Noise Study Report

City of Moreno Valley

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

April 2019

This page intentionally left blank

DEPARTMENT OF TRANSPORTATION
DISTRICT 12
3347 MICHELSON DRIVE, SUITE 100
IRVINE, CA 92612-8894
PHONE (949) 724-2000
FAX (949) 724-2019
TTY 711
www.dot.ca.gov/d12/index.html

Making Conservation a California Way of Life

May 13, 2019

08-RIV-60
EA 0M5900
SR-60/WLC Parkway
Interchange Project
PM 20.0/22.0
Project ID No.
0813000109

Mr. Jason Lui
Senior Noise Specialist
LSA Associates Inc.
20 Executive Park, Suite 200
Irvine, CA 92614

Dear Mr. Lui:

District 12 - Caltrans Environmental Engineering Branch has completed its review of the revised Noise Study Report dated April 2019 for the SR-60/World Logistics Center Parkway Interchange Project (EA 0M5900). Our comments have been addressed. Attached is the signed signature page for the NSR. Please provide District 12 two hardcopies of the report and the electronic file of the approved report in word format and portable document format with the necessary data supporting the analysis in a CD attached to the reports. A Noise Abatement Decision Report will need to be prepared for Caltrans District 8.

If you have questions, please contact Ricardo Caraig of my staff at (657) 328-6441 or myself at (657) 328-6138.

Sincerely,

for **Reza Aurasteh, Ph.D., P.E.**
Branch Chief
Environmental Engineering

c: Elihah Hadipour, District 8 Senior Project Manager, Project Management
Olufemi A. Odufalu, District 8 Branch Chief, Environmental Engineering "Unit B"
Tami Saghafi, District 8 Assoc. Env. Planner - Generalist, Environmental Studies B
Project File

Noise Study Report

State Route 60/World Logistics Center Parkway Interchange

City of Moreno Valley

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

April 2019

Prepared By: _____ Date: 4/26/19

Jason Lui
Senior Noise Specialist
LSA Associates, Inc.
20 Executive Park, Suite 200
Irvine, California 92614
(949) 553-0666

Approved By: _____ Date: 4/26/19

Amy Fischer
Principal
LSA Associates, Inc.
7086 North Maple Avenue, Suite 104
Fresno, California 93720
(559) 490-1210

Concurred By: R. Aurasteh Date: 5/10/2019

Reza Aurasteh, Ph.D., P.E.
Chief, Environmental Engineering Branch
California Department of Transportation, District 12
1750 East 4th Street, Suite 100
Santa Ana, California 92705
(657) 328-6138

Summary

Theodore Street south of the State Route 60 (SR-60) westbound ramps has been renamed to World Logistics Center Parkway (WLC Pkwy). The City is currently renaming Theodore Street to WLC Pkwy from the SR-60 westbound ramps to Ironwood Avenue. The City of Moreno Valley (City), in cooperation with the California Department of Transportation (Caltrans), District 8, proposes to reconstruct and improve the State Route 60/World Logistics Center Parkway Interchange Project (project). The majority of the project site is in Moreno Valley; however, the northeast quadrant of the site is in unincorporated Riverside County but within the City's Sphere of Influence.

The purpose of the project is to alleviate existing and future traffic congestion at the SR-60/WLC Pkwy interchange ramps during peak hours, to improve traffic flow along the freeway and through the interchange, to improve safety by upgrading the geometry at the current interchange, and to provide standard vertical clearance for the WLC Pkwy overcrossing.

This Noise Study Report (NSR) evaluates the potential traffic noise impacts from the No Build Alternative, two Build Alternatives (Alternatives 2 and 6), and two Design Variations (Alternative 2 with Design Variation 2a and Alternative 6 with Design Variation 6a). No improvements will be made to the freeway mainline or to the existing SR-60/WLC Pkwy interchange under the No Build Alternative. The following discusses Alternatives 2 and 6 along with their design variations.

Alternative 2 improvements would include the construction of a new westbound direct on-ramp and a new westbound loop off-ramp in the northwest quadrant of the interchange, in a partial cloverleaf configuration. A new eastbound direct off-ramp, a new eastbound loop on-ramp, and a new eastbound direct on-ramp would be constructed in the southwest and southeast quadrants, in a partial cloverleaf configuration. Alternative 2 would also remove the existing two-lane WLC Pkwy overcrossing and replace it with a new four-lane overcrossing. The proposed overcrossing would accommodate turn lanes in the northbound and southbound directions. Design Variation 2a would have the same features as Alternative 2 with the exception of the location of the Eucalyptus Avenue/WLC Pkwy intersection. Design Variation 2a would consist of moving the current Eucalyptus Avenue/WLC Pkwy intersection approximately 900 feet (ft) south from its current location. The shift would cause a partial realignment of Eucalyptus Avenue from approximately

2,600 ft west of WLC Pkwy to connect with the west side of WLC Pkwy aligned with existing Eucalyptus Avenue extending east.

Alternative 6 would include the construction of a new westbound direct on-ramp and a new westbound loop off-ramp in the northwest quadrant, in a partial cloverleaf configuration. New eastbound direct off- and on-ramps would be constructed in the southwest and southeast quadrants, respectively, in a partial cloverleaf configuration. Similar to Alternative 2, Alternative 6 would also remove the existing two-lane overcrossing and replace it with a new four-lane overcrossing. Also, the proposed Alternative 6 improvements include the installation of roundabouts at both the proposed eastbound and westbound ramp intersections, as well as at Eucalyptus Avenue/WLC Pkwy. Design Variation 6a would have the same features as Alternative 6 with the exception of the location of the Eucalyptus Avenue/WLC Pkwy intersection. Design Variation 6a would consist of moving the current Eucalyptus Avenue/WLC Pkwy intersection approximately 900 ft south from its current location. The shift would cause a partial realignment of Eucalyptus Avenue from approximately 2,600 ft west of WLC Pkwy to connect to the west side of WLC Pkwy aligned with existing Eucalyptus Avenue extending east. All alternatives would also include additions of auxiliary lanes in both directions on SR-60, west and east of WLC Pkwy between Redlands Boulevard and Gilman Springs Road.

The proposed project is considered a Type I project because the project would add through-travel lanes on WLC Pkwy and one auxiliary lane in each direction on SR-60 between the Redlands Boulevard and Gilman Springs Road interchanges. In addition, the interchange ramps would be relocated. A noise analysis is required for all Type I projects.

Existing land uses in the project area include single-family residences, agriculture, vacant land, and industrial uses. Currently, there are no known permitted developments adjacent to the proposed project. The primary source of noise in the project area is traffic on SR-60 and Theodore Street/WLC Pkwy.

One long-term 24-hour noise level measurement was conducted within the project area to characterize the change in hourly noise levels over the course of a 24-hour period and to identify the peak traffic noise hour. Thirteen short-term noise level measurements were conducted at representative locations to document the existing noise environment. Eight of the 13 short-term noise level measurements were used to

calibrate the noise prediction model with concurrent traffic counts and measured vehicle speeds.

A total of 38 representative receptors were modeled and evaluated for potential traffic noise impacts. The results of the modeled noise levels for Existing and Future No Build are shown in Tables B.1 through B.4 in Appendix B. Also, the results of the modeled noise levels for Alternatives 2 and 6 and Design Variations are shown in Tables B.1 through B.4 in Appendix B.

When traffic noise impacts have been identified, noise abatement measures must be considered. Traffic noise impacts result from one or more of the following occurrences: (1) an increase of 12 A-weighted decibels (dBA) or more over their corresponding existing noise level, or (2) predicted noise levels approaching or exceeding the Noise Abatement Criteria (NAC).

Implementation of the proposed project would result in potential short-term noise impacts during construction and long-term noise impacts from use of the completed project.

Of the 38 modeled receptors, 2 receptors (Receptors R-10 and R-25) under Alternative 2, Design Variation 2a, and Alternative 6 conditions, and 1 receptor (Receptor R-10) under Design Variation 6a conditions would approach or exceed the NAC. Of the 38 modeled receptors, 2 receptor locations (Receptors R-25 and R-28) under the Alternative 2, Design Variation 2a, and Alternative 6 conditions would experience a substantial noise increase of 12 dBA or more over the corresponding modeled existing noise level. One receptor location (Receptor R-28) under the Design Variation 6a conditions would experience a substantial noise increase of 12 dBA or more over the corresponding modeled existing noise level. Receptors R-25 and R-27 would be fully acquired as part of the project under Design Variation 6a.

Noise abatement measures were evaluated for receptors within the project limits that would be or would continue to be exposed to traffic noise levels approaching or exceeding the NAC. Three noise barriers (NB Nos. 1, 2, and 3) were evaluated under Alternative 2, Design Variation 2a, and Alternative 6 conditions. Two noise barriers (NB Nos. 1 and 3) were evaluated under the Design Variation 6a conditions. The results of the noise barrier modeling are shown in Tables B.1 through B.4 in Appendix B. NB No. 1 for all conditions was capable of reducing noise levels by 5 dBA or more, as required to be considered feasible. NB No. 2 was capable of reducing noise levels by 5 dBA or more, as required to be considered feasible, for the

Alternative 2, Design Variation 2a, and Alternative 6 conditions. NB No. 3 for all conditions was capable of reducing noise levels by 5 dBA or more as required to be considered feasible.

A Noise Abatement Decision Report (NADR) will be prepared for the proposed project. 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 proposed project. The NADR is prepared 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 reasonable allowances in the NADR to identify which noise barrier configurations are reasonable from a cost perspective. The reasonableness determination of the feasible noise barrier shown in Tables 7.1 through 7.7 will be reported in the NADR for the proposed project.

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 proposed project. 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 the noise abatement will be made upon completion of the public involvement process during the final project design process.

The closest residence is within 50 ft of the project construction areas and approximately 400 ft from pile driving. Therefore, the closest residence may be subject to short-term noise reaching 87 dBA maximum instantaneous sound level (L_{max}) or higher generated by construction activities within the project area. Additionally, it is possible that the project may need to import soil from the borrow site at the northwestern corner of the intersection of Alessandro Boulevard/Nason Street, which would generate 13 truck trips per day based on construction activity assumptions. This volume of trucks when spread over a typical 8-hour workday would be minimal compared to the existing traffic volumes along the haul route. Compliance with the construction hours specified by the City's Municipal Code and Caltrans Standard Specifications Section 14-8.02 will be required to minimize construction noise impacts on sensitive land uses adjacent to the project site. The

noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA L_{max} at a distance of 50 ft.

This page intentionally left blank

Table of Contents

List of Figures

This page intentionally left blank

List of Tables

This page intentionally left blank

List of Abbreviated Terms

μPa	micropascals
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of Moreno Valley
CNEL	Community Noise Equivalent Level
cy	cubic yards
dB	decibels
dBA	A-weighted decibels
EMWD	Eastern Municipal Water District
FHWA	Federal Highway Administration
ft	foot/feet
HOT	high-occupancy toll
HOV	high-occupancy vehicle
Hz	Hertz
IS/EA	Initial Study/Environmental Assessment
kHz	kilohertz
kV	kilovolts
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
$L_{eq}(h)$	1-hour A-weighted equivalent continuous sound level
L_{max}	maximum instantaneous sound level
LOS	levels of service
L_{XX}	percentile-exceeded sound level
mi	mile/miles
MND/FONSI	Mitigated Negative Declaration/Finding of No Significant Impact
mph	miles per hour
MWD	Metropolitan Water District of Southern California
NAC	Noise Abatement Criteria
NADR	Noise Abatement Decision Report

NEPA	National Environmental Policy Act
NSR	Noise Study Report
PM	Post Mile
project	State Route 60/World Logistics Center Parkway Interchange Project
Protocol	*Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects*
RCFCWCD	Riverside County Flood Control and Water Conservation District
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCG	Southern California Gas Company
SCS	Sustainable Communities Strategy
SPL	sound pressure level
SR-60	State Route 60
TeNS	Technical Noise Supplement to the Traffic Noise Analysis Protocol
TNM	Traffic Noise Model
USC	United States Code
vplph	vehicles per lane per hour
WLC Pkwy	World Logistics Center Parkway
WMWD	Western Municipal Water District

Chapter 1. Introduction

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" (FHWA 2018). 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 the National Environmental Policy Act (NEPA).

The Caltrans *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Protocol) (May 2011) 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 the California Environmental Quality Act (CEQA) are evaluated in the project's environmental document.

1.2. Project Purpose and Need

1.2.1. Purpose

The purpose of the proposed project is to:

- Provide increased interchange capacity, reduce congestion, and improve traffic operations to support the forecast travel demand for the 2045 design year;
- Improve existing and projected interchange geometric deficiencies; and
- Accommodate a multimodal facility that has harmony with the community and preserves the values of the area.

1.2.2. Need

The proposed project is needed for the following reasons:

- According to the demographics and growth forecast prepared for the 2016 Southern California Association of Governments (SCAG) Regional

Transportation Plan/Sustainable Communities Strategy (RTP/SCS), between 2012 and 2040, Riverside County's population is expected to increase by 41 percent, job growth is anticipated to increase by 90 percent, and the number of households is anticipated to increase by 51 percent. For Moreno Valley specifically, between 2012 and 2040, population is anticipated to increase by 30 percent, household jobs are anticipated to increase by 165 percent, and households are anticipated to increase by 51 percent. Without improvements, in the year 2045, the eastbound and westbound on-and off- ramps are anticipated to operate at unacceptable levels of service (LOS) (LOS E in the a.m. peak hour and LOS F in the p.m. peak hour, respectively) and the ramp intersections with World Logistics Center Parkway (WLC Pkwy) are anticipated to operate at LOS F for both the a.m. and p.m. peak hours. The westbound mainline segment on State Route 60 (SR-60) between WLC Pkwy and Redlands Boulevard is anticipated to operate at LOS E during the a.m. peak hour. The Theodore Street intersection with Ironwood Avenue, the WLC Pkwy intersections with the SR-60 westbound and eastbound ramps, and Eucalyptus Avenue are forecast to operate at LOS F in the p.m. peak hour.

- The overcrossing bridge at the interchange was hit by a truck in January 2015 and a costly emergency repair project was required, so there is a need to bring vertical clearance up to current standards. In addition, the WLC Pkwy overcrossing is geometrically deficient and needs additional capacity to accommodate projected future travel volumes.
- This project will fulfill the need to accommodate the movement of people using multiple modes of transportation by community-based design taking into consideration the natural environment, social environment, transportation behavior, cultural characteristics and economic environment.

Chapter 2. Project Description

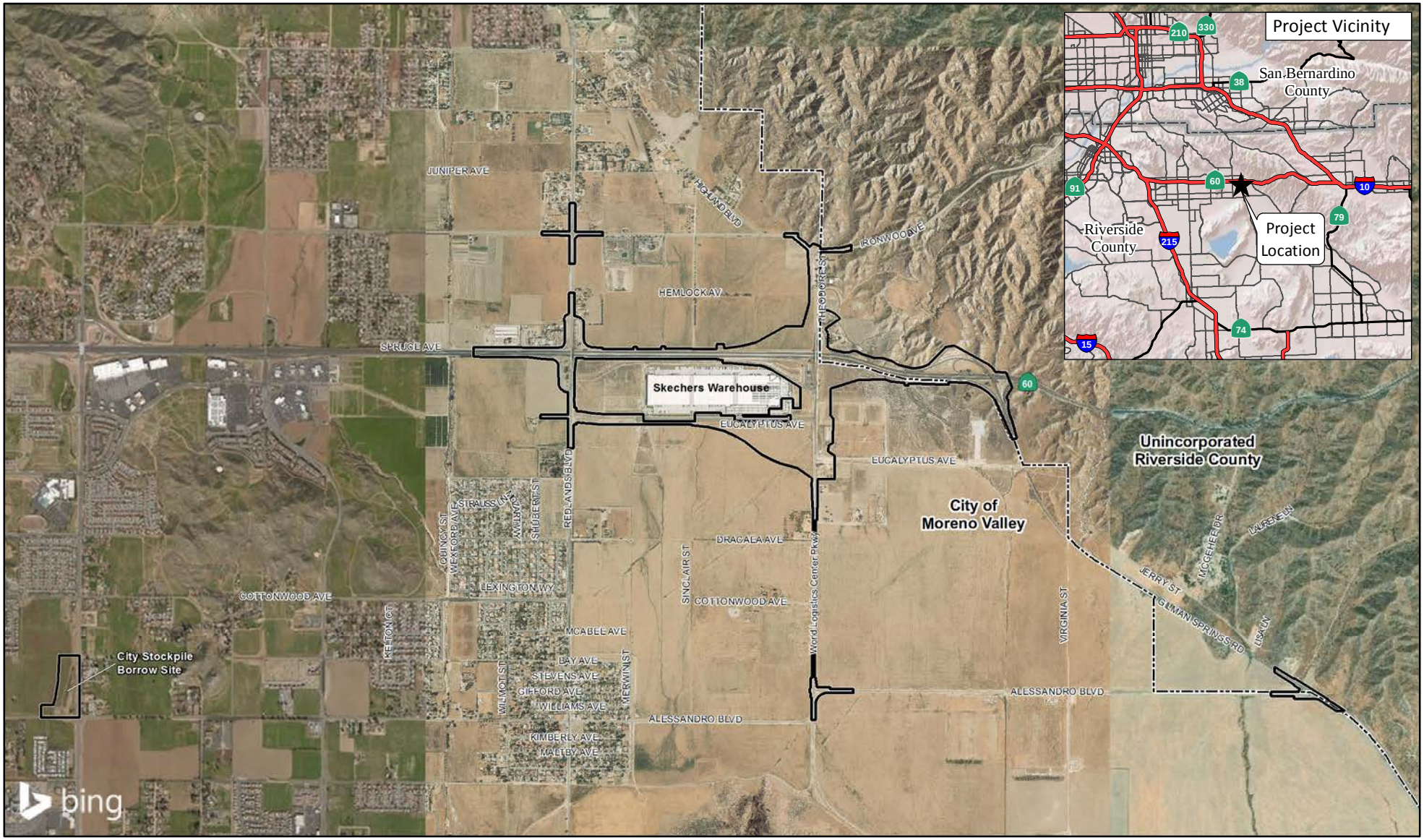
A segment of Theodore Street south of the State Route 60 (SR-60) westbound ramps has been renamed to World Logistics Center Parkway (WLC Pkwy). The City is currently renaming Theodore Street to WLC Pkwy from the SR-60 westbound ramps to Ironwood Avenue. The State Route 60/Theodore Street Interchange Project will now be referred to as the State Route 60/World Logistics Center Parkway Interchange Project (project).

The City of Moreno Valley (City), in cooperation with the California Department of Transportation (Caltrans), District 8, proposes to reconstruct and improve the SR-60/WLC Pkwy interchange. The majority of the project site is located in Moreno Valley; however, the northeast quadrant of the site is located within unincorporated Riverside County but within the City's Sphere of Influence. Figure 2-1 shows the project location and vicinity map. The purpose of the project is to alleviate existing and future traffic congestion at the SR-60/WLC Pkwy interchange ramps during peak hours, to improve traffic flow along the freeway and through the interchange, to improve safety by upgrading the geometry at the current interchange, and to provide standard vertical clearance for the WLC Pkwy overcrossing.

The project will be funded with a variety of funding sources including federal and local funds and, as such, will be required to comply with both CEQA and NEPA. Caltrans will be the Lead Agency for CEQA, the City is a Responsible Agency under CEQA, and the FHWA is the federal Lead Agency for NEPA. Caltrans will carry out the environmental review, consultation, and any other action required in accordance with the applicable federal laws for this project under its assumption of responsibility pursuant to 23 United States Code (USC) 327. Therefore, preparation of the NEPA compliance documents, including the technical studies and the environmental document, will have oversight from Caltrans District 8. An Initial Study/ Environmental Assessment (IS/EA) (i.e., a joint CEQA/NEPA document) is being prepared and is anticipated to result in a Mitigated Negative Declaration/Finding of No Significant Impact (MND/FONSI).

Although the City's General Plan Circulation Element designates WLC Pkwy as a Minor Arterial (two lanes in each direction), the existing WLC Pkwy through the project limits is one travel lane in each direction, including on the overcrossing over SR-60. Existing SR-60 between Redlands Boulevard and Gilman Springs Road is two mixed-flow travel lanes in each direction. The proposed project would construct

This page intentionally left blank



LEGEND

Project Area

City Boundary

FIGURE 2-1

SR-60/World Logistics Center Pkwy Interchange Project

Project Location and Vicinity

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

0 1500 3000

FEET

SOURCE: Bing (2015); MBI (9/2018); ESRI (07/2012)

I:\RBF1301\GIS_Mod\MXD\Noise\ProjectLocation_Aerial_8x11.mxd (1/28/2019)

This page intentionally left blank

modifications to the existing SR-60/WLC Pkwy interchange from Post Mile (PM) 20.0 to PM 22.0 on SR-60, a distance of 2 miles (mi). Major improvements to the interchange will include:

1. Reconstruction of the westbound and eastbound on- and off-ramps to SR-60;
2. Replacement of the existing WLC Pkwy overcrossing with an expanded four-lane overcrossing (two through lanes in each direction) with a minimum 16.5-foot (ft) vertical clearance between the eastbound and westbound SR-60 ramps and reconstruction of WLC Pkwy between the southern limits of the project and the eastbound SR-60 ramps; and
3. Construction of three lanes each direction on WLC Pkwy between the eastbound SR-60 ramps and Eucalyptus Avenue west (Eucalyptus Avenue west of WLC Pkwy); construction of two lanes in each direction but graded for three lanes in each direction on WLC Pkwy between Eucalyptus Avenue west and Eucalyptus Avenue east (Eucalyptus Avenue east of WLC Pkwy); and south of Eucalyptus Avenue east, WLC Pkwy would narrow to one lane in each direction.

The proposed improvements to the on- and off-ramps would extend west and east of the proposed overcrossing on SR-60 for proposed auxiliary lanes in each direction. The proposed improvements to Theodore Street/WLC Pkwy would extend north of SR-60 to Ironwood Avenue and south of SR 60 to south of Eucalyptus Avenue. Project construction is anticipated to begin in early 2022 and be completed in winter 2023, contingent upon full funding of all phases.

Three Alternatives and two Design Variations are evaluated in the environmental document for the proposed project: Alternative 1 (No Build Alternative [No Project]), Alternative 2 (Modified Partial Cloverleaf), Alternative 6 (Modified Partial Cloverleaf with Roundabout Intersections), Alternative 2 with Design Variation 2a, and Alternative 6 with Design Variation 6a. The Design Variations for each Build Alternative are similar and would realign Eucalyptus Avenue to join WLC Pkwy approximately 900 ft south of the existing Eucalyptus Avenue/WLC Pkwy intersection. Both Build Alternatives and Design Variations would require full right-of-way acquisitions. Design Variation 6a would require the same amount of acquisitions with an additional full acquisition in the southeast quadrant of the intersection that would result in one residential displacement. There would be partial right-of-way acquisitions within all four quadrants of the interchange.

During the construction phase of the proposed project, removal of the existing overcrossing and construction of the new overcrossing and ramps would interfere with access to the SR-60 at WLC Pkwy. The WLC Pkwy overcrossing is being evaluated for closure during construction of the proposed project. Therefore, if not done prior to this project, Eucalyptus Avenue would be extended and improved approximately 5,100 ft between WLC Pkwy and Redlands Boulevard to provide a detour route to SR-60. The improvements to Eucalyptus Avenue will be constructed early in the construction schedule, prior to the closure of the WLC Pkwy overcrossing. North of the freeway, access to SR-60 during construction would be provided via Ironwood Avenue and Redlands Boulevard. South of the freeway, access to SR-60 would be provided via Alessandro Boulevard and Gilman Springs Road and via Eucalyptus Avenue and Redlands Boulevard. Additional intersection improvements are proposed along the detour routes to facilitate vehicle movement. As a result, widening is proposed at the Redlands Boulevard/Ironwood Avenue, WLC Pkwy/Alessandro Boulevard, and Alessandro Boulevard/Gilman Springs Road intersections. Consequently, signal modifications are proposed at the Redlands Boulevard/Ironwood Avenue and Redlands Boulevard/Eucalyptus Avenue intersections. A new signal would be installed at the Gilman Springs Road/ Alessandro Boulevard intersection due to the high through movements on Gilman Springs Road conflicting with left turns to and from Alessandro Boulevard. The improvements required for the detour routes also include utility adjustments and/or relocations at Redlands Boulevard/Ironwood Avenue, WLC Pkwy/Alessandro Boulevard, and Alessandro Boulevard/Gilman Springs Road.

Project construction would also involve the import of soils to the project site from a borrow site. One borrow site, the City Stockpile, is at the northwest corner of the intersection of Alessandro Boulevard/Nason Street, approximately 2.3 mi from the western boundary of the project site. Approximately 50,000 cubic yards (cy) of import material is available for the project from the City Stockpile borrow site. The City Stockpile will be environmentally cleared with this project. Additional fill material beyond the 50,000 cy will be necessary for the project and will come from another site(s) to be determined during future phases of the project.

2.1. No Build Alternative

The No Build Alternative assumes that no improvements will be made to the freeway mainline or to the existing SR-60/WLC Pkwy interchange. Without the planned improvements proposed as part of the project, the LOS at the on- and off-ramps and

traffic operations at the interchange would continue to worsen over time. Alternative 1 was determined to not meet or satisfy the project purpose and need.

2.2. Common Design Features for Both Build Alternatives

As described further in Sections 1.3.3 and 1.3.4, Alternatives 2 and 6 both propose to modify the SR-60/WLC Pkwy interchange and share several common design features. These common design features are discussed below by type of improvement.

2.2.1. Interchange On- and Off-Ramp Improvements

The proposed interchange is located approximately 1 mi east of the SR-60/Redlands Boulevard interchange and 0.7 mi west of the SR-60/Gilman Springs Road interchange. The new on- and off- ramps and the new bridge overcrossing would provide a direct and continuous alignment for WLC Pkwy traffic crossing SR-60. In accordance with the Caltrans *Ramp Metering Design Manual* (April 2016), all interchange on-ramps would be two-lane and/or three-lane metered ramps, with sufficient right-of-way to accommodate vehicle storage, ramp meter equipment, and California Highway Patrol enforcement areas. Additionally, all on-ramps would provide high-occupancy vehicle (HOV) preferential lanes.

2.2.2. Roadway Improvements

Roadway improvements associated with the proposed project include the following:

- Widening of WLC Pkwy through the proposed project limits
- Improvements along WLC Pkwy to include a parkway, sidewalk, and multi-use trail
- Improvement of Eucalyptus Avenue to a four-lane cross-section between Redlands Boulevard and WLC Pkwy
- Addition of one auxiliary lane in each direction between the Redlands Boulevard and Gilman Springs Road interchanges with SR-60

The WLC Pkwy improvements listed above would have a design speed of 45 miles per hour (mph). Aside from the improvements listed above, no additional future widening on WLC Pkwy is planned within the interchange limits. The proposed overcrossing would be designed to the ultimate width.

2.2.3. Non-Vehicular and Pedestrian Access Improvements

The proposed project includes construction of a number of non-vehicular and pedestrian access improvements. These include an 8 ft wide sidewalk on the east side

of WLC Pkwy along the limits of the WLC Pkwy improvements, a 6 ft wide sidewalk on the west side of WLC Pkwy between the southern project limits and Eucalyptus Avenue, and a 6 ft wide sidewalk on both sides of Eucalyptus Avenue from WLC Pkwy to Redlands Boulevard. Additionally, an 11 ft wide multi-use trail would be constructed on the east side of WLC Pkwy between Eucalyptus Avenue and Ironwood Avenue.

The proposed project would also accommodate a future 11 ft wide multi-use trail on the north side of Eucalyptus Avenue between Redlands Boulevard and WLC Pkwy. A grade-separated trail and pedestrian crossing over the eastbound SR-60 direct on-ramp would potentially be provided with the proposed project based on available funding.

2.2.4. Utility and Right-of-Way Requirements

The proposed project would require relocation or protection in-place of several utility facilities. To prevent impacts to utility facilities and services during construction, the following utilities have been contacted regarding the proposed project: Eastern Municipal Water District (EMWD), Metropolitan Water District of Southern California (MWD), Western Municipal Water District (WMWD), Riverside County Flood Control and Water Conservation District (RCFCWCD), Riverside County Waste Management, Moreno Valley Electric Utility, Time Warner Cable, Charter Communications, Southern California Edison (SCE), Southern California Gas Company (SCG), Questar Southern Trails Pipeline Company, Sunesys, Verizon, and AT&T. The existing SCE overhead 115-kilovolt (kV) transmission line and 12 kV distribution line that are currently adjacent to the west side of WLC Pkwy would be relocated to the east side of WLC Pkwy between the westbound ramps intersection and the southern limits of the proposed project. North of the westbound ramps intersection, the SCE utility lines will cross WLC Pkwy and be relocated to the parkway on the west side of WLC Pkwy. In order to accommodate future utilities, the proposed overcrossing would incorporate conduits for Moreno Valley Electric Utility, SCE, and other utility companies as requested.

Build Alternatives 2 and 6 and Design Variation 2a would each require a total of six full acquisitions: one full acquisition in the northwest quadrant and five full acquisitions in the southwest quadrant. Design Variation 6a will require the same amount of acquisitions with an additional full acquisition in the southeast quadrant of the interchange. There would be partial right-of-way acquisitions within all four

quadrants of the interchange. The full acquisition for Design Variation 6a in the southeast quadrant of the interchange would require one residential displacement.

2.2.5. Additional Considerations

Geotechnical investigations would be required during final design of the WLC Pkwy overcrossing and the interchange improvements.

Highway planting would potentially be provided and coordinated with Caltrans and the City.

Infiltration basins will be proposed in the undeveloped areas between the on-/off-ramps and SR-60.

2.3. Alternative 2 (Modified Partial Cloverleaf)

Alternative 2 proposes to reconstruct the SR-60/WLC Pkwy interchange in a modified partial cloverleaf configuration. Improvements under Alternative 2 would include the construction of a new westbound direct on-ramp and a new westbound loop off-ramp in the northwest quadrant of the interchange, in a cloverleaf configuration. A new eastbound direct off-ramp, a new eastbound loop on-ramp, and a new eastbound direct on-ramp would be constructed in the southwest and southeast quadrants, in a partial cloverleaf configuration.

Alternative 2 would also remove the existing two-lane (one lane in each direction) WLC Pkwy overcrossing and replace it with a new four-lane (two lanes in each direction) overcrossing. The proposed overcrossing would accommodate turn lanes in the northbound and southbound directions.

Additional improvements as part of Alternative 2 include the installation of signals at both the proposed eastbound and westbound ramp intersections, as well as at the intersection of Eucalyptus Avenue/WLC Pkwy. Bike lanes would be provided on both sides of WLC Pkwy and Eucalyptus Avenue throughout the project limits.

2.3.1. Design Variation 2a (Alternative 2 with Design Variation)

Design Variation 2a will have the same features as Alternative 2 with the exception of the location of the Eucalyptus Avenue/WLC Pkwy intersection. Design Variation 2a will consist of moving the current Eucalyptus Avenue/WLC Pkwy intersection approximately 900 ft south from its current location. The shift will cause a partial realignment of Eucalyptus Avenue from approximately 2,600 ft west of WLC Pkwy to connect with the west side of WLC Pkwy.

2.4. Alternative 6 (Modified Partial Cloverleaf with Roundabout Intersections)

Alternative 6 proposes to reconstruct the SR-60/WLC Pkwy interchange in a modified partial cloverleaf configuration. Improvements under Alternative 6 would include the construction of a new westbound direct on-ramp and a new westbound loop off-ramp in the northwest quadrant, in a partial cloverleaf configuration. New eastbound direct off- and on-ramps would be constructed in the southwest and southeast quadrants, respectively, in a partial cloverleaf configuration.

Similar to Alternative 2, Alternative 6 would also remove the existing two-lane (one lane in each direction) WLC Pkwy overcrossing and replace it with a new four-lane (two through lanes in each direction) overcrossing. Additional improvements included as part of Alternative 6 include the installation of roundabouts at both the proposed eastbound and westbound ramp intersections as well as at Eucalyptus Avenue/WLC Pkwy. On WLC Pkwy north of the Eucalyptus Avenue intersection and on Eucalyptus Avenue, bike lanes are provided on both sides within the width of the proposed shoulders. Bicyclists would have the option to merge with vehicular traffic to navigate through the roundabout or exit the travel lane prior to each roundabout and cross the roundabout with pedestrian traffic.

2.4.1. Design Variation 6a (Alternative 6 with Design Variation)

Design Variation 6a will have the same features as Alternative 6 with the exception of the location of the Eucalyptus Avenue/WLC Pkwy intersection. Design Variation 6a will consist of moving the current Eucalyptus Avenue/WLC Pkwy intersection approximately 900 ft south from its current location. The shift will cause a partial realignment of Eucalyptus Avenue from approximately 2,600 ft west of WLC Pkwy to connect to the west side of WLC Pkwy. Construction of the roundabout at WLC Pkwy and Eucalyptus Avenue east would result in one residential displacement in the southeast quadrant of WLC Pkwy and Eucalyptus Avenue east.

Chapter 3. Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to the Caltrans 2013 *Technical Noise Supplement* (TeNS) (a technical supplement to the Protocol), which is available on the Caltrans website.[1]

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 receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determine the sound level and characteristics of the noise perceived by the receiver. 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 micropascals (μPa). One μPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise

[1] California Department of Transportation (Caltrans). Website: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf (accessed December 2018).

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 about 0 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 A-weighted decibels, or 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 about the relative loudness or annoyance of a sound, their judgments correlate with the A-scale sound 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 3.1 describes typical A-weighted noise levels for various noise sources.

Table 3.1. Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 ft		
	— 100 —	
Gas lawnmower at 3 ft		
	— 90 —	
Diesel truck at 50 ft at 50 mph		Food blender at 3 ft
	— 80 —	Garbage disposal at 3 ft
Noisy urban area, daytime		
Gas lawnmower, 100 ft	**— 70 —**	Vacuum cleaner at 10 ft
Commercial area		Normal speech at 3 ft
Heavy traffic at 300 ft	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher in next room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

Source: Table 2-5, *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (Caltrans 2013).
Caltrans = California Department of Transportation
dBA = A-weighted decibels
ft = feet
mph = miles per hour

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 is able to discern 1 dB changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the midfrequency (1,000 Hz–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. Further, 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 Continuous 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 continuous 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 the Noise Abatement Criteria (NAC) used by Caltrans and the FHWA.
- **Percentile-Exceeded Sound Level (L_{xx}):** L_{xx} 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 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, and hence 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 receiver 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 ft. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, 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 receiver, 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 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 ft) 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 receiver can substantially attenuate noise levels at the receiver. 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 receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and the receiver is rarely effective in reducing noise, because it does not create a solid barrier.

Chapter 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 the 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 projects 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 an HOV lane, high-occupancy toll (HOT) lane, bus lane, or truck climbing lane,
- The addition of an auxiliary lane, except for 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 identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and 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 4.1 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 4.1. 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, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F	—	—	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	—	—	Undeveloped lands that are not permitted.

Source: Federal Highway Administration. 2018. 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. Website: https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title23/23cfr772_main_02.tpl (accessed December 2018).

[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 in A-weighted decibels (dBA).

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

CFR = Code of Federal Regulations

$L_{eq}(h)$ = 1-hour equivalent continuous sound level

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 NAC specified in the Protocol are the same as those specified in 23 CFR 772. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA. 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 TeNS to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This guidance includes field measurement methods, noise modeling methods, and report preparation guidance.

4.2. State Regulations and Policies

4.2.1. California Environmental Quality Act (CEQA)

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 affected, and the absolute noise level.

The significance of noise impacts under CEQA are addressed in the environmental document rather than the NSR. Even though the NSR (or noise technical memorandum) 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 52 dBA $L_{eq}(h)$ 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 D 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 52 dBA $L_{eq}(h)$. If the noise levels generated from freeway and non-freeway sources exceed 52 dBA $L_{eq}(h)$ prior to the 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.

4.3. Local Regulations

4.3.1. City of Moreno Valley

Section 11.80.030 of the City's Municipal Code limits construction activities to the hours of 7:00 a.m. to 8:00 p.m. on weekdays and weekends. Construction–related noise is prohibited beyond the specified hours except for emergency work by public service utilities or for other work approved by the City manager or designee.

Chapter 5. Study Methods and Procedures

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

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use type, by Activity Category as defined in Table 4.1, and by the extent of frequent human use. As stated in the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Although all developed land uses are evaluated in this analysis, the focus is on locations 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 and common use areas at single-family residences.

The geometry of the project relative to nearby existing and planned land uses was also identified.

Short-term measurement locations were selected to represent each major developed area and to serve as representative modeling locations within the project area. The long-term measurement site was selected to capture the diurnal traffic noise level pattern in the project area. Several other receptor locations were selected as modeling locations at which noise measurements were not gathered.

5.2. Field Measurement Procedures

A field noise study was conducted in accordance with the recommended procedures in the Caltrans TeNS (September 2013). The following is a summary of the procedures used to collect short-term and long-term sound level data.

5.2.1. Short-Term Measurements

Short-term noise level measurements in the project vicinity were sampled during off-peak traffic hours when traffic was flowing freely. Short-term noise level measurements were made using Larson Davis Model 720, 820, 824, and 831 Type 1 sound level meters.

The following measurement procedures were used:

- Calibrate the sound level meter.
- Set up the sound level meter at a height of 5 ft.
- Commence noise monitoring.
- Collect site-specific data such as date, time, direction of traffic, vehicle speed, and location of the sound level meter relative to any existing feature.
- Count passing vehicles for a period of 15 minutes during noise level measurement. Vehicles are split into five categories: automobiles, medium trucks, heavy trucks, buses, and motorcycles.
- Stop measurement after 15 minutes.
- Calibrate the sound level meter.
- Proceed to the next monitoring site and repeat.

The traffic counts were expanded to hourly volumes (multiplied by four to normalize the results to hourly values) and entered into the FHWA Traffic Noise Model (TNM) 2.5 for each monitoring site. The monitoring results were used to calibrate the model outputs.

5.2.2. Long-Term Measurements

One long-term noise level measurement was conducted using a dosimeter sound level meter within the study area. The purpose of the long-term measurement was to identify variations in sound levels throughout the day.

5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using FHWA TNM 2.5. TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key inputs to the traffic noise model included the locations of roadways, shielding features (e.g., topography and buildings), sound walls, ground type, and receptors. Three-dimensional representations of these inputs were developed using topographic maps provided by the engineer.

The existing and future traffic noise levels at all 38 receptor locations were modeled using the a.m. peak-hour traffic volume from the *Methodology and Traffic Volumes Report* (WSP 2018a) and supplemental traffic data provided by WSP and contained in Appendix A of this NSR because long-term noise level measurement shows the noise levels during the a.m. peak hour are higher than the p.m. peak hour. Also, the worst-case traffic volume of 1,950 vehicles per lane per hour (vplph) on the freeway

mainline, 1,500 vplph on the freeway auxiliary lanes, and 900 vplph on the freeway on-ramps were used when the a.m. peak-hour traffic volumes exceed the worst-case traffic volumes. The worst-case traffic condition is assumed to be LOS D/E and is generally loudest when vehicles on a given roadway travel at free-flowing traffic conditions. Accordingly, the worst-case traffic volume assumptions are based on the maximum number of vehicles that can typically travel in a given lane while still resulting in free-flowing traffic conditions. Appendix A presents a summary of traffic data inputs for existing and future conditions.

TNM 2.5 is sensitive to the volume of trucks on the roadway, because trucks contribute disproportionally to traffic noise. Vehicle distributions on all roadways within the project area were provided by the Vehicle Mix for Noise Analysis Memorandum (WSP 2018b) in Appendix A. The modeled future noise levels were compared to the modeled existing noise levels (for substantial increases in noise levels) and to the NAC to determine potential noise impacts.

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 at least 12 dBA greater than existing noise levels, or where predicted design-year noise levels would 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.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dBA at impacted receptor locations is predicted with implementation of the abatement measure. 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 considering factors such as the construction cost of the barrier, the noise reduction design goal (a noise level reduction of 7 dBA or more at one or more benefited receptors), and the viewpoints of benefited receptors (including property owners and residents of the benefited receptors).

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

The Protocol defines the procedure for assessing the reasonableness of noise barriers from a cost perspective. The 2019 allowance is $107,000 per benefited unit/receptor (i.e., receptors that receive at least 5 dBA 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 benefit receptors are determined by a survey that is typically conducted after completion of the noise study report. The Protocol details the process for conducting the survey.

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

Chapter 6. Existing Noise Environment

6.1. Existing Land Uses

As previously described, developed and undeveloped land uses in the project vicinity were identified through land use maps, aerial photography, and site inspection. Within each land use category, receptors were identified. Existing land uses in the vicinity of the project area include single-family residences, agriculture, vacant land, and industrial uses. The following describes existing land uses in the project area in further detail.

- **North of SR-60 between Redlands Boulevard and Theodore Street[1]:** Land use in this area includes only vacant land. Land uses in this area ranges from approximately 5 ft lower in elevation than SR-60 to approximately 2 ft higher in elevation than SR-60. Vacant land was classified under Activity Category G for reporting purposes.
- **North of SR-60, East of Theodore** Street**[1]:** Land uses in this area include a single-family residence and a racetrack. Land uses in this area are approximately 25 to 55 ft higher in elevation than SR-60. The single-family residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The racetrack has no outdoor frequent human use areas and was evaluated under Activity Category F for reporting purposes.
- **South of SR-60 between Redlands Boulevard and WLC Pkwy:** Land uses in this area include vacant land and an industrial facility. Land uses in this area are approximately 4 to 30 ft lower in elevation than SR-60. The industrial facility has no outdoor frequent human use areas and was evaluated under Activity Category F for reporting purposes.
- **South of SR-60, East of WLC Pkwy:** Land use in this area includes only vacant land. Land in this area is located approximately 30 to 50 ft lower in elevation than SR-60. Vacant land was classified under Activity Category G for reporting purposes.
- **Along WLC Pkwy, South of Eucalyptus Avenue:** Land uses in this area include single-family residences, vacant land, and agriculture. Land uses in this area are similar in elevation to WLC Pkwy. The single-family residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}.

[1] The City is currently renaming Theodore Street to WLC Pkwy from the SR-60 westbound ramps to Ironwood Avenue.

Agriculture was classified under Activity Category F for reporting purposes. Vacant land was classified under Activity Category G for reporting purposes.

- **Along Theodore Street[1], North of SR-60 Westbound Ramps:** Land uses in this area include single-family residences, vacant land, and agriculture. Land uses in this area are similar in elevation to Theodore Street. The single-family residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. Agriculture was classified under Activity Category F for reporting purposes. Vacant land was classified under Activity Category G for reporting purposes.

6.2. Noise Measurements Results

The existing noise environment in the project area is based on short-term and long-term 24-hour noise level measurements.

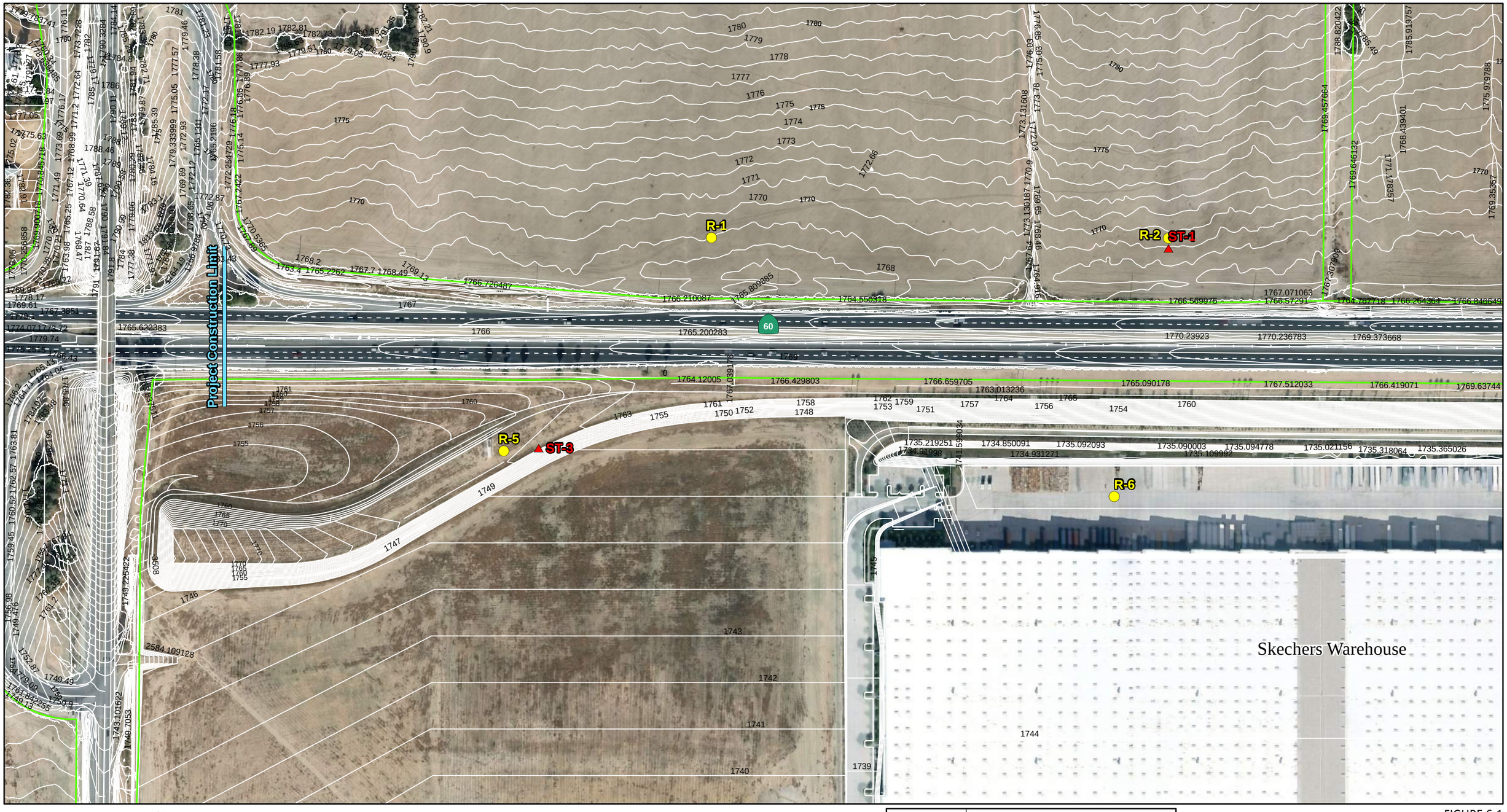
6.2.1. Short-Term Monitoring

The primary source of noise in the project area is traffic on SR-60 and WLC Pkwy/ Theodore Street within the project area. Short-term (15-minute) noise measurements were conducted to document existing noise levels at 13 representative sensitive receptor locations within the project area. Table 6.1 contains the results of the short-term noise level measurements along with a description of the physical location at each monitoring site. Eight of the 13 short-term noise measurements were used to calibrate the noise model and to predict the noise levels at all 38 modeled receptors in the project area. Figure 6-1 shows the short-term monitoring locations. Table A-1 in Appendix A provides the concurrent traffic counts and vehicle speeds for each monitoring site. Appendix C provides the short-term noise monitoring results. Table 6.2 shows the meteorological conditions during the short-term noise measurements.

