standards that address seismic risks. Proposed structures including, retaining walls, sound walls, and embankments constructed within the geologic study area would consider seismically-induced liquefaction and settlement during the final design phase.

The final design phase would also include the evaluation of the Design Response Spectrum, which measures the ground motion or acceleration caused by the input of a vibration from an earthquake at a specific location and can help understand how structures would respond to earthquakes in a given place.

Measure GEO 2: With respect to worker safety during construction, OSHA requires employers to comply with hazard-specific safety and health standards. Pursuant to Section 5(a) (1) of Occupational Health and Safety Administration (OSHA), employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Potential seismic-related hazards to workers during construction are expected to be less than substantial with compliance with the OSHA and compliance with Caltrans' standard design and construction guidelines.

West Segment–Fundable First Phase

Caltrans' standard design and construction guidelines are applicable to the entire Build Alternative alignment, including the West Segment. No avoidance, minimization, or mitigation measures would be required beyond the implementation of the Caltrans' standard specifications.

2.2.4 PALEONTOLOGY

REGULATORY SETTING

Paleontology is the study of prehistoric life based primarily on the study of fossil plants and animals. A number of federal statutes specifically address paleontological resources, their treatment, and funding for mitigation as a part of federally authorized projects (e.g., Antiquities Act of 1906 [16 USC 431-433], Federal-Aid Highway Act of 1960 [23 USC 305]). The Antiquities Act prohibits appropriating, excavating, injuring, or destroying any object of antiquity situated on federal land without the permission of the Secretary of the Department of Government having jurisdiction over the land. Fossils are considered "objects of antiquity" by the Bureau of Land Management, the National Park Service, the Forest Service, and other federal agencies. The Federal-Aid Highway Act of 1960 authorizes the appropriation and use of federal highway funds for paleontological salvage as necessary by the highway department of any state, in compliance with the Antiquities Act above and state law. In addition, 23 United States Code (USC) 1.9(a) requires that the use of federal-aid funds must be in conformity with federal and state law.

Under California law, paleontological resources are protected by CEQA.

AFFECTED ENVIRONMENT

Paleontological information for this section is based on the Paleontological Evaluation Report prepared for the project (Caltrans, 2014n). The geologic study area defined in **Section 2.2.3, Geology/Soils/Seismic/Topography**, is used in this evaluation of potential sensitivities for paleontological resources (i.e., vertebrate, invertebrate, and plant fossils), and includes those geologic units within which the Build Alternative improvements would be located.

The geologic units encountered within the project limits include units from the Holocene, Pleistocene, Eocene, and Cretaceous periods. **Table 2.2-14** presents a summary of the geologic units within the study area, and their respective paleontological sensitivities. The distribution of these units is illustrated in **Figure 2.2-5**.

If a paleontological resource cannot be avoided, then it is necessary to determine its significance or scientific importance before any mitigation measures are proposed. This may be stated for a particular fossil species, fossil assemblage, or for a rock unit as a whole. Definitions of a scientifically significant paleontological resource can vary by jurisdictional agency and paleontological practitioner. Generally, scientifically significant paleontological resources are identified sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally. Particularly important are fossils found *in situ* (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization).[5]

[5] Caltrans Standard Environmental Reference, Volume 1, Chapter 8, Paleontology (see *Definitions of Significance and Sensitivity*). Available: http://www.dot.ca.gov/ser/vol1/sec3/physical/Ch08Paleo/chap08paleo.htm#per; Last Accessed: April 11, 2014.

Table 2.2-14 Paleontological Sensitivities of Geological Units within Project Limits

Map Symbol	Age	Formation	Lithology	Project Segment Affected	Known Paleontological Resources	Paleontological Sensitivity
af	Holocene to Historic	Artificial Fill	Undifferentiated man-made deposits of various materials and ages	West	No significant resources	None
Qls	Pleistocene to Holocene	Quaternary landslide deposits	Chaotic, poorly-sorted deposits ranging in grain-size from clay to boulders	West	No significant resources	Low
Qha, Qhf, Qhff, Qhc, Qhl	Holocene	Holocene Alluvial Deposits	Poorly consolidated, younger alluvial deposits consisting of silt, sand, and gravel deposited in stream channels, basins, and on alluvial fans.	West, East	No significant resources	Low
Qa, Qf, Qpf	Late Pleistocene to early Holocene	Pleistocene Alluvial Deposits	Poorly consolidated older alluvial deposits consisting of silt, sand, and gravel deposited in basins and on alluvial fans. Mostly late Pleistocene in age but some units (Qa and Qf) include early Holocene sediments as well.	West, East	Vertebrates, including mammoth, ground sloth	High
Tpth	Plio-Pleistocene	Tehama Formation	Poorly consolidated siltstone, sandstone, tuff, and conglomerate	East	Vertebrates including horse, camel, sloth, tortoise	High
Tsv, Tsvt	Pliocene	Sonoma Volcanics	Rhyolite ash flows, andesite	West	Horse remains and plants	High

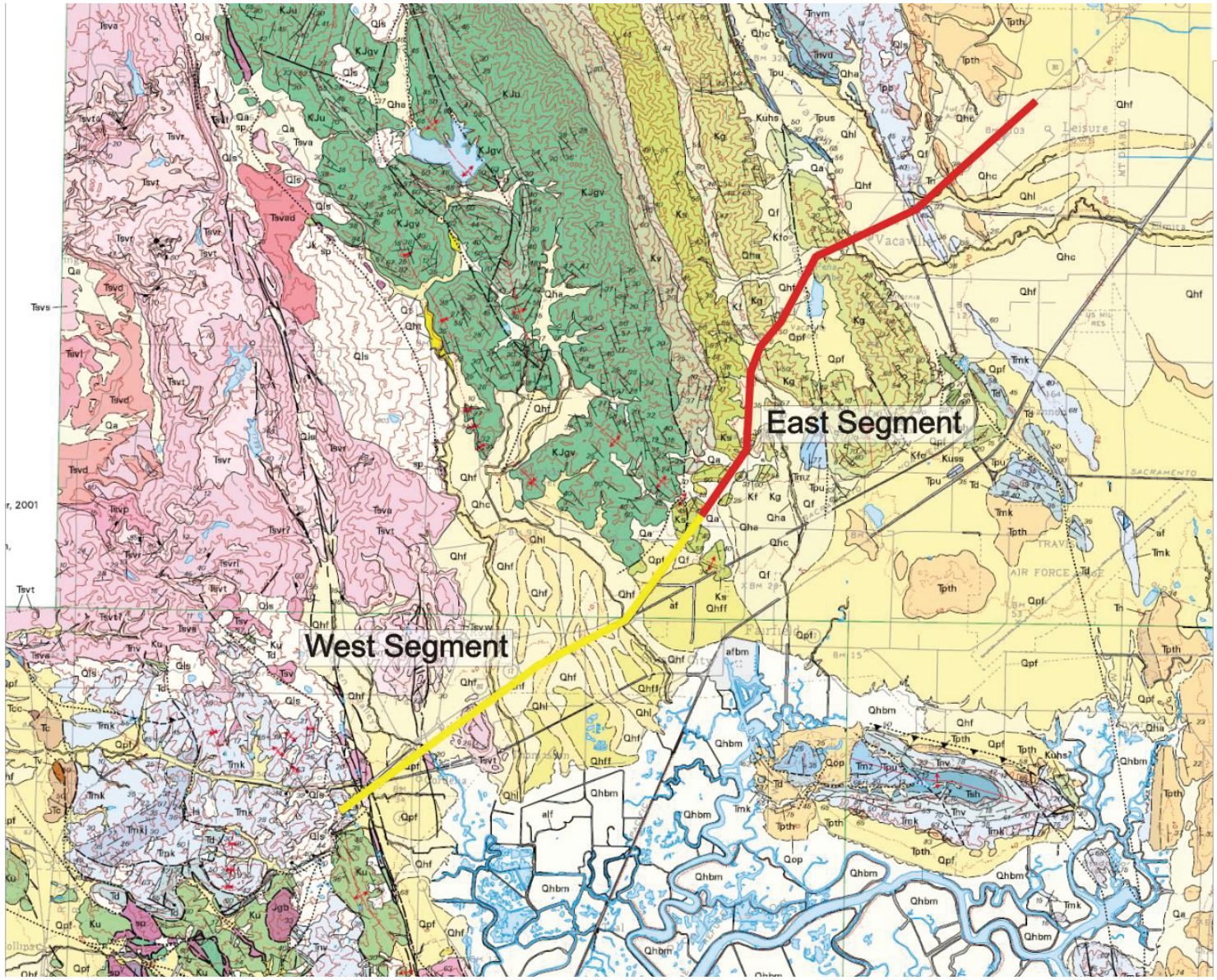
Map Symbol	Age	Formation	Lithology	Project Segment Affected	Known Paleontological Resources	Paleontological Sensitivity
			lavas, and volcaniclastic sedimentary deposits			
Tn	Miocene	Neroly Formation	Fine to coarse-grained marine lithic sandstones	East	Vertebrates, invertebrate, plants	High
Tmk	Eocene	Markley Formation	Fine to coarse-grained quartz-muscovite and quartz-lithic sandstone and siltstone	West, East	Fish remains and invertebrates	High
Kg, Kf, Ks	Cretaceous	Great Valley Sequence (Guinda, Funks, and Sites formations)	Deep-marine sandstones and siltstones	West, East	Rare invertebrates (ammonoids) and marine microfossils	Low

Table Notes:
A. Symbols correspond to map on **Figure 2.2-5**
Source: Caltrans, 2014n

Cretaceous Great Valley Sequence

The Early to Late Cretaceous Great Valley Sequence is composed of interbedded sandstones, mudstones, and shales deposited on a submarine fan along the continental margin. Within the project limits the Great Valley Sequence has been differentiated into three separate formations:.

- **Sites Formation:** The Sites Formation crops out towards the eastern end of the West Segment, from just west of the Waterman Boulevard/Airbase Parkway intersection to the eastern project limits. It also crops out within the East Segment from the western project limits to just north of the Soda Springs Road/Lyon Road intersection.
- **Funks Formation:** The Funks Formation crops out only within the East Segment, from the Dickson Hill Road/North Texas Street intersection to just south of the Blue Mountain Drive/Lyon Road intersection near the City of Fairfield.
- **Guinda Formation:** The Guinda Formation crops out within the East Segment from north of the Soda Springs Road/Lyon Road intersection, along Nelson Road north of Manuel Campos Parkway, at the Lagoon Valley Road/Lyon Road intersection, and where Cherry Glen Road joins I-80 within and near the City of Fairfield.



Legend

LIST OF MAP UNITS
SURFICIAL DEPOSITS

- af — Artificial fill (Holocene, historic)
- Qha — Alluvium (Holocene)
- Qhf — Alluvial fan deposits (Holocene)
- Qhff — Fine-grained alluvial fan deposits (Holocene)
- Qhc — Stream channel deposits (Holocene)
- Qhl — Natural levee deposits (Holocene)
- Qa — Alluvium (Holocene and late Pleistocene)
- Qf — Alluvial fan deposits (Holocene and late Pleistocene)
- Qls — Landslide deposits (Holocene and Pleistocene)
- Qpf — Alluvial fan deposits (late Pleistocene)
- Tpth — Tehama Formation (Pliocene)
- Tsv — Sonoma Volcanics (Pliocene and late Miocene)
- Tsvt — Ash-flow tuff
- Tn — Neroly Sandstone (late Miocene)
- Tmk — Markley Sandstone (Eocene)

Great Valley Complex

- Kg — Gunda Formation (Late Cretaceous)
- Kf — Funks Formation (Late Cretaceous)
- Ks — Sites Formation (Late Cretaceous)
- Ku — Undivided sandstone, siltstone, and shale (Late Cretaceous)

N

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MILES

Paleontological Deposits

Figure 2.2-5

Source: Caltrans, 2014n

Marine fossils and microfossils have been reported from the Sites, Funks, and Guinda Formations. Reports of other invertebrate fossil localities without catalogued specimens have been documented in all three geologic units from Yolo and Glenn counties. However, none of the reported fossil localities are from Solano County. No vertebrate remains have been previously reported from the Great Valley Sequence stratigraphic units exposed in the study area. During the field survey, unidentifiable plant fragments were observed at a construction site just south of the project limits, located near the North Texas Street and Manual Campos Parkway intersection within the City of Fairfield. While these fossils are not significant, they indicate that conditions favorable for fossil preservation can occur within sediments of the Great Valley Sequence within the study area.

Eocene Markley Formation

The Markley Formation consists of fine- to coarse-grained muscovite-rich sandstone and siltstone with thin interbeds of foraminiferal mudstone. Plant debris is locally abundant within the mudstone beds. Within the study area, the Markley Formation occurs at the ground surface near the following locations:

- where Red Top Road crosses I-80, near Cordelia (West Segment)
- between Davis Street and Mason Street, on the north side of I-80, near the City of Vacaville (East Segment)
- between Davis Street and Elmira Road on the south side of I-80, near the City of Vacaville (East Segment)

The Markley Formation has produced an extremely diverse and important assemblage of fossils, including invertebrates and fish. Owing to the favorable conditions for fossil preservation and the significant fossils previously reported from this unit, the Markley Formation has a have high paleontological sensitivity.

Miocene Neroly Formation

Within the study area, the Neroly Formation is found at the ground surface at the following locations within the East Segment, near the City of Vacaville:

- where Sharpe Road merges with I-80, on the east side of I-80
- along Callen Street, just east of the Callen Street/East Monte Vista Avenue intersection on the west side of I-80

Neroly fossil localities have produced an extremely diverse and important assemblage of fossils, including plants and animals. The floral assemblage is particularly significant as it provides important data for the reconstruction of the paleotopography and paleoclimate of the western United States during the middle to late Miocene. Because significant fossils have been previously reported from this unit, the Neroly Formation has a high paleontological sensitivity.

Pliocene Tehama Formation

Within the study area, the Tehama Formation crops out only in the East Segment and is present between:

- Allison Drive and Callen Street to the north of I-80
- Allison Drive and Travis Way south of I-80

The Pliocene Tehama Formation is composed of fluvial sedimentary deposits of semi-consolidated pale-green, gray, and tan sand, tuffaceous sand, silt, and clay with discontinuous lenses of gravel that coarsen to the west. Locally, the Tehama Formation forms rounded hills with moderate relief and a thin soil cover.

The diverse fossil assemblage from the Tehama Formation documents faunal and environmental conditions in California not long before the Pleistocene transition. Because vertebrate fossils have been previously reported from this unit, the sediments belonging to the Tehama Formation exists are assigned a high paleontological sensitivity.

Pliocene Sonoma Volcanics

Within the study area, the Pliocene Sonoma Volcanics crop out only along the West Segment in the following locations:

- south of Suisun Parkway on the north side of I-80, between Fairfield Linear Park and Kaiser Drive
- south side of I-80, north of Cordelia Road, between Mountain Meadow Drive and Fairfield Linear Park

The majority of the volcanic units are poorly fossiliferous. However, the sedimentary units, such as the lacustrine and fluvial deposits, and some of the tuffs, are fossiliferous and have previously produced vertebrate fossils as well as highly significant fossil floras, including a petrified forest near Calistoga. Because vertebrate fossils have been previously reported from this unit, the Sonoma Volcanics are assigned a high paleontological sensitivity.

Pleistocene Alluvial Deposits

Pleistocene alluvial deposits occur at or near the surface along the entire project limits and consist of crudely bedded, moderately to poorly sorted, brown gravely and clayey sand that fines upward to sandy clay. These deposits are located along ancient stream channels and can be distinguished from younger alluvial deposits by their higher topographic position, greater degree of dissection, development of alfisols, and lesser permeability than younger deposits.[6]

[6] Alfisols are a soil order in USDA soil taxonomy. Alfisols form in semiarid to humid areas, typically under a hardwood forest cover. They have a clay-enriched subsoil and relatively high native fertility. "Alf" refers to aluminum (Al) and iron (Fe).

Sedimentary units mapped as Pleistocene Alluvium in Solano County have previously produced abundant fossils representing many extinct taxa. Although no indications of fossils were seen at the surface in the exposed Pleistocene Alluvium during the field survey, since abundant fossil vertebrates have been previously reported elsewhere from this unit in similar sediments. There is a potential that additional significant paleontological resources will be found in sediments of the Pleistocene Alluvium during excavations for the Build Alternative. Because vertebrate fossils have previously reported from this unit and from localities not far from the study area, the Pleistocene alluvial deposits are assigned a high paleontological sensitivity.

