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 such measures are not feasible. The rest of this section will focus on the NEPA/23 Code of Federal Regulations Part 772 (23 CFR 772) noise analysis; please see Chapter 3 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 the Federal Highway Administration (FHWA) involvement (and the California Department of Transportation [Caltrans], as assigned), the Federal-Aid Highway Act of 1970 and its implementing regulations (23 CFR 772) govern the analysis and abatement of traffic noise impacts. The regulations require that potential noise impacts in areas of frequent human use be identified during the planning and design of a highway project. The regulations contain noise abatement criteria (NAC) that are used to determine when a noise impact would occur. The NAC differ depending on the type of land use under analysis. For example, the NAC for residences (67 A-weighted decibels [dBA]) are 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.

Table 2.14.2 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.

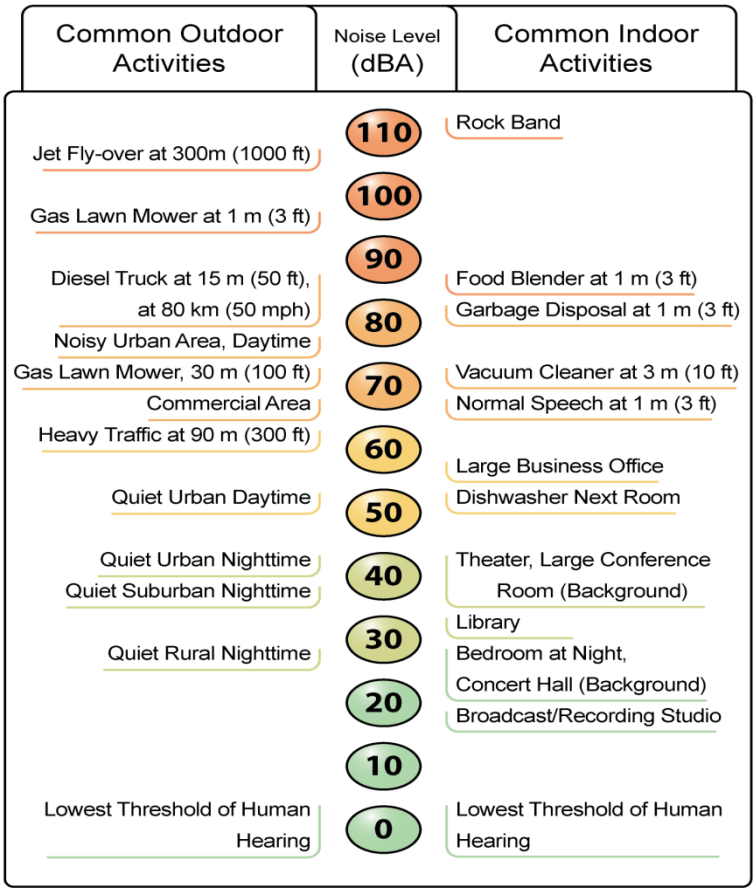
According to Caltrans *Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects* (Traffic Noise Analysis Protocol) (May 2011), a noise impact occurs when the predicted future noise level with the project substantially exceeds

Table 2.14.1: Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level, dBA $L_{eq}(h)$	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, daycare 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, daycare 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 Categories 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 = A-weighted decibels
$L_{eq}(h)$ = one-hour A-weighted equivalent continuous noise level
NAC = Noise Abatement Criteria
NEPA = National Environmental Policy Act

Table 2.14.2: Noise Levels of Common Activities



dBA = A-weighted decibel(s)
ft = foot/feet
m = meter(s)
mph = miles per hour

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, 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 considered for this project.

Caltrans May 2011 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 to be considered feasible. Other considerations include topography, access requirements, other noise sources, and safety considerations. Additionally, a design goal of 7 dBA noise reduction must be achieved at one or more benefited receptor for an abatement measure to be considered reasonable. 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 June 2017 *Noise Study Report* (NSR) and the February 2018 *Noise Abatement Decision Report* (NADR) prepared for the proposed project. The NSR followed the Caltrans May 2011 Traffic Noise Analysis Protocol.

2.14.2.1 Surrounding Land Use and Receptors

Developed and undeveloped land uses in the project vicinity were identified through land use maps, aerial photography, and site inspection. Receptors were identified within each land use category. Existing land uses in the project area include single- and multifamily residences, churches, schools, an institution, a community center, a daycare center, an after-school facility, a park, a golf course, recreational areas, hotels, restaurants, vacant land, retail, office, commercial, and light industrial uses. Existing land uses in the project area are described below in further detail.

- **Northbound Side of Interstate 5 (I-5) between Interstate 405 (I-405) and Alton Parkway:** Land uses in this area include a school with playgrounds and office uses, which are located approximately two feet (ft) lower in elevation than I-5 to approximately six ft higher in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. The playgrounds associated with the school were evaluated under Activity Category C, which has an exterior NAC of 67 dBA equivalent continuous sound level (L_{eq}). The classroom associated with the school was evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Office uses that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}.
- **Northbound Side of I-5 between Alton Parkway and State Route 133 (SR-133):** Land uses in this area include a restaurant, vacant land, retail, and office uses, which are located approximately two ft to eight ft higher than I-5. Currently, no existing walls shield these uses from traffic noise. The restaurant, retail, and office uses that have outdoor frequent human use areas were evaluated under Activity Category E,

which has an exterior NAC of 72 dBA L_{eq}. Vacant land was classified under Activity Category G for reporting purposes.

- **Northbound Side of I-5 between SR-133 and Sand Canyon Avenue:** Land uses in this area include a church and vacant land, which are located approximately 20 ft to 30 ft lower in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. Outdoor frequent human use areas associated with the church were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The interior area of the church was evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Vacant land was classified under Activity Category G for reporting purposes.
- **Northbound Side of I-5 between Sand Canyon Avenue and Jeffrey Road:** Land uses in this area include multifamily residences and a park, which are located approximately 18 ft lower in elevation than I-5 to approximately 14 ft higher in elevation than I-5. Currently, an existing seven ft to 13.5 ft high wall (Existing Wall [EW] No. 2.1) located along the property line of the residential development shield residences from traffic noise. Multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The outdoor frequent human use areas associated with the park were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}.
- **Northbound Side of I-5 between Jeffrey Road and Culver Drive:** Land uses in this area include single- and multifamily residences, a park, retail, and office uses, which are located approximately 16 ft lower in elevation than I-5 to approximately ten ft higher in elevation than I-5. Currently, a number of existing five ft to 16 ft high walls (EW Nos. 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 4.5, and 4.6) located along the State right-of-way, the edge of the shoulder, and the private property line shield these uses from traffic noise. The single- and multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Outdoor frequent human use areas associated with the park were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. Office uses that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Retail and office uses that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes.
- **Northbound Side of I-5 between Culver Drive and Jamboree Road:** Land uses in this area include multifamily residences, a swimming pool, retail, and office uses, which are located approximately 18 ft lower in elevation than I-5 to approximately six ft higher in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. The multifamily residences were evaluated under Activity Category B,

which has an exterior NAC of 67 dBA L_{eq}. The swimming pool was evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. Retail and office uses that have outdoor active use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Retail uses that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes.

- **Northbound Side of I-5 between Jamboree Road and Tustin Ranch Road:** Land uses in this area include retail, which are similar in elevation to I-5 to approximately four ft higher in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. Retail uses that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}.
- **Northbound Side of I-5 between Tustin Ranch Road and Red Hill Avenue:** Land uses in this area include single- and multifamily residences, recreational uses, hotels, restaurants, retail, and commercial uses, which are located approximately 20 ft lower in elevation than I-5 to approximately four ft higher in elevation than I-5. Currently, an existing 12 ft high wall (EW No. 6.2) along the State right-of-way and an existing seven ft high wall (EW No. 6.1) along the private property line shield residences from traffic noise. The single- and multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Recreational uses were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. Hotels and retail that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Restaurants and retail uses that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes, and commercial uses were classified under Activity Category F for reporting purposes.
- **Northbound Side of I-5 between Red Hill Avenue and Newport Avenue:** Land uses in this area include multifamily residences, two schools, restaurants, vacant land, commercial, and light industrial uses, which are located approximately nine ft to 22 ft lower in elevation than I-5. Currently, existing ten ft high walls (EW Nos. 7.1 and 7.2) located along the State right-of-way and the edge of the shoulder shield residences and the school from traffic noise. The multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Outdoor frequent human use areas associated with schools were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. Classrooms associated with the school's center were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Restaurants that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Restaurants that have no outdoor frequent human use areas were

classified under Activity Category E for reporting purposes, and commercial and light industrial uses were classified under Activity Category F for reporting purposes. In addition, vacant land was classified under Activity Category G for reporting purposes.

- **Northbound Side of I-5 between Newport Avenue and State Route 55 (SR-55):** Land uses in this area include single- and multifamily residences, a church, an after-school facility, restaurants, office, retail, commercial, and light industrial uses, which are located approximately two ft to 22 ft lower in elevation than I-5. Currently, existing ten ft to 16 ft high walls (EW Nos. 7.3 and 7.4) located along the edge of the shoulder shield the residences, a church, and an after-school facility from traffic noise. The single- and multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Outdoor frequent human use areas associated with the after-school facility and church were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. Classrooms associated with the after-school facility and the interior area of the church were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Restaurant and retail uses that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Office uses that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes, and commercial and light industrial uses were classified under Activity Category F for reporting purposes.
- **Southbound Side of I-5 between I-405 and Alton Parkway:** Land uses in this area include retail and a parking lot, which are located approximately four ft to 18 ft lower in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. Retail space with outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. The parking lot was classified under Activity Category F for reporting purposes.
- **Southbound Side of I-5 between Alton Parkway and SR-133:** Land uses in this area include office uses, which are located approximately five ft to ten ft lower in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. Office uses that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}.
- **Southbound Side of I-5 between SR-133 and Sand Canyon Avenue:** Land uses in this area include a hotel, restaurants, vacant land, office, and commercial uses, which are located approximately between 16 ft and 33 ft lower in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. Hotels, restaurants, and office uses that have outdoor frequent human use areas were evaluated under

Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Office uses and restaurants that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes, and commercial uses were classified under Activity Category F for reporting purposes. In addition, vacant land was classified under Activity Category G for reporting purposes.

- **Southbound Side of I-5 between Sand Canyon Avenue and Jeffrey Road:** Land uses in this area include a golf course and vacant land, which are located approximately between two ft and 22 ft lower in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. The golf course has no frequent human uses along I-5 in the Study Area and was evaluated under Activity Category C for reporting purposes. Vacant land was classified under Activity Category G for reporting purposes.
- **Southbound Side of I-5 between Jeffrey Road and Culver Drive:** Land uses in this area include single- and multifamily residences, a park, a community center, schools, an institution, a church, a daycare center, restaurants, retail, and commercial uses, which are located approximately one ft to 24 ft lower in elevation than I-5. Currently, existing 8.5 ft to 16 ft high walls (EW Nos. 10.1, 11.1, and 11.2) in the State right-of-way and along the edge of the shoulder and an existing 5.3 ft to six ft high wall (EW No. 11.3) along the private property line shield these uses from traffic noise. The single- and multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Outdoor frequent human use areas associated with the park, schools, church, and the daycare center were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The interior areas of the community center, institution, school, church, and daycare center were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Restaurants that have frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Restaurants and retail that have no frequent human use areas were classified under Activity Category E for reporting purposes.
- **Southbound Side of I-5 between Culver Drive and Jamboree Road:** Land uses in this area include single-family residences and office uses, which are located approximately one ft to 20 ft lower in elevation than I-5. Currently, existing five ft to 19 ft high walls (EW Nos. 12.1, 12.2, 12.3, and 12.4) shield these uses from traffic noise. The single-family residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Office uses that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes.

- **Southbound Side of I-5 between Jamboree Road and Tustin Ranch Road:** Land uses in this area include office and light industrial uses, which are located approximately three ft to 14 ft lower in elevation than I-5. Currently, no existing walls shield these uses from traffic noise. Offices that have outdoor frequent human use areas were evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. Office uses that have no outdoor frequent human use areas were classified under Activity Category E for reporting purposes. Light industrial uses were classified under Activity Category F for reporting purposes.
- **Southbound Side of I-5 between Tustin Ranch Road and Red Hill Avenue:** Land uses in this area include multifamily residences, mobile home parks, a swim school, a restaurant, and commercial uses, and these uses are approximately three ft to 24 ft lower in elevation than I-5. Currently, existing 5.6 ft to 15 ft high walls (EW Nos. 13.1, 13.2, and 13.3) shield these uses from traffic noise. The multifamily residences and mobile home parks were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Outdoor frequent human use areas associated with the swim school were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The restaurant has no outdoor frequent human use areas and was classified under Activity Category E for reporting purposes. Commercial uses were classified under Activity Category F for reporting purposes.
- **Southbound Side of I-5 between Red Hill Avenue and Newport Avenue:** Land uses in this area include single- and multifamily residences and commercial uses, which are located approximately eight ft to 24 ft lower in elevation than I-5. Currently, existing ten ft high walls (EW Nos. 14.1 and 14.2) in the State right-of-way shield these uses from traffic noise. The single- and multifamily residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Commercial uses were classified under Activity Category F for reporting purposes.
- **Southbound Side of I-5 between Newport Avenue and SR-55:** Land uses in this area include single- and multifamily residences, a mobile home park, swimming pools, a restaurant, and retail uses, which are located approximately six ft to 24 ft lower in elevation than I-5. Currently, existing six ft to 11 ft high walls (EW Nos. 14.3, 14.4, and 14.5) along the State right-of-way and the edge of the shoulder and an existing five ft high wall (EW No. 14.6) along the private property line shield these uses from traffic noise. The single- and multifamily residences and the mobile home park were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Swimming pools were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The restaurant and retail uses

have no outdoor frequent human use areas and were classified under Activity Category E for reporting purposes.

2.14.2.2 Existing Noise Level Measurements

The existing noise environment in the Study Area is described below based on short- and long-term noise monitoring that was conducted at representative receptor locations.

Short-Term Monitoring

The primary source of noise in the project area is traffic on I-5. Short-term (15-minute) noise measurements were conducted to document existing noise levels at 82 representative receptor locations in the project area. Short-term noise level measurements were conducted using Larson Davis Models 831, 824, and 820 Type 1 sound level meters. Table 2.14.3 contains the results of the short-term noise level measurements and a description of the noise-monitoring locations. These short-term (ST) noise measurements were used to calibrate the noise model and to predict the noise levels at all 974 modeled receptors in the project area. The short-term monitoring locations are shown on Figure J-1, provided in Appendix J of this document.

Long-Term Monitoring

Long-term traffic noise level measurements were conducted to document the peak traffic noise hour. Long-term ambient noise monitoring was conducted using a dosimeter at six representative locations in the project area. The following is a summary of those measurements:

- The long-term (LT) noise level measurement at LT-1 was performed at 604 Hayes Street from 9:00 a.m. on Wednesday, March 4, 2015, to 9:00 a.m. on Thursday, March 5, 2015. Table 2.14.4 shows that traffic noise peaks during the 9:00 a.m. hour at LT-1.
- The long-term noise level measurement at LT-2 was performed at 248 Monroe from 10:00 a.m. on Thursday, March 5, 2015, to 10:00 a.m. on Friday, March 6, 2015. Table 2.14.5 shows that traffic noise peaks during the 6:00 a.m. hour at LT-2.
- The long-term noise level measurement at LT-3 was performed at 27 Georgia from 11:00 a.m. on Thursday, March 12, 2015, to 11:00 a.m. on Friday, March 13, 2015. Table 2.14.6 shows that traffic noise peaks during the 9:00 a.m. hour at LT-3.
- The long-term noise level measurement at LT-4 was performed at 13881 Tustin East Drive from 8:00 a.m. on Tuesday, March 10, 2015, to 8:00 a.m. on Wednesday, March 11, 2015. Table 2.14.7 shows that traffic noise peaks during the 10:00 a.m. hour at LT-4.

Table 2.14.3: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Source	Comments
ST-1	3/4/2015	9:55 a.m.	15 minutes	61.5	1 Technology Drive, patio on south side of building J	Traffic on I-5 and I-5/I-405 connectors	None
ST-2	3/4/2015	9:55 a.m.	15 minutes	59.3	19 Technology Drive, in patio area between buildings	Traffic on I-5	None
ST-3	3/4/2015	10:48 a.m.	15 minutes	61.0	33 Technology Drive, near bench on the north side of the United Way building	Traffic on I-5 and Alton Parkway	None
ST-4	3/4/2015	10:48 a.m.	15 minutes	60.9	107 Technology Drive, near the PGA Superstore	Traffic on I-5 and in parking lot	None
ST-5	3/4/2015	9:37 a.m.	15 minutes	69.4	189 Technology Drive, in front of the Cercacor building	Traffic on I-5	None
ST-6	3/4/2015	10:23 a.m.	15 minutes	63.8	14804 Sand Canyon Avenue, Irvine Community Church, near the office and playground	Traffic on I-5 and SR-133 connector	None
ST-7	3/4/2015	10:23 a.m.	15 minutes	58.2	90 Jade Flower, in the front yard area of the building facing I-5 in line with the balconies	Traffic on I-5	None
ST-8	3/4/2015	12:30 p.m.	15 minutes	56.8	62 Rose Arch, Cypress Village, in the side yard	Traffic on I-5	None
ST-9	3/4/2015	1:11 p.m.	15 minutes	59.1	1211–1238 Pendio, Umbria Apartment Homes, at the barbeque patio area between buildings	Traffic on I-5	None
ST-10	3/4/2015	1:11 p.m.	15 minutes	60.5	255 Visions, Cypress Community Park, near the baseball diamond bleachers	Traffic on I-5 and Jeffrey Road	Some construction activity nearby
ST-11	3/4/2015	1:51 p.m.	15 minutes	68.5	1300 Hayes, Northwood Place Apartments, behind apartment unit 1024.	Traffic on I-5	None
ST-12	3/5/2015	9:59 a.m.	15 minutes	65.9	46 Hayes, Northwood Place Apartments	Traffic on I-5	None
ST-13	3/5/2015	10:36 a.m.	15 minutes	68.3	46 Hayes, Northwood Place Apartments, behind apartment unit 37	Traffic on I-5	None
ST-14	3/12/2015	11:08 a.m.	15 minutes	56.8	1 Van Buren, Orchard Park, near the end of the dugout fence closest to Yale Avenue	Traffic on I-5, Yale Avenue and Roosevelt	None
ST-15	3/12/2015	12:48 p.m.	15 minutes	66.0	Northwood Park Apartment Homes, behind apartment unit 78	Traffic on I-5	None
ST-16	3/12/2015	12:48 p.m.	15 minutes	65.1	248 Monroe, on the side of the building facing Roosevelt	Traffic on I-5, Monroe, and Roosevelt	None

Table 2.14.3: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Source	Comments
ST-17	3/12/2015	1:25 p.m.	15 minutes	58.8	1 Monroe, the Parklands Apartments, in front of apartment unit 165.	Traffic on I-5	None
ST-18	3/10/2015	11:10 a.m.	15 minutes	56.0	11 Henry, in the back yard	Traffic on I-5 and Trabuco Road	None
ST-19	3/10/2015	11:10 a.m.	15 minutes	56.4	47 Phillipsburg, in the back yard	Traffic on I-5 and Trabuco Road	None
ST-20	3/12/2015	9:52 a.m.	15 minutes	55.5	50 New Season, between 50 and 52 on the sidewalk	Traffic on I-5	None
ST-21	3/12/2015	10:46 a.m.	15 minutes	54.1	350 Commerce, in the outdoor seating area outside of Cafe 350	Traffic on I-5	None
ST-22	3/12/2015	11:26 a.m.	15 minutes	60.8	3230 El Camino Real Suite 200, at the bench along the sidewalk between buildings	Traffic on I-5	None
ST-23	3/10/2015	12:50 p.m.	15 minutes	62.8	13672 Jamboree Road, Babies'R'Us in the southern corner of the parking lot	Traffic on I-5 and Jamboree Road	None
ST-24	3/10/2015	12:50 p.m.	15 minutes	63.9	45 Auto Center Drive, Lexus dealership, near the north side of the building	Traffic on I-5 and parking lot activities	None
ST-25	3/11/2015	9:25 a.m.	15 minutes	56.1	13800 Parkcenter Lane, Rancho Alisal Apartments, behind unit 341 and unit 342	Traffic on I-5, Tustin Ranch Road, I-5 northbound on-ramp, and I-5 southbound on-ramp	None
ST-26	3/11/2015	9:55 a.m.	15 minutes	61.4	13800 Parkcenter Lane, Rancho Alisal Apartments, near the basketball court	Traffic on I-5 and some traffic on El Camino Real	None
ST-27	3/11/2015	9:55 a.m.	15 minutes	60.7	2016 Cherokee, in the back yard	Traffic on I-5 and El Camino Real	None
ST-28	3/11/2015	10:26 a.m.	15 minutes	70.5	1881 El Camino Real, south end of the second floor walkway, near unit Z	Traffic on I-5 and El Camino Real	No private balconies; approximately 9.5 ft above El Camino Real
ST-29	3/11/2015	10:26 a.m.	15 minutes	62.7	13299 Tustin East Drive, apartment unit 51 in front patio	Traffic on I-5	None
ST-30	3/12/2015	1:29 p.m.	15 minutes	58.1	1611 El Camino Real, Key Inn and Suites, in the pool area in the southern courtyard	Traffic on I-5	None