6.2.2. Long-Term Monitoring

Long-term traffic noise level measurement was conducted to document the peak traffic noise hour. Long-term ambient noise monitoring was conducted using a dosimeter sound level meter at a representative location within the project area. The long-term noise level measurement at LT-1 was conducted at 12400 Theodore Street[1] from 9:00 a.m. on Wednesday, September 19, 2018, to 9:00 a.m. on Thursday, September 20, 2018. Figure 6-1 shows the long-term noise monitoring location.

[1] The City is currently renaming Theodore Street to WLC Pkwy from the SR-60 westbound ramps to Ironwood Avenue.



LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

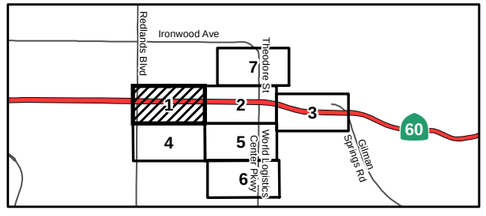


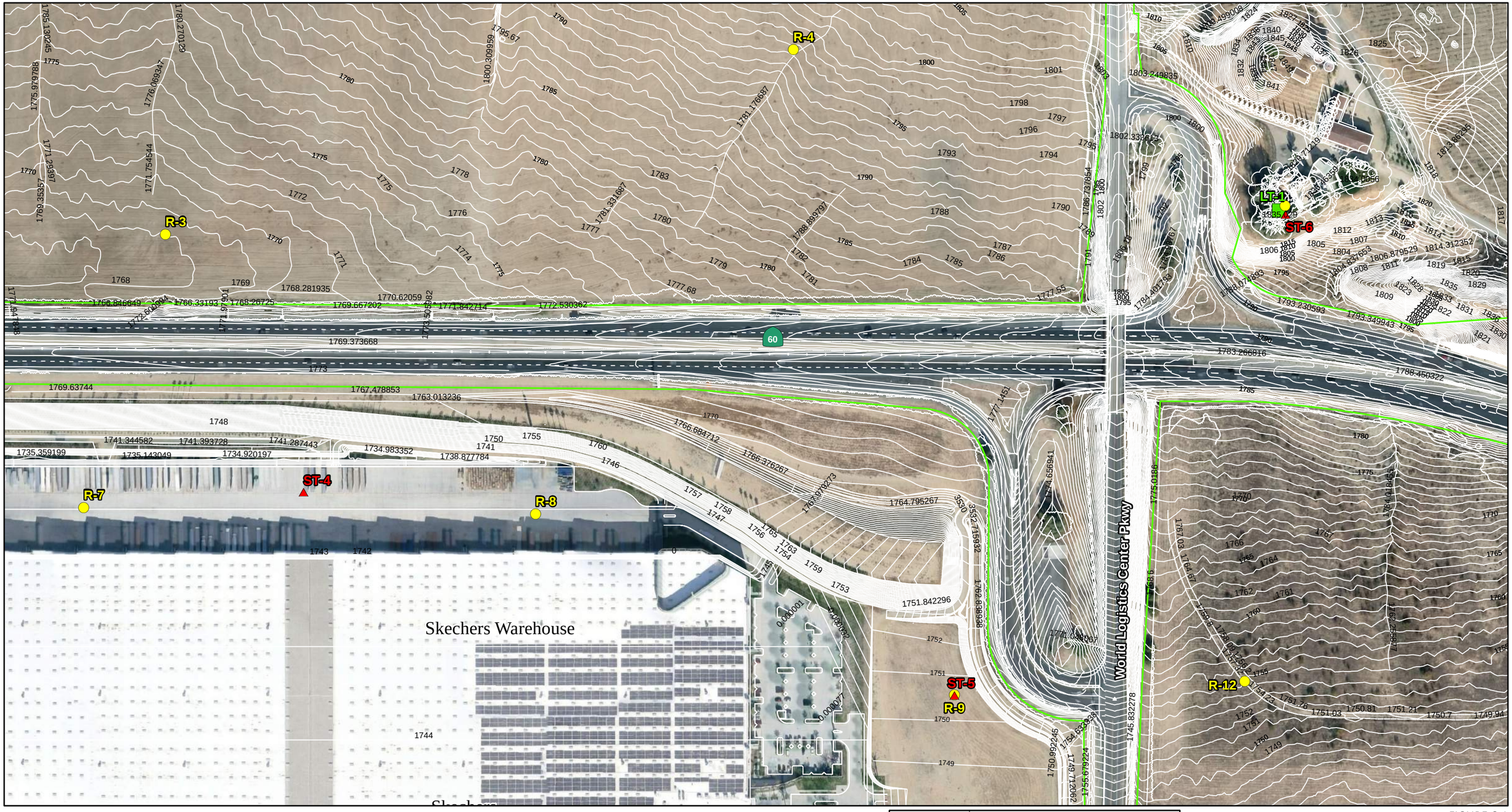
FIGURE 6-1
Sheet 1 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Monitoring and Modeled Receptor Locations
08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

This page intentionally left blank



LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

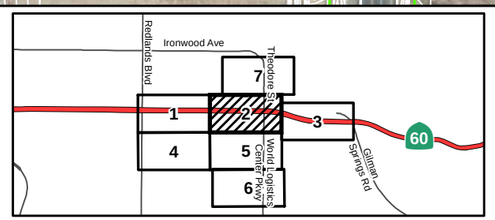


FIGURE 6-1

Sheet 2 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Monitoring and Modeled Receptor Locations

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

This page intentionally left blank

R-11

ST-7

Gilman Springs Rd

60

LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

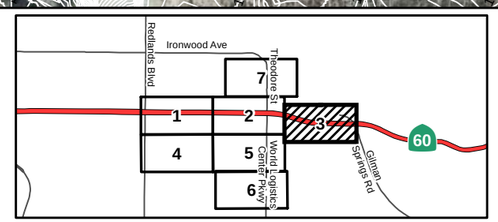


FIGURE 6-1

Sheet 3 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Monitoring and Modeled Receptor Locations

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

This page intentionally left blank

R-15
R-16
R-17
R-18
ST-8
Eucalyptus Ave
Redlands Blvd

LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

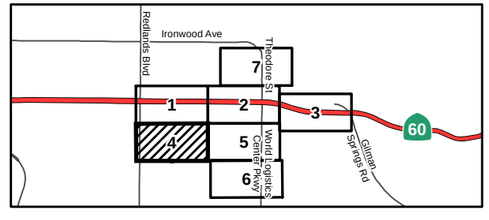


FIGURE 6-1
Sheet 4 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Monitoring and Modeled Receptor Locations
08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

Skechers Warehouse

Eucalyptus Ave

Herschel Ln

R-19
R-20
R-21
R-22
R-23
R-24
R-25
R-27
ST-9
ST-10
ST-11

LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

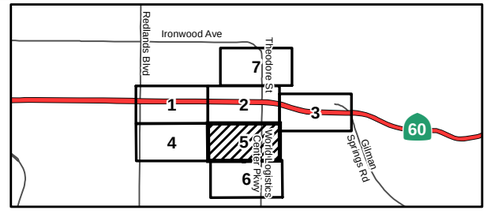


FIGURE 6-1

Sheet 5 of 7

SR-60/World Logistics Center Pkwy Interchange Project

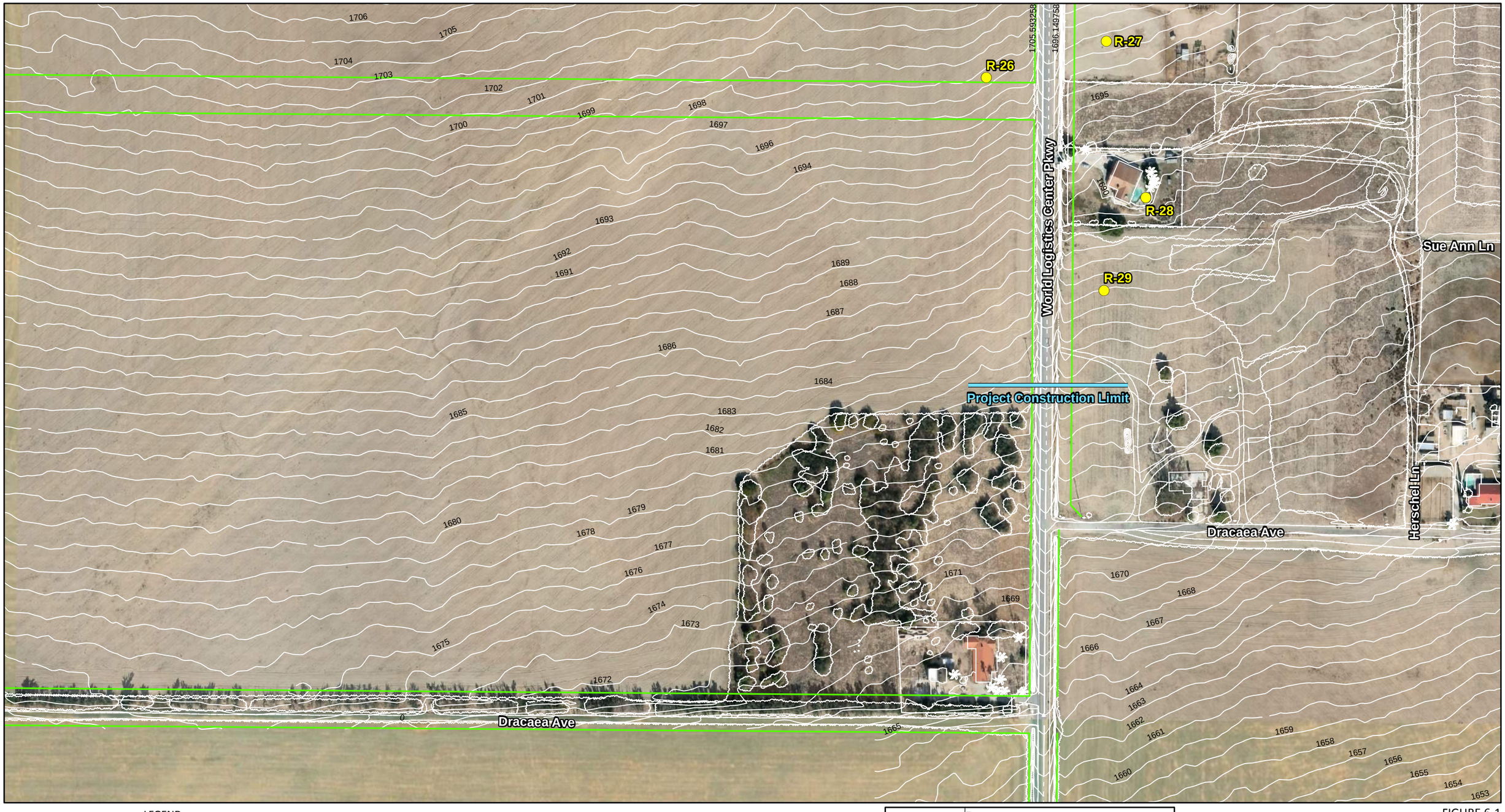
Monitoring and Modeled Receptor Locations

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

This page intentionally left blank



LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

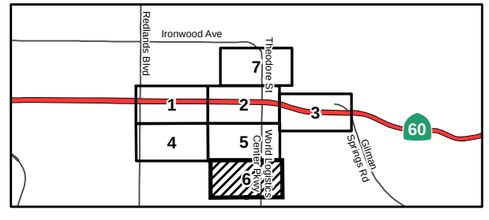


FIGURE 6-1

Sheet 6 of 7

SR-60/World Logistics Center Pkwy Interchange Project

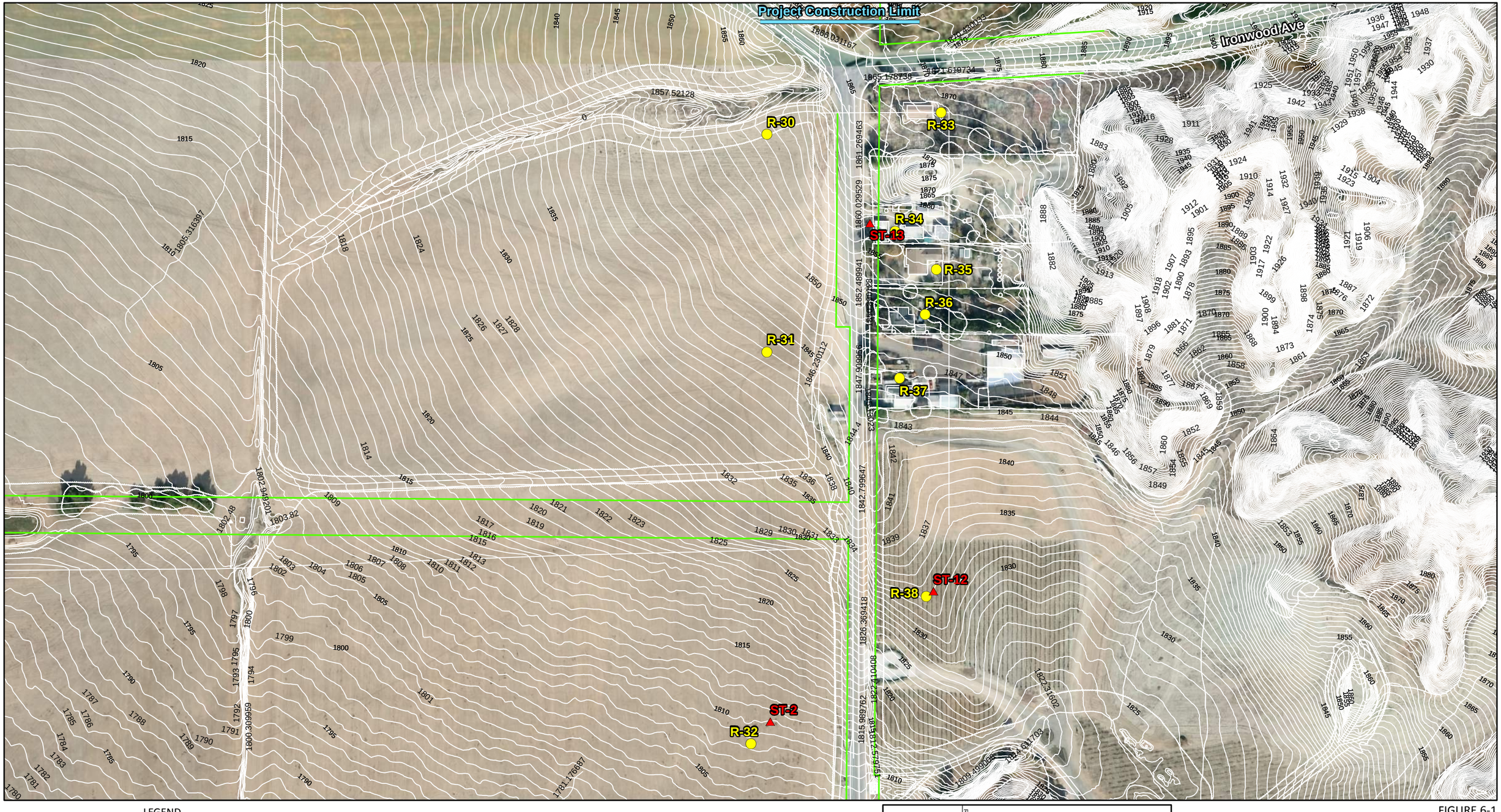
Monitoring and Modeled Receptor Locations

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

This page intentionally left blank



LEGEND

- Short-Term Monitoring Locations
- Modeled Receptor Locations
- Long-Term Monitoring Location
- Existing Right-of-Way

0 100 200
FEET

SOURCE: Google Imagery (2012); RBF (7/31/2013)

I:\RBF1301\GIS_Mod\MXD\Noise\MonitoringModeledReceptors.mxd (4/25/2019)

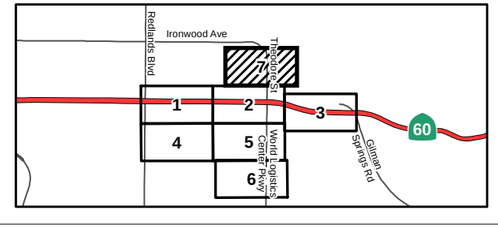


FIGURE 6-1

Sheet 7 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Monitoring and Modeled Receptor Locations

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

This page intentionally left blank

Table 6.1. Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Sources	Comments
ST-1	9/19/18	9:44 AM	15 minutes	67.2	Vacant land north of SR-60 between Redlands Boulevard and WLC Pkwy.	Traffic on SR-60.	None.
ST-2	9/19/18	10:37 AM	15 minutes	55.6	Vacant land north of SR-60 and west of Theodore Street.	Traffic on SR-60 and occasional traffic on Theodore Street.	None.
ST-3	9/19/18	9:44 AM	15 minutes	63.1	Vacant land south of SR-60 between Redlands Boulevard and the Skechers warehouse.	Traffic on SR-60.	None.
ST-4	9/19/18	9:44 AM	15 minutes	57.5	29800 Eucalyptus Avenue. Skechers Distribution Center. North of the building in the truck parking lot.	Traffic on SR-60.	None.
ST-5	9/19/18	11:18 AM	15 minutes	49.5	Vacant land located on the southwest corner of SR-60 and WLC Pkwy.	Traffic on SR-60, SR-60 eastbound ramps, and WLC Pkwy.	White noise from the Skechers warehouse. Truck wheel screech. Kitchen ventilation fan, which was 78.8 dBA at 5 ft from source.
ST-6	9/19/18	10:37 AM	15 minutes	68.4	12400 Theodore Street. Located northeast of SR-60 and Theodore Street Interchange in the backyard of the residence.	Traffic on SR-60 and SR-60 westbound on- and off-ramps, occasional traffic on Theodore Street, and birds.	None.
ST-7	9/19/18	11:18 AM	15 minutes	56.5	Vacant land located approximately 350 ft south of SR-60 and 1,000 ft east of WLC Pkwy.	Traffic on SR-60.	None.
ST-8	9/19/18	11:58 AM	15 minutes	41.1	Vacant land south of Eucalyptus Avenue near the west end of the Skechers warehouse building.	Traffic on SR-60.	None.
ST-9	9/19/18	11:58 AM	15 minutes	42.6	Vacant land located at the southwest corner of WLC Pkwy and Eucalyptus Avenue.	Distant traffic on SR-60, intermittent vehicles on WLC Pkwy/Theodore Street and Eucalyptus Ave, and SR-60 eastbound ramps.	None.

Table 6.1. Short-Term Ambient Noise Monitoring Results

Monitor No.	Date	Start Time	Duration	dBA L_{eq}	Location Description	Noise Sources	Comments
ST-10	9/19/18	11:18 AM	15 minutes	45.9	Vacant land located at the northeast corner of WLC Pkwy and Eucalyptus Avenue. Location relative to the south side of the Skechers warehouse.	Distant traffic on SR-60, occasional traffic on WLC Pkwy, and eastbound ramps from SR-60 to WLC Pkwy.	None.
ST-11	9/19/18	11:58 AM	15 minutes	51.0	Vacant land at the northeast corner of Eucalyptus Avenue and WLC Pkwy.	Traffic on WLC Pkwy and distant traffic on SR-60.	None.
ST-12	9/19/18	10:37 AM	15 minutes	53.7	Agricultural land associated with the farm residence at 12400 Theodore Street; located north of entrance gate to the vineyard on the northbound side of Theodore Street.	Traffic on Theodore Street and distant traffic on SR-60.	None.
ST-13	9/19/18	10:37 AM	15 minutes	67.0	12130 Theodore Street, in front of the house. On the east side of Theodore Street	Traffic on Theodore Street.	None.

Source: Compiled by LSA Associates, Inc. (2018).
Note: Since the completion of the short-term noise level measurements, the City has renamed Theodore Street south of the SR-60 westbound ramps to WLC Pkwy. In addition, the City is currently renaming Theodore Street to WLC Pkwy from the SR-60 westbound ramps to Ironwood Avenue.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels
ft = foot/feet
SR-60 = State Route 60
WLC Pkwy = World Logistics Center Parkway

Table 6.2. Meteorological Conditions During Noise Monitoring

Date	Temperature (°F)	Average Wind Speed (mph)
9/19/2018	78.3–91.3	0.9–4.7

Source: Compiled by LSA Associates, Inc. (2018).
°F = degrees Fahrenheit
mph = miles per hour

Table 6.3 shows that traffic noise peaks during the 6:00 a.m. to 7:00 a.m. hour at LT-1. To determine existing peak traffic noise levels in the project area, the difference between the hour in which the short-term ambient noise measurements were conducted and the peak traffic noise hour was added to the monitored noise levels. For example, monitoring at ST-1 was conducted during the 9:00 a.m. hour. Table 6.3 shows that the noise level during this hour is generally 1 dB lower than the level during the peak traffic noise hour. Therefore, 1 dB is added to the measured noise level at ST-1 to determine the existing peak traffic noise level.

6.2.3. Noise Model Calibration

A total of four separate model runs were conducted using the traffic counts and measured vehicle speeds collected during the ambient noise monitoring. The results of these model runs were compared to the measured ambient noise levels to ensure TNM 2.5's accuracy. Correction factors known as K-factors were applied to each of the modeled receptor locations so the monitored and modeled noise levels were the same. Table 6.4 shows the measured ambient noise level, the modeled noise levels using traffic counts and measured vehicle speeds during noise monitoring, and the K-factor at each of the 13 monitored locations.

As shown in Table 6.4, monitoring locations ST-3, ST-5, ST-7, ST-8, ST-9, ST-10, ST-12, and ST-13 have K-factors greater than 3 dBA. Based on Section 4.4.1.6 of the TeNS, K-factors between 3 and 4 can be calibrated unless the validity of the noise measurement conducted is in serious doubt. Also, differences of 5 dBA or greater should be approached with caution by retaking measurements and looking for obvious causes for the difference, such as meteorology, pavement conditions, obstructions, and reflections. Monitoring locations ST-3, ST-8, and ST-12 were rechecked; noise level measurements, field surveys of existing features, and the TNM 2.5 modeled input data were reexamined and determined to be accurate. Therefore, the K-factors for ST-3, ST-8, and ST-12 were used to calibrate the noise model in addition to ST-1, ST-2, ST-4, ST-6, and ST-11. Monitoring locations ST-5, ST-7, ST-9, ST-10, and ST-13 were reexamined and were not used for noise model calibration because either traffic noise levels or traffic volumes were too low.

Table 6.3. Long-Term 24-Hour Noise Level Measurement Results at LT-1

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

Source: Compiled by LSA Associates, Inc. (2018).
[1] **Bold** numbers represent the peak traffic noise hour.
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

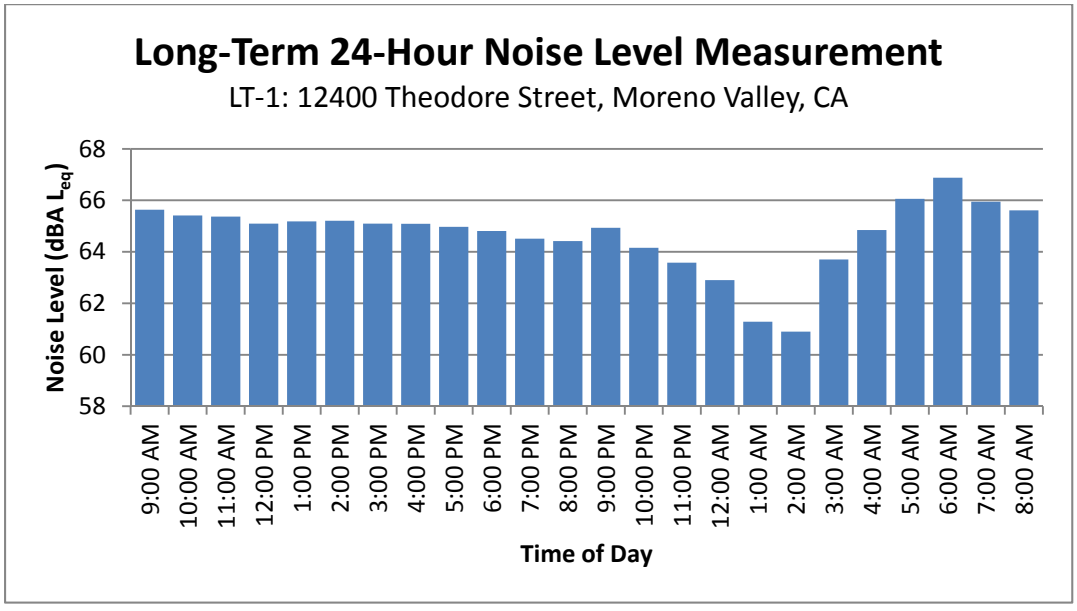


Table 6.4. Model Calibration

Monitor No.	Measured Noise Level (dBA L_{eq})	Modeled Noise Level (dBA L_{eq})	K-Factor (dBA)
ST-1	67.2	69.1	-1.9
ST-2	55.6	58.1	-2.5
ST-3	63.1	68.0	-4.9
ST-4	57.5	60.4	-2.9
ST-5[1]	49.5	55.9	-6.4
ST-6	68.4	68.3	0.1
ST-7[1]	56.5	61.8	-5.3
ST-8	41.1	46.0	-4.9
ST-9[1]	42.6	51.6	-9.0
ST-10[1]	45.9	54.0	-8.1
ST-11	51.0	53.5	-2.5
ST-12	53.7	57.7	-4.0
ST-13[1]	67.0	63.6	3.4

Source: Compiled by LSA Associates, Inc. (2019).
[1] These noise monitoring locations were not used to calibrate the Traffic Noise Model because either traffic noise levels or traffic volumes were too low.
dBA = A-weighted decibels
K-factor = correction factor
L_{eq} = equivalent continuous sound level

6.3. Existing Noise Levels

The existing a.m. peak-hour traffic volume from the *Methodology and Traffic Volumes Report* (WSP 2018a) was used to determine the existing worst-hour noise levels, because the long-term noise level measurement shows the noise level during the a.m. peak hour are higher than the p.m. peak hour. Also, the worst-case traffic volume of 1,950 vplph on the highway mainline and 900 vplph on the highway on-ramps were used when the a.m. peak-hour traffic volumes exceeded the worst-case traffic volumes. The results of the existing traffic noise modeling is shown in Table B.1 in Appendix B. Currently, of the 38 modeled receptor locations, 1 receptor (Receptor R-10) would approach or exceed the NAC. Figure 6-1 shows the locations of the modeled receptors.

This page intentionally left blank

Chapter 7. Future Noise Environment, Impacts, and Considered Abatement

7.1. Future Noise Environment and Impacts

The noise study was conducted to determine the future traffic noise impacts at receptors within the project area. Potential long-term noise impacts associated with project operations are solely from traffic noise. Traffic noise was evaluated for the worst-case traffic condition. Using coordinates obtained from the topographic maps, 38 receptor locations were evaluated in the model.

Future traffic noise levels at all 38 receptor locations were determined using 2045 a.m. peak-hour traffic volumes obtained from the *Methodology and Traffic Volumes Report* (WSP 2018a) and supplemental traffic data provided by WSP, as described in Section 5.3. The a.m. peak-hour traffic volumes were used because the long-term noise level measurement shows the noise level during the a.m. peak hour is higher than the p.m. peak hour. For roadway segments that exceed the worst-case traffic volume of 1,950 vplph for the mainline freeway, 1,500 vplph for freeway auxiliary lanes, and 900 vplph for on-ramps, the worst-case traffic volumes were used instead of the a.m. peak-hour traffic volumes. Tables B.1 through B.4 in Appendix B summarize the traffic noise modeling results for the Existing and the Future No Build conditions. Tables B.1 through B.4 in Appendix B summarize the traffic noise modeling for Alternative 2, Design Variation 2a, Alternative 6, and Design Variation 6a conditions, respectively. The modeled future noise levels with the project were compared to the modeled existing noise levels (after calibration) from TNM 2.5 to determine whether a substantial noise increase would occur. The modeled future noise levels for Alternative 2, Design Variation 2a, Alternative 6, and Design Variation 6a were also compared to the NAC to determine whether a traffic noise impact would occur.

Traffic noise impacts occur when either of the following occurs: (1) if the traffic noise level at a receptor location is predicted to “approach or exceed” its NAC, or (2) if the predicted traffic noise level is 12 dBA or more over the corresponding modeled existing noise level at the receptor locations analyzed. When traffic noise impacts occur, noise abatement measures must be considered.

Of the 38 modeled receptors, 2 receptors (Receptors R-10 and R-25) under Alternative 2, Design Variation 2a, and Alternative 6 conditions, and 1 receptor (Receptor R-10) under the Design Variation 6a conditions would approach or exceed the NAC. Of the 38 modeled receptors, 2 receptor locations (Receptors R-25 and R-28) under Alternative 2, Design Variation 2a, and Alternative 6 conditions would experience a substantial noise increase of 12 dBA or more over their corresponding modeled existing noise level. One receptor location (Receptor R-28) under the Design Variation 6a conditions would experience a substantial noise increase of 12 dBA over its corresponding modeled existing level. Receptors R-25 and R-27 would be fully acquired as part of the project under the Design Variation 6a condition.

The following receptor locations would be or would continue to be exposed to noise levels that approach or exceed the NAC and/or a substantial noise increase under Alternative 2, Design Variation 2a, and Alternative 6:

- **Receptor R-10:** This receptor location represents an existing residence along the east side of WLC Pkwy north of SR-60. Currently, there is no existing wall that shields this residence. One noise barrier (NB No. 1) was modeled at the top of the slope on private property. Noise barriers were not evaluated within the State right-of-way or edge of shoulder because the receptor is approximately 30 ft higher in elevation than the area within the State right-of-way and the barrier would not be feasible at that location.
- **Receptor R-25:** This receptor location represents an existing residence along the east side of WLC Pkwy south of SR-60. Currently, there is no existing wall that shields this residence. One noise barrier (NB No. 2) was modeled along the City right-of-way and private property line.
- **Receptor R-28:** This receptor location represents an existing residence along the east side of WLC Pkwy south of SR-60. Currently, there is no existing wall that shields this residence. One noise barrier (NB No. 3) was modeled along the City right-of-way and private property line.

The following receptor locations would be or would continue to be exposed to noise levels that approach or exceed the NAC and/or a substantial noise increase under Design Variation 6a:

- **Receptor R-10:** This receptor location represents an existing residence along the east side of WLC Pkwy north of SR-60. Currently, there is no existing wall that shields this residence. One noise barrier (NB No. 1) was modeled at the top of the

slope on private property. Noise barriers were not evaluated within the State right-of-way or edge of shoulder because the receptor is approximately 30 ft higher in elevation than the area within the State right-of-way and the barrier would not be feasible at that location.

- **Receptor R-28:** This receptor location represents an existing residence along the east side of WLC Pkwy south of SR-60. Currently, there is no existing wall that shields this residence. One noise barrier (NB No. 3) was modeled along the City right-of-way and private property line.

7.2. Preliminary Noise Abatement Analysis

Noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. According to 23 CFR 772(13)(c) and 772(15)(c), federal funding may be used for the following abatement measures:

- Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way.
- Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
- Noise insulation of Activity Category D land use facilities listed in Table 4.1. Post-installation maintenance and operational costs for noise insulation are not eligible for federal-aid funding.

Noise barriers are the only form of noise abatement considered for this project. Each noise barrier considered has been evaluated for feasibility based on achievable noise reduction. For each noise barrier found to be acoustically feasible, reasonable cost allowances were calculated by multiplying the number of benefited receptors by $107,000. Tables B.1 through B.4 in Appendix B summarize results at receptor locations for the noise barrier evaluated in detail for this project.

For any noise barrier to be considered reasonable from a cost perspective, the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier must

include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, retaining walls, landscaping for graffiti abatement, and right-of-way costs. Construction cost estimates are not provided in this NSR, but 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.

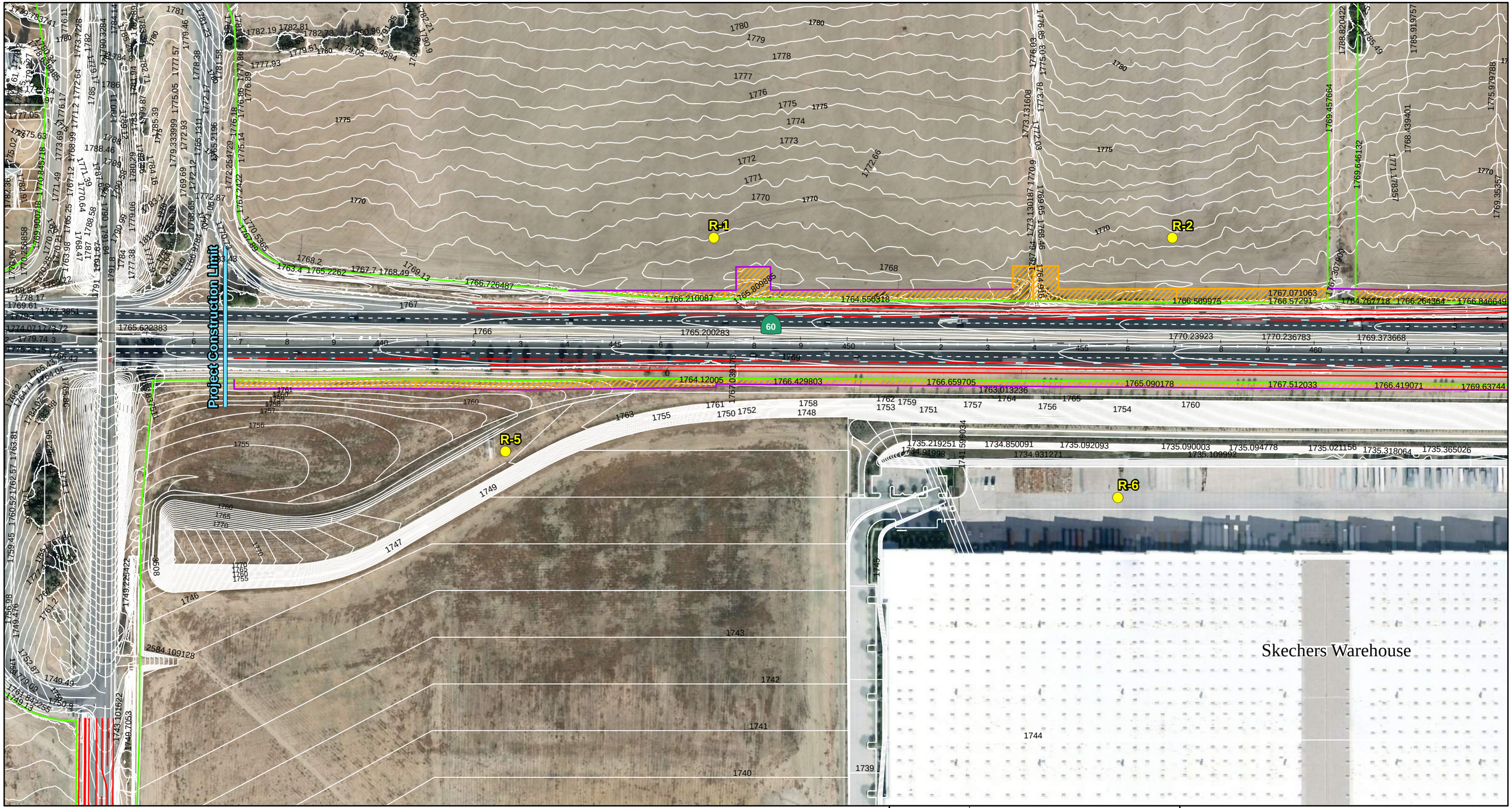
The design of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the project. This report provides preliminary information on the physical location, length, and height of noise barriers. If pertinent 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 the noise abatement will be made upon completion of the project design.

7.2.1. Alternative 2

The following is a discussion of the noise abatement considered for Alternative 2 where traffic noise impacts are predicted.

Noise Barrier No. 1

A 339 ft long barrier along the top of slope on private property on the east side of WLC Pkwy north of SR-60 was analyzed to shield Receptor R-10 because under Alternative 2 conditions, Receptor R-10 would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.1 in Appendix B indicates that traffic noise levels would be 70 dBA L_{eq}, and the increase in noise levels would be 3 dBA. NB No. 1 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 1 is shown on Figure 7-1 for Alternative 2. Table 7.1 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Alternative 2.



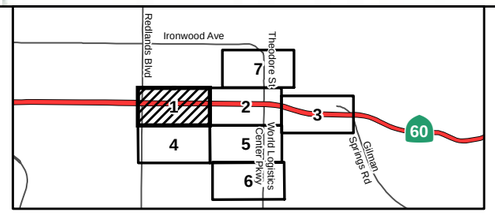
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquistition

- Full Acquistition
- Partial Acquisition

0 100 200
FEET



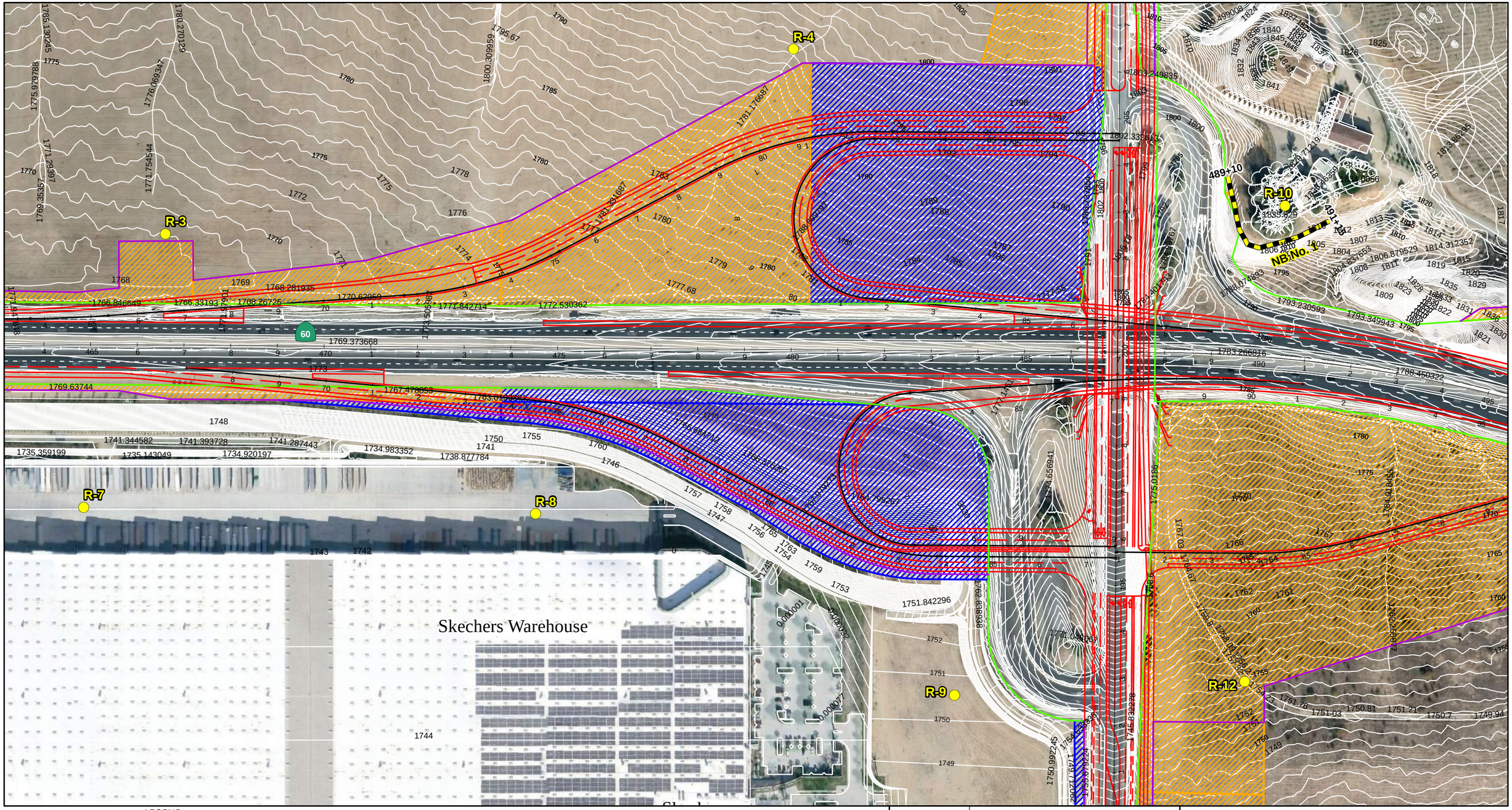
SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

FIGURE 7-1
Sheet 1 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



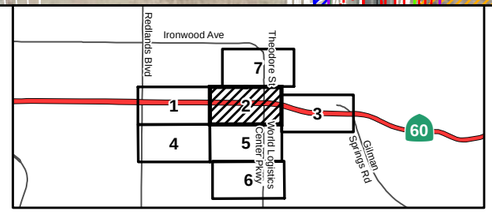
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquistition

- Full Acquistition
- Partial Acquisition

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

FIGURE 7-1
Sheet 2 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

R-11

Gilman Springs Rd

60

LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisition

- Full Acquisition
- Partial Acquisition

N

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

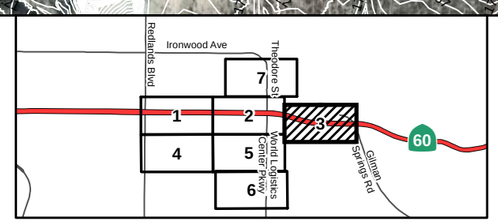
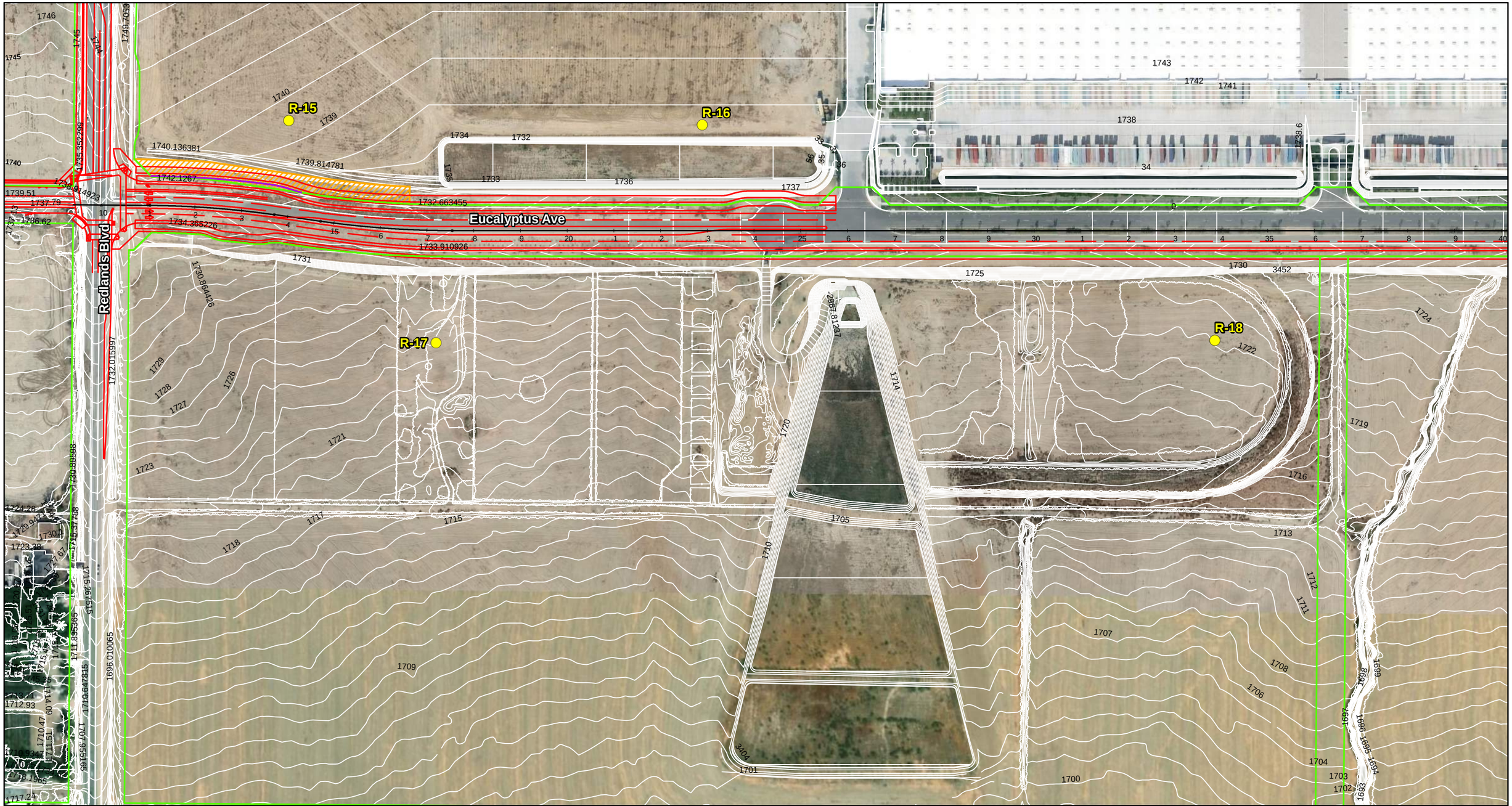


FIGURE 7-1
Sheet 3 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



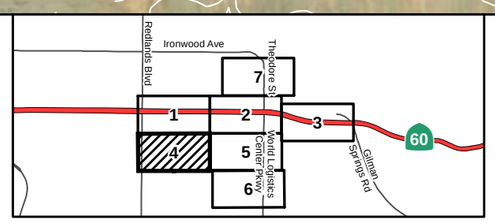
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquistition

- Full Acquistition
- Partial Acquisition

0 100 200
FEET



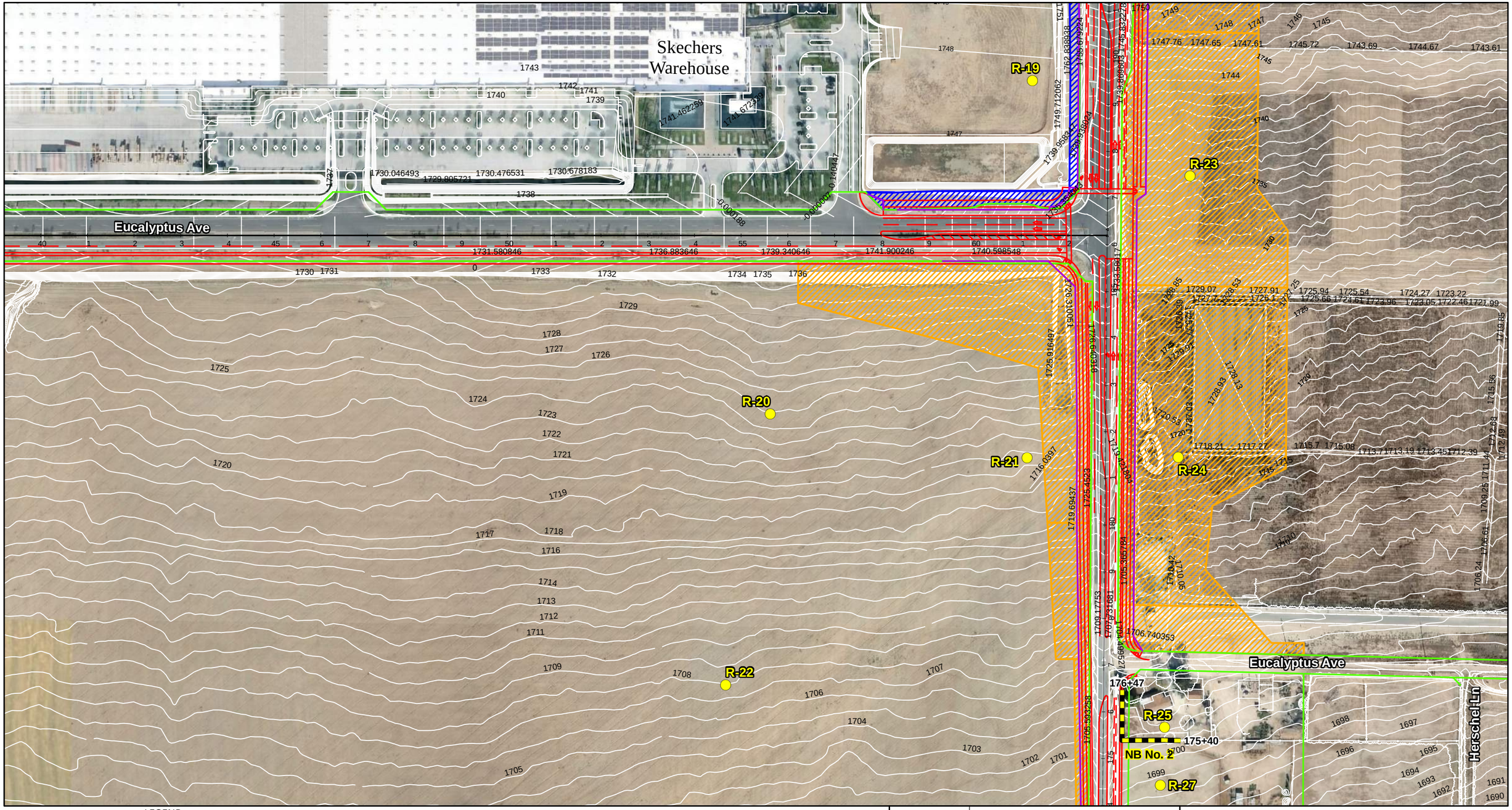
SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

FIGURE 7-1
Sheet 4 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

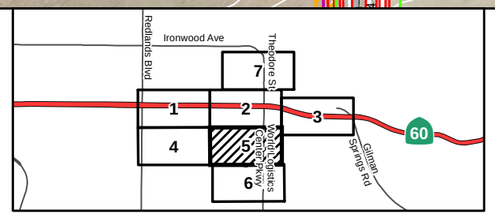


LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way
- Parcel Acquistition
- Full Acquistition
- Partial Acquisition

N

0 100 200
FEET



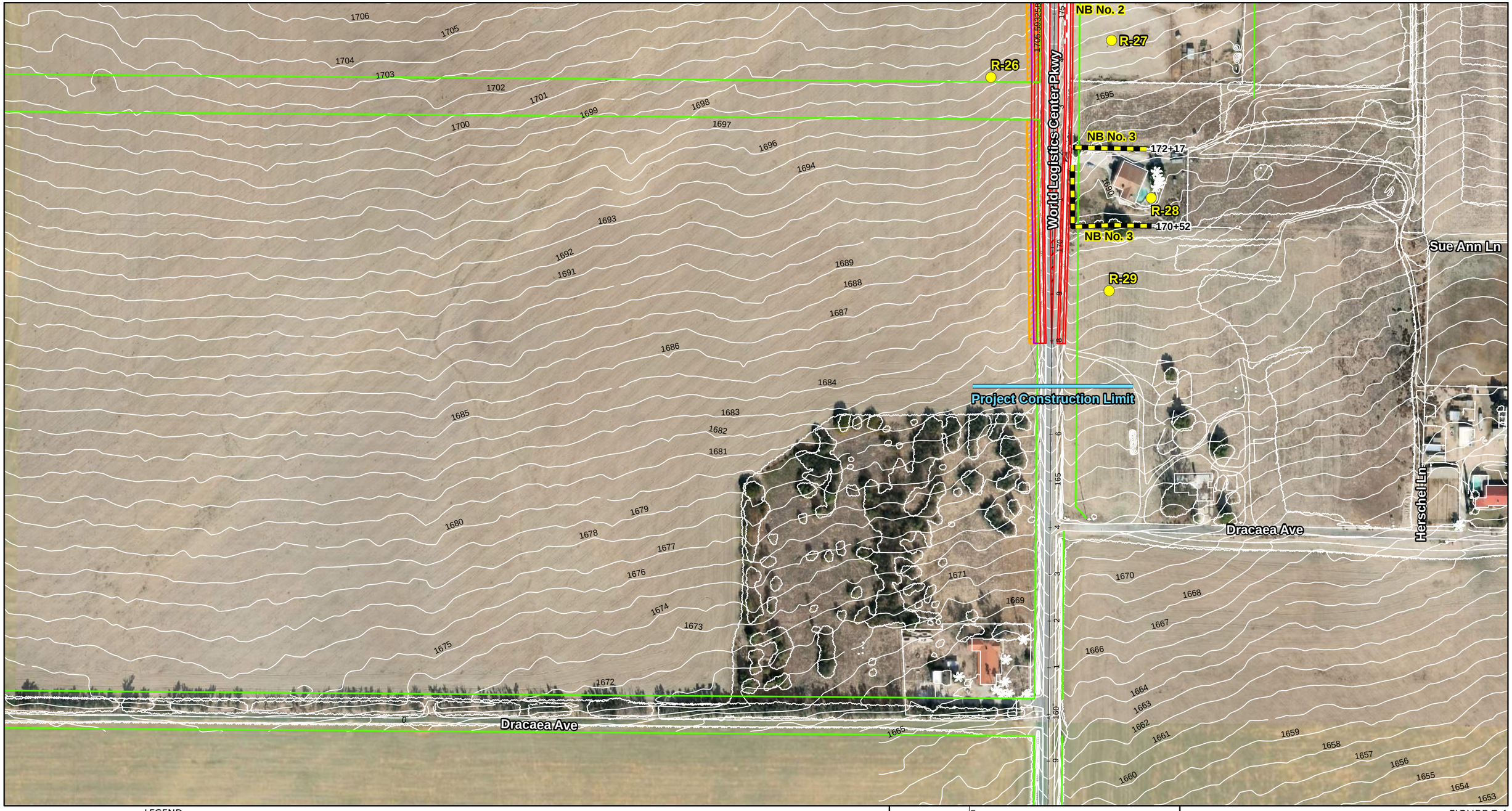
SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

FIGURE 7-1
Sheet 5 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

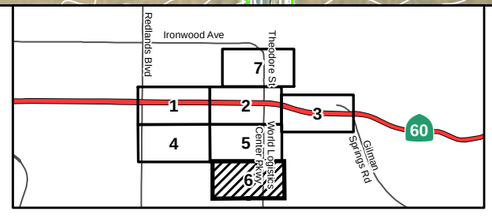
- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquistition

- Full Acquistition
- Partial Acquisition

N

0 100 200
FEET



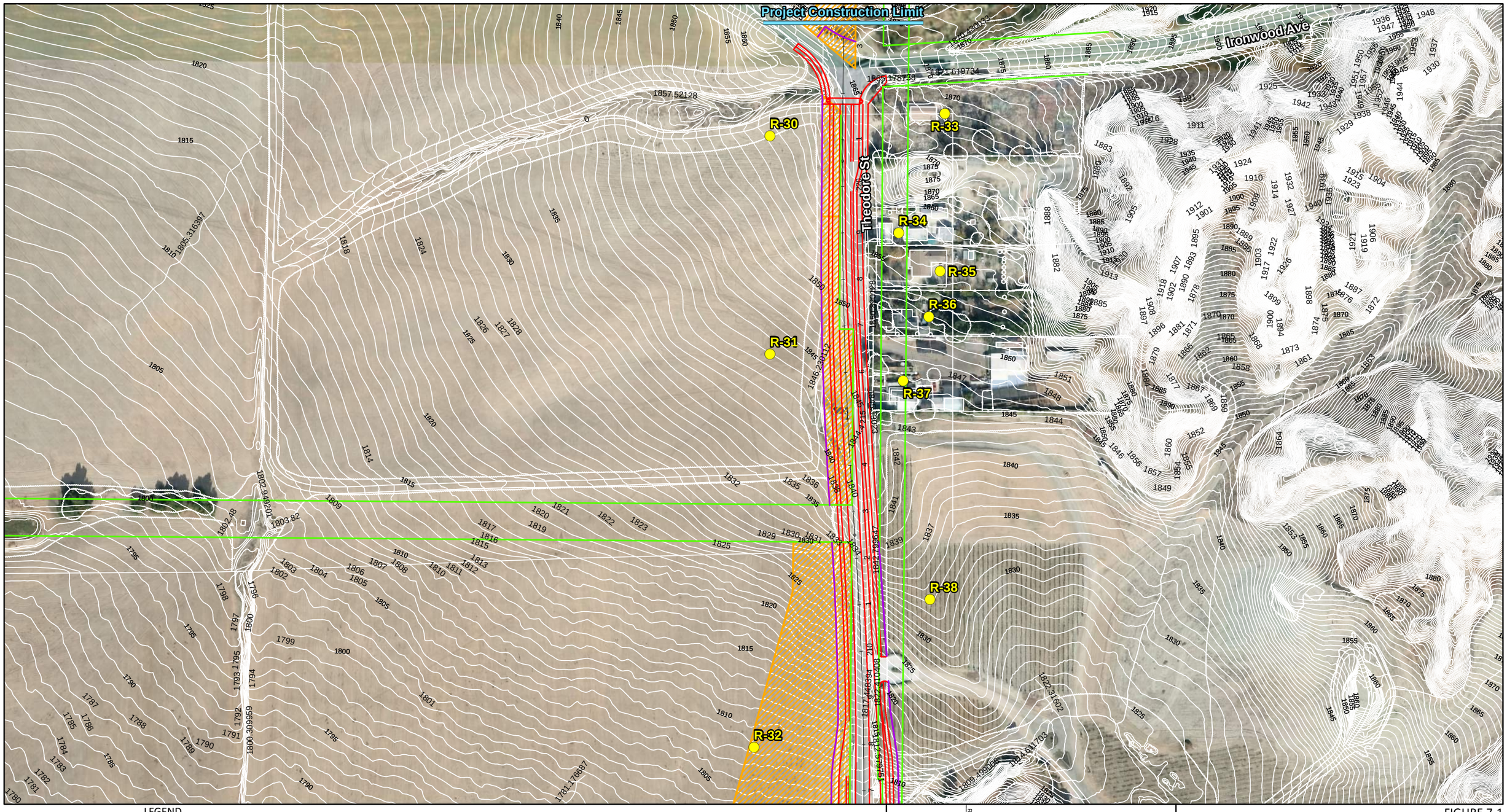
SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

FIGURE 7-1
Sheet 6 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



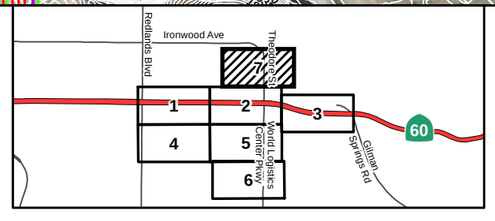
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 2 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquistition

- Full Acquistition
- Partial Acquisition

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2.mxd (4/25/2019)

FIGURE 7-1
Sheet 7 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 2

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

Table 7.1. Summary of Reasonableness Allowances for NB No. 1

Alternative 2 with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	5	6	7	8	9	10
Number of Benefited Residences	1	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

Noise Barrier No. 2

A 233 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-25 because traffic noise levels under Alternative 2 conditions would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.1 in Appendix B indicates that traffic noise levels would be 69 dBA L_{eq}, and the increase in noise levels would be 14 dBA. NB No. 1 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 2 is shown on Figure 7-1 for Alternative 2. Table 7.2 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Alternative 2.

Table 7.2. Summary of Reasonableness Allowances for NB No. 2

Alternative 2 with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	4	5	6	10	11	11
Number of Benefited Residences	0	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

Noise Barrier No. 3

A 453 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-28 because a

substantial traffic noise increase of 12 dBA or more over its corresponding existing noise level would occur under Alternative 2 conditions. Traffic modeling results in Table B.1 in Appendix B indicate that traffic noise levels would be 63 dBA L_{eq} and the increase in noise levels would be 14 dBA. NB No. 3 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 3 is shown on Figure 7-1 for Alternative 2. Table 7.3 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Alternative 2.

Table 7.3. Summary of Reasonableness Allowances for NB No. 3

Alternative 2 with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	2	4	5	8	8	9
Number of Benefited Residences	0	0	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

7.2.2. Design Variation 2a

The following is a discussion of the noise abatement considered for Design Variation 2a where traffic noise impacts are predicted.

Noise Barrier No. 1

A 339 ft long barrier along the top of the slope on private property on the east side of WLC Pkwy north of SR-60 was analyzed to shield Receptor R-10 because traffic noise levels under Design Variation 2a conditions would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.2 in Appendix B indicates that traffic noise levels would be 70 dBA L_{eq}, and the increase in noise levels would be 3 dBA. NB No. 1 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 1 is shown on Figure 7-2 for Design Variation 2a. Table 7.4 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Design Variation 2a.

R-1
R-2
R-5
R-6
Project Construction Limit
60
Skechers Warehouse

LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

N

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

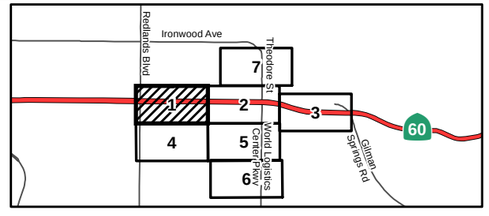


FIGURE 7-2

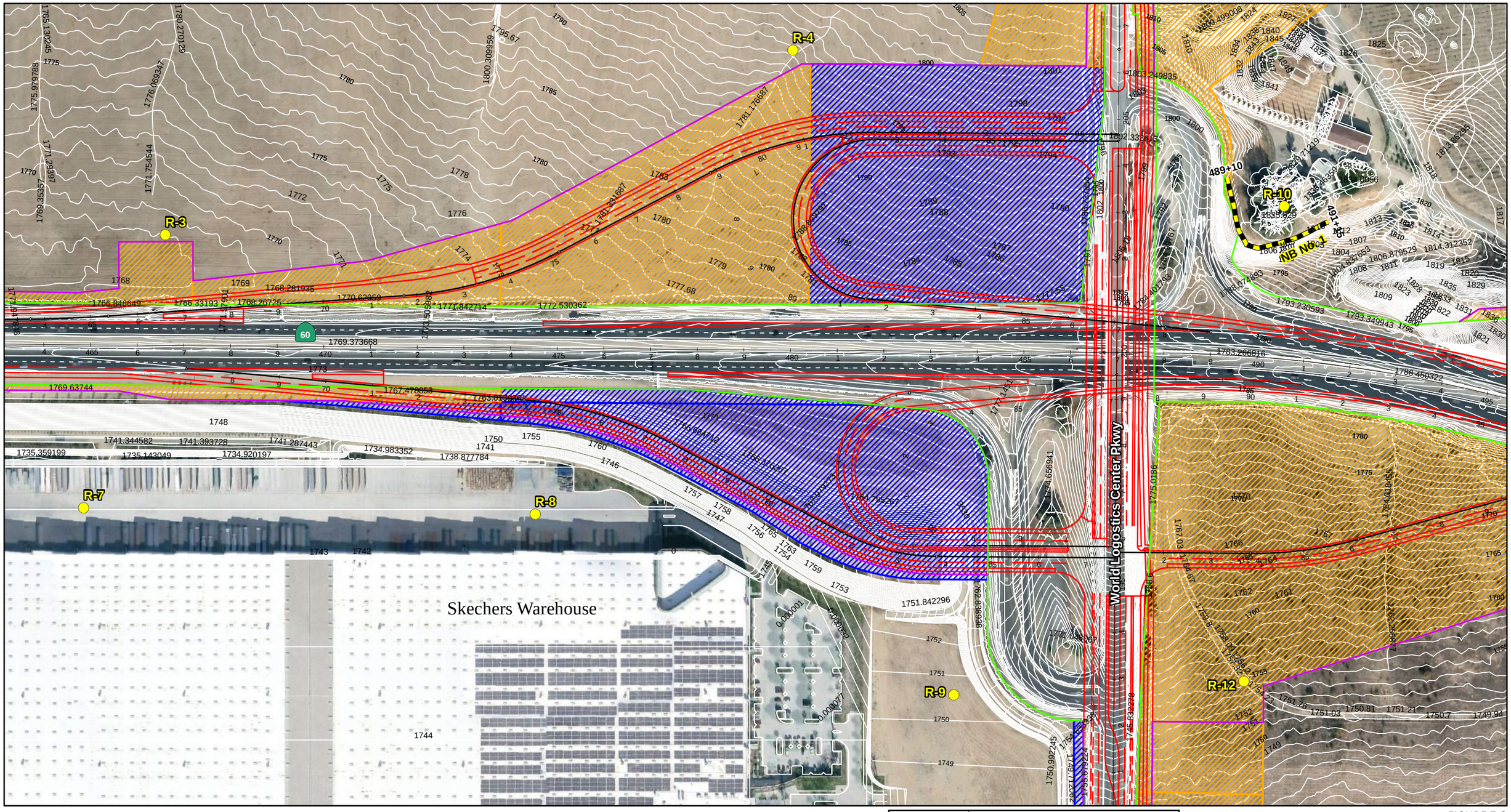
Sheet 1 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

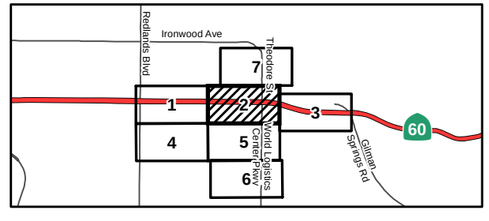


FIGURE 7-2

Sheet 2 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

R-11

Gilman Springs Rd

60

LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

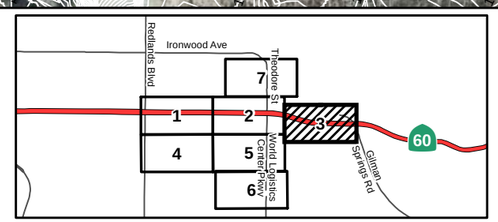


FIGURE 7-2

Sheet 3 of 7

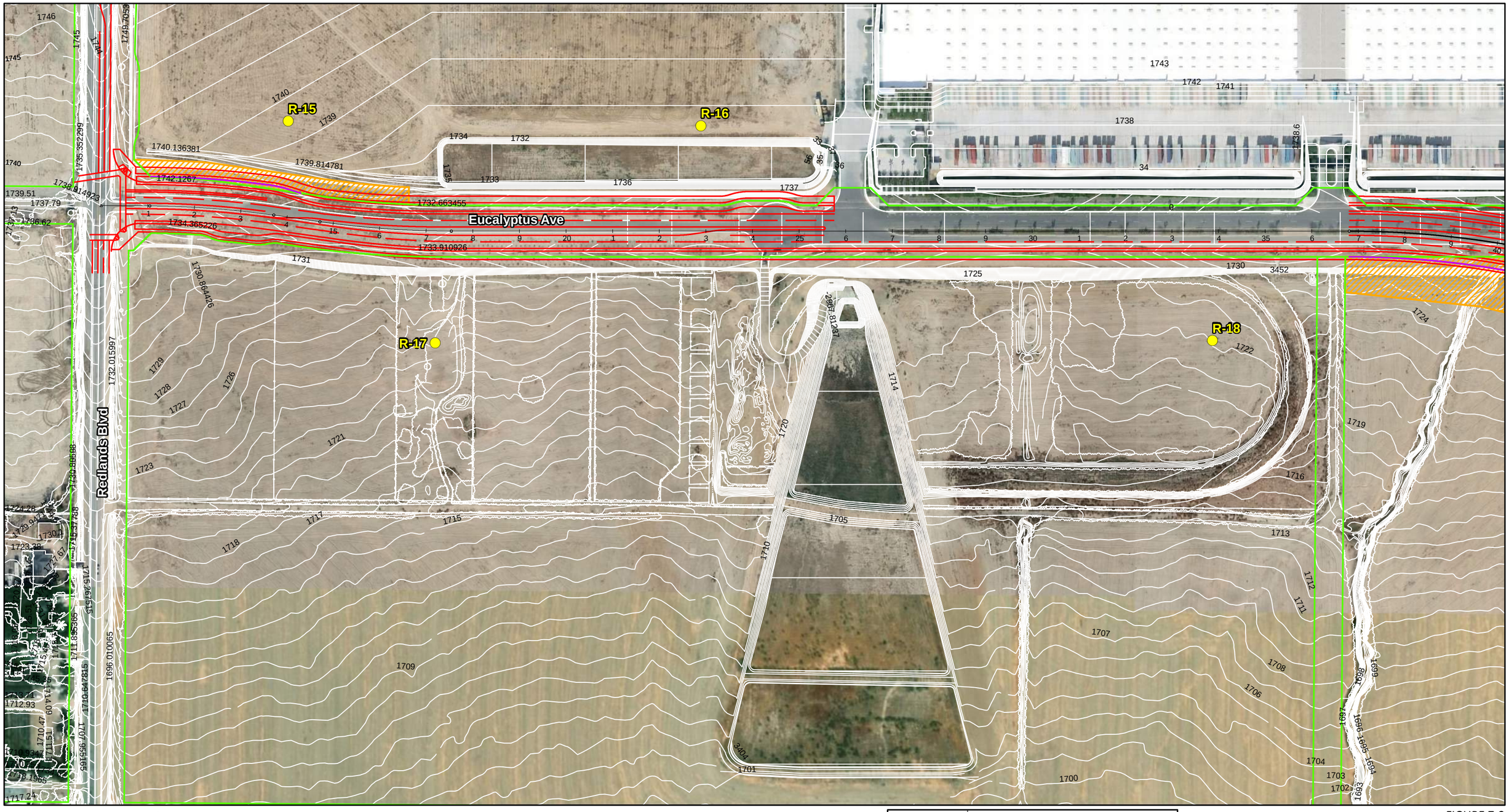
SR-60/World Logistics Center Pkwy

Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

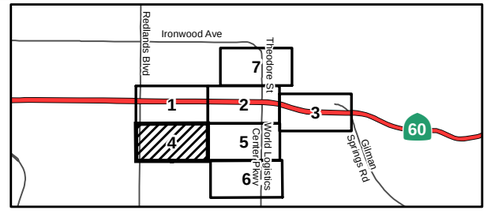


FIGURE 7-2

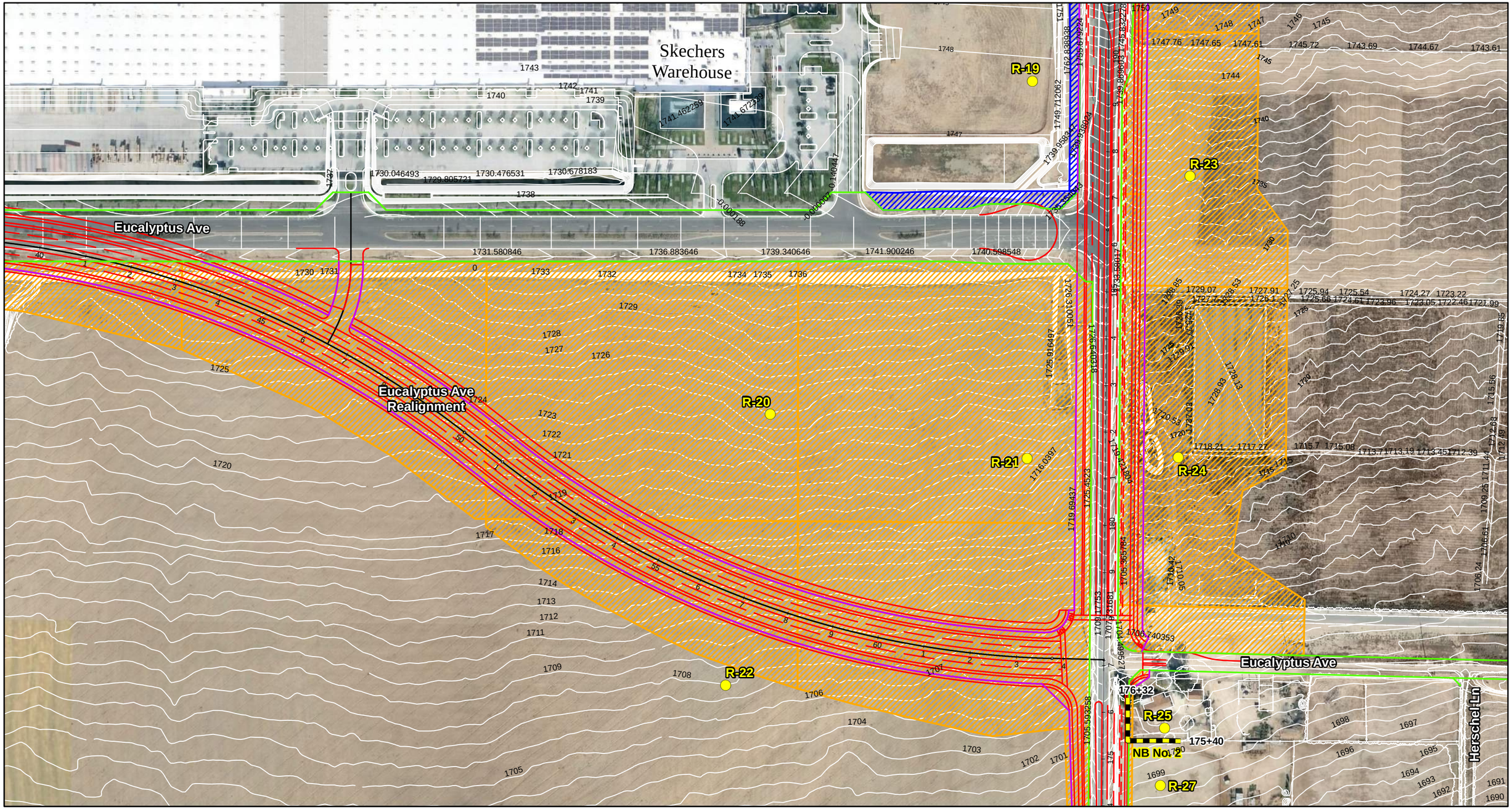
Sheet 4 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

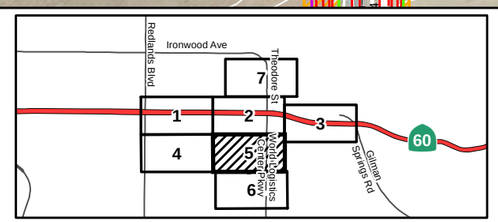


FIGURE 7-2

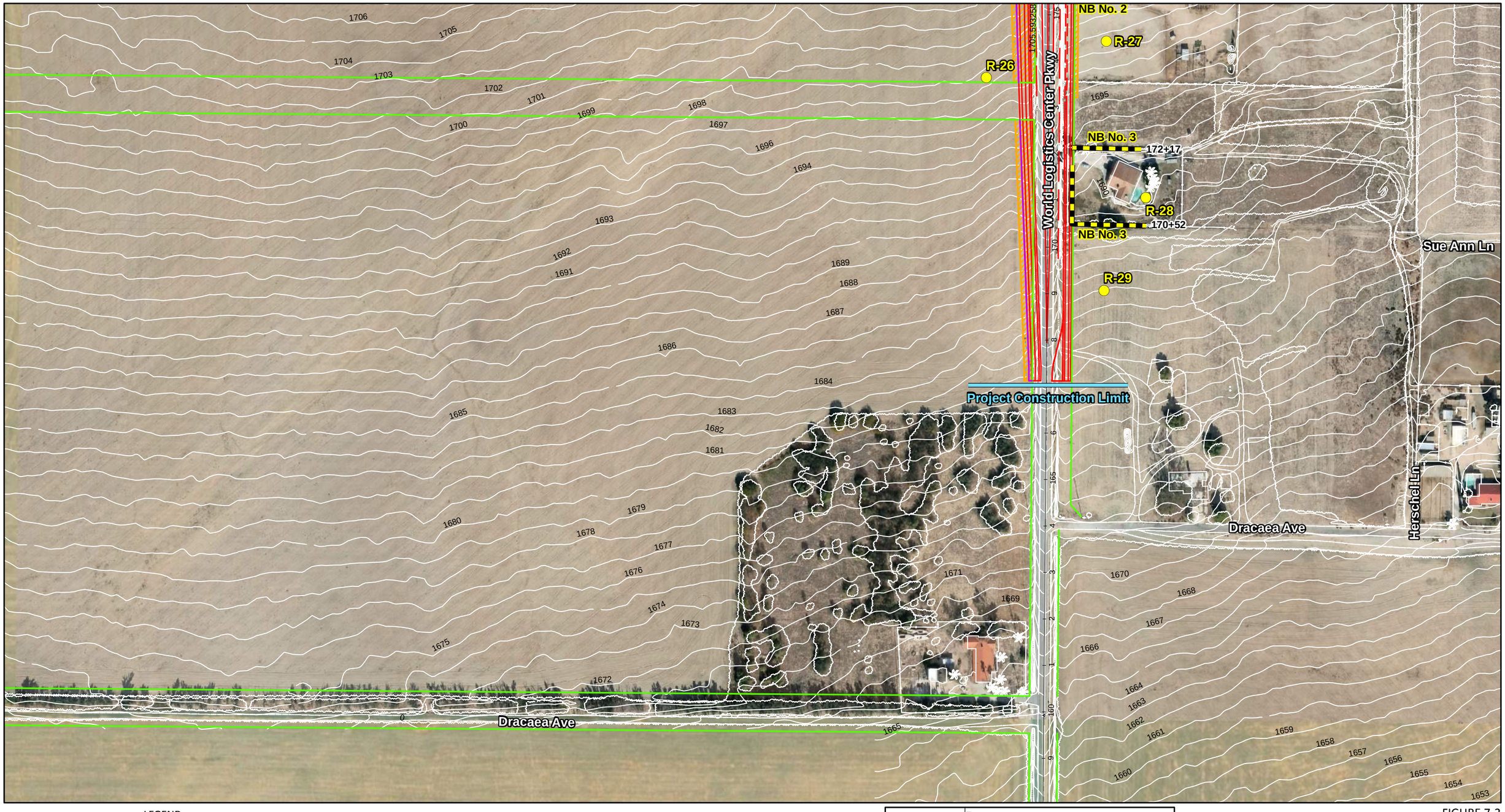
Sheet 5 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

N

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

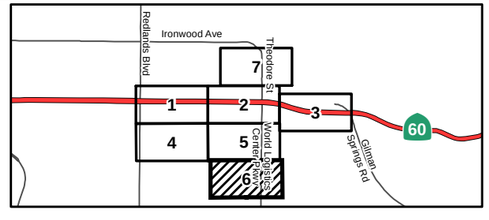


FIGURE 7-2

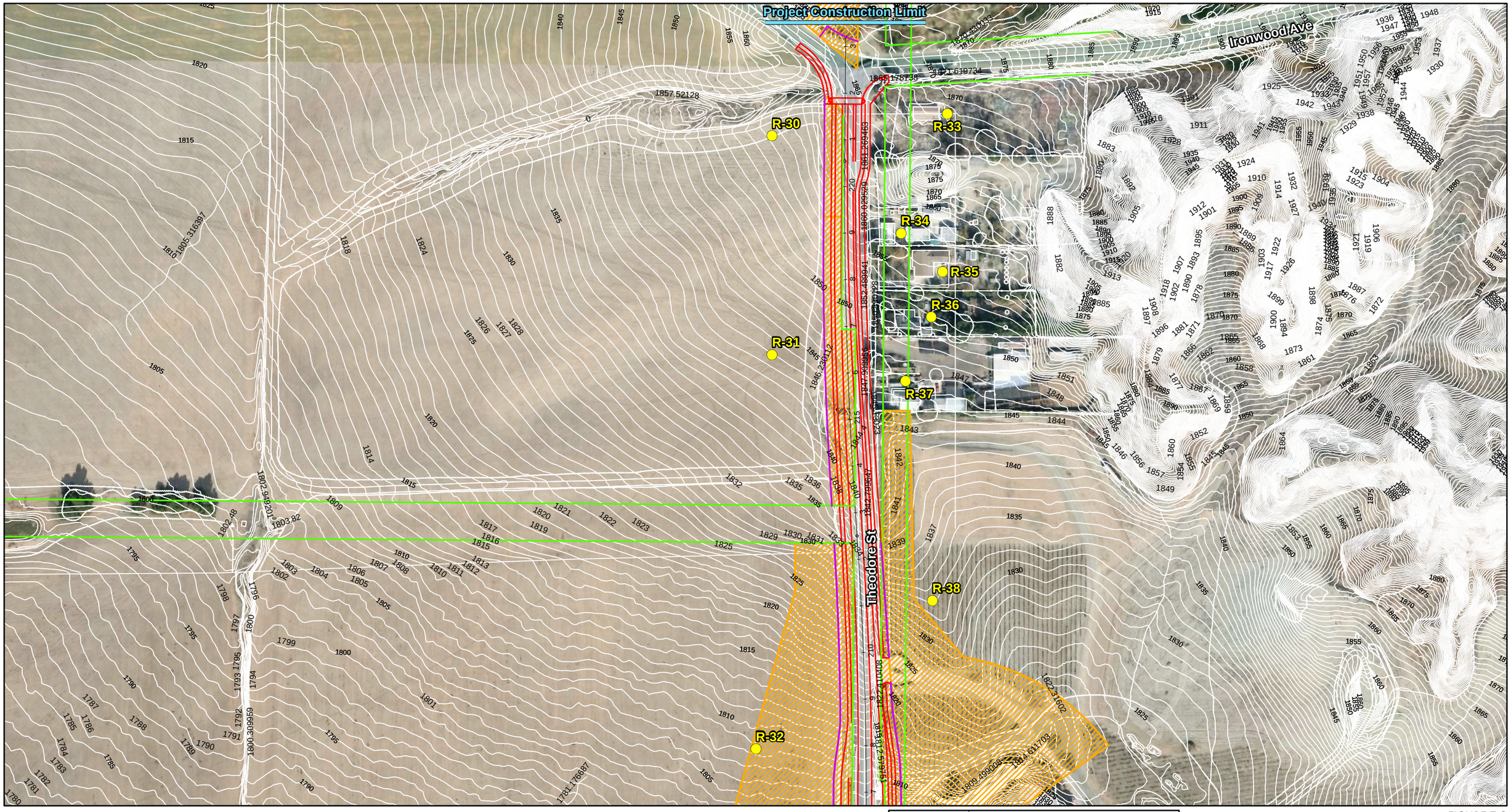
Sheet 6 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



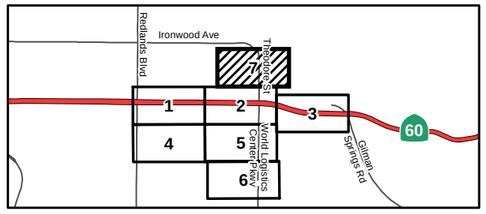
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 2a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt2A.mxd (4/25/2019)

FIGURE 7-2

Sheet 7 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 2a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

Table 7.4. Summary of Reasonableness Allowances for NB No. 1

Design Variation 2a with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	5	6	7	8	9	10
Number of Benefited Residences	1	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

Noise Barrier No. 2

A 206 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-25 because traffic noise levels under Design Variation 2a conditions would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.2 in Appendix B indicates that traffic noise levels would be 70 dBA L_{eq}, and the increase in noise levels would be 15 dBA. NB No. 1 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 2 is shown on Figure 7-2 for Design Variation 2a. Table 7.5 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Design Variation 2a.

Table 7.5. Summary of Reasonableness Allowances for NB No. 2

Design Variation 2a with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	4	5	7	9	10	10
Number of Benefited Residences	0	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

Noise Barrier No. 3

A 434 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-28 because a

substantial traffic noise increase of 12 dBA or more over its corresponding existing noise level would occur under Design Variation 2a conditions. Traffic modeling results in Table B.2 in Appendix B indicate that traffic noise levels would be 64 dBA L_{eq}, and the increase in noise levels would be 15 dBA. NB No. 3 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 3 is shown on Figure 7-2 for Design Variation 2a. Table 7.6 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Design Variation 2a.

Table 7.6. Summary of Reasonableness Allowances for NB No. 3

Design Variation 2a with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	2	4	6	8	9	9
Number of Benefited Residences	0	0	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$107,000	$107,000	$107,000	$107,000

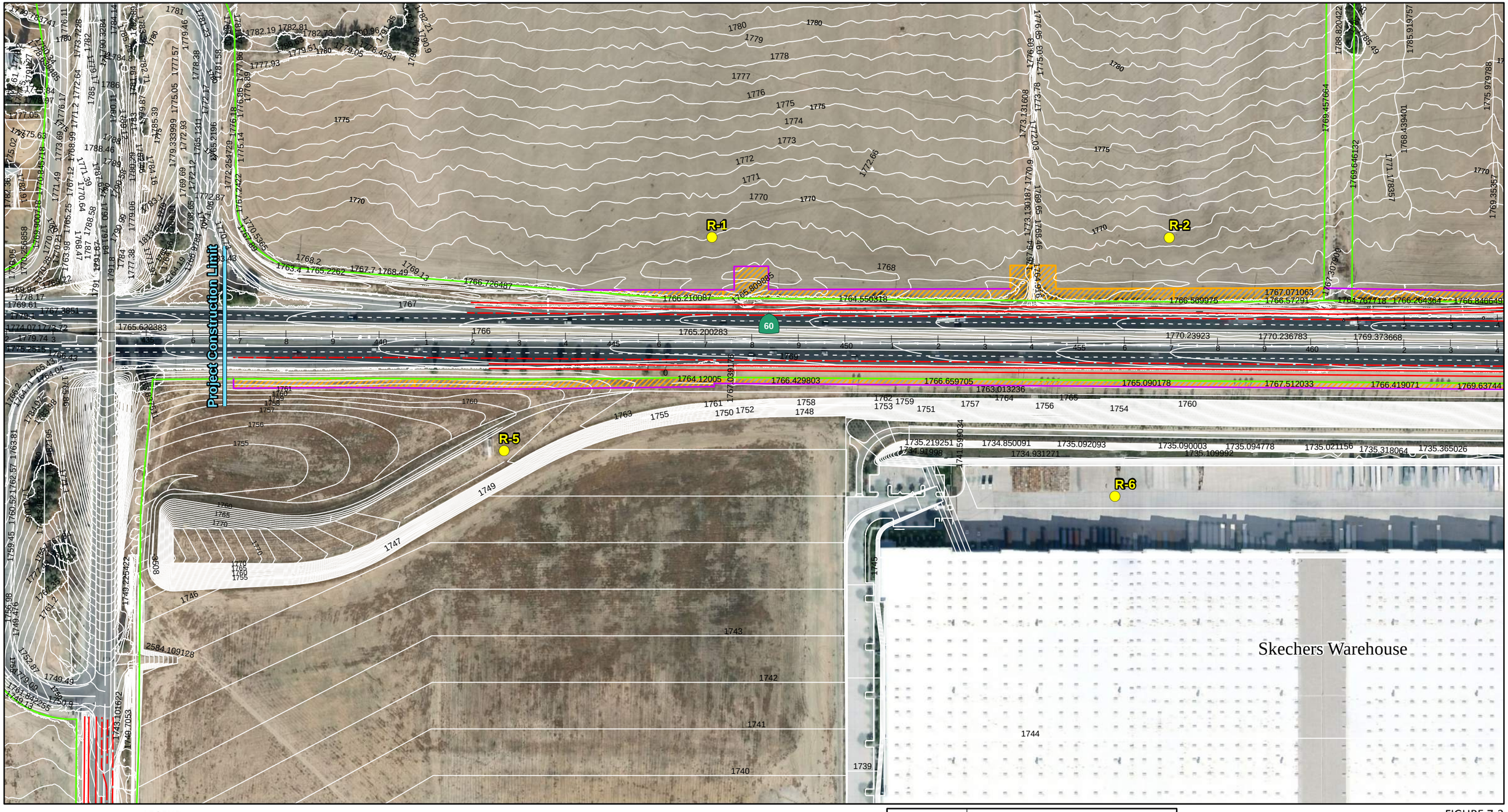
Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

7.2.3. Alternative 6

The following discusses the noise abatement considered for Alternative 6 where traffic noise impacts are predicted.

Noise Barrier No. 1

A 339 ft long barrier along the top of slope on private property on the east side of WLC Pkwy north of SR-60 was analyzed to shield Receptor R-10, because traffic noise levels under Alternative 6 conditions would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.3 in Appendix B indicates that traffic noise levels would be 69 dBA L_{eq}, and the increase in noise levels would be 2 dBA. NB No. 1 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 1 is shown on Figure 7-3 for Alternative 6. Table 7.7 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Alternative 6.