Holocene Alluvial Deposits

Within the study area, the alluvial deposits may be found at the surface along the entire project limits, and consist poorly sorted, and moderately to poorly bedded, clay, silt, sand, and gravel deposited in fan, valley fill, terrace, or basin environments. These deposits are too thin and too young for the preservation of fossils and, over much of the study area, are already disturbed. This unit is, therefore, assigned a low paleontological sensitivity.

Artificial Fill

Because artificial fill is manmade, it has no potential to produce significant fossils. Any fossils found in artificial fill would not be considered paleontologically significant since they are no longer in-situ, and as such, have been removed from their stratigraphic context.

ENVIRONMENTAL CONSEQUENCES

Build Alternative

The Build Alternative includes a wide range of construction activities. However, only those that could potentially impact significant paleontological resources, typically through excavation or earth-moving, are of concern. Both segments of the Build Alternative would have excavation activities that could potentially impact geological units of both high and low sensitivities for producing significant paleontological resources.

Potential effects to paleontologically sensitive geological units would be avoided to a large extent because most of the construction work associated with the Build Alternative would occur within the existing I-80 right-of-way. Artificial fill and previously disturbed sediment underlie most, if not all of, the freeway right-of-way to a depth of 3 to 6 feet. Planned clearing, grading, augering, and excavations associated with the Build Alternative that only disturbs the artificial fill or previously disturbed material would not result in adverse effects to paleontological resources.

However, because highly sensitive sediments are found at or near the surface along some sections of the study area, any ground disturbance deeper than 3-6 feet could have adverse effects on significant paleontological resources. Other construction activities that could adversely impact paleontological resources could include:

- excavations for overhead sign foundations (22-45 feet below ground surface) and reader foundations (estimated depth of 11 feet)
- modification of drainage ditches
- modification of structures (East Segment)
- construction of retaining walls (East Segment)

West Segment – Fundable First Phase

The risks associated with the local geology and paleontological sensitivities described above for the Build Alternative are applicable to the West Segment. Excavations for the West Segment could impact the Sites Formation of the Great Valley Sequence, the Markley Formation, the Sonoma Volcanics, and Pleistocene and Holocene alluvial deposits. Of these geological units, the Markley, and Neroly formations, as well the Sonoma Volcanics and Pleistocene alluvial deposits have a high potential for producing significant paleontological resources.

As previously discussed, potential effects to paleontologically sensitive geological units would be avoided to a large extent because most of the construction work would not create ground disturbance greater than 3 to 6 feet below ground surface, and would occur within the existing I-80 right-of-way. This is particularly true for the proposed West Segment improvements that are mostly related to the restriping and repurposing of existing HOV lanes.

No-Build Alternative

The No-Build Alternative assumes that the freeway travel lanes along northbound I-680 would remain as they currently exist. No bridge structures would be widened or replaced. Implementation of the other planned and approved transportation projects in the vicinity would be subject to the same paleontological sensitivities as the Build Alternative, since they would occur in the same geologic region. These projects would be required to comply with Caltrans' standard design and construction guidelines regarding paleontological resources, which would be determined under separate environmental review.

AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

Mitigation Measure PAL-A: Monitoring and Mitigation Program

During the final design phase of the project, a qualified professional paleontologist would be retained to both design a monitoring and mitigation program, and implement the program during project-related excavation and earth disturbance activities. The paleontological resource monitoring and mitigation program would include:

- preconstruction coordination
- construction monitoring

- emergency discovery procedures
- sampling and data recovery, if needed
- preparation, identification, and analysis of the significance of fossil specimens salvaged, if any
- museum storage of any specimens and data recovered
- reporting

This program will be described in the Paleontological Mitigation Plan (PMP), which will be prepared by the qualified professional paleontologist during the design phase of the project. The PMP will also describe fieldwork and laboratory methods; curation requirements; report format, content, and distribution; and proposed staff and their qualifications.

Prior to the start of construction, the professional paleontologist would conduct a field survey of exposures of sensitive geological units within the construction footprint that would be disturbed. Earth-moving construction activities would be monitored and inspected for the presence of potentially fossiliferous sediments. Ground disturbance and earth-moving activities will only require paleontological mitigation if they will impact a geologic unit of high potential to produce significant fossils either because that unit occurs at the surface or excavation could encounter it at depth.

Activities that occur solely within units with low potential to produce significant fossils (i.e., Guinda, Sites, and Funks formations of the Great Valley Sequence; and Holocene Alluvial deposits) and solely within previously disturbed material underlying the I-80 right-of-way, would not require mitigation. Monitoring would not need to be conducted in sediments that have been previously disturbed or in areas where exposed sediments would be buried, but not otherwise disturbed.

Prior to the start of construction, construction personnel involved with earth-moving activities would be informed that fossils could be discovered during excavating, that these fossils are protected by laws, on the appearance of common fossils, and on proper notification procedures should fossils be discovered. This worker training would be prepared and presented by a qualified professional paleontologist.

West Segment–Fundable First Phase

Mitigation Measure PAL-1 is applicable to the West Segment. No avoidance, minimization, or mitigation measures specific to West Segment would be required beyond the implementation of the Monitoring and Mitigation Program outlined above.

2.2.5 HAZARDOUS WASTE/MATERIALS

REGULATORY SETTING

Hazardous materials, including hazardous substances and wastes, are regulated by many state and federal laws. Statutes govern the generation, treatment, storage and disposal of hazardous materials, substances, and waste, and also the investigation and mitigation of waste releases, air and water quality, human health and land use.

The primary federal laws regulating hazardous wastes/materials are the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Resource Conservation and Recovery Act of 1976 (RCRA). The purpose of CERCLA, often referred to as "Superfund," is to identify and clean up abandoned contaminated sites so that public health and welfare are not compromised. The RCRA provides for "cradle to grave" regulation of hazardous waste generated by operating entities. Other federal laws include:

- Community Environmental Response Facilitation Act (CERFA) of 1992
- Clean Water Act
- Clean Air Act
- Safe Drinking Water Act
- Occupational Safety and Health Act (OSHA)
- Atomic Energy Act
- Toxic Substances Control Act (TSCA)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

In addition to the acts listed above, Executive Order (EO) 12088, *Federal Compliance with Pollution Control Standards*, mandates that necessary actions be taken to prevent and control environmental pollution when federal activities or federal facilities are involved.

California regulates hazardous materials, waste, and substances under the authority of the CA Health and Safety Code and is also authorized by the federal government to implement RCRA in the state. California law also addresses specific handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning of hazardous waste. The Porter-Cologne Water Quality Control Act also restricts disposal of wastes and requires clean-up of wastes that are below hazardous waste concentrations but could impact ground and surface water quality. California regulations that address waste management and prevention and clean up contamination include Title 22 Division 4.5 Environmental Health Standards for the Management of Hazardous Waste, Title 23 Waters, and Title 27 Environmental Protection.

Worker and public health and safety are key issues when addressing hazardous materials that may affect human health and the environment. Proper management and disposal of hazardous material is vital if it is found, disturbed, or generated during project construction.

AFFECTED ENVIRONMENT

The analysis summarized in this section is based on an Initial Site Assessment (ISA) prepared for the project (Caltrans, 2014i). The analysis focuses on determining whether health risks related to hazardous materials are present within the physical extent of all Build Alternative improvements, including construction activities and staging areas.

The ISA included an environmental regulatory database search, which identifies known hazardous waste sites that could negatively impact the project. A regulatory agency files review of selected sites of potential concern, a review of historical and current land use information, and a site reconnaissance survey were also conducted as part of the ISA. The ISA was prepared in accordance with ASTM E1527 05 and the Caltrans' Project Development Procedures Manual and Standard Environmental Reference.

Data sources related to historical land uses, current land uses, and environmental records from regulatory agencies were reviewed to identify known or potential sites associated with hazardous materials within one mile of the project limits. These sites were then evaluated to identify known or potential releases of hazardous materials that could impact soils and/or groundwater beneath the physical footprint of the proposed Build Alternative. Following the review of data sources and evaluation of hazardous materials release sites, each site was assigned a level of risk related to the potential impacts to the project.

The limits of the ISA database searches and survey were determined by using the footprint of proposed Build Alternative construction activities, which is not a single contiguous commercial parcel, as assumed in ASTM E1527-05. Interviews with past, present, and prospective owners or operators likely to have material information regarding the potential for contamination beneath the proposed improvements were not conducted because such persons could not be identified. Interviews with state or local government officials were not conducted, because any information obtained would likely duplicate information already reviewed from federal, state, and local regulatory agency records.

Summary of Findings

The ISA identified several hazardous material release sites and former land uses that may have contaminated soils and/or groundwater that would potentially be encountered during project construction. Disturbance of contaminated media during construction could adversely impact human health and the environment. These locations, along with other environmental concerns associated with the I-80 corridor, are discussed in greater detail below, as they relate to the environmental consequences of the proposed project.

ENVIRONMENTAL CONSEQUENCES

Build Alternative

Hazardous Material Release Sites

A search of environmental regulatory databases was conducted for the I-80 corridor and surrounding properties within the project limits. The sites identified in the database search were evaluated with respect to their potential to adversely affect the soils and/or groundwater that would be encountered during project construction. Three main criteria were used to evaluate whether the listed sites warranted further consideration: (1) proximity to the site (less than 1/8 mile); (2) hydraulically upgradient with respect to groundwater flow; and (3) hydraulically upgradient of the site with respect to surface water flow/storm water runoff.

In 2012 California Regional Water Quality Control Board adopted a new set of standards for closure of sites impacted with petroleum hydrocarbons (e.g., gasoline and/or diesel). In summary, these low risk standards allow for site closure if the plume is well defined, there are no free-floating hydrocarbons in the groundwater, there are no bodies of water nearby, and vapor risk to future occupants are mitigated. While many sites have been granted closure, there is a still a potential risk that the site may adversely impact adjacent sites. Accordingly, the analysis of potential release sites included "closed" sites.

Within the West Segment, the regulatory review did not identify any listed sites that would be of potential concern. Within the East Segment, the regulatory review identified the seven sites that would be of potential concern, as listed in **Table 2.2-15**.

Table 2.2-15 Hazardous Release Sites of Potential Concern – East Segment

Site	Name and Location	Status
1	ARCO #2067 Service Station, 310 Orange Drive, Vacaville	This site is currently undergoing groundwater monitoring. During the site visit groundwater monitoring wells were observed on Orange Drive between this site and I-80 entrance. Review of the 4th Quarter 2012 groundwater monitoring report, reveals a gentle groundwater gradient trending towards the freeway right-of-way. Two of the monitoring wells located on the west side of Orange Drive MW18, and MW-26 showed historical presence of methyl tertiary butyl ether MTBE (a harmful, carcinogenic gasoline additive) in the groundwater. This indicates that MTBE may have impacted the groundwater within the project limits where construction activities may occur.
2	Shell Service Station, 1611 Monte Vista Avenue E, Vacaville	This site is listed as "closed"; however, review of the last groundwater monitoring report (May 2013) indicates a flat gradient with a gentle slope towards the freeway right-of-

Site	Name and Location	Status
		way. The site is a parking lot west of the I-80 on- and off ramps at East Monte Vista Avenue. The report shows presence of MTBE in the groundwater. Wells that are closest to the project limits have the lowest current concentration of MTBE, indicating that potential adverse effects to areas where project construction would occur are unlikely.
3	Former Chevron Service Station, 1615 East Monte Vista, Vacaville	The previous site improvements and service station structures at this site have been removed. The site is now covered by the realigned East Monte Vista Road and I-80 on-ramp. However, because groundwater contamination is present, groundwater monitoring is ongoing. The gradient of groundwater flow is towards the freeway right-of-way. The latest quarterly groundwater monitoring report indicates presence of high levels of MTBE in the groundwater. As the right-of-way is adjacent to this site, groundwater is likely impacted at locations where project construction would occur.
4	Valero Service Station, 1501 East Monte Vista, Vacaville	This site contains elevated concentrations of MTBE, Benzene and other petroleum hydrocarbons. Because the site is located adjacent to the freeway right-of-way, there is potential that these contaminants might have migrated into areas where project construction would occur.
5	Autocraft Collision, 1275 Callen Street, Vacaville	This site contains elevated concentrations of benzene and other petroleum hydrocarbons. The downgradient extent of contamination has not been characterized; however, due to the site's proximity to the project limits, it is likely for the contaminated groundwater might have reached the areas where project construction would occur.
6	ARCO # 2184 Service Station, 3560 Nelson Road, Fairfield	This site is currently undergoing remediation. Recent groundwater data showed gradient is towards the freeway right-of-way and MTBE and benzene are present in the groundwater. As this site is adjacent to the project limits, there is potential that the contaminants might have impacted the areas where project construction would occur.
7	Stans Service Center, 3350 N Texas Road, Fairfield	The site is a non-operating Chevron service station. Review of one of the latest groundwater monitoring reports indicates petroleum hydrocarbons are present in groundwater. As this site is adjacent to the project limits, there is potential that these contaminants might have migrated into the areas where project construction would occur.

Source: Caltrans, 2014i

The Build Alternative may encounter contaminated soils and/or groundwater that could expose construction workers to the hazardous materials associated with these sites. Within the existing project limits, no other build alternatives were deemed viable because of the physical constraints associated with the developed land uses surrounding the I-80 corridor. The current design of the Build Alternative would not be feasible without constructing improvements in the areas near the

identified hazardous material sites. As such, these hazardous material sites cannot be avoided. During the design phase of the project, a preliminary site investigation would be performed to investigate potential hazardous materials concerns related to soil and groundwater within the project limits, as identified in the ISA (see **Measure HAZ-1**). Delaying subsurface investigations until the design phase of the project is not expected to change the project design and cost.

Other Environmental Concerns

Aerially-Deposited Lead

Lead can be hazardous to humans as exposure can adversely affect the nervous, circulatory and reproductive systems and can severely damage the brain and kidneys. Until their use was banned in the 1990s, additives in gasoline expelled lead-based compounds from engine exhaust. Consequently, lead was aerially deposited as a particulate. As a result, shallow soils within 30 feet of the edge of pavement in highway corridors have the potential to be contaminated with aerially deposited lead (ADL) from historical car emissions. The I-80 corridor has supported vehicular activity since the 1940s. Therefore, there is a potential for the presence of lead in soils adjacent to the roadway.

Asbestos-Containing Material and Lead-Based Paint

The Build Alternative proposes the modification of overpass/bridge structures, which may be coated with asbestos-containing materials and/or lead-based paint. Lead and asbestos are state-recognized carcinogens, and lead is a reproductive toxin. Asbestos fibers and lead particles emitted to the air during demolition activities could potentially pose a risk to human health.[7] According to the California Department of Conservation, there are no reported historic asbestos mines, historic asbestos prospects, or other natural occurrences of asbestos within the project limits.

Yellow Traffic Stripes and Pavement Markers

Lead and hexavalent chromium have been used in yellow thermoplastic and yellow paint for traffic striping and pavement marking for many years and as recently as 2004. Residue from existing yellow thermoplastic and yellow paint striping and markings on roadways at the project limits may contain elevated concentrations of lead and hexavalent chromium that may produce toxic fumes when heated.

Agricultural Pesticides

Arsenic from inorganic pesticides and residues from organochlorine pesticides used in the past have the potential to persist for many decades in shallow soils and can affect human health and the environment, and could potentially be present in shallow soils along the I-80 corridor where former agricultural development existed and/or currently exists.

[7] ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ms/59/MS59_Plate.pdf; accessed November 13, 2013

Railroad Crossings

There is a railroad crossing between Red Top Road and SR 12, within the West Segment of the project limits. I-80 travels under an existing railroad bridge structure. Since the railroad tracks are above the freeway, and the Build Alternative does not involve any work within railroad corridor, no environmental effects from railroad operations is expected.

West Segment –Fundable First Phase

Within the West Segment, the regulatory review did not identify any listed sites that would be of potential concern. Contaminants of concern that could potentially be encountered in soil and/or groundwater during excavation activities within the West Segment are limited to those summarized above under "other environmental concerns".

