I-5 MANAGED LANES PROJECT

(RED HILL AVE TO ORANGE / LOS ANGELES COUNTY LINE)

Counties of Orange and Los Angeles, California
Cities of Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs

12-Ora-5 – PM 28.9/44.4, 26.9, 27.9, 28.4
07-LA-5 – PM 0.1, 0.3, 0.6, 1.7
12-Ora-55 – PM 7.4, 8.0, 8.7, 8.9, 9.2, 9.7 9.9, 10.2
12-Ora-57 – PM 11.0, 11.3, 11.9, 12.5, 12.7, 12.9, 13.5
12-Ora-91 – PM 0.4, 0.7, 1.1, 1.3, 1.4, 1.6, 1.8, 2.0, 2.2, 2.6, 2.8, 3.4

EA 12-0Q950

EFIS No. 1218000006

DRAFT NOISE STUDY REPORT

Prepared for

Caltrans

CALTRANS DISTRICT 12 ORANGE COUNTY

May 4, 2023

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Draft Noise Study Report

I-5 Managed Lanes Project

(Red Hill Avenue to Orange/Los Angeles County Line)

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Cities of Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs

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May 4, 2023

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Summary

The purpose of this Noise Study Report is to assess potential traffic noise impacts and identify feasible noise abatement measures for the proposed Interstate (I) -5 Managed Lanes Project (Project). The NSR was prepared following the requirements of Title 23, Part 772 of the Code of Federal Regulations, "Procedures for Abatement of Highway Traffic Noise" and the California Department of Transportation (Caltrans) Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction and Retrofit Barrier Projects (Protocol).

Caltrans District 12 is proposing managed lanes (ML) improvements in both directions on I-5. The improvements would modify the existing high-occupancy vehicle (HOV) lanes within the proposed Project limits to address operational deficiencies. The proposed Project limits on I-5 extend from Red Hill Avenue (Post Mile [PM] 28.9) to the Orange County/Los Angeles (OC/LA) County line (12-ORA-5 PM 44.4) in the cities of Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs and include implementing associated signage (including advance signage on adjacent arterials) and tolling infrastructure.

The purpose of this project is to improve the overall movement of people and goods along this section of I-5 by:

- Improving the ML network operations
- Improving mobility and trip reliability
- Maximizing person throughput by facilitating efficient movement of bus and rideshare users
- Applying technology to help manage traffic demand

The need, or deficiency, of the project is the existing I-5 HOV lanes between Red Hill Avenue and the OC/LA County line experience:

- HOV lane degradation (does not meet the federal performance standards)
- Demand exceeds existing capacity
- Operational deficiencies

Land uses throughout the I-5 corridor include single- and multi-family residences, schools, parks, places of worship, hotels, and commercial buildings. Traffic along the freeways and local arterial streets is the dominant source of noise in the study area. The study area for this NSR was divided into 28 separate Noise Study Areas (NSAs).

Short-term noise measurements were taken at 36 locations between October and November 2022 for a total duration of 15 minutes. Meteorological conditions (i.e., temperature, wind speed and direction, and relative humidity) were logged for each measurement session using a hand-held weather station. Long-term noise measurements were conducted at 11 locations in December 2022. A total of 1,261 receivers were modeled, representing 1,803 receptors, of these 1,742 receptors are Activity Category B, 46 are Activity Category C and 15 are Activity Category E.

Existing Year (2022) and Design Year (2055) No-Build and Build condition forecasted truck percentages along with a level of service C/D volume were used to predict traffic noise levels and analyze noise impacts at receivers within the project area. There are no separate results for Alternative 2 since Alternative 2 does not have changes in the physical footprint or in traffic capacity. Alternative 2 does not meet the criteria as a Type 1 Project; therefore, noise impacts were not analyzed for this scenario.

A complete discussion of the traffic modeling breakdown methodology is included in Chapter 5, Study Methods and Procedures.

Because of the constrained configuration and urban location of the project, abatement in the form of noise barriers or soundwalls is the only abatement measure considered practical. Noise barrier analysis was conducted by placing soundwalls on the edge-of-shoulder, right-of-way line, or any other acoustically feasible location within Caltrans right-of-way.

This report analyzes noise barriers with heights ranging from 6 to 22 feet for soundwalls along the edge-of-shoulder and right-of-way to determine feasible noise abatement for each Build Alternative. Soundwalls are considered feasible when the barrier can provide at least 5 decibels (dB) of noise reduction at the impacted receiver. The noise reduction design goal, which is one measure in determining whether a soundwall is reasonable, is achieved when a barrier is predicted to provide a noise reduction of at least 7 dB at one or more benefited receptors. Tables S-1 and S-2 summarize the range of existing and predicted future traffic noise levels, number of impacts, number of existing and proposed soundwalls, number of benefited receivers, range of insertion loss, and the reasonable allowances broken down by NSA for Build Alternatives 3, and 4 respectively.

Construction noise control will conform to the provisions in Section 14-8.02, "Noise Control," of the Standard Specifications and Special Provisions (SSP 14-8.02). The requirements state that all construction shall not exceed 86 dBA Lmax at 50 feet from the job site from 9:00 p.m. to 6:00 a.m. Construction noise varies greatly depending on the construction process, type, and condition of equipment used, and layout of the construction site. Temporary construction noise impacts would be unavoidable at areas that are immediately adjacent to the proposed project alignment.

Based on the studies so far accomplished, Caltrans intends to consider noise abatement measures in the form of barrier(s) at locations, with respective lengths and heights as shown in this Noise Study Report. If during the final design phase, project conditions have substantially changed, the noise barriers are not feasible and reasonable, or design standards and safety requirements restrict the construction of noise barriers, noise barriers might not be provided. The final decision regarding the construction of noise barriers will be made after completion of the public involvement during the final project design process.

Table S-1. Executive Summary for Build Alternative 3

Noise Study Area	Existing Noise Level Range (dBA)	Future Noise Level Range (dBA)	Number of Impacted Receivers with Project	Number of Existing Soundwalls	Number of Proposed Soundwalls	Total Number of Benefited Receptors	Name of Proposed Soundwalls	Range of Feasible Soundwall Insertion Loss Values (dBA)	Reasonable Allowance[1]
1	48-69	48-69	1	1	--	--	--	--	--
2	53-65	52-65	--	1	--	--	--	--	--
3	47-74	47-74	14	3	1	3	Seg1A-C-NB1	6.7 – 9.0	$321,000
4	50-64	50-64	--	--	--	--	--	--	--
5	51-81	51-81	33	2	1	2	Seg1B-NB2	5.0 – 7.5	$321,000
6	49-68	49-68	10	2	--	--	--	--	--
7	52-73	52-73	21	2	--	--	--	--	--
8	55-71	55-71	5	--	1	2-5	Seg1C-SB1	5.0 – 7.4	$428,000–$856,000
9	53-68	53-67	12	2	--	--	--	--	--
10	50-76	50-75	15	1	1	12-23	Seg1D-SB2-A	8.8 – 14.5	$1,284,000-$2,461,000
10	50-76	50-75	15	1	2	12-25	Seg1D-SB2-A and Seg1D-SB2-B	8.8 – 14.6	$1,284,000-$2,675,000
10	50-76	50-75	22	1	3	12-26	Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB2-B	9.2 – 14.9	$1,284,000-$2,568,000
11	64-69	64-70	6	1	--	--	--	--	--
12	54-68	54-68	16	2	--	--	--	--	--
13	62-71	63-72	2	--	--	--	--	--	--
14	52-73	53-73	27	3	--	--	--	--	--
15	60-69	60-70	15	1	--	--	--	--	--
16	59-69	59-70	2	--	--	--	--	--	--
17	51-71	52-72	15	3	--	--	--	--	--
18	54-71	55-71	16	2	--	--	--	--	--
19	44-68	45-69	18	4	--	--	--	--	--
20	57-64	52-64	--	--	--	--	--	--	--
21	56-71	56-71	25	2	--	--	--	--	--
22	57-65	57-65	--	--	--	--	--	--	--
23	55-77	55-77	12	--	1	5-12	Seg3A-NB-1	5.8 – 7.9	$1,284,000
24	57-65	57-65	--	--	--	--	--	--	--
25	53-64	57-65	--	--	--	--	--	--	--

26	48-58	53-64	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--	--
28	54-66	56-67	1	1	--	--	--	--	--

[1] Allowance of $107,000 per benefited receptor (as of February 2022)

Table S-2. Executive Summary for Build Alternative 4

Noise Analysis Area	Existing Noise Level Range (dBA)	Future Noise Level Range (dBA)	Number of Impacted Receivers with Project	Number of Existing Soundwalls	Number of Proposed Soundwalls	Total Number of Benefited Receptors	Name of Proposed Soundwalls	Range of Feasible Soundwall Insertion Loss Values (dBA)	Reasonable Allowance[1]
1	48-69	48-69	1	1	--	--	--	--	--
2	53-65	52-65	--	1	--	--	--	--	--
3	47-74	47-74	14	3	1	3	Seg1A-C-NB1	6.7 – 9.0	$321,000
4	50-64	50-64	--	--	--	--	--	--	--
5	51-81	51-81	33	2	1	2	Seg1B-NB2	5.0 – 7.5	$321,000
6	49-68	49-68	10	2	--	--	--	--	--
7	52-73	52-73	21	2	--	--	--	--	--
8	55-71	55-71	5	--	1	2-5	Seg1C-SB1	5.0 – 7.4	$428,000–$856,000
9	53-68	53-67	12	2	--	--	--	--	--
10	50-76	50-75	15	1	1	12-23	Seg1D-SB2-A	8.8 – 14.5	$1,284,000-$2,461,000
10	50-76	50-75	15	1	2	12-25	Seg1D-SB2-A and Seg1D-SB2-B	8.8 – 14.6	$1,284,000-$2,675,000
10	50-76	50-75	22	1	3	12-26	Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB2-B	9.2 – 14.9	$1,284,000-$2,568,000
11	64-69	64-70	6	1	--	--	--	--	--
12	54-68	54-68	16	2	--	--	--	--	--
13	62-71	62-72	3	--	--	--	--	--	--
14	52-73	53-73	27	3	--	--	--	--	--
15	60-69	60-70	14	1	--	--	--	--	--
16	59-69	59-70	2	--	--	--	--	--	--
17	51-71	52-72	14	3	--	--	--	--	--
18	54-71	55-71	16	2	--	--	--	--	--
19	44-68	45-69	17	4	--	--	--	--	--
20	57-64	52-64	--	--	--	--	--	--	--
21	56-71	56-71	26	2	--	--	--	--	--
22	57-65	57-65	--	--	--	--	--	--	--
23	55-77	55-77	12	--	1	5-12	Seg3A-NB-1	5.8 – 7.9	$1,284,000
24	57-65	57-65	--	--	--	--	--	--	--

25	53-64	57-65	--	--	--	--	--	--	--
26	48-58	53-64	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--	--
28	54-66	56-67	1	1	--	--	--	--	--

[1] Allowance of $107,000 per benefited receptor (as of February 2022)

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Acronyms and Abbreviations

Abbreviation	Definition
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibel
FHWA	Federal Highway Administration
HOV	High-Occupancy Vehicle
Hz	Hertz
I	Interstate
kHz	Kilohertz
Ldn	Day-Night Level
Leq	Equivalent Sound Level
Lmax	Maximum Sound Level
Lxx	Percentile-Exceeded Sound Level
ML	Managed Lanes
$_{m}$Pa	Micro-Pascals
Mph	Miles per hour
NAC	Noise abatement criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSA	Noise Study Area
NSR	Noise Study Report
PM	Post Mile
PeMS	Caltrans Performance Measurement System

Abbreviation	Definition
Caltrans	California Department of Transportation
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	Sound pressure level
TeNS	Technical Noise Supplement to the Traffic Noise Analysis Protocol
TNM 2.5	FHWA Traffic Noise Model Version 2.5
Vphpl	Vehicles per Hour per Lane

1. INTRODUCTION

The California Department of Transportation (Caltrans) District 12, in cooperation with Caltrans District 7, and the Federal Highway Administration (FHWA), is proposing managed lanes (ML) improvements in both directions on Interstate (I) 5. The improvements would modify the existing high-occupancy vehicle (HOV) lanes within the proposed Project limits to address operational deficiencies.

1.1 Purpose of the Noise Study Report

The purpose of this Noise Study Report (NSR) is to evaluate traffic noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (CFR) "Procedures for Abatement of Highway Traffic Noise and Construction Noise" (July 2010). The 23 CFR 772 requirements provide procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards. Compliance with 23 CFR 772 provides compliance with the noise impact assessment requirements of NEPA.

The Caltrans' *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Protocol) (2020) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing NSRs. Noise impacts associated with this project under NEPA and CEQA are evaluated in the project's environmental document.

1.2 Project Purpose and Need

The purpose of the proposed Project is to improve the overall movement of people and goods along this section of I-5. The proposed improvements along the I-5 corridor would accomplish the following objectives:

- Improving the overall regional ML network operations
- Improving mobility and trip reliability
- Maximizing person throughput by facilitating the efficient movement of bus and rideshare users
- Applying technology to help manage traffic demand

The need for the proposed Project is to address the following deficiencies being experienced by motorists along the existing I-5 HOV lanes between Red Hill Avenue and the Orange County/Los Angeles County line:

- HOV lane degradation (does not meet the federal performance standards)
- Demand that exceeds existing capacity
- Operational deficiencies

2. PROJECT DESCRIPTION

The California Department of Transportation (Caltrans) District 12 is proposing managed lanes (ML) improvements in both directions on Interstate (I) 5. The improvements would modify the existing high-occupancy vehicle (HOV) lanes within the proposed Project limits to address operational deficiencies. The proposed Project limits on I-5 extend from Red Hill Avenue (Post Mile [PM] 28.9) to the Orange County/Los Angeles (OC/LA) County line (12-ORA-5 PM 44.4) in the cities of Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs and include implementing associated signage (including advance signage on adjacent arterials) and tolling infrastructure.

The purpose of this project is to improve the overall movement of people and goods along this section of I-5 by:

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- Improving mobility and trip reliability
- Maximizing person throughput by facilitating efficient movement of bus and rideshare users
- Applying technology to help manage traffic demand

The need, or deficiency, of the project is the existing I-5 HOV lanes between Red Hill Avenue and the OC/LA County line experience:

- HOV lane degradation (does not meet the federal performance standards)
- Demand exceeds existing capacity
- Operational deficiencies

Four preliminary alternatives, including three Build Alternatives and the No Build Alternative, are under consideration and are described below.

2.1 Alternative 1—No Build Alternative

Alternative 1, the No Build Alternative, does not include improvements to the existing lane configurations for I-5. Under the No Build Alternative, no additional roadway improvements would occur. This alternative includes other projects on the financially-constrained project list in the adopted Southern California Association of Governments (SCAG) 2020–2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) within the proposed Project limits on I-5 and the Preferred Plan in the Orange County Transportation Authority (OCTA) 2018 Long-Range Transportation Plan (LRTP) within the proposed Project limits.

2.2 Alternative 2—Build Alternative: Modify Existing HOV 2+ Lanes to HOV 3+ Lanes

Alternative 2 would maintain the existing lane configurations for I-5 with a modification of the minimum HOV-lane occupancy requirement from two-plus (2+) to three-plus (3+) passengers within the current HOV system in each direction, between Red Hill Avenue and the OC/LA County line. As a result of this increase in the occupancy requirement and improved trip reliability, through the Transportation System Management/Transportation Design Management (TSM/TDM) elements, it would promote and encourage public and private transit such as Bus Rapid Transit (BRT) and ridesharing. Under this alternative, no additional roadway improvements would occur. Additionally, two proposed park-and-ride facilities are being evaluated as part of Alternative 2 and would

be constructed within the existing freeway right-of-way. Sign replacement and pavement delineation would also be implemented to meet the latest California Manual on Uniform Traffic Control Devices (CA MUTCD) standards.

2.2.1 Ramps

Physical modifications of the ramp geometry will not be required where the current HOV system is converted from 2+ to 3+ passengers; however, replacement of signage at direct-access ramps will be required accordingly for Alternative 2.

2.2.2 Impact to Structures

Alternative 2 would not impact existing structures or create new structures (e.g., bridges) as part of its proposed design.

2.2.3 Drainage and Water Quality

Drainage management measures would be included in Alternative 2 to address the impacts to drainage patterns associated with new construction of the park-and-ride facilities. Proposed major drainage design features would include: maintaining existing drainage flow patterns and incorporating existing drainage systems to the maximum extent practicable; providing drainage facilities that would accommodate future improvements; and providing drainage facilities to prevent and/or reduce substantial erosion or siltation on or off site.

Some of the existing systems may be abandoned or removed to accommodate construction of Alternative 2. Best Management Practices (BMPs) would be included to address stormwater requirements and treatment of the added impervious area created by Alternative 2.

2.2.4 Tolled Components

Alternative 2 would not include the implementation of any new tolling components as part of the proposed design.

2.2.5 Transportation Management Plan

Alternative 2 may be implemented in phases and/or segments and procured under one or more contracts, including the option of using design/build. Construction-related delays are anticipated during construction of Alternative 2.

In accordance with Caltrans Deputy Directive (60-R2), a Transportation Management Plan (TMP) has been prepared for Alternative 2 which includes strategies that, when implemented, would minimize Project-related construction and circulation impacts.

It is anticipated that lane closures would be required, and it may be necessary to temporarily close on/off-ramps and connectors during construction of Alternative 2.

Some of the key elements recommended in the TMP include the following: Public Information/Public Awareness Campaign; Motorist Information Strategies; Incident Management; Construction Strategies; Demand Management; and Alternate Route Strategies.

Detailed detour plans, staging plans, and traffic handling plans would also be developed during the final design phase.

2.2.6 Construction Staging

As no additional construction would occur with Alternative 2, there would be no stage construction impacts associated with construction acitivites within the freeway mainline, which are limited to signage replacement and pavement delineators along the freeway mainline. Construction staging is anticipated for the development of the park-and-ride facilities to minimize impacts to existing traffic.

Stage construction concept plans are currently being developed. Should Alternative 2 be selected as the Preferred Alternative, detailed stage construction and detour plans would be developed during final design. Detailed stage construction plans and traffic handling plans would also be developed in the final design stage.

2.2.7 Right-of-Way Data

Additional right-of-way (e.g., full acquisition, partial acquisition, aerial easements, temporary construction easements) is not anticipated for the construction of Alternative 2.

2.2.8 Utility and Other Owner Involvement

Alternative 2 is not expected to have any impacts to surrounding utilities, as there are no proposed utility relocations associated with its proposed design.

2.2.9 Nonstandard Design Features (Design Standards Risk Assessment)

Alternative 2 would not impact existing nonstandard design features or create new nonstandard design features as part of the proposed design.

2.2.10 Sound Walls

Alternative 2 would not impact any existing sound walls as part of the proposed design.

2.2.11 Transportation System Management/Transportation Demand Management

Alternative 2 would not implement any new TSM/TDM measures or features beyond the ramp metering, changeable message signs (CMS), cameras, and traffic speed detection systems that already exist within the proposed Project limits.

2.2.12 Highway Planting

Existing planting and irrigation systems removed during construction of the Alternative 2 park-and-ride facilities would be replaced wherever space is available. Generally, existing vegetation in and around the park-and-ride areas would be replanted to the maximum extent practicable.

Should Alternative 2 be selected as the Preferred Alternative, planting design would be provided during the final design phase; would consider safety, maintainability, and aesthetic compatibility with adjacent urban communities; and would not deviate significantly from the existing planting theme.

2.2.13 Erosion Control

Alternative 2 would be required to comply with the terms and conditions in accordance with Attachment D of the NPDES Statewide Construction General Permit (SWRCB 2020), which includes a written site-specific Construction Site Monitoring Program (CSMP). The CSMP would include implementation of specific stormwater

effluent monitoring requirements to ensure that the implemented BMPs are effective in preventing discharges from exceeding any of the water quality standards.

Erosion control measures would be implemented during construction as well as after completion of Alternative 2 construction in accordance with the requirements of the Santa Ana (Region 8) and Los Angeles (Region 4) Regional Water Quality Control Boards (RWQCBs) and the current statewide National Pollutant Discharge Elimination System (NPDES) Construction General Permit. During construction, potential construction site best management practices (BMPs), such as temporary fiber rolls, temporary mulch, drainage inlet protection, concrete washout facilities, street sweeping, and hydroseeding, would be used to minimize erosion. All finished slopes would receive replacement planting or vegetative erosion control application.

Should Alternative 2 be selected as the Preferred Alternative, specific erosion control measures and construction site BMP design would be developed during final design. Preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) would be required during construction.

