

## 2.2 PHYSICAL ENVIRONMENT

### 2.2.1 HYDROLOGY AND FLOODPLAIN

#### Regulatory Setting

Executive Order 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 (FHWA) requirements for compliance are outlined in 23 CFR 650 Subpart A.

In order 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; and
- Measures to minimize floodplain impacts and to preserve/restore any beneficial floodplain values impacted 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

The analysis in this section is based on the Location Hydraulic Study Report prepared in July 2011 (Department, 2011b). The Location Hydraulic Study Report incorporates information from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Solano County, FEMA Flood Insurance Study, and the Vallejo Sanitation & Flood Control District Storm Drain Master Plan (November 2002).

The only portion of the Build Alternative improvements that would be located within an existing base floodplain is the area where Rindler Creek parallels Fairgrounds Drive, north of Coach Lane. This area makes up the hydrologic study area for determining potential adverse effects related to flooding and floodplain encroachment.

#### **Floodplain**

According to the FEMA FIRM Map for Solano County (see **Figure 2-24**), areas adjacent to Rindler Creek which parallels Fairgrounds Drive, north of Coach Lane, fall within the base floodplain, Zone AE.<sup>1</sup> This indicates that this area is subject to inundations by the 1-percent annual chance flood event. Other areas along Fairgrounds Drive, Redwood Parkway, Redwood Street, Admiral Callaghan Lane, I-80 and SR 37 are not within a designated floodplain.

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<sup>1</sup> FEMA FIRM Map No. 06095C044OE

Although some portions of Fairgrounds Drive are identified as being within the 100-year floodplain (Zone AE), based on the 2009 FEMA Flood Insurance Study for Solano County, there is no history of flooding on Fairgrounds Drive during the 100-year storm event. The flood profile for Rindler Creek in the Flood Insurance Study indicated that the 1-percent annual chance flood elevations are either at or below Fairground Drive's original elevation. In addition, the City of Vallejo's Storm Drain Master Plan shows no evidence of flooding on Fairgrounds Drive (see **Figure 2-25**).

FEMA is currently updating the FIRM for the hydrologic study area. As there is no historic evidence of flooding along Fairgrounds Drive, there is a potential that the new FIRM will be changed so that none of the Fairgrounds Drive roadway alignment falls within the 100-year floodplain.

## Environmental Consequences

### Build Alternative

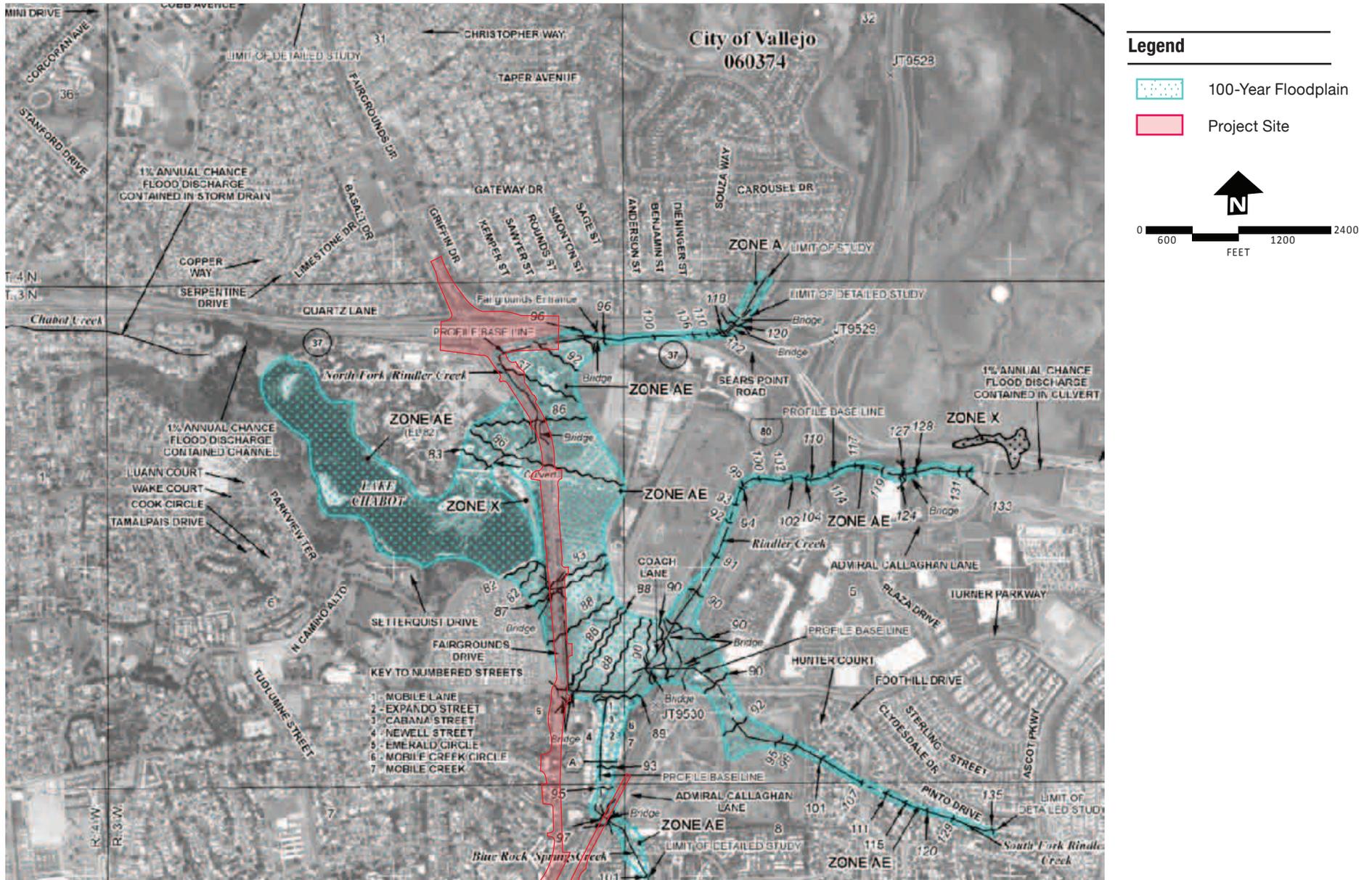
The Build Alternative proposes shifting the Rindler Creek channel and its associated riparian vegetation to the east in order to accommodate the widening of Fairgrounds Drive, which would add approximately 380,000 cubic feet of embankment within the existing 100-year base floodplain. The placement of new embankment within the floodplain could result in a rise in water surface elevation within Rindler Creek; however, the Build Alternative proposes a deeper and wider creek channel that would be able to offset the volume equivalent to this rise in water surface elevation. This offset would ensure that the new embankment associated with the relocation of Rindler Creek would have no effect on the hydrology and existing drainage pattern within the floodplain.

In addition, the Build Alternative would create an increase of approximately 3.7 acres of impervious area due to the conversion of existing unpaved surfaces to paved improvements. This increase in impervious area would result in a slight increase in the stormwater flow from the project area by approximately 0.09 percent of the total discharge volume, and would raise the water surface elevation within the floodplain by 0.09 inches. This level of floodplain elevation is considered negligible, and would have no adverse effect on the hydrology and existing drainage pattern within the floodplain.

In summary, with the proposed relocation of Rindler Creek as a slightly larger channel than what currently exists, neither the addition of impervious area nor the added embankment within the floodplain will significantly affect the discharge rates or water surface elevation of the floodplain within the project limits. As such, this floodplain encroachment is not considered an environmental risk in terms of flooding.

The realigned Rindler Creek would be slightly larger than the existing creek and revegetated to maintain hydrological and biological function (beneficial floodplain values). Refer to **Subsection 2.2.2, Water Quality**, and **Section 2.3, Biological Environment**, for a detailed description of the measures that would be taken to protect hydrology and water quality.

Redwood Parkway – Fairgrounds Drive Improvement Project  
 Draft EIR/EA



FEMA Flood Insurance Rate Map

Figure

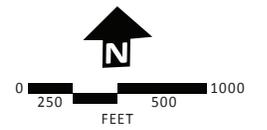
Source: Federal Emergency Management Agency; Map Number 06095C0440E, 2009.



**Legend**

- Project Site
- Reported Flooding Area\*

\*Note: Reported flooding area is approximate



**Reported Flooding within the Hydrologic Study Area**

Figure

**2-25**

Source: Vallejo Sanitation and Flood Control District - Storm Drain Master Plan, October 2002; Circlepoint, 2012.

### **No-Build Alternative**

The No-Build Alternative would make no physical or operational improvements to Fairgrounds Drive, Redwood Parkway, or the connecting freeways. The No-Build Alternative would therefore not affect the hydrology or result in floodplain development within the areas evaluated above. Implementation of the currently planned and funded transportation projects outside the project limits but within the hydrologic study area would require a review of the FEMA FIRMs under separate environmental review in order to determine if any of those projects would be located within a 100-year floodplain.

### **Avoidance, Minimization, and /or Mitigation Measures**

The Build Alternative proposes a deeper and wider Rindler Creek channel that would be able to offset the volume equivalent to the rise in water surface elevation. This would ensure that the relocation of Rindler Creek would have no effect on the hydrology and existing drainage pattern within the floodplain. There will be no impacts on I-80 and SR 37, and the impact on the base water surface elevation near Fairgrounds Drive is not significant. As such, no avoidance, minimization, or mitigation measures are proposed.

## **2.2.2 WATER QUALITY**

### **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 unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Known today as the Clean Water Act (CWA), Congress has amended it 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. Important CWA sections are:

- Sections 303 and 304 require states to promulgate water quality standards, criteria, and guidelines.
- Section 401 requires an applicant for a federal license or permit to conduct any activity, which 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. (Most frequently 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) administers 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 U.S. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

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

USACE issues two types of 404 permits: Standard and General 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 authorize a variety of minor project activities with no more than minimal effects.

There are two types of Standard permits: Individual permits and Letters of Permission. Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of USACE's Standard permits. For Standard permits, the USACE decision to approve is based on compliance with U.S. EPA's Section 404 (b)(1) Guidelines (U.S. EPA CFR 40 Part 230), and whether permit approval is in the public interest. The Section 404(b)(1) Guidelines were developed by the U.S. EPA in conjunction with 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 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. Per 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 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 regarding water quality standards in a project area are contained in the applicable RWQCB Basin Plan. States designate beneficial uses for all water body segments, and then set criteria necessary to protect these uses. Consequently, the water quality standards developed for particular water segments are based on the designated use and

vary depending on such use. In addition, each state identifies waters failing to meet standards for specific pollutants, which 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 source controls, 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, water pollution control, and water quality functions throughout the state. 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 Pollution Discharge Elimination System (NPDES) Program**

#### *Municipal Separate Storm Sewer Systems*

Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of storm water dischargers, including Municipal Separate Storm Sewer Systems (MS4s). The U.S. EPA defines an MS4 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 are designed or used for collecting or conveying storm water. The SWRCB has identified the Department as an owner/operator of an MS4 by the SWRCB. This 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, under revision at the time of this update, contains 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) and other measures.

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 BMPs. The proposed Project will be programmed to follow the guidelines and procedures outlined in the latest SWMP to address storm water runoff.

Part of and appended to the SWMP is the Storm Water Data Report (SWDR) and its associated checklists. The SWDR documents the relevant storm water design decisions made regarding project compliance with the MS4 NPDES permit. The preliminary information in the SWDR prepared during the Project Initiation Document (PID) phase will be reviewed, updated, confirmed, and if required, revised in the SWDR prepared for the later phases of the project. The information contained in the SWDR may be used to make more informed decisions regarding the selection of BMPs and/or recommended avoidance, minimization, or mitigation measures to address water quality impacts.

#### *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 which 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 results 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 Clean Water Act (CWA), any project requiring a federal license or permit that may result in a discharge to a water body 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 U.S. Army Corps of Engineers (USACE). The 401 permit certifications are obtained from the appropriate Regional Water Quality Control Board (RWQCB), dependent on the project location, and are required before 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 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

The analysis in this section is based on the Water Quality Assessment Technical Report prepared in January 2012 (Department, 2012l).

The hydrologic study area consists of the watershed that contains Rindler Creek, North and South Fork Rindler Creek, Blue Rock Spring Creek, and Lake Chabot. The watershed drains westerly to San Pablo Bay through Chabot Creek. Surface runoff from the hydrologic study area flows through a series of dikes, open channels, and subsurface drainage systems into Rindler Creek and Blue Rock Springs Creek. Both creeks flow into Lake Chabot located approximately 1,800 feet north of I-80 and 400 feet west of SR 37, then continues to the northwest and ultimately discharges into the Napa River located approximately 2.5 miles from the study area. Lake Chabot serves as a flood control retention basin for the watershed. The Napa River is on the 2006 Section 303(d) list for impairment of nutrients, pathogens and sediments. Lake Chabot is not on the 2006 Section 303(d) list.