Table 2.14.3: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Source	Comments
ST-31	3/12/2015	2:01 p.m.	15 minutes	66.3	1611 El Camino Real, Key Inn and Suites, in the pool area near El Camino Real	Traffic on I-5 and El Camino Real	None
ST-32	3/11/2015	12:54 p.m.	15 minutes	70.7	1361 El Camino Real, Tustin Cottages, on the sidewalk in front of the buildings, at the end of a walkway between two apartment buildings	Traffic on I-5 and El Camino Real	None
ST-33	3/11/2015	12:54 p.m.	15 minutes	65.1	1171 El Camino Real, Tustin High School, on a walkway outside the gates in front of classroom buildings, 170 ft northwest of the main entrance	Traffic on I-5	None
ST-34	3/11/2015	12:54 p.m.	15 minutes	65.7	1081 El Camino Real, Tustin Lanai Apartments, near the pool area	Traffic on I-5 and El Camino Real	None
ST-35	3/13/2015	10:12 a.m.	15 minutes	66.3	14002 Newport Avenue, at Jack-in-the-Box	Traffic on I-5 and Newport Avenue	None
ST-36	3/13/2015	10:56 a.m.	15 minutes	60.8	690 El Camino Real, in the patio area of the strip mall	Traffic on I-5	None
ST-37	3/13/2015	10:56 a.m.	15 minutes	69.3	580 West 6th Street, Boys & Girls Clubs of Tustin, in the patio area	Traffic on I-5	None
ST-38	3/13/2015	11:40 a.m.	15 minutes	60.1	639 West 6th Street, Tustin Acres Apartments, near the pool area	Traffic on I-5 and pedestrians on 6th Street	None
ST-39	3/13/2015	11:40 a.m.	15 minutes	61.8	648 West Main Street, near the back patio of unit 667A	Traffic on I-5	None
ST-40	3/13/2015	11:40 a.m.	15 minutes	64.2	682 West Main Street, just outside the back patios	Traffic on I-5 and SR-55 interchange ramps	None
ST-41	3/4/2015	9:55 a.m.	15 minutes	64.4	Between 91 Spectrum Center Drive and 81 Fortune Drive, Suite 151, Irvine Spectrum, outdoor eating area between Corner Bakery and Wahoo's Fish Tacos	Traffic on I-5, music playing in Wahoo's, and bird noise	None
ST-42	3/4/2015	10:48 a.m.	15 minutes	64.9	3 Glen Bell Way, Suite 110, Ford Motor Co., approximately 15 ft from the northwest corner of the building in line with the building edge	Traffic on I-5	7 ft high berm between parking lot and I-5 partially blocks the line of sight to vehicles on I-5

Table 2.14.3: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Source	Comments
ST-43	3/10/2015	9:37 a.m.	15 minutes	62.1	7545 Irvine Center Drive, patio area between office buildings	Traffic on I-5	None
ST-44	3/10/2015	9:37 a.m.	15 minutes	66.0	Between 32 and 36 Discovery, in the outdoor area	Traffic on I-5 and ramps to SR-133	None
ST-45	3/10/2015	10:23 a.m.	15 minutes	70.8	14886 Sand Canyon Avenue, in the parking lot of the 76 gas station near the I-5 southbound on-ramp	Traffic on I-5	None
ST-46	3/4/2015	12:30 p.m.	15 minutes	65.2	Vacant land southeast of Oak Creek Golf Course, approximately 125 ft from I-5		None
ST-47	3/4/2015	12:30 p.m.	15 minutes	58.6	1 Golf Club Drive, Oak Creek Golf Course, the green on hole 15	Traffic on I-5	None
ST-48	3/4/2015	1:11 p.m.	15 minutes	51.9	1 Golf Club Drive, Oak Creek Golf Course, the green on hole 14	Traffic on I-5 and Jeffrey Road	None
ST-49	3/4/2015	1:51 p.m.	15 minutes	59.0	5396 Walnut Avenue, KinderCare daycare playground area	Traffic on I-5	None
ST-50	3/4/2015	1:51 p.m.	15 minutes	58.8	94 Austin, Heritage Point Apartments, at the corner of Austin and Topeka, in the front yard of apartment unit 94	Traffic on I-5	None
ST-51	3/5/2015	9:59 a.m.	15 minutes	54.7	5151 Walnut Avenue, Wildflower Apartments, at the pool area	Traffic on I-5	None
ST-52	3/5/2015	9:59 a.m.	15 minutes	62.5	5101 Walnut Avenue, Irvine Baptist Church, at the outdoor sitting area near the freeway wall	Traffic on I-5	None
ST-53	3/5/2015	10:36 a.m.	15 minutes	61.9	Near 2 Montgomery, in line with a private patio	Traffic on I-5	None
ST-54	3/5/2015	10:36 a.m.	15 minutes	60.2	34 Helena, in the middle of the patio, approximately ten ft from the garage	Traffic on I-5	None
ST-55	3/12/2015	11:08 a.m.	15 minutes	62.4	Between 19 and 21 Denver, between private patios	Traffic on I-5	None
ST-56	3/12/2015	11:08 a.m.	15 minutes	61.5	14301 Yale Avenue, Heritage Park Community Center, in front of the building	Traffic on I-5	None
ST-57	3/12/2015	12:48 p.m.	15 minutes	61.8	4321 Walnut Avenue, Irvine High School, near the bleachers of the football field	Traffic on I-5	None
ST-58	3/12/2015	1:25 p.m.	15 minutes	59.4	25 Orangetip, in the back yard	Traffic on I-5	None

Table 2.14.3: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Source	Comments
ST-59	3/12/2015	1:25 p.m.	15 minutes	65.7	14100 Culver Drive, in the back of the Caspian restaurant	Traffic on I-5	None
ST-60	3/12/2015	9:52 a.m.	15 minutes	53.4	14138 Moore Court, in the back yard	Traffic on I-5 and I-5 southbound off-ramp	None
ST-61	3/12/2015	9:52 a.m.	15 minutes	60.4	14072 Picasso Court, in the back yard	Traffic on I-5	None
ST-62	3/12/2015	10:46 a.m.	15 minutes	64.8	On the east sidewalk on the end of the cul-de-sac of Nebraska, behind the back yard of the house at 14031 Chagall Avenue	Traffic on I-5	None
ST-63	3/12/2015	10:46 a.m.	15 minutes	63.5	27 Georgia, in the back yard	Traffic on I-5	None
ST-64	3/12/2015	11:26 a.m.	15 minutes	63.5	12 New Hampshire, on the sidewalk near the side/back yard of the house	Traffic on I-5	None
ST-65	3/12/2015	11:26 a.m.	15 minutes	73.5	111 Peters Canyon Road, Kia Motors America, in the patio area facing the freeway	Traffic on I-5	None
ST-66	3/10/2015	12:50 p.m.	15 minutes	59.2	2855 Michelle Drive, at the outdoor area of the office building	Traffic on I-5	None
ST-67	3/11/2015	9:25 a.m.	15 minutes	66.0	2441 Michelle Drive, outdoor patio area at Toshiba	Traffic on I-5	None
ST-68	3/11/2015	9:25 a.m.	15 minutes	59.7	2181 Larch Lane, near the patio	Traffic on I-5 and ambient neighborhood noise	None
ST-69	3/11/2015	9:25 a.m.	15 minutes	75.4	120 Madrid Street, near rear of mobile home	Traffic on I-5	None
ST-70	3/11/2015	10:26 a.m.	15 minutes	63.4	14031 Pinebrook Drive, patio of Apartment A	Traffic on I-5 and Nisson Road	None
ST-71	3/12/2015	1:29 p.m.	15 minutes	67.7	1782 Nisson Road, Trail-A-Way Mobile Home Park, near unit 79	Traffic on I-5	None
ST-72	3/12/2015	1:29 p.m.	15 minutes	58.6	1702 Nisson Road, Blue Buoy Swim Club, on the northeast side of the pool, near its middle	Traffic on I-5 and Nisson Road	None
ST-73	3/12/2015	2:01 p.m.	15 minutes	65.0	1602 Nisson Road, Westchester Park Apartments, on the lawn near the north side of the pool area	Traffic on I-5; car wash air dryers are definitely a main noise source	None
ST-74	3/11/2015	12:14 p.m.	15 minutes	62.1	1451 Nisson Road, Nisson Apartments, edge of pool area	Traffic on I-5	None

Table 2.14.3: Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Source	Comments
ST-75	3/11/2015	12:14 p.m.	15 minutes	63.0	14011 Utt Drive, in back yard of the house, in line with the northeastern façade of the house	Traffic on I-5 and Nisson Road	None
ST-76	3/11/2015	12:14 p.m.	15 minutes	68.6	14062 Carfax Avenue, on the sidewalk north of the back yard of the house	Traffic on I-5 and Nisson Road	None
ST-77	3/13/2015	10:12 a.m.	15 minutes	64.3	160 Nisson Road, Tustin Gardens Apartment Homes, on the lawn area near the north staircase of the building	Traffic on I-5 and Nisson Road	None
ST-78	3/13/2015	10:12 a.m.	15 minutes	69.9	14041 Newport Avenue, in front of Carl's Jr.	Traffic on I-5 and Newport Avenue	No outdoor frequent human use area
ST-79	3/13/2015	10:56 a.m.	15 minutes	68.8	15601 South B Street, unit 55 on Via Entrada, Montesilla mobile home park, in the back yard area behind the home	Traffic on I-5	None
ST-80	3/13/2015	12:25 p.m.	15 minutes	65.5	17212 Nisson Road, Influential Square condominiums, on the walkway in front of the office, behind the parking lot	Traffic on I-5	None
ST-81	3/13/2015	12:25 p.m.	15 minutes	63.0	15482 Pasadena Avenue, Pasadena Village Apartments, on the east side of the pool on the north side of the complex	Traffic on I-5 and Nisson Road	None
ST-82	3/13/2015	12:25 p.m.	15 minutes	59.4	15491 Pasadena Avenue, Las Casa Apartment Homes, in the pool area	Traffic on I-5	Surrounded by two-story apartment buildings

Source: *Noise Study Report* (June 2017).
dBA = A-weighted decibels
ft = foot/feet
I-5 = Interstate 5
L_{eq} = equivalent continuous sound level
SR-133 = State Route 133

Table 2.14.4: Long-Term 24-Hour Noise Level Measurement Results at 604 Hayes, Irvine, CA (LT-1)

	Start Time	Date	Noise Level (dBA L_{eq})
1	9:00 AM	3/4/15	**71**[1]
2	10:00 AM	3/4/15	70
3	11:00 AM	3/4/15	69
4	12:00 PM	3/4/15	69
5	1:00 PM	3/4/15	70
6	2:00 PM	3/4/15	70
7	3:00 PM	3/4/15	66
8	4:00 PM	3/4/15	65
9	5:00 PM	3/4/15	64
10	6:00 PM	3/4/15	66
11	7:00 PM	3/4/15	68
12	8:00 PM	3/4/15	68
13	9:00 PM	3/4/15	68
14	10:00 PM	3/4/15	67
15	11:00 PM	3/4/15	65
16	12:00 AM	2/5/15	63
17	1:00 AM	2/5/15	62
18	2:00 AM	2/5/15	62
19	3:00 AM	2/5/15	62
20	4:00 AM	2/5/15	66
21	5:00 AM	2/5/15	68
22	6:00 AM	2/5/15	70
23	7:00 AM	2/5/15	67
24	8:00 AM	2/5/15	64

Source: LSA Associates, Inc. (June 2017).
Note: Refer to Figure J-1 (sheet 10 of 41) in Appendix J of this document.
[1] **Bold** numbers represent the peak traffic noise hour.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

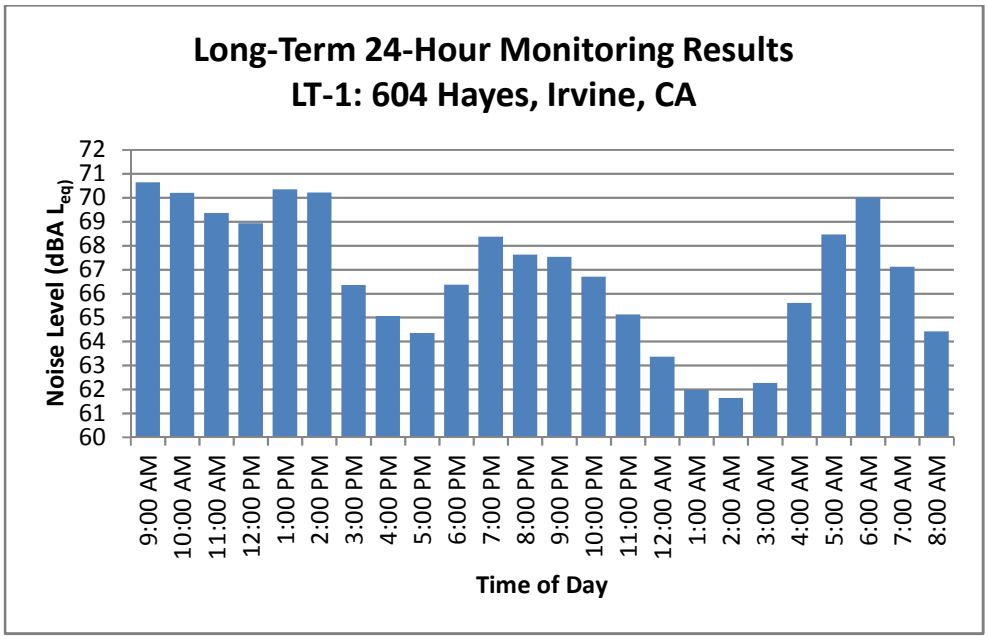


Table 2.14.5: Long-Term 24-Hour Noise Level Measurement Results at 248 Monroe, Irvine, CA (LT-2)

	Start Time	Date	Noise Level (dBA L_{eq})
1	10:00 AM	3/5/15	65
2	11:00 AM	3/5/15	65
3	12:00 PM	3/5/15	66
4	1:00 PM	3/5/15	65
5	2:00 PM	3/5/15	64
6	3:00 PM	3/5/15	63
7	4:00 PM	3/5/15	61
8	5:00 PM	3/5/15	61
9	6:00 PM	3/5/15	62
10	7:00 PM	3/5/15	64
11	8:00 PM	3/5/15	64
12	9:00 PM	3/5/15	64
13	10:00 PM	3/5/15	63
14	11:00 PM	3/5/15	62
15	12:00 AM	3/6/15	60
16	1:00 AM	3/6/15	59
17	2:00 AM	3/6/15	58
18	3:00 AM	3/6/15	60
19	4:00 AM	3/6/15	62
20	5:00 AM	3/6/15	66
21	6:00 AM	3/6/15	**68**[1]
22	7:00 AM	3/6/15	66
23	8:00 AM	3/6/15	63
24	9:00 AM	3/6/15	64

Source: LSA Associates, Inc. (June 2017).
Note: Refer to Figure J-1 (sheet 12 of 41) in Appendix J of this document.
[1] **Bold** numbers represent the peak traffic noise hour.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

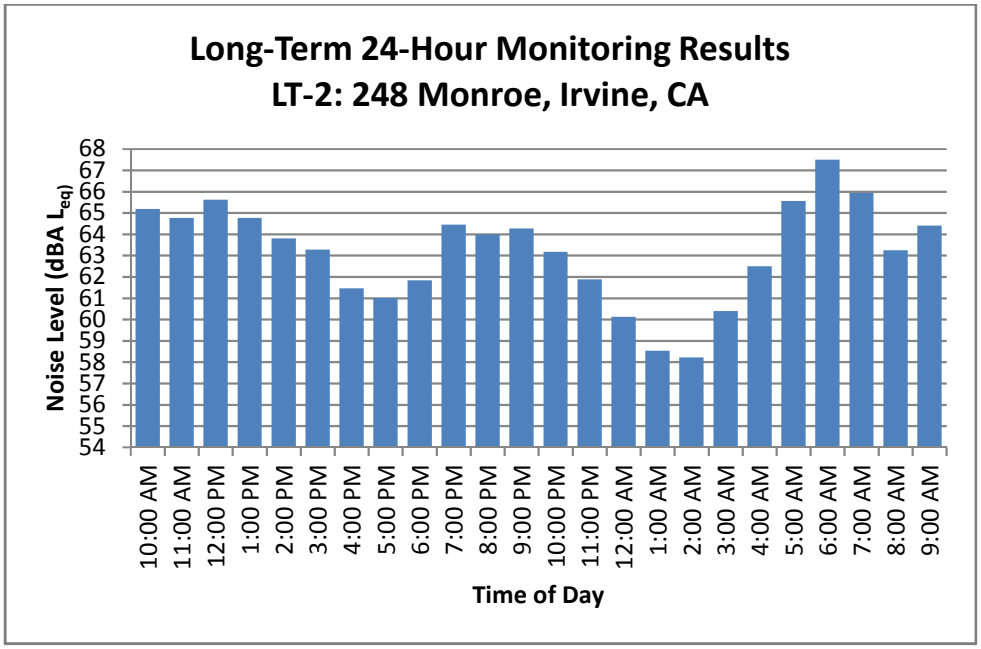


Table 2.14.6: Long-Term 24-Hour Noise Level Measurement Results at 27 Georgia, Irvine, CA (LT-3)

	Start Time	Date	Noise Level (dBA L_{eq})
1	11:00 AM	3/12/15	64
2	12:00 PM	3/12/15	65
3	1:00 PM	3/12/15	64
4	2:00 PM	3/12/15	63
5	3:00 PM	3/12/15	63
6	4:00 PM	3/12/15	63
7	5:00 PM	3/12/15	62
8	6:00 PM	3/12/15	62
9	7:00 PM	3/12/15	63
10	8:00 PM	3/12/15	65
11	9:00 PM	3/12/15	65
12	10:00 PM	3/12/15	63
13	11:00 PM	3/12/15	60
14	12:00 AM	3/13/15	58
15	1:00 AM	3/13/15	56
16	2:00 AM	3/13/15	56
17	3:00 AM	3/13/15	57
18	4:00 AM	3/13/15	60
19	5:00 AM	3/13/15	63
20	6:00 AM	3/13/15	64
21	7:00 AM	3/13/15	63
22	8:00 AM	3/13/15	62
23	9:00 AM	3/13/15	**66**[1]
24	10:00 AM	3/13/15	65

Source: LSA Associates, Inc. (June 2017).
Note: Refer to Figure J-1 (sheet 34 of 41) in Appendix J of this document.
[1] **Bold** numbers represent the peak traffic noise hour.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

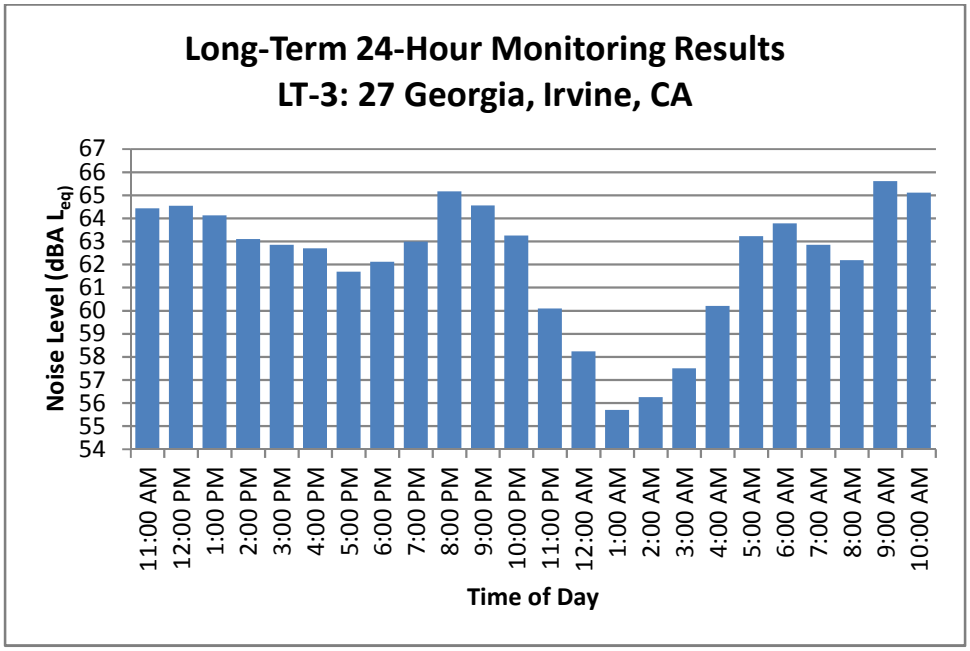
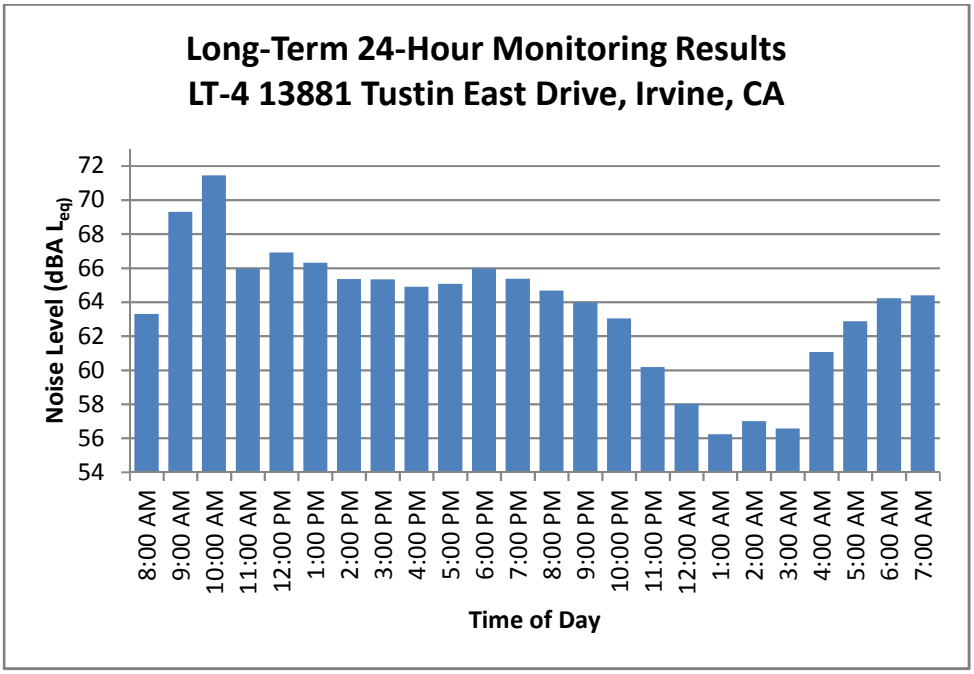


Table 2.14.7: Long-Term 24-Hour Noise Level Measurement Results at 13881 Tustin East Drive, Irvine, CA (LT-4)

	Start Time	Date	Noise Level (dBA L_{eq})
1	8:00 AM	3/10/15	63
2	9:00 AM	3/10/15	69
3	10:00 AM	3/10/15	**71**[1]
4	11:00 AM	3/10/15	66
5	12:00 PM	3/10/15	67
6	1:00 PM	3/10/15	66
7	2:00 PM	3/10/15	65
8	3:00 PM	3/10/15	65
9	4:00 PM	3/10/15	65
10	5:00 PM	3/10/15	65
11	6:00 PM	3/10/15	66
12	7:00 PM	3/10/15	65
13	8:00 PM	3/10/15	65
14	9:00 PM	3/10/15	64
15	10:00 PM	3/10/15	63
16	11:00 PM	3/10/15	60
17	12:00 AM	3/11/15	58
18	1:00 AM	3/11/15	56
19	2:00 AM	3/11/15	57
20	3:00 AM	3/11/15	57
21	4:00 AM	3/11/15	61
22	5:00 AM	3/11/15	63
23	6:00 AM	3/11/15	64
24	7:00 AM	3/11/15	64

Source: LSA Associates, Inc. (June 2017).
Note: Refer to Figure J-1 (sheet 18 of 41) in Appendix J of this document.
[1] **Bold** numbers represent the peak traffic noise hour.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels



- The long-term noise level measurement at LT-5 was performed at 14071 Carfax Avenue from 9:00 a.m. on Wednesday, March 11, 2015, to 6:00 p.m. on Wednesday, March 11, 2015. The measurement was stopped before completing all 24 hours due to rain. The peak traffic noise was not determined at LT-5, shown in Table 2.14.8, because noise monitoring was stopped due to rain.
- The long-term noise level measurement at LT-6 was performed at 15482 Pasadena Avenue from 10:00 a.m. on Thursday, March 12, 2015, to 10:00 a.m. on Friday, March 13, 2015. Table 2.14.9 shows that traffic noise peaks during the 11:00 a.m. to 12:00 p.m. hour at LT-6.