No-Build Alternative

The No-Build Alternative assumes that the freeway travel lanes along I-80 would remain as they currently exist. No bridge structures would be widened or replaced. Therefore, the No-Build Alternative would avoid the health risks associated with the hazardous materials within the I-80 Corridor in the project limits.

AVOIDANCE, MINIMIZATION, AND/ OR MITIGATION MEASURES

Build Alternative

Measure HAZ-1: During the design phase of the project, a preliminary site investigation would be performed to investigate potential hazardous materials concerns related to soil and groundwater within the project limits, as identified in the ISA. A work plan for the preliminary site investigation would be submitted to Caltrans for review and approval. Additional investigation may be required to fully evaluate potential hazardous materials issues if concerns are identified during the preliminary site investigation. The preliminary site investigation report for the project would be provided to project contractors so that the findings can be incorporated into their Health and Safety and Hazard Communication Programs. The general areas and contaminants of concern for investigating soil and groundwater are summarized further below.

Based on the findings and recommendations of the preliminary site investigation, the Build Alternative may need to implement special soil, groundwater, and construction materials management and disposal procedures for hazardous materials, as well as construction worker health and safety measures during construction (see **Measures HAZ-2** through **HAZ-5**). If such implementation occurs, required coordination with the Alameda County Department of Environmental Health (ACDEH) Certified Unified Program Agency (CUPA) would occur. The ACDEH CUPA is the administrative agency that coordinates and enforces numerous local, state, and federal hazardous materials management and environmental protection programs in the county.

Measure HAZ-2: In accordance with Caltrans protocol, a site safety plan would be prepared and implemented prior to initiation of any construction/development activities to reduce potential health and safety hazards to workers and the public. In accordance with Caltrans' standard special provision related to earth work, the contractor would be notified that lead will be present in the construction area, and would be required to prepare a lead compliance plan to prevent or minimize worker exposure to lead. Caltrans soil sampling requirements for potential reuse of lead-contaminated soil are summarized further below.

Measure HAZ-3: An asbestos and lead-based paint survey would be conducted by a qualified professional for the bridge structures that are subject to demolition as part of the Build Alternative. All loose and peeling lead-based paint and asbestos-containing material would be removed prior to the demolition of the bridge structure by a certified contractor(s) in accordance with local, state, and federal requirements.

Measure HAZ-4: Yellow thermoplastic and yellow paint striping and markings on existing roadways would be analyzed for lead chromate prior to disturbance or removal in accordance with Chapter 7 of Caltrans' Construction Manual. Alternatively, yellow stripe and pavement markings may be managed in accordance with Caltrans standard special provision 14-11-07.

Soil and Groundwater Investigations

Measure HAZ-5: Representative soil and/or groundwater sampling would be conducted by a licensed professional to evaluate the potential presence of hazardous materials in soil and groundwater within the project limits prior to construction and earthwork activities. The sampling would be performed in accordance with the work plan that has been reviewed and approved by Caltrans. Soil samples collected would be analyzed for total lead and soluble lead to evaluate potential reuse of lead-affected soils in accordance with the Department of Toxic Substances Control's variance issued to Caltrans. Soil and groundwater analytical results would be screened against the San Francisco Bay Regional Water Quality Control Board's Environmental Screening Levels to determine appropriate actions that would ensure the protection of construction workers, future site users, and the environment, and also be screened against hazardous waste thresholds to determine soil management options.

Implementation of the subsurface sampling for the entire Build Alternative alignment is anticipated to cost approximately $375,000. The soil and groundwater sampling would likely be a three-month endeavor, assuming property access and approval of the work plan is obtained in a timely fashion.

West Segment – Fundable First Phase

The discussion above identified all avoidance, minimization, and mitigation measures applicable to the Built Alternative, including the West Segment. However, because documented hazardous material release sites that are likely to affect the soils/groundwater where West Segment project construction were not identified, subsurface sampling would be less intensive, and only related to

the determination of ADL levels and pesticides associated with agricultural land uses. Implementation of the subsurface sampling in the high-risk areas within the West Segment is anticipated to cost approximately $150,000. The soil and groundwater sampling would likely be a one-month endeavor, assuming property access and approval of the work plan is obtained in a timely fashion.

2.2.6 AIR QUALITY

REGULATORY SETTING

The Federal Clean Air Act (FCAA), as amended, is the primary federal law that governs air quality while the California Clean Air Act is its companion state law. These laws, and related regulations by the United States Environmental Protection Agency (U.S. EPA) and California Air Resources Board (ARB), set standards for the concentration of pollutants in the air. At the federal level, these standards are called National Ambient Air Quality Standards (NAAQS). NAAQS and state ambient air quality standards have been established for six transportation-related criteria pollutants that have been linked to potential health concerns: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), which is broken down for regulatory purposes into particles of 10 micrometers or smaller (PM_{10}) and particles of 2.5 micrometers and smaller ($PM_{2.5}$), and sulfur dioxide (SO_2). In addition, national and state standards exist for lead (Pb) and state standards exist for visibility reducing particles, sulfates, hydrogen sulfide (H_2S), and vinyl chloride. The NAAQS and state standards are set at levels that protect public health with a margin of safety, and are subject to periodic review and revision. Both state and federal regulatory schemes also cover toxic air contaminants (air toxics); some criteria pollutants are also air toxics or may include certain air toxics in their general definition.

Federal air quality standards and regulations provide the basic scheme for project-level air quality analysis under the National Environmental Policy Act (NEPA). In addition to this environmental analysis, a parallel "Conformity" requirement under the FCAA also applies.

Conformity

The conformity requirement is based on Federal Clean Air Act Section 176(c), which prohibits the U.S. Department of Transportation (USDOT) and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to State Implementation Plan (SIP) for attainting the NAAQS. "Transportation Conformity" applies to highway and transit projects and takes place on two levels: the regional—or, planning and programming—level and the project level. The proposed project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and "maintenance" (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or were violated. U.S. EPA regulations at 40 Code of Federal Regulations (CFR) 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS and do not apply at all for state standards regardless of the status of the area.

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the NAAQS for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), and in some areas (although not in California) sulfur dioxide (SO_2). California has attainment or maintenance areas for all of these transportation-related "criteria pollutants" except SO_2, and also has a nonattainment area for lead (Pb); however, lead is not currently required by the FCAA to be covered in transportation conformity analysis. Regional conformity is based on emission analysis of Regional Transportation Plans (RTPs) and Federal Transportation Improvement Programs (FTIPs) that include all transportation projects planned for a region over a period of at least 20 years for the RTP) and 4 years (for the TIP). RTP and FTIP conformity uses travel demand and emission models to determine whether or not the implementation of those projects would conform to emission budgets or other tests at various analysis years showing that requirements of the Clean Air Act and the SIP are met. If the conformity analysis is successful, the Metropolitan Planning Organization (MPO), Federal Highway Administration (FHWA), and Federal Transit Administration (FTA), make determinations that the RTP and FTIP are in conformity with the SIP for achieving the goals of the FCAA. Otherwise, the projects in the RTP and/or FTIP must be modified until conformity is attained. If the design concept, scope, and "open-to-traffic" schedule of a proposed transportation project are the same as described in the RTP and FTIP, then the proposed project meets regional conformity requirements for purposes of project-level analysis.

Conformity analysis at the project-level includes verification that the project is included in the regional conformity analysis and a "hot-spot" analysis if an area is "nonattainment" or "maintenance" for carbon monoxide (CO) and/or particulate matter (PM_{10} or $PM_{2.5}$). A region is "nonattainment" if one or more of the monitoring stations in the region measures a violation of the relevant standard and the U.S. EPA officially designates the area nonattainment. Areas that were previously designated as nonattainment areas but subsequently meet the standard may be officially redesignated to attainment by U.S. EPA and are then called "maintenance" areas. "Hot-spot" analysis is essentially the same, for technical purposes, as CO or particulate matter analysis performed for NEPA purposes. Conformity does include some specific procedural and documentation standards for projects that require a hot-spot analysis. In general, projects must not cause the "hot-spot" related standard to be violated, and must not cause any increase in the number and severity of violations in nonattainment areas. If a known CO or particulate matter violation is located in the project vicinity, the project must include measures to reduce or eliminate the existing violation(s) as well.

AFFECTED ENVIRONMENT

The analysis summarized in this section is based on the Air Quality Report prepared for the project (Caltrans, 2014a). The project is located within two different air basins within the jurisdictional boundaries of the Bay Area Air Quality Management District (BAAQMD) and Yolo-Solano Air Quality Management District (YSAQMD), respectively. BAAQMD oversees the western portions of the project limits within the communities of Fairfield, Benicia, Suisun City, and Vallejo, which are located within the San Francisco Air Basin (SF Air Basin). YSAQMD oversees the easternmost portion of the project limits within the City of Vacaville, which is located within the Sacramento

Valley Air Basin (SV Air Basin). The boundary between these air basins is about 1.5 miles north of Manuel Campos Parkway, as shown in **Appendix D**. These air basins effectively make up the air quality study area for the Build Alternative.

The climate within the air quality study area is affected by its proximity to both the Pacific Ocean and the San Francisco Bay, which has a moderating influence. The Bay cools the air with which it comes in contact during warm weather and warms the air during cold weather. Typical summer maximum temperatures (Fahrenheit) for the region are in the upper 80's and 90's, while winter maximum temperatures are in the high 50's or low 60's. Minimum temperatures usually range from the high 50's in the summer to the upper 30's and low 40's in the winter. Rainfall in the area occurs mostly in the months of November through mid-April. Winds flow typically from the southwest.

Air quality in the region is controlled by meteorological conditions and the rate of pollutant emissions. Meteorological conditions such as wind speed, atmospheric stability, and mixing height may all affect the atmosphere's ability to mix and disperse pollutants. Long-term variations in air quality typically result from changes in air pollutant emissions, while frequent, short-term variations result from changes in atmospheric conditions.

Air quality standards for ozone are traditionally exceeded when relatively stagnant wind conditions occur for periods of several days during the warmer months of the year. The regional meteorological factors make air pollution potential relatively high during summer and fall months. When high pressure dominates the weather, low mixing depths and bay and ocean wind patterns can concentrate and carry pollutants from other cities to this area, adding to the locally emitted pollutants.

Regional Air Quality

The BAAQMD and YSAQMD monitor pollutants of concern, known as criteria pollutants, and air quality conditions throughout the SF Air Basin and SV Air Basin, respectively. **Table 2.2-16** includes a summary of the applicable air quality standards, the typical sources of pollutants and their associated health effects. **Tables 2.2-17** and **2.2-18** summarize each basin's attainment status' with respect to the air quality standards.

As shown in **Tables 2.2-17** and **2.2-18**, the SF Air Basin and SV Air Basin are not in attainment of State or Federal standards with respect to O_3 or $PM_{2.5}$. In addition, neither air basin is in attainment of State standards for PM_{10}.

Table 2.2-16 State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State [8] Standard	Federal [8] Standard	Principal Health and Atmospheric Effects	Typical Sources
Ozone (O_3) [2]	1 hour 8 hours	0.09 ppm 0.070 ppm	--- [4] 0.075 ppm (4th highest in 3 years)	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage and cancer. Long-term exposure damages plant materials and reduces crop productivity. Precursor organic compounds include many known toxic air contaminants. Biogenic VOC may also contribute.	Low-altitude ozone is almost entirely formed from reactive organic gases/volatile organic compounds (ROG or VOC) and nitrogen oxides (NOx) in the presence of sunlight and heat. Common precursor emitters include motor vehicles and other internal combustion engines, solvent evaporation, boilers, furnaces, and industrial processes.
Carbon Monoxide (CO)	1 hour 8 hours 8 hours (Lake Tahoe)	20 ppm 9.0 ppm [1] 6 ppm	35 ppm 9 ppm ---	CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen. CO also is a minor precursor for photochemical ozone. Colorless, odorless.	Combustion sources, especially gasoline-powered engines and motor vehicles. CO is the traditional signature pollutant for on-road mobile sources at the local and neighborhood scale.
Respirable Particulate Matter (PM_{10}) [2]	24 hours Annual	50 µg/m3 20 µg/m3	150 µg/m^3 --- 2 (expected number of days above standard < or equal to 1)	Irritates eyes and respiratory tract. Decreases lung capacity. Associated with increased cancer and mortality. Contributes to haze and reduced visibility. Includes some toxic air contaminants. Many toxic & other aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke & vehicle exhaust; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources.
Fine Particulate Matter ($PM_{2.5}$) [2]	24 hours Annual 24 hours (conformity process [5]) Secondary Standard (annual; also for conformity process [5])	--- 12 µg/m^3 --- ---	35 µg/m^3 12.0 µg/m^3 65 µg/m^3 15 µg/m^3 (98th percentile over 3 years)	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter – a toxic air contaminant – is in the $PM_{2.5}$ size range. Many toxic & other aerosol and solid compounds are part of $PM_{2.5}$.	Combustion including motor vehicles, other mobile sources, and industrial activities; residential and agricultural burning; also formed through atmospheric chemical and photochemical reactions involving other pollutants including NOx, sulfur oxides (SOx), ammonia, and ROG.

Pollutant	Averaging Time	State [8] Standard	Federal [8] Standard	Principal Health and Atmospheric Effects	Typical Sources
Nitrogen Dioxide (NO_2)	1 hour Annual	0.18 ppm 0.030 ppm	0.100 ppm [6] (98th percentile over 3 years) 0.053 ppm	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain & nitrate contamination of storm water. Part of the "NOx" group of ozone precursors.	Motor vehicles and other mobile or portable engines, especially diesel; refineries; industrial operations.
Sulfur Dioxide (SO_2)	1 hour 3 hours 24 hours	0.25 ppm --- 0.04 ppm	0.075 ppm [7] (99th percentile over 3 years) 0.5 ppm [9]	Irritates respiratory tract; injures lung tissue. Can yellow plant leaves. Destructive to marble, iron, steel. Contributes to acid rain. Limits visibility.	Fuel combustion (especially coal and high-sulfur oil), chemical plants, sulfur recovery plants, metal processing; some natural sources like active volcanoes. Limited contribution possible from heavy-duty diesel vehicles if ultra-low sulfur fuel not used.
Lead (Pb)[3]	Monthly Rolling 3-month average	1.5 µg/m^3 ---	--- 0.15 µg/m^3 11	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also a toxic air contaminant and water pollutant.	Lead-based industrial processes like battery production and smelters. Lead paint, leaded gasoline. Aerially deposited lead from older gasoline use may exist in soils along major roads.
Sulfate	24 hours	25 µg/m^3	---	Premature mortality and respiratory effects. Contributes to acid rain. Some toxic air contaminants attach to sulfate aerosol particles.	Industrial processes, refineries and oil fields, mines, natural sources like volcanic areas, salt-covered dry lakes, and large sulfide rock areas.
Hydrogen Sulfide (H_2S)	1 hour	0.03 ppm	---	Colorless, flammable, poisonous. Respiratory irritant. Neurological damage and premature death. Headache, nausea. Strong odor.	Industrial processes such as: refineries and oil fields, asphalt plants, livestock operations, sewage treatment plants, and mines. Some natural sources like volcanic areas and hot springs.
Visibility Reducing Particles (VRP)	8 hours	Visibility of 10 miles or more (Tahoe: 30 miles) at relative	---	Reduces visibility. Produces haze. NOTE: not directly related to the Regional Haze program under the Federal Clean Air Act, which is oriented primarily toward visibility issues in	See particulate matter above. May be related more to aerosols than to solid particles.