The Build Alternative is within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB), which implements water quality protection through the issuance of permits for projects found to be in compliance with the San Francisco Basin Plan. The RWQCB separates the San Francisco Bay Region into seven hydrologic planning areas, with the hydrologic study area falling in the San Pablo – Napa River Hydrologic area.

## Environmental Consequences

### **Build Alternative**

#### *Temporary Construction Related Effects*

Construction would require the temporary disturbance of surface soils and removal of vegetative cover. During the construction period, grading and excavation activities would result in exposure of soil to runoff, potentially causing erosion and entrainment of sediment in the runoff. The accumulation of sediment could result in blockage of water flows, potentially resulting in increased localized ponding or flooding. The potential for chemical releases is present at most construction sites associated with refueling equipment, lubricants, and solvents. Once released, these substances could be transported to nearby surface waterways and/or groundwater in storm water runoff, wash water, and dust control water, potentially reducing the quality of the receiving waters.

#### *Permanent Operation Effects*

The operation of roadways could result in permanent adverse effects to storm water quality because of contaminant discharge to the environment that could be transported by

runoff away from the roadways and new or modified ramps. These pollutants could reach receiving waters and potentially increase the incremental pollutant load discharged to the Napa River. Pollutants associated with roadways include metals and petroleum hydrocarbons contained in fuels and lubricants and pollutants associated with wear of tires and brake pads such as particulate matter and metals.

### **No-Build Alternative**

The No-Build Alternative would make no physical or operational improvements to Fairgrounds Drive, Redwood Parkway, or the connecting freeways. Existing storm water treatment systems would remain unchanged. The currently planned and funded transportation projects within the hydrologic study area would be required to adhere to the applicable State requirements and permitting issued by San Francisco Bay RWQCB, which would protect water quality in the study area under separate review.

### **Avoidance, Minimization, and/ or Mitigation Measures**

Construction activities and operation of the roadway improvements would be regulated under the applicable Department NPDES permits and SWMP, which regulate storm water discharge from activities on local roadways. Compliance with the NPDES permit and SWMP would require the implementation of maximum extent practicable (MEP) pollutant control for roadway runoff. In addition, construction site runoff must be controlled using best available technology economically achievable (BAT) for toxic pollutants, and best conventional pollutant control technology (BCT) for other pollutants. Full compliance with the provisions of existing NPDES permits and SWMP would minimize potential adverse effects to water quality.

The terms for coverage under the Department's NPDES permit also require that a SWPPP be developed and implemented for the Build Alternative during construction to reduce the potential for adverse water quality effects from erosion and sedimentation. 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. Typical temporary construction site BMPs may include, but are not limited to, temporary storm drain inlet protection, concrete cleanout facilities, and stabilized construction entrances/exits. Proposed areas where soils will be disturbed will either be hardscaped or re-vegetated to reduce the potential for future soil erosion and sedimentation issues. A planting plan would be prepared for restoration of temporary work areas.

Implementation of the SWMP also requires that long-term pollution prevention and control measures be incorporated into the Build Alternative design. Typical permanent treatment BMPs may include vegetated basins and/or swales along the roadways that collect stormwater runoff. The basins allow pollutants to settle and filter out prior to the stormwater entering the drainage systems. Specific temporary construction and permanent pollution prevention BMPs would be determined during the final design phase of the Build Alternative.

Incorporation of these BMPs and any measures outlined in the SWPPP would ensure that the Build Alternative would not adversely affect water quality in local waterways or groundwater quality.

### 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. The current policy is to use the anticipated Maximum Credible Earthquake (MCE), from young faults in and near California. The MCE is defined as the largest earthquake that can be expected to occur on a fault over a particular period of time.

#### Affected Environment

The analysis in this section is based on the Preliminary Geotechnical and Foundations Report completed in May 2012 (Department, 2012i). The geologic study area includes those geologic features within which the Build Alternative improvements would be located.

#### Site Geology and Subsurface Conditions

No natural landmarks or other examples of major geologic features (such as scenic rock outcroppings) occur within the geologic study area.

The geologic study area is situated in the Coast Ranges geomorphic province of California. This province is characterized by northwest-trending mountain ranges and elongated valleys between the San Joaquin Valley and Pacific Ocean. The province is generally divided into three northwest-trending blocks that are underlain by metamorphic or igneous rocks and separated by major physical breaks. The geologic study area is within the Eastern Franciscan Block.

Surface and underlying geological formations within the geologic study area are mapped as the Cretaceous Great Valley Sequence, Pleistocene alluvial fan deposits (older alluvium), and Holocene alluvial fan deposits (younger alluvium). The bedrock in this unit of the Great Valley Sequence contains undivided sandstone and shale from the Cretaceous Period. It is also known to include carbonaceous-biotite wacke, white-mica-carbonaceous sandstone, greenish-gray mudstone and shale, laminated fine-grained sandstone and gray shale, carbonaceous siltstone, black shale, and fine-grained mica wacke. Near the ground surface, artificial fill that was placed during past construction activities is present along the existing Fairgrounds Drive alignment. Fill materials range from loose to very consolidated gravel, sand, silt, clay, rock fragments, organic matter, and

debris in various combinations. **Figure 2-26** illustrates the general geology of the study area.

Alluvium within the geologic area consists of Holocene-aged fan and fluvial deposits from rivers or streams. The alluvial fan deposits are generally brown or tan, medium dense to dense, gravelly sand or sandy gravel that generally grades upward to sandy or silty clay. Specifically, the area around Redwood Parkway is underlain by younger alluvial deposits, as well as sandstone and shale formations.

#### *Liquefactions Susceptibility*

Liquefaction is a result of ground shaking associated with earthquakes, and causes soil to lose strength and behave as a liquid. Liquefaction is known to occur in saturated or near-saturated, loose cohesionless soils at depths shallower than 50 feet. Susceptibility to liquefaction in portions of the geologic study area is very low to moderate. Areas near the Fairgrounds Drive/Redwood Parkway intersection face very low to low susceptibility to liquefaction, while portions of Fairgrounds Drive alignment near Lake Chabot face moderate susceptibility to liquefaction.

#### *Dynamic Settlement*

Dynamic settlement is caused by the strong vibratory motion associated with earthquakes, and compacts loose, granular soil, leading to surface settlements. Dynamic settlement is not limited to the near surface environment and may occur in both dry and saturated sand and silt. Seismically induced dynamic settlement may occur within the geologic study area following a significant seismic event, particularly in the areas where the liquefaction susceptibility is mapped as moderate. Within the geologic study area, dynamic settlement could occur along portions of Fairgrounds Drive near Lake Chabot where liquefaction susceptibility is moderate.

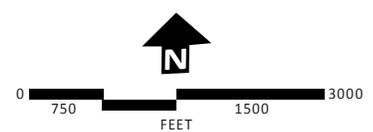
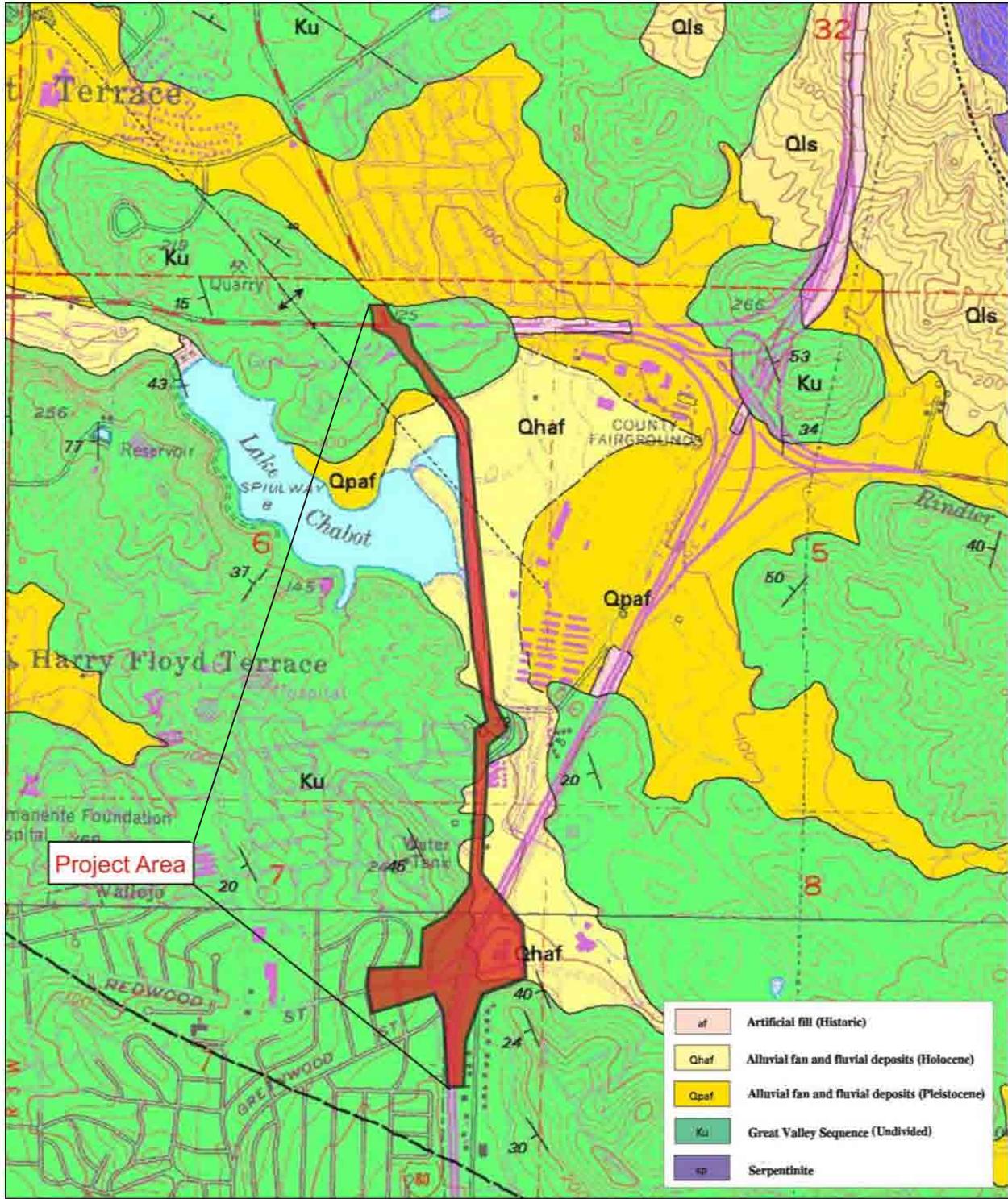
The support characteristics of the artificial fill materials within the geologic study area are variable and may induce differential settlement. In general, undocumented fill materials are unsuitable for the support of structures and embankments proposed as part of the Build Alternative.

#### *Lateral Spread*

Seismic ground shaking can also induce horizontal displacements as surface soil deposits spread laterally by floating atop liquefied subsurface layers. This is known as lateral spread, and can occur on gently sloping ground or on flat ground adjacent to an exposed face. Lateral spread is a concern over soil that is moderately susceptible to liquefaction. Within the geologic study area, lateral spreading could occur along portions of Fairgrounds Drive near Lake Chabot where liquefaction susceptibility is moderate.

#### *Groundwater*

The subsurface exploration information conducted for other improvements near the project limits found that groundwater is generally encountered within 5 to 30 feet below the ground surface within the geologic study area. Groundwater levels may fluctuate based on seasonal conditions, including rainfall amounts and water level changes in the active stream and rivers within the geologic study area, changes in nearby irrigation practices, and groundwater pumping.



Geologic Map

Figure 2-26

Source: Department, 2012i.

## Seismic Conditions

The geologic study area is located in a seismically active area of California. Many faults in this area are capable of producing earthquakes that may cause ground shaking. **Table 2.2.3-1** presents seismic parameters from the 2007 Fault Database that contains a list of faults that are active or potentially active near the geologic study area. The parameters within this table also include the estimated most likely a size of earthquake that has not yet occurred within the geologic study area (Maximum Moment Magnitude). This information was determined in conformance with the Department's Geotechnical Services Design Manual and Seismic Design Criteria.

There are no active faults that pass through the geologic study area; therefore, the potential for fault rupture is considered low. However, the geologic study area could experience a relatively large degree of ground shaking due to seismic activity on a nearby fault.

Table 2.2.3-1 Maximum Credible Earthquake for Faults in the Vicinity of the Build Alternative

Fault	Fault Type	Maximum Moment Magnitude	Fault Distance to Geologic Study Area (kilometer)	Fault Rupture Plane Distance to Geologic Study Area (kilometer)	Projection of Rupture Plane Distance to Geologic Study Area (kilometer)	Peak Ground Acceleration PGA (g) <sup>1</sup>
West Napa (416)	Strike-Slip	7.1	~0.9	~3.0	~3.0	0.43
Green Valley (213)	Strike-Slip	6.9	~8.1	~8.5	~8.5	0.30
Hayward (353)	Strike-Slip	7.3	~18.3	~18.3	~18.32	0.21
Rodgers Creek (157)	Strike-Slip	7.1	~18.9	~18.9	~18.9	0.19
San Andreas North (308)	Strike-Slip	7.9	~47.1	~47.1	~47.13	0.14
Southampton (151)	Strike-Slip	6.3	~14.4	~14.4	~14.4	0.18

Notes: <sup>1</sup> Peak Ground Acceleration (PGA): how hard the earth shakes in a given geographic area (the *intensity*).