2.3 Alternative 3—Build Alternative: Convert Existing HOV Lanes to Express Lanes

Alternative 3 would convert the existing HOV lane to an Express Lane (EL) in each direction between Red Hill Avenue and State Route (SR) 55; convert two existing HOV lanes to ELs in each direction between SR-55 and SR-57; and convert the existing HOV lane to an EL in each direction from SR-57 to the OC/LA County line. The typical cross-section consists of a 12-foot-wide EL, a 2- to 4-foot buffer, 12-foot-wide general-purpose (GP) lanes, 12-foot-wide auxiliary lanes, a 4- to 26-foot-wide inside shoulder, and a 10-foot-wide outside shoulder and would be provided to accommodate the EL. One 12-foot weave lane is proposed at locations of ingress or egress. Additionally, two proposed park-and-ride facilities are being evaluated as part of Alternative 3 and would be constructed within the existing freeway right-of-way. Sign replacement and pavement delineation would also be implemented to meet the latest CA MUTCD standards.

2.3.1 Ramps

Alternative 3 would impact several existing ramps. The affected ramps and the proposed improvements are summarized in Table 1 and Table 2, below. In general, several existing ramps would be shifted to accommodate outside widening by Alternative 3.

Table 1: Anticipated Impacts to On-Ramps within the Proposed Project Limits—Alternative 3

Location		Post Mile (Approx.)	Ramp Improvements
1	NB SR-55 to NB I-5 Direct Connector	30.472	X
2	Grand Ave. SB Direct-Access On-Ramp	31.794	X
3	N. Main St. SB On-Ramp	32.953	X
4	SB SR-57 to SB I-5 Direct Connector	34.222	X
5	Gene Autry Wy. SB Direct-Access On-Ramp	35.949	X
6	Gene Autry Wy. NB Direct-Access On-Ramp	35.949	X

Location		Post Mile (Approx.)	Ramp Improvements
7	EB SR-91 to SB I-5 Direct Connector	41.928	X
8	WB SR-91 to NB I-5 Direct Connector	42.42	X
9	Auto Center Dr. NB On-Ramp	42.928	X
10	Artesia Blvd. SB On-Ramp	44.271	X
Total Number of On-Ramp Improvements:			**10**

Notes: * Existing ramp metering to be relocated and/or upgraded to latest equipment requirements.
**Ramps metered separately before joining.

EB = eastbound
I = Interstate
NB = northbound
SB = southbound
SR = State Route
WB = westbound

Table 2: Anticipated Impacts to Off-Ramps within the Proposed Project Limits—Alternative 3

Location		Post Mile (Approx.)	Ramp Improvements
1	Grand Ave. NB Direct-Access Off-Ramp	31.532	X
2	Penn Wy. SB Off-Ramp	32.521	X
3	NB I-5 to NB SR-57 Direct Connector	33.433	X
4	Gene Autry Wy. NB Direct-Access Off-Ramp	35.466	X
5	Gene Autry Wy. SB Direct-Access Off-Ramp	36.309	X
6	Anaheim Blvd. NB Direct-Access Off-Ramp	36.072	X
7	Disneyland Dr. SB Direct-Access Off-Ramp	38.439	X
8	NB I-5 to WB SR-91 Direct Connector	41.909	X
9	SB I-5 to EB SR-91 Direct Connector	42.545	X
10	Beach Blvd. SB Off-Ramp	43.680	X
11	Artesia Blvd. NB Off-Ramp	43.996	X
Total Number of Off-Ramp Improvements:			**11**

EB = eastbound
I = Interstate
NB = northbound
SB = southbound
SR = State Route
WB = westbound

Alternative 3 is not anticipated to impact system interchanges within the proposed Project limits. Within the proposed Project limits, ramp metering is incorporated into the existing local interchange on-ramps, except at the South Anaheim Boulevard northbound on-ramp. Where ramp improvements affect ramp metering, any ramp metering equipment would be reestablished. Existing ramp meters and equipment would be reused where possible.

For the majority of locations, physical modifications of the ramp geometry will not be required where the HOV direct connector is converted to an ELs Connector; however, replacement of signage and addition of tolling equipment will be required accordingly. The incorporation of weave lanes required physical modifications of the ramp gore geometry where the HOV Direct Connector is converted to an ELs Connector at the northbound Gene Autry Way off-ramp, northbound Disney Way off-ramp, southbound Gene Autry Way off-ramp, and southbound Disneyland Drive off-ramp.

2.3.2 Impact to Structures

Alternative 3 would not create new structures (e.g., bridges) but would impact one existing retaining wall to accommodate widening the mainline to avoid right-of-way acquisition. The affected retaining wall structure and the proposed improvements are summarized in Table 3.

Table 3: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 3

Location	Post Mile	Retaining Wall Improvements		Maximum Length of Extension (Feet)
		Rebuild (R) / New (N)	Type	
SB I-5, North of E. 17th St.	32.521	R*	Special	793

Notes: *Retaining Wall/Sound Wall.
I = Interstate
SB = Southbound

2.3.3 Drainage and Water Quality

Drainage management measures would be included in Alternative 3 to address the impacts to drainage patterns associated with new construction. Proposed major drainage design features would include: maintaining existing drainage flow patterns and incorporating existing drainage systems to the maximum extent practicable; providing drainage facilities that would accommodate future improvements; and providing drainage facilities to prevent and/or reduce substantial erosion or siltation on or off site.

Some of the existing systems may be abandoned or removed to accommodate the construction of Alternative 3. For widened sections of the pavement for Alternative 3, the existing edge drains would be replaced and reconnected to the drainage system; final connection and location details would be developed in the final design phase. BMPs would be included to address stormwater requirements and treatment of the added impervious area created by Alternative 3.

2.3.4 Tolled Components

TOLL OPERATIONS POLICIES

The ELs would require single-occupant vehicles to pay a toll. The objective is to open the tolled ELs with some level of HOV occupancy free to encourage rideshare and transit usage. Operational adjustments to the tolled ELs may be implemented based on demand, rates of speed, traffic volumes, and to meet financial covenants, maintenance, and operational obligations. This would be determined based on the Traffic and Revenue (T&R) analysis, input from public, and Caltrans business rules. Caltrans has the authority to set the occupancy policy on the I-5 ELs.

Key Caltrans business rules may include, but are not limited to:

- Toll-free travel for vehicles that meet minimum vehicle occupancy requirements, motorcycles, and buses.
- Qualifying carpools would continue to be able to access the lanes without a charge; trucks, other than two-axle light-duty trucks, would not be allowed.
- Toll/transit credits would be available to frequent ELs transit riders.
- Emergency vehicles may use the ELs toll-free when responding to incidents.
- Qualifying Clean Air Vehicles would be given a toll discount.
- Equity Assistance Plan.

TOLL OPERATIONS AND MAINTENANCE

At this time, a process is in place to develop a formal maintenance plan as part of the Caltrans and FHWA systems engineering process. It is anticipated that Caltrans would maintain the physical infrastructure, such as pavement, striping, and median barriers, as well as perform general maintenance, such as trash and graffiti removal, paid for from toll revenues. It is anticipated that Caltrans would also manage the tolling infrastructure, while the customer service centers and other back-office support facilities would be contracted to others. However, final agreements and decisions on such responsibilities will be decided in the future phases of the Project.

TOLL REVENUE/PRICING STRUCTURE

Time-of-day pricing and dynamic pricing methods are being analyzed for their application as part of the proposed Project. Toll rates would be set in response to vehicle demand and would be adjusted as necessary to regulate volume in the ELs to maintain traffic flow at a predetermined level of service (LOS).

The pricing structure and details would be evaluated further during final design. No tolling amount or pricing decisions have been made at this time.

TOLL COLLECTION

The I-5 ELs facility is expected to use an all-electronic toll collection system and would not accept cash or credit card payment on the facility. This would eliminate the need for customers to stop and pay tolls at traditional tollbooths. The electronic toll collection system would require customers to have pre-paid accounts with a tolling agency and mount a nonstop automated vehicle identification transponder or toll tag on the windshield of a registered vehicle. Tolls would be collected electronically by reading the transponder at highway speeds.

TOLL ENFORCEMENT

Toll enforcement is an essential element of any successful EL system, ensuring that traffic laws are enforced, customers are charged the appropriate toll based on vehicle occupancy, and toll evasion is minimized. Toll enforcement would be accomplished through California Highway Patrol (CHP) patrols, electronic systems, and facility design. The CHP is anticipated to be contracted to conduct routine and supplemental enforcement services on the I-5 Express Lanes facility, including toll infractions, HOV eligibility occupancy infractions, buffer crossing infractions, speeding, and other moving violations. The Electronic Toll Collection (ETC) system is intended to identify both vehicles that do not have a transponder as well as the declared transponder switch setting. Caltrans would incorporate an infrared occupancy detection system into the EL enforcement. The CHP currently provides enforcement on all of the toll roads in southern California under several different institutional arrangements.

2.3.5 Transportation Management Plan

The same TMP described under Alternative 2 would be utilized as part of Alternative 3. This infrastructure is detailed in Section 2.2.5, above.

2.3.6 Construction Staging

It is anticipated that Alternative 3 would be designed and constructed in separate phases to facilitate Project delivery based on available funding. Each phase would include construction staging to minimize impacts to existing traffic. The same number of existing mainline lanes would be kept open to traffic during construction whenever feasible.

Stage construction concept plans are currently being developed. However, Alternative 3 would require ramp closures of less than 10 days to accommodate reconstruction of pavement at or near on- and off-ramps. Closures of successive on- or off-ramps would be avoided. Should Alternative 3 be selected as the Preferred Alternative, detailed stage construction and detour plans would be developed during final design. Detailed stage construction plans and traffic handling plans would also be developed in the final design stage.

2.3.7 Right-of-Way Data

Additional right-of-way (e.g., full acquisition, partial acquisition, aerial easements, temporary construction easements) is not anticipated for the construction of Alternative 3.

2.3.8 Utility and Other Owner Involvement

Underground and above-ground utility conflicts are anticipated within the proposed Project limits. The anticipated utility impacts within the proposed Project limits are summarized in Table 4.

Table 4: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 3

No.	Location	Utility Owner and/or Contact Name	Wet (W) / Dry (D)	Utility Type	Utility Conflict Description	H
1	N. Main St. SB On-Ramp	AT&T	D *	Telecom	Roadway Conflict	N/A
2	North of N. State College Blvd.	PacBell	D	Telecom	Overhead Sign Conflict	N/A
3	North of N. State College Blvd.	SCE	W	Electric	Overhead Sign Conflict	N/A

Notes: H* denotes high-priority utilities based on Chapter 600 of the Caltrans Encroachment Permits Manual.
AT&T = American Telephone and Telegraph Company
Caltrans = California Department of Transportation
N/A = Not Applicable
PacBell = Pacific Bell Telephone Company
SB = Southbound
SCE = Southern California Edison

Should Alternative 3 be selected as the Preferred Alternative, a "positive location" verification would be performed during the final design phase, which would include surveying and boring the area in order to verify the depth and specific locations of underground utilities in the proposed Project vicinity that may be in close proximity to or conflict with proposed improvements as determined from as-built plans and utility company records. Relocation or addition of towers are not anticipated for the existing overhead electrical lines.

2.3.9 Nonstandard Design Features (Design Standards Risk Assessment)

A listing of major existing nonstandard design features for Alternative 3 is included in Table 5, below.

Table 5: Design Standards Risk Assessment—Alternative 3

No.	Design Standard	Probability of Design Exception Approval (None, Low, Medium, High)
1	201.1 (Stopping Sight Distance Standards)*	Medium/High
2	301.1 (Lane Width)*	Medium
3	302.1 (Shoulder Width)*	Medium/High
4	305.1 (Median Width Freeways and Expressways-Urban)**	High
5	305.1(3)(a) (Median Width)*	High
6	309.1(3)(a) (Horizontal Clearances for Highways)*	Medium /High
7	504.7 (Minimum Weave Length)*	High

Notes: *Boldface
**Underline

2.3.10 Sound Walls

Alternative 3 would impact one existing sound wall. The affected sound wall and the proposed improvements are summarized in Table 6**.**

Table 6: Anticipated Sound Wall Impacts within the Proposed Project Limits—Alternative 3

Location	Post Mile	Sound Wall Improvements			Maximum Length of Extension (Feet)
		Rebuild (R) / New (N)	Extension	Removal	
SB I-5, North of E. 17th St.	32.521	R*			793

Notes: *Retaining Wall/Sound Wall.

I = Interstate

SB = Southbound

2.3.11 Transportation System Management/Transportation Demand Management

TSM/TDM aims to improve traffic flow, promote travel safety, and increase transit usage and rideshare participation. The TSM/TDM measures included as part of Alternative 3 would add TSM/TDM techniques to existing features within the proposed Project limits.

The following TSM features would be incorporated into Alternative 3's proposed design:

- Ramp metering
- Intelligent Transportation Systems
- CHP observation and enforcement areas

The following TDM measures have been incorporated into Alternative 3:

- The EL use would be incentivized for carpool, transit users, electric and clean-emissions vehicles (e.g., discounted fare, partial or full subsidized fare).
- Potential excess toll revenue would be allocated to fund projects and programs to reduce vehicle miles traveled (VMT), such as:
    - Outreach and education regarding ridesharing, transit travel, and multimodal opportunities;
    - Outreach and education regarding alternative work schedule programs and telecommuting; and
    - Construction of two park-and-ride facilities.
- Generating sustainable funding to support ongoing operations and promoting transit equity programs.
- Alternative 3 would facilitate travel for commercial buses and tourist buses to and from tourist destinations within the proposed Project area.

2.3.12 Highway Planting

The same erosion control features described under Alternative 2 would be included as part of Alternative 3. These are detailed in Section 2.2.12, above. Generally, existing vegetation in and around the interchange areas would be replanted; however, due to limited space between the freeway improvements and right-of-way, planting replacement would not always be possible along the mainline.

2.3.13 Erosion Control

The same erosion control features described under Alternative 2 would be included as part of Alternative 3. These are detailed in Section 2.2.13, above.

2.4 Alternative 4—Build Alternative: Convert Existing HOV Lanes to Express Lanes and Construct Additional Express Lanes

Alternative 4 would convert the existing HOV lane to an EL in each direction between Red Hill Avenue and SR-55; convert two existing HOV lanes to ELs in each direction between SR-55 and SR-57; convert the existing HOV lane to an EL in each direction from SR-57 to the OC/LA County line; and construct an additional EL in each direction between SR-57 and SR-91. The typical cross-section consists of 12-foot-wide ELs, a 2- to 4-foot buffer, 12-foot-wide GP lanes, 12-foot-wide auxiliary lanes, a 4- to 14-foot wide inside shoulder, and a 10-foot-wide outside shoulder and would be provided to accommodate the ELs. One 12-foot weave lane is proposed at locations of ingress or egress. Additionally, two proposed park-and-ride facilities are being evaluated as part of Alternative 4 and would be constructed within the existing freeway right-of-way. Sign replacement and pavement delineation would also be implemented to meet the latest CA MUTCD standards.

2.4.1 Ramps

Alternative 4 would impact some existing ramps within the proposed Project limits. The affected ramps and the proposed improvements are summarized in Table 7 and 8, below. In general, some existing ramps would be shifted to accommodate outside widening by Alternative 4. Alternative 4 is not anticipated to impact system interchanges within the proposed Project limits. Within the proposed Project limits, ramp metering is incorporated into the existing local interchange on-ramps, except at the South Anaheim Boulevard northbound on-ramp. Where ramp improvements affect ramp metering, any ramp metering equipment would be re-established. Existing ramp meters and equipment would be reused where possible.

For the majority of locations, physical modifications of the ramp geometry would not be required where the HOV Direct Connector is converted to an ELs Connector; however, replacement of signage and the addition of tolling equipment would be required accordingly. The incorporation of weave lanes would require physical modifications at the ramp gore where the HOV Direct Connector is converted to an ELs Connector at the following locations:

- Southbound SR-57 connector
- Northbound SR-57 connector
- Southbound Gene Autry Way on-ramp

- Northbound Gene Autry Way off-ramp
- Northbound Disney Way off-ramp
- Southbound Gene Autry Way off-ramp
- Northbound Gene Autry Way on-ramp
- Southbound Disneyland Drive off-ramp

Table 7: Anticipated Impacts to On-Ramps within the Proposed Project Limits—Alternative 4

Location		Post Mile (Approx.)	Ramp Improvements
1	NB SR-55 to NB I-5 Direct Connector	30.472	X
2	Grand Ave. SB Direct-Access On-Ramp	31.794	X
3	N. Main St. SB On-Ramp	32.953	X
4	SB SR-57 to SB I-5 Direct Connector	34.222	X
5	Gene Autry Wy. SB Direct-Access On-Ramp	35.949	X
6	Gene Autry Wy. NB Direct-Access On-Ramp	35.949	X
7	W. Lincoln Ave. NB On-Ramp	38.913	X
8	EB SR-91 to SB I-5 Direct Connector	41.928	X
9	WB SR-91 to NB I-5 Direct Connector	42.42	X
10	Auto Center Dr. NB On-Ramp	42.928	X
11	Artesia Blvd. SB On-Ramp	44.271	X
Total Number of Off-Ramp Improvements:			**11**

Notes: * Existing ramp metering to be relocated and/or upgraded to latest equipment requirements.

**Ramps metered separately before joining.
EB = Eastbound

I = Interstate

NB = Northbound

SB = Southbound

SR = State Route

WB = Westbound

Table 8: Anticipated Impacts to Off-Ramps within the Proposed Project Limits—Alternative 4

	Location	Post Mile (Approx.)	Ramp Improvements
1	Grand Ave. NB Direct-Access Off-Ramp	31.532	X
2	Penn Wy. SB Off-Ramp	32.521	X
3	NB I-5 to NB SR-57 Direct Connector	33.433	X
4	Gene Autry Wy. NB Direct-Access Off-Ramp	35.466	X
5	Gene Autry Wy. SB Direct-Access Off-Ramp	36.309	X
6	Anaheim Blvd. NB Direct-Access Off-Ramp	36.072	X
7	Disneyland Dr. SB Direct-Access Off-Ramp	38.439	X
8	Lincoln Ave. SB Off-Ramp	39.471	X
9	N. Euclid St. NB Off-Ramp	39.263	X
10	NB I-5 to WB SR-91 Direct Connector	41.909	X
11	SB I-5 to EB SR-91 Direct Connector	42.545	X
12	Beach Blvd. SB Off-Ramp	43.680	X
13	Artesia Blvd. NB Off-Ramp	43.996	X
	Total Number of Off-Ramp Improvements:		**13**

EB = Eastbound
I = Interstate
NB = Northbound
SB = Southbound
SR = State Route

2.4.2 Impact to Structures

Alternative 4 would not create new structures (e.g., bridges) but would impact existing retaining walls and create a new retaining wall. Retaining walls would be provided, where required, to minimize and avoid right-of-way acquisition. The affected retaining wall structures and the proposed improvements are summarized in Table 9.

Table 9: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 4

Location	Post Mile	Retaining Wall Improvements		Maximum Length of Extension (Feet)
		Rebuild (R) / New(N)	Type	
SB I-5, South of E. 17th St.	32.521	R*	Special	793
Along NB I-5 to NB SR-57 Direct Connector	34.117	R	Special	479
Along SB SR-57 to SB I-5 Direct Connector	34.124	R	Special	446

Notes: *Retaining Wall/Sound Wall.

I = Interstate
NB = Northbound
SB = Southbound
SR = State Route

2.4.3 Drainage and Water Quality

The same drainage and water quality features described under Alternative 3 would be constructed as part of Alternative 4. These features are detailed in Section 2.3.3, above.

2.4.4 Tolled Components

The same tolling infrastructure described under Alternative 3 would be constructed as part of Alternative 4. This infrastructure is detailed in Section 2.3.4, above.

2.4.5 Transportation Management Plan

The same TMP described under Alternative 2 would be utilized as part of Alternative 4. This infrastructure is detailed in Section 2.2.5, above.

2.4.6 Construction Staging

Stage construction concept plans are currently being developed. However, Alternative 4 would require several 55-hour weekend closures of the SR-57 HOV Connectors to accommodate construction of retaining walls, the median barrier, and concrete pavement. Should Alternative 4 be selected as the Preferred Alternative, detailed stage construction and detour plans would be developed during final design. Detailed stage construction plans and traffic handling plans would also be developed in the final design stage.

2.4.7 Right-of-Way Data

Additional right-of-way (e.g., full acquisition, partial acquisition, aerial easements, temporary construction easements) is not anticipated for the construction of Alternative 4.