Pollutant	Averaging Time	State [8] Standard	Federal [8] Standard	Principal Health and Atmospheric Effects	Typical Sources
		humidity less than 70%		National Parks and other "Class I" areas. However, some issues and measurement methods are similar.	
Vinyl Chloride[3]	24 hours	0.01 ppm	---	Neurological effects, liver damage, cancer. Also considered a toxic air contaminant.	Industrial processes

Notes: ppm = parts per million; µg/m3 = micrograms per cubic meter; ppb=parts per billion (thousand million)

1. Rounding to an integer value is not allowed for the State 8-hour CO standard. A violation occurs at or above 9.05 ppm.
2. Annual PM_{10} NAAQS revoked October 2006; was 50 µg/m3. 24-hr. $PM_{2.5}$ NAAQS tightened October 2006; was 65 µg/m3. Annual $PM_{2.5}$ NAAQS tightened from 15 µg/m3 to 12 µg/m3 December 2012 and secondary annual standard set at 15 µg/m3.
3. The ARB has identified vinyl chloride and the particulate matter fraction of diesel exhaust as toxic air contaminants. Diesel exhaust particulate matter is part of PM_{10} and, in larger proportion, $PM_{2.5}$. Both the ARB and U.S. EPA have identified lead and various organic compounds that are precursors to ozone and $PM_{2.5}$ as toxic air contaminants. There are no exposure criteria for adverse health effect due to toxic air contaminants, and control requirements may apply at ambient concentrations below any criteria levels specified above for these pollutants or the general categories of pollutants to which they belong.
4. Prior to 6/2005, the 1-hour ozone NAAQS was 0.12 ppm. Emission budgets for 1-hour ozone are still in use in some areas where 8-hour ozone emission budgets have not been developed, such as the S.F. Bay Area.
5. The 65 µg/m3 $PM_{2.5}$ (24-hr) NAAQS was not revoked when the 35 µg/m3 NAAQS was promulgated in 2006. The 15 µg/m3 annual $PM_{2.5}$ standard was not revoked when the 12 µg/m3 standard was promulgated in 2012. The 0.08 ppm 1997 ozone standard is revoked FOR CONFORMITY PURPOSES ONLY when area designations for the 2008 0.75 ppm standard become effective for conformity use (7/20/2013). Conformity requirements apply for all NAAQS, including revoked NAAQS, until emission budgets for newer NAAQS are found adequate, SIP amendments for the newer NAAQS are approved with a emission budget, EPA specifically revokes conformity requirements for an older standard, or the area becomes attainment/unclassified. SIP-approved emission budgets remain in force indefinitely unless explicitly replaced or eliminated by a subsequent approved SIP amendment. During the "Interim" period prior to availability of emission budgets, conformity tests may include some combination of build vs. no build, build vs. baseline, or compliance with prior emission budgets for the same pollutant.
6. Final 1-hour NO_2 NAAQS published in the Federal Register on 2/9/2010, effective 3/9/2010. Initial area designation for California (2012) was attainment/unclassifiable throughout. Project-level hot spot analysis requirements do not currently exist. Near-road monitoring starting in 2013 may cause redesignation to nonattainment in some areas after 2016.
7. EPA finalized a 1-hour SO_2 standard of 75 ppb in June 2010. Nonattainment areas have not yet been designated as of 9/2012.
8. State standards are "not to exceed" or "not to be equaled or exceeded" unless stated otherwise. Federal standards are "not to exceed more than once a year" or as described above.
9. Secondary standard, set to protect public welfare rather than health. Conformity and environmental analysis address both primary and secondary NAAQS.
10. Standards no longer apply in CA starting in 2013 (1 year after designations to attainment/unclassified statewide) were completed. Do not use or quote any more. Will be removed in 2013 edition of this table.
11. Lead NAAQS are not considered in Transportation Conformity analysis.

Greenhouse Gases and Climate Change: Greenhouse gases do not have concentration standards for that purpose. Conformity requirements do not apply to greenhouse gases.

Source: Caltrans, 2014a

Table 2.2-17 Attainment Status – San Francisco Air Basin

Pollutant	Federal Status	State Status
Ozone (O_3) – 1-Hour Standard	Not Applicable	Nonattainment
Ozone (O_3) – 8-Hour Standard	Nonattainment	Nonattainment
Respirable Particulate Matter (PM_{10})	Unclassified	Nonattainment
Fine Particulate Matter ($PM_{2.5}$)	Nonattainment	Nonattainment
Carbon Monoxide (CO)	Attainment (maintenance)	Attainment
Nitrogen Dioxide (NO_2)	Attainment	Attainment
Sulfur Dioxide (SO_2)	Attainment	Attainment
Sulfates	No National Standards	Attainment
Lead	Attainment	Not Applicable
Hydrogen Sulfide	No National Standards	Unclassified
Visibility Reducing Particles	No National Standards	Unclassified

Source: Caltrans, 2014a

Table 2.2-18 Attainment Status – Sacramento Valley Air Basin

Pollutant	Federal Status	State Status
Ozone (O_3) – 1-Hour Standard	Not Applicable	Nonattainment
Ozone (O_3) – 8-Hour Standard	Nonattainment	Nonattainment
Respirable Particulate Matter (PM_{10})	Unclassified	Nonattainment
Fine Particulate Matter ($PM_{2.5}$)	Partial Nonattainment	Not Applicable
Carbon Monoxide (CO)	Attainment	Attainment
Nitrogen Dioxide (NO_2)	Attainment	Attainment
Sulfur Dioxide (SO_2)	Attainment	Attainment
Sulfates	No National Standards	Attainment
Lead	Attainment	Not Applicable
Hydrogen Sulfide	No National Standards	Unclassified
Visibility Reducing Particles	No National Standards	Unclassified

Source: Caltrans, 2014a

Within three years of the effective date of designations, nonattainment areas for $PM_{2.5}$ are required to submit SIP revisions that, among other elements, provide for implementation of reasonably available control measures, reasonable further progress, attainment of the standard as expeditiously as practicable but no later than five years from the nonattainment designation (i.e., December 14, 2014), as well as contingency measures. ARB has requested that the U.S. EPA make a determination that the San Francisco Bay Area has since attained the $PM_{2.5}$ NAAQS since its 2009 non-attainment designation. As such, ARB is asking the U.S. EPA to determine that attainment-

related SIP submittal requirements are not applicable for as long as the area continues to attain the standard. On October 29, 2012 the U.S. EPA proposed to determine that the SF Air Basin has attained the $PM_{2.5}$ NAAQS. This proposed determination is based on recent ambient air monitoring data showing that the SF Air Basin has monitored attainment of the $PM_{2.5}$ NAAQS for the 2009–2011 monitoring period. If the U.S. EPA finalizes this determination of attainment, the only SIP requirements would include an updated emission inventory for primary $PM_{2.5}$, as well as precursor pollutants that contribute to formation of secondary particulate matter and amendments to BAAQMD's New Source Review to address $PM_{2.5}$. The SF Air Basin $PM_{2.5}$ emission inventory was submitted to the U.S. EPA on January 14, 2013. The SV Air Basin was designated "partial non-attainment" as it was included as part of a larger $PM_{2.5}$ non-attainment area. The YSAQMD is currently developing an attainment plan for $PM_{2.5}$.

ENVIRONMENTAL CONSEQUENCES

Regional Conformity

The proposed project is listed in the 2013 Plan Bay Area financially constrained Regional Transportation Plan (RTP) which was found to conform by MTC on July 18, 2013, and FHWA and FTA made a regional conformity determination finding on August 12, 2013. The project is also included in MTC's financially constrained 2015 Regional Transportation Improvement Program (RTIP), page S3-282 (RTP Reference No. 230659 and 230660 and TIP ID SOL110001[8]). The MTC 2015 RTIP was determined to conform by FHWA and FTA on December 15, 2014. The design concept and scope of the proposed project is consistent with the project description in the 2013 RTP, 2015 RTIP, and the open to traffic assumptions of the MTC's regional emissions analysis.

Project Level Conformity

Carbon Monoxide

The effects of the Build Alternative impacts from local traffic were evaluated by modeling roadside carbon monoxide concentrations. The modeling was conducted for the busiest mainline segment on I-80 where there would be a combination of the highest traffic volumes, greatest project traffic contribution, and highest level of congestion. High volume freeways, such as I-80, have the greatest potential to cause high-localized concentrations of carbon monoxide. Of the two standards for carbon monoxide, the 8-hour standard is the more stringent. Modeling results are shown in **Table 2.2-19**.

The results indicate that current carbon monoxide concentrations are below ambient air quality standards and that future level with or without the Build Alternative would remain below the standards. The predicted decrease in future levels is due to vehicle fleet turnover, with newer (less

[8] The project was originally listed under the two TIP numbers SOL110001 and SOL110002 (relative to the East and West Segments). TIP Amendment No. 2013-16 combined the two segments under one TIP ID SOL110001, and reprogramed the funding sources and phases.

polluting) vehicles replacing older vehicles. As a result, the project would not cause or contribute to any localized carbon monoxide violations; and therefore, meets the "hot-spot" conformity requirements of 40 CFR 93.116(a).

Table 2.2-19 Worst-Case 1-Hour and 8-Hour Carbon Monoxide Concentrations (ppm)

Roadway Segment	Existing		2020 No-Build		2020 Build		2040 No-Build		2040 Build	
	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr
West Segment										
Receiver 1 East of Suisun Valley Road	6.3	5.0	4.3	3.4	4.4	3.5	4.0	3.2	4.1	3.2
Receiver 2 Buckingham Drive/Flint Way	5.9	4.7	4.2	3.3	4.2	3.3	3.9	3.1	3.9	3.1
NAAQS	*35*	*9*	*35*	*9*	*35*	*9*	*35*	*9*	*35*	*9*
CAAQS	*20*	*9.0*	*20*	*9.0*	*20*	*9.0*	*20*	*9.0*	*20*	*9.0*
East Segment										
Receiver 3 Piedmont Court/East of Alamo Drive	5.8	4.6	4.1	3.2	4.1	3.2	3.8	3.0	3.9	3.1
Receiver 4 Paradise Valley Road and Manuel Campos Parkway	5.7	4.5	4.0	3.2	4.0	3.2	4.0	3.2	3.9	3.1
NAAQS	*35*	*9*	*35*	*9*	*35*	*9*	*35*	*9*	*35*	*9*
CAAQS	*20*	*9.0*	*20*	*9.0*	*20*	*9.0*	*20*	*9.0*	*20*	*9.0*

Note: ppm = parts per million
Source: Caltrans, 2014a

Particulate Matter

On March 10, 2006, the U.S. EPA published a final rule that establishes the transportation conformity criteria and procedures for determining which transportation projects must be analyzed for local air quality impacts in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas (71 FR 12468). The Federal PM_{10} standards have been met in the SF Air Basin and SV Air Basin, and therefore the Build Alternative is not subject to hot spot analysis for PM_{10} for purposes of transportation conformity. However, because the Federal $PM_{2.5}$ standards are exceeded in both air basins, certain criteria must be met in order for the project to be subject to hot spot analysis for

$PM_{2.5}$ for purposes of transportation conformity. MTC's Air Quality Conformity Task Force met on September 25, 2012 as part of interagency consultation for the Build Alternative and took action to conclude that the Build Alternative was not a project of air quality concern (POAQC).

Mobile Source Air Toxics (MSAT)

California's vehicle emissions control and fuel standards are more stringent than federal standards, and are effective sooner, so the effect on air toxics of combined state and federal regulations is expected to result in greater emission reductions, more quickly, than the FHWA analysis shows. The FHWA analysis, with modifications related to use of the California-specific EMFAC model rather than the MOBILE model, would be conservative.

The design year traffic volumes under the Build Alternative are projected to exceed 125,000 annual average daily traffic (AADT). Caltrans reports annual average daily traffic volumes of 121,000 to 214,000 vehicles per average day. Traffic levels in the future would increase above 125,000 average annual daily trips.

FHWA has issued Interim Guidance on Air Toxic Analysis in NEPA Documents. In this guidance, FHWA identified three levels of analysis:

1. *Category 1* Projects are projects with No Meaningful Potential MSAT Effects or Exempt Projects. The types of projects included in this category are projects qualifying as a categorical exclusion under 23 CFR 771.117(c), Projects exempt under the Clean Air Act conformity rule under 40 CFR 93.126, or other projects with no meaningful impacts on traffic volumes or vehicle mix.
2. *Category 2* projects are projects with Low Potential MSAT Effects. The types of projects included in this category are those that serve to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase MSAT emissions.
3. *Category 3* Projects are projects with Higher Potential MSAT Effects. This category includes projects that have the potential for meaningful differences in MSAT emissions among project alternatives.

The Build Alternative meets the Category 2 project criteria, in that it has a low potential MSAT, because the project would improve traffic operations without adding substantial new capacity. As defined above, the FHWA guidance considers a "meaningful increase in MSAT emissions" as a project that serves a significant volume of diesel truck traffic, such as a facility with greater than 125,000 ADDT, and where 8 percent or more of such AADT is diesel truck traffic.[9] The design year for the Build Alternative for traffic is projected to exceed 140,000 to 150,000 AADT, which is above the 125,000 AADT in the FHWA guidance. However, the truck percentage and truck AADT is less than 8 percent and the AADT truck traffic is less than 10,000. For these reasons, the Build Alternative remains in the Category 2 project bracket since it would not result in a meaningful increase in MSAT emissions.

[9] *Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas* (FHWA and EPA 2006).

Based on FHWA guidance, a more rigorous analysis of MSAT impacts was conducted. This approach included a quantitative analysis to forecast local-specific emission trends of the priority MSAT for each alternative, to use as a basis of comparison. However, there are several uncertainties that do not allow quantitative estimates of health effects from MSAT emissions in the project limits. One can examine MSAT emissions in the project limits and estimate the relative impacts of MSAT emissions under different scenarios**. Table 2.2-20** represents the total MSAT emissions from traffic on I-80 for five scenarios as listed. As shown in the table emissions for all MSATs are projected to decrease considerably over existing conditions. However, due to an increase in traffic and speed, diesel particulate matter would be about six percent higher than the No-Build scenario.

Additional Environmental Analysis

The SF Air Basin and SV Air Basin are considered a nonattainment area for ground-level ozone and $PM_{2.5}$ under both the federal Clean Air Act and the California Clean Air Act. The area is also considered non-attainment for PM_{10} under the California Clean Air Act, but not the federal Act. Transportation plans that have been found to conform with the State Implementation Plan (SIP) are not considered to cause or contribute to violations of ambient air quality standards. Furthermore, a project included in a conforming plan would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard. Conforming transportation plans are subject to a threshold of no net increase in emissions. Because the Build Alternative is included in Plan Bay Area 2040 and 2015 TIP, which conform to the SIP, the project would not result in a considerable net increase of any criteria pollutant.

Table 2.2-20 Project MSAT Emissions in Grams per Day

Pollutant	Existing	2020 No-Build	2020 Build	2040 No-Build	2040 Build
Benzene	18,471	8,035	8,059	7,288	7,762
Acrolein	735	290	291	267	285
Formaldehyde	19,108	7,370	7,392	7,226	7,693
Butadiene	3,303	1,283	1,287	1,193	1,271
Naphthalene	1,024	580	582	702	748
POM	335	129	129	156	166
Diesel PM	51,404	14,593	14,637	16,705	17,794
DEOG	57,954	23,279	23,340	24,072	25,603

Notes: POM = Polycyclic Organic Matter; Diesel PM = Diesel Particulate Matter; DEOG = Diesel Exhaust Organic Gas
Source: Caltrans, 2014a

Naturally Occurring Asbestos

According to information presented in the Department of Conservation Division of Mines and Geology map, naturally occurring asbestos is not indicated in the project footprint or in the vicinity of the project limits. **Section 2.2.5, Hazardous Waste/Materials** discusses potential asbestos-containing material in the bridge structures within the project limits. In accordance with

Measure HAZ-3, all asbestos-containing material would be removed by a certified contractor(s) in accordance with local, state, and federal requirements to prevent asbestos fibers from being emitted into the air during demolition activities.

Temporary Construction Impacts

Airborne Dust and Emissions

Dust would be generated during grading and construction operations. The amount of dust generated would be highly variable and is dependent on the size of the area disturbed, amount of activity, soil conditions, and meteorological conditions. Although grading and construction activities would be temporary, they would have the potential to cause both nuisance and health air quality impacts for sensitive receptors adjacent to the project limits. PM_{10} is the pollutant of greatest concern associated with dust. If uncontrolled, elevated PM_{10} levels could occur downwind of actively disturbed areas. In addition, dust fall on adjacent properties could be a nuisance.

Emissions from construction equipment also are expected, and would include carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOCs), directly-emitted particulate matter (PM_{10} and $PM_{2.5}$), and toxic air contaminants such as diesel exhaust particulate matter. As previously discussed, ozone is a regional pollutant that is derived from NO_x and VOCs in the presence of sunlight and heat.