Source: Department, 2012i.

## Environmental Consequences

### Build Alternative

The Build Alternative is located in a seismically active region. Without proper seismic engineering, improvements located adjacent to or spanning Fairgrounds Drive could pose safety issues to people and structures as a result of strong ground shaking, liquefaction, dynamic settlement, and lateral spread.

### *Temporary Construction Impacts*

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.

The Build Alternative would require extensive excavation and earth moving construction activities, which could result in substantial soil erosion or the loss of top soil. In addition, groundwater may be encountered during excavation work for the proposed improvements. As previously discussed in **Subsection 2.2.2**, the potential for chemical releases is present at most construction sites associated with refueling equipment, lubricants, and solvents. Once released, these substances could be transported directly into groundwater exposed during excavation work, potentially reducing the quality of the receiving waters.

### **No-Build Alternative**

The No-Build Alternative would make no physical or operational improvements to Fairgrounds Drive, Redwood Parkway, or the connecting freeways. Implementation of the currently planned and funded transportation projects outside the project limits but within the City of Vallejo 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 the Department's standard design and construction guidelines and OSHA requirements regarding seismic and geologic hazards, which would be determined under separate environmental review.

### **Avoidance, Minimization, and/ or Mitigation Measures**

Under the Build Alternative, any new structures would be constructed in compliance with the Department's seismic design standards and construction guidelines. No avoidance, minimization, or mitigation measures would be required beyond the implementation of the Department's standard specifications. As part of the final design phase, the Department requires preparation of the geotechnical design reports that incorporate 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 area would be used to determine the appropriate final design for the foundations and footings that would support the proposed Build Alternative improvements.

The Department's standard design and construction guidelines incorporate engineering standards that address seismic risks. Proposed structures including, retaining walls, soundwalls, 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.

With respect to worker safety during construction, the Occupational Safety and Health Act (OSHA) requires employers to comply with hazard-specific safety and health standards.

Pursuant to Section 5(a)(1) of the 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 the Department's standard design and construction guidelines.

As described in **Subsection 2.2.2**, 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.

## 2.2.4 PALEONTOLOGY

### Regulatory Setting

Paleontology is the study of life in past geologic time based on 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 or funded projects. (e.g., Antiquities Act of 1906 [16 USC 431-433], Federal-Aid Highway Act of 1960 [23 USC 305]), and the Omnibus Public Land Management Act of 2009 [16 USC 470aaa]). Under California law, paleontological resources are protected by the California Environmental Quality Act (CEQA).

### Affected Environment

This section is based on the Paleontological Evaluation Report completed in September 2011 (Department, 2011c).

The paleontological area is similar to the geologic study area, and includes those geologic features within which the Build Alternative improvements would be located, plus a 1-mile buffer on either side of the proposed improvements. As discussed in **Subsection 2.2.3**, surface and underlying geological formations within the paleontological study area are mapped as the Cretaceous Great Valley Sequence, Pleistocene alluvial fan deposits (older alluvium), and Holocene alluvial fan deposits (younger alluvium), and have been confirmed with a field survey.

#### **Cretaceous Great Valley Sequence**

The paleontological study area is generally underlain by undivided shale and sandstone of the Great Valley Sequence. The massive, hardened sandstones form the backbone of the ridges to the north and south of Lake Chabot and to the southeast along I-80.

No invertebrate macrofossils have been reported in the Great Valley Sequence exposed in the paleontological study area; however, microfossils have been reported. Fossil plant remains were observed along bedding planes within the Cretaceous Great Valley Sequence exposed within the paleontological study area. The presence of fossil plant material within the Great Valley Sequence indicates that depositional conditions observed in exposures in the paleontological study area are favorable for the preservation of fossils. Therefore, it is

possible that additional paleontological resources will be found. However, because significant fossils have not previously been reported from the Great Valley Sequence within or near the paleontological study area, although potentially could, this unit is characterized as having a low paleontological sensitivity.

### **Pleistocene Alluvial Deposits**

A small area north of Lake Chabot, within the paleontological study area, is underlain by older alluvial deposits dating from the Pleistocene Epoch. Units mapped as Pleistocene Alluvium in Solano County have previously produced abundant both vertebrate and invertebrate fossils representing many extinct taxonomic groups. Many of these fossil specimens represent the best-preserved examples of their taxonomic groups found to date. Since fossil vertebrates have been previously reported elsewhere from this unit and 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 significant fossils have previously been reported from this unit and from localities not far from the paleontological study area, this unit is characterized as having a high paleontological sensitivity.

### **Holocene Alluvial Deposits**

The portion of the paleontological study area around the Redwood Parkway overcrossing is underlain by younger alluvial deposits dating from the Holocene Epoch. This unit is exposed within the paleontological study area as a thin veneer over older sediments, and its depth varies widely. The Holocene alluvial deposits are too thin and too young for the preservation of fossils and, over much of the paleontological study area, are already disturbed. This unit is, therefore, characterized as having a low paleontological sensitivity.

## **Environmental Consequences**

### **Build Alternative**

The paleontological study area contains Pleistocene alluvial deposits, which are considered to have a high sensitivity for the presence of paleontological resources. Ground disturbance and earth moving associated with the construction of the Build Alternative, such as excavations, augering, and drainage diversion measures, could unearth previously unidentified paleontological resources within this sensitive unit. Resources affected could include fossil remains and sites, associated specimen data and corresponding geological and geographic site data, and the fossil-bearing strata.

### **No-Build Alternative**

The No-Build Alternative would make no physical or operational improvements to Fairgrounds Drive, Redwood Parkway, or the connecting freeways. Implementation of the currently planned and funded transportation projects outside the project limits but within the same geologic units in Solano County would be subject to the same paleontological sensitivities ratings as in the Build Alternative, since they would occur in the same region and in the same geologic units. These projects would be required to comply with the Department's 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-1: Monitoring and Mitigation Program**

A qualified paleontologist, with Caltrans approval, shall design a monitoring and mitigation program and implement the program during project-related excavation and earth disturbance activities prior to construction. The paleontological resource monitoring and mitigation program shall include preconstruction coordination, construction monitoring, emergency discovery procedures, and sampling and data recovery. Prior to the start of construction, the paleontologist shall conduct a field survey of exposures of sensitive stratigraphic units within the study area that would be disturbed. Finally, construction personnel would be informed that fossils could be discovered during excavation, that these fossils are protected by laws, on the appearance of common fossils, and on proper notification procedures.

Both the Great Valley Sequence and Holocene alluvial deposits have a low sensitivity for paleontological resources. However, Holocene alluvial deposits typically occur as a thin layer overlying Pleistocene alluvial deposits, which have a high potential for paleontological resources. Excavation in areas covered by Holocene alluvial deposits would likely encounter Pleistocene alluvial deposits in the shallow subsurface. As such, construction activities within Pleistocene alluvial deposit areas covered by Holocene alluvial deposits would need to be monitored where excavations are expected to reach more than three feet below ground surface.

## 2.2.5 HAZARDOUS WASTE/MATERIALS

### Regulatory Setting

Hazardous materials and hazardous wastes are regulated by many state and federal laws. These include not only specific statutes governing hazardous waste, but also a variety of laws regulating air and water quality, human health and land use.

The primary federal laws regulating hazardous wastes/materials are the Resource Conservation and Recovery Act of 1976 (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). The purpose of CERCLA, often referred to as Superfund, is to clean up contaminated sites so that public health and welfare are not compromised. RCRA provides for "cradle to grave" regulation of hazardous wastes. 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 12088, Federal Compliance with Pollution Control, mandates that necessary actions be taken to prevent and control environmental pollution when federal activities or federal facilities are involved.

Hazardous waste in California is regulated primarily under the authority of the federal Resource Conservation and Recovery Act of 1976, and the California Health and Safety Code. Other California laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, cleanup and emergency planning.

Worker health and safety and public safety are key issues when dealing with hazardous materials that may affect human health and the environment. Proper disposal of hazardous material is vital if it is disturbed during project construction.

## Affected Environment

The analysis summarized in this section is based on an Initial Site Assessment conducted in 2007 for the I-80 High Occupancy Vehicle (HOV) Lanes and Turner Parkway Overcrossing project<sup>2</sup>, and the subsequent Preliminary Site Investigation and Aerially Deposited Lead Survey Report, prepared in January 2012 (Department, 2012j).

The initial site assessment (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 were also conducted as part of the ISA. The ISA was performed in accordance with ASTM E1527 05 and the Department's project development procedures manual (PDPM) and standard environmental reference (SER).

### Sites of Potential Environmental Concern

The preliminary site investigation identified five sites of potential environmental concern associated with petroleum products release from leaking underground storage tanks within the hazardous materials study area. These sites are listed in **Table 2.2.5-1** and depicted in **Figure 2-27**. The potential release of petroleum products from these sites may have impacted the subsurface conditions within the area where improvements would be constructed.

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<sup>2</sup> Several components of this larger project have since been withdrawn from consideration as part of the alternatives analysis (see Chapter 1); however, the improvements proposed under the Build Alternative would be located in areas that were previously evaluated for health risks related to hazardous materials. Information in the 2007 assessment is therefore applicable to the proposed Build Alternative.

Table 2.2.5-1 Potential Impacts from Hazardous Materials Release Sites

Site Name and Location		Summary of Potential Impacts to Build Alternative Improvements
1	Unocal 76 Gasoline Service Station (223 Fairgrounds Drive)	Potential petroleum constituents in soil and/or groundwater associated with former and current service station activities. This site is currently undergoing groundwater and soil remediation.  The Build Alternative would relocate the Fairgrounds Drive/Redwood Street intersection on to this property. As such, this site may pose a risk to people or structures.
2	Chevron Gasoline Service Station (200 Fairgrounds Drive)	Potential petroleum constituents in soil and/or groundwater associated with former service station activities. The regulatory oversight of the release from this property has since been closed as of 1997.  The Build Alternative would realign Fairgrounds Drive to the west of this release site. As such, this site is not likely to pose a risk to people or structures.
3	Stop N Save Gasoline Station and Liquor (501 Fairgrounds Drive)	Existing UST and fuel dispensing activities associated with former and current service station activities.  The Build Alternative would widen Fairground Drive onto this property. Sub-surface sampling could not be conducted at this site because access was not granted. This presents a data gap.
4	American Furniture Galleries (709 Admiral Callaghan Lane)	Potential petroleum constituents and Title 22 metals in soil and/or groundwater associated with active and inactive UST facilities. Soil samples taken from the American Furniture Galleries property were analyzed for these contaminants; the concentrations were below the laboratory reporting limits. As such, this site would not pose a risk to people or structures.
5	Tell Rentals (711 Admiral Callaghan Lane)	Potential petroleum constituents, volatile organic compounds, and Title 22 metals in soil and/or groundwater associated with former release from leaking underground storage tank facilities. The regulatory oversight of the release from this property has since been closed as of 1998. Soil samples taken in 2011 on the Tell Rentals property were analyzed for these compounds; one compound, 2-methylnaphthalene, was reported above the Commercial Environmental Screening Levels (ESL). This site may pose a risk to site occupants and construction workers.

Source: Department, 2011d.



Properties of Environmental Concern

Figure

### **Aerially Deposited Lead (ADL)**

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, frequently concentrating onto the adjacent road shoulders and in medians. 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.

Fairgrounds Drive and the surrounding roads and freeways were constructed prior to the 1990s, and therefore there is potential for lead to be present in the soils adjacent to the roadways. Due to this potential, an aerially deposited lead survey was conducted at 13 locations at varying depths within the hazardous materials study area, including the two properties where subsurface assessments were conducted. Soluble lead concentration in one soil sample was found to be above the State's regulatory threshold (i.e., soluble threshold limit concentration [STLC]) defining hazardous waste.

