

West Santa Ana Branch Transit Corridor

Final Noise and Vibration Impact Analysis Report



Metro®

WEST SANTA ANA BRANCH TRANSIT CORRIDOR PROJECT

Final Noise and Vibration Impact Analysis Report

Prepared for:



Metro[®]

Los Angeles County
Metropolitan Transportation Authority

Prepared by:



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TABLE OF CONTENTS

1	INTRODUCTION	1-1
1.1	Study Background.....	1-1
1.2	Alternatives Evaluation, Screening, and Selection Process	1-1
1.3	Draft Environmental Impact Statement/Environmental Impact Report.....	1-2
1.4	Report Purpose and Structure.....	1-4
1.5	General Background	1-4
1.5.1	Noise Definitions, Characteristics, and Effects.....	1-4
1.5.2	Noise Associated with Light Rail Transit Systems	1-7
1.5.3	Vibration Definitions, Characteristics, and Effects	1-8
1.5.4	Vibration Associated with Light Rail Transit Systems.....	1-9
1.6	Methodology.....	1-10
1.6.1	Operational Noise	1-10
1.6.2	Operations – Vibration.....	1-20
2	PROJECT DESCRIPTION	2-1
2.1	No Build Alternative	2-4
2.2	Locally Preferred Alternative.....	2-6
2.2.1	Refinements to the Locally Preferred Alternative	2-6
2.2.2	Alignment Configuration.....	2-8
2.2.3	Design Option – Close 186th Street	2-12
2.2.4	Maintenance and Storage Facility.....	2-14
3	REGULATORY FRAMEWORK.....	3-1
3.1	Federal.....	3-1
3.1.1	Transit Noise	3-1
3.1.2	Construction Noise	3-5
3.1.3	Transit Vibration.....	3-5
3.1.4	Construction Vibration.....	3-7
3.2	State	3-7
3.2.1	Noise.....	3-7
3.2.2	Vibration	3-7
3.3	Regional	3-8
3.3.1	Noise.....	3-8
3.3.2	Vibration	3-8
3.4	Local	3-8
3.4.1	City of Los Angeles	3-8
3.4.2	City of Vernon	3-9
3.4.3	City of Huntington Park	3-10
3.4.4	County of Los Angeles.....	3-10
3.4.5	City of Bell.....	3-14
3.4.6	City of Cudahy.....	3-15
3.4.7	City of South Gate	3-16
3.4.8	City of Downey.....	3-18
3.4.9	City of Paramount.....	3-21
3.4.10	City of Bellflower	3-22
3.4.11	City of Artesia.....	3-22
3.4.12	City of Cerritos	3-24

3.4.13	Los Angeles Metro Groundborne Vibration	3-25
4	AFFECTED ENVIRONMENT/EXISTING CONDITIONS.....	4-1
4.1	Noise	4-1
4.2	Vibration.....	4-4
5	ENVIRONMENTAL CONSEQUENCES /ENVIRONMENTAL IMPACTS	5-1
5.1	No Build Alternative	5-1
5.2	Locally Preferred Alternative.....	5-2
5.2.1	Light Rail Transit (At-grade and Aerial)	5-2
5.2.2	Ancillary Facilities	5-34
5.2.3	Parking Facilities.....	5-34
5.2.4	Freight Track Relocation	5-39
5.3	Design Option: Close 186th Street	5-49
5.3.1	Noise.....	5-49
5.3.2	Vibration	5-49
5.4	Maintenance and Storage Facility	5-53
5.4.1	Noise.....	5-53
5.4.2	Vibration	5-55
5.5	United States Army Corps of Engineers Facilities	5-55
5.6	California Department of Transportation Facilities.....	5-55
6	CEQA DETERMINATION.....	6-1
6.1	Threshold NOI-1: Would the Project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances?.....	6-1
6.1.1	No Project Alternative	6-1
6.1.2	Locally Preferred Alternative	6-1
6.1.3	Design Option: Close 186th Street.....	6-3
6.1.4	Maintenance and Storage Facilities.....	6-4
6.2	Threshold NOI-2: Would the Project result in generation of excessive groundborne vibration or groundborne noise levels?.....	6-4
6.2.1	No Project Alternative	6-4
6.2.2	Locally Preferred Alternative	6-5
6.2.3	Design Option: Close 186th Street.....	6-5
6.2.4	Maintenance and Storage Facility.....	6-6
6.3	Threshold NOI-3: For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the project area to excessive noise levels?.....	6-6
6.3.1	No Project Alternative	6-6
6.3.2	Locally Preferred Alternative, Maintenance and Storage Facility.....	6-6
7	CONSTRUCTION IMPACTS.....	7-1
7.1	Construction Activities	7-1
7.2	Construction Methodology.....	7-1
7.2.1	Noise Model	7-3
7.2.2	Vibration Model.....	7-3

7.3	Construction Impacts	7-5
7.3.1	No Build Alternative	7-5
7.3.2	Locally Preferred Alternative	7-8
7.3.3	Design Option: Close 186th Street	7-12
7.3.4	Maintenance and Storage Facility.....	7-12
7.4	U.S. Army Corps of Engineers Facilities	7-13
7.4.1	Noise.....	7-13
7.4.2	Vibration	7-13
7.5	California Department of Transportation Facilities.....	7-13
7.5.1	Noise.....	7-13
7.5.2	Vibration	7-13
7.6	California Environmental Quality Act Determination	7-13
7.6.1	Threshold NOI-CON-1: Would the Project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances?.....	7-13
7.6.2	Threshold NOI-CON-2: Would the Project result in generation of excessive GBV or GBN levels?	7-15
7.6.3	Threshold NOI-CON-3: For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	7-17
8	PROJECT MEASURES AND MITIGATION MEASURES	8-1
8.1	Project Measures	8-1
8.1.1	Noise (Operation)	8-1
8.1.2	Vibration (Construction)	8-2
8.2	Mitigation Measures	8-2
8.2.1	Operation.....	8-2
8.2.2	Construction	8-9
8.3	Impacts Remaining After Mitigation.....	8-11
8.3.1	Locally Preferred Alternative	8-11
8.3.2	Maintenance and Storage Facility – Mitigated.....	8-37
8.3.3	Design Option – Mitigated	8-37
8.3.4	Construction – Mitigated	8-37
9	REFERENCES.....	9-1

Appendices

APPENDIX A	UNMITIGATED LRT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS
APPENDIX B	UNMITIGATED VIBRATION CLUSTERS
APPENDIX C	UNMITIGATED ANCILLARY EQUIPMENT CLUSTERS AND IMPACTS
APPENDIX D	UNMITIGATED PARKING FACILITY CLUSTERS AND IMPACTS
APPENDIX E	UNMITIGATED FREIGHT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS
APPENDIX F	UNMITIGATED MAINTENANCE AND STORAGE FACILITY NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS
APPENDIX G	MITIGATED LRT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS
APPENDIX H	MITIGATED VIBRATION CLUSTERS
APPENDIX I	MITIGATED FREIGHT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS
APPENDIX J	NOISE CALCULATIONS
APPENDIX K	DANTE VALVE COMPANY VIBRATION ASSESSMENT

Tables

Table 1.1.	LRT Operating Schedule	1-12
Table 1.2.	LRT Daytime and Nighttime Train Volumes	1-13
Table 1.3.	Screening Distances for Vibration Assessment	1-20
Table 2.1.	No Build Alternative – Existing Transportation Network and Planned Improvements	2-4
Table 2.2.	Summary of LPA Components	2-8
Table 3.1.	Land Use Categories and Metrics for Transit Noise Impact Criteria	3-1
Table 3.2.	Levels of Impact	3-2
Table 3.3.	Noise Impact Criteria for Transit Operations	3-4
Table 3.4.	FTA Construction Noise Impact Criteria	3-5
Table 3.5.	Groundborne Vibration Impact Criteria for General Assessment	3-6
Table 3.6.	Groundborne Vibration Impact Criteria for Special Buildings	3-6
Table 3.7.	Construction Vibration Damage Risk Criteria	3-7
Table 3.8.	City of Los Angeles – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-8
Table 3.9.	City of Vernon – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-9
Table 3.10.	City of Huntington Park – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-10
Table 3.11.	County of Los Angeles – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-11
Table 3.12.	City of Bell – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-14
Table 3.13.	City of Cudahy – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-15
Table 3.14.	City of South Gate – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-17
Table 3.15.	City of Downey – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-18
Table 3.16.	City of Paramount – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-21
Table 3.17.	City of Bellflower – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-22
Table 3.18.	City of Artesia – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-23
Table 3.19.	City of Cerritos – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies	3-25
Table 4.1.	Short-Term Noise Monitoring Locations	4-1
Table 4.2.	Long-Term Noise Monitoring Locations	4-4
Table 5.1.	Audible Warnings Noise Assessment of the LPA	5-3
Table 5.2.	Category 2 Land Use Light Rail Noise Assessment of the LPA	5-7

Table 5.3.	Category 3 Land Use Light Rail Noise Assessment of the LPA.....	5-22
Table 5.4.	Vibration Category 2 Land Use Light Rail At-Grade/Aerial Vibration Assessment – Locally Preferred Alternative	5-25
Table 5.5.	Vibration Category 3 Land Use Light Rail At-Grade/Aerial Vibration Assessment – Locally Preferred Alternative	5-33
Table 5.6.	TPSS Noise Impact Assessment	5-35
Table 5.7.	Parking Facility Noise Impact Assessment.....	5-38
Table 5.8.	Category 2 Land Use Freight Track Relocation Noise Assessment	5-40
Table 5.9.	Category 3 Land Use Freight Track Relocation Noise Assessment	5-45
Table 5.10.	Relocated Freight Track Vibration Assessment – Locally Preferred Alternative.....	5-46
Table 5.11.	Category 2 Land Use Light Rail Noise Assessment of the Design Option	5-50
Table 5.12.	Category 3 Land Use Light Rail Noise Assessment – Design Option	5-52
Table 5.13.	Maintenance and Storage Facility Noise Assessment.....	5-53
Table 7.1.	Construction Standards by Jurisdiction	7-1
Table 7.2.	Construction Vibration Damage Risk Criteria.....	7-2
Table 7.3.	Equipment Vibration Emission Levels	7-4
Table 7.4.	Construction Vibration Emission Levels and Distance to Impact Threshold.....	7-4
Table 7.5.	Predicted Construction Vibration at Listed and Eligible Historic Properties	7-6
Table 7.6.	Construction Noise by Phase	7-9
Table 7.7.	Predicted Construction Vibration Levels.....	7-11
Table 7.8.	Predicted Construction Vibration Levels.....	7-12
Table 8.1.	NOI PM-1 Crossing Signal Bells Shroud Locations	8-1
Table 8.2.	NOI PM-2 Gate-Down-Bell Stop Variance Locations	8-1
Table 8.3.	NOI-1 LRT Soundwall Locations	8-2
Table 8.4.	NOI-2 Low Impact Frog Locations	8-5
Table 8.5.	NOI-3 Wheel Squeal Wayside Friction Applicator Locations	8-6
Table 8.6.	NOI-4 TPSS Locations	8-7
Table 8.7.	NOI-5 Freight Track Relocation Soundwalls.....	8-7
Table 8.8.	VIB-1 Ballast Mat or Resilient Rail Fasteners.....	8-8
Table 8.9.	VIB-2 Low Impact Frogs.....	8-8
Table 8.10.	VIB-6 Construction Restrictions near Historic Properties.....	8-11
Table 8.11.	Mitigated LRT Noise Assessment	8-13
Table 8.12.	Mitigated Category 3 Land Use LRT Noise Assessment.....	8-24
Table 8.13.	Sensitive Land Uses Where Mitigation is Not Feasible or Reasonable	8-24
Table 8.14.	Mitigated LRT Vibration – Locally Preferred Alternative.....	8-25
Table 8.15.	Mitigated Category 2 Land Use Freight Track Relocation Noise Assessment	8-32
Table 8.16.	Mitigated Category 3 Land Use Freight Track Relocation Noise Assessment	8-36

Table 8.17. Mitigated LRT Noise Assessment – Design Option.....	8-38
Table 8.18. Mitigated Category 3 LRT Noise – Design Option	8-40

Figures

Figure 1-1. Draft EIS/EIR Build Alternatives	1-3
Figure 1-2. A-Weighted Decibel Scale	1-5
Figure 1-3. Typical Levels of Groundborne Vibration.....	1-9
Figure 1-4. Noise Barrier Effectiveness Illustration.....	1-18
Figure 1-5. Noise Barrier Path Length Illustration	1-18
Figure 2-1. Locally Preferred Alternative Alignment by Grade	2-2
Figure 2-2. Existing Rail Right-of-Way Ownership.....	2-3
Figure 2-3. Freeway Crossings	2-9
Figure 2-4. Locally Preferred Alternative and Design Option: Close 186th Street	2-13
Figure 2-5. Maintenance and Storage Facility Site	2-15
Figure 3-1. Noise Impact Criteria for Transit Projects	3-3

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AA	Alternatives Analysis
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNC	computer-numerically-controlled
CPUC	California Public Utilities Commission
dB	decibel
dBA	A-weighted decibel
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GBN	groundborne noise
GBV	groundborne vibration
GIS	Geographic Information System
HVAC	heating-ventilation-air conditioning
LA	Los Angeles
L_{dn}	day-night noise level
L_{eq}	equivalent noise level
L_{max}	maximum noise level
LOSSAN	Los Angeles—San Diego—San Luis Obispo Rail Corridor
LPA	Locally Preferred Alternative
LRT	light rail transit
LRTP	Long Range Transportation Plan
LRV	light rail vehicle
Metro	Los Angeles County Metropolitan Transportation Authority
MFR	multi-family residential
mph	miles per hour
MSF	Maintenance and Storage Facility
NEPA	National Environmental Policy Act

Acronym	Definition
NOP	Notice to Proceed
PA	Public Address
PEROW	Pacific Electric Right-of-Way
PM	Project Measure
PPV	peak particle velocity
Project	West Santa Ana Branch Transit Corridor Project
RCNM	Roadway Construction Noise Model
RMS	Root Mean Square
ROW	Right-of-Way
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
SCAG	Southern California Association of Governments
SEL	Sound Exposure Level
SFR	single-family residential
TPSS	traction power substation
UPRR	Union Pacific Railroad
USACE	United States Army Corps of Engineers
VdB	decibel notation
WSAB	West Santa Ana Branch

1 INTRODUCTION

1.1 Study Background

The West Santa Ana Branch (WSAB) Transit Corridor (Project) is a proposed light rail transit (LRT) line. In January 2022, the Los Angeles County Metropolitan Transportation Authority (Metro) Board of Directors identified the Locally Preferred Alternative (LPA), which will extend approximately 14.5 miles from the northern terminus in the City of Los Angeles/Florence-Firestone community of Los Angeles (LA) County to the southern terminus in the City of Artesia, traversing densely populated, low-income, and heavily transit-dependent communities. The Project will provide reliable, fixed-guideway transit service that will increase mobility and connectivity for historically underserved, transit-dependent, and environmental justice communities; reduce travel times on local and regional transportation networks; and accommodate substantial future employment and population growth.

1.2 Alternatives Evaluation, Screening, and Selection Process

A wide range of potential alternatives have been considered and screened through the alternatives analysis processes. In March 2010, the Southern California Association of Governments (SCAG) initiated the Pacific Electric Right-of-Way (PEROW)/WSAB Alternatives Analysis (AA) Study (SCAG 2013) in coordination with the relevant cities, the Orangeline Development Authority (renamed to Eco-Rapid Transit, which has since been dissolved), the Gateway Cities Council of Governments, Metro, the Orange County Transportation Authority, and the owners of the right-of-way (ROW)—Union Pacific Railroad (UPRR), BNSF Railway, and the Ports of Los Angeles and Long Beach. The AA Study evaluated a wide variety of transit connections and modes for a broader 34-mile corridor from Union Station in downtown Los Angeles to the City of Santa Ana in Orange County. In February 2013, SCAG completed the PEROW/WSAB Corridor Alternatives Analysis Report¹ and recommended two LRT alternatives for further study: West Bank 3 and the East Bank.

Following completion of the AA, Metro completed the *West Santa Ana Branch Transit Corridor Project Technical Refinement Study* (Metro 2015) in 2015 focusing on the design and feasibility of five key issue areas along the 19-mile portion of the WSAB Transit Corridor within LA County:

- Access to Union Station in downtown Los Angeles
- Northern Section options
- Huntington Park Alignment and Stations
- New C (Green) Line Station
- Southern Terminus at Pioneer Station in Artesia

In September 2016, Metro initiated the WSAB Transit Corridor Environmental Study (Environmental Study) with the goal of environmentally clearing the Project under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

¹ Initial concepts evaluated in the SCAG report included transit connections and modes for the 34-mile corridor from Union Station in downtown Los Angeles to the City of Santa Ana. Modes included low-speed magnetic levitation (maglev) heavy rail, light rail, and bus rapid transit.

Metro issued a Notice of Preparation (NOP) on May 25, 2017, with a revised NOP issued on June 14, 2017, extending the comment period to 60 days. In June 2017, Metro held public scoping meetings in the Cities of Bellflower, Los Angeles, South Gate, and Huntington Park. Metro provided project updates and information to stakeholders with the intent to receive comments and questions through a comment period that ended in August 2017. A total of 1,122 comments were received during the public scoping period from May through August 2017. The comments focused on concerns regarding the Northern Alignment options, with specific concerns related to potential impacts to Alameda Street with an aerial alignment. Given potential visual and construction issues raised through public scoping, additional Northern Alignment concepts were evaluated.

In February 2018, the Metro Board of Directors approved further study of the alignment in the Northern Section due to community input during the 2017 scoping meetings. A second alternatives screening process was initiated to evaluate the original four Northern Alignment options and four new Northern Alignment concepts. The *Final Northern Alignment Alternatives and Concepts Updated Screening Report* was completed in May 2018 (Metro 2018). The alternatives were further refined and, based on the findings of the second screening analysis and the input gathered from the public outreach meetings, the Metro Board of Directors approved Alternatives E and G for further evaluation.

On July 11, 2018, Metro issued a revised and recirculated CEQA NOP, thereby initiating a scoping comment period. The purpose of the revised NOP was to inform the public of the Metro Board's decision to carry forward Alternatives E and G into the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). During the scoping period, one agency and three public scoping meetings were held in the Cities of Los Angeles, Cudahy, and Bellflower. The meetings provided project updates and information to stakeholders with the intent to receive comments and questions to support the environmental process. The comment period for scoping ended on August 24, 2018; more than 250 comments were received.

Following the July 2018 scoping period, a number of project refinements were made to address comments received, including additional grade separations, removing certain stations with low ridership, and removing the Bloomfield extension option. The Metro Board adopted these project refinements at its November 2018 meeting.

1.3 Draft Environmental Impact Statement/Environmental Impact Report

The Draft EIS/EIR and corresponding technical studies included evaluation of a No Build Alternative, four Build Alternatives, two station design options, and two site options for a maintenance and storage facility (MSF):

- Alternative 1: Los Angeles Union Station to Pioneer Station
 - Design Option 1: Los Angeles Union Station – Metropolitan Water District
 - Design Option 2: Addition of Little Tokyo Station
- Alternative 2: 7th St/Metro Center to Pioneer Station
- Alternative 3: Slauson/A Line (Blue) to Pioneer Station
- Alternative 4: I-105/C Line (Green) to Pioneer Station

- Paramount MSF site option
- Bellflower MSF site option

Figure 1-1 illustrates the Build Alternatives evaluated in the Draft EIS/EIR.

Figure 1-1. Draft EIS/EIR Build Alternatives



Source: Metro 2020

The Draft EIS/EIR was released for public review and comment in July 2021 for 45 days, which was then extended to a 60-day public review period through September 28, 2021, to provide additional time for the public to respond. Notices of the Draft EIS/EIR release were done in accordance with CEQA and NEPA regulations and included two rounds of notices to announce details of the release of the Draft EIS/EIR, as well as to provide information on the public hearings and comment methods. The Notice of Availability was distributed to 261 agencies via USB drives, which included an electronic copy of the Draft EIS/EIR.

During the 60-day public review period, Metro hosted four virtual public hearings, four virtual community information sessions, and over 19 pop-up booths for in-person engagement at locations throughout the project corridor. In addition, Metro held approximately 20 briefings to key stakeholders, elected officials, corridor cities, and other agencies. In total, approximately 450 submissions were received during the public review and comment period. In January 2022, the Metro Board of Directors identified Alternative 3 as the LPA. The LPA extends from a northern terminus at the Slauson/A Line Station located in the City of Los Angeles/Florence-Firestone unincorporated area of LA County to a southern terminus at the Pioneer Station located in Artesia for a total of 14.5 miles. With identification of the LPA, the Metro Board also identified the MSF site option located in the City of Bellflower as a component of the LPA.

1.4 Report Purpose and Structure

This Impact Analysis Report examines the environmental effects of the Project as it relates to noise and vibration. The report is organized into nine sections:

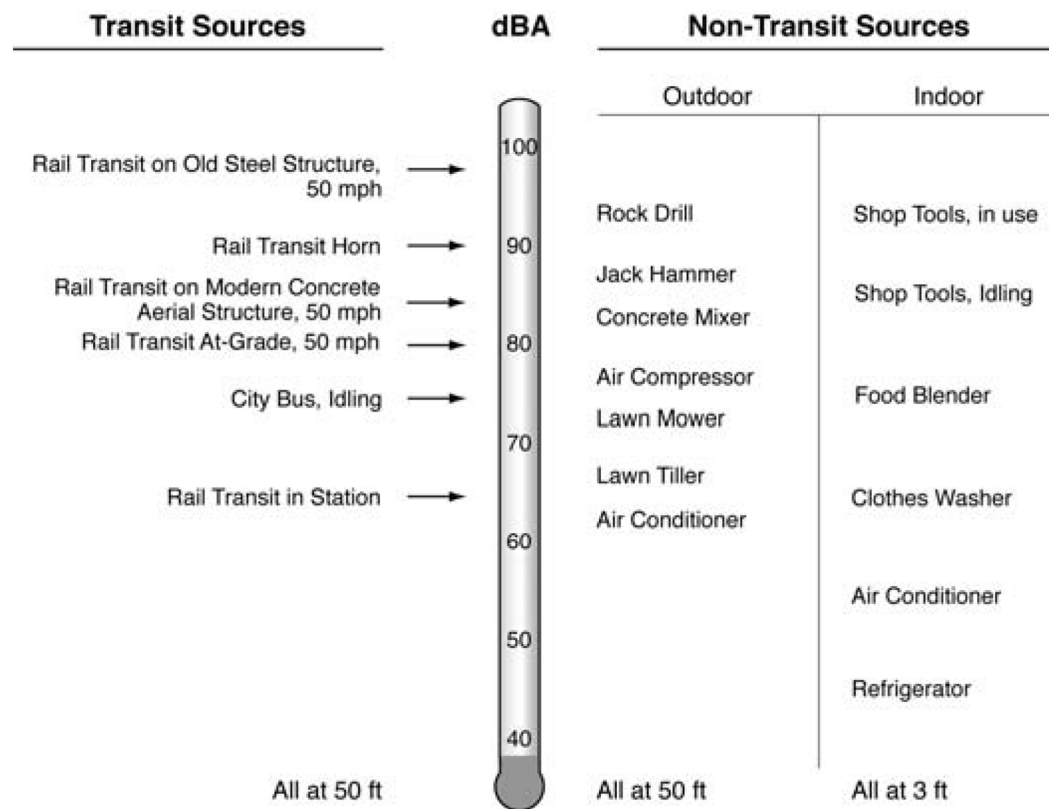
- Section 1 – Introduction
- Section 2 – Project Description
- Section 3 – Regulatory Framework
- Section 4 – Affected Environment/Existing Conditions
- Section 5 – Environmental Consequences /Environmental Impacts
- Section 6 – CEQA Determination
- Section 7 – Construction Impacts
- Section 8 – Project Measures and Mitigation Measures
- Section 9 – References

1.5 General Background

1.5.1 Noise Definitions, Characteristics, and Effects

Sound is technically described in terms of the amplitude (loudness) and pitch (frequency) of the sound. Sound is transmitted as acoustic energy, which is vibration (sound waves) transmitted through various media. The standard unit of measurement for sound is the decibel (dB). The human ear is not equally sensitive to sound at all frequencies. The A-weighted scale, abbreviated dBA, reflects the normal hearing sensitivity range of the human ear. Human hearing extends from a range of approximately 3 to 130 dBA. Figure 1-2 provides examples of the typical noise levels of transit and non-transit sources.

Figure 1-2. A-Weighted Decibel Scale



Source: FTA 2018

This noise analysis discusses sound levels in terms of equivalent noise level (L_{eq}), day-night noise level (L_{dn}), sound exposure level (SEL), and maximum noise level (L_{max}). L_{eq} is the average noise level on an energy basis for any specific time period. The L_{eq} for one hour is the energy average noise level during the hour. The L_{eq} for 8 hours is the energy average noise level over eight consecutive hours. The average noise level is based on the energy content (acoustic energy) of the sound. L_{eq} can be thought of as the level of a continuous noise that has the same energy content as the fluctuating noise level. The L_{eq} is expressed in units of dBA.

L_{dn} is a 24-hour L_{eq} with an adjustment to reflect the greater sensitivity of most people to nighttime noise. The adjustment is a 10-dBA penalty for all sound that occurs in the nighttime hours of 10:00 p.m. to 7:00 a.m. The effect of the penalty is that in the calculation of L_{dn} , any event that occurs during the nighttime hours is equivalent to 10 of the same events during the daytime hours.

SEL is the cumulative noise exposure from a single noise event. The fact that SEL is a cumulative measure means that (1) louder events have greater SELs than do quieter ones, and (2) events that last longer in time have greater SELs than do shorter ones.

L_{max} is the maximum A-weighted sound level reached during a single noise event. However, L_{max} is not used as the descriptor for transit environmental noise impact assessment for several reasons. L_{max} ignores the number and duration of transit events, which are important to people's reaction to noise, and cannot be totaled into a one-hour or a 24-hour cumulative measure of impact. For the purposes of this analysis L_{max} was used to obtain SEL.

Noise is generally defined as unwanted sound. The degree to which noise can impact the human environment ranges from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Human response to noise is subjective and can vary greatly from person to person. Factors that influence individual response include the intensity, frequency, and pattern of noise as well as the amount of background noise present before the intruding noise and the nature of work or human activity that is exposed to the noise source.

A person exposed to high noise levels can suffer hearing damage, either gradual or traumatic. Sustained exposure to moderately high noise levels over a period of time can cause gradual hearing loss. It starts out as a temporary hearing loss, such as immediately after a loud rock concert. The hearing usually restores itself within a few hours after exposure, although not quite to its pre-exposure level. This is also called a temporary threshold shift. Although the permanent deterioration may be negligible, it will become significant after many repetitions of the exposure. At that time, it is considered permanent hearing damage. The primary cause of permanent hearing damage is daily exposure to industrial noise.

Short, sudden exposure to an extremely high noise level, such as a gunshot or explosion at very close range, can cause a traumatic hearing loss, which is very sudden and can be permanent. Occupational exposure to noise is controlled at the federal level by Occupational Safety and Health Administration and at the state level by the state level by the California Division of Safety and Health. A sound level of 82 dBA is protective of hearing for a continuous exposure of 24 hours (29 Code of Federal Regulations (CFR) 1910.95). The maximum allowable noise exposure over an eight-hour period is a level of 90 dBA. For each halving of the exposure time, the maximum noise level is allowed to increase 5 dBA. Therefore, the maximum allowable noise exposure (100 percent) is 90 dBA for 8 hours, 95 dBA for four hours, 100 dBA for 2 hours, 105 dBA for 1 hour, 110 dBA for 30 minutes, and 115 dBA for 15 minutes.

Noise can cause stress in humans and may be responsible for stress-related diseases, such as hypertension, anxiety, and heart disease. Although noise is probably not the sole culprit in these diseases, it can be a contributor. The degree to which noise contributes to stress-related diseases depends on noise frequencies, their bandwidths, noise levels, and time patterns. In general, higher frequencies, pure tones, and fluctuating noise levels tend to be more stressful than lower frequencies, broadband, and constant-level noise.

Studies have shown that the smallest perceptible change in sound level for a person with normal hearing sensitivity is approximately 3 dBA. A change of at least 5 dBA would be noticeable and would likely evoke a community reaction. A 10-dBA increase is subjectively heard as a doubling in loudness and would cause a community response.

Noise levels decrease as the distance from the noise source to the receiver increases. Noise generated by a stationary noise source, or “point source,” will decrease by approximately 6 dBA over hard surfaces (e.g., reflective surfaces, such as parking facilities or smooth bodies of water) and 7.5 dBA over soft surfaces (e.g., absorptive surfaces such as soft dirt, grass, or scattered bushes and trees) for each doubling of the distance. For example, if a noise source produces a noise level of 89 dBA across a hard surface at a reference distance of 50 feet, then the noise level would be 83 dBA at a distance of 100 feet from the noise source, 77 dBA at a distance of 200 feet and so on. Noise generated by a mobile source will decrease by

approximately 3 dBA over hard surfaces and 4.8 dBA over soft surfaces for each doubling of the distance.

Generally, noise is most audible when traveling by direct line-of-sight. Barriers, such as walls, berms or buildings that break the line-of-sight between the source and the receiver greatly reduce noise levels from the source since sound can only reach the receiver by bending over the top of the barrier. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

1.5.2 Noise Associated with Light Rail Transit Systems

The Project will generate operational noise associated with light rail activity along the alignment and stations. The following is a summary of the noise and vibration sources that have been evaluated in this study.

- **Light Rail Vehicle (LRV) Operations:** This is the normal noise from operation of LRVs and includes noise from steel wheels rolling on steel rails (wheel/rail noise) and from propulsion motors, air conditioning, and other auxiliary equipment on the vehicles.
- **Audible Warnings:** Audible warnings are required by the California Public Utilities Commission (CPUC) at all gate-protected at-grade crossings. The required audible warnings are ringing bells that are located on the masts of the crossing gates and sounding of horns located on the lead vehicle of the trains. CPUC requires the ringing bells to generate a minimum noise level of 75 dBA, L_{max} at 10 feet. There are three vehicle-mounted warning devices: a horn, a “quacker,” and a “gong.” The horn is a high-intensity horn used by Metro for emergencies only, while the quacker is a low-intensity horn used by Metro for standard operations. The gong is a relatively low-volume bell sound that is sometimes used when trains enter stations. All devices will comply with requirements of the CPUC. The CPUC requires that the horn create a minimum sound level of 85 dBA at 100 feet in front of the train. This is a higher noise level than a typical automobile horn. The quacker is a relatively low-volume sound (75 dBA at 100 feet in front of the lead vehicle) and has a marginal effect on community noise exposure at train speeds greater than 35 miles per hour (mph).
- **Station Public Address (PA) System:** PA systems will be installed at the stations to announce when trains are arriving at the stations and to provide other information to patrons. These systems will have automatic volume adjustment controls that are designed so the announcements are only a few decibels above ambient noise levels. With proper design of the PA systems and the automatic volume adjustment, the noise from the PA system should not generate any adverse effects in communities near the stations.
- **Special Trackwork:** The Project will be constructed of continuously welded rail as are virtually all modern light rail systems. Welded rail eliminates most rail joints, which means that the “clickety-clack” noise associated with older rail systems is eliminated. The one exception is at the special trackwork for turnouts and crossovers. Turnouts and crossovers require that two rails cross; the special fixture used where two rails cross is referred to as a “frog.” Standard frogs have gaps where the two rails cross and the wheels must “jump” across the gap. The wheels striking the ends of the gap increases noise levels near special trackwork by approximately 5 dBA. Because noise levels are higher near special trackwork, it is common for many of the predicted noise effects to be near special trackwork.

- **Wheel Squeal:** Wheel squeal can be generated when steel-wheel transit vehicles traverse tight radius curves. It is very difficult to predict when and where wheel squeal would occur. A general guideline is that there is potential for wheel squeal at any curve with a radius that is less than 600 feet.
- **Ancillary Facilities:** Traction power substations (TPSS) are the only Ancillary Facilities associated with the Project with potential for creating noise effect. The ventilation fans at the substation are the dominant noise source of most TPSS units.
- **Parking Facility:** Parking will be provided at five stations. Typical parking lot sources of noise are vehicle idling, opening and closing of car doors, and people talking.
- **Maintenance and Storage Facility:** The MSF will accommodate daily servicing and cleaning, inspection and repairs, and storage of LRVs. Noise sources associated with the MSF will include LRV repair areas that will produce noise associated with use of hand tools and mechanical equipment, blowers associated with the enclosed car wash, the vacuum system and an air compressor associated with the vehicle blow down facility, horn testing, wheel squeal, employee vehicle trips, train movements within the yard, and on-site TPSS sites.
- **Construction Noise:** All the sources discussed above are associated with operation of the Project. Similar to any other major infrastructure project, construction will require use of heavy equipment that generates relatively high noise levels.

1.5.3 Vibration Definitions, Characteristics, and Effects

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can cause buildings to shake and rumbling sounds to be heard. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of vibration are trains, buses on rough roads, and construction activities, such as blasting, pile driving, and heavy earth-moving equipment.

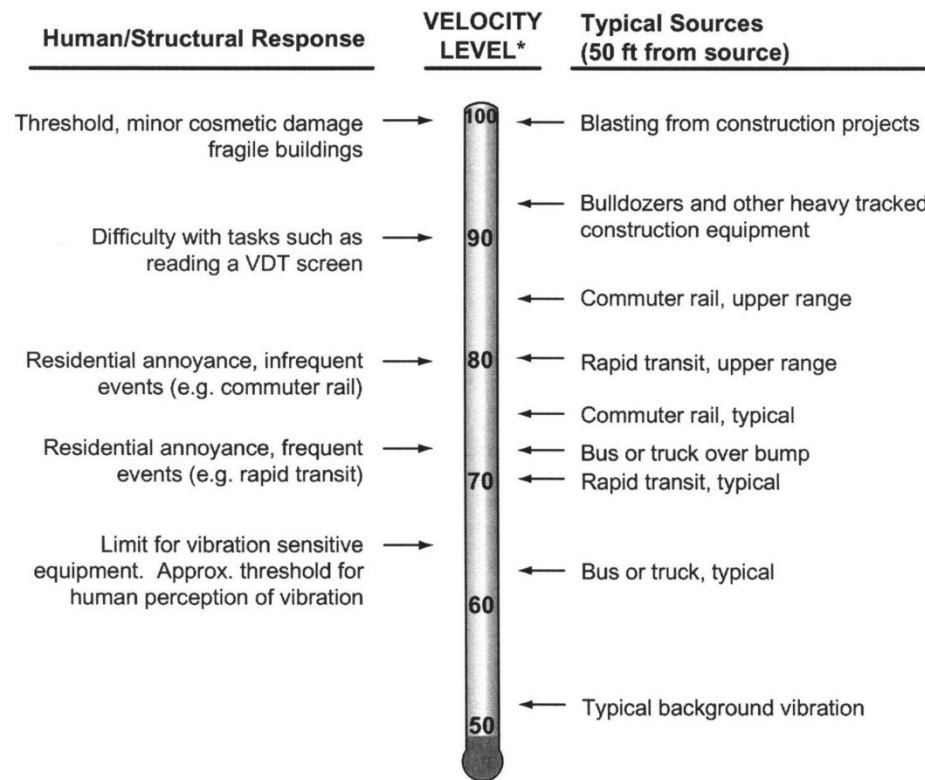
Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the square root of the average of the squared amplitude of the signal. Decibel notation (VdB) is used in this study to report RMS particle velocity.

High levels of vibration may cause physical personal injury or damage to buildings. However, groundborne vibration (GBV) levels rarely affect human health. Instead, most people consider GBV to be an annoyance that can affect concentration or disturb sleep. In addition, high levels of GBV can damage fragile buildings or interfere with equipment that is highly sensitive to GBV (e.g., electron microscopes).

Unlike noise, GBV is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB RMS or lower, well below the threshold of perception for humans, which is around 65 VdB RMS. Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible GBV are construction equipment, steel-wheeled trains, and traffic on rough

roads. If the roadway is smooth, the vibration from traffic is rarely perceptible. Typical levels of GBV are shown in Figure 1-3.

Figure 1-3. Typical Levels of Groundborne Vibration



* RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second

Source: FTA 2018

1.5.4 Vibration Associated with Light Rail Transit Systems

The Project will generate operational vibration associated with light rail activity along the alignment and stations. The following is a summary of the vibration sources evaluated in this study.

- **LRV Operations:** The vibration from the operation of LRVs is generated by the steel wheels rolling on steel rails.
- **Special Trackwork:** As discussed above, special trackwork may increase GBV by approximately 10 VdB. Because vibration levels are higher near special trackwork, it is common for many of the predicted vibration effects to be near special trackwork.
- **Maintenance and Storage Facility:** The MSF will accommodate daily servicing and cleaning, inspection and repairs, and storage of LRVs. Vibration sources associated with the MSF will include LRV movements on tangent and special track.

- **Construction Vibration:** All the sources discussed above are associated with project operation. Similar to other major transportation infrastructure projects, construction will require use of heavy equipment that generate GBV.

1.6 Methodology

To satisfy NEPA requirements, the analysis uses the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* (FTA 2018) guidance for assessing operational noise and vibration associated with transit projects. Impacts are analyzed in accordance with the FTA noise and vibration impact criteria.

FTA standards and criteria for assessing noise impacts related to transit projects are based on community reactions to noise. The criteria reflect changes in noise exposure using a sliding scale where the higher the level of existing noise, the smaller increase in total noise exposure is allowed. FTA has also developed impact criteria for GBV. These criteria, as summarized in Table 3.5, are presented in terms of acceptable indoor GBV and noise levels. Impacts will occur if these levels are exceeded. Criteria for GBV are expressed in terms of RMS velocity levels in VdB. The criteria for special buildings such as concert halls, television and recording studios, auditoriums, and theaters, which are also sensitive to vibration but do not fit into the three FTA sensitive land use categories, are presented in Table 3.6.

To satisfy CEQA requirements, noise and vibration impacts are generally analyzed in accordance with Appendix G of the *CEQA Guidelines* and based on the FTA noise and vibration impact criteria. Impacts are considered significant if the Project has the potential to:

- Result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances;
- Result in generation of excessive GBV or GBN levels; and/or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the project area to excessive noise levels.

1.6.1 Operational Noise

FTA screening distances were used to identify the receivers that are included in the detailed assessment:

- **Operational Transit Noise:** 350 feet for unobstructed receivers and 175 feet for obstructed.
- **MSF Noise:** 1,000 feet for unobstructed receivers and 650 feet for obstructed.
- **TPSS Noise:** 250 feet for unobstructed receivers and 125 feet for obstructed.
- **Parking Facility Noise:** 125 feet for unobstructed receivers and 75 feet for obstructed.

Sensitive land uses were then clustered dependent on the similarity of existing noise conditions, distance to the alignment, LRT system operating parameters, trackwork, and LRT speed along the alignment. Each cluster (group of sensitive land uses with similar existing noise conditions, distance to the alignment, and other similar conditions) was categorized as FTA Land Use Categories 1, 2, or 3 and assigned a representative receiver for modeling noise impacts for the cluster.

An analysis of operational noise levels at sensitive land uses was completed using the FTA Detailed Noise Analysis procedure. A general outline of the procedures is as follows:

- **Receivers of Interest:** Cluster sensitive land uses and select receivers of interest.
- **Project Noise:** Identify the project noise sources that are in the vicinity of receivers of interest. For these sources, determine the source reference noise in terms of SEL. Convert each source SEL to noise exposure (L_{dn} or $L_{eq}(h)$) at 50 feet, for the appropriate project operating parameters.
- **Propagation and Summation of Project Noise at Receivers of Interest:** Draw a noise exposure vs. distance curve for each relevant source. This curve will show source noise as a function of distance, accounting for shielding along the path, as well as any propagation-path mitigation that will be included in the Project. From these curves, determine the total project noise exposure at all receivers of interest by combining the levels from all relevant sources.
- **Existing Noise in the Study Area:** Estimate the existing noise exposure at each receiver of interest.
- **Noise Impact Assessment:** Assess noise impact at each receiver of interest using the impact criteria defined in Table 3.5.
- **Mitigation of Noise Impact:** Where the assessment shows either Severe Impact or Moderate Impact, evaluate alternative mitigation measures. Then loop back to modify the project noise computations, thereby accounting for the adopted mitigation, and reassess the remaining noise impact.

1.6.1.1 Refinements to Noise Methodology and Analysis

Since circulation of the Draft EIS/EIR, refinements were made to the noise methodology for the LPA to address comments received on the Draft EIS/EIR and for stakeholder coordination. These refinements include the following:

- Clusters were removed because they are not noise sensitive, they are no longer applicable to the LPA, or the LPA will require a full acquisition of the parcel and the sensitive receiver will be eliminated:
 - N1 through N36 removed as they are north of LPA limits and no longer part of the analysis
 - Full acquisition: N47
 - Not noise sensitive: N218, N232, N233, N264, N266
 - Parking noise analysis cluster GS1 from Draft EIS/EIR removed, no longer within screening distance

- Clusters were added as part of refinements:
 - N349 to N366 and N368
 - N367 added as an identified sensitive use by the City of Huntington Park (site is under construction)
 - N369 through N376 added for new multi-family residential use constructed in City of South Gate
- Updated operational conditions:
 - Adjustment from design speed to operational speed
 - Evaluation of setting all LRT warning bells to lowest level allowed by CPUC
 - Checked receiver and source height assumptions based on updated design
 - Refined receiver elevation inputs
 - Noise reductions associated with bell shroud and gate-down-bell-stop CPUC variance in residential areas applied as a project measure
 - Updated parking facility parking spaces and parking noise analysis
- Soundwall Refinements:
 - Analysis of 8-foot soundwalls along Randolph Street
 - Analysis of soundwalls extended to the pedestrian crossing of at-grade crossings
 - Analysis of noise reduction benefit of soundwalls for clusters near at grade crossings
 - Analysis of taller soundwall heights to reduce severe impacts

1.6.1.2 Light Rail Vehicle Operations Noise Model

Operating conditions were obtained from projected LPA operating parameters, as shown in Table 1.1 and Table 1.2. These parameters are used as inputs to predict train noise associated with the LPA using the below formulas included in the FTA *Transit Noise and Vibration Impact Assessment* guidance. Reference noise levels were obtained from the previous studies of Metro LRT cars, including noise measurements of L (Gold) Line vehicles, as included in the E (Expo) Phase 2 Final EIR.

Table 1.1. LRT Operating Schedule

Time	Headway (minutes)	Train Length	Trains per Hour
4:00 a.m. – 6:00 a.m. (Early)	15	3	8
6:00 a.m. – 9:00 a.m. (AM Peak)	5	3	24
9:00 a.m. – 4:00 p.m. (Base)	10	3	12
4:00 p.m. – 7:00 p.m. (PM Peak)	5	3	24
7:00 p.m. – 10:00 p.m. (Early Evening)	10	3	12
10:00 p.m. – 12:00 a.m. (Late Evening)	20	1	6
12:00 a.m. – 2:00 a.m.	20	1	3

Source: Metro, 2017

Table 1.2. LRT Daytime and Nighttime Train Volumes

Time	Train Volume
Daytime (7:00 a.m. – 10:00 p.m.)	240
Nighttime (10:00 p.m. – 7:00 a.m.)	64

Source: Metro, 2017

1.6.1.3 Reference Data

- **Maximum Sound Level (L_{max}):** Two-car train operating at 40 mph on a ballast and tie track at a distance of 50 feet (77 dBA). The reference data, which is based upon a two-car train, was translated to a three-car train using the FTA *Transit Noise and Vibration Impact Assessment* Manual (FTA Guidance Manual) methods.
- **Reference SEL:** 81 dBA. Obtained using formula in Section 1.6.1.5

1.6.1.4 Operating Condition

- **L_{eq} or L_{dn} :** Calculated based upon a three-car train operating at various speeds.
- **Train speed:** Based on maximum design speeds and deceleration/acceleration coming into/leaving stations. As expected, the wheel/rail noise increases with speed. At speeds greater than 20 to 30 mph, the wheel/rail noise usually dominates noise from the vehicle auxiliary equipment.

1.6.1.5 Conversion of L_{max} to Source Reference Level (SEL_{ref}) at 50 Feet for Light Rail Noise

$$SEL_{ref} = L_{max} + 10 \times \text{Log} (L_{meas}/50) + 10 \times \text{LOG} (D_{meas}/50) - 10 \times \text{Log} [2 \times \arctan + \text{Sin}(2 \times \arctan)] - 10 \text{Log} (N) - 30 \times \text{Log} (S_{meas}/50) + 3.3$$

L_{max} = source maximum noise level.

L_{meas} = total length of measured group of locomotives or rail cars in feet (a three-car light rail train is 270 feet long)

D_{meas} = closest distance between the measurement position and source in feet

S_{meas} = speed of measured vehicle(s) in mph

N = consist (number of locomotives or rail cars in a measured group)

$\text{Arctan} = [L_{meas}/(2 \times D_{meas})]$ in radians

1.6.1.6 Computation of L_{dn} and L_{eq} at 50 Feet for Light Rail Noise

$$\text{Hourly } L_{eq} \text{ at 50 feet } [L_{eq} (h)] = SEL_{ref} + 10 \times \text{Log} (N_{cars}) + 20 \times \text{Log} (S/50) + 10 \times \text{Log} (V) - 35.6$$

$$\text{Daytime } L_{eq} \text{ at 50 feet } [L_{eq} (day)] = L_{eq} (h) \text{ where } V = V_d$$

$$\text{Nighttime } L_{eq} \text{ at 50 feet } [L_{eq} (night)] = L_{eq} (h) \text{ where } V = V_n$$

N_{cars} = average number of cars per train

S = train speed in mph

V = Average hourly volume of train traffic

V_d = Average hourly daytime volume of traffic in trains per hour

= Number of trains 7:00 a.m. to 10:00 p.m./15 hours

V_n = Average hourly nighttime volume of train traffic in trains per hour

= Number of trains 10:00 p.m. to 7:00 a.m./9 hours

$$\text{Day/Night at 50 feet } (L_{dn}) = 10 \times \text{Log} [(15 \times 10^{(L_{eq} (day)/19)} + 9 \times 10^{(L_{eq} (night)10/10)})] - 13.8$$

1.6.1.7 LRT Noise Exposure Over Distance Formula

$$L_{dn} \text{ or } L_{eq} = (L_{dn} \text{ or } L_{eq}) \text{ at 50 feet} - 10 \times \text{Log} (D/50) - 10 \times G \times \text{Log} (D/42)$$

L_{dn} at 50 feet = Reference L_{dn} from previous calculation

D = Distance to receiver location

G = Ground absorption, G is 0 for “acoustically hard (non-absorptive) conditions”

1.6.1.8 LRT Pass-By Noise Adjustments

The following adjustments have been made to LRT pass-by noise levels by location:

- +5 dB for jointed track or crossover within 300 feet of a receptor
- +4 dB for aerial structure with slab track
- +3 dB for embedded track on grade, commonly occurring at grade crossings
- -4.5 dB for first row of intervening buildings
- -1.5 dB for second row of intervening buildings

1.6.1.9 Wheel Squeal Noise Model

Metro LRT vehicles are equipped with resilient wheels instead of solid steel wheels such as those used on freight rail systems. Several different types of resilient wheels are used on light rail vehicles; the most common resilient wheels have small rubber blocks that separate the wheel tread from the hub. Both the tread and hub are made of steel. The use of resilient wheels substantially reduces the occurrence and amplitudes of wheel squeal, but do not always eliminate wheel squeal. The analysis assumes that LRT activity on curves with a radius less than 600 feet would increase pass-by noise by 10 dBA due to wheel squeal.

1.6.1.10 Maintenance and Storage Facility Noise Model

Train Movement on Tracks

Train movements within the MSF will generate noise from steel wheels rolling on steel rails. Trains will travel at low speeds within the MSF. As described in Section 7 of the *Metro Rail Rule Book for the A/E (Blue/Expo) Line*, the trains are anticipated to move with an average speed of 10 mph within the yard and 5 mph along curves. Train movement noise within the yard was calculated using the same formulas for the calculation of light rail noise.

Crossovers

Turnouts and crossovers require that two rails cross; the special fixture used where two rails cross is referred to as a “frog.” Standard frogs have gaps where the two rails cross and the wheels must “jump” across the gap. The wheels striking the ends of the gap increases noise levels near special trackwork by approximately 5 dBA.

Wheel Squeal

The MSF will include tight curves that may generate wheel squeal. The analysis assumes that LRT activity on tight curves within the yard would add 10 dBA due to wheel squeal and light rail noise.

Maintenance Shops

The maintenance shop will accommodate daily servicing and cleaning, inspection and repairs, and storage of LRVs. A reference noise level for the maintenance shops was obtained from the E (Expo) Phase 2 Final EIR noise measurements at the C (Green) Line Maintenance

Yard. The reference noise level was 62 dBA L_{eq} at 30 feet for a period of 30 minutes. The noise level from the maintenance shops is assumed to be continuous. The L_{dn} was calculated using an FTA methodology for determining L_{dn} from a one-hour L_{eq} measurement.

L_{eq} : 62 dBA at 30 feet

L_{dn} : 69 dBA at 30 feet ($L_{eq} + 8$)

L_{dn} or L_{eq} = (L_{dn} or L_{eq}) at 50 feet - 20 x Log (D/30)

L_{dn} at 30 feet = Reference L_{dn} from previous calculation

Car Wash

The car wash will include one vehicle wash bay and servicing area for daily cleaning. The mechanical system will operate 50 percent of the time both day and night. The FTA *Transit Noise and Vibration Impact Assessment* guidance provides a reference SEL for car washes of 111 dBA at 50 feet (75 dBA L_{max} at 50 feet). However, it is noted that FTA would prefer measurements for this noise source. For this Project, the SEL is based on measurements taken for other recent Metro Studies, such as the E (Expo) Phase 2 Project, and a reference SEL of 85 dBA (64 dBA L_{max}) at 20 feet was used.

- SEL: 85 dBA at 20 feet
- Based upon wash cycle information from the A (Blue) Line, a three-car train would typically take five minutes with a maximum of 22 three-car trains able to be washed per day. This would lead to a total operation time of 110 minutes per day of the car wash. The car wash was assumed to operate two hours during the day and two hours during the night.

Vehicular Traffic

Employee parking will be on-site at the MSF. The California Department of Transportation (Caltrans) Technical Noise Supplement to the Traffic Noise Analysis Protocol (Caltrans 2013a) states that a doubling of traffic volumes would result in a perceptible increase of noise of 3 dBA. Employee trips will not double traffic volumes along any roadway and the permanent increase in noise levels will be less than 3 dBA. As such, employee trips have not been further assessed in this analysis.

Combined Noise Level

Noise levels from MSF noise sources were combined and used to assess impacts at receivers. The combined L_{dn} was calculated using the following FTA methodology.

$$L_{dn} \text{ (total)} = 10 \times \text{LOG} (\Sigma \text{All sources } 10^{(L_{dn}/10)})$$

Σ = Sum

L_{dn} (total) = Total L_{dn} from all sources combined

1.6.1.11 Audible Warnings at Crossing Gates and Stations Noise Model

Crossing signal noise was modeled for all at-grade gate-protected crossings. The model does not include quacker noise or train horn noise. Quacker noise is not included as a separate noise source because at speeds greater than 35 mph the noise from the quacker adds less than 1 dBA to the noise exposure caused by light rail train operations. However, where the trains are coming into a station with speeds of less than 35 mph, 1 dBA has been included for quacker noise. The train horn will not be a regularly occurring noise source and only

sounded during emergencies. As such, with its infrequent use, the train horn is not included in the analysis.

A reference noise level for crossing signals was obtained from the CPUC minimum bell noise level of 75 dBA, L_{max} at 10 feet (SEL of 110 dBA at 10 feet).

- SEL: 110 dBA at 10 feet for crossing signals.

$$\text{Crossing Signal Bell SEL} = 10 \times \text{LOG} (E \times 10^{(L_{max}/10)})$$

$$L_{max} = 75 \text{ dBA at 10 feet}$$

E = Event Duration

- Duration of event with Gate-Down-Bell-Stop Variance: 10 seconds
- Bell Shroud: -5 dBA of crossing signal bell noise
- Number of events: based on train volumes per hour and during daytime and nighttime hours, as described in Table 1.1 and Table 1.2

$$\text{Hourly } L_{eq} \text{ at 50 feet } [L_{eq}(h)] = SEL_{ref} + 10 \times \text{Log}(N) + 10 \times \text{Log}(E/3600) - 35.6$$

$$\text{Daytime } L_{eq} \text{ at 50 feet } [L_{eq}(\text{day})] = L_{eq}(h) \text{ where } N = Nd$$

$$\text{Nighttime } L_{eq} \text{ at 50 feet } [L_{eq}(\text{night})] = L_{eq}(h) \text{ where } N = Nn$$

E = Duration of one event in seconds

N = Number of events of this type that occur during one hour

Nd = hourly average number of events of this types that occur during daytime (7:00 a.m. to 10:00 p.m.)

= number that occur between 7:00 a.m. and 10:00 p.m./15 hours

Nn = hourly average number of events of this types that occur during nighttime (7:00 a.m. to 10:00 p.m.)

= number that occur between 10:00 p.m. and 7:00 a.m./9 hours

$$\text{Day/Night at 50 feet } (L_{dn}) = 10 \times \text{Log} [15 \times 10^{(L_{eq}(\text{day})/10)} + 9 \times 10^{(L_{eq}(\text{night})+10)/10}] - 13.8$$

1.6.1.12 Audible Warning Noise Exposure Over Distance

$$(L_{dn} \text{ or } L_{eq}) = (L_{dn} \text{ or } L_{eq}) \text{ at 50 feet } - 20 \times \text{Log}(D/50) - 10 \times G \times \text{Log}(D/50)$$

L_{dn} at 50 feet = Reference L_{dn} from previous calculation

G = Ground absorption, G is 0 for “acoustically hard (non-absorptive) conditions”

1.6.1.13 Special Trackwork

Standard frogs have gaps where the two rails cross and the wheels must “jump” across the gap. The wheels striking the ends of the gap increases noise levels near special trackwork by approximately 5 dBA. A 5-dBA adjustment has been applied for receivers within 300 feet of a crossover.

Low impact frogs are equipped with a loaded spring mechanism or moveable mechanism, which closes the gap between rails and reduces the chance for the “clickety-clack” noise to occur, as well as vibration. This reduces or eliminates the 5-dBA penalty assigned to noise receptors near crossovers.

1.6.1.14 Ancillary Facilities Noise Model

TPSS units were the only ancillary facility noise considered for the operational noise analysis. Emergency, standby, and critical operations power system generators, located along the alignment, at maintenance facilities, and at a rail operations control center will be another potential source of noise. Reduction of noise from these sources will be provided by barriers, enclosures, sound-absorptive materials, and engine silencers as applicable to the individual facility or unit design. Operation of the generators will not be a part of regular operation and will only be used during emergency situations and during weekly testing for approximately 20 minutes. Thus, generator operation has not been included as part of the operational analysis.

Sources of TPSS noise include heating, ventilation, and cooling systems (HVAC) and transformer hum. The HVAC system is the primary source of sound emitted from a TPSS. TPSS noise levels were measured at seven feet from the cooling fan of the TPSS unit located at Farmdale Avenue and Exposition Boulevard. The resulting noise level was 66.5 dBA L_{eq} at seven feet. The equivalent noise level is approximately 49.4 dBA L_{eq} at 50 feet. The measured noise level is consistent with the specifications used for the purchase of the TPSS units for the Metro L (Gold) Line Phase 1 and the East Side extension to the L (Gold) Line.

The specifications limit TPSS noise to a maximum of 50 dBA at 50 feet from any side of the TPSS.

- Reference noise level ($TPSS_{ref}$): 50.0 dBA
- Reference Distance (D_{ref}): 50 feet

$$Ldn_{TPSS} = 10 \times \text{Log} (15 \times 10^{(SPL/10)} + 9 \times 10^{((SPL+10)/10)}) - 13.8 - 20 \times \text{Log} (D/D_{ref})$$

Ldn_{TPSS} = Project TPSS Day-Night noise level at the receiver

SPL = TPSS reference sound pressure level of 50 dBA

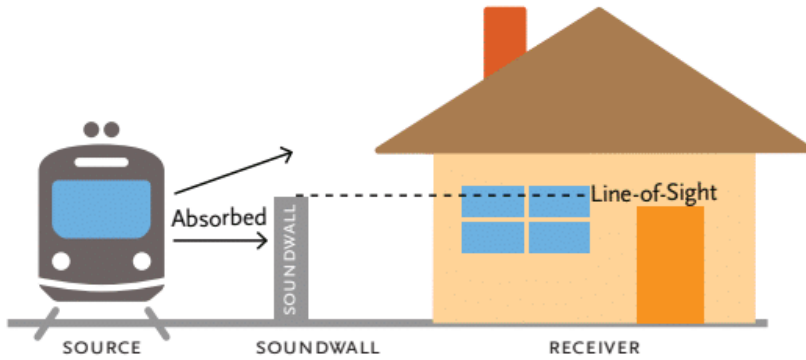
D_{ref} = Reference distance for reference TPSS sound pressure noise level

D = Distance of receiver from TPSS unit

1.6.1.15 Sound Barrier Attenuation Noise Model

Sound barriers will effectively mitigate noise when the barriers break the path of the sound waves between source and receiver. The necessary height of a barrier depends on various factors, such as source height and distance from the source to the barrier. For example, if a barrier is located close to a light rail train, the barrier will need to be three to four feet above the top of rail to be effective, whereas a noise barrier at the ROW line may need to be 8 feet. Barriers close to vehicles can provide noise reductions of up to 12 dBA. For barriers farther away, such as on the ROW line or for trains on the far track, the height must be increased to provide equivalent effectiveness. Otherwise, the effectiveness can drop to 3 dB or less, even if the barrier breaks the path of sound waves. Barriers at at-grade crossings are less effective because of the gap in the barrier required to maintain roadway access. Receivers near at-grade crossings typically still receive some noise reduction, but barrier effectiveness may be reduced depending on the width of the gap. Figure 1-4 is a depiction of a soundwall blocking the path of sound waves.

Figure 1-4. Noise Barrier Effectiveness Illustration



Source: Metro 2023

Barrier Attenuation

$$A_{\text{barrier}} = \min \{12 \text{ or } [5.3 \times \text{LOG} (P) + 6.7]\}$$

A_{barrier} = Barrier attenuation in dB

Min = Chooses the lowest decibel reduction between 12 dB and $[5.3 \times \text{LOG} (P) + 6.7]$

The maximum decibel reduction is therefore 12 dB

P = Path length difference, in feet

Path Length Difference

$$P = A + B - C \text{ (Figure 1-5)}$$

P = Path length difference

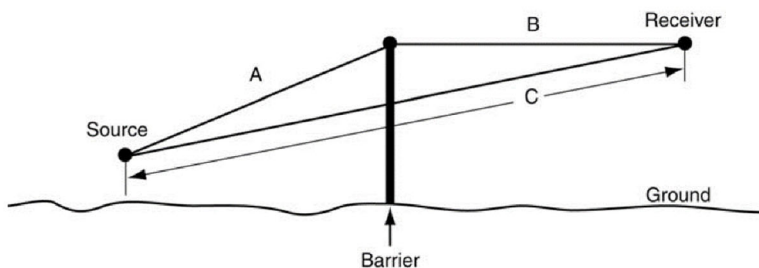
A = Sloped distance from top of source to top of barrier

B = Sloped distance from top of barrier to top of receiver

C = Sloped distance from top of source to top of receiver

Figure 1-5. Noise Barrier Path Length Illustration

Barrier Parameter P
 $P = A + B - C$



Source: FTA, 2018

1.6.1.16 Parking Facility Noise Model

Parking facility noise was modeled at each proposed parking facility along the alignment. Sensitive receivers were screened along the alignment using the FTA Guidance Manual distances and clustered. Each cluster was categorized as FTA Land Use Categories 1, 2, or 3 and assigned a representative receiver for modeling noise impacts for the cluster. A reference noise level for parking facilities was obtained from the FTA *Transit Noise and Vibration Impact Assessment* guidance, which provides an SEL of 92 dBA at 50 feet for a 1,000-car parking facility.

- SEL: 92 dBA for 1,000 cars in peak activity hour

An adjustment to the reference noise level was made based on the car volume of each parking facility.

$$\text{Volume Adjustment} = 10 \times \text{LOG} (N_a/1,000)$$

N_a = Average number of automobiles per hour during the day or night

1.6.1.17 Freight Train Noise Model

Construction will require relocation of existing freight tracks. A reference noise level was obtained from the CREATE railroad noise model. A locomotive warning horn noise level was obtained from the FTA *Transit Noise and Vibration Impact Assessment* guidance. Train frequency is based on observed existing freight traffic patterns.

- Freight Locomotive SEL: 97 dBA at 40 mph
- Freight Car SEL: 100 dBA at 40 mph for a 2,000-foot train
- Locomotive Warning Horn SEL: 110 dBA
- Randolph Street Train Frequency: One per day during daytime and one during nighttime
- Façade Avenue Train Frequency: Three per day during daytime and zero during nighttime

Freight Locomotive Formula

$$\text{Hourly } L_{eq} \text{ at 50 feet } [L_{eq} (1hr)] = SEL_{ref} + 10 \times \text{Log} (N_{loco}) + 10 \times \text{Log} (S/50) + 10 \times \text{LOG} (V) - 35.6$$

SEL_{ref} = Reference Locomotive Noise Level

N_{loco} = Average number of locomotives per train

S = Train speed, mph

V = Average hourly volume of train traffic

Freight Car Formula

$$\text{Hourly } L_{eq} \text{ at 50 feet } [L_{eq} (1hr)] = SEL_{ref} + 10 \times \text{Log} (N_{cars}) + 10 \times \text{Log} (S/50) + 10 \times \text{LOG} (V) - 35.6$$

SEL_{ref} = Reference Freight Car Noise Level

N_{cars} = Average number of cars per train (assumes one 2000 foot set of freight cars)

S = Train speed, mph

V = Average hourly volume of train traffic

Transit Warning Horn Formula

$$\text{Hourly } L_{eq} \text{ at 50 feet } [L_{eq} (1hr)] = SEL_{ref} + 10 \times \text{Log} (N_{loco}) + 10 \times \text{Log} (S/50) + 10 \times \text{LOG}(V) - 35.6$$

SEL_{ref} = Reference locomotive warning horn noise level

N_{loco} = Average number of locomotives per train

S= Train speed, mph

V = Average hourly volume of train traffic

Vehicular Traffic on Local Roadways

Signalization of intersections, roadway re-striping, and minor roadway modifications would occur as part of the LPA. The Caltrans Technical Noise Supplement to the Traffic Noise Analysis Protocol (Caltrans 2013a) states that a doubling of traffic volumes would result in a perceptible increase of noise of 3 dBA. Vehicular trips will not double traffic volumes along any roadway and the permanent increase in noise levels will be less than 3 dBA. As such, traffic noise has not been further assessed in this analysis.

1.6.2 Operations – Vibration

For operational vibration assessment, sensitive receivers were screened along the alignment using the FTA Guidance Manual distances for LRT screening presented in Table 1.3.

- 450 feet for buildings where vibration would interfere with interior operations that may be well below those associated with human annoyance (FTA Vibration Category 1);
- 150 feet for residences and buildings where people normally sleep (FTA Vibration Category 2); and
- 100 feet for institutional land uses with primarily daytime use (FTA Vibration Category 3).

Table 1.3. Screening Distances for Vibration Assessment

Type of Projects	Critical Distance for Land Use Categories ¹ Distance (feet) from Right-of-Way or Property Line		
	Vibration Category 1	Vibration Category 2	Vibration Category 3
Conventional Commuter Railroad	600	200	120
Rail Rapid Transit	600	200	120
Light Rail Transit	450	150	100
Intermediate Capacity Transit	200	100	50
Bus Projects	100	50	--

Source: FTA, 2018

Note: ¹ The land uses not included in these categories are: concert halls and TV studios which, for the screening procedure, should be evaluated as Category 1; and theaters and auditoriums, which should be evaluated as Category 2.

Sensitive receivers near the MSF site were screened at the same distances. Similar to noise, screening of receivers was completed to ensure that only those identified receivers with the potential to be affected by the LPA will be included in the analysis. Sensitive receivers were then clustered dependent on similarity of existing conditions, distance to the alignment, LRT

system operating parameters, trackwork, and LRT speed along the alignment. Each cluster was categorized as FTA Vibration Category 1, 2, or 3 and assigned a representative receiver for modeling vibration impacts for the cluster.

The screening distances in Table 1.3 are based on the criteria presented in the FTA Guidance Manual with a 5 VdB factor of safety included. The distances were determined using the reference vibration levels in the FTA Guidance Manual prediction procedures assuming “normal” vibration propagation. Efficient vibration propagation can result in substantially higher vibration levels than predicted using the FTA Guidance Manual. Because of the 5 VdB safety factor, the screening distances identify potentially affected areas, even with efficient propagation. While not specifically accounting for the possibility that efficient vibration propagation could fail to identify some impact areas in the screening process, the likelihood is minimal, and the process follows industry-standard procedure.

An analysis of operational vibration levels at sensitive receivers was completed using the FTA General Vibration Analysis procedure. A general outline of the procedures is as follows:

- **Receivers of Interest:** Identify cluster of sensitive receivers and select closest receiver to LPA alignment.
- **Project Vibration:** Identify the project vibration sources that are within the FTA screening distances (see Table 1.3). For these sources, determine the source reference vibration levels at the distance between the source and receiver for the appropriate project operating parameters.
- **Vibration Impact Assessment:** Assess vibration impact at each receiver of interest using the impact criteria defined in Table 3.5 and Table 3.6.
- **Mitigation of Vibration Impact:** Where the assessment shows an exceedance of the FTA vibration impact thresholds, evaluate alternative mitigation measures. Then loop back to modify the LPA vibration computations, thereby accounting for the adopted mitigation, and reassess the remaining vibration impact.

