PHYSICAL ENVIRONMENT

2.8 Hydrology and Floodplains

2.8.1 Regulatory Setting

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

To comply, the following must be analyzed:

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

2.8.2 Affected Environment

This section is based on the *Location Hydraulic Study State Route 55 Widening Project* (2014).

2.8.2.1 Regional Hydrology

The project area is under the jurisdiction of the Regional Water Quality Control Board (RWQCB) Santa Ana Region 8. The project segment of State Route 55 (SR-55) is within the Santa Ana River Hydrologic Unit, the Lower Santa Ana River Hydrologic Area, and the East Coastal Plain Subarea. The receiving waters from the project segment of SR-55 are Peters Canyon Channel, San Diego Creek Reach 1, Santa Ana Delhi Channel, Upper Newport Bay and the Pacific Ocean.

2.8.2.2 100-Year Floodplains

There are two floodplains within the project limits as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Nos. 06059C0278J and 06059C0277J. They are Lane Channel (Orange County Flood Control District [OCFCD] Facility No. 8) and the Santa Ana-Santa Fe Channel

(OCFCD Facility No. F10). Both facilities are mapped as Zone A, which denotes areas subject to inundation by the 1 percent annual chance flood, otherwise known as the 100-year floodplain. Discharges are contained within the channels in each floodplain. The FEMA FIRMs are included in Appendix H.

2.8.2.3 Lane Channel

Lane Channel is parallel to the west side of SR-55 between MacArthur Boulevard and Dyer Road. This segment (reach) of Lane Channel is a concrete-lined open trapezoidal section that is 8 feet (ft) wide at the bottom and 9 ft high. Lane Channel crosses under SR-55 in a double 10 ft by 9 ft reinforced concrete box (RCB) just north of the MacArthur Boulevard interchange before joining San Diego Creek Reach 1, which flows to Upper Newport Bay, Lower Newport Bay, and the Pacific Ocean. The 3,150-acre (ac) watershed for Lane Channel includes areas in the Cities of Irvine and Santa Ana and a small area in unincorporated Orange County near John Wayne Airport, and is generally bounded by the Southern California Regional Rail Authority (SCRRA) tracks on the north, the Southern Pacific Railroad (SPRR) and Main Street on the west, Interstate 405 (I-405) and Campus Drive on the south, and Interstate 5 (I-5) and Von Karman Avenue on the east.

No base flood elevation (BFE) has been determined for the segment of Lane Channel in the project area. The normal depth was calculated based on the geometry of the channel in the project area for the 100-year flow discharge to approximate the BFE. Normal depth calculations indicate that the BFE in the project area is contained within the existing Lane Channel.

2.8.2.4 Santa Ana-Santa Fe Channel

The Santa Ana-Santa Fe Channel is a reinforced concrete trapezoidal channel that conveys flows southeast into Peters Canyon Channel, which drains to San Diego Creek, Upper Newport Bay, Lower Newport Bay, and the Pacific Ocean. This channel crosses perpendicularly under SR-55 between the Edinger Avenue and McFadden Avenue interchanges, parallels the northeast side of the SCRRA tracks and Edinger Avenue, and drains areas northeast of the project area before joining Peters Canyon Wash.

As it crosses under SR-55, the Santa Ana-Santa Fe Channel is a double reinforced 8 ft by 8 ft concrete box. Upstream of its crossing of SR-55, the channel is a 6 ft by 9 ft trapezoidal section, but the channel is an 8 ft by 10 ft trapezoidal section downstream of its crossing of SR-55.

Although the Santa Ana-Santa Fe Channel is designated as Zone A and the 100-year discharge is contained in the channel according to FEMA FIRM No. 06059C0277J, the capacity of this channel is deficient according to the OCFCD. No BFE has been determined for the segment of this channel in the project area. Normal depth was calculated based on the geometry of the channel in the project area for the 100-year flow discharge to approximate the BFE. Normal depth calculations indicate that the BFE in the project area is not contained within the existing Santa Ana-Santa Fe Channel.

2.8.2.5 Natural and Beneficial Floodplain Values

Floodplains and wetlands in their natural or relatively undisturbed state provide natural and beneficial floodplain values including, but not limited to, fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge. The *Natural Environment Study (Minimal Impact)* (2014) concluded that there are no fish, wildlife, plants, or forestry supported in or by Lane Channel and the Santa Ana-Santa Fe Channel. Both channels are man-made and have no natural beauty. Both are closed facilities with restricted access and are unlikely to serve as a means for scientific study or recreational activities. Neither channel contributes to groundwater recharge or is suitable for agriculture or water quality maintenance. The only beneficial floodplain value for Lane Channel and the Santa Ana-Santa Fe Channel is "natural moderation of floods."

According to the Santa Ana RWQCB Santa Ana River Basin Water Quality Control Plan (updated February 2008), the Lane Channel and Santa Ana-Santa Fe Channel are not listed as having beneficial uses.

2.8.3 Environmental Consequences

2.8.3.1 Temporary Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

During construction of Build Alternatives construction activities would occur in Lane Channel and near Santa Ana-Santa Fe Channel. The only beneficial floodplain value for these channels is the "natural moderation of floods." The project construction activities would not reduce or otherwise affect the flood storage capacity of the Lane Channel and Santa Ana-Santa Fe Channel and would not modify the flood flows in those channels. Furthermore, construction activities would be limited to the dry season. As a result, construction activities under Alternatives 1, 2, 3, and 4 would not result in temporary adverse impacts related to hydrology and floodplains.

No Build Alternative

The No Build Alternative would not include the construction of any of the proposed project improvements. Therefore, the No Build Alternative would not result in temporary impacts to hydrology and floodplains in the project area.

2.8.3.2 Permanent Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

Hydraulic Analysis

All the Build Alternatives would result in a slight increase in flow discharges as a result of the minor increase in the total impervious surface areas on SR-55. Most of the proposed improvements would be constructed within the Lane Channel watershed, and the increase in flows within the Lane Channel watershed was estimated at 14 cubic feet per second (cfs). The increase in flows in the Santa Ana-Santa Fe watershed was estimated at 2 cfs. These increases would have only minor effects on the BFEs in the Lane and Santa Ana-Santa Fe channels.

As noted earlier, the existing Santa Ana-Santa Fe Channel is identified as being deficient. However, the potential increase in the water surface elevation in this channel as a result of the Build Alternatives would be minor and the freeway road surface would be approximately 25 ft above the top of this channel. Therefore, the Build Alternatives would not have an adverse impact on the Santa Ana-Santa Fe Channel or increase the potential for road flooding at this location.

The analysis of the potential effects of the Build Alternatives related to floodplains and hydrology was based on assessment of the effects of Alternative 3 because that Build Alternative would result in the largest footprint of the four Build Alternatives. Assessment of the effects under Alternative 3 would result in the most conservative estimate of the project effects related to hydrology and floodplains. The effects of the other three Build Alternatives would be the same or less than the impacts under Alternative 3.

100 Year Floodplain Encroachment

Potential Risk from Longitudinal Encroachment

The improvements in the Build Alternatives would result in a longitudinal encroachment into the Lane Channel at its crossing of SR-55. At that location, the Lane Channel would be reconfigured and slightly realigned to the west (farther from SR-55), and modified from the existing open trapezoidal concrete-lined section to a rectangular section 20 ft wide at the base and 10 ft high. This section

would be sized to carry the 100-year flood discharge flow, including flows from the project improvements, and would include approximately 4 ft of additional space (freeboard) in the channel above the recorded high water mark. The road surface at the freeway would be approximately 2 ft above the top of the Lane Channel and the surrounding areas. Therefore, there is no potential for water to overtop the channel or flood the SR-55 facility as a result of the proposed improvements.

The Build Alternatives include improvements in the area where the Santa Ana-Santa Fe Channel crosses perpendicularly under SR-55, between the Edinger Avenue and McFadden Avenue interchanges. The geometry of this channel would not be altered, and no structures are proposed in this floodplain as part of the Build Alternatives. Therefore, there would be no physical encroachments into the existing Santa Ana-Santa Fe Channel or floodplain under the Build Alternatives and no longitudinal encroachment at this location.

The Build Alternatives do not propose any other structures in either channel.

In summary, the potential encroachments into the Lane Channel and Santa Ana-Santa Fe Channel floodplains associated with the Build Alternatives would be classified as “insignificant encroachments” and would not be adverse.

All the proposed improvements in and near the Lane Channel and Santa Ana-Santa Fe Channel would be designed and constructed in consultation with the OCFCD to contain the base flood with additional freeboard as required by the OCFCD. Those improvements would be within the existing OCFCD parcels and would not affect the adjacent land uses. The Build Alternatives would be designed consistent with the land use and floodplain safety requirements of the Cities of Santa Ana, Tustin, and Irvine, and therefore would not impact those Cities’ agreements with the FEMA National Flood Insurance Program (NFIP) for safeguarding against incompatible floodplain development.

Potential Risk to Life and Property

As described above, the floodplain encroachment in the Build Alternatives would not adversely affect the base flood at the Lane Channel. The road surface on SR-55 would be above the 100-year floodplain at the crossing of the Lane Channel. The potential for flows to overtop the channel at this location would be unchanged from existing conditions. Because the base flood would be contained

within the Lane Channel, there is no potential for disruptions to school bus or postal service routes, or residential and nonresidential uses in the floodplain.

Potential Risk to Natural and Beneficial Floodplain Values

As described earlier, the only beneficial floodplain value at the Lane Channel and Santa Ana-Santa Fe Channel is "natural moderation of floods." Because the base floods would continue to be contained in these channels under the Build Alternatives, there would be no change in this beneficial floodplain value at these channels.

Potential Risk for Support of Incompatible Floodplain Development

The project improvements at and near the Lane Channel and Santa Ana-Santa Fe Channel and their respective floodplains would be consistent with the existing local General Plans and would meet the required flood control requirements of the OCFCD and the Cities of Santa Ana, Tustin, and Irvine. Therefore, the Build Alternatives would not result in incompatible development in those two floodplains.

Overall Assessment of Risk

As described above, the Build Alternatives would not pose any appreciable risk related to traffic disruption, loss of life and property, or natural or beneficial floodplain values. The modifications to the Lane Channel would be designed to convey the base flood with minimal impacts to the existing floodplain elevation and would be consistent with OCFCD requirements. In summary, the combined assessed level of risk associated with the longitudinal encroachment at the Lane Channel, risks to life and property, risks to natural and beneficial floodplain values, and risks of probable incompatible floodplain development is Low Risk.

As defined in 23 CFR 650 Subpart A, the encroachment in the Lane Channel under the Build Alternatives would be classified as Minimal.

No Build Alternative

The No Build Alternative would not result in the construction and operation of the improvements in the Build Alternatives and therefore would not result in adverse permanent impacts to hydrology and floodplains in the proposed project area.

2.8.4 Avoidance, Minimization, and/or Mitigation Measures

The Build Alternatives would not result in adverse impacts related to floodplains and hydrology. No avoidance, minimization and/or mitigation measures have been identified.

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2.9 Water Quality and Storm Water Runoff

2.9.1 Regulatory Setting

2.9.1.1 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[1] unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. This act and its amendments are known today as the Clean Water Act (CWA). Congress has amended the act several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the NPDES permit scheme. The following are important CWA sections:

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

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

The USACE issues two types of 404 permits: General and Standard permits. There are two types of General permits: Regional permits and Nationwide Permits. Regional

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

permits are issued for a general category of activities when they are similar in nature and cause minimal environmental effect. Nationwide permits are issued to allow a variety of minor project activities with no more than minimal effects.

Ordinarily, projects that do not meet the criteria for a Nationwide Permit may be permitted under one of USACE's Standard permits. There are two types of Standard permits: Individual permits and Letters of Permission. For Standard permits, the USACE decision to approve is based on compliance with U.S. Environmental Protection Agency's Section 404 (b)(1) Guidelines (U.S. EPA Code of Federal Regulations [CFR] 40 Part 230), and whether permit approval is in the public interest. The Section 404(b)(1) Guidelines (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. According to the Guidelines, documentation is needed that a sequence of avoidance, minimization, and compensation measures has been followed, in that order. The Guidelines also restrict permitting activities that violate water quality or toxic effluent[1] 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.

2.9.1.2 State Laws and 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

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

definition is broader than the CWA definition of "pollutant". Discharges under the Porter-Cologne Act are permitted by Waste Discharge Requirements (WDRs) and may be required even when the discharge is already permitted or exempt under the CWA.

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

State Water Resources Control Board and Regional Water Quality Control Boards

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

- **National Pollutant Discharge Elimination System (NPDES) Program**

  Municipal Separate Storm Sewer Systems (MS4s)

  Section 402(p) of the CWA requires the issuance of NPDES permits for five categories of storm water discharges, including Municipal Separate Storm Sewer Systems (MS4). An MS4 is defined as "any conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels, and storm drains) owned or operated by a

state, city, town, county, or other public body having jurisdiction over storm water, that is designed or used for collecting or conveying storm water." The SWRCB has identified Caltrans as an owner/operator of an MS4 under federal regulations. The Caltrans MS4 permit covers all Caltrans 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.

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

1. Caltrans must comply with the requirements of the Construction General Permit (see below);
2. Caltrans must implement a year-round program in all parts of the State to effectively control storm water and non-storm water discharges; and
3. Caltrans storm water discharges must meet water quality standards through implementation of permanent and temporary (construction) Best Management Practices (BMPs) to the Maximum Extent Practicable, and other measures as the SWRCB determines to be necessary to meet the water quality standards.

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

Construction General Permit

Construction General Permit (Order No. 2009-009-DWQ), adopted on September 2, 2009, became effective on July 1, 2010. The permit regulates storm water discharges from construction sites that result in a Disturbed Soil Area

(DSA) of one acre or greater, and/or are smaller sites that are part of a larger common plan of development. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation 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 Caltrans' Standard Specifications, a Water Pollution Control Plan (WPCP) is necessary for projects with DSA less than one acre.

Section 401 Permitting

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

In some cases the RWQCB may have specific concerns with discharges associated with a project. As a result, the RWQCB may issue a set of requirements known as Waste Discharge Requirements (WDRs) under the State Water Code (Porter-Cologne Act) that define activities, such as the inclusion of

specific features, effluent limitations, monitoring, and plan submittals that are to be implemented for protecting or benefiting water quality. WDRs can be issued to address both permanent and temporary discharges of a project.

2.9.2 Affected Environment

This section is based on the *Water Quality Assessment Report* (2014) prepared for the proposed project.

2.9.2.1 Surface Water

The study area is located in the Newport Bay Watershed, which is made up of four sub-watersheds. The study area is located in two of those sub-watersheds – Lower San Diego Creek and Peters Canyon Channel.

The surface waters in the project area consist of nine channelized storm water or drainage features. Three of the channelized storm water or drainage features are named: Lane Channel, Santa Ana-Santa Fe Channel, and Peters Canyon Channel. All nine channelized storm water and drainage features eventually discharge into either the Santa Ana-Delhi Channel or San Diego Creek Reach 1, both of which are tributaries to Upper Newport Bay. Upper Newport Bay connects directly to the Pacific Ocean.

Receiving waters in the project area are not used for drinking water or water recharge. The study area is not located in a "high risk" area, which is defined as a location where spills from the State-owned rights-of-way, activities, or facilities can discharge directly to municipal or domestic water supply reservoirs or groundwater percolation facilities. The surface water quality objectives for all inland waters in the Santa Ana region, including San Diego Creek Channel, as documented in the Basin Plan, are provided in Table A of the *Water Quality Assessment Report* (2014).

Beneficial uses are identified in the Santa Ana RWQCB Basin Plan (*Santa Ana River Basin Water Quality Control Plan*, updated March 2012) for Upper and Lower Newport Bay, Reach 1 of San Diego Creek, and Peters Canyon Channel. The present or potential beneficial uses for Upper and Lower Newport Bay are:

- NAV: shipping, travel, or other transportation by private, commercial, or military vessels
- GWR: Groundwater recharge
- REC-1: Body-contact recreation (swimming/wading)
- REC-2: Non-body contact recreation (boating/fishing)

- BIOL: Habitats or areas designated for the special protection of natural resources
- WILD: Habitat for wild plants and animals
- RARE: Habitat for rare, threatened, or endangered species
- SPWN: Spawning, reproduction and development habitat for fish and wildlife
- MAR: Ecosystems that support marine habitats, vegetation, fish and shellfish, and wildlife
- SHEL: Waters supporting habitat necessary for shellfish that are collected for human consumption, commercial or sport
- EST: Waters that support estuarine ecosystems

The present or potential beneficial uses for Reach 1 of San Diego Creek are:

- REC-1: Body-contact recreation (swimming/wading)
- REC-2: Non-body contact recreation (boating/fishing)
- WARM: Warm water habitat for fish amenable for reproduction in warm water
- WILD: Habitat for wild plants and animals

The present or potential beneficial uses for the Peters Canyon Channel are identified as intermittent and are:

- GWR: Groundwater Recharge
- REC-1: Body-contact recreation (swimming/wading)
- REC-2: Non-body contact recreation (boating/fishing)
- WARM: Warm water habitat for fish amenable for reproduction in warm water
- WILD: Habitat for wild plants and animals

Primary water quality concerns in the Newport Bay Watershed include excess algal blooms (nutrients), aquatic life toxicity, bacterial quality, stream channel erosion and sedimentation in Newport Bay, wetland protection, and Upper Newport Bay being designated as a Critical Coastal Area.

The SWRCB approved the 2010 Integrated Report (CWA Section 303(d) List/305(b) Report) on August 4, 2010. On November 12, 2010, the U.S. EPA approved the 2010 California 303(d) List of Water Quality Limited Segments. Table 2.9.1 lists the 303(d) receiving waters in the study area, the impairment, the potential source of the impairment, and the proposed TMDL completion date. As shown in Table 2.9.1, Peters Canyon Channel is listed as impaired for dichloro-diphenyl-trichloroethane (DDT), indicator bacteria, toxaphene, and pH. The Santa Ana-Delhi Channel is listed

Table 2.9.1 2010 Clean Water Act Section 303(d) Listing for Receiving Waters in the Study Area

Water Body	Pollutant	Expected TMDL Completion Date	Potential Sources
Peters Canyon Channel	DDT	2019	Source Unknown
	Indicator bacteria	2021	Source Unknown
	pH	2021	Unknown Nonpoint Source/Urban Runoff/Storm Sewers
	Toxaphene	2019	Source Unknown
Santa Ana-Delhi Channel	Indicator bacteria	2021	Source Unknown
San Diego Creek Reach 1	Fecal coliform	2019	Urban Runoff/Storm Sewers/Other Urban Runoff
	Nutrients	None	Source Unknown
	Pesticides	None	Source Unknown
	Sedimentation/siltation	None	Source Unknown
	Selenium	2007	Source Unknown
	Toxaphene	2019	Source Unknown
Upper Newport Bay	Chlordane	2019	Source Unknown
	Copper	2007	Source Unknown
	DDT	2019	Source Unknown
	Indicator bacteria	None	Source Unknown
	Metals	2019	Urban Runoff
	Nutrients	None	Source Unknown
	PCBs	2019	Source Unknown
	Pesticides	None	Unknown Nonpoint Source
	Sedimentation/siltation	None	Agriculture
	Sediment Toxicity	2019	Source Unknown
Lower Newport Bay	Chlordane	2019	Source Unknown
	Copper	2007	Source Unknown
	DDT	2019	Source Unknown
	Indicator bacteria	None	Source Unknown
	Nutrients	None	Source Unknown
	PCBs	2019	Source Unknown
	Pesticides	None	Agriculture
	Sediment toxicity	2019	Source Unknown

Source: *Water Quality Assessment Report* (2014).
DDT = dichloro-diphenyl-trichloroethane
PCBs = polychlorinated biphenyls
pH = percentage hydrogen
TMDL = Total Maximum Daily Load

as impaired for indicator bacteria. San Diego Creek Reach 1 is listed as impaired for fecal coliform, nutrients, pesticides, sedimentation/siltation, selenium, and toxaphene. Upper Newport Bay is listed as impaired for chlordane, copper, DDT, indicator bacteria, metals, nutrients, polychlorinated biphenyls (PCBs), pesticides, sedimentation/siltation, and sediment toxicity. Lower Newport Bay is listed as impaired for chlordane, copper, DDT, indictor bacteria, nutrients, PCBs, pesticides, and sediment toxicity.

There are TMDLs applicable to San Diego Creek and Upper and Lower Newport Bay, which are downstream receiving waters in the study area for: organochlorine

compounds (legacy pesticides, PCBs, and organophosphate pesticides); copper, lead, zinc, and cadmium; nutrients, selenium; sediment; and fecal coliform.

2.9.2.2 Groundwater

As designated by the RWQCB (Region 8), the study area is within the Irvine and Orange County Groundwater Management Zones. In the study area, groundwater was encountered during previous explorations between approximately 11 feet (ft) and 84 ft below ground surface (bgs). Recharge to the Irvine and Orange County Groundwater Management Zones is derived from percolation of the Santa Ana River flow, infiltration of precipitation, and injection wells.

The groundwater quality objectives for the Santa Ana Region as designated in the Basin Plan are provided in Table B of the *Water Quality Assessment Report* (2014). The specific groundwater quality objectives for the Irvine and Orange County Groundwater Management Zones are:

- Total dissolved solids (TDS): 910 milligrams per liter (mg/L)
- Nitrate as nitrogen: 5.9 mg/L

The following present or potential beneficial uses are identified in the Basin Plan for the Irvine and Orange County Groundwater Management Zones:

- MUN: Waters are used for community, military, municipal or individual water supply systems
- AGR: Waters are used for farming, horticulture or ranching
- IND: Waters are used for industrial activities that do not depend primarily on water quality (e.g., mining, cooling, gravel washing)
- PROC: Waters are used for industrial activities that depend primarily on water quality (e.g., food preparation)

Water in the Irvine and Orange County Groundwater Management Zones is primarily sodium-calcium bicarbonate based. TDS range from 232 to 661 mg/L and average 475 mg/L. Groundwater in the study area is impaired by salinity, nitrate, and methyl tertiary-butyl ether (MTBE).

2.9.3 Environmental Consequences

2.9.3.1 Temporary Impacts

Alternative 1

Pollutants of concern during construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. Each of these pollutants on its own or in combination with other pollutants can have a detrimental effect on water quality. During construction, Alternative 1 would disturb a total area of 38.9 ac. All aspects of the project (widening the roadway for new general-purpose lanes, high-occupancy vehicle [HOV] lanes, auxiliary lanes, and longer merging lanes, as well as installing roadway utilities and constructing retaining walls) involve grading and earth-moving activities and, in some instances, the removal of existing vegetation. These construction-related activities expose soil; therefore, there would be an increased potential for soil erosion compared to existing conditions. In addition, during a storm event, soil erosion could occur at an accelerated rate. Grading and earth-moving equipment for widening the roadway, installing utilities, and constructing retaining walls would also be a source of chemical, liquid, and petroleum products (such as paints, solvents, and fuels) if the equipment leaks; furthermore, concrete-related waste (i.e., during the construction of retaining walls) may be spilled or leaked on the project site. Therefore, grading and earth-moving activities for the road widening and associated improvements (e.g., installing roadway utilities and constructing retaining walls) have the potential to transport chemical and concrete-related waste via storm runoff into receiving waters.

Temporary or portable sanitary facilities provided for construction workers would be a source of sanitary waste that could be transported to downstream receiving waters. Construction workers would also generate trash and debris (e.g., food wrappers) that could also be transported to receiving waters. If water is detained at the construction site, it has the potential to reach ambient air temperature and, if discharged to receiving waters, could contribute to the increase in water temperatures.

Construction activities associated with Alternative 1 would result in the least amount of disturbed area of all the Build Alternatives. Therefore, Alternative 1 would involve the least amount of exposed soil and result in the least potential for soil erosion and downstream sedimentation and contamination when compared to the other Build Alternatives.

Because Alternative 1 would result in the least amount of disturbed area, the duration of construction would be shorter and there would be less opportunity for construction-

related pollutants to spill, leak, and/or affect on-site drainages and downstream receiving waters when compared to the other Build Alternatives.

Dewatering may be required during construction of Alternative 1. If groundwater dewatering becomes necessary during construction, Build Alternative 1 would be required to comply with a groundwater dewatering permit which requires monitoring discharges from groundwater extraction waste from construction to ensure that groundwater effluent that is pumped and ultimately discharged to surface water does not exceed surface water effluent limitations for particular pollutant constituents; therefore, it is not anticipated that surface water would be impacted during construction activities as a result of site dewatering so long as the groundwater discharge meets the RWQCB dewatering permit requirements.

Under the Construction General Permit, the California Department of Transportation (Caltrans) would be required to prepare a SWPPP and implement the construction BMPs detailed in the SWPPP during construction to minimize erosion and prevent spills. The SWPPP would be developed and construction BMPs selected and implemented to target pollutants of concern during construction. Because the construction BMPs would be designed to retain sediment and other pollutants on the project site so they would not reach receiving waters, storm water discharges and authorized non-storm water discharges are not anticipated to cause or contribute to any violations of applicable water quality standards or objectives, or adversely impact human health or the environment. When construction BMPs are properly designed, implemented, and maintained to address pollutants of concern, the pollutants of concern would be retained on the project site so they would not reach receiving waters.

Alternative 2

During construction, Alternative 2 would disturb a total area of 70.3 ac. Construction of Alternative 2 would disturb a larger area than Alternatives 1 and 4, but a smaller area than Alternative 3. Therefore, Alternative 2 would result in greater potential for soil erosion, downstream sedimentation, and opportunity for construction-related pollutants to spill, leak, and/or affect on-site drainages and downstream receiving waters than Alternatives 1 and 4, but less than under Alternative 3.

Dewatering may be required during construction of Alternative 2. If groundwater dewatering becomes necessary during construction, Build Alternative 2 would be required to comply with a groundwater dewatering permit which requires monitoring

discharges from groundwater extraction waste from construction to ensure that groundwater effluent that is pumped and ultimately discharged to surface water does not exceed surface water effluent limitations for particular pollutant constituents; therefore, it is not anticipated that surface water would be impacted during construction activities as a result of site dewatering so long as the groundwater discharge meets the RWQCB dewatering permit requirements.

Alternative 2 would require the preparation and implementation of a SWPPP and construction BMPs detailed in the SWPPP during construction to minimize erosion and prevent spills. Based on implementation of the BMPs, pollutants of concern would be retained on the project site so they would not reach receiving waters.

Alternative 3

During construction, Alternative 3 would disturb a total area of 77.2 ac. Construction of Alternative 3 would involve the greatest amount of disturbed area of all the Build Alternatives. Alternative 3, therefore, would involve the greatest amount of exposed soil and result in the greatest potential for soil erosion, downstream sedimentation, and opportunity for construction-related pollutants to spill, leak, and/or affect on-site drainages and downstream receiving waters compared to the other Build Alternatives.

Dewatering may be required during construction of Alternative 3. If groundwater dewatering becomes necessary during construction, Build Alternative 3 would be required to comply with a groundwater dewatering permit which requires monitoring discharges from groundwater extraction waste from construction to ensure that groundwater effluent that is pumped and ultimately discharged to surface water does not exceed surface water effluent limitations for particular pollutant; therefore, it is not anticipated that surface water would be impacted during construction activities as a result of site dewatering so long as the groundwater discharge meets the RWQCB dewatering permit requirements.

Alternative 3 would require the preparation and implementation of a SWPPP and construction BMPs detailed in the SWPPP during construction to minimize erosion and prevent spills. Based on implementation of the BMPs, pollutants of concern would be retained on the project site so they would not reach receiving waters.

Alternative 4

During construction, Alternative 4 would disturb a total area of 64.9 ac. Construction of Alternative 4 would involve disturbing a larger area than Alternative 1 and a smaller area than Alternatives 2 and 3. Therefore, Alternative 4 would result in

greater potential for soil erosion, downstream sedimentation, and opportunity for construction-related pollutants to spill, leak, and/or affect on-site drainages and downstream receiving waters than Alternative 1, but less than under Alternatives 2 and 3.

Dewatering may be required during construction of Alternative 4. If groundwater dewatering becomes necessary during construction, Build Alternative 4 would be required to comply with a groundwater dewatering permit which requires monitoring discharges from groundwater extraction waste from construction to ensure that groundwater effluent that is pumped and ultimately discharged to surface water does not exceed surface water effluent limitations for particular pollutant; therefore, it is not anticipated that surface water would be impacted during construction activities as a result of site dewatering so long as the groundwater discharge meets the RWQCB dewatering permit requirements.

Alternative 4 would require the preparation and implementation of a SWPPP and construction BMPs detailed in the SWPPP during construction to minimize erosion and prevent spills. Based on implementation of the BMPs, pollutants of concern would be retained on the project site so they would not reach receiving waters.

No Build Alternative

The No Build Alternative would not include the construction any of the proposed project improvements and therefore would not result in adverse temporary impacts to water quality and storm water runoff in the study area.

2.9.3.2 Permanent Impacts

Alternative 1

Alternative 1 includes the construction of an additional general-purpose lane, a new auxiliary lane, and lengthening some of the existing merging lanes, which would result in a permanent increase in impervious surface area of 7.3 ac. The additional impervious area would increase the volume of runoff during a storm, which would more effectively transport pollutants to receiving waters. The additional impervious surface would also increase the total amount of pollutants in storm water and non-storm water runoff and the amount of pollutants traveling to on-site drainages and downstream receiving waters. Pollutants of concern during operation of Alternative 1 include suspended solids/sediments, nutrients, pesticides, heavy metals, oil and grease, toxic organic compounds, and trash and debris. Alternative 1 results in the smallest increase in impervious surface area and therefore would be expected to

contain the lowest concentrations of suspended solids/sediments, nutrients, pesticides, heavy metals, oil and grease, toxic organic compounds, and trash and debris in storm water runoff when compared to the other Build Alternatives.

Currently, storm water runoff from State Route 55 (SR-55) within the proposed project limits is untreated. As part of Alternative 1, Design and Treatment BMPs would be implemented to target constituents of concern in storm water runoff from the new impervious surface area (7.3 ac) to the maximum extent practical. Design Pollution Prevention BMPs are measures that focus on reducing or eliminating runoff and controlling sources of pollutants during operation of the project. Treatment BMPs utilize treatment mechanism to remove pollutants that have entered storm water runoff.

Design Pollution Prevention BMPs identified as features in Alternative 1 include reconstructing dikes, constructing overside drains, installing additional drainage inlets, relocating storm drain systems to reduce velocity and sediment transport, preserving existing vegetation as much as possible, revegetating new slopes, and constructing ditches and berms.

Treatment BMPs identified as features in Alternative 1 include biofiltration strips and swales and, potentially, an infiltration basin. Biofiltration strips are vegetated sections of land over which storm water flows as sheet flow. Biofiltration swales are vegetated channels that convey storm water. Both biofiltration strips and swales remove pollutants by filtration through grass, sedimentation, adsorption to soil particles, and infiltration through soil. Biofiltration strips and swales are effective at removing debris and solid particles, and some removal of dissolved constituents. An infiltration basin is a shallow artificial pond designed to infiltrate storm water though permeable soils into the groundwater aquifer and remove pollutants as the storm water percolates through the soil. Biofiltration strips and swales are proposed in multiple locations throughout the project limits. The infiltration basin, if included as part of Alternative 1, would potentially be developed on a vacant parcel adjacent to the southbound SR-55 off-ramp to westbound Dyer Road.

The Design and Treatment BMPs would target the constituents of concern from transportation facilities described earlier. Because Treatment BMPs would treat pollutants of concern from runoff from the project-related impervious surface (7.3 ac), Alternative 1 would not impact the Newport Bay Watershed or cause or contribute to a violation of water quality standards or objectives for surface or

downstream receiving waters in the study area. In addition, because the proposed BMPs would remove pollutants of concern from storm water runoff associated with Alternative 1, Alternative 1 would not contain pollutants in quantities that would create a condition of nuisance or adversely affect beneficial uses of waters of the State.

Alternative 2

Alternative 2 includes the construction of new general-purpose lanes, new auxiliary lanes, and lengthening some of the existing merging lanes, which would result in a permanent increase in impervious surface area of 11.3 ac. The pollutants of concern during operation of Alternative 2 would be the same as those discussed under Alternative 1. Alternative 2 results in the second smallest increase in impervious surface area and therefore would be expected to contain the second lowest concentration of pollutants of concern in storm water runoff of all the Build Alternatives.

Alternative 2 would include the Design and Treatment BMPs to target constituents of concern in storm water runoff to the maximum extent practical similar to those described under Alternative 1. Because the Design and Treatment BMPs for Alternatives 1 and 2 would be similar, Alternative 2 would also not impact the Newport Bay Watershed or cause or contribute to a violation of water quality standards or objectives for surface or downstream receiving waters within the proposed project area. Furthermore, as with Alternative 1, Alternative 2 would not contain pollutants in storm water runoff in quantities that would create a condition of nuisance or adversely affect beneficial uses of waters of the State.

Alternative 3

Alternative 3 includes the construction of new general-purpose lanes, new auxiliary lanes, and lengthening some of the existing merging lanes, which would result in a permanent increase in impervious surface area of 15.4 ac. The pollutants of concern during operation of Alternative 3 would be the same as those discussed under Alternatives 1 and 2. Alternative 3 would result in the largest increase in impervious surface area of all the Build Alternatives and therefore would be expected to contain the highest concentration of pollutants of concern in storm water runoff of all the Build Alternatives.

Alternative 3 would include the Design and Treatment BMPs to target constituents of concern in storm water runoff to the maximum extent practical similar to those

described under Alternatives 1 and 2. Because the Design and Treatment BMPs for Alternative 3 would be similar to those in Alternatives 1 and 2, Alternative 3 would also not impact the Newport Bay Watershed or cause or contribute to a violation of water quality standards or objectives for surface or downstream receiving waters within the proposed project area. Furthermore, Alternative 3 would not contain pollutants in storm water runoff in quantities that would create a condition of nuisance or adversely affect beneficial uses of waters of the State.

Alternative 4

Alternative 4 includes the construction of new HOV lanes, a new general-purpose lane, and new auxiliary lanes, which would result in a permanent increase in impervious surface area of 15.0 ac. The pollutants of concern during operation of Alternative 4 would be the same as those discussed under the other Build Alternatives. Alternative 4 would result in the second largest increase in impervious surface area of all the Build Alternatives and therefore would be expected to contain the second highest concentration of pollutants of concern in storm water runoff of all the Build Alternatives.

Alternative 4 would include the Design and Treatment BMPs to target constituents of concern in storm water runoff to the maximum extent practical similar to those described for the other Build Alternatives. Because the Design and Treatment BMPs for Alternative 4 would be similar to those in the other Build Alternatives, Alternative 4 would also not impact the Newport Bay Watershed or cause or contribute to a violation of water quality standards or objectives for surface or downstream receiving waters within the proposed project area. Alternative 4 would not contain pollutants in storm water runoff in quantities that would create a condition of nuisance or adversely affect beneficial uses of waters of the State.

No Build Alternative

The No Build Alternative would not include the operation of any of the proposed project improvements and therefore would not result in adverse permanent impacts to water quality and storm water runoff in the study area.

2.9.4 Avoidance, Minimization, and/or Mitigation Measures

The measures below are required to reduce potential project impacts to water quality and storm water runoff from construction and operation of Alternatives 1 through 4.

WQ-1 The Project will comply with the provisions of the National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm

Water Permit, Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation Order No. 2012-0011-DWQ, NPDES No. CAS000003 (Caltrans Permit) or any subsequent permit.

WQ-2 Construction activities will comply with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-009-DWQ, as amended by 2010-0014-DWQ; NPDES No. CAS000002, or any subsequent permit. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared to address all construction-related activities, equipment, and materials that have the potential to impact water quality for the appropriate Risk Level. The SWPPP will identify the sources of pollutants that may affect the quality of storm water and include Best Management Practices (BMPs) to control the pollutants, such as sediment control, catch basin inlet protection, construction materials management and non-storm water BMPs. All work will conform to the Construction Site BMP requirements specified in the latest edition of the *Storm Water Quality Handbooks: Construction Site Best Management Practices Manual* to control and minimize the impacts of construction and construction related activities, material and pollutants on the watershed. These include, but are not limited to temporary sediment control, temporary soil stabilization, scheduling, waste management, materials handling, and other non-storm water BMPs.

WQ-3 Caltrans-approved Design Pollution Prevention BMPs will be implemented to the Maximum Extent Practicable (MEP) consistent with the requirements of the Caltrans Permit and Project Planning and Design Guide. Design Pollution Prevention BMPs include preservation of existing vegetation, slope/surface protection systems (permanent soil stabilization and replanting of vegetation) dikes, overside drains, drainage inlets, and concentrated flow conveyance systems such as ditches, berms, and biofiltration strips and swales.

WQ-4 Caltrans-approved Treatment BMPs will be implemented to the MEP consistent with the requirements of the Caltrans Permit and Project Planning and Design Guide. Treatment BMPs may include biofiltration strips, biofiltration swales, and an infiltration basin.

WQ-5 If dewatering is required during construction, construction site dewatering will comply with one of two orders, or any subsequent orders, that apply to groundwater discharges to surface waters within the Santa Ana Region depending on the nature of the groundwater. Order No. R8-2009-0003 (NPDES No. CAG998001) covers general waste discharge requirements for discharges to surface waters that pose an insignificant (de minimus) threat to water quality within the Santa Ana Region. This Order would be applicable to the project if it can be demonstrated that the groundwater being discharged to surface waters does not contain pollutants of concern (selenium and nitrates) in the discharge. However, if groundwater in the project area is found to contain petroleum hydrocarbons, solvents, metals and/or salts, the project would be subject to Order No. R8-2009-0045 (NPDES No. CAG918002). Order No. R8-2009-0045 (NPDES No. CAG918002) covers general discharge permits for discharges to surface waters of groundwater resulting from groundwater dewatering operations and/or groundwater cleanup activities at sites within the San Diego Creek/ Newport Bay Watershed polluted by petroleum hydrocarbons, solvents, metals and/or salts, or nutrients, selenium and other pollutants of total maximum daily loads concern. Under both orders, permittees are required to monitor their discharges from groundwater extraction waste from construction to ensure that effluent limitations for constituents are not exceeded.

2.10 Geology/Soils/Seismic/Topography

2.10.1 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. Caltrans' Office of Earthquake Engineering is responsible for assessing the seismic hazard for Caltrans projects. Structures are designed using Caltrans Seismic Design Criteria (SDC). The SDC provides the minimum seismic requirements for highway bridges designed in California. A bridge's category and classification will determine its seismic performance level and which methods are used for estimating the seismic demands and structural capabilities. For more information, please see Caltrans Division of Engineering Services, Office of Earthquake Engineering, Seismic Design Criteria.