All long-term noise monitoring locations are shown on Figure J-1, provided in Appendix J of this document.

2.14.2.3 Existing Noise Levels

Traffic volume counts and vehicle speeds measured during the ambient noise monitoring were coded into Traffic Noise Model (TNM) 2.5 with existing roadway conditions to calibrate the modeling result. The results of the existing traffic noise modeling are shown in Table J-1 in Appendix J of this document. Currently, of the 974 modeled receptor locations, 132 receptors approach or exceed the NAC. Figure J-1 in Appendix J of this document shows the locations of the modeled receptors.

2.14.3 Environmental Consequences

The Build Alternative is considered a Type 1 project because it would use federal aid to add a through-traffic lane in each direction to the existing I-5. A noise analysis is required for all Type 1 projects. Therefore, noise impacts of the Build Alternative are analyzed below.

2.14.3.1 Temporary Impacts

Build Alternative (Alternative 2A and Alternative 2B [Preferred Alternative], and Design Option 3)[1]

Two types of short-term noise impacts would occur during project construction. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site and would incrementally raise noise levels on access roads leading to the site. The pieces of heavy equipment for grading and

[1] Alternative 2B without Design Option 3 has been selected as the Preferred Alternative

construction activities would be moved on site, would remain for the duration of each construction phase, and would not add to the daily traffic volume in the project vicinity.

Table 2.14.8: Long-Term 24-Hour Noise Level Measurement Results at 14071 Carfax Avenue, Irvine, CA (LT-5)

	Start Time	Date	Noise Level (dBA L_{eq})
1	9:00 AM	3/11/15	64
2	10:00 PM	3/11/15	64
3	11:00 AM	3/11/15	64
4	12:00 PM	3/11/15	65
5	1:00 PM	3/11/15	65
6	2:00 PM	3/11/15	64
7	3:00 PM	3/11/15	65
8	4:00 PM	3/11/15	65
9	5:00 PM	3/11/15	65
10	6:00 PM	3/11/15	66
11	7:00 PM	3/11/15	--[2]
12	8:00 PM	3/11/15	--
13	9:00 PM	3/11/15	--
14	10:00 PM	3/11/15	--
15	11:00 PM	3/11/15	--
16	12:00 AM	3/12/15	--
17	1:00 AM	3/12/15	--
18	2:00 AM	3/12/15	--
19	3:00 AM	3/12/15	--
20	4:00 AM	3/12/15	--
21	5:00 AM	3/12/15	--
22	6:00 AM	3/12/15	--
23	7:00 AM	3/12/15	--
24	8:00 AM	3/12/15	--

Source: LSA Associates, Inc. (June 2017).
Note: Refer to Figure J-1 (sheet 39 of 41) in Appendix J of this document.
[1] **Bold** numbers represent the peak traffic noise hour.
[2] Noise monitoring was stopped due to rain.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

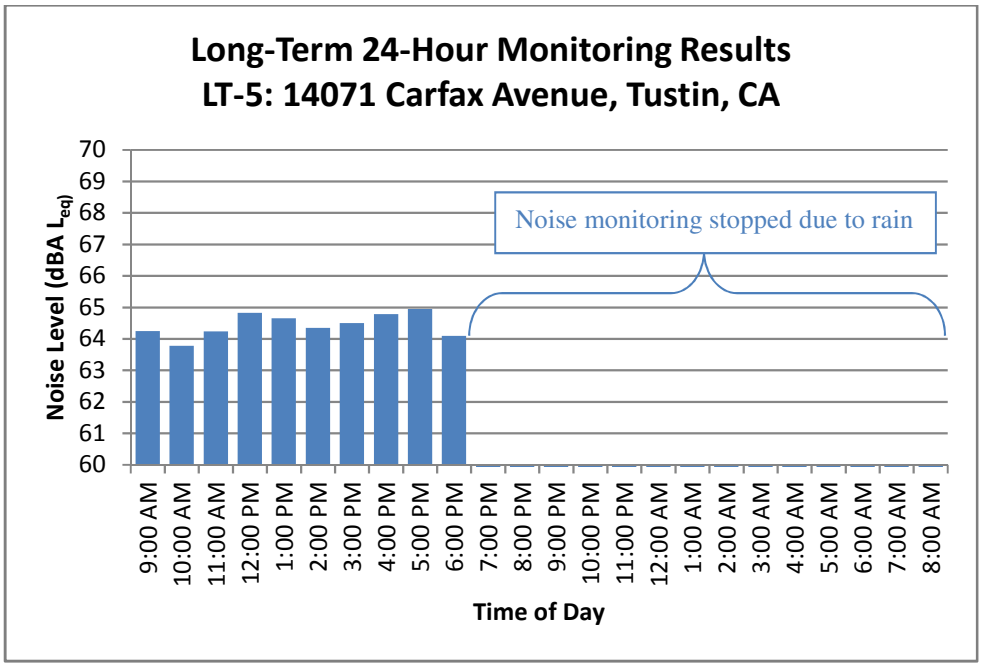
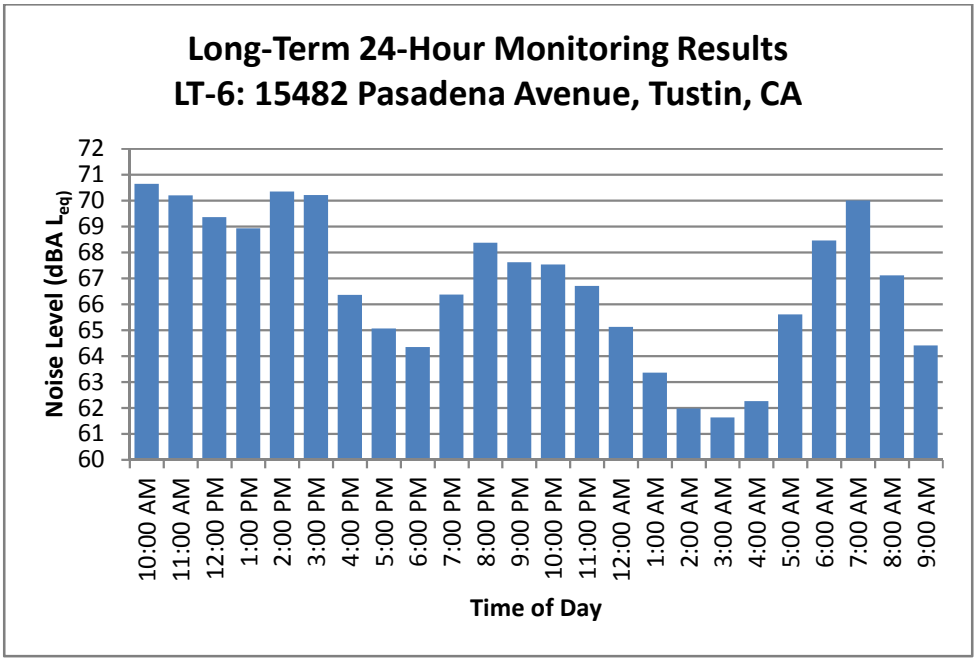


Table 2.14.9: Long-Term 24-Hour Noise Level Measurement Results at 15482 Pasadena Avenue, Irvine, CA (LT-6)

	Start Time	Date	Noise Level (dBA L_{eq})
1	10:00 PM	3/12/15	60
2	11:00 AM	3/12/15	**65**[1]
3	12:00 PM	3/12/15	**65**
4	1:00 PM	3/12/15	64
5	2:00 PM	3/12/15	62
6	3:00 PM	3/12/15	62
7	4:00 PM	3/12/15	63
8	5:00 PM	3/12/15	61
9	6:00 PM	3/12/15	60
10	7:00 PM	3/12/15	61
11	8:00 PM	3/12/15	60
12	9:00 PM	3/12/15	60
13	10:00 PM	3/12/15	59
14	11:00 PM	3/12/15	57
15	12:00 AM	3/13/15	56
16	1:00 AM	3/13/15	57
17	2:00 AM	3/13/15	54
18	3:00 AM	3/13/15	54
19	4:00 AM	3/13/15	56
20	5:00 AM	3/13/15	59
21	6:00 AM	3/13/15	61
22	7:00 AM	3/13/15	60
23	8:00 AM	3/13/15	60
24	9:00 AM	3/13/15	60

Source: LSA Associates, Inc. (June 2017).
Note: Refer to Figure J-1 (sheet 41 of 41) in Appendix J of this document.
[1] **Bold** numbers represent the peak traffic noise hour.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels



A high single-event noise exposure potential at a maximum level of 75 dBA maximum instantaneous noise level (L_{max}) at a distance of 50 ft from trucks passing would exist. However, the projected construction traffic would be minimal when compared to existing traffic volumes on I-5 and other affected streets, and its associated long-term noise level change would not be perceptible. Therefore, short-term construction-related worker commutes and equipment transport noise impacts would be less than substantial.

The second type of short-term noise impact is related to noise generated during roadway construction. 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 the noise levels in the project area as construction progresses. 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 2.14.10 lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor.

Table 2.14.10: Typical Construction Equipment Noise Levels

Type of Equipment	Actual Maximum Sound Levels at 50 ft (dBA)
Backhoe	78

Table 2.14.10: Typical Construction Equipment Noise Levels

Type of Equipment	Actual Maximum Sound Levels at 50 ft (dBA)
Crane	81
Dozer	82
Drill Rig Truck	79
Dump Truck	76
Excavator	81
Flat Bed Truck	74
Front End Loader	79
Generator	81
Impact Pile Driver	101
Jackhammer	89
Pickup Truck	75
Pneumatic Tools	85
Pumps	81
Roller	80
Scraper	84

Source: Federal Highway Administration. *Roadway Construction Noise Model* (January 2006).
dBA = A-weighted decibels
FHWA = Federal Highway Administration
ft = foot/feet

Typical noise levels at 50 ft from an active construction area range up to 86 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. Earthmoving equipment includes excavating machinery (e.g., backfillers, bulldozers, and front loaders). Earthmoving and compacting equipment includes compactors, scrapers, and graders.

The construction of the Build Alternative is expected to require the use of earthmovers, bulldozers, water trucks, and pickup trucks. Noise associated with the use of construction equipment is estimated to be between 75 and 84 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As seen in Table 2.14.10, the maximum noise level generated by each scraper is assumed to be approximately 84 dBA L_{max} at 50 ft from the scraper in operation. Each bulldozer would generate approximately 82 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 three 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 86 dBA L_{max} (at a distance of 50 ft from an active construction area).

The closest sensitive receptors are within 50 ft of project construction areas for the Build Alternative. Sensitive receptor locations may be subject to short-term noise higher than 86 dBA L_{max} generated by construction activities along the project alignment. Project Feature PF-N-1 requires compliance with Caltrans' Standard Specifications Section 14-8.02 (2015) and will address construction noise impacts on sensitive land uses adjacent to the project site. The noise level from the contractor's operations between the hours of 9:00 p.m. and 6:00 a.m. shall not exceed 86 dBA L_{max} at a distance of 50 ft.

PF-N-1 The control of noise from construction activities will conform to the California Department of Transportation (Caltrans) Standard Specifications, Section 14-8.02, "Noise Control." The nighttime noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., will not exceed 86 A-weighted decibels (dBA).

No Build Alternative (Alternative 1)

The No Build Alternative would not result in the construction of improvements within the project area and, therefore, would not result in temporary noise effects.

2.14.3.2 Permanent Impacts

Potential long-term noise impacts associated with operation of the Build Alternative are solely from traffic noise. Traffic noise was evaluated for the worst-case traffic condition. Using coordinates obtained from the topographic maps, a total of 974 receptor locations associated with existing single- and multifamily residences, churches, schools, an institution, a community center, a daycare center, an after-school facility, a park, a golf course, recreational areas, hotels, restaurants, vacant land, retail, office, commercial, and light industrial uses were evaluated in the model.

Build Alternative (Alternative 2A and Alternative 2B [Preferred Alternative], and Design Option 3)[1]

Future traffic noise levels for all 974 receptor locations were determined with existing walls using the worst-case traffic operations (prior to speed degradation) or the future (2050) peak-hour traffic volumes obtained from the *Final Traffic/Circulation Impact Report* (January 2017), whichever was lower. Tables J-1 through J-6 in Appendix J of this document show the existing, Future No Build, Alternative 2A and Alternative 2B, and Alternatives 2A and 2B with Design Option 3 traffic noise level results. The modeled future noise levels with the Build Alternative were compared to the modeled existing

[1] Alternative 2B without Design Option 3 has been selected as the Preferred Alternative

noise levels (after calibration) from TNM 2.5 to determine whether a substantial noise increase would occur. The modeled future noise levels were also compared to the NAC under Activity Categories B, C, D, and E to determine whether a traffic noise impact would occur.

Traffic noise impacts occur when either of the following takes place: (1) if the traffic noise level at a sensitive receptor location is predicted to "approach (within 1 dBA) or exceed" the NAC, or (2) if the predicted traffic noise level is substantially higher than its corresponding modeled existing noise level at the sensitive receptor locations analyzed. When traffic noise impacts occur, noise abatement measures must be considered. Of the 974 modeled receptors, 275 receptors under Alternative 2A and 169 receptors under Alternative 2B would approach or exceed the NAC and/or experience a substantial noise increase over their corresponding existing noise levels. Of the 275 impacted receptors under Alternative 2A, 274 receptors would approach or exceed the NAC. Under Alternative 2A with Design Option 3, two additional receptors would approach or exceed the NAC (Receptors R-3.30 and R-3.80) while one receptor (Receptor R-3.88) would no longer approach or exceed the NAC. Of the 169 impacted receptors under Alternative 2B, all 169 receptors would approach or exceed the NAC. Under Alternative 2B with Design Option 3, one additional receptor would approach or exceed the NAC (Receptor R-3.30) while one receptor (Receptor R-3.03) would no longer approach or exceed the NAC.

Of the 275 impacted receptors under Alternative 2A, 21 receptors would experience a substantial noise increase. Of the 169 impacted receptors under Alternative 2B, one receptor would experience a substantial noise increase. Design Option 3 for both Alternative 2A and Alternative 2B would not result in an additional substantial noise increase. The substantial noise increase is caused by the demolition of existing walls to accommodate the project. Once these walls are reconstructed to match the existing height at a minimum, the substantial increase would cease.

Alternative 2A

The following receptor locations would be or would continue to be exposed to noise levels that approach or exceed the NAC and/or experience a substantial noise increase of 12 dBA over their corresponding existing noise levels under Alternative 2A.

- **Receptor R-1.24:** This receptor location represents an existing sitting area associated with office buildings located along Technology Drive on the northbound side of I-5, north of Barranca Parkway. Currently, no existing walls shield the sitting area associated with the office building. One noise barrier (Noise Barrier [NB] No. 1.1)

was modeled along the edge of the shoulder to shield the sitting area on the northbound side of I-5.

- **Receptor R-2.02:** This receptor location represents a church with an outdoor playground located on the northbound side of I-5 and the eastbound side of Sand Canyon Avenue. Currently, no existing walls shield the church and playground. No noise barriers were modeled for the church building because the predicted future interior noise levels would not approach or exceed 52 dBA L_{eq} NAC. One noise barrier (NB No. 2.1) was modeled along the private property line to shield the playground because barriers along the I-5 mainline and freeway connectors would not likely be feasible due to traffic noise contributed by other roadways such as Sand Canyon Avenue and Marine Way.
- **Receptors R-3.11, R-3.13 through R-3.15, R-3.17, R-3.19, R-3.21 through R-3.23, R-3.25, R-3.27, R-3.29, R-3.31 through R-3.37, R-3.40, R-3.41, R-3.43, R-3.45, R-3.51, R-3.53, R-3.55, R-3.60, R-3.62, R-3.64, R-3.66, R-3.68, R-3.70, R-3.72, R-3.74, R-3.77, R-3.79, R-3.81 through R-3.83, R-3.87 through R-3.89, and R-3.91:** These receptor locations represent existing multifamily residences located along Hayes Street and Huntington on the northbound side of I-5 between Jeffrey Road and Yale Avenue. Currently, an existing six ft high wall (EW No. 3.1) shields these residences. One noise barrier (NB No. 3.3) was modeled along the State right-of-way, the edge of the shoulder, and the private property line on the northbound side of I-5 to shield these residences.
- **Receptors R-4.02, R-4.11, R-4.17, R-4.20, R-4.24, R-4.26 through R-4.31, R-4.39, R-4.40, R-4.64, R-4.71, R-4.89, R-4.91, R-4.107, R-4.113, R-4.123, and R-4.133:** These receptor locations represent existing multifamily residences located along Roosevelt and Monroe on the northbound side of I-5, between Yale Avenue and the I-5 northbound off-ramp to Trabuco Road. Currently, an existing 11.5 ft high wall (EW No. 4.1) shields these residences represented by Receptors R-4.02, R-4.11, R-4.17, R-4.20, R-4.24, and R-4.26 through R-4.31, and an existing five ft high wall (EW No. 4.2) shields residences representing Receptors R-4.39, R-4.40, R-4.64, R-4.71, R-4.89, and R-4.91, while no existing walls shield residences representing Receptors R-4.107, R-4.113, R-4.123, and R-4.133. One noise barrier (NB No. 4.1) was modeled along the edge of the shoulder and the State right-of-way on the northbound side of I-5 to shield the residences.
- **Receptor R-4.138:** This receptor location represents an existing single-family residence along Westmoreland on the northbound side of I-5, near the I-5 northbound off-ramp to Trabuco Road. Currently, a combination of existing 12 ft and 16 ft high walls (EW Nos. 4.3, 4.4, and 4.5) along the edge of the shoulder and an existing six ft

to 7.5 ft high private property wall (EW No. 4.6) shield this residence. One noise barrier (NB No. 4.2) was modeled along the edge of the shoulder on the northbound side of I-5 to shield this residence.

- **Receptors R-4.149 and R-4.150:** These receptor locations represent existing single-family residences located along Phillipsburg on the northbound side of I-5 and the eastbound side of Culver Drive. Currently, a combination of existing 12 ft and 16 ft high walls (EW Nos. 4.3, 4.4, and 4.5) along the edge of the shoulder and an existing six ft to 7.5 ft high private property wall (EW No. 4.6) shields these residences. Two noise barrier locations were evaluated separately to shield these receptors and to compare the effectiveness of the two barriers. NB No. 4.2 was modeled along the edge of the shoulder on the northbound side of I-5 to shield these residences. NB No. 4.3 was modeled along the private property line to shield these residences.
- **Receptors R-6.30, R-6.50, and R-6.52:** These receptor locations represent existing multifamily residences along Park Center Lane on the northbound side of I-5, north of Tustin Ranch Road. Currently, an existing seven ft high wall (EW No. 6.1) shields these residences. One noise barrier (NB No. 6.1) was modeled along the private property line to shield these residences because the location of the State right-of-way is lower in elevation than the existing private property line.
- **Receptors R-6.55, R-6.61 through R-6.70, R-6.77 through R-6.79, R-6.84, R-6.89, R-6.90, R-6.92 through R-6.97, R-6.106, R-6.107, R-6.119, and R-6.121:** These receptor locations represent existing single-family and multifamily residences located along Sierra Vista Drive, El Camino Real, and Tustin East Drive on the northbound side of I-5 between Tustin Ranch Road and Red Hill Avenue. Currently, an existing 12 ft high wall (EW No. 6.2) shields residences representing Receptors R-6.61 through R-6.70, R-6.77 through R-6.79, R-6.92 through R-6.97, R-6.106, and R-6.107, while no existing walls shield residences representing Receptors R-6.119 and R-6.121. One noise barrier (NB No. 6.2) was modeled along the State right-of-way and the edge of the shoulder to shield these residences.
- **Receptors R-7.03 through R-7.07, R-7.10, and R-7.11:** These receptor locations represent existing multifamily residences, a school, and an associated swimming pool along El Camino Real on the northbound side of I-5, between Red Hill Avenue and Newport Avenue. Currently, an existing ten ft high wall (EW No. 7.2) shields the residences and school representing Receptors R-7.03 through R-7.07, while no existing walls shield residences representing Receptors R-7.10 and R-7.11. One noise barrier (NB No. 7.1) was modeled along the State right-of-way and the edge of the shoulder on the northbound side of I-5 to shield these residences and the school.