1.6.2.1 Light Rail Vehicle Operations Vibration Model

The FTA General Assessment procedures outlined in Section 6 of the FTA Guidance Manual General Assessment was used to model the train vibrations in areas where the screening procedure identified that vibration impacts might occur. The General Assessment is an extension of the screening procedure and uses generalized data to develop a curve of vibration level as a function of distance from the track. The GBV levels at specific buildings are estimated by reading values from the curve and applying adjustments to account for factors such as track support system, vehicle speed, type of building, and track and wheel condition. The general level deals only with the overall vibration velocity level and does not consider the frequency spectrum of the vibration.

The FTA General Assessment procedures use generalized data to develop a curve of vibration levels as a function of distance from the track. The General Assessment was used to predict where potential vibration impacts will occur. The appropriateness of this approach is documented in the FTA Transit Noise and Vibration Impact Assessment Manual. Section 6.4 of the FTA Guidance Manual states: “In the General Vibration Assessment, it is preferable to make a conservative assessment of the impact and include buildings that may ultimately not be subject to impact.” The manual also states that following the General Vibration Assessment procedures, if the “Projected vibration is below the impact threshold [then vibration impact is unlikely, and the environmental document should state this.” Additionally, the manual states that if the “Projected

[groundborne] vibration is 0 to 5 dB greater than the impact threshold [then t]here is a strong chance that actual [groundborne] vibration levels will be below the impact threshold. The environmental document should report impact at these locations as exceeding the applicable threshold, present possible mitigation measures and costs, and commit to conducting more detailed studies to refine the vibration impact analysis during the engineering phase.”

The General Assessment is a method to estimate overall levels of GBV for comparison to the FTA impact criteria. For projects where no measurements were conducted to determine the line source transfer mobility of the ground and the force density level of the train, the General Assessment approach is sufficient for the environmental impact assessment. Where there are potential impacts, a Detailed Analysis is undertaken during final design to accurately define the level of impact and to design mitigation measures. A Detailed Analysis supports designing special track support systems such as floating slabs or ballast mats.

The basic approach for the General Assessment is to define a curve, or set of curves, that predicts the overall ground-surface vibration as a function of distance from the source, then apply adjustments to these curves to account for factors such as vehicle speed, building type, and receiver location within the building.

The General Assessment follows the FTA Guidance Manual approach to consider attenuation of different types of buildings, which is referred to as coupling loss. The vibration attenuation of smaller buildings is less than larger buildings. The building sizes and different foundations are referenced in the FTA Guidance Manual and used for this assessment.

Once the base curve has been selected, the adjustments can be used to develop vibration projections for specific receiver positions inside buildings. The adjustments are given as single numbers to be added to, or subtracted from, the base level. The adjustment parameters include speed, wheel and rail type and condition; type of track support system; type of building foundation; and number of floors above the basement level. Several of these adjustments are strongly dependent on the frequency spectrum of the vibration source and the frequency dependence of the vibration propagation. The single number values are suitable for generalized evaluation of the vibration impact and vibration mitigation measures since they are based on typical vibration spectra. However, the single number adjustments are not adequate for detailed evaluations of impact of sensitive buildings or for detailed specification of mitigation measures. Detailed Analysis requires consideration of the relative importance of different frequency components. However, since there was no transfer mobility testing conducted, the General Assessment was used to predict where potential vibration impacts will occur. These impacts will be confirmed after transfer mobility testing is completed during final design. The following guidelines are used to select the appropriate adjustment factors used for the General Assessment.

- **Train Speed:** The FTA Guidance Manual adjustment to the GBV vary approximately as 20 times the logarithm of speed. This means that doubling train speed will increase the vibration levels approximately 6 dB and halving train speed will reduce the levels by 6 dB. Since the publication of the FTA Guidance Manual, empirical measurements of train vibration have resulted in a modification of the speed adjustment from 20 to 15 times the logarithm. The FTA reference train vibration levels 50 mph for steel-wheel vehicles were adjusted using the following relationship to calculate the GBV levels for other speeds.

$$\text{adjustment (VdB)} = 15 \times \log (\text{speed}/\text{speed}_{\text{ref}})$$

The FTA Guidance Manual default values is a 20 log speed adjustment. Over past years, LRT force density level measurements at different train speeds have been found to vary by 15 times the log of the ratio of speed rather than the 20 log that is recommended by the FTA Guidance Manual. The 15 log speed adjustment has been observed for measurements conducted on several of Metro's vehicles used for the vibration impact assessment for many of Metro's recent LRT projects, including the E (Expo) Phase II, L (Gold) Line Phase 2, Regional Connector, and Westside D (Purple) Line Extension. The 2018 FTA Guidance Manual acknowledges that vibration variation with speed has been observed to be as low as 15 log.

- **Special Trackwork:** The additional vibration at special trackwork was accounted for by adding 10 VdB to the predicted vibration levels when the special trackwork frog would be located less than 100 feet from a sensitive receiver. At distances greater than 100 to 200 feet, the additional vibration from crossovers typically decays at a rate of 15 x log (dist/50 feet) (decay rate based on measured vibration propagation).
- **Transit Structure:** The weight and size of a transit structure affects the vibration radiated by that structure. The general rule-of-thumb is that vibration levels will be lower for heavier transit structures. The vibration from elevated structures is lower than from at-grade track because of the mass and damping of the structure and the extra distance that the vibration must travel before it reaches the receiver.
- **Propagation Characteristics:** In the General Assessment, it is necessary to make a selection among the general propagation characteristics. When considering at-grade vibration sources, the selection is between "normal" vibration propagation and "efficient" vibration propagation. Efficient vibration propagation results in approximately 10 VdB higher vibration levels. This more than doubles the potential impact zone for GBV. For the at-grade and aerial sections of this Project, a Detailed Analysis during final design will include vibration propagation tests to confirm normal propagation.
- **Theoretical Coupling Loss and Floor Amplification:** For lightweight wood-frame structures, the FTA Guidance Manual suggests +6 VdB for floor amplification and -2 VdB per floor for floor-to-floor attenuation up to five floors above grade, as well as a -5 VdB adjustment for coupling loss. Combining the adjustment factors for a wood-frame structure such as a residence, there is -5 VdB for the coupling loss, +6 VdB for floor amplification, and an additional -2 VdB for each floor above the grade level. This leads to a net adjustment of between -1 to +1 VdB for the vibration inside a typical residence. Therefore, no adjustment is applied to account for coupling loss and floor amplification in the prediction model for small single-story residences. For large masonry buildings, the FTA Guidance Manual suggests a -10 VdB adjustment for coupling loss. This adjustment has been used at most multi-family residences and large office buildings.
- **Safety Factor:** It is not feasible to consider each receiver individually without conducting line source propagation and building vibration response measurements at that receiver. Therefore, to account for potential amplification effects from buildings and other possible sources of error in the predictions, a safety factor of +3 VdB was added to the predicted vibration levels. This is a conservative approach, ensuring that in the majority of cases the predicted vibration levels are higher than what will occur after the Project is operational.

- **Further Study Needs:** The predicted vibration impacts using the FTA General Assessment will be confirmed as part of the final design when an FTA Detailed Vibration Assessment will be conducted. This detailed assessment will require conducting line source transfer mobility tests at at-grade and aerial sections at representative locations where impacts have been identified. The LRT vehicle proposed by Metro will need to be tested to determine its force density level at different operating speeds if this data is not already available.

The level of GBV at historic buildings is not considered in the operational assessment because these levels are well below the architectural or structural damage risk criteria. The damage risk concern to historic buildings is GBV from construction, which is included in Construction Impacts (Section 7).

In response to comments on the Draft EIS/EIR regarding vibration, additional vibration analysis was completed for the Dante Valve Company located in Bellflower. The assessment consisted of the following:

- Vibration monitoring of the Dante Valve activities during normal operations at the test stand and the room that houses the computer-numerically-controlled (CNC) machines
- Measurement of the ground attenuation, referred to as the line source transfer mobility, at different distances from the proposed track locations
- Prediction of the train vibration levels at the test stand and CNC locations
- Comparison of the predicted train vibration levels with the existing ambient levels.

The complete vibration assessment for Dante Valve Company is included in Appendix K

1.6.2.2 Maintenance and Storage Facility Vibration Model

Train movements within the MSF will generate vibration from steel wheels rolling on steel rails. Trains will travel at low speeds within the yard. As described in Section 7 of the *Metro Rail Rule Book for the A/E (Blue/Expo) Line*, trains are anticipated to move with an average speed of 10 mph within the yard and 5 mph along curves. Train movement vibration within the yard was calculated using the same formulas for the calculation of light rail vibration.

1.6.2.3 Freight Train Vibration Model

As part of the FTA General Assessment, generalized ground-surface vibration emissions are provided for locomotive powered freight trains at different track centerline distances operating at 50 mph. These vibration emission levels were compared to in-situ measurements conducted of the BNSF operations along the Los Angeles—San Diego—San Luis Obispo Rail Corridor (LOSSAN) train alignment in Carlsbad as part of a double track project conducted for the San Diego Association of Governments. The freight train vibration measurements at Carlsbad were conducted for trains operating at 30 mph. At a reference speed of 20 mph and 20 feet, the FTA vibration emission levels are 6 VdB higher than the LOSSAN measurements. The FTA General Assessment vibration assessment for freight train operations was adjusted by -6 VdB to determine the predicted levels. This adjustment is used to determine vibration impacts at the freight train relocation sites.

2 PROJECT DESCRIPTION

This section describes the No Build Alternative and the LPA studied in the WSAB Transit Corridor Final EIS/EIR, including station locations, and the MSF. The LPA was developed through a comprehensive alternatives analysis process and meets the purpose and need of the Project.

The No Build Alternative and LPA are generally defined as follows:

- **No Build Alternative:** Reflects the transportation network in the 2042 horizon year without the LPA. The No Build Alternative includes the existing transportation network along with planned transportation improvements that have been committed to and identified in the constrained *Metro 2009 Long Range Transportation Plan (2009 LRTP)* (Metro 2009) and SCAG's *2016-2040 RTP/SCS (SCAG 2016)*, as well as additional projects funded by Measure M that would be completed by 2042.
- **LPA:** The LPA consists of a 14.5-mile LRT line that will extend from the northern terminus in the City of Los Angeles/Florence-Firestone community of LA County to a southern terminus in the City of Artesia.

Figure 2-1 illustrates the LPA. The northern terminus of the LPA will be located just south of the intersection of Long Beach Avenue and Slauson Avenue, connecting to the current Slauson/A Line Station. South of Slauson Avenue, the LPA will follow the UPRR-owned La Habra Branch² ROW east along Randolph Street. At the Ports-owned San Pedro Subdivision ROW, the LPA will turn southeast to follow the San Pedro Subdivision ROW and then transition to the PEROW south of the I-105 freeway. The LPA will then follow the Metro-owned PEROW to the southern terminus at the Pioneer Station in Artesia. Figure 2-2 depicts the alignment sections that will require freight track relocation. The LPA will be grade separated where warranted, as indicated on Figure 2-1.

² The La Habra Branch may also be referred to as the La Habra Subdivision. La Habra Branch is used within this document.

Figure 2-1. Locally Preferred Alternative Alignment by Grade



Source: WSP and TAHA 2023

Figure 2-2. Existing Rail Right-of-Way Ownership



Source: WSP and TAHA 2023

2.1 No Build Alternative

For the NEPA evaluation, the No Build Alternative is evaluated in the context of the existing transportation facilities in the project corridor (the corridor extends approximately 2 miles from each side of the four alternatives evaluated in the Draft EIS/EIR) and other capital transportation improvements and/or transit and highway operational enhancements that are reasonably foreseeable. Because the No Build Alternative provides the background transportation network against which the LPA's impacts are identified and evaluated, the No Build Alternative does not include the Project.

The No Build Alternative reflects the transportation network in 2042 and includes the existing transportation network along with planned transportation improvements that have been committed to and identified in the constrained Metro 2009 LRTP and the SCAG 2016 RTP/SCS, as well as additional projects funded by Measure M, a sales tax initiative approved by voters in November 2016. The No Build Alternative includes Measure M projects that are scheduled to be completed by 2042.

The required environmental baseline socioeconomic growth projections, including the reasonably foreseeable transportation network in 2042, were established in July 2017 when the preparation of the Draft EIS/EIR began. The SCAG 2016-2040 RTP/SCS was the adopted current regional growth forecast at the time the Draft EIS/EIR baseline was established. Specifically, the baseline year 2017 and future year 2042 population, housing, and employment are derived from the Transportation Analysis Zone-level estimates from the SCAG 2016-2040 RTP/SCS.

Table 2.1 lists the existing transportation network and planned improvements included as part of the No Build Alternative based on the Metro 2009 LRTP and SCAG 2016 RTP/SCS.

Table 2.1. No Build Alternative – Existing Transportation Network and Planned Improvements

Project	To / From	Location Relative to Study Area
Rail (Existing)		
Metro Rail System (LRT and Heavy Rail Transit)	Various locations	Within Study Area
Metrolink (Southern California Regional Rail Authority) System	Various locations	Within Study Area
Rail (Under Construction/Planned)¹		
Metro Westside D Line Extension	Wilshire/Western to Westwood/VA Hospital	Outside Study Area
Metro C Line Extension ² to Torrance	96th Street Station to Torrance	Outside Study Area
Metro C Line Extension	Norwalk to Expo/Crenshaw	Outside Study Area
Metro East-West Line/Regional Connector/Eastside Phase 2	Santa Monica to Lambert Road Santa Monica to Peck Road	Within Study Area
Metro North-South Line/Regional Connector/Foothill Extension to Claremont Phase 2B	Long Beach to Claremont	Within Study Area
Metro Sepulveda Transit Corridor	Metro G Line to Metro E Line	Outside Study Area

Project	To / From	Location Relative to Study Area
Metro East San Fernando Valley Transit Corridor	Sylmar to Metro G Line	Outside Study Area
Los Angeles World Airport Automated People Mover	96th Street Station to LAX Terminals	Outside Study Area
Metrolink Capital Improvement Projects	Various projects	Within Study Area
California High-Speed Rail	Burbank to LA LA to Anaheim	Within Study Area
Link US ³	LAUS	Within Study Area
Bus (Existing)		
Metro Bus System (including BRT, Express, and local)	Various locations	Within Study Area
Municipality Bus System ⁴	Various locations	Within Study Area
Bus (Under Construction/Planned)		
Metro G Line (BRT)	Del Mar (Pasadena) to Chatsworth Del Mar (Pasadena) to Canoga Canoga to Chatsworth	Outside Study Area
Vermont Transit Corridor (BRT)	120th Street to Sunset Boulevard	Outside Study Area
North San Fernando Valley BRT	Chatsworth to North Hollywood	Outside Study Area
North Hollywood to Pasadena	North Hollywood to Pasadena	Outside Study Area
Highway (Existing)		
Highway System	Various locations	Within Study Area
Highway (Under Construction/Planned)		
High Desert Multi-Purpose Corridor	SR-14 to SR-18	Outside Study Area
I-5 North Capacity Enhancements	SR-14 to Lake Hughes Road	Outside Study Area
SR-71 Gap Closure	I-10 to Rio Rancho Road	Outside Study Area
Sepulveda Pass Express Lane	I-10 to US-101	Outside Study Area
SR-57/SR-60 Interchange Improvements	SR-57/SR-60	Outside Study Area
I-710 South Corridor Project (Phases 1 and 2)	Ports of Long Beach and LA to SR-60	Within Study Area
I-105 Express Lane	I-405 to I-605	Within Study Area
I-5 Corridor Improvements	I-605 to I-710	Outside Study Area

Source: Metro 2018, WSP 2019

Notes: ¹ Where extensions are proposed for existing Metro rail lines, the origin/destination is defined for the operating scheme of the entire rail line following completion of the proposed extensions and not just the extension itself.

² The Metro C Line extension to Torrance includes new construction from Redondo Beach to Torrance; however, the line will operate from Torrance to 96th Street.

³ Link US rail walk times included only.

⁴ The municipality bus network system is based on service patterns for Bellflower Bus, Cerritos on Wheels, Cudahy Area Rapid Transit, Get Around Town Express, Huntington Park Express, La Campana, Long Beach Transit, Los Angeles Department of Transportation, Norwalk Transit System, and the Orange County Transportation Authority.

BRT = bus rapid transit; LA = Los Angeles; LAUS = Los Angeles Union Station; LAX = Los Angeles International Airport; LRT = light rail transit; SR = State Route; VA = Veterans Affairs

2.2 Locally Preferred Alternative

2.2.1 Refinements to the Locally Preferred Alternative

The LPA evaluated in this report is Alternative 3 from the Draft EIS/EIR with refinements to address stakeholder coordination and comments on the Draft EIS/EIR. Refinements to the LPA include the following:

- Shift the Slauson/A Line aerial station platform south and add a second set of vertical circulation and pedestrian circulation elements between the Slauson/A Line Station and the existing A Line Station. Additionally, a set of stairs was added between the A Line station and street level.
- Swap the location of the freight and LRT tracks within the La Habra Branch ROW compared to the Draft EIS/EIR design. Freight tracks will be located on the north side of the ROW and LRT tracks on the south side to accommodate potential freight connectivity to an existing industrial track on the north side of the ROW.
- Open or close at-grade crossings and implement left-turn restrictions over the LRT tracks in the City of Huntington Park:
 - Open crossings previously proposed for closure at Albany Street and Rugby Boulevard
 - Close crossings previously proposed to remain open at Malabar Street and Arbutus Avenue
 - Implement left-turn restrictions at Santa Fe Avenue, Pacific Boulevard, Miles Avenue, and State Street
- Modify roadway design at the southeast corner of Florence Avenue and California Avenue to avoid partial acquisition of infrastructure related to a water well.
- Redesign a freight spur track connection north of Rayo Avenue on the west side of the freight tracks to avoid impacts to a spur track.
- Close the private at-grade crossing at Miller Way. The private business will be displaced by the Project.
- Extend the LRT viaduct north of Imperial Highway to avoid impacts to a spur track and full acquisition of a property.
- Reconfigure the I-105/C Line Station parking facility by removing dedicated transit parking on the west side of the freight tracks and expanding the parking facility on the east side of the freight tracks to the north; also add a new driveway entrance to the parking facility at Century Boulevard.
- Eliminate demolition and reconstruction of the Arthur Avenue and Façade Avenue bridges; modify Façade Avenue to an emergency exit only from the I-105/C Line infill station (rather than a station entrance and exit).
- Modify the replacement freight bridge at I-105 to a four-span structure, consistent with the current bridge, rather than the previously proposed two-span structure.
- Replace the proposed pedestrian undercrossing with a pedestrian bridge at Paramount High School that will span the entire rail ROW.
- Realign the MSF site entrance on Somerset Boulevard to align with Bayou Avenue to allow for a signalized pedestrian crossing of Somerset Boulevard.
- Add protected left turn and a traffic signal on Clark Avenue at Los Angeles Street to accommodate dedicated turning movements to the community.

- Modify alignment of the LRT tracks and soundwall at the Bellflower Mobile Home Park to minimize parking loss and provide replacement parking elsewhere on the property to maintain the existing number of parking spaces.
- Redesign retaining walls on the southeast side of the 183rd Street/Gridley Road crossing from retained fill to columns.
- Incorporate the Artesia Historic District Recreation Trails as an existing, rather than future, condition in the Final EIS/EIR plan set.
- Add a design option that will close 186th Street but keep 187th Street open to traffic in the City of Artesia, and turn Corby Avenue into a cul-de-sac with an access driveway for the existing business.
- Modify the entrance to the Pioneer Station parking structure to align with Solana Place and shift structure north to provide alley egress resulting in an additional level on the Pioneer parking structure to maintain the number of parking spaces identified in the Draft EIS/EIR.
- Extend the median located north of the LRT tracks at the Pioneer Boulevard grade crossing to prohibit left turns from a shopping center driveway along the east side.
- Incorporate Mitigation Measures NOI-4 (Crossing Signal Bell Shrouds) and NOI-5 (Gate-Down-Bell-Stop Variance), recommended in the Draft EIS/EIR to further reduce noise at grade crossings, as Project Measure NOI PM-1 and NOI PM-2 in the Final EIS/EIR to be implemented as part of the LPA.
- Add Project Measure VA PM-8 (Residential Screening for Aerial Structures), which requires privacy screening along portions of the aerial structure adjacent to the rear of residential properties in the Cities of Paramount, Bellflower, and Cerritos if the soundwall in those locations will not be sufficiently tall to provide similar privacy screening.
- Add Project Measures BIO PM-1 (Invasive Plant Species Best Management Practices) and BIO PM-2 (Prohibition of Invasive Plant Species in Landscape Plans) to provide options to minimize the spread of invasive species during construction and prohibit the inclusion of invasive species in landscape plans; add Project Measure BIO PM-3 (LA Metro Tree Policy) to require adherence to LA Metro Tree Policy, adopted by Metro in October 2022.
- Add Project Measure CR PM-1 (Secretary of the Interior Standards Design Review), which requires review and approval of the design of the new LRT bridge and C Line station that will be constructed within the Century Freeway-Transitway Historic District and extension of the Union Pacific LA River Rail Bridge's existing concrete piers by a professional who meets the Secretary of the Interior's Professional Qualification Standards in architectural history, history, or architecture.

Refinements also included the following modifications to construction laydown/staging areas:

- Relocate the construction laydown area near State Street and Randolph Street to east of State Street in the railroad ROW.
- Relocate the laydown area at the southeast corner of Imperial Highway and Garfield Place to north of Imperial Highway within the San Pedro Subdivision ROW.
- Locate a construction laydown/staging area on the east side of the ROW between Rayo Avenue and Southern Avenue.

Additionally, refinements included changes to traction power substations (TPSS) site locations:

- Relocate TPSS Site 14 from the northwest corner of Randolph Street and State Street to the east within railroad ROW.
- Eliminate optional TPSS Sites 16E and 12E in the City of Huntington Park.
- Add Optional TPSS Site 7E within the reconfigured parking facility east of the tracks at the I-105/C Line Station parking facility.
- Relocate the proposed TPSS Site 2 from the northwest side of the intersection of 183rd Street/Gridley Road to the southeast side.

2.2.2 Alignment Configuration

This section summarizes the LPA alignment. The general characteristics of the LPA are summarized in Table 2.2. Figure 2-3 illustrates the freeway crossings along the alignment. Additionally, the LPA will require relocation of existing freight rail tracks within the ROW to maintain existing operations where freight tracks will be in a shared corridor with the LRT tracks. Figure 2-2 depicts the alignment sections that will require freight track relocation.

Table 2.2. Summary of LPA Components

Component	Quantity
Alignment length	14.5 miles
Length of at-grade and aerial	12.1 miles at-grade; 2.4 miles aerial ¹
Station configurations	9 along WSAB alignment, 1 at-grade infill station along C Line 3 aerial; 6 at-grade
Parking facilities	5 total: 4 surface lots and 1 parking structure (approximately 2,800 spaces)
At-grade crossings	30
Elevated street crossings	15
Freight crossings	6
Freeway crossings	4 (1 aerial/overcrossing at I-105; 3 freeway undercrossings ² at I-710, I-605, SR 91)
Freight realignment	8.7 miles
River crossings	3 (Rio Hondo, LA River and San Gabriel)
TPSS facilities	17
Maintenance and Storage Facility site	1 (City of Bellflower)

Source: WSP 2023

Notes: ¹ Alignment configuration measurements count retained fill embankments as at-grade.

² The light rail tracks crossing beneath freeway structures.

LA = Los Angeles; TPSS = traction power substation; WSAB = West Santa Ana Branch

Figure 2-3. Freeway Crossings



Source: WSP 2023

The total alignment length of the LPA will be approximately 14.5 miles, consisting of approximately 12.1 miles of at-grade and 2.4 miles of aerial alignment. The LPA will include nine new LRT stations along the WSAB alignment, of which six will be at-grade and three will be aerial. Additionally, the Project will add one new infill station along the C Line at I-105 to allow transfers between the WSAB alignment and the C Line. Five of the stations will include parking facilities, providing a total of approximately 2,800 dedicated transit parking spaces. Four of the parking facilities will be surface lots and the fifth will be a parking structure. The alignment will include 30 at-grade crossings, 4 freeway crossings (3 freeway undercrossings and 1 aerial freeway crossing), 3 river crossings, 15 aerial road crossings, and 6 freight crossings. The following further describes the LPA along the alignment.

Northern terminus (City of Los Angeles/Florence-Firestone community of LA County): The northern terminus of the LPA will begin at the Slauson/A Line Station, which will serve as a transfer point to the Metro A Line. Transfers between the Slauson/A Line Station and the existing Metro A Line will be accommodated via two pedestrian bridges between the two station platforms. The pedestrian bridges will be located at the southern and northern ends of the platforms and will be accessed by stairs, escalators, and/or elevators. Stairs, escalators, and/or elevators will also connect with the street level on the north side of the station, while stairs will connect with the street level on the south side of the station. An additional set of stairs will be added to the existing A Line Station providing access to street level. Tail tracks³ accommodating layover storage for a three-car train will extend approximately 1,000 feet north from the station.

La Habra Branch ROW⁴ (City of Huntington Park): South of the Slauson/A Line Station, the alignment will turn east along the existing UPRR owned La Habra Branch ROW in the median of Randolph Street. The alignment will be on the south side of the La Habra Branch ROW, and the freight tracks will be realigned but remain in the northern portion of the ROW. The alignment will transition to an at-grade configuration west of Alameda Street and will proceed east along the Randolph Street median. Wilmington Avenue, Regent Street, and Malabar Street will be closed to traffic crossing the ROW, altering the intersection design to a right-in, right-out configuration. The Pacific/Randolph Station will be located just east of Pacific Boulevard. From the Pacific/Randolph Station, the alignment will continue east at-grade. Arbutus Avenue and Rita Avenue will be closed to traffic crossing the ROW, altering the intersection design to a right-in, right-out configuration.

San Pedro Subdivision ROW (Cities of Huntington Park, Bell, Cudahy, South Gate, Downey, and Paramount): At the San Pedro Subdivision ROW, the alignment will transition to an aerial configuration and turn south to cross over Randolph Street and the freight tracks, returning to an at-grade configuration north of Gage Avenue. The alignment will be located on the east side of the existing San Pedro Subdivision ROW freight tracks, and the existing track(s) will be relocated to the west side of the ROW. The alignment will continue at-grade within the San Pedro Subdivision ROW to the at-grade Florence/Salt Lake Station south of Florence Avenue.

³ Tail tracks are additional tracks that extend beyond the end of the mainline tracks and can be used for temporarily parking, storing, or reversing the direction of trains. While the tracks are designed to allow for layover if needed, trains will not sit at the end of the line.

⁴ The La Habra Branch may also be referred to as the La Habra Subdivision. La Habra Branch is used within this document.

The alignment will continue southeast from the at-grade Florence/Salt Lake Station within the San Pedro Subdivision ROW, crossing Otis Avenue, Santa Ana Street, and Ardine Street at-grade. The alignment will be located on the east side of the existing San Pedro Subdivision freight tracks, and the existing tracks will be relocated to the west side of the ROW. South of Ardine Street, the alignment will transition to an aerial structure to cross over the existing UPRR tracks and Atlantic Avenue. The Firestone Station will be located on an aerial structure between Atlantic Avenue and Firestone Boulevard. The Firestone Station will include a dedicated transit parking facility providing approximately 600 parking spaces with a vehicle underpass under the freight tracks to access the parking facility.

The alignment will then cross over Firestone Boulevard and transition back to an at-grade configuration prior to crossing Rayo Avenue at-grade. The alignment will continue south along the San Pedro Subdivision ROW, crossing Southern Avenue at-grade and continuing at-grade until it transitions to an aerial configuration to cross over the LA River. The LRT bridge will be constructed next to the existing freight bridge. South of the LA River, the alignment will transition to an at-grade configuration, then passing under the I-710 freeway through a new box tunnel structure. The alignment will then return to an aerial structure to cross over the Rio Hondo Channel. South of the Rio Hondo Channel, the alignment will transition to an aerial structure to cross over a realigned spur track, Imperial Highway and Garfield Avenue. South of Garfield Avenue, the alignment will transition to an at-grade configuration and serve the Gardendale Station north of Gardendale Street.

From the Gardendale Station, the alignment will continue south in an at-grade configuration, crossing Gardendale Street and Main Street to serve the I-105/C Line Station, which will be located at-grade north of Century Boulevard. The I-105/C Line Station will include a dedicated transit parking facility providing approximately 340 to 360 parking spaces, depending on the location of the TPSS. The alignment will continue at-grade, crossing Century Boulevard, then will cross over the I-105 freeway in an aerial configuration within the existing San Pedro Subdivision ROW bridge footprint. A new Metro C Line Station will be constructed in the median of the I-105 freeway. The I-105/C Line Station will be connected to the new infill C Line Station in the middle of the freeway via a pedestrian walkway on the new LRT bridge. Vertical pedestrian access will be provided from the LRT bridge to the new C Line Station platform via stairs, escalators, and/or elevators. Emergency egress from the C Line Station will also be provided at Façade Avenue via stairs and elevators. To accommodate construction of the new station platform, the existing Metro C Line tracks will be widened and, as part of the I-105 Express Lanes Project, the I-105 lanes will be reconfigured.

PEROW (Cities of Paramount, Bellflower, Cerritos, and Artesia): South of the I-105 freeway, the alignment will continue at-grade within the San Pedro Subdivision ROW. In order to maintain freight operations and allow for freight train crossings, the alignment will transition to an aerial configuration as it turns southeast and enter the PEROW. The existing freight track will cross beneath the aerial alignment and align on the north side of the PEROW east of the San Pedro Subdivision ROW. The Paramount/Rosecrans Station will be located in an aerial configuration west of Paramount Boulevard and north of Rosecrans Avenue. The existing freight track will be relocated to the northeast side of the alignment adjacent to the viaduct structure. The Paramount/Rosecrans Station will include a dedicated transit parking facility providing approximately 490 parking spaces located south of the alignment between Los Angeles Department of Water and Power property and Rosecrans Avenue.

The alignment will continue southeast in an aerial configuration over the Paramount Boulevard/Rosecrans Avenue intersection and descend to an at-grade configuration. The alignment will return to an aerial configuration to cross over Downey Avenue descending back to an at-grade configuration north of Somerset Boulevard. The existing Paramount High School pedestrian bridge will be reconstructed over the LPA and freight tracks to maintain the connection between Paramount High School and the athletics fields. One of the adjacent freight storage tracks at the World Energy facility will be relocated to accommodate the new LRT tracks and maintain storage capacity. There are no active freight tracks south of the World Energy facility (Somerset Boulevard).

The alignment will cross Somerset Boulevard at-grade. South of Somerset Boulevard, the at-grade alignment will parallel the existing Bellflower Bike Trail that is currently aligned on the south side of the PEROW. The alignment will continue at-grade crossing Lakewood Boulevard, Clark Avenue, and Alondra Boulevard. The at-grade Bellflower Station will be located west of Bellflower Boulevard. The Bellflower Station will include a dedicated transit parking facility providing approximately 260 parking spaces.

East of Bellflower Boulevard, the Bellflower Bike Trail will be realigned to the south side of the PEROW to accommodate an existing historic building located near the southeast corner of Bellflower Boulevard and the PEROW. The realigned bike trail will then match the existing bike trail east of the historic building near Bellflower Boulevard. The LRT alignment will continue southeast within the PEROW and transition to an aerial configuration near Cornuta Avenue, crossing over Flower Street and Woodruff Avenue. The alignment will return to an at-grade configuration south of Woodruff Avenue. South of Woodruff Avenue, the Bellflower Bike Trail will be realigned along the north side of the PEROW. Continuing southeast, the LRT alignment will cross under the SR-91 freeway in an existing undercrossing. The alignment will cross over the San Gabriel River on a new bridge, replacing the existing abandoned freight bridge. South of the San Gabriel River, the alignment will transition back to an at-grade configuration before crossing Artesia Boulevard at-grade.

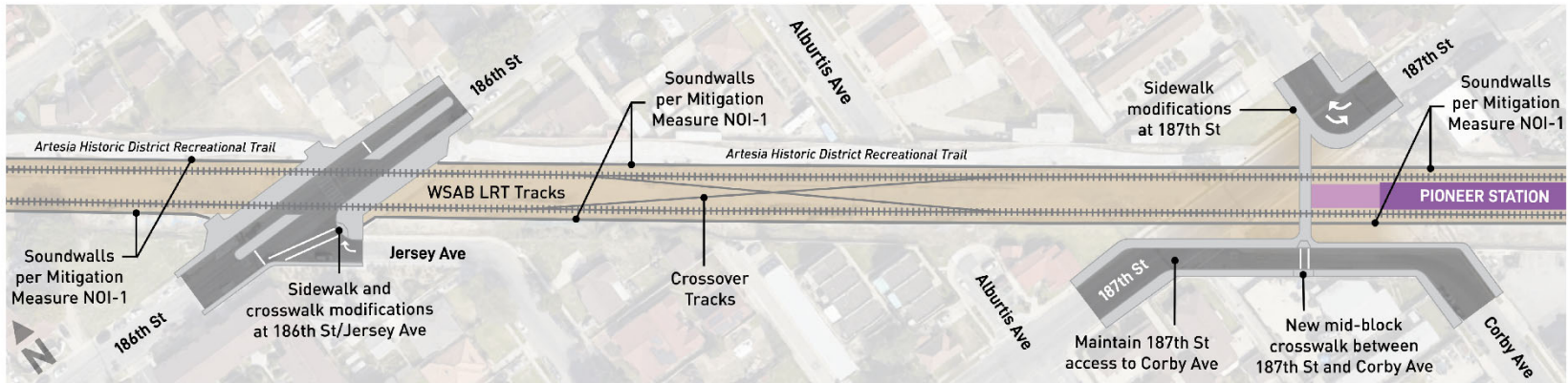
East of Artesia Boulevard, the alignment will cross beneath the I-605 freeway in an existing underpass. Southeast of the underpass, the alignment will continue at-grade, crossing Studebaker Road. North of Gridley Road, the alignment will transition to an aerial configuration to cross over 183rd Street and Gridley Road. The alignment will return to an at-grade configuration and cross 186th Street and 187th Street at-grade. The alignment will then pass through the Pioneer Station on the north side of Pioneer Boulevard at-grade. The Pioneer Station will include a dedicated transit parking facility providing approximately 1,100 parking spaces. Tail tracks accommodating layover storage for a three-car train will extend approximately 1,000 feet south from the station, crossing Pioneer Boulevard and terminating north of South Street.

2.2.3 Design Option – Close 186th Street

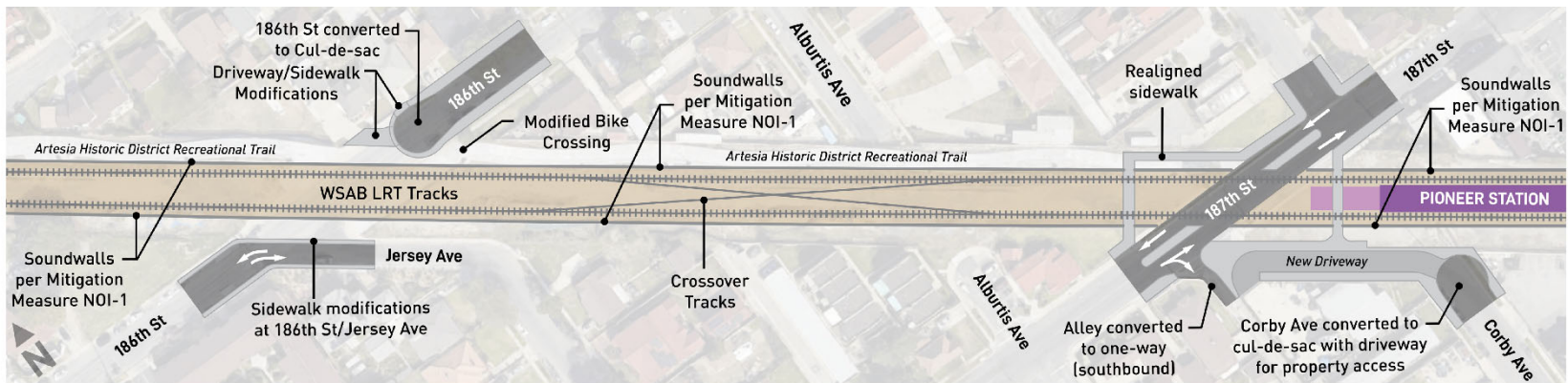
The LPA includes one design option:

- **Design Option:** Close 186th Street – The design option would close 186th Street but keep 187th Street open to traffic in the City of Artesia. Corby Avenue would become a cul-de-sac with an access driveway for the existing business (Figure 2-4).

Figure 2-4. Locally Preferred Alternative and Design Option: Close 186th Street



Locally Preferred Alternative



Design Option 1: Close 186th Street

Source: Cityworks Design and WSP 2023

2.2.4 Maintenance and Storage Facility

Generally, each LRT project requires an MSF facility to provide daily servicing and cleaning, inspection and repairs, and storage of light rail vehicles (LRVs). Activities may take place in the MSF throughout the day and night depending upon train schedules, workload, and the maintenance requirements.

In January 2022, the Metro Board identified the Bellflower MSF as the WSAB Project's MSF site. The MSF site is located in the City of Bellflower and is bounded by a mobile home community and industrial facilities to the west, Somerset Boulevard and apartment complexes to the north, residential homes to the east, and the PEROW and Bellflower Bike Trail to the south. Access to the site will be via a signalized driveway at Somerset Boulevard and Bayou Avenue (Figure 2-5). In total, the MSF site is approximately 21 acres and could accommodate up to 80 LRVs to serve the Project's operations plan.

The MSF will have storage tracks, each with sufficient length to store three-car train sets and a maintenance-of-way vehicle storage. The facility will include a main shop building with administrative offices, a cleaning platform, a TPSS, employee parking, a vehicle wash facility, a paint and body shop, and other facilities as needed. The east and west yard leads (i.e., the tracks leading from the mainline to the facility) will have sufficient length for a three-car train set.

Figure 2-5. Maintenance and Storage Facility Site



Source: WSP and TAHA 2023

3 REGULATORY FRAMEWORK

3.1 Federal

3.1.1 Transit Noise

FTA standards and criteria for assessing noise impacts related to transit projects are based on community reactions to noise. The criteria reflect changes in noise exposure using a sliding scale where the higher the level of existing noise, the smaller increase in total noise exposure is allowed. Some land use activities are more sensitive to noise than others, such as parks, churches, and residences, as compared to industrial and commercial uses. FTA Noise Impact Criteria groups sensitive land uses into the three categories described in Table 3.1. Most commercial or industrial uses are not considered noise-sensitive because activities within these buildings are generally compatible with higher noise levels. Business can be considered noise-sensitive if low noise levels are an important part of operations, such as sound and motion picture recording studios. Most parks used primarily for active recreation such as sports complexes and bike or running paths are not considered noise-sensitive. However, some parks (even some in dense urban areas) are primarily used for passive recreation such as reading, conversation, or meditation. These places, which may be valued as havens from the noise and rapid pace of everyday city life, are treated as noise-sensitive, and are included in land use Category 3. Non-sensitive uses do not require noise impact assessment.

Table 3.1. Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Land Use Type	Noise Metric, dBA	Description of Land Use Category
1	High Sensitivity	Outdoor L_{eq} (1hr) ¹	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	Residential	Outdoor L_{dn}	This category is applicable all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	Institutional	Outdoor L_{eq} (1hr) ¹	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also included in this category.

Source: FTA 2018

Notes: ¹ L_{eq} (1hr) for the loudest hour of project-related activity during hours of noise sensitivity.

Note: dBA = A-weighted decibels; $L_{eq}(h)$ = hourly equivalent noise level; L_{dn} = day-night noise level

The FTA has also identified special cases for certain land use categories.

Severe: Noise mitigation will be specified for severe impact areas unless there is no practical method of mitigating the noise.

Moderate: In this range, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors may include the predicted increase over existing noise levels, the type and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation and the cost effectiveness of mitigating noise to more acceptable levels.

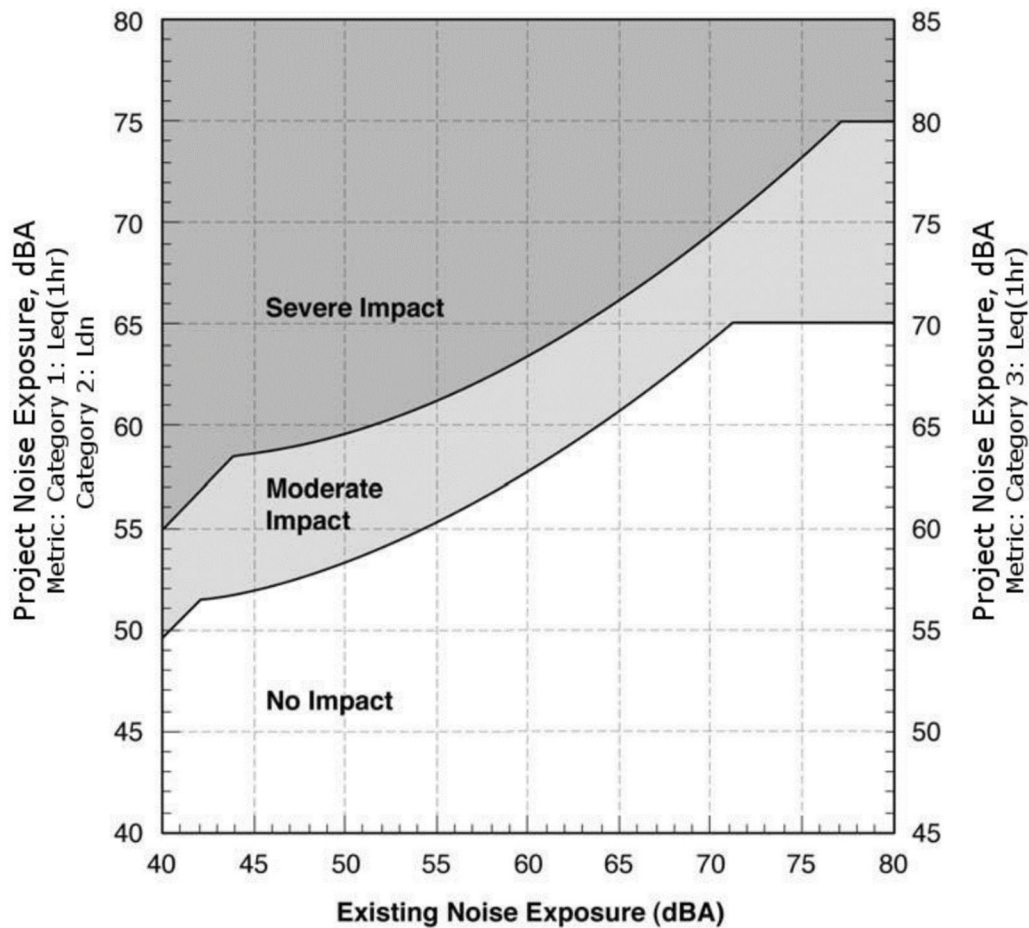
The FTA has defined three levels of impacts for sensitive uses affected by transit projects: no impact, moderate impact, or severe impact. A description of each impact level is shown in Table 3.2. The three impact levels are also illustrated in Figure 3-1.

Table 3.2. Levels of Impact

Level of Impact	Description
No Impact	Project-generated noise is not likely to cause community annoyance. Noise projections in this range are considered acceptable by FTA and mitigation is not required.
Moderate Impact	Project-generated noise in this range is considered to cause impact at the threshold of measurable annoyance. Moderate impacts serve as an alert to project planners for potential adverse impacts and complaints from the community. Mitigation should be considered at this level of impact based on project specifics and details concerning the affected properties.
Severe Impact	Project-generated noise in this range is likely to cause a high level of community annoyance. The project sponsor should first evaluate alternative locations/alignments to determine whether it is feasible to avoid severe impacts altogether. In densely populated urban areas, evaluation of alternative locations may reveal a trade-off of affected groups, particularly for surface rail alignments. Projects that are characterized as point sources rather than line sources often present greater opportunity for selecting alternative sites. This guidance manual and FTA's environmental impact regulations both encourage project sites which are compatible with surrounding development when possible. If it is not practical to avoid severe impacts by changing the location of the project, mitigation measures must be considered.

Source: FTA 2018

Figure 3-1. Noise Impact Criteria for Transit Projects



Source: FTA 2018

The noise impact criteria for transit operations are summarized in Table 3.3. The first column shows the existing noise exposure and the remaining columns show the additional noise exposure caused by a transit project that will result in the two impact levels. As the existing noise exposure increases, the amount of allowable increase in noise exposure from the LPA decreases. For the purposes of this analysis the FTA impact criteria were calculated for each cluster based upon existing noise exposure using equations found within Table C-1 of the FTA *Transit Noise and Vibration Impact Assessment* guidance. The future noise exposure will be the combination of the existing noise exposure and the additional noise exposure caused by a transit project.

Table 3.3. Noise Impact Criteria for Transit Operations

Existing Noise Exposure L_{eq} or L_{dn} (dBA)	Project Noise Impact Exposure, L_{eq} (h) or L_{dn} (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
<43	< Ambient + 10	Ambient + 10 to 15	>Ambient + 15	< Ambient + 15	Ambient + 15 to 20	>Ambient + 20
43	<52	52-58	>58	<57	57-63	63
44	<52	52-58	>58	<57	57-63	63
45	<52	52-58	>58	<57	57-63	63
46	<53	53-59	>59	<58	58-64	64
47	<53	53-59	>59	<58	58-64	64
48	<53	53-59	>59	<58	58-64	64
49	<54	54-59	>59	<59	59-64	64
50	<54	54-59	>59	<59	59-64	64
51	<54	55-60	>60	<59	59-65	65
52	<55	55-60	>60	<60	60-65	6
53	<55	55-60	>60	<60	60-65	65
54	<55	55-61	>61	<60	60-66	66
55	<56	55-61	>61	<61	61-66	66
56	<56	56-62	>62	<61	61-67	67
57	<57	57-62	>62	<62	62-67	67
58	<57	57-62	>62	<62	62-67	67
59	<58	58-63	>63	<63	63-68	68
60	<58	58-63	>63	<63	63-68	68
61	<59	59-64	>64	<64	64-69	69
62	<59	59-64	>64	<64	64-69	69
63	<60	60-65	>65	<65	65-70	70
64	<61	61-65	>65	<66	66-70	70
65	<61	61-66	>66	<66	66-71	71
66	<62	62-67	>67	<67	67-72	72
67	<63	63-67	>67	<68	68-72	72
68	<63	63-68	>68	<68	68-73	73
69	<64	64-69	>69	<69	69-74	74
70	<65	65-69	>69	<70	70-74	74
71	<66	66-70	>70	<71	71-75	75
72	<66	66-71	>71	<71	71-76	76

Existing Noise Exposure L_{eq} or L_{dn} (dBA)	Project Noise Impact Exposure, L_{eq} (h) or L_{dn} (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
73	<66	66-71	>71	<71	71-76	76
74	<66	66-72	>72	<71	71-77	77
75	<66	66-73	>73	<71	71-78	78
76	<66	66-74	>74	<71	71-79	79
77	<66	66-74	>74	<71	71-79	79
>77	<66	66-75	>75	<71	71-80	80

Source: FTA 2018

Note: dBA = A-weighted decibels; $L_{eq}(h)$ = hourly equivalent noise level; L_{dn} = day-night noise level

For at-grade or aerial transit systems, groundborne noise (GBN) is not considered because the airborne noise from the train pass-by will result in higher noise levels at the interior of the receiver buildings. GBN is a potential impact from underground transit operations where there is no wayside noise. Because the LPA does not include tunnel sections, a GBN analysis is not included.

3.1.2 Construction Noise

Construction noise is assessed using guidance provided in the FTA Guidance Manual. FTA construction noise criteria are shown in Table 3.4. Local ordinances are shown in Section 3.4.

Table 3.4. FTA Construction Noise Impact Criteria

Land Use	1-hour L_{eq} (dBA)	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: FTA 2018

Note: dBA = A-weighted decibels; L_{eq} = equivalent noise level

3.1.3 Transit Vibration

FTA has developed impact criteria for groundborne vibration. These criteria, as summarized in Table 3.5 and are presented in terms of acceptable indoor GBV and noise levels. Impacts will occur if these levels are exceeded. Criteria for GBV are expressed in terms of rms velocity levels in VdB. The criteria for special buildings such as concert halls, television and recording studios, auditoriums, and theaters, which are also sensitive to vibration but do not fit into the three FTA sensitive land use categories previously described, are presented in Table 3.6. Since the LPA will have more than 70 train pass-bys per day, the FTA criteria for frequent events is used to assess potential impact.

Table 3.5. Groundborne Vibration Impact Criteria for General Assessment

Land Use Category	GBV Impact Levels (VdB, 1 micro-inch / sec)		
	Frequent Events ¹	Occasional Events ²	Infrequent Events ³
Category 1: Buildings where vibration would interfere with interior operations. ⁴	65	65	65
Category 2: Residences and buildings where people normally sleep.	72	75	80
Category 3: Institutional land uses with primarily daytime use.	75	78	83

Source: FTA 2018

Notes: ¹ "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

² "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operation.

³ "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes commuter rail branch lines.

⁴ This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. GBV = groundborne vibration; VdB = vibration notation

Table 3.6. Groundborne Vibration Impact Criteria for Special Buildings

Type of Building or Room	GBV Impact Levels (VdB, 1 micro-inch / sec)	
	Frequent Events ¹	Occasional or Infrequent Events ^{2,3}
Concert Halls	65	65
TV Studios	65	65
Recording Studios	65	65
Auditoriums	72	80
Theaters	72	80

Source: FTA 2018

Notes: ¹ "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

² "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operation.

³ "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes commuter rail branch lines.

GBV = groundborne vibration; VdB = vibration notation

When the LPA does not cause vibration more than 5 VdB greater than the existing source of freight train operations, the existing source can be ignored. Table 3.5 includes the consideration of frequency of vibration events. If the combined frequency of existing and LPA vibration events change the Vibration Category, for example from occasional to frequent, the impact criteria for the higher-frequency of events is applicable.

3.1.4 Construction Vibration

To evaluate potential annoyance or interference with vibration-sensitive activities caused by construction vibration, the criteria for General Assessment shown in Table 3.5 can be applied; however, short-term annoyance during construction is not a NEPA-significant impact. In most cases, the primary concern regarding construction vibration relates to potential damage effects. Vibration damage criteria are provided in Table 3.7 for various structural categories.

Table 3.7. Construction Vibration Damage Risk Criteria

Building Category	PPV (inches / second)
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Historic buildings that have average sensitivity to vibration damage and non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: FTA 2018

Note: PPV = peak particle velocity

The limit of 0.12 in/sec for fragile historic structures is among the most restrictive limits used for vibration damage risk to buildings. A damage risk criterion of 0.2 in/sec (PPV) is protective of all but the most fragile buildings.

In most cases, the primary concern regarding construction vibration relates to potential architectural or structural damage effects to structures. The potential for damage to building structures associated with construction vibration is normally assessed using FTA vibration damage criteria, as shown in Table 3.7. However, FTA does not have a criterion related to at-grade or underground structures, such as a water well or buried pipeline. The U.S. Bureau of Mines damage risk limit for blasting is 4.0 in/sec PPV for underground structures and 2.0 in/sec PPV for buildings (Bureau of Mines 1962). The Caltrans *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013b) states in Chapter 11 that “[w]ater wells and buried pipelines can survive rather high-vibration intensities because they are constrained by the soil and bedding materials surrounding them.” While the Caltrans manual does not set impact criteria for underground utilities, it cites multiple datasets showing no effects on water wells at vibration levels of between 5 and 8 in/sec PPV depending on the geology and soil conditions. Therefore, 2.0 in/sec PPV has been selected as a conservative damage risk criterion that will protect wells and pipelines during construction of the LPA.

3.2 State

3.2.1 Noise

There are no applicable state noise regulations relevant to the LPA.

3.2.2 Vibration

There are no applicable state vibration regulations relevant to the LPA.

3.3 Regional

3.3.1 Noise

There are no applicable regional noise regulations relevant to the LPA.

3.3.2 Vibration

There are no applicable regional vibration regulations relevant to the LPA.

3.4 Local

The regulations of local jurisdictions do not apply to transit noise, which is most appropriately assessed using guidance provided by the FTA. However, the regulations of local jurisdictions are relevant with regard to LPA construction.

3.4.1 City of Los Angeles

The City of Los Angeles has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Los Angeles Municipal Code* and the *City of Los Angeles General Plan Noise Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.8.

Table 3.8. City of Los Angeles – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Los Angeles Municipal Code	
Section 41.40	Engaging in construction, repair, or excavation work with any construction type device or job-site delivering of construction materials without a Police Commission approved variance would constitute a violation: <ul style="list-style-type: none"> ▪ Between the hours of 9:00 p.m. and 7:00 a.m. of the following day. ▪ In any residential zone, or within 500 feet of land so occupied, before 8:00 a.m. or after 6:00 p.m. on any Saturday, or at any time on any Sunday. In a manner as to disturb the peace and quiet of neighboring residents or any reasonable person of normal sensitiveness residing in the area.
Section 41.40(j)	States that the noise standards do not apply to major public works construction by the City of Los Angeles and its proprietary Departments, including all structures and operations necessary to regulate or direct traffic due to construction activities. It also states that the Board of Police Commissioners will grant a variance for this work and construction activities will be subject to all conditions of the variance as granted. Concurrent with the request for a variance, the City Department that will conduct the construction work will notify each affected Council district office and established Neighborhood Council of projects where proposed Sunday and/or Holiday work will occur.
Section 91.1207.14.2	Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the day-night average sound level (L_{dn}) or the community noise equivalent level (CNEL), consistent with the noise element of the local general plan.

Code/Goal/Objective/Policy	Description
Section 112.05	Specifies the maximum noise level of powered equipment or powered hand tools. Any powered equipment or hand tool that produces a maximum noise level exceeding 75 dBA at a distance of 50 feet when operated within 500 feet of a residential zone is prohibited. However, this noise limitation does not apply where compliance is technically infeasible. Technically infeasible means the above noise limitation cannot be met despite the use of mufflers, shields, sound barriers and/or any other noise reduction device or techniques during the operation of equipment.
City of Los Angeles General Plan Noise Element	
P11	For a proposed development project that is deemed to have a potentially significant noise impact on noise-sensitive uses, as defined by this chapter, require mitigation measures, as appropriate, in accordance with California Environmental Quality Act and city procedures.
P12	When issuing discretionary permits for a proposed noise-sensitive use (as defined by this chapter) or a subdivision of four or more detached single-family units and which use is determined to be potentially significantly impacted by existing or proposed noise sources, require mitigation measures, as appropriate, in accordance with procedures set forth in the California Environmental Quality Act so as to achieve an interior noise level of a CNEL of 45 dB, or less, in any habitable room, as required by Los Angeles Municipal Code Section 91.

Source: City of Los Angeles, *Municipal Code*, March 2017; City of Los Angeles, *General Plan, Noise Element*, November 1998

3.4.2 City of Vernon

The City of Vernon has established noise standards to control unnecessary, excessive, and annoying noise. The city standards are codified in *Article IV, Zones, Permitted Uses, Development Standards, and Site Planning Standards* in Section 26.4.1-7 (b) (2) of the Comprehensive Zoning Ordinance. The City of Vernon has also established community noise standards to help guide land use decisions and protect sensitive uses from excessive noise levels. These standards are defined in the *City of Vernon General Plan Noise Element*. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.9.

Table 3.9. City of Vernon – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Vernon Municipal Code	
Section 26.4.1-7 (b) (2)	<p>The standards state that, unless otherwise specifically indicated, the noise restrictions below shall apply to all lots within designated noise zones, measured cumulatively with existing noise from all business on the lot.</p> <ul style="list-style-type: none"> ▪ Lots located within one tenth of mile of any residence or school located in Vernon or abutting communities shall have an allowable exterior noise level of 60 dBA from 10:00 p.m. to 7:00 a.m. and 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ All other lots shall have an allowable exterior noise level of 75 dBA at any time

Code/Goal/Objective/Policy	Description
City of Vernon General Plan Noise Element	
Goal N-1	Reduce impacts from transportation noise sources to the extent they may affect industrial businesses.
Policy N-1.1	Encourage the effective enforcement of local, state, and federal noise levels by all appropriate City divisions.
Policy N-1.2	Review noise impacts when rail corridors are consolidated, and review ways to reduce impacts on adjacent businesses.

Source: City of Vernon, *Municipal Code*; City of Vernon, *General Plan Noise Element*, 2015

3.4.3 City of Huntington Park

The City of Huntington Park has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Huntington Park Municipal Code* and the *City of Huntington Park General Plan Noise Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.10.

Table 3.10. City of Huntington Park – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Huntington Park Municipal Code	
Section 9-3.506 (5)	Noise sources associated with construction, repair, remodeling or grading of any real property, provided the activities do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, including Saturdays, or at any time on Sundays or Federal holidays.
Section 9-3.507 (2)	Loading and Unloading. No person shall cause the loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans or similar objects between the hours of 8:00 p.m. and 7:00 a.m. in a manner which would cause a noise disturbance to a residential area.
City of Huntington Park General Plan Noise Element	
Table N-1	Contains guidelines for noise compatible land uses to determine the appropriate land use and mitigation measures.
Goal 1.0	Reduce noise impacts from transportation noise sources.
Policy 1.1	Require construction of barriers to shield noise-sensitive uses from noise.
Policy 1.3	Reduce transportation noise through proper design and coordination of new or remodeled transportation and circulation facilities.

Source: City of Huntington Park, *Municipal Code*; City of Huntington Park, *General Plan Noise Element*, February 1992

3.4.4 County of Los Angeles

The *Los Angeles County General Plan 2035*, adopted in October 2015, provides the policy framework and establishes the long-range vision for how and where the unincorporated areas of the county will grow. The Noise Element sets the goals and policy direction for the

management of noise in the unincorporated areas. The *county's Noise Control Ordinance* establishes standards to regulate intrusive noise in the county. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.11.

Table 3.11. County of Los Angeles – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
County of Los Angeles Noise Control Ordinance	
Section 12.08.390	<p>Exterior noise standards:</p> <ul style="list-style-type: none"> ▪ Noise Zone I, Noise Sensitive Area: 45 dB at any time of the day ▪ Noise Zone II, Residential Properties: 45 dB from 10:00 p.m. to 7:00 a.m. (nighttime) and 50 dB from 7:00 a.m. to 10:00 p.m. (daytime) ▪ Noise Zone III, Commercial Properties: 55 dB from 10:00 p.m. to 7:00 a.m. (nighttime) and 70 dB from 7:00 a.m. to 10:00 p.m. ▪ Noise Zone IV, Industrial Properties: 70 dB at any time of the day <p>Standard No. 1 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 30 minutes in any hour. Standard No. 1 shall be the applicable noise level from subsection A of this section; or, if the ambient L50 exceeds the foregoing level, then the ambient L50 becomes the exterior noise level for Standard No. 1.</p> <p>Standard No. 2 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 15 minutes in any hour. Standard No. 2 shall be the applicable noise level from subsection A of this section plus 5dB; or, if the ambient L25 exceeds the foregoing level, then the ambient L25 becomes the exterior noise level for Standard No. 2.</p> <p>Standard No. 3 shall be the exterior noise level which may not be exceeded for a cumulative period of more than five minutes in any hour. Standard No. 3 shall be the applicable noise level from subsection A of this section plus 20dB; or, if the ambient L8.3 exceeds the foregoing level, then the ambient L8.3 becomes exterior noise level for Standard No. 3.</p> <p>Standard No. 4 shall be the exterior noise level which may not be exceeded for a cumulative period of more than one minute in any hour. Standard No. 4 shall be the applicable noise level from subsection A of this section plus 15dB; or, if the ambient L1.7 exceeds the foregoing level, then the ambient L1.7 becomes the exterior noise level for Standard No. 4.</p> <p>Standard No. 5 shall be the exterior noise level which may not be exceeded for any period of time. Standard No. 5 shall be the applicable noise level from subsection A of this section plus 20dB; or, if the ambient L0 exceeds the foregoing level then the ambient L0 becomes the exterior noise level for Standard No. 5.</p>

Code/Goal/Objective/Policy	Description
Section 12.08.400	<p>No person shall operate or cause to be operated with a dwelling unit, any source of sound, or allow the creation of any noise, which causes the noise level when measured inside a neighboring receiving dwelling unit to exceed the following standards.</p> <p>Standard No. 1 The applicable interior noise level for cumulative period of more than five minutes in any hour; or</p> <p>Standard No. 2 The applicable interior noise level plus 5dB for a cumulative period of more than one minute in any hour; or</p> <p>Standard No. 3 The applicable interior noise level plus 10dB or the maximum measured ambient noise level for any period of time.</p> <p>Interior noise standards</p> <ul style="list-style-type: none"> ▪ Multi-family: 40 dB from 10:00 p.m. to 7:00 a.m. ▪ Residential 45 dB from 7:00 a.m. to 10:00 p.m. <p>If the measured ambient noise level reflected by the L50 exceeds that permissible within any of the interior noise standards in subsection A of Section 12.08.390, the allowable interior noise level shall be increased in 5dB increments in each standard as appropriate to reflect said ambient noise level (L50).</p>
Section 12.08.440 (a)	<ul style="list-style-type: none"> ▪ Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work of public service utilities or by variance issued by the health officer is prohibited.

Code/Goal/Objective/Policy	Description
Section 12.08.440 (b)	<p>Noise restrictions at affected structure. The contractor shall conduct construction activities in such a manner that the maximum noise levels at the affected buildings will not exceed those listed in the following schedule:</p> <p>Maximum noise levels for short-term operation of mobile equipment (less than 10 days)</p> <ul style="list-style-type: none"> ▪ 7:00 a.m. to 8:00 p.m. daily and all day Sundays and holidays. <ul style="list-style-type: none"> – Single-family residential 75 dBA – Multi-family residential 80 dBA – Semi-residential/commercial 85 dBA ▪ 8:00 p.m. to 7:00 a.m. daily and all day Sundays and holidays. <ul style="list-style-type: none"> – Single-family residential 60 dBA – Multi-family residential 64 dBA – Semi-residential/commercial 70 dBA <p>Maximum noise levels for short term operation of stationary equipment (more than 10 days)</p> <ul style="list-style-type: none"> ▪ 7:00 a.m. to 8:00 p.m. daily and all day Sundays and holidays. <ul style="list-style-type: none"> – Single-family residential 60 dBA – Multi-family residential 65 dBA – Semi-residential/commercial 70 dBA ▪ 8:00 p.m. to 7:00 a.m. daily and all day Sundays and holidays. <ul style="list-style-type: none"> – Single-family residential 50 dBA – Multi-family residential 55 dBA – Semi-residential/commercial 60 dBA
Section 12.08.460	Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans or similar objects between the hours of 10:00 p.m. and 6:00 a.m. in such a manner as to cause noise disturbance is prohibited.
Section 12.08.560	Vibration. Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec over the range of 1 to 100 Hertz.
County of Los Angeles General Plan Noise Element	
Goal N 1	The reduction of excessive noise impacts.
Policy N 1.1	Utilize land uses to buffer noise-sensitive uses from sources of adverse noise impacts.
Policy N 1.3	Minimize impacts to noise-sensitive land uses by ensuring adequate site design, acoustical construction, and use of barriers, berms, or additional engineering controls through Best Available Technologies (BAT).
Policy N 1.8	Minimize noise impacts to pedestrians and transit-riders in the design of transportation facilities and mobility networks.

Code/Goal/Objective/Policy	Description
Policy N 1.9	Require construction of suitable noise attenuation barriers on noise-sensitive uses that would be exposed to exterior noise levels of 65 dBA CNEL and above, when unavoidable impacts are identified.
Policy N 1.12	Decisions on land adjacent to transportation facilities, such as the airports, freeways and other major highways, must consider both existing and future noise levels of these transportation facilities to assure the compatibility of proposed uses.

Source: County of Los Angeles, *Code of Ordinances*, July 5, 2017; County of Los Angeles, *General Plan 2035*, October 2015

3.4.5 City of Bell

The City of Bell has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Bell Municipal Code* and the *City of Bell 2030 General Plan Health and Safety Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.12.

Table 3.12. City of Bell – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Bell Municipal Code	
Section 8.28.040 (a)	No person shall play, use, or operate or permit to be played, used or operated any radio, receiving set, TV. set, musical instrument, phonograph, jukebox or other machine or device for producing or reproducing sound in a manner which disturbs the peace and quiet of any residentially zoned neighborhood.
Section 8.28.040 (b)	No person shall play, use, operate or permit to be played, used or operated any radio, receiving set, TV. set, musical instrument, phonograph, jukebox or other machine or device for producing or reproducing sound between the hours of 10:00 p.m. and 7:00 a.m. on property located in any residential zone and when clearly the same is audible at a distance of fifty (50) feet or more from the building, structure, property or vehicle where the sound is produced.
City of Bell General Plan Health and Safety Element	
Policy 22	The City shall implement noise regulations that will lower excessive and intrusive noise to levels that conform to acceptable standards. The City shall ensure Code Enforcement and the Police Department will continue to enforce noise control regulations.
Policy 23	The City of Bell shall cooperate with all public agencies so as to minimize transportation-related noise. Applicable City, State, and Federal noise control regulations shall be enforced.

Source: City of Bell, *Municipal Code*, 1998; City of Bell, *2030 General Plan Health and Safety Element*, May 9, 2018.

3.4.6 City of Cudahy

The City of Cudahy has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Cudahy Municipal Code* and the *City of Cudahy General Plan Noise Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.13.

Table 3.13. City of Cudahy – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Cudahy Municipal Code	
Section 20.60.070 (c) (1)	Maximum permissible exterior sounds levels by receiving land uses. <ul style="list-style-type: none"> ▪ Residential (except multi-family) <ul style="list-style-type: none"> – 45 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Multi-family Residential and Mobile Home Parks <ul style="list-style-type: none"> – 50 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Commercial (All “C” Zones) <ul style="list-style-type: none"> – 60 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Light Industrial Zones <ul style="list-style-type: none"> – 70 dBA from 10:00 p.m. to 7:00 a.m. – 70 dBA from 7:00 a.m. to 10:00 p.m. ▪ Heavy Industrial Zones (All “C” Zones) <ul style="list-style-type: none"> – 70 dBA from 10:00 p.m. to 7:00 a.m. – 70 dBA from 7:00 a.m. to 10:00 p.m.
Section 20.60.070 (d) (1)	Maximum permissible interior noise levels. <ul style="list-style-type: none"> ▪ Residential any duration of time <ul style="list-style-type: none"> – 35 dBA from 10:00 p.m. to 7:00 a.m. – 45 dBA from 7:00 a.m. to 10:00 p.m. ▪ Residential for the duration of one minute within an hour <ul style="list-style-type: none"> – 40 dBA from 10:00 p.m. to 7:00 a.m. – 50 dBA from 7:00 a.m. to 10:00 p.m. ▪ Residential for the duration of five minutes within an hour <ul style="list-style-type: none"> – 35 dBA from 10:00 p.m. to 7:00 a.m. – 45 dBA from 7:00 a.m. to 10:00 p.m.