Average daily construction exhaust emissions were modeled for the East Segment using the construction year (2015), total expected duration (2 years) and the length of the segment limits. Other model inputs such as area of disturbance and soil imported on a daily basis were estimated based on conservative and reasonable assumptions for similar construction projects. **Table 2.2-21** presents these emissions predictions for the East Segment of the Build Alternative.

However, for the West Segment, the scope of construction would be limited to installation and removal of signage, restriping, lighting installation, the extension of an auxiliary lane, and other work that would occur over a relatively short time. No major heavy equipment usage is proposed for any substantial period of time. Therefore, construction exhaust and evaporative emissions from construction activities associated with the West Segment have not been quantified.

Table 2.2-21 Daily Maximum Construction Emissions – East Segment

Construction Phase	Pollutant					
	ROG	NO_x	Exhaust PM_{10}	Fugitive Dust PM_{10}	Exhaust $PM_{2.5}$	Fugitive Dust $PM_{2.5}$
Grubbing/Land Clearing	5.9 lbs/day	40.2 lbs/day	1.9 lbs/day	25 lbs/day	1.7 lbs/day	5.2 lbs/day
Grading/Excavation	7.0 lbs/day	51.3 lbs/day	2.4 lbs/day	25 lbs/day	2.2 lbs/day	5.2 lbs/day
Drainage/Utilities/Sub-grade	3.6 lbs/day	24.3 lbs/day	1.4 lbs/day	25 lbs/day	1.6 lbs/day	5.2 lbs/day
Paving	3.0 lbs/day	16.4 lbs/day	1.2 lbs/day	--	1.1 lbs/day	--
BAAQMD Significance Thresholds (for comparison only)	*54 lbs/day*	*54 lbs/day*	*82 lbs/day*	*BMP*	*54 lbs/day*	*BMP*
YVAQMD Significance Thresholds (for comparison only)	*10 tons/year*	*10 tons/year*	*80 lbs/day*	*BMP*	*--*	*BMP*

Note: BMP – Best Management Practices
Source: Caltrans, 2014a

Construction activities will not last for more than 24 months at one general location, so construction-related emissions do not need to be included in regional and project-level conformity analysis (40 CFR 93.123(c)(5)).

Mobile Source Air Toxics (MSAT)

Construction activity may generate a temporary increase in MSAT emissions. Project-level assessments that render a decision to pursue construction emission mitigation will benefit from a number of technologies and operational practices that should help lower short-term MSATs. **Measure AIR-1** and **AIR-3** help to address these short-term MSAT emissions.

West Segment – Fundable First Phase

Environmental effects applicable to the Build Alternative are also applicable to West Segment. There are no anticipated average daily emissions specific to the West Segment that would change the regional conformity conclusions. All conformity determination applicable to the Build Alternative would apply to the West Segment.

No-Build Alternative

The No Build Alternative assumes that the existing I-80 would remain in place and no further action of improvements would occur. The currently planned and funded transportation projects within the air quality study area would be required to adhere to the applicable State requirements under separate review, which would protect air quality in the study area.

AVOIDANCE, MINIMIZATION, AND/ OR MITIGATION MEASURES

Build Alternative

Construction Related Minimization Measures

Measure AIR-1: Construction period to air quality effects are short-term in duration and, therefore, will not result in long-term adverse conditions. Implementation of the following measures, some of which may also be required for other purposes such as storm water pollution control will reduce any air quality impacts resulting from construction activities:

- The construction contractor must comply with Caltrans' Standard Specifications in Section 14-9 (2010). Section 14-9-02 specifically requires compliance by the contractor with all applicable laws and regulations related to air quality, including air pollution control district and air quality management district regulations and local ordinances. Section 14-9.03 is directed at controlling dust. If dust palliative materials other than water are to be used, material specifications are described in Section 18.

Measure AIR-2: Water or dust palliative will be applied to the site and equipment as often as necessary to control fugitive dust emissions. Fugitive emissions generally must meet a "no visible dust" criterion either at the point of emissions or at the right-of-way line depending on local regulations.

Measure AIR-3: Measures to reduce PM_{10}, $PM_{2.5}$ and diesel particulate matter from construction would be incorporated to the extent feasible to ensure that short-term health impacts to nearby sensitive receptors are avoided. These include:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power' sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. At a minimum, all equipment should meet the current CARB fleet standards.
- Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Operational Related Measures

No avoidance, minimization, and/or mitigation measures are required for the operation of the Build Alternative, as the proposed improvements would not produce substantial operational air quality effects.

West Segment – Fundable First Phase

Caltrans' standard specifications and dust control measures are applicable to the entire Build Alternative alignment, including the West Segment. No avoidance, minimization, or mitigation measures would be required beyond the implementation of the Caltrans' standard specifications.

CLIMATE CHANGE

Climate change is analyzed at the end of this chapter (see **Section 2.5, Climate Change**). Neither the United States Environmental Protection Agency (U.S. EPA) nor Federal Highway Administration (FHWA) has issued explicit guidance or methods to conduct project-level greenhouse gas analysis. As stated on FHWA's climate change website (http://www.fhwa.dot.gov/environment/climate_change), climate change considerations should be integrated throughout the transportation decision-making process–from planning through project development and delivery. Addressing climate change mitigation and adaptation up front in the planning process will aid decision-making and improve efficiency at the program level, and will inform the analysis and stewardship needs of project-level decision-making. Climate change considerations can easily be integrated into many planning factors, such as supporting economic vitality and global efficiency, increasing safety and mobility, enhancing the environment, promoting energy conservation, and improving the quality of life.

Because there have been more requirements set forth in California legislation and executive orders on climate change, the issue is addressed in a separate California Environmental Quality Act (CEQA) discussion at the end of this chapter and may be used to inform the National Environmental Policy Act (NEPA) decision. The four strategies set forth by FHWA to lessen climate change impacts do correlate with efforts that the State has undertaken and is undertaking to deal with transportation and climate change; the strategies include improved transportation system efficiency, cleaner fuels, cleaner vehicles, and reduction in the growth of vehicle hours travelled.

2.2.7 NOISE

REGULATORY SETTING

The National Environmental Policy Act (NEPA) of 1969 and the California Environmental Quality Act (CEQA) provide the broad basis for analyzing and abating highway traffic noise effects. The intent of these laws is to promote the general welfare and to foster a healthy environment. The requirements for noise analysis and consideration of noise abatement and/or mitigation, however, differ between NEPA and CEQA.

California Environmental Quality Act

CEQA requires a strictly baseline versus build analysis to assess whether a proposed project will have a noise impact. If a proposed project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless those measures are not feasible. The CEQA noise analysis is included at the end of this section.

National Environmental Policy Act and 23 CFR772

For highway transportation projects with FHWA (and the Department, as assigned) involvement, the federal-Aid Highway Act of 1970 and the associated implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. The regulations include noise abatement criteria (NAC) that are used to determine when a noise impact would occur, as shown in **Table 2.2-22**. The NAC differ depending on the type of land use under analysis. Noise levels are expressed in terms of the A-weighted decibel (dBA) and the one-hour equivalent sound level (Leq[h]). For example, the NAC for residences (67 dBA) is lower than the NAC for commercial areas (72 dBA). The following table lists the noise abatement criteria for use in the NEPA 23 CFR 772 analysis.

Table 2.2-22 Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level, Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[A]	67 (Exterior)	Residential.
C[A]	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.

Activity Category	NAC, Hourly A-Weighted Noise Level, Leq(h)	Description of Activity Category
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	No NAC--- reporting only	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical, etc.), and warehousing.
G	No NAC--- reporting only	Undeveloped lands that are not permitted.

Note:
A. Includes undeveloped lands permitted for this activity category.
Source: Caltrans, 2011. Traffic Noise Analysis Protocol

Figure 2.2-6 lists the noise levels of common activities to enable readers to compare the actual and predicted highway noise-levels discussed in this section with noise levels of common activities.

According to Caltrans' *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects*, May 2011, a noise impact occurs when the predicted future noise level with the project substantially exceeds the existing noise level (defined as a 12 dBA or more increase) or when the future noise level with the project approaches or exceeds the NAC. Approaching the NAC is defined as coming within 1 dBA of the NAC.

If it is determined that the project will have noise impacts, then potential abatement measures must be considered. Noise abatement measures that are determined to be reasonable and feasible at the time of final design are incorporated into the project plans and specifications. This document discusses noise abatement measures that would likely be incorporated in the project.

Caltrans' Traffic Noise Analysis Protocol sets forth the criteria for determining when an abatement measure is reasonable and feasible. Feasibility of noise abatement is basically an engineering concern. A minimum 5 dBA reduction in the future noise level must be achieved for an abatement measure to be considered acoustically feasible. Other considerations include topography, access requirements, other noise sources, and safety considerations. The reasonableness determination is basically a cost-benefit analysis. Factors used in determining whether a proposed noise abatement measure is reasonable include: the noise reduction design goal (at least 7 dB of noise reduction at one or more benefitted receptors), residents acceptance and the cost of the noise abatement.

AFFECTED ENVIRONMENT

The information for the noise analysis was obtained through the Noise Study Report prepared for the project (Caltrans, 2014m). The noise study area encompasses all developed land uses surrounding the project limits, with a focus on noise-sensitive land uses. Noise-sensitive land uses include areas where serenity and quiet are of extraordinary significance, residential land uses, and other community uses such as hospitals, schools, cemeteries, and parks. Commercial land uses including hotels, motels, and offices are also sensitive to noise.

Noise-sensitive land uses in the vicinity of the project limits include single- and multi-family residences, active recreational areas, day care centers, churches, and hotels. The existing noise environment throughout the project limits varies by location, depending on site characteristics such as proximity to major roadways or other significant sources of noise, the relative elevation of roadways and receptors, and any intervening structures or barriers. The noise study area was divided into six segments for noise modeling and noise abatement assessment purposes. **Appendix G** shows the sensitive land use locations and the sensitive receptor locations that were modeled in each noise study segment.

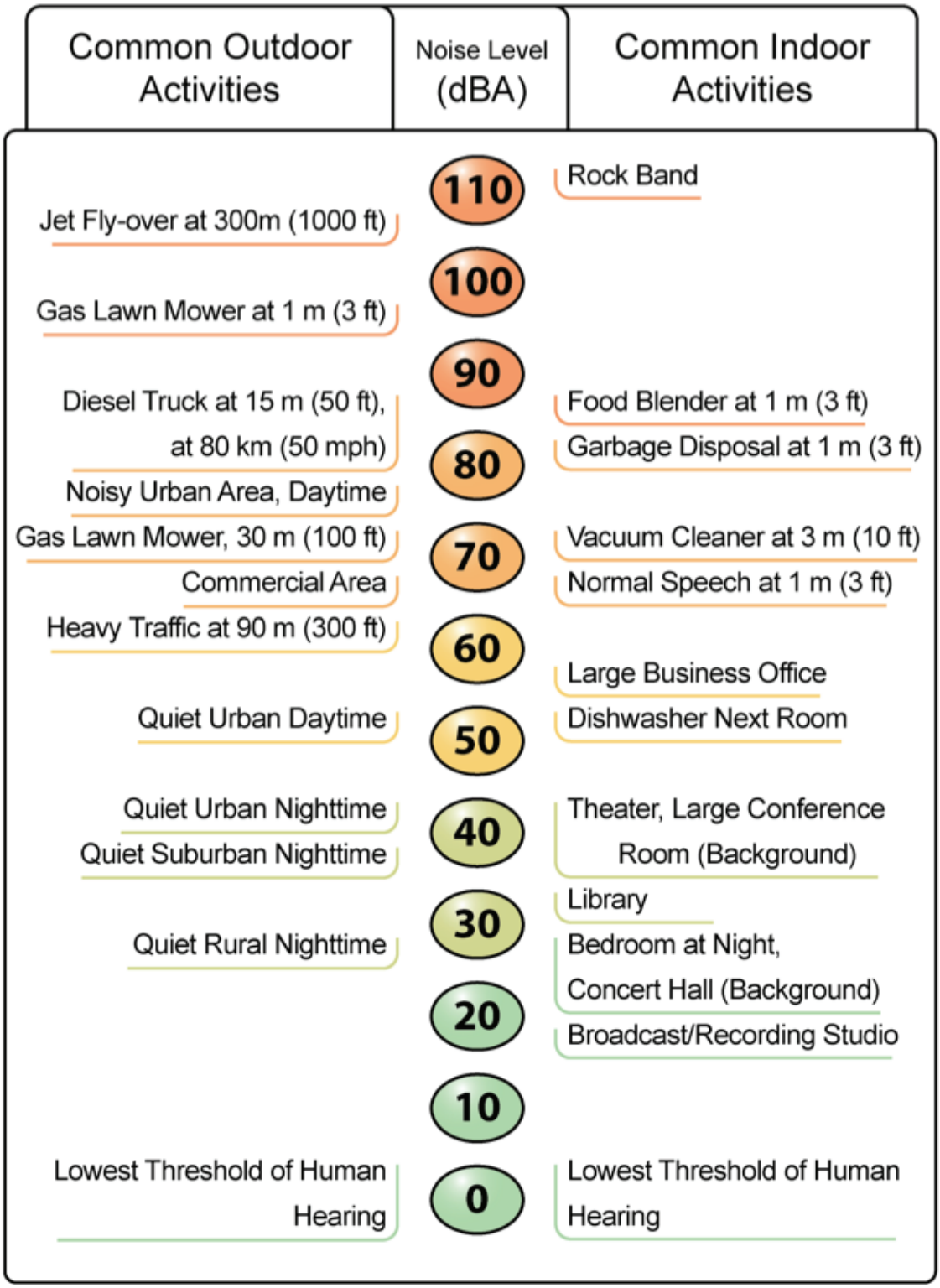
Noise Modeling

Short- and long-term field measurements were taken to document the current noise environment within the noise study area (see **Appendix G**). Noise measurement locations were used as noise modeling receivers for the prediction of existing and future worst-hour traffic noise levels.

Long-term (LT) noise measurements were made at six (6) locations along the I-80 corridor to quantify the daily trend in noise levels and to establish the peak traffic noise hour. The noise measurements were made in August, October, and November 2012, over periods ranging from one to three days. Long-term noise measurement locations were selected to generally represent human activity areas such as residential rear yard areas adjoining I-80 or in areas considered to be acoustically equivalent to noise-sensitive exterior use areas.

Fifty-eight (58) short-term (ST) noise measurements were made concurrent with the data being collected at the long-term measurement sites. This facilitates a direct comparison between both the short-term and long-term reference noise measurements and allows for the identification of the worst-hour noise levels at Category B, C, D, and E land uses in the vicinity of the project limits. Thirty-four (34) short-term noise measurements were made along the corridor in Fairfield, and twenty-four (24) short-term noise measurements were made along the corridor in Vacaville.

Table 2.2-23 presents the long-term noise measurements. **Table 2.2-24 through Table 2.2-29** summarize short-term noise measurements and calculated worst-hour noise levels by each segment of the noise study area.



Noise Levels for Common Activities

Figure 2.2-6

Source: Caltrans Standard Environmental References, 2014

Table 2.2-23 Summary of Long-Term Noise Measurements

Receptor ID	Noise Study Segment Number	Location	Date	Worst Hour	Measured Leq[h], dBA During Worst Hour
West Segment					
LT-1	2	End of Mankas Boulevard, Fairfield	10/3/2012	5:00 p.m.	64
			10/4/2012	6:00 a.m.	65
			10/18/2012	9:00 a.m.	68
			10/19/2012	6:00 a.m.	68
East Segment					
LT-2	3	Rear yard of 3418 Ellen Drive, Fairfield	10/18/2012	10:00 a.m.	58
			10/19/2012	7:00 a.m.	58
LT-3	4	Parking lot of Rancho Hotel on Rivera Road, Vacaville	1025/2012	2:00 p.m.	76
			10/26/2012	9:00 a.m.	75
LT-4	4	~15 feet from existing sound wall, near 195 Fairoaks Drive, Vacaville	10/25/2012	10:00 a.m.	71
			10/26/2012	6:00 a.m.	72
LT-5	5	Front of 100 Birch Street, Vacaville	11/14/2012	12:00 p.m.	62
			11/15/2012	7:00 a.m.	64
LT-6	5	Front of 128 Sunset Lane, Vacaville	9/12/2012	5:00 p.m.	69
			9/13/2012	5:00 a.m.	64

Notes: LT = Long-term
Source: Caltrans, 2014m

Existing Conditions

A summary of the existing and planned sensitive land uses within each noise study segment and the current noise levels at these locations is provided below. Future development considered in the noise analysis include those that have received final development approval and are within approximately 500 feet of the centerline of I-80, where traffic noise levels from the highway could dominate the noise environment. Future developments located beyond this distance are excluded from further analysis. Most of the land uses within the noise study area are built-out; however, there are a few residential projects in the Cities of Fairfield and Vacaville, which would be developed in the future. No future development of noise-sensitive projects is proposed within the portion of the noise study area that is in Solano County.