2.4.8 Utility and Other Owner Involvement

Underground and above-ground utility conflicts are anticipated within the proposed Project limits. The anticipated utility impacts within the proposed Project limits are summarized in Table 10

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Table 10: Anticipated Impacts to Utilities within the Proposed Project Limits—Alternative 4

No.	Location	Utility Owner and/or Contact Name	Wet (W) / Dry (D)	Utility Type(s)	Utility Conflict Description	H*
1	N. Main St. SB On-Ramp	AT&T	D	Telecom	Roadway Conflict	N/A
2	North of N. State College Blvd.	Pacbell	D	Telecom	Overhead Sign Conflict	N/A
3	North of N State College Blvd.	SCE	W	Electric	Overhead Sign Conflict	N/A
4	N. Euclid St. NB Off-Ramp	City of Anaheim	W	Water	Roadway Conflict	N/A
5	N. Euclid St. SB	City of Anaheim	W	Water	Roadway Conflict	N/A
6	N. Euclid St. SB	Sprint	D	Telecom	Roadway Conflict	N/A
7	North of N. Euclid St. SB	Sprint	D	Telecom	Roadway Conflict	N/A

Notes: H* denotes high-priority utilities based on Chapter 600 of the Caltrans Encroachment Permits Manual.
AT&T = American Telephone and Telegraph Company
Caltrans = California Department of Transportation
N/A = Not Applicable
NB = Northbound
PacBell = Pacific Bell Telephone Company
SB = Southbound
SCE = Southern California Edison

Positive location would be performed for underground utilities in the proposed Project vicinity that may be in close proximity to or conflict with proposed improvements as determined from as-built plans and utility company records.

Relocation or addition of towers are not anticipated for the existing overhead electrical lines.

2.4.9 Nonstandard Design Features (Design Standards Risk Assessment)

A listing of major existing nonstandard design features for Alternative 4 is included in Table 11, below.

Table 11: Design Standards Risk Assessment—Alternative 4

No.	Design Standard	Probability of Design Exception Approval (None, Low, Medium, High)
1	201.1 (Stopping Sight Distance Standards)*	Medium/High
2	201.7 (Decision Sight Distance)**	High
3	301.1 (Lane Width)*	Medium
4	302.1 (Shoulder Width)*	Medium/High
5	305.1 (Median Width Freeways and Expressways-Urban)**	High
6	305.1(3)(a) (Median Width)*	High
7	309.1(3)(a) (Horizontal Clearances for Highways)*	Medium/High
8	504.2(2) (Design of Freeways Entrances and Exits)**	Medium

9	504.7 (Minimum Weave Length)*	High

Notes: *Boldface

**Underline

2.4.10 Sound Walls

The same impacts to sound walls described under Alternative 3 would occur as part of Alternative 4. These are detailed in Section 2.3.10, above.

2.4.11 Transportation System Management/Transportation Demand Management

The same TSM/TDM measures described under Alternative 3 would also be included as part of Alternative 4. These are detailed in Section 2.3.11, above.

2.4.12 Highway Planting

The same highway planting impacts described under Alternative 3 would occur as part of Alternative 4. These are detailed in Section 2.3.12, above.

2.4.13 Erosion Control

The same erosion control impacts described under Alternative 2 would occur as part of Alternative 4. These are detailed in Section 2.2.13, above.

3. FUNDAMENTALS OF TRAFFIC NOISE

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to Caltrans' *Technical Noise Supplement* (TeNS) (September 2013), a technical supplement to the Protocol, that is available on the Caltrans website (http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf).

3.1 Sound Noise and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receptor, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receptor determine the sound level and characteristics of the noise perceived by the receptor. The field of acoustics deals primarily with the propagation and control of sound.

3.2 Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

3.3 Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (µPa). One µPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 µPa. Because of this huge range of values, sound is rarely expressed in terms of µPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is approximately zero dB, which corresponds to 20 µPa.

3.4 Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

3.5 A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an "A-weighted" sound level (expressed in units of dBA) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-weighted levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels. Table 12 describes typical A-weighted noise levels for various noise sources.

Table 12: Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	**— 70 —**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher next room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		

	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

Source: Caltrans 2013.

3.6 Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound; however, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear can discern 1-dB change in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible; however, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Furthermore, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound would generally be perceived as barely detectable.

3.7 Noise Descriptors

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis:

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level ($L_{eq[h]}$) is the energy average of A-weighted sound levels occurring during a 1-hour period and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.
- **Percentile-Exceeded Sound Level (L_n):** L_n represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time).
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period.

- **Day-Night Level (L_{dn}):** L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10:00 p.m. and 7:00 a.m.
- **Community Noise Equivalent Level (CNEL):** Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10:00 p.m. and 7:00 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7:00 p.m. and 10:00 p.m.

3.8 Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the following factors.

3.8.1 Geometric Spreading

Sound from a localized source (i.e., a point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path; hence, they can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source.

3.8.2 Ground Absorption

The propagation path of noise from a highway to a receptor is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receptor, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receptor, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance.

3.8.3 Atmospheric Effects

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) from the highway due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors, such as air temperature, humidity, and turbulence, can also have significant effects.

3.8.4 Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and

the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receptor specifically to reduce noise. A barrier that breaks the line of sight between a source and a receptor will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receptor is rarely effective in reducing noise because it does not create a solid barrier.

4. FEDERAL REGULATIONS AND STATE POLICIES

This report focuses on the requirements of 23 CFR 772, as discussed below.

4.1 Federal Regulations

4.1.1 23 CFR 772

23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23 CFR 772.7, projects are categorized as Type I, Type II, or Type III projects.

- FHWA defines a Type I project as a proposed federal or federal-aid highway project for construction of a highway on a new location or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment of the highway. The following are also considered to be Type I projects:

- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, high-occupancy toll lane, bus lane, or truck climbing lane.

- The addition of an auxiliary lane, except when the auxiliary lane is a turn lane.

- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange.

- Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane.

- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

If a project is determined to be a Type I project under this definition, the entire project area as defined in the environmental document is a Type I project.

A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Under 23 CFR 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor "consider" noise abatement before adoption of the final NEPA document. This process involves (1) identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project; and (2) identification of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the predicted noise level in the design year approaches or exceeds the NAC specified in 23 CFR 772, or a predicted noise level

substantially exceeds the existing noise level (a "substantial" noise increase). 23 CFR 772 does not specifically define the terms "substantial increase" or "approach"; these criteria are defined in the Protocol, as described below.

Table 13 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual or permitted land use in a given area.

Table 13: Activity Categories and Noise Abatement Criteria

Activity Category	Activity $L_{eq[h]}$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	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, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurant/bars, and other developed lands, properties, or activities not included in A–D or F.
F			Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, railyards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G			Undeveloped lands that are not permitted.

Source: 23 CFR Part 772, 2010.

[1] The $L_{eq(h)}$ activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are dBA.

[2] Includes undeveloped lands permitted for this activity category.

4.1.2 Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or Federal-aid highway projects. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA or more. The Protocol also states that a sound level is considered to approach an NAC

level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The Technical Noise Supplement to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

4.2 State Regulations and Policies

4.2.1 California Environmental Quality Act

Noise analysis under CEQA may be required regardless of whether the project is a Type I project. The CEQA noise analysis is completely independent of the 23 CFR 772 analysis done for NEPA. Under CEQA, the baseline noise level is compared to the build noise level. The assessment entails looking at the setting of the noise impact and then how large or perceptible any noise increase would be in the given area. Key considerations include the uniqueness of the setting, the sensitive nature of the noise receptors, the magnitude of the noise increase, the number of residences impacted, and the absolute noise level.

The significance of noise impacts under CEQA is addressed in the environmental document rather than the NSR. Even though the NSR does not specifically evaluate the significance of noise impacts under CEQA, it must contain the technical information that is needed to make that determination in the environmental document.

4.2.2 Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed an Leq[h] of 52 dBA in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the “approach or exceed” NAC criterion for FHWA Activity Category E for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below an Leq[h] of 52 dBA. If the noise levels generated from freeway and non-freeway sources exceed an Leq[h] of 52 dBA prior to construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

5. STUDY METHODS AND PROCEDURES

5.1 Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receptor Locations

A detailed field investigation was conducted to identify frequent outdoor use areas that could be subject to traffic and construction noise impacts from the proposed project and to consider the geometry of the freeway alignment relative to those areas. Land uses in the project area were categorized as defined in Table 13. As stated in the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards, patios and balconies, common use areas at multifamily residences, outdoor sports and recreation areas, outdoor dining areas of restaurants, and school playgrounds.

Noise measurement sites are locations where noise measurements were taken to determine existing noise levels and verify or validate computer noise models. These sites are chosen to be representative of frequent outdoor use areas. Locations that are expected to receive the greatest noise impacts, such as the first row of houses from the noise source, are generally chosen. Noise measurements were mainly conducted in frequent outdoor human use areas along the project alignment with backyard locations held at the highest priority. All measurement sites were selected so there would be no unusual noises from sources such as barking dogs, air conditioners, pool pumps, or children that could affect the measured levels. It is desirable to choose sites that are free of major obstructions or contamination. In some cases, noise measurements were conducted in areas that were considered acoustically equivalent (adjacent to or geometrically similar) to the areas of frequent human use. Reasons that this may have occurred could have been: permission to access properties was not granted, the homeowner was not home, or other noise sources (as listed above) may have influenced the measurement.

5.2 Field Measurement Procedures

Noise measurements were conducted at selected locations to evaluate the existing noise environment and calibrate the traffic noise model. Noise measurements were conducted in conformance with the TeNS and with the guidelines outlined in FHWA's "Measuring of Highway Related Noise," FHWA-DP-96-046.

The following are brief descriptions of the measurement procedures used for this project:

- Microphones were placed approximately 5 feet above the ground and were positioned more than 10 feet from any wall or building to prevent reflections or unrepresentative shielding of the noise.
- Sound-level meters were calibrated before and after each set of measurements.
- Following calibration of equipment, a windscreen was placed over the microphone.
- Frequency weighting was set on "A," and the slow detector response was selected.
- Results of the short-term noise measurements were recorded on data sheets in the field. Long-term measured data were downloaded to the computer for tabulation and graphing.
- During the short-term noise measurements, any noise contaminations, such as barking dogs, aircraft flyovers, or lawn mowers, were noted.
- Traffic was counted for model calibration measurements. Vehicle types were separated into five vehicle groups: automobiles, medium trucks (two-axle with six wheels including dually pick-up trucks were counted as medium trucks), heavy trucks (three or more axle vehicles), buses, or

motorcycles. Average traffic speeds were estimated from either a sample of traffic speeds obtained during each measurement with use of a radar gun or vehicle speed data from the Caltrans Performance Measurement System (PeMS).

- Wind speed, temperature, humidity, and sky conditions were observed and documented during the short-term noise measurements.

The instruments used for the noise measurements included the following:

- Sound-level meters:
  - Bruel & Kjaer SLM 2238
  - Larson Davis models 712 and 720
- Acoustic field calibrators:
  - Larson Davis model CAL 150
  - Bruel & Kjaer 4231
- 4-inch-diameter windscreens, and tripods
- Wind monitor/temperature and humidity gauge—Kestrel 3000 pocket weather meter
- Video camera—digital video cameras for traffic count and vehicle identification recording

Instrumentation serial numbers, calibration data, noise measurement dates and times, noise measurement data, meteorological data, and measurement locations are noted on the noise measurement field forms located in Appendix D.

5.2.1 Short-Term Measurements

WSP staff conducted short-term monitoring at 36 locations between October 15, 2022 and November 30, 2022, using the equipment referenced. The measurements were taken over a 15-minute period at each site. Short-term monitoring was conducted at Activity Category B or C land uses. The short-term measurements were conducted to assess the existing noise environment as well as to calibrate the TNM. The short-term measurement locations are identified in Figures 1 through 22 in Appendix C. Noise measurement field sheets and field photos are in Appendix D.

During the short-term measurements, field staff attended each sound level meter. L_{eq} values collected during the measurement period were logged manually, and any non-traffic-related noise sources (e.g., air conditioning units, aircraft flyovers, and barking dogs) observed during each interval were also identified and logged. Locations were chosen to ensure that the I-5 facility was the dominant source of traffic noise, and any non-traffic noise sources that could potentially contaminate the measured noise levels were avoided.

Calibration of the sound level meter was checked before and after each measurement using acoustic calibrators. Temperature, wind speed, and humidity were recorded manually during the short-term monitoring sessions using a portable weather station. During the short-term measurements, wind speeds, temperature ranges, and relative humidity were recorded in the field sheets (included in Appendix D).

Traffic on the highway facilities as well as any arterial or local roads was either videotaped or classified and counted during short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, heavy-duty trucks, buses, or motorcycles (as discussed above). An automobile is defined as a vehicle with two axles and four tires that is designed primarily to carry passengers. Small vans and light trucks are included in this category. Medium-duty trucks include all cargo vehicles and trucks with two axles and six tires. Heavy-duty trucks include all vehicles with three or more axles. Buses include city buses and school buses. Average traffic speeds on the highway facilities were estimated from either a sample of traffic speeds obtained during each measurement with use of a radar gun or vehicle speed data from the PeMS.

5.2.2 Long-Term Measurements

In addition to the short-term noise measurements, WSP staff conducted long-term monitoring at 11 locations between December 7 and 14, 2022 using field equipment listed above. The purpose of these measurements was to identify variations in sound levels throughout the day and to identify peak noise hours within the study area. The long-term sound-level data was collected for 24-hour periods. Long-term monitoring locations are shown on Figures 1 to 22 in Appendix C. Noise measurement field notes and field photos are provided in Appendix D.

5.3 Traffic Noise-Level Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5) (2004). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). All roadways, barriers, terrain lines, and receiver points are defined by their x, y, and z coordinates. Roadways, terrain lines, and barriers are coded into TNM 2.5 as line segments defined by their end points. Receivers, defined as single points, are typically located at frequent outdoor use areas such as residences, schools, and recreational areas. Receivers are modeled at a height of 4.92 feet for first-story locations, 14.92 feet for second-story locations, and 24.92 feet for third-story locations above their corresponding ground elevation

To determine the noise levels generated by traffic, the TNM 2.5 computer program requires inputs of traffic volumes, speeds, and vehicle types. Three vehicle types were input into the model: cars, medium trucks, and heavy trucks. The propagation path between source and receptor was modeled in TNM 2.5 by specifying special terrain features (such as berms), rows of houses or building structures, existing barriers, retaining walls, and existing property walls. Existing property wall heights were determined by physical measurements of the walls during field visits or by counting the number of blocks as seen on the Street View function of Google Earth/Maps. All other natural obstructions, such as cuts and fills that could affect the future predicted noise levels, were also included in the input file.

Traffic noise is a function of traffic volumes and traffic speed. Noise increases with speed and higher volumes of traffic; however, at higher volumes, speed decreases (stop and go), so the worst-case noise levels are experienced when there is a balance between the volume and speed. For purposes of determining noise impacts, the worst-case traffic noise occurs when traffic is operating at or under LOS C/D conditions. Under these conditions, traffic is heavy but remains free flowing. For the purposes of this report, an LOS C/D traffic volume of 1,950 vehicles per hour per lane (vphpl) was chosen for mainline mixed flow lanes. A volume of 1,500 vphpl (all automobiles) was used for HOV lanes, and a volume of

1,500 vphpl was used for auxiliary lanes. For on- and off-ramps, a volume of 1,000 vphpl was used. Total truck breakdown percentages (medium vs. heavy trucks) were 4% medium and 2% heavy along the mainline, 4% medium only along HOV lanes, and 3% medium and 1% heavy for ramps.

All traffic volumes, truck percentages, and volume distributions used for TNM modeling are presented in Appendix A. Automobile and medium truck volumes were proportionally distributed among the mixed flow lanes, while heavy truck traffic was allocated to the outside two lanes (4 total) or three lanes (5 total) in TNM.

Appendix A presents the comprehensive listing of the existing and future traffic volumes and traffic distribution per direction of travel used for the noise analysis for the Existing, No-Build, and Build Alternative conditions.

5.4 Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receptor locations where predicted design-year noise levels are 12 dB or greater than existing noise levels, or where predicted design-year noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

In California a noise level is considered to approach the NAC for a given activity category if it is within 1 dBA of the NAC. In California a substantial noise increase is considered to occur when the project's predicted worst- hour design-year noise level exceeds the existing worst-hour noise level by 12 dBA or more. The use of 12 dB was established in California many years ago and is based on the concept that a 10 dB increase generally is perceived as a doubling of loudness. A collective decision by Caltrans staff, which was approved by FHWA, was made to use 12 dB.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at impacted receptor locations is predicted with implementation of the abatement measures. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations.

The overall reasonableness of noise abatement is determined by the following three factors:

- The noise reduction design goal.
- The cost of noise abatement.
- The viewpoints of benefited receptors (including property owners and residents of the benefited receptors).

The Caltrans' acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one benefited receptor. This design goal applies to any receptor and is not limited to impacted receptors.

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. Based on 2022 construction costs an allowance of $107,000 is provided for each benefited receptor (i.e., receptors that receive at least 5 dB of noise reduction from a noise barrier). The total allowance for each barrier is calculated by multiplying the number of benefited receptors by $107,000. If the estimated construction cost of a barrier is less than the total calculated allowance for the barrier, the barrier is considered reasonable from a cost perspective. The viewpoints of benefited receptors are determined by a survey that is typically conducted after completion of the noise study report. The survey solicits viewpoints either to approve or oppose the proposed noise abatement. The process for conducting the survey is described in detail in the Protocol.

The noise study report identifies traffic noise impacts and evaluates noise abatement for acoustical feasibility. It also reports information that will be used in the reasonableness analysis including if the 7 dB design goal reduction in noise can be achieved and the abatement allowances. The noise study report does not make any conclusions regarding reasonableness. The feasibility and reasonableness of noise abatement is reported in the Noise Abatement Decision Report (NADR).

6. EXISTING NOISE ENVIRONMENT

6.1 Existing Land Uses

A detailed field investigation was conducted by WSP staff to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. The following land uses were identified in the project area:

- Single- and multi-family residences: Activity Category B
- Recreation, schools, and day care facilities: Activity Category C
- Commercial retail uses: Activity Category E

As required by the Protocol, noise abatement is considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses primarily on locations with defined outdoor activity areas, such as residential backyards, common use areas at multi-family residences, parks, schools, golf courses, outdoor dining areas of restaurants, and churches.

For the purpose of this NSR, the study area is divided into three project segments and 28 separate NSAs:

NSA 1 – Redhill to Newport Northbound Side

Land uses in this NSA are primarily residential (Activity Category B). Other land uses include high school and day care facility (Activity Category C) and commercial (Activity Category E). Twenty-two (22) modeled receivers, — M-S1A-A-NB1 through M-S1A-A-NB22— representing 39 receptors, are located within this NSA as well as an additional measurement location— FM1. Thirty-two (32) of the receptors are Activity Category B, five (5) are Activity Category C and two (2) are Activity Category E. Measurement location FM1 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified in the northwest quadrant of Redhill/I-5 and along the southeast quadrant of the I-5/Newport Avenue; however, most of the modeling sites had no frequently used outdoor use. Land uses are generally below grade from I-5 with an existing soundwall located along the northbound edge-of-shoulder of the I-5 which provides shielding to the land uses. There are two existing sound walls both are existing state-owned walls (ESW) in NSA 1, ESW-1 which is 10-foot high and approximately 413-foot long, located on the edge-of-shoulder of the northbound on-ramp from Redhill, and ESW-2, which is 10-foot high and approximately 1,890-foot long, on the northbound edge-of-shoulder.

NSA 2 – Redhill to Newport Southbound Side

Land uses in this NSA are primarily residential (Activity Category B) with a few commercial (Activity Category E). Forty-nine (49) modeled receivers—M-S1A-B-SB1 through M-S1A-B-SB49—representing 76 receptors, are located within this NSA as well as additional measurement locations— FM1 and LT-1. Seventy-two (72) of the receptors are Activity Category B, two (2) are Activity Category C. Measurement locations FM1 and LT-1 are not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were identified in the southwest quadrant of Redhill/I-5 and along the southeast quadrant of the I-5/Newport Avenue. Land uses are generally below grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder which provides shielding to the land uses. There are two existing soundwalls within NSA 2. Soundwall ESW-3 is 10-foot high and approximately 408-foot long, located

the southbound off-ramp to Red Hill Avenue, and ESW-4. ESW-4 is 10-foot high and approximately 2,192-foot long, located on the southbound edge-of-shoulder.