Code/Goal/Objective/Policy	Description
Section 20.60.090	<p>No vibration shall be detectable beyond the property line of the site from which the vibration is emanating. Within industrial districts, vibration shall not exceed the standards below.</p> <ul style="list-style-type: none"> ▪ Frequency under 10 <ul style="list-style-type: none"> – Steady state vibration displacement of 0.055 inches – Impact displacement of 0.0010 inches ▪ Frequency 10-19 <ul style="list-style-type: none"> – Steady state vibration displacement of 0.0044 inches – Impact displacement of 0.0008 inches ▪ Frequency 20-29 <ul style="list-style-type: none"> – Steady state vibration displacement of 0.0033 inches – Impact displacement of 0.0006 inches ▪ Frequency 30-39 <ul style="list-style-type: none"> – Steady state vibration displacement of 0.0002 inches – Impact displacement of 0.0004 inches ▪ Frequency 40 plus <ul style="list-style-type: none"> – Steady state vibration displacement of 0.0001 inches – Impact displacement of 0.0002 inches
City of Cudahy General Plan Noise Element	
Goal 1	Protect noise-sensitive uses.
Policy NE 1.2	Require all exterior noise sources (construction operations, air compressors, pumps, fans, and leaf blowers) to use available noise-suppression techniques and devices to lower exterior noise to acceptable levels which are compatible with adjacent land uses.
Policy NE 1.4	Consult with responsible federal and state agencies to minimize the impact of transportation-related noise, including noise associated with freeways, major arterials, rail, and public transportation.
Goal 2	Clear and enforced noise regulations
Policy NE 2.6	Implement appropriate standard construction noise controls for all construction projects.

Source: City of Cudahy, *Municipal Code*, December 2018; City of Cudahy, *2040 General Plan Noise Element*, March 2018

3.4.7 City of South Gate

The City of South Gate has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of South Gate Municipal Code* and the *City of South Gate General Plan 2035 Noise Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.14.

Table 3.14. City of South Gate – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of South Gate Municipal Code	
Section 11.34.080 (A)	<p>Maximum sound levels by noise zone.</p> <ul style="list-style-type: none"> ▪ Noise Zone 1, Noise-Sensitive Area: 45 dBA at any time ▪ Noise Zone 2, Residential Properties (in any zone): 40 dBA from 10:00 p.m. to 7:00 a.m. (nighttime) and 50 dBA from 7:00 a.m. to 10:00 p.m. (daytime) ▪ Noise Zone 3, Commercial Properties: 55 dBA any time ▪ Noise Zone 4, Industrial Properties: 65 dBA at any time
Section 11.34.080 (C)	<p>Permitted temporary noise level increase.</p> <ul style="list-style-type: none"> ▪ +5 dBA 30 minutes per hour ▪ +10 dBA 15 minutes per hour ▪ +12 dBA 10 minutes per hour ▪ +15 dBA 5 minutes per hour ▪ +20 dBA 2 minutes per hour
City of South Gate General Plan Noise Element	
Objective N1.1	Minimize noise levels from construction and maintenance equipment, vehicles, and activities.
P.1	Construction activities will be prohibited between the hours of 7:00 p.m. to 8:00 a.m. Monday through Saturday and on Sundays and Federal holidays.
P.2	Construction noise reduction methods will be employed to the maximum extent feasible. These measures may include, but not limited to, shutting off idling equipment, installing temporary acoustic barriers around stationary construction noise sources, maximizing the distance between construction equipment staging areas and occupied sensitive receptor areas, and use of electric air compressors and similar power tools, rather than diesel equipment.
P.3	Prior to approval of project plans and specifications by the City, project applicants and/or construction contractors will identify construction equipment and noise-reducing measures, and the anticipated noise reduction.
P.5	The City may exceed the noise standards on a case-by-case basis for special circumstances including emergency situations, special events and expedited development projects.
Objective N2.1	Ensure noise impacts are considered in land use planning decisions.
P.7	New development projects will provide buffers and/or appropriate mitigation measures to reduce potential noise sources on noise-sensitive land uses.
Objective N4.2	Minimize noise levels created by the Union Pacific, Southern Pacific, and any future rail systems located in close proximity to residential and other noise-sensitive land uses.

Code/Goal/Objective/Policy	Description
P.1	The City will work with rail operators to install and maintain noise mitigation features where operations adversely impact existing or planned residential and other noise-sensitive land uses.
P.2	The City will work with rail operators to ensure noise impacts are considered and mitigated through proper design, siting, and construction.
P.3	Future rail projects under the City's control will be required to analyze noise impacts and to identify and incorporate noise-reducing features into the project design.
P.4	The City should encourage the construction of noise barriers for residential uses near active rail corridors.
P.6	The City will require that noise attenuation measures be incorporated into all new development, renovations, and remodels of residential, health care facilities, schools, libraries, senior facilities, and churches in close proximity to existing or known planned rail lines. Sound attenuation measures will reduce interior noise to a maximum of 45 dBA CNEL.

Source: City of South Gate, *Municipal Code*, February 14, 2017; City of South Gate, *General Plan 2035*, December 2009

3.4.8 City of Downey

The City of Downey has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Downey Municipal Code* and the *City of Downey General Plan 2025 Noise Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.15.

Table 3.15. City of Downey – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Downey Municipal Code	
Section 4606.3 (a)	All activities to which this chapter is applicable shall be conducted in such a manner that any noise produced shall not create a disturbance. The maximum permissible sound pressure level measured at the property boundary of any land use in Subsection (b) of this section from any noise source not operating on a public right-of-way shall constitute prima facie evidence of a public nuisance when such noise level exceeds five (5) dB(A) above the ambient noise level at any period during the course of a twenty-four (24) hour day.

Code/Goal/Objective/Policy	Description
Section 4606.3 (b)	<p>If the alleged noise source is of a continuous nature and cannot reasonably be discontinued for a time period wherein the ambient noise level can be determined, the maximum permissible steady noise level by sound sources across the property boundary of any land use cited below may be less, but not greater than:</p> <ul style="list-style-type: none"> ▪ Residential <ul style="list-style-type: none"> – 45 dBA from 10:00 p.m. to 7:00 a.m. – 55 dBA from 7:00 a.m. to 10:00 p.m. ▪ Commercial <ul style="list-style-type: none"> – 65 dBA from 10:00 p.m. to 7:00 a.m. – 65 dBA from 7:00 a.m. to 10:00 p.m. ▪ Manufacturing <ul style="list-style-type: none"> – 70 dBA from 10:00 p.m. to 7:00 a.m. – 70 dBA from 7:00 a.m. to 10:00 p.m. <p>In the hours between 7:00 a.m. to 10:00 p.m., the noise levels permitted in Subsection (b) of this section may be adjusted by the inclusion of the following factors when applicable:</p> <ul style="list-style-type: none"> ▪ Noise source operated 12 minutes per hour or less + 5 dB(A) ▪ Noise source operated 3 minutes per hour or less + 10 dB(A) ▪ Noise source operated 1 minute per hour or less + 15 dB(A) ▪ Impulsive sounds, pure tone, or sounds with a cyclically varying amplitude shall be considered a public nuisance when such noises are at a sound pressure level of five (5) dB(A) less than those listed above.
Section 4606.5	<p>Construction, repair or remodeling equipment and devices and other related construction noise sources shall be exempted from the provisions of this chapter provided a valid permit for such construction, repair, or remodeling shall have been obtained from the City. In any circumstance other than emergency work, no repair or remodeling shall take place between the hours of 9:00 p.m. of one day and 7:00 a.m. of the following day, and no repair or remodeling shall exceed eighty-five (85) dB(A) across any property boundary at any time during the course of a twenty-four (24) hour day.</p>
Section 5276	<p>To protect the public health, safety and quiet enjoyment of the residents of the noise level for the collection vehicles during the stationary compaction process shall not exceed seventy-five (75) Db (A) at a distance of twenty-five feet (25') from the collection vehicle and at an elevation of five feet (5') from the horizontal base place of such vehicles.</p>
Section 9516.06 (e)	<p>Vibration from any machine, operation, or process which causes a displacement of three thousandth's (0.003) of an inch as measured at the lot lines of the use shall be prohibited. Shock absorbers or similar mountings shall be allowed which will reduce vibration below three-thousandths (0.003) of an inch as measured at the lot lines. See Section 9318 of this chapter.</p>

Code/Goal/Objective/Policy	Description
City of Downey General Plan Noise Element	
Goal 6.1	Protect persons from exposure to excessive noise.
Policy 6.1.1	Minimize noise impacts onto noise-sensitive uses.
Program 6.1.1.1	Enforce noise standards.
Program 6.1.1.2	Ensure that new developments within areas with exterior noise at unacceptable levels are designed to maintain interior noise levels at acceptable levels.
Program 6.1.1.3	Continue to enforce provisions prohibiting construction activities during noise-sensitive hours.
Program 6.1.1.4	Encourage the use of different construction methods, including insulations, for new developments to reduce impacts generated by other land uses and traffic.
Policy 6.2.2	Support measures to reduce noise generated by railroad traffic.
Program 6.2.2.1	Coordinate with railroad companies in developing and implementing noise reduction methods in their operations.
Program 6.2.2.3	Coordinate with railroad companies to maintain rubberized railroad crossings at intersections.
Goal 6.3	Minimize noise impacts on noise-sensitive land uses.
Program 6.3.1.9	Concentrate construction activities producing the most noise during midday hours to minimize impacts onto nearby residents.
Program 6.3.1.10	Encourage the use of noise-suppression equipment.

Source: City of Downey, *Municipal Code*, February 2017; City of Downey, *General Plan 2025, Chapter 6 Noise*, January 25, 2005

3.4.9 City of Paramount

The City of Paramount has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Paramount Municipal Code* and the *City of Paramount General Plan 2025 Health and Safety Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.16.

Table 3.16. City of Paramount – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Paramount Municipal Code	
Section 45-4	Noise performance standards. <ul style="list-style-type: none"> ▪ Noise Zones: Industrial and Commercial <ul style="list-style-type: none"> – 77 dB from 10:00 p.m. to 6:00 a.m. – 82 dB from 6:00 a.m. to 10:00 p.m. ▪ Noise Zones: R1 and R2 <ul style="list-style-type: none"> – 57 dB from 10:00 p.m. to 7:00 a.m. – 62 dB from 7:00 a.m. to 10:00 p.m. ▪ Noise Zones: R3 and R4 <ul style="list-style-type: none"> – 62 dB from 10:00 p.m. to 7:00 a.m. – 67 dB from 7:00 a.m. to 10:00 p.m.
Section 45-7 (d) (1)	Construction, repair or remodeling equipment and devices and other related construction noise sources shall be exempted from the provisions of this chapter provided a permit for such construction, repair or remodeling shall have been obtained for such construction, repair or remodeling from the building department of the city and the construction, repair or remodeling does not take place between the hours of 8:00 p.m. and 7:00 a.m.
Section 45-8	Notwithstanding other sections of this chapter, it shall be unlawful for any person to create, maintain or cause to be created or maintained, any noise within the interior of any multiple family dwelling unit which exceeds 55 dBA as measured. In any adjoining dwelling unit between the hours of 10:00 p.m. and 6:00 a.m.
City of Paramount General Plan Health and Safety Element	
Policy 32	The City of Paramount will cooperate with State and Federal agencies so as to minimize transportation-related noise.
Policy 34	The City of Paramount will promote the development of a compatible noise environment throughout the City.

Source: City of Paramount, *Municipal Code*, 2017; City of Paramount, *General Plan, Health and Safety Element*, August 2007

3.4.10 City of Bellflower

The City of Bellflower has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Bellflower Municipal Code* and the *City of Bellflower General Plan Noise Element 1994* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.17.

Table 3.17. City of Bellflower – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Bellflower Municipal Code	
Section 8.32.010 (b)	Any unreasonable noise level caused by such use or operation which is audible to the human ear at a distance in excess of two hundred (200) feet from the property line of a noise source, which is within any residential area or zone of the City or within five hundred (500) feet of any residential zone, shall be a violation of the provisions of this chapter. "Residential area" as used herein shall mean property zoned or used for residential purposes.
City of Bellflower General Plan Noise Element	
Goal 1	Maintain or reduce noise levels throughout the City.
Policy 1.2	Utilize noise attenuation mechanisms specified in the Uniform Building Code and the State Noise Insulation Standards (California Administrative Code, Title 24). Noise attenuation mechanisms include; double glazing, sound walls, insulation, and proper siting of land uses.
Policy 1.4	Limit construction activities which impact adjacent residential uses to the hours of 7:00 a.m. to 8:00 p.m. during weekdays and Saturdays.
Policy 1.5	Require construction activities to incorporate feasible and practical techniques which minimized noise impacts.
Policy 1.7	Ensure the outdoor noise limits for residential uses do not exceed 60 dB CNEL for single-family uses and 65 dB L _{dn} for multiple family uses.
Policy 1.8	Ensure the indoor noise limits for all residential uses do not exceed 45 dB CNEL.
Policy 1.9	Actively pursue sound wall mitigation measures with Cal Trans and the Metropolitan Transit Authority (MTA).
Figure 1	Contains guidelines for noise compatible land uses to determine the appropriate land use and mitigation measures.

Source: City of Bellflower, *Municipal Code*, February 2017; City of Bellflower, *General Plan, Noise Element*, December 1994

3.4.11 City of Artesia

The City of Artesia has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Artesia Municipal Code* and the *City of Artesia General Plan 2030 Noise Sub-Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.18.

Table 3.18. City of Artesia – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Artesia Municipal Code	
Section 5-2.03 (b)	<p>Except as otherwise allowed in this chapter, no person, from any location within the City, shall create or allow the creation of noise, sound or vibration on any property owned, leased, occupied, or other controlled by such person, which causes the noise level on any residential property to exceed the greater of either the actual measured ambient noise level, or the following ambient noise level for a cumulative period of more than thirty (30) minutes in any hour as measured at any property line:</p> <ul style="list-style-type: none"> ▪ 55 dBA from 7:00 a.m. to 10:00 p.m. ▪ 50 dBA from 10:00 p.m. to 7:00 a.m. <p>If the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, the permissible noise level set forth above shall be reduced by five (5) dB(A).</p> <p>Increases in noise levels are permitted in accordance with the following:</p> <ul style="list-style-type: none"> ▪ 5 dBA for 15 minutes in an hour ▪ 10 dBA for 5 minutes per hour ▪ 15 dBA for 1 minute per hour ▪ 20 dBA for less than one minute
Section 5-2.04	<p>Permissible Interior Sound Limits or Levels at residential properties.</p> <ul style="list-style-type: none"> ▪ 55 dBA from 7:00 a.m. to 10:00 p.m. ▪ 45 dBA from 10:00 p.m. to 7:00 a.m. <p>If the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, the permissible noise level set forth above shall be reduced by five (5) dB(A).</p>
Section 5-2.06 (e)	<p>Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans or similar objects between the hours of 8:00 p.m. and 7:00 a.m. in volume sufficiently loud as to be plainly audible at a distance of fifty (50) feet or more from the property line of the property where the activity is occurring.</p>
Section 5-2.06 (f)	<p>Operating or causing the operation of any tools, equipment, impact devices, derricks or hoists used on construction, drilling, repair, alteration, demolition, or earthwork, between the hours of 7:00 p.m. and 7:00 a.m. on weekdays or at any time on Sunday or Federal holiday.</p>

Code/Goal/Objective/Policy	Description
City of Artesia General Plan Noise Sub-Element	
Policy Action N 1.1.2	Require a noise impact evaluation for projects, if determined necessary through the environmental review process. If noise abatement is found necessary, require implementation mitigation measures based on a technical study prepared by a qualified acoustical professional.
Policy Action N 1.1.3	Implement noise mitigation by placing conditions of approval on development projects and require a clear description of mitigation on subdivision maps, site plans, and building plans for inspection purposes.
Community Policy N 1.2	Consider noise impacts associated with the development of non-residential uses in the vicinity of residential uses.
Policy Action N 1.2.1	Require that any proposed development near existing residential land uses demonstrate compliance with the City’s Noise Ordinance prior to the approval of the project.
Community Policy N 3.1	Ensure non-transportation sources of noise have incorporated appropriate mitigation measures, so that standards contained in the Noise Sub-Element or adopted ordinances are met.
Policy Action N 3.1.1	Require that noise mitigation techniques are incorporated into all construction-related activities.
Policy Action N 3.1.2	Enforce the Noise Ordinance to ensure that stationary noise and noise emanating from construction activities, private development, and/or special events are minimized.
Community Goal Policy N 4	Noise impacts to noise-sensitive receptors are minimized, ensuring that City and State interior and exterior noise levels are not exceeded.
Community Policy N 4.1	Ensure Community Noise Equivalent Levels (CNEL) for noise-sensitive land uses meet normally acceptable levels, as defined by State standards.
Policy Action 4.1.1	Require buffers or appropriate mitigation of potential noise sources on noise-sensitive areas.

Source: City of Artesia, *Municipal Code*, March 2017; City of Artesia, *General Plan 2030, Noise Sub-Element*

3.4.12 City of Cerritos

The City of Cerritos has established policies and regulations concerning the generation and control of noise that could adversely affect its citizens and noise-sensitive land uses. The *City of Cerritos Municipal Code* and the *City of Cerritos General Plan Noise Element* are the two documents designed to regulate noise within the city. Codes, goals, objectives, and policies designed to regulate noise are shown in Table 3.19.

Table 3.19. City of Cerritos – Relevant Noise and Vibration Codes, Goals, Objectives, and Policies

Code/Goal/Objective/Policy	Description
City of Cerritos Municipal Code	
Section 22.80.460	No vibration (other than from transportation facilities or temporary construction work) shall be permitted which is discernible without instruments at the points of measurement specified in Section 22.80.210.
Section 22.80.480 (1)	Cerritos Noise Standards by use. No noise shall be generated which causes the maximum sound level (noise level) at any point on property lines surrounding the premises on which noise is produced to exceed the background (ambient noise) including traffic noise by 5 dBA measured at the same point, or the following limits, whichever is greater: <ul style="list-style-type: none"> ▪ Residential or agricultural maximum sound level of 50 dBA ▪ Commercial maximum sound level of 60 dBA ▪ Industrial maximum sound level of 70 dBA
Section 22.80.480 (5)	The provisions for noise limits shall not be applied to occasional use of equipment for maintenance of any lot or buildings or for building construction, for which a valid building permit has been issued, between the hour of 7:00 a.m. and 7:00 p.m. or for any public works activities or civic event which are authorized by the city.
City of Cerritos General Plan Noise Element	
Goal N-1	Reduction in noise impacts from transportation sources.
Policy N-1.1	Mitigate transportation equipment impacts at construction sites.
Policy N-2.2	Strive to resolve existing and potential conflicts between noise-generating uses and human activities.
Policy N-2.3	Ensure noise mitigation techniques are incorporated into all construction-related activities.
Policy N-3.1	Enforce noise standards, as contained in the City's Noise Ordinance.
Policy N-3.2	Ensure Community Noise Equivalent Levels (CNEL) levels for noise-sensitive land uses meet or exceed normally acceptable levels, as defined by State of California standards.
Policy N-3.4	Consider noise impacts associated with the development of non-residential uses in the vicinity of residential uses.

Source: City of Cerritos, *Municipal Code*, May 2017; City of Cerritos, *General Plan, Noise Element*, 2004

3.4.13 Los Angeles Metro Groundborne Vibration

Metro Specification Section 01 56 19, Construction Noise and Vibration Control, includes limits on the levels of building GBV generated by construction activities. The limits are different for occupant annoyance and for risk of cosmetic damage to buildings. The construction GBV limits inside residences, hotels and motels, and office buildings from construction operations is 80 VdB. This level of GBV is used to assess potential annoyance to building occupants during construction. This limit is substantially lower than the damage risk criteria for the building.

4 AFFECTED ENVIRONMENT/EXISTING CONDITIONS

4.1 Noise

The noise environment in urban areas is dominated by traffic noise. Several industrial areas along the LPA alignment generate noise from operation of machinery and truck trips associated with the uses. Occasional aircraft flyovers and movement of trains along existing railroads are also contributors to the existing noise environment. Land uses found along the alignment include public facilities, public and commercial office buildings, various types of commercial uses, institutional uses, multi-family residential uses (including adaptive reuse of older non-residential buildings), industrial uses, surface parking facilities, and parking structures.

Noise-sensitive land uses were identified using Geographic Information System (GIS), assessor's parcel maps, and aerial photos, and were verified through field work. Noise monitoring locations were carefully selected to best represent existing conditions at sensitive receivers along the LPA corridor. It is not possible to monitor noise levels at every receiver along the LPA alignment due to time and cost limitations. Monitoring locations were selected to represent conditions that could be applied to multiple receiver locations. Typical situations where representative measurement sites can be used to estimate noise levels at other sites occur when both share proximity to the same major transportation noise sources and similar type of land use density and housing. Noise measurements included in the analysis presented in the Draft EIS/EIR were taken in 2017, 2018, and 2020. Additional noise measurements related to refinements to the noise analysis were taken in 2023, which include noise sites 40 through 50. Table 4.1 identifies short-term noise monitoring locations.

Table 4.1. Short-Term Noise Monitoring Locations

Noise Site	Location	FTA Land Use Category ¹	Representative Land Uses	Noise Level (dBA, L _{eq})
3	5325 Long Beach Ave. Los Angeles	2	Residential	72.5
4	5905 Holmes Ave. Los Angeles	2, 3	Residential, Lillian Street Elementary School	67.4
6	2776 Randolph St. Huntington Park	2, 3	Residential, Huntington Park High School	63.8
7	San Antonio Elementary School (6222 State St. Huntington Park)	2, 3	Residential, San Antonio Elementary School	65.1
8	Huntington Park Community Center (6925 Salt Lake Ave. Bell Gardens)	2, 3	Residential, Huntington Park Community Center	68.8
10	7732 Salt Lake Ave. Cudahy	2	Residential	65.1
11	7915 Salt Lake Ave. Cudahy	2	Residential	63.1

4 Affected Environment/Existing Conditions

Noise Site	Location	FTA Land Use Category ¹	Representative Land Uses	Noise Level (dBA, L _{eq})
12	8208 Wilcox Ave. Bell Gardens	2	Residential	67.1
13	9637 Salt Lake Ave. South Gate	2	Residential	60.7
15	10315 Karmont Ave. South Gate	2	Residential	57.8
16	5751 Taft Ave. South Gate	2	Residential	58.4
17	Hollydale Community Center (12221 Industrial Ave. South Gate)	2, 3	Residential, Hollydale Community Center, American Indian Bible Church, Trinity Bible Church	56.9
18	12508 Center St. South Gate	2	Residential	58.0
20	14005 Arthur Ave. Paramount	2	Residential	52.3
21	14121 McClure Ave. Paramount	2	Residential	52.8
22	Bianchi Stadium 11 Theatres (7770 Rosecrans Ave. Paramount)	3	Bianchi Stadium 11 Theatres	59.4
23	Paramount Adult School (3419, 14507 Paramount Blvd. Paramount)	3	Paramount Adult School	64.3
27	8429 2nd St. Paramount	2	Residential	53.7
29	9158 Hegel St. Bellflower	2	Residential	54.0
30	Adventist Union School (15548 Santa Ana Ave. Bellflower)	2, 3	Residential, Adventist Union School	53.2
31	9521 Harvard St. Bellflower	2, 3	Residential, Door Christian Fellowship Church	61.5
32	9827 Oak St. Bellflower	2, 3	Residential, Open Door Worship Center	58.0
33	10144 Maple St. Bellflower	2	Residential	71.4
34	17230 Palo Verde Ave. Bellflower	2	Residential	59.7

Noise Site	Location	FTA Land Use Category ¹	Representative Land Uses	Noise Level (dBA, L _{eq})
35	Valley Christian High School (10818 Artesia Blvd. Cerritos)	3	Valley Christian High School	61.4
36	11255 Sharon St. Cerritos	2, 3	Residential, Artesia Cemetery	53.2
37	18615 Alburdis Ave. Artesia	2, 3	Residential, Wan Yuen Temple	50.0
39	20012 Teresa Wy. Cerritos	2	Residential	69.6
40	2715 Randolph St. Huntington Park	2	Residential	66.5
41	15104 Hayter Ave. Paramount	2	Residential	64.7
42	Somerset Blvd. north of 15107 Bellota Ave. Paramount	2	Residential	68.2
43	Clark Ave. and Flora Vista St. Bellflower	2	Residential	64.4
44	Alondra Blvd. and Pacific Ave. Bellflower	2	Residential	68.0
45	18112 Harvest Ave. Cerritos	2	Residential	55.1
46	183rd St. and Gridley Rd. Artesia	2	Residential	67.8
47	187th St. and Corby Ave. Artesia	2	Residential	58.8
48	1654 59th St. Los Angeles	2	Residential	58.8
50	10930 Garfield Ave. South Gate (Street)	2	Residential	66.0

Source: TAHA 2017/2018; WSP 2017/2018/2020, TAHA 2023

Note: ¹ Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

dBA = A-weighted decibels; L_{eq} = equivalent noise level

Table 4.2 identifies long-term noise monitoring locations. Noise monitoring locations are shown in Appendices A, C, D, and E.

Table 4.2. Long-Term Noise Monitoring Locations

Location	Jurisdiction	FTA Land Use Category ¹	Representative Land Uses	Noise Level (dBA, L _{dn})
5	Randolph St. and Rugby Ave. Huntington Park	2, 3	Residential, UEI College	68.0
9	6815 California Ave. Huntington Park	2, 3	Residential, Huntington Park Community Center	64.0
14	10001 W. Frontage Rd. South Gate	2	Residential	57.4
19	13820 Façade Ave. Paramount	2	Residential	64.0
26	8327 3rd St. Paramount	2, 3	Residential, Paramount High School	58.0
28	9208 Ives St. Bellflower	2	Residential	48.1
38	11886 Park Ave. Artesia	2	Residential	52.0
49	10930 Garfield Ave. South Gate (Apartment Balcony)	2	Residential	64.0

Source: TAHA 2017/2018; WSP 2017/2018; TAHA 2023

Note: ¹ Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

dBA = A-weighted decibels; Leq = equivalent noise level

4.2 Vibration

The LPA is located in an urban center. Primary existing sources of GBV include trucks traveling along roadways, construction utilizing heavy equipment, and active freight lines within the corridor. According to the FTA Guidance Manual, the background vibration levels are expected to range from 50 VdB to 65 VdB. Ambient vibration levels were not measured as part of this study since the FTA vibration impact assessment is not based on the ambient levels but instead is based on FTA Vibration Impact Criteria. These criteria were used to identify vibration-sensitive receivers along the LPA where potential impacts may occur based on existing land use activities. These receivers include residences, hotel/motels, medical facilities, schools, movie theaters, live theaters, and museums.

5 ENVIRONMENTAL CONSEQUENCES /ENVIRONMENTAL IMPACTS

5.1 No Build Alternative

The No Build Alternative includes projects identified in the SCAG 2016 RTP/SCS, Metro's 2009 LRTP, and Measure M. Under the No Build Alternative, the LPA would not be developed. However, several infrastructure and transportation-related projects located within the Study Area as described in Table 2.1 would be implemented and built. SCAG 2016 RTP/SCS, Metro's 2009 LRTP, and Measure M projects in the vicinity of the LPA include the Metro East-West Line/Regional Connector/Eastside Phase 2, California High-Speed Rail, Metro North-South Line/Regional Connector, improvements to the Metro bus system and local municipality bus systems, I-710 South Corridor Project, and I-105 Express Lanes. The No Build Alternative also considers the AltAir/World Energy Paramount Conversion Project (World Energy Project), which would convert portions of the World Energy's oil refinery to manufacturing renewable fuels. Project-related transit-oriented developments are not included in the No Build Alternative because the future planning of transit-oriented developments surrounding the LPA stations would not occur without implementation of the LPA.

The projects included in the No Build Alternative would change the regional transportation system and likely reduce regional vehicle miles traveled. This would result in fewer automobiles on the regional roadway network and less mobile noise. Projects under the No Build Alternative would generate noise and vibration levels typical to urban construction activities and long-term transportation noise. Under the No Build Alternative, no changes related to the LPA and no project-related noise or vibration sources would occur.

The World Energy Project, which is independent of the WSAB Project, would include both new operational sources of industrial noise and an increase in frequency of rail traffic from one train to two trains per day along the one-mile-long railroad connection between the refinery and UPRR ROW. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. The World Energy Project Final Subsequent EIR concluded that operational stationary noise related to the refinery would be less than significant with mitigation incorporated, while the increased rail operations would result in a significant and unavoidable impact related to operational noise (City of Paramount 2022). Operational vibration as a result of the World Energy Project would result in a less than significant impact. These effects would occur independent of the WSAB Transit Corridor Project.

Other existing noise sources such as industrial areas along the LPA alignment, occasional aircraft flyovers, traffic noise, and the movement of trains along existing railroads would remain the dominant noise sources in the LPA area. Therefore, the No Build Alternative would cause new adverse effects related to increased noise levels at sensitive receivers, but no new adverse effects related to vibration.

5.2 Locally Preferred Alternative

5.2.1 Light Rail Transit (At-grade and Aerial)

5.2.1.1 Noise

Noise-sensitive land uses along the LPA alignment were categorized using the FTA Land Use Categories of 1, 2, or 3. The sensitive uses were grouped into clusters, each having one representative receiver. Sensitive uses will be exposed to a combination of noise sources, including LRT pass-by noise, audible warnings noise at protected at-grade crossings, wheel squeal noise, special trackwork noise, and freight noise related to relocated freight tracks. The number of protected at-grade crossings are shown in Table 2.2. Noise levels at protected at-grade crossings were modeled at the nearest clusters to determine the potential for impacts, and noise levels are shown in Table 5.1. The audible warnings noise utilizes the minimum allowable bell noise level of 75 dBA, L_{max} at 10 feet, crossing signal bell shrouds, and a gate-down-bell-stop variance at crossings located near sensitive receivers. The measures are listed as Project Measure NOI PM-1 (Crossing Signal Bells) and NOI PM-2 (Gate-Down-Bell-Stop-Variance). The two project measures would be installed at at-grade crossings with adjacent residential sensitive receptors once CPUC approval is obtained. Obtaining approval requires demonstrating to the CPUC that the safety measures in place on the crossing more than compensate for stopping the bell noise once the gates are in the horizontal position. Based on experience with previous Metro projects and coordination with CPUC, NOI PM-1 and NOI PM-2 are anticipated to be approved and implemented.

Curves with a radius of less than 600 feet could produce wheel squeal. Three curves along the alignment could produce wheel squeal: the first curve serves as the transition point from Randolph Street to Long Beach Boulevard; the second curve is the transition from the San Pedro Subdivision ROW to Randolph Street; and the third curve serves as the transition point from the PEROW to the San Pedro Subdivision ROW following Arthur Avenue, just before it crosses the I-105 freeway. A 10-dBA adjustment was added to LRT pass-by noise to account for possible wheel squeal at clusters near these locations. Freight train noise related to the relocated freight tracks has been added to clusters at two locations: Randolph Street west of Holmes Avenue to Bissell Place and Façade Avenue starting north of the I-105 freeway at Main Street to Rosecrans Avenue.

Noise levels were modeled at each cluster and are shown in the following tables. Clusters and impacts are shown in Appendix A. Category 1 land uses, characterized as buildings where quiet is an essential element of their purpose, were not identified within the vicinity of the LPA. Table 5.2 provides noise levels for Category 2 land uses, characterized as residences and buildings where people normally sleep (i.e., hospitals and hotels) and where nighttime sensitivity is assumed to be of utmost importance. Table 5.3 provides noise levels for Category 3 land uses, characterized as institutional land uses with primarily daytime use that depend on quiet as an important part of operations (i.e., schools, libraries, and churches).

Table 5.1. Audible Warnings Noise Assessment of the LPA

Grade Crossing	Cluster No. ¹	FTA Land Use Category ²	Distance (ft.) ³	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Alameda St. West	No Sensitive Uses	—	—	—	—	—	—	—
Albany St	N52	2	200	68.0	28	63	68	No
Albany St	N53	2	95	68.0	34	63	68	No
Albany St	N54	2	45	68.0	41	63	68	No
Santa Fe Ave	N55	2	135	68.0	31	63	68	No
Santa Fe Ave	N56	2	55	68.0	39	63	68	No
Santa Fe Ave	N58	2	180	68.0	29	63	68	No
Rugby Ave	N63	2	210	68.0	27	63	68	No
Rugby Ave	N64	2	200	68.0	28	63	68	No
Rugby Ave	N65	2	70	68.0	37	63	68	No
Rugby Ave	N66	2	40	68.0	42	63	68	No
Rugby Ave	N67	3	45	64.2	43	65	71	No
Pacific Blvd	No Sensitive Uses	—	—	—	—	—	—	—
Seville Ave	N69	2	185	61.8	28	59	64	No
Seville Ave	N70	2	210	61.8	27	59	64	No
Seville Ave	N71	2	75	61.8	36	59	64	No
Seville Ave	N73	2	40	61.8	42	59	64	No
Seville Ave	N351	2	25	61.8	46	59	64	No
Miles Ave	N78	2	100	61.8	34	59	64	No
Miles Ave	N79	2	40	61.8	42	59	64	No
Miles Ave	N80	2	50	61.8	40	59	64	No
Miles Ave	N82	2	200	61.8	28	59	64	No

5 Environmental Consequences /Environmental Impacts

Grade Crossing	Cluster No. ¹	FTA Land Use Category ²	Distance (ft.) ³	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Miles Ave	N83	3	80	63.8	38	65	70	No
Miles Ave	N86	2	120	61.8	32	59	64	No
Miles Ave	N350	2	40	61.8	42	59	64	No
State St/Boyle Ave	N94	2	240	63.1	38	60	65	No
State St/Boyle Ave	N367	2	80	63.1	48	60	65	No
State St/Boyle Ave	N98	2	160	63.1	42	60	65	No
State St/Boyle Ave	N99	2	190	63.1	40	60	65	No
State St/Boyle Ave	N100	3	160	65.1	44	66	71	No
Gage Ave	N106	3	260	68.8	28	68	74	No
Gage Ave	N107	2	100	66.8	46	62	67	No
Gage Ave	N108	2	180	66.8	29	62	67	No
Bell Ave	N112	2	330	66.8	23	62	67	No
Bell Ave	N113	2	30	66.8	44	62	67	No
Bell Ave	N114	2	100	66.8	34	62	67	No
Bell Ave	N115	2	230	66.8	27	62	67	No
Bell Ave	N116	2	30	64.0	44	60	66	No
Florence Ave	N119	2	130	64.0	44	60	66	No
Florence Ave	N120	2	220	64.0	39	60	66	No
Florence Ave	N121	2	280	64.0	37	60	66	No
Florence Ave	N122	2	285	63.1	37	60	65	No
Otis Ave	N161	2	80	61.1	36	58	64	No
Otis Ave	N163	2	90	61.1	35	58	64	No
Santa Ana St	N162	2	300	61.1	36	58	64	No

Grade Crossing	Cluster No. ¹	FTA Land Use Category ²	Distance (ft.) ³	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Santa Ana St	N163	2	280	61.1	37	58	64	No
Santa Ana St	N165	2	200	61.1	40	58	64	No
Santa Ana St	N166	2	280	61.1	37	58	64	No
Ardine St	No Sensitive Uses	—	—	—	—	—	—	—
Rayo Ave	No Sensitive Uses	—	—	—	—	—	—	—
Southern Ave	N170	2	250	58.7	38	57	63	No
Gardendale St	No Sensitive Uses	—	—	—	—	—	—	—
Main St	N181	3	20	75.3	62	70	78	No
Main St	N184	3	20	74.7	62	70	78	No
Century Blvd	N188	2	200	60.3	28	58	64	No
Century Blvd	N189	2	140	61.2	31	58	64	No
Century Blvd	N190	2	50	63.7	40	60	65	No
Somerset Blvd	N224	2	330	66.4	23	62	67	No
Somerset Blvd	N226	2	125	62.7	32	59	65	No
Somerset Blvd	N227	2	60	66.4	38	62	67	No
Lakewood Blvd	N231	2	85	56.0	47	56	62	No
Clark Ave	N246	2	50	62.4	40	59	65	No
Clark Ave	N247	2	150	62.4	30	59	65	No
Clark Ave	N248	2	310	62.4	24	59	65	No
Clark Ave	N249	2	165	59.5	29	58	63	No
Clark Ave	N251	2	105	59.5	33	58	63	No
Alondra Blvd	N251	2	140	59.5	31	58	63	No
Alondra Blvd	N252	3	120	61.5	34	64	69	No

Grade Crossing	Cluster No. ¹	FTA Land Use Category ²	Distance (ft.) ³	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
				Existing	Project	Impact Threshold		
						Moderate	Severe	
Alondra Blvd	N253	2	115	66.0	33	61	67	No
Bellflower Blvd	N261	2	350	59.5	35	58	63	No
Bellflower Blvd	N267	2	280	56.0	37	56	62	No
Bellflower Blvd	N348	3	70	66.0	51	66	72	No
Private Crossing (Extra Space Storage)	No Sensitive Uses	—	—	—	—	—	—	—
Artesia Blvd	N302	3	221	61.4	29	64	69	No
Studebaker Rd	N303	3	162	61.4	32	64	69	No
186th St	N322	2	230	48.0	27	53	59	No
186th St	N326	2	130	48.0	32	53	59	No
186th St	N327	2	240	48.0	26	53	59	No
186th St	N328	2	61	48.0	38	53	59	No
186th St	N333	2	150	48.0	30	53	59	No
186th St	N334	2	50	48.0	40	53	59	No
186th St	N335	2	300	48.0	24	53	59	No
Pioneer Blvd	N344	2	85	52.0	35	54	60	No

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix A.

² Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

³ Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibels; ft = feet; FTA = Federal Transit Administration; Ldn = day/night noise level; Leq = equivalent noise level

Table 5.2. Category 2 Land Use Light Rail Noise Assessment of the LPA

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N37	MFR	250	15	D	70.5	52	65	70	No
N38	MFR	200	15	D	70.5	53	65	70	No
N39	MFR	240	15	D	70.5	52	65	70	No
N40	SFR	240	15	DE	70.5	57	65	70	No
N42	SFR/MFR	100	15	DE	70.5	61	65	70	No
N43	SFR	25	15	DEF	70.5	68	65	70	Moderate
N44	SFR	160	15	DEF	70.5	60	65	70	No
N45	SFR	120	15	DEF	70.5	61	65	70	No
N46	SFR	120	15	DEF	70.5	61	65	70	No
N48	SFR	240	15	DEF	70.5	58	65	70	No
N49	SFR	160	15	DEF	70.5	60	65	70	No
N50	SFR/MFR	65	15	DG	65.4	68	61	66	Severe
N52	SFR/MFR	210	35	AC	68.0	55	63	68	No
N53	SFR/MFR	110	35	H	68.0	59	63	68	No
N54	SFR	55	35	CH	68.0	65	63	68	Moderate
N55	SFR	120	35	ACH	68.0	57	63	68	No
N56	SFR	55	35	CH	68.0	65	63	68	Moderate
N57	SFR/MFR	230	35	None	68.0	56	63	68	No
N58	SFR/MFR	50	35	H	68.0	62	63	68	No
N59	SFR/MFR	220	35	None	68.0	56	63	68	No
N60	SFR/MFR	65	35	None	68.0	61	63	68	No

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N61	SFR	70	35	None	68.0	61	63	68	No
N63	SFR/MFR	215	35	H	68.0	56	63	68	No
N64	SFR/MFR	230	25	CFH	68.0	57	63	68	No
N65	SFR/MFR	50	25	CFH	68.0	64	63	68	Moderate
N66	SFR/MFR	40	20	CFH	68.0	63	63	68	Moderate
N69	SFR/MFR	200	20	CFH	61.8	56	59	64	No
N70	SFR/MFR	240	20	CFH	61.8	55	59	64	No
N71	MFR	35	20	FH	61.8	60	59	64	Moderate
N72	SFR/MFR	230	25	F	61.8	54	59	64	No
N73	MFR	60	35	CH	61.8	65	59	64	Severe
N74	SFR/MFR	200	35	E	61.8	61	59	64	Moderate
N75	MFR	100	35	AE	61.8	60	59	64	Moderate
N76	SFR/MFR	50	35	E	61.8	67	59	64	Severe
N77	SFR/MFR	130	35	E	61.8	63	59	64	Moderate
N78	SFR/MFR	100	35	ACEH	61.8	63	59	64	Moderate
N79	SFR/MFR	50	35	EH	61.8	67	59	64	Severe
N80	SFR/MFR	80	35	CEH	61.8	68	59	64	Severe
N81	SFR	230	35	E	61.8	61	59	64	Moderate
N82	SFR/MFR	210	35	CH	61.8	59	59	64	Moderate
N84	SFR/MFR	130	35	A	61.8	54	59	64	No
N85	SFR/MFR	70	35	None	61.8	61	59	64	Moderate
N86	SFR/MFR	50	35	H	61.8	62	59	64	Moderate

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N87	SFR	210	35	None	61.8	56	59	64	No
N88	SFR/MFR	48	35	None	61.8	63	59	64	Moderate
N89	SFR/MFR	80	35	None	63.1	60	60	65	Moderate
N90	SFR	110	35	A	63.1	55	60	65	No
N91	SFR	170	35	A	63.1	53	60	65	No
N92	SFR/MFR	155	35	None	63.1	58	60	65	No
N93	SFR	85	35	None	63.1	60	60	65	Moderate
N94	SFR/MFR	100	35	H	63.1	59	60	65	No
N95	SFR/MFR	210	35	None	63.1	56	60	65	No
N96	SFR	80	35	None	63.1	60	60	65	Moderate
N97	SFR/MFR	250	35	None	63.1	55	60	65	No
N98	SFR/MFR	165	35	H	63.1	57	60	65	No
N99	SFR/MFR	200	35	CH	63.1	59	60	65	No
N101	SFR	120	35	None	63.1	59	60	65	No
N102	SFR	80	35	None	63.1	60	60	65	Moderate
N103	SFR	205	35	None	63.1	56	60	65	No
N104	SFR	80	35	None	63.1	60	60	65	Moderate
N105	SFR/MFR	80	35	None	63.1	60	60	65	Moderate
N107	SFR	130	35	CH	66.8	61	62	67	No
N108	SFR	20	35	CEH	66.8	74	62	67	Severe
N109	SFR	145	35	AE	66.8	58	62	67	No
N110	SFR	220	35	E	66.8	61	62	67	No

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N111	SFR	120	35	E	66.8	64	62	67	Moderate
N112	SFR/MFR	65	35	H	66.8	61	62	67	No
N113	SFR/MFR	25	35	CEH	66.8	73	62	67	Severe
N114	SFR	110	35	CH	66.8	62	62	67	Moderate
N115	SFR/MFR	270	35	CH	66.8	58	62	67	No
N116	SFR/MFR	25	35	CH	64.0	68	60	66	Severe
N117	SFR/MFR	125	35	A	64.0	54	60	66	No
N118	SFR	25	35	None	64.0	65	60	66	Moderate
N119	SFR	35	35	FH	64.0	65	60	66	Moderate
N120	SFR	240	25	CFH	64.0	57	60	66	No
N121	MFR	285	25	CFH	64.0	56	60	66	No
N122	SFR	350	20	CFH	63.1	53	60	65	No
N123	SFR	100	20	F	63.1	56	60	65	No
N124	SFR	145	20	AF	63.1	49	60	65	No
N125	SFR	210	25	F	63.1	54	60	65	No
N126	SFR	100	25	F	63.1	58	60	65	No
N127	SFR	130	25	AF	63.1	52	60	65	No
N128	SFR/MFR	270	20	F	63.1	51	60	65	No
N129	SFR/MFR	100	20	AF	63.1	51	60	65	No
N130	SFR	60	20	F	63.1	58	60	65	No
N131	SFR	180	25	F	63.1	55	60	65	No
N132	SFR	245	35	None	63.1	56	60	65	No

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N133	SFR	110	35	None	63.1	59	60	65	No
N134	SFR	175	35	A	63.1	52	60	65	No
N135	SFR	200	40	None	63.1	58	60	65	No
N136	SFR/MFR	110	35	A	63.1	55	60	65	No
N137	SFR	60	35	None	63.1	62	60	65	Moderate
N138	SFR	260	35	None	63.1	55	60	65	No
N139	SFR	250	35	None	63.1	55	60	65	No
N140	MFR	115	35	None	63.1	59	60	65	No
N141	SFR	85	40	None	63.1	61	60	65	Moderate
N142	SFR	160	40	A	63.1	54	60	65	No
N143	SFR	260	45	None	63.1	57	60	65	No
N144	SFR	70	45	None	63.1	63	60	65	Moderate
N145	SFR	240	45	None	63.1	58	60	65	No
N146	SFR	100	45	None	63.1	62	60	65	Moderate
N147	SFR	130	45	A	63.1	56	60	65	No
N148	SFR	250	55	None	63.1	59	60	65	No
N149	SFR	100	55	None	63.1	63	60	65	Moderate
N150	SFR	150	55	A	63.1	57	60	65	No
N151	SFR	240	55	None	63.1	60	60	65	Moderate
N152	SFR	120	55	A	63.1	58	60	65	No
N153	SFR	65	55	None	63.1	65	60	65	Severe
N154	SFR	140	55	A	63.1	57	60	65	No

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N155	SFR	200	55	None	63.1	60	60	65	Moderate
N156	SFR	90	55	None	63.1	64	60	65	Moderate
N157	SFR	140	55	A	61.1	57	58	64	No
N158	SFR	90	55	None	61.1	64	58	64	Severe
N159	SFR	205	55	None	61.1	60	58	64	Moderate
N160	SFR	140	55	None	61.1	62	58	64	Moderate
N161	SFR	110	55	H	61.1	63	58	64	Moderate
N162	SFR	170	55	EH	61.1	66	58	64	Severe
N163	SFR/MFR	95	55	EH	61.1	69	58	64	Severe
N164	SFR/MFR	180	55	E	61.1	66	58	64	Severe
N165	MFR	185	55	CH	61.1	64	58	64	Severe
N166	MFR	70	55	H	61.1	65	58	64	Severe
N167	SFR	140	55	A	61.1	57	58	64	No
N168	Mobile Homes	70	55	None	61.1	65	58	64	Severe
N169	Motel	230	50	D	68.0	63	63	68	Moderate
N170	SFR	305	55	H	58.7	59	57	63	Moderate
N171	SFR	250	55	None	58.7	59	57	63	Moderate
N172	SFR	125	55	None	58.7	62	57	63	Moderate
N173	SFR	240	55	None	58.7	60	57	63	Moderate
N174	SFR	140	55	None	58.7	62	57	63	Moderate
N175	SFR	240	55	None	58.7	60	57	63	Moderate
N176	MFR	145	55	None	58.7	62	57	63	Moderate

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N177	Thunderbird Villa Mobile Home Estates	140	55	D	57.4	66	56	62	Severe
N178	Thunderbird Villa Mobile Home Estates	175	55	None	57.4	61	56	62	Moderate
N179	Thunderbird Villa Mobile Home Estates	90	55	None	57.4	64	56	62	Severe
N180	Thunderbird Villa Mobile Home Estates	110	55	D	57.4	67	56	62	Severe
N182	SFR	280	35	None	59.3	55	57	63	No
N185	SFR	210	25	None	59.9	53	58	63	No
N186	SFR	300	25	None	59.3	52	57	63	No
N187	SFR	220	15	E	59.9	54	58	63	No
N188	SFR	220	15	CFH	60.3	53	58	64	No
N189	SFR	185	15	CFH	61.2	53	58	64	No
N190	SFR	100	15	CFH	63.7	56	60	65	No
N191	SFR	60	25	F	64.0	60	60	66	Moderate
N192	SFR	20	25	F	64.0	64	60	66	Moderate
N193	SFR	15	25	F	64.0	66	60	66	Severe
N194	SFR	65	25	F	64.0	59	60	66	No
N195	SFR	230	25	F	64.0	54	60	66	No
N196	SFR	70	25	F	64.0	59	60	66	No
N197	SFR	15	25	F	64.0	66	60	66	Severe
N198	SFR	290	25	None	64.0	52	60	66	No

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N199	SFR	285	25	D	54.1	56	55	61	Moderate
N200	SFR	20	25	D	62.4	67	59	65	Severe
N201	SFR	85	25	D	58.5	61	57	63	Moderate
N202	SFR	240	25	D	54.8	57	55	61	Moderate
N203	SFR	190	20	DG	56.0	66	56	62	Severe
N204	SFR	65	20	DG	60.1	70	58	63	Severe
N205	SFR	280	20	DG	54.0	64	55	61	Severe
N206	SFR	15	20	DG	60.0	77	58	63	Severe
N207	SFR	75	20	DG	62.4	70	59	65	Severe
N208	SFR	170	20	DG	55.5	66	56	61	Severe
N209	SFR	290	25	DG	54.4	66	55	61	Severe
N210	SFR	80	25	DG	60.4	71	58	64	Severe
N211	SFR	260	25	D	54.9	56	55	61	Moderate
N212	SFR	140	25	D	56.2	59	56	62	Moderate
N213	SFR	55	25	D	60.8	63	58	64	Moderate
N214	MFR	335	35	D	62.3	58	59	65	No
N215	SFR	100	35	None	58.0	59	57	62	Moderate
N216	SFR	70	35	None	58.0	61	57	62	Moderate
N217	SFR	100	35	None	58.0	59	57	62	Moderate
N219	SFR	120	55	None	58.0	63	57	62	Severe
N220	SFR	130	55	None	58.0	62	57	62	Severe
N222	SFR	135	55	None	66.4	62	62	67	Moderate

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N223	SFR	135	55	None	56.0	62	56	62	Severe
N224	SFR	135	55	H	66.4	62	62	67	Moderate
N225	SFR	220	55	None	51.7	60	54	60	Severe
N226	SFR	125	55	CH	62.7	65	59	65	Severe
N227	SFR	20	55	CEH	66.4	78	62	67	Severe
N228	SFR	200	55	E	51.7	65	54	60	Severe
N229	SFR	100	55	E	51.7	68	54	60	Severe
N230	SFR	30	55	E	51.7	74	54	60	Severe
N231	SFR	60	55	CH	56.0	69	56	62	Severe
N234	Mobile Homes	160	55	AC	52.0	60	54	60	Severe
N235	Mobile Homes	60	55	None	52.0	66	54	60	Severe
N236	SFR	100	55	None	52.0	63	54	60	Severe
N237	SFR	160	55	None	52.0	61	54	60	Severe
N238	SFR	95	55	A	52.0	59	54	60	Moderate
N239	SFR	170	55	None	48.1	61	53	59	Severe
N240	SFR	100	55	None	48.1	63	53	59	Severe
N241	SFR	155	55	None	52.0	61	54	60	Severe
N242	SFR	215	55	None	52.0	60	54	60	Severe
N243	SFR	60	55	None	52.0	66	54	60	Severe
N245	MFR	70	55	None	51.2	65	54	60	Severe
N246	MFR	70	55	CH	62.4	68	59	65	Severe
N247	SFR	110	55	CH	62.4	66	59	65	Severe

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N248	MFR	170	55	H	62.4	61	59	65	Moderate
N249	SFR	165	55	CH	59.5	64	58	63	Severe
N250	SFR	165	55	A	59.5	57	58	63	No
N251	SFR	85	55	CH	59.5	67	58	63	Severe
N253	SFR	100	45	CH	66.0	65	61	67	Moderate
N254	SFR	100	45	E	59.5	67	58	63	Severe
N255	Aztec Mobile Home	35	35	E	59.5	69	58	63	Severe
N256	SFR	215	35	None	59.5	56	58	63	No
N258	SFR/MFR	150	35	A	59.5	53	58	63	No
N259	SFR	100	35	None	59.5	59	58	63	Moderate
N260	SFR	220	25	F	59.5	54	58	63	No
N261	SFR/MFR	90	20	FH	59.5	56	58	63	No
N262	MFR	305	20	F	59.5	51	58	63	No
N265	MFR	270	20	F	56.0	51	56	62	No
N267	MFR	35	30	H	56.0	63	56	62	Severe
N268	MFR	50	45	None	56.0	65	56	62	Severe
N270	MFR	140	55	None	56.0	62	56	62	Severe
N271	MFR	130	55	None	56.0	62	56	62	Severe
N274	SFR	125	55	None	56.0	62	56	62	Severe
N275	MFR	295	55	None	56.0	59	56	62	Moderate
N276	MFR	220	55	D	69.4	64	64	69	Moderate
N277	SFR	130	55	D	69.4	66	64	69	Moderate

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N278	SFR/MFR	60	55	D	69.4	70	64	69	Severe
N279	SFR	245	55	D	69.4	63	64	69	No
N280	MFR	320	55	D	69.4	62	64	69	No
N281	MFR	235	55	D	69.4	64	64	69	Moderate
N282	MFR	205	55	D	69.4	64	64	69	Moderate
N283	SFR	110	55	None	57.7	63	57	62	Severe
N284	SFR	175	55	None	57.7	61	57	62	Moderate
N285	SFR	185	55	E	57.7	66	57	62	Severe
N286	Bel Tooren Villa Convalescent Hospital	115	55	None	69.4	63	64	69	No
N287	SFR	50	55	None	57.7	66	57	62	Severe
N288	SFR	220	55	None	57.7	60	57	62	Moderate
N289	SFR	200	55	E	57.7	65	57	62	Severe
N290	SFR	50	55	E	57.7	71	57	62	Severe
N291	SFR	100	55	E	57.7	68	57	62	Severe
N292	SFR	160	55	A	57.7	57	57	62	Moderate
N293	SFR	230	55	E	57.7	65	57	62	Severe
N294	SFR	65	55	E	57.7	70	57	62	Severe
N295	SFR	135	55	E	57.7	67	57	62	Severe
N296	SFR	150	55	AE	57.7	62	57	62	Severe
N297	SFR	60	55	None	57.7	66	57	62	Severe
N298	SFR	95	55	None	57.7	64	57	62	Severe

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N299	SFR	210	55	D	57.7	64	57	62	Severe
N300	SFR	140	55	D	57.7	66	57	62	Severe
N301	SFR	70	55	D	57.7	69	57	62	Severe
N306	SFR	210	55	None	51.2	60	54	60	Severe
N307	SFR	70	55	None	51.2	65	54	60	Severe
N308	SFR	210	55	D	51.2	64	54	60	Severe
N309	SFR	70	55	D	51.2	69	54	60	Severe
N310	SFR	55	55	D	51.2	70	54	60	Severe
N311	SFR	140	55	D	51.2	66	54	60	Severe
N312	SFR	50	55	D	53.1	70	54	60	Severe
N313	SFR	175	55	D	65.8	65	61	67	Moderate
N314	SFR	70	55	D	65.8	69	61	67	Severe
N315	SFR	45	50	D	65.8	70	61	67	Severe
N316	SFR	130	50	A	51.2	57	54	60	Moderate
N317	SFR	220	45	None	51.2	58	54	60	Moderate
N318	SFR	110	45	None	51.2	61	54	60	Severe
N319	SFR	50	45	None	51.2	65	54	60	Severe
N320	SFR	110	45	A	51.2	57	54	60	Moderate
N321	SFR	210	40	None	48.0	57	53	59	Moderate
N322	SFR	40	40	H	48.0	65	53	59	Severe
N323	SFR	45	45	None	48.0	65	53	59	Severe
N324	SFR	200	45	None	48.0	59	53	59	Severe

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N325	SFR	140	40	None	48.0	59	53	59	Severe
N326	SFR	50	40	H	48.0	64	53	59	Severe
N327	MFR	210	30	CH	48.0	58	53	59	Moderate
N328	SFR/MFR	45	30	CEH	48.0	70	53	59	Severe
N329	SFR	190	30	None	48.0	55	53	59	Moderate
N330	SFR	180	30	AE	48.0	56	53	59	Moderate
N331	SFR/MFR	35	20	EH	48.0	64	53	59	Severe
N333	SFR	175	40	AH	48.0	54	53	59	Moderate
N334	SFR	40	30	CEH	48.0	70	53	59	Severe
N335	SFR/MFR	300	30	CH	48.0	56	53	59	Moderate
N336	SFR	180	30	E	48.0	61	53	59	Severe
N338	SFR/MFR	160	20	EF	48.0	59	53	59	Severe
N339	SFR/MFR	90	20	EFH	48.0	61	53	59	Severe
N340	SFR	200	20	EF	48.0	58	53	59	Moderate
N341	SFR	110	15	EFH	48.0	58	53	59	Moderate
N342	SFR	80	15	EFH	48.0	59	53	59	Severe
N343	SFR	200	15	EF	48.0	55	53	59	Moderate
N344	SFR	40	15	CEH	52.0	64	54	60	Severe
N345	SFR	165	15	AE	52.0	50	54	60	No
N346	SFR	40	15	E	52.0	61	54	60	Severe
N347	SFR	45	15	None	52.0	56	54	60	Moderate
N349	SFR	75	35	CE	61.8	69	59	64	Severe

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N350	SFR/MFR	50	35	CH	61.8	65	59	64	Severe
N351	MFR	35	20	CFH	61.8	63	59	64	Moderate
N352	MFR	22	25	D	60.7	67	58	64	Severe
N353	SFR	105	55	None	57.7	63	57	62	Severe
N354	SFR	100	55	None	57.7	63	57	62	Severe
N355	SFR	185	55	None	57.7	61	57	62	Moderate
N356	SFR	105	55	None	57.7	63	57	62	Severe
N357	SFR	45	55	None	57.7	67	57	62	Severe
N358	SFR	100	55	None	57.7	63	57	62	Severe
N359	SFR	60	55	None	57.7	66	57	62	Severe
N360	SFR	40	55	E	57.7	72	57	62	Severe
N361	Thunderbird Villa Mobile Home Estates	30	55	None	57.4	69	56	62	Severe
N362	SFR	80	35	None	63.1	60	60	65	Moderate
N363	SFR	80	35	D	63.1	64	60	65	Moderate
N364	SFR	190	35	None	63.1	57	60	65	No
N365	SFR	215	35	None	63.1	56	60	65	No
N366	SFR	190	35	D	63.1	61	60	65	Moderate

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N367	MFR	100	35	H	63.1	60	60	65	Moderate
N368	SFR	250	20	DG	56.8	65	56	62	Severe
N369	MFR	150	55	D	64.0	66	60	66	Severe
N370	MFR	150	55	AD	64.0	61	60	66	Moderate
N371	MFR	130	55	D	64.0	66	60	66	Severe
N372	MFR	55	55	None	64.0	66	60	66	Severe
N373	MFR	135	55	AD	64.0	62	60	66	Moderate
N374	MFR	100	55	A	64.0	59	60	66	No
N375	MFR	230	55	D	64.0	64	60	66	Moderate
N376	MFR	260	55	D	64.0	63	60	66	Moderate

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix A.

² Distance to the closest area of human use or closest building façade.

³ Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.

A = first row of intervening buildings

B = second row of intervening buildings

C = embedded track on grade

D = aerial structure with slab track

E = jointed track or crossover

F = quacker noise

G = wheel squeal noise

H = audible warning noise

dBA = A-weighted decibels; ft = feet; Ldn = day/night noise level; LPA = Locally Preferred Alternative; LRT = light rail transit; MFR = multi-family residential; mph = miles per hour; SFR = single-family residential

Table 5.3. Category 3 Land Use Light Rail Noise Assessment of the LPA

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N41	Greater Holy Saint John Baptist Church	260	15	DE	72.5	53	70	76	No
N51	Lillian Street Elementary	75	25	D	67.4	58	67	73	No
N62	Templo Asamblea De Oracion	70	35	None	64.2	57	65	71	No
N67	UEI College	160	20	CFH	64.2	53	65	71	No
N68	Huntington Park Iglesia Pentecostes	200	25	F	63.8	51	65	70	No
N83	Huntington Park High School	70	35	CH	63.8	60	65	70	No
N100	San Antonio Elementary	120	35	CH	65.1	58	66	71	No
N106	Southeast Rio Family YMCA	290	35	CH	68.8	54	68	74	No
N181	Trinity Bible Church	20	35	CH	75.3	67	70	78	No
N183	Apostolic Assembly South Gate	280	35	None	66.6	51	67	72	No
N184	American Indian Bible Church	80	35	CH	74.7	64	70	78	No
N221	Paramount High School	85	55	None	53.7	61	60	66	Moderate
N244	Adventist Union School	230	55	None	53.2	56	60	66	No
N252	Door Christian Fellowship Church	150	55	CH	61.5	61	64	69	No
N257	Greek Apostolic Church	290	35	None	61.5	51	64	69	No
N263	Kingdom Causes Bellflower	245	20	F	66.0	48	66	72	No
N269	Open Door Worship Center	200	55	None	58.0	57	62	67	No
N272	Bristol Civic Auditorium	70	55	None	58.0	61	62	67	No
N273	Bellflower Health Center	120	55	None	58.0	59	62	67	No
N302	Valley Christian High School	180	55	CH	61.4	60	64	69	No
N303	Rio Hondo Metal Health Clinic	160	55	CH	61.4	61	64	69	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N304	Fremont College	200	55	None	53.2	57	60	66	No
N305	Artesia Cemetery	220	55	None	53.2	56	60	66	No
N332	Artesia Historical Museum	45	20	EH	50.0	59	58	65	Moderate
N337	Wan Yuen Temple	55	20	EH	50.0	59	58	65	Moderate
N348	Mayne Events Center/Los Angeles County Fire Museum	60	20	FH	66.0	56	66	72	No

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix A.

² Distance to the closest area of human use or closest building façade.

³ Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.

A = first row of intervening buildings

B = second row of intervening buildings

C = embedded track on grade

D = aerial structure with slab track

E = jointed track or crossover

F = quacker noise

G = wheel squeal noise

H = audible warnings noise

dBA = A-weighted decibels; ft = feet; Leq = equivalent noise level; LPA = Locally Preferred Alternative; LRT = light rail transit; mph = miles per hour

Under the LPA, 94 of 308 Category 2 clusters will experience moderate impacts from LRT noise and 117 will experience severe impacts. Three of 26 Category 3 clusters will experience moderate impacts. In total, the LPA will result in 97 moderate impacts and 117 severe impacts. Regarding health effects, it is unlikely for LRT noise to result in noise-induced hearing loss, as this is an occupational hazard related to working over long periods of time in high noise environments. The Occupational Safety and Health Administration has established a sound level of 82 dBA as being protective of hearing for a continuous exposure of 24 hours (29 CFR 1910.95). FTA defines moderate impacts as having the potential to result in measurable annoyance in a community and severe impacts to cause a high level of community annoyance. High levels of noise could increase stress and the potential for stress-related diseases at affected sensitive uses. This applies for other areas that will result in noise impacts. Calculation details are shown in Appendix J.

5.2.1.1 Vibration

Vibration-sensitive land uses along the alignment were categorized using the FTA Vibration Categories of 1, 2, or 3. The sensitive uses were grouped into clusters, each having one representative receiver. Vibration levels were modeled at each cluster and are shown in the following tables. The locations of these clusters are shown in Appendix B.

No Vibration Category 1 land uses (i.e., buildings where vibration will interfere with interior operations) were identified for the LPA. Table 5.4 provides vibration levels for Vibration Category 2 land uses that are within 150 feet of the near track centerline (the screening distance for Vibration Category 2 uses shown in Table 1.3). Vibration Category 2 includes all residential land uses and buildings where people normally sleep, such as hospitals and hotels, where nighttime sensitivity is assumed to be of utmost importance.

Under the LPA, 88 Vibration Category 2 receivers are predicted to exceed the FTA vibration impact threshold of 72 VdB for frequent events. These predicted GBV levels are in the range of 1 to 18 VdB above the FTA vibration criteria. Twenty-three clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold, there is a strong chance that actual GBV levels will be below the impact threshold and will not result in an adverse effect. Where the projected GBV is 5 VdB greater than the impact threshold, a vibration impact is probable.

Table 5.5 provides vibration levels for Vibration Category 3 land uses that are within 100 feet of the nearest track centerline. Vibration Category 3 includes schools, churches, and other institutions, and quiet offices that do not contain vibration-sensitive equipment. With the exception of Dante Valve Company, none of the Vibration Category 3 receivers are predicted to exceed the FTA vibration impact threshold.

Peak existing vibration levels of between 75 and 80 VdB were measured in the manufacturing and testing areas of the Dante Valve Company at 15230 Lakewood Boulevard in the City of Bellflower. Predicted LRT pass-by operation vibration levels of 72 VdB for through trains operating on the tangent track would be less than the measured existing level of 75 VdB. Vibration created at the track switch for the MSF access track could reach 77 VdB, which, if not mitigated, would exceed the 75 VdB existing level measured at the test stand used by Dante Valve Company. The complete vibration assessment for Dante Valve Company is included in Appendix K.