2.10.2 Affected Environment

This section discusses the existing geologic and soils conditions along the project segment of State Route 55 (SR-55) and provides analysis of the potential impacts of the proposed project that are related to geology and soils. This section also addresses the potential for structural damage to project facilities due to the local geology underlying the project site, as well as slope stability, ground settlement, soils, grading, and seismic conditions. This section summarizes information provided in the following reports:

- *Project Memorandum Preliminary Geotechnical Information*, Proposed Improvements to State Route 55 between Interstate 405 and Interstate 5 (2011)
- *Project Study Report (Project Development Support)* for the SR-55 project (2008)
- *Preliminary Foundation Report for Proposed Widening of Edinger Avenue Undercrossing (Bridge No. 55-393), State Route 55, Orange County, California* (2012)
- *Preliminary Foundation Report for Proposed Widening of South Tustin Overhead (Bridge No. 55-0026), State Route 55, Orange County, California* (2012)

- *Preliminary Foundation Report for Proposed Widening of State Route 55 at the Warner Avenue Overcrossing (Bridge No. 55-394), State Route 55, Orange County, California* (2012)
- *Preliminary Foundation Report for Proposed Widening of Dyer Road Uncrossing (Bridge No. 55-0409), State Route 55, Orange County, California* (2012)
- *Preliminary Foundation Report for Proposed Widening of MacArthur Boulevard Undercrossing (Bridge No. 55-410), State Route 55, Orange County, California* (2012)

2.10.2.1 National Natural Landmarks and Other Geographic and Topographic Features

National Natural Landmarks (NNLs) designated by the United States Department of the Interior are areas that contain important resources such as natural habitats and unusual geological formations. There are no NNLs or unique or unusual geologic features within or in the vicinity of the disturbance limits for the Build Alternatives. The nearest NNL to the project segment of SR-55 is the approximately 20,000-acre (ac) Irvine Ranch NNL, which is generally bounded by State Route 91 (SR-91) on the north, the Orange County/Riverside County boundary on the east, the City of Irvine to the south, and the Cities of Tustin, Orange, and Anaheim to the west. At its closest point, the project segment of SR-55 is approximately 5 miles (mi) west of the nearest part of the Irvine Ranch NNL.

SR-55 traverses a developed area with no unique or unusual geologic features within or adjacent to the project segment of SR-55.

2.10.2.2 Local Geology, Topography, and Soils

There are 11 geomorphic provinces in California, as defined by the California Geological Survey (CGS). Geomorphic provinces are geologic regions with distinct landforms and geology. The project segment of SR-55 is in the northern Peninsular Ranges geomorphic province of southern California. The project segment of SR-55 is east of the lower reaches of the Santa Ana River. Flooding of the Santa Ana River likely led to the deposition of alluvial materials in the Tustin Basin.

The project segment of SR-55 is on the relatively flat Tustin Plain, which was formed by the Santa Ana River, San Diego Creek, Peters Canyon Wash, and their tributaries. The site topography is a relatively level alluvial plain with natural ground elevations rising gradually at about a 0.5 percent gradient from 35 feet (ft) above mean sea level (amsl) at MacArthur Boulevard to approximately 125 ft amsl at Interstate 5 (I-5).

The Tustin Plain consists of flat-lying basin sediments and Holocene or modern fluvial deposits. The younger fan deposits, which include floodplain deposits, generally consist of unconsolidated sand, sandy silt, silt, and clays. In the Tustin Plain, these deposits consist of approximately 1,400 ft of unconsolidated to semi-consolidated Quaternary-age alluvial sediments. The upper 30 to 40 ft of native soils in this area are typically loose to medium dense granular soils, interbedded with soft to stiff cohesive soils. Soils in the area are generally interbedded alluvial sands, silts, clays, and gravels that increase in density and stiffness with depth. Underlying the Quaternary alluvial deposits are Tertiary-age bedrock units that are approximately 31,000 ft thick and consist of sandstone, siltstone, shale, and conglomerate.

Soils along the project segment of SR-55 are classified by the Natural Resources Conservation Service (NRCS) as follows:

- **Group B:** There are Group B soils along the project segment of SR-55 north of Edinger Avenue. Group B soils are generally characterized as having moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained sandy-loam soils with moderately fine to moderately coarse textures.
- **Group C:** There are Group C soils along the project segment of SR-55 between Edinger Avenue and MacArthur Boulevard, and on the east side of SR-55 from Interstate 405 (I-405) to MacArthur Boulevard. These soils are generally characterized as having slow infiltration rates when thoroughly wetted and consist chiefly of silty-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures.
- **Group D:** There are Group D soils along the project segment of SR-55 south of MacArthur Boulevard and west of SR-55 to I-405. Group D soils have very slow infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

There are no active, potentially active, or inactive volcanoes in Orange County.

2.10.2.3 Faulting and Seismicity

The entire southern California region is seismically active due to the influence of several earthquake fault systems resulting from interaction between the Pacific and North American crustal plates. An active fault is defined by the State of California as a "…sufficiently active and well defined fault that has exhibited surface displacement

within the last 11,000 years." A potentially active fault is defined by the State as a "…fault with a history of movement between 11,000 and 1.6 mya [million years ago]."

The project segment of SR-55 is not located in an Alquist-Priolo Earthquake Fault Zone and there are no known active or potentially active faults that are mapped as crossing or in the immediate vicinity of SR-55. The principal seismic hazard in this area is ground shaking resulting from an earthquake occurring along one of several major active or potentially active faults in southern California that could damage the SR-55 facilities and structures. Those faults include the San Joaquin Hills blind thrust fault (approximately 1.4 mi from the nearest part of the project segment of SR-55), the Compton-Los Alamitos blind thrust fault (approximately 6 mi away), and the Newport Inglewood-Rose Canyon fault zone (approximately 3.7 mi away). The blind thrust faults do not have surface traces and the indicated distance is the closest distance to the fault rupture in the subsurface.

2.10.2.4 Landslides

Landslides are rock, earth, or debris flows on slopes due to gravity that are a major geologic hazard because they are widespread and can cause substantial damage to life and property. Although landslides commonly occur in connection with other major natural disasters such as earthquakes, volcanoes, wildfires, and floods, they can occur on any terrain given the right soil, moisture, and angle/slope conditions. Steep bare slopes, clay-rich rock, deposits of stream or river sediment, and heavy rains can contribute to landslides.

There are no seismically induced, mapped landslides or other landslides and mudflows within or in the vicinity of the project segment of SR-55. There are some areas of artificial fill within the freeway right-of-way that could be subject to slumping or failure, but these would not be considered landslides. The artificial fills in the SR-55 right-of-way were constructed to the appropriate standards for fill used in highway construction, and slumping or failure of those areas is not expected to occur.

2.10.2.5 Liquefaction, Lateral Spreading, and Seismic Settlement

Soil liquefaction occurs when saturated, loose soils lose strength due to excess water buildup in the soils during an earthquake. The spaces between the soil particles are completely filled with water. As the shaking action of an earthquake progresses, the soil grains are rearranged and the soil densifies within a short period of time. The

water in the spaces between the soil particles is trapped and does not have adequate time to dissipate. As the water pressure builds up rapidly, the strength of the soils is greatly reduced. When liquefaction occurs, the strength of the soil and the ability of the soil to support building and bridge foundations are reduced. The potential impacts of liquefaction may include settlement of the ground surface, additional forces pushing on retaining walls or pushing down on foundation piles as a result of soil settlement above the liquefied layers, reduction of the shear strength of the liquefied soil, reduced load-carrying capacity, sand boils, and lateral spreading.

The primary factors affecting the possibility of liquefaction are the intensity and duration of the earthquake shaking, the soil type, the relative density of that soil, the pressures of material above that soil, and the depth to groundwater. The soils most susceptible to liquefaction are clean, loose, uniformly graded, fine-grained sands, nonplastic silts that are saturated, and silty sands.

Seismically induced settlement consists of dry dynamic settlement (above the level of the groundwater) and liquefaction-induced settlement (below the groundwater level). Settlement occurs primarily in loose to moderately dense sandy soil as a result of the loss of volume during and shortly after an earthquake.

Soils along the entire project segment of SR-55 are poorly consolidated Quaternary alluvial sediments and groundwater levels are relatively shallow at 5 to 13 ft below ground surface (bgs) at Warner Avenue. Groundwater was encountered at approximately 24 to 26 ft bgs at MacArthur Boulevard during previous exploration in the area. The area along SR-55 from approximately MacArthur Boulevard to McFadden Avenue is a mapped liquefaction zone.

2.10.2.6 Water Resources

Surface and groundwater are discussed briefly in this section as they relate to potential geological and geotechnical conditions such as liquefaction. Detailed discussions of surface water and groundwater are provided in Sections 2.8, Hydrology and Floodplains, and Section 2.9, Water Quality and Storm Water Runoff.

Surface Waters

There are no streams or rivers crossing or in the immediate vicinity of the project segment of SR-55. There are no large inland bodies of water in the vicinity of SR-55. Peters Canyon Wash is approximately 2 mi east of the project segment of SR-55 in the City of Irvine. The Santa Ana River is approximately 4.5 mi west of the closest part of SR-55, at the SR-55/I-405 Interchange.

Two flood control channels parallel and cross the project segment of SR-55: Lane Channel (Orange County Flood Control District [OCFCD] Facility F08) and Santa Ana-Santa Fe Channel (OCFCD Facility F10). Those facilities are described in more detail in Section 2.8.

There are no large bodies of water upstream of the project segment of SR-55 that could result in inundation of the area. The nearest large upstream body of water is in the Prado Basin, which is held behind Prado Dam approximately 15 mi north of the SR-55/I-5 Interchange.

Seiches are large waves generated in enclosed bodies of waters like lakes in response to ground shaking. Tsunamis are waves generated in large bodies of water as a result of fault displacement or major ground movement. There are no enclosed bodies of water near the project site. The Pacific Ocean is approximately 3 mi south of the southern end of the project segment of SR-55. As a result, the existing potential risks to SR-55 related to seiches, tsunamis, and seismically induced inundation are considered negligible.

Groundwater

As noted earlier, groundwater levels along the project segment of SR-55 are as shallow as approximately 5 to 13 ft bgs as encountered during previous exploration in the area. In the winter season or after periods of locally intense rain or storm water runoff, fluctuations in the groundwater level, localized zones of perched water and/or an increase in soil moisture may occur.

2.10.2.7 Contaminated Soils

As described in detail in Section 2.12, Hazardous Waste/Materials, aerially deposited lead (ADL) is generally encountered in unpaved areas (or formerly unpaved areas) adjacent to older roads, primarily as a result of deposition from historical vehicle emissions. Because the alignment of SR-55 has been used since approximately 1927, the adjacent unpaved surficial soils may contain ADL. In addition, based on the historical agricultural uses in the study area, persistent pesticides may remain in soils in the study area including along SR-55. Other potential areas of soil contamination associated with individual land uses adjacent to SR-55 are discussed in Section 2.12.

2.10.3 Environmental Consequences

2.10.3.1 Temporary Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

The potential temporary impacts of the four Build Alternatives related to geotechnical issues and resources would be very similar along the project segment of SR-55 and would differ only as a result of improvements being provided in slightly different areas under each Build Alternative. Those impacts are discussed generally in this section and are summarized by alternative in the following sections.

Construction for all four Build Alternatives may temporarily disturb soil outside the project footprint but within the freeway rights-of-way, primarily in the trample zone around work areas, heavy equipment traffic areas, and material laydown areas. Construction activities in temporary construction easements (TCEs) outside the freeway right-of-way would temporarily disturb soils in those areas. Excavated soil in the construction areas would be exposed and, as a result, there would be an increased potential for soil erosion during construction compared to existing conditions. During a storm event, soil erosion could occur at an accelerated rate. The anticipated total area disturbed during construction is shown in Table 2.10.1 for each of the Build Alternatives.

Table 2.10.1 Total Disturbed Areas During Construction

Alternative	Total Disturbed Area (acres)
Alternative 1	38.9
Alternative 2	70.3
Alternative 3	77.2
Alternative 4	64.9

Source: *Water Quality Assessment Report* (2014).

During all construction activities for the four Build Alternatives, the construction contractor will be required to adhere to the requirements of the General Construction Permit and to implement erosion and sediment control best management practices (BMPs) specifically identified in the project Storm Water Pollution Prevention Plan (SWPPP) to keep sediment from moving off site into receiving waters and impacting water quality in those waters. Refer to Section 2.9 for additional information regarding construction-related water quality impacts and mitigation.

Worker safety hazards resulting from erosion during construction of the four Build Alternatives would be minimized based on implementation of the requirements in the General Construction Permit and erosion and sediment control BMPs in the SWPPP.

Construction activities for the Build Alternatives could be affected by ground motion from seismic activities, possible ground rupture, liquefaction, landslides, and slumping or failures of areas of artificial, engineered fill if an earthquake were to occur during construction. Implementation of safe construction practices and compliance with Caltrans and the California Division of Occupational Safety and Health (Cal-OSHA) requirements would minimize the impacts to worker safety during construction activities.

Disturbance of unpaved areas adjacent to the SR-55 mainline and ramps and the arterial streets crossing SR-55 could disturb ADL and pesticides in the soils. Refer to Section 2.12 for discussion of the potential effects associated with disturbance of soils containing ADL and pesticides during construction of the Build Alternatives and the measures addressing those effects.

There are no NNLs or unique or unusual geologic features within or in the vicinity of the disturbance limits for the four Build Alternatives. As a result, the construction of the four Build Alternatives would not impact NNLs or unique or unusual geologic features.

There are no active, potentially active, or inactive volcanoes in Orange County. Therefore, no impacts related to volcanoes would occur during construction of the four Build Alternatives.

Due to the distance of the Prado Basin and Santa Ana River from the project segment of SR-55, it is unlikely that a failure of Prado Dam would result in inundation impacts on the project segment of SR-55 during construction of the four Build Alternatives. There are no bodies of water in the project vicinity that could result in seiches or tsunami. As a result, no effects related to inundation, seiches, or tsunami would occur during construction of the Build Alternatives.

Alternative 1

As shown earlier on Figure 1-7, Alternative 1 would result in construction on SR-55 between approximately McFadden Avenue and MacArthur Boulevard. The temporary impacts described above related to erosion, water quality, worker safety, seismically

induced impacts, and soils containing ADL and pesticides would potentially occur during construction of Alternative 1 on that part of SR-55.

Alternatives 2, 3, and 4

As shown earlier on Figures 1-8, 1-9, and 1-10, respectively, Alternatives 2, 3, and 4 would each result in construction on SR-55 between approximately McFadden Avenue and I-405. The temporary impacts described above related to erosion, water quality, worker safety, seismically induced impacts, and soils containing ADL and pesticides would potentially occur during construction of Alternatives 2, 3, and 4 on that part of SR-55.

No Build Alternative

Under the No Build Alternative, the temporary construction-related impacts discussed above for the Build Alternatives would not occur because there would be no construction of project improvements on SR-55 under this alternative.

2.10.3.2 Permanent Impacts

Build Alternatives

The potential permanent impacts of the four Build Alternatives related to geotechnical issues and resources along the project segment of SR-55 would be similar and would differ only as a result of the improvements being provided in slightly different areas under each Build Alternative. Those impacts are discussed generally in this section and are summarized by alternative in the following sections.

National Natural Landmarks and Other Geographic and Topographic Features

There are no NNLs or unique or unusual geologic features within or in the vicinity of the disturbance limits for the Build Alternatives. As a result, the Build Alternatives would not result in permanent impacts to NNLs or unique or unusual geologic features.

Local Geology, Topography, and Soils

The four Build Alternatives would not result in permanent substantive changes in the area topography because the improvements would generally be constructed at or close to the same grade as the existing facility.

Some soils in the project limits may be compressible and/or expansive. Removal and treatment of those types of soils recommended in the *Final Geotechnical Design*

Report (required in Measure GEO-1, which is provided later in this section) would substantially reduce this effect to below a level of significance.

The soil and rock material excavated (cut) during construction of the four Build Alternatives is expected to be used as fill elsewhere in the project limits during construction. The amounts of excavated material anticipated to be used as fill in the project construction were summarized by Build Alternative in Table 1.10. In addition to these amounts, soil material would be imported to the project site in areas needing additional fill material. The amounts of imported fill material anticipated to be used during the construction of the Build Alternatives were also summarized in Table 1.10. Any soil imported to the project site for use as fill will be certified as clean prior to its use on the project site.

Because there are no active, potentially active, or inactive volcanoes in Orange County, the improvements to SR-55 provided in the four Build Alternatives would not impact or be impacted by volcanoes.

Faulting and Seismicity

Moderate to severe seismic shaking is likely to occur in the project area during the life of the improvements provided by the Build Alternatives. As a result, the improvements provided by the Build Alternatives would be subject to effects associated with seismic shaking that could damage bridge and ramp structures or the road surfaces. Because the project segment of SR-55 is not crossed by a known fault or is not in an Alquist-Priolo Earthquake Fault Zone, the project improvements are not expected to be exposed to effects associated with fault displacement and ground rupture. Design and construction of the project improvements consistent with the Caltrans *Highway Design Manual* (HDM) and other required standards, and recommendations from the *Final Geotechnical Design Report*, as required in Measure GEO-1 provided later in this section, would substantially reduce the potential for seismic damage to the project facilities.

Landslides

Because there are no mapped landslides within or in the vicinity of the project segment of SR-55, the design and operation of the project improvements provided by the four Build Alternatives would not be affected by known landslides.

Artificial fill used in the construction of the project improvements for the Build Alternatives would be constructed to the appropriate standards for fill used in

highway facilities, which would reduce the potential for slumping or failure of those areas.

Liquefaction, Lateral Spreading, and Seismic Compaction

As described earlier, the area along SR-55 from approximately MacArthur Boulevard to McFadden Avenue is a mapped liquefaction zone. Key issues of concern in this area are ground settlement, down drag loads on piles, reduced pile lateral capacity, and lateral spreading of embankments that could damage bridge and ramp structures and the road surfaces. As a result, project improvements on this segment of SR-55 would be potentially subject to effects related to liquefaction, lateral spreading, and seismic settlement. Design and construction of the project improvements in the four Build Alternatives consistent with the Caltrans HDM and other required standards and recommendations from the *Final Geotechnical Design Report* (such as the use of piles, and removal and recompaction of low-density, near-surface soils) would substantially reduce the potential effects of liquefaction, lateral spreading, and seismic settlement on the structures and facilities provided in the four Build Alternatives.

Water Resources

Potential long-term impacts under the Build Alternatives that are related to erosion and may affect the traveling public or the project facilities can be substantially reduced based on the implementation of landscaping and other BMPs. Refer to Section 2.9 for additional discussion regarding operations-related water quality issues and mitigation, including BMPs.

Due to the distances of the Prado Basin and Santa Ana River from the project segment of SR-55, it is unlikely that a failure of the Prado Dam would result in inundation impacts on the improvements provided in the four Build Alternatives. There are no bodies of water in the project vicinity that could result in seiches or tsunami. As a result, the improvements provided in the Build Alternatives would not be impacted by inundation, seiches, or tsunami.

As discussed earlier, groundwater along the project segment of SR-55 is relatively shallow and may fluctuate after periods of intense rainfall or due to other factors. The widened bridge structures in the Build Alternatives would be supported on piles embedded below the groundwater table. As groundwater causes buoyancy that reduces the effective weight of soils, fluctuation of the groundwater table will affect the axial and lateral capacities of the piles. The pile foundations will be designed

consistent with the Caltrans Bridge Design Specifications and the *Final Foundation Reports*, which will reduce the impact of groundwater and groundwater fluctuation on the bridge foundation piles.

Contaminated Soils

Lead is no longer used in gasoline, so there is no potential for continued deposition of ADL in soils adjacent to the project segment of SR-55. There are no existing agricultural uses immediately adjacent to the project segment of SR-55; therefore, deposition of pesticides in soils adjacent to SR-55 is not expected to occur during operation of the four Build Alternatives. As a result, the operation of the four Build Alternatives would not result in impacts related to ADL or pesticides.

Alternative 1

As shown earlier on Figure 1-7, Alternative 1 would result in construction on SR-55 between approximately McFadden Avenue and MacArthur Boulevard. The permanent impacts described above related to faulting and seismicity, artificial engineered fill, and seismically induced impacts would potentially occur on that segment of SR-55 under Alternative 1 and could adversely affect the project structures and road surface. Those effects would be addressed through compliance with design and construction standards in the Caltrans HDM and other required standards, and implementation of recommendations from the *Final Geotechnical Design Report*.

Alternatives 2, 3, and 4

As shown earlier on Figures 1-8, 1-9, and 1-10, respectively, Alternatives 2, 3, and 4 would result in construction on SR-55 between approximately McFadden Avenue and I-405. The permanent impacts described above related to faulting and seismicity, artificial engineered fill, and seismically induced impacts would potentially occur on that segment of SR-55 under those three Build Alternatives and could adversely affect the project structures and road surface. Those effects of Alternatives 2, 3, and 4 would be addressed through compliance with design and construction standards in the Caltrans HDM and other required standards, and implementation of recommendations from the *Final Geotechnical Design Report*.

No Build Alternative

Under the No Build Alternative, the permanent impacts discussed above for the Build Alternatives would not occur because none of the permanent improvements on SR-55

provided in the Build Alternatives would be implemented and operated under this alternative.

2.10.4 Avoidance, Minimization, and/or Mitigation Measures

The following measures avoid and/or minimize the potential geological and seismic effects of the Build Alternatives.

GEO-1 During final design, a *Final Geotechnical Design Report* will be prepared as required by Topic 113 in the California Department of Transportation (Caltrans) *Highway Design Manual* (HDM) (May 2012 or more recent version). A *Foundation Report* will also be prepared for each bridge structure along the segment of State Route 55 (SR-55) that will be widened as part of the Build Alternatives. These reports will document soil-related constraints and hazards such as slope instability, settlement, liquefaction, or related secondary seismic impacts that may be present along the project segment of SR-55. The performance standard for these reports will be the Caltrans *Geotechnical Manual* (2012 or most recent version) standards as they apply to the project features and structures. These reports will include but not be limited to:

- Evaluation of expansive soils and recommendations regarding construction procedures and/or design criteria to minimize the effects of these soils on the construction of the project and to minimize effects related to expansive soils on project facilities in the long term.
- Confirmation of potential liquefiable areas within the project limits and recommendations for mitigation.
- Evaluation of the corrosion potential of soils along segments of the project alignment not previously tested.
- Demonstration that the design of all retaining walls is geotechnically suitable for project area soils.
- Demonstration that side slopes can be designed and graded so that surface erosion of the engineered fill is not increased compared to existing conditions.

The measures recommended in the *Final Geotechnical Design Report* and *Foundation Reports* will be incorporated in the final design and project specifications.

During construction, the construction contractor will implement the measures recommended in the *Final Geotechnical Design Report* and *Foundation Reports* as included in the project specifications.

GEO-2 A quality assurance/quality control (QA/QC) plan will be maintained during construction. The QA/QC plan shall include observing, monitoring, and testing by the Project Geotechnical Engineer and/or Project Geologist prior to and during construction to confirm that the geotechnical/geologic recommendations from the *Final Geotechnical Design Report*, *Foundation Reports*, and standard design and construction practices are fulfilled by the construction contractor, or if different site conditions are encountered, appropriate changes are made to accommodate such issues. The Geotechnical Engineer shall submit weekly reports during all project-related grading, excavation, and construction activities.

GEO-3 The construction contractor will be required to certify that any fill material imported to the project site is clean prior to the use of that material in project construction.

Refer also to Section 2.9 for additional measures related to soil erosion, including BMPs.

Refer also to Section 2.12 for additional measures related to hazardous materials and wastes.

Because the construction and operation of the Build Alternatives would not result in any impacts related to NNLs, other geographic or topographic features, landslides, volcanoes, or inundation by flood waters, tsunami, or seiches, no mitigation for those environmental parameters is required.

2.11 Paleontology

2.11.1 Regulatory Setting

Paleontology is a natural science focused on the study of ancient animal and plant life as it is preserved in the geologic record as fossils. Under California law, paleontological resources are protected by the California Environmental Quality Act (CEQA).

2.11.2 Affected Environment

This section is based on the *Paleontological Resources Identification Report* (2014).

The area studied for this project is the Area of Project Disturbance (APD) for all areas of the project where excavation is proposed. The paleontological locality search included an area extending over 1 mile (mi) from the APD to assist with determining the paleontological sensitivities of geologic sediments that are present within the project study area. The APD is based on the horizontal and vertical extent of anticipated ground-disturbing activities.

A paleontological resource locality search was completed through the Natural History Museum of Los Angeles County (LACM) in November 2011, and a literature review was conducted through museums and data maintained at LSA Associates, Inc. A vehicular survey of most of the project area was conducted on June 5 and 6, 2012, and a pedestrian survey of the undeveloped parcels was conducted on July 18, 2012.

The project area is within the Peninsular Range Geomorphic Province of Southern California. It is in the Los Angeles Basin, which is bounded on the north and northeast by hills and mountains of the Northern Peninsular and Transverse Ranges and on the south and west by the Pacific Ocean. The Los Angeles Basin is a broad, almost level, alluvial plain.

Geologic mapping indicates there are two geologic units mapped as being exposed at the surface in the project area: Young Alluvial Fan Deposits and Young Axial-Channel Deposits. Although not mapped, artificial fill occurs in many areas within the project limits and was observed during the vehicular survey. These three types of sediment, which are present within the surface of the area of project disturbance, do not have the potential to contain paleontological resources within the upper 10 feet (ft) below the ground surface because of their young age (less than 10,000 years) and/or disturbed context. Older Quaternary Alluvial Deposits, which have a good

chance of containing significant vertebrate fossils, are likely present in the area at depths greater than 10 ft below the original ground surface.

The findings of the locality search conducted at the LACM indicated that the surface of the project area is located entirely on younger Quaternary Alluvium that is derived from alluvial fan deposits located to the north. The LACM search results state that because of their young age, these sediments usually do not contain fossil remains in the upper layers of sediment, but can overlie older sediment that can contain fossils. The LACM search results further indicate that the closest fossil locality in the Museum's records that contains sediment similar to that which likely exists in the subsurface of the project is for a road cut along State Route 55 (SR-55), approximately 1.6 mi to the southwest, where a turtle (*Testudinata*) and camel (*Camelidae*) were found at a depth of 30 ft below the original ground surface. The next closest locality is 2.9 mi to the west-southwest that contained the remains of a mammoth (*Mammuthus* sp.) and a camel at a depth of 15 ft below the original ground surface.

The vehicular survey indicated that most of the project area is underlain by artificial fill. Other sediments observed are consistent with the Quaternary Alluvium that has been previously mapped in the project area. The pedestrian survey indicated there were very few areas that could potentially contain intact, native sediments; however, these sediments are consistent with the younger Quaternary Alluvium sediments that are unlikely to contain paleontological resources.

2.11.3 Environmental Consequences

2.11.3.1 Temporary Impacts

Build Alternatives

Alternatives 1, 2, 3, and 4 would require similar ground disturbance, excavation, and modifications to existing freeway and local street facilities and structures. If construction requires excavation greater than 10 ft below the original ground surface, those activities could result in impacts to paleontological resources. Those impacts to paleontological resources would be permanent impacts as described later in Section 2.11.3.2, Permanent Impacts.

The construction of Alternatives 1, 2, 3, and 4 would not result in temporary impacts to paleontological resources because the impacts to those types of resources during construction would be considered permanent.

No Build Alternative

Under the No Build Alternative, none of the proposed improvements to SR-55 would be constructed. The No Build Alternative would maintain the existing conditions; therefore, the No Build Alternative would not result in temporary adverse impacts related to paleontological resources as a result of construction activities.

2.11.3.2 Permanent Impacts

Build Alternatives

Alternatives 1, 2, 3, and 4 would require similar ground disturbance, excavation, and modifications to existing freeway and local street facilities and structures. Therefore, the Build Alternatives would result in similar potential effects to paleontological resources. Specifically, if construction requires excavation greater than 10 ft below the original ground surface, those activities could result in impacts to paleontological resources.

Excavation during the construction of Alternatives 1, 2, 3, and 4 is not expected to extend deeper than 10 ft below the original ground surface and, as a result, it is unlikely that older sensitive sediments that might contain paleontological resources will be encountered during construction of the Build Alternatives.

However, older alluvial deposits from the Pleistocene may be encountered if project excavation extends deeper than 10 ft beneath the original ground surface. If deeper excavation is needed during construction of Alternatives 1, 2, 3, and 4, that excavation could result in permanent effects to paleontological resources.

The construction plans for Alternatives 1, 2, 3, and 4 are not expected to be modified to require construction deeper than 10 ft below the original ground surface. As a result, it is unlikely that paleontological resources would be permanently impacted during the excavation for the Build Alternatives.

No Build Alternative

Under the No Build Alternative, none of the proposed improvements to SR-55 would be constructed. The No Build Alternative would maintain the existing conditions; therefore, the No Build Alternative would not result in permanent adverse impacts to paleontological resources as a result of construction activities.

2.11.4 Avoidance, Minimization, and/or Mitigation Measures

The following measures provide procedures for the treatment of paleontological resources during construction:

PAL-1 In the unlikely event that paleontological resources are discovered during ground-disturbing activities including excavation, the construction contractor will redirect work in the immediate area of the discovery until the find can be evaluated by a qualified paleontologist, and if necessary, collected from the field. If the find is determined to be significant and there is a potential to encounter sediments similar to those from which the fossil was recovered, the paleontologist will prepare a Paleontological Mitigation Plan (PMP) to guide paleontological mitigation for the remainder of the project. The PMP will follow the guidelines in the Caltrans Standard Environmental Reference (SER), Environmental Handbook, Volume 1, Chapter 8 – Paleontology (February 2012 or more current).

PAL-2 If construction project plans are modified to include excavation deeper than 10 feet below the original ground surface, a qualified paleontologist will be contacted to prepare a Paleontological Evaluation Report (PER). If the PER determines that a PMP is required, the PMP will be prepared following the guidelines in Caltrans SER, Environmental Handbook, Volume 1, Chapter 8 – Paleontology (February 2012 or more current).

2.12 Hazardous Waste/Materials

2.12.1 Regulatory Setting

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

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

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

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

California regulates hazardous materials, waste, and substances under the authority of the CA Health and Safety Code and is also authorized by the federal government to implement RCRA in the state. California law also addresses specific handling, storage, transportation, disposal, treatment, reduction, cleanup and emergency planning of hazardous waste. The Porter-Cologne Water Quality Control Act also restricts disposal of wastes and requires cleanup of wastes that are below hazardous waste concentrations but could impact ground and surface water quality. California regulations that address waste management and prevention and cleanup

contamination include Title 22 Division 4.5 Environmental Health Standards for the Management of Hazardous Waste, Title 23 Waters, and Title 27 Environmental Protection.

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

2.12.2 Affected Environment

This section is based on the *Initial Site Assessment* (ISA) (2013) and the *Aerially Deposited Lead Investigation Report* (2013).

2.12.2.1 Field Survey and Record Search Methodology

The following were conducted as part of the ISA:

- **Reconnaissance-level Visits:** On May 9 and 10, 2012, and January 24 and 25, 2013, site reconnaissance visits consisting of the observation and documentation of existing conditions along and in the vicinity of the project segment of State Route 55 (SR-55) and the nature of the development within 0.25 mile (mi) of the project segment of SR-55 were conducted. The visits included observations of specific properties for evidence of release(s) and assessment of the potential for on-site releases of hazardous materials and petroleum products. The reconnaissance-level visits were limited to the exterior parts of properties proposed for full or partial acquisition as part of the Build Alternatives.
- **Environmental Database Review:** A records search of federal and State environmental databases for the area within approximately 0.5 mi of the project segment of SR-55 was conducted on May 10, 2012. The search of the National Priority List (NPL) covered an area within 1.0 mi of the project segment of SR-55.
- **Agency Records Review:** The California Department of Toxic Substances Control (DTSC) Hazardous Materials Division and the Santa Ana Regional Water Quality Control Board (RWQCB) were contacted to obtain documentation for properties within and adjacent to the right-of-way limits for the Build Alternatives.
- **Historical Research:** Aerial photographs, Sanborn Fire Insurance Maps, and historical topographic maps of the area along and in the vicinity of the project segment of SR-55 were reviewed.

Based on the site visits and records searches, several hazardous materials were identified as potentially of concern within the existing SR-55 right of way at properties proposed for full or partial acquisition or use as temporary construction easements (TCEs) under the Build Alternatives, and parcels directly adjacent to those areas. Those types of hazardous materials are described below.

2.12.2.2 Results of the Initial Site Assessment

Proposed Acquisition Parcels

Based on the field survey and database search discussed above in Section 2.12.2.1, the following properties would be fully acquired, partially acquired, or used for TCEs and were identified as having hazardous waste concerns. Refer to Table 2.12.1 below, for more detailed information regarding the type of hazardous concern at each parcel. Refer to Figures 2.12-1 through 2.12-4 for the location of the properties. The Map ID numbers are individual numbers assigned to the properties discussed here, shown in Table 2.12.1 and on Figures 2.12-1 through 2.12-4.

- **Team Surgical, Align Med, and Automotive Shop, 2400 South Pullman Street, Santa Ana, CA (Assessor's Parcel Number [APN] 430-012-03, Map ID No. A-1):** During the reconnaissance-level visit, the rear part of the building on this parcel was observed to be occupied by an automotive shop, and the front part of the building was vacant. Based on the nature of the automotive shop and the potential presence of hazardous chemicals associated with the automotive shop, the use is considered a Recognized Environmental Concern. In addition, based on the age of the building structure on this parcel, the structure may contain asbestos-containing materials, lead-based paints, mercury, and/or chlorofluorocarbons.
- **Various industrial businesses including Fletcher's Drapery Cleaning, Sunny Hills Cleaners, and Monarch Precision Deburring, 1981, 1999, 2011 South Ritchey Street, Santa Ana, CA (APN 403-041-07, Map ID No. A-2):** Based on the database search, the businesses at the addresses were listed as small quantity generators; however, no violations were noted. Recorded dry cleaning operations have been present at 1999 South Ritchey Street since 1992. Based on the past operations (dry cleaning and deburring), hazardous chemicals may be present at these addresses. In addition, contaminated soils and groundwater are reported beneath this parcel from the adjacent parcel occupied by Bell Industries which is considered an off-site Recognized Environmental Concern.
- **Ricoh/Industrial, 1123 Warner Avenue, Santa Ana, CA (APN 430-241-12, Map ID No. A-3):** Based on the database search, a leak of chlorinated hydrocarbons was discovered in 1987 that affected the groundwater beneath the

facility. Contaminated soils and groundwater are present in the southeastern portion of this parcel. The leaking underground storage tank and known dissolved contaminant plume in the groundwater are considered Recognized Environmental Concerns.

- **City of Santa Ana Property, South Ritchey Street, Santa Ana, CA (APN 403-072-02, Map ID No. A-4):** Based on the historic agricultural uses on this parcel, there may be residual organochlorine pesticides and arsenical herbicides in the subsurface soils.
- **City of Santa Ana Property, South Ritchey Street, Santa Ana, CA (APN 403-072-01, Map ID No. A-5):** Based on the historic agricultural uses on this parcel, there may be residual organochlorine pesticides and arsenical herbicides in the subsurface soils.
- **Various commercial businesses, 1411 Village Way, Santa Ana, CA (APN 402-111-24, Map ID No. A-6):** A vacant warehouse building and an adjacent asphalt-paved and landscaped area were observed as being present on site. No recorded violations were reported; however, based on the age of the building structure on this parcel, the structure may consist of asbestos-containing materials, lead-based paints, mercury, and/or chlorofluorocarbons.
- **Niagara/Commercial, 17842 Cowan Avenue, Irvine, CA (APN 427-261-08, Map ID No. 7):** The facility located on this parcel has one 12,000-gallon diesel fuel tank that was installed in 1984. A leak of diesel was discovered in 1999 affecting the groundwater beneath the facility. Based on the site reconnaissance, residual contamination from the above dispenser piping leak is still present at the facility as noted in the closure report.

Non-Acquisition Parcels

Based on the field survey and database search discussed above in Section 2.12.2.1, the following properties are located in the vicinity of the maximum disturbance limits of the Build Alternatives and were identified as having hazardous waste concerns. Refer to Table 2.12.2 below, for more detailed information regarding the type of hazardous concern at each parcel. Refer to Figures 2.12-1 through 2.12-4 for the location of the properties. The Map ID numbers are individual numbers assigned to the properties discussed here, shown in Table 2.12.2 and on Figures 2.12-1 through 2.12-4.

- **ITT Cannon, LLC, 666 East Dyer Road, Santa Ana, CA (APN 411-141-12, Map ID No. B-1):** This parcel is located approximately 500 feet west and northwest of the maximum disturbance limits. According to the database search,

this facility was previously listed as a large quantity generator from August 1980 to May 2010; however, all violations were corrected. A leak of primarily chlorinated solvents was reported to affect the groundwater beneath the facility consisting of waste, waste oil, and product. In addition, based on groundwater monitoring conducted in 2011, the groundwater quality beneath the site has been affected by contamination from the ITT Cannon property.

- **American Food Service Equipment/Western Method Machinery Corporation, 2344 Pullman Street, Santa Ana, CA (APN 430-012-02, Map ID No. B-2):** This parcel is adjacent to the maximum disturbance limits. Based on the database search, a gasoline leak occurred at the facility affecting the groundwater aquifer beneath the facility. In addition, a hazardous waste storage area was observed in the northwest corner of the property.
- **Bell Industries ESD, 1831 South Ritchey Street, Santa Ana, CA (APN 403-042-02, Map ID No. B-3):** The parcel is located 200 feet west and northwest of the maximum disturbance limits. Based on the database search, no violations were noted at this property; however, chlorinated solvents associated with an on-site drycleaners were spilt which contaminated the soils and groundwater beneath this parcel.

Hazardous Substances Drums and Other Chemical Containers

During the site reconnaissance visits, no hazardous substances drums or other chemical containers were identified within the existing SR-55 right of way or on the visible areas of properties identified for full or partial acquisition or for use as TCEs. However, a number of hazardous waste drums and containers were observed on the property at 2344 South Pullman Street in Santa Ana (APN 430-012-02), which is not proposed for acquisition or use as a TCE but is adjacent to the project limits. Due to the proximity of that hazardous waste storage area to the project limits, there is potential for the storage area on this parcel to adversely impact the proposed project. If a release has occurred at that property, there is potential for the soil vapor and groundwater beneath the property limits to be impacted, thus presenting an inhalation risk to future occupants or construction workers within the project limits.