- **Receptors R-7.21, R-7.22, and R-7.24:** These receptor locations represent existing single-family residences, an outdoor recreation area at an after-school facility, and a playground at a church located along Pacific Street and West 6th Street on the northbound side of I-5, east of SR-55. Currently, an existing 13.3 ft high wall (EW No. 7.3) shields the residence, the outdoor recreation area at the after-school facility, and the playground at the church. One noise barrier (NB No. 7.2) was modeled along the edge of the shoulder on the northbound side of I-5 to shield the residence, the outdoor recreation area at the after-school facility, and the playground at the church.
- **Receptors R-10.08, R-10.11, R-10.13, R-10.22, R-10.24, R-10.29 through R-10.32, R-10.34 through R-10.41, R-10.44 through R-10.47, R-10.49, R-10.50, R-10.55 through R-10.70, R-10.73, R-10.74, and R-10.77 through R-10.79:** These receptor locations represent existing multifamily residences, a church, and an outdoor sitting area associated with the church located along Austin, Walnut Avenue, Raleigh, Heritage, Montgomery, Lincoln, Helena, and Cheyenne on the southbound side of I-5, between Jeffrey Road and Yale Avenue. Currently, an existing 12 ft to 16 ft high wall (EW No. 10.1) shields these residences. One noise barrier (NB No. 10.1) was modeled along the edge of the shoulder on the southbound side of I-5 to shield the residences, church, and sitting area.
- **Receptors R-11.03 through R-11.06:** These receptor locations represent an existing playground, basketball courts, tennis court, and baseball diamond located along Yale Avenue on the southbound side of I-5, east of Walnut Avenue. Currently, an existing 12 ft high wall (EW No. 11.1) shields the community center, playground, basketball courts, tennis court, and baseball diamond. One noise barrier (NB No. 11.1) was modeled along the edge of the shoulder on the southbound side of I-5 to shield the community center, playground, basketball courts, tennis court, and baseball diamond.
- **Receptors R-11.10 and R-11.11:** These receptor locations represent existing multifamily residences along Orangetip and Skipper on the southbound side of I-5, south of Culver Drive. Currently, an existing 5.3 ft to six ft high wall (EW No. 11.3) at the property line and an 8.5 ft high wall (EW No. 11.2) at the edge of the shoulder shield these residences. One noise barrier (NB No. 11.2) was modeled along the edge of the shoulder on the southbound side of I-5 to shield these residences. The combination of NB Nos. 11.2 and 11.4 was modeled along the edge of the shoulder as an additional noise barrier configuration.
- **Receptor R-11.22:** This receptor location represents the tennis courts along Skipper and Bird Wing on the southbound side of I-5, south of Culver Drive. Currently, an existing 5.3 ft to six ft high wall (EW No. 11.3) shields the tennis courts. Two noise barrier locations were evaluated separately to shield this receptor and to compare the

effectiveness of the two barriers. NB No. 11.2 was modeled along the edge of the shoulder on the southbound side of I-5 to shield the tennis courts. NB No. 11.3 was modeled along the private property line and the State-right-of-way to shield the tennis courts. The combination of NB Nos. 11.2 and 11.4 was modeled along the edge of the shoulder as an additional noise barrier configuration.

- **Receptors R-12.01 through R-12.03:** These receptor locations represent existing single-family residences along Moore Court on the southbound side of I-5 and the westbound side of Culver Drive. Currently, an existing five ft to 6.5 ft high wall (EW No. 12.1) shields these residences. Two noise barrier locations were evaluated separately to shield this receptor and to compare the effectiveness of the two barriers. NB No. 12.1 was modeled along the private property line on the westbound side of Culver Drive to shield these residences. Based on direction from Caltrans in the February 2018 NADR, these receptors were evaluated with traffic on the I-5 only (no traffic on Culver Drive), and it was determined that Receptor R-12.03 would be impacted by traffic noise from I-5 only, while Receptors R-12.01 and R-12.02 would not be impacted. The revised noise level results are shown in Table J-7 in Appendix J. The combination of NB Nos. 11.4 and 12.3 was modeled along the edge of the shoulder on the southbound side of I-5 to shield these residences. The noise level results are shown in Table J-7 in Appendix J. As shown in this table in Appendix J, the combination of NB Nos. 11.4 and 12.3 was not capable of reducing noise levels by 5 dBA or more and was determined to be not feasible. The locations of NB Nos. 11.4 and 12.3 are shown on Figure J-2 in Appendix J.
- **Receptors R-12.13 through R-12.26:** These receptor locations represent existing single-family residences located along Chagall Avenue, Nebraska, Minnesota, and Georgia on the southbound side of I-5, between Culver Drive and Peters Canyon Regional Trails and Bikeway. Currently, an existing 12.6 ft high wall (EW No. 12.2) shields residences representing Receptors R-12.13 and R-12.14 while residences representing Receptors R-12.15 through R-12.25 are shielded by an existing 15.6 ft high wall (EW No. 12.3). In addition, residences representing Receptor R-12.26 are shielded by an existing 19 ft high wall (EW No. 12.4). One noise barrier (NB No. 12.2) was modeled along the State right-of-way and the private property wall on the southbound side of I-5 to shield these residences.
- **Receptors R-13.58 through R-13.71, R-13.73, R-13.76, R-13.79 through R-13.106, R-13.108, R-13.109, R-13.112, R-13.121, R-13.123 through R-13.125, R-13.127, R-13.129, R-13.130, R-13.133, and R-13.142:** These receptor locations represent existing multifamily and mobile home residences and a swimming pool located along Seville Street, Malaga Street, Madrid Street, Granada Street, Pinebrook Drive, and

Nisson Road on the southbound side of I-5, between Tustin Ranch Road and Red Hill Avenue. Currently, an existing 7.3 ft to 15 ft high wall (EW No. 13.2) shields residences representing Receptors R-13.58 through R-13.65, while residences and the swimming pool representing Receptors R-13.66 through R-13.71, R-13.73, R-13.76, R-13.79 through R-13.106, R-13.108, R-13.109, R-13.112, R-13.121, R-13.123 through R-13.125, R-13.127, R-13.129, R-13.130, R-13.133, and R-13.142 are shielded by an existing 10.5 ft to 12.5 ft high wall (EW No. 13.3). One noise barrier (NB No. 13.1) was modeled along the State right-of-way/private property line on the southbound side of I-5 to shield these residences.

- **Receptors R-14.02 through R-14.25:** These receptor locations represent existing single-family and multifamily residences and an associated swimming pool along Nisson Road on the southbound side of I-5, between Red Hill Avenue and Newport Avenue. Currently, an existing ten ft high wall (EW No. 14.1) along the edge of the shoulder shields the residences and swimming pool representing Receptors R-14.02 through R-14.05 while another existing ten ft high wall (EW No. 14.2) along the edge of the shoulder shields these residences representing Receptors R-14.06 through R-14.25. One noise barrier (NB No. 14.1) was modeled along the edge of the shoulder on the southbound side of I-5 to shield the residences and swimming pool.
- **Receptors R-14.29 through R-14.33:** These receptor locations represent existing multifamily and single-family residences along South B Street and South C Street on the southbound side of I-5, north of Newport Avenue. Currently, an existing five ft high wall (EW No. 14.6) shields these residences. Five noise barrier locations were evaluated separately to shield these receptors and to compare the effectiveness of the five barriers. NB No. 14.2 was modeled along the State right-of-way and the edge of the shoulder on the southbound side of I-5 to shield the residences. NB No. 14.3 was modeled along the private property line to shield the residences. NB Nos. 14.4, 14.4a, and the combination of NB Nos. 14.2 and 14.4a were modeled along the edge of the shoulder on the southbound side of I-5 to shield these residences.
- **Receptors R-14.34 through R-14.41, R-14.48, R-14.51, R-14.54, R-14.55, R-14.73, and R-14.74:** These receptor locations represent existing single-family, multifamily, and mobile home residences and a swimming pool associated with the mobile home park along Nisson Road on the southbound side of I-5, between Newport Avenue and SR-55. Currently, an existing ten to 11 ft high wall (EW No. 14.3) along the I-5 southbound off-ramp shields the residences and swimming pool representing Receptors R-14.34 through R-14.41, R-14-48, R-14.51, R-14.54, and R-14.55, an existing six ft high wall (EW No. 14.4) along the I-5 southbound off-ramp shields these residences representing R-14.73 and R-14.74, and an existing ten ft high wall

(EW No. 14.5) along the southbound SR-55 to southbound I-5 connector edge of the shoulder shields a smaller group of residences representing Receptors R-14.48, R-14.51, R-14.54, and R-14.55. One noise barrier (NB No. 14.2) was modeled along the State right-of-way and the edge of the shoulder on the southbound side of I-5 to shield the residences and swimming pool.

In addition to the receptors identified for Alternative 2A in the area of Design Option 3, the following receptor locations would be exposed to noise levels that approach or exceed the NAC under Alternative 2A with Design Option 3:

- **Receptors R-3.30 and R-3.80:** These receptor locations represent existing multifamily residences along Hayes Street and Huntington on the northbound side of I-5, between Jeffrey Road and Yale Avenue. Currently, an existing six ft high wall (EW No. 3.1) shields these residences. One noise barrier (NB No. 3.3) was modeled along the State right-of-way, the edge of the shoulder, and private property on the northbound side of I-5 to shield these residences.

The following receptor location would be exposed to noise levels that approach or exceed the NAC under Alternative 2A, but would not be exposed to noise levels that approach or exceed the NAC under Alternative 2A with Design Option 3:

- **Receptor R-3.88:** This receptor location represents existing multifamily residences located along Huntington on the northbound side of I-5 between Jeffrey Road and Yale Avenue. Currently, an existing six ft high wall (EW No. 3.1) shields these residences.

Alternative 2B (Preferred Alternative)

The following receptor locations would be exposed to noise levels that approach or exceed the NAC under Alternative 2B:

- **Receptor R-1.24:** This receptor location represents an existing sitting area associated with office buildings located along Technology Drive on the northbound side of I-5, north of Barranca Parkway. Currently, no existing walls shield the sitting area associated with the office building. One noise barrier (NB No. 1.1) was modeled along the edge of the shoulder to shield the sitting area on the northbound side of I-5.
- **Receptor R-2.02:** This receptor location represents a church with an outdoor playground located on the northbound side of I-5 and the eastbound side of Sand Canyon Avenue. Currently, no existing walls shield the church and playground. No noise barriers were modeled for the church building because the predicted future

interior noise levels would not approach or exceed 52 dBA L_{eq} NAC. One noise barrier (NB No. 2.1) was modeled along the private property line to shield the playground because barriers along the I-5 mainline and freeway connectors would not likely be feasible due to traffic noise contributed by other roadways such as Sand Canyon Avenue and Marine Way.

- **Receptor R-3.03:** This receptor location represents an existing sitting area associated with office buildings along Roosevelt on the northbound side of I-5, north of Jeffrey Road. Currently, no existing walls shield the sitting area. Two noise barrier locations were evaluated separately to shield this receptor and to compare the effectiveness of the two barriers. NB No. 3.1 was modeled along the edge of the shoulder on the northbound side of I-5 to shield the sitting area. NB No. 3.2 was modeled along the private property line to shield the sitting area.
- **Receptors R-3.11, R-3.13 through R-3.15, R-3.17, R-3.19, R-3.21 through R-3.23, R-3.25, R-3.27, R-3.29, R-3.31 through R-3.37, R-3.40, R-3.41, R-3.43, R-3.45, R-3.51, R-3.53, R-3.55, R-3.60, R-3.62, R-3.64, R-3.66, R-3.68, R-3.70, R-3.72, R-3.74, R-3.77, R-3.79, R-3.81, R-3.83, R-3.87, R-3.89, and R-3.91:** These receptor locations represent existing multifamily residences located along Hayes Street and Huntington on the northbound side of I-5 between Jeffrey Road and Yale Avenue. Currently, an existing six ft high wall (EW No. 3.1) shields these residences. One noise barrier (NB No. 3.3) was modeled along the State right-of-way, the edge of the shoulder, and the private property line on the northbound side of I-5 to shield these residences.
- **Receptors R-4.63, R-4.64, R-4.71, R-4.89, R-4.107, R-4.113, R-4.123, and R-4.133:** These receptor locations represent existing multifamily residences located along Roosevelt on the northbound side of I-5, between Yale Avenue and the I-5 northbound off-ramp to Trabuco Road. Currently, an existing five ft high wall (EW No. 4.2) shields residences representing Receptors R-4.63, R-4.64, R-4.71, and R-4.89, while no existing walls shield residences representing Receptors R-4.107, R-4.113, R-4.123, and R-4.133. One noise barrier (NB No. 4.1) was modeled along the edge of the shoulder and the State right-of-way on the northbound side of I-5 to shield the residences.
- **Receptor R-4.138:** This receptor location represents an existing single-family residence along Westmoreland on the northbound side of I-5, near the I-5 northbound off-ramp to Trabuco Road. Currently, a combination of existing 12 ft and 16 ft high walls (EW Nos. 4.3, 4.4, and 4.5) along the edge of the shoulder and an existing six ft to 7.5 ft high private property wall (EW No. 4.6) shield this residence. One noise

barrier (NB No. 4.2) was modeled along the edge of the shoulder on the northbound side of I-5 to shield this residence.

- **Receptors R-4.149 and R-4.150:** These receptor locations represent existing single-family residences located along Phillipsburg on the northbound side of I-5 and the eastbound side of Culver Drive. Currently, a combination of existing 12 ft and 16 ft high walls (EW Nos. 4.3, 4.4 and 4.5) along the edge of the shoulder and an existing six ft to 7.5 high private property wall (EW No. 4.6) shields these residences. Two noise barrier locations were evaluated separately to shield these receptors and to compare the effectiveness of the two barriers. NB No. 4.2 was modeled along the edge of the shoulder on the northbound side of I-5 to shield these residences. NB No. 4.3 was modeled along the private property line to shield these residences.
- **Receptors R-6.30, R-6.50, and R-6.52:** These receptor locations represent existing multifamily residences along Park Center Lane on the northbound side of I-5, north of Tustin Ranch Road. Currently, an existing seven ft high wall (EW No. 6.1) shields these residences. One noise barrier (NB No. 6.1) was modeled along the private property line to shield these residences because the location of the State right-of-way is lower in elevation than the existing private property line.
- **Receptors R-6.61 through R-6.70, R-6.77, R-6.79, R-6.93, R-6.106, R-6.107, R-6.119, and R-6.121:** These receptor locations represent existing single-family and multifamily residences located along Sierra Vista Drive, El Camino Real, and Tustin East Drive on the northbound side of I-5 between Tustin Ranch Road and Red Hill Avenue. Currently, an existing 12 ft high wall (EW No. 6.2) shields residences representing Receptors R-6.61 through R-6.70, R-6.77, R-6.79, R-6.93, R-6.106, and R-6.107, while no existing walls shield residences representing Receptors R-6.119 and R-6.121. One noise barrier (NB No. 6.2) was modeled along the State right-of-way and the edge of the shoulder to shield these residences.
- **Receptors R-7.03, R-7.04, R-7.06, R-7.07, R-7.10, and R-7.11:** These receptor locations represent existing multifamily residences and a school along El Camino Real on the northbound side of I-5, between Red Hill Avenue and Newport Avenue. Currently, an existing ten ft high wall (EW No. 7.2) shields the residences and school representing Receptors R-7.03, R-7.04, R-7.06, and R-7.07, while no existing walls shield residences representing Receptors R-7.10 and R-7.11. One noise barrier (NB No. 7.1) was modeled along the State right-of-way and the edge of the shoulder on the northbound side of I-5 to shield these residences and the school.
- **Receptors R-7.21 and R-7.22:** These receptor locations represent an outdoor recreation area at an after-school facility and a playground at a church located along West 6th Street on the northbound side of I-5, south of SR-55. Currently, an existing

13.3 ft high wall (EW No. 7.3) shields the outdoor recreation area at the after-school facility and the playground at the church. One noise barrier (NB No. 7.2) was modeled along the edge of the shoulder on the northbound side of I-5 to shield the outdoor recreation area at the after-school facility and the playground at the church.

- **Receptors R-11.10 and R-11.11:** These receptor locations represent existing multifamily residences along Orangetip and Skipper on the southbound side of I-5, south of Culver Drive. Currently, an existing 5.3 ft to six ft high wall (EW No. 11.3) at the property line and an 8.5 ft high wall (EW No. 11.2) at the edge of the shoulder shield these residences. One noise barrier (NB No. 11.2) was modeled along the edge of the shoulder on the southbound side of I-5 to shield these residences. The combination of NB Nos. 11.2 and 11.4 was modeled along the edge of the shoulder as an additional noise barrier configuration.
- **Receptor R-11.22:** This receptor location represents the tennis courts along Skipper and Bird Wing on the southbound side of I-5, south of Culver Drive. Currently, an existing 5.3 ft to six ft high wall (EW No. 11.3) shields the tennis courts. Two noise barrier locations were evaluated separately to shield this receptor and to compare the effectiveness of the two barriers. NB No. 11.2 was modeled along the edge of the shoulder on the southbound side of I-5 to shield the tennis courts. NB No. 11.3 was modeled along the private property line to shield the tennis courts. The combination of NB Nos. 11.2 and 11.4 was modeled along the edge of the shoulder as an additional noise barrier configuration.
- **Receptors R-12.01 through R-12.03:** These receptor locations represent existing single-family residences along Moore Court on the southbound side of I-5 and the westbound side of Culver Drive. Currently, an existing five ft to 6.5 ft high wall (EW No. 12.1) shields these residences. Two noise barrier locations were evaluated separately to shield this receptor and to compare the effectiveness of the two barriers. NB No. 12.1 was modeled along the private property line on the westbound side of Culver Drive to shield these residences. Based on direction from Caltrans in the February 2018 NADR, these receptors were evaluated with traffic on the I-5 only (no traffic on Culver Drive), and it was determined that Receptor R-12.03 would be impacted by traffic noise from I-5 only, while Receptors R-12.01 and R-12.02 would not be impacted. The revised noise level results are shown in Table J-8 in Appendix J. The combination of NB Nos. 11.4 and 12.3 was modeled along the edge of the shoulder on the southbound side of I-5 to shield these residences. The noise level results are shown in Table J-8 in Appendix J. As shown in this table in Appendix J, the combination of NB Nos. 11.4 and 12.3 was not capable of reducing noise levels

by 5 dBA or more and was determined to be not feasible. The locations of NB Nos. 11.4 and 12.3 are shown on Figure J-4 in Appendix J.

- **Receptors R-12.13 through R-12.26:** These receptor locations represent existing single-family residences located along Chagall Avenue, Nebraska, Minnesota, and Georgia on the southbound side of I-5, between Culver Drive and Peters Canyon Regional Trails and Bikeway. Currently, an existing 12.6 ft high wall (EW No. 12.2) shields residences representing Receptors R-12.13 and R-12.14 while residences representing Receptors R-12.15 through R-12.25 are shielded by an existing 15.6 ft high wall (EW No. 12.3). In addition, residences representing Receptor R-12.26 are shielded by an existing 19 ft high wall (EW No. 12.4). One noise barrier (NB No. 12.2) was modeled along the private property wall on the southbound side of I-5 to shield these residences.
- **Receptors R-13.58 through R-13.65, R-13.67 through R-13.71, R-13.79, R-13.81, R-13.82, R-13.85 through R-13.95, R-13.133, and R-13.142:** These receptor locations represent existing multifamily and mobile home residences and a swimming pool located along Seville Street, Malaga Street, Madrid Street, Granada Street, Pinebrook Drive, and Nisson Road on the southbound side of I-5, between Tustin Ranch Road and Red Hill Avenue. Currently, an existing 7.3 ft to 15 ft high (EW No. 13.2) wall shields residences representing Receptors R-13.58 through R-13.65, while residences and the swimming pool representing Receptors R-13.67 through R-13.71, R-13.79, R-13.81, R-13.82, R-13.85 through R-13.95, R-13.133, and R-13.142 are shielded by an existing 10.5 ft to 12.5 ft high wall (EW No. 13.3). One noise barrier (NB No. 13.1) was modeled along the State right-of-way/private property line on the southbound side of I-5 to shield these residences.
- **Receptors R-14.02 through R-14.09, R-14.14 through R-14.17, R-14.19 through R-14.21, and R-14.23 through R-14.25:** These receptor locations represent existing single-family and multifamily residences and an associated swimming pool along Nisson Road on the southbound side of I-5, between Red Hill Avenue and Newport Avenue. Currently, an existing ten ft high wall (EW No. 14.1) along the edge of the shoulder shields the residences and swimming pool representing Receptors R-14.02 through R-14.05 while another existing ten ft high wall (EW No. 14.2) along the edge of the shoulder shields these residences representing Receptors R-14.06 through R-14.09, R-14.14 through R-14.17, R-14.19 through R-14.21, and R-14.23 through 14.25. One noise barrier (NB No. 14.1) was modeled along the edge of the shoulder on the southbound side of I-5 to shield the residences and swimming pool.
- **Receptors R-14.29 through R-14.33:** These receptor locations represent existing multifamily and single-family residences along South B Street and South C Street on

the southbound side of I-5, north of Newport Avenue. Currently, an existing five ft high wall (EW No. 14.6) shields these residences. Five noise barrier locations were evaluated separately to shield these receptors and to compare the effectiveness of the five barriers. NB No. 14.2 was modeled along the State right-of-way and the edge of the shoulder on the southbound side of I-5 to shield the residences. NB No. 14.3 was modeled along the private property line to shield the residences. NB Nos. 14.4, 14.4a, and the combination of NB Nos. 14.2 and 14.4a were modeled along the edge of the shoulder on the southbound side of I-5 to shield the residences.

- **Receptors R-14.34 through R-14.41, R-14.48, R-14.51, R-14.54, R-14.55, R-14.73, and R-14.74:** These receptor locations represent existing single-family, multifamily, and mobile home residences and a swimming pool associated with the mobile home park along Nisson Road on the southbound side of I-5, between Newport Avenue and SR-55. Currently, an existing ten ft to 11 ft high wall (EW No. 14.3) along the I-5 southbound off-ramp shields the residences and swimming pool representing Receptors R-14.34 through R-14.41, R-14-48, R-14.51, R-14.54, and R-14.55, an existing six ft high wall (EW No. 14.4) shields these residences representing Receptors R-14.73 and R-14.74, and an existing ten ft high wall (EW No. 14.5) along the southbound SR-55 to southbound I-5 connector edge of the shoulder shields a smaller group of residences representing Receptors R-14.48, R-14.51, R-14.54, and R-14.55. One noise barrier (NB No. 14.2) was modeled along the State right-of-way and the edge of the shoulder on the southbound side of I-5 to shield the residences and swimming pool.

In addition to the receptors identified for Alternative 2B in the area of Design Option 3, the following receptor location would be exposed to noise levels that approach or exceed the NAC under Alternative 2B with Design Option 3:

- **Receptor R-3.30:** This receptor location represents an existing multifamily residence along Hayes Street on the northbound side of I-5, between Jeffrey Road and Yale Avenue. Currently, an existing six ft high wall (EW No. 3.1) shields this residence. One noise barrier (NB No. 3.3) was modeled along the State right-of-way, the edge of the shoulder, and the private property line on the northbound side of I-5 to shield this residence.