Table 5.4. Vibration Category 2 Land Use Light Rail At-Grade/Aerial Vibration Assessment – Locally Preferred Alternative

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V41	SFR/MFR	1,330	55	Aerial	54	72	No	–
V43 ³	SFR/MFR	100	45	Aerial	70	72	No	–
V44	SFR/MFR	100	25	Aerial	61	72	No	–
V45	SFR/MFR	55	15	Aerial	68	72	No	–
V47	SFR/MFR	110	35	Ballast & Tie	67	72	No	–
V48	SFR	35	35	Ballast & Tie	75	72	Yes	3
V49	SFR	115	35	Ballast & Tie	66	72	No	–
V50	SFR	45	35	Ballast & Tie	74	72	Yes	2
V51	SFR/MFR	95	35	Ballast & Tie	68	72	No	–
V52	SFR/MFR	40	35	Ballast & Tie	74	72	Yes	2
V53	SFR/MFR	60	35	Ballast & Tie	73	72	Yes	1
V54	SFR	45	35	Ballast & Tie	74	72	Yes	2
V56	SFR/MFR	35	35	Ballast & Tie	75	72	Yes	3
V58	MFR	35	35	Ballast & Tie	75	72	Yes	3
V59	SFR/MFR	70	35	Ballast & Tie	73	72	Yes	1
V60	SFR/MFR	115	35	Ballast & Tie	66	72	No	–
V61	MFR	70	35	Ballast & Tie	70	72	No	–
V62	SFR/MFR	90	35	Ballast & Tie	75	72	Yes	3
V63 ³	SFR/MFR	30	35	Ballast & Tie	83	72	Yes	11
V65	SFR/MFR	140	35	Ballast & Tie	66	72	No	–
V66	SFR/MFR	60	35	Ballast & Tie	73	72	Yes	1
V67	SFR/MFR	30	35	Ballast & Tie	76	72	Yes	4

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V68	SFR/MFR	30	35	Ballast & Tie	76	72	Yes	4
V69	SFR/MFR	65	35	Ballast & Tie	73	72	Yes	1
V70	SFR	90	35	Ballast & Tie	68	72	No	–
V71	SFR	165	35	Ballast & Tie	64	72	No	–
V72	SFR	70	35	Ballast & Tie	73	72	Yes	1
V73	SFR/MFR	95	35	Ballast & Tie	69	72	No	–
V74	SFR	55	35	Ballast & Tie	72	72	No	–
V75	SFR/MFR	65	35	Ballast & Tie	71	72	No	–
V77	SFR	70	35	Ballast & Tie	65	72	No	–
V78	SFR	75	35	Ballast & Tie	65	72	No	–
V79	SFR/MFR	80	35	Ballast & Tie	65	72	No	–
V80	SFR	135	35	Ballast & Tie	65	72	No	–
V81 ³	SFR	20	35	Ballast & Tie	89	72	Yes	17
V82	SFR	90	35	Ballast & Tie	74	72	Yes	2
V83	SFR/MFR	100	35	Ballast & Tie	69	72	No	–
V84	SFR/MFR	35	35	Ballast & Tie	77	72	Yes	5
V85	SFR	115	35	Ballast & Tie	67	72	No	–
V86	SFR/MFR	25	35	Ballast & Tie	78	72	Yes	6
V87	SFR/MFR	125	35	Ballast & Tie	66	72	No	–
V88	SFR	25	35	Ballast & Tie	78	72	Yes	6
V89	SFR	30	25	Ballast & Tie	75	72	Yes	3
V90	SFR	90	20	Ballast & Tie	65	72	No	–
V91	SFR	135	35	Ballast & Tie	63	72	No	–

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V92	SFR	80	35	Ballast & Tie	67	72	No	–
V93	SFR	120	35	Ballast & Tie	66	72	No	–
V94	SFR/MFR	55	35	Ballast & Tie	73	72	Yes	1
V95	SFR	100	35	Ballast & Tie	68	72	No	–
V96	SFR	80	35	Ballast & Tie	70	72	No	–
V97	SFR	150	35	Ballast & Tie	64	72	No	–
V98	SFR/MFR	110	35	Ballast & Tie	67	72	No	–
V99	SFR	60	35	Ballast & Tie	72	72	No	–
V100	MFR	110	40	Ballast & Tie	68	72	No	–
V101	SFR	80	40	Ballast & Tie	71	72	No	–
V102	SFR	50	45	Ballast & Tie	76	72	Yes	4
V103	SFR	85	45	Ballast & Tie	72	72	No	–
V104	SFR	130	55	Ballast & Tie	69	72	No	–
V105	SFR	80	55	Ballast & Tie	73	72	Yes	1
V106	SFR	130	55	Ballast & Tie	69	72	No	–
V107	SFR	120	55	Ballast & Tie	69	72	No	–
V108	SFR	65	55	Ballast & Tie	75	72	Yes	3
V109	SFR	130	55	Ballast & Tie	69	72	No	–
V110	SFR	75	55	Ballast & Tie	74	72	Yes	2
V111	SFR	120	55	Ballast & Tie	69	72	No	–
V112	SFR	70	55	Ballast & Tie	74	72	Yes	2
V113	SFR	80	55	Ballast & Tie	73	72	Yes	1
V114	SFR	75	55	Ballast & Tie	74	72	Yes	2

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V115 ³	SFR	140	55	Ballast & Tie	75	72	Yes	3
V116 ³	SFR/MFR	80	55	Ballast & Tie	80	72	Yes	8
V117	MFR	75	55	Ballast & Tie	74	72	Yes	2
V118	SFR	150	55	Ballast & Tie	67	72	No	–
V119	Mobile Homes	85	55	Ballast & Tie	73	72	Yes	1
V120 ³	SFR	95	55	Ballast & Tie	72	72	No	–
V121	SFR	95	55	Aerial DF	67	72	No	–
V122	MFR	95	55	Aerial DF	67	72	No	–
V123	Thunderbird Villa Mobile Home Estates	145	55	Aerial DF	63	72	No	–
V124	Thunderbird Villa Mobile Home Estates	80	55	Aerial DF	68	72	No	–
V127	SFR	60	15	Ballast & Tie	67	72	No	–
V128	SFR	25	25	Ballast & Tie	76	72	Yes	4
V129	SFR	15	25	Ballast & Tie	79	72	Yes	7
V130	SFR	24	25	Ballast & Tie	76	72	Yes	4
V131	SFR	20	25	Ballast & Tie	77	72	Yes	5
V132	SFR	34	25	Ballast & Tie	74	72	Yes	2
V133	SFR	20	25	Ballast & Tie	77	72	Yes	5
V134	SFR	20	25	Ballast & Tie	77	72	Yes	5
V135	SFR	25	25	Ballast & Tie	76	72	Yes	4
V136	SFR	60	25	Ballast & Tie	70	72	No	–
V137	SFR	15	20	Aerial	72	72	No	–
V138	SFR	95	25	Aerial	61	72	No	–

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V139	SFR	50	25	Aerial	64	72	No	–
V140	SFR	70	25	Ballast & Tie	69	72	No	–
V141	SFR	60	35	Ballast & Tie	72	72	No	–
V142	SFR	72	55	Ballast & Tie	74	72	Yes	2
V143	SFR	118	55	Ballast & Tie	70	72	No	–
V144	SFR	66	55	Ballast & Tie	75	72	Yes	3
V145	SFR	130	55	Ballast & Tie	69	72	No	–
V146	SFR	120	55	Ballast & Tie	69	72	No	–
V148	SFR	118	55	Ballast & Tie	70	72	No	–
V149	SFR	125	55	Ballast & Tie	75	72	Yes	3
V150	SFR	117	55	Ballast & Tie	70	72	No	–
V151	SFR	115	55	Ballast & Tie	70	72	No	–
V152	SFR	20	55	Ballast & Tie	82	72	Yes	10
V153 ³	SFR	33	55	Ballast & Tie	84	72	Yes	12
V154 ³	SFR	31	55	Ballast & Tie	90	72	Yes	18
V155 ³	SFR	50	55	Ballast & Tie	77	72	Yes	5
V156	SFR	136	55	Ballast & Tie	68	72	No	–
V157	Mobile Homes	70	55	Ballast & Tie	74	72	Yes	2
V158	SFR	65	55	Ballast & Tie	75	72	Yes	3
V159	SFR	120	55	Ballast & Tie	70	72	No	–
V160	SFR	70	55	Ballast & Tie	74	72	Yes	2
V161	SFR	100	55	Ballast & Tie	71	72	No	–
V162	SFR	65	55	Ballast & Tie	75	72	Yes	3

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V163	SFR	75	55	Ballast & Tie	74	72	Yes	2
V165	MFR	80	55	Ballast & Tie	73	72	Yes	1
V166	MFR	65	55	Ballast & Tie	75	72	Yes	3
V167	SFR	100	55	Ballast & Tie	71	72	No	–
V168	MFR	115	55	Ballast & Tie	70	72	No	–
V169	SFR	150	55	Ballast & Tie	67	72	No	–
V170	SFR	150	55	Ballast & Tie	67	72	No	–
V171	SFR	60	55	Ballast & Tie	75	72	Yes	3
V172	SFR	115	45	Ballast & Tie	69	72	No	–
V173 ³	SFR	115	45	Ballast & Tie	75	72	Yes	3
V174 ³	Aztec Mobile Home	25	35	Ballast & Tie	88	72	Yes	16
V175 ³	SFR	120	35	Ballast & Tie	73	72	Yes	1
V176	SFR	115	35	Ballast & Tie	67	72	No	–
V177	SFR/MFR	110	20	Ballast & Tie	63	72	No	–
V178	MFR	130	30	Ballast & Tie	57	72	No	–
V180	MFR	25	45	Ballast & Tie	80	72	Yes	8
V181	MFR	60	55	Ballast & Tie	75	72	Yes	3
V182	MFR	122	55	Ballast & Tie	69	72	No	–
V185	SFR	100	55	Ballast & Tie	71	72	No	–
V186	SFR	110	55	Ballast & Tie	70	72	No	–
V187	SFR/MFR	40	55	Ballast & Tie	78	72	Yes	6
V189	SFR	25	55	Ballast & Tie	81 ³	72	Yes	9
V190	SFR	120	55	Ballast & Tie	69	72	No	–

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V191	SFR	115	55	Ballast & Tie	70	72	No	–
V192 ³	SFR	60	55	Ballast & Tie	84 ³	72	Yes	12
V193 ³	SFR	50	55	Ballast & Tie	86 ³	72	Yes	14
V194 ³	SFR	30	55	Ballast & Tie	90 ³	72	Yes	18
V195 ³	SFR	45	55	Ballast & Tie	78 ³	72	Yes	6
V196 ³	SFR	95	55	Ballast & Tie	72 ³	72	No	–
V197 ³	SFR	58	55	Ballast & Tie	76 ³	72	Yes	4
V198	SFR	129	55	Ballast & Tie	69	72	No	–
V199	SFR	65	55	Ballast & Tie	75	72	Yes	3
V200	SFR	91	55	Ballast & Tie	72	72	No	–
V201	SFR	140	55	Ballast & Tie	68	72	No	–
V202	SFR	65	55	Ballast & Tie	75	72	Yes	3
V204	SFR	50	55	Ballast & Tie	77	72	Yes	5
V205	SFR	60	55	Ballast & Tie	75	72	Yes	3
V206	SFR	45	55	Ballast & Tie	77	72	Yes	5
V207	SFR	40	55	Ballast & Tie	78	72	Yes	6
V208	SFR	100	55	Ballast & Tie	71	72	No	–
V209	SFR	160	55	Ballast & Tie	67	72	No	–
V210	SFR	60	55	Ballast & Tie	75	72	Yes	3
V211	SFR	40	55	Ballast & Tie	78	72	Yes	6
V212	SFR	50	55	Ballast & Tie	77	72	Yes	5
V213	SFR	80	55	Ballast & Tie	73	72	Yes	1
V214	SFR	50	45	Ballast & Tie	76	72	Yes	4

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V215	SFR	80	45	Ballast & Tie	72	72	No	–
V216	SFR	40	45	Ballast & Tie	77	72	Yes	5
V217 ³	SFR	56	40	Ballast & Tie	83	72	Yes	11
V218 ³	SFR	50	30	Ballast & Tie	83	72	Yes	11
V219 ³	SFR	40	30	Ballast & Tie	84	72	Yes	12
V220	SFR	180	30	Ballast & Tie	61	72	No	–
V221 ³	SFR/MFR	65	20	Ballast & Tie	74	72	Yes	2
V222 ³	SFR/MFR	40	20	Ballast & Tie	76	72	Yes	4
V223 ³	SFR	45	20	Ballast & Tie	76	72	Yes	4
V225	SFR/MFR	80	30	Ballast & Tie	69	72	No	–
V226	SFR/MFR	60	30	Ballast & Tie	72	72	No	–
V227	SFR	114	15	Ballast & Tie	61	72	No	–
V228	SFR	80	15	Ballast & Tie	72	72	No	–
V229	SFR	63	15	Ballast & Tie	67	72	No	–
V230 ³	SFR	52	15	Ballast & Tie	77	72	Yes	5
V231 ³	SFR	160	15	Ballast & Tie	63	72	No	–
V232 ³	SFR	50	15	Ballast & Tie	78	72	Yes	6
V233	SFR	57	15	Ballast & Tie	68	72	No	–
V235	MFR	60	55	Ballast & Tie	67	72	No	–

Source: WSP 2023

Notes: ¹ Cluster sites shown in Appendix B.

² A vibration level is an impact if it exceeds the impact criteria threshold.

³ Predicted GBV at these locations include the added vibration from turnouts and crossovers.

DF = direct fixation; ft = feet; FTA = Federal Transit Administration; GBV = groundborne vibration; MFR = multi-family residential; mph = miles per hour; SFR = single-family residential; VdB = vibration decibel notation

Table 5.5. Vibration Category 3 Land Use Light Rail At-Grade/Aerial Vibration Assessment – Locally Preferred Alternative

Cluster No. ¹	Land Use	Near Track Distance (ft.)	Speed (mph)	Track Type	Predicted GBV Level, VdB	FTA GBV Criteria, VdB	Exceeds? ²	Amount Exceeds, VdB
V42	Pace Headstart	530	30	Aerial	53	75	No	–
V46	Lillian Street Elementary	50	35	Aerial	65	75	No	–
V55	Templo Asamblea De Oracion	30	35	Ballast & Tie	69	75	No	–
V57	UEI College	55	35	Ballast & Tie	67	75	No	–
V64	Huntington Park High School	70	35	Ballast & Tie	70	75	No	–
V76	San Antonio Elementary	90	55	Ballast & Tie	64	75	No	–
V125	Trinity Bible Church	30	50	Ballast & Tie	72	75	No	–
V126	American Indian Bible Church	80	50	Ballast & Tie	65	75	No	–
V147	Paramount High School	85	55	Ballast & Tie	66	75	No	–
V164	Adventist Union School	155	55	Ballast & Tie	67	75	No	–
V179	Los Angeles County Fire Museum	95	55	Ballast & Tie	65	75	No	–
V183	Bristol Civic Auditorium	75	55	Ballast & Tie	64	75	No	–
V184	Bellflower Health Center	90	55	Ballast & Tie	62	75	No	–
V188	Bel Toren Villa Convalescent Hospital	65	55	Ballast & Tie	65	72	No	–
V203	Rio Hondo Mental Health Clinic	160	55	Ballast & Tie	60	75	No	–
V224	Wan Yuen Temple	70	55	Ballast & Tie	69	75	No	–
V234 ³	Dante Valve	59	55	Ballast & Tie	77	75 ⁴	Yes	2

Source: WSP 2020

Notes: ¹ Cluster sites shown in Appendix B.

² A vibration level is an impact if it exceeds the impact criteria threshold.

³ Predicted GBV at this location includes the added vibration from turnouts and crossovers

⁴ Site-specific vibration design criteria established based on existing facility operations.

ft = feet; FTA = Federal Transit Administration; GBV = groundborne vibration; mph = miles per hour; VdB = vibration decibel notation

5.2.2 Ancillary Facilities

Seventeen at-grade TPSSs will be required. Some of the TPSSs have alternatives denoted as site “e,” resulting in multiple possible TPSS locations. Of these, 17 will be located near a residence and 1 (TPSS 14) will be located near San Antonio Elementary School. As shown in Table 5.6, operation of the TPSSs will result in one moderate impact and two severe impacts. Calculation details are shown in Appendix J. Clusters and impacts are shown in Appendix C.

5.2.3 Parking Facilities

The LPA includes five stations with parking: Firestone Station, I-105/C Line Station, Paramount/Rosecrans Station, Bellflower Station, and Pioneer Station. According to the FTA Guidance Manual, the appropriate screening distance to identify sensitive receivers for parking facilities is 125 feet because the potential to exceed the FTA noise impact criteria is limited beyond that distance. Sensitive receivers will be located within 125 feet of each of the parking facilities, except for the Firestone Station parking facility. As shown in Table 5.7, 13 clusters will be located within 125 feet of the other parking facility sites. No impacts will occur related to parking facility noise. Sensitive receptors located more than 125 feet away will therefore not experience parking facility noise that will exceed the FTA noise impact criteria. Clusters and impacts are shown in Appendix D.

Table 5.6. TPSS Noise Impact Assessment

TPSS Site	Location	Civil Station	Closest Noise – Sensitive Use	Distance (ft.) ¹	Existing (dBA, L _{dn})	TPSS Noise (dBA, L _{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
17 Slauson	South of Slauson Ave and west of Randolph St within Union Pacific Railroad property.	670+50	SFR to the southwest	115	56.8	49	56	62	No
16	West of Regent St and north of Randolph St within private property.	694+25	None	None	None	None	None	None	None
15	North of Randolph St and west of Seville Ave within private property.	729+00	MFR to the southeast	130	61.8	48	59	64	No
15(e)	East of Stafford Ave and north of Randolph St within private property.	737+75	SFR to the west, east, and south	15	61.8	67	59	64	Severe
14	East of State St and north of Randolph St within Union Pacific Railroad property	768+46	SFR to the southeast	190	63.1	45	60	65	No
14	East of State St and north of Randolph St within Union Pacific Railroad property	768+46	San Antonio Elementary School ³	170	65.1 dBA, L _{eq} ³	39 dBA, L _{eq}	66 dBA, L _{eq}	71 dBA, L _{eq}	No
13	North of Randolph Ave and Bissel Pl within Union Pacific Railroad property	787+00	None	None	None	None	None	None	None
12	North of Walnut St and east of Salt Lake Ave within private property.	834+75	SFR to the south	100	61.1	50	60	65	No
11	North of Cecilia St and east of Salt Lake Ave within private property.	887+00	SFR to the north	50	61.1	56	58	64	No
10	South of Firestone Blvd and east of Branyon Ave within private property.	938+75	None	None	None	None	None	None	None

5 Environmental Consequences /Environmental Impacts

TPSS Site	Location	Civil Station	Closest Noise – Sensitive Use	Distance (ft.) ¹	Existing (dBA, L _{dn})	TPSS Noise (dBA, L _{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
9	Between Miller Way and the Interstate 710 Freeway and north of the existing tracks within private property.	987+75	None	None	None	None	None	None	None
9(e)	Southeast of the Rio Hondo Channel and north of Meadow Rd within private property.	998+75	None	None	None	None	None	None	None
8	North of Laurel St within a vacant, private-owned property.	1044+75	SFR to the south	None	None	None	None	None	None
8(e)	South of Gardendale and adjacent to the west side of Dakota Ave within private property.	1052+25	SFR to the west	120	56.4	49	56	62	No
7(e1)	West of Industrial Ave and Lincoln Ave within private property in the proposed parking facility.	1073+40	SFR to the east	140	59.9	47	58	63	No
7	North of Century Blvd and east of Center St within private property.	1080+00	SFR to the south	220	63.7	44	60	65	No
7(e2)	South of Rose Street and just west of Arthur Ave within Metro-owned property	1110+50	SFR to the north	20	62.4	64	59	65	Moderate
6	South of Paramount High School’s tennis courts and just east of the existing pedestrian bridge within public-owned property	1140+00	SFR to the south	80	58.0	52	57	62	No
5(e)	North of Hegel St and south of the Bellflower Bike Trail within private property.	1195+50	SFR to south, southwest, and southeast	30	52.0	61	54	60	Severe
5	North of Hegel St and the Bellflower Bike Trail within private property.	1196+50	SFR to the south	110	52.0	50	54	60	No

TPSS Site	Location	Civil Station	Closest Noise – Sensitive Use	Distance (ft.) ¹	Existing (dBA, L _{dn})	TPSS Noise (dBA, L _{dn})	Noise Impact Criteria		Impact
							Moderate	Severe	
4	West of Bellflower Blvd within private property within the proposed parking facility.	1243+50	SFR to the south	150	59.5	47	58	63	No
3	South of Flora Vista Park and just east of Beach St. within Metro-owned property.	1301+50	SFR to the northwest	100	57.5	50	57	62	No
3(e)	East of Studebaker Rd within Metro-owned property.	1345+00	None	None	None	None	None	None	None
2	Southeast of the crossing at Gridley Rd and 183rd St within Metro-owned property.	1376+25	SFR to the east	60	65.8	55	61	67	No
1	Between Corby Ave and Pioneer Blvd north of 188th St impacting a private property within the proposed parking structure.	1405+00	SFR to the west	100	48.0	50	53	59	No

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix C.

² Distance to the closest area of human use or closest building façade.

³ Category 3 land use noise impact is evaluated using loudest hour Leq (1hr).

dBA = A-weighted decibels; ft = feet; Ldn = day-night noise level; Leq = equivalent noise level; MFR = multi-family residential; SFR = single-family residential; TPSS = traction power substation

Table 5.7. Parking Facility Noise Impact Assessment

Parking Facility	Cluster No. ¹	Land Use	FTA Land Use Category ²	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
				Existing	Parking Facility Noise	Impact Threshold		
						Moderate	Severe	
Firestone Station	None	None	None	None	None	None	None	None
I-105/C Line Station	GS1	SFR	2	56.0	39	56	62	No
	GS2	SFR	2	54.9	46	55	61	No
Paramount/Rosecrans Station	PRS1	Bianchi Stadium 11 Theatre	3	59.4	40	63	68	No
Bellflower Station	BS1	SFR/MFR	2	59.5	41	58	63	No
	BS2	SFR/MFR	2	56.0	39	56	62	No
	BS3	SFR/MFR	2	59.5	39	58	63	No
	BS4	SFR/MFR	2	56.0	39	56	62	No
Pioneer Station	PS1	SFR/MFR	2	48.0	42	53	59	No
	PS2	SFR/MFR	2	48.0	47	53	59	No
	PS3	SFR/MFR	2	48.0	44	53	59	No
	PS4	SFR/MFR	2	48.0	47	53	59	No
	PS5	SFR/MFR	2	52.0	46	54	60	No

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster Sites are shown in Appendix D.

² Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

dBA = A-weighted decibels; FTA = Federal Transit Administration; Leq = equivalent noise level; MFR = multi-family residential; SFR = single-family residential

5.2.4 Freight Track Relocation

5.2.4.1 Noise

Construction of the LPA will require relocation of existing freight tracks. Freight tracks will be relocated to the north of the LPA alignment within the La Habra Branch ROW, to the west of the LPA alignment within the San Pedro Subdivision ROW, and to the north of the LPA alignment within the Metro-owned PEROW to accommodate the LPA alignment and maintain existing operations along the ROW where the proposed LRT tracks will overlap.

Freight train counts were conducted in September 2019 and it was found that only one train traversed the freight tracks along Randolph Street over a period of nine days. The train event occurred at midnight. One daytime train event occurred near the junction of Randolph Street and Slauson Avenue but did not fully traverse Randolph Street. Due to the infrequency and timing of freight trains along Randolph Street, it is unlikely that noise measurements captured freight train noise. Therefore, the FTA impact criteria has been based upon existing freight noise calculated based upon the existing location of freight tracks. Existing noise levels were also adjusted along Façade Avenue to account for existing freight that was not captured during noise measurements.

Relocated freight tracks will generally differ from their current alignments by only a few feet and will remain in the rail ROW. Freight train noise is generally intermittent, and only approximately two to three trains pass-by per day. No new noise source will be added, and the frequency of freight trains will not change. However, two locations will bring the freight tracks closer to sensitive receivers. The first location will be an approximately 9-foot shift of the centerline of the freight tracks to the north of the La Habra Branch ROW along Randolph Street. This will bring the freight tracks to approximately 50 feet from inhabited structures along the northern side of Randolph Street. Freight trains are anticipated to travel at a speed of 10 mph along Randolph Street and will be required to sound their warning horns due to grade crossings.

Close to the I-105 freeway, the centerline of the freight tracks will be shifted approximately 15 feet. Sensitive uses north and south of the I-105 freeway, residences along Façade Avenue, and near Rosecrans Avenue will be affected by the relocated freight tracks. Freight trains are anticipated to travel at a speed of 10 mph along Façade Avenue and will only be required to sound their warning horns near the grade crossing at Century Boulevard. Freight train noise at both of these locations has been added to the LRT noise below.

As shown in Table 5.8, 53 Category 2 Clusters will experience moderate impacts and 22 will experience severe impacts as a result of freight track relocation combined with LRT noise. As shown in Table 5.9, eight Category 3 clusters will experience moderate impacts as a result of the freight track relocation and freight train noise combined with the LRT noise. The extent of impacts from freight track relocation is limited to the areas where freight is being shifted closer to sensitive receptors and does not encompass the entirety of the LPA alignment. Category 3 clusters along Randolph Street are unlikely to regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and will not typically be open when the freight is traversing Randolph Street at night. Calculation details are shown in Appendix J. Clusters and impacts are shown in Appendix E.

Table 5.8. Category 2 Land Use Freight Track Relocation Noise Assessment

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N50	SFR/MFR	65	10	68	68	64	69	63	68	Severe
N52	SFR/MFR	240	10	69	55	59	60	63	68	No
N53	SFR/MFR	140	10	69	59	61	63	63	69	Moderate
N54	SFR	80	10	69	65	63	67	64	69	Moderate
N55	SFR	150	10	69	57	61	62	63	69	No
N56	SFR	95	10	69	65	63	67	64	69	Moderate
N57	SFR/MFR	210	10	69	56	59	61	63	68	No
N58	SFR/MFR	90	10	69	62	63	66	64	69	Moderate
N59	SFR/MFR	250	10	69	56	58	60	63	68	No
N60	SFR/MFR	45	10	70	61	66	67	64	69	Moderate
N61	SFR	90	10	69	61	63	65	64	69	Moderate
N63	SFR/MFR	250	10	69	56	58	60	63	68	No
N64	SFR/MFR	210	10	69	57	59	61	63	68	No
N65	SFR/MFR	80	10	69	64	63	66	64	69	Moderate
N66	SFR/MFR	80	10	69	63	63	66	64	69	Moderate
N69	SFR/MFR	240	10	64	56	59	60	60	65	Moderate
N70	SFR/MFR	217	10	64	55	59	60	60	65	Moderate
N71	MFR	80	10	66	60	63	65	61	67	Moderate
N72	SFR/MFR	210	10	64	54	59	60	60	65	Moderate
N73	MFR	60	10	66	65	65	68	61	67	Severe

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N74	SFR/MFR	240	10	64	61	59	63	60	65	Moderate
N75	MFR	130	10	65	60	61	64	61	66	Moderate
N76	SFR/MFR	85	10	66	67	63	69	61	67	Severe
N77	SFR/MFR	160	10	64	63	60	65	60	66	Moderate
N78	SFR/MFR	135	10	65	63	61	65	60	66	Moderate
N79	SFR/MFR	85	10	66	67	63	69	61	67	Severe
N80	SFR/MFR	55	10	66	68	65	70	61	67	Severe
N81	SFR	215	10	64	61	59	63	60	65	Moderate
N82	SFR/MFR	240	10	64	59	59	62	60	65	Moderate
N84	SFR/MFR	120	10	65	54	62	62	60	66	Moderate
N85	SFR/MFR	50	10	66	61	65	67	62	67	Severe
N86	SFR/MFR	85	10	66	62	63	66	61	67	Moderate
N87	SFR	245	10	64	56	58	60	60	65	Moderate
N88	SFR/MFR	80	10	66	63	63	66	61	67	Moderate
N89	SFR/MFR	60	10	67	60	65	66	62	67	Moderate
N90	SFR	145	10	65	55	61	62	61	66	Moderate
N91	SFR	160	10	65	53	60	61	61	66	Moderate
N92	SFR/MFR	130	10	65	58	61	63	61	66	Moderate
N93	SFR	60	10	67	60	65	66	62	67	Moderate
N94	SFR/MFR	80	10	66	60	63	65	61	67	Moderate
N95	SFR/MFR	240	10	64	56	59	61	60	66	Moderate
N96	SFR	110	10	66	60	62	64	61	67	Moderate

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N97	SFR/MFR	280	10	64	55	58	60	60	66	Moderate
N98	SFR/MFR	120	10	66	57	62	63	61	67	Moderate
N99	SFR/MFR	240	10	64	60	59	62	60	66	Moderate
N101	SFR	240	10	65	59	59	62	61	66	Moderate
N102	SFR	110	10	66	60	62	64	62	67	Moderate
N103	SFR	235	10	65	56	59	61	61	66	Moderate
N104	SFR	120	10	66	60	62	64	62	67	Moderate
N105	SFR/MFR	110	10	67	60	62	64	62	67	Moderate
N349	SFR	60	10	66	69	65	70	61	67	Severe
N350	SFR/MFR	85	10	66	66	63	67	61	67	Severe
N351	MFR	80	10	66	63	63	66	61	67	Moderate
N362	SFR	120	10	66	60	62	64	61	67	Moderate
N363	SFR	125	10	66	64	61	66	61	67	Moderate
N364	SFR	215	10	65	57	59	61	61	66	Moderate
N365	SFR	250	10	64	56	58	60	60	66	Moderate
N366	SFR	225	10	65	61	59	63	61	66	Moderate
N367	MFR	85	10	66	60	63	65	61	67	Moderate
Façade Avenue										
N182	SFR	270	10	60	55	53	57	58	63	No
N185	SFR	240	10	61	53	53	56	58	64	No
N186	SFR	290	10	60	52	52	55	58	63	No
N187	SFR	250	10	61	54	53	56	58	64	No

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N188	SFR	250	10	61	53	53	56	58	64	No
N189	SFR	160	10	62	53	55	57	59	65	No
N190	SFR	70	10	65	56	58	60	61	66	No
N191	SFR	35	10	65	60	61	64	61	66	Moderate
N192	SFR	60	10	66	65	59	66	61	67	Moderate
N193	SFR	60	10	66	66	59	67	61	67	Severe
N194	SFR	40	10	65	59	61	63	61	66	Moderate
N195	SFR	240	10	64	54	53	57	60	66	No
N196	SFR	55	10	65	59	60	62	61	66	Moderate
N197	SFR	55	10	66	66	60	67	61	67	Severe
N198	SFR	320	10	64	52	52	55	60	66	No
N199	SFR	320	10	54	56	52	57	55	61	Moderate
N200	SFR	52	10	62	68	60	68	59	65	Severe
N201	SFR	60	10	59	61	59	63	57	63	Severe
N202	SFR	220	10	55	57	54	58	55	61	Moderate
N203	SFR	170	10	56	66	55	66	56	62	Severe
N204	SFR	40	10	60	70	61	71	58	63	Severe
N205	SFR	325	10	54	64	52	64	55	61	Severe
N206	SFR	50	10	60	77	60	77	58	63	Severe
N207	SFR	28	10	62	70	62	71	59	65	Severe
N208	SFR	183	10	56	66	54	67	56	61	Severe
N209	SFR	265	10	54	66	53	66	55	61	Severe

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
N210	SFR	40	10	60	72	61	72	58	64	Severe
N211	SFR	225	10	55	56	53	58	55	61	Moderate
N212	SFR	150	10	56	59	55	60	56	62	Moderate
N213	SFR	35	10	61	63	61	65	58	64	Severe
N352	MFR	55	10	61	67	60	68	58	64	Severe

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix E.

² Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibels; ft = feet; Ldn = day/night noise level; LRT = light rail transit; MFR = multi-family residence; mph = miles per hour; SFR = single-family residence

Table 5.9. Category 3 Land Use Freight Track Relocation Noise Assessment

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{eq})						Impact
				Existing	LRT	Freight	Combined	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N51	Lillian Street Elementary	110	10	73	58	71	71	70	77	Moderate
N62	Templo Asamblea De Oracion	100	10	73	57	72	72	70	76	Moderate
N67	UEI College	140	10	71	53	70	70	70	75	Moderate
N68	Huntington Park Iglesia Pentecostes	240	10	69	51	68	68	69	74	No
N83	Huntington Park High School	50	10	74	60	75	75	70	78	Moderate
N100	San Antonio Elementary	150	10	72	58	70	70	70	76	Moderate
Façade Avenue										
N181	Trinity Bible Church	50.0	10	75	77	74	79	70	78	Severe
N183	Apostolic Assembly South Gate	275.0	10	67	51	66	66	67	72	No
N184	American Indian Bible Church	50.0	10	75	77	74	79	70	78	Severe

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix E.

² Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibels; ft = feet; L_{eq} = equivalent noise level; LRT = light rail transit; mph = miles per hour

5.2.4.1 Vibration

Construction of the LPA will require relocation of existing freight tracks. Freight tracks will be relocated to the north of the LPA alignment within the La Habra Branch ROW, to the west of the LPA alignment within the San Pedro Subdivision ROW, and to the north of the LPA alignment within the Metro-owned PEROW to accommodate the LPA and maintain existing operations along the ROW where the proposed LRT tracks will overlap. Freight trains will be relocated 15 feet closer to the residences along Façade Avenue near Rosecrans Avenue. The vibration levels associated with freight trains on the relocated tracks are shown in Table 5.10. These levels are in the range of 74 dBA to 80 dBA over a one-hour period operating at 20 mph at the occupied building structures at Cluster V45 to V151 along Façade Avenue. These levels are based on at-grade ballast and tie track. Freight train vibration will be infrequent as only two to three trains are estimated to travel near this location in any one day. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration will not exceed the impact threshold at any of these residential clusters.

Table 5.10. Relocated Freight Track Vibration Assessment – Locally Preferred Alternative

Cluster No. ¹	Relocated Freight Track Distance (ft.)	Freight Speed (mph)	Predicted GBV Level, VdB	FTA GBV Criteria, VdB ²	Exceeds?
V45	50	20	79	80	No
V47	145	20	75	80	No
V48	70	20	78	80	No
V49	150	20	75	80	No
V50	80	20	77	80	No
V51	130	20	75	80	No
V52	75	20	78	80	No
V53	40	20	80	80	No
V54	80	20	77	80	No
V56	70	20	78	80	No
V58	70	20	78	80	No
V59	50	20	79	80	No
V60	150	20	75	80	No
V61	105	20	76	80	No
V62	125	20	75	80	No
V63	65	20	78	80	No
V65	120	20	76	80	No
V66	40	20	80	80	No
V67	65	20	78	80	No
V68	65	20	78	80	No
V69	45	20	80	80	No
V70	125	20	75	80	No
V71	145	20	75	80	No

Cluster No. ¹	Relocated Freight Track Distance (ft.)	Freight Speed (mph)	Predicted GBV Level, VdB	FTA GBV Criteria, VdB ²	Exceeds?
V72	50	20	79	80	No
V73	75	20	78	80	No
V74	90	20	77	80	No
V75	100	20	76	80	No
V77	105	20	76	80	No
V78	110	20	76	80	No
V79	115	20	76	80	No
V80	170	20	74	80	No
V81	55	20	79	80	No
V82	125	20	75	80	No
V83	135	20	75	80	No
V84	70	20	78	80	No
V85	150	20	75	80	No
V86	60	20	79	80	No
V87	160	20	74	80	No
V88	60	20	79	80	No
V89	65	20	78	80	No
V90	125	20	75	80	No
V91	170	20	74	80	No
V92	115	20	76	80	No
V93	155	20	75	80	No
V94	90	20	77	80	No
V95	135	20	75	80	No
V96	115	20	76	80	No
V97	185	20	74	80	No
V98	145	20	75	80	No
V99	95	20	77	80	No
V100	145	20	75	80	No
V101	115	20	76	80	No
V102	85	20	77	80	No
V103	120	20	76	80	No
V104	165	20	74	80	No
V105	115	20	76	80	No
V106	165	20	74	80	No
V107	155	20	75	80	No
V108	100	20	76	80	No
V109	165	20	74	80	No

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Relocated Freight Track Distance (ft.)	Freight Speed (mph)	Predicted GBV Level, VdB	FTA GBV Criteria, VdB ²	Exceeds?
V110	110	20	76	80	No
V111	155	20	75	80	No
V112	105	20	76	80	No
V113	115	20	76	80	No
V114	110	20	76	80	No
V115	175	20	74	80	No
V116	115	20	76	80	No
V117	110	20	76	80	No
V118	185	20	74	80	No
V119	120	20	76	80	No
V120	130	20	75	80	No
V121	130	20	75	80	No
V122	130	20	75	80	No
V123	180	20	74	80	No
V124	115	20	76	80	No
V127	95	20	77	80	No
V128	60	20	79	80	No
V129	50	20	79	80	No
V130	59	20	79	80	No
V131	55	20	79	80	No
V132	69	20	78	80	No
V133	55	20	79	80	No
V134	55	20	79	80	No
V135	60	20	79	80	No
V136	95	20	77	80	No
V137	50	20	79	80	No
V138	110	20	76	80	No
V139	45	20	80	80	No
V140	50	20	79	80	No
V141	95	20	77	80	No
V142	107	20	76	80	No
V143	153	20	75	80	No
V144	101	20	76	80	No
V145	165	20	74	80	No
V146	155	20	75	80	No
V148	153	20	75	80	No
V149	160	20	74	80	No

Cluster No. ¹	Relocated Freight Track Distance (ft.)	Freight Speed (mph)	Predicted GBV Level, VdB	FTA GBV Criteria, VdB ²	Exceeds?
V150	152	20	75	80	No
V151	150	20	75	80	No

Source: WSP 2023

Notes: ¹ Cluster sites shown in Appendix B.

² The impact criteria threshold for infrequent events applies to freight operation in the corridor (Table 3.5).

ft = feet; FTA = Federal Transit Administration; GBV = groundborne vibration; mph = miles per hour; VdB = vibration decibel notation

5.3 Design Option: Close 186th Street

5.3.1 Noise

The LPA with the design option would close the 186th Street at-grade crossing and maintain the 187th Street as an at-grade crossing. The LPA with the design option would also remove the crossing signal noise from 186th Street and add crossing signal noise to 187th Street. Table 5.11 provides noise levels for Category 2 land uses and Table 5.12 provides noise levels for Category 3 land uses. The LPA with the design option would result in 96 moderate impacts and 118 severe impacts, which would be a decrease of 1 moderate impact and an increase of 1 severe impact compared to the LPA without the design option. The LPA with the design option and LPA without the design option would both result in a total of 214 impacts.

5.3.2 Vibration

The LPA with the design option would not change vibration from that generated by the LPA without the design option. Therefore, vibration levels would be the same for the LPA with the design option as for the LPA without the design option (refer to Section 5.2.1.1).

Table 5.11. Category 2 Land Use Light Rail Noise Assessment of the Design Option

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N322	SFR	40	40	H	48	65	53	59	Severe
N323	SFR	45	45	None	48	65	53	59	Severe
N324	SFR	200	45	None	48	59	53	59	Severe
N325	SFR	140	40	None	48	59	53	59	Severe
N326	SFR	50	40	H	48	64	53	59	Severe
N327	MFR	210	30	H	48	55	53	59	Moderate
N328	SFR/MFR	45	30	EH	48	67	53	59	Severe
N329	SFR	190	30	None	48	55	53	59	Moderate
N330	SFR	180	30	AE	48	56	53	59	Moderate
N331	SFR/MFR	35	20	EH	48	64	53	59	Severe
N333	SFR	175	40	AH	48	54	53	59	Moderate
N334	SFR	40	30	EH	48	67	53	59	Severe
N335	SFR/MFR	300	30	H	48	53	53	59	Moderate
N336	SFR	180	30	E	48	61	53	59	Severe
N338	SFR/MFR	160	20	EF	48	59	53	59	Severe
N339	SFR/MFR	90	20	EFH	48	61	53	59	Severe
N340	SFR	200	20	EF	48	58	53	59	Moderate
N341	SFR	110	15	CEFH	48	61	53	59	Severe
N342	SFR	80	15	CEFH	48	62	53	59	Severe

Cluster No. ¹	Land Use	Near Distance Track (ft.) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{dn})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N343	SFR	200	15	EF	48	55	53	59	Moderate
N344	SFR	40	15	CEH	52	64	54	60	Severe

Source: TAHA 2023

Notes: ¹ Cluster sites shown in Appendix A.

² Distance to the closest area of human use or closest building façade.

³ Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.

A = first row of intervening buildings

B = second row of intervening buildings

C = embedded track on grade

D = aerial structure with slab track

E = jointed track or crossover

F = quacker noise

G = wheel squeal noise

H = audible warning noise

dBA = A-weighted decibels; ft = feet; Ldn = day/night noise level; LRT = light rail transit; MFR = multi-family residence; mph = miles per hour; SFR = single-family residence

Table 5.12. Category 3 Land Use Light Rail Noise Assessment – Design Option

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Adjustment to LRT Noise ³	Noise Level (dBA, L _{eq})				Impact
					Existing	Project	Impact Threshold		
							Moderate	Severe	
N332	Artesia Historical Museum	45	20	CEH	50	63	58	65	Moderate
N337	Wan Yuen Temple	55	20	EH	50	59	58	65	Moderate

Source: TAHA 2023

Notes: ¹ Cluster sites shown in Appendix A.

² Distance to the closest area of human use or closest building façade.

³ Adjustments to LRT noise based on intervening rows of buildings, track type, special trackwork, quacker noise, wheel squeal noise, and audible warning noise.

A = first row of intervening buildings

B = second row of intervening buildings

C = embedded track on grade

D = aerial structure with slab track

E = jointed track or crossover

F = quacker noise

G = wheel squeal noise

H = audible warnings noise

dBA = A-weighted decibels; ft = feet; Leq = equivalent noise level; LRT = light rail transit; mph = miles per hour

5.4 Maintenance and Storage Facility

5.4.1 Noise

The MSF site is located on property owned by the City of Bellflower and leased to the Hollywood Sports Paintball & Airsoft Park, a recreational commercial business. The site is bounded by industrial facilities to the west, Somerset Boulevard and apartment complexes to the north, residential homes to the east, and the PEROW and Bellflower Bike Trail to the south. Noise levels at the clusters near the MSF were modeled and are shown in Table 5.13. No impacts will occur. Calculation details are included in Appendix J. Clusters and impacts are shown in Appendix F.

Table 5.13. Maintenance and Storage Facility Noise Assessment

Cluster No. ¹	Land Use	FTA Land Use Category ²	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
			Existing	Project	Impact Threshold		
					Moderate	Severe	
BF1	SFR	2	52.0	46	54	60	No
BF2	SFR	2	52.0	37	54	60	No
BF3	SFR	2	52.0	42	54	60	No
BF4	SFR	2	52.0	37	54	60	No
BF5	SFR	2	52.0	36	54	60	No
BF6	SFR	2	52.0	35	54	60	No
BF7	SFR	2	52.0	35	54	60	No
BF8	SFR	2	52.0	36	54	60	No
BF9	SFR	2	52.0	36	54	60	No
BF10	SFR	2	52.0	34	54	60	No
BF11	SFR	2	52.0	34	54	60	No
BF12	SFR	2	52.0	34	54	60	No
BF13	SFR	2	52.0	26	54	60	No
BF14	SFR	2	52.0	41	54	60	No
BF15	SFR	2	52.0	45	54	60	No
BF16	SFR	2	52.0	44	54	60	No
BF17	SFR	2	52.0	33	54	60	No
BF18	SFR	2	52.0	27	54	60	No
BF19	SFR	2	48.1	52	53	59	No
BF20	SFR	2	48.1	52	53	59	No
BF21	SFR	2	48.1	40	53	59	No
BF22	SFR	2	48.1	38	53	59	No
BF23	SFR	2	48.1	37	53	59	No

5 Environmental Consequences /Environmental Impacts

Cluster No. ¹	Land Use	FTA Land Use Category ²	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
			Existing	Project	Impact Threshold		
					Moderate	Severe	
BF24	SFR	2	48.1	42	53	59	No
BF25	SFR	2	48.1	45	53	59	No
BF26	SFR	2	48.1	41	53	59	No
BF27	SFR	2	48.1	40	53	59	No
BF28	SFR	2	48.1	51	53	59	No
BF29	MFR	2	48.1	45	53	59	No
BF30	MFR	2	48.1	38	53	59	No
BF31	MFR	2	48.1	37	53	59	No
BF32	MFR	2	48.1	36	53	59	No
BF33	SFR	2	48.1	40	53	59	No
BF34	SFR	2	48.1	37	53	59	No
BF35	SFR	2	48.1	36	53	59	No
BF36	SFR	2	48.1	36	53	59	No
BF37	SFR	2	48.1	35	53	59	No
BF38	SFR	2	48.1	36	53	59	No
BF39	SFR	2	48.1	42	53	59	No
BF40	SFR	2	48.1	36	53	59	No
BF41	SFR	2	48.1	35	53	59	No
BF42	SFR	2	48.1	24	53	59	No
BF43	SFR	2	48.1	43	53	59	No
BF44	SFR	2	48.1	38	53	59	No
BF45	SFR	2	48.1	36	53	59	No
BF46	SFR	2	48.1	26	53	59	No
BF47	SFR	2	48.1	41	53	59	No
BF48	SFR	2	48.1	36	53	59	No
BF49	Albert Baxter Elementary School	3	48.7	27	58	64	No
BF50	MFR	2	48.1	33	53	59	No
BF51	MFR	2	48.1	27	53	59	No
BF52	Mobile Homes	2	48.1	25	53	59	No
BF53	Mobile Homes	2	48.1	45	53	59	No
BF54	SFR	2	52.0	23	54	60	No

Cluster No. ¹	Land Use	FTA Land Use Category ²	Noise Level (Cat 2 dBA, L _{dn}) (Cat 3 dBA, L _{eq})				Impact
			Existing	Project	Impact Threshold		
					Moderate	Severe	
BF55	SFR	2	52.0	27	54	60	No
BF56	Mobile Homes	2	52.0	44	54	60	No
BF57	Mobile Homes	2	52.0	37	54	60	No

Source: TAHA 2020

Notes: ¹ Cluster Sites are shown in Appendix F.

² Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Category 3: Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included.

dBA = A-weighted decibels; FTA = Federal Transit Administration; L_{dn} = day/night noise level; L_{eq} = equivalent noise level; MFR = multi-family residence; SFR = single-family residence

5.4.2 Vibration

The MSF site is approximately 75 feet from the nearest residential land uses along Virginia Avenue. Train movements through crossover trackwork at 10 mph are predicted to result in a GBV level at these residential land uses of 71 VdB, which will not exceed the FTA impact threshold of 72 VdB for residential Category 2 clusters.

In response to comments on the Draft EIS/EIR regarding vibration, additional vibration analysis was completed for the Dante Valve Company located in Bellflower. At Dante Valve Company, peak existing vibration levels of between 75 and 80 VdB were measured in the manufacturing and testing areas of the Dante Valve Company. Vibration created at the track switch for the MSF access track could reach 77 VdB, which, if not mitigated, would exceed the 75 VdB existing level measured at the test stand used by Dante Valve Company.

5.5 United States Army Corps of Engineers Facilities

The LPA alignment will cross three United States Army Corps of Engineers (USACE) facilities: Los Angeles River just west of I-710, Rio Hondo channel just east of I-710, and San Gabriel River channel just west of I-605. All three are concrete lined.

5.5.1.1 Noise

The USACE facilities are not sensitive to noise. Therefore, no adverse effects will occur during operation of the LPA at the USACE facilities.

5.5.1.2 Vibration

The USACE facilities are not areas of frequent human use that is sensitive to operational vibration. Therefore, no adverse effects will occur during operation of the LPA at the USACE facilities.

5.6 California Department of Transportation Facilities

The LPA alignment transects the following Caltrans facilities, from north to south: I-710, I-105, SR-91, and I-605.

5.6.1.1 Noise

The Caltrans facilities are not sensitive to noise. Therefore, no adverse effects will occur during operation of the LPA crossings of the I-710, I-105, SR-91, or I-605.

5.6.1.2 Vibration

The Caltrans facilities are not areas of frequent human use that is sensitive to operational vibration. Therefore, no adverse effects will occur during operation of the LPA crossings of the I-710, I-105, SR-91, or I-605.

6 CEQA DETERMINATION

To satisfy CEQA requirements, noise and vibrations impacts are generally analyzed in accordance with Appendix G of the *CEQA Guidelines* and based on the FTA Noise and vibration impact criteria.

6.1 Threshold NOI-1: Would the Project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances?

6.1.1 No Project Alternative

Under the No Project Alternative, the LPA would not be developed; properties would not be acquired for the LPA; no structures along the LPA alignment would be demolished; and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. The World Energy Project would increase rail operations between Façade Avenue and the World Energy Oil Paramount Facility and construct additional stationary sources of noise independent of the LPA. Existing noise sources such as industrial areas along the LPA alignment, occasional aircraft flyovers and the movement of trains along existing railroads would remain the dominant noise sources in the LPA area. Any changes in noise levels in the Affected Area for noise would not be related to the WSAB Project. No project-related operational noise impacts would occur. Therefore, impacts would be less than significant, and no mitigation measures are required.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

6.1.2 Locally Preferred Alternative

6.1.2.1 LRT

Noise sources associated with at-grade and aerial LRT include steel wheels rolling on steel rails (wheel/rail noise), propulsion motors, air conditioning, and other auxiliary equipment on the vehicles. Sensitive uses will be exposed to a combination of noise sources, including LRT pass-by noise, audible warnings noise, wheel squeal noise, and special trackwork noise. Audible warnings noise includes implementation of the minimum CPUC bell noise level of 75 dBA, L_{max} at 10 feet, bell shrouds (Project Measure NOI PM-1), and the gate-down-bell-stop variance (Project Measure NOI PM-2) (project measures are described in Section 8.1.1). Throughout the LPA area, Category 2 clusters will experience 94 moderate impacts and 117 severe impacts. Three of 26 Category 3 clusters will experience moderate impacts. In total, the LPA will result in 97 moderate impacts and 117 severe impacts. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to LRT noise will be significant.

Regarding health effects of noise, it is unlikely for LRT noise to result in noise-induced hearing loss, as this is an occupational hazard related to working over long periods of time in high noise environments. FTA defines moderate impacts as having the potential to result in measurable annoyance in a community and severe impacts to cause a high level of community annoyance. LRT noise could increase stress and the potential for stress-related diseases at affected sensitive uses. This applies for other areas that will result in noise impacts.

6.1.2.2 Ancillary Facilities

One moderate and two severe impacts will occur as a result of ancillary facility noise. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, without mitigation, impacts related to ancillary facility noise will be potentially significant.

6.1.2.3 Parking Facilities

No impacts will occur related to parking facility noise. Therefore, without mitigation, impacts related to parking facility noise will be less than significant.

6.1.2.4 Freight Track Relocation

Construction of the LPA will require relocation of existing freight tracks. Freight tracks will be relocated to the north of the LPA alignment within the La Habra Branch ROW, to the west of the LPA alignment within the San Pedro Subdivision ROW, and to the north of the LPA alignment within the Metro-owned PEROW to accommodate the LPA and maintain existing operations along the ROW where the proposed LRT tracks will overlap.

Relocated freight tracks will generally differ from their current alignments by only a few feet and will remain in the rail ROW. Freight train noise is generally intermittent and only approximately two to three trains pass-by per day. No new noise source will be added, and the frequency of freight trains will not change. However, two locations will bring the freight tracks closer to sensitive receivers. The first location will be an approximately 9-foot shift of the centerline of the freight tracks to the north of the La Habra Branch ROW along Randolph Street. Close to the I-105 freeway, the centerline of the freight tracks will be shifted approximately 15 feet. Residences along Façade Avenue and near Rosecrans Avenue will be affected by the relocated freight tracks.

Freight train noise at both of these locations have been added to the LRT noise. Under the LPA, with respect to LRT-plus-freight-relocations noise, 53 Category 2 Clusters will experience moderate impacts and 22 will experience severe impacts. Eight Category 3 clusters will experience moderate impacts. These LRT-plus-freight-relocation impacts are confined to areas where the freight tracks are being shifted closer to sensitive receptors and do not affect the LPA alignment. Category 3 clusters along Randolph Street are unlikely to regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and will not typically be open when freight trains traverse Randolph Street at night. Therefore, without mitigation, impacts related to relocated freight track noise will be potentially significant.

6.1.2.5 Mitigation Measures

Mitigation Measures NOI-1 (Soundwalls) through NOI-5 (Freight Track Relocation Soundwalls) would be implemented. Mitigation measures are discussed in detail in Section 8.2.

6.1.2.6 Impacts Remaining After Mitigation

Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), and NOI-3 (Wheel Squeal Noise Monitoring) and Project Measures NOI-1 (Crossing Signal Bells) and NOI-2 (Gate-Down-Bell-Stop Variance) will reduce the number and severity of operational noise impacts. After implementation of mitigation measures and project measures related to LRT noise, 31 moderate impacts and 4 severe impacts will remain at Category 2 clusters. No impacts will remain at Category 3 clusters.

Regarding ancillary facility noise, implementation of Mitigation Measure NOI-4 (TPSS Noise Reduction) will reduce TPSS noise levels. However, various TPSS noise reduction methods may or may not be completely effective due to design constraints for individual TPSS locations, which will be determined as part of final design. Therefore, two moderate and one severe ancillary facility impact could remain. Impacts related to the LPA will remain significant and unavoidable with mitigation.

Regarding LRT-plus-freight-relocation noise, 31 moderate impacts and 1 severe impact will remain at Category 2 clusters (Table 8.11) after implementation of Mitigation Measures NOI-1 (Soundwalls), NOI-2 (Low Impact Frogs), NOI-3 (Wheel Squeal Noise Monitoring), and NOI-5 (Freight Track Relocation Soundwalls). Seven moderate impacts will remain at Category 3 clusters.

6.1.3 Design Option: Close 186th Street

The LPA with the design option would close the 186th Street at-grade crossing and maintain 187th Street as an at-grade crossing. The LPA with the design option would also remove the crossing signal noise from 186th Street and add crossing signal noise to 187th Street. Table 5.11 provides noise levels for Category 2 land uses and Table 5.12 provides noise levels for Category 3 land uses. The design option would result in 96 moderate impacts and 118 severe impacts related to LRT noise which would be a decrease of 1 moderate impact and an increase of 1 severe impact compared to the LPA without the design option. The LPA with the design option and LPA without the design option would both result in a total of 214 impacts.

6.1.3.1 Mitigation Measures

Mitigation Measures NOI-1 (Soundwalls) and NOI-2 (Low Impact Frogs) would be applicable to sensitive receptors within the vicinity of the design option. Mitigation measures are discussed in detail in Section 8.2.

6.1.3.2 Impacts Remaining After Mitigation

The design option would close the 186th Street at-grade crossing and open the 187th Street at-grade crossing. The design option would permit a soundwall to be constructed with no gap until reaching 187th Street, which would improve the effectiveness of the wall for the clusters near 186th Street. The design option would also remove the crossing signal noise from 186th Street and add crossing signal noise to 187th Street. Table 8.17 provides noise levels for

Category 2 land uses and Table 8.18 provides noise levels for Category 3 land uses. Thirty-three moderate impacts and 2 severe impacts will remain at Category 2 clusters after implementation of Mitigation Measures NOI-1 and NOI-2. No impacts will remain at Category 3 clusters. Impact levels would change from the LPA as follows: the impact at Cluster 334 would be reduced from severe to no impact; the impact at Cluster 328 would be reduced from severe to moderate impact; and the impact at Cluster 342 would change from no impact to moderate impact. Compared to the LPA, this would reduce the number of remaining severe impacts by two and increase the number of moderate impacts by two. The overall remaining number of impacts after mitigation would be 35 for both the design option and LPA. Impacts related to the design option will remain significant and unavoidable with mitigation.

6.1.4 Maintenance and Storage Facilities

Noise levels related to MSF noise sources were modeled at the 57 sensitive use clusters near the Bellflower MSF. The modeling results indicated that noise levels will not exceed the FTA Noise Impact Criteria at nearby sensitive uses. The Bellflower MSF will not result in impacts. For the purposes of this analysis, moderate and severe impacts under FTA's noise criteria are considered significant impacts under CEQA. Therefore, impacts related to noise at the Bellflower MSF site option will be less than significant.

6.1.4.1 Mitigation Measures

No mitigation measures are required.

6.1.4.2 Impacts Remaining After Mitigation

Less than significant impact.

6.2 Threshold NOI-2: Would the Project result in generation of excessive groundborne vibration or groundborne noise levels?

6.2.1 No Project Alternative

Under the No Project Alternative, the LPA would not be developed; properties would not be acquired for the LPA; no structures along the LPA alignment would be demolished; and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. Existing sources of GBV, including trucks traveling along roadways, construction utilizing heavy equipment, and active freight lines within the corridor, would remain the dominant GBV sources in the LPA area. Significant GBN is not expected in the area. No project-related operational vibration impacts would occur. Therefore, impacts would be less than significant and no mitigation measures are required.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

6.2.2 Locally Preferred Alternative

6.2.2.1 LRT

For at-grade or aerial transit systems, GBN is not evaluated because the airborne noise from the train pass-by will result in higher noise levels at the interior of the receiver buildings. As described in Section 5.2.1.1, 96 Vibration Category 2 clusters will experience impacts from at-grade and aerial LRT pass-by vibration. These predicted GBV levels are in the range of 1 to 20 VdB above the FTA vibration criteria. Thirty-eight clusters are predicted to exceed the impact criteria by more than 5 VdB. Therefore, where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold, there is a strong chance that actual GBV levels will be below the impact threshold and will not result in an adverse effect. Where the projected GBV is 5 VdB greater than the impact threshold, a vibration impact is probable. None of the Category 3 clusters will experience impacts. Therefore, without mitigation, impacts related to LRT pass-by vibration will be potentially significant.

6.2.2.2 Freight Track Relocation

The realignment of freight tracks included with the LPA are minor and will not result in vibration impacts at sensitive land uses. No new sources of train vibration will be added to the existing freight tracks. Realignment of the freight tracks north of the I-105 freeway and along Façade Avenue will move freight tracks closer to some residences and farther from others. The vibration level associated with freight trains at the new location will range from 74 dBA to 80 dBA at the nearest residential structures. The FTA impact criterion for residential properties exposed to infrequent vibration events is 80 VdB. Projected freight train vibration will not exceed the impact threshold. Therefore, impacts related to freight track relocation vibration will be less than significant, and no mitigation measures are required.

6.2.2.3 Mitigation Measures

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) will be implemented. Mitigation measures are discussed in detail in Section 8.2.

6.2.2.4 Impacts Remaining After Mitigation

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) will reduce LRT pass-by vibration impacts. However, 2 impacts in the range of 1 VdB to 5 VdB will remain along the alignment after mitigation. In accordance with the FTA Guidance Manual, there is a strong chance that actual GBV levels at these two locations will be below the impact threshold with mitigation. An FTA Detail Vibration Assessment will be conducted during final design to determine if vibration impacts will not occur and control measures will not be needed. Based on current analysis, impacts will be significant even after implementation of mitigation. Therefore, impacts related to LRT pass-by vibration may be significant and unavoidable.

6.2.3 Design Option: Close 186th Street

The LPA with the design option is substantially similar to the LPA without the design option in regard to LRT operational vibration because the same number of trains would pass by the same track location under either option. The determination provided in Section 6.1.2.1 for the LPA without the design option is applicable to the LPA with the design option. Where the projected GBV is 1 VdB to 5 VdB greater than the impact threshold, there is a strong chance that actual GBV levels will be below the impact threshold and will not result in an adverse

effect. Where the projected GBV is 5 VdB greater than the impact threshold, a vibration impact is probable. None of the Category 3 clusters will experience impacts. Therefore, without mitigation, impacts related to LRT pass-by vibration potentially would be significant, which is the same conclusion as for the LPA without the design option.

6.2.3.1 Mitigation Measures

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) would be the same as for the LPA.

6.2.3.2 Impacts Remaining After Mitigation

Mitigation Measures VIB-1 (Ballast Mat or Resilient Rail Fasteners) and VIB-2 (Low Impact Frogs) will reduce LRT pass-by vibration impacts. However, two impacts in the range of 1 VdB to 5 VdB will remain along the alignment after mitigation. None of the two locations are in the area of the design option. Therefore, impacts related to LRT pass-by vibration would be identical to the LPA and may be significant and unavoidable.

6.2.4 Maintenance and Storage Facility

As described in Section 5.4.2, no impacts will occur related to vibration at the Bellflower MSF site options.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

6.3 Threshold NOI-3: For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the project area to excessive noise levels?

6.3.1 No Project Alternative

There are no public airports or private airstrips located within two miles of the project area. Therefore, no impacts related to airport noise would occur.

6.3.2 Locally Preferred Alternative, Maintenance and Storage Facility

There are no public airports or private airstrips located within two miles of the LPA, including the MSF. Therefore, no impacts related to airport noise will occur.

6.3.2.1 Mitigation Measure

No mitigation is required.

6.3.2.2 Impacts Remaining After Mitigation

No impacts were identified.

7 CONSTRUCTION IMPACTS

7.1 Construction Activities

Construction activities associated with the West Santa Ana Branch Project are detailed in the *West Santa Ana Branch Transit Corridor Project Construction Methods Report* (Metro 2024).

7.2 Construction Methodology

To satisfy NEPA requirements, the analysis uses the FTA Transit Noise and Vibration Impact Assessment guidance for the General Assessment construction noise criteria associated with transit projects. The criteria are based upon a 1-hour L_{eq} . There may be adverse community reaction if the following 1-hour L_{eq} noise levels are exceeded:

- Residential: 90 dBA during the day and 80 dBA at night
- Commercial: 100 dBA during the day and 100 dBA at night
- Industrial: 100 dBA during the day and 100 dBA at night

As shown in Table 7.1, several jurisdictions have not established quantitative thresholds for construction noise, but instead rely on allowable hours of construction to limit construction noise. The City of Los Angeles, the County of Los Angeles, and the City of Downey have established quantitative standards for construction noise. For the purposes of this analysis, the FTA General Assessment construction noise limit criteria 1-hour L_{eq} have been applied. Construction noise levels were assessed as they will typically occur on the alignment based on the type of construction. Construction noise effects are typically limited to 500 feet from construction activity.

Table 7.1. Construction Standards by Jurisdiction

Jurisdiction	Permissible Construction Time	Quantitative Construction Noise Standard
City of Artesia	7:00 a.m. to 7:00 p.m. Monday through Saturday	No
City of Bell	Not Established	No
City of Bellflower	7:00 a.m. to 6:00 p.m. Monday through Friday 8:00 a.m. to 6:00 p.m. Saturdays	No
City of Cerritos	7:00 a.m. to 7:00 p.m.	No
City of Cudahy	Daytime (not defined)	No
City of Huntington Park	7:00 a.m. to 7:00 p.m. Monday through Saturday	No
City of Paramount	7:00 a.m. to 8:00 p.m. Monday through Saturday	No
City of South Gate	8:00 a.m. to 7:00 p.m. Monday through Saturday	No

Jurisdiction	Permissible Construction Time	Quantitative Construction Noise Standard
City of Vernon	Not Established	No
City of Downey	7:00 a.m. to 9:00 p.m.	85 dBA at the property line
City of Los Angeles	7:00 a.m. to 9:00 p.m. Monday through Friday 8:00 a.m. to 6:00 p.m. Saturdays:	75 dBA at 50 feet within 500 feet of a residential zone
County of Los Angeles	7:00 a.m. to 7:00 p.m. Monday through Saturday	75 dBA at single-family residence 80 dBA at multi-family residence

Source: City of Artesia, *Municipal Code*, March 2017; City of Bellflower, *Municipal Code*, February 2017; City of Cerritos, *Municipal Code*, May 25, 2017; City of Cudahy, *2010 General Plan Noise Element*, September 15, 2010; City of Huntington Park, *Municipal Code*; City of Paramount, *Municipal Code*, 2017; City of South Gate, *Municipal Code*, February 14, 2017

Short-term annoyance from vibration during construction is not a NEPA-significant impact. In most cases, the primary concern regarding construction vibration relates to potential damage effects. To satisfy NEPA requirements, the potential for damage to structures associated with construction vibration has been assessed using the FTA vibration damage criteria shown in Table 7.2.

Table 7.2. Construction Vibration Damage Risk Criteria

Building Category	PPV (inches / second)
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Historic buildings that have average sensitivity to vibration damage and non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: FTA, 2018

Note: PPV = peak particle velocity

The limit of 0.12 in/sec for fragile historic structures is among the most restrictive limits used for vibration damage risk to buildings. A damage risk criteria of 0.2 in/sec (PPV) is protective of all but the most fragile buildings.

To satisfy CEQA requirements, noise and vibration impacts are generally analyzed in accordance with Appendix G of the *CEQA Guidelines* and based on the FTA noise and vibration impact criteria. Impacts would be considered significant if the LPA has the potential to:

- Result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances;
- Result in generation of excessive GBV or GBN levels; and/or
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the Project expose people residing or working in the project area to excessive noise levels.

7.2.1 Noise Model

Construction noise was modeled using noise levels from the FTA Guidance Manual and the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) version 1.1. The FTA Guidance Manual includes noise levels for common pieces of construction equipment. For equipment noise levels not listed in the FTA Guidance Manual, noise levels from the RCNM were used. Construction noise levels were assessed as they will typically occur on the alignment. The two loudest pieces of construction equipment were combined and this noise level was used to assess construction noise against the FTA construction 1-hour L_{eq} noise criteria.

7.2.2 Vibration Model

The FTA analytical/empirical construction vibration prediction model was used to estimate vibration level propagation from construction equipment to vibration-sensitive locations. The vibration model is based on a combination of previous works, including measured equipment vibration emission data from several reference sources and projects, including the FTA's Guidance Manual, the Central Artery/Tunnel Project in Boston, and ground transmissibility relationships found in Charles Dowding's reference textbook. The fundamental equation used in the model is based on propagation relationships of vibration through average soil conditions and distance, as follows:

$$PPV_{receiver} = PPV_{ref} \times (25/Dist_{receiver})^n$$

where:

$PPV_{receiver}$ = predicted PPV at the receiver

PPV_{ref} = reference PPV of equipment at 25 feet

$Dist_{receiver}$ = distance from the receiver to the equipment in feet

$n = 1.5$ (the vibration attenuation rate through the soil)

The suggested value for “n” in the FTA Guidance Manual is 1.5. The value for “n” can lie between 1.0 and 2.0, and a value of 1.5 is commonly used in general vibration prediction models for distances less than 100 feet.

Equipment vibration emission levels used for the predictions are shown in Table 7.3. As additional guidance for the contractor, the distance beyond which the damage risk criteria will not be exceeded is presented in Table 7.4 building categories I and III.