NSA 3 – Newport to SR55 Northbound Side

Land uses in this NSA are primarily residential and outdoor use (Activity Category B & C) with a few commercial (Activity Category E). Forty-nine (49) modeled receivers—M-S1A-C-NB1 through M-S1A-C-NB41—representing 54 receptors, are located within this NSA as well as additional measurement locations— FM3 and FM5. Fifty-one (51) of the receptors are Activity Category B, three (3) are Activity Category C. Measurement locations FM3 and FM5 are not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were identified in the northwest quadrant of Newport Avenue/I-5. Land uses are slightly below grade from I-5 with an existing soundwall located along the northbound freeway edge-of-shoulder which provides shielding to the land uses. There are three existing soundwalls in NSA 3, one existing private wall (EPW) and two existing state-owned walls (ESW). EPW-1 is an 18-foot high, 695-foot long private wall, outside the northbound right-of-way. ESW-5 is a 12-foot high, approximately 508-foot barrier on the north bound EOS and ESW-6 is a 10- to 14-foot high, approximately 1,234-foot long wall, located on the edge-of-shoulder of the northbound I-5 to the northbound SR-55 ramp.

NSA 4 – Newport to SR55 Southbound Side

Land uses in this NSA are primarily residential and outdoor use (Activity Category B & C) with a few commercial (Activity Category E). Fifty-seven (57) modeled receivers—M-S1A-D-SB1 through M-S1AD-SB57—representing 101 receptors, are located within this NSA as well as additional measurement location— FM4. Ninety-seven (97) of the receptors are Activity Category B, four (4) are Activity Category C. Measurement location FM4 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified in the southwest quadrant of Newport Avenue/I-5. Land uses are generally below grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder which provides shielding to the land uses. There are four existing barriers in NSA 4, two private walls and two existing soundwalls. EPW-2 is a 6-foot high, approximately 880-foot long, backyard wall located south of Nisson Road. EPW-3 is a 16-foot high, approximately 651-foot long, wall located south of the I-5/SR55 Interchange. The two existing sound walls are, ESW-7, a 6- to 12-foot high, approximately 2,230-foot long wall on the edge-of-shoulder of the southbound I-5 off-ramp to Newport Avenue, and ESW-8, a 12-foot high, approximately 434-foot long wall located on the edge-of-shoulder of the southbound SR-55 to southbound I-5 ramp.

NSA 5 – SR55 to Grand Avenue Northbound Side

Land uses in this NSA are primarily residential, outdoor use, school facilities (Activity Category B & C) and commercial (Activity Category E). Ninety-four (94) modeled receivers—M-S1B-NB1 through M-S1B-NB95—representing 99 receptors, are located within this NSA as well as additional measurement locations— FM7, FM9 and LT-3. Eight-five (85) of the receptors are Activity Category B, 13 are Activity Category C. Measurement locations FM7, FM9 and LT-3 are not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were identified along the northbound side of the I-5, north and south of First Street. Land uses are below the grade of the I-5 near SR-55 and Main Street with an existing soundwall located along the northbound edge-of-shoulder of the SR55 to I-5 connector ramp which provides shielding to the land uses. As I-5 travels north to Grand Avenue, the land uses are generally above grade from I-5 with an existing soundwall located along the northbound side which provides shielding to the land uses. The existing barriers in NSA 5 are ESW-9 and ESW-10. ESW-9 is 10- to 14-foot high and approximately 1,112-foot

long, located on the edge-of-shoulder of the northbound SR-55 to I-5 ramp. ESW-10 is 10- to 12-foot high and approximately 3,243-foot long, located northbound edge-of-shoulder between 4th Street and Grand Avenue.

NSA 6 – SR55 to Grand Avenue Southbound Side

Land uses in this NSA are primarily residential and outdoor use (Activity Category B & C) and commercial (Activity Category E). Ninety-two (92) modeled receivers—M-S1B-SB1 through M-S1B-SB96—representing 62 receptors, are located within this NSA as well as additional measurement locations— FM6, FM8 and LT-2. One hundred six (106) of the receptors are Activity Category B, two (2) are Activity Category C and three (3) are Activity Category E. Measurement locations FM6, FM8 and LT-2 are not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were identified along the southbound side of I-5 freeway from north of Fourth Street to south of First Street. Land uses are slightly below grade from I-5 with an existing soundwall located along the southbound I-5 edge-of-shoulder which provides shielding to the land uses. There are two existing sound walls in NSA 6, ESW-11, which is 12- to 16-foot high and approximately 3,390-foot long located along the right shoulder of the southbound I-5 on-ramp from 1st St and along the edge-of-shoulder/right-of-way of southbound I-5 connector to SR-55 and ESW-12, which is 12- to 14-foot high and approximately 2,664-foot long located along the southbound I-5 edge-of-shoulder.

NSA 7 – Grand Avenue to 17th Street Northbound Side

Land uses in this NSA are primarily residential (Activity Category B) and commercial (Activity Category E). Fifty-eight (58) modeled receivers—M-S1C-NB1 through M-S1C-NB58—representing 63 receptors, are located within this NSA as well as an additional measurement location— FM11. Sixty-three (63) of the receptors are Activity Category B. Measurement location FM11 is not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were identified along the northbound side of I-5, along Lincoln Avenue. Land uses are above grade from I-5 with an existing soundwall located along the northbound I-5 freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are two existing sound walls in NSA 7, ESW-13, which is 12- to 14-foot high and approximately 1,305-foot long and ESW-14, which is 14-foot high and 1,127-foot long.

NSA 8 – Grand Avenue to 17th Street Southbound Side

Land uses in this NSA are primarily commercial (Activity Category E) with pockets of residential (Activity Category B). Fifteen (15) modeled receivers—M-S1C-SB1 through M-S1C-SB15— representing 15 receptors, are located within this NSA as well as an additional measurement location— FM10. Fifteen (15) of the receptors are Activity Category B. Measurement location FM10 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified along most of the southbound side of I-5 in this NSA. Land uses are above grade from I-5 with no existing soundwalls located along the southbound right-of-way. There are two existing private walls in NSA 8, EPW-4, which is 5- to 6-foot high and approximately 243-foot long, between Lincoln Avenue and Logan Street. The other private wall is EPW-5, which is 5 feet tall and 577-foot long, located south of Penn Way.

NSA 9 – 17th Street to Main Street Northbound Side

Land uses in this NSA are primarily residential (Activity Category B) and commercial (Activity Category E). Fifty-eight (58) modeled receivers—M-S1D-NB1 through M-S1D-NB103— representing 105 receptors, are located within this NSA as well as additional measurement locations— FM12 and LT-4. One hundred five (105) of the receptors are Activity Category B. Measurement locations FM11 and LT-4 are not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were

identified along the northbound side of I-5, along 17th Street. Land uses are generally above grade from I-5 with an existing soundwall located along the northbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are three existing sound walls in NSA 9 and two private walls. ESW-15 is 12-foot high and approximately 936-foot long, located on the northbound EOS. ESW-16 is 12-foot high and approximately 602-foot long, located on the EOS of the northbound on-ramp from westbound 17th Street. ESW-17 is 14-foot high and approximately 3,650-foot long, it is located on the top of the northbound slope between 17th Street and Main Street. EPW-6 is a 10-foot high, approximately 287-foot private wall located at the top of slope of the northbound on-ramp from 17th Street. EPW-7 is 6-foot high, approximately 156-foot long, located along Main Steet, south of Edgewood Road.

NSA 10 – 17th Street to Main Street Southbound Side

Land uses in this NSA are primarily residential (Activity Category B), school playground (Activity Category C) and commercial (Activity Category E). Fifty-eight (58) modeled receivers—M-S1D-SB1 through M-S1D-SB633 representing 81 receptors, are located within this NSA as well as an additional measurement location— FM13. Eighty-one (81) of the receptors are Activity Category B. Measurement location FM13 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified along the southbound side of I-5, along 17th Street. Land uses are generally below grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There is one existing soundwall, ESW-18, is 12-foot high and approximately 1,965-foot long, located on the southbound top of slope and edge-of-shoulder.

NSA 11 – Main Street to SR57 Interchange - Northbound Side

Land uses in this NSA are primarily commercial (Activity Category E), hotel pool (Activity Category E) and residential (Activity Category B). Seven (7) modeled receivers—M-S1E-NB1 through M-S1E-NB7— representing 13 receptors, are located within this NSA. While commercial land uses were identified along most of the northbound side of I-5, 12 receptors are Activity Category B and one (1) is Activity Category E Land uses are generally at or above grade from I-5 with an existing soundwall located along the northbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are two existing soundwalls in NSA 11. ESW-19 is 6-foot high and approximately 161-foot long, located along the edge-of-shoulder of the northbound I-5 between Main Street and Broadway, just north of the Discovery Center. ESW-20 is 16-foot high and approximately 993-foot long along the right-of-way of the I-5/SR-57/SR-22 interchange.

NSA 12 – Main Street to SR57 Interchange - Southbound Side

Land uses in this NSA are primarily residential (Activity Category B). One-hundred and eleven (111) modeled receivers—M-S1E-SB1 through M-S1D-SB111— representing 171 receptors, are located within this NSA as well as additional measurement locations— FM14, FM 15 and LT-5. All 171 of the receptors are Activity Category B. Measurement locations FM14, FM15, and LT-5 are not directly representative of noise-sensitive land uses and are for monitoring and validation purposes only. Commercial land uses were identified along the southbound side of the I-5, between Main Street and North Broadway. Land uses are generally at or below grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are three existing sound walls in NSA 12. ESW-21 is 8- to 16-foot high and approximately 4,703-foot long located along the southbound right-of-way and on to southbound off-ramp to Broadway. ESW-22 is 14-foot high and approximately 1,329-foot long, located along the eastbound SR-22. EPW-8 is 20-foot high and approximately 1,291-foot long, located behind a portion of ESW-21.

SEGMENT 2

NSA 13 – SR57 Interchange to Katella Northbound Side

Land uses in this NSA are primarily commercial (Activity Category E), hotel pool (Activity Category E), residential (Activity Category B) and outdoor use (Activity Category C). Five (5) modeled receivers—M-S2A-NB1 through M-S2A-NB5 — representing 171 receptors, are located within this NSA. Two (2) receptors are Activity Category B, two (2) are Activity Category C and one (1) is Activity Category E. Commercial land uses were identified along most of the northbound side of I-5. Land uses are generally below grade from I-5 with no existing soundwalls are located along the northbound I-5 freeway edge-of-shoulder or right-of-way.

NSA 14 – SR57 Interchange to Katella Southbound Side

Land uses in this NSA are mix of residential (Activity Category B) and commercial (Activity Category E). Other land uses include a medical center (UCI Medical Center), memorial park and mortuary (Melrose Abbey) and public services (Orange County Court, Juvenile Hall, and Justice Center). There are fifty-seven (57) modeled receivers —M-S2A-SB1 through M-S2A-SB51— representing 72 receptors, are located within this NSA, along with measurement locations—FM17, FM18 and LT-6. There are 64 Activity Category B receptors, six (6) Activity Category C and two (2) Activity Category E receptors. Measurement locations FM17, FM18 and LT-6 are not directly representative of a noise sensitive land use and are for monitoring and validation purposes only. Land uses are generally below grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are five existing sound walls in NSA 14. ESW-23 is 14-foot high and approximately 524-foot long, located on the southbound I-5 edge-of-shoulder to the westbound SR-22 ramp. ESW-24 is 12- to 14-foot high and approximately 2,118-foot long, located on the southbound I-5 ramp edge-of-shoulder to eastbound and westbound SR-22. ESW-25 is 10-foot high and approximately 703-foot long, located on the edge-of-shoulder of the southbound on-ramp from Chapman Avenue. ESW-26 is 12- to 14-foot high and approximately 3,224-foot long and runs on the edge-of-shoulder of the southbound off-ramp to The City Drive. ESW-27 is 12-foot high and approximately 1,185-foot long, located on the southbound edge-of-shoulder near the Katella Avenue interchange. There are three existing private walls in NSA 14. EPW-9 is 8-foot high and approximately 345-foot long, located in front of the mobile homes represented by receiver Seg2-SB-33. EPW-10 is 16-foot high and approximately 302-foot long located south of Manchester Avenue by the mobile homes, with receiver Seg2-SB-47. EPW-11 is 16-foot high and approximately 228-foot long and located south of Manchester Avenue.

NSA 15 – Disney Way/Katella Avenue to Harbor Northbound Side

Land uses in this NSA are primarily residential (Activity Category B). There are fifty-three (53) modeled receivers —M-S2B-NB24 through M- S2B-NB76 — representing 149 receptors, are located within this NSA, along with measurement locations—FM20 and LT-7. There are 148 Activity Category B receptors and one (1) Activity Category E receptor. Measurement locations FM20 and LT-7 are not directly representative of a noise sensitive land use and are for monitoring and validation purposes only. Land uses are generally at or above grade from I-5 with an existing soundwall located along the northbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There is one (1) existing sound wall in NSA 15. ESW-28 is 10 to 16 feet high and approximately 3,658 feet long. ESW-18 is located on the NB EOS of the off-ramp to Harbor Boulevard.

NSA 16 – Disney Way/Katella Avenue to Harbor Southbound Side

Land uses in this NSA are primarily commercial, including hotels and hotel pools (Activity Category E) and residential (Activity Category B). The residential land uses are located in pockets throughout the southbound side of I-5. There are six (6) modeled receivers —M-S2B-SB52 through M- S2B-SB57 — representing 6 receptors,

that are within this NSA, along with one measurement location—FM19. There is one (1) Activity Category B receptor, one (1) Activity Category C receptor and four (4) Activity Category E receptors. Measurement location FM19 is not directly representative of a noise sensitive land use and is for monitoring and validation purposes only. Land uses are generally below grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder which provides shielding to the land uses. The existing sound wall, ESW-29, is 6-foot high and approximately 1,043-foot long. The barrier is located on the southbound edge-of-shoulder between the southbound on-ramp from Harbor Boulevard to Manchester Ave.

NSA 17 – Harbor to Lincoln Northbound Side

Land uses in this NSA are primarily residential (Activity Category B) and commercial (Activity Category E), including a hotel pool (Activity Category E). There are eighty-four (84) modeled receivers—M-S2C-NB76 through M-S2C-NB159—representing 186 receptors, that are within this NSA, along with measurement locations—FM21, FM23 and LT-8. There are 184 Activity Category B receptors, one (1) Activity Category C and one (1) Activity Category E receptor. Measurement locations FM21, FM23 and LT-8 are not directly representative of a noise sensitive land use and are for monitoring and validation purposes only. Land uses are generally at or above grade from I-5 with an existing soundwall located along the northbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are five existing sound walls and two private walls in NSA 17. ESW-30 is 16-foot high and approximately 836-foot long, it is located on the edge-of-shoulder of the northbound on-ramp from Harbor Boulevard. ESW-31 is 16-foot high and approximately 718-foot long, on the edge-of-shoulder of the northbound on-ramp from Ball Road. ESW-32 is 14- to 16-foot high and approximately 3,128-foot long, located on the northbound top of slope between I-5 and the residences. ESW-33 is 16-foot high and approximately 758-foot long, located on the northbound top of slope between I-5 and the residences. ESW-34 is 16-foot high and approximately 986-foot long, located on the northbound top of slope between I-5 off ramp to Lincoln and the residences.

NSA 18 – Harbor to Lincoln Southbound Side

Land uses in this NSA are primarily residential (Activity Category B), recreational (Activity Category C), and commercial (Activity Category E), including a hotel pool. There are forty-five (45) modeled receivers—M-S2C-SB58 through M-S2C-SB102—representing 57 receptors, that are located within this NSA, along with 2 measurement locations—FM22 and FM24. There are 54 Activity Category B receptors and three (3) Activity Category C receptors. Measurement locations FM22 and FM24 are not directly representative of a noise sensitive land use and are for monitoring and validation purposes only. Land uses are generally at or above grade from I-5 with an existing soundwall located along the southbound edge-of-shoulder and right-of-way which provides shielding to the land uses. The existing soundwall, ESW-35, is 10- to 16-foot high and approximately 2,360-foot long. ESW-35 is located on the southbound top of slope between the I-5 and Manchester Ave and on to the edge-of-shoulder of the southbound off-ramp to Disneyland Drive.

NSA 19 – Lincoln to La Palma Northbound Side

Land uses in this NSA are primarily residential (Activity Category B), recreational (Activity Category C), and commercial (Activity Category E), including a hotel pool. There are eighty-three (83) modeled receivers—M-S2D-NB161 through M-S2D-NB243—representing 117 receptors, that are within this NSA, along with four additional measurement locations—FM25, FM26, FM27 and LT-9. One hundred fourteen (114) of the receptors are Activity Category B and three (3) are Activity Category C. Measurement locations FM25, FM26, FM27 and LT-9 are not directly representative of a noise sensitive land use and are for monitoring and validation purposes

only. Land uses are generally at or above grade from I-5 with an existing soundwall located along the northbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. There are six existing sound walls in NSA 19. ESW-36 is 16-foot high and approximately 2,336-foot long, the wall is on northbound top of slope from Lincoln Avenue to the northbound off-ramp to Euclid. ESW-37 is 16-foot high and approximately 1,336-foot long, it is along the northbound top of slope to the northbound edge-of-shoulder from the northbound I-5 on-ramp from Euclid. ESW-38 is 16-foot high and approximately 2,114-foot long, it is along the northbound top of slope from Westmont Drive to Greenleaf Avenue. ESW-39 is 16-foot high and approximately 2,114-foot long, it is along the northbound top of slope from Westmont Drive to Greenleaf Avenue. ESW-40 is 10-foot high and approximately 701-foot long, it is along the northbound top of slope of the northbound off-ramp to La Palma Avenue. ESW-41 is 10- to 16-foot high and approximately 933-foot long, it is along the northbound edge-of-shoulder of the northbound I-5 off-ramp to La Palma Avenue.

NSA 20 – Lincoln to La Palma Southbound Side

Land uses in this NSA are primarily commercial (Activity Category E) with an area of residential (Activity Category B) and recreational (Activity Category C) between Brookhurst Street and La Palma Avenue. There are fifteen (15) modeled receivers—M-S2D-SB104 through M-S2D-SB118— representing 22 receptors, that are within this NSA, along with an additional measurement location—FM28. Twenty-one (21) receptors are Activity Category B and one (1) is Activity Category C. Measurement location FM28 is not directly representative of a noise sensitive land use and is for monitoring and validation purposes only. Land uses are generally at grade from I-5 with an existing soundwall located along the southbound freeway edge-of-shoulder and right-of-way which provides shielding to the land uses. The existing noise barrier ESW-42 is 14- to 16-foot high and approximately 1,571-foot long.

NSA 21– La Palma to SR91 Interchange Northbound Side

Land uses in this NSA are primarily residential (Activity Category B). There are sixty-eight (68) modeled receivers—M-S2E-NB244 through M-S2E-NB311— representing 114 receptors, that are within this NSA, along with three additional measurement locations—FM29, FM30 and LT-10. The 114 receptors are all Activity Category B. Measurement locations FM29, FM30 and LT-10 are not directly representative of a noise sensitive land use and are for monitoring and validation purposes only. Land uses are generally at or above grade from I-5 with an existing soundwall located along the northbound edge-of-shoulder and right-of-way which provides shielding to the land uses. There are three existing noise walls in NSA 21. ESW-43 is 16-foot high and approximately 4,503 feet long and located on the edge-of-shoulder of the northbound on-ramp from Brookhurst Avenue, then along the right-of-way to the northbound I-5 off-ramp to the westbound SR-91. ESW-44 is 12-foot high and approximately 1,177-foot long and located on the edge-of-shoulder of the northbound I-5 off-Ramp to the westbound SR-91 on-ramp. ESW-45 is 14- to 16-foot high and approximately 325-foot long and located on the edge-of-shoulder between the northbound I-5 and the northbound off-ramp to the westbound SR-91.

NSA 22 – La Palma to SR91 Interchange Southbound Side

Land uses in this NSA are primarily commercial (Activity Category E) with an area of residential (Activity Category B) along the eastbound SR-91 ramp to southbound I-5. There are six (6) modeled receivers—M-S2E-SB117 through M-S2E-SB122— representing 19 receptors, that are within this NSA, along with an additional measurement location—FM21. All 19 receptors are Activity Category B. Measurement location FM21 is not directly representative of a noise sensitive land use and is for monitoring and validation purposes only. There are no existing barriers in NSA 22.

SEGMENT 3

NSA 23 – SR91 to Stanton Avenue Northbound Side

Land uses in this NSA are primarily commercial (Activity Category E) with one area of residential (Activity Category B) located at the intersection of Auto Center Drive and Dale Street. Thirty-eight (38) modeled receivers—M-S3A-NB1 through M-S3A-NB-38—representing 43 receptors, are located within this NSA as well as an additional measurement location— FM32. All 43 receptors are Activity Category B. Measurement location FM32 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Land uses are at or above grade from I-5 with no existing soundwalls located along the northbound right-of-way. There are no existing soundwalls in NSA 23.