### **Asbestos-Containing Material and Lead-Based Paint**

The Build Alternative involves the demolition of residential and commercial building structures. There is potential that asbestos-containing material (ACM) and lead-based paint (LCP) may be present in these building structures. Asbestos, a known human carcinogen, was commonly used in construction and building materials until the 1980s, when it was phased out. Lead oxide and lead chromate were commonly used in paint until 1978, when regulations limited the allowable lead content in paint. Lead is a known teratogen (i.e., it has the potential to cause birth defects), and a reproductive toxin. Asbestos fibers and lead particles emitted to the air during demolition activities could potentially pose a risk to human health.<sup>3</sup>

## **Environmental Consequences**

### **Build Alternative**

Five sites with known or potential releases of hazardous materials were identified that could potentially contaminate soil and/or groundwater beneath areas of proposed construction from the Build Alternative (see **Table 2.2.5-1** and **Figure 2-27**). This could pose a potential risk to construction workers. Upon further investigation of these releases, and subsequent subsurface sampling, three of these sites were determined not likely to pose a risk to people. The remaining two sites, Stop N Save Gasoline Station and Liquor (501 Fairgrounds Drive) and Unocal 76 Gasoline Service Station (223 Fairgrounds Drive), are likely to pose some risk, as Unocal 76 Gasoline Service Station has been identified as a petroleum products release site and Stop N Save Gasoline Station and Liquor could potentially be a petroleum products release site upon future investigation. Within the existing project corridor, no other build alternatives were deemed viable because of the physical constraints associated with the topography of the area and developed land uses surrounding the roadways. Given these constraints, the current design of the Build

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<sup>5</sup> The California EPA Department of Toxic Substances Control (DTSC) Variance No. V09HQSCD006 (Caltrans Variance), states that "lead-contaminated soil (s) that meets the criteria for hazardous waste but contains less than 3397 mg/Kg total lead and is hazardous primarily because of ADL contamination associated with exhaust emissions..." can be managed within a project site under certain circumstances

Alternative would not be feasible without the acquisition of these hazardous material sites. As such, these hazardous material sites cannot be avoided.

Additionally, construction workers may be exposed to aurally deposited lead in the surface soils within the hazardous materials study area, which could result in harmful health hazards. Furthermore, the Build Alternative involves demolition of older existing freeway elements and structures that potentially contain asbestos and lead-based paint. Asbestos was commonly used in construction materials, such as insulation in buildings and piping until the 1980's, when its use was phased out. Similarly, lead-based paints were used up until 1978. The demolition of residential and commercial structures could generate waste containing asbestos and lead-based paint that could pose a threat to human health and the environment. It is possible that construction workers would be exposed to these harmful hazardous materials during demolition activities.

### **No-Build Alternative**

The No-Build Alternative would make no physical or operational improvements to Fairgrounds Drive, Redwood Parkway, or the connecting freeways. Therefore, the No-Build Alternative would avoid the hazardous waste and materials effects associated with the Build Alternative.

### **Avoidance, Minimization, and/ or Mitigation Measures**

Under the Build Alternative, demolition of building structures will be required. Prior to any demolition work, an asbestos and lead-based paint survey would be conducted to determine the presence or absence of asbestos-containing materials and lead-based paint in these building structures. Preceding any demolition activities, construction contractors will follow regulations requiring the abatement of asbestos-containing materials and lead-based paint to prevent exposure to construction workers and nearby residents.

Because of the potential for exposure to hazardous materials and aurally deposited lead, the following measures would be taken to avoid any potential adverse effects:

- If acquisition of the Stop N Save Gasoline Station and Liquor site (501 Fairgrounds Drive) is necessary, a limited subsurface sampling for potential soil and groundwater contamination would be conducted prior to purchase. Implementation of the limited surface sampling in this area is expected to cost approximately \$15,000.
- In the event that excavation occurs in the former UST pit on the Tell Rentals property, and petroleum impacts on the 223 Fairgrounds Drive property remain within soil and groundwater, a Soil Management Plan (SMP) would be developed to manage excavation of soil from these areas. The SMP would specifically address worker protection during excavation and removal activities. The SMP would also address the transport and disposal of petroleum-impacted soil to the appropriate Class II Landfill facility. Implementation of the SMP in this area is expected to cost approximately \$16,000.

- The Department's Variance<sup>5</sup> would be used to manage soil excavated in the area of the ADL sample location with hazardous concentration levels. Excavated soil would be placed in other roadway right-of-way areas and covered with one foot of clean soil. The management of ADL-contaminated soils during the construction of the Build Alternative is expected to cost approximately \$26,000.

## 2.2.6 AIR QUALITY

### Regulatory Setting

The Federal Clean Air Act (FCAA) as amended in 1990 is the federal law that governs air quality. The California Clean Air Act of 1988 is its companion state law. These laws, and related regulations by the United States Environmental Protection Agency (U.S. EPA) and the California Air Resources Board (ARB), set standards for the quantity of pollutants that can be 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. The criteria pollutants are: carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM, broken down for regulatory purposes into particles of 10 micrometers or smaller – PM<sub>10</sub> and particles of 2.5 micrometers and smaller – PM<sub>2.5</sub>), lead (Pb), and sulfur dioxide (SO<sub>2</sub>). In addition, State standards exist for visibility reducing particles, sulfates, hydrogen sulfide (H<sub>2</sub>S), and vinyl chloride. The NAAQS and State standards are set at a level that protects 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 within their general definition.

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

FCAA Section 176(c) prohibits the U.S. Department of Transportation and other Federal agencies from funding, authorizing, or approving plans, programs or projects that are not first found to conform to State Implementation Plan (SIP) for achieving the goals of Clean Air Act requirements related to the NAAQS. "Transportation Conformity" 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 CFR 93 govern the conformity process.

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<sup>5</sup> The California EPA Department of Toxic Substances Control (DTSC) Variance No. V09HQSCD006 (Caltrans Variance), states that "lead-contaminated soil (s) that meets the criteria for hazardous waste but contains less than 3397 mg/Kg total lead and is hazardous primarily because of ADL contamination associated with exhaust emissions..." can be managed within a project site under certain circumstances

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the standards set for carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and in some areas sulfur dioxide (SO<sub>2</sub>). California has attainment or maintenance areas for all of these transportation-related “criteria pollutants” except SO<sub>2</sub>, 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 Regional Transportation Plans (RTPs) and Federal Transportation Improvement Programs (FTIPs) that include all of the transportation projects planned for a region over a period of at least 20 years (for the RTP), and 4 years (for the FTIP). RTP and FTIP conformity is based on use of travel demand and air quality models to determine whether or not the implementation of those projects would conform to emission budgets or other tests showing that requirements of the Clean Air Act and the SIP are met. If the conformity analysis is successful, the Metropolitan Planning Organization (MPO), and the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), make the determinations that the RTP and FTIP are in conformity with the SIP for achieving the goals of the Clean Air Act. 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 the FTIP, then the proposed project is deemed to meet regional conformity requirements for purposes of project-level analysis.

Conformity at the project-level also requires “hot spot” analysis if an area is “nonattainment” or “maintenance” for carbon monoxide (CO) and/or particulate matter (PM<sub>10</sub> or PM<sub>2.5</sub>). A region is “nonattainment” if one or more of the monitoring stations in the region measures violation of the relevant standard, and 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 following analysis is based on the *Air Quality Technical Report* completed in March 2012 (Department, 2012a). The Build Alternative is located within the San Francisco Bay Area Air Basin (SF Air Basin) and within the jurisdictional boundaries of the Bay Area Air Quality Management District (BAAQMD). These boundaries 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 for the region are in the upper 70'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 March. Winds flow typically from the southwest.

### Regional Air Quality Conformity

The BAAQMD monitors pollutants of concern, known as criteria pollutants, and air quality conditions throughout the SF Air Basin. The current attainment status for the SF Air Basin according to national and State standards of criteria pollutants is included in **Table 2.2.6-1**.

As shown in **Table 2.2.6-1**, the SF Air Basin is not in attainment of State or Federal standards with respect to Ozone or PM<sub>2.5</sub>. In addition, the SF Air Basin is not in attainment of State standards for PM<sub>10</sub>.

Table 2.2.6-1 San Francisco Bay Area Basin Attainment Status

Pollutant	Federal Status	State Status
Ozone (O <sub>3</sub> ) – 1-Hour Standard	Not Applicable	Serious Nonattainment
Ozone (O <sub>3</sub> ) – 8-Hour Standard	Nonattainment	Not Applicable
Respirable Particulate Matter (PM <sub>10</sub> )	Unclassified	Nonattainment
Fine Particulate Matter (PM <sub>2.5</sub> )	Nonattainment	Nonattainment
Carbon Monoxide (CO)	Attainment (maintenance)	Attainment
Nitrogen Dioxide (NO <sub>2</sub> )	Attainment	Attainment
Sulfur Dioxide (SO <sub>2</sub> )	Attainment	Attainment
Sulfates	No National Standards	Attainment
Lead	Not Applicable	Attainment
Hydrogen Sulfide	No National Standards	Unclassified
Visibility Reducing Particles	No National Standards	Unclassified

Source: Department, 2012a.

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## Environmental Consequences

### Build Alternative

#### *Regional Conformity*

A portion of the Build Alternative is included in the Metropolitan Transportation Commission (MTC) current conforming regional transportation plan (i.e., Transportation 2035 Plan) and the 2011 Transportation Improvement Program (or TIP) as Project SOL-090015 (RTP Project 230708). MTC approved the financially constrained TIP on October 27, 2010. Following approval by the Department, the FHWA, and Federal Transit Administration (FTA) incorporated the TIP into the Federal Statewide Transportation Improvement Program (FSTIP) on December 14, 2010. The Build Alternative design scope and concept have not changed from the design scope and concept in the RTP and TIP listings. However, all applicable Transportation Control Measures are included in the Build Alternative. The Build Alternative is not considered to be a Project of Air Quality Concern with respect to PM<sub>2.5</sub>.

#### *Project Level Conformity*

##### Carbon Monoxide

The SF Bay Area Air Basin, including the air quality study area, is located in a maintenance area for the Federal 1-hour and 8-hour CO standards. Therefore, a CO hot spot analysis was conducted for the Build Alternative.

CO concentrations were modeled using traffic volumes, emissions, meteorology, and the roadway/receptor geometry. I-80 and SR 37 mainline segments, Redwood Street and Fairground Drive were modeled since this is 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/SR 37 and congested intersections with a large volume of traffic have the greatest potential to cause high-localized concentrations of CO. Project impacts from local traffic were evaluated by the quantitative method, which is modeling roadside CO concentrations associated with the Build Alternative and comparing them to the National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (CAAQS). Predicted CO concentrations, which include background levels, are shown in **Table 2.2.6-2**.

The CO assessment was conducted for future No-Build and Build Alternative conditions in 2015 and 2035.<sup>6</sup> The results indicate that future CO levels with or without the project would remain below the NAAQS and CAAQS. The predicted decrease in future levels is due to vehicle fleet turnover, with newer (less polluting) vehicles replacing older vehicles. As a result, the Build Alternative would not cause or contribute to any localized CO violations.

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<sup>6</sup> As a conservative approach to the air quality analysis, the 2015 conditions incorporate future traffic operations assuming the complete construction and operation of the Build Alternative, including those improvements that are anticipated to be constructed concurrently with the construction of the I-80 HOV Lane Project (2035). See **Subsection 2.1.3** for a detailed description of the traffic forecasts assumptions.

Table 2.2.6–2 Project Worst–Case 1–Hour and 8–Hour Carbon Monoxide Concentrations

Receiver ID	2015 No-Build		2015 Build		2035 No-Build		2035 Build		Exceed Thresholds
	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	1-hour	8-hour	
Redwood Street	3.8	2.7	3.8	2.7	3.5	2.5	3.5	2.5	No
Fairgrounds Drive	3.8	2.7	3.8	2.7	3.6	2.5	3.6	2.5	No
I-80	5.5	3.9	5.5	3.9	4.0	2.8	4.0	2.8	No
SR 37	4.9	3.4	4.9	3.4	4.0	2.8	4.0	2.8	No
NAAQS	35	9.0	35	9.0	35	9.0	35	9.0	No
CAAQS	20	9.0	20	9.0	20	9.0	20	9.0	No

Source: Department, 2012a.

The project-level air quality analysis indicates that the Build Alternative would not cause or contribute to any new localized CO violations; therefore, meeting the “hot-spot” conformity requirements of 40 CFR 93.116(a).

#### Particulate Matter

Because the SF Air Basin is located within nonattainment areas for the Federal and State PM<sub>2.5</sub> standards, and nonattainment for the State PM<sub>10</sub> standard, a qualitative PM hot-spot analysis is required under the EPA Transportation Conformity rule for projects of air quality concern (POAQC).

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<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas (71 FR 12468). The Federal PM<sub>10</sub> standards have been met in the SF Bay Area, and therefore the Build Alternative is not subject to hot spot analysis for PM<sub>10</sub> for purposes of transportation conformity. The Federal PM<sub>2.5</sub> standards are exceeded in the SF Bay Area and the Build Alternative would be subject to hot spot analysis for PM<sub>2.5</sub> for purposes of transportation conformity. MTC’s Air Quality Conformity Task Force met on September 22, 2011 as part of interagency consultation for the Build Alternative. On October 6, 2011, the task force took action to conclude that the Build Alternative was not a POAQC. As a result of that action, a project-level PM<sub>2.5</sub> Hot Spot Analysis is not required.