Table 7.3. Equipment Vibration Emission Levels

Equipment		Vibration Level at 25 feet (in/sec PPV)
Pile Driver (impact)	Upper range	1.518
	Typical	0.644
Large Bulldozer		0.089
Caisson Drilling		0.089
Small Bulldozer		0.003
Jack Hammer		0.035
Hoe Ram		0.089
Mobile crane		0.008
Loaded Truck		0.076
Vibratory Roller		0.210

Source: FTA 2018

Note = PPV = peak particle velocity

Table 7.4. Construction Vibration Emission Levels and Distance to Impact Threshold

Equipment	PPV Ref Level at 25 ft (in/sec)	Distance to FTA Building Impact Category I of 0.20 in/sec (PPV) ¹ , feet	Distance to FTA Building Impact Category I of 0.50 in/sec (PPV) ² , feet
Auger Drill Rig	0.089	15	8
Backhoe	0.028	7	4
Bulldozer (small)	0.03	7	4
Bulldozer (large)	0.089	15	8
Caisson Drill	0.089	15	8
Compactor/Ballast Tamper	0.4254	41	23
Concrete Mixer	0.076	13	8
Concrete Pump	0.076	13	8
Crane	0.0006	1	1
Dump Truck	0.02	6	3
Excavator	0.175	23	13
Flat Bed Truck	0.02	20	3
Front-End Loader	0.087	15	8
Grader	0.0866	15	8
In-situ Soil Sampling Rig	0.089	15	8
Jackhammer	0.035	8	5

Equipment	PPV Ref Level at 25 ft (in/sec)	Distance to FTA Building Impact Category I of 0.20 in/sec (PPV) ¹ , feet	Distance to FTA Building Impact Category I of 0.50 in/sec (PPV) ² , feet
Loaded Trucks	0.076	13	8
Mounted Hammer hoe ram	0.325	35	20
Paver	0.076	13	8
Soil Mix Drill Rig	0.089	15	8
Tractor	0.076	14	8
Vibratory Pile Driver	0.734	60	33
Vibratory Roller (large)	0.21	26	15
Vibratory Roller (small)	0.126	19	10
Clam Shovel Drop	0.202	26	14

Source: WSP 2023

Notes: ¹ Damage risk criteria for well-constructed historic buildings.

² Damage risk criteria for well-constructed historic non-building structures.

ft = feet; FTA = Federal Transit Administration; PPV = peak particle velocity

7.3 Construction Impacts

7.3.1 No Build Alternative

The No Build Alternative includes projects identified in the SCAG 2016 RTP/SCS (SCAG 2016a), Metro's 2009 LRTP (Metro 2009a), and Measure M. Under the No Build Alternative, the LPA would not be developed. However, several infrastructure and transportation-related projects would be implemented and built in the vicinity of the project alignment, including improvements to the Metro bus system and local municipality bus systems, the I-710 South Corridor Project, the I-105 Express Lanes, and the World Energy Project. The projects in the No Build Alternative would have their own environmental evaluations with mitigation measures, if necessary. The World Energy Project Subsequent EIR concluded that construction noise and vibration would be less than significant with mitigation incorporated. Under the No Build Alternative, the LPA would not be constructed. Therefore, the No Build Alternative would not result in an adverse effect related to increasing noise levels or vibration levels at sensitive receivers.

Table 7.5. Predicted Construction Vibration at Listed and Eligible Historic Properties

Eligible	APE Map No.	Property Location	Land Use	Year Built	Track Type	Horizontal Distance from Track Centerline to Building	Damage Risk Criteria – in/sec (PPV)	Predicted Maximum Construction Vibration Level – in/sec (PPV)	Exceed Damage Risk Criteria without Mitigation
Yes	8-013	Pueblo del Rio Housing Complex	Building District	1941-1944	Aerial	357	0.50	0.00	No
Yes	9-015	6000 Alameda St, Huntington Park	Industrial	N/A	At-Grade	63	0.20	0.02 to 0.11	No
Yes	9-034	L & F Machine Company 2110 Belgrave Ave, Huntington Park	Industrial	1946	At-Grade	63	0.50	0.02 to 0.11	No
Yes	10-012	6101 Santa Fe Ave, Huntington Park	Commercial	N/A	At-Grade	43	0.20	0.09 to 0.19	No
Yes	10-017	2860 Randolph St, Huntington Park	Residential	1926	At-Grade	54	0.20	0.07 to 0.13	No
Yes	10-021	Huntington Park High School 6020 Miles Avenue, Huntington Park	Institutional	1909	At-Grade	502	0.30	0.00	No
Yes	11-016	Randolph Substation/Randolph St, Huntington Park	Miscellaneous	N/A	Aerial	84	0.50	0.03 to 0.07	No
Yes	11-018	6300-6302 State St, Huntington Park	Commercial	1929	At-Grade	626	0.50	0.00	No
Yes	13-001	6231 Maywood Ave, Huntington Park	Industrial	1930	At-Grade	125	0.50	0.02 to 0.04	No
Yes	13-003	Gage Bowl Sign at 3477 Gage Avenue, Huntington Park	Commercial (Sign Structure Only)	1960	At-Grade	112	0.50	0.02 to 0.05	No

Eligible	APE Map No.	Property Location	Land Use	Year Built	Track Type	Horizontal Distance from Track Centerline to Building	Damage Risk Criteria – in/sec (PPV)	Predicted Maximum Construction Vibration Level – in/sec (PPV)	Exceed Damage Risk Criteria without Mitigation
Yes	15-032	Cudahy Substation/Salt Lake Avenue	Miscellaneous	N/A	At-Grade	90	0.50	0.03 to 0.06	No
Listed	17-005	LADWP Boulder Dam-Los Angeles 287.5 kV Transmission Line (1936)	Linear Utility (No Building)	N/A	At-Grade	14	0.50	0.50 to 1.02	Yes (during compacting)
Yes	18-016	Southern California Edison, Long Beach to Laguna Bell Transmission Line	Linear Utility (No Building)	N/A	Aerial	30	0.50	0.16 to 0.32	No
Yes	19-013	7601 E Imperial Hwy, Downey	Miscellaneous	N/A	At-Grade	136	0.50	0.00	No
Yes	28-008	Bellflower Pacific Electric Railway Depot, 16336 Bellflower Boulevard, Bellflower	Institutional	N/A	At-Grade	11	0.50	0.72 to 1.46	Yes (using a large vibratory roller or a compacter)
Yes	28-009	10040 Flora Vista St, Bellflower	Residential	1931	At-Grade	118	0.20	0.00	No
Contributing Property	32-021	The Frampton-Dantema House/18644 Alburdis Avenue, Artesia	Residential	1929	At-Grade	27	0.20	0.19 to 0.38	Yes (during compacting)

Source: WSP 2020, WSP 2023

Notes:

The range of predicted maximum construction vibration levels is based on the low end of the range, the use of large vibratory roller and on the high end of the range compactors for at-grade trackwork.

Aerial trackwork maximum construction vibration levels will occur from caisson drilling for the column structures.

In/sec = inches per second; LADWP= Los Angeles Department of Water and Power; N/A: Not Applicable because mitigation is not required to meet damage risk criteria; PPV = peak particle velocity

7.3.2 Locally Preferred Alternative

7.3.2.1 Noise

Environmental impacts and consequences were analyzed for the LPA as a whole and not broken down by geographic section as the urban nature of the Affected Area is generally consistent across geographic sections for this resource. The LPA will be located in a fully built-out urban environment and construction activities will occur in close proximity to sensitive land uses, including residences, parks, religious uses, and schools, throughout the corridor and may occur during daytime or nighttime hours. Unless variances, such as variances for nighttime or weekend construction, are obtained, the LPA will be required to comply with the construction time limits of the Cities of Los Angeles, Huntington Park, Cudahy, South Gate, Downey, Paramount, Bellflower, Artesia, and Cerritos, and the County of Los Angeles.

Construction of the LPA will take place over the course of approximately 8 years. During this time, various components of the LPA will be under construction concurrently throughout the 14.5-mile alignment. Some portions may be constructed in phases with activities occurring progressively from one end of the alignment to the other. Working hours of construction will vary to meet the type of work being performed and to meet local ordinance restrictions. Nighttime and weekend construction may be required to minimize impacts to the commute period, traffic congestion, and to accommodate construction scheduling for specific work activities.

Construction may be minimized during weekday AM and PM peak hours but will typically occur between 8:00 a.m. and 7:00 p.m. in accordance with the most conservative of the local ordinance restrictions among all involved cities. Metro will obtain a variance if construction is required outside the hours of the local ordinance. Nighttime construction may be required at times to minimize impacts to congested freeways and surface streets or due to the nature of certain construction processes. The contractor will develop an excavation plan that defines haul routes, dust control, sweeping, and disposal sites.

The LPA will require at-grade construction and elevated guideway construction. Construction of the LRT guideway and MSF will use equipment similar to heavy earth-moving equipment, generators, cranes, pneumatic tools, and other similar pieces of equipment. Construction activity at station areas will be dependent on the profile of the station (at-grade or aerial). Construction activity at staging areas will be most similar to noise levels generated by at-grade construction and will primarily involve the movement of equipment to and from the project site.

The FTA has provided guidance for assessing construction noise associated with transit projects. The criteria are based upon a 1-hour L_{eq} , as shown in Table 7.6. For residential uses, the threshold is 90 dBA for daytime construction and 80 dBA for nighttime construction. Commercial and industrial uses are held to a 100-dBA daytime and nighttime noise construction threshold. For the purposes of this analysis, the FTA General Assessment construction noise limit criteria 1-hour L_{eq} have been applied. Typical construction equipment used during each phase of construction are listed in Table 7.6.

Table 7.6. Construction Noise by Phase

Equipment	1-hour L_{eq} (dBA)
At-Grade Construction	
Backhoe	80.0
Compressor (air)	80.0
Crane	83.0
Dump Truck	76.5
Flat Bed Truck	74.3
Generator	82.0
Grader	85.0
Rail Saw	90.0
Paver	85.0
Pneumatic Tools	85.0
Welder/Torch	74.0
Combined At-Grade Construction 1-hour L_{eq} ¹	91.2
Elevated Guideway	
Concrete Mixer Truck	85.0
Concrete Pump Truck	82.0
Concrete Saw	89.6
Crane	83.0
Dump Truck	76.5
Flat Bed Truck	74.3
Generator	82.0
Pneumatic Tools	85.0
Welder/Torch	74.0
Combined Elevated Guideway Construction 1-hour L_{eq} ¹	90.9

Source: FHWA 2008; FTA 2018

Notes: ¹ Logarithmic sum of two loudest pieces of equipment.

dBA = A-weighted decibel; L_{eq} = equivalent noise level

At-grade construction will be the loudest phases with a 1-hour L_{eq} of 91.2 dBA at 50 feet. The 1-hour L_{eq} will exceed the 1-hour L_{eq} FTA standards of 90 dBA during the day and 80 dBA at night for residential uses during the at-grade and elevated guideway phases. Therefore, without mitigation, construction activity will result in a potentially adverse noise impact.

7.3.2.2 Vibration

Construction vibration varies greatly depending on the construction process, type of equipment used, and distance to the closest receivers. Many of these factors are traditionally left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction vibration. Overall, construction vibration levels are governed primarily by the equipment being used.

Construction vibration estimates are approximate because of the lack of specific information available at the time of the environmental assessment. Project designers usually try to minimize constraints on how the construction will be performed and what equipment will be used so that contractors can perform construction in the most cost-effective manner. Environmental impacts and consequences were analyzed for the LPA as a whole and were not broken down by geographic section as the urban nature of the Affected Area is generally consistent across geographic sections for this resource. Construction activity will be similar along the alignment as well as at the MSF. Activities will occur in close proximity to sensitive land uses throughout the corridor.

Construction of the LRT guideways, MSF, and freight track relocation will use equipment such as heavy earth-moving equipment, cranes, and other similar pieces of equipment. The FTA has provided guidance for assessing construction vibration associated with transit projects. The vibration criteria are based on potential damage risk to buildings (Table 3.7) and potential annoyance to building occupants (see Section 3.1.2). The FTA standards are used in this analysis to ensure that the potential for construction vibration impacts is assessed equally throughout the corridor.

Typical construction equipment to be used during construction is listed in Table 7.3 along with the predicted vibration levels at 25 feet. Vibration-generating activities could result in noticeable levels of vibration but will largely occur within the ROW and are unlikely to result in building damage. Most buildings within the project corridor are constructed of engineered concrete and masonry (no plaster) or non-engineered timber masonry which are held to vibration damage thresholds of 0.3 in/sec PPV and 0.2 in/sec PPV, respectively. The use of vibration-intensive equipment, such as a compactor/ballast tamper or an impact pile driver, could exceed the 0.2 in/sec PPV threshold within 45 feet of a structure. Equipment such as a vibratory roller could result in an exceedance of the 0.2 in/sec PPV threshold within 25 feet of a structure. Equipment such as large bulldozers, caisson drills, and hoe rams could result in an exceedance of the 0.2 in/sec PPV threshold within 15 feet of a structure. Additionally, 17 potentially vibration-sensitive historic structures have been identified along the alignment. An impact pile driver will exceed a vibration damage threshold of 0.2 in/sec PPV within 35 feet of a historic structure. A vibratory roller will exceed this threshold within 26 feet of a historic structure, and equipment such as a large bulldozer will exceed the threshold within 20 feet of a historic structure. Vibration could also exceed the FTA vibration annoyance criteria outlined in Table 3.5 and Table 3.6 when vibration-intensive equipment will be operated within 25 feet of sensitive uses. Therefore, without mitigation, construction activity may result in a potentially adverse vibration impact.

Construction Vibration Effects on City of Bellflower High Capacity Well

Vibration levels were estimated to assess construction vibration effects at the City of Bellflower underground High Capacity Well No. 1 and aboveground support facilities located at 9944 Flora Vista Street. The underground well extends from 800 to 1,300 feet below

ground. Support facilities are located at-grade above the underground well at the closest distance of about 20 feet to the edge of the railroad right-of-way or 40 feet from the proposed LRT tracks. Jack hammers and vibratory rollers would generate the highest groundborne vibration levels of all the equipment expected to be used near this underground well during construction of the transit guideway. The vibration estimates were made at the closest expected location of construction activity to the wellhead, a distance of about 20 feet from the railroad ROW, to represent the at-grade piping and other ancillary facilities. The estimated construction vibration levels at the wellhead and at intake depth are compared to the damage risk criteria of 2.0 in/sec PPV in Table 7.7. These estimated worst-case construction vibration levels are substantially lower than the 2.0 in/sec PPV damage risk criteria and would not cause damage to the well. Project Measure VIB PM-1, described in Section 8.1.2 will be implemented to ensure vibration levels do not exceed 2.0 in/sec PPV.

Table 7.7. Predicted Construction Vibration Levels

Receiver	Distance (feet)	Reference Equipment Vibration Levels at 25 feet (in/sec PPV)	Predicted Vibration Level at Receiver (in/sec PPV)	Damage Risk Criteria (in/sec PPV)
At-grade facilities	20	Vibratory roller – 0.210	0.29	2.0
Underground well	801	Vibratory roller – 0.210	0.0012	2.0
At-grade facilities	20	Jack hammer – 0.035	0.049	2.0
Underground well	801	Jack hammer – 0.035	0.0019	2.0

Source: WSP 2023

Note: PPV = peak particle velocity

Construction Vibration Effects on Historic Resources

The predicted construction vibration from the equipment and activities associated with the LPA is presented in Table 7.5 at each of the eligible historic resources. The location of these historic resources is shown in the *West Santa Ana Branch Transit Corridor Project Final Cultural Resources Survey Report – Rev 2* (Metro 2023a). Compaction of the track beds and ballast tamping will generate the highest levels at at-grade trackwork alignments, and caisson drilling for column structures will generate the highest levels at the aerial trackwork alignments. Without mitigation, vibration levels could exceed the damage risk criteria at three historic resources: the LADWP Boulder Dam—Los Angeles 287.5kV Transmission Line, the Bellflower Pacific Electric Railway Depot, and the Frampton-Dantema House (81644 Alburdis Avenue, Artesia). Although the vibration damage risk criteria are not anticipated to be exceeded at the other 14 vibration-sensitive historic structures along the LPA alignment, as a precautionary measure, Mitigation Measure VIB-7 (Construction Monitoring for Vibration Near Historic Properties/Historical Resources) will be implemented to monitor construction vibration levels within 200 feet of historic properties/historical resources to ensure the vibration damage thresholds will not be exceeded.

Construction Vibration Effects on Dante Valve Company

Jack hammers and vibratory rollers would generate the highest ground vibration levels of all the equipment anticipated to be used near the Dante Valve facilities during construction. The vibration estimates were made at the closest expected location of construction activity to the Test Stand area, a distance of 50 feet from the transit guideway. The estimated construction

vibration at these distances is compared to the damage risk criteria of 0.5 in/sec PPV in Table 7.8. These estimated worst-case construction vibration levels are lower than the 0.5 in/sec PPV damage risk criteria. Short-term construction vibration at Dante Valve Company in the City of Bellflower could exceed existing baseline vibration levels but will be less than the levels that could damage equipment or facilities.

Table 7.8. Predicted Construction Vibration Levels

Receiver	Distance (feet)	Reference Equipment Vibration Levels (in/sec PPV)	Predicted Vibration Level at Receiver (in/sec PPV)	Damage Risk Criteria (in/sec PPV)
Test Stand area	50	Vibratory Roller	0.07	0.5
Test Stand area	50	Jack Hammer	0.01	0.5

Note: in/sec = inches per second; PPV = peak particle velocity

7.3.3 Design Option: Close 186th Street

7.3.3.1 Noise

Construction required for the LPA with the design option would be similar to the LPA without the design option in the location of 186th and 187th Street. Construction noise will be characterized as at-grade construction with a 1-hour L_{eq} of 91 dBA at 50 feet. The 1-hour L_{eq} will exceed the 1-hour L_{eq} FTA standards of 90 dBA during the day and 80 dBA at night for residential uses during the at-grade phase. The LPA with the design option would result in similar construction noise impacts as the LPA without the design option. Construction noise impacts would not increase beyond those identified for the LPA without the design option. Therefore, without mitigation, construction activity related to the design option is expected to result in a potentially adverse noise impact.

7.3.3.2 Vibration

Construction required for the design option would be similar to the LPA at 186th and 187th Streets. Vibration effects to historic properties would be the same as for the LPA.

7.3.4 Maintenance and Storage Facility

Noise

Construction of the MSF will use equipment most similar to that used for at-grade construction of the alignment. The 1-hour L_{eq} for MSF construction is anticipated to be 91 dBA at 50 feet. Sensitive receptors near the MSF construction activity will include residences to the north, west, east, and south and Albert Baxter Elementary School approximately 400 feet to the north. The 1-hour L_{eq} of 91 dBA will exceed the FTA standards for residential uses. Therefore, without mitigation, MSF construction activity is expected to result in a potentially adverse noise impact.

Vibration

The construction equipment used during construction of the MSF that is likely to generate the greatest vibration will be a large bulldozer. A large bulldozer generates a vibration level of approximately 0.089 inch per second PPV at 25 feet. Vibration-generating activities could result in noticeable levels of vibration but will largely occur within the MSF site and are unlikely to result in building damage. Most buildings within the project corridor are constructed of engineered concrete and masonry (no plaster) or non-engineered timber masonry, which are held to

vibration damage thresholds of 0.3 in/sec PPV and 0.2 in/sec PPV, respectively. Nearby structures will typically be more than 25 feet from construction occurring at the MSF site and are unlikely to exceed the vibration damage threshold. However, residences to the northwest and northeast of the MSF site are adjacent to where construction activity will occur, which could result in the exceedance of the vibration damage threshold.

7.4 U.S. Army Corps of Engineers Facilities

7.4.1 Noise

Construction of the new bridge crossings will be located near the existing facilities similar to the current footprints. USACE facilities are not sensitive to noise. Therefore, no adverse effects will occur during construction of the LPA at the USACE facilities.

7.4.2 Vibration

The USACE facilities were constructed with similar activities as those that will be used to construct the LPA and are not highly sensitive to construction vibration. Work occurring within the river channels will be completed under conditions of a USACE Section 408 permit that will condition equipment and activities to those compatible with the sites to limit potential for damage to the channel from the weight of or vibration caused by the equipment. Therefore, no adverse effects will occur during construction of the LPA at the USACE facilities.

7.5 California Department of Transportation Facilities

7.5.1 Noise

Construction of the LPA will result in temporary noise-generating activities. Caltrans freeway facilities are not sensitive to noise. Therefore, no adverse effects will occur during construction of the LPA crossings of the I-710, I-105, SR-91, or I-605.

7.5.2 Vibration

Caltrans freeway facilities were constructed with similar activities as those that will be used to construct the LPA and are not sensitive to construction vibration. Therefore, no adverse effects will occur during construction of the LPA crossings of the I-710, I-105, SR-91, or I-605.

7.6 California Environmental Quality Act Determination

To satisfy CEQA requirements, noise and vibration impacts are generally analyzed in accordance with Appendix G of the *CEQA Guidelines* and based on the FTA noise and vibration impact criteria.

7.6.1 **Threshold NOI-CON-1: Would the Project result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established by FTA or in the local general plan or noise ordinances?**

7.6.1.1 **No Project Alternative**

Under the No Project Alternative, the LPA would not be developed; properties would not be acquired for the LPA; no structures along the LPA alignment would be demolished; and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed.

No construction noise impacts would occur related to the LPA. Therefore, impacts would be less than significant and no mitigation measures are required.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

7.6.1.2 Locally Preferred Alternative

The LPA will result in temporary and periodic increases in ambient noise levels due to construction activity that will exceed FTA's criteria, and, where applicable, the standards established by the local noise ordinances of the Cities of Artesia, Bell, Bellflower, Cerritos, Cudahy, Huntington Park, Paramount, South Gate, Vernon, Downey, and Los Angeles, and the County of Los Angeles, as listed in Table 7.1. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels will be potentially significant.

Regarding health effects of noise, it is unlikely for construction noise to result in noise-induced hearing loss for persons residing or working near construction zones, as this is an occupational hazard related to working over long periods of time (years) in high noise environments. Construction noise could increase stress and the potential for stress-related diseases at affected sensitive uses.

Mitigation Measures

Refer to Mitigation Measure NOI-6.

Impacts Remaining After Mitigation

Mitigation Measure NOI-6 is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels will be significant and unavoidable with mitigation.

7.6.1.3 Design Option: Close 186th Street

Construction required for the LPA with design option would be similar to the LPA without the design option. The LPA with the design option would result in temporary and periodic increases in ambient noise levels due to construction activity that would exceed FTA's criteria, and, where applicable, the standards established by the local noise ordinances shown in Section 3.4. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels will be potentially significant.

Mitigation Measures

Refer to Mitigation Measure NOI-6. Mitigation measures are discussed in detail in Section 8.2.

Impacts Remaining After Mitigation

Mitigation Measure NOI-6 is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore,

impacts related to temporary or periodic increases in ambient noise levels will be significant and unavoidable with mitigation.

7.6.1.4 Maintenance and Storage Facility

The City of Bellflower has not established a quantitative construction noise standard; therefore, an impact determination has been made based upon FTA construction noise criteria. Construction of the MSF will exceed the FTA standards for residential uses. Therefore, without mitigation, impacts related to temporary or periodic increases in ambient noise levels will be potentially significant.

Mitigation Measures

Refer to Mitigation Measure NOI-6.

Impacts Remaining After Mitigation

Mitigation Measure NOI-6 is anticipated to reduce construction noise levels. However, in some instances the FTA construction impact criteria may still be exceeded. Therefore, impacts related to temporary or periodic increases in ambient noise levels will be significant and unavoidable with mitigation.

7.6.2 Threshold NOI-CON-2: Would the Project result in generation of excessive GBV or GBN levels?

7.6.2.1 No Project Alternative

Under the No Project Alternative, the LPA would not be developed; properties would not be acquired for the LPA; no structures along the LPA alignment would be demolished; and no new structures would be constructed along the rail and street ROWs. The existing freight tracks within the rail ROWs would remain in place and the rail ROWs would be undisturbed. No construction vibration impacts would occur related to the LPA. Therefore, impacts would be less than significant and no mitigation measures are required.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

7.6.2.2 Locally Preferred Alternative

The FTA has provided guidance for assessing construction vibration associated with transit projects. The vibration criteria are based on potential damage risk to buildings and potential annoyance to building occupants. The FTA standards are used in this analysis to ensure that the potential for construction vibration impacts is assessed equally throughout the corridor. Typical construction equipment to be used during construction is listed in Section 7.3 along with the predicted vibration levels at 25 feet. To limit the damage risk to buildings along the alignment, operation of the vibratory roller will be restricted to no closer than 15 feet, and other equipment such as large bull dozers, front-end loaders, and hoe rams will operate no closer than 8 feet to a building. Construction activities beyond 15 feet from a building are unlikely to cause damage. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures VIB-3 through VIB-7.

Impacts Remaining After Mitigation

Mitigation Measure VIB-3 will require the contractor to prepare a vibration control plan to be approved by Metro to reduce construction vibration levels. Typical approaches to reducing vibration levels are outlined in Mitigation Measures VIB-4 through VIB-7. Mitigation Measures VIB-4 through VIB-7 include typical approaches to avoid vibration levels that will exceed the FTA damage risk thresholds. Mitigation Measures VIB-3 through VIB-7 are anticipated to avoid construction vibration levels that will exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration will be less than significant with mitigation incorporated.

7.6.2.3 Design Option: Close 186th Street

The LPA with the design option is substantially similar to the LPA in regard to vibration levels. Similar to the LPA without the design option, the LPA with the design option would result in temporary and periodic increases in vibration levels that would exceed the FTA damage risk thresholds; therefore, without mitigation, construction activity is expected to result in the same potentially significant vibration impact as the LPA without the design option.

Mitigation Measures

Mitigation Measures VIB-3 through VIB-7 would be implemented.

Impacts Remaining After Mitigation

Mitigation Measures VIB-3 through VIB-7 would avoid construction vibration levels that would exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration would be less than significant with mitigation incorporated.

7.6.2.4 Maintenance and Storage Facility

Construction equipment used during construction of the Bellflower MSF will be most similar to a large bulldozer. Nearby structures will typically be more than 25 feet from construction occurring at the MSF site and are unlikely to exceed the vibration damage threshold. There are no historical resources near the MSF. However, residences to the northwest and northeast of the MSF site are adjacent to where construction activity will occur, which could result in the exceedance of the vibration damage threshold. Therefore, without mitigation, construction activity is expected to result in a potentially significant vibration impact.

Mitigation Measures

Refer to Mitigation Measures VIB-3 through VIB-5.

Impacts Remaining After Mitigation

Mitigation Measures VIB-3 through VIB-5 are anticipated to avoid construction vibration levels that will exceed the FTA construction impact criteria. Therefore, impacts related to construction vibration will be less than significant with mitigation incorporated.

7.6.3 Threshold NOI-CON-3: For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No public airports or private airstrips are located within 2 miles of the project area. Therefore, no impacts related to airport noise will occur.

Mitigation Measures

No mitigation measures are required.

Impacts Remaining After Mitigation

Less than significant impact.

8 PROJECT MEASURES AND MITIGATION MEASURES

8.1 Project Measures

Project measures have been identified for noise during operation of the LPA and for vibration during construction.

8.1.1 Noise (Operation)

NOI PM-1 Crossing Signal Bells. Crossing signal bell noise will not exceed 75 dBA L_{max} sound exposure level at 10 feet at all protected at-grade crossings. Crossing signal bells at the locations identified in Table 8.1 will be equipped with shrouds to direct bell noise away from residential sensitive receivers. This measure has been coordinated with CPUC but remains subject to its final approval.

Table 8.1. NOI PM-1 Crossing Signal Bells Shroud Locations

Grade Crossing Locations	
Albany St	Century Blvd
Santa Fe Ave	Somerset Blvd
Rugby Ave	Clark Ave
Seville Ave	Alondra Blvd
Miles Ave	186th St
Bell Ave	Pioneer Blvd
Otis Ave	–

NOI PM-2 Gate-Down-Bell-Stop Variance. Metro will apply for a gate-down-bell-stop variance at the locations identified in Table 8.2 to reduce the duration of bell ringing and therefore reduce impacts at residential sensitive receivers. Crossing signal noise will not exceed 30 seconds in duration. This measure has been coordinated with CPUC but remains subject to its final approval.

Table 8.2. NOI PM-2 Gate-Down-Bell Stop Variance Locations

Grade Crossing Locations	
Albany St	Century Blvd
Santa Fe Ave	Somerset Blvd
Rugby Ave	Clark Ave
Seville Ave	Alondra Blvd
Miles Ave	186th St
Bell Ave	Pioneer Blvd
Otis Ave	–

8.1.2 Vibration (Construction)

VIB PM-1 City of Bellflower Vibration Sensitive Facilities. As part of project construction, Metro will establish a requirement that in no case shall vibration levels, in any direction, for all construction activities, exceed 2.0 in/sec PPV at the location of the City of Bellflower High Capacity Well No. 1 to protect underground and at-grade utility structures or exceed 0.5 in/sec PPV at the location of Dante Valve Company to protect the facility and at-grade test equipment. Vibratory rollers and other vibration-causing construction equipment shall not be used within 15 feet of the wellhead or Dante Valve Company facility.

8.2 Mitigation Measures

8.2.1 Operation

8.2.1.1 Noise

NOI-1 Soundwalls. Soundwalls will be placed at-grade or at the edge of aerial structures to reduce noise related to light rail transit vehicles at the identified sensitive receiver locations shown in Table 8.3 where moderate and severe impacts have been identified based on design completed to date. Height and length will be verified during final design with the objective to reduce noise from light rail trains to below the FTA moderate impact criteria. Where separate soundwalls are identified in close proximity and gaps are not required for access, they may be linked to form a continuous wall.

Table 8.3. NOI-1 LRT Soundwall Locations

Approximate Civil Station	Location	Track Side	Placement	Height
653+04 to 657+60	Between 55th St and 57th St	Left	Aerial	4 Feet
698+30 to 702+25	Between Cottage St and Albany St	Right	At-grade	8 Feet
703+25 to 709+25	Between Albany St and Santa Fe Ave	Right	At-grade	8 Feet
711+00 to 719+50	Between Santa Fe Ave and Rugby Ave	Left	At-grade	8 Feet
710+15 to 720+90	Between Santa Fe Ave and Rugby Ave	Right	At-grade	8 Feet
721+50 to 724+50	Between Rugby Ave and Pacific Blvd	Right	At-grade	8 Feet
729+50 to 732+50	Between Rita Ave and Seville Ave	Right	At-grade	8 Feet
733+75 to 743+00	Between Seville Ave and Miles Ave	Left	At-grade	8 Feet
733+50 to 743+00	Between Seville Ave and Miles Ave	Right	At-grade	8 Feet
744+00 to 762+80	Between Miles Ave and State St	Right	At-grade	8 Feet
745+75 to 762+00	Between west of Oak St and State St	Left	At-grade	8 Feet
764+00 to 769+75	Between State St. and Plaska Ave	Right	At-grade	12 feet
769+75 to 779+00	Between Plaska Ave and Hollenbeck St	Right	At-grade	10 feet
778+00 to 789+00	Between Hollenbeck St and Benedict Wy	Right	Aerial	6 Feet
803+00 to 813+69	Between Gage Ave and Bell Ave	Left	At-grade	8 feet

Approximate Civil Station	Location	Track Side	Placement	Height
815+15 to 829+85	Between Bell Ave and Florence Ave	Left	At-grade	8 feet
840+00 to 868+75	Between Live Oak St and Otis Ave	Right	At-grade	8 feet
840+40 to 862+50	Between Live Oak St and Olive St	Left	At-grade	8 feet
870+50 to 878+00	Between Otis Ave and Santa Ana St	Right	At-grade	8-feet
872+50 to 877+50	Between Otis Ave and Santa Ana St	Left	At-grade	8 feet
881+20 to 893+50	Between Santa Ana St and Cecilia St	Left	At-grade	8 feet
957+50 to 962+50	Between Southern Ave and Duncan Wy	Right	At-grade	8 feet
962+50 to 973+00	Between Duncan Wy and center of Los Angeles River Channel	Right	Aerial	6 feet
971+00 to 983+00	Between center of Los Angeles River Channel and Frontage Rd	Left	Aerial	8 feet
1023+00 to 1029+75	Between Imperial Hwy and Garfield Ave	Left	Aerial	8 feet
1089+50 to 1096+00	Between I-105 Fwy and Happy St	Right	At-grade	14 feet
1096+00 to 1107+75	Between Happy St and Pacific Electric Right-of-Way (PEROW)	Right	At-grade	16 feet
1089+50 to 1096+50	Between I-105 Fwy and Pearle St	Left	At-grade	12 feet
1096+50 to 1104+00	Between Happy St and south of Howe St	Left	At-grade	16 feet
1104+00 to 1108+50	Between south of Howe St and PEROW	Left	At-grade	12 feet
1108+50 to 1120+50	Between Union Pacific Right-of-Way and Colorado Ave	Left	At-grade	14 feet
1096+50 to 1104+00	Between Happy St and south of Howe St	Left	Aerial	8 feet
1096+50 to 1104+00	Between Happy St and south of Howe St	Right	Aerial	8 feet
1104+00 to 1124+00	Between south of Howe St and Paramount Blvd	Left	Aerial	6 feet
1104+00 to 1108+00	Between south of Howe St and PEROW	Right	Aerial	6 feet
1124+00 to 1134+50	Between Paramount Blvd and approximately 350 feet east of 144th St	Left	Aerial	4 feet
1141+00 to 1155+50	Between Paramount High School railroad pedestrian crossing and Downey Ave	Left	Aerial	8 feet
1140+00 to 1167+00	Between Paramount High School railroad pedestrian crossing and approximately 400 feet west Somerset Blvd	Right	Aerial	8 feet
1167+00 to 1171+00	Between approximately 400 feet west of Somerset Blvd and Somerset Blvd	Right	At-grade	8 feet
1173+00 to 1184+50	Between Somerset Blvd and Lakewood Blvd	Right	At-grade	12 feet

8 Project Measures and Mitigation Measures

Approximate Civil Station	Location	Track Side	Placement	Height
1186+50 to 1216+00	Between Lakewood Blvd and approximately Clark Ave	Right	At-grade	12 feet
1200+00 to 1215+70	Between approximately 50 feet west of Virginia Ave and Clark Ave	Left	At-grade	12 feet
1217+00 to 1222+00	Between Clark Ave and Alondra Blvd	Left	At-grade	10 feet
1224+00 to 1245+50	Between Alondra Blvd and approximately 200 feet west of Bellflower Blvd	Right	At-grade	8 feet
1226+50 to 1241+75	Between approximately 220 feet southeast of Alondra Blvd and Orchard Ave	Left	At-grade	8 feet
1248+50 to 1256+50	Between Bellflower Blvd and approximately 120 feet northwest of Civic Center Dr	Left	At-grade	12 feet
1250+00 to 1257+50	Between approximately 130 southeast of Bellflower Blvd and Civic Center Dr	Right	At-grade	12 feet
1257+50 to 1261+50	Between Civic Center Dr and approximately 200 feet southeast of Civic Center Dr	Right	At-grade	8 feet
1261+00 to 1265+50	Between approximately 500 feet northwest of Cornuta Ave and approximately 130 feet northwest of Cornuta Ave	Left	Aerial	8 Feet
1265+50 to 1275+50	Between approximately 130 feet northwest of Cornuta Ave and Woodruff Ave	Left	Aerial	4 feet
1261+00 to 1276+50	Between approximately 200 feet southeast of Civic Center Dr and Woodruff Ave	Right	Aerial	4 Feet
1275+50 to 1286+80	Between Woodruff Ave and Flora Vista St.	Left	Aerial	8 feet
1276+50 to 1286+50	Between Woodruff Ave and Flora Vista St	Right	Aerial	10 feet
1286+80 to 1300+00	Between Flora Vista St and approximately 300 feet southeast of Ripon Ave	Left	At-grade	10 feet
1286+50 to 1303+00	Between California Ave and SR-91 Fwy	Right	At-grade	10 feet
1309+00 to 1320+00	Between SR-91 Fwy and approximately 600 feet southeast of San Gabriel River Channel	Right	At-grade/ Structure	10 feet
1351+00 to 1360+00	Between approximately 230 feet northwest of Rosewood Park and approximately 450 feet northwest of Harvest Ave	Left	At-grade	12 feet
1360+00 to 1372+00	Between approximately 450 feet northwest of Harvest Ave and Harvest Ave	Left	Aerial	12 feet

Approximate Civil Station	Location	Track Side	Placement	Height
1372+00 to 1389+00	Between Harvest Ave and approximately 300 feet northwest of 186th St	Left	Aerial	10 Feet
1374+80 to 1389+00	Between Gridley Rd and approximately 300 feet northwest of 186th St	Right	Aerial	10 Feet
1389+00 to 1392+50	Between approximately 300 feet northwest of 186th St and 186th St	Left	At-grade	10 feet
1389+00 to 1392+00	Between approximately 300 feet northwest of 186th St and 186th St	Right	At-grade	10 feet
1393+75 to 1397+00	Between 186th St and 187th St	Left	At-grade	10 feet
1393+40 to 1397+00	Between 186th St and 187th St	Right	At-grade	10 feet
1397+00 to 1405+50	Between Alburdis Ave and approximately 200 feet northwest of Pioneer Blvd	Left	At-grade	8 feet
1397+00 to 1405+50	Between Alburdis Ave and approximately 200 feet northwest of Pioneer Blvd	Right	At-grade	8 feet
1409+50 to 1417+87	Between Pioneer Blvd and South St	Left	At-grade	8 feet
1409+20 to 1413+60	Between Pioneer Blvd and approximately 350 feet northwest of South St	Right	At-grade	8 feet

Note: LRT = light rail transit

NOI-2 Low Impact Frogs. Low impact frogs (Crossing point of two rails) will be installed at the identified locations shown in Table 8.4 to reduce crossover impact noise where necessary to reduce noise from light rail trains to below the FTA moderate impact criteria. Locations will be verified during final design with the objective to reduce noise from light rail trains to below the FTA moderate impact criteria.

Table 8.4. NOI-2 Low Impact Frog Locations

Civil Station	Location	Noise Clusters	Vibration Clusters
657+14 to 662+34	Between 55th St and Slauson Ave	N40, N41, N42, N43, N44, N45, N46, N48, N49	V43
739+92 to 741+32	Between Templeton St and Miles Ave	N74, N75, N76, N77, N78, N79, N80, N81, N349	V63
807+41 to 808+82	Between Gage Ave and Nevada St	N108, N109, N110, N11, N112, N113	V81
873+15 to 874+56	Between Otis Ave and Santa Ana St	N162, N163, N164	V115 and V116
1004+06 to 1005+47	Between Lincoln Ave and Florence Ave	N187	V153, V154, and V155

Civil Station	Location	Noise Clusters	Vibration Clusters
1178+55 to 1179+96	Between Castana Ave and Olivia Ave	N227, N228, N229, N230	V172, V173, V174, and V175
1228+76 to 1230+17	Between Alondra Blvd and Harvard St	N254, N255	V192, V193, and V194
1289+49 to 1291+03 and 1294+09 to 1295+37	Between Flora Vista St and Park St	N285, N289, N290, N291, N293, N294, N295, N296, N360	V195, V196, V197, and V198
1394+72 to 1399+92	Between 186th St and 187th St	N328, N330, N331, N332, N334, N336, N337, N338, N339, N340, N341, N342, N343	V217, V218, V221, V222, and V223
1409+62 to 1414+81	Between Pioneer Blvd and South Ave	N344, N345, N346	V230, V231, and V232

NOI-3 Wheel Squeal Noise Monitoring. Metro will conduct wheel squeal noise monitoring prior to the start of revenue operations to determine if excessive wheel squeal is occurring at the curves identified in Table 8-5. If wheel squeal occurs, Metro will use wayside rail lubrication to lubricate rail surfaces as necessary with the objectives of minimizing wheel squeal and reducing noise from light rail trains to below the FTA moderate impact criteria.

Table 8.5. NOI-3 Wheel Squeal Wayside Friction Applicator Locations

Civil Station	Curve
670+00	Curve from Randolph St to Long Beach Ave
788+00	Curve from San Pedro Subdivision Right-of-Way to Randolph St
1109+00	Curve from Pacific Electric Right-of-Way to San Pedro Subdivision Right-of-Way following Arthur Ave

NOI-4 TPSS Noise Reduction. At the traction power substation (TPSS) locations identified in Table 8.6, Metro will implement measures to reduce TPSS noise below the performance criteria shown in that table. Federal Transit Administration impact criteria shown in the table are based on existing noise levels per Federal Transit Administration guidance. Measures to reduce TPSS noise may include, but are not limited to:

- Orient cooling fans and heating, ventilation, and air conditioning (HVAC) equipment away from sensitive receivers
- Utilize quieter cooling fans or HVAC equipment
- Provide a surrounding enclosure around the TPSS unit and HVAC equipment
- Install baffles on the exterior of the cooling fan

- Sound insulation of TPSS unit enclosure or mounting of sound isolation materials to minimize transformer hum

Table 8.6. NOI-4 TPSS Locations

Civil Station	TPSS	Location	FTA Impact Criteria (dBA, L _{eq})
737+75	15(e)	East of Stafford Ave and north of Randolph St within private property.	59
1110+50	7(e2)	South of Rose Street and just west of Arthur Ave within Metro-owned property.	59
1195+50	5(e)	North of Hegel St and south of the Bellflower Bike Trail within private property.	54

Note: dBA = A-weighted decibel; Leq = equivalent noise level; TPSS = traction power substation

NOI-5 Freight Track Relocation Soundwalls. Soundwalls will be placed at-grade at the locations identified in Table 8.7 to reduce freight and LRT noise related to the freight track relocation. Height and length will be verified during final design with the objective to reduce noise from light rail trains to below the FTA moderate impact criteria.

Table 8.7. NOI-5 Freight Track Relocation Soundwalls

Civil Station	Location	Track Side	Placement	Height
764+00 to 769+75	Between State St. and Plaska Ave	Right	At-grade	12 feet
769+75 to 779+00	Between Plaska Ave and Hollenbeck St	Right	At-grade	10 feet
1089+50 to 1096+00	Between I-105 Fwy and Happy St	Right	At-grade	14 feet
1096+00 to 1107+75	Between Happy St and Pacific Electric Right-of-Way (PEROW)	Right	At-grade	16 feet
1089+50 to 1096+50	Between I-105 Fwy and Pearle St	Left	At-grade	12 feet
1096+50 to 1104+00	Between Happy St and south of Howe St	Left	At-grade	16 feet
1104+00 to 1108+50	Between south of Howe St and PEROW	Left	At-grade	12 feet
1108+50 to 1120+50	Between Union Pacific Right-of-Way and Colorado Ave	Left	At-grade	14 feet

8.2.1.2 Vibration

VIB-1 Ballast Mat or Resilient Rail Fasteners. At the locations identified in Table 8.8 where exceedance of FTA groundborne vibration impact criteria for frequent events will occur, Metro will isolate trackwork using ballast mats for ballast and tie track and resilient rail fasteners for direct fixation track or other comparable vibration isolation techniques. Locations where mitigation is necessary will be verified during final design with the objective to reduce vibration levels to below the FTA groundborne vibration impact criteria for frequent events.

Table 8.8. VIB-1 Ballast Mat or Resilient Rail Fasteners

Civil Station	Location
705+00 to 720+00	Between Albany St and Rugby Ave
732+00 to 757+00	Between Seville Avenue and Arbutus Ave
802+00 to 893+00	Between Gage Ave. and Cecilia St
1089+00 to 1105+00	Between I-105 and Racine Avenue
1124+00 to 1135+00	Between Paramount Boulevard and Paramount High School
1162+00 to 1240+00	Between approximately 600 feet southeast of Downey Ave and Orchard Ave
1251+00 to 1257+00	Between approximately 300 feet southeast of Bellflower Blvd and approximately 200 feet northeast of Civic Center Dr
1273+00 to 1311+00	Between Flower St and San Gabriel River Channel
1363+00 to 1403+00	Between approximately 500 feet southeast of Rosewood Park and 187th St
1410+00 to 1419+00	Between Pioneer Blvd and South St

VIB-2 Low Impact Frogs. Low impact frogs will be used at the turnout and crossover track locations identified in Table 8.9 where exceedance of the FTA impact thresholds have been identified. Locations where mitigation is necessary will be verified during final design with the objective to reduce vibration levels to below the FTA groundborne vibration impact criteria for frequent events. A low impact frog is also indicated for the MSF access track switch nearest the Dante Valve Company to reduce track switch vibration levels at the test bench to below 75 VdB.

Table 8.9. VIB-2 Low Impact Frogs

Civil Station	Location	Vibration Clusters
657+14 to 662+34	Between 55th St and 57th St	V43
739+92 to 741+32	Between Templeton St and Miles Ave	V63
807+41 to 808+82	Between Gage Ave and Nevada St	V81
873+15 to 874+56	Between Otis Ave and Santa Ana St	V115 and V116
1004+06 to 1005+47	Between Lincoln Ave and Florence Ave	V153, V154, and V155
1178+55 to 1179+96	Between Castana Ave and Olivia Ave	V172, V173, V174, and V175

Civil Station	Location	Vibration Clusters
1188+00	Maintenance and storage facility access track switch east of Lakewood Boulevard	V234
1228+76 to 1230+17	Between Alondra Blvd and Harvard St	V192, V193, and V194
1289+49 to 1291+03 and 1294+09 to 1295+37	Between Flora Vista St and Park St	V195, V196, V197, and V198
1394+72 to 1399+92	Between 186th St and 187th St	V217, V218, V219, V221, V222, and V223
1409+62 to 1414+81	Between Pioneer Blvd and South Ave	V230, V231, and V232

8.2.2 Construction

8.2.2.1 Noise

NOI-6 Noise Control Plan. Metro’s contractor will develop a Noise Control Plan demonstrating how noise criteria will be achieved during construction. The Noise Control Plan will be designed to follow Metro requirements, Construction Noise Control, and will include measurements of existing noise, a list of the major pieces of construction equipment that will be used, and predictions of the noise levels at the closest noise-sensitive receivers (residences, hotels, schools, churches, temples, and similar facilities). The Noise Control Plan will be approved by Metro prior to initiating construction. Where the construction cannot be performed in accordance with the FTA 1-hour L_{eq} construction noise standards, the contractor will investigate alternative construction measures that will result in lower sound levels. The FTA 1-hour L_{eq} construction noise standards are as follows: Residential daytime standard of 90 dBA L_{eq} and nighttime standard of 80 dBA L_{eq} , and Commercial and Industrial daytime standard of 100 dBA L_{eq} and nighttime standard of 100 dBA L_{eq} . The contractor will conduct noise monitoring to demonstrate compliance with contract noise limits. In addition, Metro will comply with local noise ordinances when applicable. Noise-reducing methods that may be implemented by Metro include:

- If nighttime construction is planned, a noise variance may be prepared by the contractor, if required by the jurisdiction, that demonstrates the implementation of control measures to maintain noise levels below the applicable FTA standards.
- Where construction occurs near noise-sensitive land uses, specialty equipment with enclosed engines, acoustically attenuating shields, and/or high-performance mufflers may be used.
- Limit unnecessary idling of equipment.
- Install temporary noise barriers or noise control curtains, where feasible and desirable.
- Reroute construction-related truck traffic away from local residential streets and/or sensitive receivers.
- Limit impact pile driving where feasible and effective.

- Use electric instead of diesel-powered equipment and hydraulic instead of pneumatic tools where feasible.
- Minimize the use of impact devices such as jackhammers and hoe rams, using concrete crushers and pavement saws instead.

8.2.2.2 Vibration

VIB-3 Vibration Control Plan. Metro’s contractor will prepare a Vibration Control Plan demonstrating how the Federal Transit Administration (FTA) building damage risk criteria and the FTA vibration annoyance criteria will be achieved. The Vibration Control Plan will include a list of the major pieces of construction equipment that will be used and predictions of the vibration levels at the closest sensitive receivers (residences, hotels, schools, churches, temples, historic properties, and similar facilities). The Vibration Control Plan must be approved by Metro prior to initiating construction. Where the construction cannot be performed to meet the FTA vibration damage criteria, the contractor will investigate and implement alternative means and methods of construction measures that will result in lower vibration levels.

As part of the Vibration Control Plan, the contractor will prepare a Vibration Monitoring Plan that specifies construction activities requiring monitoring, monitoring locations, warning levels and limits at each location, equipment, procedures, schedule of measurements, and reporting methods to be used to ensure that the FTA damage criteria, and the criteria specified in Mitigation Measure VIB-6 (Construction Vibration Limits for Historic Properties/Historical Resources), are not exceeded. Vibration levels will be monitored in real time. If limits are exceeded, the activity causing the exceedance must immediately be halted. Work on that activity will be suspended until such time as alternative construction methods can be used and additional abatement measures can be implemented as specified in the Vibration Control Plan. Vibration monitoring data will be submitted to the Project Engineer weekly.

VIB-4 Minimize the Use of Impact Devices. Metro’s contractor will avoid or minimize the use of impact devices such as jackhammers and hoe rams, using concrete crushers and pavement saws instead.

VIB-5 Drilling for Building Foundations. Where building foundation systems are needed, drilling instead of driven piles will be used.

VIB-6 Construction Vibration Limits for Historic Properties/Historical Resources. Historic structures will be held to the vibration damage criteria identified in Table 8.10. Where possible, operation of the compactor/ballast tamper, vibratory rollers, and other similar equipment will be restricted to no closer than 40 feet, and other equipment, such as, and similar to, vibratory rollers, large bulldozers, caisson drills, and hoe rams no closer than 25 feet to a historic structure. Such equipment will not be used within 25 feet of the Bellflower Pacific Electric Railway Depot or the Los Angeles Department of Water and Power Boulder Dam-Los Angeles 287.5 kV Transmission Line towers or within 40 feet of the Frampton-Dantema House (81644 Alburdis Ave, Artesia).

Table 8.10. VIB-6 Construction Restrictions near Historic Properties

APE Map No.	Property Location	Damage Risk Criteria – in/sec (PPV)	Predicted Vibration Level – in/sec (PPV) with Mitigation Measure VIB-6
17-005	Los Angeles Department of Water and Power Boulder Dam-Los Angeles 287.5 kV Transmission Line (1936)	0.50	0.21 to 0.43 at 25 feet (below damage risk criteria)
28-008	Bellflower Pacific Electric Railway Depot, 16336 Bellflower Boulevard, Bellflower	0.50	0.21 to 0.43 at 25 feet (below damage risk criteria)
32-021	81644 Alburdis Ave, Artesia	0.20	0.10 to 0.20 at 40 feet (below damage risk criteria)

Note: APE = Area of Potential Effect; in/sec = inches per second; PPV = peak particle velocity

VIB-7 Construction Monitoring for Vibration Near Historic Properties/Historical Resources. The contractor will monitor construction vibration levels within 200 feet of historic buildings and structures to ensure the vibration damage threshold for that building or structure will not be exceeded. A pre-construction and post-construction survey of these buildings will be conducted by a qualified structural engineer. Any damage will be noted. All vibration monitors used for these measurements will be equipped with an “alarm” feature to provide advanced notification that vibration impact criteria have been approached. This measure applies to structures identified as eligible for the National Register of Historic Places and/or California Register of Historical Resources in the *West Santa Ana Branch Transit Corridor Project Final Cultural Resources Survey Report – Rev 2* (Metro 2023a).

8.3 Impacts Remaining After Mitigation

8.3.1 Locally Preferred Alternative

8.3.1.1 LRT

Noise

Clusters that have been determined to have moderate to severe impacts related to LRT pass-by noise are discussed below with recommended mitigation measures implemented. LRT pass-by noise is mitigated by breaking the line-of-sight between receivers and the train. This can be achieved using soundwalls, which provides up to a 12-dB reduction in noise levels at receivers when located at the edge of the ROW (Mitigation Measure NOI-1). The level of noise reduction is based on the height of the soundwall and elevation of the receiver relative to the trackwork. Mitigation to second-story receivers will require higher soundwalls. Soundwalls can be installed both at-grade and on aerial structures. Soundwalls may not be feasible if, for instance, there is a grade crossing or other physical features that prevent installation. Soundwalls will also provide mitigation for freight train noise. Increased LRT noise also occurs as a result of impact noise created by crossovers. A low impact frog, which decreases impact noise caused by the wheels hitting the crossover, is a common mitigation measure for reducing crossover noise. The low impact frogs will eliminate the impact created by the LRT passing over the crossover by closing the gap between the rails, thereby reducing the elevated “clickety-clack” sound crossovers generate (Mitigation Measure NOI-2). For curves of 600-foot radius

or less, the LPA will be designed to accommodate a wayside lubrication system if wheel squeal occurs during pre-revenue operations (Mitigation Measure NOI-3). Wheel squeal noise is considered mitigated.

Crossing signal bell noise can be reduced using shrouds, which will direct bell noise away from sensitive receivers. Shrouds have the capability of providing approximately 1 to 5 dB of attenuation (Project Measure NOI PM-1). Shrouds can only be installed through CPUC approval. The bell noise can be further reduced by applying to the CPUC for a gate-down-bell-stop variance (Project Measure NOI PM-2), which will reduce the ringing duration of the bells. The two project measures would be installed at at-grade crossings with adjacent residential sensitive receptors. Obtaining approval requires demonstrating to the CPUC that the safety measures in place on the crossing more than compensate for stopping the bell noise once the gates are in the horizontal position. Based on experience with previous Metro projects and coordination with CPUC, NOI PM-1 and NOI PM-2 are anticipated to be approved and implemented.

As shown in Table 8.11 and Table 8.12, the majority of LRT-related noise impacts could be mitigated with the use of soundwalls (Mitigation Measure NOI-1) and Mitigation Measures NOI-2 through NOI-3. However, soundwalls will not be feasible at several receivers or will not provide enough of a noise reduction to totally mitigate all impacts. Available mitigation methods, including soundwalls, methods to reduce special track work noise, and wheel squeal, have been applied to reduce LRT noise to the greatest extent feasible. An explanation of areas where mitigation is not feasible or reasonable is included in Table 8.13. The LPA will have 27 clusters that will be reduced from a severe impact to a moderate impact; 92 clusters that will be reduced from a moderate impact to no impact; and 87 clusters that will be reduced from severe to no impact for a total of 206 benefited clusters. 31 moderate impacts and 4 severe impacts will remain at Category 2 clusters after implementation of Mitigation Measures NOI-1 through NOI-3. No impacts will remain at Category 3 clusters. Therefore, impacts will remain adverse even after implementation of mitigation. Mitigated clusters and impacts are shown in Appendix G. Calculation details are included in Appendix J.

Table 8.11. Mitigated LRT Noise Assessment

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N43	SFR	25	15	Yes	4	NOI-1, NOI-2	70.5	68	52	65	70	No
N50	SFR/MFR	65	15	No	0	NOI-3	65.4	68	58	61	66	No
N54	SFR	55	35	Yes	8	NOI-1	68.0	65	61	63	68	No
N56	SFR	55	35	Yes	8	NOI-1	68.0	65	60	63	68	No
N65	SFR/MFR	50	25	Yes	8	NOI-1	68.0	64	56	63	68	No
N66	SFR/MFR	40	20	Yes	8	NOI-1	68.0	63	60	63	68	No
N71	MFR	35	20	Yes	8	NOI-1	61.8	60	52	59	64	No
N73	MFR	60	35	Yes	8	NOI-1	61.8	65	65	59	64	Severe
N74	SFR/MFR	200	35	Yes	8	NOI-1, NOI-2	61.8	61	48	59	64	No
N75	MFR	100	35	Yes	8	NOI-1, NOI-2	61.8	60	47	59	64	No
N76	SFR/MFR	50	35	Yes	8	NOI-1, NOI-2	61.8	67	54	59	64	No
N77	SFR/MFR	130	35	Yes	8	NOI-1, NOI-2	61.8	63	50	59	64	No
N78	SFR/MFR	100	35	Yes	8	NOI-1, NOI-2	61.8	63	50	59	64	No
N79	SFR/MFR	50	35	Yes	8	NOI-1, NOI-2	61.8	67	55	59	64	No
N80	SFR/MFR	80	35	Yes	8	NOI-1, NOI-2	61.8	68	59	59	64	Moderate
N81	SFR	230	35	Yes	8	NOI-1, NOI-2	61.8	61	48	59	64	No
N82	SFR/MFR	210	35	Yes	8	NOI-1	61.8	59	51	59	64	No
N85	SFR/MFR	70	35	Yes	8	NOI-1	61.8	61	53	59	64	No
N86	SFR/MFR	50	35	Yes	8	NOI-1	61.8	62	54	59	64	No
N88	SFR/MFR	48	35	Yes	8	NOI-1	61.8	63	55	59	64	No
N89	SFR/MFR	80	35	Yes	8	NOI-1	63.1	60	52	60	65	No

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N93	SFR	85	35	Yes	8	NOI-1	63.1	60	52	60	65	No
N96	SFR	80	35	Yes	8	NOI-1	63.1	60	52	60	65	No
N102	SFR	80	35	Yes	10	NOI-1	63.1	60	50	60	65	No
N104	SFR	80	35	Yes	10	NOI-1	63.1	60	50	60	65	No
N105	SFR/MFR	80	35	Yes	10	NOI-1	63.1	60	49	60	65	No
N108	SFR	20	35	Yes	8	NOI-1, NOI-2	66.8	74	59	62	67	No
N111	SFR	120	35	No	0	NOI-2	66.8	64	59	62	67	No
N113	SFR/MFR	25	35	Yes	8	NOI-1, NOI-2	66.8	73	59	62	67	No
N114	SFR	110	35	Yes	8	NOI-1	66.8	62	56	62	67	No
N116	SFR/MFR	25	35	Yes	8	NOI-1	64.0	68	62	60	66	Moderate
N118	SFR	25	35	Yes	8	NOI-1	64.0	65	53	60	66	No
N119	SFR	35	35	Yes	8	NOI-1	64.0	65	53	60	66	No
N137	SFR	60	35	Yes	8	NOI-1	63.1	62	54	60	65	No
N141	SFR	85	40	Yes	8	NOI-1	63.1	61	56	60	65	No
N144	SFR	70	45	Yes	8	NOI-1	63.1	63	55	60	65	No
N146	SFR	100	45	Yes	8	NOI-1	63.1	62	56	60	65	No
N149	SFR	100	55	Yes	8	NOI-1	63.1	63	57	60	65	No
N151	SFR	240	55	Yes	8	NOI-1	63.1	60	55	60	65	No
N153	SFR	65	45	Yes	8	NOI-1	63.1	65	57	60	65	No
N155	SFR	200	55	Yes	8	NOI-1	63.1	60	54	60	65	No
N156	SFR	90	55	Yes	8	NOI-1	63.1	64	57	60	65	No
N158	SFR	90	55	Yes	8	NOI-1	61.1	64	56	58	64	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N159	SFR	205	55	Yes	8	NOI-1	61.1	60	54	58	64	No
N160	SFR	140	55	Yes	8	NOI-1	61.1	62	57	58	64	No
N161	SFR	110	55	Yes	8	NOI-1	61.1	63	62	58	64	Moderate
N162	SFR	170	55	Yes	8	NOI-1, NOI-2	61.1	66	55	58	64	No
N163	SFR/MFR	95	55	Yes	8	NOI-1, NOI-2	61.1	69	61	58	64	Moderate
N164	SFR/MFR	180	55	Yes	8	NOI-1, NOI-2	61.1	66	53	58	64	No
N165	MFR	185	55	Yes	8	NOI-1	61.1	64	59	58	64	Moderate
N166	MFR	70	55	Yes	8	NOI-1	61.1	65	56	58	64	No
N168	Mobile Homes	70	55	Yes	8	NOI-1	61.1	65	53	58	64	No
N169	Motel	230	50	No	0	NF ³	68.0	63	63	63	68	Moderate
N170	SFR	305	55	Yes	8	NOI-1	58.7	59	54	57	63	No
N171	SFR	250	55	Yes	8	NOI-1	58.7	59	51	57	63	No
N172	SFR	125	55	Yes	8	NOI-1	58.7	62	53	57	63	No
N173	SFR	240	55	Yes	6	NOI-1	58.7	60	53	57	63	No
N174	SFR	140	55	Yes	6	NOI-1	58.7	62	55	57	63	No
N175	SFR	240	55	Yes	6	NOI-1	58.7	60	53	57	63	No
N176	MFR	145	55	Yes	6	NOI-1	58.7	62	55	57	63	No
N177	Thunderbird Villa Mobile Home Estates	140	55	Yes	8	NOI-1	57.4	66	57	56	62	Moderate
N178	Thunderbird Villa Mobile Home Estates	175	55	Yes	8	NOI-1	57.4	61	53	56	62	No

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N179	Thunderbird Villa Mobile Home Estates	90	55	Yes	8	NOI-1	57.4	64	55	56	62	No
N180	Thunderbird Villa Mobile Home Estates	110	55	Yes	8	NOI-1	57.4	67	58	56	62	Moderate
N191	SFR	60	25	Yes	14	NOI-1	64.0	60	48	60	66	No
N192	SFR	20	25	Yes	14	NOI-1	64.0	64	52	60	66	No
N193	SFR	15	25	Yes	14	NOI-1	64.0	66	54	60	66	No
N197	SFR	15	25	Yes	14	NOI-1	64.0	66	54	60	66	No
N199	SFR	285	25	Yes	8	NOI-1	54.1	56	48	55	61	No
N200	SFR	20	25	Yes	8	NOI-1	62.4	67	56	59	65	No
N201	SFR	85	25	Yes	8	NOI-1	58.5	61	52	57	63	No
N202	SFR	240	25	Yes	8	NOI-1	54.8	57	49	55	61	No
N203	SFR	190	20	Yes	6	NOI-1, NOI-3	56.0	66	48	56	62	No
N204	SFR	65	20	Yes	6	NOI-1, NOI-3	60.1	70	50	58	63	No
N205	SFR	280	20	Yes	6	NOI-1, NOI-3	54.0	64	47	55	61	No
N206	SFR	15	20	Yes	6	NOI-1, NOI-3	60.0	77	55	58	63	No
N207	SFR	75	20	Yes	6	NOI-1, NOI-3	62.4	70	50	59	65	No
N208	SFR	170	20	Yes	6	NOI-1, NOI-3	55.5	66	48	56	61	No
N209	SFR	290	25	Yes	6	NOI-1, NOI-3	54.4	66	49	55	61	No
N210	SFR	80	25	Yes	6	NOI-1, NOI-3	60.4	71	52	58	64	No
N211	SFR	260	25	Yes	6	NOI-1	54.9	56	49	55	61	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N212	SFR	140	25	Yes	6	NOI-1	56.2	59	51	56	62	No
N213	SFR	55	25	Yes	6	NOI-1	60.8	63	53	58	64	No
N215	SFR	100	35	Yes	4	NOI-1	58.0	59	53	57	62	No
N216	SFR	70	35	Yes	4	NOI-1	58.0	61	54	57	62	No
N217	SFR	100	35	Yes	4	NOI-1	58.0	59	54	57	62	No
N219	SFR	120	55	Yes	8	NOI-1	58.0	63	55	57	62	No
N220	SFR	130	55	Yes	8	NOI-1	58.0	62	53	57	62	No
N222	SFR	135	55	Yes	8	NOI-1	66.4	62	54	62	67	No
N223	SFR	135	55	Yes	8	NOI-1	56.0	62	55	56	62	No
N224	SFR	135	55	Yes	8	NOI-1	66.4	62	55	62	67	No
N225	SFR	220	55	Yes	12	NOI-1	51.7	60	52	54	60	No
N226	SFR	125	55	Yes	12	NOI-1	62.7	65	57	59	65	No
N227	SFR	20	55	Yes	12	NOI-1, NOI-2	66.4	78	61	62	67	No
N228	SFR	200	55	Yes	12	NOI-1, NOI-2	51.7	65	50	54	60	No
N229	SFR	100	55	Yes	12	NOI-1, NOI-2	51.7	68	53	54	60	No
N230	SFR	30	55	Yes	12	NOI-1, NOI-2	51.7	74	58	54	60	Moderate
N231	SFR	60	55	Yes	12	NOI-1	56.0	69	59	56	62	Moderate
N234	Mobile Homes	160	55	Yes	12	NOI-1	52.0	60	50	54	60	No
N235	Mobile Homes	60	55	Yes	12	NOI-1	52.0	66	55	54	60	Moderate
N236	SFR	100	55	Yes	12	NOI-1	52.0	63	53	54	60	No
N237	SFR	160	55	Yes	12	NOI-1	52.0	61	51	54	60	No
N238	SFR	95	55	Yes	12	NOI-1	52.0	59	49	54	60	No

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N239	SFR	170	55	Yes	12	NOI-1	48.1	61	51	53	59	No
N240	SFR	100	55	Yes	12	NOI-1	48.1	63	52	53	59	No
N241	SFR	155	55	Yes	12	NOI-1	52.0	61	51	54	60	No
N242	SFR	215	55	Yes	12	NOI-1	52.0	60	50	54	60	No
N243	SFR	60	55	Yes	12	NOI-1	52.0	66	55	54	60	Moderate
N245	MFR	70	55	Yes	12	NOI-1	51.2	65	55	54	60	Moderate
N246	MFR	70	55	Yes	12	NOI-1	62.4	68	65	59	65	Severe
N247	SFR	110	55	Yes	12	NOI-1	62.4	66	58	59	65	No
N248	MFR	170	55	Yes	12	NOI-1	62.4	61	51	59	65	No
N249	SFR	165	55	Yes	10	NOI-1	59.5	64	58	58	63	Moderate
N251	SFR	85	55	Yes	10	NOI-1	59.5	67	57	58	63	No
N253	SFR	100	45	Yes	8	NOI-1	66.0	65	62	61	67	Moderate
N254	SFR	100	45	Yes	8	NOI-1, NOI-2	59.5	67	54	58	63	No
N255	Aztec Mobile Home	35	35	Yes	8	NOI-1, NOI-2	59.5	69	55	58	63	No
N259	SFR	100	35	Yes	8	NOI-1	59.5	59	51	58	63	No
N267	MFR	35	30	Yes	12	NOI-1	56.0	63	59	56	62	Moderate
N268	MFR	50	45	Yes	12	NOI-1	56.0	65	57	56	62	Moderate
N270	MFR	140	55	Yes	8	NOI-1	56.0	62	54	56	62	No
N271	MFR	130	55	Yes	8	NOI-1	56.0	62	55	56	62	No
N274	SFR	125	55	Yes	8	NOI-1	56.0	62	53	56	62	No
N275	MFR	295	55	Yes	4	NOI-1	56.0	59	55	56	62	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N276	MFR	220	55	Yes	4	NOI-1	69.4	64	59	64	69	No
N277	SFR	130	55	Yes	4	NOI-1	69.4	66	60	64	69	No
N278	SFR/MFR	60	55	Yes	4	NOI-1	69.4	70	62	64	69	No
N281	MFR	235	55	Yes	4	NOI-1	69.4	64	59	64	69	No
N282	MFR	205	55	Yes	4	NOI-1	69.4	64	59	64	69	No
N283	SFR	110	55	Yes	4	NOI-1	57.7	63	56	57	62	No
N284	SFR	175	55	Yes	4	NOI-1	57.7	61	56	57	62	No
N285	SFR	185	55	Yes	8	NOI-1, NOI-2	57.7	66	52	57	62	No
N287	SFR	50	55	Yes	10	NOI-1	57.7	66	55	57	62	No
N288	SFR	220	55	Yes	10	NOI-1	57.7	60	50	57	62	No
N289	SFR	200	55	Yes	10	NOI-1, NOI-2	57.7	65	51	57	62	No
N290	SFR	50	55	Yes	10	NOI-1, NOI-2	57.7	71	56	57	62	No
N291	SFR	100	55	Yes	10	NOI-1, NOI-2	57.7	68	54	57	62	No
N292	SFR	160	55	Yes	10	NOI-1	57.7	57	48	57	62	No
N293	SFR	230	55	Yes	10	NOI-1, NOI-2	57.7	65	51	57	62	No
N294	SFR	65	55	Yes	10	NOI-1, NOI-2	57.7	70	55	57	62	No
N295	SFR	135	55	Yes	10	NOI-1, NOI-2	57.7	67	53	57	62	No
N296	SFR	150	55	Yes	10	NOI-1, NOI-2	57.7	62	48	57	62	No
N297	SFR	60	55	Yes	10	NOI-1	57.7	66	56	57	62	No
N298	SFR	95	55	Yes	10	NOI-1	57.7	64	54	57	62	No
N299	SFR	210	55	Yes	10	NOI-1	57.7	64	54	57	62	No
N300	SFR	140	55	Yes	10	NOI-1	57.7	66	56	57	62	No

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N301	SFR	70	55	Yes	10	NOI-1	57.7	69	58	57	62	Moderate
N306	SFR	210	55	Yes	12	NOI-1	51.2	60	50	54	60	No
N307	SFR	70	55	Yes	12	NOI-1	51.2	65	54	54	60	Moderate
N308	SFR	210	55	Yes	12	NOI-1	51.2	64	53	54	60	No
N309	SFR	70	55	Yes	12	NOI-1	51.2	69	58	54	60	Moderate
N310	SFR	55	55	Yes	12	NOI-1	51.2	70	58	54	60	Moderate
N311	SFR	140	55	Yes	10	NOI-1	51.2	66	56	54	60	Moderate
N312	SFR	50	55	Yes	10	NOI-1	53.1	70	58	54	60	Moderate
N313	SFR	175	55	Yes	10	NOI-1	65.8	65	55	61	67	No
N314	SFR	70	55	Yes	10	NOI-1	65.8	69	58	61	67	No
N315	SFR	45	50	Yes	10	NOI-1	65.8	70	58	61	67	No
N316	SFR	130	50	Yes	10	NOI-1	51.2	57	47	54	60	No
N317	SFR	220	45	Yes	10	NOI-1	51.2	58	48	54	60	No
N318	SFR	110	45	Yes	10	NOI-1	51.2	61	51	54	60	No
N319	SFR	50	45	Yes	10	NOI-1	51.2	65	55	54	60	Moderate
N320	SFR	110	45	Yes	10	NOI-1	51.2	57	47	54	60	No
N321	SFR	210	40	Yes	10	NOI-1	48.0	57	49	53	59	No
N322	SFR	40	40	Yes	10	NOI-1	48.0	65	57	53	59	Moderate
N323	SFR	45	45	Yes	10	NOI-1	48.0	65	54	53	59	Moderate
N324	SFR	200	45	Yes	10	NOI-1	48.0	59	49	53	59	No
N325	SFR	140	40	Yes	10	NOI-1	48.0	59	50	53	59	No
N326	SFR	50	40	Yes	10	NOI-1	48.0	64	54	53	59	Moderate

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N327	MFR	210	30	Yes	10	NOI-1	48.0	58	49	53	59	No
N328	SFR/MFR	45	30	Yes	10	NOI-1, NOI-2	48.0	70	60	53	59	Severe
N329	SFR	190	30	Yes	10	NOI-1	48.0	55	46	53	59	No
N330	SFR	180	30	Yes	8	NOI-1, NOI-2	48.0	56	43	53	59	No
N331	SFR/MFR	35	20	Yes	8	NOI-1, NOI-2	48.0	64	50	53	59	No
N333	SFR	175	40	Yes	8	NOI-1	48.0	54	46	53	59	No
N334	SFR	40	30	Yes	10	NOI-1, NOI-2	48.0	70	60	53	59	Severe
N335	SFR/MFR	300	30	Yes	10	NOI-1	48.0	56	48	53	59	No
N336	SFR	180	30	Yes	8	NOI-1, NOI-2	48.0	61	48	53	59	No
N338	SFR/MFR	160	20	Yes	8	NOI-1, NOI-2	48.0	59	46	53	59	No
N339	SFR/MFR	90	20	Yes	8	NOI-1, NOI-2	48.0	61	48	53	59	No
N340	SFR	200	20	Yes	8	NOI-1, NOI-2	48.0	58	45	53	59	No
N341	SFR	110	15	Yes	8	NOI-1, NOI-2	48.0	58	48	53	59	No
N342	SFR	80	15	Yes	8	NOI-1, NOI-2	48.0	59	49	53	59	No
N343	SFR	200	15	Yes	8	NOI-1, NOI-2	48.0	55	42	53	59	No
N344	SFR	40	15	Yes	8	NOI-1, NOI-2	52.0	64	50	54	60	No
N346	SFR	40	15	Yes	8	NOI-1, NOI-2	52.0	61	49	54	60	No
N347	SFR	45	15	Yes	8	NOI-1	52.0	56	50	54	60	No
N349	SFR	75	35	Yes	8	NOI-1, NOI-2	61.8	69	56	59	64	No
N350	SFR/MFR	50	35	Yes	8	NOI-1	61.8	65	61	59	64	Moderate

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N351	MFR	35	20	Yes	8	NOI-1	61.8	63	61	59	64	Moderate
N352	MFR	22	25	Yes	8	NOI-1	60.7	67	55	58	64	No
N353	SFR	105	55	Yes	8	NOI-1	57.7	63	54	57	62	No
N354	SFR	100	55	Yes	8	NOI-1	57.7	63	54	57	62	No
N355	SFR	185	55	Yes	8	NOI-1	57.7	61	53	57	62	No
N356	SFR	105	55	Yes	8	NOI-1	57.7	63	54	57	62	No
N357	SFR	45	55	Yes	10	NOI-1	57.7	67	56	57	62	No
N358	SFR	100	55	Yes	10	NOI-1	57.7	63	53	57	62	No
N359	SFR	60	55	Yes	10	NOI-1	57.7	66	56	57	62	No
N360	SFR	40	55	Yes	10	NOI-1, NOI-2	57.7	72	57	57	62	Moderate
N361	Thunderbird Villa Mobile Home Estates	30	55	Yes	8	NOI-1	57.4	69	58	56	62	Moderate
N362	SFR	80	35	Yes	6	NOI-1	63.1	60	51	60	65	No
N363	SFR	80	35	Yes	6	NOI-1	63.1	64	54	60	65	No
N366	SFR	190	35	Yes	6	NOI-1	63.1	61	51	60	65	No
N367	MFR	100	35	Yes	8	NOI-1	63.1	60	58	60	65	No
N368	SFR	250	20	No	0	NOI-3	56.8	65	55	56	62	No
N369	MFR	150	55	Yes	8	NOI-1	64.0	66	58	60	66	No
N370	MFR	150	55	Yes	8	NOI-1	64.0	61	53	60	66	No
N371	MFR	130	55	Yes	8	NOI-1	64.0	66	58	60	66	No
N372	MFR	55	55	Yes	8	NOI-1	64.0	66	59	60	66	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N373	MFR	135	55	Yes	8	NOI-1	64.0	62	54	60	66	No
N375	MFR	230	55	Yes	8	NOI-1	64.0	64	56	60	66	No
N376	MFR	260	55	Yes	8	NOI-1	64.0	63	55	60	66	No

Source: TAHA 2023

Notes: ¹ Cluster sites are shown in Appendix G.