Land uses in the five segments detailed below include Activity Categories B, C, D, and E; all segments except Segment 6 contain Activity Category B (residences). Worst hour noise levels range from 51 to 72 dBA, and all segments except Segment 6 have noise measurements that approach or exceed the NAC. Each segment is described in more detail below.

Segment 1 – Red Top Road to Chadbourne Road (West Segment)

Segment 1 of the noise study area is located in the City of Fairfield, from the westernmost project limit at Red Top Road to Chadbourne Road. This noise study segment contains Activity Category B land uses (residences), Activity Category C land uses (Guru Nanak Sikh Temple, Fairfield Linear Park Trail, and Scandia Family Fun Center), and Activity Category E land uses (Days Inn and Best Western Hotels). As indicated in **Table 2.2-24**, existing worst-hour noise levels at this location are 70 dBA, which exceeds the NAC threshold of 67 dBA. No existing noise barriers were identified within this segment.

Table 2.2-24 Summary of Existing Noise Measurement in Segment 1 of Noise Study Area

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-1	On Fairfield Linear Park Trail near WB I-80, south of Business Center Drive, Fairfield	C(67)	11:50 a.m. - 12:10 p.m.	70

Notes: ST = Short-term; WB = Westbound
Source: Caltrans, 2014m

Segment 2 – Chadbourne Road to Air Base Parkway (West Segment)

Segment 2 of the noise study area is located in the City of Fairfield, from Chadbourne Road to Air Base Parkway. This noise study segment contains Activity Category B land uses (residences), several Activity Category D and E land uses (Extended Stay America Fairfield Hotel, Courtyard by Marriott Fairfield Napa Valley Area, Kindercare Learning Center), and Activity Category C uses (Guru Nanak Sikh Temple, Harvest Valley School, recreational soccer fields, and the Fairfield Linear Park Trail). As indicated in **Table 2.2-25**, existing worst-hour noise levels at short-term measurement locations range from 57 to 71 dBA. Several 8- to 12-foot-high noise barriers shield many of these land uses. One noise measurement at the Fairfield Linear Park Trail near the westbound I-80 off-ramp at Chadbourne Road (ST-2) exceeded the NAC threshold of 67 dBA, and a second noise measurement at the front yard of 1806 Michigan Street (ST-6) approached the NAC threshold of 67 dBA.

Table 2.2-25 Summary of Existing Noise Measurements in Segment 2 of Noise Study Area

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-2	On Fairfield Linear Park Trail near WB I-80 off-ramp at Chadbourne Road, Fairfield	C(67)	11:00 a.m. - 11:20 a.m.	**71**

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-3	Rear yard of 2518 Raleigh Court, Fairfield	B(67)	10:40 a.m. - 11:00 a.m.	57
ST-4	Rear yard of 2406 Woolner Avenue, Fairfield	B(67)	10:00 a.m. - 10:20 a.m.	60
ST-5	Rear yard of 1262 Hartford Circle, Fairfield	B(67)	11:30 a.m. - 11:50 a.m.	59
ST-6	Front yard of 1806 Michigan Street, Fairfield	B(67)	11:20 a.m. - 11:40 a.m.	66
ST-7	Rear yard of 1828 Barbour Drive, Fairfield	B(67)	10:00 a.m. - 10:20 a.m.	65
ST-8	Rear yard of 1942 Buckingham Drive, Fairfield	B(67)	12:20 p.m. - 12:40 p.m.	64
ST-9	Front yard of 1971 Buckingham Drive, Fairfield	B(67)	10:10 a.m. - 10:30 a.m.	57
ST-10	Front yard of 1379 Flint Way, Fairfield	B(67)	10:10 a.m. - 10:20 a.m.	58
ST-11	Front yard of 1360 Avon Way, Fairfield	B(67)	12:20 p.m. - 12:40 p.m.	61
ST-12	Rear yard eq. to 2401 Mankas Boulevard (dead end), Fairfield	B(67)	10:00 a.m. - 10:30 a.m.	65

Notes: ST = Short-term; WB = Westbound
1. **BOLD** font indicates noise levels approaching or exceeding NAC.
Source: Caltrans, 2014m

Segment 3 – Air Base Parkway to Manuel Campos Parkway (East Segment)

Segment 3 of the noise study area is located in the City of Fairfield, from Air Base Parkway to Manuel Campos Parkway. This noise study segment contains Activity Category B land uses (residences) and Activity Category D and E land uses (America's Best Value Inn). There is undeveloped land in this segment. As shown in **Table 2.2-26**, existing worst-hour noise levels at the short-term measurement locations range from 53 to 67 dBA. Several 8- to 16-foot-high noise barriers shield sensitive receptors within this segment. Several rear yards of the residences adjacent to the I-80 corridor (ST-20 and ST-22) approached the NAC threshold of 67 dBA.

Table 2.2-26 Summary of Existing Noise Measurements in Segment 3 of Noise Study Area

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-13	Rear yard of 425 Violet Court, Fairfield	B(67)	10:50 a.m. - 11:10 a.m.	56
ST-14	Rear yard of 390 Carnation Drive, Fairfield	B(67)	10:50 a.m. -11:10 a.m.	63
ST-15	Rear yard of 9 Dali Court (mobile homes), Fairfield	B(67)	10:40 a.m. - 11:00 a.m.	58
ST-16	Rear yard of 2 Dali Court (mobile homes), Fairfield	B(67)	10:40 a.m. - 11:00 a.m.	63
ST-17	Rear yard of 444 Bluebonnet Court, Fairfield	B(67)	11:30 a.m. - 11:50 a.m.	63
ST-18	Rear yard of 2768 Violet Avenue, Fairfield	B(67)	11:40 a.m. - 12:00 p.m.	60
ST-19	Side yard eq. of 2805 Marigold Drive, Fairfield	B(67)	12:20 p.m. - 12:40 p.m.	53
ST-20	Rear yard of 2884 Montclair Way, Fairfield	B(67)	11:10 a.m. - 11:30 a.m.	**66**
ST-21	Rear yard of 2855 Marigold Drive, Fairfield	B(67)	12:20 p.m. -12:40 p.m.	61
ST-22	Rear yard eq. of 2100 Greenfield Drive (dead end), Fairfield	B(67)	11:10 a.m. - 11:30 a.m.	**67**
ST-23	Rear yard of 2957 Marigold Drive, Fairfield	B(67)	12:50 p.m. - 1:10 p.m.	55
ST-24	Front yard of 2021 Hillridge Drive, Fairfield	B(67)	12:00 p.m. - 12:20 p.m.	57
ST-25	Rear yard of 2021 Cliffwood Drive, Fairfield	B(67)	12:10 p.m. - 12:30 p.m.	62
ST-26	Rear yard of 3414 Glen Ellen Drive, Fairfield	B(67)	12:40 p.m. - 1:00 p.m.	59
ST-27	Rear yard of 3522 Glen Ellen Drive, Fairfield	B(67)	12:50 p.m. - 1:10 p.m.	61

Notes: ST = Short-term; WB = Westbound
1. **BOLD** font indicates noise levels approaching or exceeding NAC.
Source: Caltrans, 2014m

Segment 4 – Manuel Campos Parkway to Alamo Drive (East Segment)

Segment 4 of the noise study area passes through the cities of Fairfield and Vacaville, from Manuel Campos Parkway to Alamo Drive. This noise study segment contains Activity Category B land uses (residences), Activity Category C land uses (Lagoon Valley Park, Peña Adobe Park, and Paradise Valley Golf Course), and Activity Category D and E land uses (Ranchotel Horse Center, New Life Church, Crossroads Christian Church, and the Alamo Inn). There is also a considerable amount of undeveloped land use in this noise segment. As shown in **Table 2.2-27**, existing worst-hour noise levels at short-term measurement locations (excluding model calibration points) range from 51 to 72 dBA. There is one existing 8-foot-high barrier (Barrier 9), located along the Merchant Street on-ramp to westbound I-80. However, there are several locations within segment 4 of the noise study area the approach or exceed the NAC (ST-34, ST-35, and ST-37).

Table 2.2-27 Summary of Existing Noise Measurements in Segment 4 of Noise Study Area

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-28	Rear yard of 3817 Poppy Hills Court, Fairfield	B(67)	1:30 p.m. - 1:50 p.m.	51
ST-29	Rear yard of 4001 The Masters Drive, Fairfield	B(67)	1:30 p.m. - 1:50 p.m.	54
ST-30	1st-story patio eq. at Rolling Oaks Apts., Fairfield	B(67)	1:20 p.m. - 1:40 p.m.	60
ST-31	Basketball courts at Rolling Oaks Apts., Lyon Road, Fairfield	C(67)	1:20 p.m. - 1:40 p.m.	58
ST-32	Rear yard of 4137 The Masters Drive, Fairfield	B(67)	2:10 p.m. - 2:30 p.m.	58
ST-33	Eastern end of Rolling Oaks Apts., Fairfield	B(67)	1:40 p.m.	61
ST-34	New Life Church parking lot, Fairfield	D(52)	10:40 a.m. - 11:00 a.m.	**72**
ST-35	Peña Adobe Park, Vacaville	C(67)	10:40 a.m. - 11:00 a.m.	**69**
ST-36	Pool area of Vacaville Apt. Complex, Vacaville	B(67)	11:10 a.m. - 11:30 a.m.	58
ST-37	Adjacent to 270 Butcher Road, Vacaville	B(67)	11:30 a.m. - 11:50 a.m.	**72**
ST-38	Pre-school play area at Crossroads Church, Vacaville	C(67)	11:50 a.m. - 12:10 p.m.	62

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-39	Near Fair oaks Drive Condo, Vacaville	Calibration Point	11:20 a.m. - 11:40 a.m	65
ST-40	Parking lot of Alamo Inn, Vacaville	Calibration Point	11:50 a.m. - 12:10 p.m.	76

Notes: ST = Short-term; WB = Westbound
BOLD font indicates noise levels approaching or exceeding NAC.
Source: Caltrans, 2014m

Segment 5 – Alamo Drive to Allison Drive (East Segment)

Segment 5 of the noise study area is located in the City of Vacaville, from Alamo Drive to Allison Drive. This noise study segment contains Activity Category B land uses (residences) and Activity Category C land uses (Willows Park). There is also some undeveloped land in this segment. As shown in **Table 2.2-28**, existing worst-hour noise levels at the short-term measurement locations range from 59 to 72 dBA. Several 8- to 14-foot-high noise barriers shield some of the sensitive receptors within this segment. However, some residential areas (ST-43, ST-45, ST-47, ST-47, and ST-49) approach or exceed the NAC.

Table 2.2-28 Summary of Existing Noise Measurements in Segment 5 of Noise Study Area

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-41	Willows Park, Ogden Way, Vacaville	C(67)	10:10 a.m. - 10:30 a.m.	62
ST-42	Rear yard of 620 Piedmont Court, Vacaville	B(67)	11:10 a.m. - 11:30 a.m.	61
ST-43	Front yard of 112 Oak Street, Vacaville	B(67)	10:00 a.m. - 10:20 a.m.	66
ST-44	Front yard of 116 Birch Street, Vacaville	B(67)	10:30 a.m. - 10:50 a.m.	63
ST-45	Adjacent to 191, 201 Bella Vista Road, Vacaville	D(52)	11:30 a.m. - 11:50 a.m.	72
ST-46	Front yard of 90 Birch Street, Vacaville	B(67)	11:00 a.m. - 11:20 a.m.	63
ST-47	Rear yard eq. of 460 Pecan Street, across from the Park & Ride, Vacaville	B(67)	11:30 a.m. - 11:50 a.m.	**68**

Receptor ID	Location	Noise Abatement Criteria (NAC) Threshold	Start Time – End Time	Worst Hour Leq[h], dBA
ST-48	Southeast corner of Hampton Inn, near pool area, Vacaville	E(72)	10:00 a.m. - 10:20 a.m.	68
ST-49	Comstock Way, Chaparral Loop, Vacaville	B(67)	10:30 a.m. - 10:50 a.m.	**67**
ST-50	End of Valley Drive, near Chaparral Loop, Vacaville	B(67)	11:00 a.m. - 11:20 a.m.	59
ST-51	Front yard of 49 Sunset Lane (mobile homes), Vacaville	B(67)	10:00 a.m. - 10:20 a.m.	59

Notes: ST = Short-term; WB = Westbound
BOLD font indicates noise levels approaching or exceeding NAC.
Source: Caltrans, 2014m

Segment 6 – Allison Drive to Leisure Town Road (East Segment)

Segment 6 of the noise study area is located in the City of Vacaville, from Allison Drive to Leisure Town Road. No Activity Category B land uses were identified adjacent to the freeway corridor within this noise study segment. This noise study segment contains Activity Category C land uses (Green Tree Golf Club) and Activity Category E land uses (several hotels and motels). As shown in **Table 2.2-29**, existing worst-hour noise levels at short-term measurement locations range from 53 to 63 dBA. No existing noise barriers were identified in segment 6 of the noise study area. No areas within segment 6 of the noise study area approach or exceed the NAC.

Table 2.2-29 Summary of Existing Noise Measurements in Segment 6 of Noise Study Area

Receptor ID	Location	Activity Category (NAC)	Start Time – End Time	Worst Hour Leq[h], dBA
ST-52	Pool area of America's Value Inn, Vacaville	E(72)	11:30 a.m. - 11:50 a.m.	63
ST-53	Courtyard Marriott, 120 Nut Tree Parkway, Vacaville	E(72)	10:40 a.m. - 11:00 a.m.	55
ST-54	Tennis courts of Marriott Residence Inn, Vacaville	E(72)	12:30 p.m. - 12:50 p.m.	57
ST-55	Pool area of Motel 6, Orange Drive & Lawrence Drive, Vacaville	E(72)	12:50 p.m. - 1:10 p.m.	53
ST-56	Golf Course near 671 Orange Drive, Vacaville	C(67)	12:30 p.m. - 12:50 p.m.	60

Receptor ID	Location	Activity Category (NAC)	Start Time – End Time	Worst Hour Leq[h], dBA
ST-57	Parking lot of Extended Stay America, Vacaville	E(72)	12:30 p.m. - 12:50 p.m.	59
ST-58	Kaiser Permanente, southeast corner of nearest building, Vacaville	C(67)	12:30 p.m. - 12:50 p.m.	57

Notes: ST = Short-term; WB = Westbound
BOLD font indicates noise levels approaching or exceeding NAC.
Source: Caltrans, 2014m

ENVIRONMENTAL CONSEQUENCES

Build Alternative

The Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise" provides procedures for preparing operational and construction noise studies and evaluating noise abatement options. Under 23 CFR 772, projects are categorized as Type I, Type II, or Type III projects. Type I projects are defined as proposed federal or federal-aid highway improvements for the construction of a highway on new location; or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes. The FHWA identifies Type I projects as improvements that will create a completely new noise source, increase the volume or speed of traffic, or move the traffic closer to a receiver. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or the widening of an existing ramp by a full lane for its entire length. As the Build Alternative involves the construction of a new lane on I-80, as well as auxiliary lanes and ramp improvements, it is considered a Type I project. The FHWA noise regulations require noise analyses for all Type I projects.

Future (2040) traffic noise conditions under the Build and No-Build Alternatives were modeled for the identified noise sensitive land uses illustrated in **Appendix G**. **Tables 2.2-30** through **Table 2.2-35** present the existing and future modeled noise levels for these land uses (receptors). Land uses are grouped together by segments, described previously, and are listed consecutively. The noise-sensitive receptors in the study area are mainly defined as Activity Category B and C land uses, which have an NAC threshold of 67 dBA. There are some Activity Category D and E land uses, the NAC threshold for which is 52 dBA and 72 dBA, respectively. Traffic noise impacts are identified when noise levels are predicted to approach or exceed the NAC.