The project area is nonattainment for the much more stringent  $PM_{10}$  and  $PM_{2.5}$  CAAQS. All urbanized portions of California do not attain these standards. The Build Alternative would result in no net change in emissions of these pollutants, since the vehicle miles traveled (VMT) would essentially be the same with or without implementation of the project. There would be less congestion during peak hours with the Build Alternative than without the Build Alternative.  $PM_{10}$  and to some extent,  $PM_{2.5}$  are almost directly related to VMT. With the Build Alternative, there would be a slight increase in peak traffic period speeds for some roadway segments. However, these changes would not affect localized concentrations of  $PM_{10}$  and  $PM_{2.5}$ .

#### Mobile Source Air Toxics (MSAT)

In addition to the criteria pollutants, mobile source air toxics (MSAT) are regulated by the EPA in order to meet air quality attainment goals. MSAT are a subset of the 188 hazardous air pollutants identified by the Clean Air Act as harmful to human health. MSATs are emitted into the air as fuel evaporates or by passing through engines unburned.

The purpose of this project is to relieve congestion and improve traffic flow on the local roadway network by constructing several roadway improvements along portions of Fairgrounds Drive and Redwood Parkway/Redwood Street. The Build Alternative would not result in any significant changes in traffic volumes, vehicle mix, the general location of the existing roadway facilities, or any other factor that would cause an increase in emissions impacts relative to the No-Build Alternative. FHWA has determined that the types of improvements proposed by the Build Alternative would generate minimal air quality impacts for Clean Air Act criteria pollutants (i.e., no meaningful potential for MSAT effects) and should not be linked with any special MSAT concerns.<sup>7</sup> Consequently, a qualitative analysis for MSATs is not required.

Moreover, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOBILE6.2 model forecasts a combined reduction of 72 percent in the total annual emission rate for the priority MSAT from 1999 to 2050, while vehicle-miles of travel are projected to increase by 145 percent. This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from the Build Alternative.

#### *Temporary Construction Impacts*

During construction, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and various other activities related to construction. Emissions from construction equipment also are anticipated and would include CO,  $NO_x$ , VOCs,  $PM_{10}$ ,  $PM_{2.5}$ , and toxic air contaminants such as diesel exhaust particulate matter. Ozone is a regional pollutant that is derived from  $NO_x$  and VOCs in the presence of sunlight and heat.

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<sup>7</sup> FHWA, September 30, 2009. "Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents", Available at: [http://www.fhwa.dot.gov/environment/air\\_quality/air\\_toxics/policy\\_and\\_guidance/100109guidmem.pdf](http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/100109guidmem.pdf); Last accessed June 25, 2012.

Site preparation and roadway construction typically involves clearing, cut-and-fill activities, grading, removing or improving existing roadways, building bridges, and paving roadway surfaces. Construction-related effects on air quality from most highway projects would be greatest during the site preparation phase because most engine emissions are associated with the excavation, handling, and transport of soils to and from the site. These activities could temporarily generate enough PM<sub>10</sub>, PM<sub>2.5</sub>, and small amounts of CO, SO<sub>2</sub>, NO<sub>x</sub>, and VOCs to be of concern. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site could deposit mud on local streets, which could be an additional source of airborne dust after it dries. PM<sub>10</sub> emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM<sub>10</sub> emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site.

Construction activities for large development projects are estimated by the U.S. EPA to add 1.09 tonne (1.2 tons) of fugitive dust per acre of soil disturbed per month of activity. If water or other soil stabilizers are used to control dust, the emissions can be reduced by up to 50 percent. Caltrans' Standard Specifications (Section 14-9.02) pertaining to dust minimization requirements requires use of water or dust palliative compounds and will reduce potential fugitive dust emissions during construction.

In addition to dust-related PM<sub>10</sub> emissions, heavy-duty trucks and construction equipment powered by gasoline and diesel engines would generate CO, SO<sub>2</sub>, NO<sub>x</sub>, VOCs and some soot particulate (PM<sub>10</sub> and PM<sub>2.5</sub>) in exhaust emissions. If construction activities were to increase traffic congestion in the area, CO and other emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site.

SO<sub>2</sub> is generated by oxidation during combustion of organic sulfur compounds contained in diesel fuel. Off-road diesel fuel meeting Federal standards can contain up to 5,000 parts per million (ppm) or more of sulfur, whereas on-road diesel is restricted to less than 15 ppm of sulfur. However, under California law and ARB regulations, off-road diesel fuel used in California must meet the same sulfur and other standards as on-road diesel fuel (not more than 15 ppm), so SO<sub>2</sub>-related issues due to diesel exhaust will be minimal. Some phases of construction, particularly asphalt paving, would result in short-term odors in the immediate area of each paving site(s). Such odors would be quickly dispersed below detectable thresholds as distance from the site(s) increases.

Construction is expected to begin in fall 2014 and last 15 months. Construction-related emissions are generally short-term in duration but may still cause adverse air quality impacts. Average daily construction exhaust emissions were analyzed for the Build Alternative, as shown in **Table 2.2.6-3**.

Table 2.2.6-3 Daily Construction Emissions

Project Construction Phase	Average Daily Emission Estimates (lbs/day)			
	ROG	NOx	Exhaust PM <sub>10</sub>	Exhaust PM <sub>2.5</sub>
Grubbing/Land Clearing	5.7	42.7	1.9	1.7
Grading/Excavation	5.2	35.2	1.8	1.6
Drainage/Utilities/Sub-Grade	4.1	26.9	1.5	1.3
Paving	3.2	16.3	1.4	1.2
BAAQMD Significance Thresholds	54	54	82	54
Exceeds Threshold?	No	No	No	No

Source: Department, 2012a.

Emissions associated with construction were found not to exceed any of the BAAQMD thresholds of significance for construction-related criteria air pollutants and precursors.

### No-Build Alternative

The No-Build Alternative would make no physical improvements or alterations to Fairgrounds Drive and Redwood Parkway/Redwood Street or the connecting roadways. Therefore, the No-Build Alternative would avoid the localized air quality effects associated with the Build Alternative. Other planned and programmed projects that would occur under the No-Build Alternative within the SF Air Basin would have the same potential for adverse air quality effects related to construction activities and vehicle emissions. Any improvements under the No-Build Alternative would require project-specific environmental review to determine the environmental impacts related to such expansions and/or improvements. These improvements would be subject to the same conformity requirements, Federal and State air quality standards and regulations as the Build Alternative.

### Avoidance, Minimization, and/ or Mitigation Measures

Most of the construction impacts to air quality are short-term in duration and, therefore, will not result in adverse or long-term conditions. Implementation of the following measures will reduce any air quality impacts resulting from construction activities:

- The construction contractor shall comply with Caltrans' Standard Specifications Section 14-9.01 and Section 10 of Caltrans' Standard Specifications (2010).
  - Section 7, "Legal Relations and Responsibility," addresses the contractor's responsibility on many items of concern, such as: air pollution; protection of lakes, streams, reservoirs, and other water bodies; use of pesticides; safety; sanitation; and convenience of the public; and damage or injury to any person or property as a result of any construction operation. Section 14-9.01 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 10 is directed at controlling dust. If dust palliative materials other than water are to be used, material specifications are contained in Section 18.
- Apply water or dust palliative to the site and equipment as frequently as necessary to control fugitive dust emissions, at least two times per day.
- Spread soil binder on any unpaved roads used for construction purposes, and all project construction parking areas.
- Wash off trucks as they leave the right-of-way as necessary to control fugitive dust emissions.
- Properly tune and maintain construction equipment and vehicles. Use low-sulfur fuel in all construction equipment as provided in California Code of Regulations Title 17, Section 93114. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- Develop a dust control plan documenting sprinkling, temporary paving, speed limits, and expedited revegetation of disturbed slopes as needed to minimize construction impacts to existing communities.
- Locate equipment and materials storage sites as far away from residential and park uses as practical. Keep construction areas clean and orderly.
- Establish ESAs for sensitive air receivers within which construction activities involving extended idling of diesel equipment would be prohibited, to the extent that is feasible.
- Use track-out reduction measures such as gravel pads at project access points to minimize dust and mud deposits on roads affected by construction traffic.
- Cover all transported loads of soils, sand, loose material and wet materials prior to transport, or provide adequate freeboard (space from the top of the material to the top of the truck) to reduce  $PM_{10}$  and deposition of particulate matter during transportation.
- Remove dust and mud that are deposited on paved, public roads due to construction activity and traffic to decrease particulate matter. 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.
- Route and schedule construction traffic to avoid peak travel times as much as possible, to reduce congestion and related air quality impacts caused by idling vehicles along local roads.
- Install mulch or plant vegetation as soon as practical after grading to reduce windblown particulate in the area.
- All vehicle speeds on unpaved roads shall be limited to 15 miles per hour.
- 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.

- 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.

## Climate Change

Climate change is analyzed in **Chapter 3.0, CEQA Evaluation**. Neither U.S. EPA nor FHWA has promulgated explicit guidance or methodology to conduct project-level greenhouse gas analysis. As stated on FHWA's climate change website (<http://www.fhwa.dot.gov/hep/climate/index.htm>), 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 facilitate 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 regarding climate change, the issue is addressed in the California Environmental Quality Act (CEQA) chapter of this environmental document 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 such measures are not feasible. The rest of this

section will focus on the NEPA-23 CFR 772 noise analysis; please see Chapter 3 of this document for further information on noise analysis under CEQA.

*National Environmental Policy Act and 23 CFR 772*

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 contain noise abatement criteria (NAC) that are used to determine when a noise impact would occur. The NAC differ depending on the type of land use under analysis. For example, the NAC for residences (67 dBA) is lower than the NAC for commercial areas (72 dBA). **Table 2.2.7-1** lists the noise abatement criteria for use in the NEPA-23 CFR 772 analysis.

**Figure 2-28** lists the noise levels of common activities to enable readers to compare the actual and predicted highway noise-levels discussed in this section with common activities.

In accordance with the Department's Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects, May 2011, a noise impact occurs when the future noise level with the project results in a substantial increase in 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.

The Department's 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 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: residents acceptance and the cost per benefited residence.

Table 2.2.7-1 Noise Abatement Criteria

Activity Category	NAC, Hourly A- Weighted Noise Level, dBA L <sub>eq</sub> (h)	Description of Activities
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 <sup>1</sup>	67 (Exterior)	Residential.
C <sup>1</sup>	67 (Exterior)	Active sport areas, amphitheatres, 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.
E	72 (Interior)	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.

<sup>1</sup> Includes undeveloped lands permitted for this activity category.

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Jet Fly-over at 300m (1000 ft)	110	Rock Band
Gas Lawn Mower at 1 m (3 ft)	100	
Diesel Truck at 15 m (50 ft), at 80 km (50 mph)	90	Food Blender at 1 m (3 ft)
Noisy Urban Area, Daytime	80	Garbage Disposal at 1 m (3 ft)
Gas Lawn Mower, 30 m (100 ft)	70	Vacuum Cleaner at 3 m (10 ft)
Commercial Area		Normal Speech at 1 m (3 ft)
Heavy Traffic at 90 m (300 ft)	60	
Quiet Urban Daytime	50	Large Business Office
		Dishwasher Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		Library
Quiet Rural Nighttime	30	Bedroom at Night, Concert Hall (Background)
	20	Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

Noise Levels of Common Activities

Source: California Department of Transportation, 2011.

## Affected Environment

The following analysis is based on the Noise Study Report completed in November 2011 (Department, 2012h). The Noise Study Report follows FHWA and Caltrans policies to address traffic noise impacts and noise abatement. The report was prepared in accordance with the Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol or TNAP). The Protocol addresses both Federal and State environmental statutes with regard to noise.

The existing noise environment throughout the Build Alternative's noise study area varies by location, depending on site characteristics such as proximity to Interstate I-80, SR 37, Fairgrounds Drive, Redwood Parkway, and other noise sources, the relative elevation of roadways and receivers, and any intervening structures or barriers. Land uses that could be subject to traffic and construction noise impacts from the proposed improvements along the noise study area include single- and multi-family residences (Category B land uses) and hotels/motels (Category E land use). No other noise-sensitive Category A, C, or D land uses were identified.

The noise study area was divided into three segments for noise modeling and noise abatement assessment purposes. **Figures 2-29, 2-30, and 2-31** show the sensitive receiver locations in each segment.

As shown in **Figure 2-29**, Category B land uses within Segment 1 are residences located north of SR 37, both west and east of Fairgrounds Drive. Ten-foot noise barriers currently shield these Category B land uses. The Marriott Courtyard Vallejo Napa Valley, a Category E land use, is also located within Segment 1 and has an outdoor pool. The location of the pool is to the east and south of the hotel building, thus is not affected by traffic noise from Fairgrounds Drive. This land use was not included as a sensitive receiver since the noise environment at the outdoor pool area results primarily from vehicle traffic along portions of I-80 and SR 37 outside of the Build Alternative limits.