NSA 24 – SR91 to Stanton Avenue Southbound Side

Land uses in this NSA are primarily commercial (Activity Category E) with one area of residential (Activity Category B) located along Utah Avenue. Twenty-six (26) modeled receivers— M-S3B-SB1 through M-S3B-SB-26—representing 26 receptors, are located within this NSA as well as an additional measurement location— FM33. All 26 receptors are Activity Category B. Measurement location FM33 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified along the southbound side of the I-5 on both sides of the residential area in this NSA. Land uses are above grade from I-5 with an existing soundwall located along the southbound side of I-5 between the railroad tracks and the residential properties providing shielding to the homes. There are two existing sound walls in NSA 24, ESW-46 and ESW-47. ESW-46 is 12- to 16-foot high and approximately 591-foot long. It is located on the southbound I-5 edge-of-shoulder. ESW-47 is 16-foot high and approximately 1,201-foot long. It is between the railroad tracks and the homes.

NSA 25 – Stanton Avenue to Beach Boulevard Northbound Side

First row uses in this NSA are all commercial (Activity Category E). Residential land use is located north of Auto Center Drive, second and third row from I-5, along Homewood Avenue and 8th Street. Seventeen (17) modeled receivers— M-S3C-NB1 through M-S3C-NB17— representing 17 receptors, are located within this NSA as well as an additional measurement location— FM35. All 17 receptors are Activity Category B. Measurement location FM32 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Land uses are at or above grade from I-5 with no existing soundwalls. There are no existing soundwalls in NSA 25.

NSA 26 – Stanton Avenue to Beach Boulevard Southbound Side

First row uses in this NSA are all commercial (Activity Category E). Residential land use is located south of 9th, second and third row from I-5, along Pinchot Court. Sixteen (16) modeled receivers—M-S3D-SB1 through M-S3D-SB16— representing 16 receptors, are located within this NSA as well as an additional measurement location— FM34. All 16 receptors are Activity Category B. Measurement location FM34 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified along the entire I-5 southbound side frontage in this NSA. Land uses are at or above grade from I-5 with no existing soundwalls. There are no existing soundwalls in NSA 26.

NSA 27 – Beach Boulevard to Artesia Northbound Side

Land uses in this NSA are all commercial (Activity Category E). No noise sensitive land uses were identified, so there are no modeling sites or additional measurement locations in this NSA.

NSA 28 – Beach Boulevard to Artesia Southbound Side

Land uses in this NSA are primarily commercial (Activity Category E) with one area of residential (Activity Category B) located along 8 Street, between Beach Boulevard and Western Avenue. Twenty-nine (29) modeled receivers—M-S3E-SB17 through M-S3E-SB45— representing 29 receptors, are located within this NSA as well as an additional measurement location— FM36. All 29 receptors are Activity Category B. Measurement location FM36 is not directly representative of noise-sensitive land uses and is for monitoring and validation purposes only. Commercial land uses were identified along the entire southbound side of I-5 on both sides of the residential area in this NSA. Land uses are above grade from I-5 with an existing soundwall (ESW-48) located along the southbound side of I-5 between the freeway and adjacent railroad tracks and the residential properties providing shielding to the homes. ESW-48 is 16-foot high and approximately 1,098-foot long.

6.2 Noise Measurement Results

Frequent outdoor use areas that might be impacted by the proposed project include single- and multi-family residences, fields or outdoor play areas at schools, churches, parks, and outdoor seating areas that are close to the project corridor. Noise measurements were taken at 47 representative locations within the project study area for use in evaluating the existing noise environment and in validating the noise prediction model. Short-term measurements were conducted at 36 locations for a total duration of 20 minutes each, and long-term measurements were completed at 11 locations. The measured noise levels associated with each of these locations is included in Table 14 and Table 15.

6.2.1 Short- and Long-Term Monitoring

Results for the short- and long-term measurements are presented in Table 14 and Table 15: , respectively. Also included in the tables is the land use type for each of the measurement sites. The figures in Appendix C delineates the measurement locations. Noise measurement data sheets recorded in the field are included in Appendix D.

6.3 Traffic Noise Model Validation

Short-term noise measurement locations (36 in total) were used for model calibration. During the validation measurements, traffic volumes and speeds along the I-5 mainline and connectors were concurrently recorded (where it was feasible to obtain).

Traffic volumes along local arterials and on- and off-ramps were also recorded for the purposes of validation. The traffic counts were tabulated according to five vehicle types: automobiles, medium trucks (two-axle with six wheels including dual pick-up trucks), heavy trucks (three or more axle vehicles), motorcycles, and buses. All validation traffic volumes and distributions used for TNM modeling are presented in Appendix A.

Flow control was used for speeds along on-ramps up to the mainline speed in the outside lanes. For off-ramps, the outside lane speed was used and then manually ramped down. These speeds were used along with the recorded traffic volumes. Traffic volumes recorded during the field measurements were manually counted and normalized to 1-hour volumes based on the time interval of the measurement. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source strength at the roadways during the actual measurement periods.

After inputting the traffic counts, site geometry, and any other pertinent existing features, noise levels at the calibration sites were calculated in the TNM modeling software.

The modeled noise levels were compared to the measured levels where discrepancies were studied to determine if the TNM needed to be adjusted or whether a validation factor (K-factor) was more applicable. As stated in the 2013 TeNS, to account for deviations between measured and modeled noise levels found during the model validation process, K-factors were included to adjust any deviations between modeled and measured noise levels.

The validation results of noise measurement locations are shown in Table 16. Multiple refinements were made to the noise models; however, due to the complexity of the topography within the proposed project area, K-factors of any deviation between modeled and measured noise levels were applied to monitoring locations. Traffic counts taken during the field measurements and calculated traffic volumes as discussed above are provided in Appendix A.

Table 14: Short-Term Noise Measurement Results

Site No.[1]	Address	Noise Analysis Area	Land Use[2]	Activity Category and (NAC)	Meter Location	Measurement Dates	Start Time	Measured $L_{eq(h)}$ (dBA)
FM1	1361 El Camino Real	1	MFR	B (67)	Sidewalk	11/30/2022	10:20am	66.1
FM2	14011 Charloma Dr	2	SFR	B (67)	Sidewalk in front of house	11/30/2022	10:50am	63.2
FM3	1102 Edgeton Ct	3	Condo	B (67)	Sidewalk in front of condo unit	11/30/2022	11:25am	66.4
FM4	17222 Nisson Rd	4	MFR	B (67)	Sidewalk in front of complex	11/30/2022	11:55am	58.4
FM5	600 W 6th St	3	Place of Worship	C (67)	Sidewalk adjacent to property	11/30/2022	12:20pm	68.4
FM6	125 E Coranado Ln	6	Mobile Homes	B (67)	In front of mobile home	11/29/2022	2:15pm	60.2
FM7	16882 Stoneglass	5	Apartment	B (67)	Sidewalk in front of complex	11/29/2022	1:55pm	63.5
FM8	621 Patricia Ln	6	Park	C (67)	Middle of park	11/29/2022	12:15pm	64.8
FM9	1541 S Stafford St	5	SFR	B (67)	Sidewalk in front of house	11/29/2022	11:35am	65.5
FM10	1329 N Custer St	8	SFR	B (67)	Sidewalk in front of house	11/29/2022	11:00am	66.7
FM11	1546 N Fairmont St	7	SFR	B (67)	Sidewalk in front of house	11/29/2022	10:30am	65.9
FM12	306 22nd St	9	SFR	B (67)	Sidewalk in front of house	11/29/2022	10:00am	63.3
FM13	221 20th St	10	SFR/MFR	B (67)	Sidewalk in front of house	11/18/2022	1:52pm	64.5

FM14	2357 N Riverside Dr	12	SFR	B (67)	Sidewalk in front of house	11/18/2022	1:10pm	58.6
FM15	715 W Pepper Tree Ln	12	SFR	B (67)	Sidewalk in front of house	11/18/2022	10:55am	62.3
FM16	3099 W Chapman Ave	13	MFR	B (67)	Sidewalk in front of pool	11/18/2022	12:15pm	65.0
FM17	2303 S Manchester Ave	14	Cemetery	C (67)	In front of church building	11/17/2022	2:30pm	61.3
FM18	1835 S Manchester Ave	14	Mobile Homes	B (67)	Adjacent to mobile home	11/17/2022	2:00pm	58.0
FM19	1441 S Manchester Ave	16	Hotel	E (72)	Sidewalk in front of building	11/17/2022	12:20pm	74.1
FM20	412 W Guinida St	15	MFR	B (67)	Sidewalk in front of building	11/17/2022	12:00pm	66.8
FM21	837 W Cotton Wood Cir	17	Park	C (67)	Middle of park	11/17/2022	11:10am	66.4
FM22	1106 W South St	18	SFR	B (67)	Sidewalk in front of house	11/17/2022	10:45am	67.5
FM23	1136 W Fay Ln	17	MFR	B (67)	Sidewalk in front of building	11/17/2022	10:15am	61.1
FM24	1280 W Santa Ana St	18	Park	C (67)	Middle of park	11/15/2022	2:15pm	62.9
FM25	216 North Wilshire Ave	19	SFR	B (67)	Sidewalk in front of building	11/15/2022	1:40pm	69.0
FM26	1860 W Cresent Ave	19	MFR	B (67)	Sidewalk in front of building	11/15/2022	12:40pm	63.2
FM27	2144 Fir Ave	19	SFR	B (67)	Sidewalk in front of house	11/15/2022	11:35am	61.6
FM28	1008 Monterey St	20	SFR	B (67)	Sidewalk in front of house	11/15/2022	10:20AM	61.1
FM29	1190 Ventura St	21	SFR	B (67)	Sidewalk in front of house	11/15/2022	9:50am	65.3
FM30	2533 Avondale Pl	21	MFR	B (67)	Sidewalk in front of house	11/15/2022	9:20am	64.2

FM31	1437 N Wildwood Ln	22	MFR	B (67)	Sidewalk in front of building	10/26/2022	2:00pm	60.4
FM32	6918 Dale St	23	MFR	B (67)	Gate in front of building	10/26/2022	12:30pm	71.2
FM33	8161 Utah Ave	24	SFR	B (67)	Sidewalk in front of house	10/26/2022	12:00am	56.7
FM34	7942 Pinchot Ct	26	MFR	B (67)	Sidewalk in front of building	10/26/2022	11:30am	59.9
FM35	6410 Homewood Ave	25	SFR	B (67)	Sidewalk in front of house	10/26/2022	10:45am	62.1
FM36	6481 Fullerton Ave	28	SFR	B (67)	Sidewalk in front of house	10/26/2022	10:15am	56.6

[1] See Figures in Appendix C for the measurement location.

[2] Comm = commercial; MFR = multifamily residential; Rec = recreational; SFR = single-family residential.

Table 15: Long-Term Noise Measurement Results

Site No.[1]	Address	Area	Land Use[2]	Activity Category and (NAC)	Meter Location	Measurement Dates	Start Time	Duration (hours)	Measured Worst-Hour $L_{eq(h)}$ (dBA)
LT-1	14082 Del Amo Dr, Tustin, CA 92780	2	Residential	B (67)	Front Yard along sidewalk	12/14/2022 - 12/15/2022	11:00	24	67.8
LT-2	102 Portola Lane, Tustin, CA 92780	6	Residential	B (67)	Front of Mobile home	12/14/2022 - 12/15/2022	11:00	24	63.5
LT-3	812 Concord Street, Santa Ana, CA 92701	5	Residential	B (67)	Front Yard along sidewalk	12/14/2022 - 12/15/2022	10:00	24	69.0
LT-4	2211 N Spurgeon Street, Santa Ana, CA 92706	9	Residential	B (67)	Front Yard along sidewalk	12/14/2022 - 12/15/2022	11:00	24	67.2
LT-5	502 Memory Lane, Santa Ana, CA 92706	12	Residential	B (67)	Front Yard on light pole.	12/14/2022 - 12/15/2022	11:00	24	75.2
LT-6	2414 Tapestry Wy, Anaheim, CA 92802	14	MFR	B (67)	Front Yard on tree.	12/07/2022 - 12/08/2022	11:00	24	66.8
LT-7	109 S Dickel Street, Anaheim, CA 92805	15	Residential	B (67)	Front of Mobile home along fence.	12/07/2022 - 12/08/2022	11:00	24	68.9
LT-8	548 S West Street, Anaheim, CA 92802	17	Residential	B (67)	Empty lot adjacent to SFR.	11/17/2022 – 11/18/2022	9:00	24	66.6

Site No.[1]	Address	Area	Land Use[2]	Activity Category and (NAC)	Meter Location	Measurement Dates	Start Time	Duration (hours)	Measured Worst-Hour $L_{eq(h)}$ (dBA)
LT-9	2048 W Greenleaf Avenue, Anaheim, CA 92801	19	MFR	B (67)	Front Yard in tree along sidewalk	12/07/2022 - 12/08/2022	10:00	24	72.9
LT-10	1300 N Ferndale Street,	21	Residential	B (67)	Front Yard in tree along sidewalk	12/07/2022 - 12/08/2022	11:00	24	68.5
LT-11	7501 8th St, Buena Park, CA 90621	28	Park	C (67)	Tree in park	12/07/2022 - 12/08/2022	11:00	24	68.9

[1] See Figure 1 and 2 in Appendix C for the measurement location.
[2] Comm = commercial; MFR = multifamily residential; Rec = recreational; SFR = single-family residential

Table 16: Noise Model Calibration Results

Measurement Site	Modeled Receiver No.	Area	Date	Start Time	Noise Levels, $L_{eq(h)}$ (dBA)		Deviation (dB)	Applied Adjustment (dB)[1]
					Measured	Modeled		
FM1	M-S1A-A-NB1 to M-S1A-A-NB22	1	11/30/2022	10:20am	66.1	66.1	0.0	0.0
FM2	M-S1A-B-SB1 to M-S1A-B-SB49	2	11/30/2022	10:50am	63.2	64.1	-0.9	-0.9
FM3	M-S1A-C-NB1 to M-S1A-C-NB19	3	11/30/2022	11:25am	66.4	66.8	-0.4	-0.4
FM4	M-S1A-D-SB1 to M-S1A-D-SB57	4	11/30/2022	11:55am	58.4	59	-0.6	-0.6
FM5	M-S1A-C-NB20 to M-S1A-C-NB41	3	11/30/2022	12:20pm	68.4	68.4	0.0	0.0
FM6	M-S1B-SB1 to M-S1B-SB49	6	11/29/2022	2:15pm	60.2	60.3	-0.1	-0.1
FM7	M-S1B-NB1 to M-S1B-NB25	5	11/29/2022	1:55pm	60.5	59.2	1.3	1.3
FM8	M-S1B-SB54 to M-S1B-SB95	6	11/29/2022	12:15pm	64.8	65.2	-0.4	-0.4

Measurement Site	Modeled Receiver No.	Area	Date	Start Time	Noise Levels, $L_{eq(h)}$ (dBA)		Deviation (dB)	Applied Adjustment (dB)[1]
					Measured	Modeled		
FM9	M-S1A-A-NB1 to M-S1A-A-NB22	5	11/29/2022	11:35am	65.5	64.9	0.6	0.6
FM10	M-S1A-B-SB1 to M-S1A-B-SB49	8	11/29/2022	11:00am	66.7	67.3	-0.6	-0.6
FM11	M-S1A-C-NB1 to M-S1A-C-NB19	7	11/29/2022	10:30am	65.9	64.5	1.4	1.4
FM12	M-S1A-D-SB1 to M-S1A-D-SB57	9	11/29/2022	10:00am	63.3	62.3	1.0	1.0
FM13	M-S1A-C-NB20 to M-S1A-C-NB41	10	11/18/2022	1:52pm	64.5	64.6	-0.1	-0.1
FM14	M-S1B-SB1 to M-S1B-SB49	12	11/18/2022	1:10pm	58.6	58.2	0.4	0.4
FM15	M-S1B-NB1 to M-S1B-NB25	12	11/18/2022	10:55am	62.3	61.6	0.7	0.7
FM16	M-S1B-SB54 to M-S1B-SB95	13	11/18/2022	12:15pm	65.0	66.2	-1.2	-1.2
FM17	M-S1B-NB26 to M-S1B-NB95	14	11/17/2022	2:30pm	61.3	62.1	-0.8	-0.8
FM18	M-S1C-SB1 to M-S1C-SB15	14	11/17/2022	2:00pm	58.0	58.6	-0.6	-0.6
FM19	M-S1C-NB1 to M-S1C-NB58	16	11/17/2022	12:20pm	74.1	73.4	0.7	0.7
FM20	M-S1D-NB1 to M-S1D-NB103, M-S1E-NB1 to M-S1E-NB7	15	11/17/2022	12:00pm	66.8	66.6	0.2	0.2
FM21	M-S1D-SB1 to M-S1D-SB63	17	11/17/2022	11:10am	66.4	65.4	1.0	1.0
FM22	M-S1E-SB1 to M-S1E-SB52, M-S1E-SB58 to M-S1E-SB66	18	11/17/2022	10:45am	67.5	66.5	1.0	1.0
FM23	M-S1E-SB53 to M-S1E-SB57, to M-S1E-SB67 to M-S1E-SB111	17	11/17/2022	10:15am	61.1	61.3	-0.2	-0.2
FM24	M-S2A-NB1 to M-S2A-NB5	18	11/15/2022	2:15pm	62.9	61.9	1.0	1.0
FM25	M-S2A-SB1 to M-S2A-SB32	19	11/15/2022	1:40pm	69.0	68.9	0.1	0.1
FM26	M-S2A-SB33 to M-S2A-SB51, M-S2B-SB52 to M-S2B-SB56	19	11/15/2022	12:40pm	63.2	62.6	0.6	0.6
FM27	M-S2B-SB57	19	11/15/2022	11:35am	61.6	61.3	0.3	0.3
FM28	M-S2B-NB24 to M-S2B-NB76	20	11/15/2022	10:20AM	61.1	60.2	0.9	0.9

Measurement Site	Modeled Receiver No.	Area	Date	Start Time	Noise Levels, $L_{eq(h)}$ (dBA)		Deviation (dB)	Applied Adjustment (dB)[1]
					Measured	Modeled		
FM29	M-S2C-NB76 to M-S2C-NB112, M-S2C-NB122 to M-S2C-NB128	21	11/15/2022	9:50am	65.3	64.3	1.0	1.0
FM30	M-S2C-SB58 to M-S2C-SB99	21	11/15/2022	9:20am	64.2	63.5	0.7	0.7
FM31	M-S2C-NB113 to M-S2C-NB121, M-S2C-NB129 to M-S2C-NB159	22	10/26/2022	2:00pm	60.4	59.8	0.6	0.6
FM32	M-S2C-SB100 to M-S2C-SB102	23	10/26/2022	12:30pm	71.2	70.2	1.0	1.0
FM33	M-S2D-NB161 to M-S2D-NB186	24	10/26/2022	12:00am	56.7	56.6	0.1	0.1
FM34	M-S2D-NB187 to M-S2D-NB229	26	10/26/2022	11:30am	59.9	60.4	-0.5	-0.5
FM35	M-S2D-NB230 to M-S2D-NB243	25	10/26/2022	10:45am	62.1	62.1	0.0	0.0
FM36	M-S2D-SB104 to M-S2D-SB118	28	10/26/2022	10:15am	56.6	55.7	0.9	0.9

[1] Adjustment factor (K-factor) is applied to receptors represented by measurement site regardless of deviation.

7. FUTURE NOISE ENVIRONMENT, IMPACTS, AND CONSIDERED ABATEMENT

This NSR was produced to determine future traffic noise impacts of the proposed Project at frequent human use areas within the highway corridor. The future worst-case traffic noise impacts at frequent outdoor human use areas along the project corridor were modeled for the No-Build Alternative, Build Alternative 3 and Build Alternative 4 to determine appropriate abatement measures. This section discusses the future noise environment and feasible noise abatement measures for locations with impacts.

7.1 Future Noise Environment and Impacts

Tables in Appendix B summarize the predicted traffic noise levels for the existing and design-year No-Build condition, as well as for design-year Build Alternatives 3 and 4. Predicted design-year traffic noise levels with the Project are compared to existing conditions and to the design-year No-Build conditions. The comparison to existing conditions is included in the analysis to identify "substantial" traffic noise impacts under 23 CFR 772. The comparison to No-Build conditions indicates the direct impact of noise resulting from the project.

Per District 12 requirement, modeling results are rounded to the nearest tenth of a decibel before comparisons are made.