² Distance to the closest area of human use or closest building façade.

³ See Table 8.12 for explanation.

dBA = A-weighted decibel; ft = feet; Ldn = day-night noise level; LRT = light rail transit; mph = miles per hour; NF = not feasible; SFR = single-family residential; MFR = multi-family residential

Table 8.12. Mitigated Category 3 Land Use LRT Noise Assessment

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwall	Soundwall Height	Mitigation Measures	Noise Level (dBA, L _{eq})					Impact After Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N221	Paramount High School	85	55	Yes	8	NOI-1	53.7	61	51	60	66	No
N332	Artesia Historical Museum	45	20	Yes	8	NOI-1, NOI-2	50.0	59	46	58	65	No
N337	Wan Yuen Temple	55	20	Yes	8	NOI-1, NOI-2	50.0	59	46	58	65	No

Source: TAHA 2023

Note: ¹ Cluster Sites are shown in Appendix G.

² Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibel; ft = feet; Ldn = day-night noise level; LRT = light rail transit; mph = miles per hour

Table 8.13. Sensitive Land Uses Where Mitigation is Not Feasible or Reasonable

Cluster No.	Cat. ¹	Land Use	Mitigation Measures	Explanation of Feasibility/Reasonableness of Mitigation
N169	2	Motel	None	No other receptor within 1,000 feet of receptor. FTA moderate impact criteria exceeded only by 0.2 dBA, resulting in a moderate impact. Not reasonable to implement soundwall for isolated receptor.

Source: Metro 2023

Notes: ¹ Category 2: Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.

Cat. = category; dBA = A-weighted decibel; FTA = Federal Transit Administration

Table 8.14. Mitigated LRT Vibration – Locally Preferred Alternative

Cluster No. ¹	Land Use	Near Track Distance (ft) ¹	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact ²
V48	SFR	35	35	75	Ballast Mat	67	72	No
V50	SFR	45	35	74	Ballast Mat	66	72	No
V52	SFR/MFR	40	35	74	Ballast Mat	66	72	No
V53	SFR/MFR	60	35	73	Ballast Mat	65	72	No
V54	SFR	45	35	74	Ballast Mat	66	72	No
V56	SFR/MFR	35	35	75	Ballast Mat	67	72	No
V58	MFR	35	35	75	Ballast Mat	67	72	No
V59	SFR/MFR	70	35	73	Ballast Mat	65	72	No
V62	SFR/MFR	90	35	75	Ballast Mat	67	72	No
V63 ³	SFR/MFR	30	35	83	Ballast Mat & Low Impact Frog	65	72	No
V66	SFR/MFR	60	35	73	Ballast Mat	65	72	No
V67	SFR/MFR	30	35	76	Ballast Mat	68	72	No
V68	SFR/MFR	30	35	76	Ballast Mat	68	72	No
V69	SFR/MFR	65	35	73	Ballast Mat	65	72	No
V72	SFR	70	35	73	Ballast Mat	65	72	No
V81 ³	SFR	20	35	89	Ballast Mat & Low Impact Frog	71	72	No
V82	SFR	90	35	77	Ballast Mat	66	72	No
V84	SFR/MFR	35	35	79	Ballast Mat	69	72	No
V86	SFR/MFR	25	35	80	Ballast Mat	70	72	No
V88	SFR	25	35	81	Ballast Mat	67	72	No
V89	SFR	30	25	78	Ballast Mat	67	72	No
V94	SFR/MFR	55	35	75	Ballast Mat	67	72	No
V99	SFR	60	35	75	Ballast Mat	67	72	No

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ¹	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact? ²
V102	SFR	50	45	77	Ballast Mat	68	72	No
V103	SFR	85	45	73	Ballast Mat	64	72	No
V105	SFR	80	55	73	Ballast Mat	65	72	No
V108	SFR	65	55	75	Ballast Mat	67	72	No
V110	SFR	75	55	74	Ballast Mat	66	72	No
V112	SFR	70	55	74	Ballast Mat	66	72	No
V113	SFR	80	55	73	Ballast Mat	65	72	No
V114	SFR	75	55	74	Ballast Mat	66	72	No
V115 ³	SFR	140	55	75	Ballast Mat & Low Impact Frog	67	72	No
V116 ³	SFR/MFR	80	55	80	Ballast Mat & Low Impact Frog	65	72	No
V117	MFR	75	55	74	Ballast Mat	66	72	No
V119	Mobile Homes	85	55	73	Ballast Mat	65	72	No
V127	SFR	60	55	75	Ballast Mat	67	72	No
V128	SFR	25	25	76	Ballast Mat	68	72	No
V129	SFR	15	25	79	Ballast Mat	71	72	No
V130	SFR	24	25	76	Ballast Mat	68	72	No
V131	SFR	20	25	77	Ballast Mat	69	72	No
V132	SFR	34	25	74	Ballast Mat	66	72	No
V133	SFR	20	25	77	Ballast Mat	69	72	No
V134	SFR	20	25	77	Ballast Mat	69	72	No
V135	SFR	25	25	76	Ballast Mat	68	72	No
V142	SFR	72	55	74	Ballast Mat	66	72	No
V144	SFR	66	55	75	Ballast Mat	67	72	No
V149	SFR	125	55	75	Ballast Mat	69	72	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ¹	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact? ²
V152	SFR	20	55	82	Ballast Mat	74	72	Yes
V153 ³	SFR	33	55	84	Ballast Mat & Low Impact Frog	66	72	No
V154 ³	SFR	31	55	90	Ballast Mat & Low Impact Frog	72	72	No
V155 ³	SFR	50	55	77	Ballast Mat & Low Impact Frog	69	72	No
V157	Mobile Homes	70	55	74	Ballast Mat	66	72	No
V158	SFR	66	55	75	Ballast Mat	67	72	No
V160	SFR	70	55	74	Ballast Mat	66	72	No
V162	SFR	65	55	75	Ballast Mat	67	72	No
V163	SFR	75	55	74	Ballast Mat	66	72	No
V165	MFR	80	55	73	Ballast Mat	65	72	No
V166	MFR	65	55	75	Ballast Mat	67	72	No
V171	SFR	60	55	75	Ballast Mat	67	72	No
V173 ³	SFR	115	45	75	Ballast Mat & Low Impact Frog	67	72	No
V174 ³	Aztec Mobile Home	25	35	88	Ballast Mat & Low Impact Frog	70	72	No
V175 ³	SFR	120	35	73	Ballast Mat & Low Impact Frog	65	72	No
V180	MFR	25	45	80	Ballast Mat	72	72	No
V181	MFR	60	55	75	Ballast Mat	67	72	No
V187	SFR/MFR	40	55	78	Ballast Mat	70	72	No
V189	SFR	25	55	81	Ballast Mat	73	72	Yes

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Near Track Distance (ft) ¹	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact? ²
V192 ³	SFR	60	55	84	Ballast Mat & Low Impact Frog	66	72	No
V193 ³	SFR	50	55	86	Ballast Mat & Low Impact Frog	68	72	No
V194 ³	SFR	30	55	90	Ballast Mat & Low Impact Frog	72	72	No
V195 ³	SFR	45	55	78	Ballast Mat & Low Impact Frog	70	72	No
V197 ³	SFR	58	55	76	Ballast Mat & Low Impact Frog	68	72	No
V199	SFR	65	55	75	Ballast Mat	67	72	No
V202	SFR	65	55	75	Ballast Mat	67	72	No
V204	SFR	50	55	77	Ballast Mat	69	72	No
V205	SFR	60	55	75	Ballast Mat	67	72	No
V206	SFR	45	55	77	Ballast Mat	69	72	No
V207	SFR	40	55	78	Ballast Mat	70	72	No
V210	SFR	60	55	75	Ballast Mat	67	72	No
V211	SFR	40	55	78	Ballast Mat	70	72	No
V212	SFR	50	55	77	Ballast Mat	69	72	No
V213	SFR	80	55	73	Ballast Mat	65	72	No
V214	SFR	50	45	76	Ballast Mat	68	72	No
V216	SFR	40	45	77	Ballast Mat	69	72	No
V217 ³	SFR	56	40	83	Ballast Mat & Low Impact Frog	65	72	No
V218 ³	SFR	50	30	83	Ballast Mat & Low Impact Frog	65	72	No
V219 ³	SFR	40	30	84	Ballast Mat & Low Impact Frog	66	72	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ¹	Speed (mph)	Predicted GBV Level, VdB	Mitigation Measure	Predicted Mitigated GBV Level, VdB	FTA GBV Impact Criteria	Residual Impact? ²
V221 ³	SFR/MFR	65	20	74	Ballast Mat & Low Impact Frog	66	72	No
V222 ³	SFR/MFR	40	20	76	Ballast Mat & Low Impact Frog	68	72	No
V223 ³	SFR	45	20	76	Ballast Mat & Low Impact Frog	68	72	No
V230 ³	SFR	52	15	77	Ballast Mat & Low Impact Frog	69	72	No
V232 ³	SFR	50	15	78	Ballast Mat & Low Impact Frog	70	72	No
V234 ³	Dante Valve	59	66	77	Low Impact Frog	72	75	No

Source: WSP 2020

Note: ¹ Cluster sites shown in Appendix H.

² A vibration level is considered an impact if it exceeds the impact criteria threshold.

³ Predicted GBV at these locations include the added vibration from turnouts and crossovers.

⁴ Site-specific vibration design criteria established based on existing facility operations.

ft = feet; FTA = Federal Transit Administration; GBV = groundborne vibration; LRT = light rail transit; mph = miles per hour; SFR = single-family residential; MFR = multi-family residential; VdB = vibration decibel notation

Vibration

Receivers that have been predicted to exceed the FTA vibration impact thresholds are discussed below with possible mitigation measures evaluated. LRT pass-by vibration can be mitigated by isolating the trackwork. This can be achieved using ballast mats for the ballast and tie track and resilient rail fasteners for the direct fixation track (Mitigation Measure VIB-1). At those clusters where the GBV impact is from special trackwork, the mitigation can be achieved by using low impact frogs at turnout and crossover track locations (Mitigation Measure VIB-2). Other measures with similar effectiveness could be implemented during final design to achieve the same vibration reduction. The specific limits for trackwork isolation will be defined during final design. A site-by-site assessment of the ground conditions will also occur during final design to determine the proper mitigation.

As shown in Table 8.14, although Mitigation Measures VIB-1 and VIB-2 will reduce vibration impacts, remaining impacts will occur at two clusters, in the range of 1 VdB to 2 VdB. Mitigated clusters and impacts are shown in Appendix H. According to the FTA Guidance Manual, there is a strong chance that after mitigation groundborne vibration levels at the two clusters will be below the impact threshold. Per FTA guidance to complete a Detailed Vibration Assessment during the final design phase of a project (FTA 2018), design-level detailed vibration analysis supporting the design of mitigation will be completed for those locations identified as potentially exceeding the FTA impact thresholds. The Detailed Vibration Assessment will include vibration propagation testing to determine site-specific soil behavior to vibration and support mitigation design that is tailored to eliminating the specific impact at each location. During the Detailed Vibration Analysis, appropriate mitigation, if necessary, will be specified. A Detailed Vibration Analysis at these locations may show that vibration impacts will not occur and control measures are not needed. Nonetheless, impacts may be adverse even after implementation of mitigation.

8.3.1.1 Ancillary Facilities

Implementation of Mitigation Measure NOI-4 (TPSS Noise Reduction) will reduce TPSS noise levels where feasible. However, at this stage in design, various TPSS noise reduction methods may or may not be completely effective due to design constraints for individual TPSS locations which will be determined as part of final design. One moderate impact and two severe impacts resulting from ancillary facility noise will remain. Therefore, adverse effects related to TPSS noise will remain after implementation of mitigation.

8.3.1.2 Parking Facilities

No impacts have been identified at parking facilities and no mitigation is required.

8.3.1.3 Freight Track Relocation

Noise

In many cases, mitigation of the LRT will reduce impacts related to the combined noise level of the LRT and relocated freight tracks. The combination of the LRT noise with freight noise is the primary driver for noise impacts in the instances that freight and LRT will pass-by at the same time of day. Project Measures NOI PM-1 and NOI PM-2 will provide noise reductions to clusters near grade crossings for LRT noise. Mitigation Measures NOI-1 through NOI-3 will apply for LRT noise, which will reduce overall noise impacts related to freight track relocation. Additional soundwalls necessary to mitigate noise related to freight track relocation have been proposed under Mitigation Measure NOI-5.

Mitigated noise levels for Category 2 clusters are shown in Table 8.15 and Category 3 clusters are shown in Table 8.16. Under the LPA, 31 clusters will be reduced from a moderate impact to no impact; 14 clusters will be reduced from severe to no impact; and 7 from severe to moderate, for a total of 52 benefited clusters. Thirty-one moderate impacts and 1 severe impact will remain at Category 2 clusters after implementation of Mitigation Measures NOI-1 through NOI-3 and NOI-5. Seven moderate impacts will remain at Category 3 clusters. Category 3 clusters along Randolph Street are unlikely to regularly experience impacts due to a combination of freight and LRT noise. This is because Category 3 uses are daytime uses and will not typically be open when the freight is traversing Randolph Street at night. Nonetheless, impacts will remain adverse even after implementation of mitigation.

Vibration

No vibration impacts will result from the freight track relocations.

Table 8.15. Mitigated Category 2 Land Use Freight Track Relocation Noise Assessment

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N50	SFR/MFR	65	10	NOI-3	68	69	65	63	68	Moderate
N53	SFR/MFR	140	10	NOI-1	69	63	62	63	69	No
N54	SFR	80	10	NOI-1	69	67	65	64	69	Moderate
N56	SFR	95	10	NOI-1	69	67	64	64	69	Moderate
N58	SFR/MFR	90	10	NOI-1	69	66	63	64	69	No
N60	SFR/MFR	45	10	NOI-1	70	67	66	64	69	Moderate
N61	SFR	90	10	NOI-1	69	65	63	64	69	No
N65	SFR/MFR	80	10	NOI-1	69	66	64	64	69	Moderate
N66	SFR/MFR	80	10	NOI-1	69	66	65	64	69	Moderate
N69	SFR/MFR	240	10	NOI-1	64	60	59	60	65	No
N70	SFR/MFR	217	10	None	64	60	60	60	65	Moderate
N71	MFR	80	10	NOI-1	66	65	64	61	67	Moderate
N72	SFR/MFR	210	10	NOI-1	64	60	59	60	65	No
N73	MFR	60	10	NOI-1	66	68	68	61	67	Severe
N74	SFR/MFR	240	10	NOI-1, NOI-2	64	63	59	60	65	No
N75	MFR	130	10	NOI-1, NOI-2	65	64	61	61	66	Moderate
N76	SFR/MFR	85	10	NOI-1, NOI-2	66	69	64	61	67	Moderate
N77	SFR/MFR	160	10	NOI-1, NOI-2	64	65	61	60	66	Moderate
N78	SFR/MFR	135	10	NOI-1, NOI-2	65	65	61	60	66	Moderate
N79	SFR/MFR	85	10	NOI-1, NOI-2	66	69	64	61	67	Moderate

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
N80	SFR/MFR	55	10	NOI-1, NOI-2	66	70	66	61	67	Moderate
N81	SFR	215	10	NOI-1, NOI-2	64	63	59	60	65	No
N82	SFR/MFR	240	10	NOI-1	64	62	59	60	65	No
N84	SFR/MFR	120	10	NOI-1	65	62	62	60	66	Moderate
N85	SFR/MFR	50	10	NOI-1	66	67	66	62	67	Moderate
N86	SFR/MFR	85	10	NOI-1	66	66	64	61	67	Moderate
N87	SFR	245	10	NOI-1	64	60	59	60	65	No
N88	SFR/MFR	80	10	NOI-1	66	66	64	61	67	Moderate
N89	SFR/MFR	60	10	NOI-1	67	66	65	62	67	Moderate
N90	SFR	145	10	NOI-1	65	62	61	61	66	Moderate
N91	SFR	160	10	NOI-1	65	61	60	61	66	No
N92	SFR/MFR	130	10	NOI-1	65	63	61	61	66	Moderate
N93	SFR	60	10	NOI-1	67	66	65	62	67	Moderate
N94	SFR/MFR	80	10	NOI-1	66	65	64	61	67	Moderate
N95	SFR/MFR	240	10	NOI-1	64	61	59	60	66	No
N96	SFR	110	10	NOI-1	66	64	62	61	67	Moderate
N97	SFR/MFR	280	10	NOI-1	64	60	58	60	66	No
N98	SFR/MFR	120	10	NOI-1	66	63	62	61	67	Moderate
N99	SFR/MFR	240	10	NOI-1	64	62	61	60	66	Moderate
N101	SFR	240	10	NOI-1, NOI-5	65	62	59	61	66	No
N102	SFR	110	10	NOI-1, NOI-5	66	64	56	62	67	No
N103	SFR	235	10	NOI-1, NOI-5	65	61	59	61	66	No

8 Project Measures and Mitigation Measures

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
N104	SFR	120	10	NOI-1, NOI-5	66	64	60	62	67	No
N105	SFR/MFR	110	10	NOI-1, NOI-5	67	64	60	62	67	No
N349	SFR	60	10	NOI-1, NOI-2, NOI-5	66	70	65	61	67	Moderate
N350	SFR/MFR	85	10	NOI-1, NOI-5	66	67	65	61	67	Moderate
N351	MFR	80	10	NOI-1, NOI-5	66	66	65	61	67	Moderate
N362	SFR	120	10	NOI-1	66	64	57	61	67	No
N363	SFR	125	10	NOI-1	66	66	57	61	67	No
N364	SFR	215	10	NOI-1, NOI-5	65	61	58	61	66	No
N365	SFR	250	10	NOI-1	64	60	57	60	66	No
N366	SFR	225	10	NOI-1	65	63	56	61	66	No
N367	MFR	85	10	NOI-1	66	65	64	61	67	Moderate
Façade Avenue										
N191	SFR	35	10	NOI-1, NOI-5	60	61	57	61	66	No
N192	SFR	60	10	NOI-1, NOI-5	65	59	54	61	67	No
N193	SFR	60	10	NOI-1, NOI-5	66	59	55	61	67	No
N194	SFR	40	10	NOI-1, NOI-5	59	61	57	61	66	No
N196	SFR	55	10	NOI-1, NOI-5	59	60	58	61	66	No
N197	SFR	55	10	NOI-1, NOI-5	66	60	55	61	67	No
N199	SFR	320	10	NOI-1, NOI-5	56	52	52	55	61	No
N200	SFR	52	10	NOI-1, NOI-5	68	60	58	59	65	No
N201	SFR	60	10	NOI-1, NOI-5	61	59	56	57	63	No

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{dn})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
N202	SFR	220	10	NOI-1, NOI-5	57	54	53	55	61	No
N203	SFR	170	10	NOI-1, NOI-3, NOI-5	66	55	53	56	62	No
N204	SFR	40	10	NOI-1, NOI-3, NOI-5	70	61	55	58	63	No
N205	SFR	325	10	NOI-1, NOI-3, NOI-5	64	52	53	55	61	No
N206	SFR	50	10	NOI-1, NOI-3, NOI-5	77	60	57	58	63	No
N207	SFR	28	10	NOI-1, NOI-3, NOI-5	70	62	57	59	65	No
N208	SFR	183	10	NOI-1, NOI-3, NOI-5	66	54	55	56	61	No
N209	SFR	265	10	NOI-1, NOI-3, NOI-5	66	53	54	55	61	No
N210	SFR	40	10	NOI-1, NOI-3, NOI-5	72	61	55	58	64	No
N211	SFR	225	10	NOI-1, NOI-5	56	53	50	55	61	No
N212	SFR	150	10	NOI-1, NOI-5	59	55	52	56	62	No
N213	SFR	35	10	NOI-1, NOI-5	63	61	55	58	64	No
N352	MFR	55	10	NOI-1, NOI-5	67	60	59	58	64	Moderate

Source: TAHA 2020; TAHA 2023

Notes:¹ Cluster sites shown in Appendix I.

² Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibel; ft = feet; Ldn = day-night noise level; MFR = multi-family residence; mph = miles per hour; SFR = single-family residence

Table 8.16. Mitigated Category 3 Land Use Freight Track Relocation Noise Assessment

Cluster No. ¹	Land Use	Freight Track Distance (ft) ²	Speed (mph)	Noise Level (dBA, L _{eq})						Impact after Mitigation
				Mitigation Measure	Existing	Unmitigated	Mitigated	Impact Threshold		
								Moderate	Severe	
Randolph Street										
N51	Lillian Street Elementary	110	10	None	73	71	71	70	77	Moderate
N62	Templo Asamblea De Oracion	100	10	NOI-1	73	72	72	70	76	Moderate
N67	UEI College	140	10	None	71	70	70	70	75	Moderate
N83	Huntington Park High School	50	10	None	74	75	75	70	78	Moderate
N100	San Antonio Elementary	150	10	NOI-1, NOI-5	72	70	66	70	76	No
Façade Avenue										
N181	Trinity Bible Church	55	10	None	82	79	79	70	80	Moderate
N183	Apostolic Assembly South Gate	270	10	None	73	72	72	70	77	Moderate
N184	American Indian Bible Church	120	10	None	79	76	76	70	80	Moderate

Source: TAHA 2020; TAHA 2023

Notes: ¹ Cluster sites shown in Appendix I.

² Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibel; ft = feet; Leq = equivalent noise level; mph = miles per hour

8.3.2 Maintenance and Storage Facility – Mitigated

Noise

No noise impacts were identified for the Bellflower MSF.

Vibration

No vibration impacts were identified for the Bellflower MSF.

8.3.3 Design Option – Mitigated

Noise

The design option would close the 186th Street at-grade crossing and open the 187th Street at-grade crossing. The design option would permit a soundwall to be constructed with no gap until reaching 187th Street, which would improve the effectiveness of the wall for the clusters near 186th Street. The design option would also remove the crossing signal noise from 186th Street and add crossing signal noise to 187th Street. Table 8.17 provides noise levels for Category 2 land uses and Table 8.18 provides noise levels for Category 3 land uses. Impact levels would change from the LPA without the design option as follows: the impact at Cluster 334 would be reduced from severe to no impact; the impact at Cluster 328 would be reduced from severe to moderate impact; and the impact at Cluster 342 would change from no impact to moderate. Under the LPA with the design option, 33 moderate impacts and 2 severe impacts would remain at Category 2 clusters after implementation of Mitigation Measures NOI-1 through NOI-3. No impacts would remain at Category 3 clusters. Therefore, impacts would remain adverse even after implementation of mitigation.

Vibration

Vibration levels would be the same for the design option as for the LPA, and the same mitigation commitments would apply to the design option.

8.3.4 Construction – Mitigated

Noise

The LPA will exceed the noise limits without mitigation. Mitigation Measure NOI-6 will require the contractor to prepare a noise control plan to be approved by Metro to reduce construction noise levels. Noise-reducing methods that could be used include acoustically attenuating shields around construction equipment, high-performance noise-reducing mufflers, temporary noise barriers, and substitution of diesel power equipment for quieter electric equipment. The Noise Control Plan will require the contractor to conduct periodic noise monitoring in response to noise complaints to demonstrate compliance with FTA standards. Other less conventional techniques, such as temporarily relocating affected residents, could be employed when the noise-reducing options will not suffice, particularly when loud, necessary construction operations must occur. However, construction noise will still likely exceed the FTA construction noise criteria. Therefore, with mitigation incorporated, impacts related to construction noise will remain adverse.

Vibration

Mitigation Measure VIB-3 will require the contractor to prepare a vibration control plan to be approved by Metro to reduce construction vibration levels. Mitigation Measure VIB-4 through VIB-7 include good engineering practices that will avoid exceeding the FTA building damage risk thresholds and not exceeding the FTA construction impact criteria. Therefore, with mitigation incorporated, impacts related to construction vibration will be less than adverse.

Table 8.17. Mitigated LRT Noise Assessment – Design Option

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N322	SFR	40	40	Yes	10	NOI-1	48	65	55	53	59	Moderate
N323	SFR	45	45	Yes	10	NOI-1	48	65	54	53	59	Moderate
N324	SFR	200	45	Yes	10	NOI-1	48	59	49	53	59	No
N325	SFR	140	40	Yes	10	NOI-1	48	59	50	53	59	No
N326	SFR	50	40	Yes	10	NOI-1	48	64	54	53	59	Moderate
N327	MFR	210	30	Yes	8	NOI-1	48	55	47	53	59	No
N328	SFR/MFR	45	30	Yes	10	NOI-1, NOI-2	48	67	53	53	59	Moderate
N329	SFR	190	30	Yes	8	NOI-1	48	55	45	53	59	No
N330	SFR	180	30	Yes	8	NOI-1, NOI-2	48	56	41	53	59	No
N331	SFR/MFR	35	20	Yes	8	NOI-1, NOI-2	48	64	48	53	59	No
N333	SFR	175	40	Yes	8	NOI-1	48	54	44	53	59	No
N334	SFR	40	30	Yes	10	NOI-1, NOI-2	48	67	50	53	59	No
N335	SFR/MFR	300	30	Yes	8	NOI-1	48	53	44	53	59	No
N336	SFR	180	30	Yes	8	NOI-1, NOI-2	48	61	46	53	59	No
N338	SFR/MFR	160	20	Yes	8	NOI-1, NOI-2	48	59	44	53	59	No

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{dn})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N339	SFR/MFR	90	20	Yes	8	NOI-1, NOI-2	48	61	45	53	59	No
N340	SFR	200	20	No	0	NOI-2	48	58	43	53	59	No
N341	SFR	110	15	Yes	8	NOI-1, NOI-2	48	61	49	53	59	No
N342	SFR	80	15	No	0	NOI-2	48	62	56	53	59	Moderate
N343	SFR	200	15	No	0	NOI-2	48	55	50	53	59	No
N344	SFR	40	15	Yes	8	NOI-1, NOI-2	52	64	50	54	60	No

Source: TAHA 2023

Notes: ¹ Cluster sites are shown in Appendix G.

² Distance to the closest area of human use or closest building façade.

² See Table 8.12 for explanation.

dBA = A-weighted decibel; ft = feet; Ldn = day-night noise level; LRT = light rail transit; MFR = multi-family residence; mph = miles per hour; SFR = single-family residence

Table 8.18. Mitigated Category 3 LRT Noise – Design Option

Cluster No. ¹	Land Use	Near Track Distance (ft) ²	Speed (mph)	Soundwalls	Soundwall Height (ft)	Mitigation Measures	Noise Level (dBA, L _{eq})					Impact after Mitigation
							Existing	Unmitigated	Mitigated	Impact Threshold		
										Moderate	Severe	
N332	Artesia Historical Museum	45	20	Yes	8	NOI-1, NOI-2	48	63	50	53	59	No
N337	Wan Yuen Temple	55	20	Yes	8	NOI-1, NOI-2	48	59	43	53	59	No

Source: TAHA 2023

Notes: ¹ Cluster sites are shown in Appendix G.

² Distance to the closest area of human use or closest building façade.

dBA = A-weighted decibel; ft = feet; Ldn = day-night noise level; mph = miles per hour

9 REFERENCES

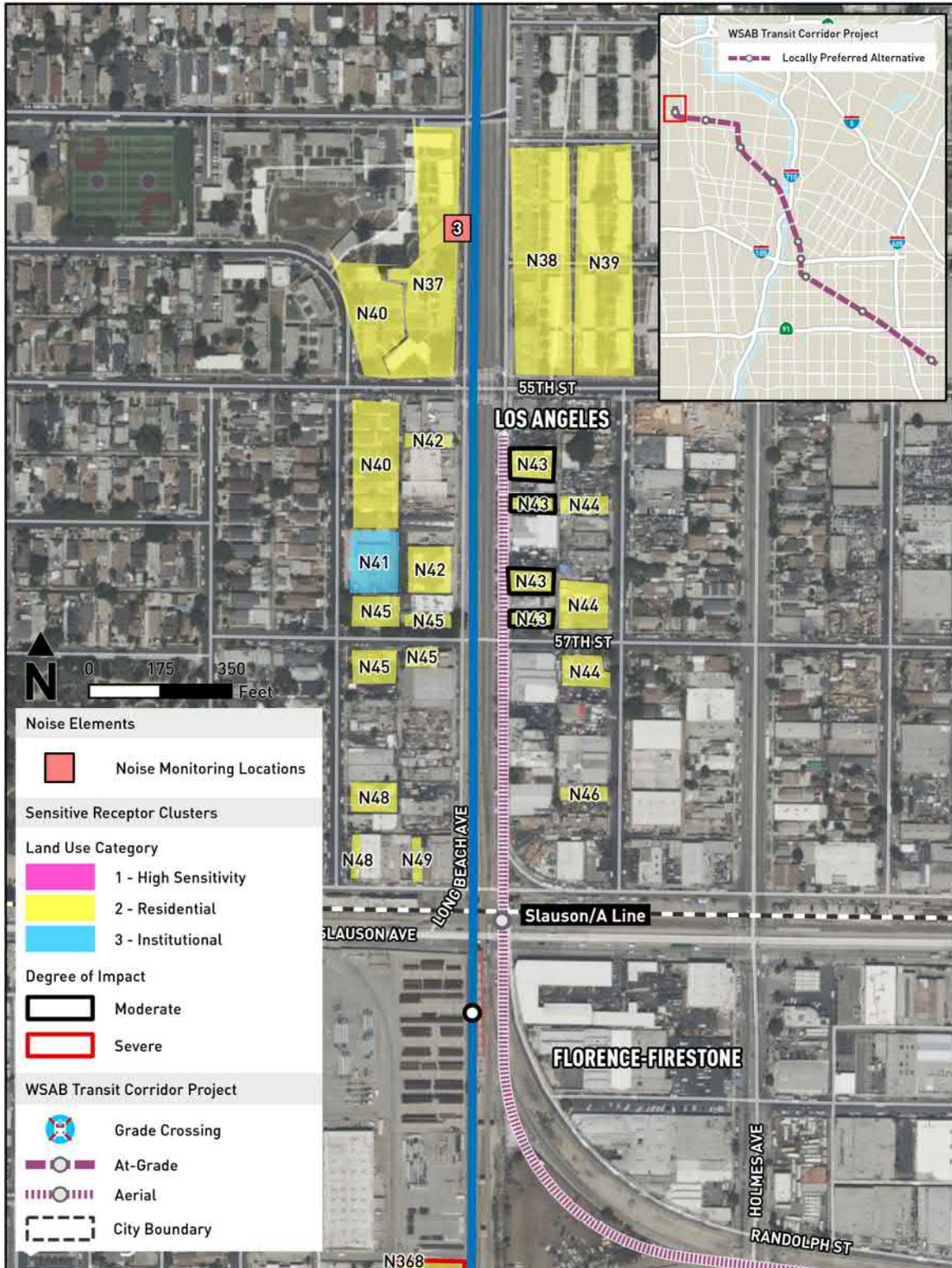
- Bureau of Mines. 1962. *Review of Criteria for Estimating Damage to Residences from Blasting Vibrations*.
- California Department of Transportation (Caltrans). 2013a. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September.
- California Department of Transportation (Caltrans). 2013b. *Transportation and Construction Vibration Guidance Manual*. September.
- City of Artesia. *General Plan 2030, Noise Sub-Element*.
- City of Artesia. 2017. *Municipal Code*. March.
- City of Bell. 1998. *Municipal Code*.
- City of Bell. 2018. *2030 General Plan Health and Safety Element*. May.
- City of Bellflower. 1994. *General Plan, Noise Element*. December.
- City of Bellflower. 2017. *Municipal Code*. February.
- City of Cerritos. 2004. *General Plan, Noise Element*.
- City of Cerritos. 2017. *Municipal Code*. May.
- City of Cudahy. 2018a. *2040 General Plan Noise Element*. March.
- City of Cudahy. 2018b. *Municipal Code*. December.
- City of Downey. 2005. *General Plan 2025, Chapter 6 Noise*. January.
- City of Downey. 2017. *Municipal Code*. February.
- City of Huntington Park. *Municipal Code*.
- City of Huntington Park. 1992. *General Plan Noise Element*. February.
- City of Los Angeles. 1998. *General Plan, Noise Element*. November.
- City of Los Angeles. 2017. *Municipal Code*. March.
- City of Paramount. 2002. *AltAir Renewable Fuels Conversion Project Final Subsequent Environmental Impact Report*. February.
- City of Paramount. 2007. *General Plan, Health and Safety Element*. August.
- City of Paramount. 2017. *Municipal Code*.
- City of South Gate. 2009. *General Plan 2035*. December.
- City of South Gate. 2017. *Municipal Code*. February.
- City of Vernon. *Municipal Code*.
- City of Vernon. 2015. *General Plan Noise Element*.
- County of Los Angeles. 2015. *General Plan 2035*. October.
- County of Los Angeles. 2017. *Code of Ordinances*. July.
- Federal Highway Administration (FHWA). 2008. *Roadway Construction Noise Model*.

- Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*.
- Gateway City Council of Governments, Los Angeles County Metropolitan Transportation Authority, *Feasibility Study for I-710 Sound Wall Early Action Project*, December 2012.
- Los Angeles County Metropolitan Transportation Authority (Metro). *Metro Rail Design Criteria*. Section 2.8, Noise and Vibration.
- Los Angeles County Metropolitan Transportation Authority (Metro). *Construction Noise and Vibration Control*. Contract Specification Section 01 56 19.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2009. *Exposition Corridor Transit Project Phase 2, Final Environmental Impact Report, Noise and Vibration Technical Background Report*, December 2009.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2017. *Rail System Book of Operating Rules and Procedures, Section 7*, September 2017.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2018. *West Santa Ana Branch Transit Corridor Project Final Northern Alignment Alternatives and Concepts Updated Screening Report*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2020. *West Santa Ana Branch Transit Corridor Project Final Cultural Resource Survey Report – Rev 1*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2023a. *West Santa Ana Branch Transit Corridor Project Final Cultural Resources Survey Report – Rev 2*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2023b. *Strategies for Reducing Transit Noise and Vibration Fact Sheet*.
- Los Angeles County Metropolitan Transportation Authority (Metro). 2024. *West Santa Ana Branch Transit Corridor Project Construction Methods Report*.

APPENDIX A UNMITIGATED LRT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS

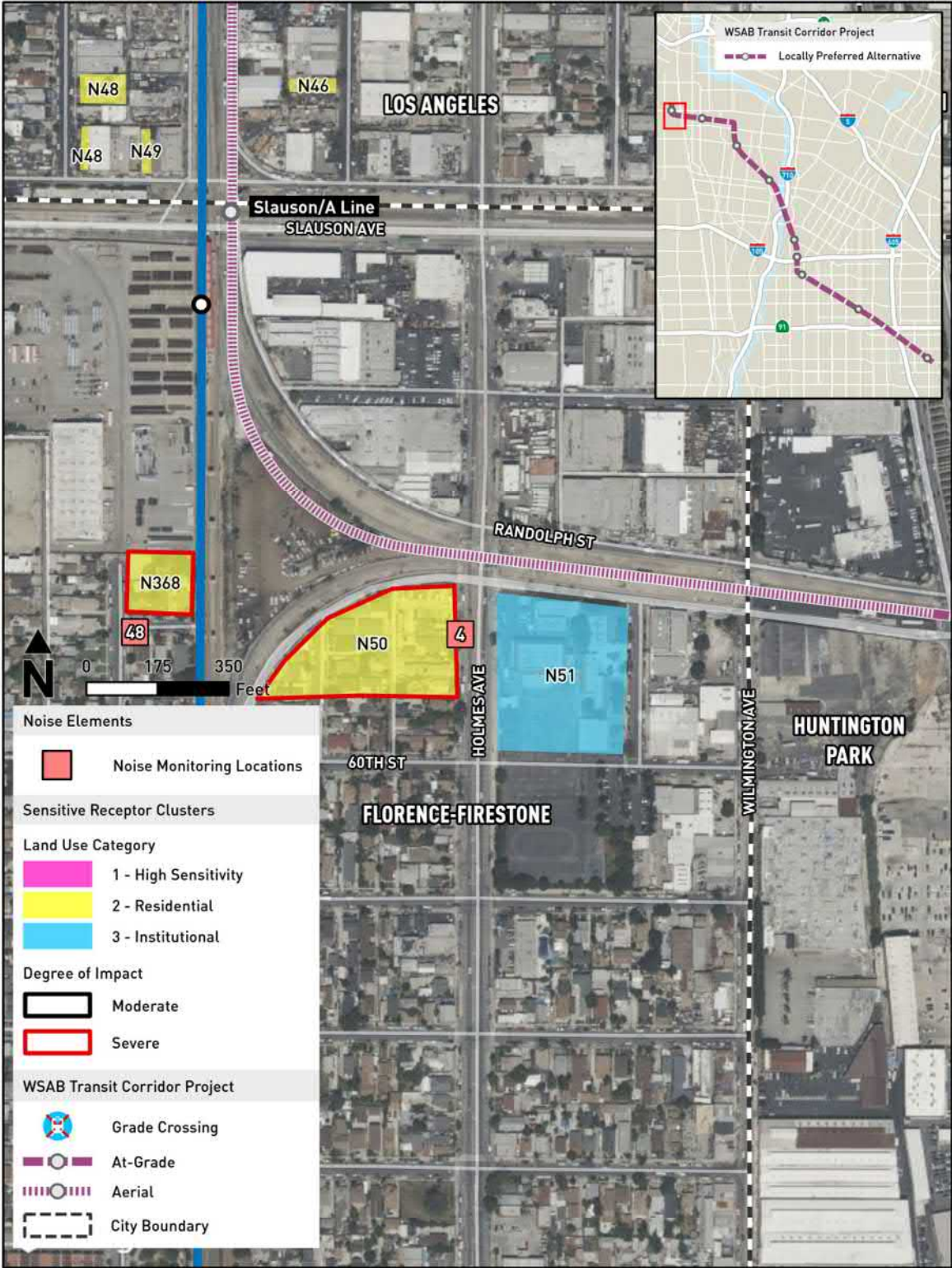
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



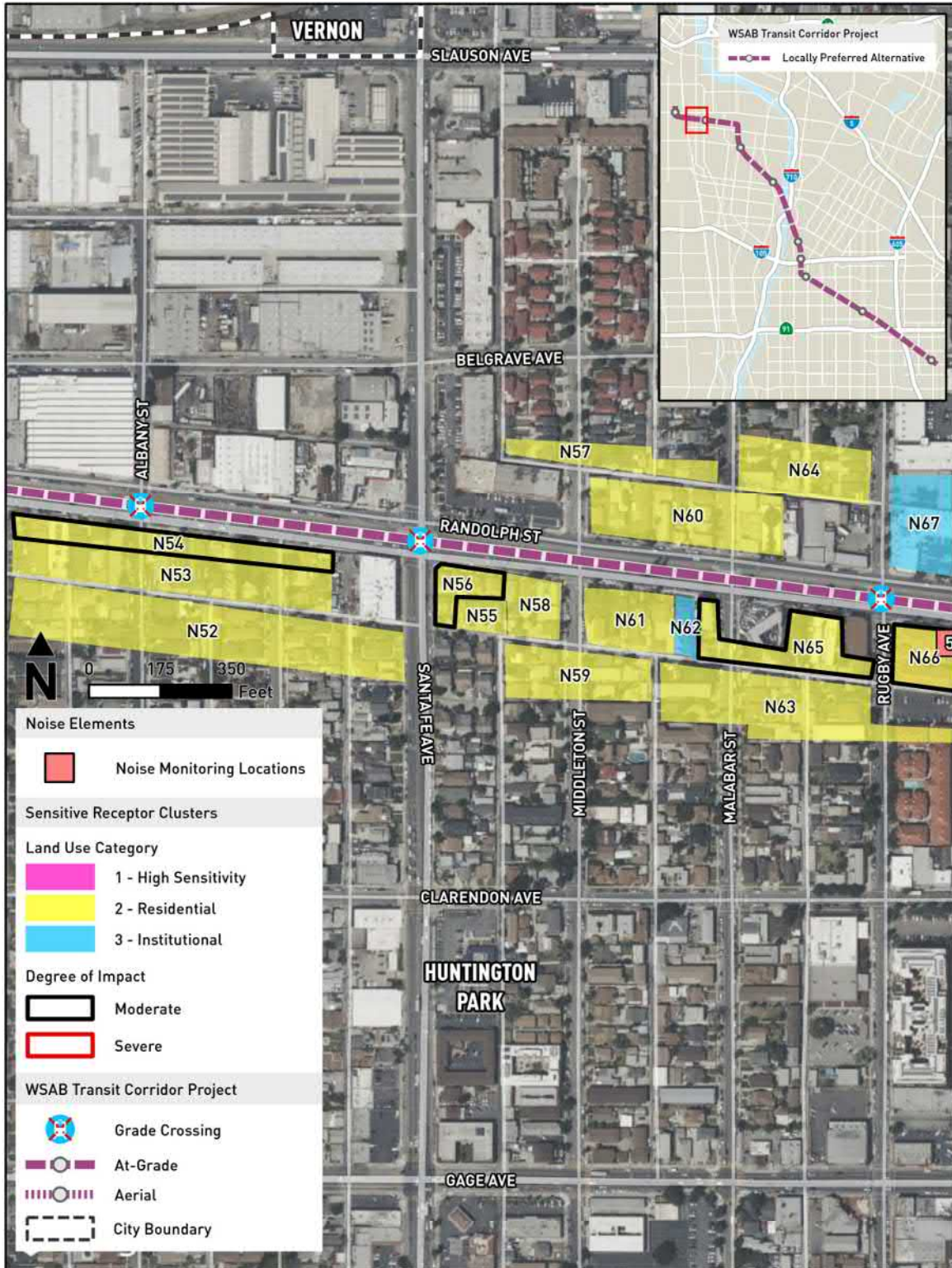
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



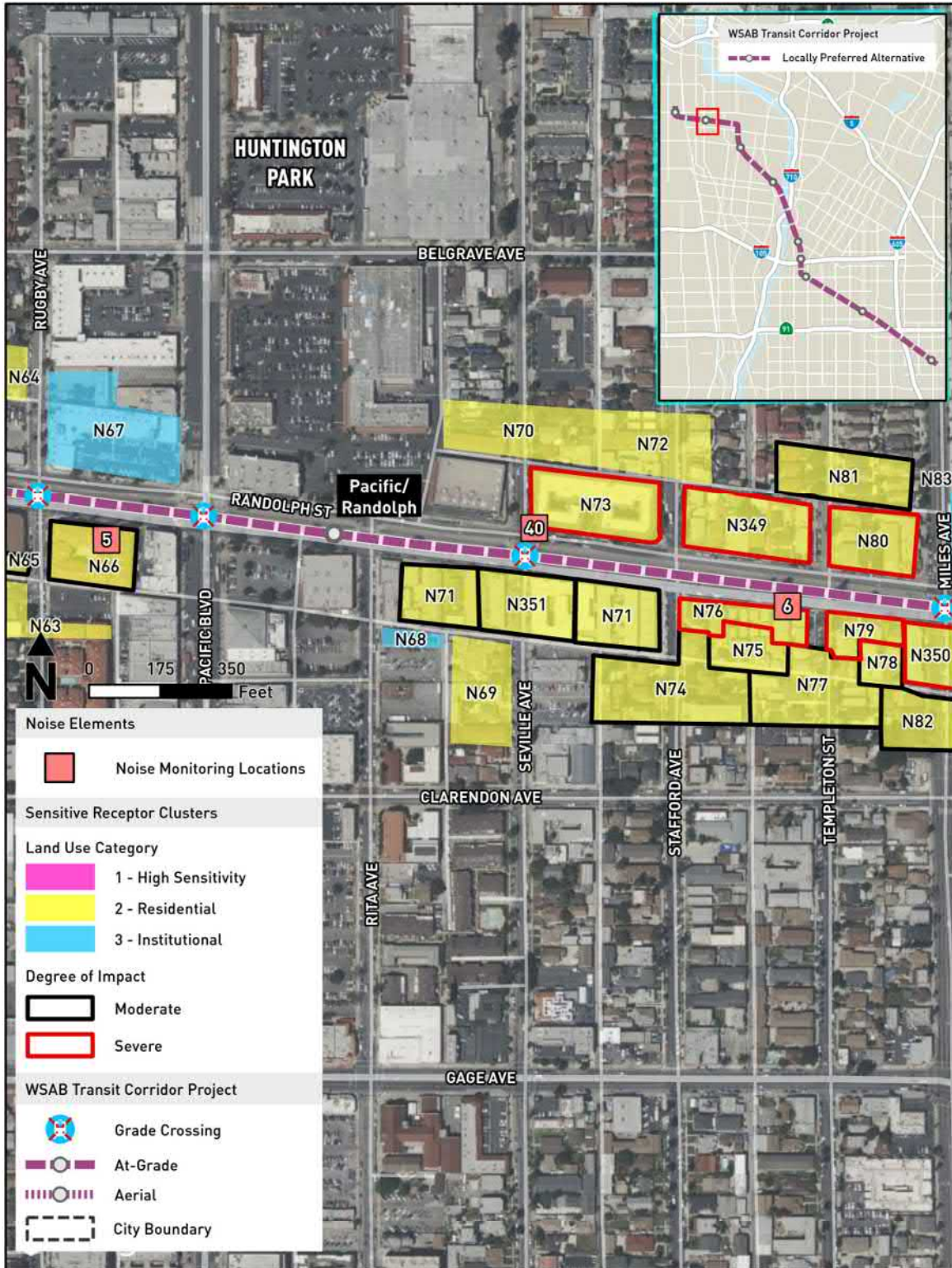
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



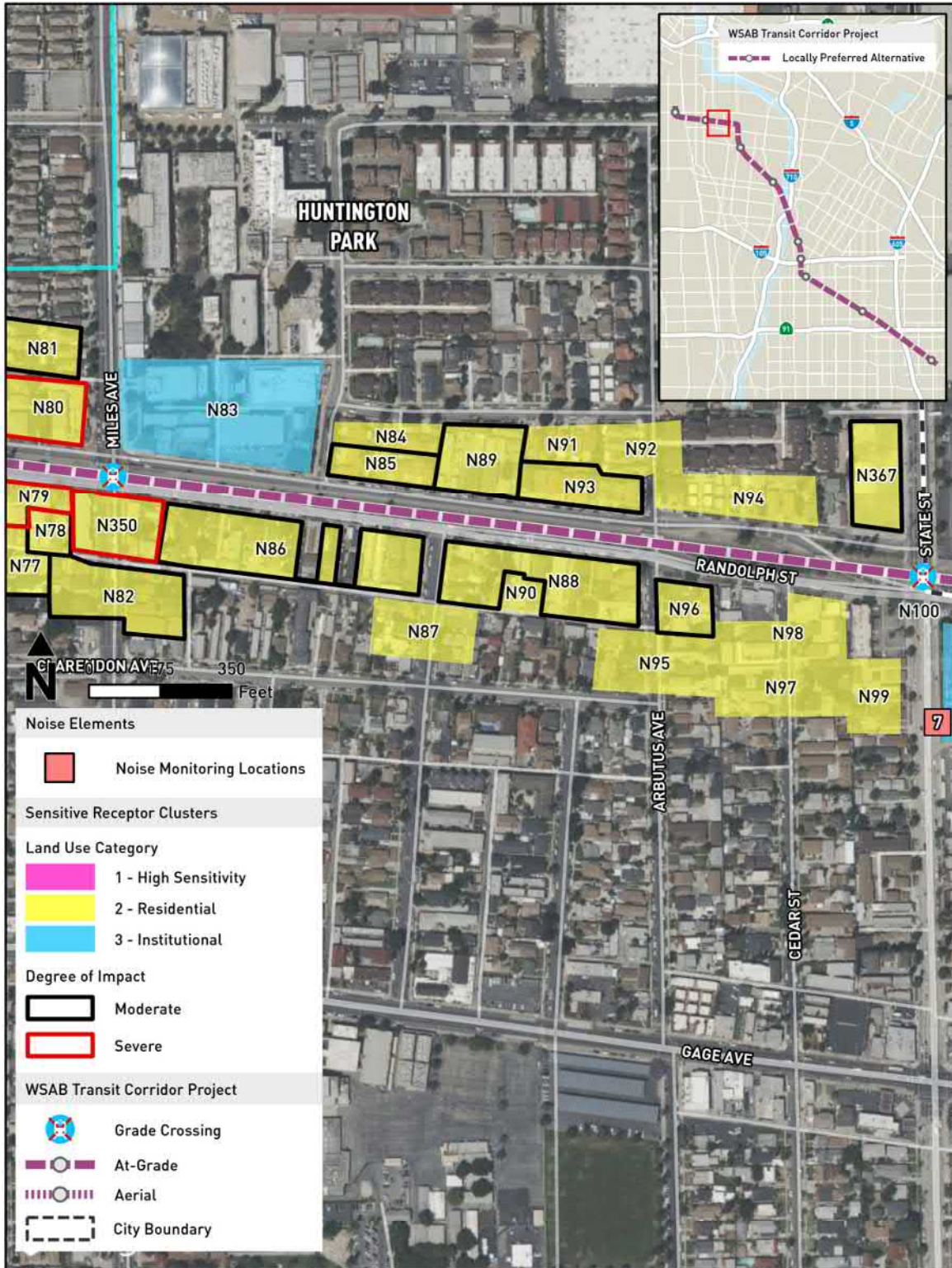
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



Appendix A

Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



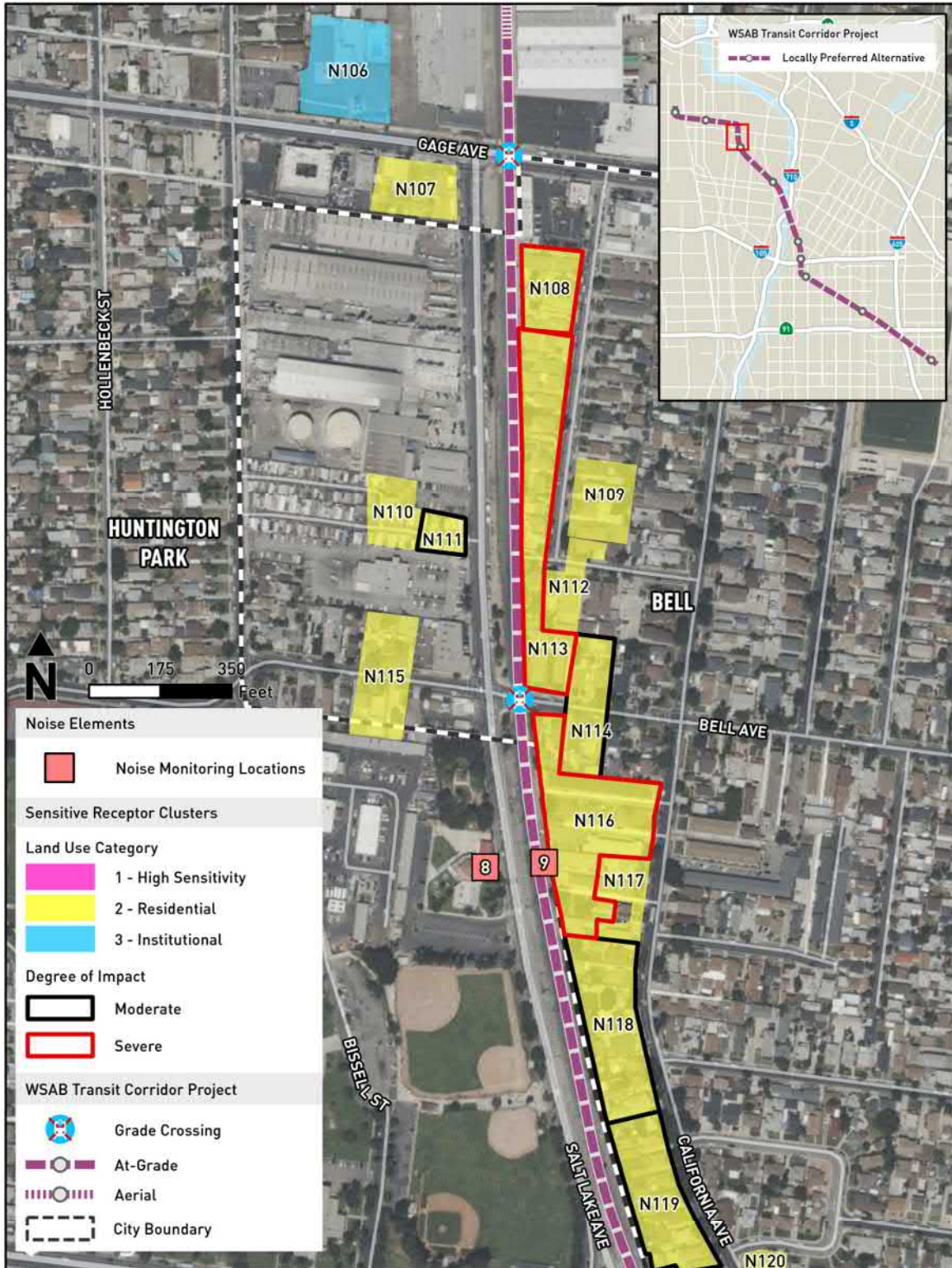
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



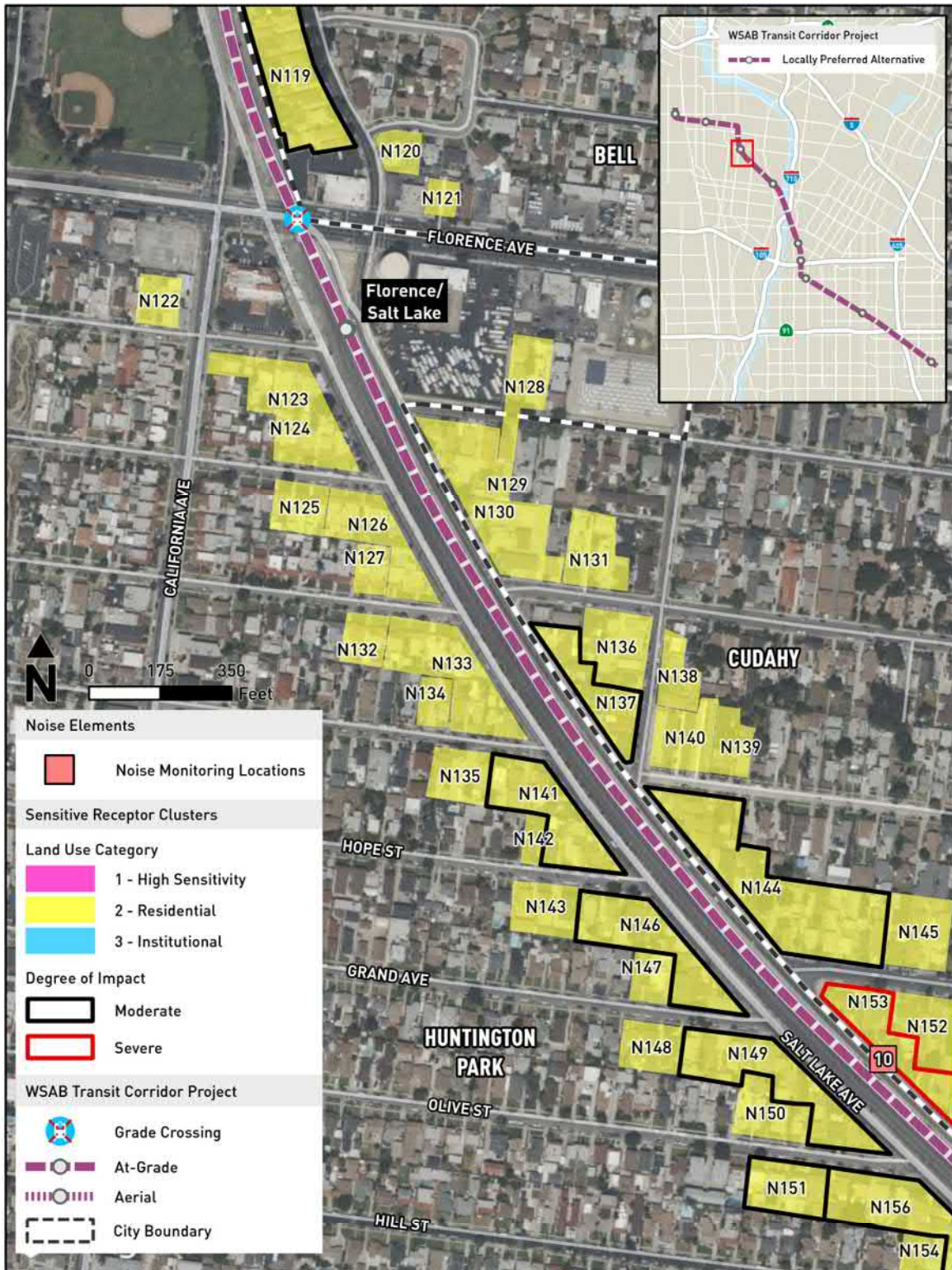
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