The following receptor location would be exposed to noise levels that approach or exceed the NAC under Alternative 2B, but would not be exposed to noise levels that approach or exceed the NAC under Alternative 2B Design Option 3:

- **Receptor R-3.03:** This receptor location represents an existing sitting area associated with office buildings along Roosevelt on the northbound side of I-5, north of Jeffrey Road. Currently, no existing walls shield the sitting area.

Noise Abatement Consideration

Noise abatement measures such as noise barriers were considered in order to shield receptors within the Study Area that would become 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, C, D, and E (67, 67, 52, and 72 dBA L_{eq} NAC, respectively). Noise barriers were analyzed for each of these receptor locations. Depending on the location of the potential barrier and existing barrier height, noise barrier heights from six to 22 ft at two ft increments were analyzed. The locations of the modeled noise barriers for Alternative 2A, Alternative 2A with Design Option 3, Alternative 2B (Preferred Alternative), and Alternative 2B with Design Option 3 are shown on Figures J-2 through J-5, respectively, in Appendix J of this document.

The following noise barriers were analyzed to shield receptor locations that would be exposed to traffic noise levels approaching or exceeding the NAC for Alternative 2A and are summarized in Tables J-1 and J-2 in Appendix J of this document:

- **NB No. 1.1:** A 686 ft long barrier along the edge of the shoulder on the northbound side of I-5, south of SR-133, was analyzed to shield Receptor R-1.24.
- **NB No. 2.1:** A 119 ft long barrier along the private property line of Irvine Community Church on the northbound side of I-5 and the eastbound side of Sand Canyon Avenue was analyzed to shield Receptor R-2.02.
- **NB No. 3.3:** A 3,181 ft long barrier along the State right-of-way, the edge of the shoulder, and the private property line on the northbound side of I-5 between Jeffery Road and Yale Avenue was analyzed to shield Receptors R-3.11, R-3.13 through R-3.15, R-3.17, R-3.19, R-3.21 through R-3.23, R-3.25, R-3.27, R-3.29, R-3.31 through R-3.37, R-3.40, R-3.41, R-3.43, R-3.45, R-3.51, R-3.53, R-3.55, R-3.60, R-3.62, R-3.64, R-3.66, R-3.68, R-3.70, R-3.72, R-3.74, R-3.77, R-3.79, R-3.81 through R-3.83, R-3.87 through R-3.89, and R-3.91.
- **NB No. 4.1:** A 3,066 ft long barrier along the edge of the shoulder and the State right-of-way on the northbound side of I-5 between Yale Avenue and the I-5 northbound off-ramp to Trabuco Road was analyzed to shield Receptors R-4.02, R-4.11, R-4.17, R-4.20, R-4.24, R-4.26 through R-4.31, R-4.39, R-4.40, R-4.64, R-4.71, R-4.89, R-4.91, R-4.107, R-4.113, R-4.123, and R-4.133.

- **NB No. 4.2:** A 1,689 ft long barrier along the edge of the shoulder on the northbound side of I-5 between the I-5 northbound off-ramp to Trabuco Road and Culver Drive was analyzed to shield Receptors R-4.138, R-4.149, and R-4.150.
- **NB No. 4.3:** A 229 ft long barrier along the private property line on the northbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-4.149 and R-4.150.
- **NB No. 6.1:** A 974 ft long barrier along the private property line on the northbound side of I-5 between Tustin Ranch Road and El Camino Real, south of Browning Avenue, was analyzed to shield Receptors R-6.30, R-6.50, and R-6.52.
- **NB No. 6.2:** A 1,959 ft long barrier along the State right-of-way and the edge of the shoulder on the northbound side of I-5 between Tustin Ranch Road and Red Hill Avenue was analyzed to shield Receptors R-6.61 through R-6.70, R-6.77 through R-6.79, R-6.84, R-6.89, R-6.90, R-6.92 through R-6.97, R-6.106, R-6.107, R-6.119, and R-6.121.
- **NB No. 7.1:** A 2,674 ft long barrier along the State right-of-way and the edge of the shoulder on the northbound side of I-5 between Red Hill Avenue and Newport Avenue was analyzed to shield Receptors R-7.03, R-7.04, and R-7.112
- **NB No. 7.2:** A 687 ft long barrier along the edge of the shoulder on the northbound side of I-5 between Newport Avenue and SR-55 was analyzed to shield Receptors R-7.21 and R-7.22.
- **NB No. 10.1:** A 3,712 ft long barrier along the edge of the shoulder on the southbound side of I-5 between Jeffrey Road and Yale Avenue was analyzed to shield Receptors R-10.08, R-10.11, R-10.13, R-10.22, R-10.24, R-10.29, R-10.30, R-10.31, R-10.32, R-10.34, R-10.35, R-10.36, R-10.37, R-10.38, R-10.39, R-10.40 through R-10.41, R-10.44, R-10.45 through R-10.47, R-10.49, R-10.50, R-10.55, R-10.56, R-10.57, R-10.58, R-10.59, R-10.60, R-10.61 through R-10.62, R-10.64, R-10.65, R-10.66, R-10.67, R-10.68, R-10.69 through R-10.70, R-10.73, R-10.74, R-10.77, R-10.78, and R-10.79.
- **NB No. 11.1:** A 1,095 ft long barrier along the edge of the shoulder on the southbound side of I-5 and the westbound side of Yale Avenue was analyzed to shield Receptors R-11.03 through R-11.06.
- **NB No. 11.2:** A 1,049 ft long barrier along the edge of the shoulder on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-11.10 and R-11.11.
- **NB No. 11.2 (Slope):** A 1,048 ft long barrier on the slope on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-11.10 and R-11.11.

- **NB No. 11.3:** A 503 ft long barrier along the State right-of-way and the private property line on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptor R-11.22.
- **NB Nos. 11.2 and 11.4:** A combination of a 1,047 ft long barrier (NB No. 11.2) and a 1,082 ft long barrier (NB No. 11.4) along the edge of shoulder on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-11.10, R-11.11, and R-11.22.
- **NB No. 12.1:** A 469 ft long barrier along the private property line on the southbound side of I-5 and the westbound side of Culver Drive was analyzed in the June 2017 NSR to shield Receptors R-12.01 through R-12.03. Based on direction from Caltrans in the February 2018 NADR, the evaluation of this barrier was based on traffic on the I-5 only (no traffic on Culver Drive). The revised results are shown in Table J-7 in Appendix J.
- **NB No. 12.2:** A 1,704 ft long barrier along the State right-of-way and the private property line on the southbound side of I-5 between Culver Drive and Jamboree Road was analyzed to shield Receptors R-12.13 through R-12.26.
- **NB Nos. 12.3 and 11.4:** A 2,485 ft long barrier along the edge of shoulder on the southbound side of I-5 north of Culver Drive and south of Culver Drive was analyzed to shield Receptors R-12.01 through R-12.03. The results are shown in Table J-7 in Appendix J.
- **NB No. 13.1:** A 3,755 ft long barrier located along the State right-of-way/private property line and the edge of the shoulder on the southbound side of I-5 between Tustin Ranch Road and Red Hill Avenue was analyzed to shield Receptors R-13.58 through R-13.71, R-13.73, R-13.76, R-13.79 through R-13.106, R-13.108, R-13.109, R-13.112, R-13.121, R-13.123 through R-13.125, R-13.127, R-13.129, R-13.130, and R-13.142.
- **NB No. 14.1:** A 2,672 ft long barrier along the edge of the shoulder on the southbound side of I-5 between Red Hill Avenue and Newport Avenue was analyzed to shield Receptor R-14.05.
- **NB No. 14.2:** A 2,840 ft long barrier along the State right-of-way and the edge of the shoulder on the southbound side of I-5 between Newport Avenue and SR-55 was analyzed to shield Receptors R-14.29 through R-14.37, R-14.39 through R-14.41, R-14.48, R-14.51, R-14.54, R-14.55, R-14.73, and R- 14.74.
- **NB No. 14.3:** A 430 ft long barrier along the private property line on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.

- **NB No. 14.4:** An 861 ft long barrier along the edge of shoulder on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.
- **NB No. 14.4a:** A 959 ft long barrier along the edge of shoulder on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.
- **NB Nos. 14.2 and 14.4a:** A combination of a 620 ft long barrier (NB No. 14.2) and a 959 ft long barrier (NB No. 14.4a) along the edge of shoulder on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.

The following noise barrier was analyzed to shield receptor locations that would be exposed to traffic noise levels approaching or exceeding the NAC for Alternative 2A with Design Option 3 and is summarized in Table J-3 in Appendix J of this document:

- **NB No. 2.1:** A 119 ft long barrier along the private property line of Irvine Community Church on the northbound side of I-5 and the eastbound side of Sand Canyon Avenue was analyzed to shield Receptor R-2.02.
- **NB No. 3.3**: A 3,181 ft long barrier along the State right-of-way, the edge of shoulder, and the private property line on the northbound side of I-5 between Jeffery Road and Yale Avenue was analyzed to shield Receptors R-3.11, R-3.13 through R-3.15, R-3.17, R-3.19, R-3.21 through R-3.23, R-3.25, R-3.27, R-3.29 through R-3.37, R-3.40, R-3.41, R-3.43, R-3.45, R-3.51, R-3.53, R-3.55, R-3.60, R-3.62, R-3.64, R-3.66, R-3.68, R-3.70, R-3.72, R-3.74, R-3.77, R-3.79 through R-3.83, R-3.87, R-3.89, and R-3.91.
- **NB No. 10.1:** A 3,712 ft long barrier along the edge of the shoulder on the southbound side of I-5 between Jeffrey Road and Yale Avenue was analyzed to shield Receptors R-10.08, R-10.11, R-10.13, R-10.22, R-10.24, R-10.29 through R-10.32, R-10.34 through R-10.41, R-10.44 through R-10.46, R-10.49, R-10.50, R-10.55 through R-10.62, R-10.64 through R-10.70, R-10.73, R-10.74, and R-10.77 through R-10.79.

The following noise barriers were analyzed to shield receptor locations that would be exposed to traffic noise levels approaching or exceeding the NAC for Alternative 2B (Preferred Alternative) and are summarized in Tables J-4 and J-5 in Appendix J of this document:

- **NB No. 1.1:** A 686 ft long barrier along the edge of the shoulder on the northbound side of I-5, south of SR-133, was analyzed to shield Receptor R-1.24.
- **NB No. 2.1:** A 119 ft long barrier along the private property line of Irvine Community Church on the northbound side of I-5 and the eastbound side of Sand Canyon Avenue was analyzed to shield Receptor R-2.02.
- **NB No. 3.1:** A 298 ft long barrier along the edge of the shoulder on the northbound side of I-5 north of Jeffery Road was analyzed to shield Receptor R-.03.
- **NB No. 3.2:** A 105 ft long barrier along the private property line on the northbound side of I-5 north of Jeffery Road was analyzed to shield Receptor R-3.03.
- **NB No. 3.3:** A 3,181 ft long barrier along the State right-of-way, the edge of the shoulder, and the private property line on the northbound side of I-5 between Jeffery Road and Yale Avenue was analyzed to shield Receptors R-3.11, R-3.13 through R-3.15, R-3.17, R-3.19, R-3.21 through R-3.23, R-3.25, R-3.27, R-3.29, R-3.31 through R-3.37, R-3.40, R-3.41, R-3.43, R-3.45, R-3.51, R-3.53, R-3.55, R-3.60, R-3.62, R-3.64, R-3.66, R-3.68, R-3.70, R-3.72, R-3.74, R-3.77, R-3.79, R-3.81, R-3.83, R-3.87, R-3.89, and R-3.91.
- **NB No. 4.1:** A 2,518 ft long barrier along the State right-of-way on the northbound side of I-5 between Yale Avenue and the I-5 northbound off-ramp to Trabuco Road was analyzed to shield Receptors R-4.63, R-4.64, R-4.71, R-4.89, R-4.107, R-4.113, R-4.123, and R-4.133.
- **NB No. 4.2:** A 1,690 ft long barrier along the edge of the shoulder on the northbound side of I-5 between the I-5 northbound off-ramp to Trabuco Road and Culver Drive was analyzed to shield Receptors R-4.149 and R-4.150.
- **NB No. 4.3:** A 229 ft long barrier along the private property line on the northbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-4.149 and R-4.150.
- **NB No. 6.1:** A 974 ft long barrier along the private property line on the northbound side of I-5 between Tustin Ranch Road and the I-5 northbound on-ramp and El Camino Real was analyzed to shield Receptor R-6.52.
- **NB No. 6.2:** A 1,965 ft long barrier along the State right-of-way and the edge of the shoulder on the northbound side of I-5 between Tustin Ranch Road and Red Hill Avenue was analyzed to shield Receptors R-6.61 through R-6.70, R-6.77, R-6.79, R-6.93, R-6.106, R-6.107, R-6.119, and R-6.121.
- **NB No. 7.1:** A 2,672 ft long barrier along the State right-of-way and the edge of the shoulder on the northbound side of I-5 between Red Hill Avenue and Newport Avenue was analyzed to shield Receptors R-7.03, R-7.04, and R-7.11.

- **NB No. 7.2:** A 688 ft long barrier along the edge of the shoulder on the northbound side of I-5 between Newport Avenue and SR-55 was analyzed to shield Receptors R-7.21, and R-7.22.
- **NB No. 11.2:** A 1,050 ft long barrier along the edge of the shoulder on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-11.10 and R-11.11.
- **NB No. 11.2 (Slope):** A 1,048 ft long barrier on the slope on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-11.10 and R-11.11.
- **NB No. 11.3:** A 503 ft long barrier along the State right-of-way and the private property line on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptor R-11.22.
- **NB Nos. 11.2 and 11.4:** A combination of a 1,047 ft long barrier (NB No. 11.2) and a 1,082 ft long barrier (NB No. 11.4) along the edge of shoulder on the southbound side of I-5 and the eastbound side of Culver Drive was analyzed to shield Receptors R-11.10, R-11.11, and R-11.22.
- **NB No. 12.1:** A 469 ft long barrier along the private property line on the southbound side of I-5 and the westbound side of Culver Drive was analyzed in the June 2017 NSR to shield Receptors R-12.01 through R-12.03. Based on direction from Caltrans in the February 2018 NADR, the evaluation of this barrier was based on traffic on the I-5 only (no traffic on Culver Drive). The revised results are shown in Table J-8 in Appendix J.
- **NB No. 12.2:** A 1,704 ft long barrier along the State right-of-way and the private property line on the southbound side of I-5 between Culver Drive and Jamboree Road was analyzed to shield Receptors R-12.13 through R-12.26.
- **NB Nos. 12.3 and 11.4:** A 2,485 ft long barrier along the edge of shoulder on the southbound side of I-5 north of Culver Drive and south of Culver Drive was analyzed to shield Receptors R-12.01 through R-12.03. The results are shown in Table J-8 in Appendix J.
- **NB No. 13.1:** A 3,759 ft long barrier along the State right-of-way/private property line and the edge of the shoulder on the southbound side of I-5 between Tustin Ranch Road and Red Hill Avenue was analyzed to shield Receptors R-13.58 through R-13.65, R-13.67 through R-13.71, R-13.79, R-13.81, R-13.82, R-13.85 through R-13.95, and R-13.142.
- **NB No. 14.1:** A 2,674 ft long barrier along the edge of the shoulder on the southbound side of I-5 between Red Hill Avenue and Newport Avenue was analyzed to shield Receptor R-14.05.

- **NB No. 14.2:** A 2,840 ft long barrier along the State right-of-way and the edge of the shoulder on the southbound side of I-5 between Newport Avenue and SR-55 was analyzed to shield Receptors R-14.29 through R-14.41, R-14.48, R-14.51, R-14.54, R-14.55, R-14.73, and R-14.74.
- **NB No. 14.3:** A 430 ft long barrier along the private property line on the southbound side of I-5 west of Newport Avenue was analyzed to shield Receptors R-14.29 through R-14.33.
- **NB No. 14.4:** An 863 ft long barrier along the edge of shoulder on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.
- **NB No. 14.4a:** A 984 ft long barrier along the edge of shoulder on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.
- **NB Nos. 14.2 and 14.4a:** A combination of a 595 ft long barrier (NB No. 14.2) and a 984 ft long barrier (NB No. 14.4a) along the edge of shoulder on the southbound side of I-5 and the westbound side of Newport Avenue was analyzed to shield Receptors R-14.29, R-14.30, R-14.31, R-14.32, and R-14.33.

The following noise barriers were analyzed to shield receptor locations that would be exposed to traffic noise levels approaching or exceeding the NAC for Alternative 2B with Design Option 3[1] and are summarized in Table J-6 in Appendix J of this document:

- **NB No. 2.1:** A 119 ft long barrier along the private property line of Irvine Community Church on the northbound side of I-5 and the eastbound side of Sand Canyon Avenue was analyzed to shield Receptor R-2.02.
- **NB No. 3.3:** A 3,181 ft long barrier along the State right-of-way on the northbound side of I-5 between Jeffery Road and Yale Avenue was analyzed to shield Receptors R-3.11, R-3.13 through R-3.15, R-3.17, R-3.19, R-3.21 through R-3.23, R-3.25, R-3.27, R-3.29 through R-3.37, R-3.40, R-3.41, R-3.43, R-3.45, R-3.51, R-3.53, R-3.55, R-3.60, R-3.62, R-3.64, R-3.66, R-3.68, R-3.70, R-3.72, R-3.74, R-3.77, R-3.79, R-3.81, R-3.83, R-3.87, R-3.89, and R-3.91.

Feasibility and Reasonable Allowance

Section 3 of the Protocol states that a minimum noise reduction of 5 dBA must be achieved at the impacted receptors in order for the proposed noise abatement measure to

[1] Alternative 2B without Design Option 3 has been selected as the Preferred Alternative

be considered feasible. Greater noise reductions are encouraged if they can be reasonably achieved. Feasibility may also be restricted by the following factors: (1) topography, (2) access requirement for driveways, (3) presence of local cross-streets, (4) underground utilities, (5) other noise sources in the area, and (6) safety considerations.

Tables 2.14.11 through 2.14.14, which summarize the feasibility of the modeled noise barriers, list the noise barrier heights, approximate lengths, highest noise attenuation, number of benefited units/receptors, total reasonable allowance, noise barrier locations, beginning and ending station numbers, and beginning and ending top of wall elevation under Alternative 2A, Alternative 2A with Design Option 3, Alternative 2B (Preferred Alternative), and Alternative 2B with Design Option 3, respectively.

Of the 25 modeled noise barriers evaluated for Alternative 2A, 21 noise barriers were determined to be feasible. NB Nos. 2.1, 12.2, 12.3, and 14.2 were determined to be not feasible because the noise barriers were not capable of reducing noise levels by 5 dBA or more. Of the three modeled noise barriers evaluated for Alternative 2A with Design Option 3, two noise barriers were determined to be feasible, and one noise barrier was determined to be not feasible (NB No. 2.1).

Table 2.14.11: Summary of Feasible Noise Barriers for Alternative 2A

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
1.1	10	686	5.4	12[4]	$1,104,000	EOS	441+65	448+45	231.45	230.57
	12	686	6.6	12[4]	$1,104,000		441+65	448+45	233.45	232.57
	14	686	7.6	12[4]	$1,104,000		441+65	448+45	235.45	234.57
	16	686	8.2	12[4]	$1,104,000		441+65	448+45	237.45	236.57
	18	686	8.6	12[4]	$1,104,000		441+65	448+45	239.45	238.57
	20[3]	686	9.0	12[4]	$1,104,000		441+65	448+45	241.45	240.57
	22	686	9.2	12[4]	$1,104,000		441+65	448+45	243.45	242.57
3.3	12	3,181	6.4	44	$4,048,000	EOS/ROW/PL	569+10	601+00	172	153
	14	3,181	8.6	104	$9,568,000		569+10	601+00	174	155
	16[3]	3,181	9.7	163	$14,996,000		569+10	601+00	176	157
	18	3,181	10.4	173	$15,916,000		569+10	601+00	178	159
	20	3,181	10.1	176	$16,192,000		569+10	601+00	180	161
	22	3,181	10.8	168	$15,456,000		569+10	601+00	182	163
4.1	8	3,066	5.4	1	$92,000	EOS/ROW	603+00	635+50	141	123
	10	3,066	6.6	7	$644,000		603+00	635+50	143	125
	12	3,066	8.4	22	$2,024,000		603+00	635+50	145	127
	14	3,066	9.6	45	$4,140,000		603+00	635+50	147	129
	16	3,066	11.1	74	$6,808,000		603+00	635+50	149	131
	18	3,066	12.2	102	$9,384,000		603+00	635+50	151	133
	20	3,066	13.1	142[6]	$13,064,000		603+00	635+50	153	135
	22[5]	3,066	13.9	151[6]	$13,892,000		603+00	635+50	155	137
4.2	22	1,689	5.0	2	$184,000	EOS	633+00	649+60	152.42	143.7
4.3	12	229	5.8	3	$276,000	PL	640+70	642+65	131.16	125
	14	229	7.1	3	$276,000		640+70	642+65	133.16	127
	16	229	8.5	3	$276,000		640+70	642+65	135.16	129
	18	229	9.4	3	$276,000		640+70	642+65	137.16	131
	20	229	10.0	3	$276,000		640+70	642+65	139.16	133
	22[5]	229	10.4	3	$276,000		640+70	642+65	141.16	135
6.1	12	974	5.0	1	$92,000	PL	735+25	744+35	108	105.06
	14	974	6.5	2	$184,000		735+25	744+35	110	107.06
	16[3]	974	7.8	5	$460,000		735+25	744+35	112	109.06
	18	974	8.7	6	$552,000		735+25	744+35	114	111.06
	20	974	9.5	7	$644,000		735+25	744+35	116	113.06
	22	974	10.2	8	$736,000		735+25	744+35	118	115.06
6.2	8	1,959	6.0	9	$828,000	EOS/ROW	747+20	766+80	99.54	123.6
	10	1,959	7.5	23	$2,116,000		747+20	766+80	101.54	125.6
	12	1,959	9.7	53	$4,876,000		747+20	766+80	103.54	127.6
	14	1,959	9.8	89	$8,188,000		747+20	766+80	105.54	129.6