Storage Tanks

There is no evidence of any registered underground storage tanks (USTs) such as vent lines, fill, or overfill ports, within the existing SR-55 right of way or on the visible areas of properties identified for full or partial acquisition or for use as TCEs. Based on the database search, current or historic USTs have been identified at properties proposed as full or partial acquisitions under the Build Alternatives, such as 2400

South Pullman Street in Santa Ana (APN 430-241-12) and 17842 Cowan Avenue in Irvine (APN 427-261-08); or properties adjacent to the maximum disturbance and right-of-way limits under the Build Alternatives, such as 666 East Dyer Road in Santa Ana (APN 411-141-12) and 2344 Pullman Street in Santa Ana (APN 430-012-02). Refer to Tables 2.12.1 and 2.12.2 for more detailed information regarding the potential properties contaminated from storage tanks.

Polychlorinated Biphenyls

Multiple pad- and pole-mounted transformers were observed at a number of locations in the construction area within the City-owned right of way adjacent to the SR-55 right of way and parcels proposed for use as TCEs. Those transformers are owned and operated by Southern California Edison (SCE). No staining or leaks were observed beneath the transformers, and all the transformers appear to be in good condition.

Pesticide Use

Based on historical agricultural use of areas adjacent to the project segment of SR-55, persistent pesticides may remain in area soils, including soils within the proposed SR-55 right of way, such as the parcels at South Ritchey Street in Santa Ana (APN 403-072-02 and APN 403-072-01). Refer to Table 2.12.1 for more detailed information regarding the potential properties contaminated with pesticides.

Staining, Discolored Soils, and/or Corrosion

No staining, discolored soils, or corrosion were observed within the SR-55 right of way or the parcels proposed for full or partial acquisition or for use as TCEs.

Lead Chromate

Yellow pavement traffic markings (thermoplastic and paint) on SR-55 and the arterials crossing SR-55 potentially contain hazardous levels of lead chromate.

Lead-Based Paint

There may be lead-based paint in buildings and structures constructed before 1979 located within the SR-55 right of way and on parcels proposed for full or partial acquisition under the Build Alternatives, such as 2400 South Pullman Street in Santa Ana (APN 430-012-03) and 1411 Village Way in Santa Ana (APN 402-111-24). Refer to Table 2.12.1 for more detailed information regarding the potential properties contaminated with lead-based paint.

Asbestos-Containing Materials

The use of asbestos in many building products was banned by the United States Environmental Protection Agency (EPA) by the late 1970s. Asbestos-containing materials (ACMs) represent a concern when they are subject to damage that results in the release of fibers. ACMs may be found in building materials such as rails, bearing pads, support piers, and expansion joint material in bridges, asphalt, and concrete. There may be ACMs in bridge structures along the project segment of SR-55 based on the construction dates of the bridges and in buildings located on parcels proposed for full or partial acquisition under the Build Alternatives. In addition, areas in the vicinity of the project segment of SR-55 were historically used for agriculture. Therefore, the potential exists for buried asbestos containing cementitious pipe or "transite" pipe associated with agricultural uses within the maximum disturbance limits for the Build Alternatives or on parcels proposed for full or partial acquisition under the Build Alternatives, such as 2400 South Pullman Street in Santa Ana (APN 430-012-03) and 1411 Village Way in Santa Ana (APN 402-111-24). Refer to Table 2.12.1 for more detailed information regarding the potential properties contaminated with asbestos-containing materials.

Soil and/or Groundwater Contamination

Soil and/or groundwater contamination has been identified at properties proposed as full or partial acquisitions under the Build Alternatives, or properties adjacent to the maximum disturbance and right-of-way limits under the Build Alternatives. The properties proposed for full or partial acquisitions that were identified as containing groundwater and soil contamination include 1981, 1999, and 2011 South Ritchey Street in Santa Ana (APN 403-041-07) and 1123 Warner Avenue in Santa Ana (APN 430-214-12). In addition, the property at 17842 Cowan Avenue in Irvine was identified as containing contaminated groundwater beneath the facility. The property located in the maximum disturbance limits of the Build Alternatives that were identified as containing contaminated groundwater and soil includes 1831 South Ritchey Street in Santa Ana (APN 403-042-02). In addition, the properties at 666 East Dyer Road in Santa Ana (APN 411-141-12) and 2344 South Pullman Street in Santa Ana (APN 430-012-02) were identified as containing contaminated groundwater beneath the facilities. Refer to Table 2.12.1 for more detailed information regarding the potential properties with groundwater and/or soil contamination.

Gas and Oil, and Groundwater Monitoring Wells

No evidence of oil or gas production wells was observed within the SR-55 right of way. Several groundwater monitoring wells were observed within the City-owned

right of way adjacent to the existing SR-55 right of way. No wells were observed within parcels proposed for full and partial acquisition or the parcels proposed for use as TCEs under the Build Alternatives.

Other Observations

Several dirt piles of unknown origin were observed adjacent to the SR-55 right of way, east of 1717 Dyer Road in Santa Ana.

A dry-cleaning facility, Sunny Hills Cleaners, was observed at 1999 Ritchey Street in Santa Ana, immediately adjacent to a parcel proposed for partial acquisition. Sunny Hills Cleaners has operated at this location for approximately 10 years and specializes in cleaning upholstery and area rugs. Due to the nature of the business and the use of chemicals such as chlorinated solvents, there is potential for this facility to adversely impact the proposed partial acquisition area.

2.12.2.3 Results of the Aerially Deposited Lead Investigation Report

Aerially deposited lead (ADL) is generally encountered in unpaved or formerly unpaved areas adjoining older roads, primarily as a result of deposition from historical vehicle emissions when gasoline contained lead. SR-55 has been used since approximately 1927, resulting in the exposure of the adjacent unpaved surficial soils to ADL.

As part of the *Aerially Deposited Lead Investigation Report*, soil samples were collected at approximately 70 locations within the unpaved areas in the existing SR-55 right of way. Total lead concentrations in the soil samples did not exceed 1,000 milligrams per kilogram. However, the soluble threshold limit concentrations of lead, using citric acid for some soil samples, were higher than 5 milligrams per liter (mg/L). The soluble threshold limit concentrations of lead using the deionized water waste extraction test were below 1.5 mg/L and toxicity characteristic leaching procedure concentrations of lead were below 5 mg/L. As a result, the soils can be reused on site per the guidance in the DTSC variance to the California Department of Transportation (Caltrans). After October 2015, the requirements of the DTSC variance may be updated.

2.12.3 Environmental Consequences

2.12.3.1 Temporary Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

Temporary impacts related to hazardous materials/wastes during project construction could occur within the maximum disturbance limits for all the Build Alternatives and

on individual properties identified for TCEs and/or partial or full acquisition, as described in the following sections.

Impacts within the Maximum Disturbance Limits

Aerially Deposited Lead

Based on the *Aerially Deposited Lead Investigation Report*, the soils are not considered RCRA hazardous materials. As a result, those soils can be reused onsite during construction of Alternatives 1, 2, 3, and 4, per the guidance in the DTSC variance to Caltrans, and they may be managed as either nonhazardous material (variance soil type X) and reused onsite without restrictions or non-RCRA hazardous material (variance Y1) and reused onsite with a minimum 1-foot of clean material cover, as required in Measure HAZ-2 (provided later in this section). Measure HAZ-2 specifically requires the construction contractor to reuse or dispose of soil with ADL consistent with the Caltrans lead variance from the DTSC. As a result, the construction of Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to ADL.

Hazardous Materials/Wastes During Construction

Typical hazardous materials anticipated to be used during construction of Alternatives 1, 2, 3, and 4 (e.g., solvents, paints, fuels) and hazardous wastes generated during construction would be handled in accordance with applicable federal and State regulations and Caltrans policies regarding the use, storage, handling, disposal, and transport of those materials. As a result, Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to the use of hazardous materials or the generation of hazardous wastes during construction.

Polychlorinated Biphenyls

There may be Polychlorinated Biphenyls (PCBs) in pad- and pole-mounted transformers within the maximum disturbance limits for the Build Alternatives. None of those transformers appeared to be leaking during the site reconnaissance visits. If any leaking transformers are noted during the property acquisition for and construction of the Build Alternatives, those leaks will be considered a PCB hazard unless tested and confirmed otherwise, and must be handled accordingly. As a result, Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to PCBs.

Pavement Marking Materials

Yellow traffic striping and pavement-marking materials (paint, thermoplastic, permanent tape, and temporary tape) that would be removed from the SR-55 mainline

and ramps, and arterials at their crossings of SR-55 during construction of the Build Alternatives may contain elevated concentrations of metals such as lead. Removal of these materials during construction could affect construction workers and the surrounding environment. Measure HAZ-3, provided later, specifically requires the construction contractor to test, remove, and properly dispose of yellow traffic striping and pavement marking materials in accordance with Caltrans *Construction Manual*, Chapter 7, Section 7-106, Environmental Hazards and Safety Procedures. As a result, Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to yellow traffic striping and pavement marking materials.

Asbestos Containing Materials related to Bridge Structures

Based on the construction dates of the bridges within the disturbance limits, ACMs may be present in bridges proposed to be widened or replaced as part of the Build Alternatives. ACMs represent a concern when they are subject to damage that results in the release of fibers. Measure HAZ-4, provided later, specifically requires proper testing, removal, and disposal of ACMs. As a result, Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to ACMs.

Potentially Contaminated Soil and/or Groundwater

There is potential for all four Build Alternatives to disturb potentially contaminated soil and/or groundwater on land used for TCEs or partial or full acquisitions, as discussed below. In addition, all four Build Alternatives could disturb potentially contaminated soil and/or groundwater originating at properties outside the maximum disturbance limits and the boundaries of property proposed for TCEs or acquisition. Two parcels are outside the maximum disturbance limits for the Build Alternatives, but the land uses on those parcels have contributed to known groundwater impacts. These two parcels are American Food Service Equipment/Western Method Machinery Corporation at 2344 Pullman Street, APN 430-012-02, Map ID No. B-2; and Bell Industries ESD at 1831 South Ritchey Street, APN 403-042-02, Map ID No. B-3. Described in Table 2.12.2 and shown on Figures 2.12-1 through 2.12-4 are outside the maximum disturbance limits for the Build Alternatives, but the land uses on those parcels have contributed to known groundwater impacts. Due to the nature of the businesses and the proximity of these facilities to the maximum disturbance limits for the Build Alternatives, there is potential that contaminated groundwater originating at those parcels would be encountered during the widening or replacement of the bridge structures under Alternatives 1, 2, 3, and 4. Measure HAZ-1, provided later, specifically requires that a Site Investigation be performed on these parcels to identify potential hazards that may occur during project construction associated with

contaminated soil and groundwater. The Site Investigation will provide the appropriate avoidance, minimization, or mitigation for those hazards. As a result, Alternatives 1, 2, 3 and 4 would not result in adverse impacts related to contaminated soil and/or groundwater at these parcels.

Potentially Contaminated Groundwater and Hazardous Waste Storage Area

There is the potential for all four Build Alternatives to disturb a potentially contaminated groundwater and/or a potentially hazardous waste storage area located at a property outside the maximum disturbance limits and the boundaries of properties proposed for TCEs or full or partial acquisition as described in Table 2.12.2 and shown on Figures 2.12-1 through 2.12-4. This parcel is located at 2344 Pullman Street in Santa Ana (APN 430-012-02) and the potentially hazardous waste storage area is located adjacent to the parcel at 2400 South Pullman Street in Santa Ana (APN 430-012-03), which is proposed for partial acquisition under Alternatives 1 and 2 and full acquisition under Alternatives 3 and 4. Due to the nature of the business and the proximity of the hazardous waste storage area to the maximum disturbance limits for the Build Alternatives, there is a moderate potential for this parcel to result in an environmental concern during construction of the Build Alternatives. These risks would be addressed by Measure HAZ-8, provided later, which specifically requires that a preliminary site investigation be performed on the parcel to assess the presence or absence of impacts associated with the hazardous waste storage area. As a result, the Build Alternatives would not result in adverse impacts related to the hazardous waste storage area.

Impacts Associated with Temporary Construction Easements

Alternatives 1, 2, 3, and 4 would result in the use of land for TCEs at three parcels. Those parcels and the potential risks associated with the use of land from those parcels for TCEs under all the Build Alternatives are:

- **1981, 1999, and 2011 South Ritchey Street, Santa Ana, CA (APN 403-041-07, Map ID No. A-2):** Because contaminated soils and groundwater are reported beneath this parcel, there would be potential for encountering contaminated soil and groundwater during construction of the Build Alternatives. There is also potential to encounter unknown hazardous materials in groundwater if dewatering is necessary during construction. Additional investigation to properly characterize and define the extent of contamination at this parcel is recommended. Measure HAZ-1, provided later, requires that a Site Investigation be performed for this

parcel to identify potential hazards that may occur during project construction associated with contaminated soil and groundwater. The Site Investigation will provide the appropriate avoidance, minimization, or mitigation for those hazards. As a result, Alternatives 1, 2, 3 and 4 would not result in adverse impacts related to contaminated soil and/or groundwater at this parcel.

- **1123 Warner Avenue, Santa Ana, CA (APN 430-241-12, Map ID No. A-3):** Similar to the conditions at APN 403-041-07 described above, contaminated soils and groundwater are reported beneath this parcel. Measure HAZ-1 requires that a Site Investigation be performed for this parcel to identify potential hazards that may occur during construction activities associated with contaminated soil and groundwater. As a result, Alternatives 1, 2, 3 and 4 would not result in adverse impacts related to contaminated soil and/or groundwater at this parcel.
- **1411 Village Way, Santa Ana, CA (APN 402-111-24, Map ID No. A-6):** Based on the age of the building structure on this parcel, the structures may contain ACMs, LBPs, mercury, and/or chlorofluorocarbons. However, none of the structures on this parcel will be demolished or renovated as part of the Build Alternatives. As a result, Alternatives 1, 2, 3 and 4 would not result in adverse effects related to these types of materials.

In addition to the land for TCEs, discussed above, Alternatives 1 and 2 would also require the use of land from one additional parcel for TCEs. That parcel and the risks associated with that parcel are:

- **2400 South Pullman Street, Santa Ana, CA (APN 430-012-03, Map ID No. A-1):** Based on the age of the building structure on this parcel, the structure may contain ACMs, LBPs, mercury, and/or chlorofluorocarbons. However, the structure on this parcel will not be demolished or renovated as part of the Build Alternatives. As a result, Alternatives 1 and 2 would not result in adverse effects related to these types of materials.

In addition to the land for TCEs, discussed above, Alternatives 2 and 3 would also require the use of land from one additional parcel for TCEs. That parcel and the risks associated with that parcel are:

- **17842 Cowan Avenue, Irvine, CA (APN 427-261-08, Map ID No. A-7):** Based on the site reconnaissance, residual contamination from the above dispenser piping leak is still present at the facility as noted in the closure report. Measure HAZ-1 requires that a Site Investigation be performed for this parcel to identify

whether any residual contamination from the above dispenser piping leak is still present and to determine if any potential hazards may occur during construction activities associated with residual contamination. As a result, Alternatives 2 and 3 would not result in adverse impacts related to residual contamination from the above dispenser piping leak at this parcel.

Refer to Table 2.12.1 following the last page of text in this section for the types of acquisition (full and partial acquisitions and TCEs) by alternative.

Impacts Associated with Partial Acquisitions

Alternatives 1, 2, 3, and 4 would result in the partial acquisition of land from two parcels. Those parcels and the potential risks associated with the partial acquisition of land from those parcels under all the Build Alternatives are:

- **Parcel at 1123 Warner Avenue, Santa Ana, CA (APN 430-241-12, Map ID No. A-3):** The risks associated with the partial acquisition of land from this parcel under the Build Alternatives would be the same as described above for the use of TCEs at this parcel related to contaminated soil and groundwater. Those risks would be addressed based on implementation of Measure HAZ-1. As a result, Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to these types of materials at this parcel.
- **Parcel at 1411 Village Way, Santa Ana, CA (APN 402-111-24, Map ID No. A-6):** Based on the age of the building structure on this parcel, the structure may contain ACMs, LBPs, mercury, and/or chlorofluorocarbons. A portion of the structure on this parcel will be demolished or renovated as part of the Build Alternatives. Those risks would be addressed by Measures HAZ-4 and HAZ-5. As a result, Alternatives 1, 2, 3, and 4 would not result in adverse impacts related to these types of materials at this parcel.

In addition to the land for partial acquisitions, discussed above, Alternatives 1 and 2 would also require the partial acquisition of land from one additional parcel. That parcel and the risks associated with that parcel are:

- **Parcel at 2400 South Pullman Street, Santa Ana, CA (APN 430-012-03, Map ID No. A-1):** Based on the age of the building structure on this parcel, the structure on this parcel may contain ACMs, LBPs, mercury, and/or chlorofluorocarbons. However, none of the structure on this parcel will be demolished or renovated as part of the Build Alternatives. As a result,

Alternatives 1 and 2 would not result in adverse effects related to these types of materials.

In addition to the land for partial acquisitions, discussed above, Alternatives 2 and 3 would also require the partial acquisition of land from one additional parcel. That parcel and the risks associated with that parcel are:

- **Parcel at 17842 Cowan Avenue, Irvine, CA (APN 427-261-08, Map ID No. A-7):** The risks associated with the partial acquisition of land from this parcel under Alternatives 2 and 3 would be the same as described above for the TCE at this parcel related to residual contamination from the above dispenser piping leak is still present at the facility as noted in the closure report. As mentioned above, Measure HAZ-1 requires that a Site Investigation be performed for this parcel to identify if there is any residual contamination from the above dispenser piping leak is still present and determine if any potential hazards may occur during construction activities associated with residual contamination. As a result, Alternatives 2 and 3 would not result in adverse impacts related to residual contamination from the above dispenser piping leak at this parcel.

In addition to the land for partial acquisitions, discussed above, Alternatives 3 and 4 would also require the partial acquisition of land from one additional parcel. That parcel and the risks associated with that parcel are:

- **Parcel at 1981, 1999, and 2011 South Ritchey Street, Santa Ana, CA (APN 403-041-07, Map ID No. A-2):** The risks associated with the partial acquisition of land from this parcel under the Build Alternatives would the same as described above for the use of TCEs at this parcel related to contaminated soil and groundwater. Those risks would be addressed based on implementation of Measure HAZ-1. As a result, Alternatives 3 and 4 would not result in adverse impacts related to contaminated soil and/or groundwater at this parcel.

Refer to Table 2.12.1 for the types of acquisition (full and partial acquisitions and TCEs) by alternative.

Impacts Associated with Full Acquisitions

Alternatives 3 and 4 would both result in the full acquisition of three parcels. Those parcels and the potential risks associated with the full acquisition of those parcels under Alternatives 3 and 4 are:

- **2400 South Pullman Street, Santa Ana, CA (APN 430-012-03, Map ID No. A-1):** The risks associated with the full acquisition of this parcel under Alternatives 3 and 4 would be the same as described above for the use of TCEs and partial acquisitions at this parcel related to the potential for the building structure on this parcel to contain ACMs, LBPs, mercury, and/or chlorofluorocarbons. In addition, as discussed in Table 2.12.1, the rear portion of the building at this parcel is occupied by an automotive shop. Based on the nature of the business and the potential presence of hazardous chemicals associated with the business, the use of the building at this parcel is considered as a risk. Those risks would be addressed by Measures HAZ-1, HAZ-4 and HAZ-5. As a result, Alternatives 3 and 4 would not result in adverse impacts related to these types of materials at this parcel.
- **South Ritchey Street, Santa Ana, CA (APN 403-072-02, Map ID No. A-4):** Based on the historic agricultural uses on this parcel, there may be residual organochlorine pesticides (OCPs) and arsenical herbicides in the subsurface soils. Hazardous concentrations of herbicides and pesticides may be encountered during grading or excavation of soils that have remained undisturbed. Disturbance of those soils on this parcel could result in a potential environmental concern during construction of Alternatives 3 and 4. Measure HAZ-6, provided later, requires soil testing prior to any disturbance of soils on this parcel and requires the construction contractor to properly handle and dispose of all soils exceeding the requirements for State or federal hazardous waste at an appropriate certified landfill. As a result, Alternatives 3 and 4 would not result in adverse effects related to soils contaminated with herbicides and/or pesticides.
- **South Ritchey Street, Santa Ana, CA (APN 403-072-01, Map ID No. A-5):** Similar to the parcel on APN 403-072-02 described above, there may be residual OCPs and arsenical herbicides in the subsurface soils. Disturbance of those soils on this parcel could result in a potential environmental concern during construction of Alternatives 3 and 4. These risks would be addressed by Measure HAZ-6. As a result, Alternatives 3 and 4 would not result in adverse effects related to soils contaminated with herbicides and/or pesticides.

Alternatives 1 and 2 would not result in the full acquisition of any parcels.

Refer to Table 2.12.1 for the types of acquisition (full and partial acquisitions and TCEs) by alternative.

Summary of Temporary Impacts Under the Build Alternatives

In summary, the total numbers of TCEs and partial and full acquisitions under the Build Alternatives that could result in potential effects related to hazardous materials and wastes are:

- Alternative 1: 4 TCEs, 3 partial acquisitions, and 0 full acquisitions
- Alternative 2: 5 TCEs, 4 partial acquisitions, and 0 full acquisitions
- Alternative 3: 4 TCEs, 4 partial acquisitions, and 3 full acquisitions
- Alternative 4: 3 TCEs, 3 partial acquisitions, and 3 full acquisitions

No Build Alternative

The No Build Alternative would not result in the disturbance or removal of any soils, groundwater, or structures and, therefore, would not result in temporary impacts related to hazardous waste and materials.

2.12.3.2 Permanent Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

Routine maintenance activities during operation of the Build Alternatives would be required to follow applicable regulations with respect to the use, storage, handling, transport, and disposal of potentially hazardous materials. Therefore, the operation of the Build Alternatives would not result in adverse impacts related to hazardous waste or materials.

No Build Alternative

The No Build Alternative would not change the existing physical environment and, therefore, there would be no permanent impacts related to hazardous waste under this alternative. Similar to the Build Alternatives, routine maintenance activities would continue under the No Build Alternative, including compliance with applicable regulations regarding the handling and disposal of potentially hazardous materials.

2.12.4 Avoidance, Minimization, and/or Mitigation Measures

The avoidance and minimization measures below apply to all four Build Alternatives and will avoid and/or minimize potential effects related to hazardous materials and hazardous wastes during construction of the Build Alternatives.

HAZ-1 Site investigations will be performed at the following properties that may be either partially acquired, fully acquired, or used for temporary construction easements (TCEs) for the project will be initiated prior to completion of the Project Approval and Environmental Documentation

(PA&ED) phase and completed during the Project Specifications and Estimates (PS&E) phase. The site investigations will determine whether more extensive subsurface investigation will be needed. If deemed necessary, subsurface investigations will be performed according to the recommendations of the assessment. The following is a list of properties that may be either partially acquired, fully acquired, or used for TCEs for the project and will require site investigations:

- 2400 South Pullman Street (Assessor's Parcel Number [APN] 430-012-03)
- Fetcher's Drapery Cleaning (1981 South Ritchey Street), Sunny Hills Cleaners (1999 South Ritchey Street), and Monarch Precision Deburring Co. (2011 South Ritchey Street) (all on APN 403-041-07)
- 17842 Cowan Avenue (APN 427-261-08)
- Area adjacent to 1123 Warner Avenue (APN 430-241-12)

HAZ-2 During construction, the construction contractor will remove and either reuse or properly dispose of soils, including requiring special handling, treatment, and/or disposal of aerially deposited lead consistent with the California Department of Transportation (Caltrans) lead variance from the California Department of Toxic Substances Control (DTSC).

HAZ-3 During the design phase, the yellow traffic striping and pavement marking materials will be tested for lead and lead chromate. If hazardous materials are discovered, the construction contractor will remove and properly dispose of any materials in accordance with Caltrans *Construction Manual*, Chapter 7, Section 7-106, Environmental Hazards and Safety Procedures.

HAZ-4 The proposed widening along State Route 55 (SR-55) will involve the removal of minor portions of the existing bridge structures. Based on the Preliminary General Plans, items to be removed will mainly consist of existing concrete railings and bridge-mounted signs. Below is a list of bridge structures that will be modified as a result of implementation of the Build Alternatives:

- Dyer Road undercrossing

- Edinger Avenue undercrossing
- South Tustin overhead bridge structure
- MacArthur Boulevard undercrossing bridge structure

Qualified professionals will initiate an asbestos-containing materials (ACM) survey prior to completion of the PA&ED phase and complete the ACM survey during the PS&E phase. The survey should be conducted in conformance with the United States Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants Title 40 Code of Federal Regulations regulation, and South Coast Air Quality Management District (SCAQMD) Rule 1403. Additionally, notification of the SCAQMD prior to any structure renovation or demolition is mandatory according to Rule 1403 (d)(1)(B).

In addition, based on the age of the structures located on proposed full acquisition parcel at 2400 South Pullman Street (APN 430-012-03) and the partial acquisition area of 1411 Village Way (APN 402-111-24), there is potential for ACM and mercury- and chlorofluorocarbon-containing equipment to be present in the structures. During final design, the qualified professionals will conduct an ACM survey and a survey and sampling for mercury- and chlorofluorocarbon-containing materials in the structures at 2400 South Pullman Street (APN 430-012-03) (full acquisition) and the area for partial acquisition at 1411 Village Way (APN 402-111-24). The ACM survey will be overseen by a California Certified Asbestos Consultant. The ACM survey report will provide a description of the ACMs on those two parcels, their locations, their estimated quantities, and specific requirements for removal, containment, and off-site transport and disposal of ACMs. The requirements from that study will be included in the project specifications for implementation during project construction activities.

During construction, the construction contractor will implement the requirements in the ACM survey report as included in the project specifications.

HAZ-5 Based on the age of the structures located at 2400 South Pullman Street (APN 430-012-03) (proposed full acquisition) and at 1411 Village Way (APN 402-111-24) (proposed partial acquisition), there is potential for lead-based paint (LBP) to be present in the structures on those parcels. The qualified professionals will initiate an LBP survey on the structures on 2400 South Pullman Street (APN 430-012-03) (full acquisition) and the area for partial acquisition at 1411 Village Way (APN 402-111-24) prior to completion of the PA&ED phase and complete the LBP survey during the PS&E phase. The LBP study will be conducted by trained and/or licensed professionals and will comply with the EPA, Housing and Urban Development, and California Department of Public Health guidelines. The LBP study report will provide a description of the LBP locations on the two parcels; the estimated quantities of LBP; and specific requirements for removal, containment, and off-site transport and disposal of materials containing LBP from those two properties. The requirements from that study will be included in the project specifications for implementation during project construction.

The construction contractor will implement the requirements in the LBP survey report as included in the project specifications.

HAZ-6 Prior to completion of the PA&ED phase, if Alternative 3 or 4 is selected as the Preferred Alternative, the soil sampling for pesticides on former agricultural properties will be initiated prior to completion of the PA&ED phase and completed during the PS&E phase. Soils located in the upper 5 feet of the full acquisition of APNs 403-072-02 and 403-072-01 will be collected and analyzed to evaluate the presence or absence of residual organochlorine pesticides and arsenical herbicides. The soil sampling will be conducted in general accordance with DTSC Interim Guidance for Sampling Agricultural Fields for School Sites (August 26, 2002). The performance standard for this measure complies with applicable federal, State, and local regulations regarding removal, handling, transport, and disposal of soils contaminated with pesticides. The analytical results of the soil sampling will determine the appropriate handling and disposal of the soil.

During construction, the construction contractor will properly dispose of all soils exceeding the criteria for State or federal hazardous waste at an appropriate State-certified landfill facility.

HAZ-7 During construction, the construction contractor will monitor soil excavation for visible soil staining, odor, and the possible presence of unknown hazardous material sources. If hazardous material contamination or sources are suspected or identified during project construction activities, the construction contractor will be required to cease work in the area and to have an environmental professional evaluate the soils and materials to determine the appropriate course of action required, consistent with the Unknown Hazards Procedures in Chapter 7 in the Caltrans *Construction Manual* (August 2006).

HAZ-8 Prior to completion PA&ED, a preliminary site investigation will be initiated during PA&ED and completed during PS&E on the property at 2344 Pullman Street (APN 430-012-02), which is located adjacent to the maximum limits of disturbance of the Build Alternatives. The preliminary site investigation will assess the presence or absence of impacts associated with the hazardous waste storage area observed in the northwest corner on the site.

As discussed in Section 2.9, Water Quality and Storm Water Runoff, groundwater dewatering during construction may be required. As specified in Measure WQ-5, if dewatering is required, construction site dewatering will comply with one of two orders, or any subsequent orders, that apply to groundwater discharges to surface waters within the Santa Ana Region depending on the nature of the groundwater.

Although the full extent of potential remediation will not be determined until the preliminary site investigations are conducted, the worst-case scenario for each parcel is as follows:

- **17842 Cowan, Irvine (APN 427-261-08):** Removal and off-site disposal of impacted soil.
- **No Address (APNs 403-072-02 and 403-072-01):** Removal and off-site disposal of impacted soil.
- **1981, 1999, and 2011 South Ritchey Street, Santa Ana (APN 403-041-07):** Removal and off-site disposal of impacted soil.

- **1123 Warner Avenue, Santa Ana (APN 430-241-12):** Treatment of impacted groundwater prior to its disposal through a sewer system or storm drain.
- **2400 South Pullman Street, Santa Ana (APN 430-012-03):** Removal and off-site disposal of impacted soil, long-term monitoring of impacted groundwater, and installation of a soil vapor barrier system beneath any future structures.

The worst-case remediation activities on the parcels listed above would have little to no impact on public safety (residents and business employees). Adequate protection to construction workers could be provided with the implementation of a Health and Safety Plan and Soil Management Plan.

The cost of remediation for the parcels listed above is not known at this time and will be determined upon completion of the preliminary site investigations.

Table 2.12.1 Properties Proposed for Full and Partial Acquisitions or TCEs with Hazardous Waste Concerns

Map ID[1], Address, APN, and Current Occupant/ Type of Business	Type of Acquisition by Alternative				Databases	Types of Concern	Proposed for Site Investigation
	Alternative 1	Alternative 2	Alternative 3	Alternative 4			
Map ID No. A-1 2400 South Pullman Street Santa Ana, CA APN 430-012-03 Team Surgical Align Med Automotive shop Commercial	TCE Partial	TCE Partial	Full	Full	N/A	During the reconnaissance-level visit, the rear part of the building on this parcel was observed to be occupied by an automotive shop. The front part of the building was vacant. It appeared that Team Surgical Align Med had just recently vacated the building and another commercial business specializing in banners and signs would be occupying the front portion of the structure in the future. One pad-mounted transformer was observed in the northeastern part of the parcel. No staining was observed on the concrete pad beneath the transformer. A hazardous waste storage area was observed directly adjacent to the southeast part of the parcel. In addition, a hazardous chemical/waste storage area was observed directly adjacent to the southeast part of the parcel. Based on the nature of the businesses and the potential presence of hazardous chemicals associated with the businesses, the uses on these properties are considered Recognized Environmental Concerns. In addition, based on the age of the structure, LBP and ACM might be contained in the structure, and there is also potential for mercury- and chlorofluorocarbon-containing equipment to be present in the structures.	Yes
Map ID No. A-2 1981, 1999, 2011 South Ritchey Street Santa Ana, CA APN 403-041-07 Various industrial uses, including Fletcher's Drapery Cleaning, Sunny Hills Cleaners, and Monarch Precision Deburring Co.	TCE	TCE	TCE Partial	TCE Partial	RCRA-SQG Drycleaners	The RCRA-SQG lists these businesses as small quantity generators that generate more than 100 and less than 1,000 kg of hazardous waste during any calendar month and accumulate less than 6,000 kg of hazardous waste at any time. No violations were noted. The waste generated was listed as liquids with halogenated organic compounds greater than 1,000 mg/L, and halogenated solvents. Recorded dry cleaning operations have been present at 1999 South Ritchey Street since 1992. Based on the nature of the businesses (dry cleaning and deburring) at these addresses and the potential presence of hazardous chemicals associated with these businesses, the uses on this parcel are considered Recognized Environmental Concerns. In addition, this parcel is adjacent to the parcel occupied by Bell Industries (Map ID No. B-3) at 1831 South Ritchey. Groundwater and potential soil gas under APN 403-041-07, which is proposed for partial acquisition under all four Build Alternatives, may be impacted by the up-gradient Bell facility since the former Bell Industries is considered an off-site Recognized Environmental Concern.	Yes

Table 2.12.1 Properties Proposed for Full and Partial Acquisitions or TCEs with Hazardous Waste Concerns

Map ID[1], Address, APN, and Current Occupant/ Type of Business	Type of Acquisition by Alternative				Databases	Types of Concern	Proposed for Site Investigation
	Alternative 1	Alternative 2	Alternative 3	Alternative 4			
						There is potential for the soil vapor and groundwater beneath the property limits to be impacted by this off-site facility, thus presenting an inhalation risk to future occupants or construction workers within the project limits. Additional investigation may be warranted if groundwater is encountered at the Fletcher's Drapery Cleaning parcel during project construction.	
Map ID No. A-3 1123 Warner Avenue Santa Ana, CA APN 430-241-12	TCE Partial	TCE Partial	TCE Partial	TCE Partial	LUST	The LUST database listing states a leak of chlorinated hydrocarbons was discovered in 1987 that affected the groundwater beneath the facility. The facility status is listed as "open – remediation." The abatement method is listed as "Pump and Treat Groundwater – generally employed to remove dissolved contaminants." In 2005, a dual-phase extraction system was installed and began operation at the facility. Since the system began operating in 2005, approximately 1,632,000 gal of contaminated groundwater have been extracted and approximately 626 gal of liquid-phase solvent have been recovered. From September 2008 to December 2011, approximately 0.01 lb of dissolved-phase solvent, 100 lbs of non-methane vapor phase organic compounds, and 0.1 lb of vapor phase VOCs have been recovered, which indicates the system is reaching its potential limit for removing additional contamination. Elevated concentrations of VOCs above cleanup goals were detected in the groundwater in December 2011. Shutdown of the system was recommended in the *Annual Groundwater Monitoring Report* for the facility dated April 26, 2012. The LUST and known dissolved contaminant plume in groundwater are considered Recognized Environmental Concerns. A majority of the groundwater plume and contaminated soil at this facility is in the southeastern part, which is downgradient from the proposed partial acquisition area and the proposed tieback wall for the Warner Avenue Overcrossing; however, because groundwater will likely be encountered during the installation of tie-back walls beneath the Warner Avenue Overcrossing, additional assessment of the groundwater is recommended to determine proper handling and disposal. Depending on the results of the analysis, groundwater may require off-site treatment and disposal at a licensed facility or could be treated on site prior to discharge to the municipal sewer system or storm drain under an approved NPDES permit.	Yes

Table 2.12.1 Properties Proposed for Full and Partial Acquisitions or TCEs with Hazardous Waste Concerns

Map ID[1], Address, APN, and Current Occupant/ Type of Business	Type of Acquisition by Alternative				Databases	Types of Concern	Proposed for Site Investigation
	Alternative 1	Alternative 2	Alternative 3	Alternative 4			
Map ID No. A-4 South Ritchey Street Santa Ana, CA APN 403-072-02			Full	Full	N/A	The historical use of this parcel for agricultural uses is considered a Recognized Environmental Concern. There may be residual organochlorine pesticides and arsenical herbicides in the subsurface soils. This parcel has remained primarily undeveloped since its use for agricultural purposes as depicted in the historical aerial photographs. Additional assessment for the presence of organochlorine pesticides and arsenical herbicides should be conducted to evaluate soil conditions with respect to these constituents.	Yes
Map ID No. A-5 South Ritchey Street Santa Ana, CA APN 403-072-01			Full	Full	N/A	The historical use of this parcel for agricultural uses is considered a Recognized Environmental Concern. There may be residual organochlorine pesticides and arsenical herbicides in the subsurface soils. This parcel has remained primarily undeveloped since its use for agricultural purposes as depicted in the historical aerial photographs. Additional assessment for the presence of organochlorine pesticides and arsenical herbicides should be conducted to evaluate soil conditions with respect to these constituents.	Yes
Map ID No. A-6 1411 Village Way Santa Ana, CA APN 402-111-24	TCE Partial	TCE Partial	TCE Partial	TCE Partial	N/A	A partial acquisition area was observed to be occupied by a vacant warehouse building and an adjacent asphalt-paved and landscaped area. No recorded violation was reported. However, based on the age of the structure, LBP, ACMs, and potential mercury- and chlorofluorocarbon-containing equipment may be present in the structure.	No
Map ID No. A-7 17842 Cowan Avenue Irvine, CA APN 427-261-08		TCE Partial	TCE Partial		N/A	Files were reviewed at the Orange County Health Care Agency. A *Soil and Groundwater Investigation Report* prepared by Pacific Edge Engineering, Inc. (June 30, 1999) stated that the facility has one 12,000 gal diesel fuel tank that was installed in 1984. A leak of diesel discovered in 1999 affected the groundwater beneath the facility. The facility was remediated to the satisfaction of the Orange County Health Care Agency, and closure was granted May 30, 2000. In addition, the dispenser piping was upgraded in 1999. Total petroleum hydrocarbons as gasoline and diesel were detected in the soil at a maximum concentration of 31 mg/kg and 166 mg/kg, respectively. Benzene, toluene, ethylbenzene, and xylenes (BTEX) were not detected above the laboratory limits in the soil or groundwater samples analyzed during the investigation. A low concentration of MTBE was detected in the groundwater sample (15.6 ppb); however, because the facility did not use MTBE, this result was attributed to an off-site source. Based on these results, closure was issued by the Orange County Health Care Agency in a letter dated May 30, 2000. Additional information, with the exception of the case closure date, was not found on the SWRCB database.	Yes

Table 2.12.1 Properties Proposed for Full and Partial Acquisitions or TCEs with Hazardous Waste Concerns

Map ID[1], Address, APN, and Current Occupant/ Type of Business	Type of Acquisition by Alternative				Databases	Types of Concern	Proposed for Site Investigation
	Alternative 1	Alternative 2	Alternative 3	Alternative 4			
						On December 13, 2011, a routine inspection was conducted on the one single-walled, steel-clad Joor tank, piping, dispenser, and sump at the facility. No violations were noted. During the site reconnaissance, the fuel dispenser was noted at a distance of 20 to 30 feet east-southeast of the partial acquisition area. Residual contamination from the above dispenser piping leak is still present at the facility as noted in the closure letter, although it is limited in area and located only in the upper 5 feet below ground surface. Collect and analyze soil samples from one boring drilled along the eastern boundary of the partial acquisition area to assess whether contamination still remains that is associated with the previous dispenser piping leak.	
Total by Alternative	**4 TCE 3 Partial 0 Full**	**5 TCE 4 Partial 0 Full**	**4 TCE 4 Partial 3 Full**	**3 TCE 3 Partial 3 Full**			

Source: *Initial Site Assessment* (2013).