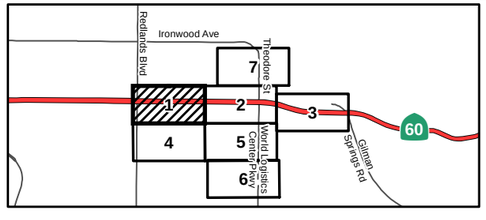
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquistition
- Partial Acquisition

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

FIGURE 7-3

Sheet 1 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

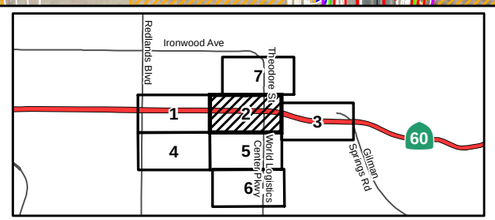
R-3
R-4
R-7
R-8
R-9
R-10
R-12
NB No1
489+10
491+15
60
Skechers Warehouse

LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way
- Parcel Acquisitions
- Full Acquistition
- Partial Acquisition

N

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

FIGURE 7-3

Sheet 2 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

R-11

Gilman Springs Rd

60

LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquistition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

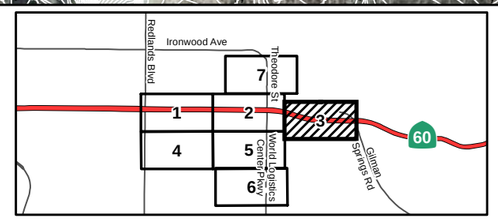


FIGURE 7-3

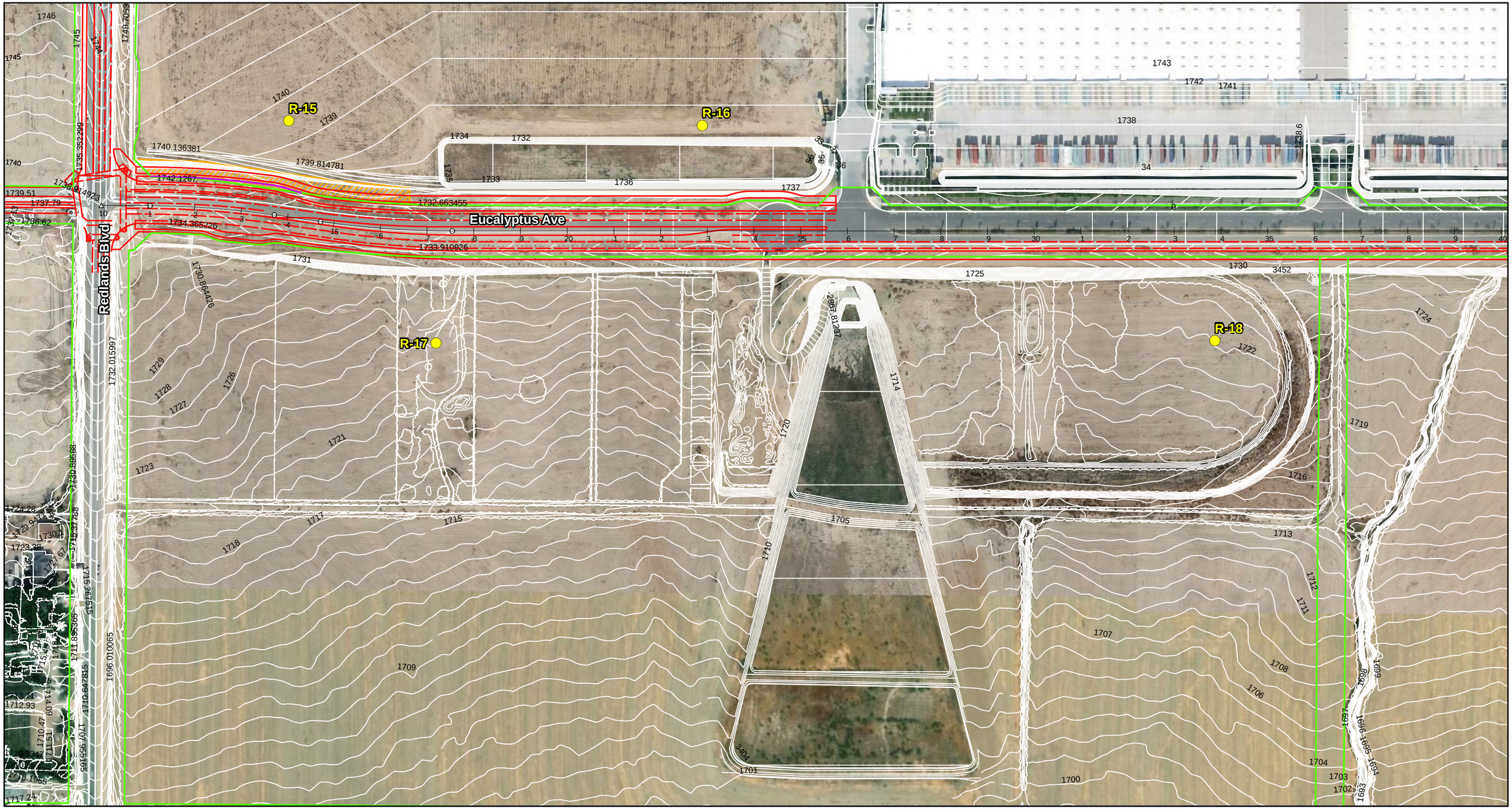
Sheet 3 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquistition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

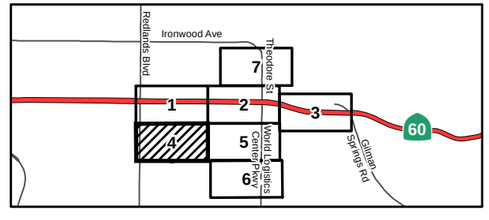


FIGURE 7-3

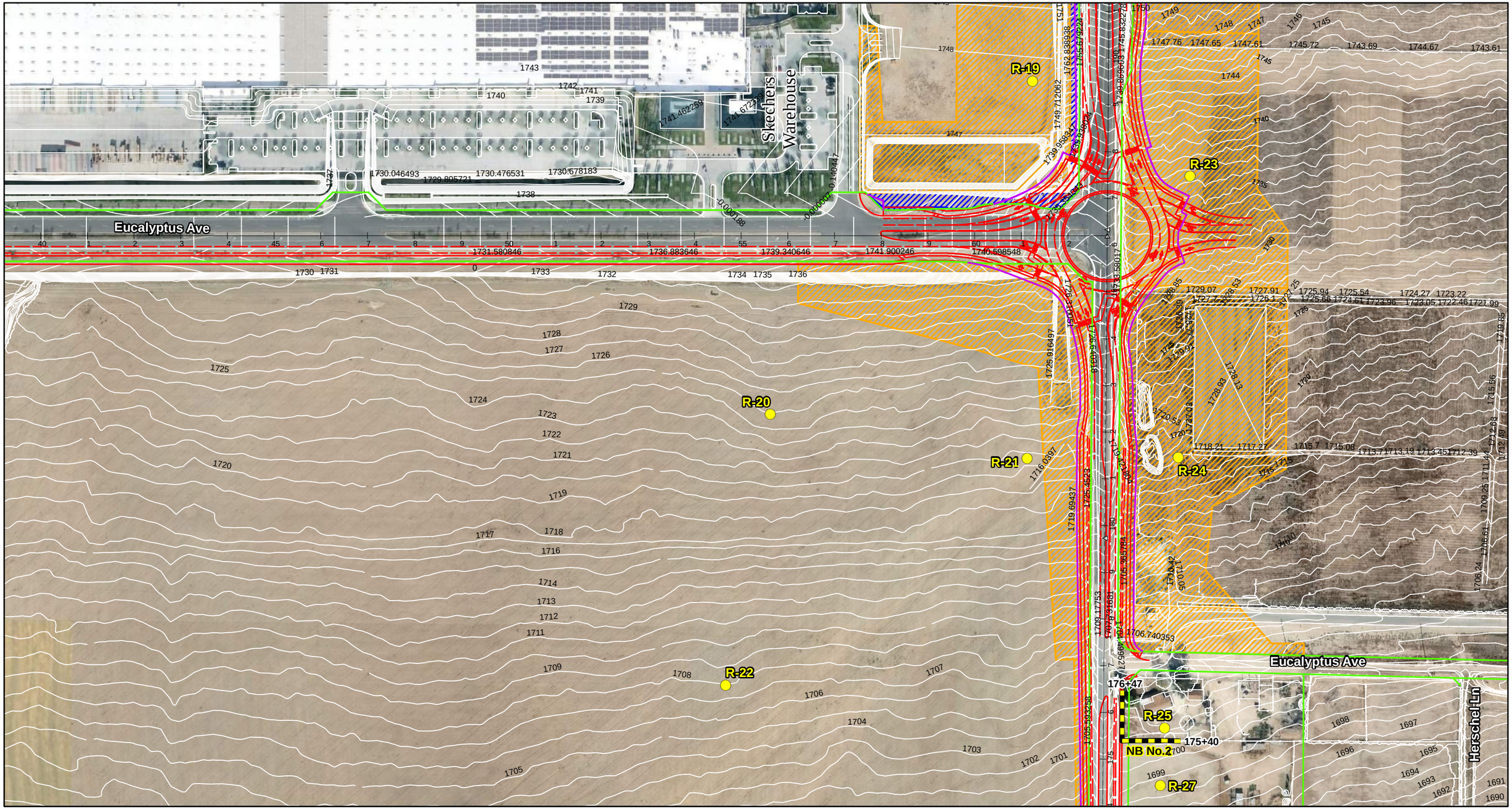
Sheet 4 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

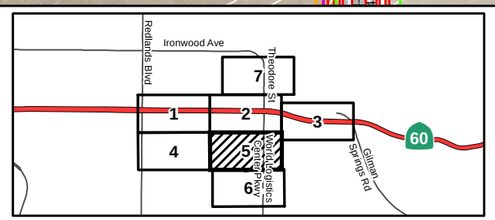


LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquistition
- Partial Acquisition



0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

FIGURE 7-3

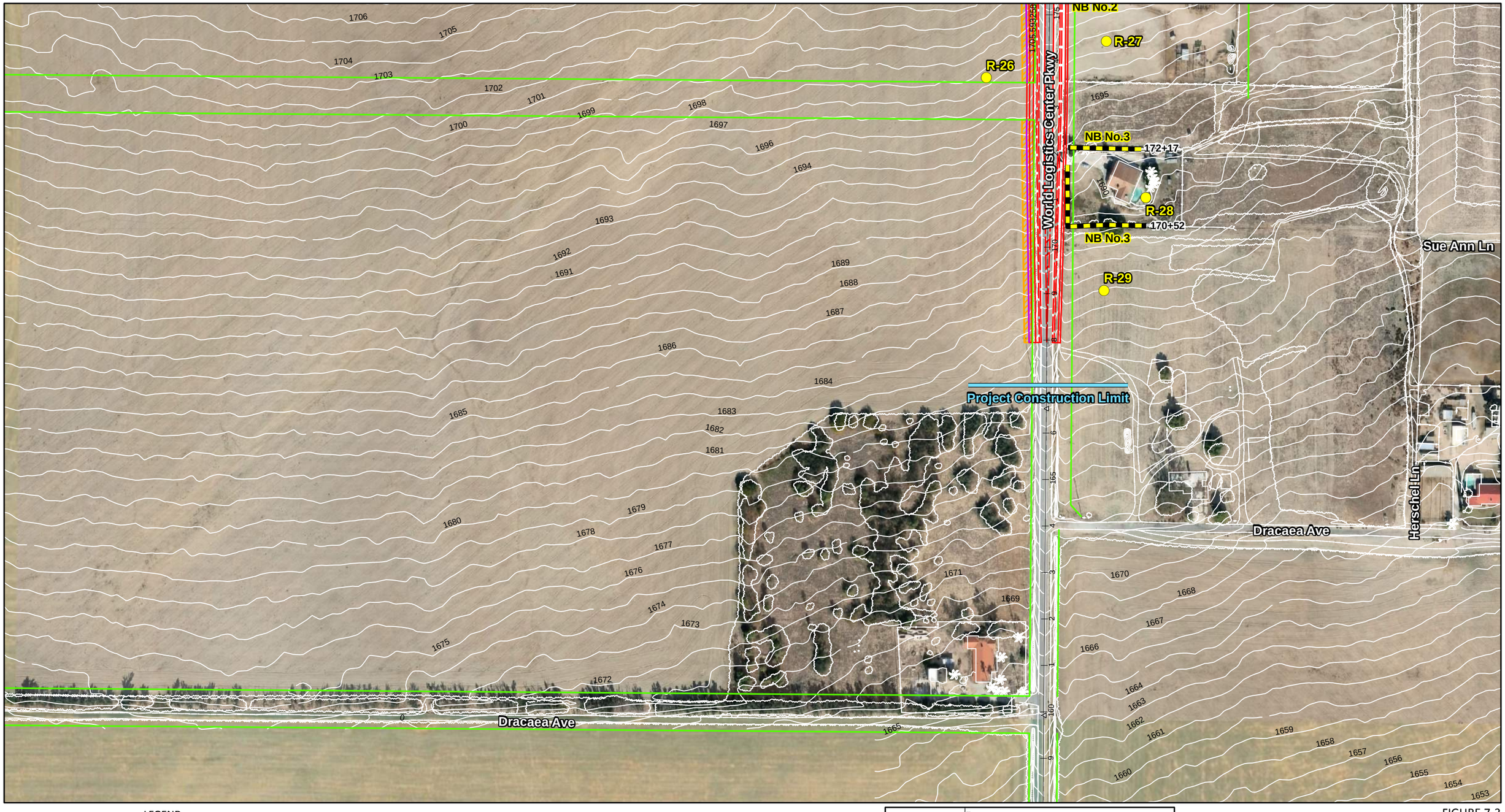
Sheet 5 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquistition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

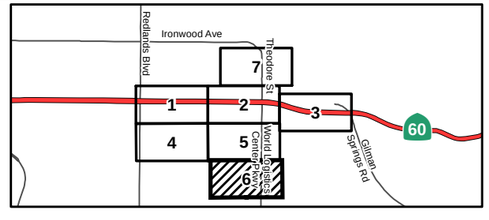
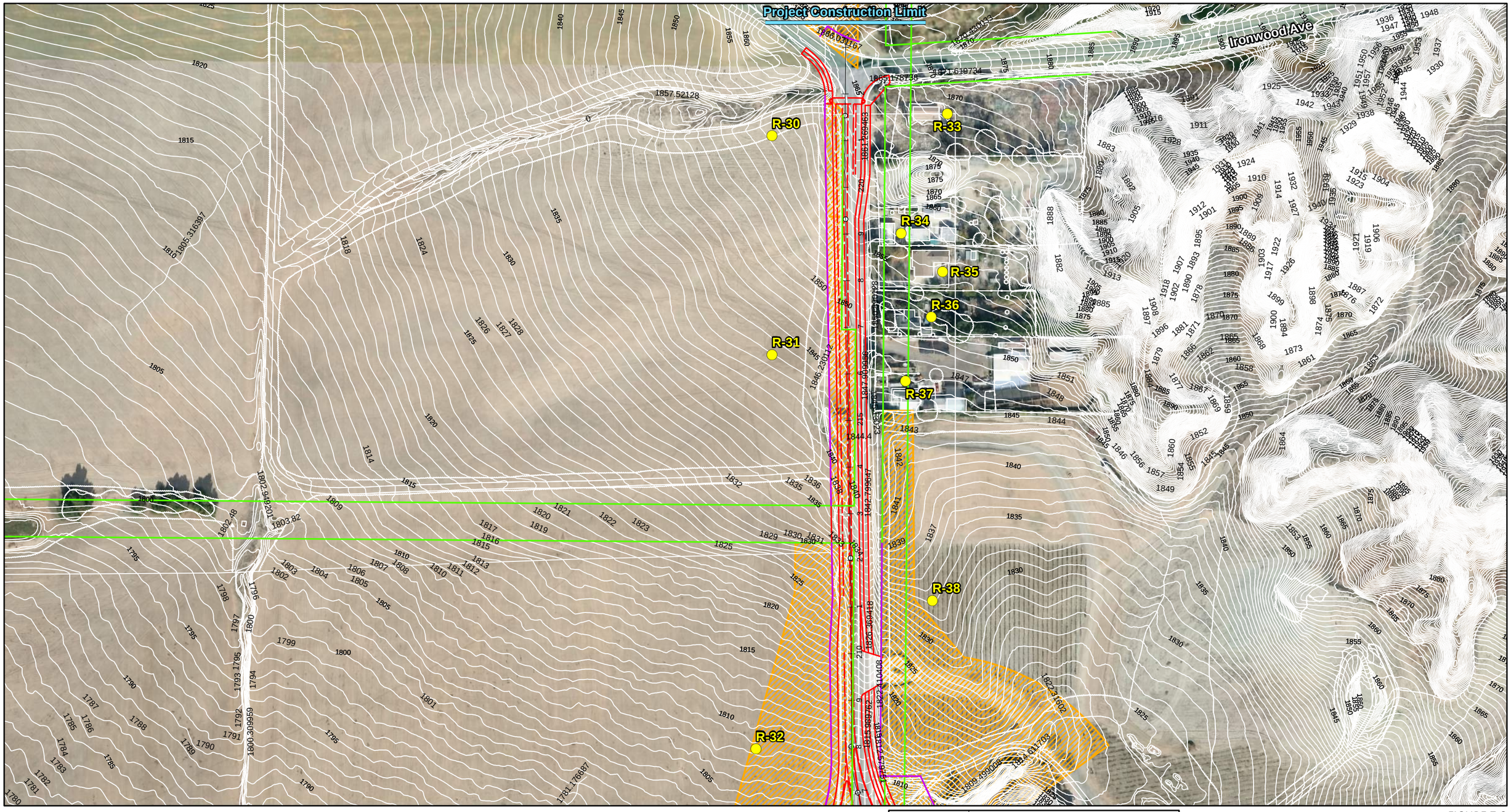


FIGURE 7-3
Sheet 6 of 7
SR-60/World Logistics Center Pkwy
Interchange Project
Modeled Noise Barrier and
Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



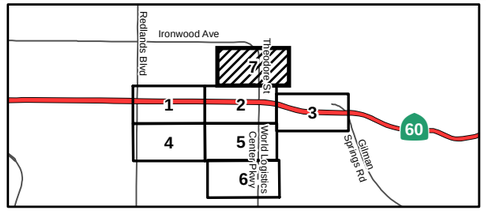
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Alternative 6 Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquistition
- Partial Acquisition

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6.mxd (4/25/2019)

FIGURE 7-3

Sheet 7 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Alternative 6

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

Table 7.7. Summary of Reasonableness Allowances for NB No. 1

Alternative 6 with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	6	6	7	8	9	9
Number of Benefited Residences	1	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit/receptor.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

Noise Barrier No. 2

A 233 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-25 because traffic noise levels under Alternative 6 conditions would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.1 in Appendix B indicate that traffic noise levels would be 69 dBA L_{eq}, and the increase in noise levels would be 14 dBA. NB No. 2 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 2 is shown on Figure 7-3 for Alternative 6. Table 7.8 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Alternative 6.

Table 7.8. Summary of Reasonableness Allowances for NB No. 2

Alternative 6 with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	4	5	6	10	11	11
Number of Benefited Residences	0	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).
[1] A NADR will be prepared to identify the noise barrier construction cost information and the noise barriers that are reasonable from a cost perspective.
[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.
dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

Noise Barrier No. 3

A 453 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-28 because a substantial traffic noise increase of 12 dBA or more over its corresponding existing noise level would occur under Alternative 6 conditions. Traffic modeling results in Table B.3 in Appendix B indicates that traffic noise levels would be 63 dBA L_{eq}, and the increase in noise levels would be 14 dBA. NB No. 3 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 3 is shown on Figure 7-3 for Alternative 6. Table 7.9 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Alternative 6.

Table 7.9. Summary of Reasonableness Allowances for NB No. 3

Alternative 6 with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	2	4	5	8	8	9
Number of Benefited Residences	0	0	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).

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

[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.

dB = decibels NADR = Noise Abatement Decision Report
ft = foot/feet NB = Noise Barrier

R-1
R-2
R-5
R-6
Project Construction Limit
60
Skechers Warehouse

LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

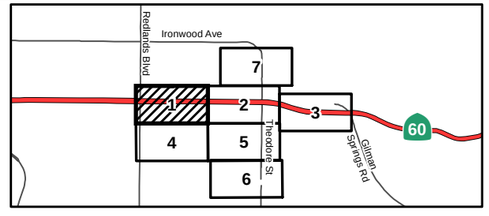


FIGURE 7-4

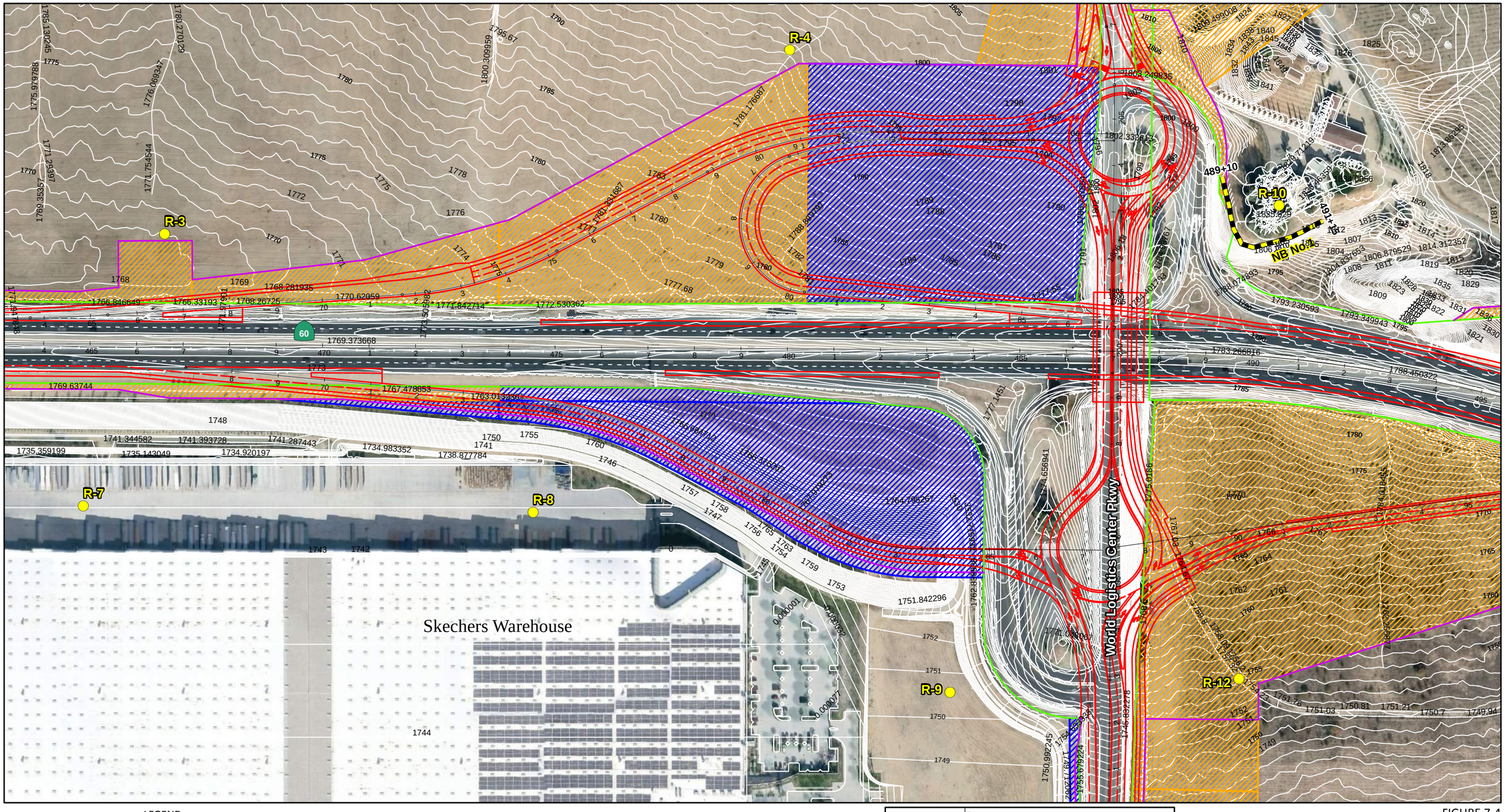
Sheet 1 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 6a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



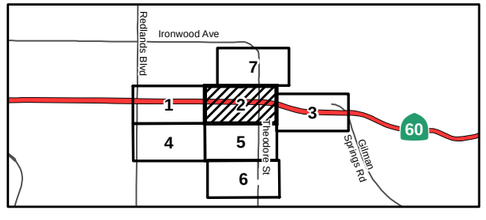
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

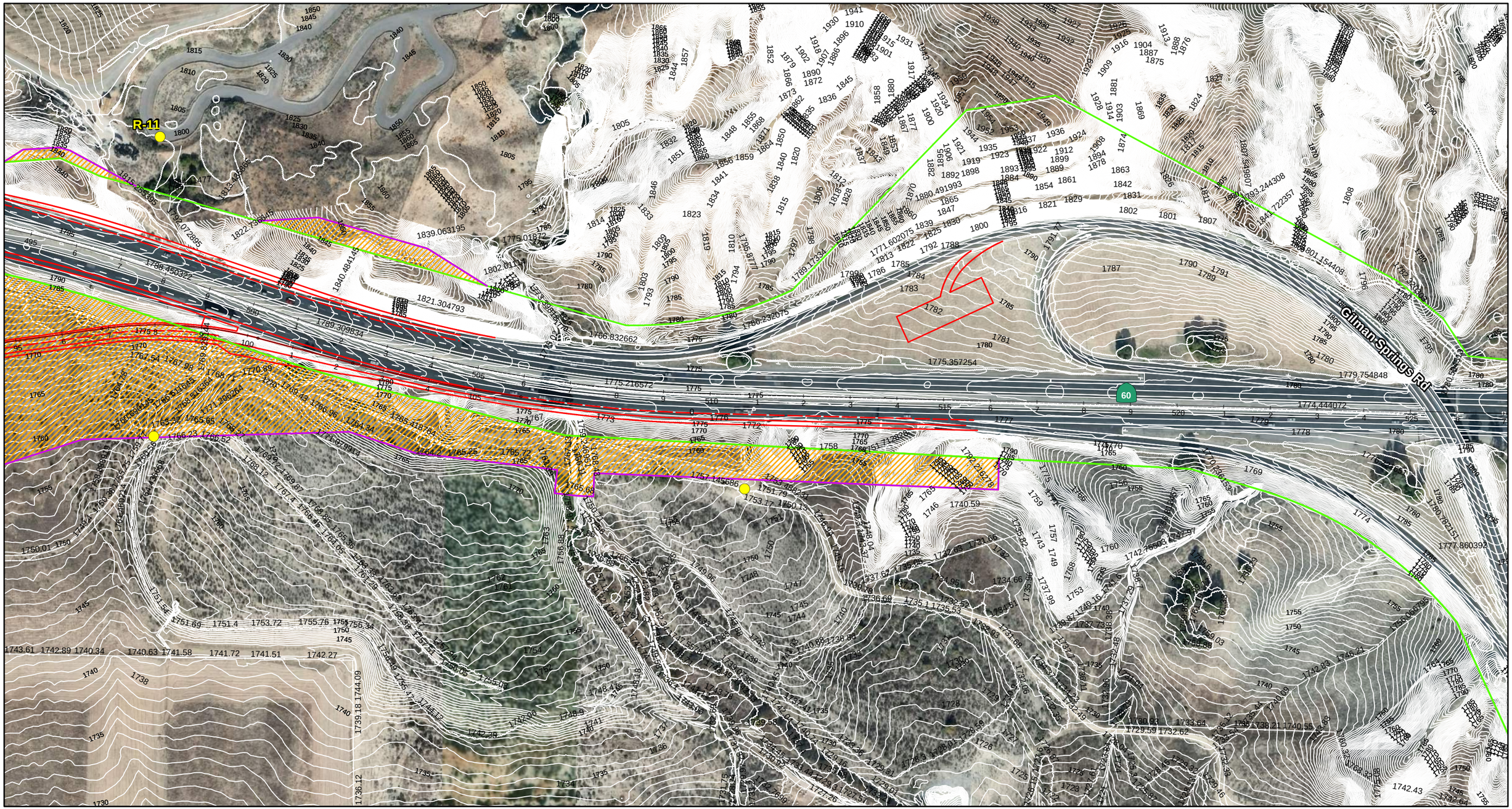


SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

FIGURE 7-4
Sheet 2 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Design Variation 6a
08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

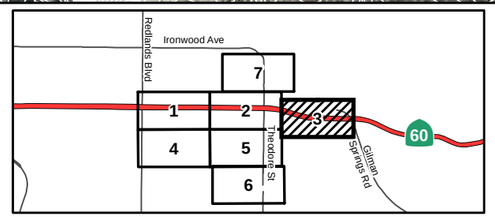


FIGURE 7-4

Sheet 3 of 7

SR-60/World Logistics Center Pkwy

Interchange Project

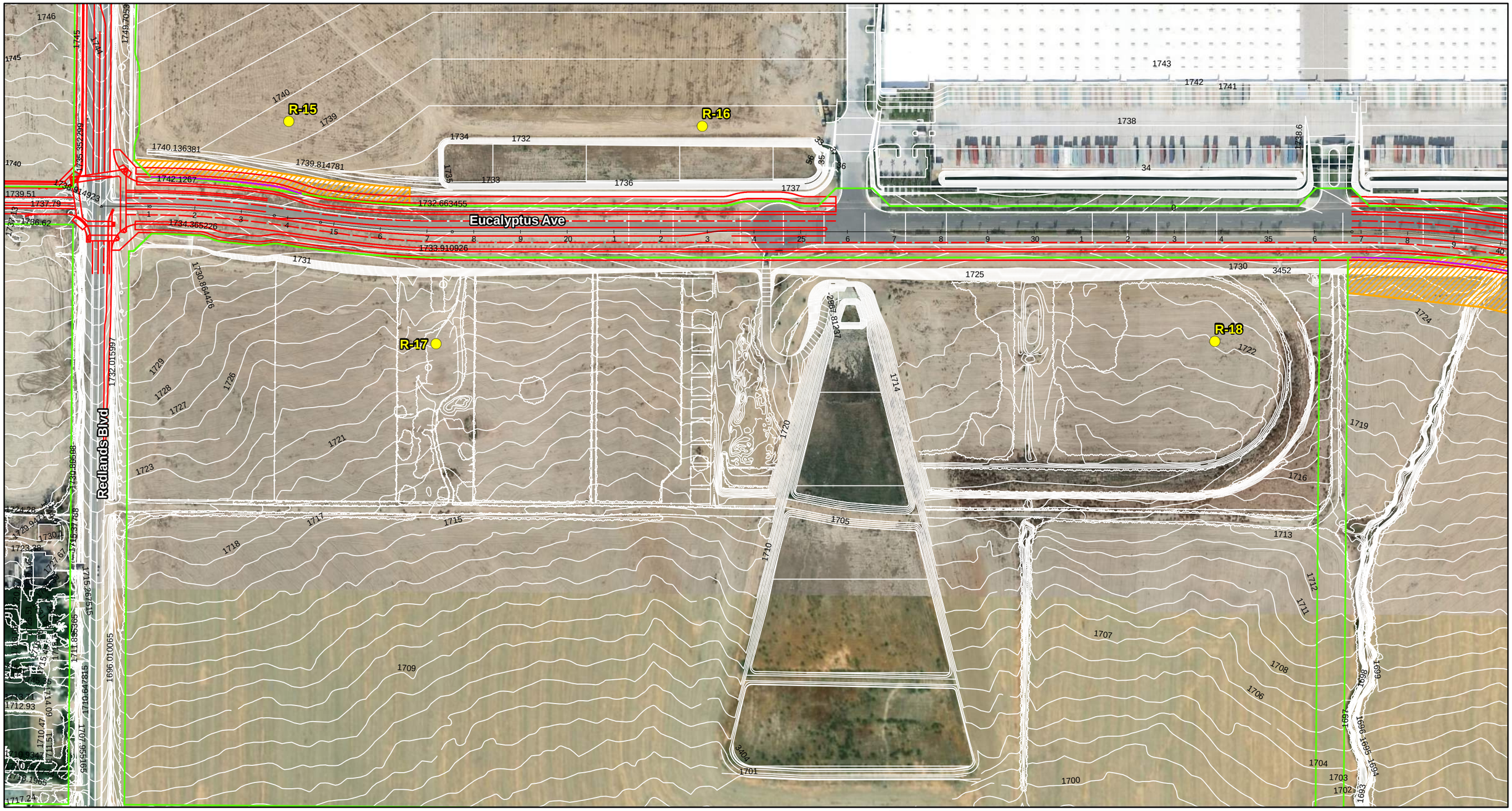
Modeled Noise Barrier and Receptor Locations for Design Variation 6a

08-RIV-60 PM 20.0/22.0

EA No. 0M590

Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

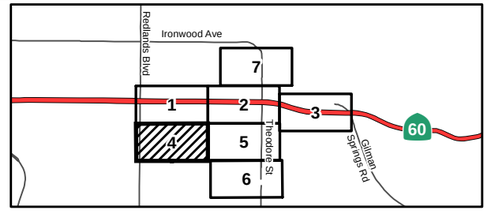


FIGURE 7-4

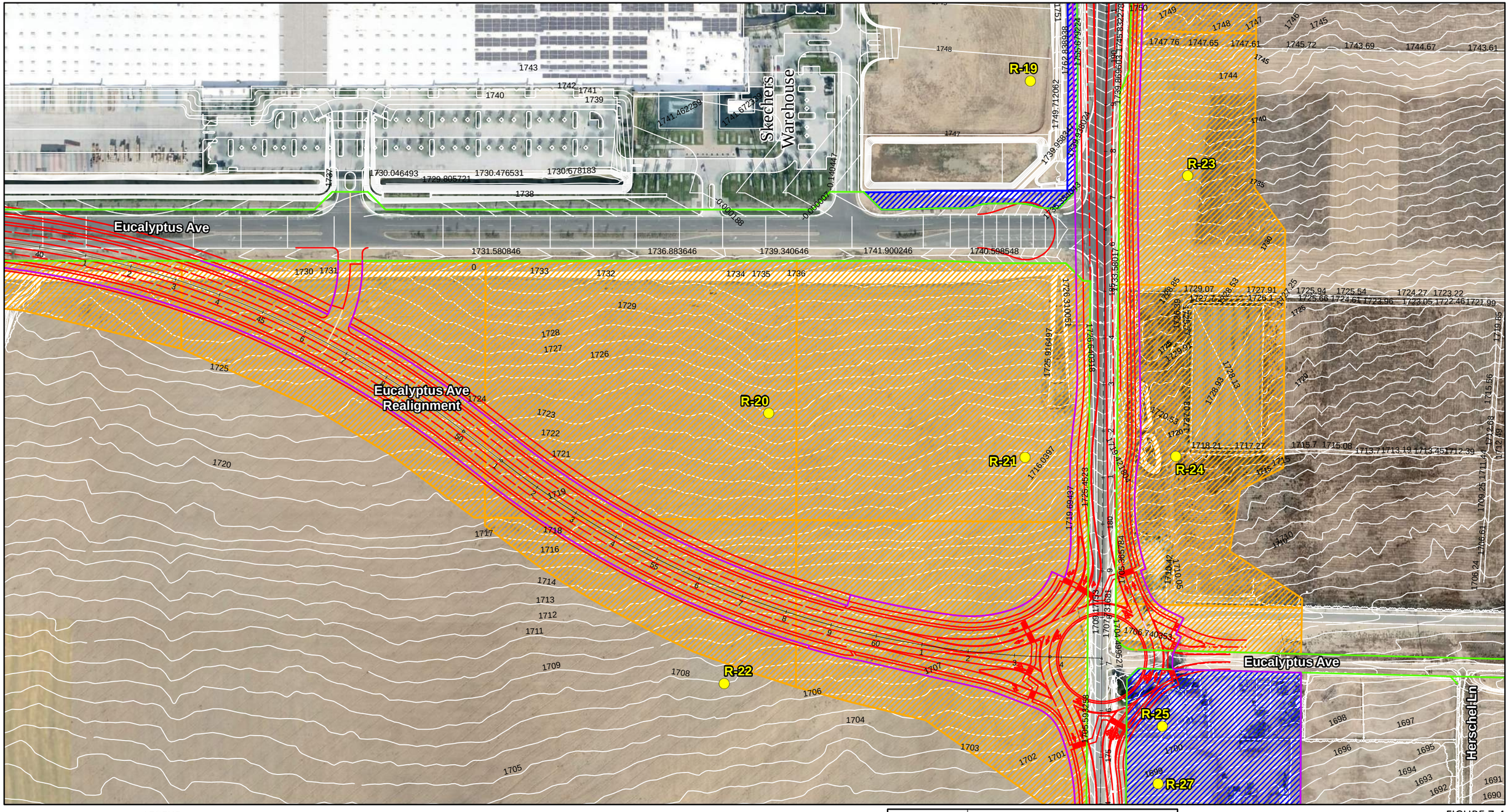
Sheet 4 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 6a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

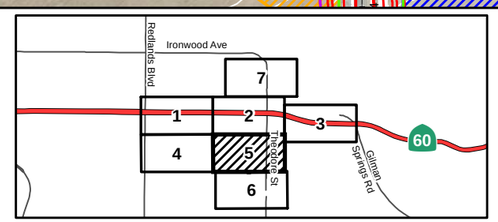


FIGURE 7-4

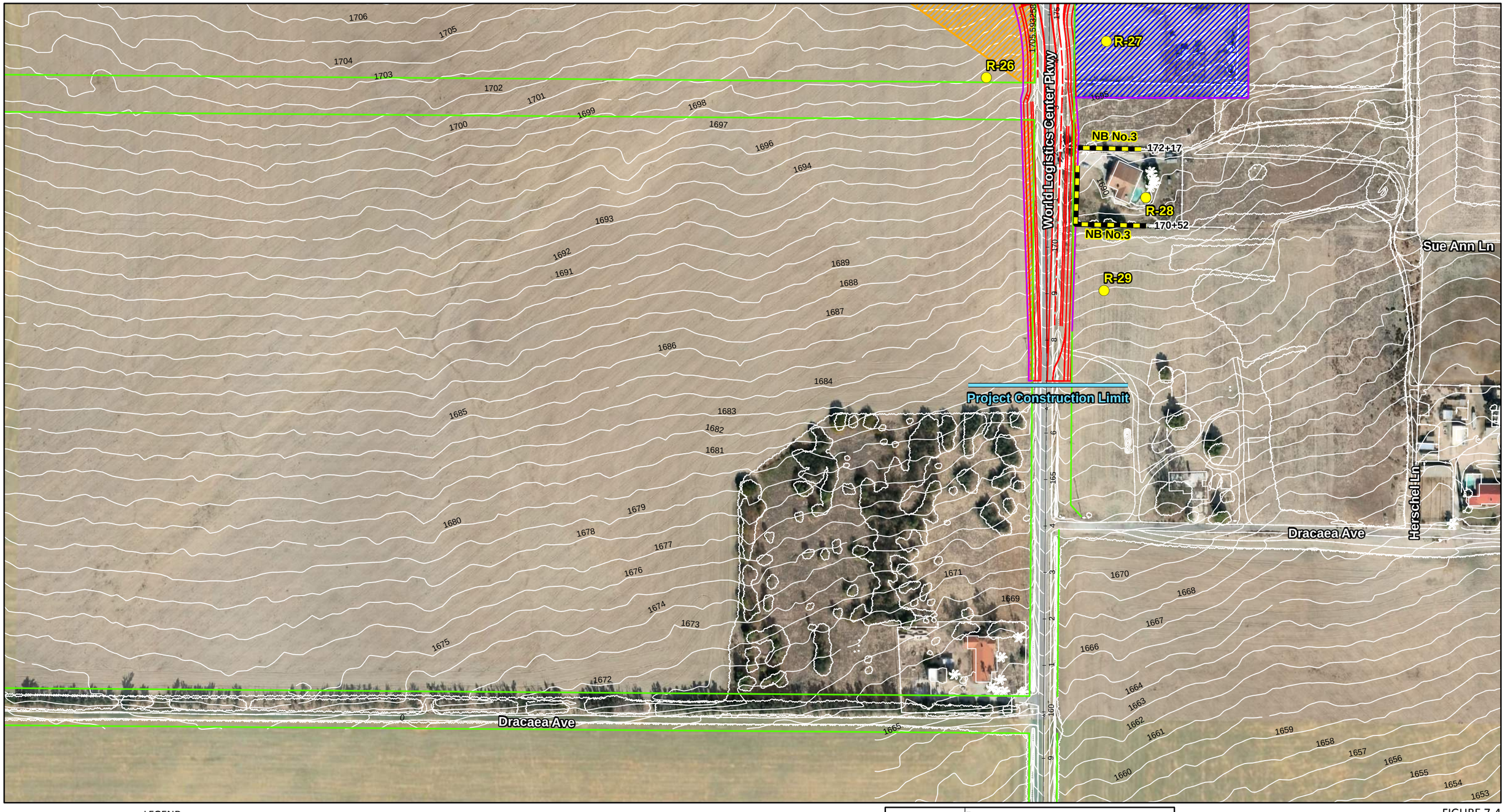
Sheet 5 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 6a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank



LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

N

0 100 200
FEET

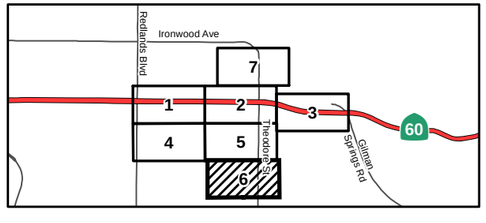


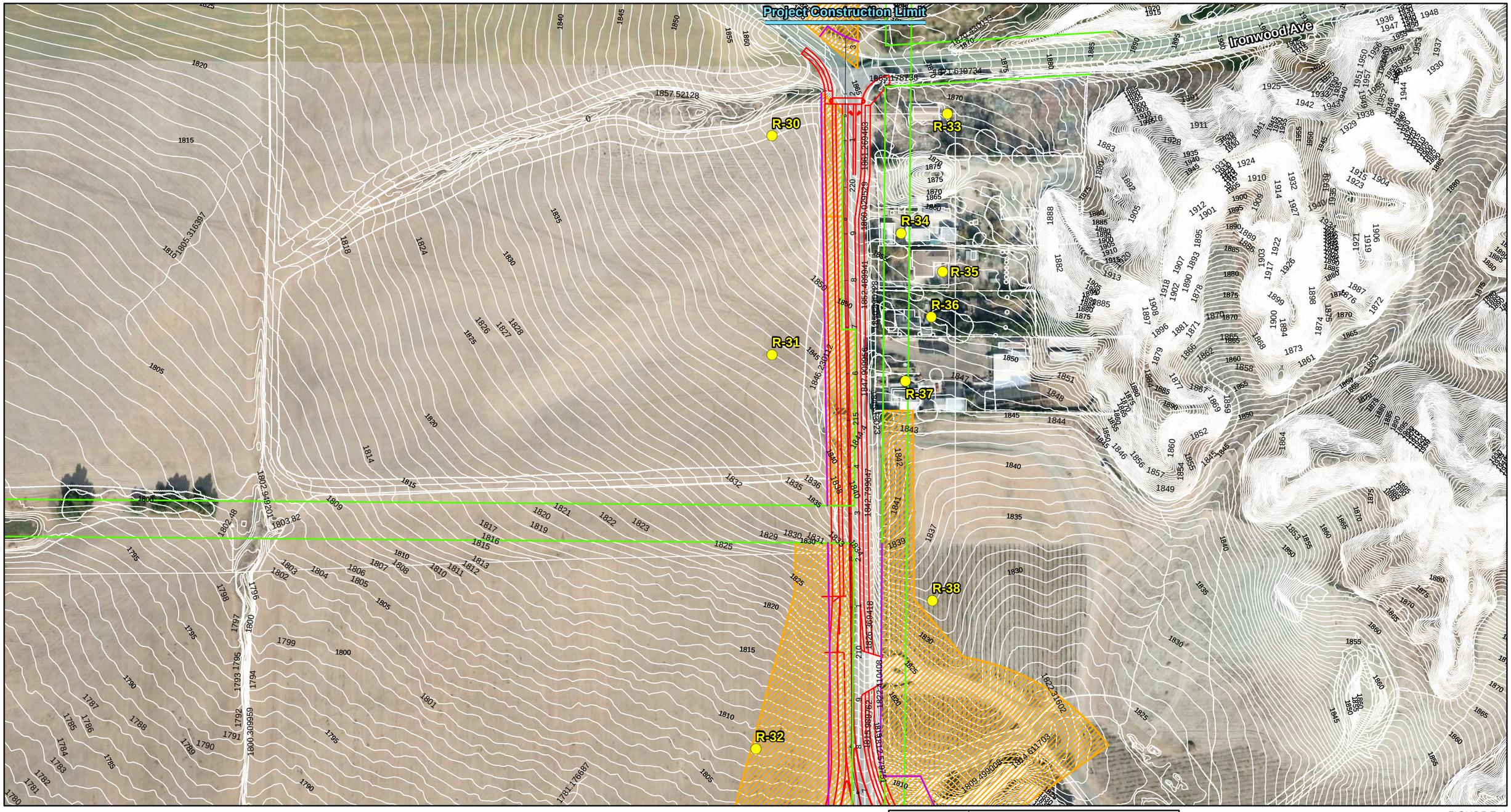
FIGURE 7-4
Sheet 6 of 7
SR-60/World Logistics Center Pkwy Interchange Project
Modeled Noise Barrier and Receptor Locations for Design Variation 6a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

This page intentionally left blank



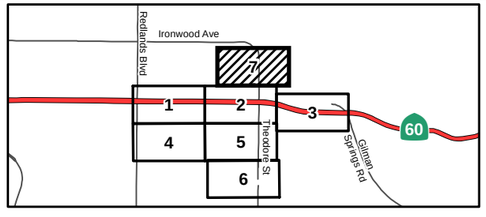
LEGEND

- Modeled Receptor Locations
- Modeled Noise Barrier
- Design Variation 6a Improvements
- Existing Right-of-Way
- Proposed Right-of-Way

Parcel Acquisitions

- Full Acquisition
- Partial Acquisition

0 100 200
FEET



SOURCE: Google Imagery (2012); Michael Baker Intl (11/20/2018)

I:\RBF1301\GIS_Mod\MXD\Noise\ModeledNoiseBarrier_Receptors_Alt6A.mxd (4/25/2019)

FIGURE 7-4

Sheet 7 of 7

SR-60/World Logistics Center Pkwy Interchange Project

Modeled Noise Barrier and Receptor Locations for Design Variation 6a

08-RIV-60 PM 20.0/22.0
EA No. 0M590
Project No. 0813000109

This page intentionally left blank

7.2.4. Design Variation 6a

The following discusses the noise abatement considered for Design Variation 6a, where traffic noise impacts are predicted.

Noise Barrier No. 1

A 339 ft long barrier along the top of the slope on private property on the east side of WLC Pkwy north of SR-60 was analyzed to shield Receptor R-10 because traffic noise levels under Design Variation 6a conditions would approach or exceed the 67 dBA L_{eq} NAC under Activity Category B. Traffic modeling results in Table B.4 in Appendix B indicates that traffic noise levels would be 69 dBA L_{eq}, and the increase in noise levels would be 2 dBA. NB No. 1 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 1 is shown on Figure 7-4 for Design Variation 6a. Table 7.10 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Design Variation 6a.

Table 7.10. Summary of Reasonableness Allowances for NB No. 1

Design Variation 6a with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	6	6	7	8	9	9
Number of Benefited Residences	1	1	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).

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

[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit/receptor.

dB = decibels
ft = foot/feet
NADR = Noise Abatement Decision Report
NB = Noise Barrier

Noise Barrier No. 3

A 414 ft long barrier along the City right-of-way and private property line on the east side of WLC Pkwy south of SR-60 was analyzed to shield Receptor R-28 because a substantial traffic noise increase of 12 dBA or more over its corresponding existing noise level would occur under Design Variation 6a conditions. Traffic modeling results in Table B.4 in Appendix B indicate that traffic noise levels would be 63 dBA L_{eq}, and the increase in noise levels would be 14 dBA. NB No. 3 was evaluated from 6 to 16 ft at 2 ft increments. NB No. 3 is shown on Figure 7-4 for Design Variation 6a. Table 7.11 lists the barrier reductions, the number of benefited residences, the reasonable allowances per benefited residence, and the total reasonable allowance for each barrier height for Design Variation 6a.

Table 7.11. Summary of Reasonableness Allowances for NB No. 3

Design Variation 6a with Barrier[1]	6 ft Barrier	8 ft Barrier	10 ft Barrier	12 ft Barrier	14 ft Barrier	16 ft Barrier
Highest Noise Barrier Reduction (dB)	2	4	5	7	8	9
Number of Benefited Residences	0	0	1	1	1	1
Reasonable Allowance Per Benefited Residence[2]	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$107,000	$107,000	$107,000	$107,000

Source: Compiled by LSA Associates, Inc. (2019).

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

[2] The cost consideration in the reasonableness determination of noise abatement is based on a 2019 allowance of $107,000 per benefited unit.

dB = decibels
ft = foot/feet
NADR = Noise Abatement Decision Report
NB = Noise Barrier

Chapter 8. Construction Noise

Two types of short-term noise impacts would occur during project construction. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site and would incrementally raise noise levels on access roads leading to the site. The pieces of heavy equipment for grading and construction activities will be moved on site, will remain for the duration of each construction phase, and will not add to the daily traffic volume in the project vicinity. A high, single-event noise exposure potential at a maximum level of 75 dBA L_{max} from trucks passing at 50 ft will exist. However, the projected construction traffic will be minimal when compared to existing traffic volumes on SR-60, Theodore Street/WLC Pkwy, and other affected streets, and its associated long-term noise level change will not be perceptible. Therefore, short-term, construction-related worker commutes and equipment transport noise impacts would be less than substantial. Additionally, it is possible that the project may need to import soil from the City Stockpile borrow site at the northwestern corner of the intersection of Alessandro Boulevard/Nason Street, which would generate 13 trucks trips per day based on construction activity assumptions. This volume of trucks when spread over a typical 8-hour workday would be minimal compared to the existing traffic volumes along the haul route.

The second type of short-term noise impact is related to noise generated during roadway construction. Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated as well as the noise levels along the project alignment as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 8.1 lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receiver.

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

Table 8.1. Typical Construction Equipment Noise Levels

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

Source: *Roadway Construction Noise Model User's Guide* (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Maximum noise levels were developed based on Spec 721.560 from the Central Artery/Tunnel (CA/T) program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
[2] The maximum noise level was developed based on the average noise level measured for each piece of equipment during the CA/T program in Boston, Massachusetts.
[3] Since the maximum noise level based on the average noise level measured for this piece of equipment was not available, the maximum noise level developed based on Spec 721.560 was used.
ft = foot/feet
L_{max} = maximum instantaneous sound level
N/A = not applicable
Spec = specification

excavating machinery such as backfillers, bulldozers, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 minutes at lower power settings.

Construction of the proposed project is expected to require the use of graders, bulldozers, water trucks, and pickup trucks. Noise associated with the use of construction equipment is estimated to be between 75 dBA L_{max} and 85 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As seen in Table 8.1, the maximum noise level generated by each grader is assumed to be approximately 85 dBA L_{max} at 50 ft from the grader in operation. Each dozer would generate approximately 82 dBA L_{max} at 50 ft. The maximum noise level generated by water trucks and pickup trucks is approximately 75 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound source with equal strength increases the noise

level by 3 dBA. Each piece of construction equipment operates as an individual point source. The worst-case composite noise level at the nearest residence during this phase of construction would be 87 dBA L_{max} (at a distance of 50 ft from an active construction area).

In addition to standard construction equipment, the proposed project may require the use of pile drivers for the overcrossing at Theodore Street/WLC Pkwy. As shown in Table 8.1, pile driving generates noise levels of approximately 95 dBA L_{max} at 50 ft.

The closest residence is within 50 ft from the project construction areas and approximately 400 ft from pile driving. Therefore, the closest residence may be subject to short-term noise reaching 87 dBA L_{max} or higher generated by construction activities within the project area. Compliance with the construction hours specified by the City's Municipal Code and Caltrans Standard Specifications, Section 14-8.02, will be required to minimize construction noise impacts on sensitive land uses adjacent to the project site. The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA L_{max} at a distance of 50 ft.

This page intentionally left blank

Chapter 9. References

California Department of Transportation (Caltrans). 2011. *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects*. May.

_____. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September. Website: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf (accessed December 2018).

_____. 2015. Standard Specifications, Section 14-8.02.

_____. 2016. *Ramp Metering Design Manual*. April. Website: http://www.dot.ca.gov/trafficops/tech/docs/RMDM.pdf (accessed January 2019).