Table 2.14.11: Summary of Feasible Noise Barriers for Alternative 2A

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
6.2	16[3]	1,959	10.6	108	$9,936,000	EOS/ROW	747+20	766+80	107.54	131.6
	18	1,959	11.4	123	$11,316,000		747+20	766+80	109.54	133.6
	20	1,959	12.0	129	$11,868,000		747+20	766+80	111.54	135.6
	22	1,959	12.6	129	$11,868,000		747+20	766+80	113.54	137.6
7.1	10	2,674	5.4	1	$92,000	EOS/ROW	775+75	801+10	138	151.5
	12	2,674	6.0	4	$368,000		775+75	801+10	140	153.5
	14	2,674	6.5	4	$368,000		775+75	801+10	142	155.5
	16	2,674	6.9	4	$368,000		775+75	801+10	144	157.5
	18	2,674	7.2	4	$368,000		775+75	801+10	146	159.5
	20	2,674	7.5	4	$368,000		775+75	801+10	148	161.5
	22[5]	2,674	7.7	4	$368,000		775+75	801+10	150	163.5
7.2	6	687	6.2	2	$184,000	EOS	822+00	828+90	131.67	133.81
	8	687	8.9	2	$184,000		822+00	828+90	133.67	135.81
	10	687	11.9	2	$184,000		822+00	828+90	135.67	137.81
	12	687	13.7	5	$460,000		822+00	828+90	137.67	139.81
	14	687	15.0	7[6]	$644,000		822+00	828+90	139.67	141.81
	16	687	15.7	8[6]	$736,000		822+00	828+90	141.67	143.81
	18	687	16.7	9[6]	$828,000		822+00	828+90	143.67	145.81
	20	687	17.6	11[6]	$1,012,000		822+00	828+90	145.67	147.81
	22[3]	687	18.2	11[6]	$1,012,000		822+00	828+90	147.67	149.81
10.1	6	3,712	9.0	56	$5,152,000	EOS	564+05	601+15	171.53	139
	8	3,712	11.0	111	$10,212,000		564+05	601+15	173.53	141
	10	3,712	13.1	143	$13,156,000		564+05	601+15	175.53	143
	12	3,712	14.2	165	$15,180,000		564+05	601+15	177.53	145
	14[3]	3,712	15.3	180	$16,560,000		564+05	601+15	179.53	147
	16	3,712	16.2	184	$16,928,000		564+05	601+15	181.53	149
	18	3,712	17.2	205	$18,860,000		564+05	601+15	183.53	151
	20	3,712	17.8	203	$18,676,000		564+05	601+15	185.53	153
	22	3,712	18.4	203	$18,676,000		564+05	601+15	187.53	155
11.1	10	1,095	5.3	1	$92,000	EOS	603+05	614+00	133.89	142
	12[3]	1,095	6.3	2	$184,000		603+05	614+00	135.89	144
	14	1,095	6.7	3	$276,000		603+05	614+00	137.89	146
	16	1,095	7.1	3	$276,000		603+05	614+00	139.89	148
	18	1,095	7.3	4	$368,000		603+05	614+00	141.89	150
	20	1,095	7.5	4	$368,000		603+05	614+00	143.89	152
	22	1,095	7.7	4	$368,000		603+05	614+00	145.89	154

Table 2.14.11: Summary of Feasible Noise Barriers for Alternative 2A

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
11.2	10	1,049	5.6	3	$276,000	EOS	627+15	637+75	133	123
	12	1,049	6.3	4	$368,000		627+15	637+75	135	125
	14	1,049	6.9	4	$368,000		627+15	637+75	137	127
	16	1,049	7.4	4	$368,000		627+15	637+75	139	129
	18[3]	1,049	7.9	8	$736,000		627+15	637+75	141	131
	20	1,049	8.3	9	$828,000		627+15	637+75	143	133
	22	1,049	8.6	10	$920,000		627+15	637+75	145	135
11.2 (Slope)[7]	18[8]	1,048	8.6	10	$920,000	Slope	627+15	637+75	141	131
11.3	14	503	5.9	1	$92,000	ROW/PL	630+75	635+00	124	120.58
	16	503	6.7	1	$92,000		630+75	635+00	126	122.58
	18	503	7.4	1	$92,000		630+75	635+00	128	124.58
	20[3]	503	7.8	3	$276,000		630+75	635+00	130	126.58
	22	503	8.2	3	$276,000		630+75	635+00	132	128.58
11.2/11.4[9]	6	2,129	5.4	2	$184,000	EOS	623+15/ 630+95	634/ 641+55	125/ 131.38	127.34/ 130
	8	2,129	7.1	7	$644,000		623+15/ 630+95	634/ 641+55	127/ 133.38	129.34/ 132
	10	2,129	8.8	14	$1,288,000		623+15/ 630+95	634/ 641+55	129/ 135.38	131.34/ 134
	12	2,129	9.9	22	$2,024,000		623+15/ 630+95	634/ 641+55	131/ 137.37	133.34/ 136
	14	2,129	10.5	24	$2,208,000		623+15/ 630+95	634/ 641+55	133/ 139.38	135.34/ 138
	16	2,129	11.1	24	$2,208,000		623+15/ 630+95	634/ 641+55	135/ 141.38	137.34/ 140
	18	2,129	11.5	24	$2,208,000		623+15/ 630+95	634/ 641+55	137/ 143.38	139.34/ 142
	20	2,129	11.9	24	$2,208,000		623+15/ 630+95	634/ 641+55	139/ 145.38	141.34/ 144
	22	2,129	12.2	24	$2,208,000		623+15/ 630+95	634/ 641+55	141/ 147.38	143.34/ 146
12.1	14	469	5.0	3	$276,000	PL	9+40	13+10	112.36	115
	16	469	5.7	3	$276,000		9+40	13+10	114.36	117
	18	469	6.0	3	$276,000		9+40	13+10	116.36	119
	20	469	6.2	3	$276,000		9+40	13+10	118.36	121
	22[5]	469	6.5	3	$276,000		9+40	13+10	120.36	123

Table 2.14.11: Summary of Feasible Noise Barriers for Alternative 2A

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
13.1	6	3,755	5.7	13	$1,196,000	EOS/ROW/PL	738+80	776+30	91.75	124
	8	3,755	6.7	46	$4,232,000		738+80	776+30	93.75	126
	10	3,755	8.4	108	$9,936,000		738+80	776+30	95.75	128
	12	3,755	10.2	135	$12,420,000		738+80	776+30	97.75	130
13.1	14	3,755	11.1	143	$13,156,000	EOS/ROW/PL	738+80	776+30	99.75	132
	16[3]	3,755	11.9	157	$14,444,000		738+80	776+30	101.75	134
	18	3,755	12.6	183	$16,836,000		738+80	776+30	103.75	136
	20	3,755	13.4	193	$17,756,000		738+80	776+30	105.75	138
	22	3,755	14.5	202	$18,584,000		738+80	776+30	107.75	140
14.1	6	2,672	6.1	18	$1,656,000	EOS	776+30	801+70	124.07	146.6
	8	2,672	7.5	27	$2,484,000		776+30	801+70	126.07	148.6
	10	2,672	9.1	30	$2,760,000		776+30	801+70	128.07	150.6
	12	2,672	10.4	34	$3,128,000		776+30	801+70	130.07	152.6
	14[3]	2,672	11.4	34	$3,128,000		776+30	801+70	132.07	154.6
	16	2,672	12.1	35	$3,220,000		776+30	801+70	134.07	156.6
	18	2,672	12.7	35	$3,220,000		776+30	801+70	136.07	158.6
	20	2,672	13.3	35	$3,220,000		776+30	801+70	138.07	160.6
	22	2,672	13.8	36	$3,312,000		776+30	801+70	140.07	162.6
14.3	8	430	5.4	2	$184,000	PL	805+60	809+55	124	126
	10	430	7.0	3	$276,000		805+60	809+55	126	128
	12	430	8.4	3	$276,000		805+60	809+55	128	130
	14	430	9.3	5	$460,000		805+60	809+55	130	132
	16	430	10.0	5	$460,000	PL	805+60	809+55	132	134
	18[3]	430	10.7	5	$460,000		805+60	809+55	134	136
	20	430	11.2	5	$460,000		805+60	809+55	136	138
	22	430	12.0	5	$460,000		805+60	809+55	138	140
14.4[9]	20	861	7.1	2	$184,000	EOS	802+95	811+60	161.10	153.60
	22	861	7.3	2	$184,000		802+95	811+60	163.10	155.60
14.4a[9]	18	959	7.3	3	$276,000	EOS	801+70	811+60	158.60	151.60
	20	959	7.6	4	$368,000		801+70	811+60	160.60	153.60
	22	959	7.8	4	$368,000		801+70	811+60	162.60	155.60

Table 2.14.11: Summary of Feasible Noise Barriers for Alternative 2A

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
14.2/14.4a[9]	14	1,579	7.0	3	$276,000	EOS	804+50/ 801+70	810+55/ 811+60	131.50/ 154.60	145.26/ 147.60
	16	1,579	7.6	4	$368,000		804+50/ 801+70	810+55/ 811+60	133.50/ 156.60	147.26/ 149.60
	18	1,579	8.0	8	$736,000		804+50/ 801+70	810+55/ 811+60	135.50/ 158.60	149.26/ 151.60
	20	1,579	8.4	8	$736,000		804+50/ 801+70	810+55/ 811+60	137.50/ 160.60	151.26/ 153.60
	22	1,579	8.7	8	$736,000		804+50/ 801+70	810+55/ 811+60	139.50/ 162.60	153.26/ 155.60

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated by 5 dBA or more by the modeled barrier.

[2] Calculated by multiplying the number of benefited receptors by $92,000 (reasonable allowance per benefited receptor/unit).

[3] Denotes the minimum wall height required to break the line-of-sight between the receptor and a truck exhaust stack.

[4] The number of benefited receptors was calculated using 100 ft frontage units because the frontage is approximately 1,200 ft.

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

[6] The number of benefited receptors/units was updated because additional benefited receptors/units were identified.

[7] A 22 ft high barrier constructed on the slope approximately four ft lower in elevation than the edge of shoulder is provided as an alternative construction method for an effective 18 ft high noise barrier.

[8] NB No. 11.2 (Slope) would be 22 ft high with an effective height of 18 ft because the barrier would be located approximately four ft lower than the edge of shoulder.

[9] The combination of NB Nos. 11.2 and 11.4, NB No. 14.4, NB No. 14.4a, and the combination of NB Nos. 14.2 and 14.4a were evaluated as an additional barrier configuration.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Table 2.14.12: Summary of Feasible Noise Barriers for Alternative 2A with Design Option 3

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
3.3	12	3,181	6.3	30	$2,760,000	EOS/ROW/PL	569+20	601+00	172	146
	14	3,181	8.6	85	$7,820,000		569+20	601+00	174	148
	16[3]	3,181	9.7	135	$12,420,000		569+20	601+00	176	150
	18	3,181	10.3	144	$13,248,000		569+20	601+00	178	152
	20	3,181	10.0	144	$13,248,000		569+20	601+00	180	154
	22	3,181	10.8	140	$12,880,000		569+20	601+00	182	156
10.1	6	3,712	9.0	51	$4,692,000	EOS	564+05	601+20	162.53	139
	8	3,712	11.0	111	$10,212,000		564+05	601+20	164.53	141
	10	3,712	13.1	138	$12,696,000		564+05	601+20	166.53	143
	12	3,712	14.2	161	$14,812,000		564+05	601+20	168.53	145
	14[3]	3,712	15.3	181	$16,652,000		564+05	601+20	170.53	147
	16	3,712	16.2	185	$17,020,000		564+05	601+20	172.53	149
	18	3,712	16.2	190	$17,480,000		564+05	601+20	174.53	151
	20	3,712	17.8	204	$18,768,000		564+05	601+20	176.53	153
	22	3,712	18.4	204	$18,768,000		564+05	601+20	178.53	155

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated by 5 dBA or more by the modeled barrier.

[2] Calculated by multiplying the number of benefited receptors by $92,000 (the dollar amount per benefited receptor/unit).

[3] Denotes the minimum wall height required to break the line-of-sight between the receptor and a truck exhaust stack.

[4] Denotes that the maximum feasible barrier height modeled would not break the line-of-sight between the receptor and a truck exhaust stack.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Table 2.14.13: Summary of Feasible Noise Barriers for Alternative 2B (Preferred Alternative)

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
1.1	10	686	5.4	12[4]	$1,104,000	EOS	441+65	448+55	231.69	230.57
	12	686	6.7	12[4]	$1,104,000		441+65	448+55	233.69	232.57
	14	686	7.6	12[4]	$1,104,000		441+65	448+55	235.69	234.57
	16	686	8.2	12[4]	$1,104,000		441+65	448+55	237.69	236.57
	18	686	8.7	12[4]	$1,104,000		441+65	448+55	239.69	238.57
	20[3]	686	9.0	12[4]	$1,104,000		441+65	448+55	241.69	240.57
	22	686	9.3	12[4]	$1,104,000		441+65	448+55	243.69	242.57
3.1	8	298	5.2	1	$92,000	EOS	561+50	564+00	183.67	171
	10	298	6.2	1	$92,000		561+50	564+00	185.67	173
	12	298	6.9	1	$92,000		561+50	564+00	187.67	175
	14	298	7.6	1	$92,000		561+50	564+00	189.67	177
	16[3]	298	8.4	1	$92,000		561+50	564+00	191.67	179
	18	298	8.8	1	$92,000		561+50	564+00	193.67	181
	20	298	9.2	1	$92,000		561+50	564+00	195.67	183
	22	298	9.5	1	$92,000		561+50	564+00	197.67	185
3.2	10	105	6.1	1	$92,000	PL	563+00	563+90	172	172
	12[3]	105	7.1	1	$92,000		563+00	563+90	172	172
	14	105	7.7	1	$92,000		563+00	563+90	172	172
	16	105	8.4	1	$92,000		563+00	563+90	172	172
	18	105	8.8	1	$92,000		563+00	563+90	172	172
	20	105	9.2	1	$92,000		563+00	563+90	172	172
	22	105	9.7	1	$92,000		563+00	563+90	172	172
3.3	12	3,181	6.3	35	$3,220,000	EOS/ROW/PL	569+20	601+00	170	151
	14	3,181	8.7	92	$8,464,000		569+20	601+00	172	153
	16[3]	3,181	9.8	163	$14,996,000		569+20	601+00	174	155
	18	3,181	10.4	170	$15,640,000		569+20	601+00	176	157
	20	3,181	10.2	170	$15,640,000		569+20	601+00	178	159
	22	3,181	11.0	164	$15,088,000		569+20	601+00	180	161
4.1	12	2,518	5.8	4	$368,000	EOS/ROW	608+50	633+50	141	127
	14	2,518	7.7	16	$1,472,000		608+50	633+50	143	129
	16	2,518	9.8	32	$2,944,000		608+50	633+50	145	131
	18	2,518	11.0	56	$5,152,000		608+50	633+50	147	133
	20	2,518	12.2	101[6]	$9,292,000		608+50	633+50	149	135
	22[5]	2,518	13.1	119[6]	$10,948,000		608+50	633+50	151	137
4.3	12	229	5.7	2	$184,000	PL	640+70	642+50	122.16	125
	14	229	7.1	3	$276,000		640+70	642+50	124.16	127
	16	229	8.4	3	$276,000		640+70	642+50	126.16	129

Table 2.14.13: Summary of Feasible Noise Barriers for Alternative 2B (Preferred Alternative)

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
4.3	18	229	9.4	3	$276,000	PL	640+70	642+50	128.16	131
	20	229	9.9	3	$276,000		640+70	642+50	130.16	133
	22[5]	229	10.3	3	$276,000		640+70	642+50	132.16	135
6.1	12[3]	974	6.5	2	$184,000	PL	735+40	744+30	104	99.06
	14	974	6.5	2	$184,000		735+40	744+30	104	99.06
	16	974	7.9	5	$460,000		735+40	744+30	104	99.06
	18	974	8.8	6	$552,000		735+40	744+30	104	99.06
	20	974	9.6	7	$644,000		735+40	744+30	104	99.06
	22	974	10.4	8	$736,000		735+40	744+30	104	99.06
6.2	10	1,965	5.1	2	$184,000	EOS/ROW	747+40	767+00	101.54	125.6
	12	1,965	6.9	6	$552,000		747+40	767+00	103.54	127.6
	14	1,965	7.9	18	$1,656,000		747+40	767+00	105.54	129.6
	16[3]	1,965	8.9	32	$2,944,000		747+40	767+00	107.54	131.6
	18	1,965	9.8	54	$4,968,000		747+40	767+00	109.54	133.6
	20	1,965	10.3	70	$6,440,000		747+40	767+00	111.54	135.6
	22	1,965	15.6	89	$8,188,000		747+40	767+00	113.54	137.6
7.1	12[3]	2,672	5.2	1	$92,000	EOS/ROW	775+70	801+15	140	153.5
	14	2,672	5.6	1	$92,000		775+70	801+15	142	155.5
	16	2,672	5.9	1	$92,000		775+70	801+15	144	157.5
	18	2,672	6.2	1	$92,000		775+70	801+15	146	159.5
	20	2,672	6.4	1	$92,000		775+70	801+15	148	161.5
	22	2,672	6.5	1	$92,000		775+70	801+15	150	163.5
11.2	10	1,050	5.5	1	$92,000	EOS	627+25	637+75	133	123
	12	1,050	6.3	3	$276,000		627+25	637+75	135	125
	14	1,050	6.9	4	$368,000		627+25	637+75	137	127
	16	1,050	7.4	4	$368,000		627+25	637+75	139	129
	18[3]	1,050	7.8	8	$736,000		627+25	637+75	141	131
	20	1,050	8.2	9	$828,000		627+25	637+75	143	133
	22	1,050	8.6	10	$920,000		627+25	637+75	145	135
11.2 (Slope)[7]	18[8]	1,048	8.6	10	$920,000	Slope	627+15	637+75	141	131
11.3	14	503	5.1	1	$92,000	ROW/PL	630+90	635+00	124	120.58
	16	503	5.8	1	$92,000		630+90	635+00	126	122.58
	18	503	6.5	1	$92,000		630+90	635+00	128	124.58
	20[3]	503	6.9	1	$92,000		630+90	635+00	130	126.58
	22	503	7.4	3	$276,000		630+90	635+00	132	128.58
11.2/11.4[9]	6	2,129	5.4	1	$92,000	EOS	623+15/ 630+95	634/ 641+55	125/ 131.38	127.34/ 130

Table 2.14.13: Summary of Feasible Noise Barriers for Alternative 2B (Preferred Alternative)

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
11.2/11.4[9]	8	2,129	6.9	7	$644,000	EOS	623+15/ 630+95	634/ 641+55	127/ 133.38	129.34/ 132
	10	2,129	8.5	14	$1,288,000		623+15/ 630+95	634/ 641+55	129/ 135.38	131.34/ 134
	12	2,129	9.5	16	$1,472,000		623+15/ 630+95	634/ 641+55	131/ 137.37	133.34/ 136
	14	2,129	10.2	24	$2,208,000		623+15/ 630+95	634/ 641+55	133/ 139.38	135.34/ 138
	16	2,129	10.7	24	$2,208,000		623+15/ 630+95	634/ 641+55	135/ 141.38	137.34/ 140
	18	2,129	11.2	24	$2,208,000		623+15/ 630+95	634/ 641+55	137/ 143.38	139.34/ 142
	20	2,129	11.5	24	$2,208,000		623+15/ 630+95	634/ 641+55	139/ 145.38	141.34/ 144
	22	2,129	11.8	24	$2,208,000		623+15/ 630+95	634/ 641+55	141/ 147.38	143.34/ 146
12.1	14	469	5.0	3	$276,000	PL	9+40	13+10	112.36	115
	16	469	5.6	3	$276,000		9+40	13+10	114.36	117
	18	469	6.0	3	$276,000		9+40	13+10	116.36	119
	20	469	6.2	3	$276,000		9+40	13+10	118.36	121
	22[5]	469	6.4	3	$276,000		9+40	13+10	120.36	123
13.1	18	3,759	5.6	19	$1,748,000	EOS/ROW/PL	738+75	776+25	97.75	134.5
	20	3,759	7.0	39[6]	$3,588,000		738+75	776+25	99.75	136.5
	22	3,759	8.0	54[6]	$4,968,000		738+75	776+25	101.75	138.5
14.1	20	2,674	5.4	8	$736,000	EOS	776+25	801+75	142.5	160.6
	22	2,674	6.0	10	$920,000		776+25	801+75	144.5	162.6
14.3	10	430	6.6	3	$276,000	PL	805+50	809+45	126	128
	12	430	7.7	3	$276,000		805+50	809+45	128	130
	14	430	9.5	5	$460,000		805+50	809+45	130	132
	16	430	10.4	5	$460,000		805+50	809+45	132	134
	18[3]	430	11.0	5	$460,000		805+50	809+45	134	136
	20	430	11.5	5	$460,000		805+50	809+45	136	138
	22	430	12.2	5	$460,000		805+50	809+45	138	140
14.4[9]	18	863	7.1	3	$276,000	EOS	802+95	811+60	161.10	153.60
	20	863	7.4	4	$368,000		802+95	811+60	161.10	153.60
	22	863	7.6	4	$368,000		802+95	811+60	163.10	155.60
14.4a[9]	16	984	7.0	5	$460,000	EOS	801+70	811+60	158.60	151.60
	18	984	7.3	5	$460,000		801+70	811+60	158.60	151.60

Table 2.14.13: Summary of Feasible Noise Barriers for Alternative 2B (Preferred Alternative)

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
14.4a[9]	20	984	7.6	6	$552,000	EOS	801+70	811+60	160.60	153.60
	22	984	7.9	6	$552,000		801+70	811+60	162.60	155.60
14.2/14.4a[9]	16	1,579	7.5	8	$736,000	EOS	804+50/ 801+70	810+55/ 811+60	133.50/ 156.60	147.26/ 149.60
	18	1,579	7.9	8	$736,000		804+50/ 801+70	810+55/ 811+60	135.50/ 158.60	149.26/ 151.60
	20	1,579	8.3	8	$736,000		804+50/ 801+70	810+55/ 811+60	137.50/ 160.60	151.26/ 153.60
	22	1,579	8.6	8	$736,000		804+50/ 801+70	810+55/ 811+60	139.50/ 162.60	153.26/ 155.60

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated by 5 dBA or more by the modeled barrier.

[2] Calculated by multiplying the number of benefited receptors by $92,000 (reasonable allowance per benefited receptor/unit).

[3] Denotes the minimum wall height required to break the line-of-sight between the receptor and a truck exhaust stack.

[4] The number of benefited receptors was calculated using 100 ft frontage units because the frontage is approximately 1,200 ft.

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

[6] The number of benefited receptors/units was updated because additional benefited receptors/units were identified.