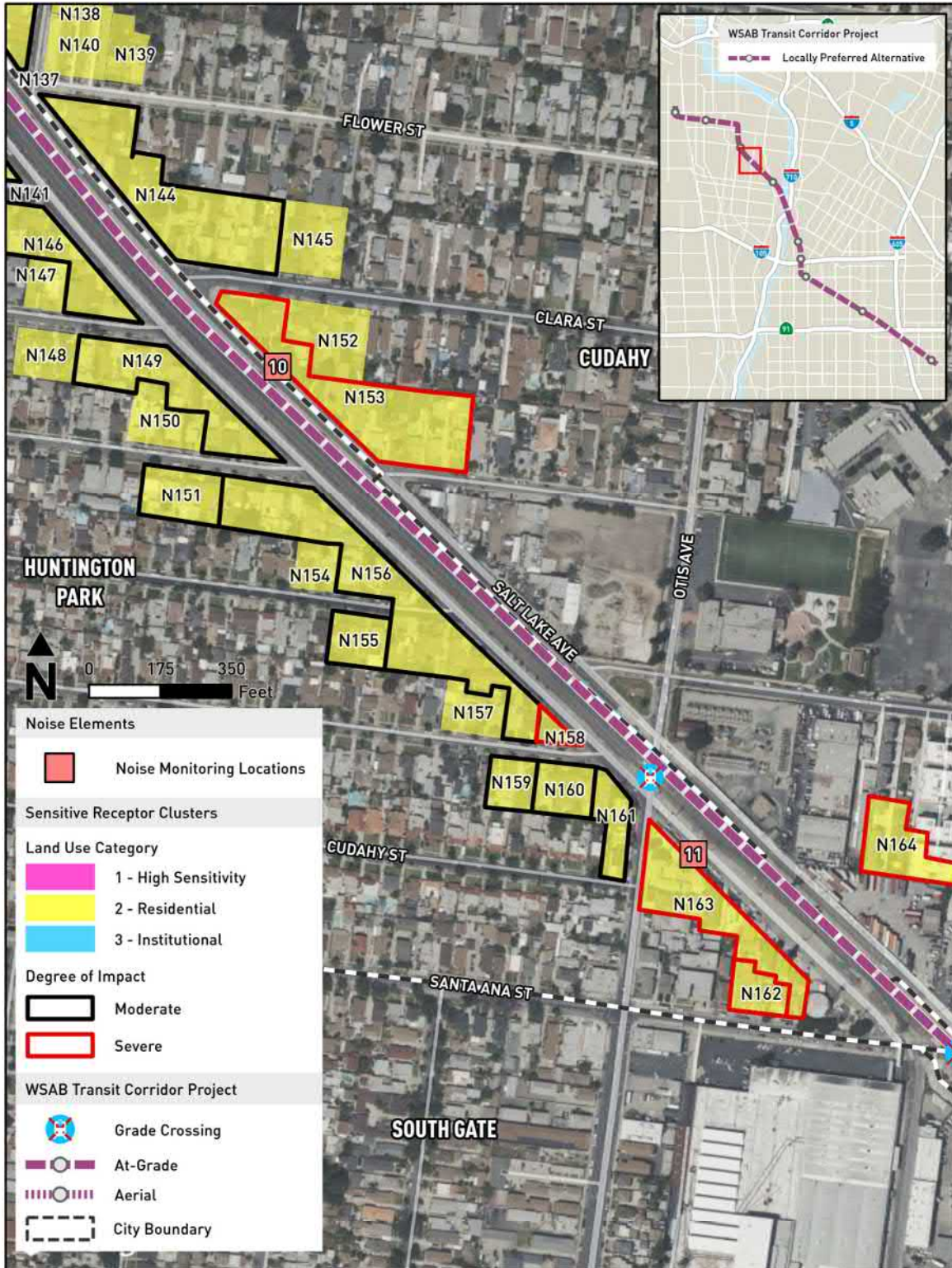
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



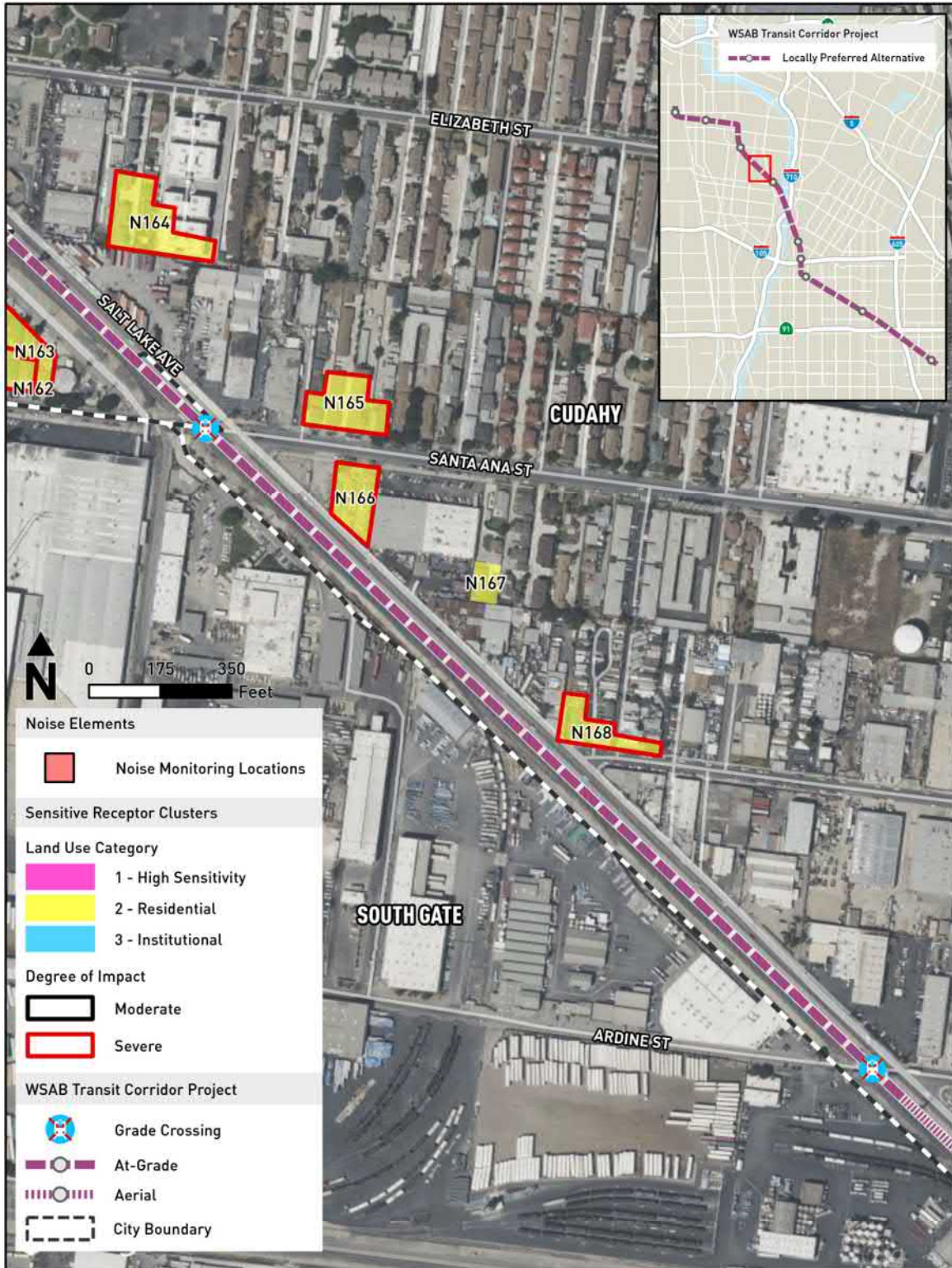
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



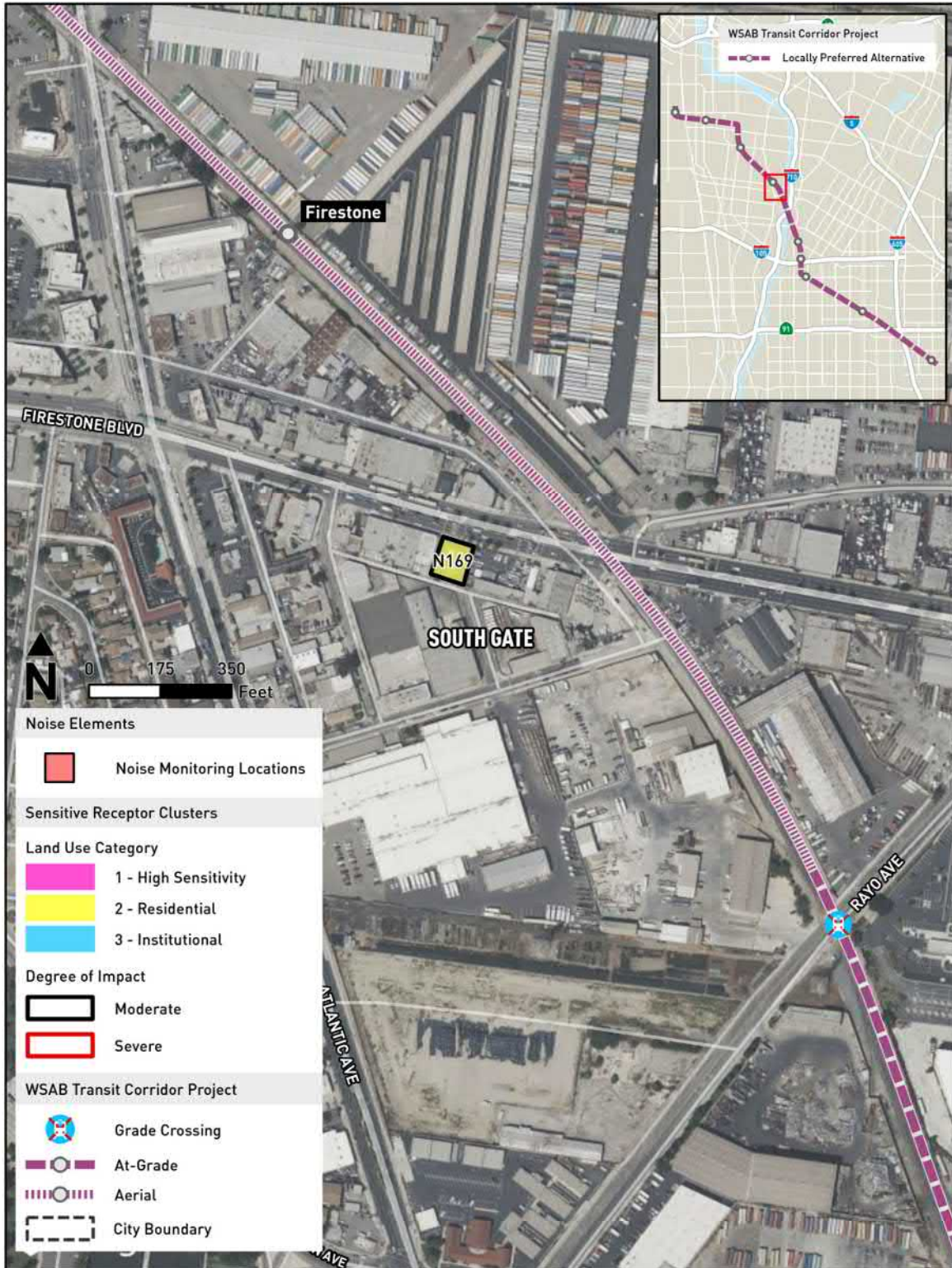
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



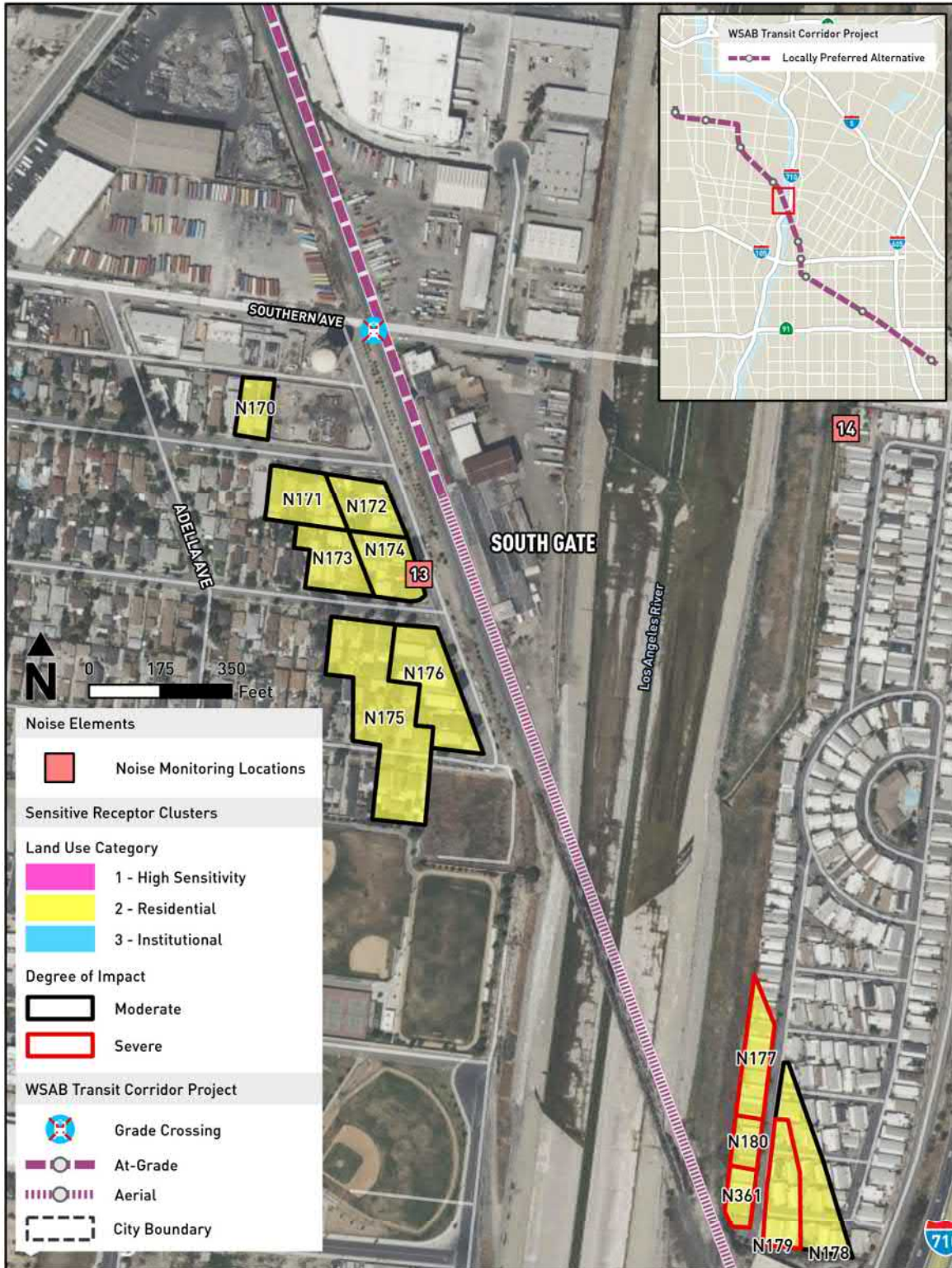
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



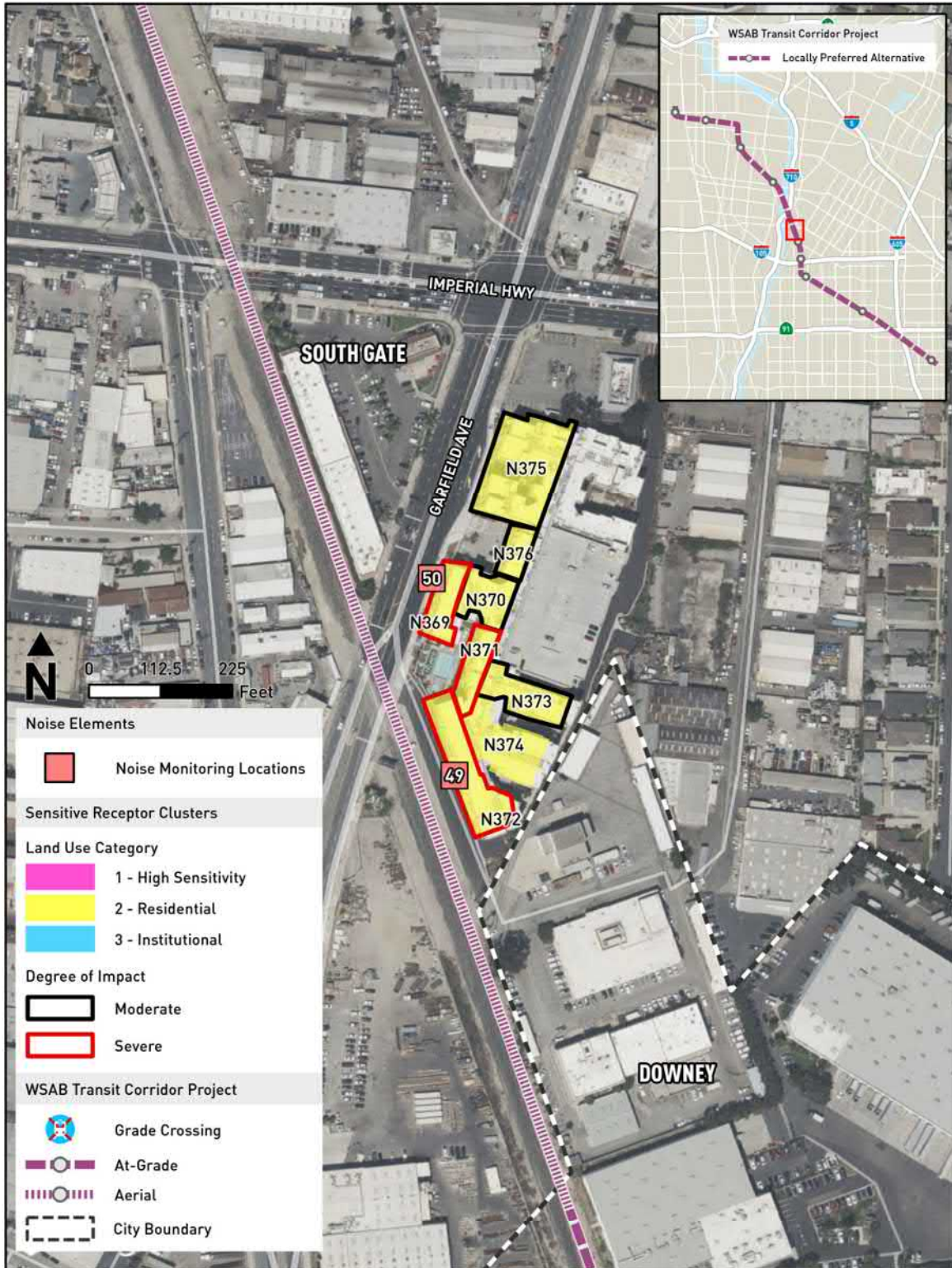
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



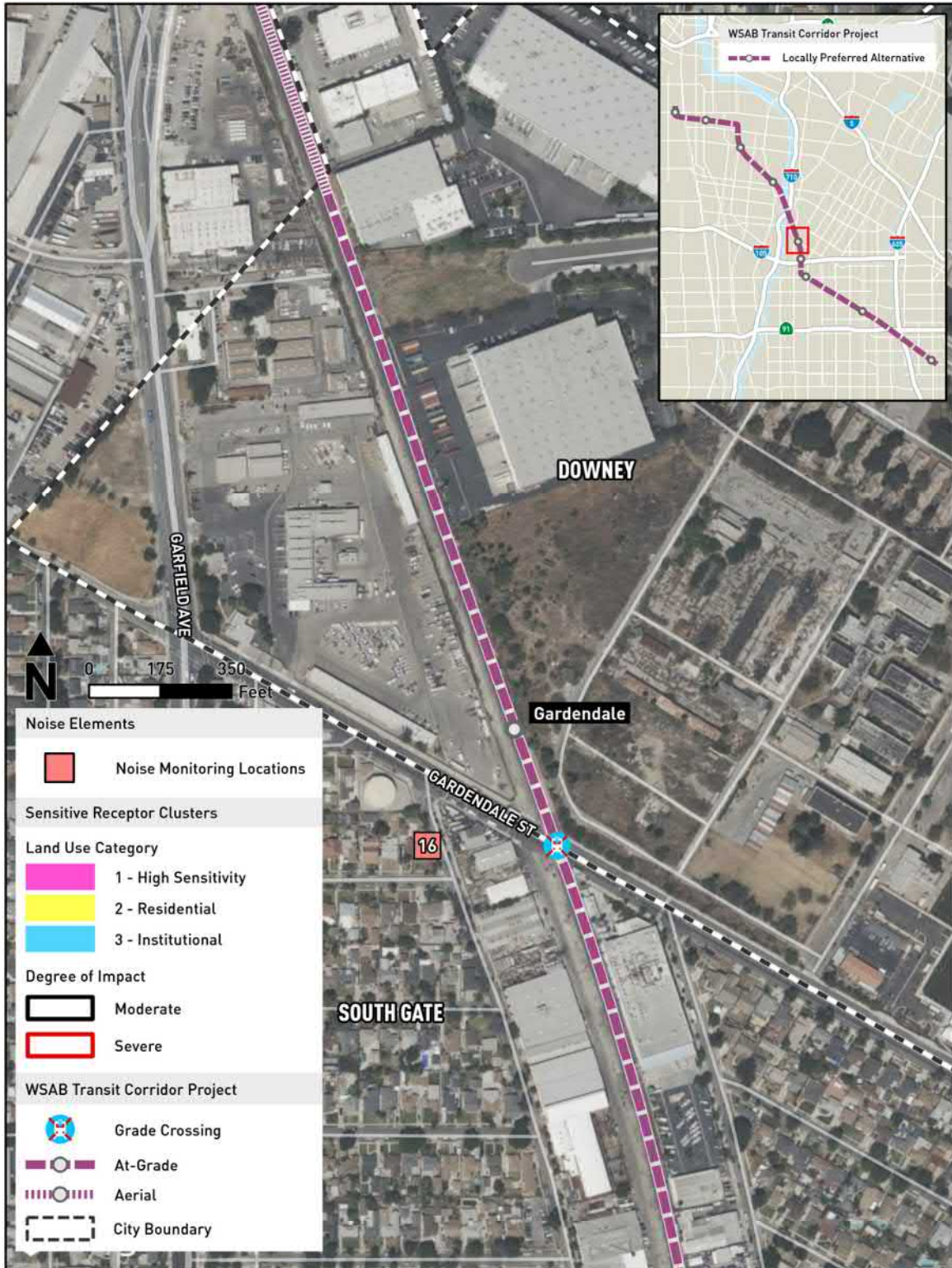
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



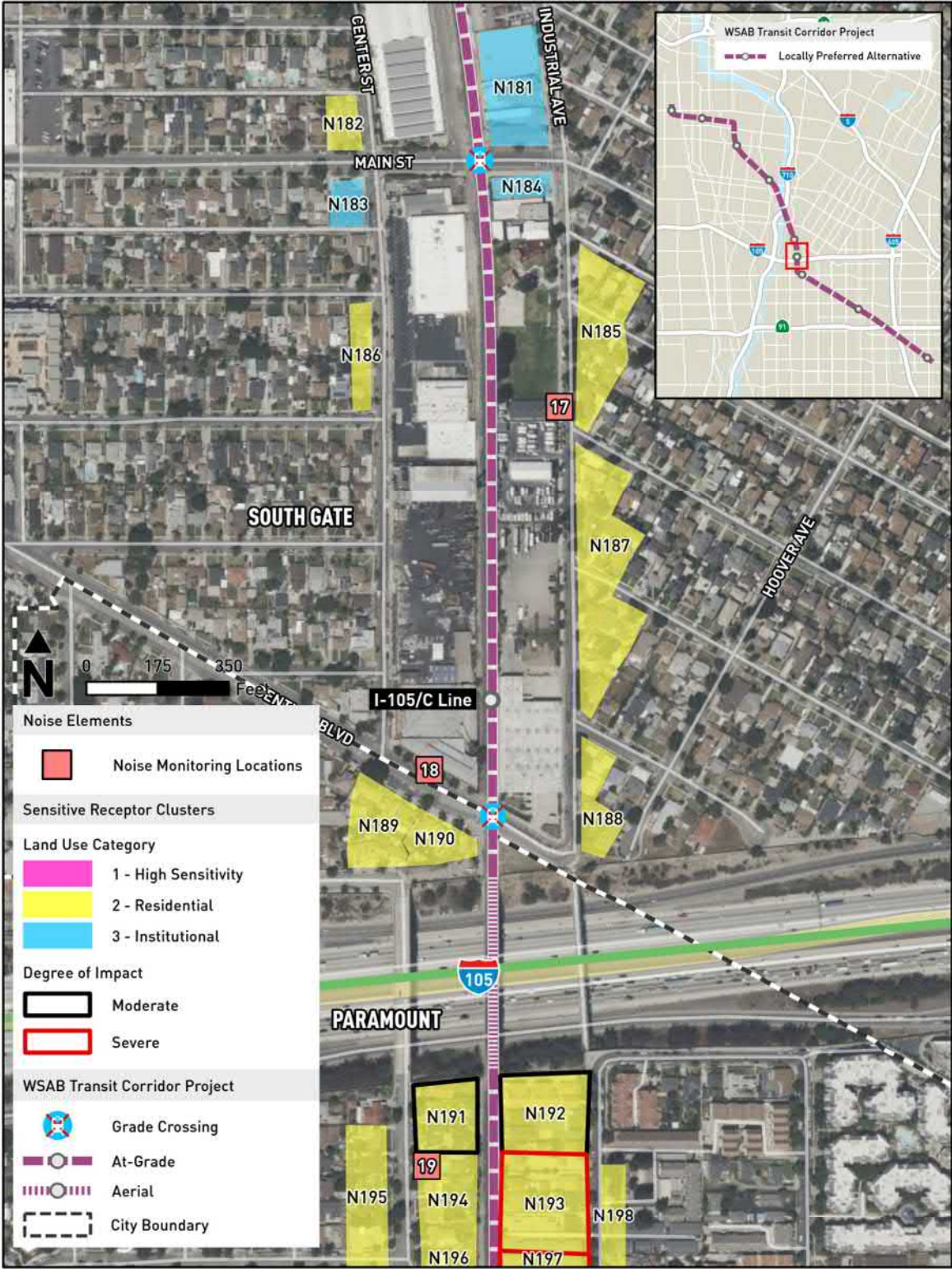
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



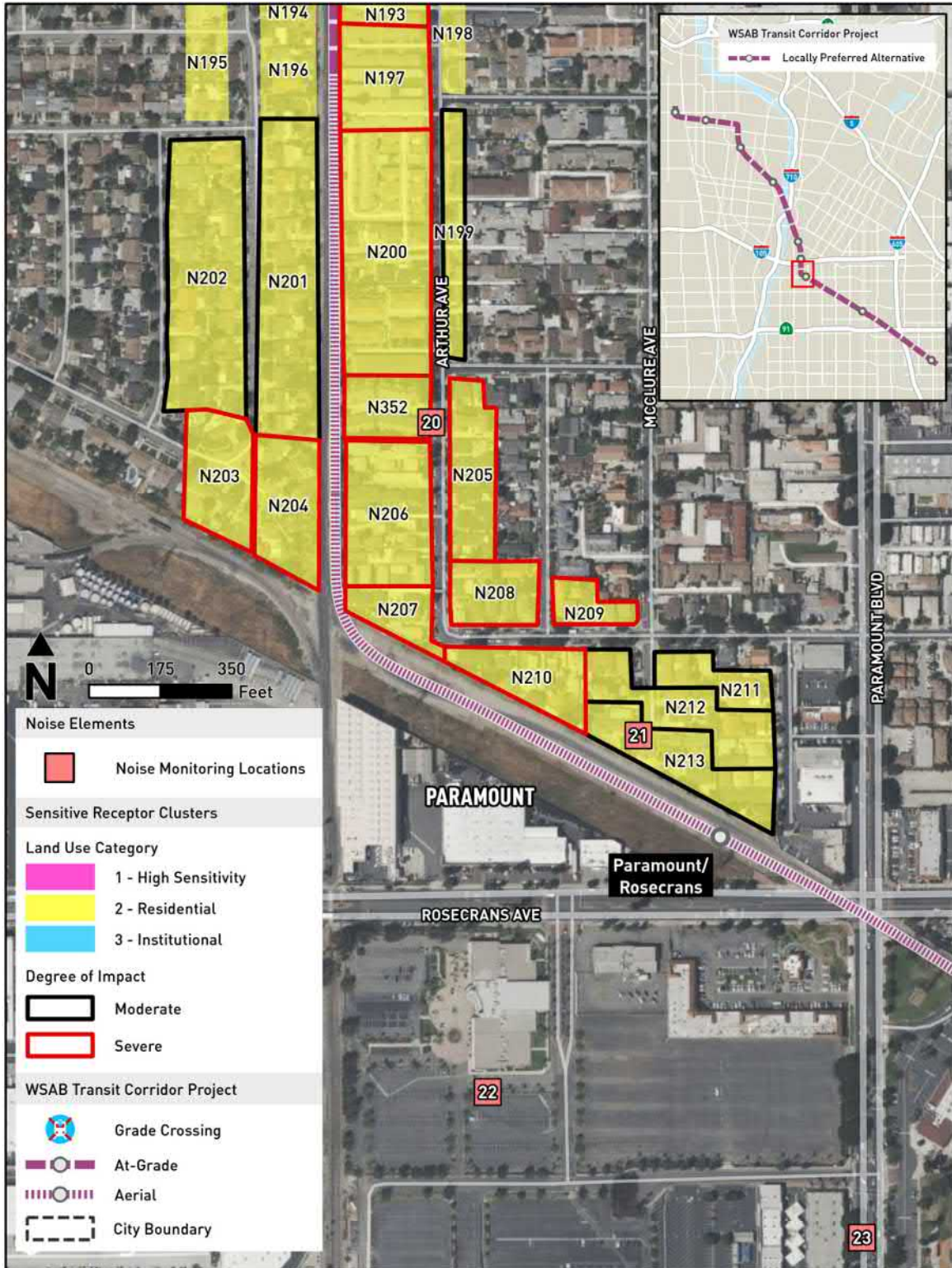
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



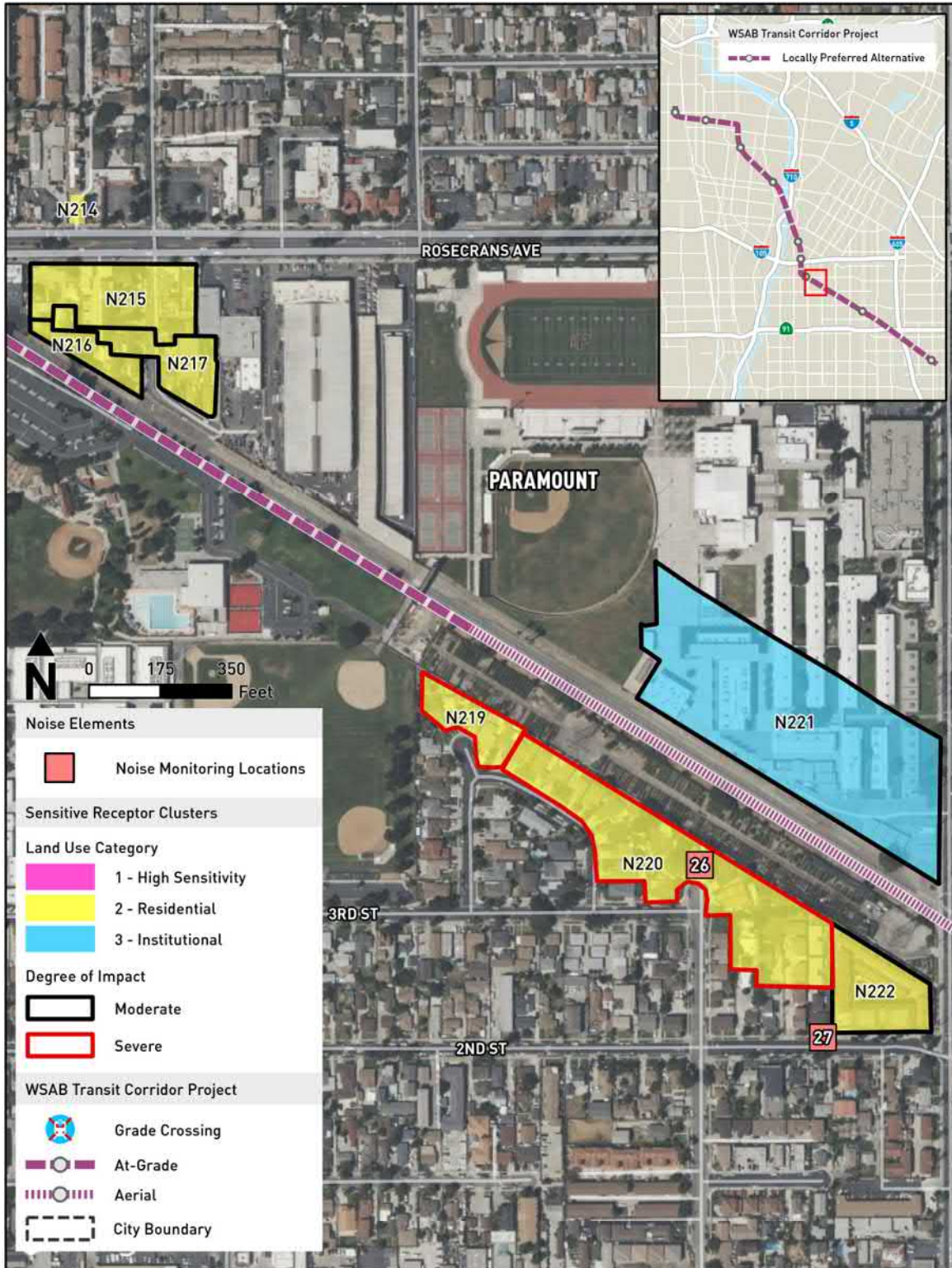
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



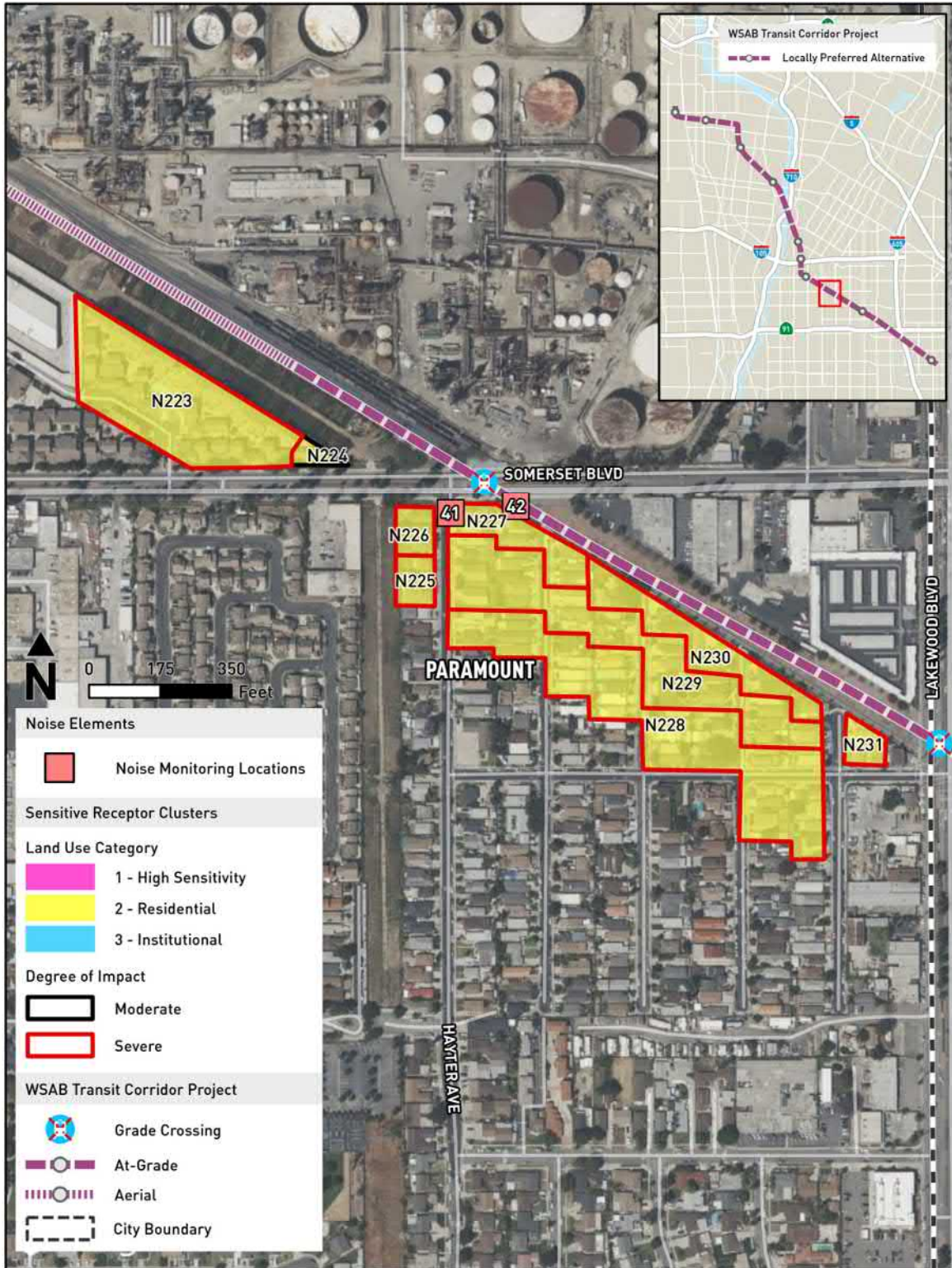
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



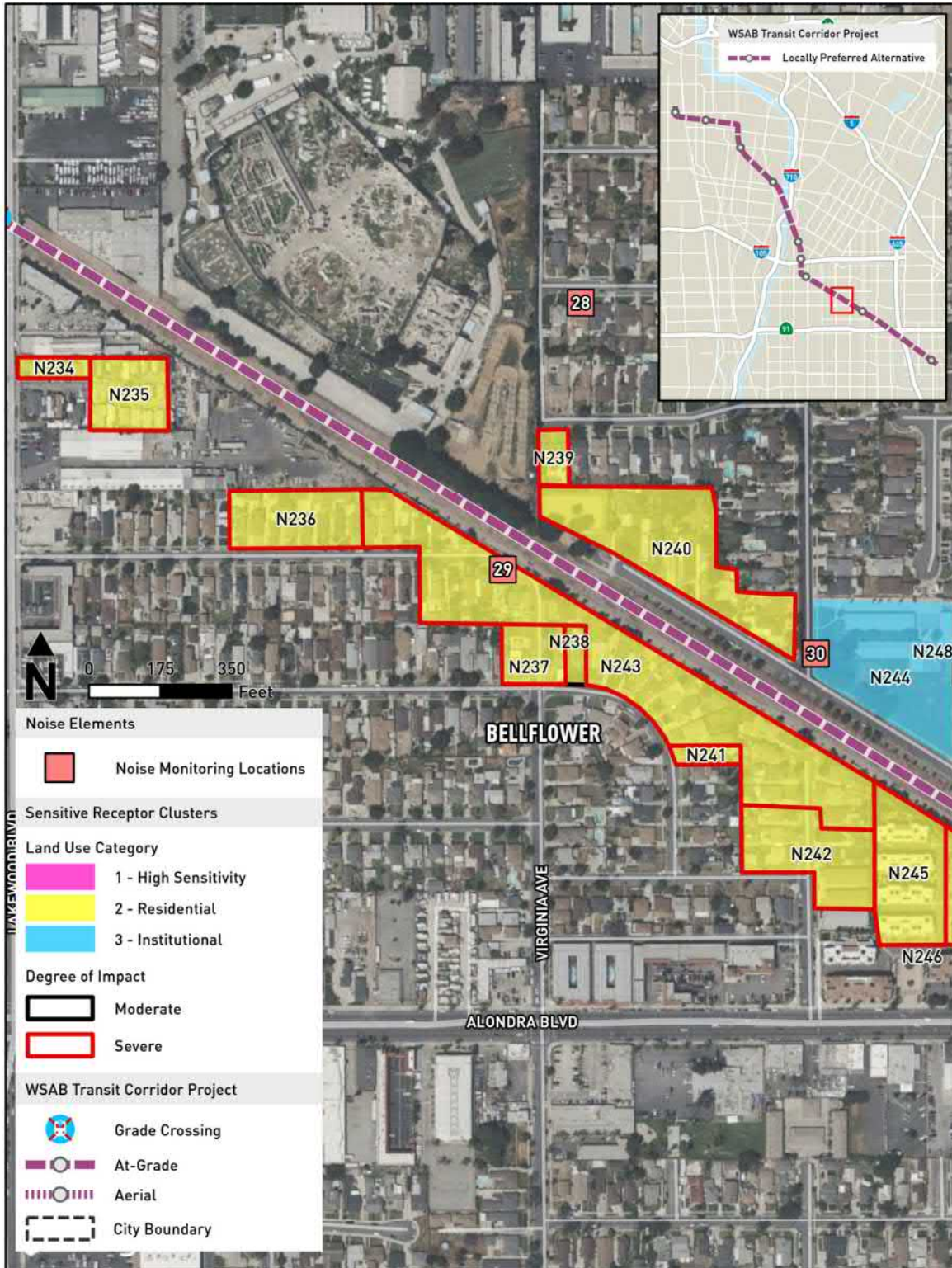
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



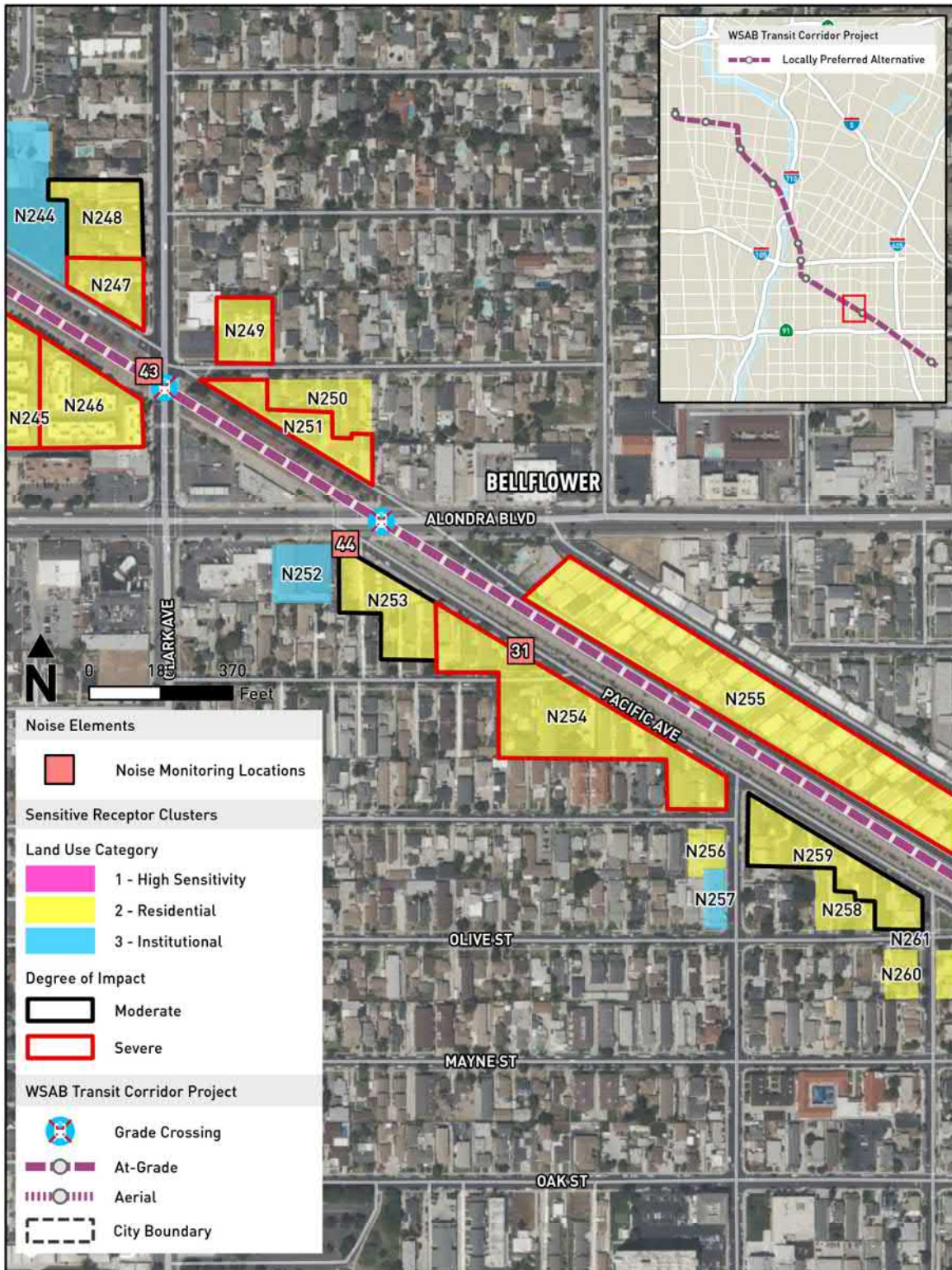
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



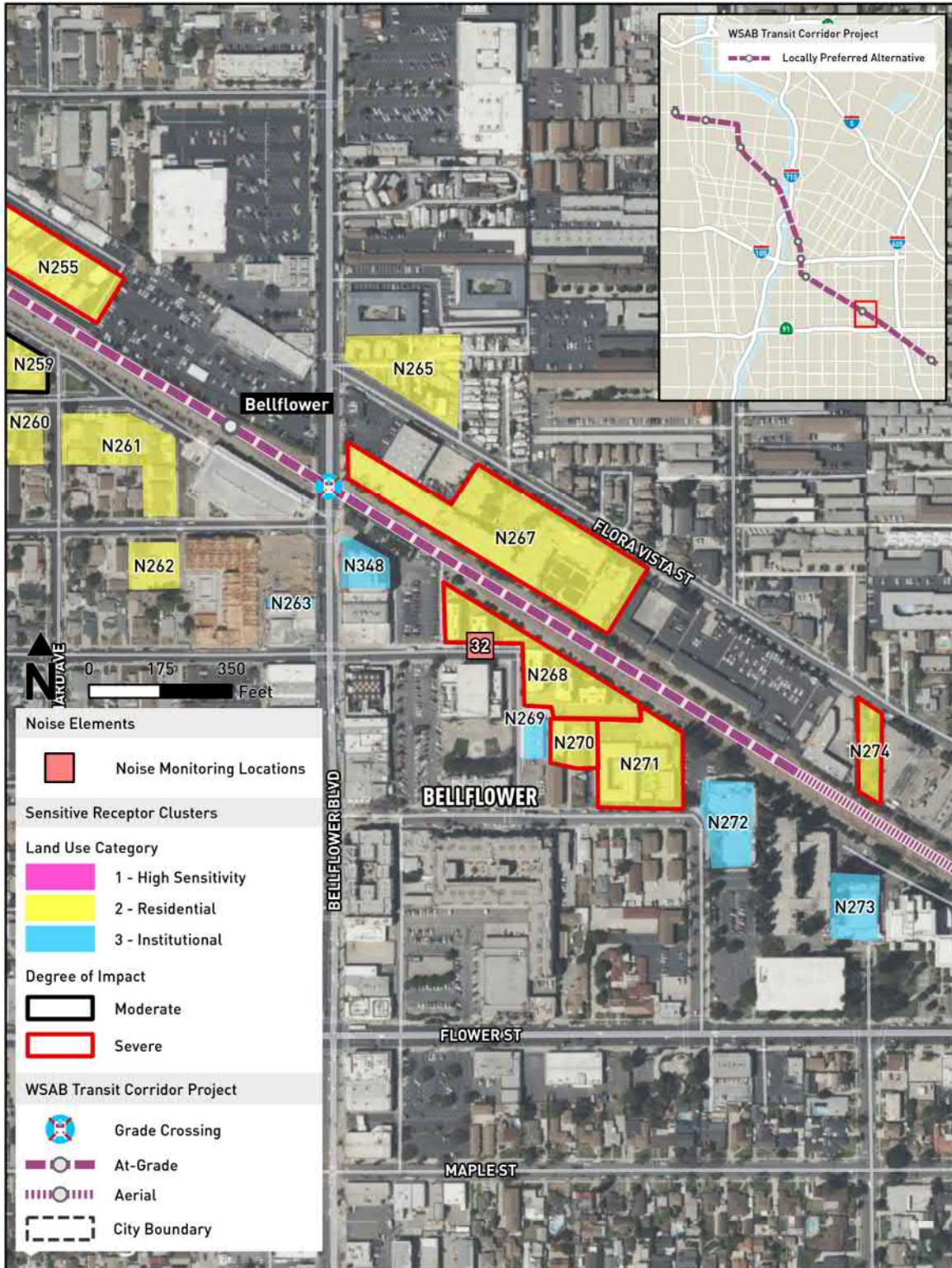
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



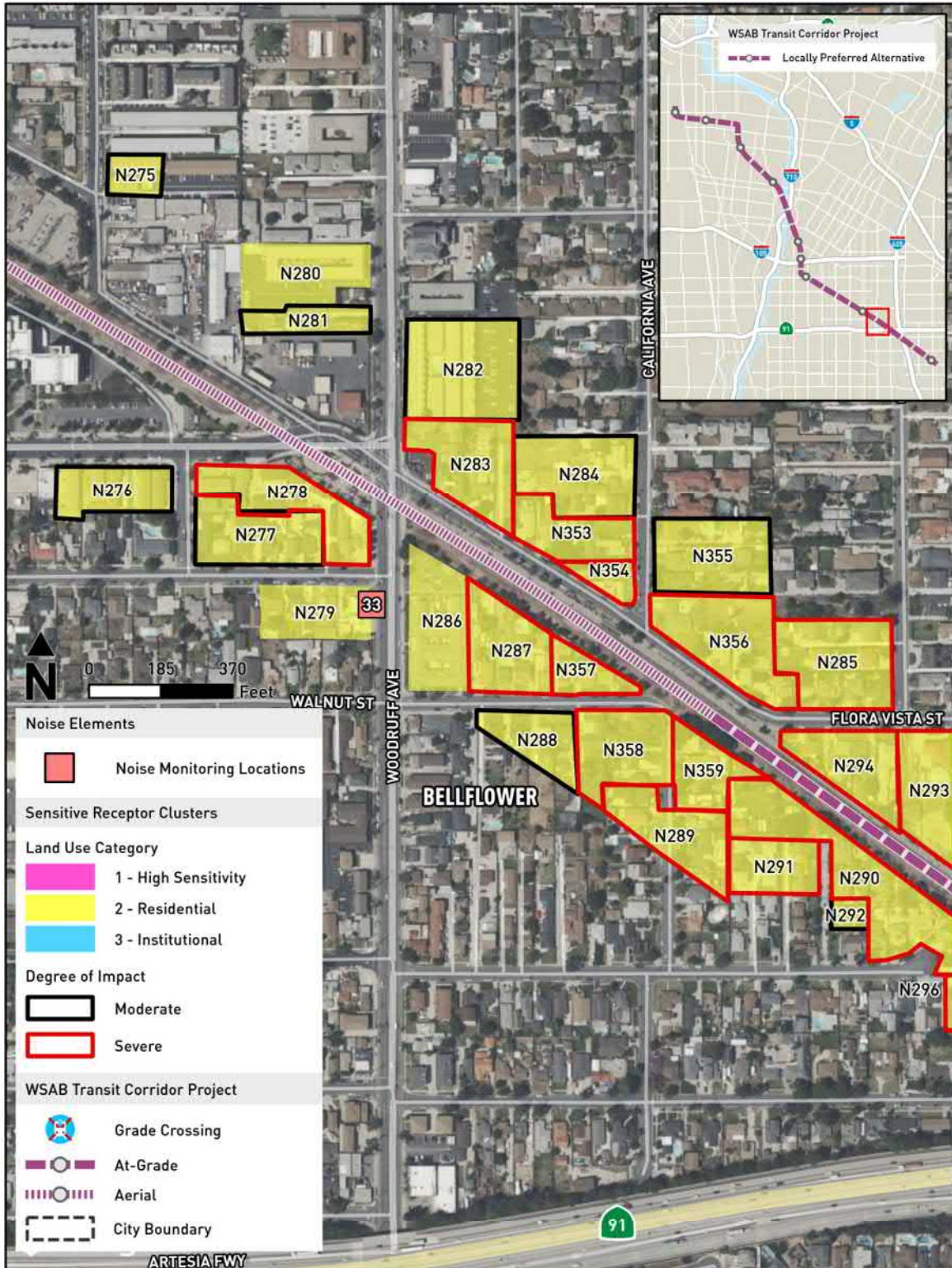
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



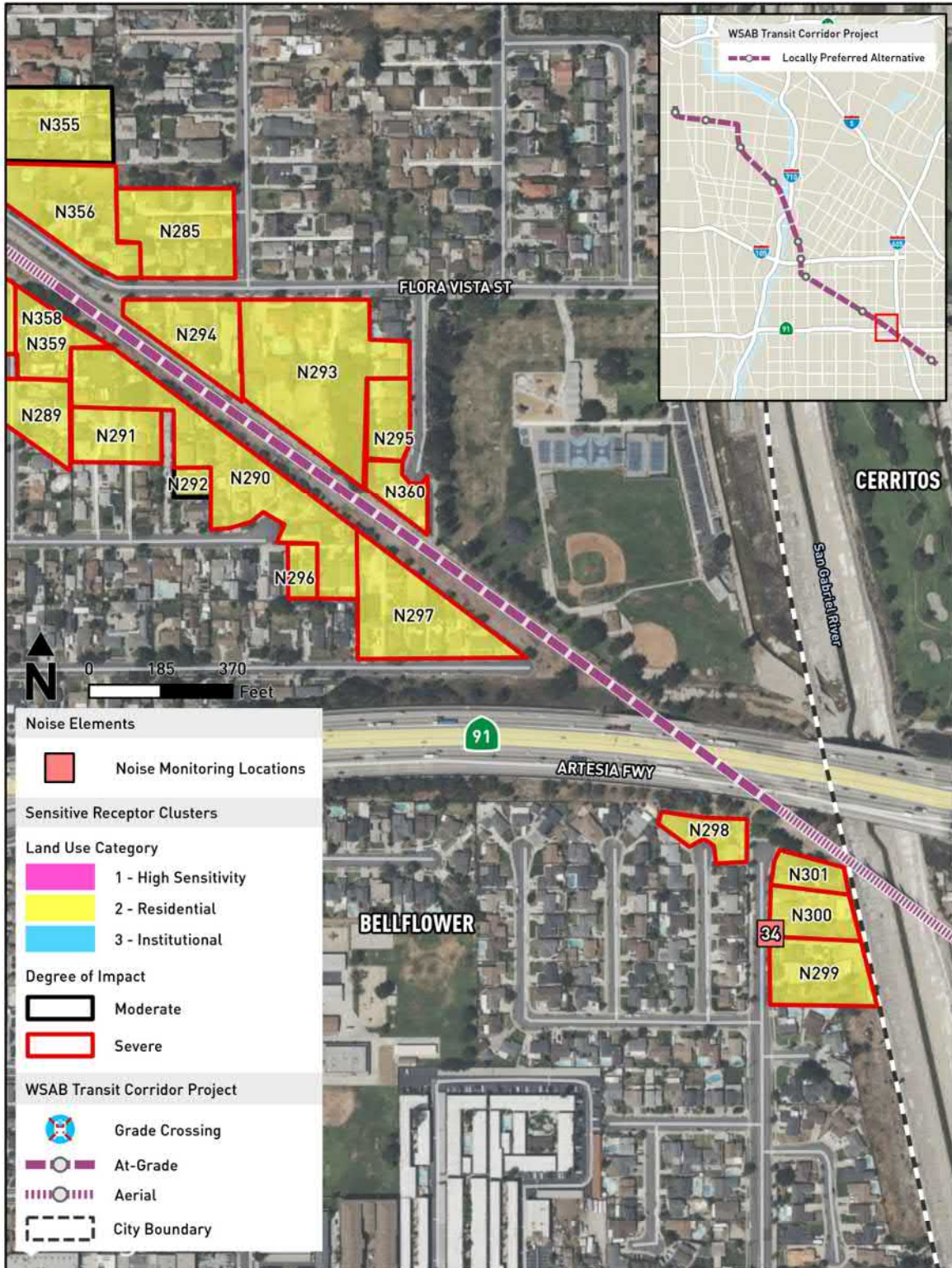
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



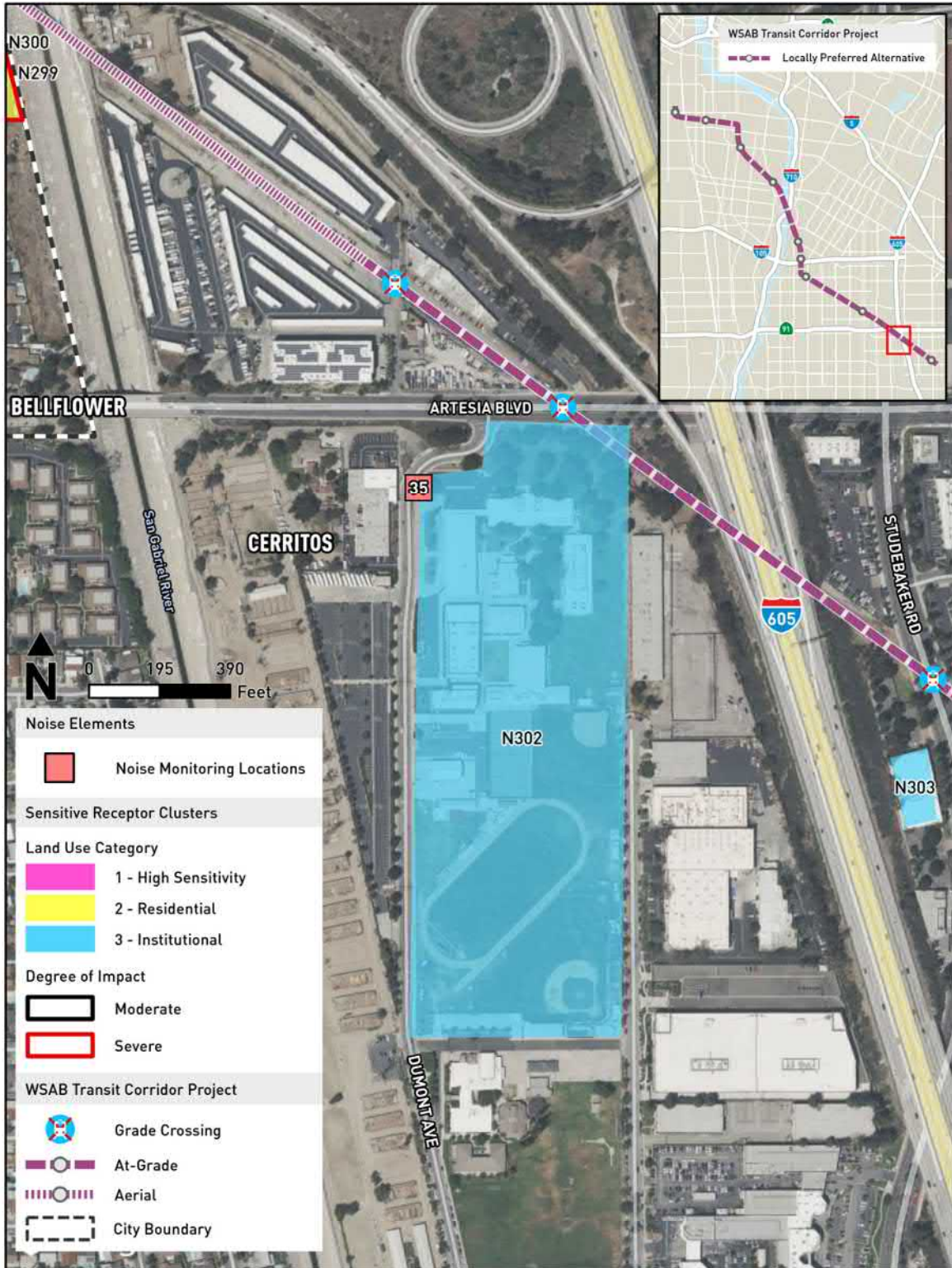
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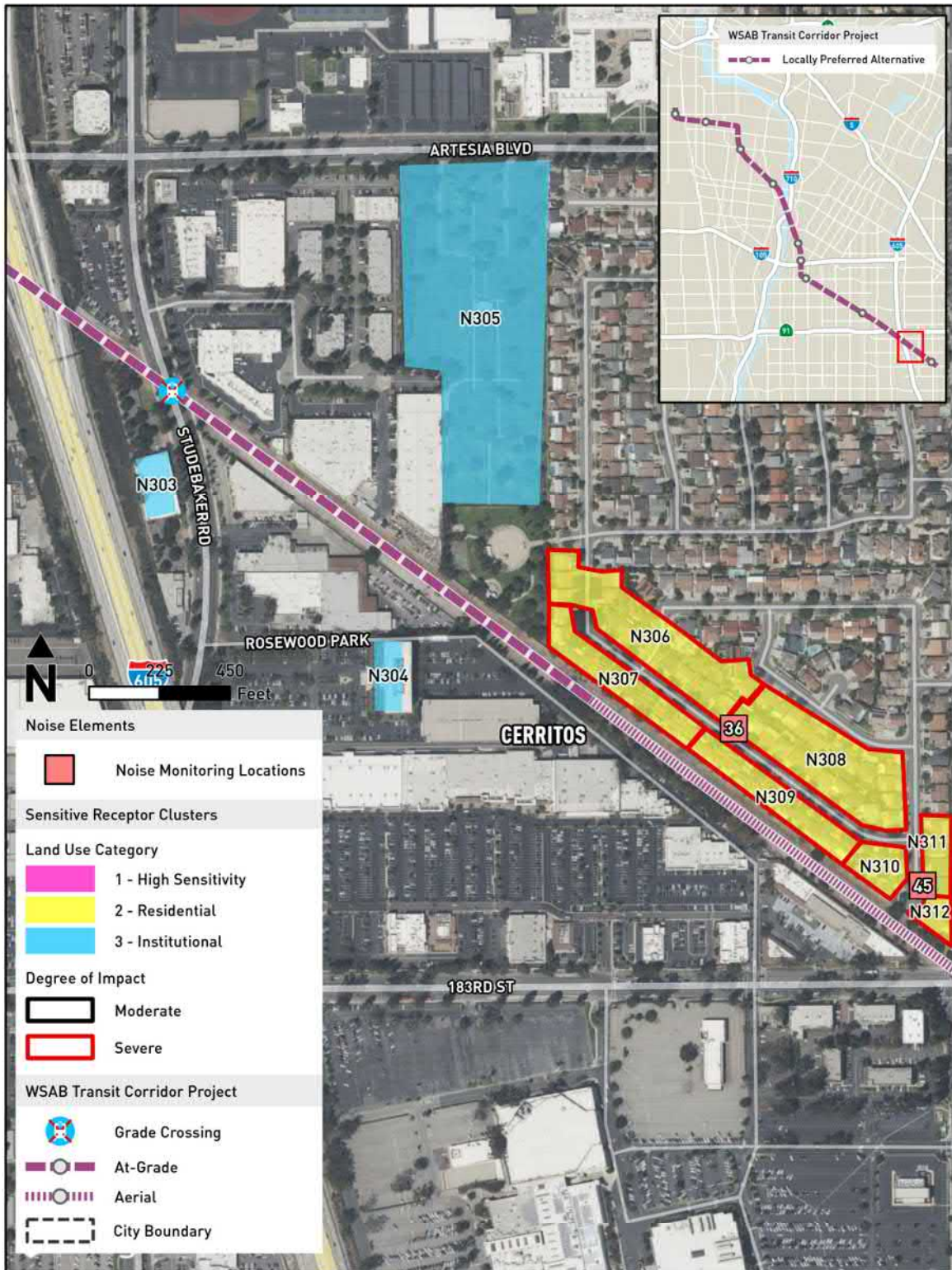
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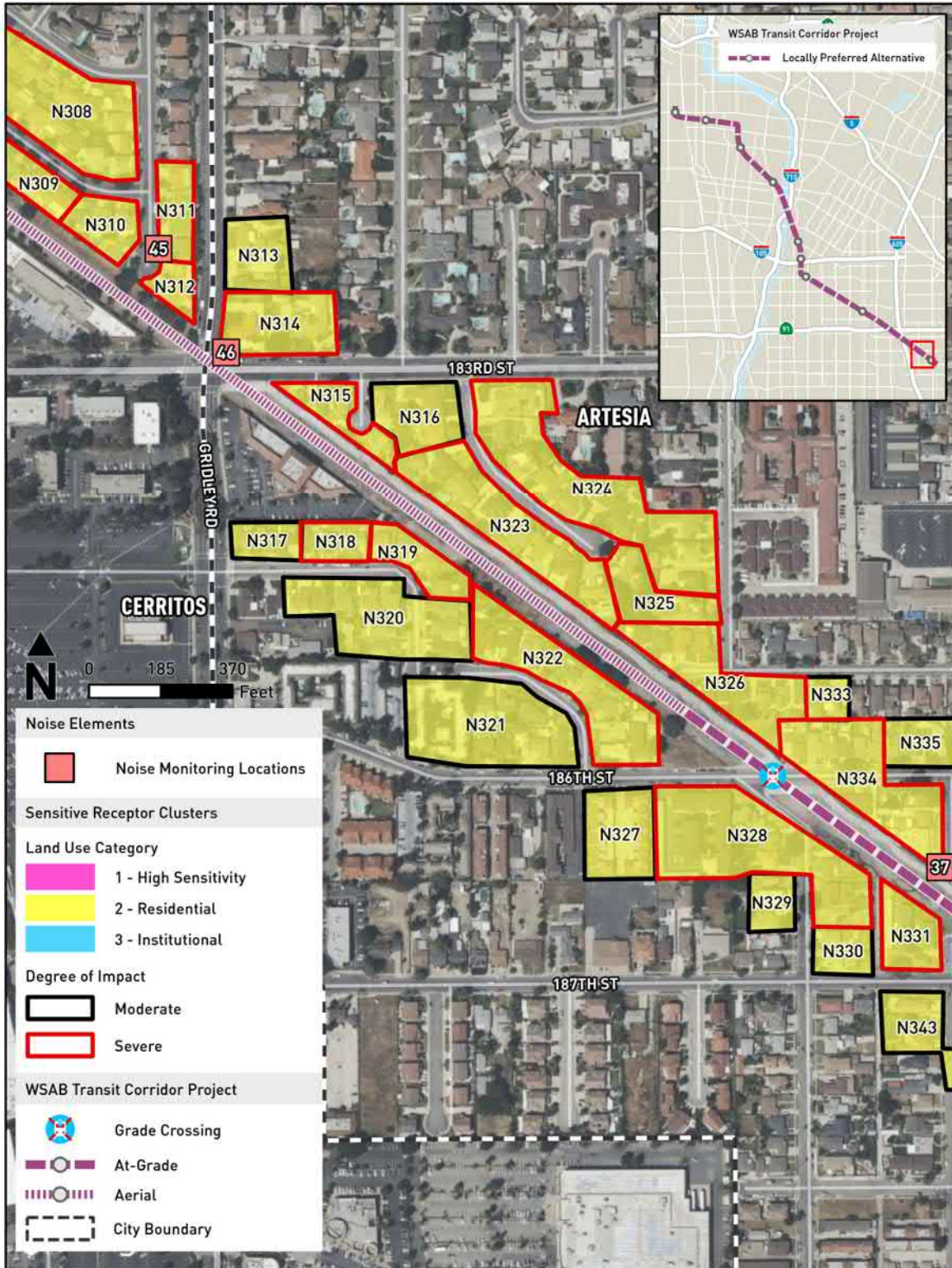
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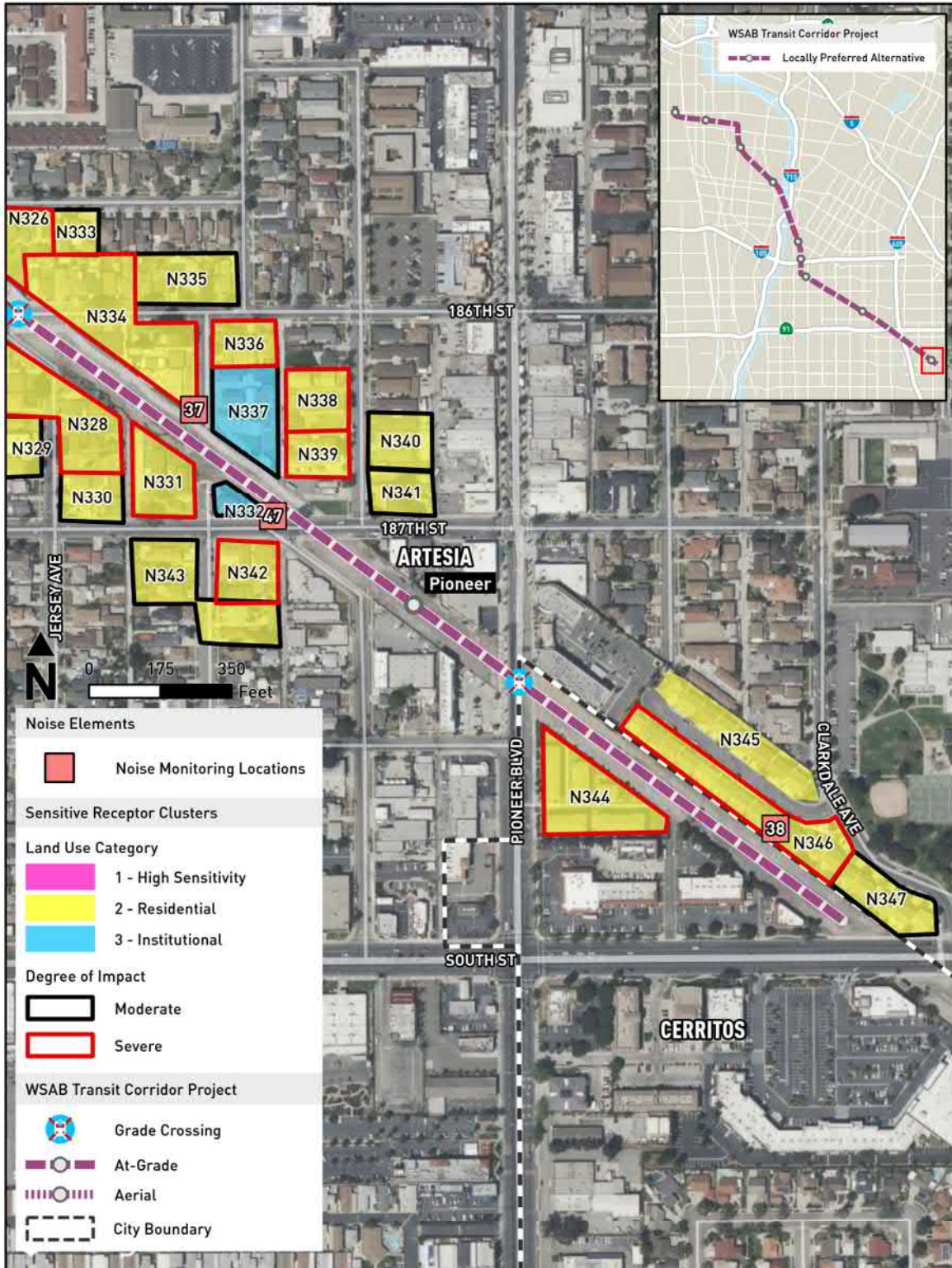
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Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