Noise levels within the noise study area would slightly increase when compared with existing conditions. Predicted noise level increases of 1 to 2 dBA are expected under the 2040 Build conditions. These increases are not considered substantial (defined as 12 dBA or more increase).

With the exception of Segment 6, all of the noise study area segments would experience noise levels that approach or exceed the NAC under the 2040 Build conditions, requiring consideration of noise abatement (see **Mitigation Measure NOI -A**).

Segment 1 – Red Top Road to Chadbourne Road (West Segment)

Under the 2040 No-Build and 2040 Build conditions, noise levels within Segment 1 of the noise study area would generally remain the same when compared with existing conditions. Slight, one-decibel increases/decreases are not considered substantial.

Under the 2040 Build conditions, noise levels are predicted to approach or exceed the NAC at the Fairfield Linear Park Trail (ST-1), Scandia Family Fun Center (R-1c), and one residence located north of I-80 near the Fairfield Linear Park Trail (R-1d). Noise abatement in the form of new sound walls (SW1 and SW2) was considered for impacted receptors.

Table 2.2-30 Modeled Noise Levels – Segment 1 of Noise Study Area

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-1	70	70	70	0	0	C(67)	A/E
R-1a	66	67	66	1	0	E(72)	None
R-1b	56	56	56	0	0	E(72)	None
R-1c	76	76	76	0	0	C(67)	A/E
R-1d	70	71	70	1	0	B(67)	A/E
R-2a	68	68	68	0	0	F	None
R-2b	64	64	64	0	0	F	None
R-2c	62	63	63	1	1	B(67)	None
R-2d	62	62	62	0	0	F	None
R-2e	67	68	68	1	1	E(72)	None

Notes:
1. Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC.
2. Modeled receptor locations (R-#)

Source: Caltrans, 2014m

Segment 2 – Chadbourne Road to Air Base Parkway (West Segment)

Under the 2040 No-Build and 2040 Build conditions, noise levels within Segment 2 of the noise study area would generally remain the same when compared with existing conditions. Slight, one-decibel increases/decreases are not considered substantial.

Under the 2040 Build conditions, noise levels are predicted to approach or exceed the NAC at the Fairfield Linear Park Trail (ST-2, R-4e, R-6a, R-6b, R-6c), residences along Loland Lane (R-4c and R-4d), first row residences located south of Travis Boulevard (ST-6, R-6d, R-6e, R-6f, R-6h, R-6j, and

R-6k), residences located south of Air Base Parkway (ST-7, R-7d, R-7e, R-7g, R-7h, R-7j, R-7l, R-12a-e, R-8a, R-8c, R-8e, R-10c, R-11a-d, and R-11f), and at Harvest Valley School (R-11g). Many of these land uses are shielded by existing 6- to 12-foot-high walls (Barriers 1, 2, 4, and 5). Noise abatement in the form of new sound walls (SW3, SW4, SW5, and SW6) and height increases for the existing noise barriers was considered for impacted receptors.

Table 2.2-31 Modeled Noise Levels – Segment 2 of Noise Study Area

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-2	71	71	71	0	0	C(67)	A/E
ST-3	57	58	58	1	1	B(67)	None
R-3a	59	60	60	1	1	B(67)	None
R-3b	62	62	62	0	0	B(67)	None
ST-4	60	61	61	1	1	B(67)	None
R-4a	60	60	60	0	0	B(67)	None
R-4b	65	65	65	0	0	C(67)	None
R-4c	68	69	69	1	1	B(67)	A/E
R-4d	69	69	69	0	0	B(67)	A/E
R-4e	78	79	79	1	1	C(67)	A/E
ST-5	59	60	60	1	1	B(67)	None
R-5a	64	65	65	1	1	B(67)	None
R-5b	60	61	61	1	1	B(67)	None
R-5c	61	61	61	0	0	B(67)	None
R-5d	60	61	61	1	1	B(67)	None
R-5e	66	66	66	0	0	E(72)	None
R-5f	62	63	63	1	1	B(67)	None
ST-6	66	66	66	0	0	B(67)	A/E
R-6a	70	71	71	1	1	C(67)	A/E
R-6b	69	70	70	1	1	C(67)	A/E
R-6c	69	69	69	0	0	C(67)	A/E
R-6d	66	66	66	0	0	B(67)	A/E
R-6e	68	69	68	1	0	B(67)	A/E
R-6f	71	72	72	1	1	B(67)	A/E
R-6g	62	63	63	1	1	B(67)	None
R-6h	72	72	72	0	0	B(67)	A/E

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
R-6i	63	64	64	1	1	B(67)	None
R-6j	72	72	72	0	0	B(67)	A/E
R-6k	66	67	66	1	0	B(67)	A/E
R-6l	64	65	65	1	1	B(67)	None
ST-7	65	66	66	1	1	B(67)	A/E
R-7a	63	64	64	1	1	B(67)	None
R-7b	60	61	61	1	1	B(67)	None
R-7c	59	60	60	1	1	B(67)	None
R-7d	66	67	67	1	1	B(67)	A/E
R-7e	67	67	67	0	0	B(67)	A/E
R-7f	58	58	58	0	0	B(67)	None
R-7g	67	67	67	0	0	B(67)	A/E
R-7h	67	68	68	1	1	B(67)	A/E
R-7i	59	59	59	0	0	B(67)	None
R-7j	68	68	68	0	0	B(67)	A/E
R-7k	59	59	59	0	0	B(67)	None
R-7l	68	69	69	1	1	B(67)	A/E
R-7m	61	62	62	1	1	B(67)	None
ST-8	64	65	65	1	1	B(67)	None
R-8a	67	68	68	1	1	B(67)	A/E
R-8b	60	60	60	0	0	B(67)	None
R-8c	66	66	66	0	0	B(67)	A/E
R-8d	58	59	59	1	1	B(67)	None
R-8e	65	66	66	1	1	B(67)	A/E
ST-9	57	58	58	1	1	B(67)	None
R-9a	62	63	63	1	1	B(67)	None
ST-10	58	59	59	1	1	B(67)	None
R-10a	62	63	63	1	1	B(67)	None
R-10b	59	60	60	1	1	B(67)	None
R-10c	67	67	67	0	0	B(67)	A/E
ST-11	61	62	62	1	1	B(67)	None
R-11a	70	71	71	1	1	B(67)	A/E

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
R-11b	65	66	66	1	1	B(67)	A/E
R-11c	70	71	71	1	1	B(67)	A/E
R-11d	69	70	70	1	1	B(67)	A/E
R-11e	62	63	63	1	1	B(67)	None
R-11f	68	68	68	0	0	B(67)	A/E
R-11g	70	71	71	1	1	C(67)	A/E
R-11h	64	65	64	1	0	F	None
R-11i	62	63	63	1	1	F	None
ST-12	65	65	65	0	0	B(67)	None
R-12a	69	70	70	1	1	B(67)	A/E
R-12b	65	66	66	1	1	B(67)	A/E
R-12c	73	73	73	0	0	B(67)	A/E
R-12d	71	71	71	0	0	B(67)	A/E
R-12e	67	68	68	1	1	B(67)	A/E

Notes:
1. Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC.
2. Modeled receptor locations (R-#)

Source: Caltrans, 2014m

Segment 3 – Air Base Parkway to Manuel Campos Parkway (East Segment)

Under the 2040 No-Build and 2040 Build conditions, noise levels within Segment 3 of the noise study area would generally remain the same when compared with existing conditions. Slight, one- to 2-decibel increases/decreases are not considered substantial.

Under the 2040 Build conditions, noise levels are predicted to approach or exceed the NAC at the residences located along Montclair Way (ST-20 and ST-22). Impacted residences are shielded by an existing 8- to 9-foot-high wall (Barrier 7). Noise abatement in the form of height increases for the existing noise barrier was considered for impacted receptors.

Table 2.2-32 Modeled Noise Levels – Segment 3 of Noise Study Area

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-13	56	56	57	0	1	B(67)	None
ST-14	63	63	64	0	1	B(67)	None
ST-15	58	59	59	1	1	B(67)	None
ST-16	63	63	64	0	1	B(67)	None
ST-17	63	63	64	0	1	B(67)	None
ST-18	60	61	62	0	2	B(67)	None
ST-19	53	54	55	0	2	B(67)	None
ST-20	67	68	68	1	1	B(67)	A/E
ST-21	61	61	62	0	1	B(67)	None
ST-22	67	67	68	0	1	B(67)	A/E
ST-23	55	55	56	0	1	B(67)	None
R-23a	56	56	57	0	1	E(72)	None
ST-24	57	58	58	1	1	B(67)	None
ST-25	62	63	63	1	1	B(67)	None
ST-26	59	60	61	1	2	B(67)	None
R-26a	59	59	60	0	1	B(67)	None
ST-27	60	60	61	0	1	B(67)	None

Notes:
1. Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC.
2. Modeled receptor locations (R-#)

Source: Caltrans, 2014m

Segment 4 – Manuel Campos Parkway to Alamo Drive (East Segment)

Under the 2040 No-Build and 2040 Build conditions, noise levels within Segment 4 of the noise study area would generally remain the same when compared with existing conditions. Slight, one-decibel increases/decreases are not considered substantial.

Under the 2040 Build conditions, noise levels are predicted to approach or exceed the NAC at the Paradise Valley Golf Course (R-32a) and at rural residences along Blue Mountain Drive (R-33a), Cherry Glen Road (R-34b), Butcher Road (ST-37 and R-37b), and further west along Butcher Road Trail (R-37a). Noise levels are also predicted to approach or exceed the NAC at the Peña Adobe Park (ST-35). The modeled receptor along Butcher R-32a is currently shielded by a large berm. Noise abatement in the form of new sound walls (SW7, SW8, SW9, and SW10) was considered for impacted receptors.

New Life Church (ST-34) is a Category D land use located in Segment 4 of the noise study area. Exterior 2040 Build noise levels are predicted to be 72 dBA. However, there are no exterior land uses at this location. Based on typical building construction with windows closed, noise levels

inside the church would typically be 20 to 25 dB lower than exterior levels. As a result, interior noise levels would not exceed the NAC of 52 dBA. No noise abatement was considered for this receptor.

Table 2.2-33 Modeled Noise Levels – Segment 4 of Noise Study Area

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-28	51	51	52	0	1	B(67)	None
ST-29	54	54	54	0	0	B(67)	None
ST-30	60	60	61	0	1	B(67)	None
ST-31	58	58	59	0	1	C(67)	None
ST-32	58	59	59	1	1	B(67)	None
R-32a	66	66	67	0	1	C(67)	A/E
ST-33	61	61	62	0	1	B(67)	None
R-33a	72	72	72	0	0	B(67)	A/E
ST-34	72	72	72	0	0	D(52)	None
R-34a	63	63	64	0	1	B(67)	None
R-34b	65	65	66	0	1	B(67)	A/E
ST-35	69	70	70	1	1	C(67)	A/E
R-35a	66	66	66	0	0	E(72)	None
ST-36	58	58	58	0	0	B(67)	None
ST-37	72	73	73	1	1	B(67)	A/E
R-37a	78	78	78	0	0	C(67)	A/E
R-37b	69	70	70	1	1	B(67)	A/E
ST-38	62	62	63	0	1	C(67)	None
ST-39	65	65	66	0	1	Cal Point	None
R-39a	64	65	65	1	1	B(67)	None
R-39b	68	69	69	1	1	D(52)	None
ST-40	75	76	76	1	1	Cal Point	None

Notes:
1. Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC.
2. Modeled receptor locations (R-#)

Source: Caltrans, 2014m

Segment 5 – Alamo Drive to Allison Drive (East Segment)

Under the 2040 No-Build and 2040 Build conditions, noise levels within Segment 5 of the noise study area would generally remain the same when compared with existing conditions. The receptors would experience noise level increases of 1 to 2 dBA. These increases are not considered substantial, as they are still below the 12 dBA threshold.

Under the 2040 Build conditions, noise levels are predicted to approach or exceed the NAC at the residences along Oak Street (ST-43), along the on-ramp from Davis Street to westbound I-80 (ST-47), and at the residences located in the Sunset Circle Mobile Homes complex (R-51a, R-51b, and R-51c).

The residences on Oak Street (ST-43) are shielded by an existing 14-foot high wall (Barrier 11). Residences adjacent to the Davis Street on ramp are not shielded from the highway and adjacent Park and Ride, which acts as a secondary noise source. Noise abatement in the form of a new sound wall (SW12) was considered for impacted receptors. Wall height increases were assessed for existing Barrier 11 to abate noise impacts at residences along Oak Street; however, increasing the height of Barrier 11 would not be considered feasible because only a maximum of 2 dB of additional attenuation can be achieved with a 16-foot barrier.

The Chaparral Loop (ST-49) is currently being developed with residential uses as part of the Ivywood Project. Construction of noise walls for this development was taking place during the noise monitoring period. Development of the Ivywood Project would be required to meet local noise regulations and, as such, is not assessed further in this document.

There is a church under construction at 201 Bella Vista Road (ST-45). Based on typical building construction with windows closed, noise levels inside the church would typically be 20 to 25 dB lower than exterior levels. As a result, interior noise levels would not exceed the NAC of 52 dBA. No noise abatement was considered for this receptor.

Table 2.2-34 Modeled Noise Levels – Segment 5 of Noise Study Area

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
R-40a	69	69	70	0	1	E(72)	None
ST-41	62	63	63	1	1	C(67)	None
ST-42	61	62	62	1	1	B(67)	None
ST-43	66	67	67	1	1	B(67)	A/E
ST-44	63	64	65	1	2	B(67)	None
R-44a	63	64	64	1	1	B(67)	None
ST-45	72	73	73	1	1	D(52)	None

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-46	63	64	64	1	1	B(67)	None
R-46a	63	64	65	1	2	B(67)	None
ST-47	68	69	69	1	1	B(67)	A/E
ST-48	68	69	69	1	1	E(72)	None
ST-49	67	68	68	1	1	B(67)	A/E
ST-50	59	60	60	1	1	B(67)	None
ST-51	59	60	60	1	1	B(67)	None
R-51a	65	66	67	1	2	B(67)	A/E
R-51b	74	75	76	1	2	B(67)	A/E
R-51c	65	65	66	0	1	B(67)	A/E

Notes:
1. Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC.
2. Modeled receptor locations (R-#)

Source: Caltrans, 2014m

Segment 6 – Allison Drive to Leisure Town Road (East Segment)

Under the 2040 No-Build and 2040 Build conditions, noise levels within Segment 6 of the noise study area would generally remain the same when compared with existing conditions. Slight, one- to 2-decibel increases/decreases are not considered substantial.

Under the 2040 Build conditions, noise levels are not predicted to approach or exceed the NAC. Noise abatement was not considered within Segment 6 of the noise study area.

Table 2.2-35 Modeled Noise Levels – Segment 6 of Noise Study Area

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-52	63	65	65	2	2	E(72)	None
R-52a	62	63	63	1	1	E(72)	None
ST-53	55	56	56	1	1	E(72)	None
ST-54	57	59	59	2	2	E(72)	None
ST-55	53	54	54	1	1	E(72)	None
ST-56	60	62	62	2	2	C(67)	None
ST-57	59	60	61	1	2	E(72)	None

Receptor ID	Worst-Hour Noise Levels, Leq[h] dBA			Noise Increase Over Existing		Activity Category (NAC)	Impact[1]
	Existing	2040 No-Build	2040 Build	2040 No-Build	2040 Build		
ST-58	57	59	59	2	2	C(67)	None

Notes:
1. Impact Type: S = Substantial Increase (12 dBA or more), A/E = Approach or Exceed NAC.
2. Modeled receptor locations (R-#)

Source: Caltrans, 2014m

Temporary Construction Noise

Noise levels generated by construction activities associated with the Build Alternative would be a function of the individual pieces of construction equipment, the type and amount of equipment operating at any given time, the timing and duration of construction activities, the proximity of nearby sensitive land uses, and the presence or lack of shielding at these sensitive land uses. Construction noise levels would vary on a day-to-day basis during each phase of construction depending on the specific task being completed. Each construction phase would require a different combination of construction equipment necessary to complete the task and differing usage factors for such equipment.