[7] A 22 ft high barrier constructed on the slope approximately four ft lower in elevation than the edge of shoulder is provided as an alternative construction method for an effective 18 ft high noise barrier.

[8] NB No. 11.2 (Slope) would be 22 ft high with an effective height of 18 ft because the barrier would be located approximately four ft lower than the edge of shoulder.

[9] The combination of NB Nos. 11.2 and 11.4, NB No. 14.4, NB No. 14.4a, and the combination of NB Nos. 14.2 and 14.4a were evaluated as an additional barrier configuration.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Table 2.14.14: Summary of Feasible Noise Barriers for Alternative 2B with Design Option 3

Noise Barrier No.	Height (ft)	Approximate Length (ft)	Noise Attenuation (dBA)	Number of Benefited Receptors/Units[1]	Total Reasonable Allowance[2]	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
							Begin	End	Begin	End
3.3	12	3,181	6.2	35	$3,220,000	ROW	569+20	601+00	172	146
	14	3,181	8.7	92	$8,464,000		569+20	601+00	174	148
	16[3]	3,181	8.7	114	$10,488,000		569+20	601+00	176	150
	18	3,181	8.7	112	$10,304,000		569+20	601+00	178	152
	20	3,181	8.7	118	$10,856,000		569+20	601+00	180	154
	22	3,181	8.8	112	$10,304,000		569+20	601+00	182	156

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated by 5 dBA or more by the modeled barrier.

[2] Calculated by multiplying the number of benefited receptors by $92,000 (the dollar amount per benefited receptor/unit).

[3] Denotes the minimum wall height required to break the line-of-sight between the receptor and a truck exhaust stack.

[4] Denotes that the maximum feasible barrier height modeled would not break the line-of-sight between the receptor and a truck exhaust stack.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Of the 25 modeled noise barriers evaluated for Alternative 2B (Preferred Alternative), 19 noise barriers were determined to be feasible. NB Nos. 2.1, 4.2, 7.2,[1] 12.2, 12.3, and 14.2 were determined to be not feasible because the noise barriers were not capable of reducing noise levels by 5 dBA or more. Of the two modeled noise barriers evaluated for Alternative 2B with Design Option 3, one noise barrier was determined to be feasible, and one noise barrier was determined to be not feasible (NB No. 2.1).

Noise Barrier Reasonableness

The reasonableness of a noise barrier is determined by comparing the estimated cost of constructing the noise barrier against the total reasonable allowance. The total reasonable allowance is determined based on the number of benefited residences/receptors multiplied by the reasonable allowance per residence/receptor. Additionally, in accordance with the Caltrans Traffic Noise Analysis Protocol, each noise barrier must provide at least 7 dBA of noise reduction at one or more benefited residence/receptor to be considered reasonable. Therefore, if the estimated noise barrier construction cost exceeds the total reasonable allowance or was not predicted to provide at least 7 dBA of noise reduction at one or more benefited residences/receptors, the noise barrier is determined to be not reasonable. However, if the estimated noise barrier construction cost is less than the total reasonable allowance and is predicted to provide at least 7 dBA of noise reduction at one or more benefited residences/receptors, the noise barrier is determined to be reasonable.

The estimated noise barrier construction cost for each barrier under each alternative was developed by the project engineer. A summary of abatement information in Tables 2.14.15 through 2.14.18 lists all the feasible noise barriers, along with their heights, approximate lengths, highest noise attenuation, number of benefited units/receptors, total reasonable allowance per barrier, and whether the noise barrier is reasonable with and without the right-of-way acquisition cost under Alternative 2A, Alternative 2A with Design Option 3, Alternative 2B (Preferred Alternative), and Alternative 2B with Design Option 3, respectively. There is the possibility that if right-of-way is donated then noise barriers could become reasonable. Property owners will be

[1] Roadway geometric updates to Alternative 2B would no longer demolish the existing wall at the location of NB No. 7.2. NB No. 7.2 was evaluated from 14 ft to 22 ft at two ft increments and was determined to be not feasible because the barrier was not able to achieve a noise level reduction of 5 dBA or more.

surveyed to determine whether they are willing to donate right-of-way to allow for construction of noise barriers.

Table 2.14.15: Summary of Reasonable Noise Barriers for Alternative 2A

Noise Barrier No.	Figure Sheet (Figure J-2 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
1.1	4-5	EOS	10	686	5.4	12[3]	$1,104,000	--[4]	No	--	--
			12	686	6.6	12[3]	$1,104,000	--	No	--	--
			14	686	7.6	12[3]	$1,104,000	$166,975	Yes	--	--
			16	686	8.2	12[3]	$1,104,000	$188,275	Yes	--	--
			18	686	8.6	12[3]	$1,104,000	$213,825	Yes	--	--
			20	686	9.0	12[3]	$1,104,000	$235,125	Yes	--	--
			22	686	9.2	12[3]	$1,104,000	$257,425	Yes	--	--
3.3	10-11	EOS/ ROW/PL	12	3,181	6.4	44	$4,048,000	--	No	--	No
			14	3,181	8.6	104	$9,568,000	$3,696,439	Yes	$1,816,939	Yes
			16	3,181	9.7	163	$14,996,000	$3,797,509	Yes	$1,918,009	Yes
			18	3,181	10.4	173	$15,916,000	$4,135,998	Yes	$2,256,498	Yes
			20	3,181	10.1	176	$16,192,000	$4,241,708	Yes	$2,362,208	Yes
			22	3,181	10.8	168	$15,456,000	$4,347,418	Yes	$2,467,918	Yes
4.1	11-13	EOS/ ROW	8	3,066	5.4	1	$92,000	--	No	--	No
			10	3,066	6.6	7	$644,000	--	No	--	No
			12	3,066	8.4	22	$2,024,000	$1,216,548	Yes	--	--
			14	3,066	9.6	45	$4,140,000	$1,321,721	Yes	--	--
			16	3,066	11.1	74	$6,808,000	$1,426,894	Yes	--	--
			18	3,066	12.2	102	$9,384,000	$1,578,806	Yes	--	--
			20	3,066	13.1	142[5]	$13,064,000	$1,691,379	Yes	--	--
			22	3,066	13.9	151[5]	$13,892,000	$1,803,952	Yes	--	--
4.2	13	EOS	22	1,689	5.0	2	$184,000	--	No	--	No
4.3	13	PL	12	229	5.8	3	$276,000	--	No	--	No
			14	229	7.1	3	$276,000	$469,243	No	$94,243	Yes
			16	229	8.5	3	$276,000	$476,913	No	$101,913	Yes
			18	229	9.4	3	$276,000	$489,279	No	$114,279	Yes
			20	229	10.0	3	$276,000	$497,749	No	$122,749	Yes
			22	229	10.4	3	$276,000	$506,219	No	$131,219	Yes
6.1	17	PL	12	974	5.0	1	$92,000	--	No	--	No
			14	974	6.5	2	$184,000	--	No	--	No
			16	974	7.8	5	$460,000	$2,196,191	No	$421,691	Yes
			18	974	8.7	6	$552,000	$2,249,955	No	$475,455	Yes
			20	974	9.5	7	$644,000	$2,285,815	No	$511,315	Yes
			22	974	10.2	8	$736,000	$2,321,675	No	$547,175	Yes

Table 2.14.15: Summary of Reasonable Noise Barriers for Alternative 2A

Noise Barrier No.	Figure Sheet (Figure J-2 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
6.2	18	EOS/ ROW	8	1,959	6.0	9	$828,000	--	No	--	--
			10	1,959	7.5	23	$2,116,000	$524,798	Yes	--	--
			12	1,959	9.7	53	$4,876,000	$589,168	Yes	--	--
			14	1,959	9.8	89	$8,188,000	$658,138	Yes	--	--
			16	1,959	10.6	108	$9,936,000	$726,108	Yes	--	--
			18	1,959	11.4	123	$11,316,000	$850,638	Yes	--	--
			20	1,959	12.0	129	$11,868,000	$919,608	Yes	--	--
			22	1,959	12.6	129	$11,868,000	$988,578	Yes	--	--
7.1	19	EOS/ ROW	10	2,674	5.4	1	$92,000	--	No	--	--
			12	2,674	6.0	4	$368,000	--	No	--	--
			14	2,674	6.5	4	$368,000	--	No	--	--
			16	2,674	6.9	4	$368,000	--	No	--	--
			18	2,674	7.2	4	$368,000	$608,000	No	--	--
			20	2,674	7.5	4	$368,000	$689,000	No	--	--
			22	2,674	7.7	4	$368,000	$771,000	No	--	--
7.2	19-20	EOS	6	687	6.2	2	$184,000	--	No	--	--
			8	687	8.9	2	$184,000	$158,585	Yes	--	--
			10	687	11.9	2	$184,000	$182,475	Yes	--	--
			12	687	13.7	5	$460,000	$204,725	Yes	--	--
			14	687	15.0	7[5]	$644,000	$228,615	Yes	--	--
			16	687	15.7	8[5]	$736,000	$253,669	Yes	--	--
			18	687	16.7	9[5]	$828,000	$297,059	Yes	--	--
			20	687	17.6	11[5]	$1,012,000	$320,949	Yes	--	--
			22	687	18.2	11[5]	$1,012,000	$344,839	Yes	--	--
10.1	29-31	EOS	6	3,712	9.0	56	$5,152,000	$1,105,000	Yes	--	--
			8	3,712	11.0	111	$10,212,000	$1,247,120	Yes	--	--
			10	3,712	13.1	143	$13,156,000	$1,390,240	Yes	--	--
			12	3,712	14.2	165	$15,180,000	$1,517,480	Yes	--	--
			14	3,712	15.3	180	$16,560,000	$1,659,600	Yes	--	--
			16	3,712	16.2	184	$16,928,000	$1,802,720	Yes	--	--
			18	3,712	17.2	205	$18,860,000	$2,126,128	Yes	--	--
			20	3,712	17.8	203	$18,676,000	$2,268,248	Yes	--	--
			22	3,712	18.4	203	$18,676,000	$2,411,368	Yes	--	--

Table 2.14.15: Summary of Reasonable Noise Barriers for Alternative 2A

Noise Barrier No.	Figure Sheet (Figure J-2 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
11.1	31	EOS	10	1,095	5.3	1	$92,000	--	No	--	No
			12	1,095	6.3	2	$184,000	--	No	--	No
			14	1,095	6.7	3	$276,000	--	No	--	No
			16	1,095	7.1	3	$276,000	$445,125	No	--	--
			18	1,095	7.3	4	$368,000	$523,795	No	--	--
			20	1,095	7.5	4	$368,000	$564,045	No	--	--
			22	1,095	7.7	4	$368,000	$603,295	No	--	--
11.2	32	EOS	10	1,050	5.6	3	$276,000	--	No	--	No
			12	1,050	6.3	4	$368,000	--	No	--	No
			14	1,050	6.9	4	$368,000	--	No	--	No
			16	1,050	7.4	4	$368,000	$403,548	No	--	--
			18	1,050	7.9	8	$736,000	$470,776	Yes	--	--
			20	1,050	8.3	9	$828,000	$507,206	Yes	--	--
			22	1,050	8.6	10	$920,000	$543,636	Yes	--	--
11.2 (Slope)[6]	32	Slope	18[7]	1,048	8.6	10	$920,000	$598,858	Yes	--	--
11.3	32	ROW/PL	14	503	5.9	1	$92,000	--	No	--	No
			16	503	6.7	1	$92,000	--	No	--	No
			18	503	7.4	1	$92,000	$536,795	No	$247,295	No
			20	503	7.8	3	$276,000	$556,245	No	$266,745	Yes
			22	503	8.2	3	$276,000	$574,695	No	$285,195	No
11.2/ 11.4[8]	32 - 33	EOS	6	2,129	5.4	2	$184,000	--	No	--	--
			8	2,129	7.1	7	$644,000	$643,873	No	--	--
			10	2,129	8.8	14	$1,288,000	$722,532	Yes	--	--
			12	2,129	9.9	22	$2,024,000	$794,747	Yes	--	--
			14	2,129	10.5	24	$2,208,000	$874,121	Yes	--	--
			16	2,129	11.1	24	$2,208,000	$952,496	Yes	--	--
			18	2,129	11.5	24	$2,208,000	$1,085,994	Yes	--	--
			20	2,129	11.9	24	$2,208,000	$1,196,408	Yes	--	--
			22	2,129	12.2	24	$2,208,000	$1,275,782	Yes	--	--
12.1	33	PL	14	469	5.0	3	$276,000	--	No	--	No
			16	469	5.7	3	$276,000	--	No	--	No
			18	469	6.0	3	$276,000	--	No	--	No
			20	469	6.2	3	$276,000	--	No	--	No
			22	469	6.5	3	$276,000	--	No	--	No

Table 2.14.15: Summary of Reasonable Noise Barriers for Alternative 2A

Noise Barrier No.	Figure Sheet (Figure J-2 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
13.1	37-38	EOS/ ROW/PL	6	3,755	5.7	13	$1,196,000	--	No	--	No
			8	3,755	6.7	46	$4,232,000	--	No	--	No
			10	3,755	8.4	108	$9,936,000	$1,092,959	Yes	$951,959	Yes
			12	3,755	10.2	135	$12,420,000	$1,221,809	Yes	$1,080,809	Yes
			14	3,755	11.1	143	$13,156,000	$1,347,459	Yes	$1,206,459	Yes
			16	3,755	11.9	157	$14,444,000	$1,473,109	Yes	$1,332,109	Yes
			18	3,755	12.6	183	$16,836,000	$1,680,697	Yes	$1,539,697	Yes
			20	3,755	13.4	193	$17,756,000	$1,810,627	Yes	$1,669,627	Yes
			22	3,755	14.5	202	$18,584,000	$1,939,557	Yes	$1,798,557	Yes
14.1	38-40	EOS	6	2,672	6.1	18	$1,656,000	--	No	--	--
			8	2,672	7.5	27	$2,484,000	$216,681	Yes	--	--
			10	2,672	9.1	30	$2,760,000	$298,161	Yes	--	--
			12	2,672	10.4	34	$3,128,000	$379,481	Yes	--	--
			14	2,672	11.4	34	$3,128,000	$460,961	Yes	--	--
			16	2,672	12.1	35	$3,220,000	$541,441	Yes	--	--
			18	2,672	12.7	35	$3,220,000	$624,587	Yes	--	--
			20	2,672	13.3	35	$3,220,000	$706,067	Yes	--	--
			22	2,672	13.8	36	$3,312,000	$787,547	Yes	--	--
14.3	40	PL	8	430	5.4	2	$184,000	--	No	--	No
			10	430	7.0	3	$276,000	$802,689	No	$196,689	Yes
			12	430	8.4	3	$276,000	$819,909	No	$213,909	Yes
			14	430	9.3	5	$460,000	$834,249	No	$228,249	Yes
			16	430	10.0	5	$460,000	$848,589	No	$242,589	Yes
			18	430	10.7	5	$460,000	$872,829	No	$266,829	Yes
			20	430	11.2	5	$460,000	$888,609	No	$282,609	Yes
			22	430	12.0	5	$460,000	$904,389	No	$298,389	Yes
14.4[8]	40	EOS	20	861	7.1	2	$184,000	$457,766	No	--	--
			22	861	7.3	2	$184,000	$487,633	No	--	--
14.4a[8]	40	EOS	18	959	7.3	3	$276,000	$480,897	No	--	--
			20	959	7.6	4	$368,000	$514,504	No	--	--
			22	959	7.8	4	$368,000	$548,112	No	--	--

Table 2.14.15: Summary of Reasonable Noise Barriers for Alternative 2A

Noise Barrier No.	Figure Sheet (Figure J-2 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
14.2/ 14.4a[8]	40	EOS	14	1,579	7.0	3	$276,000	$1,184,421	No	--	--
			16	1,579	7.6	4	$368,000	$1,238,364	No	--	--
			18	1,579	8.0	8	$736,000	$1,381,429	No	--	--
			20	1,579	8.4	8	$736,000	$1,435,891	No	--	--
			22	1,579	8.7	8	$736,000	$1,488,855	No	--	--

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated by 5 dBA or more by the modeled barrier.

[2] The estimated noise barrier construction cost information was provided by AECOM (January 2018).

[3] The number of benefited receptors was calculated using 100 ft frontage units because the frontage is approximately 1,200 ft.

[4] Shaded areas 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] The number of benefited receptors/units was updated because additional benefited receptors/units were identified.

[6] A 22 ft high barrier constructed on the slope approximately four ft lower in elevation than the edge of shoulder is provided as an alternative construction method for an effective 18 ft high noise barrier.

[7] NB No. 11.2 (Slope) would be 22 ft high with an effective height of 18 ft because the barrier would be located approximately four ft lower than the edge of shoulder.

[8] The combination of NB Nos. 11.2 and 11.4, NB No. 14.4, NB No. 14.4a, and the combination of NB Nos. 14.2 and 14.4a were evaluated as an additional barrier configuration.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Table 2.14.16: Summary of Abatement Key Information for Alternative 2A with Design Option 3

Noise Barrier No.	Figure Sheet (Figure J-3 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Noise Attenuation Level (dBA)	Number of Benefited Receptors[1]/ Units	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
3.3	4-5	EOS/ ROW/PL	12	3,181	6.3	30	$2,760,000	--[3]	No	--	No
			14	3,181	8.6	85	$7,820,000	$3,696,439	Yes	$1,816,939	Yes
			16	3,181	9.7	135	$12,420,000	$3,797,509	Yes	$1,918,009	Yes
			18	3,181	10.3	144	$13,248,000	$4,135,998	Yes	$2,256,498	Yes
			20	3,181	10.0	144	$13,248,000	$4,241,708	Yes	$2,362,208	Yes
			22	3,181	10.8	140	$12,880,000	$4,347,418	Yes	$2,467,918	Yes
7.1	8-9	EOS/ROW	10	2,586	5.0	1	$92,000	--	No	--	--
			12	2,586	5.5	2	$184,000	--	No	--	--
			14	2,586	6.0	2	$184,000	--	No	--	--
			16	2,586	6.3	2	$184,000	--	No	--	--
			18	2,586	6.6	3	$276,000	--	No	--	--
			20	2,586	6.9	3	$276,000	--	No	--	--
			22	2,586	7.1	3	$276,000	$771,000	No	--	--
10.1	6-7	EOS	6	3,712	9.0	51	$4,692,000	$1,105,000	Yes	--	--
			8	3,712	11.0	111	$10,212,000	$1,247,120	Yes	--	--
			10	3,712	13.1	138	$12,696,000	$1,390,240	Yes	--	--
			12	3,712	14.2	161	$14,812,000	$1,517,480	Yes	--	--
			14	3,712	15.3	181	$16,652,000	$1,659,600	Yes	--	--
			16	3,712	16.2	185	$17,020,000	$1,802,720	Yes	--	--
			18	3,712	16.2	190	$17,480,000	$2,126,128	Yes	--	--
			20	3,712	17.8	204	$18,768,000	$2,268,248	Yes	--	--
			22	3,712	18.4	204	$18,768,000	$2,411,368	Yes	--	--

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated 5 dBA or more by the modeled barrier.

[2] The estimated noise barrier construction cost information was provided by AECOM (January 2018).

[3] 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.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Table 2.14.17: Summary of Abatement Key Information For Alternative 2B (Preferred Alternative)

Noise Barrier No.	Figure Sheet (Figure J-4 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
1.1	4-5	EOS	10	686	5.4	12[3]	$1,104,000	--[4]	No	--	--
			12	686	6.7	12[3]	$1,104,000	--	No	--	--
			14	686	7.6	12[3]	$1,104,000	$166,235	Yes	--	--
			16	686	8.2	12[3]	$1,104,000	$187,624	Yes	--	--
			18	686	8.7	12[3]	$1,104,000	$212,838	Yes	--	--
			20	686	9.0	12[3]	$1,104,000	$234,227	Yes	--	--
			22	686	9.3	12[3]	$1,104,000	$256,615	Yes	--	--
3.1	10	EOS	8	298	5.2	1	$92,000	--	No	--	--
			10	298	6.2	1	$92,000	--	No	--	--
			12	298	6.9	1	$92,000	--	No	--	--
			14	298	7.6	1	$92,000	$191,116	No	--	--
			16	298	8.4	1	$92,000	$205,546	No	--	--
			18	298	8.8	1	$92,000	$236,491	No	--	--
			20	298	9.2	1	$92,000	$250,921	No	--	--
			22	298	9.5	1	$92,000	$269,771	No	--	--
3.2	10	PL	10	105	6.1	1	$92,000	--	No	--	No
			12	105	7.1	1	$92,000	$328,372	No	$40,372	Yes
			14	105	7.7	1	$92,000	$332,512	No	$44,512	Yes
			16	105	8.4	1	$92,000	$336,652	No	$48,652	Yes
			18	105	8.8	1	$92,000	$342,833	No	$54,833	Yes
			20	105	9.2	1	$92,000	$346,973	No	$58,973	Yes
			22	105	9.7	1	$92,000	$352,103	No	$64,103	Yes
3.3	10-11	EOS/ ROW/PL	12	3,181	6.3	35	$3,220,000	--	No	--	No
			14	3,181	8.7	92	$8,464,000	$5,282,047	Yes	$1,773,547	Yes
			16	3,181	9.8	163	$14,996,000	$5,378,927	Yes	$1,870,427	Yes
			18	3,181	10.4	170	$15,640,000	$5,721,546	Yes	$2,213,046	Yes
			20	3,181	10.2	170	$15,640,000	$5,818,426	Yes	$2,309,926	Yes
			22	3,181	11.0	164	$15,088,000	$5,915,306	Yes	$2,406,806	Yes
4.1	12-13	EOS/ ROW	12	2,518	5.8	4	$368,000	--	No	--	No
			14	2,518	7.7	16	$1,472,000	$1,434,379	Yes	--	--
			16	2,518	9.8	32	$2,944,000	$1,518,534	Yes	--	--
			18	2,518	11.0	56	$5,152,000	$1,679,995	Yes	--	--
			20	2,518	12.2	101[5]	$9,292,000	$1,773,935	Yes	--	--
			22	2,518	13.1	119[5]	$10,948,000	$1,867,775	Yes	--	--

Table 2.14.17: Summary of Abatement Key Information For Alternative 2B (Preferred Alternative)