_____. 2018. *Highway Design Manual*. July.

Federal Highway Administration (FHWA). 1998a. *FHWA Traffic Noise Model User's Guide*. January. FHWA-PD-96-009. Washington, D.C. Website: https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/users_guide/tnm10usersguide.pdf (accessed December 2018).

_____. 1998b. *FHWA Traffic Noise Model Technical Manual*. February. FHWA-PD-96-010. Washington, D.C. Website: https://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/tech_manual/TNM10TechManual.pdf (accessed December 2018).

_____. 2004. Traffic Noise Model Version 2.5. April. Washington, D.C. Website: http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/tnm_v25/ (accessed December 2018).

_____. 2006. *Roadway Construction Noise Model User's Guide*. January. Washington, D.C. Website: https://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf (accessed December 2018).

_____. 2018. Procedures for Abatement of Highway Traffic Noise and Construction Noise. CFR 23 Part 772, October 24. Website: https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title23/23cfr772_main_02.tpl (accessed December 2018).

WSP. 2018a. *Methodology and Traffic Volumes Report for SR-60/Theodore Interchange PA/ED*. August.

_____. 2018b. Vehicle Mix for Noise Analysis Memorandum. September 25.

Appendix A. Traffic Data

This appendix contains the vehicle mix technical memorandum, supplemental traffic data, and tables presenting the traffic counts with measured vehicle speeds during ambient noise level measurements (Table A.1) and traffic data for Existing (Table A.2), Future No Build (Table A.3), Alternative 2 (Table A.4), Design Variation 2a (Table A.5), and Alternative 6 and Design Variation 6a (Table A.6) conditions.

This page intentionally left blank

Technical Memorandum

To: Brandon Reyes, Michael Baker International/Project Manager

From: Daniel Block, Lead Transportation Planner/Modeler, WSP
Chang Hwan (Billy) Park, Supervising Transportation Planner/Modeler, WSP

Subject: **Draft Vehicle Mix for Noise Analysis**

Date: September 25, 2018

The purpose of this technical memorandum is to document the existing and forecast future truck percentages for use in the SR-60/World Logistics Center Parkway (formerly Theodore Street) Interchange PA/ED noise analysis. Noise analysis requires the percentage of trucks by size to a level of detail beyond what was presented in the Traffic Impact Analysis report. This memo provides the additional detail.

Geographic Scope

The geography scope of the study is shown in Exhibit 1. The study intersections included the ramp intersections of the World Logistics Center Parkway IC (intersections #2 and #3 in Exhibit 1), the intersections directly up- or down-stream of them along World Logistics Center Parkway and Theodore Street (#1, #4) and the corresponding intersections at the most likely diversion route during construction closures of the World Logistics Center Parkway IC (the Redlands Boulevard IC, intersections #5 through #8). The eight study intersections are:

1) World Logistics Center Parkway/Eucalyptus Avenue
2) World Logistics Center Parkway/Eastbound SR-60 Ramps
3) World Logistics Center Parkway/Westbound SR-60 Ramps
4) Theodore Street/Ironwood Avenue
5) Redlands Boulevard/Eucalyptus Avenue
6) Redlands Boulevard/Eastbound SR-60 Ramps
7) Redlands Boulevard/Westbound SR-60 Ramps
8) Redlands Boulevard/Ironwood Avenue

Traffic Counts

Traffic counts were collected on Wednesday, May 31st, 2017. The study intersections and freeway sections were all counted on the same day. Some of the study intersections were also counted in January of 2018. For the ramp terminal intersections, 2017 intersection counts are almost all higher than 2018. And, since we only have the freeway counts for 2017, we will use the 2017 counts for the intersections and ramps along World Logistics Center Parkway. The Redlands Blvd/Ironwood Ave intersection counts are higher in 2018 than 2017 during the worse (PM) peak hour, so 2018 counts will be used for the intersections along Redlands Blvd.

Freeway ramp volumes were found using the ramp terminal intersection counts (except for Gilman Springs Rd, for which the ramps were counted directly). Freeway mainline volumes were collected at one location (between the on- and off-ramps of the Gilman Springs Rd IC), and calculated for other segments using ramp volumes assuming flow is conserved (no congestion in existing conditions).

For locations where daily counts were not available, existing daily volumes were estimated using the ratio of daily volume to the sum of AM and PM peak hour volumes from the nearest locations where 24-hour counts were collected.

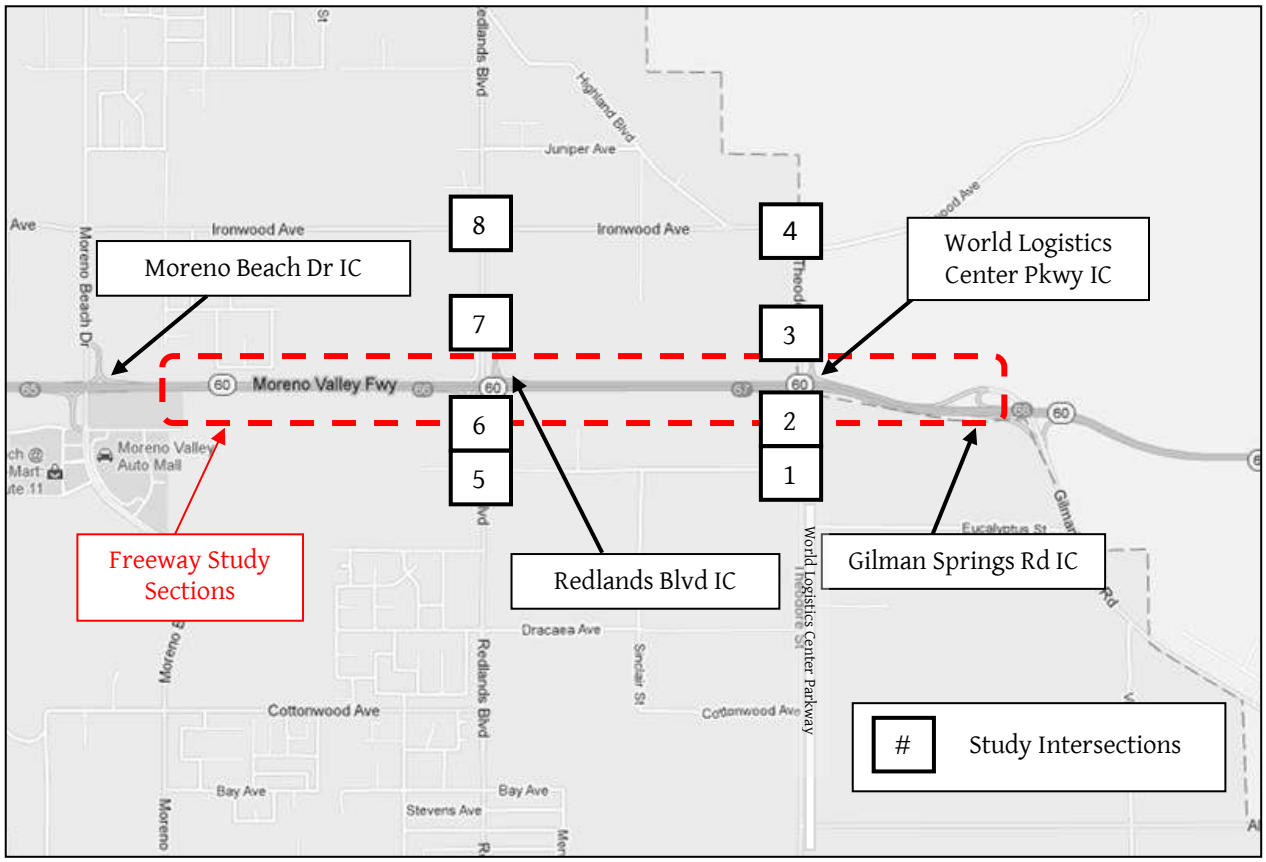


Exhibit 1: Study Area

Forecasts of Future Volumes

Traffic volumes were forecasted for four vehicle classes (autos, 2-axle trucks, 3-axle trucks, and 4+axle trucks) using the Riverside County Transportation Analysis Model (RivTAM). The forecasting methodology and volumes are described in SR-60/Theodore Interchange PA/ED Methodology and Traffic Volumes Report (August, 2018).

Truck Percentage

Vehicle mix percentages were extracted from count data and traffic forecasts. Using the count data, the four-vehicle-class forecasts were converted into five classes used for noise analysis: autos were split into motorcycles and cars; 2-axle trucks were split into buses and medium trucks; and 3- and 4-axle trucks were combined into the heavy truck class. Exhibit 2 shows the existing traffic mix. Exhibit 3 shows the forecast traffic mix for 2045. The traffic mix will not be affected by interchange configuration, so the same mix can be applied to no build and build alternatives.

Roadway Segment	AM Peak						PM Peak					
	Auto		2-Axle		3-Axle	4+Axle	Auto		2-Axle		3-Axle	4+Axle
	Motorcycles	Cars	Buses	Medium	Heavy		Motorcycles	Cars	Buses	Medium	Heavy	
World Logistics Center Parkway												
South of Eucalyptus Avenue	4.6%	63.9%	0.4%	4.3%	0.0%	26.8%	5.6%	77.3%	1.2%	12.0%	0.0%	3.9%
North of Eucalyptus Avenue	4.5%	61.7%	0.6%	5.8%	0.0%	27.4%	5.4%	74.8%	0.7%	6.9%	1.5%	10.7%
South of SR-60 EB Ranps	4.5%	61.7%	0.6%	5.8%	0.0%	27.4%	5.4%	74.8%	0.7%	6.9%	1.5%	10.7%
North of SR-60 EB Ranps	3.6%	50.2%	1.0%	9.4%	0.9%	34.9%	5.5%	75.5%	1.2%	11.8%	2.0%	4.0%
South of SR-60 WB Ranps	3.6%	50.2%	1.0%	9.4%	0.9%	34.9%	5.5%	75.5%	1.2%	11.8%	2.0%	4.0%
Theodore Street												
North of SR-60 WB Ranps	4.3%	53.9%	2.1%	10.1%	1.0%	28.6%	6.2%	78.0%	2.1%	10.1%	1.2%	2.4%
Redlands Boulevard												
South of SR-60 EB Ranps	1.5%	94.9%	0.1%	1.7%	0.6%	1.2%	1.5%	95.5%	0.1%	1.4%	0.4%	1.1%
North of SR-60 EB Ranps	1.5%	94.3%	0.2%	2.2%	0.2%	1.6%	1.5%	96.2%	0.1%	1.0%	0.4%	0.8%
South of SR-60 WB Ranps	1.5%	94.3%	0.2%	2.2%	0.2%	1.6%	1.5%	96.2%	0.1%	1.0%	0.4%	0.8%
North of SR-60 WB Ranps	0.4%	96.6%	0.1%	2.0%	0.0%	0.9%	0.4%	97.9%	0.1%	1.0%	0.1%	0.5%
Eucalyptus Avenue												
West of WLC Pkwy	3.4%	73.0%	1.7%	9.4%	0.0%	12.5%	3.4%	72.4%	1.5%	8.2%	1.9%	12.6%
Westbound SR-60												
Gilman Springs Rd to WLC Pkwy	0.4%	90.6%	0.3%	1.8%	0.2%	6.7%	0.4%	89.6%	0.4%	2.3%	0.3%	7.0%
WLC Pkwy to Redlands Blvd	0.4%	90.8%	0.3%	1.9%	0.2%	6.4%	0.4%	89.6%	0.4%	2.4%	0.3%	6.9%
Redlands Blvd to Moreno Beach Dr	0.4%	89.2%	0.4%	2.4%	0.2%	7.4%	0.4%	87.3%	0.5%	2.9%	0.6%	8.3%
Eastbound SR-60												
Moreno Beach Dr to Redlands Blvd	0.4%	84.6%	0.5%	5.5%	1.1%	7.9%	0.4%	90.4%	0.2%	2.4%	0.5%	6.1%
Redlands Blvd to WLC Pkwy	0.4%	88.1%	0.4%	4.1%	0.8%	6.2%	0.4%	92.3%	0.2%	1.8%	0.3%	5.0%
WLC Pkwy to Gilman Springs Rd	0.4%	88.4%	0.4%	4.0%	0.8%	6.0%	0.4%	92.9%	0.1%	1.7%	0.3%	4.6%
Westbound SR-60 Ramps												
On-Ramp from Gilman Springs Rd	0.6%	95.3%	0.1%	2.3%	0.0%	1.7%	0.6%	95.0%	0.2%	3.1%	0.2%	0.9%
Off-Ramp to WLC Pkwy	4.8%	60.4%	0.3%	1.2%	0.0%	33.3%	6.7%	83.6%	0.0%	0.0%	3.2%	6.5%
On-Ramp from WLC Pkwy	2.8%	34.7%	1.4%	6.9%	0.0%	54.2%	6.6%	83.2%	1.0%	5.1%	4.1%	0.0%
Off-Ramp to Redlands Blvd	0.4%	96.8%	0.0%	0.0%	1.4%	1.4%	0.4%	96.4%	0.1%	1.5%	0.0%	1.6%
On-Ramp from Redlands Blvd	0.4%	95.6%	0.1%	1.4%	0.5%	2.0%	0.4%	95.2%	0.0%	0.9%	0.9%	2.6%
Eastbound SR-60 Ramps												
Off-Ramp to Redlands Blvd	1.4%	90.0%	0.3%	4.0%	0.8%	3.5%	1.5%	96.2%	0.1%	1.2%	0.5%	0.5%
On-Ramp from Redlands Blvd	1.5%	93.8%	0.1%	1.1%	1.2%	2.3%	1.5%	93.5%	0.2%	2.8%	0.0%	2.0%
Off-Ramp to WLC Pkwy	4.6%	63.9%	0.4%	3.5%	1.3%	26.3%	4.4%	60.0%	0.8%	8.1%	0.0%	26.7%
Loop On-Ramp from WLC Pkwy	4.5%	61.4%	0.0%	0.0%	0.0%	34.1%	6.3%	86.9%	0.2%	2.1%	0.0%	4.5%
Direct On-Ramp from WLC Pkwy	Does not exist in this Scenario											
Off-Ramp to Gilman Springs Rd	0.3%	92.8%	0.1%	3.7%	0.2%	2.9%	0.4%	97.6%	0.0%	1.2%	0.1%	0.7%

Source: Counts Unlimited, Inc., May 2017. (supplemented with estimates from RIVTAM)

Exhibit 2: Existing Traffic Mix (from Traffic Counts)

Roadway Segment	AM Peak						PM Peak					
	Auto		2-Axle		3-Axle	4+Axle	Auto		2-Axle		3-Axle	4+Axle
	Motorcycles	Cars	Buses	Medium	Heavy		Motorcycles	Cars	Buses	Medium	Heavy	
World Logistics Center Parkway												
South of Eucalyptus Avenue	4.2%	57.6%	0.5%	4.9%	3.6%	29.2%	4.2%	57.7%	0.5%	5.1%	3.9%	28.6%
North of Eucalyptus Avenue	4.1%	56.6%	0.4%	3.8%	3.7%	31.4%	4.5%	61.9%	0.3%	3.1%	3.4%	26.8%
South of SR-60 EB Ranps	4.1%	56.6%	0.4%	3.8%	3.7%	31.4%	4.5%	61.9%	0.3%	3.1%	3.4%	26.8%
North of SR-60 EB Ranps	4.9%	67.6%	0.4%	3.4%	2.6%	21.1%	5.1%	70.5%	0.3%	3.3%	2.9%	17.9%
South of SR-60 WB Ranps	4.9%	67.6%	0.4%	3.4%	2.6%	21.1%	5.1%	70.5%	0.3%	3.3%	2.9%	17.9%
Theodore Street												
North of SR-60 WB Ranps	6.9%	86.6%	0.5%	2.4%	1.1%	2.5%	7.1%	88.8%	0.4%	2.2%	1.2%	0.3%
Redlands Boulevard												
South of SR-60 EB Ranps	1.5%	94.9%	0.1%	0.9%	0.8%	1.8%	1.5%	94.8%	0.0%	0.8%	1.0%	1.9%
North of SR-60 EB Ranps	1.5%	95.2%	0.1%	1.0%	0.4%	1.8%	1.5%	94.5%	0.1%	0.7%	0.8%	2.4%
South of SR-60 WB Ranps	1.5%	95.2%	0.1%	1.0%	0.4%	1.8%	1.5%	94.5%	0.1%	0.7%	0.8%	2.4%
North of SR-60 WB Ranps	0.4%	95.0%	0.1%	1.2%	0.1%	3.2%	0.4%	96.1%	0.0%	0.7%	0.4%	2.4%
Eucalyptus Avenue												
West of WLC Pkwy	2.8%	58.8%	2.8%	15.5%	3.3%	16.8%	3.6%	77.2%	1.3%	7.3%	2.0%	8.6%
Westbound SR-60												
Gilman Springs Rd to WLC Pkwy	0.4%	94.9%	0.1%	0.9%	0.3%	3.4%	0.4%	92.3%	0.2%	1.5%	0.8%	4.8%
WLC Pkwy to Redlands Blvd	0.4%	91.1%	0.2%	0.9%	0.6%	6.8%	0.4%	88.2%	0.3%	1.6%	1.0%	8.5%
Redlands Blvd to Moreno Beach Dr	0.4%	88.1%	0.2%	1.3%	0.7%	9.3%	0.4%	83.7%	0.4%	2.1%	1.2%	12.2%
Eastbound SR-60												
Moreno Beach Dr to Redlands Blvd	0.4%	81.3%	0.3%	3.8%	1.6%	12.6%	0.4%	86.6%	0.1%	1.6%	0.8%	10.5%
Redlands Blvd to WLC Pkwy	0.4%	86.1%	0.2%	2.8%	1.3%	9.2%	0.4%	91.0%	0.1%	1.0%	0.7%	6.8%
WLC Pkwy to Gilman Springs Rd	0.4%	90.6%	0.2%	2.7%	1.1%	5.0%	0.4%	93.7%	0.1%	1.0%	0.6%	4.2%
Westbound SR-60 Ramps												
On-Ramp from Gilman Springs Rd	0.6%	95.2%	0.1%	1.4%	0.6%	2.1%	0.6%	95.2%	0.1%	1.4%	0.8%	1.9%
Off-Ramp to WLC Pkwy	6.5%	82.1%	0.2%	1.1%	1.1%	9.0%	6.5%	81.2%	0.3%	1.3%	2.1%	8.6%
On-Ramp from WLC Pkwy	5.1%	64.1%	0.4%	1.8%	2.4%	26.2%	4.9%	61.3%	0.4%	2.1%	2.9%	28.4%
Off-Ramp to Redlands Blvd	0.4%	96.3%	0.0%	0.5%	0.7%	2.1%	0.4%	96.6%	0.0%	0.9%	1.5%	0.6%
On-Ramp from Redlands Blvd	0.4%	88.6%	0.1%	1.7%	0.0%	9.2%	0.4%	87.6%	0.1%	1.5%	2.2%	8.2%
Eastbound SR-60 Ramps												
Off-Ramp to Redlands Blvd	1.4%	90.5%	0.2%	2.8%	0.5%	4.6%	1.5%	95.7%	0.1%	0.9%	0.2%	1.6%
On-Ramp from Redlands Blvd	1.5%	94.2%	0.1%	1.8%	1.2%	1.2%	1.4%	89.9%	0.1%	1.7%	3.0%	3.9%
Off-Ramp to WLC Pkwy	4.1%	56.4%	0.3%	2.4%	3.2%	33.6%	4.7%	65.1%	0.2%	1.6%	2.0%	26.4%
Loop On-Ramp from WLC Pkwy	6.7%	92.5%	0.0%	0.0%	0.0%	0.8%	6.7%	92.9%	0.0%	0.0%	0.0%	0.4%
Direct On-Ramp from WLC Pkwy	4.9%	67.1%	0.3%	2.8%	3.1%	21.8%	4.6%	62.9%	0.5%	4.4%	4.3%	23.3%
Off-Ramp to Gilman Springs Rd	0.3%	94.3%	0.0%	1.9%	0.8%	2.7%	0.4%	96.7%	0.0%	0.9%	0.8%	1.2%

Source: Counts Unlimited, Inc., May 2017. (supplemented with estimates from RIVTAM)

Exhibit 3: 2045 Traffic Mix

SR-60/WLC Pkwy Interchange Project - Supplemental Traffic Data

IntID	Intersection Descripton	Link Direction	Existing Conditions AM				Existing Conditions PM				2045 Plus Project AM				2045 Plus Project PM			
			Car	Light Trucks	Medium Trucks	Heavy Trucks	Car	Light Trucks	Medium Trucks	Heavy Trucks	Car	Light Trucks	Medium Trucks	Heavy Trucks	Car	Light Trucks	Medium Trucks	Heavy Trucks
1	Theodore St/Eucalpytus Ave	S Leg Departure	39	3	0	21	34	6	0	2	631	54	33	277	656	55	36	263
		S Leg Approach	48	3	0	13	29	4	0	1	638	57	42	324	583	57	42	309
		W Leg Departure	51	6	0	7	32	3	1	12	108	27	5	17	135	25	7	41
		W Leg Approach	4	2	0	2	46	7	1	1	60	23	4	29	381	30	6	14
		N Leg Departure	33	3	0	15	57	6	1	1	628	38	38	313	680	38	36	277
		N Leg Approach	71	7	0	28	48	4	1	13	462	38	29	251	642	30	31	257
		E Leg Departure	0	0	0	0	0	0	0	0	29	4	2	7	237	4	3	7
		E Leg Approach	0	0	0	0	0	0	0	0	236	5	3	10	102	5	3	8
2	Theodore St/SR-60 EB Ramps	S Leg Departure	71	7	0	28	48	4	1	13	462	38	29	251	642	30	31	257
		S Leg Approach	33	3	0	15	57	6	1	1	628	38	38	313	680	38	36	277
		W Leg Departure	27	0	0	14	41	1	0	2	117	0	0	1	247	0	0	1
		W Leg Approach	52	3	1	20	29	4	0	12	402	18	21	223	591	15	17	224
		N Leg Departure	22	5	1	15	39	9	1	1	689	34	31	276	717	35	30	240
		N Leg Approach	35	6	0	22	42	4	1	3	403	23	8	42	445	20	15	35
		E Leg Departure	0	0	0	0	0	0	0	0	165	7	7	50	110	8	7	38
		E Leg Approach	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Theodore St/SR-60 WB Ramps	S Leg Departure	35	6	0	22	42	4	1	3	403	23	8	42	445	20	15	35
		S Leg Approach	22	5	1	15	39	9	1	1	689	34	31	276	717	35	30	240
		W Leg Departure	0	0	0	0	0	0	0	0	724	23	25	274	556	21	24	238
		W Leg Approach	0	0	0	0	0	0	0	0	415	6	5	42	336	6	8	33
		N Leg Departure	39	5	1	15	25	6	0	1	545	14	8	16	616	16	7	2
		N Leg Approach	18	7	0	13	44	4	1	1	568	20	5	14	564	16	8	2
		E Leg Departure	9	2	0	13	44	3	2	0	0	0	0	0	0	0	0	0
		E Leg Approach	43	1	0	22	28	0	1	2	0	0	0	0	0	0	0	0
4	Ironwood Ave/Theodore St	S Leg Departure	6	7	2	12	4	2	0	1	555	14	7	13	560	12	8	2
		S Leg Approach	14	8	4	10	13	14	2	1	521	17	10	11	595	23	7	2
		W Leg Departure	25	8	4	10	26	18	2	1	211	14	9	10	205	24	8	1
		W Leg Approach	18	9	2	13	21	1	0	1	139	13	6	13	287	8	9	1
		N Leg Departure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		N Leg Approach	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		E Leg Departure	16	5	0	1	20	4	0	0	518	9	1	2	652	8	1	1
		E Leg Approach	15	3	0	0	16	9	0	0	624	7	1	1	535	13	1	1
5	Redlands Blvd/Eucalyptus Ave	S Leg Departure	316	5	1	0	518	9	1	0	848	6	6	0	763	10	6	0
		S Leg Approach	488	8	1	0	369	2	0	1	502	9	2	0	800	4	4	2
		W Leg Departure	46	2	3	3	4	0	0	4	618	14	11	3	444	13	12	4
		W Leg Approach	7	0	2	5	29	0	0	1	290	11	9	5	923	13	17	1
		N Leg Departure	483	9	2	7	416	5	3	7	631	9	6	11	1364	6	15	32
		N Leg Approach	338	6	3	3	513	9	1	4	1393	11	11	26	978	13	10	14
		E Leg Departure	0	0	0	0	3	0	0	0	318	13	5	24	348	14	9	11
		E Leg Approach	12	2	0	2	30	3	3	5	230	11	6	7	218	13	11	30

SR-60/WLC Pkwy Interchange Project - Supplemental Traffic Data

IntID	Intersection Descripton	Link Direction	Existing Conditions AM				Existing Conditions PM				2045 Plus Project AM				2045 Plus Project PM			
			Car	Light Trucks	Medium Trucks	Heavy Trucks	Car	Light Trucks	Medium Trucks	Heavy Trucks	Car	Light Trucks	Medium Trucks	Heavy Trucks	Car	Light Trucks	Medium Trucks	Heavy Trucks
6	Redlands Blvd/SR-60 EB ramps	S Leg Departure	338	6	3	3	513	9	1	4	1393	11	11	26	978	13	10	14
		S Leg Approach	483	9	2	7	416	5	3	7	631	9	6	11	1365	6	15	32
		W Leg Departure	82	1	1	2	95	3	0	2	155	3	2	2	449	9	15	19
		W Leg Approach	236	11	2	9	542	7	3	3	338	11	2	17	599	6	1	10
		N Leg Departure	599	18	1	13	777	7	5	7	608	12	0	18	793	4	4	31
		N Leg Approach	300	5	1	2	427	7	0	3	1390	10	9	19	1297	14	13	22
		E Leg Departure	0	0	0	0	0	0	0	0	203	4	4	1	1041	0	0	0
		E Leg Approach	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Redlands Blvd/SR-60 WB Ramps	S Leg Departure	300	5	1	2	427	7	0	3	1390	10	9	19	1298	14	13	22
		S Leg Approach	599	18	1	13	777	7	5	7	608	12	0	18	793	4	4	31
		W Leg Departure	13	1	0	0	9	1	2	0	190	0	0	0	300	0	0	0
		W Leg Approach	9	1	1	0	15	1	0	1	0	0	0	0	0	0	0	0
		N Leg Departure	532	15	0	7	677	6	0	1	710	13	0	30	892	5	4	24
		N Leg Approach	545	8	0	3	666	9	1	6	794	8	2	20	1042	10	4	25
		E Leg Departure	379	6	2	8	405	4	4	11	97	2	0	10	162	3	4	15
		E Leg Approach	71	0	1	1	60	1	0	1	985	5	7	21	817	8	13	5
8	Ironwood Ave/Redlands Blvd	S Leg Departure	548	8	0	2	683	9	1	6	777	23	1	19	1022	10	4	25
		S Leg Approach	533	9	0	7	686	6	0	2	709	7	0	30	868	7	3	25
		W Leg Departure	145	6	0	0	203	2	0	0	366	8	1	0	428	5	2	0
		W Leg Approach	125	7	0	1	128	6	0	0	284	14	1	1	495	11	4	0
		N Leg Departure	602	11	0	5	769	9	0	2	706	13	5	28	875	13	5	25
		N Leg Approach	632	8	0	1	849	9	1	5	812	16	5	18	1028	12	6	24
		E Leg Departure	8	2	0	2	26	1	0	0	175	7	4	2	322	8	8	0
		E Leg Approach	13	3	0	0	18	0	0	1	219	14	5	0	256	6	6	1

Table A.1. Traffic Counts

SR-60/WLC Pkwy Interchange Project

	Traffic Counts (15 min)					Traffic Volume (Hourly)					Vehicle Speeds (mph)				
Traffic Counts	**Auto**	**Medium**	**Heavy**	**Bus**	**Motocycle**	**Auto**	**Medium**	**Heavy**	**Bus**	**Motocycle**	**Auto**	**Medium**	**Heavy**	**Bus**	**Motocycle**
SET 1 (ST-1, ST-3, ST-4)															
SR-60 WB Ln1	268	2	5	2	0	1,072	8	20	8	0	65	65	55	55	0
SR-60 WB Ln2	110	9	35	0	0	440	36	140	0	0	65	65	55	0	0
SR-60 EB Ln1	202	2	2	0	0	808	8	8	0	0	65	65	55	0	0
SR-60 EB Ln2	143	19	43	4	0	572	76	172	16	0	65	65	55	55	0
SR-60 WB Off-Ramp at Redlands Boulevard	6	0	0	0	0	24	0	0	0	0	45	0	0	0	0
SR-60 WB On-Ramp at Redlands Boulevard	86	0	14	0	0	344	0	56	0	0	65	0	55	0	0
SR-60 EB Off-Ramp at Redlands Boulevard	50	4	5	0	0	200	16	20	0	0	45	45	40	0	0
SR-60 EB On-Ramp at Redlands Boulevard	8	1	0	0	0	32	4	0	0	0	65	65	0	0	0
Redlands Boulevard NB	67	1	0	0	1	268	4	0	0	4	50	50	0	0	50
Redlands Boulevard SB	76	0	2	0	0	304	0	8	0	0	50	0	55	0	0
SR-60 WB On-Ramp at Theodore Street	7	4	2	0	0	28	16	8	0	0	65	65	55	0	0
SR-60 WB Off-Ramp at Theodore Street	5	0	0	0	0	20	0	0	0	0	45	0	0	0	0
SR-60 EB On-Ramp at Theodore Street	1	0	0	0	0	4	0	0	0	0	65	0	0	0	0
SR-60 EB Off-Ramp at Theodore Street	13	3	4	0	0	52	12	16	0	0	45	45	40	0	0
Theodore Street NB	13	1	4	0	0	52	4	16	0	0	25	25	20	0	0
Theodore Street SB	1	0	0	0	0	4	0	0	0	0	25	0	0	0	0
SET 2 (ST-2, ST-6, ST-12, ST-13)															
SR-60 WB Ln1	252	0	4	3	0	1,008	0	16	12	0	65	0	55	55	0
SR-60 WB Ln2	149	15	48	0	0	596	60	192	0	0	65	65	55	0	0
SR-60 EB Ln1	226	1	3	0	2	904	4	12	0	8	65	65	55	0	65
SR-60 EB Ln2	121	4	40	0	1	484	16	160	0	4	65	65	55	0	65
SR-60 WB Off-Ramp at Theodore Street	15	0	13	0	0	60	0	52	0	0	45	0	40	0	0
SR-60 WB On-Ramp at Theodore Street	6	0	0	0	0	24	0	0	0	0	65	0	0	0	0
SR-60 EB On-Ramp at Theodore Street	5	0	4	0	0	20	0	16	0	0	65	0	55	0	0
SR-60 EB Off-Ramp at Theodore Street	2	0	0	0	0	8	0	0	0	0	45	0	0	0	0
Theodore Street NB	4	0	7	0	0	16	0	28	0	0	25	0	20	0	0
Theodore Street SB	5	1	3	0	0	20	4	12	0	0	25	25	20	0	0
SET 3 (ST-5, ST-7, ST-10)															
SR-60 WB Ln1	265	1	2	1	0	1,060	4	8	4	0	65	65	55	55	0
SR-60 WB Ln2	164	15	40	0	0	656	60	160	0	0	65	65	55	0	0
SR-60 EB Ln1	291	4	4	0	0	1,164	16	16	0	0	65	65	55	0	0
SR-60 EB Ln2	125	21	35	1	0	500	84	140	4	0	65	65	55	55	0
SR-60 WB On-Ramp at Theodore Street	3	0	1	0	0	12	0	4	0	0	65	0	55	0	0
SR-60 WB Off-Ramp at Theodore Street	9	0	6	0	0	36	0	24	0	0	45	0	40	0	0
SR-60 EB On-Ramp at Theodore Street	6	0	5	0	0	24	0	20	0	0	65	0	55	0	0
SR-60 EB Off-Ramp at Theodore Street	4	0	0	0	0	16	0	0	0	0	45	0	0	0	0
Theodore Street NB	3	0	1	0	0	12	0	4	0	0	25	0	20	0	0
Theodore Street SB	10	0	5	0	0	40	0	20	0	0	25	0	20	0	0

Table A.1. Traffic Counts

SR-60/WLC Pkwy Interchange Project

	Traffic Counts (15 min)						Traffic Volume (Hourly)						Vehicle Speeds (mph)				
Traffic Counts	**Auto**	**Medium**	**Heavy**	**Bus**	**Motocycle**		**Auto**	**Medium**	**Heavy**	**Bus**	**Motocycle**		**Auto**	**Medium**	**Heavy**	**Bus**	**Motocycle**
SET 4 (ST-8, ST-9, ST-11)																	
SR-60 WB Ln1	275	4	4	0	1		1,100	16	16	0	4		65	65	55	0	65
SR-60 WB Ln2	172	13	37	0	0		688	52	148	0	0		65	65	55	0	0
SR-60 EB Ln1	292	4	5	1	1		1,168	16	20	4	4		65	65	55	55	65
SR-60 EB Ln2	129	8	41	0	0		516	32	164	0	0		65	65	55	0	0
SR-60 WB On-Ramp at Theodore Street	6	0	0	0	0		24	0	0	0	0		65	0	0	0	0
SR-60 WB Off-Ramp at Theodore Street	17	0	10	0	0		68	0	40	0	0		45	0	40	0	0
SR-60 EB On-Ramp at Theodore Street	7	1	4	0	0		28	4	16	0	0		65	65	55	0	0
SR-60 EB Off-Ramp at Theodore Street	1	0	0	0	0		4	0	0	0	0		45	0	0	0	0
Theodore Street NB	13	1	4	0	0		52	4	16	0	0		25	25	20	0	0
Theodore Street SB	5	0	0	0	0		20	0	0	0	0		25	0	0	0	0
Eucalyptus Avenue EB	5	0	0	0	0		20	0	0	0	0		40	0	0	0	0
Eucalyptus Avenue WB Ln1	5	0	3	0	0		20	0	12	0	0		40	0	40	0	0
Eucalyptus Avenue WB Ln2	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0

Table A.2. Existing Traffic Volumes (Year 2017)

SR-60/WLC Pkwy Interchange Project

					Through	Vehicle Distribution				Modeled Volumes				Lane 1				Lane 2				Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**# of Lanes**	**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**
SR-60 WB																								
East of Gillman	1,118	1,702	3,900	1,118	2	0.9105	0.0208	0.0687		1,018	23	77		547	12	0		471	11	77		65	65	55
Gillman to Theodore Off-Ramp	1,878	2,159	3,900	1,878	2	0.9105	0.0208	0.0687		1,710	39	129		918	21	0		792	18	129		65	65	55
Theodore Off-Ramp to Theodore On-Ramp	1,812	2,128	3,900	1,812	2	0.9116	0.0213	0.0671		1,651	39	122		885	21	0		766	18	122		65	65	55
Theodore On-Ramp to Redlands Off-Ramp	1,836	2,177	3,900	1,836	2	0.9128	0.0218	0.0654		1,676	40	120		897	21	0		779	19	120		65	65	55
Redlands Off-Ramp to Redlands On-Ramp	1,763	2,115	3,900	1,763	2	0.9128	0.0218	0.0654		1,610	38	115		861	20	0		749	18	115		65	65	55
West of Redlands On-Ramp	2,158	2,539	3,900	2,158	2	0.8960	0.0280	0.0760		1,934	60	164		1,047	32	0		887	28	164		65	65	55
SR-60 EB																								
West of Redlands Off-Ramp	2,057	2,893	3,900	2,057	2	0.8500	0.0600	0.0900		1,749	123	185		961	68	0		788	55	185		65	65	55
Redlands Off-Ramp to Redlands On-Ramp	1,799	2,338	3,900	1,799	2	0.8848	0.0446	0.0706		1,592	80	127		856	43	0		736	37	127		65	65	55
Redlands On-Ramp to Theodore Off-Ramp	1,885	2,438	3,900	1,885	2	0.8848	0.0446	0.0706		1,668	84	133		897	45	0		771	39	133		65	65	55
Theodore Off-Ramp to Theodore On-Ramp	1,809	2,393	3,900	1,809	2	0.8864	0.0442	0.0694		1,603	80	126		862	43	0		741	37	126		65	65	55
Theodore On-Ramp to Gilman Springs Off-Ramp	1,850	2,437	3,900	1,850	2	0.8881	0.0438	0.0681		1,643	81	126		882	43	0		761	38	126		65	65	55
East of Gilman Springs Off-Ramp	1,434	1,533	3,900	1,434	2	0.8881	0.0438	0.0681		1,273	63	98		683	34	0		590	29	98		65	65	55
SR-60 EB Auxiliary Lanes																								
West of Redlands Off-Ramp	258	555	1,500	258	1	0.8500	0.0600	0.0900		220	15	23										65	65	55
SR-60 Ramps																								
SR-60 WB on-ramp from Gillman Springs	760	457	900	760	1	0.9590	0.0240	0.0170		729	18	13										55	55	55
SR-60 WB off-ramp to Theodore	66	31		66	1	0.6515	0.0152	0.3333		43	1	22										45	45	45
SR-60 WB on-ramp from Theodore	24	49	900	24	1	0.3750	0.0833	0.5417		9	2	13										65	65	55
SR-60 WB off-ramp to Redlands	73	62		73	1	0.9726	0.0000	0.0274		71	0	2										45	45	45
SR-60 WB on-ramp from Redlands	395	424	900	395	1	0.9595	0.0152	0.0253		379	6	10										65	65	55
SR-60 EB off-ramp to Redlands	258	555		258	1	0.9148	0.0426	0.0426		236	11	11										45	45	45
SR-60 EB on-ramp from Redlands	86	100	900	86	1	0.9535	0.0116	0.0349		82	1	3										65	65	55
SR-60 EB off-ramp to Theodore	76	45		76	1	0.6842	0.0395	0.2763		52	3	21										45	45	45
SR-60 EB on-ramp from Theodore	41	44	900	41	1	0.6585	0.0000	0.3415		27	0	14										65	65	55
SR-60 EB off-ramp to Gillman Springs	416	904		416	1	0.9310	0.0380	0.0310		387	16	13										45	45	45

Table A.2. Existing Traffic Volumes (Year 2017)

SR-60/WLC Pkwy Interchange Project

					Through	Vehicle Distribution				Modeled Volumes				Lane 1				Lane 2				Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**# of Lanes**	**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**
Local Roads																								
Redlands NB - between Ironwood and SR-60 WB Ramps	552	690		552	1	0.9656	0.0217	0.0127		533	12	7										50	50	50
Redlands SB - between Ironwood and SR- 60 WB Ramps	558	691		558	1	0.9803	0.0143	0.0054		547	8	3										50	50	50
Redlands NB - between SR-60 EB and WB Ramps	631	796		631	1	0.9493	0.0285	0.0222		599	18	14										50	50	50
Redlands SB - between SR-60 EB and WB Ramps	308	437		308	1	0.9741	0.0162	0.0097		300	5	3										50	50	50
Redlands NB - between Eucalyptus and SR-60 EB Ramps	501	431		501	1	0.9640	0.0180	0.0180		483	9	9										50	50	50
Redlands SB - between Eucalyptus and SR-60 EB Ramps	350	527		350	1	0.9658	0.0171	0.0171		338	6	6										50	50	50
Redlands NB - South of Eucalyptus	497	372		497	1	0.9819	0.0161	0.0020		488	8	1										50	50	50
Redlands SB - South of Eucalyptus	322	528		322	1	0.9814	0.0155	0.0031		316	5	1										50	50	50
Theodore NB - between Ironwood and SR-60 WB Ramps	60	32		60	1	0.6500	0.0833	0.2667		39	5	16										50	50	50
Theodore SB - between Ironwood and SR-60 WB Ramps	38	50		38	1	0.4737	0.1842	0.3421		18	7	13										50	50	50
Theodore NB - between SR-60 EB and WB Ramps	43	50		43	1	0.5116	0.1163	0.3721		22	5	16										50	50	50
Theodore SB - between SR-60 EB and WB Ramps	63	50		63	1	0.5556	0.0952	0.3492		35	6	22										50	50	50
Theodore NB - between Eucalyptus and SR-60 EB Ramps	51	65		51	1	0.6471	0.0588	0.2941		33	3	15										50	50	50
Theodore SB - between Eucalyptus and SR-60 EB Ramps	106	66		106	1	0.6698	0.0660	0.2642		71	7	28										50	50	50
Theodore NB - South of Eucalyptus	64	34		64	1	0.7500	0.0469	0.2031		48	3	13										50	50	50
Theodore SB - South of Eucalyptus	63	42		63	1	0.6191	0.0476	0.3333		39	3	21										50	50	50
Eucalyptus WB - West of Theodore	64	48		64	2	0.7968	0.0938	0.1094		51	6	7		26	3	4		25	3	3		40	40	40
Eucalyptus EB - West of Theodore	8	55		8	1	0.5000	0.2500	0.2500		4	2	2										40	40	40

Table A.3. Future No Build Traffic Volumes (Year 2045)

SR-60/WLC Pkwy Interchange Project

					Through	Vehicle Distribution				Modeled Volumes				Lane 1				Lane 2				Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**# of Lanes**	**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**
SR-60 WB																								
East of Gillman	3,980	2,900	3,900	3,900	2	0.9528	0.0096	0.0376		3,716	37	147		1,931	19	0		1,785	18	147		65	65	55
Gillman to Theodore Off-Ramp	5,738	4,445	3,900	3,900	2	0.9528	0.0096	0.0376		3,716	37	147		1,931	19	0		1,785	18	147		65	65	55
Theodore Off-Ramp to Theodore On-Ramp	5,270	4,060	3,900	3,900	2	0.9336	0.0105	0.0559		3,641	41	218		1,928	22	0		1,713	19	218		65	65	55
Theodore On-Ramp to Redlands Off-Ramp	6,316	4,901	3,900	3,900	2	0.9145	0.0114	0.0741		3,567	44	289		1,926	24	0		1,641	20	289		65	65	55
Redlands Off-Ramp to Redlands Loop On-Ramp	5,300	4,060	3,900	3,900	2	0.9145	0.0114	0.0741		3,567	44	289		1,926	24	0		1,641	20	289		65	65	55
West of Redlands Loop On-Ramp	5,600	4,540	3,900	3,900	2	0.8960	0.0280	0.0760		3,495	109	296		1,891	59	0		1,604	50	296		65	65	55
SR-60 EB																								
West of Redlands Off-Ramp	3,780	5,450	3,900	3,780	2	0.8500	0.0600	0.0900		3,213	227	340		1,765	125	0		1,448	102	340		65	65	55
Redlands Off-Ramp to Redlands Loop On-Ramp	3,410	4,830	3,900	3,410	2	0.8651	0.0299	0.1050		2,950	102	358		1,648	57	0		1,302	45	358		65	65	55
Redlands Loop On-Ramp to Theodore Off-Ramp	3,781	6,367	3,900	3,781	2	0.8651	0.0299	0.1050		3,271	113	397		1,827	63	0		1,444	50	397		65	65	55
Theodore Off-Ramp to Theodore On-Ramp	3,120	5,520	3,900	3,120	2	0.8873	0.0297	0.0830		2,768	93	259		1,509	51	0		1,259	42	259		65	65	55
Theodore On-Ramp to Gilman Springs Off-Ramp	3,464	5,931	3,900	3,464	2	0.9097	0.0294	0.0609		3,151	102	211		1,678	54	0		1,473	48	211		65	65	55
East of Gilman Springs Off-Ramp	2,230	3,850	3,900	2,230	2	0.9097	0.0294	0.0609		2,028	66	136		1,080	35	0		948	31	136		65	65	55
SR-60 EB Auxiliary Lanes																								
West of Redlands Off-Ramp	368	616	1,500	368	1	0.8500	0.0600	0.0900		313	22	33										65	65	55
SR-60 Ramps																								
SR-60 WB on-ramp from Gillman Springs	1,758	1,545	900	900	1	0.9580	0.0150	0.0270		862	14	24										55	55	55
SR-60 WB off-ramp to Theodore	468	383		468	1	0.8868	0.0128	0.1004		415	6	47										45	45	45
SR-60 WB on-ramp from Theodore	1,046	839	900	900	1	0.6989	0.0611	0.2400		629	55	216										65	65	55
SR-60 WB off-ramp to Redlands	1,018	843		1,018	1	0.9676	0.0049	0.0275		985	5	28										45	45	45
SR-60 WB on-ramp from Redlands	299	484	900	299	1	0.9599	0.0067	0.0334		287	2	10										65	65	55
SR-60 EB off-ramp to Redlands	368	616		368	1	0.9185	0.0299	0.0516		338	11	19										45	45	45
SR-60 EB on-ramp from Redlands	374	1,533	900	374	1	0.9572	0.0187	0.0241		358	7	9										65	65	55
SR-60 EB off-ramp to Theodore	664	847		664	1	0.6054	0.0271	0.3675		402	18	244										45	45	45
SR-60 EB on-ramp from Theodore	347	411	900	347	1	0.8127	0.0202	0.1671		282	7	58										65	65	55
SR-60 EB off-ramp to Gillman Springs	1,234	2,081		1,234	1	0.9460	0.0190	0.0350		1,168	23	43										45	45	45

Table A.3. Future No Build Traffic Volumes (Year 2045)

SR-60/WLC Pkwy Interchange Project

					Through	Vehicle Distribution				Modeled Volumes				Lane 1				Lane 2				Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**# of Lanes**	**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**
Local Roads																								
Redlands NB - between Ironwood and 60 WB Ramps	750	914		750	1	0.9467	0.0133	0.0400		710	10	30										50	50	50
Redlands SB - between Ironwood and 60 WB Ramps	823	1,071		823	1	0.9551	0.0194	0.0255		786	16	21										50	50	50
Redlands NB - between EB and WB Ramps	638	832		638	1	0.9530	0.0188	0.0282		608	12	18										50	50	50
Redlands SB - between EB and WB Ramps	1,428	1,347		1,428	1	0.9734	0.0070	0.0196		1,390	10	28										50	50	50
Redlands NB - between Eucalyptus and EB Ramps	657	1,418		657	1	0.9604	0.0137	0.0259		631	9	17										50	50	50
Redlands SB - between Eucalyptus and EB Ramps	1,441	1,015		1,441	1	0.9667	0.0076	0.0257		1,393	11	37										50	50	50
Redlands NB - South of Eucalyptus	513	810		513	1	0.9786	0.0175	0.0039		502	9	2										50	50	50
Redlands SB - South of Eucalyptus	860	779		860	1	0.9860	0.0070	0.0070		848	6	6										50	50	50
Theodore NB - between Ironwood and 60 WB Ramps	583	641		583	1	0.9348	0.0240	0.0412		545	14	24										50	50	50
Theodore SB - between Ironwood and 60 WB Ramps	607	590		607	1	0.9358	0.0329	0.0313		568	20	19										50	50	50
Theodore NB - between EB and WB Ramps	1,030	1,022		1,030	1	0.6689	0.0330	0.2981		689	34	307										50	50	50
Theodore SB - between EB and WB Ramps	476	515		476	1	0.8467	0.0483	0.1050		403	23	50										50	50	50
Theodore NB - between Eucalyptus and EB Ramps	1,017	1,031		1,017	1	0.6175	0.0374	0.3451		628	38	351										50	50	50
Theodore SB - between Eucalyptus and EB Ramps	780	960		780	1	0.5923	0.0487	0.3590		462	38	280										50	50	50
Theodore NB - South of Eucalyptus	1,061	991		1,061	1	0.6013	0.0537	0.3450		638	57	366										50	50	50
Theodore SB - South of Eucalyptus	995	1,010		995	1	0.6341	0.0543	0.3116		631	54	310										50	50	50
Eucalyptus WB - West of Theodore	157	208		157	2	0.6879	0.1720	0.1401		108	27	22		54	14	11		54	13	11		40	40	40
Eucalyptus EB - West of Theodore	116	431		116	1	0.5172	0.1983	0.2845		60	23	33										40	40	40