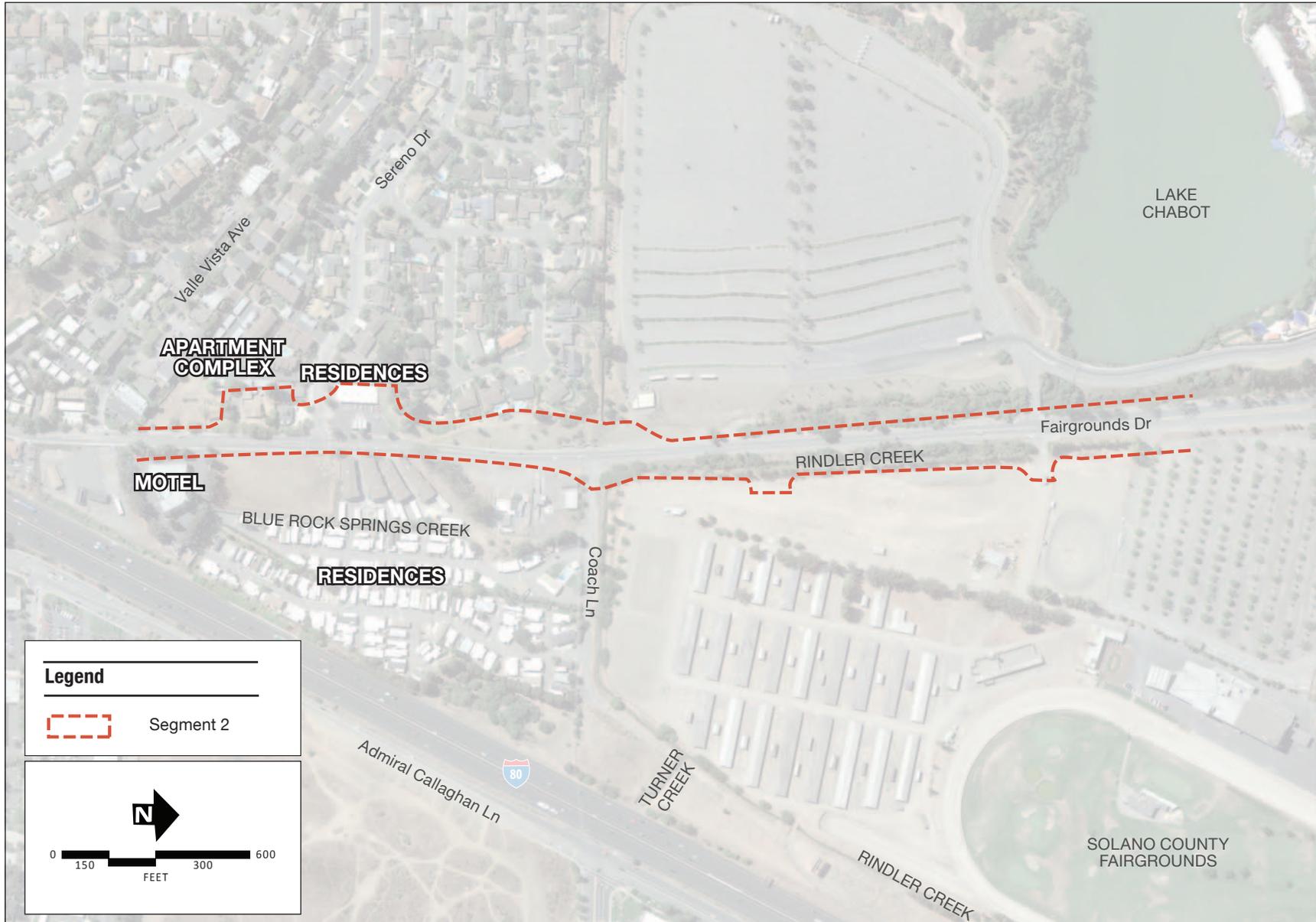
Segment 2 contains Category B and E land uses, including single- and multi-family residences and a motel (see **Figure 2-30**). Traffic noise within Segment 2 primarily results from Fairgrounds Drive and I-80. As shown in the figure, an apartment complex is located to the west of buildings planned from removal. The motel in this segment also has an outdoor pool that is located east and south of the motel building, away from Fairgrounds Drive. Since the noise environment at the outdoor pool of the motel results primarily from traffic along portions of I-80 outside of the Build Alternative limits, the motel was not included as a sensitive receiver.

The majority of land uses within Segment 3 are residential. Other non-noise sensitive land uses include gas stations, restaurants, and other small businesses. One noise barrier in Segment 3 is located along the westbound shoulder of I-80, as shown in **Figure 2-31**. Several structures would be removed as part of the Build Alternative, and receivers represented by ST-9 would be most affected since the existing buildings served as noise barriers to shield excess traffic noise from Fairgrounds Drive.



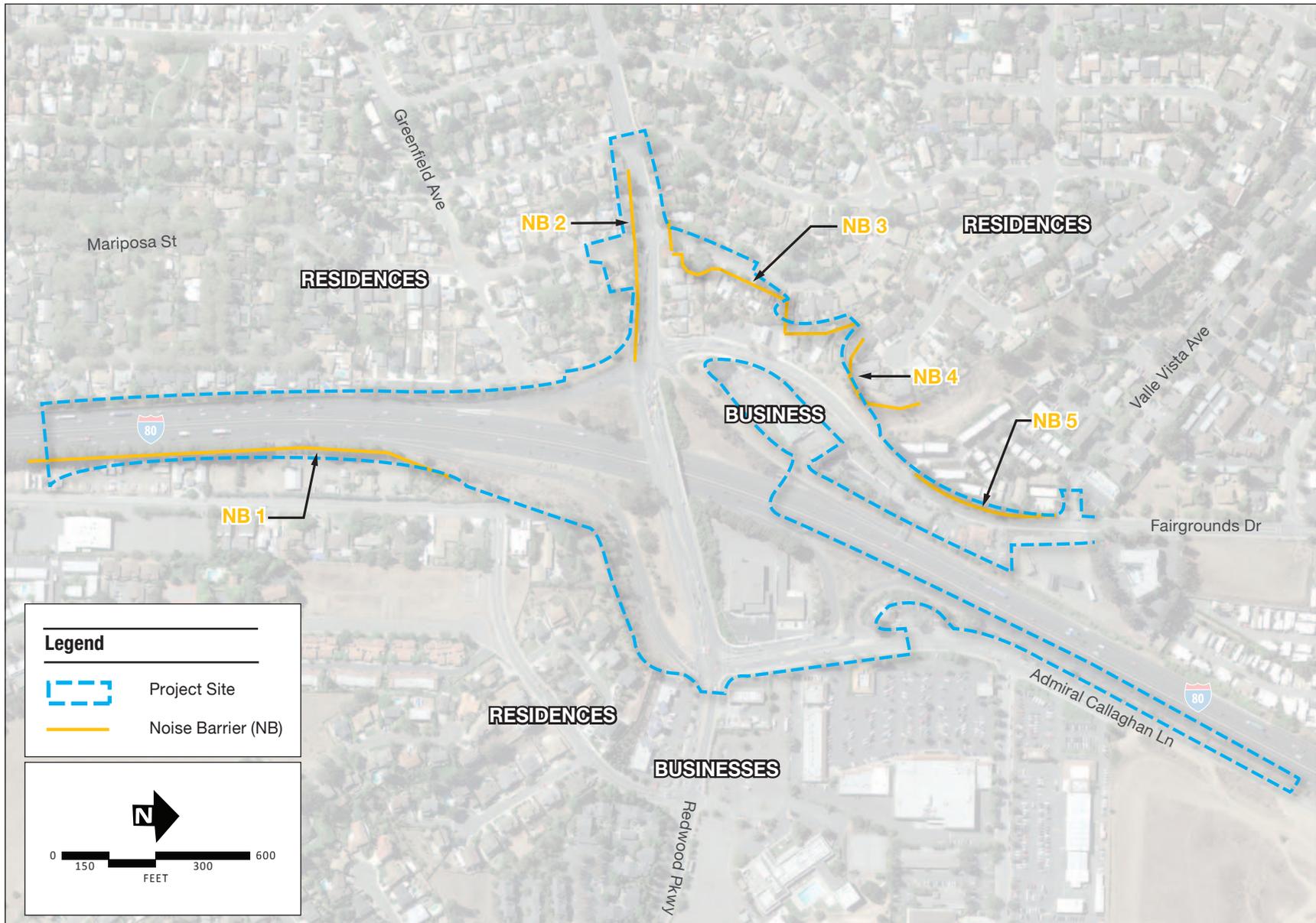
Segment 1: Noise-Affected Receivers

Figure



Segment 2: Noise-Affected Receivers

Figure



Segment 3: Noise-Affected Receivers

Figure

## Noise Modeling

Short- and long-term field measurements were taken to reflect the current noise environment within the noise study area (see **Figure 2-32**). The estimated worst-hour noise levels at short-term locations were based on daytime measurement data, peak-hour traffic data, and the trends in hourly noise levels measured at nearby representative long-term measurement sites. A direct comparison of the data collected simultaneously at the long-term and short-term noise measurement sites was made to calculate worst-hour noise levels at the short-term measurement locations. These data were then compared to the worst-hour noise levels predicted for existing conditions to confirm that the model accurately reflects the measured noise data. **Table 2.2.7-2** and **2.2.7-3** summarize the long- and short-term noise measurements.

Long-term (LT) reference noise measurements were made at four reference locations within the noise study area to quantify the daily trend in noise levels and to establish the peak traffic noise hour (see **Figure 2-32**). LT noise measurement locations were selected to generally represent human activity areas adjoining Fairgrounds Drive, Redwood Parkway, and the on- and off-ramps for I-80 and SR 37.

Twelve short-term (ST) noise measurements were made on March 30, 2011 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 and E land uses in the vicinity of the Build Alternative.

At all locations, noise levels were measured 5-feet above the ground surface and at least 10 feet from structures or barriers. Noise measurement locations were used as noise modeling receivers for the prediction of existing and future worst-hour traffic noise levels.

Table 2.2.7-2 Summary of Long-Term Noise Measurements

Receiver ID	Location	Time	Worst Hour $L_{eq[h]}$
LT-1	Rear yard of 1861 Griffin Drive	5:00 PM	61
		4:00 PM	61
		7:00 AM	60
LT-2	Rear yard of 51 Emerald Circle	1:00 PM	62
		6:00 AM	62
		7:00 PM	63
LT-3	Rear yard of 456 Moorland Street	5:00 PM	53
		7:00 AM	57
		7:00 AM	56
LT-4	Across from 11 Greenfield Court	5:00 PM	60
		6:00 AM	62
		7:00 AM	62

Source: Department, 2012h.

Notes:  $L_{eq[h]}$  = Equivalent sound level over one hour.

Table 2.2.7-3 Summary of Short-Term Noise Measurements

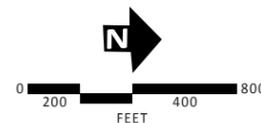
Receiver ID	Location	Time	10-min $L_{eq}$ , dBA	Estimated Worst Hour $L_{eq(h)}$ , dBA
ST-1	Side yard of 563 Admiral Callaghan Lane	11:00 AM	66	68
		11:10 AM	65	
ST-2	Rear yard of 1382 Monteith Drive	11:40 AM	58	60
		11:50 AM	58	
ST-3	Setback of Ridge Townhomes adjacent to Fairgrounds Drive	12:30 PM	66	71
		12:40 PM	68	
ST-4	Rear yard of 170 Obsidian Court	1:30 PM	60	62
		1:40 PM	59	
ST-5	Rear deck of 1354 Del Mar Avenue	2:30 PM	65	68
		2:40 PM	65	
ST-6	Rear yard of 618 Kathy Ellen Drive	10:50 AM	60	62
		11:00 AM	60	
ST-7	Front yard of 326 Greenfield Avenue	11:40 AM	61	63
		11:50 AM	61	
ST-8	Motel 6 Pool Area	12:30 PM	64	67
		12:40 PM	65	
ST-9	Front yard of 409 Moorland Street	1:30 PM	61	67
		1:40 PM	60	
ST-10	Franciscan Apartments Picnic Area	2:10 PM	48	52
		2:20 PM	49	
ST-11	Front yard of 16 Howard Street	1:30 PM	60	67
ST-12	Outdoor Use Area of the Fairgrounds Drive Apartments	2:10 PM	53	58
		2:20 PM	55	

Source: Department, 2012h.



**Legend**

- |  |           |  |   |                                       |
|--|-----------|--|---|---------------------------------------|
|  | Segment 3 |  | Noise-Sensitive Receivers                   | } (refer to Tables 2.2.7-2 through 6) |
|  | Segment 2 |  | Additional Traffic Noise Modeling Receivers |                                       |
|  | Segment 1 |  |   |                                       |



Noise Measurements and Receiver Locations

Figure

*Figure 2-32 Noise Measurements and Receiver Locations (back)*

## Environmental Consequences

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 or Type II 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 would 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 modification and realignment of interchanges and ramps, as well as widening of ramps and roadway, it is considered a Type I project. The FHWA noise regulations require noise analyses for all Type I projects.