Noise Barrier No.	Figure Sheet (Figure J-4 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
4.3	13	PL	12	229	5.7	2	$184,000	--	No	--	No
			14	229	7.1	3	$276,000	$473,519	No	$98,519	Yes
			16	229	8.4	3	$276,000	$481,289	No	$106,289	Yes
			18	229	9.4	3	$276,000	$494,412	No	$119,412	Yes
			20	229	9.9	3	$276,000	$503,082	No	$128,082	Yes
			22	229	10.3	3	$276,000	$511,752	No	$136,752	Yes
6.1	17	PL	12	974	6.5	2	$184,000	--	No	--	No
			14	974	6.5	2	$184,000	--	No	--	No
			16	974	7.9	5	$460,000	$2,214,584	No	$440,084	Yes
			18	974	8.8	6	$552,000	$2,271,585	No	$497,085	Yes
			20	974	9.6	7	$644,000	$2,308,275	No	$533,775	Yes
			22	974	10.4	8	$736,000	$2,345,965	No	$571,465	Yes
6.2	18	EOS/ ROW	10	1,965	5.1	2	$184,000	--	No	--	--
			12	1,965	6.9	6	$552,000	--	No	--	--
			14	1,965	7.9	18	$1,656,000	$1,306,584	Yes	--	--
			16	1,965	8.9	32	$2,944,000	$1,378,288	Yes	--	--
			18	1,965	9.8	48	$4,416,000	$1,614,827	Yes	--	--
			20	1,965	10.3	70	$6,440,000	$1,687,116	Yes	--	--
			22	1,965	15.6	89	$8,188,000	$1,760,406	Yes	--	--
7.1	19-20	EOS/ ROW	12	2,672	5.2	1	$92,000	--	No	--	--
			14	2,672	5.6	1	$92,000	--	No	--	--
			16	2,672	5.9	1	$92,000	--	No	--	--
			18	2,672	6.2	1	$92,000	--	No	--	--
			20	2,672	6.4	1	$92,000	--	No	--	--
			22	2,672	6.5	1	$92,000	--	No	--	--
11.2	32	EOS	10	1,050	5.6	3	$276,000	--	No	--	--
			12	1,050	6.3	4	$368,000	--	No	--	--
			14	1,050	6.9	4	$368,000	--	No	--	--
			16	1,050	7.4	4	$368,000	$399,013	No	--	--
			18	1,050	7.9	8	$736,000	$463,937	Yes	--	--
			20	1,050	8.3	9	$828,000	$500,987	Yes	--	--
			22	1,050	8.6	10	$920,000	$538,037	Yes	--	--
11.2 (Slope)[6]	32	Slope	18[7]	1,048	8.6	10	$920,000	$621,053	Yes	--	--

Table 2.14.17: Summary of Abatement Key Information For Alternative 2B (Preferred Alternative)

Noise Barrier No.	Figure Sheet (Figure J-4 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
11.3	32	ROW/PL	14	503	5.1	1	$92,000	--	No	--	No
			16	503	5.8	1	$92,000	--	No	--	No
			18	503	6.5	1	$92,000	--	No	--	No
			20	503	6.9	1	$92,000	--	No	--	No
			22	503	7.4	3	$276,000	$586,604	No	$297,104	No
11.2/ 11.4[8]	32 - 33	EOS	6	2,129	5.4	1	$92,000	--	No	--	--
			8	2,129	6.9	7	$644,000	--	No	--	--
			10	2,129	8.5	14	$1,288,000	$705,711	Yes	--	--
			12	2,129	9.5	16	$1,472,000	$778,821	Yes	--	--
			14	2,129	10.2	24	$2,208,000	$859,985	Yes	--	--
			16	2,129	10.7	24	$2,208,000	$940,150	Yes	--	--
			18	2,129	11.2	24	$2,208,000	$1,070,286	Yes	--	--
			20	2,129	11.5	24	$2,208,000	$1,150,451	Yes	--	--
			22	2,129	11.8	24	$2,208,000	$1,231,615	Yes	--	--
12.1	33	PL	14	469	5.0	3	$276,000	--	No	--	No
			16	469	5.6	3	$276,000	--	No	--	No
			18	469	6.0	3	$276,000	--	No	--	No
			20	469	6.2	3	$276,000	--	No	--	No
			22	469	6.4	3	$276,000	--	No	--	No
13.1	37-38	EOS/ ROW/PL	18	3,759	5.6	19	$1,748,000	--	No	--	No
			20	3,759	7.0	39[5]	$3,588,000	$4,860,234	No	$4,719,234	No
			22	3,759	8.0	54[5]	$4,968,000	$4,996,194	No	$4,855,194	Yes
14.1	38-40	EOS	20	2,674	5.4	8	$736,000	--	No	--	--
			22	2,674	6.0	10	$920,000	--	No	--	--
14.3	40	PL	10	430	6.6	3	$276,000	--	No	--	No
			12	430	7.7	3	$276,000	$827,599	No	$221,599	Yes
			14	430	9.5	5	$460,000	$842,119	No	$236,119	Yes
			16	430	10.4	5	$460,000	$856,639	No	$250,639	Yes
			18	430	11.0	5	$460,000	$882,303	No	$276,303	Yes
			20	430	11.5	5	$460,000	$898,443	No	$292,443	Yes
			22	430	12.2	5	$460,000	$914,583	No	$308,583	Yes
14.4[8]	40	EOS	18	863	7.1	3	$276,000	$707,217	No	--	--
			20	863	7.4	4	$368,000	$740,378	No	--	--
			22	863	7.6	4	$368,000	$773,538	No	--	--

Table 2.14.17: Summary of Abatement Key Information For Alternative 2B (Preferred Alternative)

Noise Barrier No.	Figure Sheet (Figure J-4 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
14.4a[8]	40	EOS	16	984	7.0	5	$460,000	$708,706	No	--	--
			18	984	7.3	5	$460,000	$792,895	No	--	--
			20	984	7.6	6	$552,000	$829,656	No	--	--
			22	984	7.9	6	$552,000	$866,416	No	--	--
14.2/ 14.4a[8]	40	EOS	16	1,579	7.5	8	$736,000	$1,297,225	No	--	--
14.2/ 14.4a[8]	40	EOS	18	1,579	7.9	8	$736,000	$1,470,330	No	--	--
			20	1,579	8.3	8	$736,000	$1,527,076	No	--	--
			22	1,579	8.6	8	$736,000	$1,583,822	No	--	--

Source: LSA Associates, Inc. (February 2018).

[1] Number of receptors/units that are attenuated by 5 dBA or more by the modeled barrier.

[2] The estimated noise barrier construction cost information was provided by AECOM (January 2018).

[3] The number of benefited receptors was calculated using 100 ft frontage units because the frontage is approximately 1,200 ft.

[4] Shaded areas 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] The number of benefited receptors/units was updated because additional benefited receptors/units were identified.

[6] A 22 ft high barrier constructed on the slope approximately four ft lower in elevation than the edge of shoulder is provided as an alternative construction method for an effective 18 ft high noise barrier.

[7] NB No. 11.2 (Slope) would be 22 ft high with an effective height of 18 ft because the barrier would be located approximately four ft lower than the edge of shoulder.

[8] The combination of NB Nos. 11.2 and 11.4, NB No. 14.4, NB No. 14.4a, and the combination of NB Nos. 14.2 and 14.4a were evaluated as an additional barrier configuration.

dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

Table 2.14.17: Summary of Abatement Key Information For Alternative 2B (Preferred Alternative)

Noise Barrier No.	Figure Sheet (Figure J-4 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?

Table 2.14.18: Summary of Abatement Key Information for Alternative 2B with Design Option 3

Noise Barrier No.	Figure Sheet (Figure J-5 in Appendix J of this document)	Noise Barrier Location	Height (ft)	Approximate Length (ft)	Noise Attenuation Range (dBA)	Number of Benefited Receptors/ Units[1]	Total Reasonable Allowance	Without ROW Donated		With ROW Donated	
								Estimated Construction Cost[2]	Reasonable?	Estimated Construction Cost[2]	Reasonable?
3.3	Sheet 4-5	EOS/ ROW/PL	12	3,181	6.2	35	$3,220,000	--[3]	No	--	No
			14	3,181	8.7	92	$8,464,000	$5,282,047	Yes	$1,773,547	Yes
			16	3,181	8.7	114	$10,488,000	$5,378,927	Yes	$1,870,427	Yes
			18	3,181	8.7	112	$10,304,000	$5,721,546	Yes	$2,213,046	Yes
			20	3,181	8.7	118	$10,856,000	$5,818,426	Yes	$2,309,926	Yes
			22	3,181	8.8	112	$10,304,000	$5,915,306	Yes	$2,406,806	Yes

Source: LSA Associates, Inc. (February 2018).
[1] Number of receptors/units that are attenuated 5 dBA or more by the modeled barrier.
[2] The estimated noise barrier construction cost information was provided by AECOM (January 2018).
[3] 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.
dBA = A-weighted decibels
EOS = edge of shoulder
ft = foot/feet
PL = property line
ROW = right-of-way

As shown in Tables 2.14.15 through 2.14.18, NB Nos. 1.1, 3.3, 4.1, 4.3, 6.1, 6.2, 7.2, 10.1, 11.2, 11.2 (Slope), 11.3, 11.2/11.4, 13.1, 14.1, and 14.3 under Alternative 2A, NB Nos. 3.3 and 10.1 under Alternative 2A with Design Option 3, NB Nos. 1.1, 3.2, 3.3, 4.1, 4.3, 6.1, 6.2, 11.2, 11.2 (Slope), 11.2/11.4, 13.1, and 14.3 under Alternative 2B (Preferred Alternative), and NB No. 3.3 under Alternative 2B with Design Option 3 were determined to be reasonable.

Noise barrier surveys were sent to the benefited receptors for the feasible and reasonable noise barriers identified in Noise Abatement Decision Report (NADR). Based on the *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (May 2011) for abatement located within State right-of-way, if more than 50 percent of the votes from responding benefited receptors oppose the abatement, the abatement will not be considered reasonable. Votes from property owners and non-owner occupants of benefited receptors were surveyed. For owner-occupied dwelling units, the property owner gets one vote. For non-owner-occupied dwelling units, the renter gets 10 percent of one vote and the owner get 90 percent of one vote. For noise abatement to occur on private property, 100 percent of owners of property upon which the abatement is to be placed must support the proposed abatement. In the case of proposed noise abatement on private property, a no response from a property owner, after a reasonable number of attempts, is considered a "no" vote.

On May 14, 2018, noise barrier survey letters were delivered via United States Postal Service (USPS) Certified Mail to a total of 1,308 property owners and non-owner occupants of the benefited receptors to obtain their viewpoints on the feasible and reasonable noise barriers. Specifically, for noise barriers located within the State right-of-way, survey letters were delivered to both property owners and non-owner occupants. For noise barriers located on private property, survey letters were delivered to property owners only. Residents were asked to respond by June 15, 2018, and informed that surveys not received by the due date would be counted as a "no" vote. A follow-up letter, dated July 11, 2018, and the original survey letter package were delivered to property owners who had not responded to the initial survey letter via USPS Priority Mail. The follow-up survey responses were due August 1, 2018. After August 1, 2018, an assessment was conducted specifically for property owners located behind private property noise barriers. Site visits were used to contact the property owners to obtain their viewpoint on the proposed noise barrier.

Following the due dates from the surveys, the responses were tallied for each of the noise barriers. Based on the responses received, the 16 ft high barrier received the highest vote

for Noise Barrier Nos. 1.1, 3.3, 4.1[1], 6.1, 6.2, 7.2, 10.1, 11.2/11.4, 13.1, and 14.1. In addition, Noise Barrier Nos. 3.2, 4.3, and 14.3 would no longer be considered for construction because the property owner(s) of the properties on which the noise barrier would be constructed did not achieve 100 percent support. Based on these responses and the selection of the Build Alternative with Design Variation B as the Preferred Alternative, Noise Barriers Nos. 1.1, 3.3, 4.1, 6.1, 6.2, and 11.2/11.4 will be carried forward into final design.

Project Feature PF-N-2 requires noise abatement in the form of noise barriers and will address operational noise impacts on sensitive land uses adjacent to the project site.

PF-N-2 Noise Barrier (NB) Nos. 1.1, 3.3, 4.1, 6.1, 6.2, and 11.2/11.4 were determined to be feasible and reasonable. These noise barriers will be considered for construction. The final decision on construction of the noise barriers will be made during final design.

Based on the studies completed to date and input from the public, Caltrans intends to incorporate noise abatement in the form of barriers. The feasible and reasonable noise barriers for Alternative 2A, Alternative 2A with Design Option 3, Alternative 2B (Preferred Alternative) and Alternative 2B with Design Option 3 are shown in Tables 2.14.15 through 2.14.18, respectively. If conditions have substantially changed during final design, noise abatement may not be necessary. The final decision on noise abatement will be made upon completion of project design.

Nonacoustical Factors Relating to Feasibility

Nonacoustical factors relating to feasibility were considered for the reasonable noise barriers. These factors include: geometric standards, safety, maintenance, security, drainage, geotechnical considerations, and utility relocations. The nonacoustical factors relating to feasibility are addressed below for the feasible and reasonable noise barriers.

Alternative 2A

The nonacoustical factors relating to the feasibility of NB Nos. 1.1, 3.3, 4.1, 4.3, 6.1, 6.2, 7.2, 10.1, 11.2, 11.2 (Slope), 11.3, 11.2/11.4, 13.1, 14.1, and 14.3 under Alternative 2A are addressed below.

[1] Although Alternative 2B received 11 votes not in favor of the noise barrier, the 9 votes in favor of the noise barrier represent a total of 193 residential units. Therefore, the votes in favor of the barrier outweigh the votes not in favor of the barrier.

- **Geometric Standards:** None of the noise barriers would affect the geometric standards of adjacent roadways. More specifically, NB No. 3.3 would include re-grading to achieve geometric standards. A standard safety shape barrier would be utilized with NB Nos. 6.2, 11.2, and 11.2/11.4, and the right shoulder would be widened to meet geometric standards of the adjacent roadway. A standard safety shape barrier would be utilized with NB Nos. 7.2, 10.1, and 13.1 to meet geometric standards of the adjacent roadway. The location of NB No. 14.1 would perpetuate an existing nonstandard horizontal stopping sight distance and decision sight distance; however, it would not introduce new geometric deficiencies.
- **Safety:** None of the noise barriers would affect sight distance for vehicular or pedestrian traffic. Even though NB No. 14.1 would result in a line-of-sight less than the design speed of the facility, the barrier would not introduce new geometric deficiencies.
- **Maintenance:** A temporary construction easement, permanent maintenance easement, and permanent easement for the aboveground and belowground limits of NB Nos. 3.3, 4.1, 4.3, 6.1, 11.3, and 14.3 would need to be granted to Caltrans. NB No. 6.2 would require easements and right-of-way beyond what is needed for the project due to the right shoulder widening on the I-5 northbound off-ramp to Red Hill Avenue. NB Nos. 1.1, 7.2, 10.1, and 14.1 would not require any easements or right-of-way beyond what is needed for the project. NB Nos. 11.2, 11.2 (Slope), and 11.2/11.4 would be contained within State right-of-way. NB No. 13.1 would require a temporary construction easement beyond what is needed for the project.
- **Security:** NB Nos. 11.2 and 11.2 (Slope) would create a new barrier between the ramp and existing wall at the State right-of-way, however, the distance between the two is approximately 100 ft, which would provide a relatively open and visible area. All other noise barriers would be in the same alignment as an existing property wall, fence, or retaining wall and would not change the security conditions of the site.
- **Drainage:** A new drainage channel would be needed between NB No. 11.2 (Slope) and the ramp edge of shoulder. None of the other noise barriers would affect the existing and proposed drainage system, even though existing drainage facilities may need to be reconstructed to accommodate the proposed retaining wall for NB No. 1.1, and additional drainage facilities would be needed to accommodate the existing drainage patterns for a portion of NB No. 4.1.
- **Geotechnical Considerations:** All of the noise barriers would be constructed at a similar grade to the existing condition. NB No. 1.1 would be constructed on a retaining wall. NB Nos. 6.2, 7.2, and 10.1 would be constructed on engineered fill. NB Nos. 3.3, 6.1, 11.2, 11.2 (Slope), 11.2/11.4, and 14.1 would be mostly constructed

on existing engineered fill, while the footings may encroach into native soil. NB No. 4.1 would be mostly constructed in native soil and partially in engineered fill. NB Nos. 4.3 and 13.1 would be constructed partially in native soil, and partially in engineered fill. NB Nos. 11.3 and 14.3 would be constructed mostly in native soil that has been previously disturbed with the construction of the existing wall.

- **Utility Relocations:** No utility impacts are anticipated as a result of any noise barriers.

Alternative 2A with Design Option 3

The nonacoustical factors relating to the feasibility of NB Nos. 3.3 and 10.1 under Alternative 2A with Design Option 3 are addressed below.

- **Geometric Standards:** None of the noise barriers would affect the geometric standards of adjacent roadways. More specifically, NB No. 3.3 would include regrading to achieve geometric standards. A standard safety shape barrier would be utilized with NB No. 10.1 to meet geometric standards of the adjacent roadway.
- **Safety:** None of the noise barriers would affect sight distance for vehicular or pedestrian traffic.
- **Maintenance:** A temporary construction easement, permanent maintenance easement, and permanent easement for the aboveground and belowground limits of NB No. 3.3 would need to be granted to Caltrans. NB No. 10.1 would not require any easements or right-of-way beyond what is needed for the project.
- **Security:** NB Nos. 3.1 and 10.1 would be in the same alignment as an existing property wall and would not change the security conditions of the site.
- **Drainage:** None of the noise barriers would affect the existing and proposed drainage systems.
- **Geotechnical Considerations:** NB Nos. 3.1 and 10.1 would be constructed at a similar grade to the existing condition. NB No. 3.3 would be mostly constructed on existing engineered fill, while the footings may encroach into native soil. NB No. 10.1 would be constructed on engineered fill.
- **Utility Relocations:** No utility impacts are anticipated as a result of any noise barriers.

Alternative 2B (Preferred Alternative)

The nonacoustical factors relating to the feasibility of NB Nos. 1.1, 3.2, 3.3, 4.1, 4.3, 6.1, 6.2, 11.2, 11.2 (slope), 11.2/11.4, 13.1, and 14.3 under Alternative 2B are addressed below.

- **Geometric Standards:** None of the noise barriers would affect the geometric standards of adjacent roadways. More specifically, NB No. 3.3 would include re-grading to achieve geometric standards. A standard safety shape barrier would be utilized with NB Nos. 6.2, 11.2, and 11.2/11.4 and the right shoulder would be widened to meet geometric standards of the adjacent roadway. A standard safety shape barrier would be utilized with NB No. 13.1 to meet geometric standards of the adjacent roadway.
- **Safety:** None of the noise barriers would affect sight distance for vehicular or pedestrian traffic.
- **Maintenance:** A temporary construction easement, permanent maintenance easement, and permanent easement for the aboveground and belowground limits of NB Nos. 3.2, 3.3, 4.1, 4.3, 6.1, and 14.3 would need to be granted to Caltrans. NB No. 6.2 would require easements and right-of-way beyond what is needed for the project due to the right shoulder widening on the I-5 northbound off-ramp to Red Hill Avenue. NB Nos. 11.2, 11.2 (Slope), and 11.2/11.4 would be contained within State right-of-way. NB No. 1.1 would not require any easements or right-of-way beyond what is needed for the project. NB No. 13.1 would require a temporary construction easement beyond what is needed for the project.
- **Security:** NB No. 3.2 would create a new obstruction where there was none before. NB Nos. 11.2 and 11.2 (Slope) would create a new barrier between the ramp and an existing wall at the State right-of-way. However, the distance between the two noise barriers is approximately 100 ft, which would provide a relatively open and visible area. NB Nos. 1.1, 3.3, 4.1, 6.2, and 13.1 would be in the same alignment as an existing property wall, fence, or retaining wall, and would not change the security conditions of the site.
- **Drainage:** NB No. 3.2 would require additional drainage facilities to accommodate the existing drainage patterns. A new drainage channel would be needed between NB No. 11.2 (Slope) and the ramp edge of shoulder. None of the other noise barriers would affect the existing and proposed drainage system, even though existing drainage facilities may need to be reconstructed to accommodate the proposed retaining wall for NB No. 1.1, and additional drainage facilities would be needed to accommodate the existing drainage patterns for a portion of NB No. 4.1.
- **Geotechnical Considerations:** All of the noise barriers would be constructed at a similar grade to the existing condition. NB No. 1.1 would be constructed on a retaining wall. NB Nos. 3.2, 3.3, 11.2, 11.2 (Slope), and 11.2/11.4 would be mostly constructed on existing engineered fill, while the footings may encroach into native soil. NB Nos. 4.1 and 6.1 would be mostly constructed in native soil, and partially in

engineered fill. NB Nos. 4.3 and 13.1 would be constructed partially in native soil, and partially in engineered fill. The footing of NB No. 6.2 would be constructed in native soil. NB No. 14.3 would be constructed mostly in native soil that has been previously disturbed with the construction of the existing wall.

- **Utility Relocations:** No utility impacts are anticipated as a result of any noise barriers.

Alternative 2B with Design Option 3

The nonacoustical factors relating to the feasibility of NB No. 3.3 under Alternative 2B are addressed below.

- **Geometric Standards:** Construction of NB No. 3.3 would include regrading to achieve geometric standards.
- **Safety:** The location of NB No. 3.3 would not preclude the line of sight for users of I-5 or pedestrians.
- **Maintenance:** A temporary construction easement, permanent maintenance easement, and permanent easement for the aboveground and belowground limits of NB No. 3.3 would need to be granted to Caltrans.
- **Security:** NB No. 3.3 would be in the same alignment as an existing property wall, and would not change the security conditions of the site.
- **Drainage:** The existing and proposed drainage systems would not be affected by NB No. 3.3.
- **Geotechnical Considerations:** NB No. 3.3 would be mostly constructed on existing engineered fill, at a similar grade to the existing condition. The footing may encroach into native soil.
- **Utility Relocations:** No utility impacts are anticipated as a result of NB No. 3.3.

No Build Alternative (Alternative 1)

Potential long-term noise effects under the No Build Alternative would be solely from traffic noise. Future No Build noise levels are shown in Table J-1 in Appendix J of this document. Of the 974 modeled receptor locations, 147 receptors would continue to approach or exceed the NAC under the future No Build condition.

2.14.4 Avoidance, Minimization, and/or Mitigation Measures

The Preferred Alternative will incorporate the project features outlined above in Sections 2.14.3.1 and 2.14.3.2 to help address potential noise impacts. No avoidance, minimization, and/or mitigation measures are required.