Construction activities anticipated under the Build Alternative would include earthwork demolition, the installation of utilities, construction of noise barriers that are found to be feasible and reasonable, paving, and the installation of overhead signs and electrical/communication facilities. The majority of Activity Category B land uses (residences) located adjacent to I-80 are shielded by existing noise barriers typically ranging from 8 to 16 feet in height. These existing noise barriers provide a minimum 5 to 10 dBA reduction in construction noise levels for the land uses on the opposite side of the barrier.

Table 2.2-36 presents the noise levels calculated at 100 feet for each major construction activity that would be associated with the Build Alternative. Noise generated by construction equipment drops off at a rate of 6 dB per doubling of distance.

Table 2.2-36 Construction Equipment Noise Levels at 100 feet

Construction Phase	Maximum Noise Level (Lmax, dBA)	Average Hourly Noise Levels (Leq[h], dBA)
Demolition	84	78
Earthwork	76	78
Paving	79	79
Structures (with Pile Driving)	95	89
Structures (without Pile Driving)	77	78

Source: Caltrans, 2014m

West Segment – Fundable First Phase

Segments 1 and 2 of the noise study area are located within the West Segment. Refer to the discussions above for a summary of the anticipated noise increases with the West Segment.

No-Build Alternative

Under the 2040 No-Build conditions, noise levels are anticipated to be almost equal to existing conditions in most locations, with a slight increase of 1 dBA for some areas. These changes are not considered a substantial increase in noise (defined as 12 dBA or more increase). Many locations would experience noise levels approaching or exceeding the NAC under both the 2040 Build and No-Build conditions. The No-Build Alternative would make no physical or operational improvements to I-80, nearby roadways, or interchanges; therefore, noise abatement for those areas already approaching or exceeding the NAC thresholds would not be considered for this alternative. Implementation of the currently planned and approved transportation and land use projects within the noise study area would be subject to the same noise assessment as the Build Alternative. These projects would be required to comply with the local operation and construction guidelines regarding noise impacts, which would be determined under separate environmental review.

AVOIDANCE, MINIMIZATION, AND/ OR MITIGATION MEASURES

Receptors that would experience a substantial noise increase (greater than 12 dBA) or exceed NAC thresholds must be evaluated for potential abatement/mitigation measures. Noise abatement is considered only where frequent human use occurs and where a lowered noise level would be of benefit. Noise abatement must be predicted to provide at least a 5 dBA minimum reduction at an impacted receiver to be considered feasible by Caltrans (i.e., the barrier would provide a noticeable noise reduction). Additionally, Caltrans acoustical design goal for noise abatement is that noise abatement must be predicted to provide at least 7 dBA of noise reduction at one or more benefited receptors. Noise abatement measures that provide noise reduction of more than 5 dB are encouraged as long as they meet the reasonableness guidelines. Furthermore, under Caltrans' policies, noise barriers should interrupt the line of sight between a truck stack (assumed to be 11.5 feet high) and a receiver (assumed to be 5 feet above ground).

Potential noise abatement measures identified in Caltrans' protocol include:

- Avoiding the project impact by using design alternatives, such as altering the horizontal and vertical alignment of the project
- Constructing noise barriers
- Using traffic management measures to regulate types of vehicles and speeds
- Acquiring property to serve as a buffer zone
- Acoustically insulating Activity Category D land uses

The chosen abatement type for this Build Alternative would be the construction of noise barriers. A preliminary noise abatement analysis was conducted that identified the feasibility of constructing, replacing, or increasing the height of existing noise barriers to reduce traffic noise levels. If, during final design, conditions substantially change from what was evaluated in this environmental document, noise barriers might not be provided.

The views and opinions of the residents living immediately adjacent to the proposed improvements and affected by the traffic noise would be considered in reaching a decision on noise abatement measures. Caltrans' policy is to not provide noise barriers if 50 percent or more of those affected residents do not want them. The opinions of these residents would be obtained through public and community meetings or other means, as appropriate. The final decision regarding noise abatement would be made upon completion of the Build Alternative design and public involvement processes.

Noise Abatement Decision Report

A Noise Abatement Decision Report (NADR) was completed for the project using NEPA-23 CFR 772 and Caltrans' protocol, which requires that noise abatement be considered for projects that are predicted to result in traffic noise impacts. The NADR analysis was incorporated into the Draft Project Report (Caltrans, 2014e).

Caltrans' protocol establishes a process for assessing the reasonableness and feasibility of noise abatement. Before publication of the draft environmental document, a preliminary noise abatement decision is made. The preliminary noise abatement decision is based on the feasibility of evaluated abatement and the preliminary reasonableness determination. NEPA-23 CFR 772 requires that noise abatement measures that are reasonable and feasible and are likely to be incorporated into the project be identified before adoption of the final environmental document.

To determine whether a proposed barrier is reasonable, the total reasonable allowance for that barrier must be greater or equal to the cost of the barrier. To calculate the reasonable allowance for a noise barrier, the total number of benefitted receptors is multiplied by the reasonable cost allowance ($55,000) for noise abatement per benefited receptor. A benefited receptor is any receptor receiving a minimum of a 5-dBA reduction in noise levels from the proposed barrier.

At the end of the public review process for the environmental document, the final noise abatement decision is made and is indicated in the final environmental document. The preliminary noise abatement decision will become the final noise abatement decision unless compelling information received during the environmental review process indicates that it should be changed.

Noise Barriers

A total of 21 potential noise barriers were evaluated for feasibility where the NAC would be approached or exceeded (see **Appendix G**). Ten of the 21 barriers were found to be both acoustically feasible and achieve the Caltrans noise reduction design goal (minimum 7 dBA reduction for at least one receptor). The total reasonable allowance for each feasible barrier that met the Caltrans noise reduction design goal ranged from $55,000 to $1,980,000 depending on the number of benefited receptors.

Table 2.2-37 provides a summary of the noise barriers that were determined to be acoustically feasible and the corresponding reasonable allowance. Proposed noise barriers are depicted in **Appendix G**.

Mitigation Measure NOI -A: Based on the studies completed to date, Caltrans intends to incorporate noise abatement in the form of the following noise barriers:

- Barrier SW11, along the north side of Davis Street/Hickory Lane on-ramp to westbound I-80, with a respective length and height of 280 feet and 10 feet. Calculations based on preliminary design data show that the barrier will reduce noise levels by 7 dBA for 5 residences at a cost of $136,100.
- Barrier SW12a, along the eastbound I-80 edge of shoulder, in front of the Sunset Circle Mobile Homes Complex, with a respective length and height of 1,960 feet and 14 feet. Calculations based on preliminary design data show that the barrier will reduce noise levels by 5 to 10 dBA for 28 residences at a cost of $1,194,900.

If during final design conditions have substantially changed, noise abatement may not be necessary. The final decision on noise abatement will be made upon completion of the project design and the public involvement processes.

Table 2.2-37 Summary of Noise Barrier Analysis

Sound Wall ID	Barrier Height (feet)	Noise Reduction (dBA)	Number of Benefited Receptors	Total Reasonable Monetary Allowance	Estimated Construction Cost	Preliminarily Recommended
Segment 1 – Red Top Road to Chadbourne Road (West Segment)						
SW1	8*	8	1	$55,000	$380,900	No
	10*	9	1	$55,000	$438,200	No
	12*	10	1	$55,000	$495,500	No
	14*	10	1	$55,000	$552,800	No
	16*	11	1	$55,000	$606,200	No
SW2	12*	5 to 7	2	$110,000	$1,447,600	No
	14*	6 to 8	2	$110,000	$1,615,100	No
	16*	7 to 9	2	$110,000	$1,771,200	No
Segment 2 – Chadbourne Road to Air Base Parkway (West Segment)						
SW3	8	6 to 9	2	$110,000	$2,245,200	No
	10	8 to 10	2	$110,000	$2,583,300	No
	12	5 to 13	6	$330,000	$2,921,400	No
	14	5 to 14	9	$495,000	$3,259,500	No
	16*	5 to 14	9	$495,000	$3,574,600	No

Sound Wall ID	Barrier Height (feet)	Noise Reduction (dBA)	Number of Benefited Receptors	Total Reasonable Monetary Allowance	Estimated Construction Cost	Preliminarily Recommended
SW5	16*	7	7	$385,000	$468,700	No
Segment 4 – Manuel Campos Parkway to Alamo Drive (East Segment)						
SW8	14*	8	2	$110,000	$1,024,300	No
	16*	8	2	$110,000	$1,123,300	No
SW9	12*	7	2	$110,000	$1,349,300	No
	14*	8	2	$110,000	$1,505,500	No
	16*	8	2	$110,000	$1,651,000	No
SW10	8*	6 to 7	7	$385,000	$2,820,000	No
	10*	7 to 8	7	$385,000	$3,244,600	No
	12*	5 to 11	9	$495,000	$3,669,300	No
	14*	5 to 13	9	$495,000	$4,093,900	No
	16*	5 to 14	9	$495,000	$4,489,700	No
Segment 5 – Alamo Drive to Allison Drive (East Segment)						
SW11	10*	7	5	$275,000	$136,100	Yes
	12*	8	5	$275,000	$153,900	Yes
	14*	8	5	$275,000	$171,700	Yes
	16*	8	5	$275,000	$188,200	Yes
SW12, Option a	12*	6 to 9	19	$1,045,000	$1,070,900	No
	14*	5 to 10	28	$1,540,000	$1,194,900	Yes
	16*	5 to 11	36	$1,980,000	$1,310,300	Yes
SW12, Option b	12*	7 to 9	28	$1,540,000	$1,638,500	No
	14*	8 to 10	28	$1,540,000	$1,800,300	No
	16*	5 to 11	36	$1,980,000	$1,952,300	Yes

Note: *Barrier is calculated to break line-of-sight between truck stacks and receptors.
Source: Caltrans, 2014m

Barrier SW11

Barrier SW11 would be located along the north side of Davis Street/Hickory Lane on-ramp to westbound I-80, between the on-ramp and the rear yards of the residences located on the southeast corner of Boyd Street and Pecan Street, in Vacaville.[10] This barrier would be approximately 280 feet in length.

[10] Barrier SW11 would not be a continuation of the proposed Replacement Barrier 11, located along the edge of shoulder of west-bound I-80. A continuous wall is not proposed because the residences along Boyd Street are situated behind existing structures, and would not benefit from an extended sound wall in this location.

This wall would feasibly abate traffic noise at the five residences closest to I-80, and would meet the 7 dB noise reduction goal at a minimum height of 10 feet. Barrier SW11 would also break the line-of-sight between truck stacks and receptors at a height of 10 feet. The construction cost of a 10 to 16 foot-high Barrier SW11 would range from $136,100 to $188,200, which is less than the reasonable cost allowance of $275,000. Barrier SW11, at 10 feet, is therefore recommended for incorporation into the Build Alternative.

Barrier SW12

Barrier SW12 would be located along the eastbound I-80 edge of shoulder, and would shield the residences in the Sunset Circle Mobile Homes Complex located approximately 200 feet south of the freeway. Two options were analyzed for Barrier SW12; one starting just east of Ulatis Creek (SW12a) and one starting just west of Ulatis Creek (SW12b). Barrier SW12b would require a portion of the wall to be built on the I-80 bridge structure that crosses the creek. Both Barrier SW12 options would feasibly abate traffic noise at these residences and would meet the 7 dB noise reduction goal at a minimum height of 12 feet. Both options of Barrier SW12 break the line-of-sight between truck stacks and receptors at a height of 12 feet. The reasonableness allowance calculated for barrier heights of 12 to 16 feet for SW12a ranged from $1,045,000 to $1,980,000. The reasonableness allowance calculated for barrier heights of 12 to 16 feet for SW12b ranged from $1,540,000 to $1,980,000.

Barrier SW12 Option A (14 - 16 feet high wall) and Barrier SW12 Option B (16 feet high wall) would be within the calculated reasonable cost allowance. While both are feasible, Barrier SW12a has a substantially lower estimated construction cost compared to Barrier SW12b, while providing the same noise abatement benefits. The longer wall (Barrier SW12b) adds significant cost to cross the Ulatis Creek Bridge and construct the associated retaining walls, yet provides no additional benefits to the associated receptors based on comparing the 16 foot wall height to that of option 12a. Barrier SW12a, at 14 feet, is therefore recommended for incorporation into the Build Alternative.

Construction Noise

Measure NOI-1: To reduce the potential for noise impacts resulting from construction activities, the following measures would be implemented during construction:

- Require all construction equipment to conform to Section 14-8.02, Noise Control, of the latest Standard Specifications. Section 14-8.02 states that construction noise shall not exceed an Lmax of 86 dBA at 50 feet from job site activities between the hours of 9 p.m. to 6 a.m.

- Noise-generating construction activities outside of the typical daytime hours of 7:00 a.m. to 7:00 p.m., will require contractor(s) to implement a construction noise monitoring program and, if feasible, provide additional avoidance measures as necessary (in the form of noise control blankets or other temporary noise barriers, etc.) for affected receptors.

- Pile driving activities would be limited to daytime hours only, where feasible. The contractor(s) would be required to equip all internal combustion engine equipment with intake and exhaust mufflers that are in good condition and appropriate for the machines.
- Unnecessary idling of internal combustion engines within 100 feet of residences would be strictly prohibited.
- The contractor(s) would be required to locate stationary noise generating equipment as far as possible from sensitive receptors.
- The contractor(s) would be required to utilize "quiet" air compressors and other "quiet" equipment, where such technology exists.
- The contractor(s) would prepare a detailed construction plan identifying the schedule for major noise-generating construction activities and distribute this plan to adjacent noise-sensitive receptors. The construction plan would also list the construction noise reduction measures listed above, as applicable.

West Segment – Fundable First Phase

Segments 1 and 2 of the noise study area are located within the West Segment. Refer to the **Table 2.2-37** for a summary of the acoustically feasible noise abatement options applicable to the West Segment (Barriers SW1, SW2, SW3, and SW5).

The estimated construction costs for all the potential barriers within the West Segment of the Build Alternative were higher than the monetary allowances. Therefore, none of the evaluated barriers within the West Segment were considered to be reasonable from a cost perspective, and are not anticipated to be incorporated into the Build Alternative.

Summary

Mitigation Measure NOI -A: Based on the studies completed to date, Caltrans intends to incorporate noise abatement in the form of the following noise barriers:

- Barrier SW11, along the north side of Davis Street/Hickory Lane on-ramp to westbound I-80, with a respective length and height of 280 feet and 10 feet. Calculations based on preliminary design data show that the barrier will reduce noise levels by 7 dBA for 5 residences at a cost of $136,100.
- Barrier SW12a, along the eastbound I-80 edge of shoulder, in front of the Sunset Circle Mobile Homes Complex, with a respective length and height of 1,960 feet and 14 feet. Calculations based on preliminary design data show that the barrier will reduce noise levels by 5 to 10 dBA for 28 residences at a cost of $1,194,900.

If during final design conditions have substantially changed, noise abatement may not be necessary. The final decision on noise abatement will be made upon completion of the project design and the public involvement processes.

CEQA Noise Analysis

Traffic noise impacts may be considered significant under CEQA if the project is predicted to result in a substantial increase in traffic noise. A significant noise increase is defined as an increase in 12 dBA or more from existing conditions to design-year conditions.[11] Results from the noise modeling assessment indicate that noise levels within the noise study area would slightly increase when compared with existing conditions. Predicted noise level increases of 1 to 2 dBA are expected under the 2040 Build conditions. These increases are not considered substantial (defined as 12 dBA or more increase). With the exception of Segment 6, all of the noise study area segments would experience noise levels that approach or exceed the NAC under the 2040 Build conditions, requiring consideration of noise abatement (see **Mitigation Measure NOI -A**).

[11] The 2011 update to Caltrans' *Traffic Noise Analysis Protocol* notes that the 12 dB definition should not necessarily be used for all projects, although it continues to be appropriate for some projects. While the Noise Study Report for this project (2014m) used the 12 dB definition, it should be noted that the noise increases resulting from the Build Alternative (described in **Tables 2.2-30** through **2.2-35** in *Environmental Consequences*) are between 1 and 2 dB, well below any reasonable definition of substantial noise increase.

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