Future (2015 and 2035) traffic noise conditions under the Build and No-Build Alternatives were modeled for the identified noise-sensitive receivers illustrated in **Figures 2-29, 2-30, and 2-31**.<sup>8</sup> As previously discussed, the noise-sensitive receivers in the noise study area are defined as Category B and E land uses, which have NAC thresholds of 67 dBA (exterior) and 72 dBA (interior), respectively. Noise levels predicted to approach (within 1 dBA) or exceed the NAC are considered unacceptable noise conditions for these land uses. Additional receivers were added to the traffic noise model to represent locations where noise measurements could not be made at the outdoor use area or in acoustically equivalent locations (see **Figure 2-32**).

### Build Alternative

#### *Segment 1 – Flint Court to Lake Chabot*

Category B land uses within this segment of the Build Alternative are residences located north of State Route 37, both west and east of Fairgrounds Drive (see **Figure 2-29**). Ten-foot noise barriers currently shield these Category B land uses. As shown in **Table 2.2.7-4**, worst-hour average noise levels under existing conditions range from 62 to 63 dBA  $L_{eq[h]}$ <sup>9</sup> at receivers represented by modeling sites LT-1 and ST-4. Future noise levels under the No-Build and Build Alternative scenarios are expected to remain at 62 dBA  $L_{eq[h]}$  at ST-4 and 63 dBA  $L_{eq[h]}$  at LT-1. The 2015 and 2035 Build conditions would increase existing noise levels by less than 1 decibel, and the noise level increase attributable to the Build

<sup>8</sup> As a conservative approach to the noise analysis, the 2015 conditions incorporate future traffic operations assuming the complete construction and operation of the Build Alternative, including those improvements that are anticipated to be constructed concurrently with the construction of the I-80 HOV Lane Project (2035). See **Subsection 2.1.3** for a detailed description of the traffic forecasts assumptions.

<sup>9</sup>  $L_{eq[h]}$  is the equivalent steady-state sound level over one hour.

Alternative is not considered substantial. First- and second-tier residences would not experience noise levels that approach or exceed the NAC of 67 dBA. Noise impacts were not identified at Category B land uses located north of SR 37 and noise abatement was not considered for feasibility or reasonableness.

Table 2.2.7-4 Segment 1, Modeled Noise Levels

Receiver ID	Number of Receivers Represented	Worst Hour Noise Levels, $L_{eq[h]}$ , dBA					Approaches/ Exceeds (A/E) NAC?
		2010	2015		2035		
		Existing	No-Build	Build	No-Build	Build	
LT-1	8	63	63	63	63	63	No
ST-4	5	62	62	62	62	62	No

Source: Department, 2012h.

### Segment 2 – Lake Chabot to Valle Vista Avenue

**Table 2.2.7-5** summarizes the traffic noise modeling results for Category B land uses located between Coach Lane and Valle Vista Avenue. Traffic noise levels were modeled at Sites LT-2, ST-10, and ST-12. Two additional receivers, R1 and R2, were added to the traffic noise model. Worst-hour average noise levels under existing conditions range from 50 to 57 dBA  $L_{eq[h]}$  at Category B residential outdoor use areas shielded by existing buildings (see ST-10, ST-12, and R1), and are approximately 59 to 63 dBA  $L_{eq[h]}$  at single-family rear yards and multi-family patios adjacent to Fairgrounds Drive (see LT-2 and R2).

The 2015 and 2035 Build conditions would remove several existing buildings located northwest and southwest of the Fairgrounds Drive/Sereno Drive intersection resulting in an increase of approximately 3 to 4 dBA  $L_{eq[h]}$  above existing noise levels. Category B land uses that are not currently shielded by existing buildings would experience traffic noise increases of about 0 to 2 dBA  $L_{eq[h]}$  above existing noise levels with implementation of the Build Alternative. Noise levels at Category B land uses located between Coach Lane and Valle Vista Avenue would not approach or exceed the NAC of 67 dBA in private or common outdoor spaces. As a result, noise impacts were not identified and noise abatement was not considered for feasibility or reasonableness.

Table 2.2.7-5 Segment 2, Modeled Noise Levels

Receiver ID	Number of Receivers Represented	Worst Hour Noise Levels, $L_{eq[h]}$ , dBA					Approaches/ Exceeds (A/E) NAC?
		2010	2015		2035		
		Existing	No-Build	Build	No-Build	Build	
LT-2	6	63	63	64	64	65	No
ST-10	1	50	50	53	52	54	No

Receiver ID	Number of Receivers Represented	Worst Hour Noise Levels, $L_{eq[h]}$ , dBA					Approaches/ Exceeds (A/E) NAC?
		2010	2015		2035		
		Existing	No-Build	Build	No-Build	Build	
ST-12	1	56	57	57	58	58	No
R1	1	57	57	60	59	61	No
R2	4	59	60	59	62	60	No

Source: Department, 2012h.

*Segment 3 – Valle Vista Avenue to Minahan Way*

Traffic noise modeling results for Category B land uses located within this segment of the Build Alternative are summarized in **Table 2.2.7-6**. Traffic noise levels were modeled at the ten measurement sites and at five additional modeling receivers identified as receivers R3 – R7.

Table 2.2.7-6 Segment 3, Modeled Noise Levels

Receiver ID	Number of Receivers Represented	Worst Hour Noise Levels, $L_{eq[h]}$ , dBA					Approaches/ Exceeds (A/E) NAC?
		2010	2015		2035		
		Existing	No-Build	Build	No-Build	Build	
LT-3	2	57	57	58	58	59	No
LT-4	6	63	63	63	64	64	No
ST-1	4	69	69	69	70	70	Yes
ST-2	14	60	61	61	61	61	No
ST-3	16	71	72	71	73	73	Yes
ST-5	3	69	69	69	70	71	Yes
ST-6	6	63	64	63	64	64	No
ST-7	3	64	64	63	64	64	No
ST-9	3	65	65	66	66	67	Yes
ST-11	1	65	65	65	66	66	Yes
R3	12	78	78	78	79	79	Yes
R4	3	76	76	76	77	77	Yes
R5	4	58	58	63	59	64	No
R6	3	62	62	67	63	68	Yes
R7	3	65	65	65	66	66	Yes

Source: Department, 2012h.

<sup>1</sup>Noise Increase Type: A/E = Approach or Exceed NAC, S=Substantial Increase (12 dBA or more).

Traffic noise levels at Receivers represented by measurement sites LT-3, LT-4, ST-2, ST-6, and ST-7 in **Figure 2-32** are calculated to remain below 64 dBA  $L_{eq[h]}$  and would not approach or exceed the NAC. Noise levels would not substantially increase as a result of the Build Alternative under future conditions in 2015 or 2035. Noise impacts were not identified for Category B land uses located west of the southbound on-ramp to I-80 from Redwood Parkway as these receivers are currently and would remain shielded by an existing noise barrier and topography. Category B land uses located in areas away from the Build Alternative (LT-3 and ST-6) would not be impacted by the Build Alternative. Noise abatement was not considered for receivers LT-3, LT-4, ST-2, ST-6, and ST-7.

Category B land uses represented by measurement/modeling sites ST-1, R3, and R4 are currently exposed to traffic noise levels in excess of the NAC, with hourly average noise levels during the worst-hour ranging from 69 to 78 dBA  $L_{eq[h]}$ . Worst-hour traffic noise levels at these receivers would be about 1 dBA  $L_{eq[h]}$  higher ranging from 70 to 79 dBA  $L_{eq[h]}$ .

Worst-hour average noise levels under existing conditions are approximately 69 to 71 dBA  $L_{eq[h]}$  at Category B residential outdoor use areas adjacent to Fairgrounds Drive at ST-3 and ST-5). A 2 dBA  $L_{eq[h]}$  increase in traffic noise levels is predicted at these receivers assuming 2035 Build conditions, resulting in worst-hour average noise levels of approximately 71 to 73 dBA  $L_{eq[h]}$ , exceeding the NAC by 4 to 6 dBA  $L_{eq[h]}$ . This is considered a noise impact that requires consideration of noise abatement. See discussion below.

The 2015 and 2035 Build conditions would remove several existing buildings located in the Moorland Street vicinity resulting in an increase of 2 to 6 dBA  $L_{eq[h]}$  above existing noise levels at ST-9, R5, and R6. The 2035 Build noise levels would also exceed the NAC at receivers ST-9 and R6, requiring consideration of noise abatement.

#### *Temporary Construction Impacts*

Noise generated by demolition related to the Build Alternative and construction activities would be a function of the noise levels generated by 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.

Construction phases anticipated with the Build Alternative would include demolition, clearing and grubbing, earthwork, widening of Fairgrounds Drive, widening on- and off-ramps at the Fairgrounds Drive/SR 37 interchange, reconfiguration of ramps at the Redwood Parkway/I-80 interchange, relocation of Fairgrounds Drive/Redwood Parkway intersection, construction of cul-de-sacs at Moorland Street and Howard Avenue, construction of noise barriers, and paving. Each construction phase would require a different combination of construction equipment necessary to complete the task and differing usage factors for such equipment.

Build Alternative construction activities would be primarily concentrated at the Fairgrounds Drive/Redwood Parkway/I-80 interchange region and along Fairgrounds Drive. The reconfiguration of ramps and local roadways would at times bring construction activities within approximately 75 to 150 feet of adjacent Category B receivers.

**Table 2.2.7-7** presents the construction noise levels calculated for each major phase of construction, including the highest instantaneous sound level measure during a specific period ( $L_{max}$ ), and the average noise level during the measurement period ( $L_{eq[h]}$ ). In some instances, maximum instantaneous noise levels are calculated to be slightly lower than hourly average noise levels. This occurs because maximum instantaneous noise levels generated by multiple pieces of construction equipment are not likely to occur at the same time. Hourly average noise levels resulting from multiple pieces of construction equipment would be additive resulting in slightly higher calculated noise levels. Noise generated by construction equipment drops off at a rate of 6 dB per doubling of distance.

Table 2.2.7-7 Construction Equipment Noise Levels at 100 Feet

Construction Phase	Maximum Noise Level ( $L_{max}$ , dBA)	Hourly Average Noise Level ( $L_{eq[h]}$ , dBA)
Demolition	84	78
Earthwork	76	78
Paving	79	79
Structures (with Pile Driving)	95	89
Structures (without Pile Driving)	77	78

Source: Department, 2012h.

### No-Build Alternative

The existing and 2035 No-Build noise conditions are predicted to be almost equal in Segment 1. Although noise levels would increase for receivers in Segment 2 under the 2035 No-Build conditions, the noise levels would not approach or exceed the NAC. The 2035 Build and No-Build noise conditions are predicted to be almost equal in Segment 3. Many receivers in Segment 3 would experience noise levels approaching or exceeding the NAC under both the 2035 Build and No-Build conditions. The No-Build Alternative would make no physical or operational improvement to Fairgrounds Drive, 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 funded 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

None of the noise receivers within the Build Alternative area would be exposed to a substantial increase (greater than 12 dBA) in future predicted noise levels, 2015 and 2035, under the Build Alternative. Consequently, no adverse effects under NEPA were identified.

Receivers that exceed either State or Federal 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- dB minimum reduction at an impacted receiver to be considered feasible by Caltrans (i.e., the barrier would provide a noticeable noise reduction). Additionally, the Department's acoustical design goal for noise abatement is that noise abatement must be predicted to provide at least 7 dB of noise reduction at one or more benefited receivers. Noise abatement measures that provide noise reduction of more than 5 dB are encouraged as long as they meet the reasonableness guidelines.

Potential noise abatement measures identified in the Department 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; and/or
- 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 or replacing noise barriers to reduce traffic noise levels. According to the Department and FHWA policies, a noise barrier must provide a minimum 5 dBA reduction in traffic noise to be considered feasible. Furthermore, under the Department 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). If, during final design, conditions substantially change, noise barriers might not be provided.

The views and opinions of the residents living immediately adjacent to the project area and affected by the traffic noise would be considered in reaching a decision on noise abatement measures. The Department's 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 project design and public involvement processes.

### **Noise Abatement Decision Report**

A Noise Abatement Decision Report (NADR) was prepared for the project using NEPA-23 CFR 772 and the Department's 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 (Department, 2012f).

The Department's 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. If, during final design, conditions substantially change, noise barriers might not be provided. The final decision regarding noise barriers will be made upon completion of the project design and public involvement processes.