7.2 Preliminary Noise Abatement Analysis

In accordance with 23 CFR 772, noise abatement is considered where traffic noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. Potential noise abatement measures identified in the Protocol include the following:

- Constructing noise barriers.
- Using traffic management measures to regulate types of vehicles and speeds.
- Avoiding impacts by using design alternatives, such as altering the horizontal and vertical alignment of the project.
- Acquiring property to serve as a buffer zone.
- Acoustically insulating public use or nonprofit institutional structures.

These abatement options have been considered; however, because of the constrained configuration and suburban location of the project, abatement in the form of soundwalls is the only abatement measure analyzed. Noise barrier analysis was conducted for proposed soundwalls at the highway mainline shoulders, on-/off-ramp shoulders, and right-of-way lines.

Each noise barrier has been evaluated for feasibility based on achievable noise reduction (5 dB or more) at the outdoor frequent use areas of the representative receivers. For each noise barrier determined to be acoustically feasible, it was determined if the Caltrans acoustical design goal could be achieved; then reasonable cost allowances were calculated. Tables in Appendix B summarize the predicted future noise levels at receiver locations for soundwalls with heights ranging from 6 to 22 feet at either the edge-of-shoulder and/or right-of-way line.

The Caltrans acoustical design goal must be met for a noise barrier to be considered reasonable. The design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one or more benefited receptors.

In addition, the estimated cost to build the noise barrier should be equal to or less than the total cost allowance of benefited receptors ($107,000 per benefited receptor in 2022) calculated for the barrier to be considered reasonable from a cost perspective. The cost calculations of the noise barrier should include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, retaining walls, and other items. Construction cost estimates are not provided in this NSR, but they are presented in the NADR. The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document before public review of the project. The NADR is prepared by the project engineer after completion of the NSR and prior to publication of the draft environmental document. The NADR includes noise abatement construction cost estimates that have been prepared and signed by the project engineer based on site-specific conditions. Construction cost estimates are compared to reasonableness allowances in the NADR to identify which wall configurations are reasonable from a cost perspective. The reasonableness of noise abatement is also determined by obtaining the viewpoints of benefited receptors, including property owners and residents.

The design of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the project. Preliminary information on the physical location, length, and height of noise barriers is provided in this report. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of location-specific noise abatement will be made upon completion of the project design.

The minimum heights and locations of the soundwalls that would provide feasible abatement and achieve the 7-dB design goal are shown graphically on the figures in Appendix C. However, in the NADR, an effort should be made to achieve the greatest noise reduction possible within the calculated abatement allowance.

The following discussion considers 28 areas of the corridor for both Alternatives 3 and 4. Table 7-1 through Table 7-4 are provided to assess the abatement cost allowances at each of the considered barrier heights. The following analysis presents predicted future traffic noise levels at various receivers and abatement measures. Predicted noise levels are shown in Appendix B.

7.2.1 Alternative 2

Alternative 2 does not have changes in the physical footprint or changes in traffic capacity. Alternative 2 does not meet the criteria as a Type 1 Project; therefore, noise analysis was not analyzed for this scenario.

7.2.2 Alternative 3

Tables B-1 through B-42 in Appendix B present the results of the barrier analysis for Alternative 3.

SEGMENT 1 – ALTERNATIVE 3 AND 4

NSA 1 – REDHILL TO NEWPORT NORTHBOUND SIDE

Existing exterior traffic noise levels in NSA 1 range from 48 to 69 dBA for Receivers M-S1A-A-NB1 through M-S1A-A-NB22. The future predicted exterior traffic noise levels range from 48 to 69 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C so no impacts are anticipated in NSA 1. Therefore, consideration of noise abatement is not required. Table B-1 in Appendix B

shows the existing and future noise levels for NSA 1 with Alternative 3 and 4. Figure C-1 and C-2 in Appendix C shows the locations of existing walls, measurement sites, and modeling sites.

NSA 2 – Redhill to Newport Southbound Side

Existing exterior traffic noise levels in NSA 2 range from 53 to 65 dBA for Receivers M-S1A-B-SB1 through M-S1A-B-SB49. The future predicted exterior traffic noise levels range from 52 to 65 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C so no impacts are anticipated in NSA 2. Therefore, consideration of noise abatement is not required. Table B-2 in Appendix B shows the existing and future noise levels for NSA 2 with Alternative 3 and 4. Figure C-1 and C-2 in Appendix C shows the locations of existing wall, measurement sites, and modeling sites.

NSA 3 – Newport to SR55 Northbound Side

Existing exterior traffic noise levels in NSA 3 range from 47 to 74 dBA for Receivers M-S1A-C-NB1 through M-S1A-C-NB41. The future predicted exterior traffic noise levels range from 47 to 74 dBA. There would be 14 modeled receivers, M-S1A-C-NB1 through M-S1A-C-NB12, M-S1A-C-NB20, and M-S1A-C-NB25, representing 14 receptors (12 for Activity Category B and two for Activity Category C) that would approach or exceed the NAC; therefore, consideration of noise abatement is required. Tables B-3 and B-4 in Appendix B show the existing and future noise levels, as well as barrier analysis, for the evaluated soundwall for NSA 3 with Alternative 3 and 4. Figure C-3 and C-4 in Appendix C shows the locations of measurement, modeling sites, existing and evaluated walls.

Areas with Noise Abatement

Soundwall Seg1A-C-NB1: Soundwall Seg1A-C-NB1 is located along the edge-of-shoulder of the northbound I-5 just north of the on-ramp from Newport Avenue and is in front of an existing wall, EPW-1 (18-foot tall and 650-foot long) is located at along the right-of-way/property boundary. Under future design conditions, there would be impacts at 12 modeled receivers; therefore, Soundwall Seg1A-C-NB1 (1,150-foot long) was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluated heights of 6- to 16-feet in 2-foot increments to provide feasible abatement at the impacted modeled receivers. At 16-feet in height, the barrier would provide feasible traffic noise abatement at three (3) impacted modeled receivers, achieving the 7 dB of noise reduction goal at one benefitted receiver. Table 17 summarizes the range of reasonable allowances for the feasible noise abatement measures considered. Figure C-3 in Appendix C shows the location of the evaluated soundwall.

Table 17: Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg1A-C-NB1[1]

Barrier I.D.: Seg1A-C-NB1	8-Foot Barrier	10-Foot Barrier	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier
Barrier Noise Reduction, dB	2.4	3.7	5.1	6.7	9.0
Number of Benefited Receptors	0	0	2	3	3
Reasonable Allowance Per Benefited Receiver	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$0	$0	$321,000

Barrier I.D.: Seg1A-C-NB1	8-Foot Barrier	10-Foot Barrier	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier
Barrier Noise Reduction, dB	2.4	3.7	5.1	6.7	9.0

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

Soundwall Seg1A-C-NB2A and Seg1A-C-NB2B

Soundwalls Seg1A-C-NB2A (ESW-4) and Seg1A-C-NB2B (ESW-5) are existing 12-foot tall, 2,192-foot long and 10-foot tall, 508-foot long sound walls, respectively, located along the right-of-way (ESW-4) and edge-of-shoulder (ESW-5) of the northbound I-5 connector ramp to SR-55. Under future design conditions, there would be impacts at two modeled receivers; therefore, Soundwall Seg1A-C-NB2A and Seg1A-C-NB2B was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 12- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would provide at least 5.0 dBA reduction to the impacted site to meet the feasible criteria but does not meet the reasonable criteria of 7.0 dBA reduction at any modeled sites behind the evaluated soundwall; therefore, consideration of further noise abatement is not required. Figures C-3 and C-4 in Appendix C shows the location of the evaluated soundwall.

NSA 4 – Newport to SR55 Southbound Side

Existing exterior traffic noise levels in NSA 4 range from 50 to 64 dBA for Receivers M-S1A-D-SB1 through M-S1A-D-SB57. The future predicted exterior traffic noise levels range from 50 to 64 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C so no impacts are anticipated in NSA 2. Therefore, consideration of noise abatement is not required. Table B-5 in Appendix B show the existing and future noise levels for NSA 4 with Alternative 3 and 4. Figures C-2 to C-4 in Appendix C shows the locations of existing wall, measurement sites, and modeling sites.

NSA 5 – SR55 to Grand Avenue - Northbound Side

Existing exterior traffic noise levels in NSA 5 range from 51 to 81 dBA for Receivers M-S1B-NB1 through M-S1B-NB95. The future predicted exterior traffic noise levels range from 51 to 81 dBA. There would be 24 modeled receivers, M-S1B-NB1, M-S1B-NB4 through M-S1B-NB6, M-S1B-NB14 through M-S1B-NB24, M-S1B-NB26 and M-S1B-NB27, M-S1B-NB34, M-S1B-NB36, M-S1B-NB38, M-SB1-NB40 and M-SB1B-NB41, that would approach or exceed the NAC, representing 24 receptors, 12 for Activity Category B and 12 for Activity Category C; therefore, consideration of noise abatement is required. Tables B-6 through B-8 in Appendix B show the existing and future noise levels, as well as barrier analysis, for NSA 5 with Alternative 3 and 4. Figures C-4 to C-7 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1B-NB1: Soundwall Seg1B-NB1 (ESW-9) is located along the shoulder of the northbound SR-55 to I-5 flyover ramp and is an existing 10-foot tall, 1,112-foot long sound wall. Under future design conditions, there would be impacts at 12 modeled receivers; therefore, Soundwall Seg1B-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the

existing barrier (ESW-9) to evaluated heights of 12- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-4 in Appendix C shows the location of the evaluated soundwall.

Soundwall Seg1B-NB2: Soundwall Seg1B-NB2 would be located along the shoulder of the northbound I-5. Under future design conditions, there would be impacts at four modeled receivers; therefore, Soundwall Seg1B-NB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed 600-foot long soundwall was analyzed to evaluated heights of 6- to 16-feet in 2-foot increments to provide feasible abatement at the impacted modeled receivers. At 14-feet in height, the barrier would provide feasible traffic noise abatement at three impacted modeled receivers, achieving the 7.0 dB of noise reduction goal at one benefitted receiver. Table 18 summarizes the range of reasonable allowances for the feasible noise abatement measures considered. Figures C-4 and C-5 in Appendix C shows the location of the evaluated soundwall.

Table 18: Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg1B-NB2[1]

Barrier I.D.: Seg1B-NB2	6-Foot Barrier	8-Foot Barrier	10-Foot Barrier	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier
Barrier Noise Reduction, dB	2	4.0	5.0	6.2	7.0	7.5
Number of Benefited Receptors	0	0	1	1	2	2
Reasonable Allowance Per Benefited Receiver	0	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$107,000	$214,000	$214,000	$214,000

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

Soundwall Seg1B-NB3 and Seg1B-NB4: Soundwalls Seg1B-NB3 (ESW-10) and Seg1B-NB4 (ESW-11) are existing 12-foot tall, 3,243-foot long and 10-foot tall, 3,390-foot long, respectively, soundwalls located along the northbound I-5 right-of-way. Under future design conditions, there would be impacts at eight (8) modeled receivers; therefore, Soundwall Seg1B-NB3 and Seg1B-NB4 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barriers to evaluated heights of 12- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-6 and C-7 in Appendix C shows the location of the evaluated soundwall.

NSA 6 – SR55 TO GRAND AVENUE - SOUTHBOUND SIDE

Existing exterior traffic noise levels in NSA 6 range from 49 to 68 dBA for Receivers M-S1B-SB1 through M-S1B-SB96. The future predicted exterior traffic noise levels range from 49 to 68 dBA. There would be three modeled receivers, M-S1B-SB67, M-S1B-SB76 and M-S1B-SB78, that would approach or exceed the NAC, representing three receptors all for Activity Category B; therefore, consideration of noise abatement is required. Tables B-9 and B-10 in Appendix B show the existing and future noise levels, as well as barrier analysis, for NSA 6 with Alternative 3 and 4. Figures C-4 to C-7 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1B-SB2: Soundwall Seg1B-SB2 (ESW-12) is located along the right shoulder/right-of-way of the southbound I-5 on-ramp from just south of Grand Ave on-ramp to 4th St off-ramp and is an existing 12- to 14-foot-tall, 1,510-foot long sound wall. Under future design conditions, there would be impacts at three modeled receivers; therefore, Soundwall Seg1B-SB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights up to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-6 and C-7 in Appendix C shows the location of the evaluated soundwall.

NSA 7 – Grand Avenue to 17th Street - Northbound Side

Existing exterior traffic noise levels in NSA 7 range from 52 to 73 dBA for Receivers M-S1C-NB1 through M-S1C-NB58. The future predicted exterior traffic noise levels range from 52 to 73 dBA. There would be 19 modeled receivers, representing 19 Activity Category B receptors, M-S1C-NB1 through M-S1C-NB7, M-S1C-NB11 though M-S1C-NB17, M-S1C-NB19, M-S1C-NB27, M-S1C-NB39, M-S1C-NB40, M-S1C-NB49 and M-S1C-NB50, that would approach or exceed the NAC; therefore, consideration of noise abatement is required. Tables B-11 through B-12 in Appendix B show the existing and future noise levels, as well as barrier analysis, for NSA 7 with Alternative 3 and 4. Figures C-7 and C-8 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1C-NB1: Soundwall Seg1C-NB1 (ESW-13) is located along the right-of-way/shoulder of the northbound I-5 and is an existing 12- to 14-foot-tall, 1,305-foot long sound wall. Under future design conditions, there would be impacts at 10 modeled receivers; therefore, Soundwall Seg1C-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 14- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-7 and C-8 in Appendix C shows the location of the evaluated soundwall.

Soundwall Seg1C-NB2: Soundwall Seg1C-NB2 (ESW-14) is located along the right-of-way of the northbound I-5 and is an existing 14-foot-tall, 1,127-foot long sound wall. Under future design conditions, there would be impacts at nine modeled receivers; therefore, Soundwall Seg1C-NB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 16 to 22 feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-8 in Appendix C shows the location of the evaluated soundwall.

NSA 8 – Grand Avenue to 17th Street - Southbound Side

Existing exterior traffic noise levels in NSA 8 range from 55 to 71 dBA for Receivers M-S1C-SB1 through M-S1C-SB15. The future predicted exterior traffic noise levels range from 55 to 71 dBA. There would be four modeled receivers representing four Activity Category B receptors, M-S1C-SB1 and M-S1C-SB3 though M-S1C-SB5, that would approach or exceed the NAC for Activity Category B; therefore, consideration of noise abatement is required. Table B-13 Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 8

with Alternative 3 and 4. Figures C-7 and C-8 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1C-SB1: Soundwall Seg1C-SB1 would be located along the top of slope along the right-of-way of the southbound I-5. Under future design conditions, there would be impacts at four modeled receivers; therefore, Soundwall Seg1C-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed 800-foot long soundwall was analyzed to evaluate a barrier to heights of 6- to 16-feet in 2-foot increments. At 16-feet in height, the barrier would provide feasible traffic noise abatement at all four impacted modeled receivers including additional non impacted modeled sites. Two benefitted modeling sites achieve the 7.0 dB noise reduction goal. Table 19 summarizes the range of reasonable allowances for the feasible noise abatement measures considered. Figure C-8 in Appendix C shows the location of the evaluated soundwall.

Table 19: Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg1C-SB1[1]

Barrier I.D.: Seg1C-SB1	6-Foot Barrier	8-Foot Barrier	10-Foot Barrier	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier
Barrier Noise Reduction, dB	4.3	5.0	5.7	6.3	6.9	7.4
Number of Benefited Receptors	0	2	2	2	3	5
Reasonable Allowance Per Benefited Receiver	0	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$214,000	$214,000	$214,000	$321,000	$535,000

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

NSA 9 – 17TH STREET TO MAIN STREET - NORTHBOUND SIDE

Existing exterior traffic noise levels in NSA 9 range from 53 to 68 dBA for Receivers M-S1D-SB1 through M-S1D-SB103. The future predicted exterior traffic noise levels range from 53 to 67 dBA. There would be 9 modeled receivers, representing 9 Activity Category B receptors, M-S1D-NB1, M-S1D-NB9, M-S1D-NB10, M-S1D-NB14, M-S1D-NB23 though M-S1D-NB25 and M-S1D-NB50 though M-S1D-NB51, that would approach or exceed the NAC for Activity Category B; therefore, consideration of noise abatement is required. Table B-14 Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 9 with Alternative 3. Figures C-9 and C-10 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1D-NB1: Soundwall Seg1D-NB1 (ESW-17) is located along the right-of-way/shoulder of the northbound I-5 and is an existing 14-foot tall, 3,650-foot long sound wall. Under future design conditions, there would be impacts at 9 modeled receivers; therefore, Soundwall Seg1D-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 16- to 22- feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-9 and Figure C-10 in Appendix C show the location of the evaluated soundwall.

NSA 10 – 17TH STREET TO MAIN STREET - SOUTHBOUND SIDE

Existing exterior traffic noise levels in NSA 10 range from 50 to 76 dBA for Receivers M-S1D-SB1 through M-S1D-SB63. The future predicted exterior traffic noise levels range from 50 to 75 dBA. There would be 22 modeled receivers, representing 27 Activity Category B receptors, M-S1D-SB13 through M-S1D-SB19, M-S1D-SB30 through M-S1D-SB32, M-S1D-SB35 through M-S1D-SB38, M-S1D-SB40 though M-S1D-SB42, M-S1D-SB44, M-S1D-SB53 and M-S1D-SB55 and M-S1D-SB57 that would approach or exceed the NAC for Activity Category B; therefore, consideration of noise abatement is required. Tables B-15 to B-18 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 10 with Alternative 3 and 4. Figures C-9 and C-10 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1D-SB1: Soundwall Seg1D-SB1 would be located along the edge-of-shoulder of the southbound I-5 towards the 17th Street off-ramp. Under future design conditions, there would be impacts at seven modeled receivers; therefore, Soundwall Seg1D-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed 1,008-foot long soundwall was analyzed to evaluate a barrier to heights of 6- to 16- feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-9 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg1D-SB2-A: Soundwall Seg1D-SB2-A and Seg1D-SB2-B would be located along the right-of-way/shoulder of the southbound I-5 from the southbound Main Street on-ramp to the 17th Street bridge overcrossing. Under future design conditions, part of ESW-18 along the current edge-of-shoulder (Seg1D-SB2-A) would need to be replaced due to widening of the SB off-ramp. This would cause impacts at fifteen modeled receivers; therefore, Soundwall Seg1D-SB2-A was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier height of 12-feet to evaluated heights of 14- to 22-feet in 2-foot increments for the replaced 1,210-foot section. Replacing the existing wall with another 12-foot wall would provide over 7 dBA of noise reduction at eight impacted sites and would benefit four additional sites. Table 20 summarizes the range of reasonable allowances for the feasible noise abatement measures. Figures C-9 and C-10 in Appendix C shows the location of the evaluated soundwall.

Table 20: Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg1D-SB2[1]

Barrier I.D.: Seg1D-SB2	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier	18-Foot Barrier	20-Foot Barrier	22-Foot Barrier
Barrier Noise Reduction, dB	8.8	10.5	12.0	13.1	14.0	14.5
Number of Benefited Receptors	12	20	22	22	22	23
Reasonable Allowance Per Benefited Receiver	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$1,284,000	$2,140,000	$2,354,000	$2,354,000	$2,354,000	$2,461,000

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

Soundwall Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB2-B above were studied as separated soundwalls, the options of combining the soundwalls in the area as one soundwall system are shown below:

Soundwall Seg1D-SB2-A and Seg1D-SB2-B: Soundwall Seg1D-SB2-A and Seg1D-SB2-B would be along the right-of-way/shoulder of the southbound I-5 from the southbound Main Street on-ramp to the 17th Street bridge overcrossing. Under future design conditions, part of ESW-18 along the current edge-of-shoulder (Seg1D-SB2-A) would need to be replaced due to widening of the SB off-ramp. This would cause impacts at fifteen modeled receivers; therefore, Soundwall Seg1D-SB2-A and Seg1D-SB-2-B was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier height of 12-feet to evaluated heights of 14- to 22-feet in 2-foot increments for the existing 1,160-foot section along the right-of-way and the replaced 1,210-foot section along the edge-of-shoulder for a total length of 2,370-feet. The evaluated sound walls would provide over 7 dBA of noise reduction at eight impacted sites and would benefit four additional sites at 12-foot in height. Table 21 summarizes the range of reasonable allowances for the feasible noise abatement measures. Figures C-9 and C-10 in Appendix C show the location of the evaluated soundwall.