Table A.4. Alternative 2 and Design Variation 2a Traffic Volumes (Year 2045)

SR-60/WLC Pkwy Interchange Project

					Through	Vehicle Distribution			Modeled Volumes			Lane 1			Lane 2			Lane 3			Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**# of Lanes**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**
SR-60 WB																							
East of Gillman	3,980	2,900	3,900	3,900	2	0.9528	0.0096	0.0376	3,716	37	147	1,931	19	0	1,785	18	147				65	65	55
Gillman to WLC Pkwy Off-Ramp	5,738	4,445	3,900	3,900	2	0.9528	0.0096	0.0376	3,716	37	147	1,931	19	0	1,785	18	147				65	65	55
WLC Pkwy Off-Ramp to WLC Pkwy On-Ramp	5,270	4,060	3,900	3,900	2	0.9336	0.0105	0.0559	3,641	41	218	1,928	22	0	1,713	19	218				65	65	55
WLC Pkwy On-Ramp to Redlands Off-Ramp	6,316	4,901	3,900	3,900	2	0.9145	0.0114	0.0741	3,567	44	289	1,926	24	0	1,641	20	289				65	65	55
Redlands Off-Ramp to Redlands Loop On-Ramp	5,300	4,060	3,900	3,900	2	0.9145	0.0114	0.0741	3,567	44	289	1,926	24	0	1,641	20	289				65	65	55
West of Redlands Loop On-Ramp	5,600	4,540	3,900	3,900	2	0.8960	0.0280	0.0760	3,495	109	296	1,891	59	0	1,604	50	296				65	65	55
SR-60 EB																							
West of Redlands Off-Ramp	3,780	5,450	3,900	3,780	2	0.8500	0.0600	0.0900	3,213	227	340	1,765	125	0	1,448	102	340				65	65	55
Redlands Off-Ramp to Redlands Loop On-Ramp	3,410	4,830	3,900	3,410	2	0.8651	0.0299	0.1050	2,950	102	358	1,648	57	0	1,302	45	358				65	65	55
Redlands Loop On-Ramp to WLC Pkwy Off-Ramp	3,781	6,367	3,900	3,781	2	0.8651	0.0299	0.1050	3,271	113	397	1,827	63	0	1,444	50	397				65	65	55
WLC Pkwy Off-Ramp to WLC Pkwy Loop On-Ramp	3,120	5,520	3,900	3,120	2	0.8873	0.0297	0.0830	2,768	93	259	1,509	51	0	1,259	42	259				65	65	55
WLC Pkwy Loop On-Ramp to WLC Pkwy Hook On-Ramp	3,238	5,768	3,900	3,238	2	0.8873	0.0297	0.0830	2,873	96	269	1,567	52	0	1,306	44	269				65	65	55
WLC Pkwy Hook On-Ramp to Gilman Springs Off-Ramp	3,464	5,931	3,900	3,464	2	0.9097	0.0294	0.0609	3,151	102	211	1,678	54	0	1,473	48	211				65	65	55
East of Gilman Springs Off-Ramp	2,230	3,850	3,900	2,230	2	0.9097	0.0294	0.0609	2,028	66	136	1,080	35	0	948	31	136				65	65	55
SR-60 WB Auxiliary Lanes																							
Gillman On-Ramp to WLC Pkwy Off-Ramp 1	1,758	1,545	1,500	1,500	1	0.9528	0.0096	0.0376	1,430	14	56										65	65	55
Gillman On-Ramp to WLC Pkwy Off-Ramp 2	468	383	1,500	468	1	0.9528	0.0096	0.0376	446	4	18										65	65	55
WLC Pkwy On-Ramp to Redlands Off-Ramp 1	1,046	839	1,500	1,046	1	0.9145	0.0114	0.0741	956	12	78										65	65	55
WLC Pkwy On-Ramp to Redlands Off-Ramp 2	1,018	843	1,500	1,018	1	0.9145	0.0114	0.0741	931	12	75										65	65	55
SR-60 EB Auxiliary Lanes																							
West of Redlands Off-Ramp	368	616	1,500	368	1	0.8500	0.0600	0.0900	313	22	33										65	65	55
Redlands On-Ramp to WLC Pkwy Off-Ramp 1	374	1,533	1,500	374	1	0.8651	0.0299	0.1050	324	11	39										65	65	55
Redlands On-Ramp to WLC Pkwy Off-Ramp 2	664	847	1,500	664	1	0.8651	0.0299	0.1050	574	20	70										65	65	55
WLC Pkwy On-Ramp to Gillman Off-Ramp 1	229	163	1,500	229	1	0.9097	0.0294	0.0609	208	7	14										65	65	55
WLC Pkwy On-Ramp to Gillman Off-Ramp 2	1,234	2,081	1,500	1,234	1	0.9097	0.0294	0.0609	1,123	36	75										65	65	55
SR-60 Ramps																							
SR-60 WB on-ramp from Gillman Springs	1,758	1,545	900	900	1	0.9580	0.0150	0.0270	862	14	24										55	55	55
SR-60 WB off-ramp to WLC Pkwy	468	383		468	2	0.8868	0.0128	0.1004	415	6	47										45	45	45
SR-60 WB on-ramp from WLC Pkwy	1,046	839	900	900	1	0.6989	0.0611	0.2400	629	55	216										65	65	55
SR-60 WB off-ramp to Redlands	1,018	843		1,018	1	0.9676	0.0049	0.0275	985	5	28										45	45	45
SR-60 WB on-ramp from Redlands	299	484	900	299	1	0.9599	0.0067	0.0334	287	2	10										65	65	55
SR-60 EB off-ramp to Redlands	368	616		368	1	0.9185	0.0299	0.0516	338	11	19										45	45	45
SR-60 EB on-ramp from Redlands	374	1,533	900	374	1	0.9572	0.0187	0.0241	358	7	9										65	65	55
SR-60 EB off-ramp to WLC Pkwy	664	847		664	2	0.6054	0.0271	0.3675	402	18	244										45	45	45
SR-60 EB loop on-ramp from WLC Pkwy	118	248	900	118	1	0.9915	0.0000	0.0085	117	0	1										65	65	55
SR-60 EB hook on-ramp from WLC Pkwy	229	163	900	229	1	0.7205	0.0306	0.2489	165	7	57										65	65	55
SR-60 EB off-ramp to Gillman Springs	1,234	2,081		1,234	1	0.9460	0.0190	0.0350	1,168	23	43										45	45	45

Table A.4. Alternative 2 and Design Variation 2a Traffic Volumes (Year 2045)

SR-60/WLC Pkwy Interchange Project

						Vehicle Distribution				Modeled Volumes				Lane 1				Lane 2				Lane 3				Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**Through # of Lanes**	**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**
Local Roads																												
Redlands NB - between Ironwood and 60 WB Ramps	750	914		750	1	0.9467	0.0133	0.0400		710	10	30														50	50	50
Redlands SB - between Ironwood and 60 WB Ramps	823	1,071		823	1	0.9551	0.0194	0.0255		786	16	21														50	50	50
Redlands NB - between EB and WB Ramps	638	832		638	1	0.9530	0.0188	0.0282		608	12	18														50	50	50
Redlands SB - between EB and WB Ramps	1,428	1,347		1,428	1	0.9734	0.0070	0.0196		1,390	10	28														50	50	50
Redlands NB - between Eucalyptus and EB Ramps	657	1,418		657	1	0.9604	0.0137	0.0259		631	9	17														50	50	50
Redlands SB - between Eucalyptus and EB Ramps	1,441	1,015		1,441	1	0.9667	0.0076	0.0257		1,393	11	37														50	50	50
Redlands NB - South of Eucalyptus	513	810		513	1	0.9786	0.0175	0.0039		502	9	2														50	50	50
Redlands SB - South of Eucalyptus	860	779		860	1	0.9860	0.0070	0.0070		848	6	6														50	50	50
Theodore NB - between Ironwood and SR-60 WB Ramps	583	641		583	1	0.9348	0.0240	0.0412		545	14	24														45	45	45
Theodore SB - between Ironwood and SR-60 WB Ramps	607	590		607	2	0.9358	0.0329	0.0313		568	20	19		284	10	10		284	10	9						45	45	45
WLC Pkwy NB - between EB and WB Ramps	1,030	1,022		1,030	2	0.6689	0.0330	0.2981		689	34	307		345	17	154		344	17	153						45	45	45
WLC Pkwy SB - between EB and WB Ramps - 2 Lanes	476	515		476	2	0.8467	0.0483	0.1050		403	23	50		202	12	25		201	11	25						45	45	45
WLC Pkwy SB - between EB and WB Ramps - 3 Lanes	476	515		476	3	0.8467	0.0483	0.1050		403	23	50		134	8	17		134	8	17		135	7	16		45	45	45
WLC Pkwy NB - between Eucalyptus and EB Ramps	1,017	1,031		1,017	3	0.6175	0.0374	0.3451		628	38	351		209	13	117		209	13	117		210	12	117		45	45	45
WLC Pkwy SB - between Eucalyptus and EB Ramps	780	960		780	3	0.5923	0.0487	0.3590		462	38	280		154	13	93		154	13	93		154	12	94		45	45	45
WLC Pkwy NB - South of Eucalyptus	1,061	991		1,061	1, 2	0.6013	0.0537	0.3450		638	57	366		319	29	183		319	28	183						45	45	45
WLC Pkwy SB - South of Eucalyptus	995	1,010		995	1, 2	0.6341	0.0543	0.3116		631	54	310		316	27	155		315	27	155						45	45	45
Eucalyptus WB - West of WLC Pkwy	157	208		157	2	0.6879	0.1720	0.1401		108	27	22		54	14	11		54	13	11						40	40	40
Eucalyptus EB - West of WLC Pkwy	116	431		116	2	0.5172	0.1983	0.2845		60	23	33		30	12	17		30	11	16						40	40	40

Table A.5. Alternative 6 and Design Variation 6a Traffic Volumes (Year 2045)

SR-60/WLC Pkwy Interchange Project

					Through	Vehicle Distribution			Modeled Volumes			Lane 1			Lane 2			Lane 3			Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**# of Lanes**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**	**Auto**	**Medium**	**Heavy**
SR-60 WB																							
East of Gillman	3,980	2,900	3,900	3,900	2	0.9528	0.0096	0.0376	3,716	37	147	1,931	19	0	1,785	18	147				65	65	55
Gillman to WLC Pkwy Off-Ramp	5,738	4,445	3,900	3,900	2	0.9528	0.0096	0.0376	3,716	37	147	1,931	19	0	1,785	18	147				65	65	55
WLC Pkwy Off-Ramp to WLC Pkwy On-Ramp	5,270	4,060	3,900	3,900	2	0.9336	0.0105	0.0559	3,641	41	218	1,928	22	0	1,713	19	218				65	65	55
WLC Pkwy On-Ramp to Redlands Off-Ramp	6,316	4,901	3,900	3,900	2	0.9145	0.0114	0.0741	3,567	44	289	1,926	24	0	1,641	20	289				65	65	55
Redlands Off-Ramp to Redlands Loop On-Ramp	5,300	4,060	3,900	3,900	2	0.9145	0.0114	0.0741	3,567	44	289	1,926	24	0	1,641	20	289				65	65	55
West of Redlands Loop On-Ramp	5,600	4,540	3,900	3,900	2	0.8960	0.0280	0.0760	3,495	109	296	1,891	59	0	1,604	50	296				65	65	55
SR-60 EB																							
West of Redlands Off-Ramp	3,780	5,450	3,900	3,780	2	0.8500	0.0600	0.0900	3,213	227	340	1,765	125	0	1,448	102	340				65	65	55
Redlands Off-Ramp to Redlands Loop On-Ramp	3,410	4,830	3,900	3,410	2	0.8651	0.0299	0.1050	2,950	102	358	1,648	57	0	1,302	45	358				65	65	55
Redlands Loop On-Ramp to WLC Pkwy Off-Ramp	3,781	6,367	3,900	3,781	2	0.8651	0.0299	0.1050	3,271	113	397	1,827	63	0	1,444	50	397				65	65	55
WLC Pkwy Off-Ramp to WLC Pkwy On-Ramp	3,120	5,520	3,900	3,120	2	0.8873	0.0297	0.0830	2,768	93	259	1,509	51	0	1,259	42	259				65	65	55
WLC Pkwy On-Ramp to Gilman Springs Off-Ramp	3,464	5,931	3,900	3,464	2	0.9097	0.0294	0.0609	3,151	102	211	1,678	54	0	1,473	48	211				65	65	55
East of Gilman Springs Off-Ramp	2,230	3,850	3,900	2,230	2	0.9097	0.0294	0.0609	2,028	66	136	1,080	35	0	948	31	136				65	65	55
SR-60 WB Auxiliary Lanes																							
Gillman On-Ramp to WLC Pkwy Off-Ramp 1	1,758	1,545	1,500	1,500	1	0.9528	0.0096	0.0376	1,430	14	56										65	65	55
Gillman On-Ramp to WLC Pkwy Off-Ramp 2	468	383	1,500	468	1	0.9528	0.0096	0.0376	446	4	18										65	65	55
WLC Pkwy On-Ramp to Redlands Off-Ramp 1	1,046	839	1,500	1,046	1	0.9145	0.0114	0.0741	956	12	78										65	65	55
WLC Pkwy On-Ramp to Redlands Off-Ramp 2	1,018	843	1,500	1,018	1	0.9145	0.0114	0.0741	931	12	75										65	65	55
SR-60 EB Auxiliary Lanes																							
West of Redlands Off-Ramp	368	616	1,500	368	1	0.8500	0.0600	0.0900	313	22	33										65	65	55
Redlands On-Ramp to WLC Pkwy Off-Ramp 1	374	1,533	1,500	374	1	0.8651	0.0299	0.1050	324	11	39										65	65	55
Redlands On-Ramp to WLC Pkwy Off-Ramp 2	664	847	1,500	664	1	0.8651	0.0299	0.1050	574	20	70										65	65	55
WLC Pkwy On-Ramp to Gillman Off-Ramp 1	347	411	1,500	347	1	0.9097	0.0294	0.0609	316	10	21										65	65	55
WLC Pkwy On-Ramp to Gillman Off-Ramp 2	1,234	2,081	1,500	1,234	1	0.9097	0.0294	0.0609	1,123	36	75										65	65	55
SR-60 Ramps																							
SR-60 WB on-ramp from Gillman Springs	1,758	1,545	900	900	1	0.9580	0.0150	0.0270	862	14	24										55	55	55
SR-60 WB off-ramp to WLC Pkwy - 1 or 2 Lanes	468	383		468	2	0.8868	0.0128	0.1004	415	6	47	208	3	24	207	3	23				45	45	45
SR-60 WB on-ramp from WLC Pkwy	1,046	839	900	900	1	0.6989	0.0611	0.2400	629	55	216										65	65	55
SR-60 WB off-ramp to Redlands	1,018	843		1,018	1	0.9676	0.0049	0.0275	985	5	28										45	45	45
SR-60 WB on-ramp from Redlands	299	484	900	299	1	0.9599	0.0067	0.0334	287	2	10										65	65	55
SR-60 EB off-ramp to Redlands	368	616		368	1	0.9185	0.0299	0.0516	338	11	19										45	45	45
SR-60 EB on-ramp from Redlands	374	1,533	900	374	1	0.9572	0.0187	0.0241	358	7	9										65	65	55
SR-60 EB off-ramp to WLC Pkwy	664	847		664	2	0.6054	0.0271	0.3675	402	18	244	201	9	122	201	9	122				45	45	45
SR-60 EB on-ramp from WLC Pkwy	347	411	900	347	1	0.8127	0.0202	0.1671	282	7	58	141	4	29	141	3	29				65	65	55
SR-60 EB off-ramp to Gillman Springs	1,234	2,081		1,234	1	0.9460	0.0190	0.0350	1,168	23	43										45	45	45

Table A.5. Alternative 6 and Design Variation 6a Traffic Volumes (Year 2045)

SR-60/WLC Pkwy Interchange Project

						Vehicle Distribution				Modeled Volumes				Lane 1				Lane 2				Lane 3				Vehicle Speeds		
Roadway Segment	**AM**	**PM**	**Worst-Case**	**Selected Volume**	**Through # of Lanes**	**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**		**Auto**	**Medium**	**Heavy**
Local Roads																												
Redlands NB - between Ironwood and 60 WB Ramps	750	914		750	1	0.9467	0.0133	0.0400		710	10	30														50	50	50
Redlands SB - between Ironwood and 60 WB Ramps	823	1,071		823	1	0.9551	0.0194	0.0255		786	16	21														50	50	50
Redlands NB - between EB and WB Ramps	638	832		638	1	0.9530	0.0188	0.0282		608	12	18														50	50	50
Redlands SB - between EB and WB Ramps	1,428	1,347		1,428	1	0.9734	0.0070	0.0196		1,390	10	28														50	50	50
Redlands NB - between Eucalyptus and EB Ramps	657	1,418		657	1	0.9604	0.0137	0.0259		631	9	17														50	50	50
Redlands SB - between Eucalyptus and EB Ramps	1,441	1,015		1,441	1	0.9667	0.0076	0.0257		1,393	11	37														50	50	50
Redlands NB - South of Eucalyptus	513	810		513	1	0.9786	0.0175	0.0039		502	9	2														50	50	50
Redlands SB - South of Eucalyptus	860	779		860	1	0.9860	0.0070	0.0070		848	6	6														50	50	50
Theodore NB - between Ironwood and SR-60 WB Ramps	583	641		583	1	0.9348	0.0240	0.0412		545	14	24														45	45	45
Theodore SB - between Ironwood and SR-60 WB Ramps	607	590		607	2	0.9358	0.0329	0.0313		568	20	19		284	10	10		284	10	9						45	45	45
WLC Pkwy NB - between EB and WB Ramps	1,030	1,022		1,030	2	0.6689	0.0330	0.2981		689	34	307		345	17	154		344	17	153						45	45	45
WLC Pkwy SB - between EB and WB Ramps	476	515		476	2	0.8467	0.0483	0.1050		403	23	50		202	12	25		201	11	25						45	45	45
WLC Pkwy NB - between Eucalyptus and EB Ramps - 2 Lanes	1,017	1,031		1,017	2	0.6175	0.0374	0.3451		628	38	351		314	19	176		314	19	175						45	45	45
WLC Pkwy SB - between Eucalyptus and EB Ramps - 2 Lanes	780	960		780	2	0.5923	0.0487	0.3590		462	38	280		231	19	140		231	19	140						45	45	45
WLC Pkwy NB - between Eucalyptus and EB Ramps - 3 Lanes	1,017	1,031		1,017	3	0.6175	0.0374	0.3451		628	38	351		209	13	117		209	13	117		210	12	117		45	45	45
WLC Pkwy SB - between Eucalyptus and EB Ramps - 3 Lanes	780	960		780	3	0.5923	0.0487	0.3590		462	38	280		154	13	93		154	13	93		154	12	94		45	45	45
WLC Pkwy NB - South of Eucalyptus - 1 or 2 Lanes	1,061	991		1,061	1, 2	0.6013	0.0537	0.3450		638	57	366		319	29	183		319	28	183						45	45	45
WLC Pkwy SB - South of Eucalyptus - 1 or 2 Lanes	995	1,010		995	1, 2	0.6341	0.0543	0.3116		631	54	310		316	27	155		315	27	155						45	45	45
Eucalyptus WB - West of WLC Pkwy	157	208		157	2	0.6879	0.1720	0.1401		108	27	22		54	14	11		54	13	11						40	40	40
Eucalyptus EB - West of WLC Pkwy	116	431		116	1	0.5172	0.1983	0.2845		60	23	33		30	12	17		30	11	16						40	40	40

Appendix B. Predicted Future Noise Levels and Noise Barrier Analysis

This appendix contains tables (Tables B.1 through B.4) that summarize the traffic noise modeling results for Existing and Future No Build conditions. Table B.1 summarizes the results for Alternative 2, Table B.2 summarizes the results for Design Variation 2a, Table B.3 summarizes the results for Alternative 6, and Table B.4 summarizes the results for Design Variation 6a. Tables B.1 through B.4 also compare the predicted noise reductions by barrier height for each noise barrier analyzed.

This page intentionally left blank

Table B.1. Existing and Predicted Future Noise and Noise Barrier Analysis for Alternative 2

Receptor No.	NB No.	Location	Land Use	No. of Dwelling Units / Receptors	Existing Noise Level, dBA $L_{eq}(h)$	Future Worst-Hour Noise Levels, dBA $L_{eq}(h)$																							
						2045 Noise Level				Activity Category (NAC)	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																	
												6 ft			8 ft			10 ft			12 ft			14 ft			16 ft		
						Without Project	With Project	With Project Minus No Project Conditions	With Project Minus Existing Conditions			$L_{eq}(h)$	I.L.[1]	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR
R-1		SR-60	Vacant Land	1	67	70	71	1	4	G	None	--[2]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-2		SR-60	Vacant Land	1	66	69	70	1	4	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-3		SR-60	Vacant Land	1	65	69	70	1	5	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-4		SR-60	Vacant Land	1	56	60	65	5	9	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-5		SR-60	Vacant Land	1	63	66	66	0	3	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-6		SR-60	Industrial	1	58	61	62	1	4	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-7		SR-60	Industrial	1	57	61	62	1	5	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-8		SR-60	Industrial	1	56	60	62	2	6	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-9		WLC Pkwy	Vacant Land	1	54	63	62	-1	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-10	1	WLC Pkwy	Residential	1	**67**[3]	**71**	**70**	-1	3	B(67)	A/E[4]	65[5]	5	1	64	6	1	63	7	1	62	8	1	61	9	1	60	10	1
R-11		SR-60	Racetrack	1	65	67	68	1	3	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-12		WLC Pkwy	Vacant Land	1	55	63	62	-1	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-13		SR-60	Vacant Land	1	59	61	60	-1	1	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-14		SR-60	Vacant Land	1	60	62	62	0	2	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-15		Eucalyptus Avenue	Vacant Land	1	48	52	56	4	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-16		Eucalyptus Avenue	Vacant Land	1	46	51	54	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-17		Eucalyptus Avenue	Vacant Land	1	44	48	51	3	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-18		Eucalyptus Avenue	Vacant Land	1	41	49	50	1	9	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-19		WLC Pkwy/	Vacant Land	1	57	68	65	-3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-20		Eucalyptus Avenue	Vacant Land	1	46	56	57	1	11	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-21		WLC Pkwy	Vacant Land	1	55	67	68	1	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-22		Eucalyptus Avenue	Vacant Land	1	44	54	55	1	11	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-23		WLC Pkwy	Vacant Land	1	56	67	67	0	11	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-24		WLC Pkwy	Vacant Land	1	55	68	68	0	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-25	2	WLC Pkwy	Residential	1	55	**68**	**69**	1	14	B(67)	A/E/Sub[6]	65	4	0	64	5	1	63	6	1	59	10	1	58	11	1	58	11	1
R-26		WLC Pkwy	Vacant Land	1	56	69	70	1	14	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-27		WLC Pkwy	Agriculture	1	57	70	70	0	13	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-28	3	WLC Pkwy	Residential	1	49	62	63	1	14	B(67)	Sub	61	2	0	59	4	0	58	5	1	55	8	1	55	8	1	54	9	1
R-29		WLC Pkwy	Vacant Land	1	57	70	70	0	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-30		Theodore Street[7]	Vacant Land	1	52	57	58	1	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-31		Theodore Street[7]	Vacant Land	1	53	58	61	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-32		Theodore Street[7]	Vacant Land	1	56	62	63	1	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-33		Theodore Street[7]	Residential	1	46	51	52	1	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-34		Theodore Street[7]	Residential	1	51	56	55	-1	4	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-35		Theodore Street[7]	Residential	1	47	52	53	1	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-36		Theodore Street[7]	Residential	1	50	55	55	0	5	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-37		Theodore Street[7]	Residential	1	54	60	60	0	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-38		Theodore Street[7]	Agriculture	1	54	59	61	2	7	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: Compiled by LSA Associates, Inc. (2019).

[1] I.L.: Insertion Loss.

[2] No barrier was analyzed at this location because the modeled receptor would not approach or exceed the NAC.

[3] Numbers in **bold** represent noise levels that approach or exceed the NAC.

[4] A/E = Approaches or exceeds the NAC.

[5] Underlined noise levels have been attenuated by at least 5 dBA (i.e., feasible barrier height).

[6] Sub = Substantial noise increase.

[7] The City is currently renaming Theodore Street to WLC Pkwy from SR-60 westbound ramps to Ironwood Avenue.

dBA $L_{eq}(h)$ = 1-hour equivalent continuous sound level measured in A-weighted decibels
ft = foot/feet
NAC = Noise Abatement Criteria
NB = Noise Barrier
SR-60 = State Route 60
WLC Pkwy = World Logistics Center Parkway

This page intentionally left blank

Table B.2. Existing and Predicted Future Noise and Noise Barrier Analysis for Design Variation 2a

Receptor No.	NB No.	Location	Land Use	No. of Dwelling Units / Receptors	Existing Noise Level, dBA $L_{eq}(h)$	Future Worst-Hour Noise Levels, dBA $L_{eq}(h)$																						
						2045 Noise Level				Activity Category (NAC)	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																
												6 ft			8 ft			10 ft			12 ft			14 ft			16 ft		
						Without Project	With Project	With Project Minus No Project Conditions	With Project Minus Existing Conditions			$L_{eq}(h)$	I.L.[1]	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR
R-1		SR-60	Vacant Land	1	67	70	71	1	4	G	None	--[2]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-2		SR-60	Vacant Land	1	66	69	70	1	4	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-3		SR-60	Vacant Land	1	65	69	70	1	5	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-4		SR-60	Vacant Land	1	56	60	65	5	9	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-5		SR-60	Vacant Land	1	63	66	66	0	3	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-6		SR-60	Industrial	1	58	61	62	1	4	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-7		SR-60	Industrial	1	57	61	62	1	5	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-8		SR-60	Industrial	1	56	60	62	2	6	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-9		WLC Pkwy	Vacant Land	1	54	63	62	-1	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-10	1	WLC Pkwy	Residential	1	**67**[3]	**71**	**70**	-1	3	B(67)	A/E[4]	65[5]	5	1	64	6	1	63	7	1	62	8	1	61	9	1	60	10	1
R-11		SR-60	Racetrack	1	65	67	68	1	3	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-12		WLC Pkwy	Vacant Land	1	55	63	62	-1	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-13		SR-60	Vacant Land	1	59	61	60	-1	1	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-14		SR-60	Vacant Land	1	60	62	62	0	2	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-15		Eucalyptus Avenue	Vacant Land	1	48	52	56	4	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-16		Eucalyptus Avenue	Vacant Land	1	46	51	54	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-17		Eucalyptus Avenue	Vacant Land	1	44	48	51	3	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-18		Eucalyptus Avenue	Vacant Land	1	41	49	50	1	9	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-19		WLC Pkwy/	Vacant Land	1	57	68	65	-3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-20		Eucalyptus Avenue	Vacant Land	1	46	56	58	2	12	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-21		WLC Pkwy	Vacant Land	1	55	67	67	0	12	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-22		Eucalyptus Avenue	Vacant Land	1	44	54	59	5	15	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-23		WLC Pkwy	Vacant Land	1	56	67	65	-2	9	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-24		WLC Pkwy	Vacant Land	1	55	68	68	0	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-25	2	WLC Pkwy	Residential	1	55	**68**	**70**	2	15	B(67)	A/E/Sub[6]	**66**	4	0	65	5	1	63	7	1	61	9	1	60	10	1	60	10	1
R-26		WLC Pkwy	Vacant Land	1	56	69	70	1	14	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-27		WLC Pkwy	Agriculture	1	57	70	71	1	14	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-28	3	WLC Pkwy	Residential	1	49	62	64	2	15	B(67)	Sub	62	2	0	60	4	0	58	6	1	56	8	1	55	9	1	55	9	1
R-29		WLC Pkwy	Vacant Land	1	57	70	71	1	14	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-30		Theodore Street[7]	Vacant Land	1	52	57	59	2	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-31		Theodore Street[7]	Vacant Land	1	53	58	61	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-32		Theodore Street[7]	Vacant Land	1	56	62	63	1	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-33		Theodore Street[7]	Residential	1	46	51	52	1	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-34		Theodore Street[7]	Residential	1	51	56	55	-1	4	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-35		Theodore Street[7]	Residential	1	47	52	53	1	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-36		Theodore Street[7]	Residential	1	50	55	55	0	5	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-37		Theodore Street[7]	Residential	1	54	60	60	0	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-38		Theodore Street[7]	Agriculture	1	54	59	61	2	7	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: Compiled by LSA Associates, Inc. (2019).

[1] I.L.: Insertion Loss.

[2] No barrier was analyzed at this location because the modeled receptor would not approach or exceed the NAC.

[3] Numbers in **bold** represent noise levels that approach or exceed the NAC.

[4] A/E = Approaches or exceeds the NAC.

[5] Underlined noise levels have been attenuated by at least 5 dBA (i.e., feasible barrier height).

[6] Sub = Substantial noise increase.

[7] The City is currently renaming Theodore Street to WLC Pkwy from SR-60 westbound ramps to Ironwood Avenue.

dBA $L_{eq}(h)$ = 1-hour equivalent continuous sound level measured in A-weighted decibels
ft = foot/feet
NAC = Noise Abatement Criteria
NB = Noise Barrier
SR-60 = State Route 60
WLC Pkwy = World Logistics Center Parkway

This page intentionally left blank

Table B.3. Existing and Predicted Future Noise and Noise Barrier Analysis for Alternative 6

Receptor No.	NB No.	Location	Land Use	No. of Dwelling Units / Receptors	Existing Noise Level, dBA $L_{eq}(h)$	Future Worst-Hour Noise Levels, dBA $L_{eq}(h)$																							
						2045 Noise Level				Activity Category (NAC)	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																	
												6 ft			8 ft			10 ft			12 ft			14 ft			16 ft		
						Without Project	With Project	With Project Minus No Project Conditions	With Project Minus Existing Conditions			$L_{eq}(h)$	I.L.[1]	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR
R-1		SR-60	Vacant Land	1	67	70	71	1	4	G	None	--[2]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-2		SR-60	Vacant Land	1	66	69	70	1	4	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-3		SR-60	Vacant Land	1	65	69	70	1	5	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-4		SR-60	Vacant Land	1	56	60	64	4	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-5		SR-60	Vacant Land	1	63	66	66	0	3	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-6		SR-60	Industrial	1	58	61	62	1	4	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-7		SR-60	Industrial	1	57	61	62	1	5	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-8		SR-60	Industrial	1	56	60	62	2	6	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-9		WLC Pkwy	Vacant Land	1	54	63	61	-2	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-10	1	WLC Pkwy	Residential	1	**67**[3]	**71**	**69**	-2	2	B(67)	A/E[4]	63[5]	6	1	63	6	1	62	7	1	61	8	1	60	9	1	60	9	1
R-11		SR-60	Racetrack	1	65	67	68	1	3	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-12		WLC Pkwy	Vacant Land	1	55	63	62	-1	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-13		SR-60	Vacant Land	1	59	61	60	-1	1	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-14		SR-60	Vacant Land	1	60	62	62	0	2	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-15		Eucalyptus Avenue	Vacant Land	1	48	52	56	4	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-16		Eucalyptus Avenue	Vacant Land	1	46	51	54	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-17		Eucalyptus Avenue	Vacant Land	1	44	48	51	3	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-18		Eucalyptus Avenue	Vacant Land	1	41	49	50	1	9	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-19		WLC Pkwy/	Vacant Land	1	57	68	63	-5	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-20		Eucalyptus Avenue	Vacant Land	1	46	56	56	0	10	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-21		WLC Pkwy	Vacant Land	1	55	67	67	0	12	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-22		Eucalyptus Avenue	Vacant Land	1	44	54	54	0	10	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-23		WLC Pkwy	Vacant Land	1	56	67	66	-1	10	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-24		WLC Pkwy	Vacant Land	1	55	68	68	0	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-25	2	WLC Pkwy	Residential	1	55	**68**	**69**	1	14	B(67)	A/E/Sub[6]	65	4	0	64	5	1	63	6	1	59	10	1	58	11	1	58	11	1
R-26		WLC Pkwy	Vacant Land	1	56	69	70	1	14	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-27		WLC Pkwy	Agriculture	1	57	70	70	0	13	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-28	3	WLC Pkwy	Residential	1	49	62	63	1	14	B(67)	Sub	61	2	0	59	4	0	58	5	1	55	8	1	55	8	1	54	9	1
R-29		WLC Pkwy	Vacant Land	1	57	70	70	0	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-30		Theodore Street[7]	Vacant Land	1	52	57	58	1	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-31		Theodore Street[7]	Vacant Land	1	53	58	61	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-32		Theodore Street[7]	Vacant Land	1	56	62	62	0	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-33		Theodore Street[7]	Residential	1	46	51	52	1	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-34		Theodore Street[7]	Residential	1	51	56	55	-1	4	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-35		Theodore Street[7]	Residential	1	47	52	52	0	5	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-36		Theodore Street[7]	Residential	1	50	55	55	0	5	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-37		Theodore Street[7]	Residential	1	54	60	60	0	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-38		Theodore Street[7]	Agriculture	1	54	59	58	-1	4	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: Compiled by LSA Associates, Inc. (2019).

[1] I.L.: Insertion Loss.

[2] No barrier was analyzed at this location because the modeled receptor would not approach or exceed the NAC.

[3] Numbers in **bold** represent noise levels that approach or exceed the NAC.

[4] A/E = Approaches or exceeds the NAC.

[5] Underlined noise levels have been attenuated by at least 5 dBA (i.e., feasible barrier height).

[6] Sub = Substantial noise increase.

[7] The City is currently renaming Theodore Street to WLC Pkwy from SR-60 westbound ramps to Ironwood Avenue.

dBA $L_{eq}(h)$ = 1-hour equivalent continuous sound level measured in A-weighted decibels
ft = foot/feet
NAC = Noise Abatement Criteria
NB = Noise Barrier
SR-60 = State Route 60
WLC Pkwy = World Logistics Center Parkway

This page intentionally left blank

Table B.4. Existing and Predicted Future Noise and Noise Barrier Analysis for Design Variation 6a

Receptor No.	NB No.	Location	Land Use	No. of Dwelling Units / Receptors	Existing Noise Level, dBA $L_{eq}(h)$	Future Worst-Hour Noise Levels, dBA $L_{eq}(h)$																							
						2045 Noise Level				Activity Category (NAC)	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																	
												6 ft			8 ft			10 ft			12 ft			14 ft			16 ft		
						Without Project	With Project	With Project Minus No Project Conditions	With Project Minus Existing Conditions			$L_{eq}(h)$	I.L.[1]	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR
R-1		SR-60	Vacant Land	1	67	70	71	1	4	G	None	--[2]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-2		SR-60	Vacant Land	1	66	69	70	1	4	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-3		SR-60	Vacant Land	1	65	69	70	1	5	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-4		SR-60	Vacant Land	1	56	60	64	4	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-5		SR-60	Vacant Land	1	63	66	66	0	3	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-6		SR-60	Industrial	1	58	61	62	1	4	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-7		SR-60	Industrial	1	57	61	62	1	5	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-8		SR-60	Industrial	1	56	60	62	2	6	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-9		WLC Pkwy	Vacant Land	1	54	63	61	-2	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-10	1	WLC Pkwy	Residential	1	**67**[3]	**71**	**69**	-2	2	B(67)	A/E[4]	63[5]	6	1	63	6	1	62	7	1	61	8	1	60	9	1	60	9	1
R-11		SR-60	Racetrack	1	65	67	68	1	3	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-12		WLC Pkwy	Vacant Land	1	55	63	61	-2	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-13		SR-60	Vacant Land	1	59	61	60	-1	1	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-14		SR-60	Vacant Land	1	60	62	62	0	2	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-15		Eucalyptus Avenue	Vacant Land	1	48	52	56	4	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-16		Eucalyptus Avenue	Vacant Land	1	46	51	54	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-17		Eucalyptus Avenue	Vacant Land	1	44	48	51	3	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-18		Eucalyptus Avenue	Vacant Land	1	41	49	49	0	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-19		WLC Pkwy/	Vacant Land	1	57	68	64	-4	7	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-20		Eucalyptus Avenue	Vacant Land	1	46	56	57	1	11	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-21		WLC Pkwy	Vacant Land	1	55	67	66	-1	11	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-22		Eucalyptus Avenue	Vacant Land	1	44	54	57	3	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-23		WLC Pkwy	Vacant Land	1	56	67	64	-3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-24		WLC Pkwy	Vacant Land	1	55	68	65	-3	10	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-25	2	WLC Pkwy	Residential	1	55	**68**	--[6]	--	--	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-26		WLC Pkwy	Vacant Land	1	56	69	68	-1	12	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-27		WLC Pkwy	Agriculture	1	57	70	--[6]	--	--	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-28	3	WLC Pkwy	Residential	1	49	62	63	1	14	B(67)	Sub[7]	61	2	0	59	4	0	58	5	1	56	7	1	55	8	1	54	9	1
R-29		WLC Pkwy	Vacant Land	1	57	70	70	0	13	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-30		Theodore Street[8]	Vacant Land	1	52	57	58	1	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-31		Theodore Street[8]	Vacant Land	1	53	58	61	3	8	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-32		Theodore Street[8]	Vacant Land	1	56	62	62	0	6	G	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-33		Theodore Street[8]	Residential	1	46	51	52	1	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-34		Theodore Street[8]	Residential	1	51	56	55	-1	4	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-35		Theodore Street[8]	Residential	1	47	52	52	0	5	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-36		Theodore Street[8]	Residential	1	50	55	55	0	5	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-37		Theodore Street[8]	Residential	1	54	60	60	0	6	B(67)	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R-38		Theodore Street[8]	Agriculture	1	54	59	58	-1	4	F	None	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Source: Compiled by LSA Associates, Inc. (2019).

[1] I.L.: Insertion Loss.

[2] No barrier was analyzed at this location because the modeled receptor would not approach or exceed the NAC.

[3] Numbers in **bold** represent noise levels that approach or exceed the NAC.

[4] A/E = Approaches or exceeds the NAC.

[5] Underlined noise levels have been attenuated by at least 5 dBA (i.e., feasible barrier height).

[6] Shaded area represents receptors that would be fully acquired as part of the project under Design Variation 6a.

[7] Sub = Substantial noise increase.

[8] The City is currently renaming Theodore Street to WLC Pkwy from SR-60 westbound ramps to Ironwood Avenue.

dBA $L_{eq}(h)$ = 1-hour equivalent continuous sound level measured in A-weighted decibels
ft = foot/feet
NAC = Noise Abatement Criteria
NB = Noise Barrier
SR-60 = State Route 60
WLC Pkwy = World Logistics Center Parkway

This page intentionally left blank

Appendix C. Supplemental Data

This appendix contains the noise monitoring results and sound level meter calibration certifications.

This page intentionally left blank

LONG-TERM NOISE LEVEL MEASUREMENTS

Noise Measurement Survey – 24 HR

Project Number: RBF1301.03
Project Name: SR-60/WLC Pkwy Interchange
Test Personnel: Daniel Kaufman
Equipment: Quest NoisePro DLX

Site Number: LT-1 Date: 9/19-9/20/2018 Time: From 9:00AM To 9:00AM

Site Location: 12400 Theodore Street in the backyard area.

Primary Noise Sources: Traffic on State Route 60, State Route 60 westbound on- and off- ramps, and occasional traffic on Theodore Street.

Comments:

Location:

Photo:

SHORT-TERM NOISE LEVEL MEASUREMENTS

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Jason Lui
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 820

Site Number: ST-1 Date: 9/19/2018 Time: From 9:44 AM To 9:59 AM

Site Location: Vacant land located north of SR-60 between Redlands Boulevard and WLC Pkwy.

Primary Noise Sources: Traffic on State Route 60.

Measurement Results

	dBA
L_{eq}	67.2
L_{max}	75.3
L_{min}	52.6
L_{peak}	90.5
L_2	71.6
L_8	70.2
L_{25}	68.3
L_{50}	66.3
SEL	

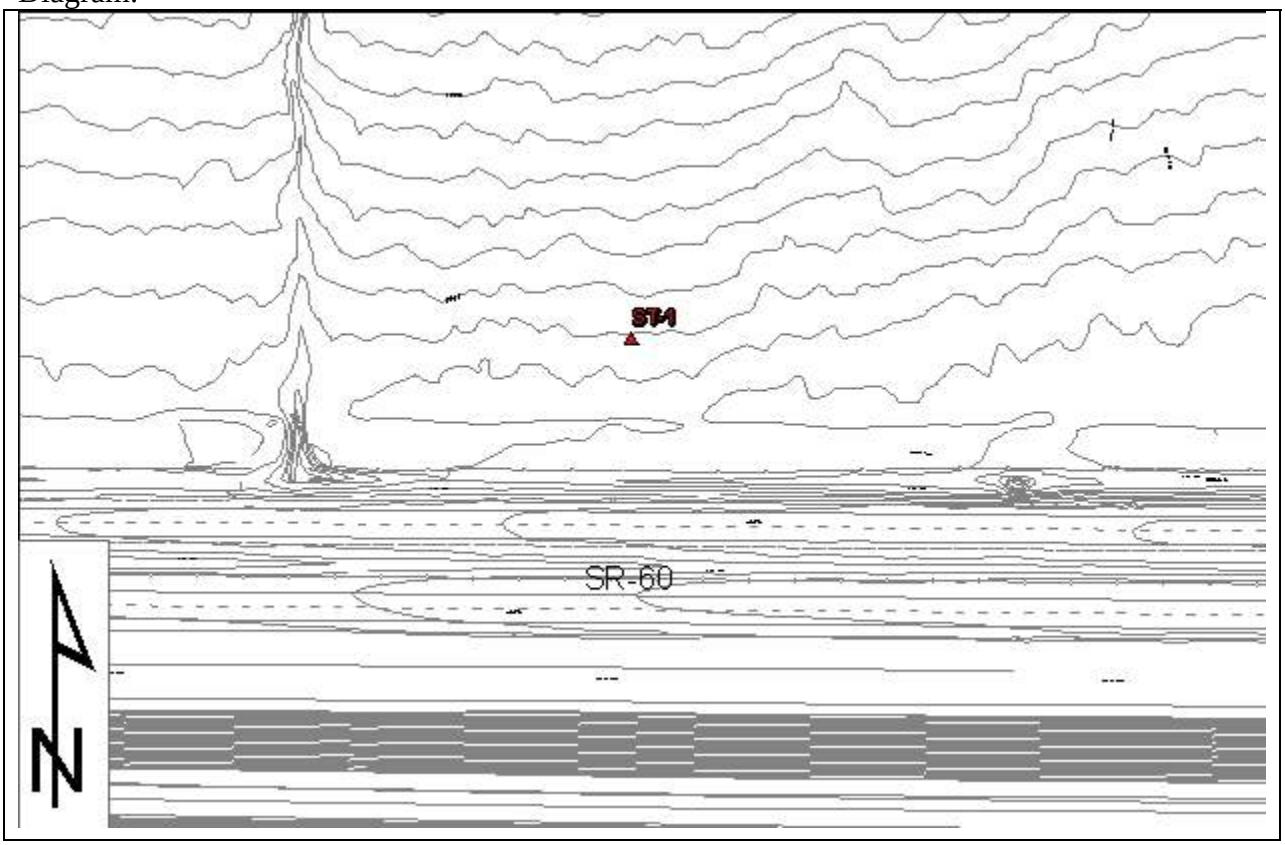
Atmospheric Conditions:

Maximum Wind Velocity (mph)	4.9
Average Wind Velocity (mph)	2.4
Temperature (F)	79.5
Relative Humidity (%)	31.4
Comments:	

Comments: No walls or barriers. Open space. Agricultural land.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Daniel Kaufman
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 824

Site Number: ST-2 Date: 9/19/2018 Time: From 10:37 AM To 10:52 AM

Site Location: Vacant land located north of SR-60 west of Theodore Street.

Primary Noise Sources: Traffic on State Route 60 and occasional traffic on Theodore Street.

Measurement Results

	dBA
L_{eq}	55.6
L_{max}	72.3
L_{min}	43.3
L_{peak}	90.3
L_2	65.1
L_8	60.6
L_{25}	53.0
L_{50}	49.9
SEL	

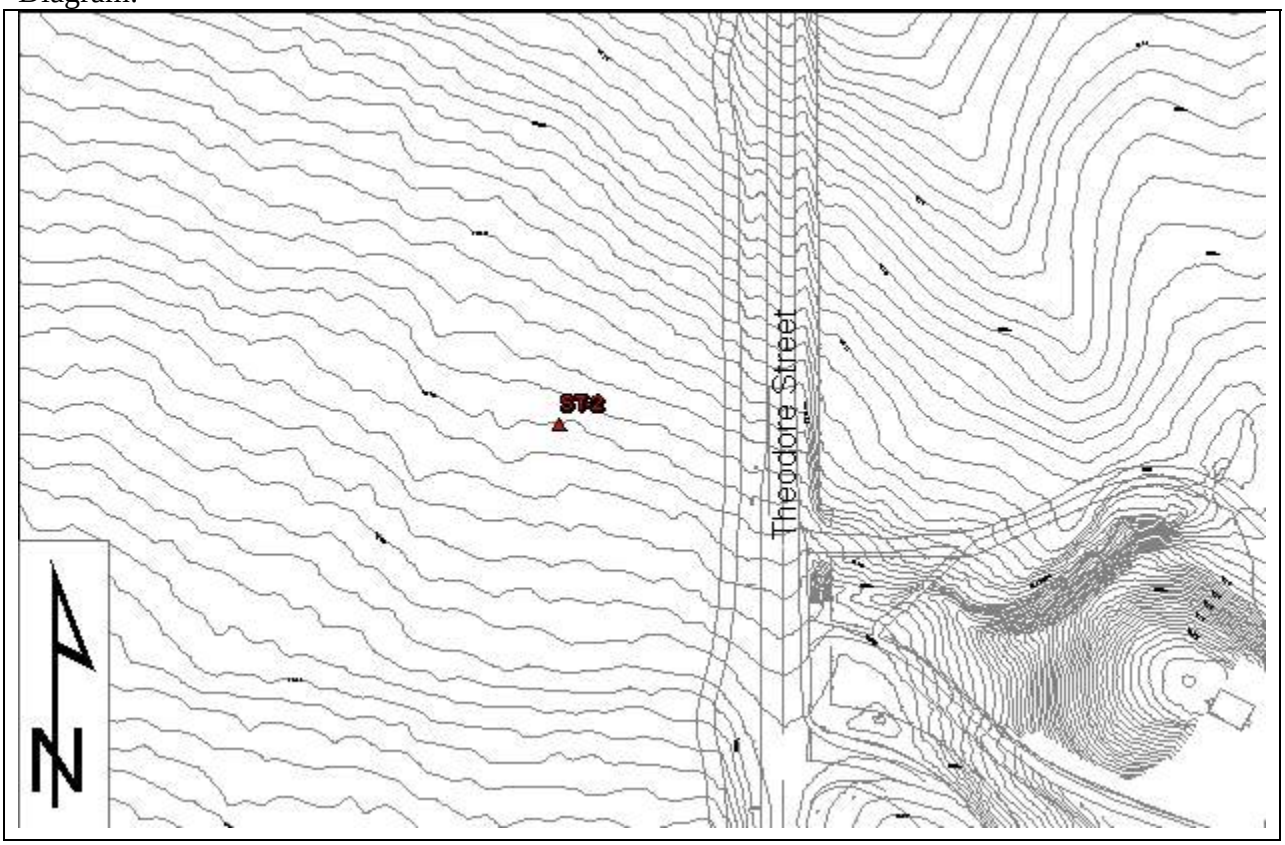
Atmospheric Conditions:

Maximum Wind Velocity (mph)	6.8
Average Wind Velocity (mph)	2.4
Temperature (F)	78.3
Relative Humidity (%)	28.3
Comments:	

Comments: At 10:47 AM, a heavy truck passed by on Theodore Street at 64 dBA.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Daniel Kaufman
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 824

Site Number: ST-3 Date: 9/19/2018 Time: From 9:44 AM To 9:59 AM

Site Location: Vacant land located south of SR-60 between Redland Boulevard and the Skechers Warehouse building.