Noise abatement is considered only where frequent human use occurs and where a lowered noise level would be beneficial. Noise abatement would be acoustically feasible if it provides noise reduction of at least 5 dBA at receivers subject to noise impacts. Other non-acoustical factors relating to geometric standards (e.g., sight distances), safety, maintenance, and security also can affect feasibility. Additionally, the Department's acoustical design goal is to provide at least 7 dBA of noise reduction at one or more benefitted receivers.

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. The reasonableness allowance is \$55,000 per benefitted receiver. A benefitted receiver is any receiver receiving a minimum of a 5-dBA reduction in noise levels from the proposed barrier.

Noise abatement was evaluated at impacted areas in Segment 3 and a total of five potential barriers were investigated, as illustrated in **Figure 2-31**. The primary focus of the investigation is on NAC Category B land uses where frequent human usage occurs and a lowered noise level would be of benefit. Noise barriers were evaluated at the following locations within Segment 3:

- Eastbound I-80 Edge of Shoulder (EOS)/Right of Way (ROW), (Noise Barrier 1)
- Eastbound Redwood Parkway ROW, (Noise Barrier 2)
- Southbound Fairgrounds Drive ROW, (Noise Barrier 3)
- Del Mar Avenue, (Noise Barrier 4)
- Southbound Fairgrounds Drive ROW, (Noise Barrier 5)

#### *Noise Barriers*

Based on preliminary design data, all noise barriers would reduce noise levels by at least 5 dBA at affected receivers. **Table 2.2.7-8** and the discussions below provide a summary of the acoustically feasibility and reasonableness of each noise barrier. Proposed noise barriers and associated affected receiver locations are depicted in **Figure 2-31**.

#### Noise Barrier 1: Eastbound I-80 Edge of Shoulder/Right-of-Way

By the year 2035, traffic noise levels at receivers ST-1, R3, and R4 are predicted to be between 70 and 79 dBA under the Build Alternative. This predicted noise level represents an increase of 1 dBA over existing conditions. Because the noise level is predicted to approach or exceed the NAC, noise abatement is considered in this area.

Noise barrier 1 is proposed along the eastbound I-80 edge of shoulder between Station 210+00 and Station 222+00. The noise barrier would transition from the eastbound I-80 edge of shoulder to the eastbound right-of-way and continue uphill to Station 225+00.

Table 2.2.7–8 Noise Abatement Summary

Noise Barrier	Barrier Height	Predicted Noise Reduction	Acoustically Feasible? (≥5 dBA reduction)	Number of Benefited Receivers	Total Reasonable Allowance	Estimated Construction Cost	Preliminary Recommendation for Incorporation?
Barrier 1	8 foot	3-6 dBA	Not for all receivers	15	\$825,000	\$1,338,000	No
	10 foot	5-9 dBA	Yes	19	\$1,045,000	\$1,491,000	No
	12 foot	6-11 dBA	Yes	19	\$1,045,000	\$1,619,000	No
	14 foot	7-12 dBA	Yes	19	\$1,045,000	Not estimated	--
	16 foot	7-13 dBA	Yes	19	\$1,045,000	Not estimated	--
Barrier 2	8 foot	4 dBA	No	--	--	--	--
	10 foot	6 dBA	Yes	3	\$165,000	\$179,000	Yes <sup>a</sup>
	12 foot	7 dBA	Yes	3	\$165,000	\$214,000	No
	14 foot	8 dBA	Yes	3	\$165,000	Not estimated	--
	16 foot	9 dBA	Yes	3	\$165,000	Not estimated	--
Barrier 3	8 foot	4-9 dBA	Not for all receivers	7	\$385,000	\$430,000	No
	10 foot	6-11 dBA	Yes	10	\$550,000	\$481,000	Yes
	12 foot	7-12 dBA	Yes	10	\$550,000	\$554,000	No
	14 foot	9-13 dBA	Yes	10	\$550,000	Not estimated	--
	16 foot	9-14 dBA	Yes	10	\$550,000	Not estimated	--
Barrier 4	6 foot	8 dBA	Yes	3	\$165,000	\$648,000	No
	8 foot	10 dBA	Yes	3	\$165,000	\$692,000	No
	10 foot	12 dBA	Yes	3	\$165,000	Not estimated	--
	12 foot	14 dBA	Yes	3	\$165,000	Not estimated	--
	14 foot	15 dBA	Yes	3	\$165,000	Not estimated	--
Barrier 5	8 foot	7 dBA	Yes	16	\$880,000	\$243,000	No <sup>b</sup>
	10 foot	9 dBA	Yes	16	\$880,000	\$292,000	No <sup>b</sup>
	12 foot	10 dBA	Yes	16	\$880,000	Not estimated	--
	14 foot	11 dBA	Yes	16	\$880,000	Not estimated	--
	16 foot	12 dBA	Yes	16	\$880,000	Not estimated	--

Source: Department, 2012f.

Notes: <sup>a</sup> Although the cost to construct Barrier 2 is more than the reasonable allowance, a 10-foot noise barrier is recommended for construction. Refer to discussion above.

<sup>b</sup> Although the cost to construct Barrier 5 is less than the reasonable allowance, a noise barrier is not recommended for construction. Refer to discussion below.

The height of the modeled noise barrier varies in heights ranging from 8 feet to 16 feet tall. An 8-foot barrier would not provide a feasible noise reduction at ST-1, but would feasibly reduce noise levels at receivers R3 and R4. A 10-foot to 16-foot barrier would provide feasible noise reductions at the 19 Category B land uses represented by receivers ST-1, R3, and R4. A minimum 10-foot barrier would also provide at least 7 dB of noise reduction at one of more benefitted receiver and would break the line of sight from first-row receivers to truck stacks. Thus, noise barrier 1 would be acoustically feasible at a minimum height of 10 feet.

The reasonable allowance calculated for an 8-foot barrier, assuming 15 benefitted receivers, is \$825,000. The reasonable allowance calculated, assuming 19 benefitted receivers for the 10-foot and 12-foot barriers, is \$1,045,000. The estimated cost of construction for an 8-foot, 10-foot, and 12-foot barrier would be \$1,338,000, \$1,491,000, \$1,619,000, respectively. For all three estimated heights, the cost to construct would surpass the reasonable allowance amount. Because the cost of the barrier is more than the reasonable allowance, noise barrier 1 is not anticipated to be incorporated into the Build Alternative.

#### Noise Barrier 2: Eastbound Redwood Parkway ROW

By year 2035, traffic noise levels at receivers R7 is predicted to be 66 dBA under the Build Alternative. This predicted noise level represents an increase of 1 dBA over existing conditions. Because the noise level is predicted to approach or exceed the NAC, noise abatement is considered in this area.

Noise barrier 2 is proposed along the eastbound Redwood Parkway right-of-way between Station 221+00 and Station 227+00. A minimum 10-foot noise barrier would provide a feasible noise reduction (minimum 5 dB reduction). However, a 12-foot noise barrier would be necessary to provide at least 7dB of noise reduction at the three Category B land uses represented by R7. Thus, noise barrier 2 would be acoustically feasible at the 10-foot and 12-foot height.

The reasonable allowance calculated for all noise barrier heights, assuming three benefitted receivers, is \$165,000. The estimated construction cost of a 10-foot noise barrier is \$179,000, which is \$14,000 higher than the reasonable allowance. The estimated cost to construct a 12-foot barrier is \$214,000, which is \$49,000 higher than the reasonable allowance. During the initial public informational meeting held in January 2011, residents representing the receivers in this area indicated that noise was an issue and that noise barriers were desired. Thus, although the cost of the barrier is more than the reasonable allowance, a 10-foot noise barrier is recommended for construction.

#### Noise Barrier 3: Southbound Fairgrounds Drive ROW

By the year 2035, traffic noise levels at receivers ST-9, R5, and R6 are predicted to be between 64 and 68 dBA under the Build Alternative. This predicted noise level represents an increase of 2 to 6 dBA over existing conditions. Because the noise level is predicted to approach or exceed the NAC, noise abatement is considered in this area.

Noise barrier 3 is proposed along the property line of Moorland Street residential properties that would remain with the Build Alternative, along the northbound Moorland

Street right-of-way, and along a segment of westbound Redwood Parkway at the right-of-way. The noise barrier is proposed to replace the existing acoustical shielding that would be lost with the removal of homes on the east side of Moorland Street. The height of the modeled noise barrier varies in heights ranging from 8 feet to 16 feet tall. An 8-foot barrier would not provide a feasible noise reduction at ST-9, but would feasibly reduce noise levels at receivers R5 and R6. A 10-foot to 16-foot barrier would provide feasible noise reductions at the 10 Category B land uses represented by receivers ST-9, R5, and R6. Thus, to be considered acoustically feasible for all receiver locations, noise barrier 3 would need to be at least 10 feet in height.

The reasonable allowance calculated for an 8-foot barrier, assuming seven benefitted receivers, is \$385,000. The reasonable allowance calculated for the 10-foot and 12-foot heights, assuming ten benefitted receivers, is \$550,000. The estimated cost to construct an 8-foot, 10-foot, and 12-foot barrier would be \$430,000, \$481,000, and \$554,000, respectively. Of these, only the 10-foot barrier's cost to construct would be less than the reasonable allowance. Because the cost of the barrier is less than the reasonable allowance, this 10-foot barrier is likely to be incorporated into the Build Alternative.

#### Noise Barrier 4: Del Mar Avenue

By year 2035, traffic noise levels at receivers ST-5 is predicted to be 71 dBA under the Build Alternative. This predicted noise level represents an increase of 2 dBA over existing conditions. Because the noise level is predicted to approach or exceed the NAC, noise abatement is considered in this area.

Noise barrier 4 would be located at the terminus of Del Mar Avenue adjacent to Fairgrounds Drive. Noise barriers tested within the right-of-way were not feasible given that the receivers are situated approximately 30 feet above Fairgrounds Drive and overlooked I-80. Thus, noise barrier 4 was tested on private property at the top of the slope generally following the 220-foot elevation contour. At this location, a minimum 6-foot noise barrier would provide at least 8 dB of noise reduction at the 3 Category B land uses represented by receiver ST-5. Thus, noise barrier 4 would be acoustically feasible at the 6-foot height.

The reasonable allowance calculated for all noise barrier heights, assuming three benefitted receivers, is \$165,000. The estimated cost to construct a 6-foot and 8-foot barrier would be \$648,000 and \$692,000, respectively. Because the cost of the barrier is more than the reasonable allowance, noise barrier 4 is not anticipated to be incorporated into the Build Alternative.

#### Noise Barrier 5: Southbound Fairgrounds Drive ROW

By year 2035, traffic noise levels at receivers ST-3 is predicted to be 73 dBA under the Build Alternative. This predicted noise level represents an increase of 2 dBA over existing conditions. Because the noise level is predicted to approach or exceed the NAC, noise abatement is considered in this area.

Noise barrier 5 is proposed along the southbound Fairgrounds Drive right-of-way between Station 241+00 and Station 246+00. The proposed location of this noise barrier is on the inside of a tight radius curve at the back of a sidewalk flanked by driveways on either side

(see

**Figure 2-31**). Receiver ST-3 represents approximately 16 Category B land uses in the apartment community southwest of the Fairgrounds Drive and Valle Vista Avenue intersection. A minimum 8-foot noise barrier would provide a feasible noise reduction (minimum 7 dB reduction). Thus, noise barrier 5 would be acoustically feasible at the 8-foot height.

The reasonable allowance calculated for all noise barrier heights, assuming 16 benefitted receivers, is \$880,000. The estimated cost to construct an 8-foot and 10-foot barrier would be \$243,000 and \$292,000, respectively. However, the construction of a noise barrier at this location would create a non-standard stopping sight distance for the Fairgrounds Drive southbound lanes and impair the corner-sight distances for vehicles exiting the apartment driveways. These factors render the barrier infeasible and construction of this noise barrier 5 is not recommended.

### **Minimizing Construction Noise**

To reduce potential noise effects resulting from construction, the following measures would be implemented during construction:

- Noise-generating construction activity shall be restricted to between the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday. No construction activities should occur on weekends or holidays. If work is necessary outside of these hours, the Department shall require the contractor to implement a construction noise monitoring program and, if feasible, provide additional mitigation as necessary (in the form of noise control blankets or other temporary noise barriers, etc.) for affected receivers.
- Equip all internal combustion engine driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Locate stationary noise generating equipment as far as possible from sensitive receivers when sensitive receivers adjoin or are near a construction project area.
- Utilize "quiet" air compressors and other "quiet" equipment where such technology exists.
- Prohibit unnecessary idling of internal combustion engines within 100 feet of residences.
- Avoid staging of construction equipment within 200 feet of residences and locate all stationary noise-generating construction equipment, such as air compressors, portable power generators, or self-powered lighting systems as far practical from noise sensitive receivers.
- 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  $L_{max}$  of 86 dBA at 50 feet from job site activities between the hours of 9 PM to 6 AM.
- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities and distribute this plan to adjacent noise-sensitive receivers. The construction plan should also list the construction noise reduction measures identified in this study.

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