Table 21: Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg1D-SB2-A and Seg1D-SB-2-B[1]

Barrier I.D.: Seg1D-SB2	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier	18-Foot Barrier	20-Foot Barrier	22-Foot Barrier
Barrier Noise Reduction, dB	8.8	10.5	12.0	13.1	14.0	14.5
Number of Benefited Receptors	12	20	22	22	24	25
Reasonable Allowance Per Benefited Receiver	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$1,284,000	$2,140,000	$2,354,000	$2,354,000	$2,568,000	$2,675,000

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

Soundwall Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB2-B: Soundwall Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB2-B would be located along the right-of-way/shoulder of the southbound I-5 from the southbound Main Street on-ramp to the 17th Street off-ramp. Under future design conditions, part of ESW-18 along the current edge-of-shoulder (Seg1D-SB2-A) would need to be replaced due to widening of the SB off-ramp. There are impacts at twenty-two modeled receivers; therefore, Soundwall Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB-2-B was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier height of 12-feet to evaluated heights of 14- to 22-feet in 2-foot increments for the existing 1,160-foot section along the right-of-way (Seg1D-SB2-B) and the replaced 1,210-foot section along the edge-of-shoulder (Seg1D-SB2-A). The evaluated barrier would be extended (Seg1D-SB1) approximately 660-feet south to the 17th Street off-ramp. The evaluated sound walls with a total length of 3,070 would provide over 7 dBA of noise reduction at eight impacted sites and would benefit four additional sites at 12-foot in height. Table 22 summarizes the range of reasonable allowances for the feasible noise abatement measures. Figures C-9 and C-10 in Appendix C shows the location of the evaluated soundwall.

Table 22: Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg1D-SB1, Seg1D-SB2-A and Seg1D-SB-2-B[1]

Barrier I.D.: Seg1D-SB2	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier	18-Foot Barrier	20-Foot Barrier	22-Foot Barrier
Barrier Noise Reduction, dB	9.2	10.9	12.2	13.4	14.3	14.9
Number of Benefited Receptors	12	20	22	22	24	26
Reasonable Allowance Per Benefited Receiver	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$1,284,000	$2,140,000	$2,354,000	$2,354,000	$2,568,000	$2,782,000

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

NSA 11 –Main Street to SR57 Interchange - Northbound Side

Existing exterior traffic noise levels in NSA 11 range from 64 to 69 dBA for Receivers M-S1E-NB1 through M-S1E-NB7. The future predicted exterior traffic noise levels range from 64 to 70 dBA. There would be six modeled receivers, representing 12 Activity Category B receptors, M-S1E-NB2 through M-S1E-NB7 that would approach or exceed the NAC for Activity Categories B; therefore, consideration of noise abatement is required. Table B-19 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 11 with Alternative 3 and 4. Figures C-11 to C-13 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1E-NB1: Soundwall Seg1E-NB1 (ESW-20) is an existing 16-foot-tall, 993-foot long soundwall located along the right-of-way of the SR-22 ramp to northbound I-5/SR-57. Under future design conditions, there would be impacts at six modeled receivers; therefore, Soundwall Seg1E-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would meet the feasible reduction criteria at two impacted sites but does not meet the reasonable criteria of 7.0 dBA reduction at any modeled sites behind the evaluated soundwall; therefore, consideration of further noise abatement is not required. Figure 8 in Appendix C shows the location of the evaluated soundwall.

NSA 12 –Main Street to SR57 Interchange - Southbound Side

Existing exterior traffic noise levels in NSA 12 range from 54 to 68 dBA for Receivers M-S1E-SB1 through M-S1E-AB111. The future predicted exterior traffic noise levels range from 54 to 68 dBA. There would be 14 modeled receivers, representing 16 Activity Category B receptors, M-S1E-SB13, M-S1E-SB33 through M-S1E-SB39, M-S1E-SB56, M-S1E-SB57, M-S1E-SB92 and M-S1E-SB100 through M-S1E-SB102 that would approach or exceed the NAC for Activity Category B; therefore, consideration of noise abatement is required. Table B-20 and B-21 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 12 with Alternative 3 and 4. Figures C-14 to C-16 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg1E-SB1: Soundwall Seg1E-SB1 (ESW-21) is an existing 8- to 16-foot tall, 2,160-foot long soundwall located along the edge-of-shoulder of the southbound I-5. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg1E-SB1 was analyzed to provide feasible abatement at the impacted modeled receiver. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 14- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-14 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg1E-SB2: Soundwall Seg1E-SB2 (ESW-21) is an 8- to 16-foot-tall, 2,160- foot long soundwall located along the edge-of-shoulder of the southbound I-5. EPW-8 is a 20-foot tall, 1,210-foot long, private wall between the residential area and the state owned soundwall ESW-21. Under future design conditions, there would be impacts at 13 modeled receivers; therefore, Soundwall Seg1E-SB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-14 and C-15 in Appendix C show the location of the evaluated soundwall.

SEGMENT 2 – ALTERNATIVE 3

NSA 13 –SR57 INTERCHANGE TO KATELLA AVENUE - NORTHBOUND SIDE

Existing exterior traffic noise levels in NSA 13 range from 62 to 71 dBA for Receivers M-S2A-SB1 through M-S2A-SB5. The future predicted exterior traffic noise levels range from 63 to 72 dBA. There would be two modeled receivers, representing 2 Activity Category B receptors, M-S2A-NB1 and M-S2A-NB2, that would approach or exceed the NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Table B-22 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 13 with Alternative 3. Figures C-17 to C-20 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2A-NB1: Soundwall Seg2A-NB1 is located along the northbound I-5 edge-of-shoulder along the northbound I-5 off-ramp to Chapman Avenue. Under future design conditions, there would be impacts at two modeled receivers; therefore, Soundwall Seg2A-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed 1,548-foot long soundwall was analyzed to evaluate a barrier to heights of 6- to 16-feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-17 and C-18 in Appendix C show the location of the evaluated soundwall.

NSA 14 –SR57 INTERCHANGE TO KATELLA AVENUE - SOUTHBOUND SIDE

Existing exterior traffic noise levels in NSA 14 range from 52 to 73 dBA for Receivers M-S2A-SB1 through M-S2A-SB52. The future predicted exterior traffic noise levels range from 53 to 73 dBA. There would be 27 modeled receivers representing 26 Activity Category B and one Activity Category C receptors, M-S2A-SB2 through M-S2A-SB16, M-S2A-SB33 through M-S2A-SB37A, M-S2A-SB44 and M-S2A-SB52 that would approach or exceed the

NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Tables B-23 to B-25 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 14 with Alternative 3. Figures C-21 to C-25 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2A-SB1: Soundwall Seg2A-SB1 (ESW-26) is an existing 12- to 14-foot tall, 3,224-foot long soundwall located along the southbound I-5 edge-of-shoulder along the southbound I-5 off-ramp to The City Drive. Under future design conditions, there would be impacts at 16 modeled receivers; therefore, Soundwall Seg2A-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising a 2,365-foot long segment of the existing barrier to heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-23 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2A-SB2: Soundwall Seg2A-SB2 (ESW-26) is an existing 12- to 14-foot tall, 3,224-foot long soundwall located along the southbound I-5 edge-of-shoulder between Gene Autry Way and Orangewood Avenue. Under future design conditions, there would be impacts at 10 modeled receivers; therefore, Soundwall Seg2A-SB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising an 859-foot long segment of the existing barrier to heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-24 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2A-SB3: Soundwall Seg2A-SB3 is a new evaluated soundwall located along the southbound I-5 edge-of-shoulder along the southbound I-5 off-ramp to Manchester Avenue. Under future design conditions, there would be impacts at two modeled receivers; therefore, Soundwall Seg2A-SB3 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed 1,654-foot long soundwall was analyzed to evaluate a barrier to heights of 6- to 16-feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-24 and C-25 in Appendix C show the location of the evaluated soundwall.

NSA 15 – Disney Way/Katella Avenue to Harbor Boulevard - Northbound Side

Existing exterior traffic noise levels in NSA 15 range from 60 to 69 dBA for Receivers M-S2B-NB24 through M-S2B-NB76. The future predicted exterior traffic noise levels range from 60 to 70 dBA. There would be 12 modeled receivers, representing 39 Activity Category B receptors, M-S2B-NB25 through M-S2B-NB32, M-S2B-NB35 through M-S2B-NB36, M-S2B-NB41 and M-S2B-NB48 that would approach or exceed the NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Table B-26 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 15 with Alternative 3. Figures C-25 to C-28 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2B-NB1: Soundwall Seg2B-NB1 (ESW-28) is an existing 10- to 16-foot-tall, 3,658-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way just north of the northbound I-5 on-ramp from Anaheim Boulevard. Under future design conditions, there would be impacts at 15 modeled receivers; therefore, Soundwall Seg2B-NB1 was analyzed to provide feasible abatement at the impacted

modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 16 to 22 feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-26 to C-28 in Appendix C show the location of the evaluated soundwall.

NSA 16 – Disney way/Katella Avenue to Harbor Boulevard - Southbound Side

Existing exterior traffic noise levels in NSA 16 range from 59 to 69 dBA for Receivers M-S2B-SB52 through M-S2B-SB57. The future predicted exterior traffic noise levels range from 59 to 70 dBA. There would be two modeled receivers, M-S2B-SB55 and M-S2B-SB56 that would approach or exceed the NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Table B-27 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 16 with Alternative 3. Figures C-25 to C-28 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2B-SB1: Soundwall Seg2B-SB1 a new evaluated, 1,540-foot long soundwall, evaluated soundwall located along the southbound I-5 edge-of-shoulder along the southbound I-5 off-ramp to Disney Way/Katella Avenue. Under future design conditions, there would be impacts at two modeled receivers; therefore, Soundwall Seg2B-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate a barrier to heights of 6- to 16- feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-26 in Appendix C show the location of the evaluated soundwall.

NSA 17 – Harbor Boulevard to Lincoln Avenue - Northbound Side

Existing exterior traffic noise levels in NSA 17 range from 51 to 71 dBA for Receivers M-S2C-NB76 through M-S2C-NB159. The future predicted exterior traffic noise levels range from 52 to 72 dBA. There would be impacts at 12 modeled receivers, representing 24 Activity Category B and one Activity Category C receptors, M-S2C-NB83 through M-S2C-NB86, M-S2C-NB120, M-S2C-NB121, M-S2C-NB141, M-S2C-NB143 through M-S2C-NB145M, M-S2C-NB148, and M-S2C-NB149 that would approach or exceed the NAC for Activity Categories B and C; therefore, consideration of noise abatement is required. Tables B-28 to B-29 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 17 with Alternative 3. Figures C-28 to C-31 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2C-NB1: Soundwall Seg2C-NB1 (ESW-32) is an existing 14- to 16-foot tall, 3,128-foot long soundwall located along the northbound I-5 right-of-way just north of the northbound I-5 on-ramp from Ball Road to Santa Ana Street. Under future design conditions, there would be impacts at six modeled receivers; therefore, Soundwall Seg2C-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-29 and C-30 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2C-NB2: Soundwall Seg2C-NB2 (ESW-33) is an existing 16-foot tall, 758-foot long soundwall located along the northbound I-5 right-of-way of the northbound I-5 from Santa Ana Street to West Broadway. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg2C-

NB2 was analyzed to provide feasible abatement at the impacted modeled receiver. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-30 and C-31 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2C-NB3: Soundwall Seg2C-NB3 (ESW-34) is an existing 16-foot tall, 986-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way of the northbound I-5 from West Broadway to Lincoln Avenue. Under future design conditions, there would be impacts at five modeled receivers; therefore, Soundwall Seg2C-NB3 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-31 in Appendix C show the location of the evaluated soundwall.

NSA 18 – Harbor Boulevard to Lincoln Avenue - Southbound Side

Existing exterior traffic noise levels in NSA 18 range from 54 to 71 dBA for Receivers M-S2C-SB58 through M-S2C-SB102. The future predicted exterior traffic noise levels range from 55 to 71 dBA. There would be 16 modeled receivers, M-S2C-SB69 through M-S2C- SB71, M-S2C-SB82 through M-S2C-SB92, M-S2C-SB100 and M-S2C- SB101 that would approach or exceed the NAC for 16 Activity Category B and two Activity Category C receptors; therefore, consideration of noise abatement is required. Tables B-31 to B-32 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 18 with Alternative 3. Figures C-29 to C-31 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2C-SB1: Soundwall Seg2C-SB1 (ESW-35) is an existing 10- to 16-foot-tall, 2,360-foot long soundwall located along the southbound I-5 right-of-way from Santa Ana Street to I-5 off-ramp Ball Road/Disney Way. Under future design conditions, there would be impacts at 14 modeled receivers; therefore, Soundwall Seg2C-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 12- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-29 and C-30 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2C-SB2: Soundwall Seg2C-SB2 is new evaluated, 780-foot long soundwall, located along the southbound I-5 right-of-way from West Broadway to Santa Ana Street. Under future design conditions, there would be impacts at two modeled receivers; therefore, Soundwall Seg2C-SB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate a barrier to heights of 6- to 16- feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-30 and C-31 in Appendix C show the location of the evaluated soundwall.

NSA 19 – Lincoln Avenue to La Palma Avenue - Northbound Side

Existing exterior traffic noise levels in NSA 19 range from 44 to 68 dBA for Receivers M-S2D-NB161 through M-S2D-NB243. The future predicted exterior traffic noise levels range from 45 to 69 dBA. There would be 16 modeled receivers, M-S2D-NB165, M-S2D-NB173 through M-S2D-NB180, M-S2D-NB188, M-S2D-NB204, M-

S2D-NB208, M-S2D-NB212, M-S2D-NB213, M-S2D-NB215 and M-S2D-NB216 that would approach or exceed the NAC for 16 Activity Category B and 2 Activity Category C receptors; therefore, consideration of noise abatement is required. Table B-33 through B-35 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 19 with Alternative 3. Figures C-31 to C-35 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2D-NB1: Soundwall Seg2D-NB1 (ESW-36) is an existing 16-foot-tall, 2,336-foot long soundwall located along the northbound I-5 right-of-way from Lincoln Avenue to Euclid. Under future design conditions, there would be impacts at nine modeled receivers; therefore, Soundwall Seg2D-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-31 and C-32 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2D-NB2: Soundwall Seg2D-NB2 (ESW-37) is an existing 16-foot tall, 1,336-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way of the northbound I-5 on-ramp from Euclid Street. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg2C-NB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-32 and C-33 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2D-NB3 and Seg2D-NB-4: Soundwall Seg2C-NB3 (ESW-38) and Seg2D-NB4 (ESW-39) are a pair of existing 16-foot tall, 2,114- and 2,116-foot long soundwalls located along the northbound I-5 edge-of-shoulder/right-of-way of the northbound I-5 from Crescent Avenue to the Brookhurst Street off-ramp. Under future design conditions, there would be impacts at six modeled receivers; therefore, Soundwall Seg2C-NB3 and Seg2D-NB4 were analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwalls were analyzed to evaluate raising the existing barriers to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-34 and C-35 in Appendix C show the location of the evaluated soundwalls.

NSA 20 – Lincoln Avenue to La Palma Avenue - Southbound Side

Existing exterior traffic noise levels in NSA 20 range from 57 to 64 dBA for Receivers M-S2D- SB104 through M-S2D- SB118. The future predicted exterior traffic noise levels range from 52 to 64 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 20; therefore, consideration of noise abatement is not required. Table B-36 in Appendix B shows the existing and future noise levels for NSA 20 with Alternative 3. Figures C-32 to C-36 in Appendix C shows the locations of existing wall, measurement sites, and modeling sites.

NSA 21 –La Palma Avenue to State Route 91 (SR-91) - Northbound Side

Existing exterior traffic noise levels in NSA 21 range from 56 to 71 dBA for Receivers M-S2E-NB244 through M-S2E-NB311. The future predicted exterior traffic noise levels range from 56 to 71 dBA. There would be 21

modeled receivers, M-S2E-NB246 through M-S2E-NB257, M-S2E-NB259 through M-S2E-NB261, M- S2E-NB263, M-S2E-NB267, M-S2E-NB268, and M-S2E-NB278 through M-S2E-NB280 that would approach or exceed the NAC at 30 Activity Category B receptors; therefore, consideration of noise abatement is required. Tables B-37 and B-38 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 21 with Alternative 3. Figures C-36 to C-38 in Appendix C shows the locations of existing walls, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2E-NB1: Soundwall Seg2E-NB1 (ESW-43) is an existing 16-foot tall, 4,503-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way from the La Palma Avenue on-ramp to northbound I-5 to SR-91 ramp. Under future design conditions, there would be impacts at 18 modeled receivers; therefore, Soundwall Seg2E-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-37 and C-38 in Appendix C show the location of the evaluated soundwalls.

Soundwall Seg2E-NB2: Soundwall Seg2D-NB2 (ESW-44) is an existing 12-foot tall, 1,177-foot long soundwall located along the northbound I-5 edge-of-shoulder off-ramp to westbound SR-91 ramp. Under future design conditions, there would be impacts at three modeled receivers; therefore, Soundwall Seg2E-NB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 14- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-38 in Appendix C show the location of the evaluated soundwalls.

NSA 22 –La Palma Avenue to State Route 91 (SR-91) - Southbound Side

Existing exterior traffic noise levels in NSA 22 range from 57 to 65 dBA for Receivers M-S2E-SB117 through M-S2E-SB122. The future predicted exterior traffic noise levels range from 57 to 65 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 22; therefore, consideration of noise abatement is not required. Table B-39 in Appendix B shows the existing and future noise levels for NSA 22 with Alternative 3. Figures C-37 to C-39 in Appendix C shows the locations of existing walls, measurement sites, and modeling sites.

SEGMENT 3 – Alternative 3 and 4

NSA 23 – SR91 to Stanton Avenue Northbound Side

Existing exterior traffic noise levels in NSA 23 range from 55 to 77 dBA for Receivers M-S3A- NB1 through M-S3A-NB38. The future predicted exterior traffic noise levels range from 55 to 77 dBA. There would be 12 modeled receivers; M-NB4, M-NB8, M-NB10, M-NB20A, M-NB22 to M-NB26, M-NB28 and M-NB30, that would approach or exceed the NAC for 16 Activity Category B receptors; therefore, consideration of noise abatement is required. Table B-40 in Appendix B shows the existing and future noise levels for NSA 23 with Alternative 3 and 4. Figures C-40 to C-42 in Appendix C shows the locations of existing walls, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg3A-NB1: Soundwall Seg3A-NB1 would be a new wall, approximately 1,050-feet in length, located on the edge-of-shoulder of the WB SR91 on-ramp to the NB I-5, between the Orangethorpe on-ramp and Auto Center Drive. Under future design conditions, there would be impacts at 12 modeled receivers; therefore, Soundwall Seg3A-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed at heights of 8- to 16-feet in 2-foot increments. At 12-feet in height, the barrier would meet the feasible reduction criteria but would not meet the design goal of 7.0 dBA reduction at one site. At 14- and 16-feet in height, the barrier would meet the feasible reduction criteria and design goal of 7.0 dBA reduction for 8 impacted receivers (representing 12 receptors). Table B-38 in Appendix B shows the existing and future noise levels, as well as barrier analysis, for the evaluated soundwall, Seg3A-NB1, Alternative 3 and 4. Table 23 summarizes the range of reasonable allowances for the feasible noise abatement measures. Figure C-40 in Appendix C show the location of the evaluated soundwall.

Table 23. Summary of Reasonableness Determination Data – Alternative 3 and 4 – Seg3A- NB1

Barrier I.D.: Seg3A-NB1	8-Foot Barrier	10-Foot Barrier	12-Foot Barrier	14-Foot Barrier	16-Foot Barrier
Barrier Noise Reduction, dB	2.0	4.2	5.8	7.0	7.9
Number of Benefited Receptors	0	0	5	12	12
Reasonable Allowance Per Benefited Receiver	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$0	$1,284,000	$1,284,000

[1] A NADR will be prepared that will identify noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.

NSA 24 – SR91 TO STANTON AVENUE SOUTHBOUND SIDE

Existing exterior traffic noise levels in NSA 24 range from 57 to 65 dBA for Receivers M-S3B-SB1 through M-S3B-SB26. The future predicted exterior traffic noise levels range from 57 to 65 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 24; therefore, consideration of noise abatement is not required. Table B-41 in Appendix B shows the existing and future noise levels for NSA 24 with Alternative 3 and 4. Figures C-40 to C-41 in Appendix C shows the locations of existing walls, measurement sites, and modeling sites.

NSA 25 –STANTON AVENUE TO BEACH NORTHBOUND SIDE

Existing exterior traffic noise levels in NSA 25 range from 53 to 64 dBA for Receivers M-S3D-NB1 through M-S3D-NB17. The future predicted exterior traffic noise levels range from 57 to 65 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 25; therefore, consideration of noise abatement is not required. Table B-42 in Appendix B shows the existing and future noise levels for NSA 25 with Alternative 3 and 4. Figures C-42 in Appendix C shows the locations of existing walls, measurement sites, and modeling sites.