Primary Noise Sources: Traffic on State Route 60.

Measurement Results

	dBA
L_{eq}	63.1
L_{max}	65.0
L_{min}	58.8
L_{peak}	76.8
L_2	68.9
L_8	66.9
L_{25}	64.2
L_{50}	61.4
SEL	92.7

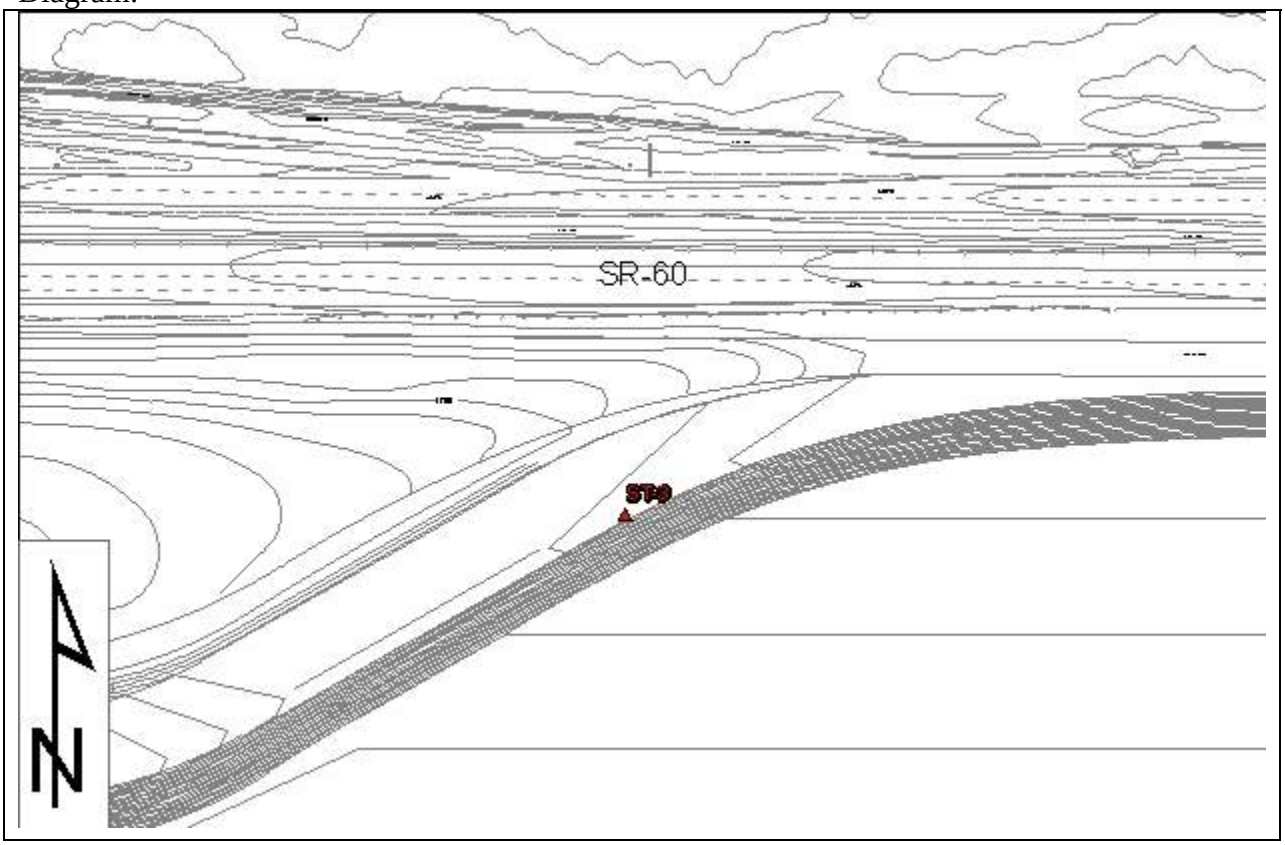
Atmospheric Conditions:

Maximum Wind Velocity (mph)	10.0
Average Wind Velocity (mph)	4.7
Temperature (F)	82.0
Relative Humidity (%)	39.7
Comments:	

Comments: Traffic on Redlands Blvd is faint or inaudible.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Zhe Chen
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 831

Site Number: ST-4 Date: 9/19/2018 Time: From 9:44 AM To 9:59 AM

Site Location: 29800 Eucalyptus Avenue. Skechers Distribution Center. North of the building in the truck parking lot.

Primary Noise Sources: Traffic on State Route 60.

Measurement Results

	dBA
L_{eq}	57.5
L_{max}	75.6
L_{min}	49.0
L_{peak}	92.9
L_2	63.3
L_8	60.6
L_{25}	58.1
L_{50}	56.0
SEL	

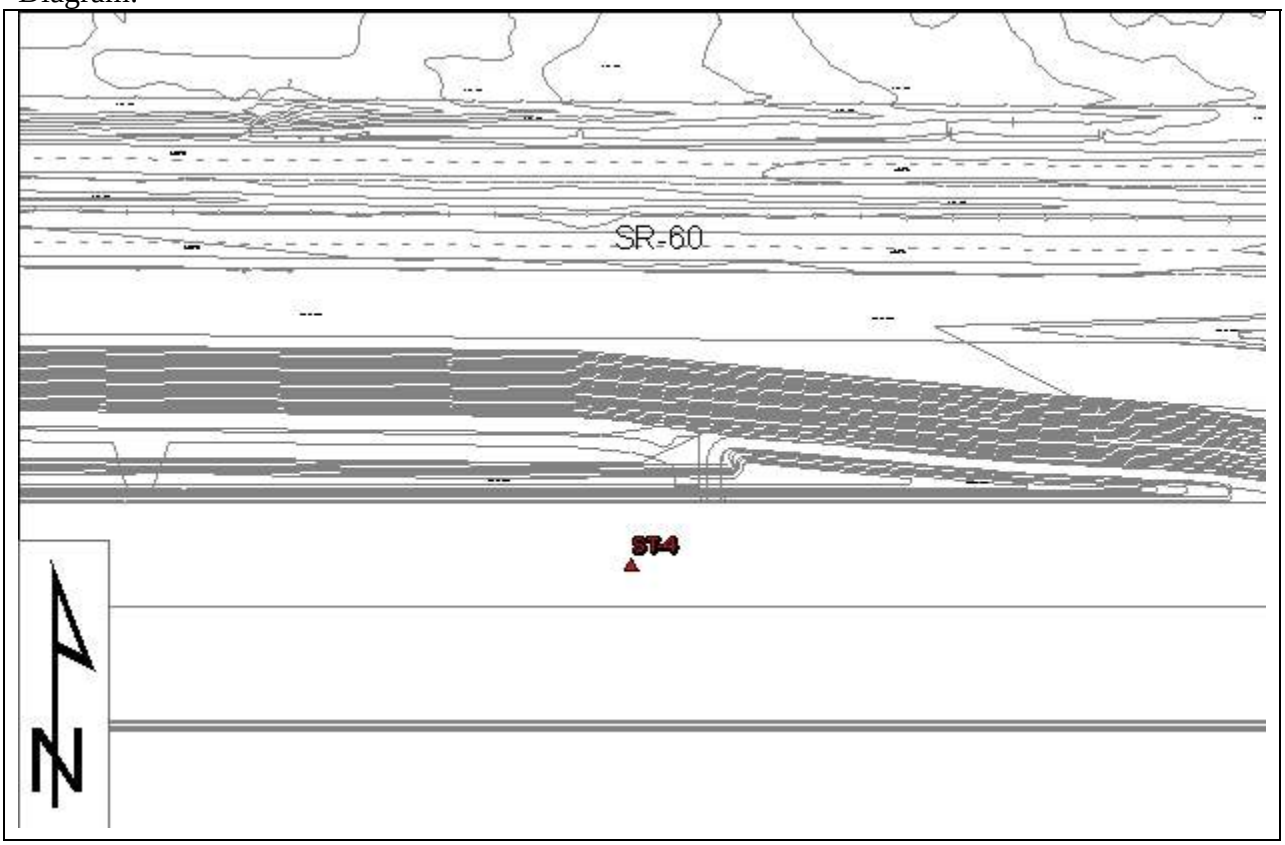
Atmospheric Conditions:

Maximum Wind Velocity (mph)	5.7
Average Wind Velocity (mph)	1.2
Temperature (F)	84.0
Relative Humidity (%)	27.1
Comments:	

Comments: Paused measurement for truck starting activity.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Jason Lui
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 820

Site Number: ST-5 Date: 9/19/2018 Time: From 11:18 AM To 11:33 AM

Site Location: Vacant land located on the southwest corner of SR-60 and WLC Pkwy.

Primary Noise Sources: Traffic on State Route 60, SR-60 eastbound ramps and WLC Pkwy. White noise from Skechers Building. Truck wheel screech. Kitchen ventilation fan which was 78.8 dBA at 5 feet from source.

Measurement Results

	dBA
L_{eq}	49.5
L_{max}	68.7
L_{min}	42.8
L_{peak}	86.2
L_2	53.7
L_8	51.2
L_{25}	49.3
L_{50}	48.0
SEL	

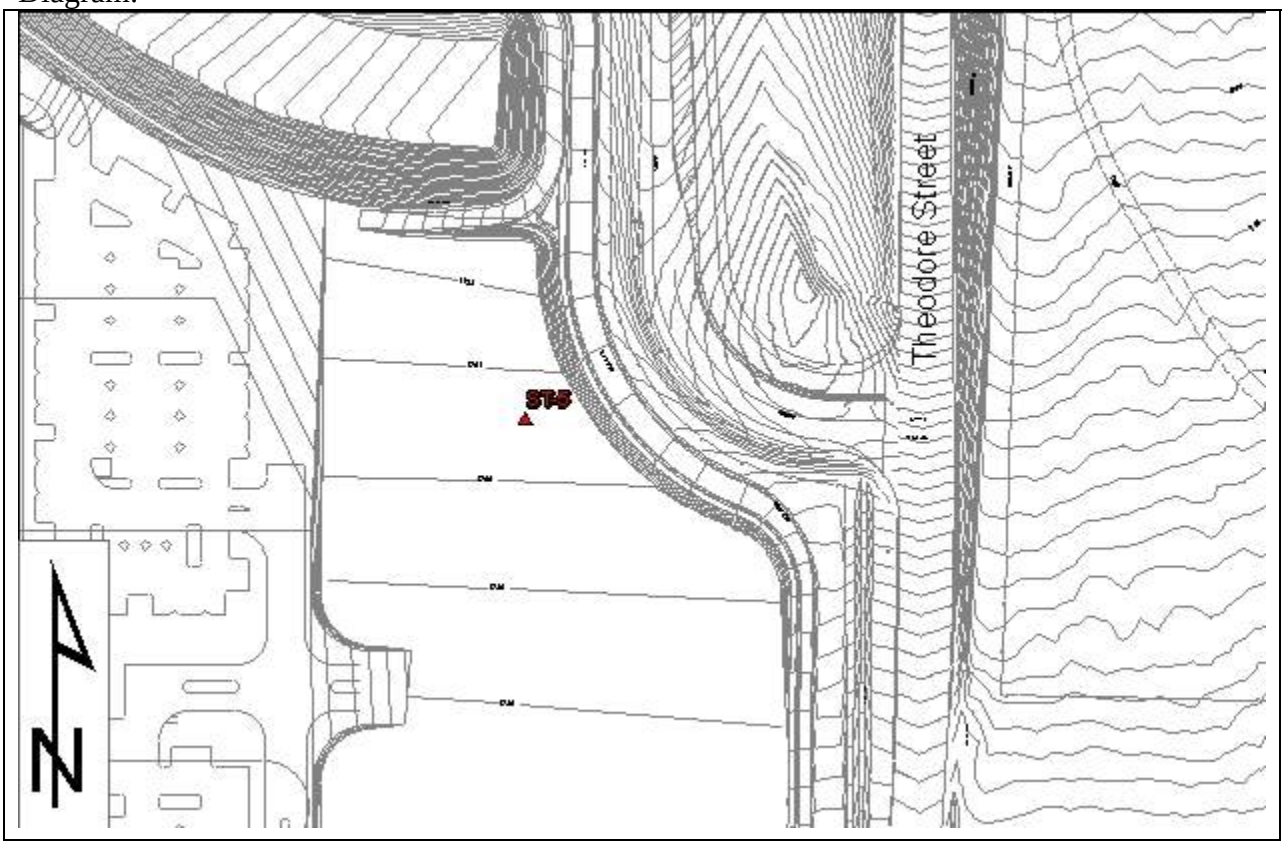
Atmospheric Conditions:

Maximum Wind Velocity (mph)	6.9
Average Wind Velocity (mph)	2.4
Temperature (F)	88.4
Relative Humidity (%)	16.7
Comments:	

Comments: Vacant land next to Skechers Building. Large berm to the west.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Logan Freeberg
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 720

Site Number: ST-6 Date: 9/19/2018 Time: From 10:37 AM To 10:52 AM

Site Location: 12400 Theodore Street. Located northeast of SR-60 and Theodore Street Interchange in the backyard of the residence.

Primary Noise Sources: Traffic on State Route 60 and State Route 60 westbound on- and off-ramps, occasional traffic on Theodore Street, and birds.

Measurement Results

	dBA
L_{eq}	68.4
L_{max}	78.5
L_{min}	59.0
L_{peak}	90.8
L_2	73.6
L_8	71.2
L_{25}	69.2
L_{50}	67.6
SEL	

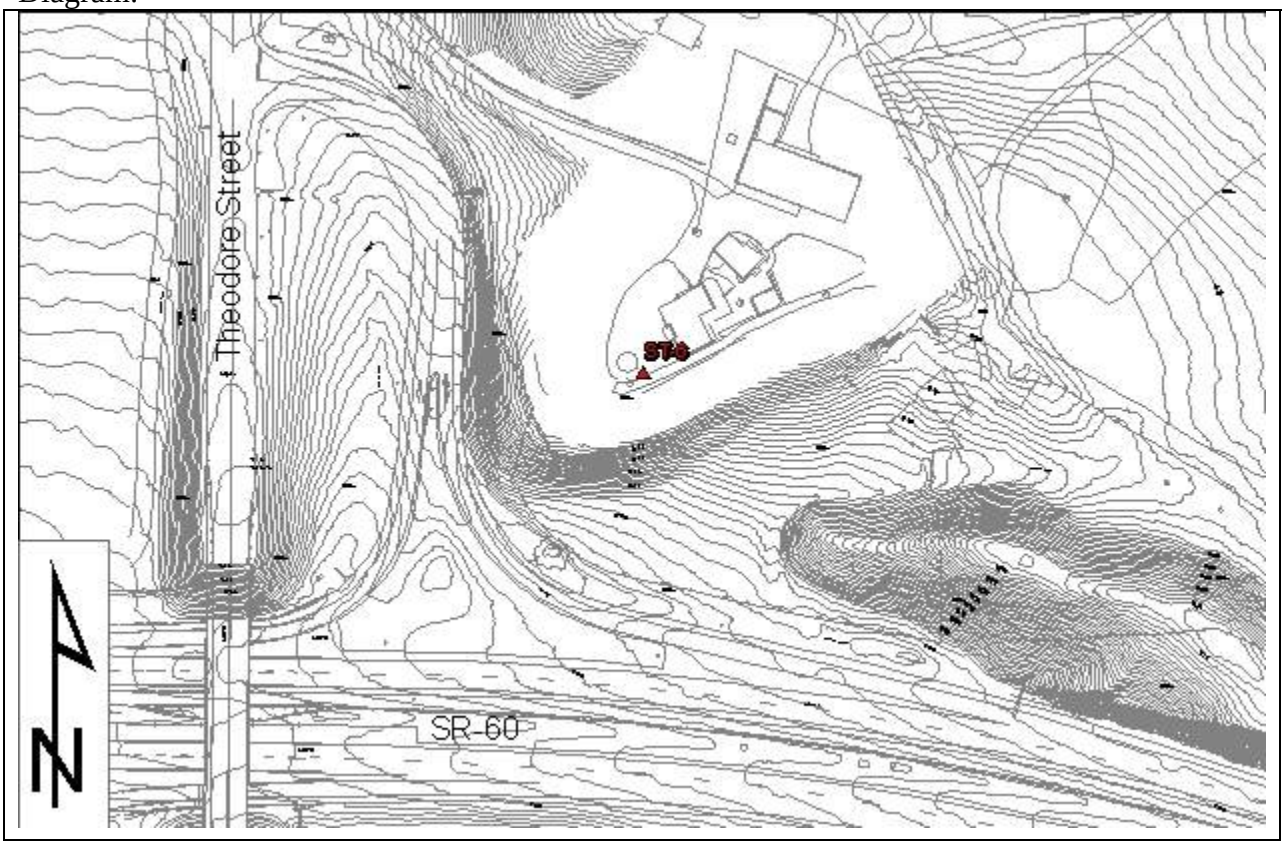
Atmospheric Conditions:

Maximum Wind Velocity (mph)	--
Average Wind Velocity (mph)	--
Temperature (F)	--
Relative Humidity (%)	--
Comments:	

Comments:

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Logan Freeberg
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 720

Site Number: ST-7 Date: 9/19/2018 Time: From 11:18 AM To 11:33 AM

Site Location: Vacant land located approximately 350 ft south of SR-60 and 1,000 ft east of WLC Pkwy.

Primary Noise Sources: Traffic on State Route 60.

Measurement Results

	dBA
L_{eq}	56.5
L_{max}	69.4
L_{min}	42.6
L_{peak}	94.2
L_2	63.6
L_8	60.7
L_{25}	57.1
L_{50}	54.1
SEL	

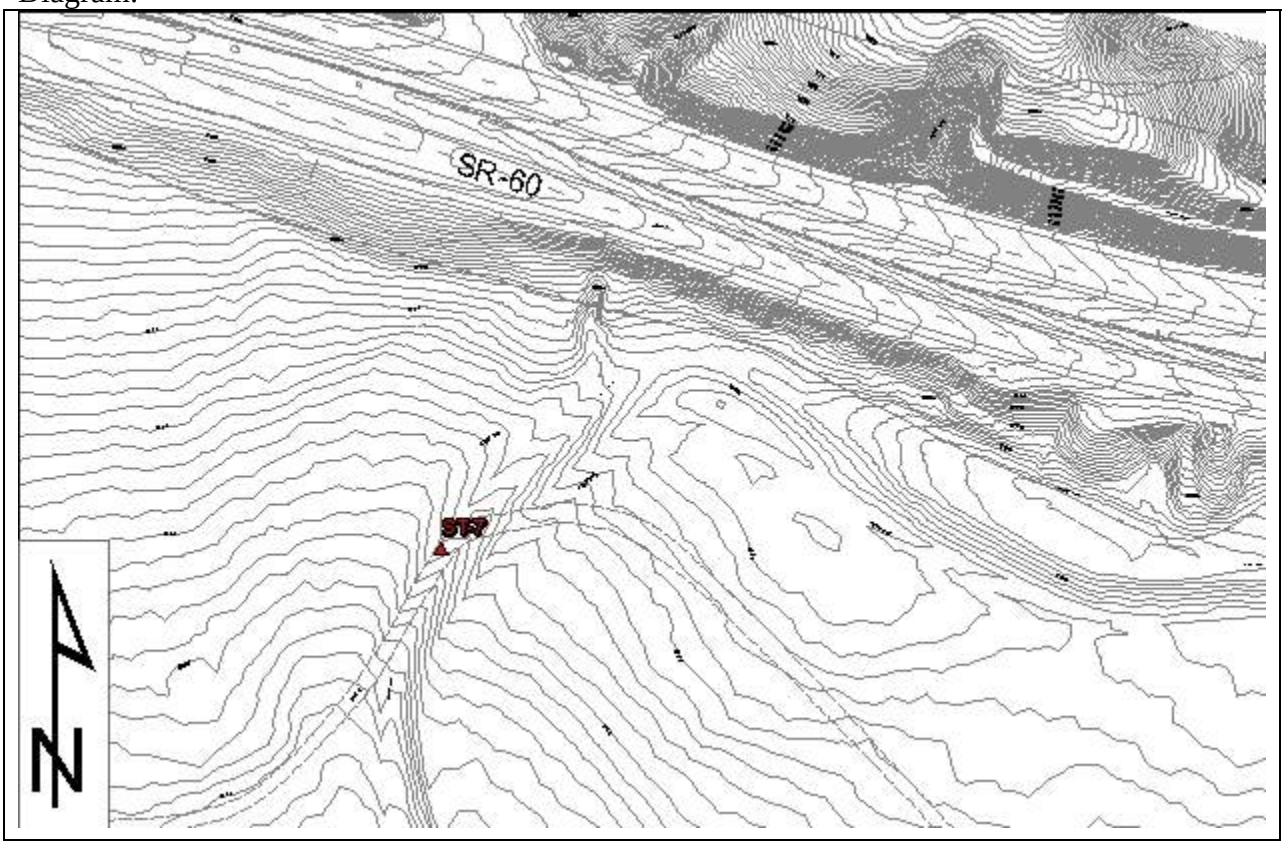
Atmospheric Conditions:

Maximum Wind Velocity (mph)	--
Average Wind Velocity (mph)	--
Temperature (F)	--
Relative Humidity (%)	--
Comments:	

Comments:

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Jason Lui
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 820

Site Number: ST-8 Date: 9/19/2018 Time: From 11:58 AM To 12:13 PM

Site Location: Vacant land south of Eucalyptus Avenue near the west end of the Skechers warehouse building.

Primary Noise Sources: Traffic on State Route 60.

Measurement Results

	dBA
L_{eq}	41.1
L_{max}	61.0
L_{min}	36.8
L_{peak}	81.7
L_2	47.1
L_8	43.2
L_{25}	40.3
L_{50}	39.2
SEL	

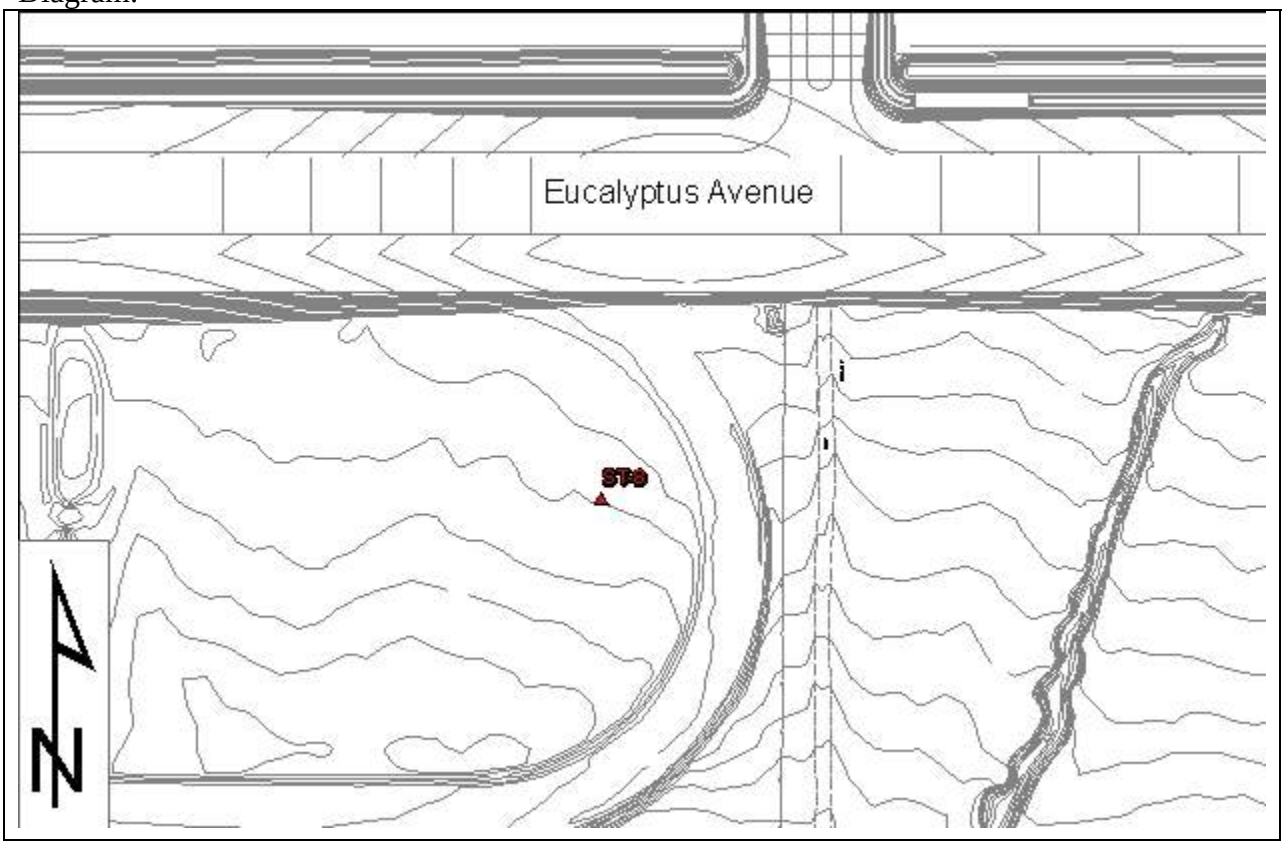
Atmospheric Conditions:

Maximum Wind Velocity (mph)	8.3
Average Wind Velocity (mph)	3.2
Temperature (F)	89.8
Relative Humidity (%)	18.0
Comments:	

Comments:

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Daniel Kaufman
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 824

Site Number: ST-9 Date: 9/19/2018 Time: From 11:58 AM To 12:13 PM

Site Location: Vacant land located at the southwest corner of WLC Pkwy and Eucalyptus Avenue.

Primary Noise Sources: Distant traffic on State Route 60. Intermittent traffic on WLC, Eucalyptus Avenue, and SR-60 eastbound ramps.

Measurement Results

	dBA
L_{eq}	42.6
L_{max}	62.3
L_{min}	34.4
L_{peak}	78.8
L_2	50.3
L_8	45.5
L_{25}	40.9
L_{50}	38.6
SEL	72.1

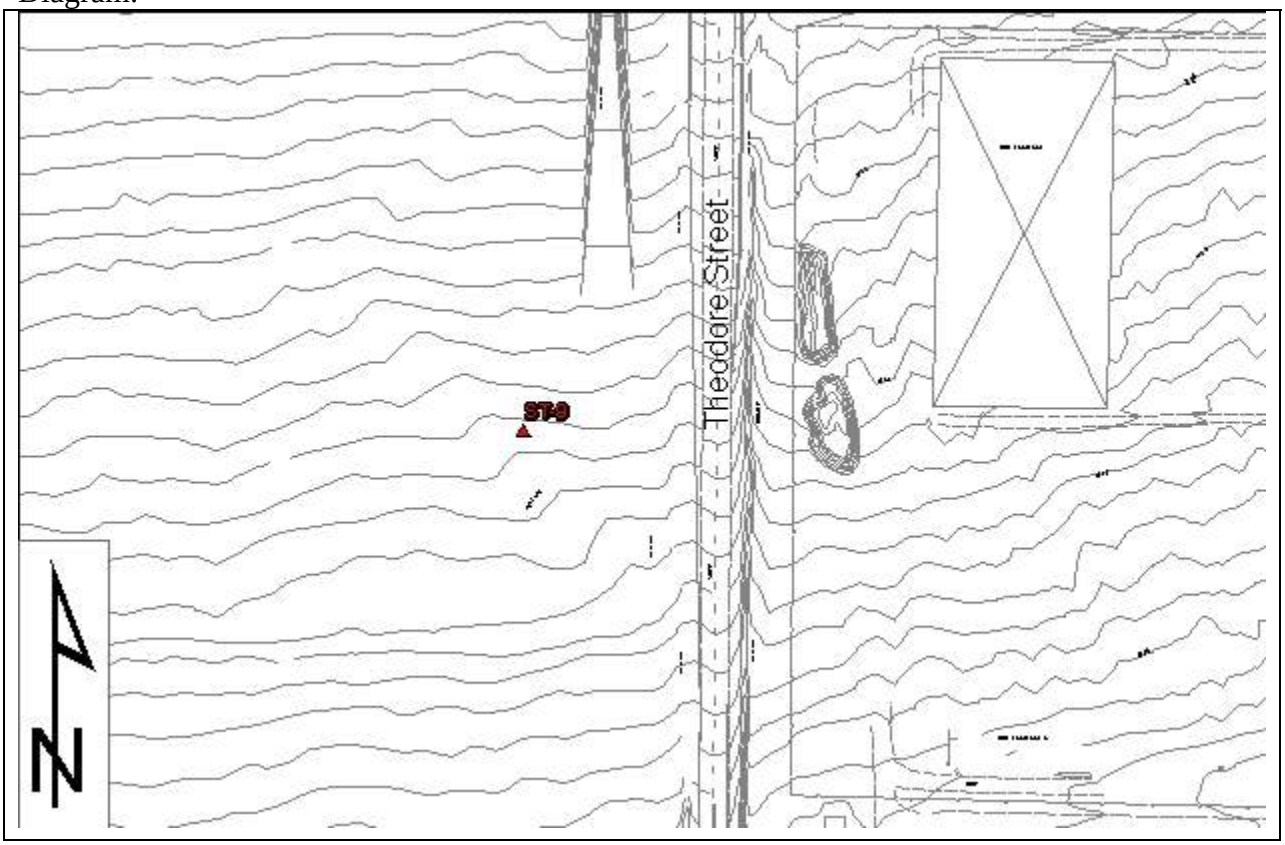
Atmospheric Conditions:

Maximum Wind Velocity (mph)	7.0
Average Wind Velocity (mph)	2.5
Temperature (F)	91.3
Relative Humidity (%)	12.9
Comments:	

Comments: Measurement was restarted due to aircraft noise.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Daniel Kaufman
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 824

Site Number: ST-10 Date: 9/19/2018 Time: From 11:18 AM To 11:33 AM

Site Location: Vacant land located at the northeast corner of WLC Pkwy and Eucalyptus Avenue. Location relative to the south side of the Skechers warehouse.

Primary Noise Sources: Distant traffic on State Route 60, occasional traffic on Theodore Street and eastbound ramps from SR-60 to Theodore Street.

Measurement Results

	dBA
L_{eq}	45.9
L_{max}	64.3
L_{min}	38.0
L_{peak}	82.3
L_2	52.7
L_8	48.9
L_{25}	45.3
L_{50}	43.0
SEL	75.5

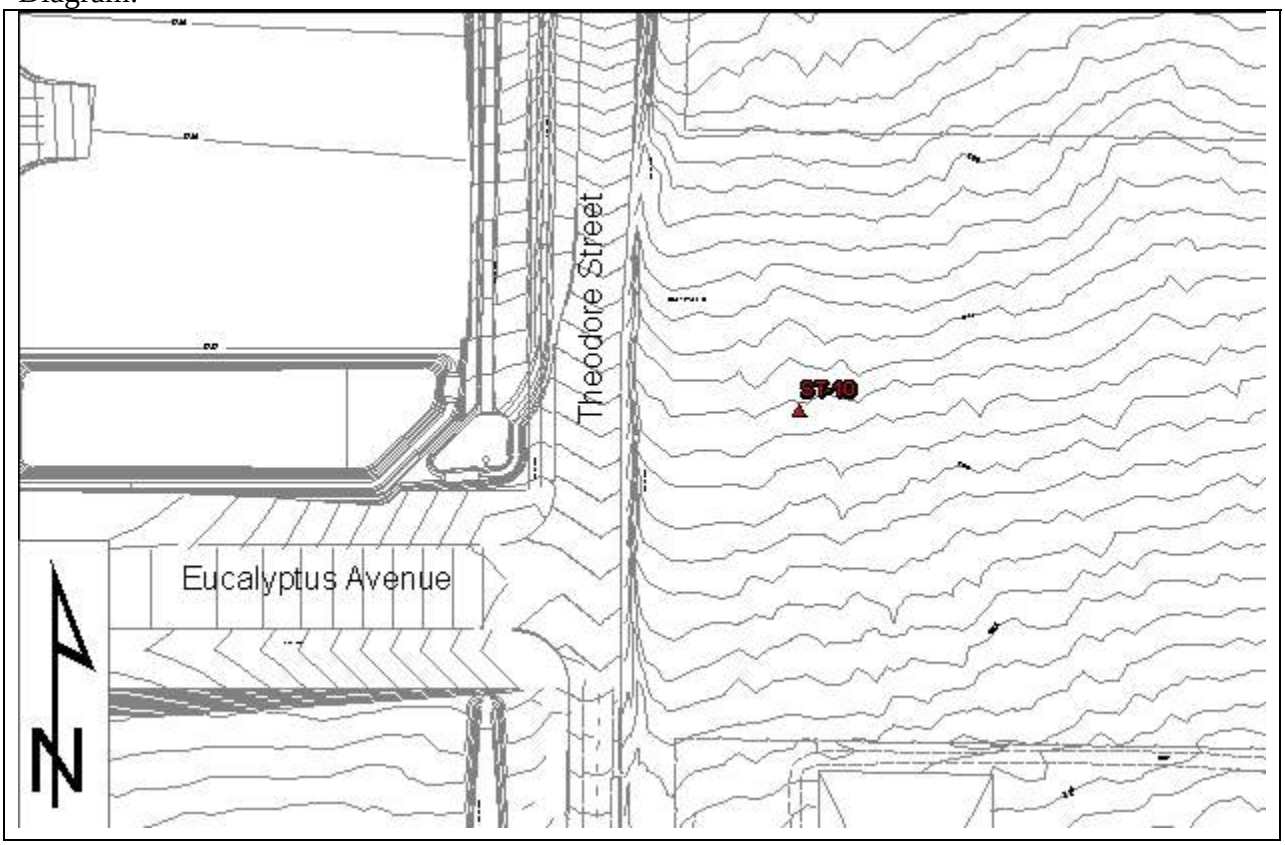
Atmospheric Conditions:

Maximum Wind Velocity (mph)	4.3
Average Wind Velocity (mph)	1.2
Temperature (F)	87.6
Relative Humidity (%)	13.5
Comments:	

Comments: Paused for car alarm at Skechers warehouse.

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Zhe Chen
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 831

Site Number: ST-11 Date: 9/19/2018 Time: From 11:58 AM To 12:13 PM

Site Location: Vacant land located at the northeast corner of Eucalyptus Avenue and WLC Pkwy.

Primary Noise Sources: Traffic on WLC Pkwy and distant traffic on State Route 60.

Measurement Results

	dBA
L_{eq}	51.0
L_{max}	71.0
L_{min}	34.4
L_{peak}	83.7
L_2	61.4
L_8	53.2
L_{25}	41.7
L_{50}	38.0
SEL	

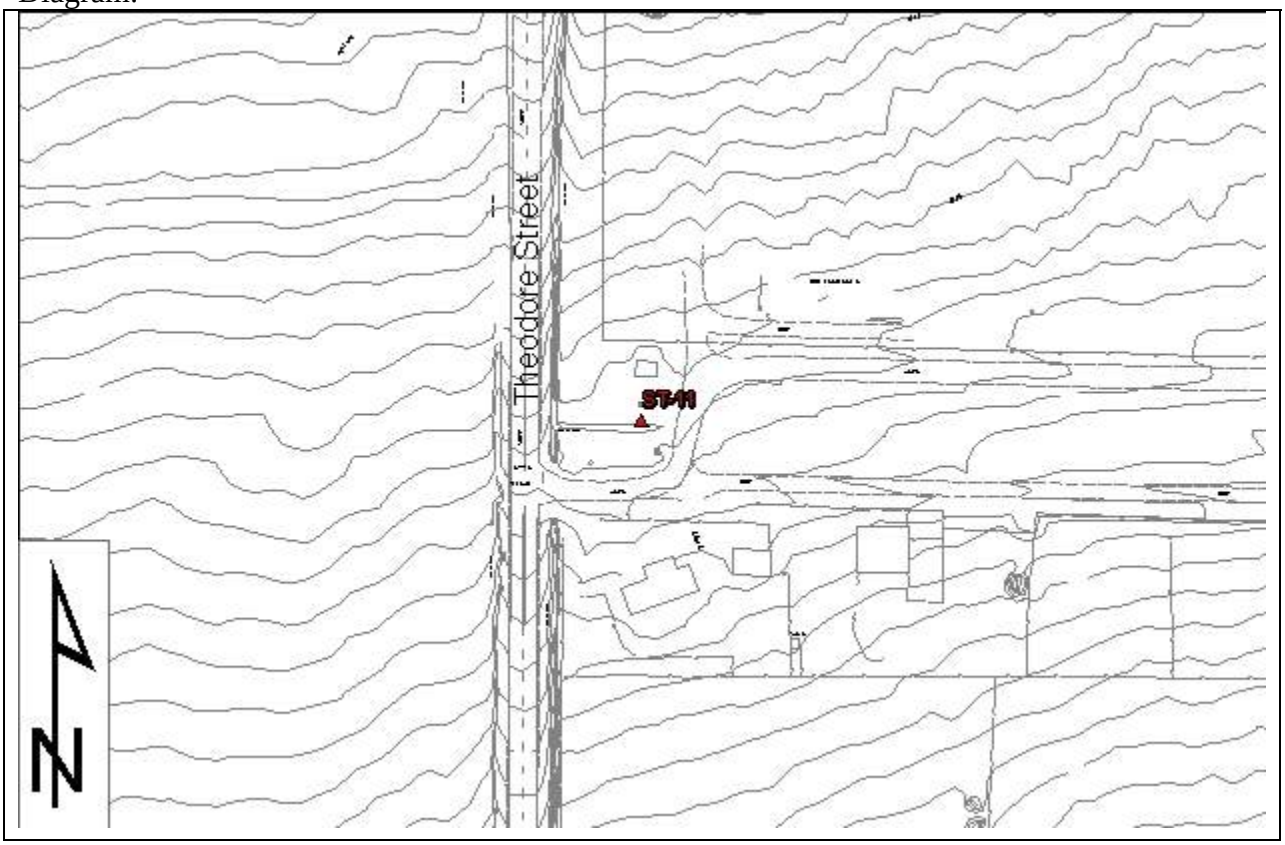
Atmospheric Conditions:

Maximum Wind Velocity (mph)	8.2
Average Wind Velocity (mph)	3.1
Temperature (F)	86.5
Relative Humidity (%)	14.1
Comments:	

Comments:

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Jason Lui
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 820

Site Number: ST-12 Date: 9/19/2018 Time: From 10:37 AM To 10:52 AM

Site Location: Agricultural land associated with the farm residence at 12400 Theodore Street. Located north of entrance gate to the vineyard on the northbound side of Theodore Street.

Primary Noise Sources: Traffic on Theodore Street and State Route 60 in background.

Measurement Results

	dBA
L_{eq}	53.7
L_{max}	68.9
L_{min}	42.7
L_{peak}	91.6
L_2	62.1
L_8	58.2
L_{25}	52.1
L_{50}	48.8
SEL	

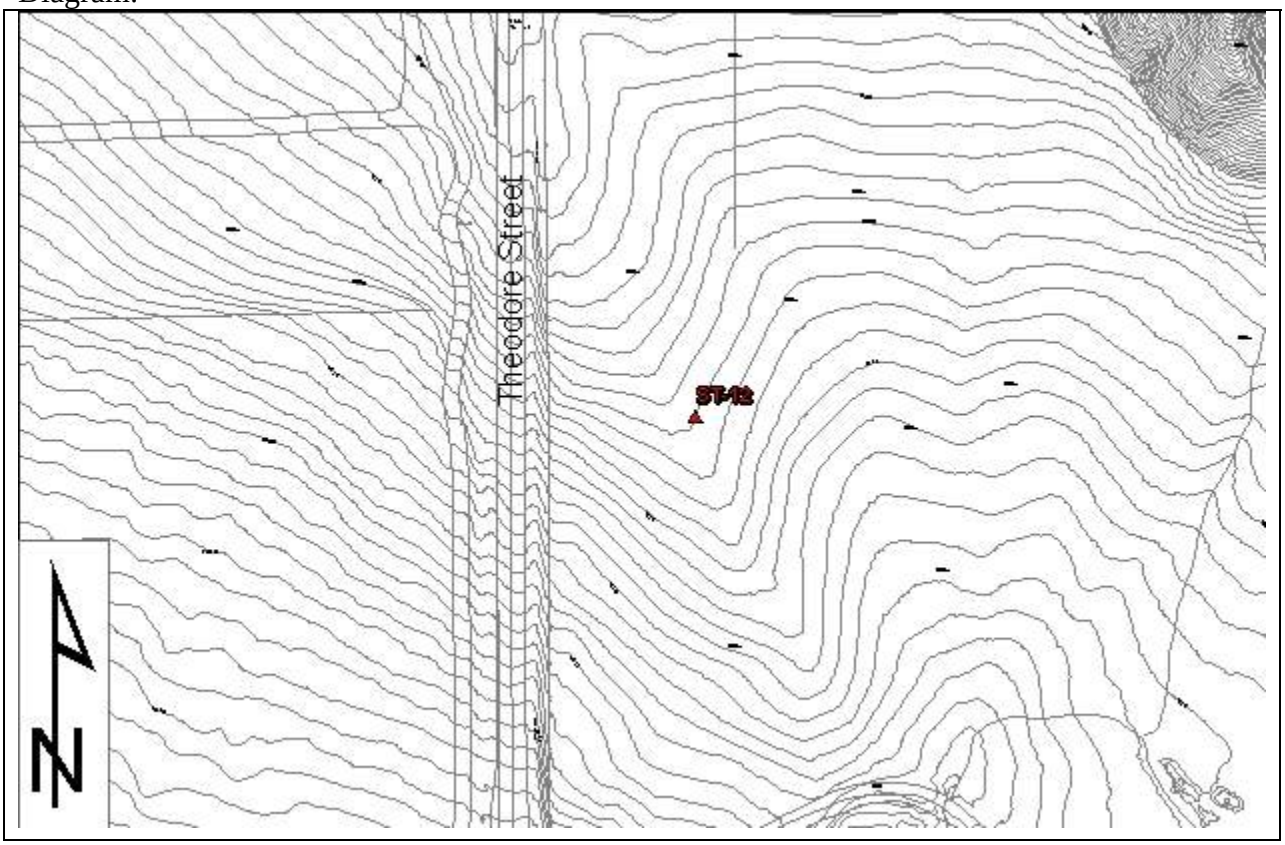
Atmospheric Conditions:

Maximum Wind Velocity (mph)	2.6
Average Wind Velocity (mph)	0.9
Temperature (F)	87.0
Relative Humidity (%)	21.7
Comments:	

Comments:

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

Noise Measurement Survey

Project Number: RBF1303.03 Test Personnel: Zhe Chen
Project Name: SR-60/WLC Pkwy Interchange Equipment: Larson Davis 831

Site Number: ST-13 Date: 9/19/2018 Time: From 10:37 AM To 10:52 AM

Site Location: 12130 Theodore Street. In front of the house. On the east side of Theodore Street.

Primary Noise Sources: Traffic on Theodore Street.

Measurement Results

	dBA
L_{eq}	67.0
L_{max}	86.7
L_{min}	40.1
L_{peak}	97.6
L_2	78.4
L_8	69.4
L_{25}	55.7
L_{50}	48.2
SEL	

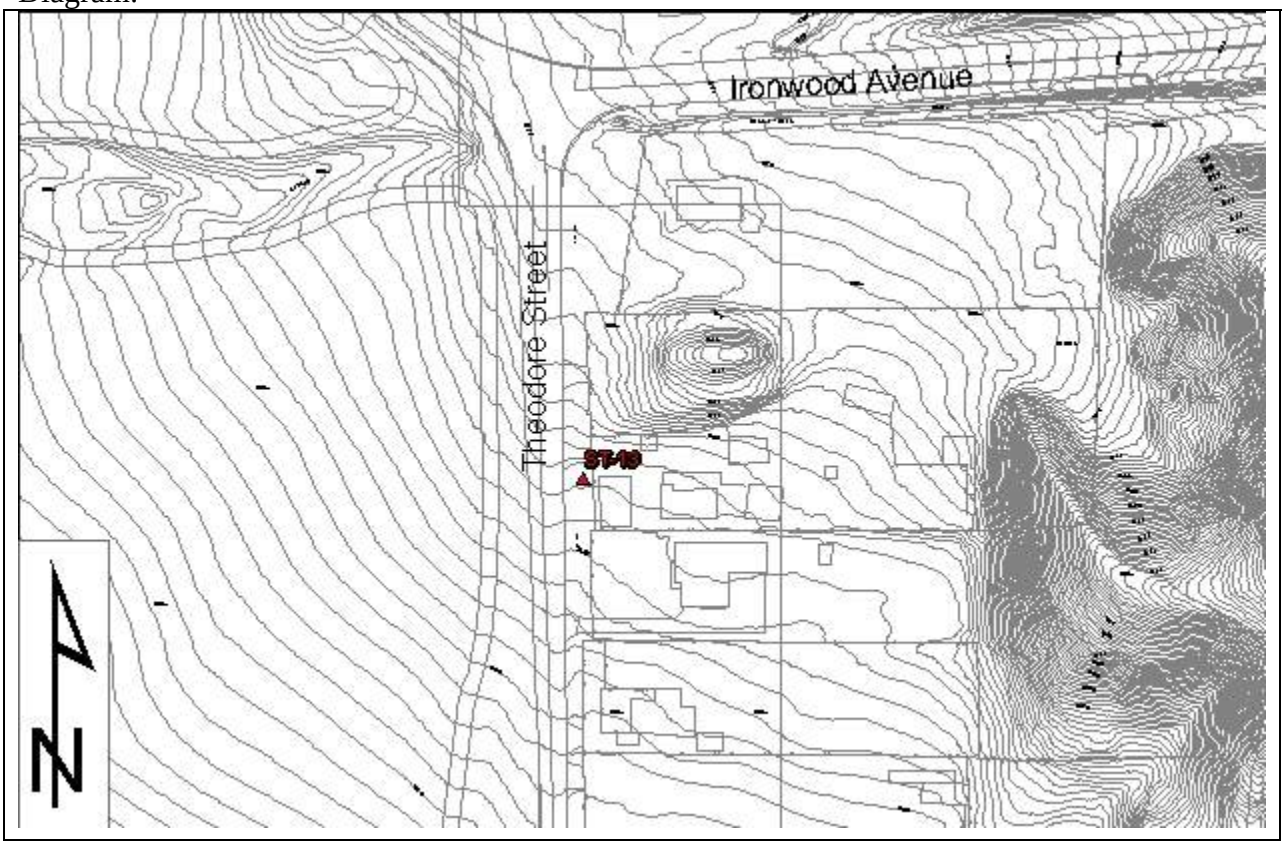
Atmospheric Conditions:

Maximum Wind Velocity (mph)	4.2
Average Wind Velocity (mph)	1.2
Temperature (F)	79.9
Relative Humidity (%)	23.1
Comments:	

Comments:

Traffic: Table A-1 in Appendix A shows the concurrent traffic counts and vehicles speeds.