[1] The locations of these properties are shown on Figures 2.12-1 through 2.12-4 for Alternatives 1, 2, 3, and 4, respectively.

ACMs = asbestos-containing materials
APN = Assessor's Parcel Number
gal = gallons
kg = kilograms
LBP = lead-based paint
lbs = pounds
LUST = leaking underground storage tank
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
MTBE = methyl tertiary-butyl ether
N/A = Not Applicable
NPDES = National Pollutant Discharge Elimination System
ppb = parts per billion
RCRA = Resource Conservation and Recovery Act of 1976
SQG = Small Quantity Generator
SWRCB = State Water Resources Control Board
TCE = temporary construction easement
VOCs = volatile organic compounds

Table 2.12.2 Properties Adjacent to the Maximum Disturbance Limits with Potential Hazardous Waste Concerns

Map ID[1], Address, APN, and Current Occupant/Type of Business	Distance from the Maximum Disturbance Limits	Databases	Type of Concern
Map ID No. B-1 666 East Dyer Road Santa Ana, CA APN 411- 141-12 ITT Cannon, LLC	500 ft west-northwest of the maximum disturbance limits	RCRA-LQG LUST CA FID UST HIST UST SWEEPS UST EnviroStor	According to the RCRA-LQG listing, this facility was listed as a large quantity generator from August 1980 to May 2010. The waste contains chromium, lead, mercury, selenium, cadmium, silver, methyl ethyl ketones, PCE, TCE, other non-halogenated solvents, spent cyanide, and benzene. Several violations were noted; however, most were regarding record keeping and general violations. All violations were corrected. The LUST listing reported a leak of primarily chlorinated solvents that has affected the groundwater beneath the facility. The HIST UST listing lists up to 20 USTs and/or sumps associated with the facility. The contents of the USTs were listed as waste, waste oil, and product. According to the SWRCB Geotracker database, there are 84 on- and off-site groundwater monitoring wells associated with this property. The most recent groundwater monitoring was conducted in 2011. Based on iso-concentration contour maps prepared in 2011, the groundwater quality beneath several properties where TCEs are proposed and the existing right of way have been affected by contamination from the ITT Cannon property. Based on the current project design, technology to be implemented during the placement of bridge pilings, and the depth of construction (upper 5 ft), the likelihood of groundwater being encountered during the construction phase is low. However, soil vapor in the potentially affected proposed right of way may be impacted, and additional assessment may be warranted. No further investigation is recommended at this time as the groundwater plume is known and regulated by local agencies; however, in order to protect the health and safety of workers, VOC monitoring of the breathing zone is recommended during construction activities.
Map ID No. B-2 2344 Pullman Street Santa Ana, CA APN 430-012-02 American Food Service Equipment/ Western Method Machinery Corporation	Adjacent to the maximum disturbance limits	LUST CA FID UST HIST UST SWEEPS UST	The HIST UST listing indicates two tanks (500 gallons and 1,000 gallons) were installed in 1965. The LUST listing states a gasoline leak occurred at the facility that affected the groundwater aquifer beneath the facility. The LUST case is currently open and being remediated. According to the SWRCB Geotracker database, groundwater beneath this parcel flows to the south-southeast, away from the study area. In addition, iso-concentration maps indicate the contaminant plume is isolated to the southeast part of the property and in an area to the east and south of that property, away from the SR-55 right of way and adjoining areas. A hazardous waste storage area was observed in the northwest corner of this property, adjacent to APN 430-012-03, which is proposed as a full

Table 2.12.2 Properties Adjacent to the Maximum Disturbance Limits with Potential Hazardous Waste Concerns

Map ID[1], Address, APN, and Current Occupant/Type of Business	Distance from the Maximum Disturbance Limits	Databases	Type of Concern
			acquisition under the Build Alternatives. As a result of the nature of this business and the location of the cited hazardous waste storage area, there is moderate potential for this property to adversely affect the SR-55 right of way and the adjoining areas.
Map ID No. B-3 1831 South Ritchey Street Santa Ana, CA APN 403-042-02 Bell Industries ESD	200 ft west-northwest of the maximum disturbance limits	RCRA-SQG SLIC Drycleaners	The RCRA-SQG listing does not describe the type of waste generated at this business; however, no violations were noted. The SLIC listing states that a spill of chlorinated solvents (PCE, TCE, 1,4-dioxane) associated with an on-site drycleaners affected the groundwater aquifer under this property. Remediation at the facility includes a large-scale on- and off-site groundwater extraction and treatment system. The plume is listed as remaining undefined, and elevated solvent/dioxane effects persist. According to the SWRCB Geotracker database, the groundwater treatment system treated approximately 91.6 million gallons of groundwater between 2001 and 2012. Although the groundwater flow direction at this property varies as a result of the groundwater extraction system, the overall general direction of the groundwater flow is to the south-southeast. The extraction and remediation of groundwater is ongoing, and there is low to moderate potential for this facility to adversely affect the SR-55 right of way. There is a low to moderate inhalation risk to construction workers working within the project limits.

Source: *Initial Site Assessment*, (2013).

[1] The locations of these properties are shown on Figures 2.12-1 through 2.12-4 for Alternatives 1, 2, 3, and 4, respectively.

APN = Assessor's Parcel Number
CA FID UST = California Environmental Protection Agency Facility Inventory Database for Active and Inactive Underground Storage Tanks
EnviroStor = California Department of Toxic Substances Control database containing information on environmental cleanups and permitted facilities
ft = feet
HIST UST = State Water Resources Control Board Hazardous Substance Storage Container Database of Historical Listing of Underground Storage Tank Sites
LQG = Large Quantity Generator
LUST = State Water Resources Control Board Leaking Underground Storage Tank Listing
PCE = perchloroethylene
RCRA = Resource Conservation and Recovery Act of 1976
SLIC = Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
SQG = Small Quantity Generator
SR-55 = State Route 55
SWEEPS UST = Statewide Environmental Evaluation and Planning System List of Underground Storage Tanks
SWRCB = State Water Resources Control Board
TCE = temporary construction easement, or trichloroethylene
UST = underground storage tank
VOCs = volatile organic compounds

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666 E Dyer Road, Santa Ana

B-1

APN 411-141-12

TECH CENTER DR

E DYER RD

S HOTEL TERRACE DR

S STANDARD AVE

S GRAND AVE

55

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 1
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

0 100 200
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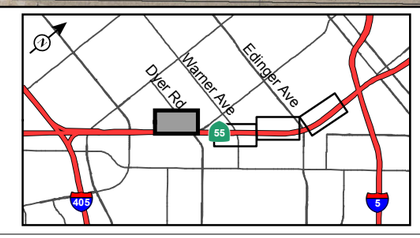

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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FIGURE 2.12-1
Sheet 1 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 1

12-ORA-55 PM 6.4/10.3
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BROOKHOLLOW DR

BROOKHOLLOW DR

E NEWPORT CIR

S RITCHEY ST

55

A-1

APN 430-012-03

2400 S Pullman St, Santa Ana

B-2

APN 430-012-02

2344 S Pullman St, Santa Ana

S PULLMAN ST

E WARNER AVE

E CARNEGIE AVE

1123 Warner Ave, Santa Ana

A-3

APN 430-241-12

BELL AVE

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 1
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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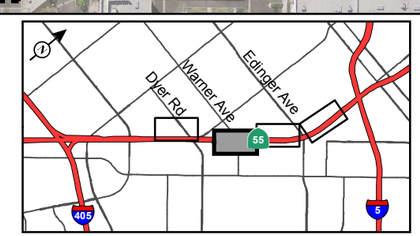

FIGURE 2.12-1
Sheet 2 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 1

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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1831 S Ritchey St, Santa Ana

B-3

APN 403-042-02

1981, 1999 and 2011 S Ritchey St, Santa Ana

A-2

APN 403-041-07

See Inset

E ST ANDREW PL

S RITCHEY ST

E GLENWOOD PL

E OCCIDENTAL ST

BOYD ST

E POMONA ST

E EDINGER AVE

55

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 1
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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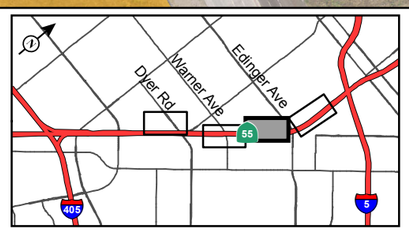

FIGURE 2.12-1
Sheet 3 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 1

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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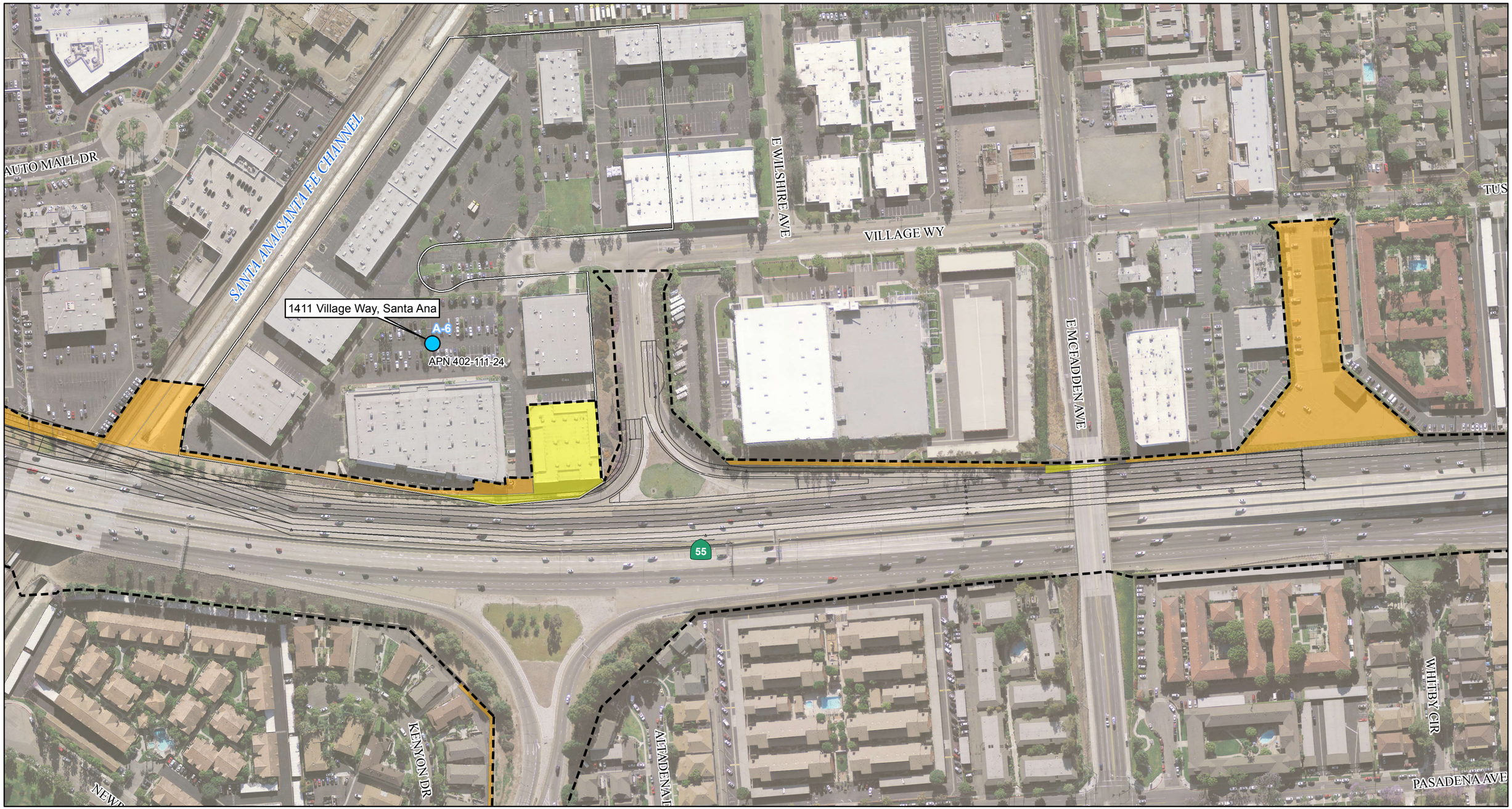

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 1
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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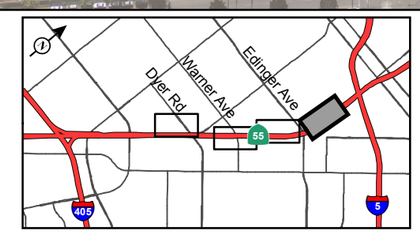

FIGURE 2.12-1
Sheet 4 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 1

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 2
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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FEET

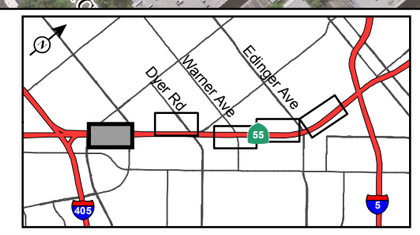

FIGURE 2.12-2
Sheet 1 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 2

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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666 E Dyer Road, Santa Ana

B-1

APN 411-141-12

TECH CENTER DR

E DYER RD

S HOTEL TERRACE DR

S STANDARD AVE

S GRAND AVE

55

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 2
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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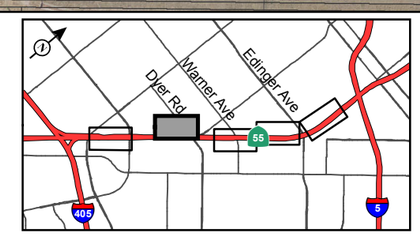

FIGURE 2.12-2
Sheet 2 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 2

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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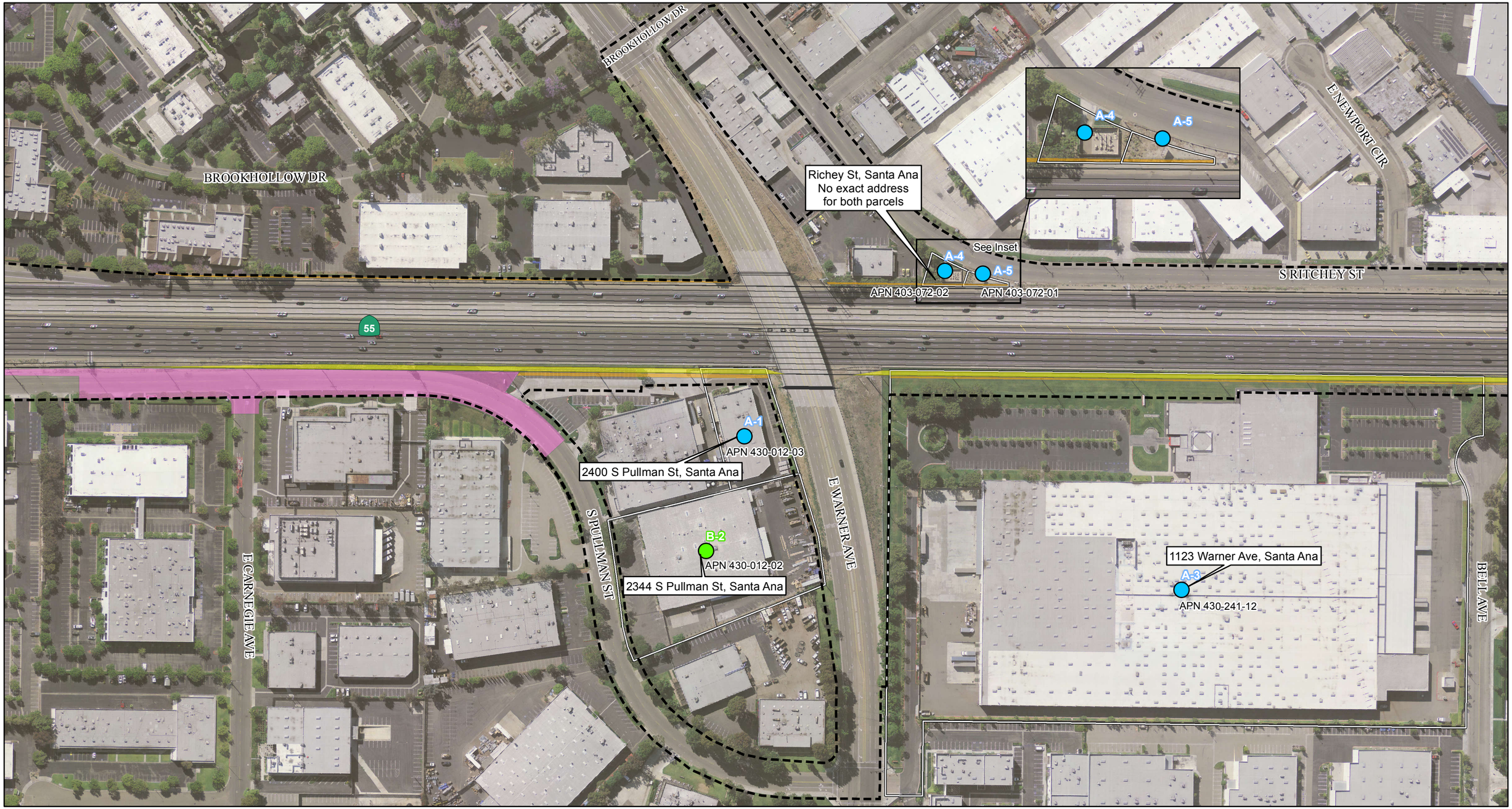

LEGEND

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- Potential Partial Right of Way Acquisition

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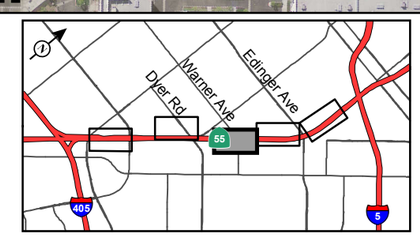

FIGURE 2.12-2
Sheet 3 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 2

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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1831 S Ritchey St, Santa Ana

B-3

APN 403-042-02

1981, 1999 and 2011 S Ritchey St, Santa Ana

A-2

APN 403-041-07

See Inset

E ST ANDREW PL

S RITCHEY ST

E GLENWOOD PL

E OCCIDENTAL ST

E POMONA ST

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E EDINGER AVE

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LEGEND

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- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 2
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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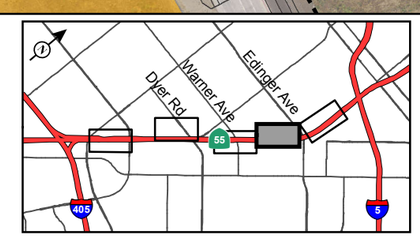

FIGURE 2.12-2
Sheet 4 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 2

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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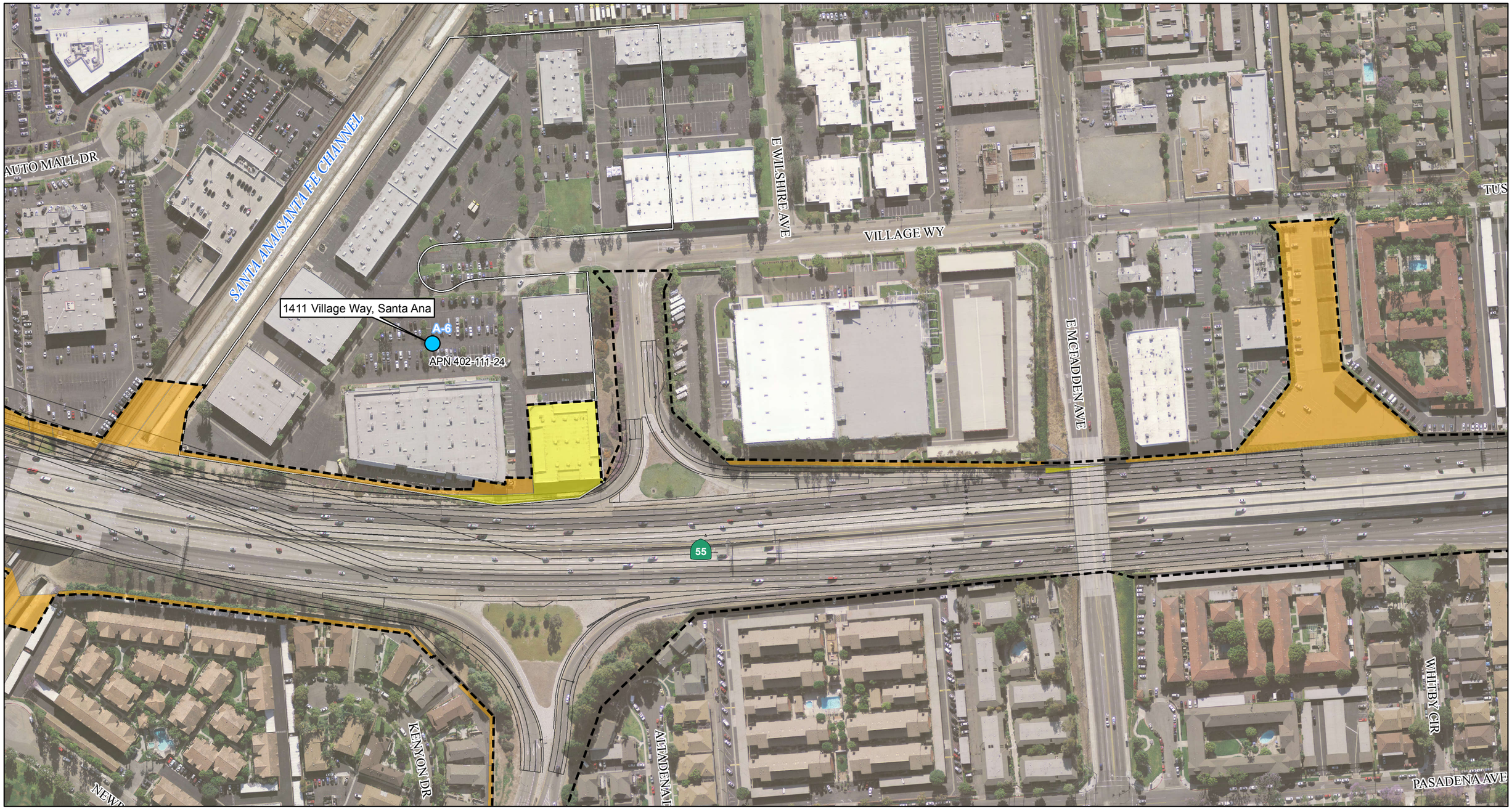

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 2
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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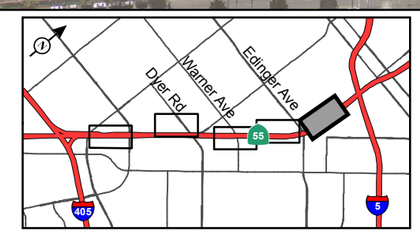

FIGURE 2.12-2
Sheet 5 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 2

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 3
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

0 100 200
FEET

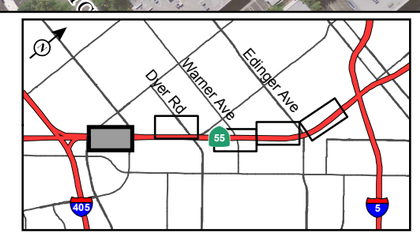

FIGURE 2.12-3
Sheet 1 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 3

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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666 E Dyer Road, Santa Ana

B-1

APN 411-141-12

TECH CENTER DR

E DYER RD

S HOTEL TERRACE DR

S STANDARD AVE

S GRAND AVE

55

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 3
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

0 100 200
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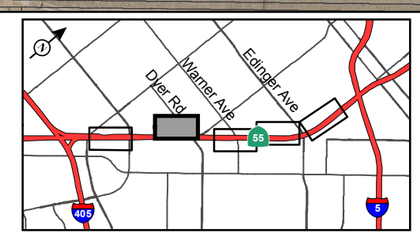

FIGURE 2.12-3
Sheet 2 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 3

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 3
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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FEET

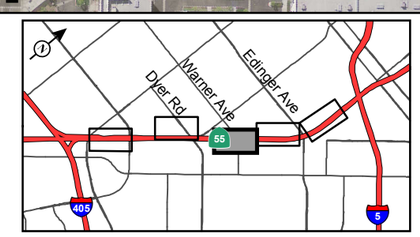

FIGURE 2.12-3
Sheet 3 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 3

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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1831 S Ritchey St, Santa Ana

B-3

APN 403-042-02

1981, 1999 and 2011 S Ritchey St, Santa Ana

A-2

APN 403-041-07

E ST ANDREW PL

S RITCHEY ST

E GLENWOOD PL

E OCCIDENTAL ST

E POMONA ST

BOYD ST

E EDINGER AVE

55

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 3
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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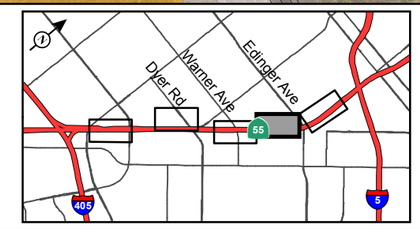

FIGURE 2.12-3
Sheet 4 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 3

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

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AUTO MALL DR
SANTA ANA/SANTA FE CHANNEL
E WILSHIRE AVE
VILLAGE WY
E MCFADDEN AVE
TUS
1411 Village Way, Santa Ana
A-6
APN 402-111-24
55
KENYON DR
ALTADENA
WHITBY CIR
PASADENA AVE

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 3
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

0 100 200
FEET

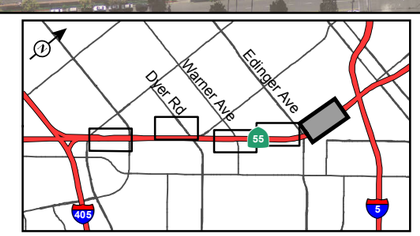

FIGURE 2.12-3
Sheet 5 of 5

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 3

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); HDR (9/2012, 2/2013, 10/2015)

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666 E Dyer Road, Santa Ana

B-1

APN 411-141-12

TECH CENTER DR

E DYER RD

S HOTEL TERRACE DR

S STANDARD AVE

S GRAND AVE

55

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 4
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

0 100 200
FEET

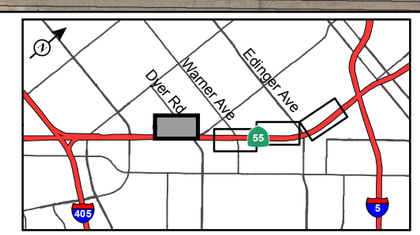

FIGURE 2.12-4
Sheet 1 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 4

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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BROOKHOLLOW DR

BROOKHOLLOW DR

Richey St, Santa Ana
No exact address
for both parcels

E NEWPORT CIR

A-4

A-5

S RITCHEY ST

APN 403-072-02

APN 403-072-01

55

A-1

APN 430-012-03

2400 S Pullman St, Santa Ana

E WARNER AVE

S PULLMAN ST

B-2

APN 430-012-02

2344 S Pullman St, Santa Ana

E CARNEGIE AVE

1123 Warner Ave, Santa Ana

A-3

APN 430-241-12

BELL AVE

LEGEND

- Right of way acquisition with hazardous waste concern
- Property adjacent to project limits with potential hazardous waste concern
- Parcel boundary
- Maximum disturbance limits
- Alternative 4
- Encroachment Area
- Temporary Construction Easement & Possible Staging Area
- Potential Full Right of Way Acquisition
- Potential Partial Right of Way Acquisition

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FEET

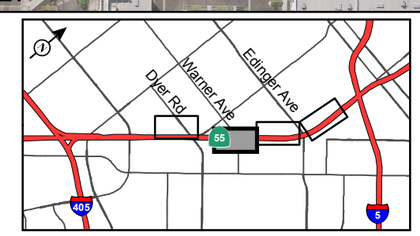

FIGURE 2.12-4
Sheet 2 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 4

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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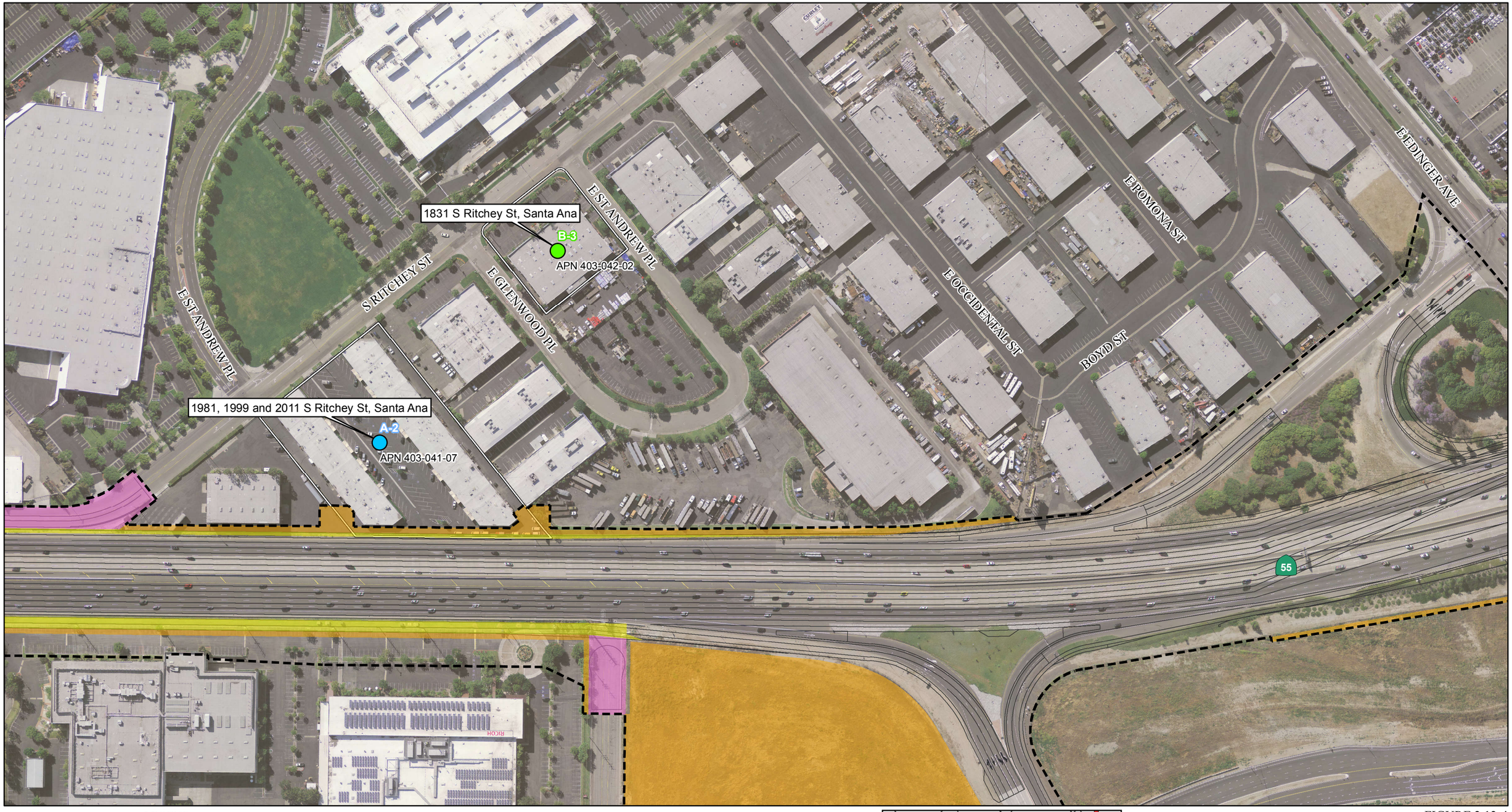

LEGEND

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FEET

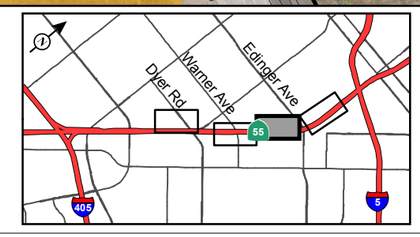

FIGURE 2.12-4
Sheet 3 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 4

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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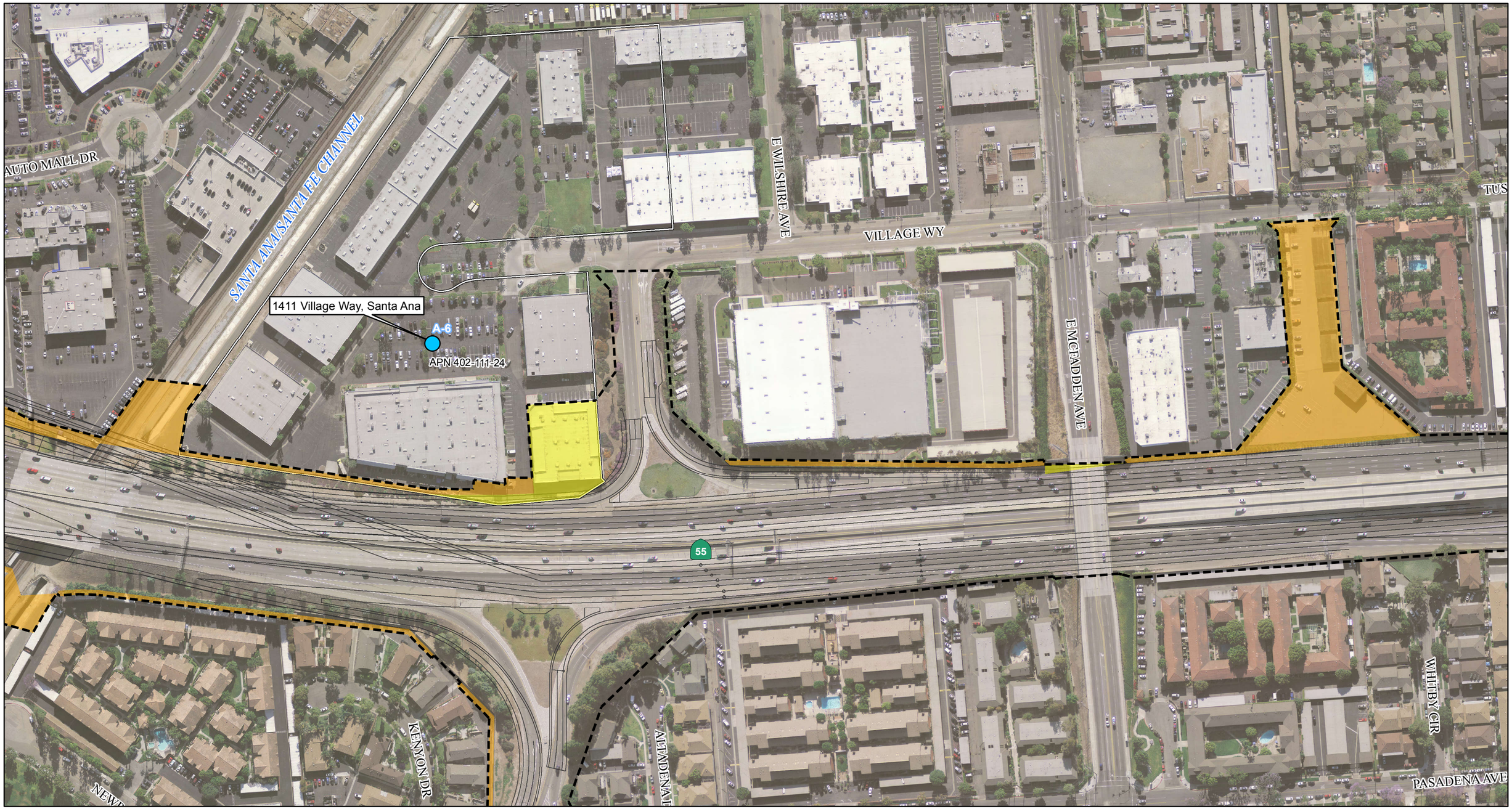

LEGEND

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FEET

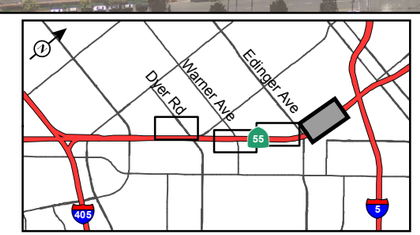

FIGURE 2.12-4
Sheet 4 of 4

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Sites of Potential Hazardous Waste Concern for Alternative 4

12-ORA-55 PM 6.4/10.3
EA 0J3400/EFIS 1200020328

SOURCE: Eagle Aerial (4/2011); TBM (2008); HDR (9/2012); Initial Study Assessment Report from HDR Engineering (Feb 2013)

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2.13 Air Quality

2.13.1 Regulatory Setting

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

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

2.13.1.1 Conformity

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

Conformity requirements apply only in nonattainment and "maintenance" (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or

were violated. U.S. EPA regulations at 40 Code of Federal Regulation (CFR) 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS and do not apply at all for state standards regardless of the status of the area.

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

Conformity analysis at the project-level includes verification that the project is included in the regional conformity analysis and a "hot-spot" analysis if an area is "nonattainment" or "maintenance" for carbon monoxide (CO) and/or particulate matter (PM_{10} or $PM_{2.5}$). A region is "nonattainment" if one or more of the monitoring stations in the region measures a violation of the relevant standard and the U.S. EPA officially designates the area nonattainment. Areas that were previously designated as nonattainment areas but subsequently meet the standard may be officially redesignated to attainment by U.S. EPA and are then called "maintenance" areas. "Hot-spot" analysis is essentially the same, for technical purposes, as CO or particulate matter analysis performed for NEPA purposes. Conformity does include

some specific procedural and documentation standards for projects that require a hot-spot analysis. In general, projects must not cause the "hot-spot" related standard to be violated, and must not cause any increase in the number and severity of violations in nonattainment areas. If a known CO or particulate matter violation is located in the project vicinity, the project must include measures to reduce or eliminate the existing violation(s) as well.

2.13.2 Affected Environment

This section is based on the *Air Quality Assessment Report* (2015) prepared for the project.

2.13.2.1 Climate

The project segment of State Route 55 (SR-55) is located in Orange County, an area within the South Coast Air Basin (Basin), which includes Orange County and the nondesert portions of Los Angeles, Riverside, and San Bernardino Counties. Air quality regulation in the Basin is administered by the South Coast Air Quality Management District (SCAQMD), a regional agency created for the Basin.