NSA 26 – Stanton Avenue to Beach Boulevard Southbound Side

Existing exterior traffic noise levels in NSA 26 range from 48 to 58 dBA for Receivers M-S3C-SB1 through M-S3C-SB16. The future predicted exterior traffic noise levels range from 48 to 59 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 26; therefore, consideration of noise abatement is not required. Table B-43 in Appendix B shows the existing and future noise levels for NSA 26 with Alternative 3. Figures C-43 in Appendix C shows the locations of existing walls, measurement sites, and modeling sites.

NSA 27 – Beach Boulevard to Artesia Northbound Side

There are no noise sensitives land uses within NSA 27, so no noise mitigation is required. Figures C-44 and C-45 in Appendix C shows the locations of existing land uses.

NSA 28– Beach Boulevard to Artesia Southbound Side

Existing exterior traffic noise levels in NSA 28 range from 54 to 66 d6A for Receivers M-S3E-SB17 through M-S3E-SB45. The future predicted exterior traffic noise levels range from 56 to 67 dBA. There would be one modeled receiver, M-S3E-SB45, that would approach or exceed the NAC for Activity Category B; therefore, consideration of noise abatement is required. Table B-44 Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 28 with Alternative 3 and 4. Figures C-44 and C-45 in Appendix C shows the locations of existing wall, evaluated wall, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg3E-SB1: Soundwall Seg3E-SB1(ESW-48) is an existing 14-foot tall, 1,908-foot long sound wall located along the property line and adjacent to the railroad and the northbound I-5. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg3E-SB1 was analyzed to provide feasible abatement at the impacted modeled receiver. The proposed soundwall was analyzed to raise the existing barrier to evaluated heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-44 in Appendix C shows the location of the evaluated soundwall.

SEGMENT 2-Alternative-4

NSA 13 –SR57 Interchange to Katella Avenue - Northbound Side

Existing exterior traffic noise levels in NSA 13 range from 62 to 71 dBA for Receivers M-S2A-SB1 through M-S2A-SB5. The future predicted exterior traffic noise levels range from 62 to 72 dBA. There would be two modeled receivers, M-S2A-NB1, and M-S2A-NB2 that would approach or exceed the NAC for two Activity Category B receptors; therefore, consideration of noise abatement is required. Table B-45 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 13 with Alternative 4. Figures C-17 to C-20 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites

Areas with Noise Abatement

Soundwall Seg2A-NB1: Soundwall Seg2A-NB1 is located along the northbound I-5 edge-of-shoulder along the northbound I-5 off-ramp to Chapman Avenue. Under future design conditions, there would be impacts at two

modeled receivers; therefore, Soundwall Seg2A-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate a barrier to heights of 6 to 16 feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Consideration of further noise abatement is not required. Figures C-17 and C-18 in Appendix C show the location of the evaluated soundwall.

NSA 14 –SR57 Interchange to Katella Avenue - Southbound Side

Existing exterior traffic noise levels in NSA 14 range from 52 to 73 dBA for Receivers M-S2A-SB1 through M-S2A-SB52. The future predicted exterior traffic noise levels range from 53 to 73 dBA. There would be 26 modeled receivers, M-S2A-SB2 through M-S2A-SB16, M-S2A-SB33 through M-S2A-SB37A, and M-S2A-SB52 that would approach or exceed the NAC for 24 Activity Category B and one Activity Category C receptors; therefore, consideration of noise abatement is required. Tables B-46 to B-48 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 14 with Alternative 4. Figures C-21 to C-25 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2A-SB1: Soundwall Seg2A-SB1 (ESW-26) is an existing 14-foot tall, 3,224-foot long soundwall located along the southbound I-5 edge-of-shoulder along the southbound I-5 off-ramp to The City Drive. Under future design conditions, there would be impacts at 16 modeled receivers; therefore, Soundwall Seg2A-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising a 2,365-foot long segment of the existing barrier to heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-23 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2A-SB2: Soundwall Seg2A-SB2 (ESW-26) is an existing 14-foot tall, 3,224-foot long soundwall located along the southbound I-5 edge-of-shoulder between Gene Autry Way and Orangewood Avenue. Under future design conditions, there would be impacts at 10 modeled receivers; therefore, Soundwall Seg2A-SB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising an 859-foot long segment of the existing barrier to heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-24 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2A-SB3: Soundwall Seg2A-SB3 is a new evaluated soundwall located along the southbound I-5 edge-of-shoulder along the southbound I-5 off-ramp to Manchester Avenue. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg2A-SB3 was analyzed to provide feasible abatement at the impacted modeled receiver. The proposed 1,654-foot long soundwall was analyzed to evaluate a barrier to heights of 6- to 16-feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-24 and C-25 in Appendix C show the location of the evaluated soundwall.

NSA 15 – Katella Avenue to Harbor Boulevard - Northbound Side

Existing exterior traffic noise levels in NSA 15 range from 60 to 69 dBA for Receivers M-S2B-NB24 through M-S2B-NB76. The future predicted exterior traffic noise levels range from 60 to 70 dBA. There would be 12

modeled receivers, M-S2B-NB25 through M-S2B-NB32, M-S2B-NB35, and M-S2B-NB36, M-S2B-NB41, and M-S2B-NB48 that would approach or exceed the NAC for 39 Activity Category B receptors; therefore, consideration of noise abatement is required. Table B-49 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 15 with Alternative 4. Figures C-25 to C-28 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2B-NB1: Soundwall Seg2B-NB1 (ESW-28) is an existing 14- to 16-foot tall, 3,658-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way just north of the northbound I-5 on-ramp from Anaheim Boulevard. Under future design conditions, there would be impacts at 12 modeled receivers; therefore, Soundwall Seg2B-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 16- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-26 to C-28 in Appendix C show the location of the evaluated soundwall.

NSA 16 – Disney Way/Katella Avenue to Harbor Boulevard - Southbound Side

Existing exterior traffic noise levels in NSA 16 range from 59 to 69 dBA for Receivers M-S2B-SB52through M-S2B-SB57. The future predicted exterior traffic noise levels range from 59 to 70 dBA. There would be two modeled receivers, M-S2B-SB55 and M-S2B-SB56 that would approach or exceed the NAC for one Activity Category B and one Activity Category C receptors; therefore, consideration of noise abatement is required. Table B-50 in Appendix B shows the existing and future noise levels, as well as barrier analysis for NSA 16 with Alternative 4. Figures C-25 to C-28 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2B-SB1: Soundwall Seg2B-SB1 is a new evaluated, 1,540-foot long soundwall, located along the southbound I-5 edge-of-shoulder along the southbound I-5 off-ramp to Disney Way/Katella Avenue. Under future design conditions, there would be impacts at two modeled receivers; therefore, Soundwall Seg2B-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate a barrier to heights of 6- to 16-feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-26 in Appendix C show the location of the evaluated soundwall.

NSA 17 – Harbor Boulevard to Lincoln Avenue - Northbound Side

Existing exterior traffic noise levels in NSA 17 range from 51 to 71 dBA for Receivers M-S2C-NB76 through M-S2C-NB159. The future predicted exterior traffic noise levels range from 52 to 72 dBA. There would be 12 modeled receivers, M-S2C-NB83 through M-S2C-NB86, M-S2C-NB120, M-S2C-NB121, M-S2C-NB141, M-S2C-NB143 through M-S2C-NB145, M-S2C-NB148 and M-S2C-NB149 that would approach or exceed the NAC for 24 Activity Category B receptors and one Activity Category C receptor; therefore, consideration of noise abatement is required. Tables B-51 through B-53 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 17 with Alternative 4. Figures C-28 to C-31 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2C-NB1: Soundwall Seg2C-NB1 (ESW-32) is an existing 14- to 16-foot-tall, 3,128-foot long soundwall located along the northbound I-5 right-of-way just north of the northbound I-5 on-ramp from Ball Road to Santa Ana Street. Under future design conditions, there would be impacts at six modeled receivers; therefore, Soundwall Seg2C-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-29 and C-30 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2C-NB2: Soundwall Seg2C-NB2 (ESW-33) is an existing 16-foot tall, 758-foot long soundwall located along the northbound I-5 /right-of-way of the northbound I-5 from Santa Ana Street to West Broadway. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg2C-NB2 was analyzed to provide feasible abatement at the impacted modeled receiver. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-30 and C-31 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2C-NB3: Soundwall Seg2C-NB3 (ESW-34) is an existing 16-foot tall, 986-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way of the northbound I-5 from West Broadway to Lincoln Avenue. Under future design conditions, there would be impacts at five modeled receivers; therefore, Soundwall Seg2C-NB3 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-31 in Appendix C show the location of the evaluated soundwall.

NSA 18 – Harbor Boulevard to Lincoln Avenue - Southbound Side

Existing exterior traffic noise levels in NSA 18 range from 54 to 71 dBA for Receivers M-S2C-SB58 through M-S2C-SB102. The future predicted exterior traffic noise levels range from 55 to 71 dBA. There would be 16 modeled receivers, M-S2C-SB69 through M-S2C- SB71, M-S2C-SB82 through M-S2C-SB92, M-S2C-SB100 and M-S2C- SB101 that would approach or exceed the NAC at 14 Activity Category B receptors and two Activity Category C receptors; therefore, consideration of noise abatement is required. Tables B-54 and B-55 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 18 with Alternative 4. Figures C-29 to C-31 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2C-SB1: Soundwall Seg2C-SB1 (ESW-35) is an existing 10- to 16-foot tall, 2,360-foot long soundwall located along the southbound I-5 right-of-way from Santa Ana Street to I-5 off-ramp Ball Road/Disney Way. Under future design conditions, there would be impacts at 14 modeled receivers; therefore, Soundwall Seg2C-SB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 12- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of

further noise abatement is not required. Figures C-29 and C-30 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2C-SB2: Soundwall Seg2C-SB2 is new evaluated, 780-foot long soundwall, located along the southbound I-5 right-of-way from West Broadway to Santa Ana Street. Under future design conditions, there would be impacts at 2 modeled receivers; therefore, Soundwall Seg2C-SB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate a barrier to heights of 6- to 16-feet in 2-foot increments. At 16-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-30 and C-31 in Appendix C show the location of the evaluated soundwall.

NSA 19 – Lincoln Avenue to La Palma Avenue - Northbound Side

Existing exterior traffic noise levels in NSA 19 range from 44 to 68 dBA for Receivers M-S2D-NB161 through M-S2D-NB243. The future predicted exterior traffic noise levels range from 45 to 69 dBA. There would be 16 modeled receivers, M-S2D-NB165, M-S2D-NB173 through M-S2D-NB180, M-S2D-NB188, M-S2D-NB204, M-S2D-NB208, M-S2D-NB212, M-S2D-NB213, M-S2D-NB215 and M-S2D-NB216 that would approach or exceed the NAC at 16 Activity Category B receptors and two Activity Category C receptors; therefore, consideration of noise abatement is required. Tables B-56 to B-58 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 19 with Alternative 4. Figures C-31 to C-35 in Appendix C shows the locations of existing wall, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2D-NB1: Soundwall Seg2D-NB1 (ESW-36) is an existing 16-foot tall, 2,336-foot long soundwall located along the northbound I-5 right-of-way from Lincoln Avenue to Euclid. Under future design conditions, there would be impacts at nine modeled receivers; therefore, Soundwall Seg2D-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-31 and C-32 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2D-NB2: Soundwall Seg2D-NB2 (ESW-27) is an existing 16-foot tall, 1,336-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way of the northbound I-5 on-ramp from Euclid Street. Under future design conditions, there would be impacts at one modeled receiver; therefore, Soundwall Seg2C-NB2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-32 and C-33 in Appendix C show the location of the evaluated soundwall.

Soundwall Seg2D-NB3 and Seg2D-NB-4: Soundwall Seg2C-NB3 (ESW-38) and Seg2D-NB4 (ESW-39) are a pair of existing 16-foot tall, 2,114- and 2,116-foot long soundwalls located along the northbound I-5 edge-of-shoulder/right-of-way of the northbound I-5 from Crescent Avenue to the Brookhurst Street off-ramp. Under future design conditions, there would be impacts at six modeled receivers; therefore, Soundwalls Seg2C-NB3 and Seg2D-NB4 were analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwalls were analyzed to evaluate raising the existing barriers to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore,

consideration of further noise abatement is not required. Figure C-34 and C-35 in Appendix C show the location of the evaluated soundwalls.

NSA 20 – Lincoln Avenue to La Palma Avenue - Southbound Side

Existing exterior traffic noise levels in NSA 20 range from 57 to 64 dBA for Receivers M-S2D- SB104 through M-S2D- SB118. The future predicted exterior traffic noise levels range from 52 to 64 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 20; therefore, consideration of noise abatement is not required. Table B-59 in Appendix B shows the existing and future noise levels for NSA 20 with Alternative 4. Figures C-32 to C-36 in Appendix C shows the locations of existing wall, measurement sites, and modeling sites.

NSA 21 –La Palma Avenue to State Route 91 (SR-91) - Northbound Side

Existing exterior traffic noise levels in NSA 21 range from 56 to 71 dBA for Receivers M-S2E-NB244 through M-S2E-NB311. The future predicted exterior traffic noise levels range from 56 to 71 dBA. There would be 21 modeled receivers, M-S2E-NB246 through M-S2E-NB257, M-S2E-NB259 through M-S2E-NB261, M-S2E-NB263, M-S2E-NB267, M-S2E-NB268, and M-S2E-NB278 through M-S2E-NB280 that would approach or exceed the NAC for 30 Activity Category B receptors; therefore, consideration of noise abatement is required. Tables B-60 and B-61 in Appendix B show the existing and future noise levels, as well as barrier analysis for NSA 21 with Alternative 4. Figures C-36 to C-38 in Appendix C shows the locations of existing walls, evaluated walls, measurement sites, and modeling sites.

Areas with Noise Abatement

Soundwall Seg2E-NB1: Soundwall Seg2E-NB1 (ESW-43) is an existing 16-foot tall, 4,503-foot long soundwall located along the northbound I-5 edge-of-shoulder/right-of-way from the La Palma Avenue on-ramp to northbound I-5 to SR-91. Under future design conditions, there would be impacts at 18 modeled receivers; therefore, Soundwall Seg2E-NB1 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 18- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figures C-37 and C-38 in Appendix C show the location of the evaluated soundwalls.

Soundwall Seg2E-NB2: Soundwall Seg2D-NB1 (ESW-44) is an existing 12-foot tall, 1,177-foot long soundwall located along the northbound I-5 edge-of-shoulder ramp to westbound SR-91. Under future design conditions, there would be impacts at three modeled receivers; therefore, Soundwall Seg2E-NB 2 was analyzed to provide feasible abatement at the impacted modeled receivers. The proposed soundwall was analyzed to evaluate raising the existing barrier to heights of 14- to 22-feet in 2-foot increments. At 22-feet in height, the barrier would not meet the feasible reduction criteria; therefore, consideration of further noise abatement is not required. Figure C-38 in Appendix C show the location of the evaluated soundwalls.

NSA 22 –La Palma Avenue to State Route 91 (SR-91) - Southbound Side

Existing exterior traffic noise levels in NSA 22 range from 57 to 65 dBA for Receivers M-S2E-SB117 through M-S2E-SB122. The future predicted exterior traffic noise levels range from 57 to 65 dBA. There would be no modeled receivers that would approach or exceed the NAC for Activity Categories B or C, so no impacts are anticipated in NSA 22; therefore, consideration of noise abatement is not required. Table B-62 in Appendix B

shows the existing and future noise levels for NSA 22 with Alternative 4. Figures C-37 to C-39 in Appendix C shows the locations of existing walls, measurement sites, and modeling sites.

8. CONSTRUCTION NOISE

During the construction phases of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Table 243 summarizes noise levels produced by construction equipment commonly used on roadway construction projects. As indicated, equipment involved in construction is expected to generate noise levels ranging from 80 to 89 dBA at a distance of 50 feet. Noise produced by construction equipment would be reduced over distance at a rate of approximately 6 dB per doubling of distance.

Table 24: Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)
Scrapers	89
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82
Source: Federal Transit Administration, 2006. See also: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm	

Construction noise varies greatly depending on the construction process, type, and condition of equipment used, and layout of the construction site. Many of these factors are traditionally left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction noise. Construction noise estimates are approximate because of the lack of specific information available at the time of the assessment. Temporary construction noise impacts would be unavoidable at areas immediately adjacent to the proposed project alignment.

Sound control will conform to the provisions in Section 14-8.02, "Noise Control," of the Standard Specifications and Special Provisions (SSP 14-8.02). According to requirements of these specifications, construction noise cannot exceed 86 dBA at 50 feet from the job site activities from 9:00 p.m. to 6:00 a.m.

Many measures can be taken to minimize noise intrusion without placing unreasonable constraints on the construction process or substantially increasing costs. These include noise monitoring to ensure that contractors take all reasonable steps to minimize impacts when near sensitive areas, noise testing and inspection of equipment to ensure that all equipment on site is in good condition and effectively muffled, and an active community liaison program. A community liaison program would keep residents informed about construction plans so they can plan around periods of particularly high noise or vibration levels, and the program would provide a conduit for residents to express any concerns or complaints.

The following are possible control measures that can be implemented to minimize noise disturbances at sensitive areas during construction:

- All equipment will have sound-control devices no less effective than those provided on the original equipment. Each internal combustion engine used for any purpose on the job or related to the job

will be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine will be operated on the job site without an appropriate muffler.

- Construction methods or equipment that will provide the lowest level of noise impact will be used.
- Idling equipment will be turned off.
- Truck loading, unloading, and hauling operations will be restricted so that noise and vibration are kept to a minimum through residential neighborhoods to the greatest possible extent.
- Construction activities will be coordinated to build recommended permanent soundwalls during the first phase of construction to protect sensitive receptors from subsequent construction noise, dust, light, glare, and other impacts to the extent feasible.
- Where feasible, temporary noise barriers will be used and relocated, as needed, to protect sensitive receptors against excessive noise from construction activities involving large equipment and by small items such as compressors, generators, pneumatic tools, and jackhammers. Noise barriers can be made of heavy plywood, moveable insulated sound blankets, or other best available control techniques.
- Construction activities will be minimized in residential areas during evening, nighttime, weekend, and holiday periods. Noise impacts are typically minimized when construction activities are performed during daytime hours; however, nighttime construction may be desirable (e.g., in commercial areas where businesses may be disrupted during daytime hours) or necessary to avoid major traffic disruption. Coordination with each city will occur before construction can be performed in noise-sensitive areas.
- Construction lay-down or staging areas will be selected in industrially zoned districts. If industrially zoned areas are not available, commercially zoned areas may be used, or locations that are at least 100 feet from any noise-sensitive land use (e.g., residences).

It is possible that certain construction activities could cause intermittent localized concern from vibration in the project area. Processes such as earth moving with bulldozers, the use of vibratory compaction rollers, demolition, or crack-and-seating of rigid pavement, if done, may cause construction-related vibration impacts such as human annoyance, dish rattling, loosening of tiles, and crack growth in stucco or concrete surfaces. There are cases in which it may be necessary to use this type of equipment close to residential buildings. If these processes are used, pre- and post-construction surveys will be performed. The following are some procedures that can be used to minimize the potential impacts from construction vibration:

- The hours of vibration-intensive equipment or activities such as vibratory rollers will be restricted so that impacts on residents are minimal (e.g., weekdays during daytime hours only when as many residents as possible are away from home).
- The owner of a building close enough to a construction vibration source such that damage to that structure due to vibration is possible will be entitled to a preconstruction building inspection to document the preconstruction condition of that structure.
- Vibration monitoring will be conducted during vibration-intensive activities such as the use of vibratory compaction rollers, demolition, or pavement breaking.

A combination of the mitigation techniques for equipment vibration control, as well as administrative measures, when properly implemented, can be selected to provide the most effective means to

minimize the effects of construction activity. Application of the mitigation measures will reduce the construction impacts; however, temporary increases in vibration would likely occur at some locations.

9. REFERENCES

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APPENDIX A – DESIGN YEAR AND CALIBRATION TRAFFIC TABLES

Appendices to be provided upon request.

APPENDIX B – TRAFFIC NOISE/EVALUATED BARRIER RESULTS

Appendices to be provided upon request.

APPENDIX C – FIGURES

Appendices to be provided upon request.

APPENDIX D – NOISE MEASUREMENT FIELD SHEETS/PHOTOS

Appendices to be provided upon request.

APPENDIX E – LONG-TERM NOISE MEASUREMENT GRAPHS/PHOTOS

Appendices to be provided upon request.

APPENDIX F – CALIBRATION CERTIFICATES

Appendices to be provided upon request.