Diagram:



Location Photo:

SUMMARY OF FEASIBLE NOISE BARRIERS

Summary of Feasible Noise Barriers

Alternative	Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
						Begin	End	Begin	End
2	1	6	339	5	PL	489+10	491+15	1,817.00	1,828.00
		8	339	6				1,819.00	1,830.00
		10	339	7				1,821.00	1,832.00
		12	339	8				1,823.00	1,834.00
		14	339	9				1,825.00	1,836.00
		16	339	10				1,827.00	1,838.00
	2	8	233	5	ROW/PL	175+40	176+47	1,708.96	1,712.45
		10	233	6				1,710.96	1,714.45
		12	233	10				1,712.96	1,716.45
		14	233	11				1,714.96	1,718.45
		16	233	11				1,716.96	1,720.45
	3	10	453	5	ROW/PL	170+52	172+17	1,697.90	1,702.00
		12	453	8				1,699.90	1,704.00
		14	453	8				1,701.90	1,706.00
		16	453	9				1,703.90	1,708.00
2a	1	6	339	5	PL	489+10	491+15	1,817.00	1,828.00
		8	339	6				1,819.00	1,830.00
		10	339	7				1,821.00	1,832.00
		12	339	8				1,823.00	1,834.00
		14	339	9				1,825.00	1,836.00
		16	339	10				1,827.00	1,838.00
	2	8	206	5	ROW/PL	175+40	176+32	1,708.96	1,712.36
		10	206	7				1,710.96	1,714.36
		12	206	9				1,712.96	1,716.36
		14	206	10				1,714.96	1,718.36
		16	206	10				1,716.96	1,720.36
	3	10	434	6	ROW/PL	170+52	172+17	1,697.90	1,702.12
		12	434	8				1,699.90	1,704.12
		14	434	9				1,701.90	1,706.12
		16	434	9				1,703.90	1,708.12

Source: Compiled by LSA Associates, Inc. (2019).
dBA = A-weighted decibels
ft = foot/feet
PL = property line
ROW = right-of-way

Summary of Feasible Noise Barriers

Alternative	Noise Barrier No.	Height (ft)	Approximate Length (ft)	Highest Noise Attenuation (dBA)	Noise Barrier Location	Noise Barrier Station Number		Top of Wall Elevation	
						Begin	End	Begin	End
6	1	6	339	6	PL	489+10	491+15	1,817.00	1,828.00
		8	339	6				1,819.00	1,830.00
		10	339	7				1,821.00	1,832.00
		12	339	8				1,823.00	1,834.00
		14	339	9				1,825.00	1,836.00
		16	339	9				1,827.00	1,838.00
	2	8	233	5	ROW/PL	175+40	176+47	1,708.96	1,712.45
		10	233	6				1,710.96	1,714.45
		12	233	10				1,712.96	1,716.45
		14	233	11				1,714.96	1,718.45
		16	233	11				1,716.96	1,720.45
	3	10	453	5	ROW/PL	170+52	172+17	1,697.90	1,702.12
		12	453	8				1,699.90	1,704.12
		14	453	8				1,701.90	1,706.12
		16	453	9				1,703.90	1,708.12
6a	1	6	339	6	PL	489+10	491+15	1,817.00	1,828.00
		8	339	6				1,819.00	1,830.00
		10	339	7				1,821.00	1,832.00
		12	339	8				1,823.00	1,834.00
		14	339	9				1,825.00	1,836.00
		16	339	9				1,827.00	1,838.00
	3	10	414	5	ROW/PL	170+52	172+17	1,697.90	1,702.12
		12	414	7				1,699.90	1,704.12
		14	414	8				1,701.90	1,706.12
		16	414	9				1,703.90	1,708.12

CALIBRATION CERTIFICATE FOR LARSON DAVIS 720

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2018-206193

Instrument Model 720 (MPR005), Serial Number 0519, was calibrated on 5 Jan 2018. The instrument meets factory specifications per Procedure D0001.8208, ANSI S1.4 1983, IEC 651-Type 2 1979, and IEC 804-Type 2 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 5 Jan 2018
Calibration due: 5 Jan 2019

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2239	0653 / 0101	12 Months	25 Apr 2018	2017-205062

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 21 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.

Signed: Eric Olson

Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS INC.
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2018-206192

Instrument Model MPR005, Serial Number B8334, was calibrated on 5 Jan 2018. The instrument meets factory specifications per Procedure D0001.8159.

Instrument found to be in calibration as received: YES
Date Calibrated: 5 Jan 2018
Calibration due: 5 Jan 2019

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
PCB	426B03	1603	12 Months	12 Apr 2018	2017-003848
Larson Davis	LDSigGn / 2209	0249 / 0124	12 Months	14 Jun 2018	2017-205280
PCB	377A13	134649	12 Months	4 Oct 2018	2017-010528

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 21 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.

Signed: Eric Olson

Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Calibration Certificate

Certificate Number 2018000316

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	CAL150	***Procedure Number***	D0001.8386		
Serial Number	3420	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	5 Jan 2018		
Initial Condition	Adjusted	***Calibration Due***	5 Jan 2019		
Description	Larson Davis CAL150 Calibrator	***Temperature***	23	°C	± 0.3 °C
		Humidity	36	%RH	± 3 %RH
		Static Pressure	101.5	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/06/2017	09/06/2018	001021
Larson Davis Model 2900 Real Time Analyzer	04/10/2017	04/10/2018	001051
Microphone Calibration System	08/08/2017	08/08/2018	005446
1/2" Preamplifier	10/05/2017	10/05/2018	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/08/2017	08/08/2018	006507
1/2 inch Microphone - RI - 200V	04/24/2017	04/24/2018	006510
Pressure Transducer	06/01/2017	06/01/2018	007310

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.3	114.00	113.70	114.30	0.13	Pass
94	101.5	93.99	93.70	94.30	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
94	101.5	1,000.11	990.00	1,010.00	0.20	Pass
114	101.3	1,000.07	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
94	101.5	0.82	0.00	2.00	0.25	Pass
114	101.3	0.42	0.00	2.00	0.25	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 37 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
101.3	101.5	0.00	-0.40	0.40	0.04 ‡	Pass
108.0	107.9	-0.03	-0.40	0.40	0.04 ‡	Pass
92.0	91.9	0.03	-0.40	0.40	0.04 ‡	Pass
83.0	82.8	0.02	-0.40	0.40	0.04 ‡	Pass
74.0	73.9	-0.03	-0.40	0.40	0.04 ‡	Pass
65.0	65.0	-0.14	-0.40	0.40	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 23 °C, 37 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	107.9	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.5	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	82.8	0.00	-10.00	10.00	0.20 ‡	Pass
74.0	73.9	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.0	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 23 °C, 37 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	107.9	0.45	0.00	2.00	0.25 ‡	Pass
101.3	101.5	0.43	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.39	0.00	2.00	0.25 ‡	Pass
83.0	82.8	0.35	0.00	2.00	0.25 ‡	Pass
74.0	73.9	0.31	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.28	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 23 °C, 37 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	107.9	0.45	0.00	2.00	0.25 ‡	Pass
101.3	101.5	0.43	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.39	0.00	2.00	0.25 ‡	Pass
83.0	82.8	0.35	0.00	2.00	0.25 ‡	Pass
74.0	73.9	0.31	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.28	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA A2LA ACCREDITED Cert. #3522.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

CALIBRATION CERTIFICATE FOR LARSON DAVIS 820

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Certificate of Calibration and Conformance

Certificate Number 2018-207226

Instrument Model 820, Serial Number 1584, was calibrated on 30 Aug 2018. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 30 Aug 2018
Calibration due: 30 Aug 2019

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2239	0653 / 0101	12 Months	27 Apr 2019	2018-206703

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 24 ° Centigrade

Relative Humidity: 31 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2484

Signed: Eric Olson

Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Certificate of Calibration and Conformance

Certificate Number 2018-207227

Instrument Model PRM828, Serial Number 2484, was calibrated on 30 Aug 2018. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 30 Aug 2018
Calibration due: 30 Aug 2019

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	2900 / 2239	0608 / 0110	12 Months	20 Dec 2018	2017-206142
Hewlett Packard	34401A	US36023299	12 Months	20 Jul 2019	2018-007384

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 24 ° Centigrade

Relative Humidity: 31 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.

Signed: 

Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Calibration Certificate

Certificate Number 2018008741

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	377A60	***Procedure Number***	D0001.8387
Serial Number	101355	***Technician***	Abraham Ortega
Test Results	**Pass**	***Calibration Date***	28 Aug 2018
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	28 Aug 2019
Description	1/2 inch Microphone - RI - 200V	***Temperature***	23.3 °C ± 0.01 °C
		Humidity	34.8 %RH ± 0.5 %RH
		Static Pressure	101.55 kPa ± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	07/02/2018	07/02/2019	001230
Microphone Calibration System	08/30/2017	08/30/2018	001233
1/2" Preamplifier	12/14/2017	12/14/2018	001274
Agilent 34401A DMM	12/07/2017	12/07/2018	001329
Larson Davis CAL250 Acoustic Calibrator	01/03/2018	01/03/2019	003030
1/2" Preamplifier	04/12/2018	04/12/2019	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/13/2017	09/13/2018	006507
1/2 inch Microphone - RI - 200V	10/23/2017	10/23/2018	006511
1/2 inch Microphone - RI - 200V	08/09/2018	08/09/2019	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/13/2017	09/13/2018	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/13/2018	08/11/2019	006531

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Sensitivity

Measurement	Test Result [mV/Pa]	Lower limit [mV/Pa]	Upper limit [mV/Pa]	Expanded Uncertainty [mV/Pa]	Result
Open Circuit Sensitivity	47.17	39.00	59.43	0.99	Pass

-- End of measurement results--

Capacitance

Measurement	Test Result [pF]				
Capacitance	19.00			‡	

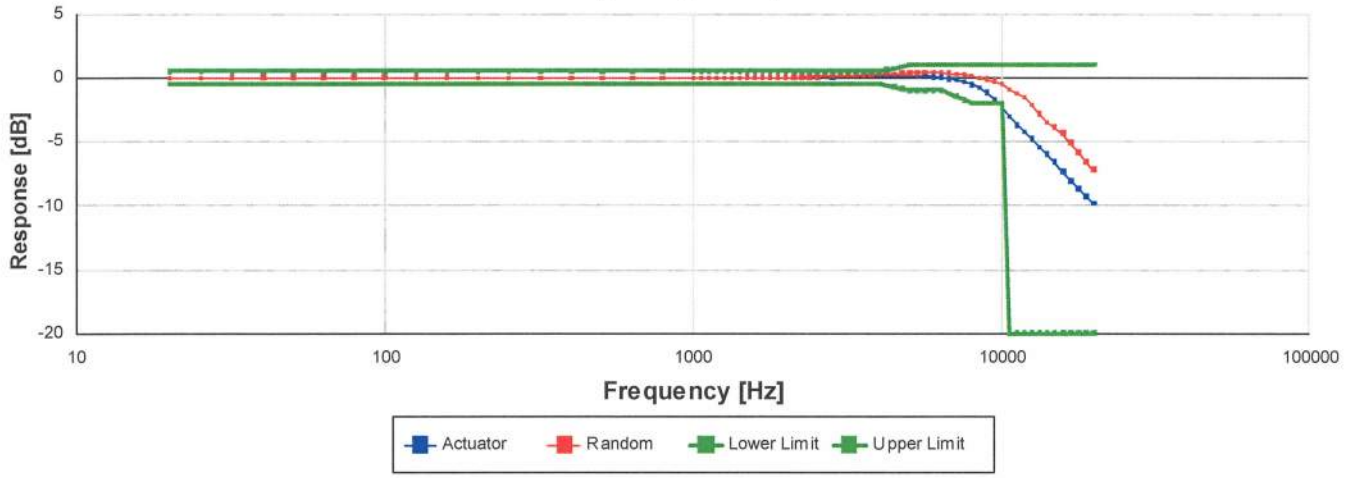
-- End of measurement results--

Lower Limiting Frequency

Measurement	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]		Result
-3 dB Frequency	1.19	1.00	2.00		Pass ‡

-- End of measurement results--

Frequency Response



Data is normalized for 0 dB @ 251.19 Hz.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
19.95	-0.04	-0.04	-0.50	0.50	Pass ‡
25.12	-0.01	-0.01	-0.50	0.50	Pass ‡
31.62	0.01	0.01	-0.50	0.50	Pass ‡
39.81	0.01	0.01	-0.50	0.50	Pass ‡
50.12	0.02	0.02	-0.50	0.50	Pass ‡
63.10	0.02	0.02	-0.50	0.50	Pass ‡
79.43	0.01	0.01	-0.50	0.50	Pass ‡
100.00	0.01	0.01	-0.50	0.50	Pass ‡
125.89	0.01	0.01	-0.50	0.50	Pass ‡
158.49	0.01	0.01	-0.50	0.50	Pass ‡
199.53	0.00	0.00	-0.50	0.50	Pass ‡

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
251.19	0.00	0.00	-0.50	0.50	Pass ‡
316.23	0.00	0.00	-0.50	0.50	Pass ‡
398.11	-0.01	-0.01	-0.50	0.50	Pass ‡
501.19	-0.01	-0.01	-0.50	0.50	Pass ‡
630.96	-0.01	-0.01	-0.50	0.50	Pass ‡
794.33	-0.01	-0.01	-0.50	0.50	Pass ‡
1,000.00	-0.01	-0.01	-0.50	0.50	Pass ‡
1,059.25	-0.01	-0.01	-0.50	0.50	Pass ‡
1,122.02	-0.01	-0.01	-0.50	0.50	Pass ‡
1,188.50	0.00	0.00	-0.50	0.50	Pass ‡
1,258.93	0.00	0.00	-0.50	0.50	Pass ‡
1,333.52	0.00	0.00	-0.50	0.50	Pass ‡
1,412.54	0.00	0.00	-0.50	0.50	Pass ‡
1,496.24	0.01	0.01	-0.50	0.50	Pass ‡
1,584.89	0.01	0.01	-0.50	0.50	Pass ‡
1,678.80	0.01	0.01	-0.50	0.50	Pass ‡
1,778.28	0.01	0.01	-0.50	0.50	Pass ‡
1,883.65	0.02	0.02	-0.50	0.50	Pass ‡
1,995.26	0.03	0.03	-0.50	0.50	Pass ‡
2,113.49	0.03	0.03	-0.50	0.50	Pass ‡
2,238.72	0.04	0.04	-0.50	0.50	Pass ‡
2,371.37	0.07	0.08	-0.50	0.50	Pass ‡
2,511.89	0.07	0.08	-0.50	0.50	Pass ‡
2,660.73	0.09	0.10	-0.50	0.50	Pass ‡
2,818.38	0.08	0.10	-0.50	0.50	Pass ‡
2,985.38	0.09	0.12	-0.50	0.50	Pass ‡
3,162.28	0.09	0.13	-0.50	0.50	Pass ‡
3,349.65	0.11	0.17	-0.50	0.50	Pass ‡
3,548.13	0.12	0.20	-0.50	0.50	Pass ‡
3,758.37	0.12	0.22	-0.50	0.50	Pass ‡
3,981.07	0.12	0.24	-0.50	0.50	Pass ‡
4,216.97	0.13	0.27	-0.63	0.63	Pass ‡
4,466.84	0.13	0.30	-0.75	0.75	Pass ‡
4,731.51	0.14	0.34	-0.88	0.88	Pass ‡
5,011.87	0.14	0.37	-1.00	1.00	Pass ‡
5,308.84	0.13	0.38	-1.00	1.00	Pass ‡
5,623.41	0.11	0.40	-1.00	1.00	Pass ‡
5,956.62	0.07	0.40	-1.00	1.00	Pass ‡
6,309.57	0.02	0.39	-1.00	1.00	Pass ‡
6,683.44	-0.08	0.34	-1.25	1.00	Pass ‡
7,079.46	-0.17	0.29	-1.50	1.00	Pass ‡
7,498.94	-0.33	0.21	-1.75	1.00	Pass ‡
7,943.28	-0.55	0.13	-2.00	1.00	Pass ‡
8,413.95	-0.82	-0.02	-2.00	1.00	Pass ‡
8,912.51	-1.19	-0.13	-2.00	1.00	Pass ‡
9,440.61	-1.67	-0.27	-2.00	1.00	Pass ‡
10,000.00	-2.29	-0.49	-2.00	1.00	Pass ‡
10,592.54	-3.06	-0.94		1.00	Pass ‡
11,220.19	-3.71	-1.26		1.00	Pass ‡
11,885.02	-4.25	-1.56		1.00	Pass ‡
12,589.25	-4.78	-2.16		1.00	Pass ‡
13,335.21	-5.42	-2.84		1.00	Pass ‡
14,125.38	-6.00	-3.46		1.00	Pass ‡

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Frequency [Hz]	Actuator [dB]	Random [dB]	Lower limit [dB]	Upper limit [dB]	Result
14,962.36	-6.61	-3.89		1.00	Pass ‡
15,848.93	-7.36	-4.36		1.00	Pass ‡
16,788.04	-8.06	-5.11		1.00	Pass ‡
17,782.80	-8.68	-5.79		1.00	Pass ‡
18,836.49	-9.25	-6.57		1.00	Pass ‡
19,952.62	-9.83	-7.21		1.00	Pass ‡

-- End of measurement results--

Signatory: *Abraham Ortega*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

CALIBRATION CERTIFICATE FOR LARSON DAVIS 824

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2017-206012

Instrument Model 824, Serial Number A1612, was calibrated on 28 Nov 2017. The instrument meets factory specifications per Procedure D0001.8046, IEC 61672-1:2002 Class 1; IEC 60651-2001, 60804-2000 and ANSI S1.4-1983 Type 1 1/3, 1/1 Oct. Filters; S1.11-1986 Type 1C; IEC61260-am1-2001 Class 1 .

Instrument found to be in calibration as received: YES
Date Calibrated: 28 Nov 2017
Calibration due: 28 Nov 2018

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0662/0114	12 Months	8 Dec 2017	2016-204417

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 26 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.
Tested with PRM902 S/N 2104

Signed: 

Technician: Sean Childs

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2017-206010

Instrument Model PRM902, Serial Number 2104, was calibrated on 28 Nov 2017. The instrument meets factory specifications per Procedure D0001.8126.

Instrument found to be in calibration as received: YES
Date Calibrated: 28 Nov 2017
Calibration due: 28 Nov 2018

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0617 / 0104	12 Months	19 Dec 2017	2016-204448
Agilent Technologies	34401A	MY41038589	12 Months	6 Jan 2018	2017000125

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 26 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.

Signed: 

Technician: Sean Childs

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

Calibration Certificate

Certificate Number 2017012481

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	2541	***Procedure Number***	D0001.8387		
Serial Number	7977	***Technician***	Abraham Ortega		
Test Results	**Pass**	***Calibration Date***	29 Nov 2017		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	29 Nov 2018		
Description	1/2 inch Microphone - FF - 200V	***Temperature***	23.5	°C	± 0.01 °C
		Humidity	27.9	%RH	± 0.5 %RH
		Static Pressure	101.49	kPa	± 0.03 kPa

Evaluation Method Tested electrically using an electrostatic actuator.

Compliance Standards Compliant to Manufacturer Specifications.

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	07/17/2017	07/17/2018	001230
Microphone Calibration System	08/30/2017	08/30/2018	001233
1/2" Preamplifier	12/15/2016	12/15/2017	001274
Agilent 34401A DMM	12/06/2016	12/06/2017	001329
Larson Davis CAL250 Acoustic Calibrator	01/04/2017	01/04/2018	003030
1/2" Preamplifier	04/12/2017	04/12/2018	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006507
1/2 inch Microphone - RI - 200V	04/24/2017	04/24/2018	006510
1/2 inch Microphone - RI - 200V	08/09/2017	08/09/2018	006519
Larson Davis 1/2" Preamplifier 7-pin LEMO	09/12/2017	09/12/2018	006530
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/11/2017	08/11/2018	006531

Sensitivity

Measurement	Test Result [mV/Pa]	Lower limit [mV/Pa]	Upper limit [mV/Pa]	Expanded Uncertainty [mV/Pa]	Result
Open Circuit Sensitivity	45.30	42.00	59.50	0.95	Pass

-- End of measurement results--

Capacitance

Measurement	Test Result [pF]				
Capacitance	19.00			‡	

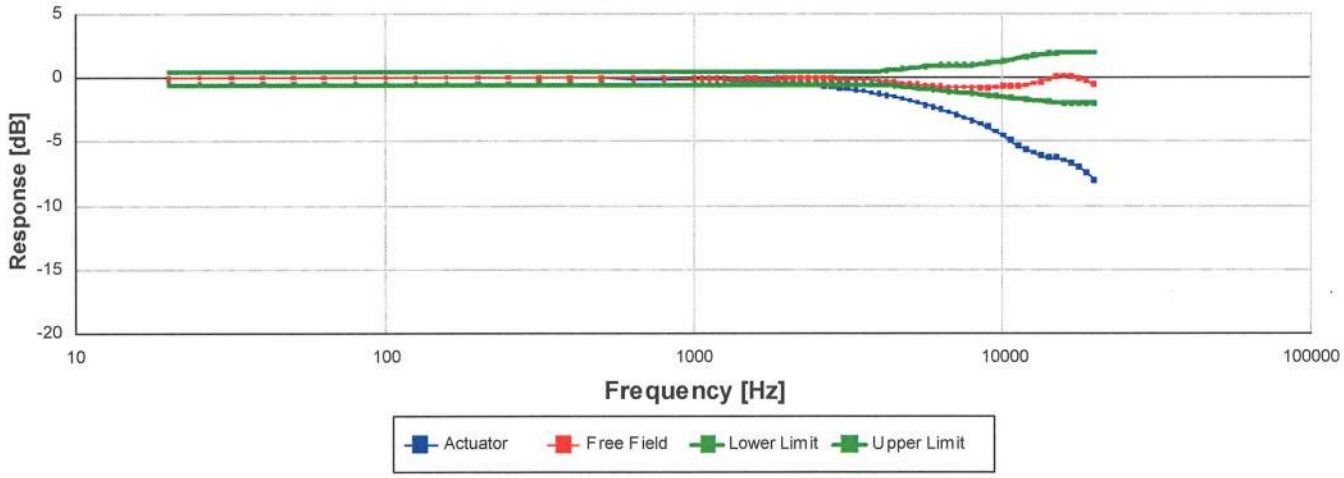
-- End of measurement results--

Lower Limiting Frequency

Measurement	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]		Result
-3 dB Frequency	1.38	1.00	2.00		Pass ‡

-- End of measurement results--

Frequency Response



Data is normalized for 0 dB @ 251.19 Hz.

Frequency [Hz]	Actuator [dB]	Free Field [dB]	Lower limit [dB]	Upper limit [dB]	Result
19.95	-0.01	-0.01	-0.50	0.50	Pass ‡
25.12	0.02	0.02	-0.50	0.50	Pass ‡
31.62	0.03	0.03	-0.50	0.50	Pass ‡
39.81	0.05	0.05	-0.50	0.50	Pass ‡
50.12	0.04	0.04	-0.50	0.50	Pass ‡
63.10	0.03	0.03	-0.50	0.50	Pass ‡
79.43	0.03	0.03	-0.50	0.50	Pass ‡
100.00	0.02	0.02	-0.50	0.50	Pass ‡
125.89	0.02	0.02	-0.50	0.50	Pass ‡
158.49	0.01	0.01	-0.50	0.50	Pass ‡
199.53	0.01	0.01	-0.50	0.50	Pass ‡

Frequency [Hz]	Actuator [dB]	Free Field [dB]	Lower limit [dB]	Upper limit [dB]	Result
251.19	0.00	0.00	-0.50	0.50	Pass ‡
316.23	-0.01	-0.01	-0.50	0.50	Pass ‡
398.11	-0.02	-0.01	-0.50	0.50	Pass ‡
501.19	-0.04	-0.02	-0.50	0.50	Pass ‡
630.96	-0.06	-0.03	-0.50	0.50	Pass ‡
794.33	-0.08	-0.03	-0.50	0.50	Pass ‡
1,000.00	-0.12	-0.05	-0.50	0.50	Pass ‡
1,059.25	-0.14	-0.06	-0.50	0.50	Pass ‡
1,122.02	-0.15	-0.06	-0.50	0.50	Pass ‡
1,188.50	-0.16	-0.07	-0.50	0.50	Pass ‡
1,258.93	-0.18	-0.08	-0.50	0.50	Pass ‡
1,333.52	-0.21	-0.09	-0.50	0.50	Pass ‡
1,412.54	-0.23	-0.09	-0.50	0.50	Pass ‡
1,496.24	-0.24	-0.08	-0.50	0.50	Pass ‡
1,584.89	-0.27	-0.08	-0.50	0.50	Pass ‡
1,678.80	-0.30	-0.09	-0.50	0.50	Pass ‡
1,778.28	-0.33	-0.09	-0.50	0.50	Pass ‡
1,883.65	-0.36	-0.08	-0.50	0.50	Pass ‡
1,995.26	-0.39	-0.06	-0.50	0.50	Pass ‡
2,113.49	-0.43	-0.04	-0.50	0.50	Pass ‡
2,238.72	-0.48	-0.03	-0.50	0.50	Pass ‡
2,371.37	-0.53	-0.02	-0.50	0.50	Pass ‡
2,511.89	-0.58	-0.02	-0.50	0.50	Pass ‡
2,660.73	-0.64	-0.03	-0.50	0.50	Pass ‡
2,818.38	-0.71	-0.05	-0.50	0.50	Pass ‡
2,985.38	-0.80	-0.10	-0.50	0.50	Pass ‡
3,162.28	-0.88	-0.13	-0.50	0.50	Pass ‡
3,349.65	-0.96	-0.15	-0.50	0.50	Pass ‡
3,548.13	-1.05	-0.16	-0.50	0.50	Pass ‡
3,758.37	-1.15	-0.18	-0.50	0.50	Pass ‡
3,981.07	-1.26	-0.20	-0.50	0.50	Pass ‡
4,216.97	-1.38	-0.25	-0.56	0.56	Pass ‡
4,466.84	-1.51	-0.32	-0.63	0.63	Pass ‡
4,731.51	-1.65	-0.39	-0.69	0.69	Pass ‡
5,011.87	-1.79	-0.45	-0.75	0.75	Pass ‡
5,308.84	-1.95	-0.53	-0.81	0.81	Pass ‡
5,623.41	-2.12	-0.59	-0.88	0.88	Pass ‡
5,956.62	-2.29	-0.64	-0.94	0.94	Pass ‡
6,309.57	-2.48	-0.68	-1.00	1.00	Pass ‡
6,683.44	-2.67	-0.70	-1.06	1.00	Pass ‡
7,079.46	-2.88	-0.71	-1.13	1.00	Pass ‡
7,498.94	-3.10	-0.73	-1.19	1.00	Pass ‡
7,943.28	-3.32	-0.76	-1.25	1.00	Pass ‡
8,413.95	-3.56	-0.77	-1.31	1.08	Pass ‡
8,912.51	-3.84	-0.76	-1.38	1.15	Pass ‡
9,440.61	-4.17	-0.75	-1.44	1.23	Pass ‡
10,000.00	-4.50	-0.68	-1.50	1.30	Pass ‡
10,592.54	-4.88	-0.64	-1.56	1.41	Pass ‡
11,220.19	-5.32	-0.67	-1.63	1.53	Pass ‡
11,885.02	-5.59	-0.54	-1.69	1.64	Pass ‡
12,589.25	-5.86	-0.44	-1.75	1.75	Pass ‡
13,335.21	-6.09	-0.32	-1.81	1.81	Pass ‡
14,125.38	-6.23	-0.13	-1.88	1.88	Pass ‡

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Frequency [Hz]	Actuator [dB]	Free Field [dB]	Lower limit [dB]	Upper limit [dB]	Result
14,962.36	-6.26	0.14	-1.94	1.94	Pass ‡
15,848.93	-6.46	0.18	-2.00	2.00	Pass ‡
16,788.04	-6.68	0.11	-2.00	2.00	Pass ‡
17,782.80	-7.00	-0.02	-2.00	2.00	Pass ‡
18,836.49	-7.43	-0.22	-2.00	2.00	Pass ‡
19,952.62	-8.00	-0.50	-2.00	2.00	Pass ‡

-- End of measurement results--

Signatory: *Abraham Ortega*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2017012136

Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	3228	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	17 Nov 2017		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	17 Nov 2018		
		Temperature	25	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	33	%RH	± 3 %RH
		Static Pressure	101.5	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	09/06/2017	09/06/2018	001021
Larson Davis Model 2900 Real Time Analyzer	04/10/2017	04/10/2018	001051
Microphone Calibration System	08/08/2017	08/08/2018	005446
1/2" Preamplifier	10/05/2017	10/05/2018	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/08/2017	08/08/2018	006507
1/2 inch Microphone - RI - 200V	04/24/2017	04/24/2018	006510
Pressure Transducer	06/01/2017	06/01/2018	007310

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
94	101.5	94.04	93.80	94.20	0.14	Pass
114	101.3	114.02	113.80	114.20	0.13	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
94	101.5	1,000.18	990.00	1,010.00	0.20	Pass
114	101.3	1,000.17	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
94	101.5	0.37	0.00	2.00	0.25	Pass
114	101.3	0.33	0.00	2.00	0.25	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 25 °C, 33 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
108.0	108.1	-0.02	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.01	-0.30	0.30	0.04 ‡	Pass
83.0	83.0	-0.01	-0.30	0.30	0.04 ‡	Pass
74.0	74.0	-0.06	-0.30	0.30	0.04 ‡	Pass
65.0	65.0	-0.17	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 25 °C, 33 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
108.0	108.1	0.01	-10.00	10.00	0.20 ‡	Pass
83.0	83.0	0.00	-10.00	10.00	0.20 ‡	Pass
74.0	74.0	0.00	-10.00	10.00	0.20 ‡	Pass
65.0	65.0	0.00	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 25 °C, 33 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
74.0	74.0	0.40	0.00	2.00	0.25 ‡	Pass
108.0	108.1	0.32	0.00	2.00	0.25 ‡	Pass
101.3	101.3	0.33	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.34	0.00	2.00	0.25 ‡	Pass
83.0	83.0	0.37	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.43	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

CALIBRATION CERTIFICATE FOR LARSON DAVIS 831

Calibration Certificate

Certificate Number 2018004969

Customer:

LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	831	***Procedure Number***	D0001.8378	
Serial Number	0002441	***Technician***	Ron Harris	
Test Results	**Pass**	***Calibration Date***	14 May 2018	
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	14 May 2019	
		Temperature	23.65 °C	± 0.25 °C
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.314	***Humidity***	50.8 %RH	± 2.0 %RH
		Static Pressure	86.11 kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRM831 S/N 017139 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Calibration Certificate

Certificate Number 2018004967
Customer:
LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	PRM831	***Procedure Number***	D0001.8383		
Serial Number	017139	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	14 May 2018		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	14 May 2019		
		Temperature	23.74	°C	± 0.01 °C
Description	Larson Davis 1/2" Preamplifier for Model 831 Type 1	***Humidity***	51.6	%RH	± 0.5 %RH
		Static Pressure	86.14	kPa	± 0.03 kPa

Evaluation Method Tested electrically using a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

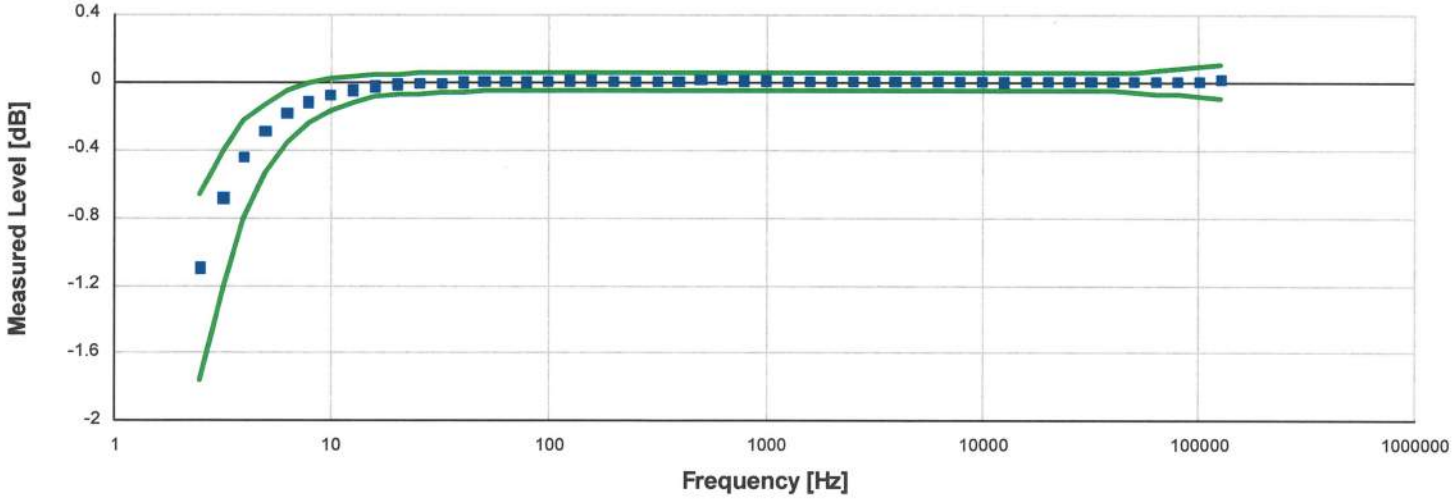
This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	03/07/2018	03/07/2019	003003
Hart Scientific 2626-S Humidity/Temperature Sensor	06/11/2017	06/11/2018	006943
Agilent 34401A DMM	06/28/2017	06/28/2018	007165
SRS DS360 Ultra Low Distortion Generator	10/05/2017	10/05/2018	007167

Frequency Response



Frequency response electrically tested at 120.0 dB re 1 µV

Frequency [Hz]	Test Result [dB re 1 kHz]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
2.50	-1.10	-1.76	-0.66	0.07	Pass
3.20	-0.69	-1.20	-0.40	0.08	Pass
4.00	-0.45	-0.81	-0.23	0.08	Pass
5.00	-0.29	-0.53	-0.13	0.07	Pass
6.30	-0.19	-0.36	-0.05	0.07	Pass
7.90	-0.12	-0.24	-0.01	0.07	Pass
10.00	-0.08	-0.17	0.03	0.06	Pass
12.60	-0.05	-0.13	0.04	0.06	Pass
15.80	-0.03	-0.09	0.04	0.06	Pass
20.00	-0.01	-0.08	0.05	0.06	Pass
25.10	-0.01	-0.07	0.05	0.06	Pass
31.60	-0.01	-0.07	0.05	0.06	Pass
39.80	0.00	-0.06	0.05	0.06	Pass
50.10	0.00	-0.06	0.05	0.06	Pass
63.10	0.00	-0.05	0.05	0.06	Pass
79.40	0.00	-0.05	0.05	0.06	Pass
100.00	0.00	-0.05	0.05	0.06	Pass
125.90	0.01	-0.05	0.05	0.06	Pass
158.50	0.01	-0.05	0.05	0.06	Pass
199.50	0.01	-0.05	0.05	0.06	Pass
251.20	0.00	-0.05	0.05	0.06	Pass
316.20	0.00	-0.05	0.05	0.06	Pass
398.10	0.00	-0.05	0.05	0.06	Pass
501.20	0.01	-0.05	0.05	0.06	Pass
631.00	0.01	-0.05	0.05	0.06	Pass
794.30	0.01	-0.05	0.05	0.06	Pass
1,000.00	0.01	-0.05	0.05	0.06	Pass
1,258.90	0.00	-0.05	0.05	0.06	Pass
1,584.90	0.00	-0.05	0.05	0.06	Pass
1,995.30	0.00	-0.05	0.05	0.06	Pass
2,511.90	0.00	-0.05	0.05	0.06	Pass
3,162.30	0.00	-0.05	0.05	0.06	Pass

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Frequency [Hz]	Test Result [dB re 1 kHz]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,981.10	0.00	-0.05	0.05	0.06	Pass
5,011.90	0.00	-0.05	0.05	0.06	Pass
6,309.60	0.00	-0.05	0.05	0.06	Pass
7,943.30	0.00	-0.05	0.05	0.06	Pass
10,000.00	0.00	-0.05	0.05	0.06	Pass
12,589.30	0.00	-0.05	0.05	0.06	Pass
15,848.90	0.00	-0.05	0.05	0.06	Pass
19,952.60	0.00	-0.05	0.05	0.06	Pass
25,118.90	0.00	-0.05	0.05	0.06	Pass
31,622.80	0.00	-0.05	0.05	0.06	Pass
39,810.70	0.00	-0.05	0.05	0.06	Pass
50,118.70	0.00	-0.06	0.06	0.07	Pass
63,095.70	0.00	-0.07	0.07	0.07	Pass
79,432.80	0.00	-0.08	0.08	0.07	Pass
100,000.00	0.01	-0.09	0.09	0.07	Pass
125,892.50	0.02	-0.10	0.10	0.24	Pass

Gain Measurement

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Output Gain @ 1 kHz	-0.13	-0.45	-0.03	0.03	Pass

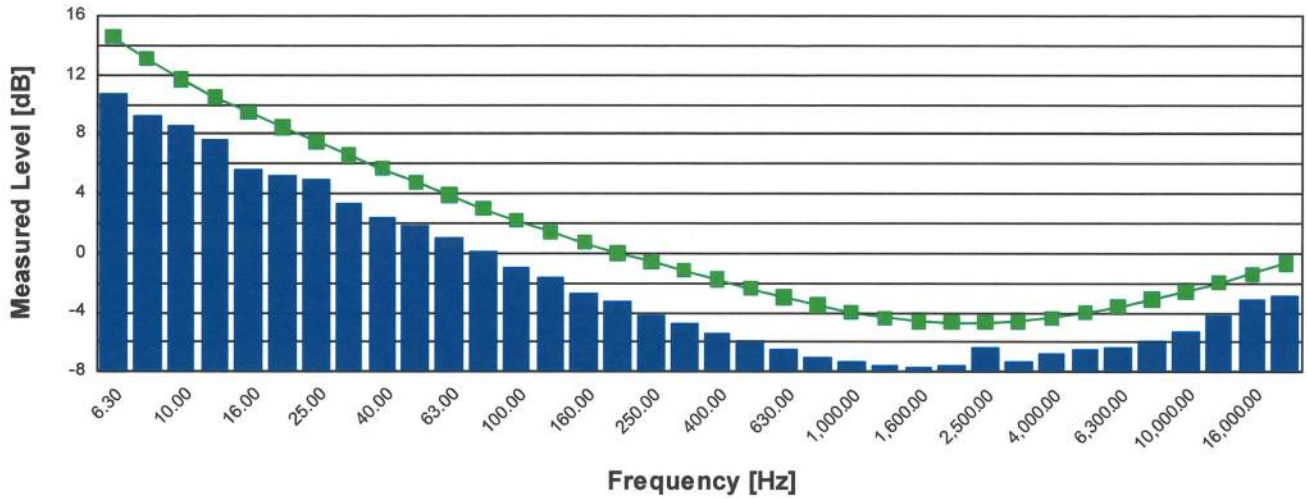
-- End of measurement results--

DC Bias Measurement

Measurement	Test Result [V]	Lower limit [V]	Upper limit [V]	Expanded Uncertainty [V]	Result
DC Voltage	18.07	15.50	18.50	0.04	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



Frequency [Hz]	Test Result [dB re 1 µV]	Upper limit [dB re 1 µV]	Result
6.30	10.70	14.60	Pass
8.00	9.30	13.10	Pass
10.00	8.60	11.70	Pass
12.50	7.70	10.50	Pass
16.00	5.70	9.50	Pass
20.00	5.30	8.50	Pass
25.00	5.00	7.50	Pass
31.50	3.30	6.60	Pass
40.00	2.40	5.70	Pass
50.00	1.90	4.80	Pass
63.00	1.00	3.90	Pass
80.00	0.10	3.00	Pass
100.00	-1.00	2.20	Pass
125.00	-1.60	1.40	Pass
160.00	-2.70	0.70	Pass
200.00	-3.30	0.00	Pass
250.00	-4.20	-0.60	Pass
315.00	-4.70	-1.20	Pass
400.00	-5.40	-1.80	Pass
500.00	-6.00	-2.40	Pass
630.00	-6.50	-3.00	Pass
800.00	-7.00	-3.50	Pass
1,000.00	-7.30	-4.00	Pass
1,250.00	-7.60	-4.40	Pass
1,600.00	-7.70	-4.60	Pass
2,000.00	-7.60	-4.70	Pass
2,500.00	-6.30	-4.70	Pass
3,150.00	-7.30	-4.60	Pass
4,000.00	-6.80	-4.40	Pass
5,000.00	-6.50	-4.00	Pass
6,300.00	-6.40	-3.60	Pass
8,000.00	-6.00	-3.10	Pass
10,000.00	-5.30	-2.60	Pass
12,500.00	-4.20	-2.00	Pass
16,000.00	-3.10	-1.40	Pass
20,000.00	-2.80	-0.70	Pass

-- End of measurement results--

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Self-generated Noise

Bandwidth	Test Result [µV]	Test Result [dB re 1 µV]	Upper limit [dB re 1 µV]	Result
A-weighted (1 Hz - 20 kHz)	1.88	5.50	8.00	Pass
Broadband (1 Hz - 20 kHz)	4.32	12.70	15.50	Pass

-- End of measurement results--

Signatory: *Ron Harris*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2018004977

Customer:

LSA Associates Inc
20 Executive Park
Irvine, CA 92614, United States

Model Number	831		***Procedure Number***	D0001.8384	
Serial Number	0002441		***Technician***	Ron Harris	
Test Results	**Pass**		***Calibration Date***	15 May 2018	
Initial Condition	AS RECEIVED same as shipped		***Calibration Due***	15 May 2019	
Description	Larson Davis Model 831 Class 1 Sound Level Meter Firmware Revision: 2.314		***Temperature***	22.92 °C	± 0.25 °C
			Humidity	50.7 %RH	± 2.0 %RH
			Static Pressure	86.31 kPa	± 0.13 kPa

Evaluation Method ***Tested with:*** ***Data reported in dB re 20 µPa.***

Larson Davis PRM831. S/N 017139
PCB 377B02. S/N 120629
Larson Davis CAL200. S/N 9079
Larson Davis CAL291. S/N 0108

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 1	ANSI S1.4-2014 Class 1
IEC 60804:2000 Type 1	ANSI S1.4 (R2006) Type 1
IEC 61252:2002	ANSI S1.11 (R2009) Class 1
IEC 61260:2001 Class 1	ANSI S1.25 (R2007)
IEC 61672:2013 Class 1	ANSI S1.43 (R2007) Type 1

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to

1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2017-09-19	2018-09-19	001250
SRS DS360 Ultra Low Distortion Generator	2017-06-23	2018-06-23	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2017-06-11	2018-06-11	006943
Larson Davis CAL200 Acoustic Calibrator	2017-07-25	2018-07-25	007027
Larson Davis Model 831	2018-02-28	2019-02-28	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2018-03-07	2019-03-07	007185

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.01	113.80	114.20	0.14	Pass

As Received Level: 115.32
Adjusted Level: 114.01

-- End of measurement results--

Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.03	-0.20	-1.20	0.80	0.23	Pass
1000	0.17	0.00	-0.70	0.70	0.23	Pass
8000	-4.86	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted, 20 dB gain	40.14

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

CALIBRATION CERTIFICATE FOR NOISEPRO DLX

INSTRUMENT CALIBRATION REPORT

Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID R10248
Description Quest NoisePro DLX Dosimeter
Calibrated 1/23/2018

Manufacturer Quest
Model Number NoisePro DLX Dosimeter
Serial Number NXG060121
Location New Jersey
Temp 70

Classification
Status pass
Frequency Yearly EOM
Department Lab
Humidity 31

Calibration Specifications

Group # 1
Group Name Acoustic Tests Performed
Test Performed: Yes **As Found Result: Fail** **As Left Result: Pass**

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
B&K 4226	Brüel & Kjær 4226	Brüel & Kjær	2590968	4/24/2017	4/24/2018
B&K 4228	Brüel & Kjær 4228	Brüel & Kjær	2667476	4/5/2017	4/5/2018

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Kevin Cole

Advanced Labs, Inc. hereby certifies that this instrument is calibrated and functions to meet the manufacture's specifications using NIST traceable standards, or is derived from accepted values of physical constants.

INSTRUMENT CALIBRATION REPORT

Advanced Labs, Inc.

Pine Environmental Services, Inc

Instrument ID R9067
Description Quest QC-10 Acoustic Calibrator
Calibrated 1/30/2018

Manufacturer Quest
Model Number QC-10
Serial Number QIF050044
Location New Jersey
Temp 70

Classification
Status pass
Frequency Yearly EOM
Department Lab
Humidity 29

Calibration Specifications

Group # 1
Group Name Acoustic Tests Performed
Test Performed: Yes **As Found Result: Fail** **As Left Result: Pass**

Test Instruments Used During the Calibration

Test Instrument ID	Description	Manufacturer	Serial Number	(As Of Cal Entry Date) Last Cal Date	Next Cal Date
B&K 4226	Brüel & Kjær 4226	Brüel & Kjær	2590968	4/24/2017	4/24/2018
B&K 4228	Brüel & Kjær 4228	Brüel & Kjær	2667476	4/5/2017	4/5/2018
SOUNDPRO DL-1-1/3	3M SoundPro DL-1-1/3	Quest Technologies	BLL070002	1/8/2018	1/8/2019

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Kevin Cole

Advanced Labs, Inc. hereby certifies that this instrument is calibrated and functions to meet the manufacture's specifications using NIST traceable standards, or is derived from accepted values of physical constants.