The Basin climate is determined by its terrain and geographical location. The Basin is a coastal plain with connecting broad valleys and low hills. The Pacific Ocean forms the southwestern boundary, and high mountains surround the rest of the Basin. The region lies in the semipermanent high pressure zone of the eastern Pacific. The resulting climate is mild and tempered by cool ocean breezes. This climatological pattern is rarely interrupted. However, periods of extremely hot weather, winter storms, and Santa Ana wind conditions do occur.

The annual average temperature varies little throughout the Basin, ranging from the low to middle 60s, measured in degrees Fahrenheit (°F). With a more pronounced oceanic influence, coastal areas show less variability in annual minimum and maximum temperatures than inland areas. The climatological station closest to the project site that monitors temperature is the Tustin Irvine Ranch Station. The annual average maximum temperature recorded at that station is 75.4°F, and the annual average minimum is 49.4°F. January is typically the coldest month in this area of the Basin.

The majority of annual rainfall in the Basin occurs between November and April. Summer rainfall is minimal and generally limited to scattered thundershowers in coastal regions and slightly heavier showers in the eastern part of the Basin along the coastal side of the mountains. The climatological station closest to the project site that

monitors precipitation is the Tustin Irvine Ranch Station. Average rainfall measured at that station varied from 2.67 inches in February to 0.29 inches or less between May and September, with an average annual total of 12.86 inches. Patterns in monthly and yearly rainfall totals are unpredictable due to fluctuations in the weather.

The Basin experiences a persistent temperature inversion (increasing temperature with increasing altitude) as a result of the Pacific high. This inversion limits the vertical dispersion of air contaminants, holding them relatively near the ground. As the sun warms the ground and the lower air layer, the temperature of the lower air layer approaches the temperature of the base of the inversion (upper) layer until the inversion layer finally breaks, allowing vertical mixing with the lower layer. This phenomenon is observed from midafternoon to late afternoon on hot summer days, when the smog appears to clear up suddenly. Winter inversions frequently break by midmorning.

Inversion layers are essential in determining O_3 formation. O_3 and its precursors will mix and react to produce higher concentrations under an inversion. The inversion will also simultaneously trap and hold directly emitted pollutants such as CO. PM_{10} is both directly emitted and created indirectly in the atmosphere as a result of chemical reactions. Concentration levels are directly related to inversion layers due to the limitation of mixing space.

Surface or radiation inversions are formed when the ground surface becomes cooler than the air above it during the night. The earth's surface goes through a radiative process on clear nights, when heat energy is transferred from the ground to a cooler night sky. As the earth's surface cools during the evening hours, the air directly above it also cools, while air higher up remains relatively warm. The inversion is destroyed when heat from the sun warms the ground, which in turn heats the lower layers of air; this heating stimulates the ground level air to float up through the inversion layer.

The combination of stagnant wind conditions and low inversions produces the greatest concentration of pollutants. On days of no inversion or high wind speeds, ambient air pollutant concentrations are the lowest. During periods of low inversions and low wind speeds, air pollutants generated in urbanized areas are transported predominantly onshore into Riverside and San Bernardino Counties. In the winter, the greatest pollution problems are from CO and oxides of nitrogen (NO_X) because of extremely low inversions and air stagnation during the night and early morning hours.

In the summer, the longer daylight hours and the brighter sunshine combine to cause a reaction between hydrocarbons and NO_X to form photochemical smog.

2.13.2.2 Monitored Air Quality

The SCAQMD operates several air quality monitoring stations within the Basin. The air quality monitoring station closest to the project site is the Costa Mesa Air Quality Monitoring Station, and its air quality trends are representative of the ambient air quality in the project area. The pollutants monitored at this station are O_3, SO_2, NO_2, and CO. The closest air quality monitoring site that monitors PM_{10} and $PM_{2.5}$ is the Anaheim Station, and its air quality trends are also representative of the ambient air quality in the project area. Air quality trends identified from data collected at both air quality monitoring stations between 2012 and 2014 are listed in Table 2.13.1.

2.13.2.3 Sensitive Receptors

Sensitive populations (sensitive receptors) are more susceptible to the effects of air pollution than the general population. Sensitive populations in proximity to localized sources of toxics and CO are of particular concern. Land uses that are considered sensitive receptors include residences, hotels, schools, playgrounds, childcare centers, athletic facilities, long-term healthcare facilities, rehabilitation centers, convalescent centers, and retirement homes. The sensitive land uses along the project segment of SR-55 consist primarily of residences and hotels. The sensitive land uses in the project area, their addresses, and their distances from the edge of pavement on SR-55 are listed in Table 2.13.2.

2.13.2.4 Criteria Pollutant Attainment/Nonattainment Status

As noted earlier, the six criteria pollutants are O_3, CO, PM (including both $PM_{2.5}$ and PM_{10}), NO_2, SO_2, and lead. The primary standards for these criteria pollutants are shown in Table 2.13.3 along with a brief description of the health effects associated with exposures to these pollutants and the typical sources of these pollutants. The NAAQS are two-tiered: primary, to protect public health, and secondary, to prevent degradation to the environment (e.g., impairment of visibility, damage to vegetation and property).

Table 2.13.1 Local Air Quality Levels

Pollutant	Primary Standard		Year	Maximum Concentration[1]	Number of Days State/Federal Standard Exceeded
	California	Federal			
Carbon Monoxide (CO) (1 hr)	20.0 ppm for 1 hr	35.0 ppm for 1 hr	2012	2.1 ppm	0 / 0
			2013	2.4 ppm	0 / 0
			2014	2.7 ppm	0 / 0
Carbon Monoxide (CO) (8 hrs)	9.0 ppm for 8 hrs	9 ppm for 8 hrs	2012	1.7 ppm	0 / 0
			2013	2.0 ppm	0 / 0
			2014	1.9 ppm	0 / 0
Ozone (O_3) (1 hr)	0.09 ppm for 1 hr	N/A	2012	0.090 ppm	0 / N/A
			2013	0.095 ppm	1 / N/A
			2014	0.096 ppm	1 / N/A
Ozone (O_3) (8 hrs)	0.07 ppm for 8 hrs	0.075 ppm for 8 hrs	2012	0.076 ppm	1 / 1
			2013	0.084 ppm	2 / 1
			2014	0.080 ppm	6 / 4
Nitrogen Dioxide (NO_2)	0.18 ppm for 1 hr	0.100 ppm for 1 hr	2012	0.074 ppm	0 / 0
			2013	0.075 ppm	0 / 0
			2014	0.060 ppm	0 / 0
Sulfur Dioxide (SO_2)	0.25 ppm for 1 hr	0.075 ppm for 1 hr	2012	0.0062 ppm	0 / 0
			2013	0.0041 ppm	0 / 0
			2014	0.0088 ppm	0 / 0
Coarse Particulate Matter (PM_{10})[2,3]	50 µg/m^3 for 24 hrs	150 µg/m^3 for 24 hrs	2012	48.0 µg/m^3	0 / 0
			2013	77.0 µg/m^3	1 / 0
			2014	85.0 µg/m^3	2 / 0
Fine Particulate Matter ($PM_{2.5}$)[2,4]	N/A	35 µg/m^3 for 24 hrs	2012	50.1 µg/m^3	N/A / 4
			2013	37.8 µg/m^3	N/A / 1
			2014	56.2 µg/m^3	N/A / 6

Source: *Air Quality Assessment Report* (2015).
[1] Maximum concentration is measured over the same period as the California standard.
[2] Measurement taken at the Anaheim Air Quality Monitoring Station.
[3] PM_{10} and $PM_{2.5}$ exceedances are derived from the number of samples exceeded, not days.
[4] $PM_{2.5}$ exceedances are based on the U.S. EPA's revision of the standard to 35 µg/m^3.
µg/m^3 = micrograms per cubic meter
ADAM = Aerometric Data Analysis and Management System
hr/hrs = hour/hours
N/A = not applicable
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ppm = parts per million
U.S. EPA = United States Environmental Protection Agency

Table 2.13.2 Sensitive Land Uses in the Project Area

Land Use Type	Address	Distance from Edge of Pavement on SR-55 (ft)
Hotel	Hutton Centre Drive, Santa Ana, CA	130
Hotel	Grand Avenue, Santa Ana, CA	185
Hotel	Dyer Road, Santa Ana, CA	115
Hotel	Newport Avenue/Edinger Avenue, Tustin, CA	150
Residential	Tustin Grove Drive, Tustin, CA	100
Residential	Kenyon Drive, Tustin, CA	50
Residential	Altadena Drive, Tustin, CA	25
Residential	15863 Pasadena Avenue, Tustin, CA	65
Residential	15829 Pasadena Avenue, Tustin, CA	50
Residential	Medallion Avenue, Tustin, CA	60
Residential	Whitby Circle, Tustin, CA	35
Residential	15641 Pasadena Avenue, Tustin, CA	80
Residential	Boleyn Circle, Tustin, CA	35
Residential	15501 Pasadena Avenue, Tustin, CA	110
Residential	15491 Pasadena Avenue, Tustin, CA	150
Residential	15660 Tustin Village Way, Tustin, CA	50
Residential	15620 Tustin Village Way, Tustin, CA	65
Residential	15580 Tustin Village Way, Tustin, CA	70
Residential	15520 Tustin Village Way, Tustin, CA	135
Residential	15440 Tustin Village Way, Tustin, CA	50
Residential	De Anza Lane, Tustin, CA	35

Source: *Air Quality Assessment Report* (2015).
CA = California
ft = feet
SR-55 = State Route 55

Table 2.13.3 State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State Standard[8]	Federal Standard[9]	Principal Health and Atmospheric Effects	Typical Sources	Attainment Status
Ozone (O_3)[2]	1 hour 8 hours	0.09 ppm 0.070 ppm	---[4] 0.075 ppm (4th highest in 3 years)	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage and cancer. Long-term exposure damages plant materials and reduces crop productivity. Precursor organic compounds include many known toxic air contaminants. Biogenic VOC may also contribute.	Low-altitude ozone is almost entirely formed from reactive organic gases/volatile organic compounds (ROG or VOC) and nitrogen oxides (NO_X) in the presence of sunlight and heat. Major sources include motor vehicles and other mobile sources, solvent evaporation, and industrial and other combustion processes.	Federal: Revoked June 2005 (1-hour) Extreme Nonattainment (8-hour) State: Nonattainment (1-hour and 8-hour)
Carbon Monoxide (CO)	1 hour 8 hours 8 hours (Lake Tahoe)	20 ppm 9.0 ppm[1] 6 ppm	35 ppm 9 ppm ---	CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen. CO also is a minor precursor for photochemical ozone.	Combustion sources, especially gasoline-powered engines and motor vehicles. CO is the traditional signature pollutant for on-road mobile sources at the local and neighborhood scale.	Federal: Attainment/ Maintenance State: Attainment
Respirable Particulate Matter (PM_{10})[2]	24 hours Annual	50 µg/m^3 20 µg/m^3	150 µg/m^3 ---[2] (expected number of days above standard < or equal to 1)	Irritates eyes and respiratory tract. Decreases lung capacity. Associated with increased cancer and mortality. Contributes to haze and reduced visibility. Includes some toxic air contaminants. Many aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke and vehicle exhaust; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources.	Federal: Attainment/ Maintenance State: Nonattainment
Fine Particulate Matter ($PM_{2.5}$)[2]	24 hours Annual Secondary Standard (annual)	--- 12 µg/m^3 ---	35 µg/m^3 12.0 µg/m^3 15 µg/m^3 (98th percentile over 3 years)	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter – a toxic air contaminant – is in the $PM_{2.5}$ size range. Many toxic and other aerosol and solid compounds are part of $PM_{2.5}$.	Combustion including motor vehicles, other mobile sources, and industrial activities; residential and agricultural burning; also formed through atmospheric chemical (including photochemical) reactions involving other pollutants including NO_X, sulfur oxides (SO_X), ammonia, and ROG.	Federal: Nonattainment State: Nonattainment
Nitrogen Dioxide (NO_2)	1 hour Annual	0.18 ppm 0.030 ppm	0.100 ppm[6] (98th percentile over 3 years) 0.053 ppm	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain. Part of the "NO_X" group of ozone precursors.	Motor vehicles and other mobile sources; refineries; industrial operations.	Federal: Attainment/ Maintenance State: Nonattainment

Table 2.13.3 State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State Standard[8]	Federal Standard[9]	Principal Health and Atmospheric Effects	Typical Sources	Attainment Status
Sulfur Dioxide (SO_2)	1 hour 3 hours 24 hours	0.25 ppm --- 0.04 ppm	0.075 ppm[7] (98th percentile over 3 years) 0.5 ppm	Irritates respiratory tract; injures lung tissue. Can yellow plant leaves. Destructive to marble, iron, steel. Contributes to acid rain. Limits visibility.	Fuel combustion (especially coal and high-sulfur oil), chemical plants, sulfur recovery plants, metal processing; some natural sources like active volcanoes. Limited contribution possible from heavy-duty diesel vehicles if ultra-low sulfur fuel not used.	Federal: Attainment/ Unclassified State: Attainment/ Unclassified
Lead (Pb)[3]	Monthly Rolling 3-month average	1.5 µg/m^3 ---	--- 0.15 µg/m^3 [10]	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also a toxic air contaminant and water pollutant.	Lead-based industrial processes like battery production and smelters. Lead paint, leaded gasoline. Aerially deposited lead from gasoline may exist in soils along major roads.	Federal: Nonattainment (Los Angeles County only) State: Nonattainment (Los Angeles County only)
Sulfate	24 hours	25 µg/m^3	---	Premature mortality and respiratory effects. Contributes to acid rain. Some toxic air contaminants attach to sulfate aerosol particles.	Industrial processes, refineries and oil fields, mines, natural sources like volcanic areas, salt-covered dry lakes, and large sulfide rock areas.	Federal: Attainment/ Unclassified State: Attainment/ Unclassified
Hydrogen Sulfide (H_2S)	1 hour	0.03 ppm	---	Colorless, flammable, poisonous. Respiratory irritant. Neurological damage and premature death. Headache, nausea.	Industrial processes such as: refineries and oil fields, asphalt plants, livestock operations, sewage treatment plants, and mines. Some natural sources like volcanic areas and hot springs.	Federal: Attainment/ Unclassified State: Attainment/ Unclassified
Visibility Reducing Particles (VRP)	8 hours	Visibility of 10 miles or more (Tahoe: 30 miles) at relative humidity less than 70 percent	---	Reduces visibility. Produces haze. NOTE: not related to the Regional Haze program under the Federal Clean Air Act, which is oriented primarily toward visibility issues in National Parks and other "Class I" areas.	See particulate matter above.	Federal: Attainment/ Unclassified State: Attainment/ Unclassified

Table 2.13.3 State and Federal Criteria Air Pollutant Standards, Effects, and Sources

Pollutant	Averaging Time	State Standard[8]	Federal Standard[9]	Principal Health and Atmospheric Effects	Typical Sources	Attainment Status
Vinyl Chloride[3]	24 hours	0.01 ppm	---	Neurological effects, liver damage, cancer. Also considered a toxic air contaminant.	Industrial processes	Federal: Attainment/ Unclassified State: Attainment/ Unclassified

Source: *Air Quality Assessment Report* (2015).

1 Rounding to an integer value is not allowed for the State 8-hour CO standard. Violation occurs at or above 9.05 ppm.

2 Annual PM_{10} NAAQS revoked October 2006; was 50 µg/m^3. 24-hour. $PM_{2.5}$ NAAQS tightened October 2006; was 65 µg/m^3. Annual $PM_{2.5}$ NAAQS tightened from 15 µg/m^3 to 12 µg/m^3 December 2012, and secondary standard set at 15 µg/m^3.

3 The ARB has identified vinyl chloride and the particulate matter fraction of diesel exhaust as toxic air contaminants. Diesel exhaust particulate matter is part of PM_{10} and, in larger proportion, $PM_{2.5}$. Both the ARB and the EPA have identified lead and various organic compounds that are precursors to ozone and $PM_{2.5}$ as toxic air contaminants. There are no exposure criteria for substantial health effect due to toxic air contaminants, and control requirements may apply at ambient concentrations below any criteria levels specified above for these pollutants or the general categories of pollutants to which they belong.

4 Prior to June 2005, the 1-hour NAAQS was 0.12 ppm. Emission budgets for 1-hour ozone are still in use in some areas where 8-hour ozone emission budgets have not been developed, such as the San Francisco Bay Area.

5 The 0.08 ppm 1997 ozone standard is revoked FOR CONFORMITY PURPOSES ONLY when area designations for the 2008 0.75 ppm standard become effective for conformity use (July 20, 2013). Conformity requirements apply for all NAAQS, including revoked NAAQS, until emission budgets for newer NAAQS are found adequate, SIP amendments for the newer NAAQS are approved with a emission budget, EPA specifically revokes conformity requirements for an older standard, or the area becomes attainment/unclassified. SIP-approved emission budgets remain in force indefinitely unless explicitly replaced or eliminated by a subsequent approved SIP amendment. During the "Interim" period prior to availability of emission budgets, conformity tests may include some combination of build vs. no build, build vs. baseline, or compliance with prior emission budgets for the same pollutant.

6 Final 1-hour NO_2 NAAQS published in the Federal Register on February 9, 2010, effective March 9, 2010. Initial area designation for California (2012) was attainment/unclassifiable throughout. Project-level hot-spot analysis requirements do not currently exist. Near-road monitoring starting in 2013 may cause redesignation to nonattainment in some areas after 2016.

7 The EPA finalized a 1-hour SO_2 standard of 75 ppb in June 2010. Nonattainment areas have not yet been designated as of September 2012.

8 State standards are "not to exceed" or "not to be equaled or exceeded" unless stated otherwise. Federal standards are "not to exceed more than once a year" or as described above.

9 Secondary standard, set to protect public welfare rather than health. Conformity and environmental analysis address both primary and secondary NAAQS.

10 Lead NAAQS are not considered in Transportation Conformity analysis.

µg/m^3 = micrograms per cubic meter
ARB = California Air Resources Board
EPA = United States Environmental Protection Agency
NAAQS = national ambient air quality standards
NO_X = nitrogen oxides
ppb = parts per billion
ppm = parts per million
ROG = reactive organic gases
VOC = volatile organic compounds

Air quality monitoring stations are located throughout the nation and maintained by the local air districts and State air quality regulating agencies. Data collected at permanent monitoring stations are used by the U.S. EPA to identify regions as "attainment," "nonattainment," or "maintenance," depending on whether the regions meet the requirements stated in the primary NAAQS. Nonattainment areas are imposed with additional restrictions as required by the U.S. EPA. In addition, different classifications of nonattainment (e.g., marginal, moderate, serious, severe, and extreme) are used to classify each air basin in the State on a pollutant-by-pollutant basis. The classifications are used as a foundation to create air quality management strategies to improve air quality and comply with the NAAQS. The Basin's attainment status for each of the criteria pollutants is listed in Table 2.13.3.

2.13.3 Environmental Consequences

2.13.3.1 Temporary Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

Construction Air Quality Conformity

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

Construction Emissions

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 other construction activities. Emissions from construction equipment are expected and would include CO, NO_X, volatile organic compounds (VOCs), directly-emitted particulate matter (PM_{10} and $PM_{2.5}$), and toxic air contaminants such as diesel exhaust particulate matter. Ozone is a regional pollutant that is derived from NO_X and VOCs in the presence of sunlight and heat.

Site preparation and roadway construction typically involve 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 PM_{10}, $PM_{2.5}$, and small amounts of CO, SO_2, NO_X, and VOCs and cause 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 added source of airborne dust after it dries. PM_{10} emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM_{10} emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of equipment in operation. 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 1.2 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. The California Department of Transportation (Caltrans) Standard Specifications (Section 14-9.03) regarding dust minimization requirements demand use of water or dust palliative compounds and would reduce potential fugitive dust emissions during construction.

In addition to dust-related PM_{10} emissions, heavy-duty trucks and construction equipment powered by gasoline and diesel engines would generate CO, SO_2, NO_X, VOCs, and some soot particulate (PM_{10} and $PM_{2.5}$) 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_2 is generated by oxidation during combustion of organic sulfur compounds contained in diesel fuel. Under California law and ARB regulations, off-road diesel fuel used in California must meet the same sulfur and additional standards as on-road diesel fuel (not more than 15 parts per million [ppm] sulfur), and as such, SO_2-related issues due to diesel exhaust would 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 quickly disperse to below detectable thresholds as distance from the site(s) increases.

The estimated peak-day construction emissions for the Build Alternatives are summarized in Table 2.13.4. Because the construction activities would be similar for each Build Alternative, the peak-day construction emissions would be the same for each Build Alternative.

Table 2.13.5 summarizes the total construction emissions (in tons) generated during the approximately 36-month project construction schedule. The total area disturbed during construction would range from a low of 38.9 acres (ac) for Alternative 1 to a high of 77.2 ac for Alternative 3. The construction emission calculations are based on the larger disturbance area required for Alternative 3.

Table 2.13.4 Peak-Day Construction Emissions by Construction Phase

Construction Phase	Emissions[1] (lbs/day)					
	CO	ROGs	NO_x	PM_{10}[2]	$PM_{2.5}$[2]	CO_2
Grubbing/Land Clearing	60	11	104	105	25	12,050
Grading/Excavation	102	19	283	111	30	47,460
Drainage/Utilities/Sub-Grade	64	10	87	105	25	12,310
Paving	46	6	47	3	2	8,000

Source: *Air Quality Assessment Report* (2015).
[1] Emissions calculated using Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model, Version 7.1.5.1.
[2] Total PM_{10} and $PM_{2.5}$ daily emission rate with fugitive dust mitigation measures, providing a 50 percent reduction, implemented.
CO = carbon monoxide
CO_2 = carbon dioxide
lbs/day = pounds per day
NO_X = oxides of nitrogen
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ROGs = reactive organic gases

Table 2.13.5 Total Construction Emissions

	Emissions[1] (tons)					
	CO	ROGs	NO_x	PM_{10}[2]	$PM_{2.5}$[2]	CO_2
Total Construction	31	5	68	37	9	10,870

Source: *Air Quality Assessment Report* (2015).
[1] Emissions calculated using Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model, Version 7.1.5.1
[2] Total PM_{10} and $PM_{2.5}$ daily emission rate with fugitive dust mitigation measures, providing a 50 percent reduction, implemented.
CO = carbon monoxide
CO_2 = carbon dioxide
NO_X = oxides of nitrogen
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ROGs = reactive organic gases

Naturally Occurring Asbestos

The project is located in Orange County, which is not among the counties listed as containing serpentine and ultramafic rock. Therefore, the impact from naturally occurring asbestos (NOA) during construction of the project would be minimal to none.

No Build Alternative

The No Build Alternative would not result in the construction of any improvements to SR-55 in the project area and, therefore, would not result in temporary impacts to air quality.

2.13.3.2 Permanent Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

Regional Air Quality Conformity

The proposed project is listed in the 2012–2035 financially constrained Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), which was found to conform by the Southern California Association of Governments (SCAG) on April 4, 2012, and the FHWA and the FTA made a regional conformity determination finding on June 4, 2012. The project is also included in SCAG's financially constrained 2015 FTIP, page 4. The 2015 FTIP was determined to conform by FHWA and the FTA on December 15, 2014. The design concept and scope of the proposed project is consistent with the project description in the 2012–2035 RTP/SCS and the 2015 FTIP, and the open to traffic assumptions of SCAG's regional emissions analysis. The listings of the SR-55 project in the 2012–2035 RTP/SCS and the 2015 FTIP are provided in Appendix G, 2012 RTP and 2015 FTIP Project Listings.

Project-Level Conformity

Because the project limits are within an attainment/maintenance area for CO and PM_{10} and a nonattainment area for federal $PM_{2.5}$ federal standards, local hot-spot analyses for CO, $PM_{2.5}$, and PM_{10} are required for conformity purposes. The results of these hot-spot analyses are provided below.

Carbon Monoxide

The methodology required for a CO local analysis is summarized in the Caltrans Transportation Project-Level Carbon Monoxide Protocol (Protocol), Sections 3 (Determination of Project Requirements) and 4 (Local Analysis). In Section 3, the Protocol provides two conformity requirement decision flowcharts that are designed to assist project sponsors in evaluating the requirements that apply to specific projects. The flowchart in Figure 1 of the Protocol (provided as Appendix B in the *Air Quality Assessment Report*) applies to new projects and was used in this local analysis conformity decision. Below is a step-by-step explanation of the flow chart. Each level cited is followed by a response, which in turn determines the next applicable level of the flowchart for the project. The flowchart begins with Section 3.1.1:

- **3.1.1. Is this project exempt from all emissions analyses?**
  NO.

  Table 1 of the Protocol is Table 2 of Section 93.126 of 40 CFR. Section 3.1.1 is inquiring if the project is exempt. Such projects appear in Table 1 of the Protocol. The proposed project would be widening an existing highway; therefore, the project is not exempt from all emissions analyses.

- **3.1.2. Is the project exempt from regional emissions analyses?**
  NO.

  Table 2 of the Protocol is Table 3 of Section 93.127 of 40 CFR. The question is attempting to determine whether the project is listed in Table 2. Projects that are included in Table 2 of the Protocol are exempt from regional conformity. The proposed project would be widening an existing highway; therefore, it is not exempt from regional emissions analysis.

- **3.1.3. Is the project locally defined as regionally significant?**
  YES.

  As mentioned above, the proposed project would be widening an existing highway; therefore, the project is potentially regionally significant.

- **3.1.4. Is the project in a federal attainment area?**
  NO.

  The project is located in an attainment/maintenance area for the federal CO standard; therefore, the project is subject to a regional conformity determination.

- **3.1.5. Are there a currently conforming Regional Transportation Plan [RTP] and transportation improvement program [TIP]?**
  YES.

- **3.1.6. Is the project included in the regional emissions analysis supporting the currently conforming Regional Transportation Plan [RTP] and transportation improvement program [TIP]?**
  YES.

  As discussed earlier, the project is included in the SCAG 2012 RTP and the 2015 FTIP. Project ID: ORA100511, Description: SR-55 widening between I-405 and

I-5 – Add one mixed-flow lane in each direction and fix chokepoints from I-405 to I-5, add one auxiliary lane in each direction between select on/off-ramps and noncapacity operational improvements through project limits. The 2012 RTP and the 2015 FTIP listings are provided in Appendix G.

- **3.1.7. Has the project design concept and/or scope changed significantly from that in the regional analysis?**
  NO.

- **3.1.9. Examine local impacts.**
  Section 3.1.9 of the flowchart directs the project evaluation to Section 4 (Local Analysis) of the Protocol. This includes Figure 1.

Section 4 contains Figure 3 (Local CO Analysis). This flowchart is used to determine the type of CO analysis required for the Build Alternatives. Below is a step-by-step explanation of the flowchart. Each level cited is followed by a response, which in turn determines the next applicable level of the flowchart for the Build Alternatives. The flowchart begins at Level 1:

- **Level 1. Is the project in a CO non-attainment area?**
  NO.

  The project site is located in an area that has demonstrated attainment with the federal CO standard.

- **Level 1 (cont.). Was the area redesignated as "attainment" after the 1990 Clean Air Act?**
  YES.

- **Level 1 (cont.). Has "continued attainment" been verified with the local Air District, if appropriate?**
  YES.

  The Basin was designated as attainment/maintenance by the U.S. EPA on June 11, 2007. (Proceed to Level 7.)

- **Level 7. Does the project worsen air quality?**
  YES.

Because two of the following conditions (listed in Section 4.7.1 of the CO Protocol) are met, the project would potentially worsen air quality:

a. *The project significantly increases the percentage of vehicles operating in cold start mode. Increasing the number of vehicles operating in cold start mode by as little as 2 percent should be considered potentially significant.*

   It is assumed that all vehicles on the freeway and in the intersections are in a fully warmed-up mode. Therefore, this criterion is not met.

b. *The project significantly increases traffic volumes. Increases in traffic volumes in excess of 5 percent should be considered potentially significant. Increasing the traffic volume by less than 5 percent may still be potentially significant if there is also a reduction in average speeds.*

   As shown in Tables 2.13.6 through 2.13.9, the proposed project would increase traffic volumes along SR-55 by up to 17,645 vehicles per day, which is an increase of 7 percent over the No Build Alternative. Therefore, this criterion is met.

c. *The project worsens traffic flow. For uninterrupted roadway segments, a reduction in average speeds (within a range of 3 to 50 miles per hour [mph]) should be regarded as worsening traffic flow. For intersection segments, a reduction in average speed or an increase in average delay should be considered as worsening traffic flow.*

   As shown in Tables 9-A through 9-D in the *Traffic Operations Report* (2015), the proposed project would increase the peak-hour delay at several ramps and highway segments along SR-55. These tables are also included in Appendix B in the *Air Quality Assessment Report* (2015). Therefore, this criterion is met.

- **Level 7 (cont.). Is the project suspected of resulting in higher CO concentrations than those existing within the region at the time of attainment demonstration?**
  NO.

  Therefore, the project has been determined to be satisfactory. No further analysis is needed.

Table 2.13.6 2020 SR-55 Traffic Volumes

Segment	No Build Alternative		Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT
South of I-405	172,260	9,991	172,745	10,019	173,285	10,051	173,465	10,061	172,875	10,027
Between I-405 and Main St	252,105	14,622	253,620	14,710	256,120	14,855	257,185	14,917	254,230	14,745
Between Main St and Dyer Rd	264,465	15,339	266,490	15,456	268,875	15,595	270,425	15,685	268,680	15,583
Between Dyer Rd and Edinger Ave	278,260	16,139	281,180	16,308	283,300	16,431	285,070	16,534	283,325	16,433
Between Edinger Ave and McFadden Ave	290,280	16,836	293,015	16,995	294,780	17,097	296,370	17,189	295,380	17,132
Between McFadden Ave and I-5	253,375	14,696	255,330	14,809	256,770	14,893	258,320	14,983	257,530	14,937
North of Irvine Blvd/4th St	219,965	12,758	220,320	12,779	220,735	12,803	221,400	12,841	220,765	12,804

Source: *Air Quality Assessment Report* (2015).
ADT = average daily trips
Ave = Avenue
Blvd = Boulevard
I-405 = Interstate 405
I-5 = Interstate 5
Rd = Road
SR-55 = State Route 55
St = Street

Table 2.13.7 2040 SR-55 Traffic Volumes

Segment	No Build Alternative		Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT
South of I-405	178,455	10,350	179,315	10,400	180,730	10,482	181,520	10,528	179,660	10,420
Between I-405 and Main St	260,950	15,135	265,235	15,384	271,515	15,748	274,590	15,926	266,060	15,431
Between Main St and Dyer Rd	270,250	15,675	275,295	15,967	281,480	16,326	285,130	16,538	278,540	16,155
Between Dyer Rd and Edinger Ave	281,920	16,351	289,320	16,781	294,815	17,099	299,565	17,375	292,615	16,972
Between Edinger Ave and McFadden Ave	293,650	17,032	300,890	17,452	306,055	17,751	309,675	17,961	304,605	17,667
Between McFadden Ave and I-5	267,135	15,494	272,925	15,830	276,225	16,021	280,335	16,259	276,980	16,065
North of Irvine Blvd/4th St	262,025	15,197	263,135	15,262	264,530	15,343	265,255	15,385	264,285	15,329

Source: *Air Quality Assessment Report* (2015).
ADT = average daily trips
Ave = Avenue
Blvd = Boulevard
I-405 = Interstate 405
I-5 = Interstate 5
Rd = Road
SR-55 = State Route 55
St = Street

Table 2.13.8 Change in 2020 SR-55 Traffic Volumes Between the No Build and Build Alternatives

Segment	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT
South of I-405	485	28	1,025	59	1,205	70	615	36
Between I-405 and Main St	1,515	88	4,015	233	5,080	295	2,125	123
Between Main St and Dyer Rd	2,025	117	4,410	256	5,960	346	4,215	244
Between Dyer Rd and Edinger Ave	2,920	169	5,040	292	6,810	395	5,065	294
Between Edinger Ave and McFadden Ave	2,735	159	4,500	261	6,090	353	5,100	296
Between McFadden Ave and I-5	1,955	113	3,395	197	4,945	287	4,155	241
North of Irvine Blvd/4th St	355	21	770	45	1,435	83	800	46

Source: *Air Quality Assessment Report* (2015).
ADT = average daily trips
Ave = Avenue
Blvd = Boulevard
I-405 = Interstate 405
I-5 = Interstate 5
Rd = Road
SR-55 = State Route 55
St = Street

Table 2.13.9 Change in 2040 SR-55 Traffic Volumes Between the No Build and Build Alternatives

Segment	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT	ADT	Truck ADT
South of I-405	860	50	2,275	132	3,065	178	1,205	70
Between I-405 and Main St	4,285	249	10,565	613	13,640	791	5,110	296
Between Main St and Dyer Rd	5,045	293	11,230	651	14,880	863	8,290	481
Between Dyer Rd and Edinger Ave	7,400	429	12,895	748	17,645	1,023	10,695	620
Between Edinger Ave and McFadden Ave	7,240	420	12,405	719	16,025	929	10,955	635
Between McFadden Ave and I-5	5,790	336	9,090	527	13,200	766	9,845	571
North of Irvine Blvd/4th Street	1,110	64	2,505	145	3,230	187	2,260	131

Source: *Air Quality Assessment Report* (2015).
ADT = average daily trips
Ave = Avenue
Blvd = Boulevard
I-405 = Interstate 405
I-5 = Interstate 5
Rd = Road
SR-55 = State Route 55
St = Street

CO concentrations at the intersections under study would be lower than those reported for the maximum of the intersections analyzed in the CO attainment plan because all the following conditions, listed in Section 4.7.2 of the CO Protocol, are satisfied:

a. The receptor locations at the intersections under study are at the same distance or farther from the traveled roadway than the receptor locations used in the intersections in the attainment plan. The attainment plan evaluates the CO concentrations at a distance of 10 feet (ft) from the edges of the roadways. The CO Protocol does not permit the modeling of receptor locations closer than this distance.
b. The project intersection traffic volumes and geometries are not substantially different from those included in the attainment plan. Also, the intersections under study have less total traffic and the same number of lanes or fewer than the intersections in the attainment plan.
c. The assumed meteorology for the intersections under study is the same as the assumed meteorology for the intersections in the attainment plan. Both use the worst-case scenario meteorology settings in the CALINE4 and/or CAL3QHC models.
d. As shown in Table 2.13.10, traffic lane volumes for all approach and departure segments are lower for the intersections under study than those assumed for the intersections in the attainment plan. The intersections in the attainment plan include Wilshire Boulevard/Veteran Avenue, Sunset Boulevard/Highland Avenue, La Cienega Boulevard/Century Boulevard, and Long Beach Boulevard/Imperial Highway. The intersections under study were selected based on their levels of service (LOS) and the proposed project's contribution to the total traffic volumes.
e. The percentages of vehicles operating in cold start mode are the same or lower for the intersections under study compared to those used for the intersections in the attainment plan. It is assumed that all vehicles in the intersections are operating in fully warmed-up mode.
f. The percentages of heavy-duty gas trucks in the intersections under study are the same or lower than the percentages used for the intersections in the attainment plan analysis. It is assumed that traffic distribution at the intersections under study does not vary from the EMFAC2007 standards.

Table 2.13.10 Traffic Volume Comparison

Attainment Plan Maximum Volumes	Intersection 1		Intersection 2		Intersection 3		Intersection 4	
	AM	PM	AM	PM	AM	PM	AM	PM
Existing Traffic Volumes	Wilshire Blvd/ Veteran Ave		Sunset Blvd/ Highland Ave		La Cienega Blvd/ Century Blvd		Long Beach Blvd/ Imperial Hwy	
Intersection Total	8,062	7,719	6,614	7,374	6,635	8,674	4,212	5,514
Turn Maximum	384	780	200	263	700	1,187	176	202

Build Alternative Maximum Volumes	Intersection 1		Intersection 2		Intersection 3		Intersection 4	
	AM	PM	AM	PM	AM	PM	AM	PM
2040 No Build Conditions	SR-55 NB Ramps/ Irvine Blvd		SR-55 SB Ramps/ Edinger Ave		SR-55 SB Ramps/ MacArthur Blvd		SR-55 NB Ramps/ MacArthur Blvd	
Intersection Total	3,750	3,905	4,845	5,060	5,465	5,700	4,955	5,350
Turn Maximum	725	595	500	440	825	1,080	1,035	1,040
2040 Alt 1 Build Conditions	SR-55 NB Ramps/ Irvine Blvd		SR-55 SB Ramps/ Edinger Ave		SR-55 SB Ramps/ MacArthur Blvd		SR-55 NB Ramps/ MacArthur Blvd	
Intersection Total	3,785	3,915	4,845	5,075	5,515	5,750	5,015	5,430
Turn Maximum	750	595	500	445	825	1,080	1,035	1,070
2040 Alt 2 Build Conditions	SR-55 NB Ramps/ Irvine Blvd		SR-55 SB Ramps/ Edinger Ave		SR-55 SB Ramps/ MacArthur Blvd		SR-55 NB Ramps/ MacArthur Blvd	
Intersection Total	3,785	3,920	4,845	5,110	5,545	5,800	5,045	5,500
Turn Maximum	750	600	500	465	825	1,080	1,035	1,090
2040 Alt 3 Build Conditions	SR-55 NB Ramps/ Irvine Blvd		SR-55 SB Ramps/ Edinger Ave		SR-55 SB Ramps/ MacArthur Blvd		SR-55 NB Ramps/ MacArthur Blvd	
Intersection Total	3,795	3,940	4,865	5,140	5,565	5,830	5,080	5,560
Turn Maximum	755	600	520	495	825	1,080	1,035	1,120
2040 Alt 4 Build Conditions	SR-55 NB Ramps/ Irvine Blvd		SR-55 SB Ramps/ Edinger Ave		SR-55 SB Ramps/ MacArthur Blvd		SR-55 NB Ramps/ MacArthur Blvd	
Intersection Total	3,800	3,925	4,845	5,085	5,525	5,760	5,050	5,480
Turn Maximum	765	595	500	445	830	1,080	1,035	1,110

Source: *Air Quality Assessment Report* (2015).
Alt = Alternative
Ave = Avenue
Blvd = Boulevard
Hwy = Highway
NB = northbound
SB = southbound
SR-55 = State Route 55

g. Average delay and queue length for each approach are the same or less for the intersections under study compared to those found in the intersections in the attainment plan. The predicted LOS for the intersections under study range from LOS A to LOS F. The LOS for the intersections in the attainment plan are not listed; however, the traffic counts and intersection geometries correspond to LOS F for three of the four intersections in the attainment plan.
h. The background CO concentrations in the area of the intersections under study are 2.7 ppm for 1 hour and 2.0 ppm for 8 hours, which is lower than the background concentrations for the intersections in the attainment plan. These varied from 5.3 to 13.2 ppm for 1 hour and 3.7 to 9.9 ppm for 8 hours.

The project is not expected to result in any concentrations exceeding the 1-hour or 8-hour CO standards. Therefore, a detailed CALINE4 CO hot-spot analysis is not required.

Particulate Matter (PM_{10} and $PM_{2.5}$)

The proposed project is within a nonattainment area for the federal $PM_{2.5}$ and PM_{10} standards. Therefore, per 40 CFR Part 93, analyses are required for conformity purposes. The U.S. EPA specified in 40 CFR 93.123(b)(1) of the 2006 Final Rule that projects of air quality concern (POAQCs) are certain highway and transit projects that involve significant levels of diesel vehicle traffic, or any other project that is identified in the $PM_{2.5}$ and PM_{10} SIP as a localized air quality concern. The 2006 Final Rule defines the POAQCs that require a $PM_{2.5}$ and PM_{10} hot-spot analysis in 40 CFR 93.123(b)(1) as:

i. New or expanded highway projects that have a significant number of or significant increase in diesel vehicles;

ii. Projects affecting intersections that are at LOS D, E, or F with a significant number of diesel vehicles, or those that will change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;

iii. New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;

iv. Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; or

v. Projects in or affecting locations, areas, or categories of sites that are identified in the $PM_{2.5}$ and PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

A *PM Conformity Hot Spot Analysis for the SR-55 Improvement Project* was presented to the SCAG Transportation Conformity Working Group (TCWG) on June 26, 2012. The TCWG determined that the proposed project would meet Criterion (i) because it would expand an existing freeway with existing and future high truck volumes. Because the proposed project meets one of the five criteria listed

above, it is considered to be a POAQC, and a qualitative project-level $PM_{2.5}$ and PM_{10} hot-spot analysis was conducted to assess whether the project would cause or contribute to any new localized $PM_{2.5}$ or PM_{10} violations, increase the frequency or severity of any existing violations, or delay timely attainment of the $PM_{2.5}$ and PM_{10} NAAQS. A copy of the draft PM hot-spot analysis is provided in Appendix E in the *Air Quality Assessment Report*. At the December 3, 2013, SCAG meeting, the TCWG determined that the detailed analysis was acceptable for NEPA circulation. Subsequent to the TCWG approval, the forecasted SR-55 traffic volumes were updated. On July 28, 2015, the TCWG determined the updated SR-55 traffic volumes would not affect the conclusions of the qualitative PM hot-spot analysis and reaffirmed that the analysis was acceptable for NEPA circulation. Copies of the TCWG determinations are provided in Chapter 3, Comments and Coordination, and are also included in Appendix E in the *Air Quality Assessment Report*.

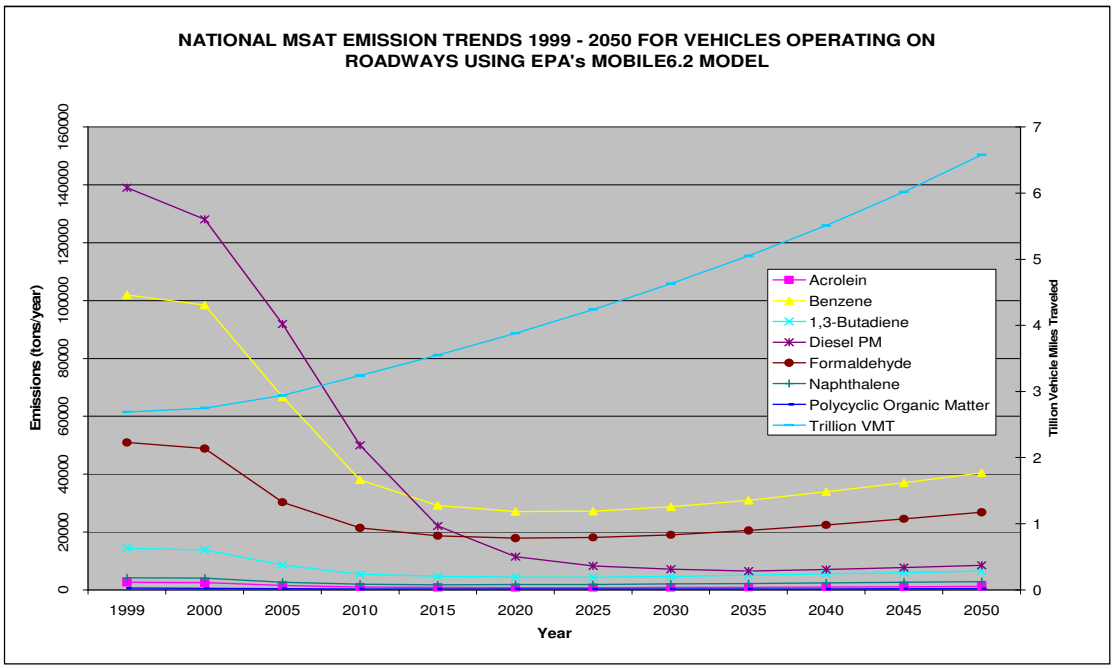
Mobile-Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, the U.S. EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, nonroad mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. EPA regulate 188 air toxics, also known as hazardous air pollutants. The U.S. EPA has assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System (IRIS). In addition, the U.S. EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from its 1999 National Air Toxics Assessment (NATA). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter (POM). While the FHWA considers these the priority Mobile Source Air Toxics (MSATs), the list is subject to change and may be adjusted in consideration of future U.S. EPA rules.

The 2007 U.S. EPA rule described above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using the U.S. EPA MOBILE 6.2 model, even if vehicle activity (in

terms of vehicle miles traveled [VMT]) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSATs is projected from 1999 to 2050, as shown on Figure 2.13-1. The projected reduction in MSAT emissions would be slightly different in California due to the use of the EMFAC2007 emission model in place of the MOBILE 6.2 model.



Source: *Air Quality Assessment Report* (2015).

Figure 2.13-1 National MSAT Emission Trends

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, we are duly expected by the public and other agencies to address MSAT impacts in our environmental documents. The FHWA, the U.S. EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the federal government be interpreted and administered in accordance with its environmental protection goals. NEPA also requires federal agencies to use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment. NEPA requires, and FHWA is committed to, the examination and avoidance of potential impacts to the natural and human environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest. The FHWA policies and procedures for implementing NEPA are contained in regulations at 23 CFR Part 771.

In December 2012, the FHWA issued guidance to advise FHWA division offices as to when and how to analyze MSATs in the NEPA process for highways. This document is an update to the guidance released in February 2006 and September 2009. The guidance is described as interim because MSAT science is still evolving. As the science progresses, FHWA will update the guidance. This analysis follows the FHWA guidance.

Information that is Unavailable or Incomplete

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

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

Other organizations are also active in the research and analyses of the human health effects of MSATs, including the Health Effects Institute. Two Health Effects Institute studies are summarized in Appendix D in FHWA's *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*. Among the adverse health effects linked to MSAT compounds at high exposures are cancer in humans in occupational settings, cancer in animals, and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations or in the future, as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts. Each step in the process builds on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevent a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified due to required lifetime (i.e., 70-year) exposure methodologies, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affect emissions rates) over that time frame because such information is unavailable. The results produced by the U.S. EPA MOBILE 6.2 model, the California EPA EMFAC2007 model, and the U.S. EPA Draft Motor Vehicle Emission Simulator (MOVES) 2009 model in forecasting MSAT emissions are highly inconsistent. Indications from the development of the MOVES model are that MOBILE 6.2 significantly underestimates diesel particulate matter (Diesel PM) emissions and significantly overestimates benzene emissions.

Regarding air dispersion modeling, an extensive evaluation of the U.S. EPA's guideline CAL3QHC model was conducted in a National Cooperative Highway Research Program (NCHRP) study, which documents poor model performance at 10 sites across the country: 3 where intensive monitoring was conducted plus an additional 7 with less intensive monitoring. The study indicates a bias of the CAL3QHC model to overestimate concentrations near highly congested intersections and underestimate concentrations near uncongested intersections. The consequence of this is a tendency to overstate the air quality benefits of mitigating congestion at intersections. Such poor model performance is less difficult to manage for demonstrating compliance with NAAQS for relatively short time frames than it is for forecasting individual exposure over an entire lifetime, especially given that some information needed for estimating 70-year lifetime exposure is unavailable. It is

particularly difficult to reliably forecast MSAT exposure near roads and to determine the amount of time that people are actually exposed at a specific location.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSATs because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, which is a concern expressed by the Health Effects Institute. As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and for Diesel PM in particular. The U.S. EPA and the Health Effects Institute have not established a basis for quantitative risk assessment of Diesel PM in ambient settings.

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

Because of these limitations in the methodologies for forecasting health impacts, any predicted difference in health impacts among alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision-makers, who would need to weigh this information against project benefits (e.g., reducing traffic congestion,

accident rates, and fatalities, plus improved access for emergency response) that are better suited for quantitative analysis.

Quantitative Project-Level MSAT Analysis

As indicated in Tables 2.13.6 and 2.13.7, average daily traffic (ADT) volumes on SR-55 in the project area would exceed 140,000 vehicles per day. Consequently, this project is considered to have higher potential MSAT effects, and a quantitative analysis of MSAT emissions is required. The results of this analysis are summarized below.

The results of the analyses are tabulated in Table 2.13.11 and included in Appendix D in the *Air Quality Assessment Report*. As speciation factors are not available for naphthalene and POM, the emissions for these pollutants are not included in Table 2.13.11. However, as with benzene, 1,3-butadiene, and formaldehyde, these pollutants are a subset of total organic gases. Therefore, the future with and without project naphthalene and POM emissions would have a similar increase or decrease as the other MSATs.

Table 2.13.11 MSAT Emissions for the SR-55 Region

Alternative	Emissions (lbs/day)						
	Diesel PM	Benzene	1,3-Butadiene	Naphthalene	POM	Acrolein	Formaldehyde
Existing (2011)	59	48	9	NA	NA	2	42
2020 No Build	31	24	3	NA	NA	1	19
2020 Alt 1	31	24	3	NA	NA	1	19
2020 Alt 2	31	24	3	NA	NA	1	19
2020 Alt 3	31	24	3	NA	NA	1	19
2020 Alt 4	31	24	3	NA	NA	1	19
2040 No Build	21	16	2	NA	NA	0.5	13
2040 Alt 1	21	16	2	NA	NA	0.5	13
2040 Alt 2	21	16	2	NA	NA	0.5	13
2040 Alt 3	21	16	2	NA	NA	0.5	13
2040 Alt 4	21	16	2	NA	NA	0.5	13

Source: *Air Quality Assessment Report* (2015).
Alt = Alternative
Diesel PM = diesel particulate matter
lbs/day = pounds per day
MSAT = Mobile Source Air Toxics
N/A = not available
POM = polycyclic organic matter
SR-55 = State Route 55

The analysis indicates that a substantial decrease in MSAT emissions can be expected between the existing (2011) and future (2020 and 2040) No Build conditions (No Build Alternative). This decrease is prevalent throughout the highest priority MSATs and the analyzed alternatives. This decrease is also consistent with a U.S. EPA study

that projects a substantial reduction in on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde between 2000 and 2050. Based on the analysis for this project, reductions in MSATs expected by 2040 are: 64 percent of Diesel PM, 66 percent of benzene, 77 percent of 1,3-butadiene, 77 percent of acrolein, and 69 percent of formaldehyde. These projected reductions are achieved while total VMTs increase by 5.5 percent between 2011 and 2040 for the No Build Alternative. As shown in Table 2.13.11, implementation of the project alternatives would result in a negligible change in MSAT emissions in the project vicinity.

In summary, while the alternatives for the proposed project would result in a negligible increase in localized MSAT emissions, the U.S. EPA vehicle and fuel regulations, coupled with fleet turnover, would cause substantial reductions over time that would cause regionwide MSAT levels to be substantially lower than they are today.

Long-Term Regional Vehicle Emissions Impacts

The Build Alternatives would not generate new vehicular traffic trips because they would not include the construction of new homes or businesses. However, there is a possibility that some traffic currently utilizing other routes would be attracted to the improved facility, thus resulting in a change in regional VMT. Therefore, the potential impact of the proposed SR-55 project on regional vehicle emissions was calculated using regional traffic data and emission rates from the EMFAC2007 emission model.[1]

Supplemental traffic data estimated the impact that the proposed project would have on regional VMT and vehicle hours traveled (VHT).

The VMT and VHT data from the traffic analysis, along with the EMFAC2007 emission rates, were used to calculate the CO, reactive organic gases (ROGs), NO_X, oxides of sulfur (SO_X), PM_{10}, and $PM_{2.5}$ emissions for the existing (2011), 2020, and 2040 regional conditions. The results of the modeling are listed in Tables 2.13.12 and 2.13.13. As shown in those tables, the Build Alternatives would result in very small

[1] EMFAC2011 was released by ARB on September 19, 2011. The EPA approved the model with a 6-month grace period for transportation conformity in March 2013. The project-level conformity determination was based on EMFAC2007 since the conformity analysis was begun before the end of the grace period. In order to be consistent with the modeling for the project-level conformity determination, the EMFAC2007 emission model was also used to calculate emissions for the various criteria pollutants.

increases or decreases in the regional emissions (less than 1 percent) when compared to the No Build Alternative. Therefore, the Build Alternatives would not contribute substantially to regional vehicle emissions.

No Build Alternative

The No Build Alternative would not result in any improvements to SR-55 in the project area. As shown in Tables 2.13.12 and 2.13.13, the No Build Alternative would result in fewer regional vehicle emissions than Alternatives 1, 3, and 4 and more regional emissions than Alternative 2.

Table 2.13.12 2020 Regional Vehicle Emissions (lbs/day)

Pollutant	Existing Baseline Emissions	2020 Baseline Emissions	Alternative 1 Emissions/ Increase from 2020 Baseline	Alternative 2 Emissions/ Increase from 2020 Baseline	Alternative 3 Emissions/ Increase from 2020 Baseline	Alternative 4 Emissions/ Increase from 2020 Baseline
CO	37,670	19,010	19,030 / 20	19,060 / 50	19,080 / 70	19,050 / 40
ROGs	1,630	690	690 / 0	700 / 10	700 / 10	700 / 10
NO_X	12,330	4,590	4,600 / 10	4,610 / 20	4,620 / 30	4,610 / 20
SO_X	60	60	60 / 0	60 / 0	60 / 0	60 / 0
PM_{10}	710	610	610 / 0	610 / 0	610 / 0	610 / 0
$PM_{2.5}$	480	360	360 / 0	360 / 0	360 / 0	360 / 0

Source: *Air Quality Assessment Report* (2015).
CO = carbon monoxide
lbs/day = pounds per day
NO_X = oxides of nitrogen
PM_{10} = coarse particulate matter less than 10 microns in diameter
$PM_{2.5}$ = fine particulate matter less than 2.5 microns in diameter
ROGs = reactive organic gases
SO_X = oxides of sulfur

Table 2.13.13 2040 Regional Vehicle Emissions (lbs/day)

Pollutant	Existing Baseline Emissions	2040 Baseline Emissions	Alternative 1 Emissions/ Increase from 2040 Baseline	Alternative 2 Emissions/ Increase from 2040 Baseline	Alternative 3 Emissions/ Increase from 2040 Baseline	Alternative 4 Emissions/ Increase from 2040 Baseline
CO	37,670	11,110	11,130 / 20	11,160 / 50	11,200 / 90	11,160 / 50
ROGs	1,630	380	390 / 10	390 / 10	390 / 10	390 / 10
NO_X	12,330	2,490	2,500 / 10	2,510 / 20	2,530 / 40	2,510 / 20
SO_X	60	70	70 / 0	70 / 0	70 / 0	70 / 0
PM_{10}	710	660	670 / 10	670 / 10	670 / 10	670 / 10
$PM_{2.5}$	480	390	390 / 0	400 / 10	400 / 10	400 / 10

Source: *Air Quality Assessment Report* (2015).
CO = carbon monoxide
lbs/day = pounds per day
NO_X = oxides of nitrogen
PM_{10} = coarse particulate matter less than 10 microns in diameter
$PM_{2.5}$ = fine particulate matter less than 2.5 microns in diameter
ROGs = reactive organic gases
SO_X = oxides of sulfur

2.13.4 Avoidance, Minimization, and/or Mitigation Measures

During construction, the contractor will comply with Section 14-9 Air Quality requirements of the Caltrans Standard Specifications. This section requires the contractor to comply with air control rules, regulations, ordinance, and statutes that apply to work performed under the Contract, including air control rules, regulations, and statutes provided in Government Code 11017 (Public Contract Code 10231).

In addition to implementing all applicable best Available Control Measures (BACMs) from the SCAQMD Rule 403 (Section [d2] and Table 1) and Rule 403.1, the following avoidance and minimization measures are included in the Build Alternatives to reduce and otherwise address particulate matter emissions:

AQ-1 During clearing, grading, earth moving, or excavation operations, the construction contractor will control excessive fugitive dust emissions by regular watering or other dust-preventative measures using the following procedures, as specified in the South Coast Air Quality Management District Rule 403.

- All material excavated or graded shall be sufficiently watered to prevent excessive amounts of dust.
- All material transported on site or off site shall be either sufficiently watered or securely covered to prevent excessive amounts of dust.
- The area disturbed by clearing, grading, earth moving, or excavation operations shall be minimized so as to prevent excessive amounts of dust.
- These control techniques shall be indicated in project specifications.

AQ-2 During final design, the project grading plans will show the duration of construction. During construction, the construction contractor will control ozone precursor emissions from construction equipment vehicles by maintaining equipment engines in good condition and in proper tune per manufacturers' specifications.

AQ-3 During construction, the construction contractor will ensure that all trucks to be used to haul excavated or graded material on site comply with State Vehicle Code Section 23114, with special attention to

Sections 23114(b)(f), (e)(2) as amended, regarding the prevention of such material spilling onto public streets and roads.

AQ-4 During clearing, grading, earth moving, excavation, and construction, the construction contractor will adhere to California Department of Transportation (Caltrans) Standard Specifications for Construction (Section 14-9 [Dust Control] and Section 39-3.06 [Asphalt Concrete Plant Emissions]).

AQ-5 Should the project geologist determine that asbestos-containing materials (ACMs) are present in the project disturbance limits during final inspection prior to construction, the construction contractor will implement the appropriate methods to remove the ACMs prior to any ground disturbance or other construction activities in those areas.

2.13.5 Climate Change

Climate change is analyzed later in Section 2.20, Climate Change. Neither the U.S. EPA nor the FHWA has issued explicit guidance or methods to conduct project-level greenhouse gas analysis. As stated on the 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 aid decision-making and improve efficiency at the program level, and will inform the analysis and stewardship needs of project-level decision-making. Climate change considerations can easily be integrated into many planning factors, such as supporting economic vitality and global efficiency, increasing safety and mobility, enhancing the environment, promoting energy conservation, and improving the quality of life.

Because there have been more requirements set forth in California legislation and executive orders on climate change, the issue is addressed in a separate California Environmental Quality Act (CEQA) discussion in Section 2.20 and may be used to inform the NEPA decision. The four strategies set forth by the 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 traveled.

2.14 Noise

2.14.1 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.

2.14.1.1 California Environmental Quality Act

CEQA requires a strictly baseline versus build analysis to assess whether a proposed project will have a noise impact. If a proposed project is determined to have a significant noise impact under CEQA, then CEQA dictates that mitigation measures must be incorporated into the project unless those measures are not feasible. The rest of this section will focus on the NEPA 23 Code of Federal Regulations (CFR) 772 noise analysis. (Please see Appendix A, CEQA Checklist, of this document for further information on noise analysis under CEQA.)

2.14.1.2 National Environmental Policy Act and 23 CFR 772

For highway transportation projects with FHWA (and Caltrans, as assigned) involvement, the federal-Aid Highway Act of 1970 and the associated implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. The regulations include noise abatement criteria (NAC) that are used to determine when a noise impact would occur. 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 2.14.1 lists the noise abatement criteria for use in the NEPA 23 CFR 772 analysis.

Figure 2.14-1 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.

Table 2.14.1 Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level, $L_{eq}(h)$	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[1]	67 (Exterior)	Residential.
C[1]	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day-care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day-care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	No NAC – reporting only	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical, etc.), and warehousing.
G	No NAC – reporting only	Undeveloped lands that are not permitted.

[1] Includes undeveloped lands permitted for this activity category.
dBA $L_{eq}(h)$ = equivalent continuous sound level per hour measured in A-weighted decibels

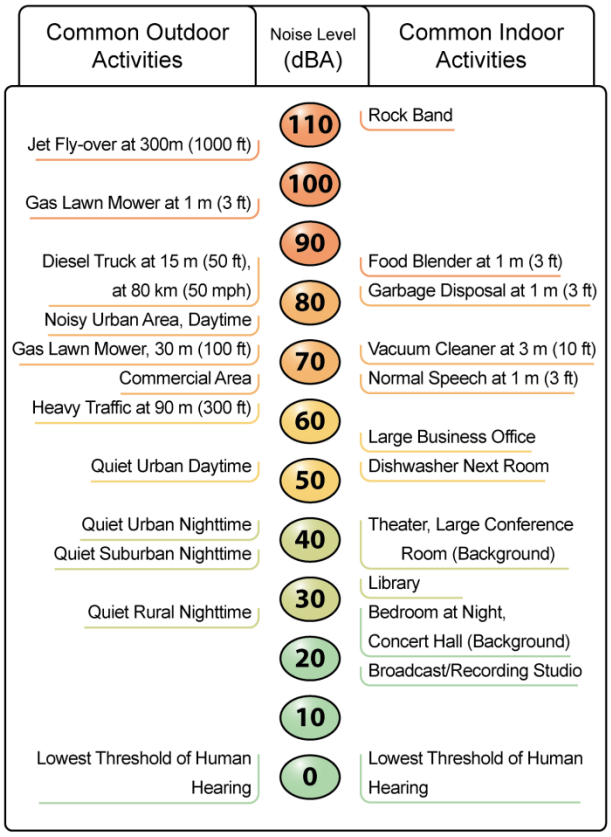


Figure 2.14-1 Noise Levels of Common Activities

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

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

Caltrans' *Traffic Noise Analysis Protocol* sets forth the criteria for determining when an abatement measure is reasonable and feasible. Feasibility of noise abatement is basically an engineering concern. A minimum 5 dBA reduction in the future noise level must be achieved for an abatement measure to be considered 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.

2.14.2 Affected Environment

This section is based on the *Noise Study Report* (NSR) (2015) and the *Noise Abatement Decision Report* (NADR) (2015) prepared for the project.

2.14.2.1 Surrounding Land Uses and Sensitive Receptors

Existing land uses in the vicinity of the project segment of State Route 55 (SR-55) include multifamily residences, hotels, a mobile home park, a utility facility, vacant land, and agricultural, office, commercial, and industrial uses as described below.

- **West of SR-55, between Interstate 405 (I-405) and MacArthur Boulevard:** Land uses in this area include a hotel, a utility facility, and agricultural, office, commercial, and industrial uses that are at the same elevation as SR-55 or up to approximately 15 feet (ft) lower than the elevation of SR-55. There are no existing noise barriers in this area. The hotel was evaluated under Activity Category E, which has an exterior NAC of 72 dBA equivalent continuous sound level (L_{eq}). The office and commercial uses were classified under Activity Category E for reporting purposes because there were no outdoor frequent human

use areas at those land uses. The utility facility and agricultural and industrial uses were classified under Activity Category F for reporting purposes.

- **East of SR-55, between I-405 and MacArthur Boulevard:** Land uses in this area include office and industrial uses that are approximately 5 ft lower in elevation than SR-55. There are no existing noise barrier walls in this area. The office and industrial uses were classified under Activity Categories E and F for reporting purposes because there are no outdoor frequent human use areas at those land uses.
- **West of SR-55, between MacArthur Boulevard and Dyer Road:** Land uses in this area include office, commercial, and industrial uses that are at elevations similar to the elevation of SR-55. There are no existing noise barriers in this area. The office and commercial uses were classified under Activity Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses. The industrial uses were classified under Activity Category F for reporting purposes.
- **East of SR-55, between MacArthur Boulevard and Dyer Road:** Land uses in this area include office, commercial, and industrial uses that are at the same elevation as, or up to approximately 20 ft lower in elevation than, SR-55. There are no existing noise barriers in this area. The office and commercial uses were classified under Activity Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses. The industrial uses were classified under Activity Category F for reporting purposes.
- **West of SR-55, between Dyer Road and Warner Avenue:** Land uses in this area include hotels and office, commercial, and industrial uses that are at the same elevation as, or up to approximately 20 ft lower in elevation than, SR-55. There are no existing noise barriers in this area. The hotels were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. The office and commercial uses were classified under Activity Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses. The industrial uses were classified under Activity Category F for reporting purposes.
- **East of SR-55, between Dyer Road and Warner Avenue:** Land uses in this area include a hotel and office, commercial, and industrial uses that are at the same elevation as, or up to approximately 15 ft lower in elevation than, SR-55. There are no existing noise barriers in this area. The hotel was evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. The office and commercial uses were classified under Activity Category E for reporting purposes

because there are no outdoor frequent human use areas at those land uses. The industrial uses were classified under Activity Category F for reporting purposes.

- **West of SR-55, between Warner Avenue and Edinger Avenue:** Land uses in this area include office, commercial, and industrial uses that are similar in elevation to SR-55. There are no existing noise barriers in this area. The office and commercial uses were classified under Activity Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses. The industrial uses were classified under Activity Category F for reporting purposes.
- **East of SR-55, between Warner Avenue and Edinger Avenue:** Land uses in this area include two hotels that are currently under construction, and office, commercial, and industrial uses that are at the same elevation as, or up to approximately 25 ft lower in elevation than, SR-55. There are no existing noise barriers in this area. The office and commercial uses were classified under Activity Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses. The hotels were also evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. The industrial uses were classified under Activity Category F for reporting purposes.
- **West of SR-55, between Edinger Avenue and McFadden Avenue:** Land uses in this area include commercial and industrial uses that are at the same elevation as, or up to approximately 25 ft lower in elevation than, SR-55. There are no existing noise barriers in this area. The commercial uses were classified under Activity Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses. The industrial uses were classified under Activity Category F for reporting purposes.
- **East of SR-55, between Edinger Avenue and McFadden Avenue:** Land uses in this area include multifamily residences and industrial uses that are at the same elevation as, or up to approximately 30 ft lower in elevation than, SR-55. There are 5 to 13 ft high existing noise barriers that shield the multifamily residences in this area. The industrial uses were classified under Activity Category F for reporting purposes.
- **West of SR-55, between McFadden Avenue and Interstate 5 (I-5):** Land uses in this area include multifamily residences, a mobile home park, and office and commercial uses that are similar in elevation to SR-55. There are 12 to 20 ft high existing walls that shield this area. The multifamily residences and the mobile home park were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The office and commercial uses were classified under Activity

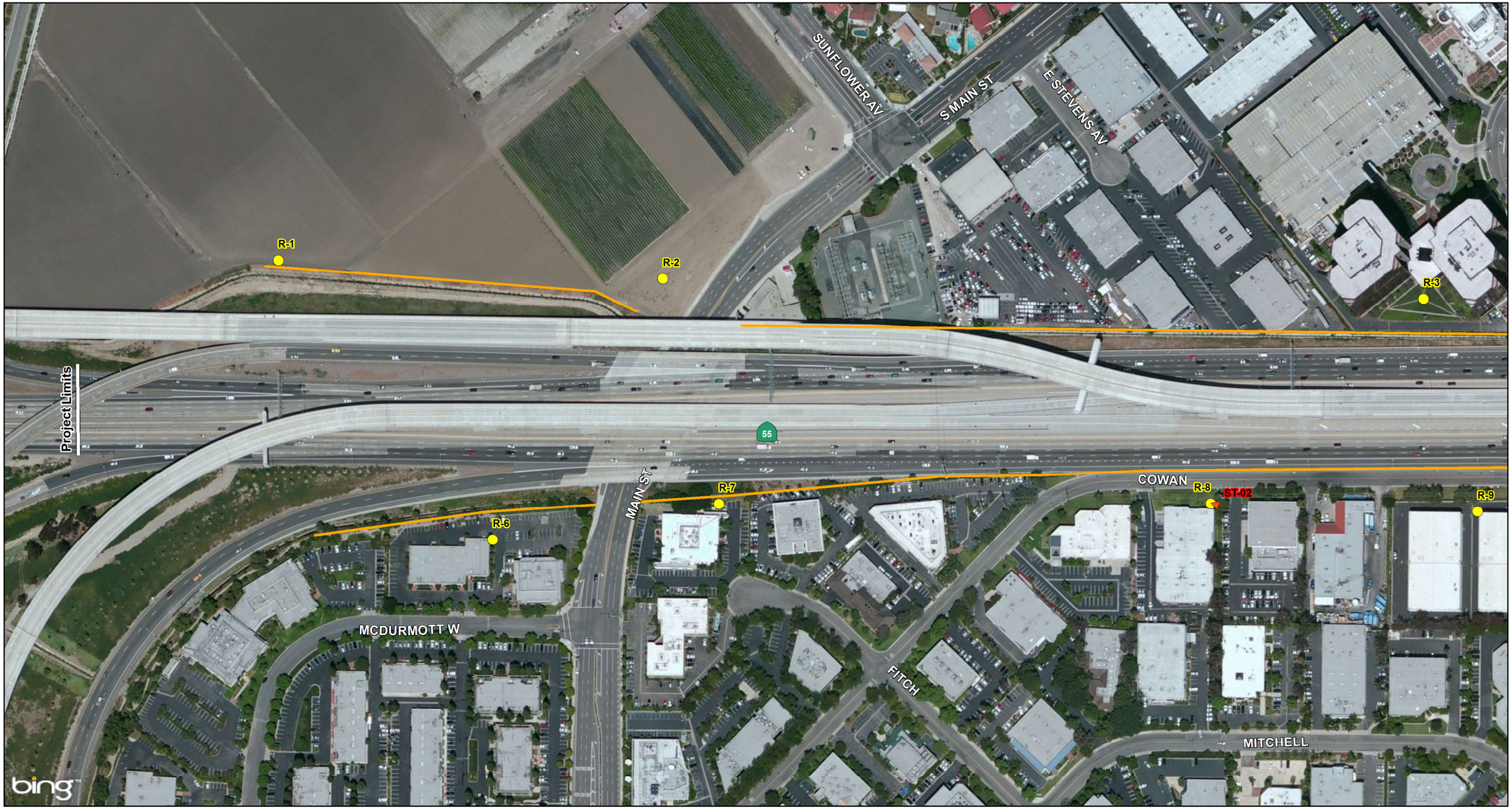
Category E for reporting purposes because there are no outdoor frequent human use areas at those land uses.

- **East of SR-55, between McFadden Avenue and I-5:** Land uses in this area include multifamily residences that are similar in elevation to SR-55. There are 12 to 14 ft high existing noise barriers in this area. The multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}.

A total of 145 receptor locations in the vicinity of the project segment of SR-55 were selected to represent noise-sensitive land uses in the project vicinity. Those receptor locations are shown in Figure 2.14-2. Receptors, as used in this section, are those locations at which noise impacts were evaluated. As shown in Table 2.14.2, the majority of the sensitive receptor locations consist of residential uses; however, some hotels in the project area include outdoor active use areas.

2.14.2.2 Existing Noise Levels

The primary source of noise in the project area is traffic on SR-55. Short-term (i.e., 15-minute) ambient noise measurements were conducted to document existing noise levels at 20 representative receptor locations along the project corridor, to calibrate the noise model, and to predict the noise levels at all 145 modeled sensitive receptors in the project area. Long-term (24-hour) ambient noise monitoring was also conducted on the northbound side of SR-55 between Warner Avenue and Edinger Avenue to identify the peak traffic noise hour and describe sound levels throughout the day rather than absolute levels at a specific receptor location. The short- and long-term noise monitoring and modeled receptor locations are shown on Figure 2.14-2. The existing PM peak-hour traffic volumes were obtained from the *Revised Final Traffic Volume Report* (2015) for the project. Table 2.14.2 shows the existing traffic noise levels at the 145 modeled receptor locations. As shown in Table 2.14.2, of the 145 modeled receptor locations, 1 receptor (Receptor R-4 representing the swimming pool at the DoubleTree Club by Hilton Hotel, Orange County Airport) would approach or exceed the 72 dBA equivalent continuous sound level (L_{eq}) NAC and 25 second-floor receptors (Receptors R-84 through R-87, R-89 through R-91, R-93, R-95, R-101, R-103, R-104, R-106, R-110, R-119, R-125 through R-128, R-130, R-135 through R-138, and R-142) representing residential uses on the north end of the project would approach or exceed the 67 dBA L_{eq} NAC. Figure 2.14-2 shows the locations of the modeled receptors.



LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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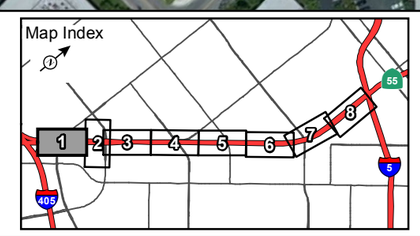

FIGURE 2.14-2
Sheet 1 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
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LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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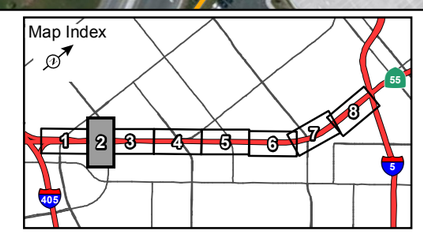

FIGURE 2.14-2
Sheet 2 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
EA No. 0J3400/EFIS 1200020328

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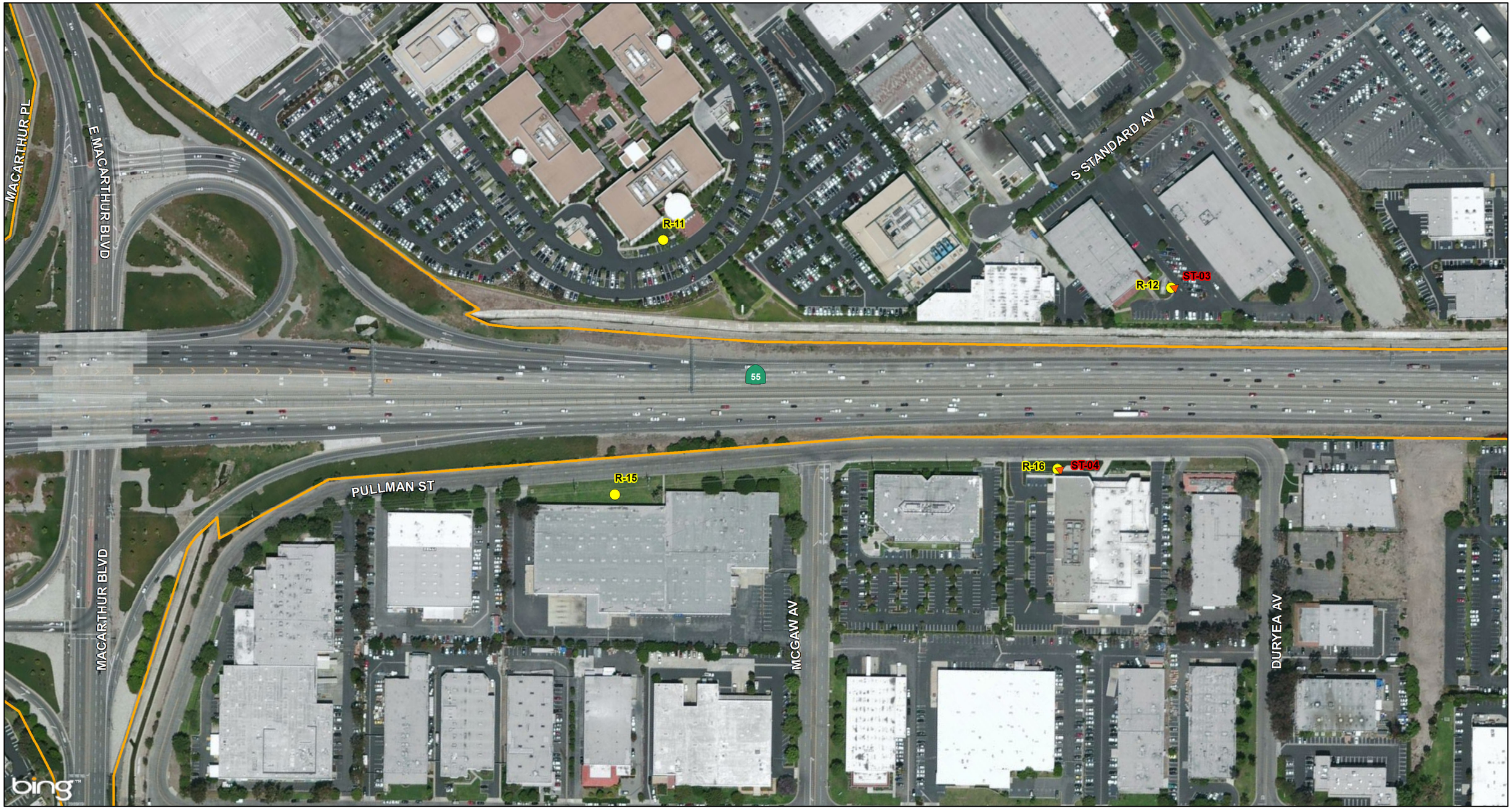

LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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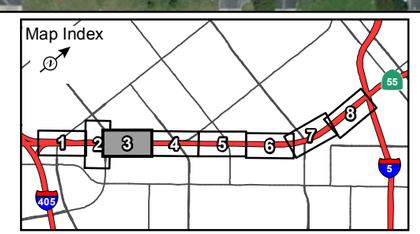

FIGURE 2.14-2
Sheet 3 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
EA No. 0J3400/EFIS 1200020328

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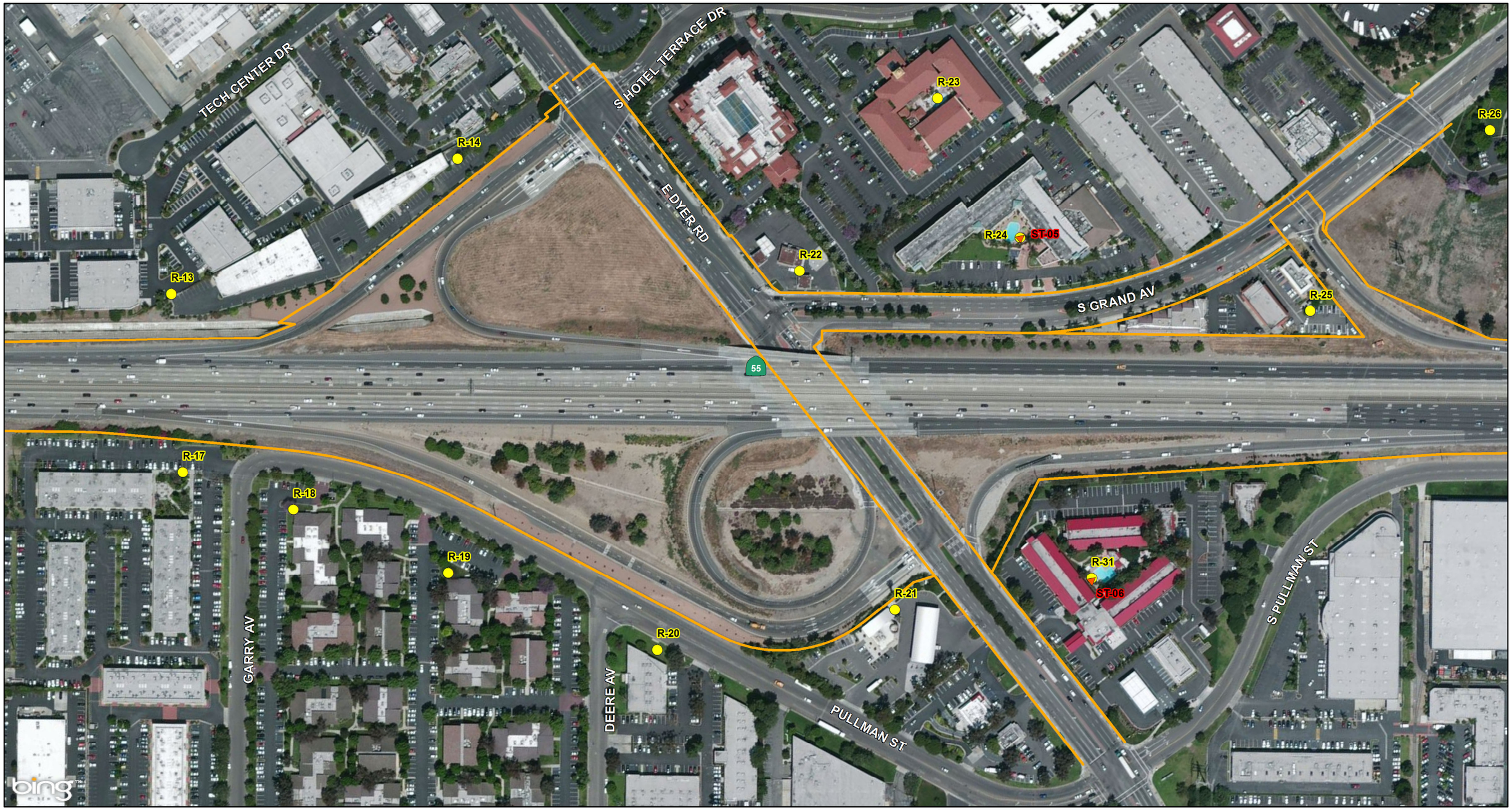

LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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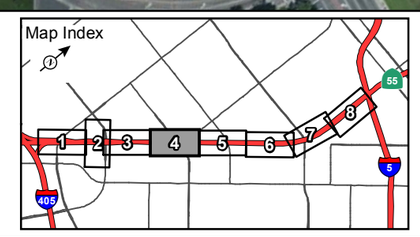

FIGURE 2.14-2
Sheet 4 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
EA No. 0J3400/EFIS 1200020328

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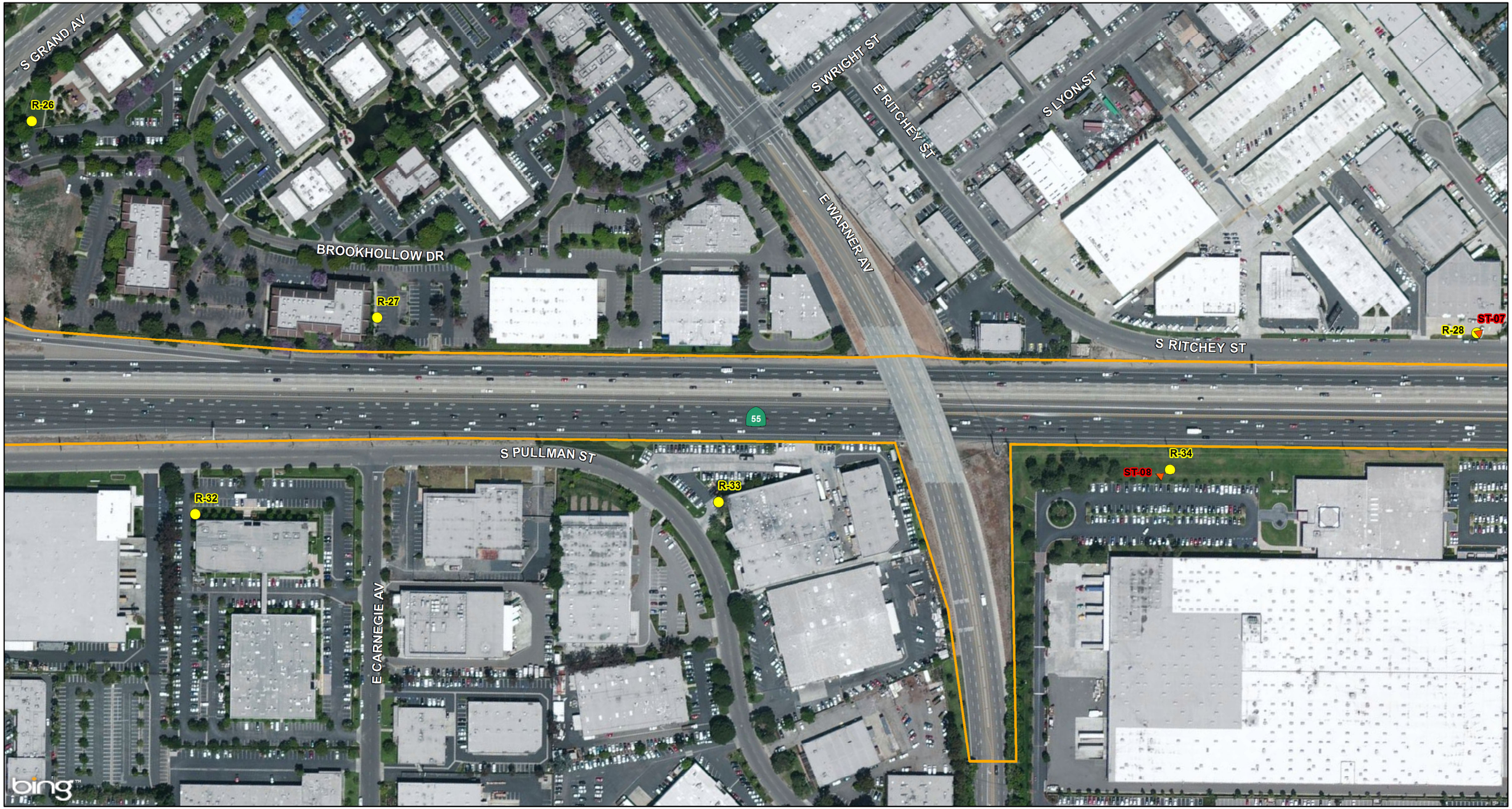

LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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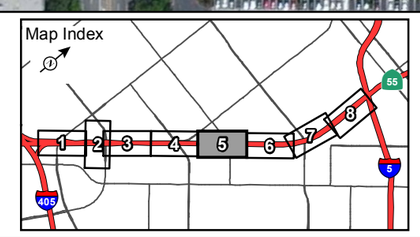

FIGURE 2.14-2
Sheet 5 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
EA No. 0J3400/EFIS 1200020328

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E NEWPORT CIR
S RITCHEY ST
E GLENWOOD PL
E SAINT ANDREW PL
E OCCIDENTAL ST
BOYD ST
R-28
ST-07
R-29
R-30
55
R-35
R-36
LT-1
R-144
HOTEL UNDER CONSTRUCTION
BELL AV
VALENCIA AV
NEWPORT AV
DEL AMO AV

LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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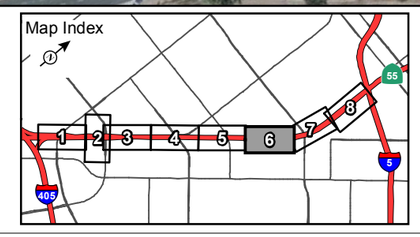

FIGURE 2.14-2
Sheet 6 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
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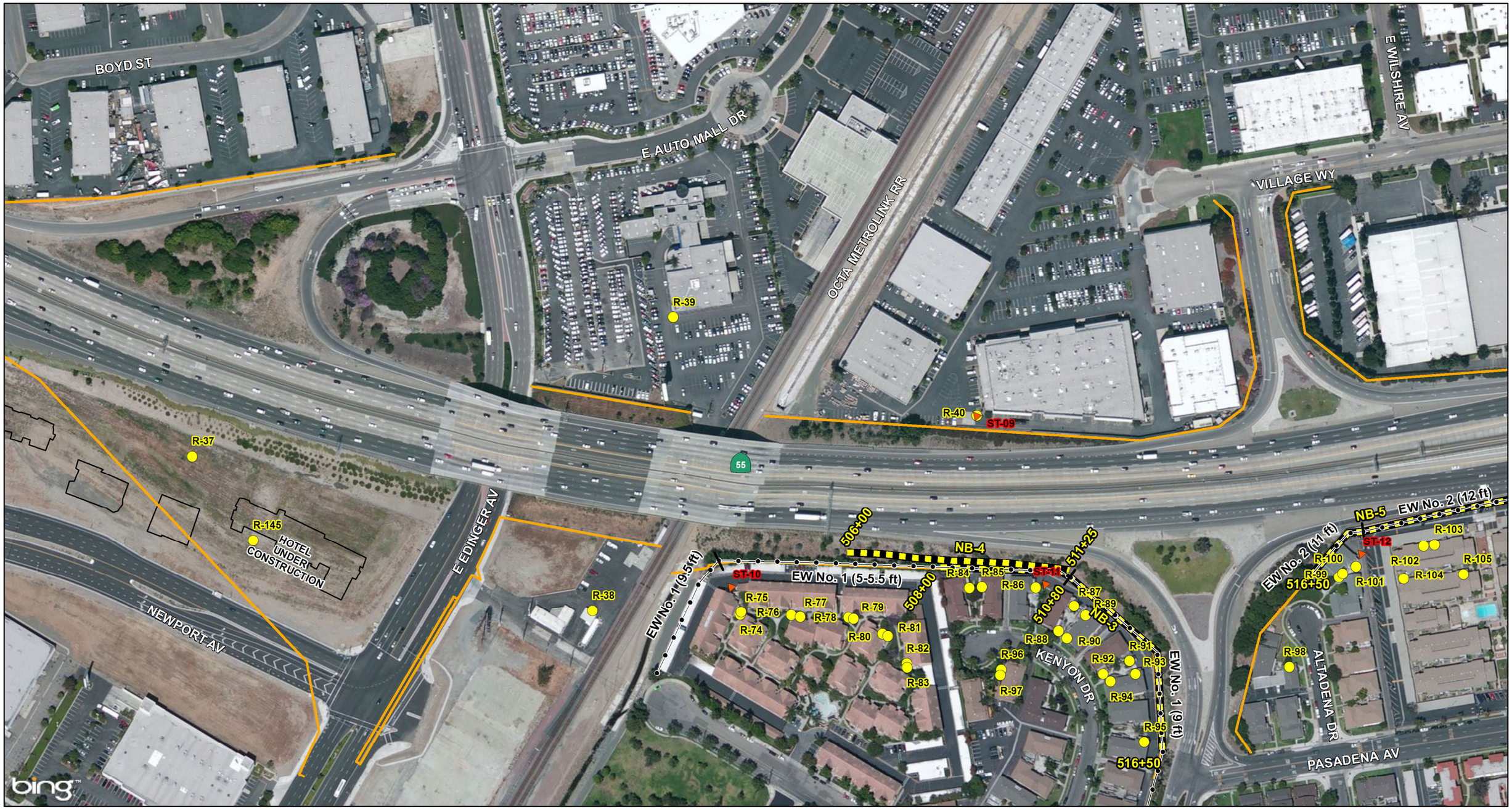

LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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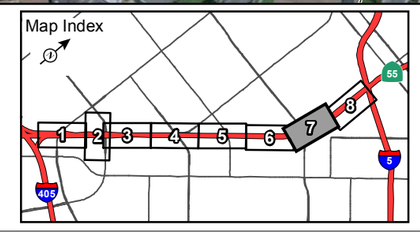

FIGURE 2.14-2
Sheet 7 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
EA No. 0J3400/EFIS 1200020328

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VILLAGE WY
TUSTIN VILLAGE WY
E MCFADDEN AV
E BALBOA LN
DE ANZA LN
Project Limits
EW No. 5 (12 ft)
EW No. 2 (12 ft)
NB-5
EW No. 2 (13 ft)
525-90
527+50
EW No. 3 (11.5-14 ft)
NB-6
EW No. 3 (12 ft)
EW No. 3 (10 ft)
543+95
NB-7
EW No. 4 (14 ft)
546+85
W MCFADDEN ST
WHITBY CIR
CARLANN CIR
PASADENA AV
MYRTLE AV
NISSON RD
55
5
405
ST-13
ST-14
ST-15
ST-16
ST-18
ST-19
ST-20
R-41
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LEGEND

- Project Limits
- Existing Caltrans Right of Way
- Modeled Noise Barriers
- Existing Walls
- Modeled Receptor Location
- Short-Term Monitoring Location
- Long-Term 24-Hour Monitor

0 100 200
FEET

SOURCE: Eagle Aerial (4/2011); ESRI (2008); TBM (2008)

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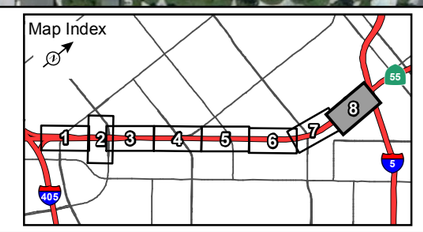

FIGURE 2.14-2
Sheet 8 of 8

State Route 55 (SR-55) Improvement Project between Interstate 405 (I-405) and Interstate 5 (I-5)

Modeled Noise Barriers and Receptor Locations

12-ORA-55 PM 6.4/10.3
EA No. 0J3400/EFIS 1200020328

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Table 2.14.2 Existing Traffic Noise Levels

Receptor No.	Location	Type of Land Use	No. of Units Represented	First or Second Floor[1]	Noise Abatement Criteria	Existing Noise Level (dBA L_{eq})
R-1	Sunflower Avenue	Agricultural	1	1	F	65.5
R-2	Sunflower Avenue	Agricultural	1	1	F	68.2
R-3	Hutton Center Drive	Office[2]	1	1	E (72)	77.0
R-4	Hutton Center Drive	Hotel	1	1	E (72)	**71.4**[3]
R-5	Hutton Center Drive	Office	1	1	E (72)	68.0
R-6	W. McDurmott	Office	1	1	E (72)	67.4
R-7	Fitch	Office	1	1	E (72)	68.4
R-8	Cowan	Office	1	1	E (72)	77.7
R-9	Cowan	Commercial/Industrial	1	1	F	76.4
R-10	Cowan	Office	1	1	E (72)	74.2
R-11	E. Columbine Avenue	Office	1	1	E (72)	70.3
R-12	S. Standard Avenue	Commercial/Industrial	1	1	F	73.9
R-13	Tech Center Drive	Commercial/Industrial	1	1	F	74.2
R-14	Tech Center Drive	Commercial/Industrial	1	1	F	67.5
R-15	Pullman Street	Commercial/Industrial	1	1	F	77.1
R-16	Pullman Street	Commercial/Industrial	1	1	F	78.7
R-17	E. Garry Avenue	Office	1	1	E (72)	77.7
R-18	Pullman Street	Office	1	1	E (72)	73.7
R-19	Pullman Street	Office	1	1	E (72)	67.8
R-20	Pullman Street	Office	1	1	E (72)	67.8
R-21	Pullman Street	Commercial	1	1	F	72.9
R-22	S. Grand Avenue	Commercial	1	1	F	71.9
R-23	Hotel Terrace Drive	Hotel	1	1	E (72)	46.1
R-24	S. Grand Avenue	Hotel	1	1	E (72)	64.4
R-25	S. Grand Avenue	Commercial	1	1	F	71.7
R-26	S. Grand Avenue	Commercial/Industrial	1	1	F	62.0
R-27	Brookhollow Drive	Office	1	1	E (72)	71.3
R-28	Ritchey Drive	Commercial/Industrial	1	1	F	73.2
R-29	Ritchey Drive	Commercial/Industrial	1	1	F	74.3
R-30	E. Glenwood Place	Commercial/Industrial	1	1	F	74.9
R-31	E. Dyer Road	Hotel	1	1	E (72)	60.7
R-32	Pullman Street	Office	1	1	E (72)	73.4
R-33	Pullman Street	Commercial/Industrial	1	1	F	74.0
R-34	Bell Avenue	Commercial/Industrial	1	1	F	75.4
R-35	Valencia Avenue	Commercial/Industrial	1	1	F	70.4
R-36	Newport Avenue	Vacant Land	1	1	F	67.9
R-37	Newport Avenue	Vacant Land	1	1	F	65.7
R-38	Edinger Avenue	Commercial/Industrial	1	1	F	67.3
R-39	Auto Mall Drive	Commercial/Industrial	1	1	F	67.5
R-40	Village Drive	Commercial	1	1	F	68.9
R-41	Village Drive	Commercial/Industrial	1	1	F	75.7
R-42	Tustin Village Way	Residential	1	1	B (67)	58.5
R-43	Tustin Village Way	Residential	1	2	D (52)[4]	71.0/46.0[5]
R-44	Tustin Village Way	Residential	2	1	B (67)	63.5
R-45	Tustin Village Way	Residential	2	1	B (67)	63.0
R-46	Tustin Village Way	Residential	2	1	B (67)	54.6
R-47	Tustin Village Way	Residential	2	1	B (67)	61.2
R-48	Tustin Village Way	Residential	2	1	B (67)	63.6
R-49	Tustin Village Way	Residential	2	1	B (67)	63.3
R-50	Tustin Village Way	Residential	3	1	B (67)	57.1
R-51	Tustin Village Way	Residential	4	1	B (67)	57.6
R-52	Tustin Village Way	Residential	3	1	B (67)	51.6
R-53	Tustin Village Way	Residential	2	1	B (67)	55.7

Table 2.14.2 Existing Traffic Noise Levels

Receptor No.	Location	Type of Land Use	No. of Units Represented	First or Second Floor[1]	Noise Abatement Criteria	Existing Noise Level (dBA L_{eq})
R-54	Tustin Village Way	Residential	2	1	B (67)	56.2
R-55	Tustin Village Way	Residential	3	1	B (67)	57.2
R-56	Tustin Village Way	Residential	3	1	B (67)	53.3
R-57	Tustin Village Way	Residential	3	1	B (67)	58.7
R-58	Tustin Village Way	Residential	2	1	B (67)	62.2
R-59	Tustin Village Way	Residential	2	1	B (67)	61.0
R-60	Tustin Village Way	Residential	2	1	B (67)	63.8
R-61	Tustin Village Way	Residential	2	1	B (67)	59.8
R-62	Tustin Village Way	Residential	2	1	B (67)	65.1
R-63	Tustin Village Way	Residential	2	1	B (67)	60.1
R-64	Tustin Village Way	Residential	2	1	B (67)	61.8
R-65	Tustin Village Way	Residential	2	1	B (67)	61.5
R-66	Tustin Village Way	Residential	2	1	B (67)	64.1
R-67	Tustin Village Way	Residential	2	1	B (67)	60.5
R-68	Tustin Village Way	Residential	2	1	B (67)	60.8
R-69	Tustin Village Way	Residential	4	1	B (67)	63.3
R-70	Tustin Village Way	Residential	2	1	B (67)	57.8
R-71	Tustin Village Way	Residential	2	1	B (67)	56.4
R-72	Tustin Village Way	Residential	2	1	B (67)	59.3
R-73	De Anza Lane	Residential	3	1	B (67)	62.2
R-74	Tustin Grove Drive	Residential	6	2	B (67)	53.1
R-75	Tustin Grove Drive	Residential	6	1	B (67)	51.3
R-76	Tustin Grove Drive	Residential	8	1	B (67)	51.4
R-77	Tustin Grove Drive	Residential	8	2	B (67)	54.7
R-78	Tustin Grove Drive	Residential	8	1	B (67)	52.4
R-79	Tustin Grove Drive	Residential	8	2	B (67)	54.4
R-80	Tustin Grove Drive	Residential	2	1	B (67)	54.6
R-81	Tustin Grove Drive	Residential	2	2	B (67)	56.4
R-82	Tustin Grove Drive	Residential	4	1	B (67)	56.3
R-83	Tustin Grove Drive	Residential	4	2	B (67)	58.3
R-84	Kenyon Drive	Residential	5	2	B (67)	**67.5**
R-85	Kenyon Drive	Residential	5	2	B (67)	**68.1**
R-86	Kenyon Drive	Residential	5	2	B (67)	**72.2**
R-87	Kenyon Drive	Residential	3	2	B (67)	**72.4**
R-88	Kenyon Drive	Residential	2	1	B (67)	59.0
R-89	Kenyon Drive	Residential	3	2	B (67)	**72.0**
R-90	Kenyon Drive	Residential	2	2	B (67)	**67.5**
R-91	Kenyon Drive	Residential	3	2	B (67)	**68.2**
R-92	Kenyon Drive	Residential	2	1	B (67)	55.4
R-93	Kenyon Drive	Residential	3	2	B (67)	**69.5**
R-94	Kenyon Drive	Residential	2	2	B (67)	64.8
R-95	Kenyon Drive	Residential	3	2	B (67)	**67.1**
R-96	Kenyon Drive	Residential	2	1	B (67)	61.2
R-97	Kenyon Drive	Residential	2	2	B (67)	62.9
R-98	Altadena Drive	Residential	2	1	B (67)	58.7
R-99	Altadena Drive	Residential	2	1	B (67)	60.2
R-100	Altadena Drive	Residential	2	2	B (67)	63.3
R-101	Altadena Drive	Residential	1	2	B (67)	**69.1**
R-102	Pasadena Avenue	Residential	4	1	B (67)	64.1
R-103	Pasadena Avenue	Residential	3	2	B (67)	**75.6**
R-104	Pasadena Avenue	Residential	3	2	B (67)	**67.3**
R-105	Pasadena Avenue	Residential	4	1	B (67)	57.7
R-106	Pasadena Avenue	Residential	3	2	B (67)	**74.9**

Table 2.14.2 Existing Traffic Noise Levels

Receptor No.	Location	Type of Land Use	No. of Units Represented	First or Second Floor[1]	Noise Abatement Criteria	Existing Noise Level (dBA L_{eq})
R-107	Pasadena Avenue	Residential	4	1	B (67)	64.2
R-108	Pasadena Avenue	Residential	3	2	B (67)	61.6
R-109	Pasadena Avenue	Residential	4	1	B (67)	53.2
R-110	Pasadena Avenue	Residential	2	2	B (67)	**72.1**
R-111	Pasadena Avenue	Residential	2	1	B (67)	58.1
R-112	Pasadena Avenue	Residential	2	2	B (67)	61.5
R-113	Pasadena Avenue	Residential	1	2	B (67)	65.8
R-114	Pasadena Avenue	Residential	3	2	B (67)	63.2
R-115	Pasadena Avenue	Residential	3	1	B (67)	58.7
R-116	Pasadena Avenue	Residential	3	2	B (67)	62.9
R-117	Pasadena Avenue	Residential	3	1	B (67)	55.9
R-118	Pasadena Avenue	Residential	2	1	B (67)	64.3
R-119	Pasadena Avenue	Residential	2	2	B (67)	**71.4**
R-120	Medallion Avenue	Residential	8	1	B (67)	59.8
R-121	Medallion Avenue	Residential	2	1	B (67)	63.6
R-122	Medallion Avenue	Residential	6	1	B (67)	61.0
R-123	Medallion Avenue	Residential	2	1	B (67)	63.5
R-124	Medallion Avenue	Residential	3	1	B (67)	61.2
R-125	Whitby Circle	Residential	1	2	B (67)	**71.3**
R-126	Whitby Circle	Residential	1	2	B (67)	**68.9**
R-127	Whitby Circle	Residential	1	2	B (67)	**70.5**
R-128	Whitby Circle	Residential	1	2	B (67)	**72.9**
R-129	Pasadena Avenue	Residential	2	1	B (67)	62.1
R-130	Pasadena Avenue	Residential	2	2	B (67)	**71.9**
R-131	Pasadena Avenue	Residential	4	1	B (67)	62.8
R-132	Pasadena Avenue	Residential	4	2	B (67)	64.2
R-133	Boleyn Circle	Residential	1	1	B (67)	65.7
R-134	Boleyn Circle	Residential	1	1	B (67)	64.6
R-135	Boleyn Circle	Residential	1	2	B (67)	**75.1**
R-136	Boleyn Circle	Residential	1	2	B (67)	**77.6**
R-137	Boleyn Circle	Residential	1	2	B (67)	**69.3**
R-138	Boleyn Circle	Residential	1	2	B (67)	**67.9**
R-139	Pasadena Avenue	Residential	1	2	D (52)[4]	67.3/42.3[5]
R-140	Pasadena Avenue	Residential	4	1	B (67)	62.4
R-141	Pasadena Avenue	Residential	4	1	B (67)	61.5
R-142	Pasadena Avenue	Residential	4	2	B (67)	**74.1**
R-143	Pasadena Avenue	Residential	4	1	B (67)	64.7
R-144	Newport Avenue	Hotel	1	1	E (72)	47.7
R-145	Newport Avenue	Hotel	1	1	E (72)	49.2

Source: *Noise Study Report* (2015).

[1] This column defines the height of the receptor. First floor receptors were assumed to have a height of 5 ft while second-floor receptors have an assumed height of 15 ft.

[2] There are no outdoor frequent human uses associated with office land uses within the project area. The highest expected noise level is provided for reporting purposes.

[3] Numbers in **bold** represent noise levels that approach or exceed the NAC and are associated with areas of frequent human use.

[4] Residential uses without exterior noise -sensitive living areas were analyzed to assess interior noise level impacts only.

[5] Exterior/interior noise level. The interior noise level was determined using a standard 20 dB exterior-to-interior noise level reduction.

dB = decibels

dBA L_{eq} = equivalent continuous noise level measured in A-weighted decibels

ft = feet

NAC = Noise Abatement Criteria

2.14.3 Environmental Consequences

The proposed project is classified as a Type 1 project because it would add through-traffic lanes and auxiliary lanes on SR-55. A noise analysis is required for all Type 1 projects. The potential short- and long-term noise impacts of the Build Alternatives and the No Build Alternative are described in the following sections.

2.14.3.1 Temporary Impacts

Alternatives 1, 2, 3, and 4 (Build Alternatives)

The potential short-term noise impacts associated with construction of the Build Alternatives would be nearly identical for each Build Alternative. The differences would be related to the locations where project construction and, as a result, construction-related noise would occur, and the total length of time each Build Alternative takes to construct.

Two types of short-term noise impacts would occur during project construction. The first would be from construction crew commutes and the transport of construction equipment and materials to and from the project site. These activities would incrementally raise noise levels on access roads leading to the project site. The heavy equipment for grading and construction would be moved onto the project site, would remain for the duration of each construction phase, and would not add to the daily traffic volumes in the project vicinity. A high single-event noise exposure potential at a maximum level of 84 dBA maximum instantaneous sound level (L_{max}) from trucks passing at 50 ft would occur. These noise effects would occur under each Build Alternative in the areas where work and equipment and materials transport would occur. However, the projected construction traffic for all the Build Alternatives would be minimal compared to existing traffic volumes on SR-55 and streets in the project vicinity, and the short-term noise level change resulting from project construction traffic would not be perceptible. Therefore, project-related, short-term, construction worker commutes and equipment transport noise impacts as a result of the Build Alternatives would not be adverse.

The second type of short-term noise impact is related to noise generated during project construction activities. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated and, therefore, the noise levels along the project alignment as construction progresses. Each Build Alternative will require the use of the same types of construction equipment, but that equipment may be operated in different areas along SR-55 and for

shorter or longer periods of time, depending on the specific improvements constructed in each Build Alternative. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase.

Table 2.14.3 lists typical construction equipment noise levels recommended for noise impact assessments based on a distance of 50 ft between a piece of equipment and a noise receptor.

Table 2.14.3 Typical Construction Equipment Noise Levels

Equipment Description	Spec 721.560[1] L_{max} at 50 ft	Actual Measured[2] L_{max} at 50 ft
Backhoes	80	78
Compactor (ground)	80	83
Cranes	85	81
Dozers	85	82
Dump Truck	84	76
Excavators	85	81
Flatbed Trucks	84	74
Front-End Loaders	80	79
Graders	85	N/A[3]
Jackhammer	85	89
Pickup Truck	55	75
Pneumatic Tools	85	85
Pumps	77	81
Rock Drill	85	81
Roller	85	80
Scrapers	85	84
Tractors	84	N/A
Vibratory Pile Driver	95	101

Source: *Noise Study Report* (2015).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Maximum noise levels were developed based on Spec 721.560 from the CA/T program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
[2] The maximum noise level was developed based on the average noise level measured for each piece of equipment during the CA/T program in Boston, Massachusetts.
[3] Since the maximum noise level based on the average noise level measured for this piece of equipment was not available, the maximum noise level developed based on Spec 721.560 was used.
CA/T = Central Artery/Tunnel
FHWA = Federal Highway Administration
ft = foot/feet
L_{max} = maximum sound level
N/A = Not Applicable

Typical noise levels at 50 ft from an active construction area can reach 88 dBA L_{max} during the noisiest construction phases. The site preparation phase, which includes grading and paving, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment, which includes graders, scrapers,

excavators, bulldozers, compactors, and front loaders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings.

Construction of the Build Alternatives will require the use of earthmovers, bulldozers, water trucks, and pickup trucks. Noise associated with the use of construction equipment is estimated at between 75 and 85 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As shown in Table 2.14.3, the maximum noise level generated by each scraper is assumed to be approximately 85 dBA L_{max} at 50 ft from the scraper. Each bulldozer would generate approximately 85 dBA L_{max} at 50 ft. The maximum noise level generated by water trucks and pickup trucks is approximately 75 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA. Each piece of construction equipment operates as an individual point source. The worst-case composite noise level at the nearest residence during this phase of construction would be 88 dBA L_{max} at a distance of 50 ft from an active construction area.

The closest sensitive receptor locations are within 50 ft of the project construction areas. Therefore, these receptor locations may be subject to short-term noise levels of 88 dBA L_{max} or higher generated by construction activities along SR-55 and local roads for each of the Build Alternatives.

No Build Alternative

The No Build Alternative would not include the construction of improvements to SR-55 and therefore would not result in temporary construction-related noise impacts.

2.14.3.2 Permanent Impacts

Build Alternatives

Potential long-term noise associated with operations of Build Alternatives 1 through 4 would be solely from traffic noise. Traffic noise impacts occur when either of the following occurs: (1) if the predicted traffic noise level is 12 dBA or more over the corresponding modeled existing noise level at the sensitive receptor locations analyzed, or (2) if the traffic noise level at a sensitive receptor location is predicted to “approach or exceed” the applicable NAC for the affected land use. When traffic noise impacts occur, noise abatement measures must be considered.

The predicted future worst-case noise levels at all 145 sensitive receptor locations in the project area were determined with the existing sound walls and with new modeled noise barriers, using the worst-case traffic volumes (prior to speed degradation) or the

future 2040 peak-hour traffic volumes from the *Revised Final Traffic Volume Report* (2015), whichever was higher. This traffic condition is assumed to be level of service (LOS) D/E, which corresponds to 1,950 vehicles per lane per hour (vplph) on the freeway mainline (SR-55 and I-5), 1,500 vplph on the high-occupancy vehicle (HOV) lanes (SR-55 and I-5), 1,000 vplph on the freeway on- and off-ramps, 1,000 vplph on the auxiliary lanes, and 1,000 vplph on local roads (i.e., MacArthur Boulevard, Dyer Road, Warner Avenue, Edinger Avenue, and McFadden Avenue).

The existing and future worst-case traffic noise level results for Alternatives 1 through 4 are shown in Table 2.14.4.

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Table 2.14.4 Predicted Traffic Noise Levels (dBA L_{eq})

Receptor No.	Location	Type of Land Use	Number of Units/Receptors Represented	First or Second Floor	Noise Abatement Criteria	Existing Noise Level	Future No Build	Alternative 1	Change from Existing Level	Alternative 2	Change from Existing Level	Alternative 3	Change from Existing Level	Alternative 4	Change from Existing Level
R-1	Sunflower Avenue	Agricultural	1	1	F	65.5	65.9	65.9	0.4	66.0	0.5	66.0	0.5	66.2	0.7
R-2	Sunflower Avenue	Agricultural	1	1	F	68.2	68.6	68.6	0.4	69.1	0.9	69.1	0.9	68.8	0.6
R-3	Hutton Center Drive	Office[1]	1	1	E (72)	77.0	77.0	77.0	0.0	77.8	0.8	77.8	0.8	77.1	0.1
R-4	Hutton Center Drive	Hotel	1	1	E (72)	71.4	71.4	**71.4**	0.0	**72.4**	1.0	**72.4**	1.0	**71.4**	0.0
R-5	Hutton Center Drive	Office	1	1	E (72)	68.0	68.1	68.1	0.0	68.9	0.8	68.8	0.7	68.1	0.0
R-6	W. McDurmott	Office	1	1	E (72)	67.4	67.5	67.5	0.1	67.6	0.2	67.6	0.2	67.8	0.4
R-7	Fitch	Office	1	1	E (72)	68.4	68.3	68.3	-0.1	68.7	0.3	68.7	0.3	68.5	0.1
R-8	Cowan	Office	1	1	E (72)	77.7	77.7	77.7	0.0	79.0	1.3	79.0	1.3	77.8	0.1
R-9	Cowan	Commercial/Industrial	1	1	F	76.4	76.5	76.5	0.1	77.5	1.1	77.5	1.1	76.6	0.2
R-10	Cowan	Office	1	1	E (72)	74.2	74.1	74.1	-0.1	75.8	1.6	75.8	1.6	74.2	0.0
R-11	E. Columbine Avenue	Office	1	1	E (72)	70.3	70.3	70.7	0.4	72.1	1.8	72.2	1.9	71.0	0.7
R-12	S. Standard Avenue	Commercial/Industrial	1	1	F	73.9	73.9	74.3	0.4	74.7	0.8	75.3	1.4	75.2	1.3
R-13	Tech Center Drive	Commercial/Industrial	1	1	F	74.2	74.3	75.0	0.8	75.9	1.7	76.0	1.8	75.6	1.4
R-14	Tech Center Drive	Commercial/Industrial	1	1	F	67.5	68.0	68.0	0.3	69.0	1.3	69.0	1.3	68.2	0.5
R-15	Pullman Street	Commercial/Industrial	1	1	F	77.1	76.4	76.7	-0.4	76.7	-0.4	76.8	-0.3	77.3	0.2
R-16	Pullman Street	Commercial/Industrial	1	1	F	78.7	77.8	79.6	0.9	80.1	1.4	80.6	1.9	80.3	1.6
R-17	E. Garry Avenue	Office	1	1	E (72)	77.7	77.7	78.5	0.8	79.5	1.8	79.6	1.9	79.2	1.5
R-18	Pullman Street	Office	1	1	E (72)	73.7	73.6	74.3	0.6	76.1	2.4	76.1	2.4	75.1	1.4
R-19	Pullman Street	Office	1	1	E (72)	67.8	67.8	68.2	0.4	69.5	1.7	69.5	1.7	68.6	0.8
R-20	Pullman Street	Office	1	1	E (72)	67.8	67.9	68.3	0.4	69.1	1.2	69.1	1.2	68.5	0.6
R-21	Pullman Street	Commercial	1	1	F	72.9	73.1	73.3	0.3	73.6	0.6	73.6	0.6	73.5	0.5
R-22	S. Grand Avenue	Commercial	1	1	F	71.9	73.0	73.3	1.4	73.5	1.6	73.8	1.9	73.7	1.8
R-23	Hotel Terrace Drive	Hotel	1	1	E (72)	46.1	46.0	46.1	-0.1	46.6	0.4	46.7	0.5	46.4	0.2
R-24	S. Grand Avenue	Hotel	1	1	E (72)	64.4	66.1	66.8	2.4	67.0	2.6	67.3	2.9	67.4	3.0
R-25	S. Grand Avenue	Commercial	1	1	F	71.7	76.1	76.4	4.7	76.5	4.8	76.8	5.1	77.0	5.3
R-26	S. Grand Avenue	Commercial/Industrial	1	1	F	62.0	64.8	65.0	3.0	65.2	3.2	65.7	3.7	65.6	3.6
R-27	Brookhollow Drive	Office	1	1	E (72)	71.3	75.0	75.4	4.1	75.5	4.2	75.9	4.6	76.2	4.9
R-28	Ritchey Drive	Commercial/Industrial	1	1	F	73.2	78.0	78.5	5.3	78.6	5.4	79.0	5.8	79.2	6.0
R-29	Ritchey Drive	Commercial/Industrial	1	1	F	74.3	77.8	78.4	4.1	78.5	4.2	79.1	4.8	79.0	4.7
R-30	E. Glenwood Place	Commercial/Industrial	1	1	F	74.9	75.2	76.6	1.7	76.7	1.8	76.8	1.9	77.1	2.2
R-31	E. Dyer Road	Hotel	1	1	E(72)	60.7	60.7	61.5	0.8	62.3	1.6	62.4	1.7	62.1	1.4
R-32	Pullman Street	Office	1	1	E (72)	73.4	73.5	73.9	0.5	74.9	1.5	75.0	1.6	74.6	1.2
R-33	Pullman Street	Commercial/Industrial	1	1	F	74.0	74.0	75.6	1.6	75.9	1.9	76.3	2.3	76.3	2.3
R-34	Bell Avenue	Commercial/Industrial	1	1	F	75.4	75.5	76.5	1.1	77.1	1.7	77.8	2.4	77.2	1.8
R-35	Valencia Avenue	Commercial/Industrial	1	1	F	70.4	70.4	71.9	1.5	72.2	1.8	72.7	2.3	72.5	2.1
R-36	Newport Avenue	Vacant Land	1	1	F	67.9	68.0	68.2	0.3	70.0	2.1	70.1	2.2	68.7	0.8
R-37	Newport Avenue	Vacant Land	1	1	F	65.7	66.4	66.3	-0.1	67.0	0.6	67.0	0.6	66.7	0.3
R-38	Edinger Avenue	Commercial/Industrial	1	1	F	67.3	67.4	67.6	0.3	68.9	1.6	68.8	1.5	67.4	0.1
R-39	Auto Mall Drive	Commercial/Industrial	1	1	F	67.5	67.6	67.8	0.3	68.1	0.6	68.0	0.5	68.0	0.5
R-40	Village Drive	Commercial	1	1	F	68.9	68.9	68.0	-0.9	68.4	-0.5	68.9	0.0	68.6	-0.3
R-41	Village Drive	Commercial/Industrial	1	1	F	75.7	76.0	77.0	1.2	77.2	1.4	77.1	1.3	77.4	1.6
R-42	Tustin Village Way	Residential	1	1	B (67)	58.5	58.9	59.0	0.3	59.1	0.4	59.2	0.5	59.1	0.4
R-43	Tustin Village Way	Residential	1	2	D (52)[4]	71.0/46.05	71.4/46.4	71.6/46.6	0.4	71.7/46.7	0.5	71.8/46.8	0.6	71.7/46.7	0.5
R-44	Tustin Village Way	Residential	2	1	B (67)	63.5	63.9	64.2	0.6	64.2	0.6	64.3	0.7	64.2	0.6
R-45	Tustin Village Way	Residential	2	1	B (67)	63.0	63.8	64.0	0.8	64.0	0.8	64.0	0.8	63.7	0.5
R-46	Tustin Village Way	Residential	2	1	B (67)	54.6	55.1	55.3	0.5	55.3	0.5	55.4	0.6	55.2	0.4
R-47	Tustin Village Way	Residential	2	1	B (67)	61.2	61.9	62.1	0.7	62.1	0.7	62.2	0.8	61.9	0.5
R-48	Tustin Village Way	Residential	2	1	B (67)	63.6	64.5	64.7	0.9	64.7	0.9	64.7	0.9	64.4	0.6

Table 2.14.4 Predicted Traffic Noise Levels (dBA L_{eq})

Receptor No.	Location	Type of Land Use	Number of Units/Receptors Represented	First or Second Floor	Noise Abatement Criteria	Existing Noise Level	Future No Build	Alternative 1	Change from Existing Level	Alternative 2	Change from Existing Level	Alternative 3	Change from Existing Level	Alternative 4	Change from Existing Level
R-49	Tustin Village Way	Residential	2	1	B (67)	63.3	64.4	64.5	1.0	64.6	1.1	64.5	1.0	64.2	0.7
R-50	Tustin Village Way	Residential	3	1	B (67)	57.1	57.7	57.8	0.5	57.9	0.6	57.9	0.6	57.7	0.4
R-51	Tustin Village Way	Residential	4	1	B (67)	57.6	58.3	58.4	0.5	58.5	0.6	58.5	0.6	58.3	0.4
R-52	Tustin Village Way	Residential	3	1	B (67)	51.6	52.2	52.3	0.4	52.4	0.5	52.4	0.5	52.1	0.2
R-53	Tustin Village Way	Residential	2	1	B (67)	55.7	56.4	56.5	0.5	56.5	0.5	56.5	0.5	56.3	0.3
R-54	Tustin Village Way	Residential	2	1	B (67)	56.2	57.0	57.0	0.4	57.1	0.5	57.1	0.5	56.9	0.3
R-55	Tustin Village Way	Residential	3	1	B (67)	57.2	58.1	58.2	0.6	58.3	0.7	58.3	0.7	58.0	0.4
R-56	Tustin Village Way	Residential	3	1	B (67)	53.3	54.0	54.1	0.4	54.1	0.4	54.1	0.4	53.9	0.2
R-57	Tustin Village Way	Residential	3	1	B (67)	58.7	59.5	59.6	0.5	59.6	0.5	59.6	0.5	59.3	0.2
R-58	Tustin Village Way	Residential	2	1	B (67)	62.2	62.8	62.8	0.4	62.9	0.5	62.9	0.5	62.7	0.3
R-59	Tustin Village Way	Residential	2	1	B (67)	61.0	61.4	61.5	0.3	61.5	0.3	61.5	0.3	61.4	0.2
R-60	Tustin Village Way	Residential	2	1	B (67)	63.8	64.5	64.6	0.5	64.6	0.5	64.6	0.5	64.4	0.3
R-61	Tustin Village Way	Residential	2	1	B (67)	59.8	60.6	60.6	0.4	60.7	0.5	60.7	0.5	60.5	0.3
R-62	Tustin Village Way	Residential	2	1	B (67)	65.1	65.7	65.8	0.3	65.8	0.3	65.8	0.3	65.6	0.1
R-63	Tustin Village Way	Residential	2	1	B (67)	60.1	60.8	60.8	0.4	60.9	0.5	60.9	0.5	60.8	0.4
R-64	Tustin Village Way	Residential	2	1	B (67)	61.8	62.2	62.2	0.2	62.2	0.2	62.2	0.2	62.2	0.2
R-65	Tustin Village Way	Residential	2	1	B (67)	61.5	62.7	62.8	0.6	62.8	0.6	62.8	0.6	62.5	0.3
R-66	Tustin Village Way	Residential	2	1	B (67)	64.1	65.0	65.0	0.5	65.1	0.6	65.1	0.6	64.9	0.4
R-67	Tustin Village Way	Residential	2	1	B (67)	60.5	61.2	61.3	0.5	61.3	0.5	61.3	0.5	61.1	0.3
R-68	Tustin Village Way	Residential	2	1	B (67)	60.8	61.3	61.3	0.3	61.4	0.4	61.4	0.4	61.2	0.2
R-69	Tustin Village Way	Residential	4	1	B (67)	63.3	64.2	64.2	0.6	64.2	0.6	64.2	0.6	64.0	0.4
R-70	Tustin Village Way	Residential	2	1	B (67)	57.8	58.5	58.6	0.4	58.6	0.4	58.6	0.4	58.4	0.2
R-71	Tustin Village Way	Residential	2	1	B (67)	56.4	57.1	57.2	0.4	57.2	0.4	57.2	0.4	57.0	0.2
R-72	Tustin Village Way	Residential	2	1	B (67)	59.3	60.1	60.2	0.4	60.2	0.4	60.2	0.4	60.1	0.3
R-73	De Anza Lane	Residential	3	1	B (67)	62.2	62.9	63.0	0.4	63.0	0.4	63.1	0.5	62.9	0.3
R-74	Tustin Grove Drive	Residential	6	2	B (67)	53.1	53.1	53.3	0.2	54.1	1.0	54.1	1.0	55.4	2.3
R-75	Tustin Grove Drive	Residential	6	1	B (67)	51.3	51.4	51.6	0.3	52.6	1.3	52.6	1.3	53.0	1.7
R-76	Tustin Grove Drive	Residential	8	1	B (67)	51.4	51.5	51.7	0.3	52.9	1.5	52.9	1.5	53.7	2.3
R-77	Tustin Grove Drive	Residential	8	2	B (67)	54.7	54.7	54.9	0.2	56.0	1.3	56.0	1.3	56.8	2.1
R-78	Tustin Grove Drive	Residential	8	1	B (67)	52.4	52.5	52.5	0.1	53.5	1.1	53.6	1.2	54.3	1.9
R-79	Tustin Grove Drive	Residential	8	2	B (67)	54.4	54.5	54.5	0.1	55.7	1.3	55.7	1.3	56.5	2.1
R-80	Tustin Grove Drive	Residential	2	1	B (67)	54.6	54.7	54.8	0.2	55.9	1.3	56.0	1.4	56.5	1.9
R-81	Tustin Grove Drive	Residential	2	2	B (67)	56.4	56.4	56.5	0.1	57.8	1.4	57.9	1.5	58.2	1.8
R-82	Tustin Grove Drive	Residential	4	1	B (67)	56.3	56.3	56.4	0.1	57.3	1.0	57.4	1.1	58.8	2.5
R-83	Tustin Grove Drive	Residential	4	2	B (67)	58.3	58.3	58.5	0.2	59.4	1.1	59.5	1.2	60.8	2.5
R-84	Kenyon Drive	Residential	5	2	B (67)	67.5	67.6	**67.7**	0.1	**68.8**	1.2	**69.0**	1.4	**73.5**	5.9
R-85	Kenyon Drive	Residential	5	2	B (67)	68.1	68.1	**68.3**	0.2	**68.7**	0.6	**68.8**	0.7	**73.2**	5.1
R-86	Kenyon Drive	Residential	5	2	B (67)	72.2	72.3	**72.3**	0.1	**72.0**	-0.2	**72.5**	0.3	**74.2**	2.0
R-87	Kenyon Drive	Residential	3	2	B (67)	72.4	72.5	**72.6**	0.2	**74.0**	1.6	**74.5**	2.1	**73.9**	1.5
R-88	Kenyon Drive	Residential	2	1	B (67)	59.0	59.1	59.2	0.2	60.4	1.4	61.0	2.0	61.1	2.1
R-89	Kenyon Drive	Residential	3	2	B (67)	72.0	72.0	**72.1**	0.1	**73.7**	1.7	**74.4**	2.4	**74.7**	2.7
R-90	Kenyon Drive	Residential	2	2	B (67)	67.5	67.5	**67.6**	0.1	**69.2**	1.7	**69.6**	2.1	**69.5**	2.0
R-91	Kenyon Drive	Residential	3	2	B (67)	68.2	68.5	**68.5**	0.3	**69.8**	1.6	**70.1**	1.9	**70.3**	2.1
R-92	Kenyon Drive	Residential	2	1	B (67)	55.4	55.9	56.1	0.5	56.6	1.0	56.7	1.1	56.9	1.3
R-93	Kenyon Drive	Residential	3	2	B (67)	69.5	69.7	**69.9**	0.3	**71.3**	1.7	**71.6**	2.0	**71.9**	2.3
R-94	Kenyon Drive	Residential	2	2	B (67)	64.8	65.0	65.0	0.2	**66.4**	1.6	**66.7**	1.9	**67.0**	2.2
R-95	Kenyon Drive	Residential	3	2	B (67)	67.1	67.7	**67.9**	0.6	**68.7**	1.4	**68.5**	1.2	**68.5**	1.2
R-96	Kenyon Drive	Residential	2	1	B (67)	61.2	61.2	61.3	0.1	61.8	0.6	62.1	0.9	63.0	1.8

Table 2.14.4 Predicted Traffic Noise Levels (dBA L_{eq})

Receptor No.	Location	Type of Land Use	Number of Units/Receptors Represented	First or Second Floor	Noise Abatement Criteria	Existing Noise Level	Future No Build	Alternative 1	Change from Existing Level	Alternative 2	Change from Existing Level	Alternative 3	Change from Existing Level	Alternative 4	Change from Existing Level
R-97	Kenyon Drive	Residential	2	2	B (67)	62.9	63.0	63.1	0.2	64.1	1.2	64.2	1.3	65.9	3.0
R-98	Altadena Drive	Residential	2	1	B (67)	58.7	59.0	59.2	0.4	60.3	1.5	60.5	1.7	60.7	1.9
R-99	Altadena Drive	Residential	2	1	B (67)	60.2	60.5	60.7	0.4	61.7	1.4	61.5	1.2	64.5	4.2
R-100	Altadena Drive	Residential	2	2	B (67)	63.3	63.6	63.7	0.4	64.1	0.8	64.3	1.0	64.5	1.2
R-101	Altadena Drive	Residential	1	2	B (67)	69.1	69.4	**69.5**	0.4	**69.9**	0.8	**70.3**	1.2	**70.4**	1.3
R-102	Pasadena Avenue	Residential	4	1	B (67)	64.1	64.3	64.4	0.3	64.9	0.8	65.4	1.3	65.6	1.5
R-103	Pasadena Avenue	Residential	3	2	B (67)	75.6	75.8	**76.1**	0.4	**76.6**	0.9	**76.9**	1.2	**77.2**	1.5
R-104	Pasadena Avenue	Residential	3	2	B (67)	67.3	67.4	**67.5**	0.2	**68.4**	1.1	**69.0**	1.7	**69.0**	1.7
R-105	Pasadena Avenue	Residential	4	1	B (67)	57.7	57.9	58.1	0.3	58.5	0.7	58.7	0.9	58.9	1.1
R-106	Pasadena Avenue	Residential	3	2	B (67)	74.9	75.1	**75.6**	0.7	**76.0**	1.1	**76.3**	1.4	**76.4**	1.5
R-107	Pasadena Avenue	Residential	4	1	B (67)	64.2	64.5	64.6	0.3	65.3	1.0	65.6	1.3	65.5	1.2
R-108	Pasadena Avenue	Residential	3	2	B (67)	61.6	61.9	62.1	0.4	62.4	0.7	62.6	0.9	62.7	1.0
R-109	Pasadena Avenue	Residential	4	1	B (67)	53.2	58.7	58.8	0.4	59.1	0.7	59.3	0.9	59.3	0.9
R-110	Pasadena Avenue	Residential	2	2	B (67)	72.1	72.4	**72.7**	0.6	**73.2**	1.1	**73.4**	1.3	**73.4**	1.3
R-111	Pasadena Avenue	Residential	2	1	B (67)	58.1	58.4	58.7	0.5	59.0	0.8	59.1	0.9	59.2	1.0
R-112	Pasadena Avenue	Residential	2	2	B (67)	61.5	61.9	62.2	0.6	62.5	0.9	62.6	1.0	62.7	1.1
R-113	Pasadena Avenue	Residential	1	2	B (67)	65.8	66.1	**66.4**	0.6	**66.8**	1.0	**67.0**	1.2	**67.1**	1.3
R-114	Pasadena Avenue	Residential	3	2	B (67)	63.2	63.6	63.8	0.5	64.1	0.8	64.3	1.0	64.3	1.0
R-115	Pasadena Avenue	Residential	3	1	B (67)	58.7	59.0	59.2	0.4	59.4	0.6	59.6	0.8	59.6	0.8
R-116	Pasadena Avenue	Residential	3	2	B (67)	62.9	63.1	63.4	0.5	63.9	1.0	64.2	1.3	64.2	1.3
R-117	Pasadena Avenue	Residential	3	1	B (67)	55.9	56.1	56.3	0.4	56.7	0.8	57.0	1.1	57.0	1.1
R-118	Pasadena Avenue	Residential	2	1	B (67)	64.3	64.5	64.6	0.2	64.8	0.4	65.3	0.9	64.9	0.5
R-119	Pasadena Avenue	Residential	2	2	B (67)	71.4	71.6	**71.7**	0.3	**72.1**	0.7	**72.5**	1.1	**72.4**	1.0
R-120	Medallion Avenue	Residential	8	1	B (67)	59.8	60.1	60.2	0.3	60.5	0.6	60.9	1.0	60.9	1.0
R-121	Medallion Avenue	Residential	2	1	B (67)	63.6	64.0	64.0	0.2	64.4	0.6	64.9	1.1	64.7	0.9
R-122	Medallion Avenue	Residential	6	1	B (67)	61.0	61.3	61.4	0.3	61.7	0.6	62.3	1.2	62.0	0.9
R-123	Medallion Avenue	Residential	2	1	B (67)	63.5	63.9	64.0	0.3	64.3	0.6	64.8	1.1	64.6	0.9
R-124	Medallion Avenue	Residential	3	1	B (67)	61.2	61.5	61.6	0.2	61.9	0.5	62.5	1.1	62.2	0.8
R-125	Whitby Circle	Residential	1	2	B (67)	71.3	71.7	**71.9**	0.4	**71.9**	0.4	**72.1**	0.6	**71.9**	0.4
R-126	Whitby Circle	Residential	1	2	B (67)	68.9	69.5	**69.6**	0.4	**69.6**	0.4	**69.8**	0.6	**69.6**	0.4
R-127	Whitby Circle	Residential	1	2	B (67)	70.5	71.0	**71.2**	0.4	**71.3**	0.5	**71.5**	0.7	**71.2**	0.4
R-128	Whitby Circle	Residential	1	2	B (67)	72.9	73.3	**73.5**	0.4	**73.5**	0.4	**73.8**	0.7	**73.6**	0.5
R-129	Pasadena Avenue	Residential	2	1	B (67)	62.1	62.9	63.0	0.5	63.2	0.7	63.3	0.8	62.9	0.4
R-130	Pasadena Avenue	Residential	2	2	B (67)	71.9	72.4	**72.5**	0.4	**72.5**	0.4	**72.5**	0.4	**72.4**	0.3
R-131	Pasadena Avenue	Residential	4	1	B (67)	62.8	63.8	63.9	0.5	64.0	0.6	64.1	0.7	63.7	0.3
R-132	Pasadena Avenue	Residential	4	2	B (67)	64.2	64.6	64.7	0.2	64.8	0.3	64.8	0.3	64.7	0.2
R-133	Boleyn Circle	Residential	1	1	B (67)	65.7	66.2	**66.3**	0.4	**66.4**	0.5	**66.4**	0.5	**66.2**	0.3
R-134	Boleyn Circle	Residential	1	1	B (67)	64.6	65.5	65.6	0.2	65.6	0.2	65.6	0.2	65.5	0.1
R-135	Boleyn Circle	Residential	1	2	B (67)	75.1	75.7	**75.8**	0.3	**75.8**	0.3	**75.9**	0.4	**75.7**	0.2
R-136	Boleyn Circle	Residential	1	2	B (67)	77.6	78.0	**78.2**	0.3	**78.2**	0.3	**78.2**	0.3	**78.2**	0.3
R-137	Boleyn Circle	Residential	1	2	B (67)	69.3	70.2	**70.3**	0.4	**70.3**	0.4	**70.5**	0.6	**70.3**	0.4
R-138	Boleyn Circle	Residential	1	2	B (67)	67.9	68.8	**68.9**	0.3	**68.9**	0.3	**69.0**	0.4	**68.9**	0.3
R-139	Pasadena Avenue	Residential	1	2	D (52)[4]	67.3/42.3	68.1/43.1	68.2/43.2	0.3	68.2/43.2	0.3	68.2/43.2	0.3	68.1/43.1	0.2
R-140	Pasadena Avenue	Residential	4	1	B (67)	62.4	63.5	63.5	0.4	63.5	0.4	63.5	0.4	63.4	0.3
R-141	Pasadena Avenue	Residential	4	1	B (67)	61.5	62.8	62.9	0.4	62.9	0.4	62.9	0.4	62.8	0.3
R-142	Pasadena Avenue	Residential	4	2	B (67)	74.1	74.4	**74.4**	0.1	**74.4**	0.1	**74.4**	0.1	**74.3**	0.0
R-143	Pasadena Avenue	Residential	4	1	B (67)	64.7	65.5	65.5	0.1	65.5	0.1	65.5	0.1	65.5	0.1
R-144	Newport Avenue	Hotel	1	1	E (72)	47.7	48.2	48.2	0.3	48.6	0.7	48.4	0.5	48.5	0.6

Table 2.14.4 Predicted Traffic Noise Levels (dBA L_{eq})

Receptor No.	Location	Type of Land Use	Number of Units/Receptors Represented	First or Second Floor	Noise Abatement Criteria	Existing Noise Level	Future No Build	Alternative 1	Change from Existing Level	Alternative 2	Change from Existing Level	Alternative 3	Change from Existing Level	Alternative 4	Change from Existing Level
R-145	Newport Avenue	Hotel	1	1	E (72)	49.2	50.3	51.4	1.1	51.4	2.2	50.4	1.2	50.4	1.2

Source: *Noise Study Report* (2015).

[1] This column defines the height of the receptor. First-floor receptors were assumed to have a height of 5 ft while second-floor receptors have an assumed height of 15 ft.

[2] There are no outdoor frequent human use areas associated with office land uses within the project area. The highest expected noise level is provided for reporting purposes.

[3] Numbers in **bold** represent noise levels that approach or exceed the NAC and contain an area of frequent human use.

[4] Residential uses without exterior noise-sensitive living areas were analyzed to assess interior noise level impacts only.

[5] Exterior/interior noise level. The interior noise level was determined using a standard 25 dB exterior-to-interior noise level reduction.

dB = decibels

dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

ft = foot/feet

NAC = Noise Abatement Criteria

Alternative 1

As shown in Table 2.14.4, no substantial noise increase of 12 dBA or more over the corresponding existing noise level would result under Alternative 1. Of the 145 modeled receptors, one first-floor receptor with noise-sensitive outdoor uses (Receptor R-4 representing the swimming pool area of the DoubleTree Club by Hilton Hotel, Orange County Airport) would approach or exceed the 72 dBA L_{eq} NAC and 1 first-floor receptor (Receptor R-133) and 26 second-floor receptors (Receptors R-84 through R-87, R-89 through R-91, R-93, R-95, R-101, R-103, R-104, R-106, R-110, R-113, R-119, R-125 through R-128, R-130, R-133, R-135 through R-138, and R-142) representing residential uses on the north end of the project would approach or exceed the 67 dBA L_{eq} NAC under Build Alternative 1. The same receptors would also exceed the NAC for Future No Build Conditions.

Alternative 2

The permanent noise impacts of Alternative 2 would be similar to those that would occur under Alternative 1 except that under Alternative 2, R-94 would approach the NAC of 67 dBA L_{eq} for residential uses, whereas R-94 would not approach the NAC at this receptor under Alternative 1. Receptor R-94 is within a cluster of other receptors (i.e., R-84 through R-97) that all represent multifamily residences with private patios and balconies that would be exposed to noise levels approaching or exceeding the NAC and for which noise barriers were modeled. As shown in Table 2.14.4, no substantial increase of 12 dBA or more over the corresponding existing noise level would result under Alternative 2. Of the 145 modeled receptor locations, 1 first-floor receptor with noise-sensitive outdoor uses would approach or exceed the 72 dBA L_{eq} NAC and 1 first-floor receptor and 27 second-floor receptors would approach or exceed the 67 dBA L_{eq} NAC under Alternative 2.

Alternative 3

The permanent noise impacts of Alternative 3 would cause the same receptors as Alternative 2, as described above, to approach or exceed the NAC; however, the overall noise levels would be greater than or equal to the NAC at all locations.

Alternative 4

The permanent noise impacts of Alternative 3 would cause the same receptors as Alternative 2 as described above to approach or exceed the NAC; however, the overall noise levels would be worst-case scenario at more locations than Alternative 3.

The following receptor locations would be or would continue to be exposed to noise levels that approach or exceed the NAC under Activity Categories B and E under Alternative 4. Noise barriers were analyzed for each of these receptor locations. Figure 2.14-2 shows the receptor locations, the locations of the existing noise barriers, the land uses, the existing Caltrans right-of-way limits, and the modeled noise barriers.

- **Receptor R-4:** This receptor location represents an outdoor swimming pool area associated with the DoubleTree Club by Hilton Hotel, Orange County Airport, at 7 Hutton Center Drive. There is an existing 5 ft high perimeter wrought iron fence around the swimming pool area. Two noise barriers (Noise Barrier [NB] Nos. 1 and 2) were modeled separately to shield R-4. One noise barrier was along the perimeter of the swimming pool area, and the second was at the edge of the shoulder on the southbound side of SR-55.
- **Receptors R-84 through R-87, R-89 through R-91, and R-93 through R-95:** These receptor locations represent multifamily residences with private balconies located at the private first-story patios and second-story balconies located along Kenyon Road on the northbound side of SR-55 south of the McFadden Avenue ramps. There are existing perimeter walls along the southern property line that are 9 ft high. Two noise barrier configurations were modeled separately to shield the impacted receivers. The first configuration evaluated NB No. 3 along the Caltrans right-of-way from station number (STA) 508+00 to STA 516+50. The second configuration evaluated a reduced version of NB No. 3, as well as NB No. 4, which is located along the edge of the shoulder, west of Existing Wall (EW) No. 1.
- **Receptors R-101, R-103, R-104, R-106, R-110, R-113, and R-119:** These receptor locations represent the second-floor multifamily residences with private balconies at the western terminus of Altadena Drive, private balconies located within the Regency West apartment complex, and private balconies located within the Tustin Gardens apartment complex on the northbound side of SR-55 between the McFadden Avenue ramps and McFadden Avenue. There is an existing wall (EW No. 2) along the western property line ranging in height from 11 to 13 ft. NB No. 5 was modeled at the edge of the Caltrans right-of-way on the northbound side of SR-55 at the same location as EW No. 2.
- **Receptors R-125 through R-128, R-130, R-133, and R-135 through R-138:** These receptor locations represent second-floor multifamily residences with private balconies at the western terminus of Whitby Circle, the second-floor

multifamily residence with a private balcony located at the Tustin Southern Apartments, and the first- and second-floor multifamily residences with private patios and balconies at the western terminus of Boleyn Circle on the northbound side of SR-55 north of McFadden Avenue. There is an existing wall along the western property line ranging in height from 10 to 14 ft (EW No. 3). NB No. 6 was modeled at the State right-of-way on the northbound side of SR-55 at the same location as EW No. 3.

- **Receptor R-142:** This receptor location represents the second-floor multifamily residence with private balcony located at the Las Casas Apartments on the northbound side of SR-55, south of I-5. There is an existing 14-ft high perimeter wall (EW No. 4) along the western and northern property line. NB No. 7 was modeled at the State right-of-way on the northbound side of the SR-55/property line of the Las Casas Apartment Complex at the same location as EW No. 4.

No Build Alternative

Potential long-term noise impacts under the No Build Alternative would be solely from traffic noise. Future noise levels under the No Build Alternative are shown in Table 2.14.4. Of the 145 modeled receptors, one first-floor receptor with noise-sensitive outdoor uses would approach or exceed the 72 dBA L_{eq} NAC and 26 second-floor receptors would approach or would continue to approach or exceed the NAC under the No Build Alternative 2040 conditions.

2.14.4 Avoidance, Minimization, and/or Abatement Measures

2.14.4.1 Noise Abatement Consideration

Noise Barrier Modeling

Noise abatement measures such as noise barriers were considered to shield receivers in the project area, where receptors would be or would continue to be exposed to traffic noise levels approaching or exceeding the NAC. All properties requiring abatement consideration are within Activity Categories B (67 dBA L_{eq} NAC) and E (72 dBA L_{eq} NAC). The **bold numbers** in Table 2.14.4 show receptor locations that would approach or exceed the 67 dBA L_{eq} NAC and 72 dBA L_{eq} NAC under future worst-case traffic conditions for Alternatives 1, 2, 3, and 4. Noise barriers were analyzed for each of those receptor locations. Depending on the location of the potential barrier and existing barrier height, noise barriers from 6 to 22 ft in height were analyzed. For this project, per Caltrans, a full barrier analysis was only completed for Alternative 4, a worst-case scenario. All noise barrier heights modeled for Alternative 4 would provide adequate noise abatement for the same receptors for

all alternatives. The results of the noise barrier modeling are shown in Table 2.14.5. The locations of the noise barriers are shown in Figure 2.14-2.

The following noise barriers were analyzed to shield receptor locations that would be exposed to traffic noise levels approaching or exceeding the 67 dBA L_{eq} NAC under Activity Category B and 72 dBA L_{eq} NAC under Activity Category E for all Build Alternatives:

- **NB No. 1:** A 236 ft long barrier along the perimeter of the swimming pool area at the DoubleTree Club by Hilton Hotel, Orange County Airport, located at 7 Hutton Center Drive, was analyzed to shield Receptor R-4.
- **NB No. 2:** A 643 ft long barrier along the edge of shoulder on the southbound side of SR-55 was analyzed to shield Receptor R-4.
- **NB No. 3:** A 1,021 ft long barrier along the Caltrans right-of-way/property line on the northbound side of SR-55 near the northbound McFadden Avenue off-ramp at Sycamore Avenue was analyzed to shield Receptors R-84 through R-87, R-89 through R-91, and R-93 through R-95.
- **NB No. 3 Reduced:** A reduced version of NB No. 3 (i.e., a 766 ft long barrier along the Caltrans right-of-way/property line on the northbound side of SR-55 near the northbound McFadden Avenue off-ramp at Sycamore Avenue) was analyzed to shield Receptors R-84 through R-87, R-89 through R-91, and R-93 through R-95.
- **NB No. 4:** A 478 ft long barrier along the edge of shoulder on the northbound side of SR-55 near the northbound McFadden Avenue off-ramp at Sycamore Avenue was analyzed to shield Receptors R-84 through R-87, R-89 through R-91, and R-93 through R-95.
- **NB No. 5:** A 959 ft long barrier along the Caltrans right-of-way/property line on the northbound side of SR-55 was analyzed to shield Receptors R-101, R-103, R-104, R-106, R-110, R-113, and R-119.
- **NB No. 6:** A 1,754 ft long barrier along the Caltrans right-of-way/property line on the northbound side of SR-55 was analyzed to shield Receptors R-125 through R-128, R-130, R-133, and R-135 through R-138.
- **NB No. 7:** A 614 ft long barrier along the Caltrans right-of-way/property line of the Las Casas Apartment complex on the northbound side of SR-55 was analyzed to shield Receptor R-142.

Table 2.14.5 Summary of Abatement Key Information

Noise Barrier No.	Figure Sheet	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Noise Attenuation Range (dBA)	Number of Benefited Units/ Receptors[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
NB-1	Sheet 2	PL	10[3]	236	5.8	1	$71,000	--[4]	No	--	No
			12	236	7.4	1	$71,000	$120,402	No	$104,826	No
			14	236	9.0	1	$71,000	$137,225	No	$121,649	No
			16	236	9.8	1	$71,000	$154,047	No	$138,471	No
			18	236	10.8	1	$71,000	$221,335	No	$205,759	No
NB-2	Sheet 2	EOS	12[3]	643	6.2	1	$71,000	--	No	N/A[6]	N/A
			14	643	7.1	1	$71,000	$320,831	No	N/A	N/A
			16	643	7.8	1	$71,000	$366,664	No	N/A	N/A
			18	643	8.4	1	$71,000	$549,996	No	N/A	N/A
NB-3	Sheet 7	ROW/PL	16	1,021	5.6 to 7.1	12	$852,000	$929,936	No	$804,336	Yes
			18	1,021	5.5 to 9.1	19	$1,349,000	$1,221,044	Yes	$1,095,444	Yes
			20	1,021	6.0 to 10.5	19	$1,349,000	$1,318,079	Yes	$1,192,479	Yes
			22[5]	1,021	5.1 to 11.6	24	$1,704,000	$1,415,115	Yes	$1,289,515	Yes
NB-3 Red. & NB-4	Sheet 7	EOS/ROW/PL	10	766 & 478	5.1 to 11.2	17	$1,207,000	$926,521	Yes	$777,021	Yes
			12[3]	766 & 478	5.0 to 12.2	19	$1,349,000	$1,015,193	Yes	$865,693	Yes
			14	766 & 478	5.0 to 12.9	19	$1,349,000	$1,103,865	Yes	$954,365	Yes
			16	766 & 478	5.3 to 14.0	34	$2,414,000	$1,192,538	Yes	$1,043,038	Yes
			18	766 & 478	5.6 to 14.1	38	$2,698,000	$1,530,191	Yes	$1,380,691	Yes
			20	766 & 478	5.7 to 15.5	38	$2,698,000	$1,648,421	Yes	$1,498,921	Yes
			22	766 & 478	5.9 to 15.6	38	$2,698,000	$1,766,651	Yes	$1,617,151	Yes
NB-5	Sheets 7 & 8	ROW	18[3]	959	5.6 to 5.9	8	$568,000	--	No	-	No
			20	959	6.9 to 7.5	8	$568,000	$1,064,745	No	$1,019,165	No
			22	959	5.0 to 8.6	13	$923,000	$1,155,888	No	$1,110,309	No
NB-6	Sheet 8	ROW	16[3]	1,754	5.1 to 7.3	2	$142,000	$1,235,393	No	$1,109,432	No
			18	1,754	5.3 to 8.9	3	$213,000	$2,187,231	No	$2,061,270	No
			20	1,754	5.7 to 10.0	7	$497,000	$2,353,931	No	$2,227,970	No
			22	1,754	5.2 to 11.1	8	$568,000	$2,520,632	No	$2,394,671	No
NB-7	Sheet 8	ROW	18[3]	614	5.1	4	$284,000	--	No	--	No
			20	614	6.9	4	$284,000	--	No	--	No
			22	614	8.6	4	$284,000	$655,408	No	N/A	N/A

Source: *Noise Study Report* (2015).

1 Number of residences that are attenuated 5 dBA or more by the modeled barrier.

2 The estimated noise barrier construction cost information was provided by HDR Engineering, Inc. (September 2015).

3 The minimum wall height required for noise barriers to break the line of sight between the receptor and a truck exhaust stack.

4 Shaded area represents barrier heights that have been determined to be not reasonable because the barrier would not reduce noise levels by 7 dBA or more.

5 Denotes that the maximum feasible barrier height would not break the line of sight between the receptor and a truck exhaust stack.

6 Denotes that the proposed barrier does not have Right-Of-Way Costs associated with the total construction costs.

dBA = A-weighted decibels EOS = edge of shoulder ft = feet PL = property line ROW = right-of-way Red. = Reduced

Noise Barrier Feasibility

A minimum noise reduction of 5 dBA must be achieved at impacted receptors for the proposed noise abatement measures (i.e., noise barriers) to be considered feasible. The feasibility criterion is not necessarily a noise abatement design goal. Greater noise reductions are encouraged if they can be reasonably achieved. Feasibility may be restricted by the following factors:

- Geometric standards
- Safety
- Maintenance contracts with private property owners
- Security
- Underground utilities
- Drainage
- Geotechnical considerations

As shown in Table 2.14.5, seven noise barriers were determined to be feasible, reducing noise levels by 5 dBA or more at one or more receptor locations. Table 2.14.5 also lists the height, approximate length, noise attenuation range, number of benefited receptors, total reasonable allowance, and the cost associated with each height analyzed, both with and without right-of-way cost, for each noise barrier that was considered feasible.

Noise Barrier Reasonableness

All the noise barriers that were considered feasible were analyzed to determine their reasonableness. The overall reasonableness of noise abatement is determined by considering the noise reduction goal combined with the construction cost of the barrier. For a noise barrier to be considered reasonable, the noise level reduction design goal of 7 dBA must be achieved at one or more of the benefited receptors. For any noise barrier to be considered reasonable from a cost perspective, the estimated construction cost of the noise barrier would be equal to or less than the total cost allowance calculated for the barrier. The total reasonable allowance was determined based on the number of benefited receptors multiplied by the reasonable allowance per residence. The reasonable allowance per residence is based on a 2015 allowance of $71,000 per benefited unit/receptor. If the estimated noise barrier construction cost exceeds the total reasonable allowance, the noise barrier is determined to be not reasonable. For the purpose of determining the reasonableness of the proposed noise barriers for the proposed project, the following two scenarios were considered:

- The construction cost of the noise barrier and the cost of the right-of-way for the noise barrier
- The construction cost of the noise barrier only (requires the property owner to donate the right-of-way for the proposed noise barrier)

A preliminary reasonableness determination of providing noise abatement for exteriors of residential areas in Activity Category B (which includes residential areas) and outdoor activity areas for commercial uses under Activity Category E was conducted. As shown in Table 2.14.5, when both the cost of construction and the cost of the right-of-way were considered, two of the seven feasible noise barriers were found to be reasonable, the NB No. 3 and the combined NB No. 3 Reduced and NB No. 4. NB No. 3 was also found to be reasonable at a height of 16 ft if it was assumed that the right-of-way for that noise barrier would be donated and would not be part of the noise barrier construction costs. For a proposed abatement location outside the State right-of-way, an easement must be secured for all affected properties to construct and maintain the noise abatement measure. The acquisition of this easement is part of the abatement cost for the purposes of assessing reasonableness. If the noise abatement is determined not to be reasonable with the cost of right-of-way included, the property owner may donate the easement. NB No. 3 at a height of 16 ft was found to be not reasonable including the cost of right-of-way; however, if the right-of-way needed for this barrier were to be donated, the wall would be reasonable.

2.14.4.2 Recommended Avoidance, Minimization, and/or Abatement Measures

Construction

The following measures would avoid and/or minimize construction noise impacts:

N-1 During construction, the construction contractor will be required to control noise from construction activities in conformance with the California Department of Transportation Standard Specifications, Section 14-8.02, “Noise Control.” The noise level from the contractor’s operations, between the hours of 9:00 PM and 6:00 AM, will not exceed 86 A-weighted decibels at a distance of 50 feet. In addition, the construction contractor will equip all internal combustion engines with the manufacturer-recommended mufflers and will not operate any internal combustion engine on the job site without the appropriate muffler.

Operation

Based on the studies completed to date, Caltrans intends to incorporate noise abatement in the form of a barrier at two potential locations. The first being NB No. 3 at the multifamily residences along Kenyon Drive, with a length of 1,021 ft and a height of 18–22 ft without right-of-way donated and 16–22 ft with right-of-way donated as shown in Table 2.14.5. Calculations based on the preliminary design data show that the barriers will reduce noise levels by 5.6 to 11.6 dBA for 12–24 residences at a cost of $1,221,044 to $1,415,115 without right-of-way donated, and $804,336 to $1,289,515 with right-of-way donated. The second option is the combined NB No. 3 Reduced and NB No. 4 at the multifamily residences along Kenyon Drive, with a length of 1,244 ft and a height of 10–22 ft as shown in Table 2.14.5. Calculations based on the preliminary design data show that the barriers will reduce noise levels by 5.1 to 15.6 dBA for 17–38 residences at a cost of $926,521 to $1,766,651 without right-of-way donated, and $777,021 to $1,617,151 with right-of-way donated. If, during final design, conditions have substantially changed, noise abatement may not be necessary. The final decision on noise abatement will be made on completion of the project design and public involvement processes.

The following abatement measure would avoid and/or minimize operational noise impacts of the Build Alternatives:

N-2 Prior to completion of final design, Noise Barrier (NB) No. 3 and the combined NB No. 3 Reduced and NB No. 4 will be coordinated with the affected property owners (owners of the multifamily residences along Kenyon Drive). The property owners will be surveyed to determine if they are in favor of the noise barrier and if they are willing to donate the right-of-way to the State for construction of the noise barrier.