Appendix A

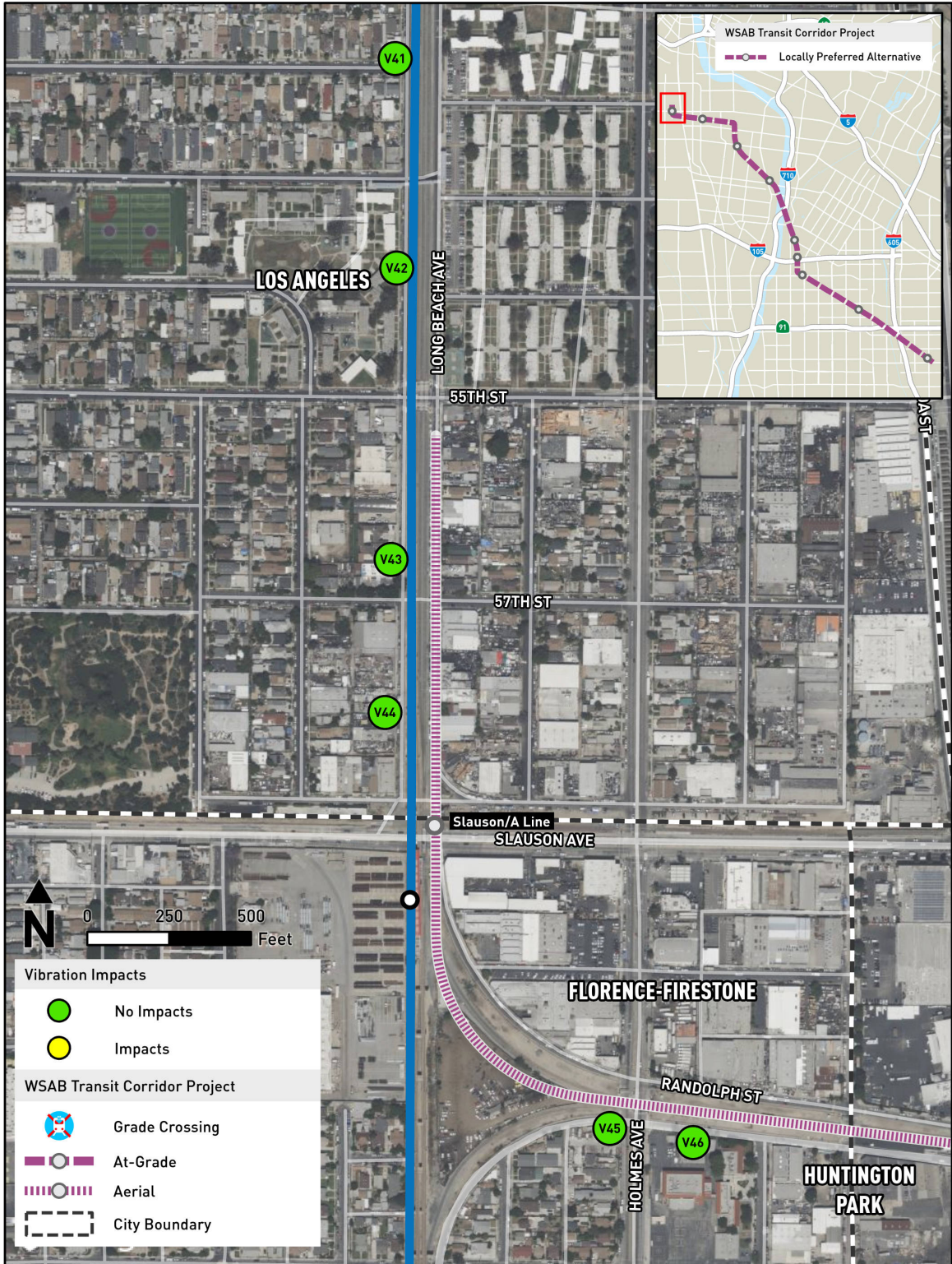
Unmitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



APPENDIX B UNMITIGATED VIBRATION CLUSTERS

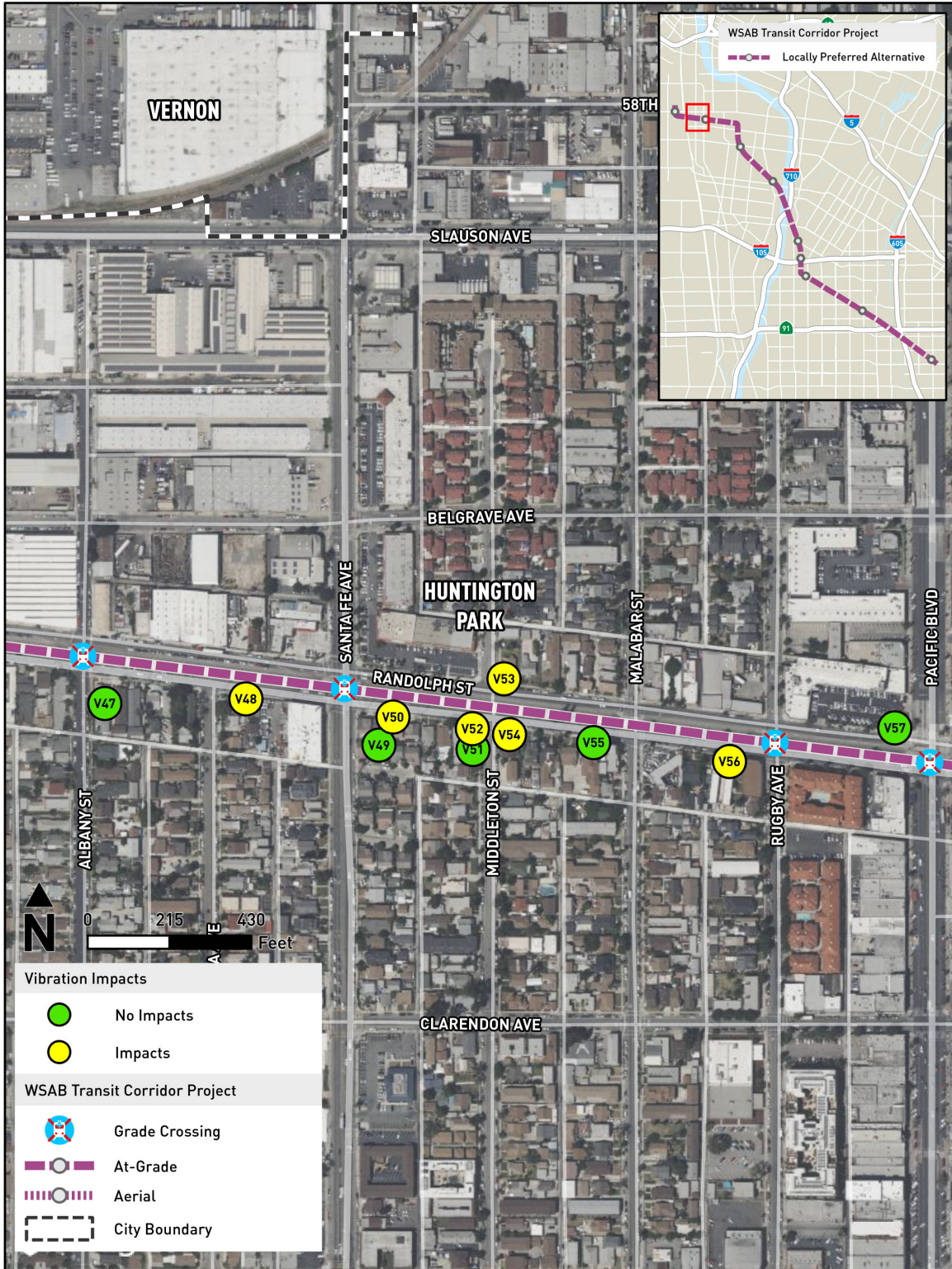
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Unmitigated Vibration Clusters



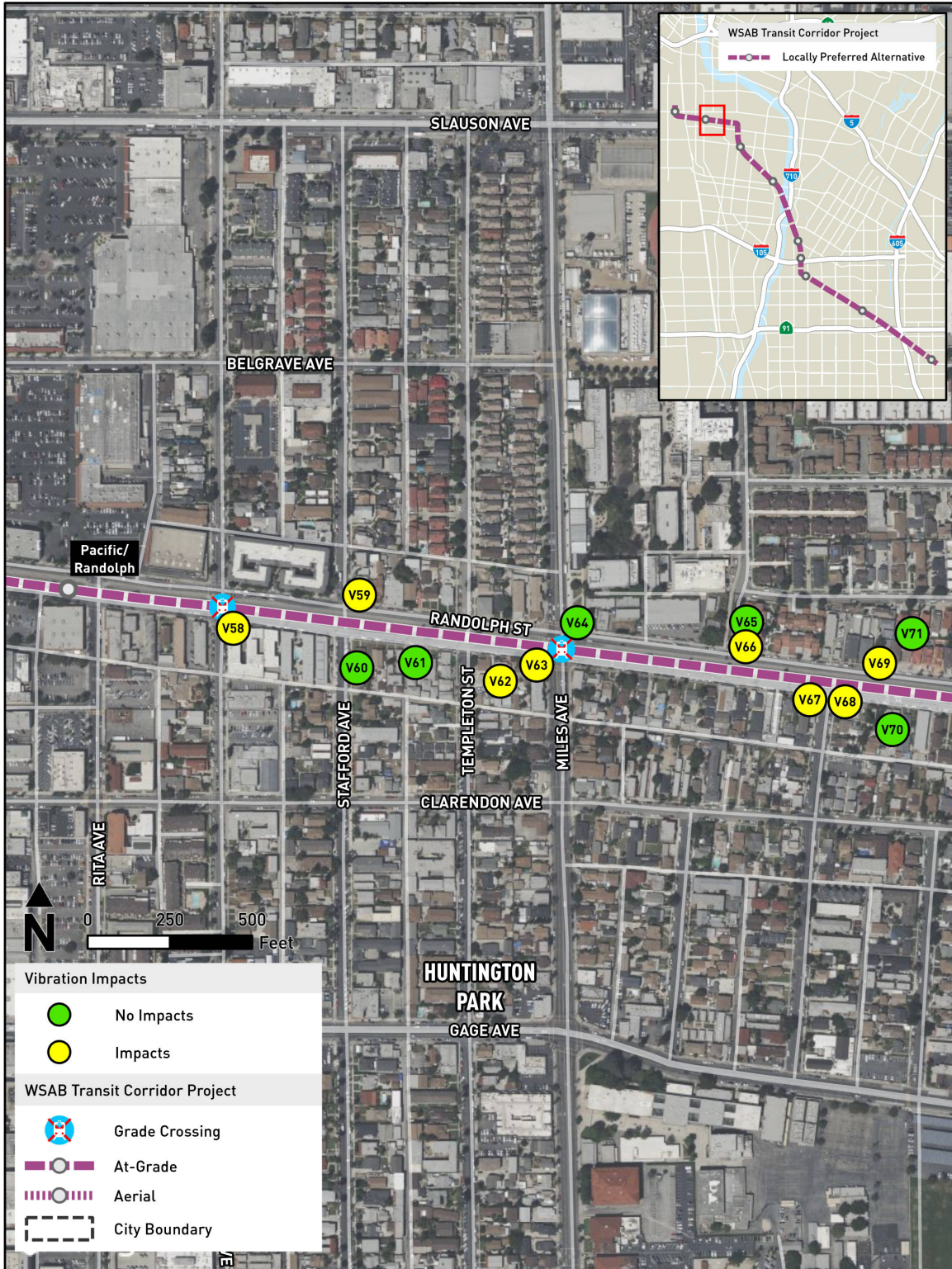
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Unmitigated Vibration Clusters



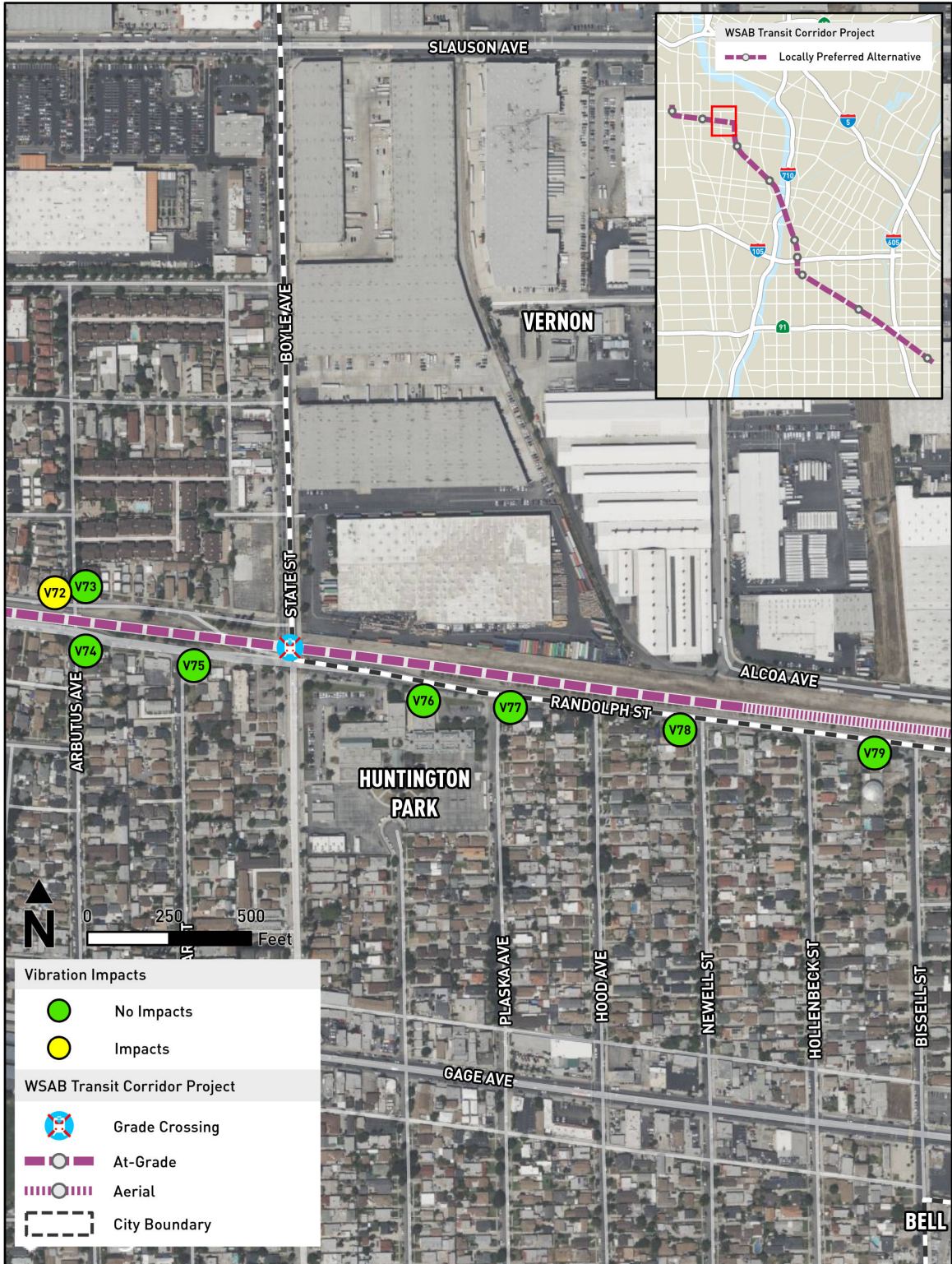
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Unmitigated Vibration Clusters



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Unmitigated Vibration Clusters



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Unmitigated Vibration Clusters



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Unmitigated Vibration Clusters



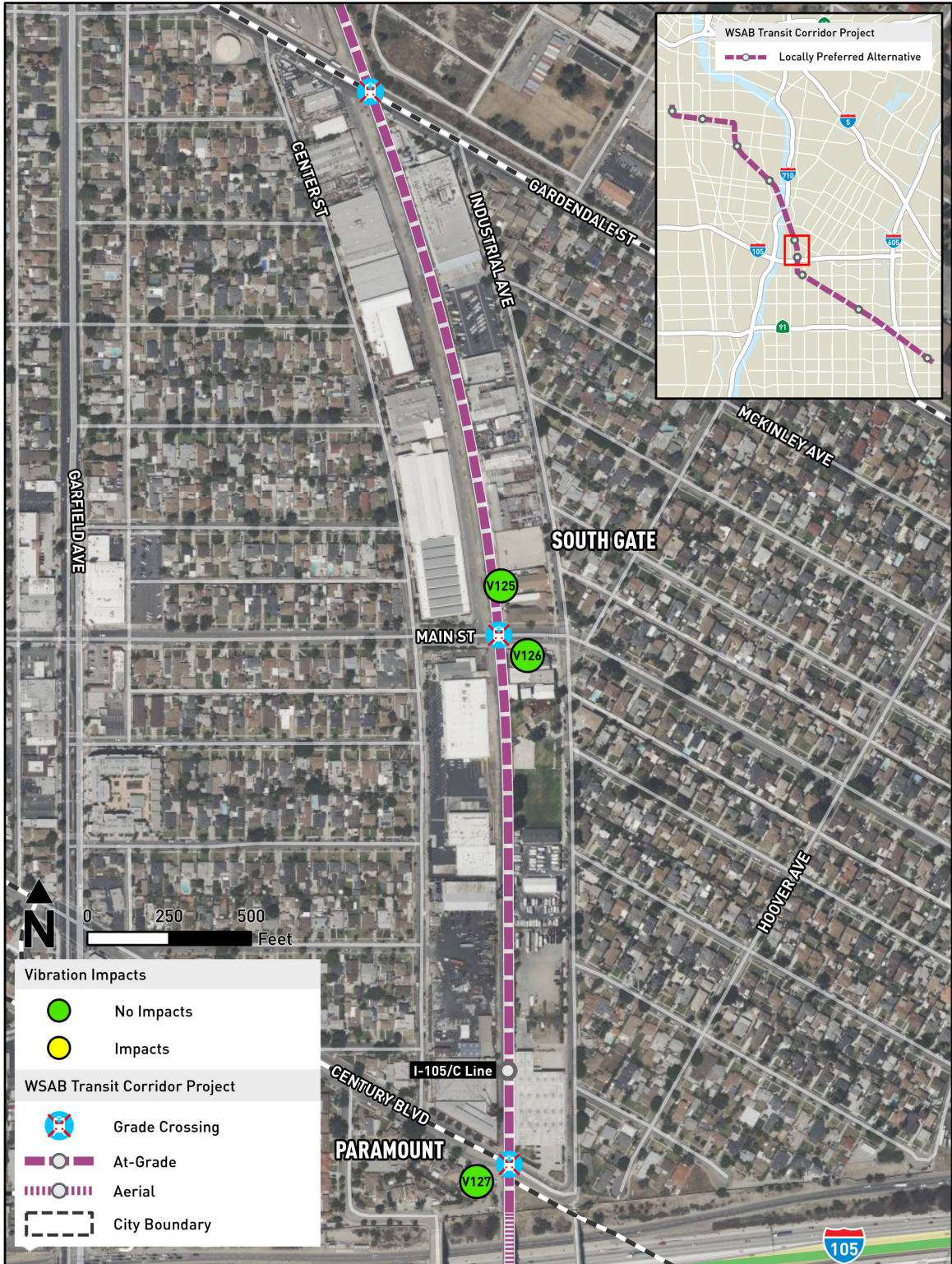
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Unmitigated Vibration Clusters



Appendix B

Unmitigated Vibration Clusters



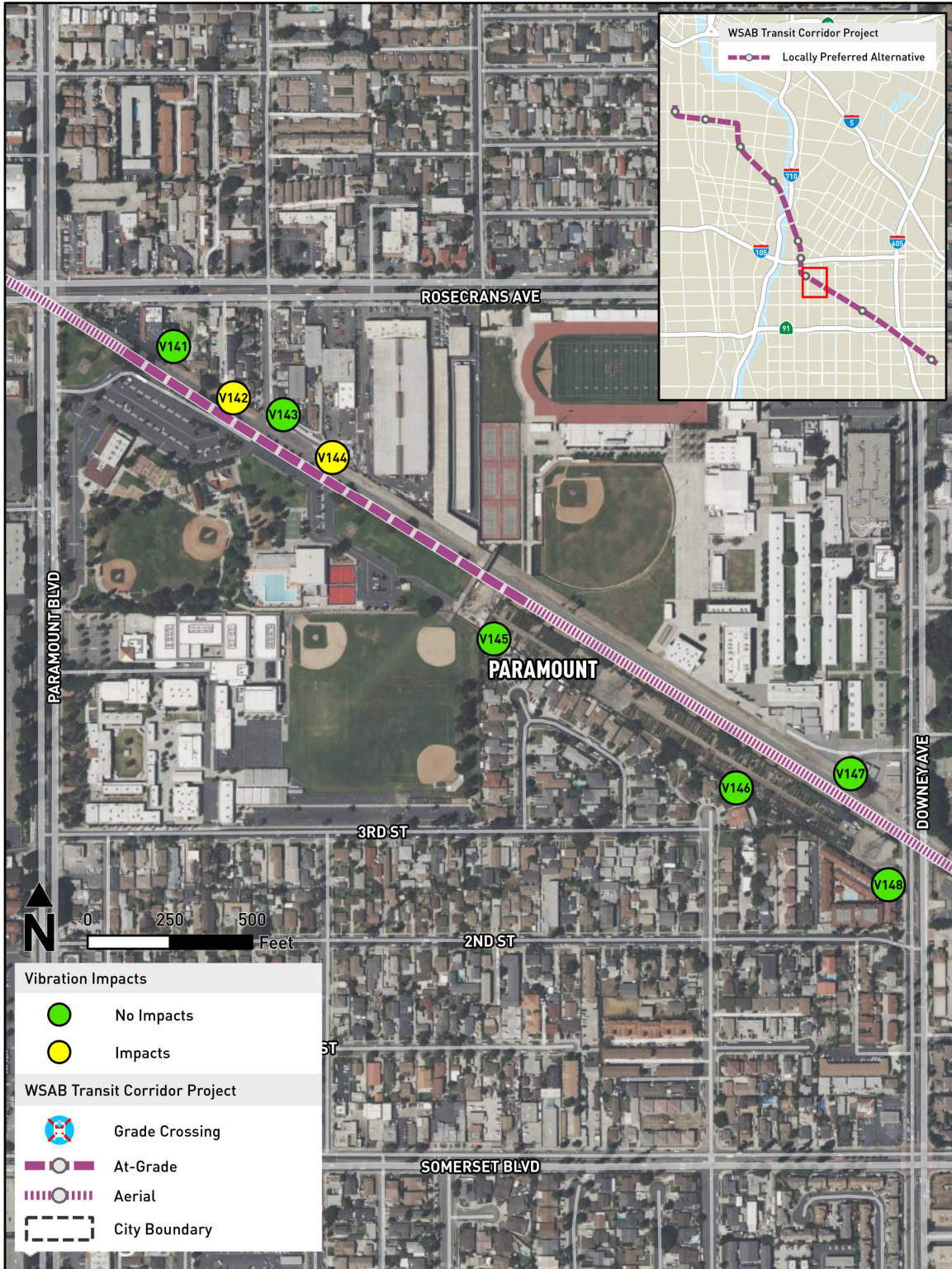
Appendix B

Unmitigated Vibration Clusters



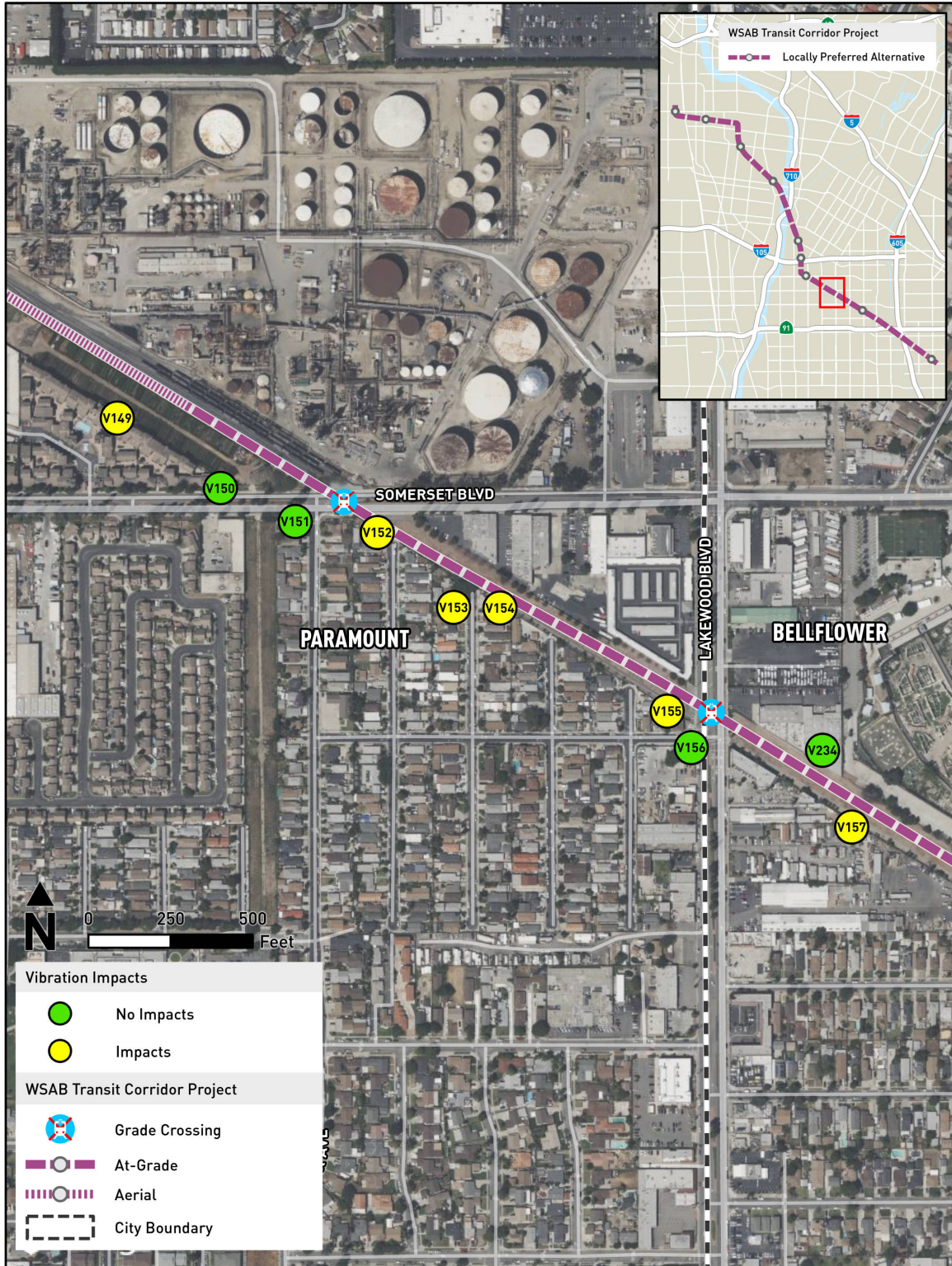
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Unmitigated Vibration Clusters



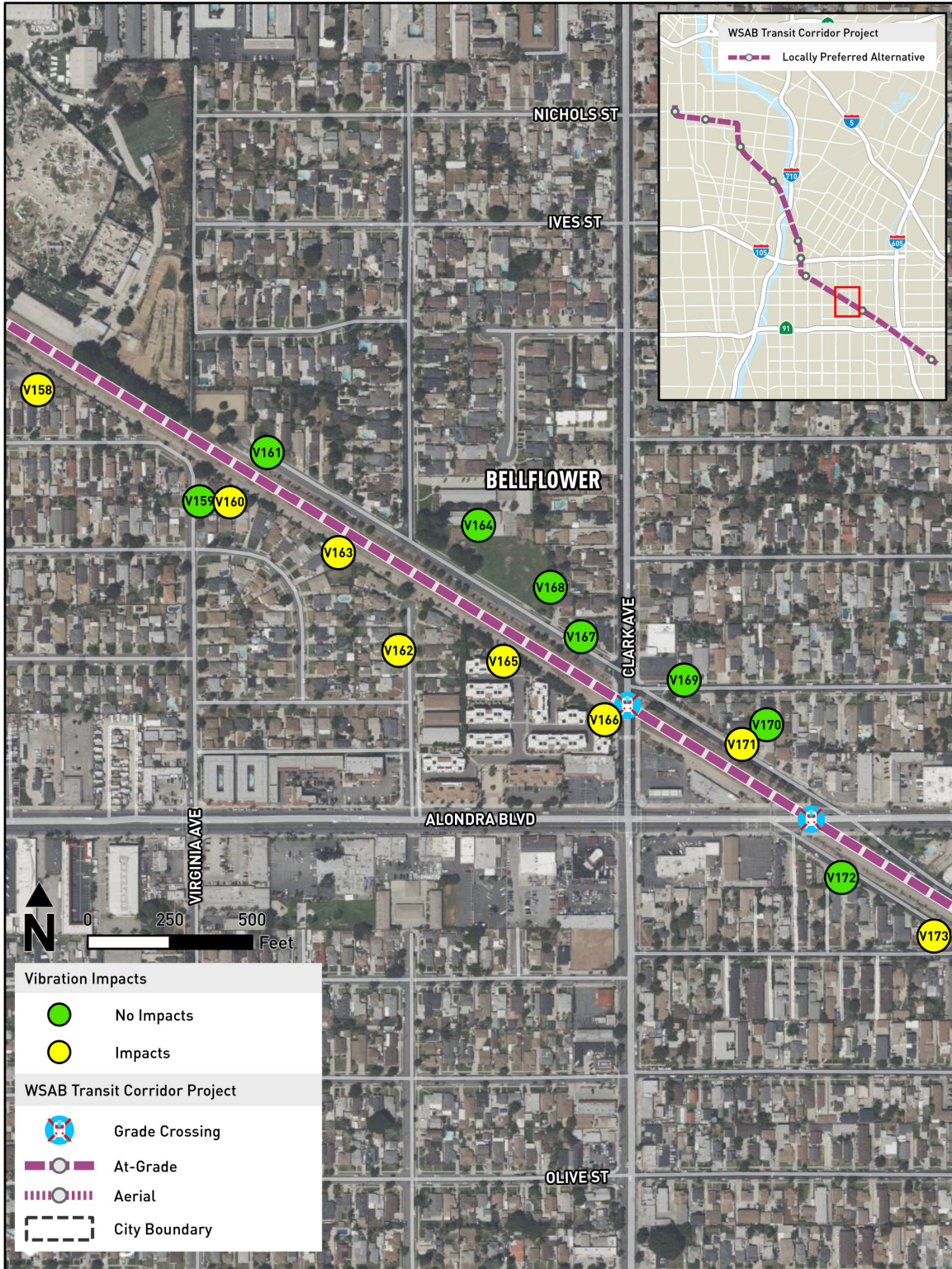
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Unmitigated Vibration Clusters



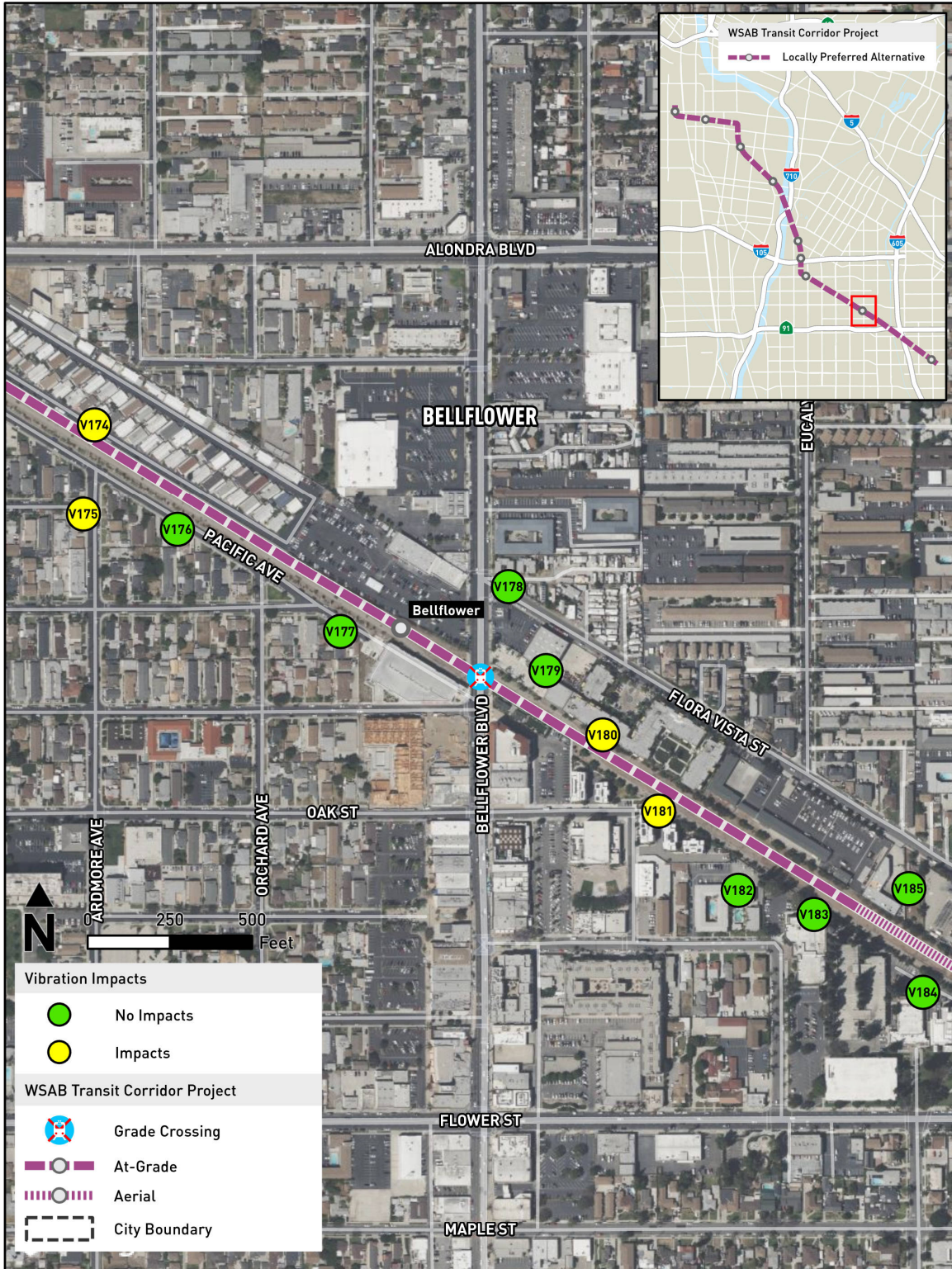
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Unmitigated Vibration Clusters



Appendix B

Unmitigated Vibration Clusters



Appendix B

Unmitigated Vibration Clusters



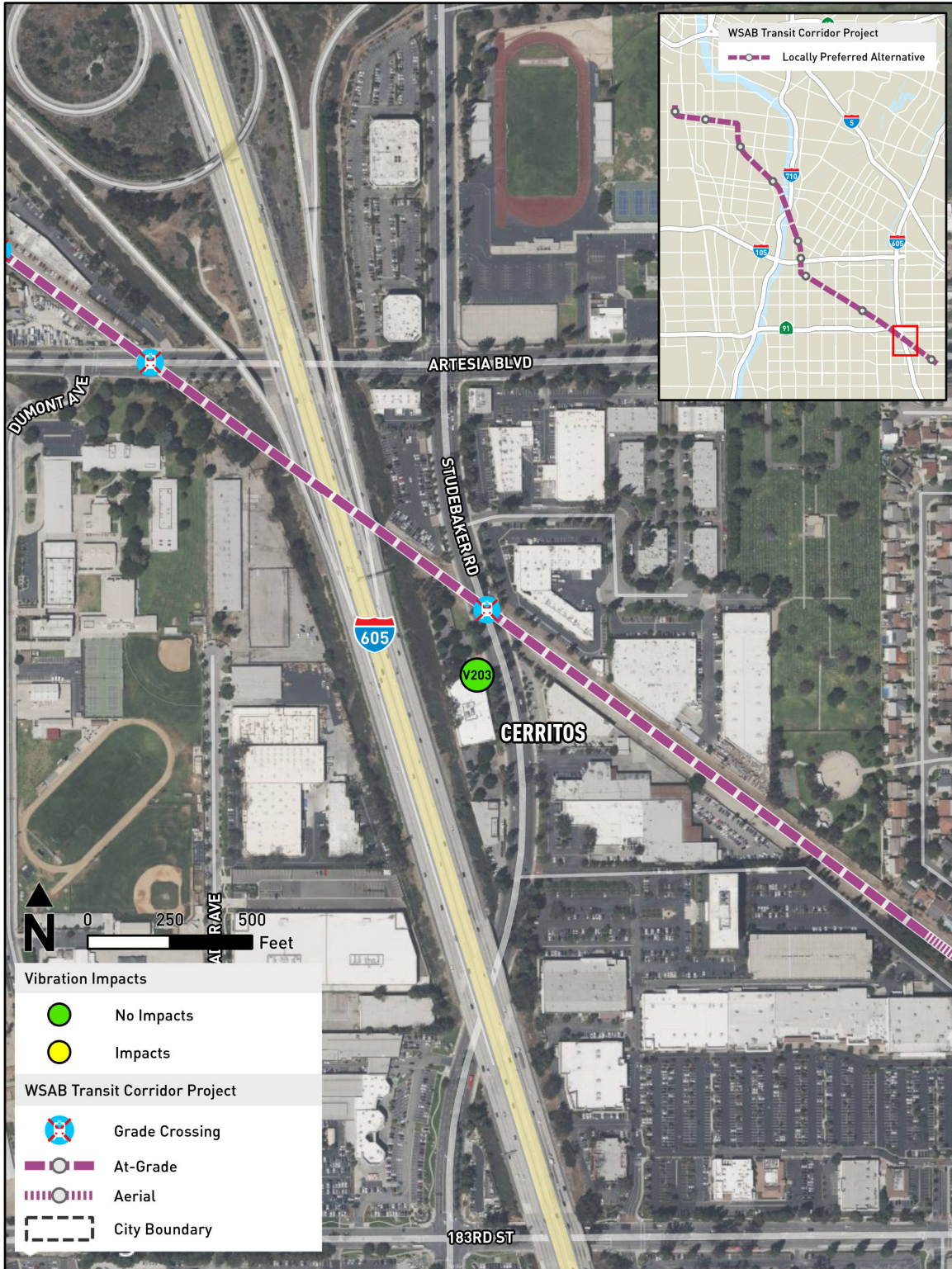
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Unmitigated Vibration Clusters



Appendix B

Unmitigated Vibration Clusters



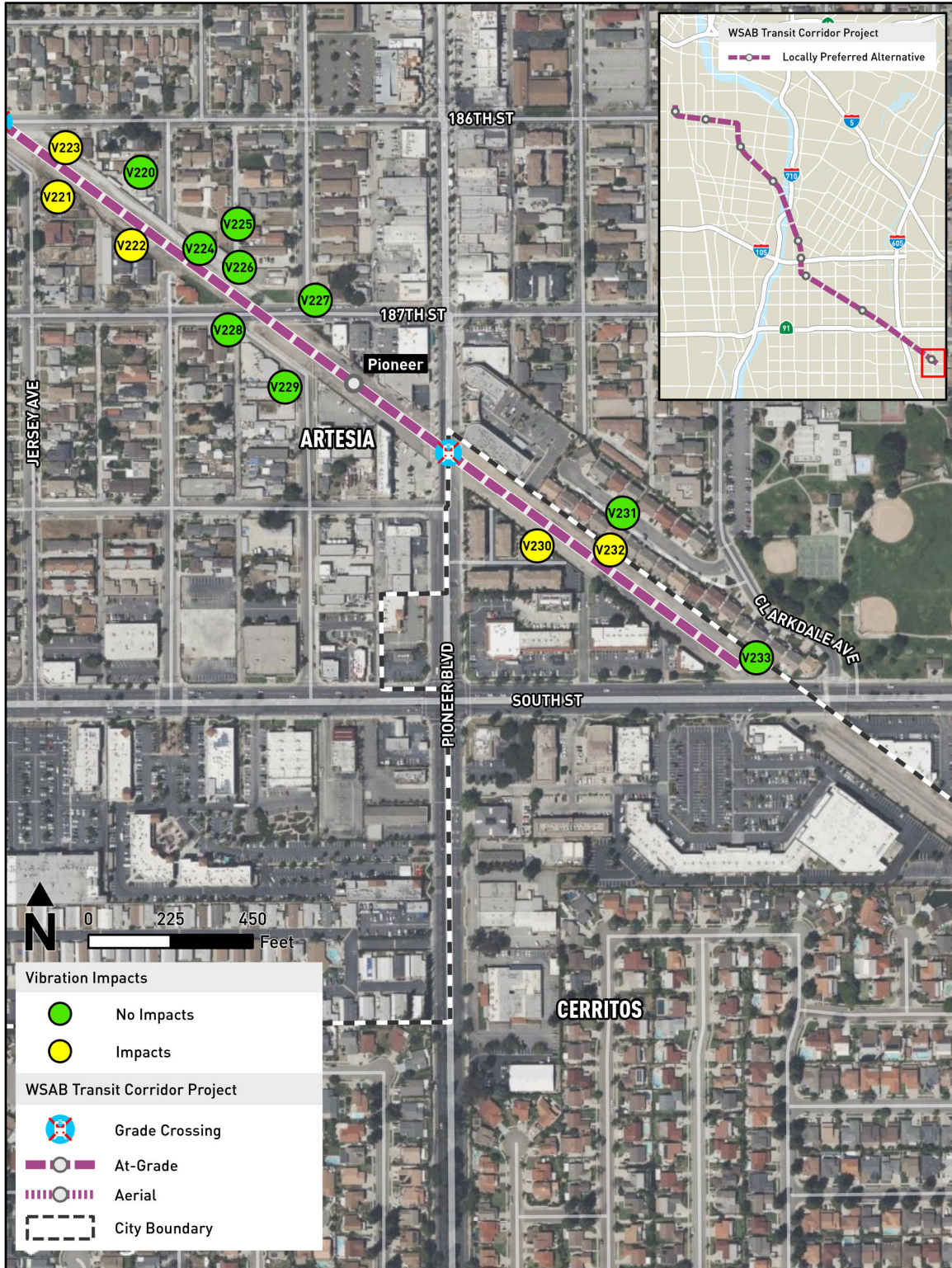
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Unmitigated Vibration Clusters



Appendix B

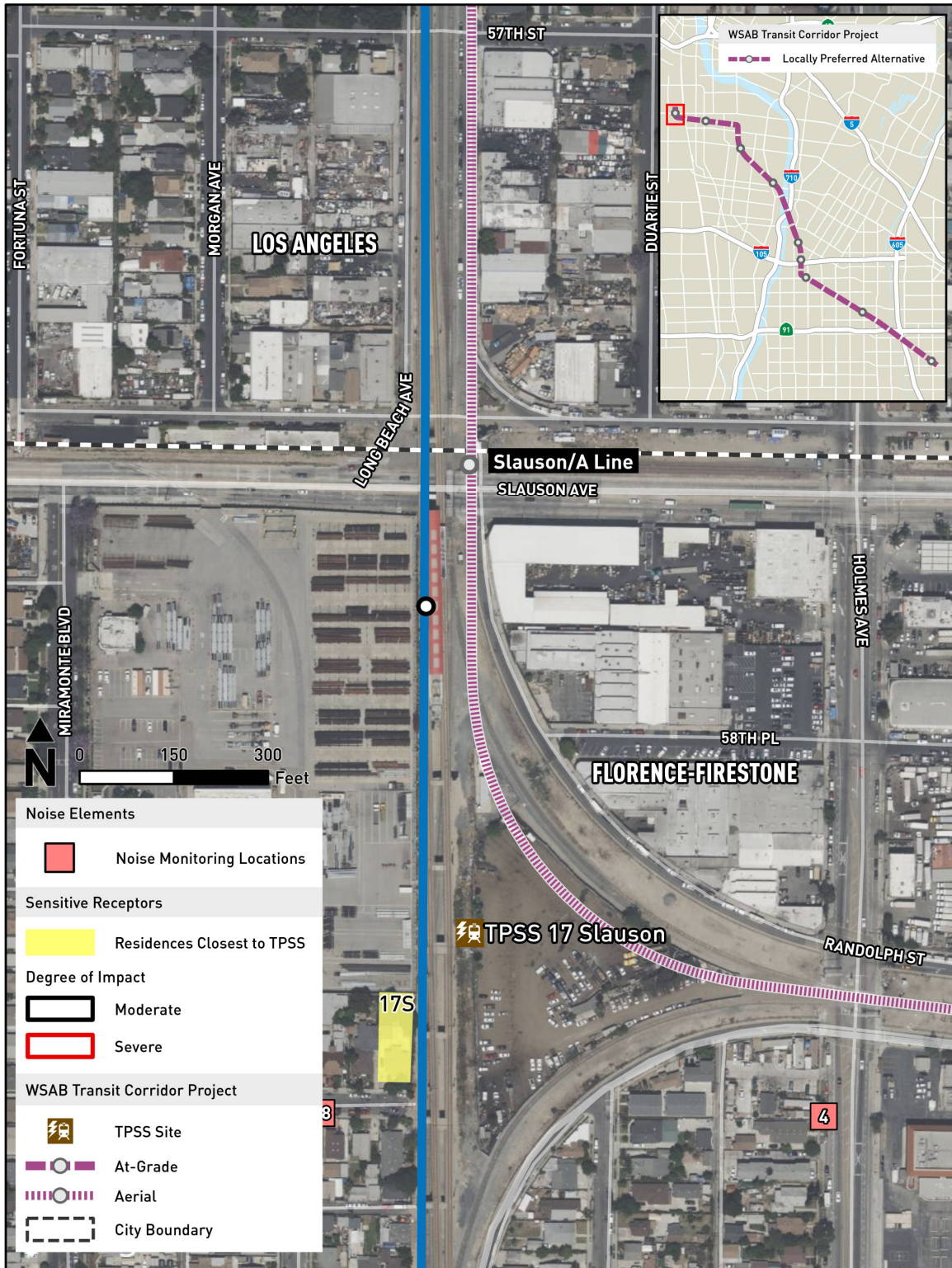
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APPENDIX C UNMITIGATED ANCILLARY EQUIPMENT CLUSTERS AND IMPACTS

Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



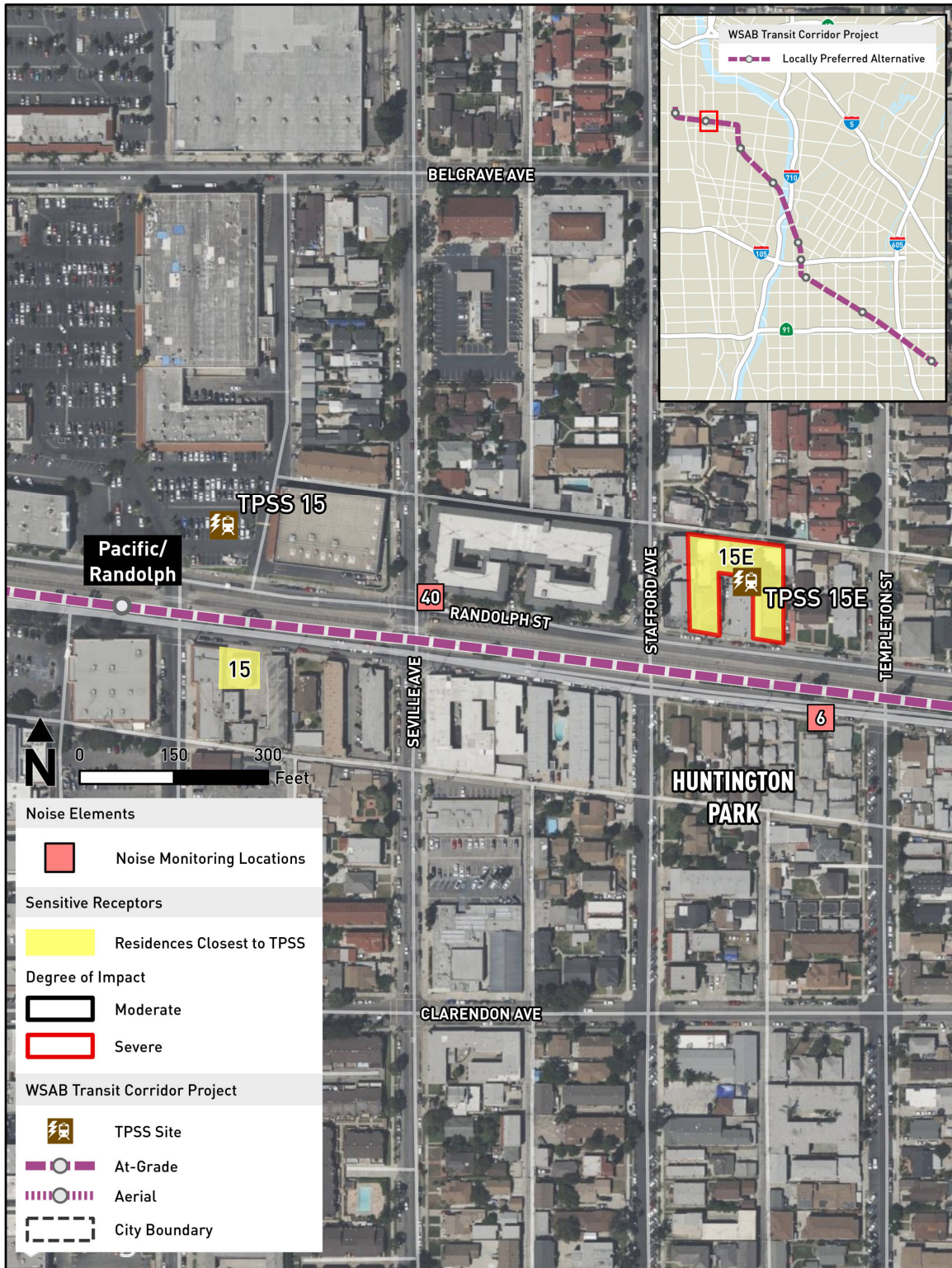
Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



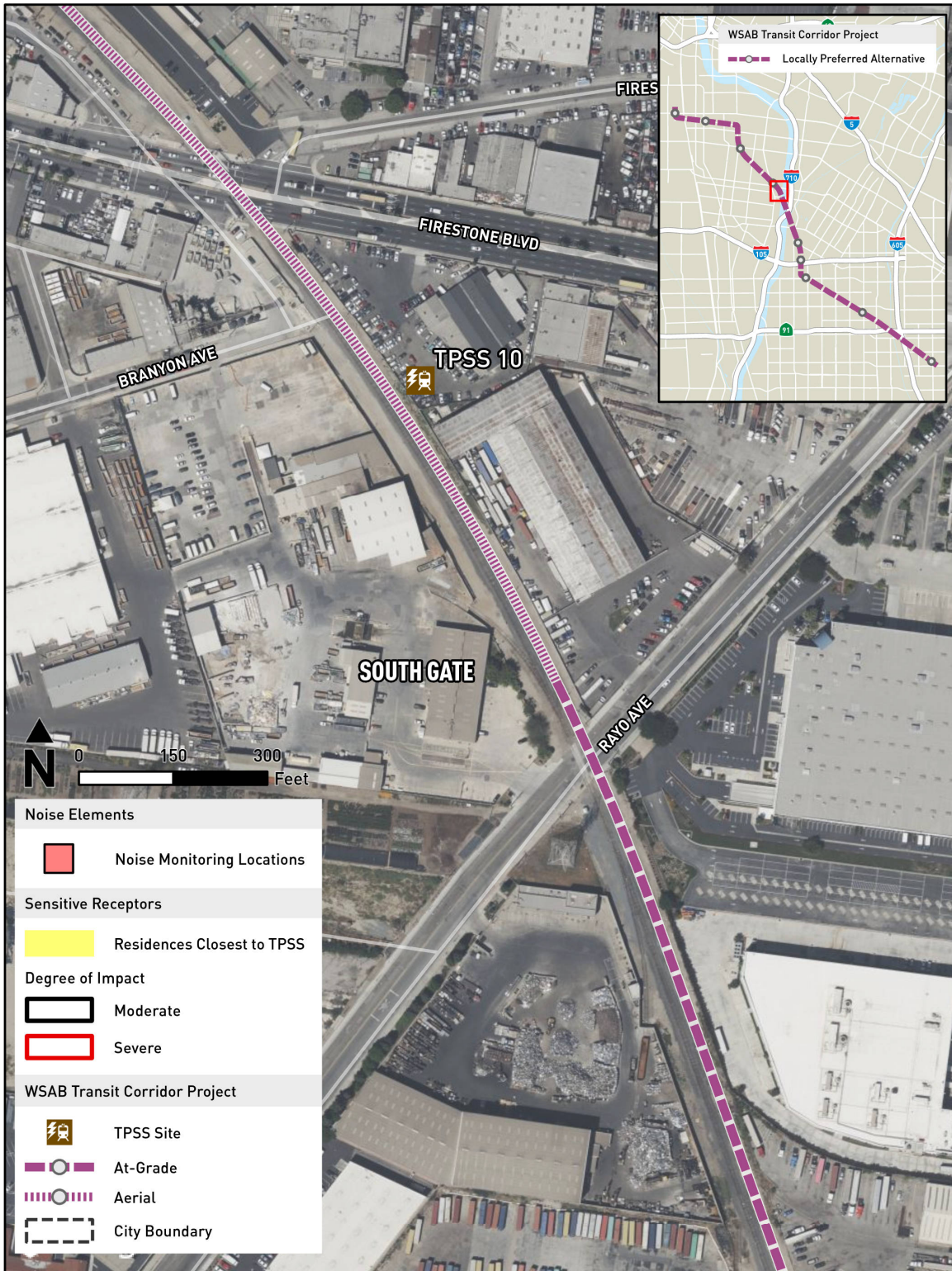
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Unmitigated Ancillary Equipment Clusters and Impacts



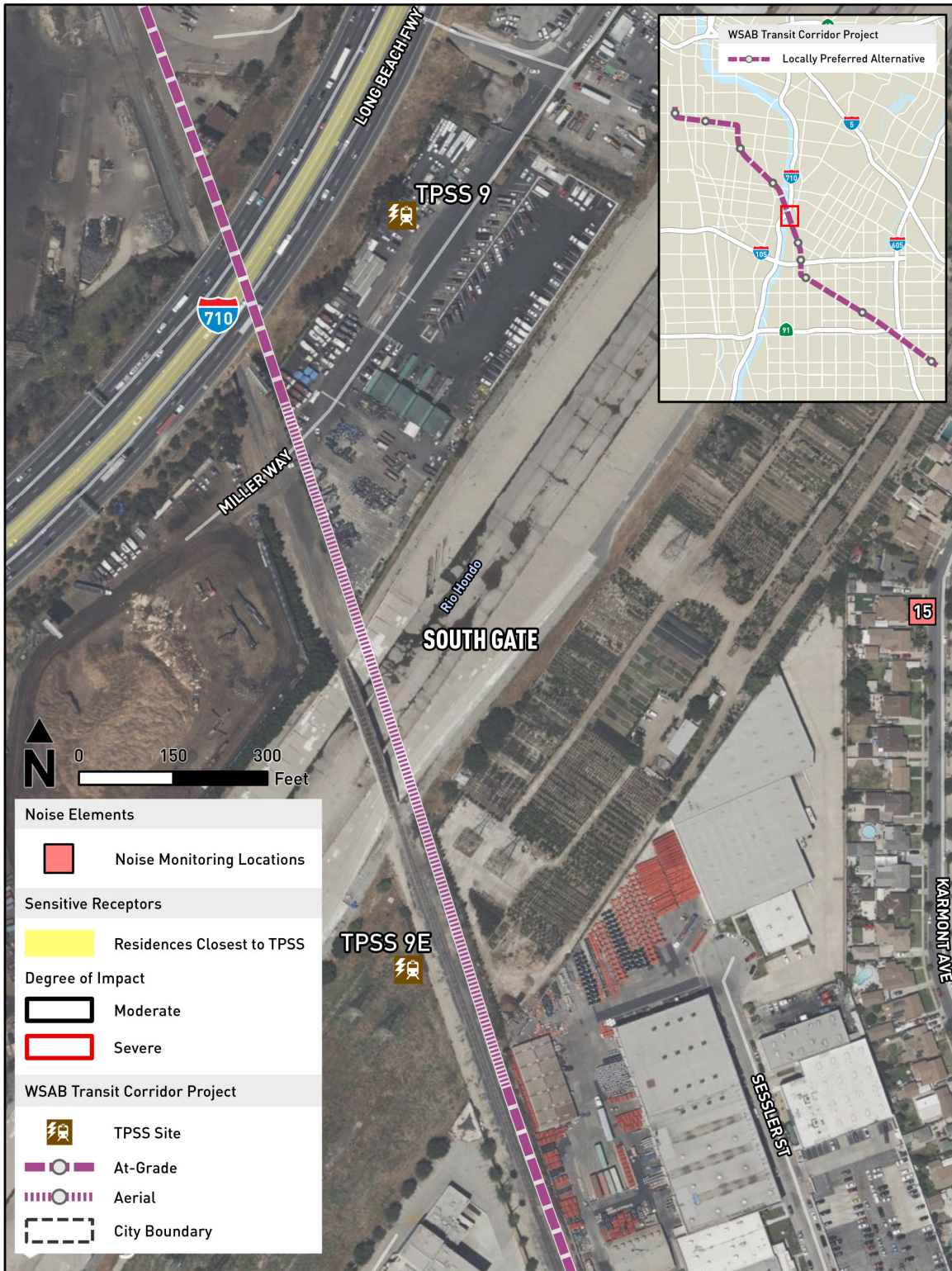
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Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



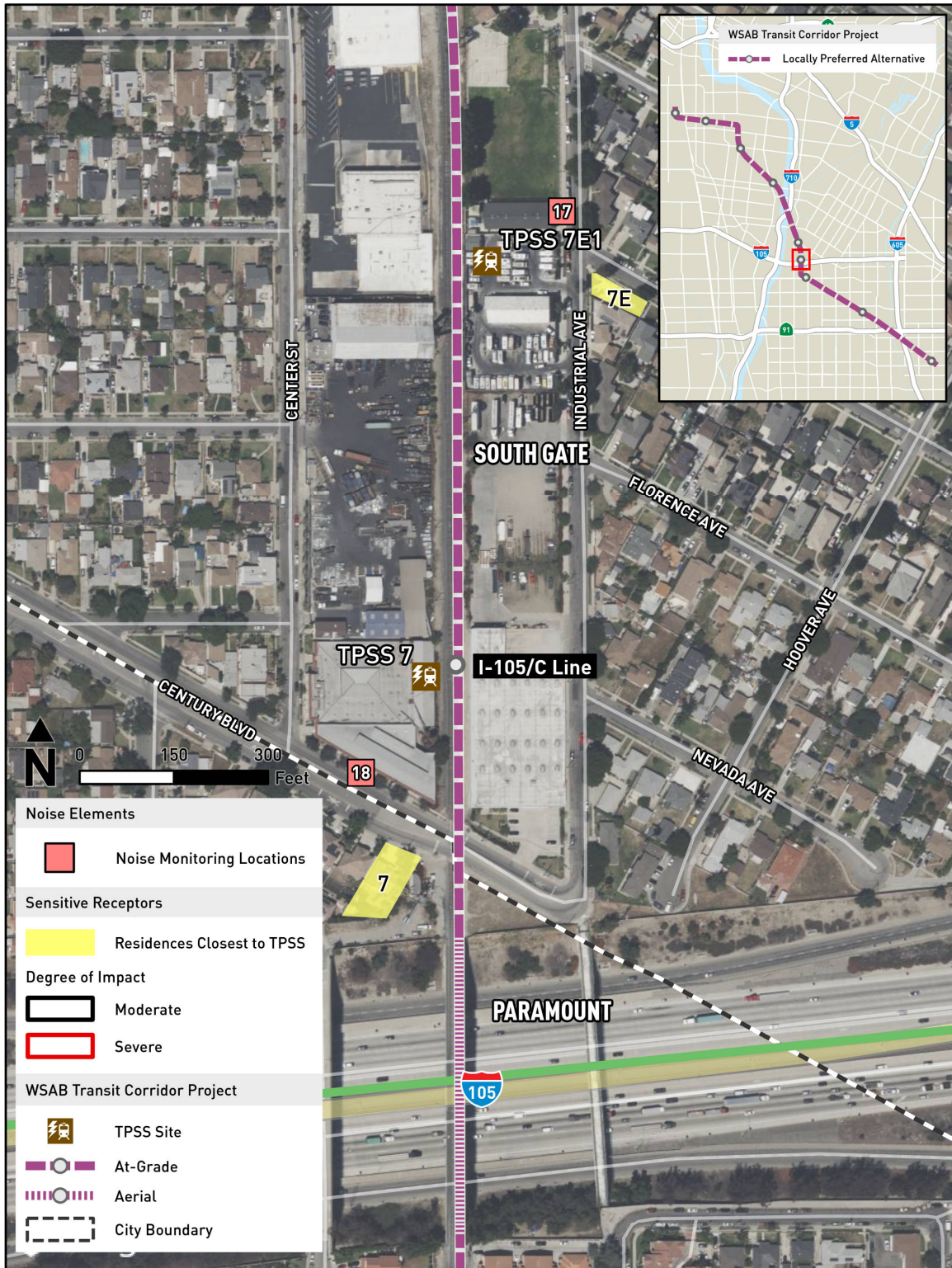
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Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



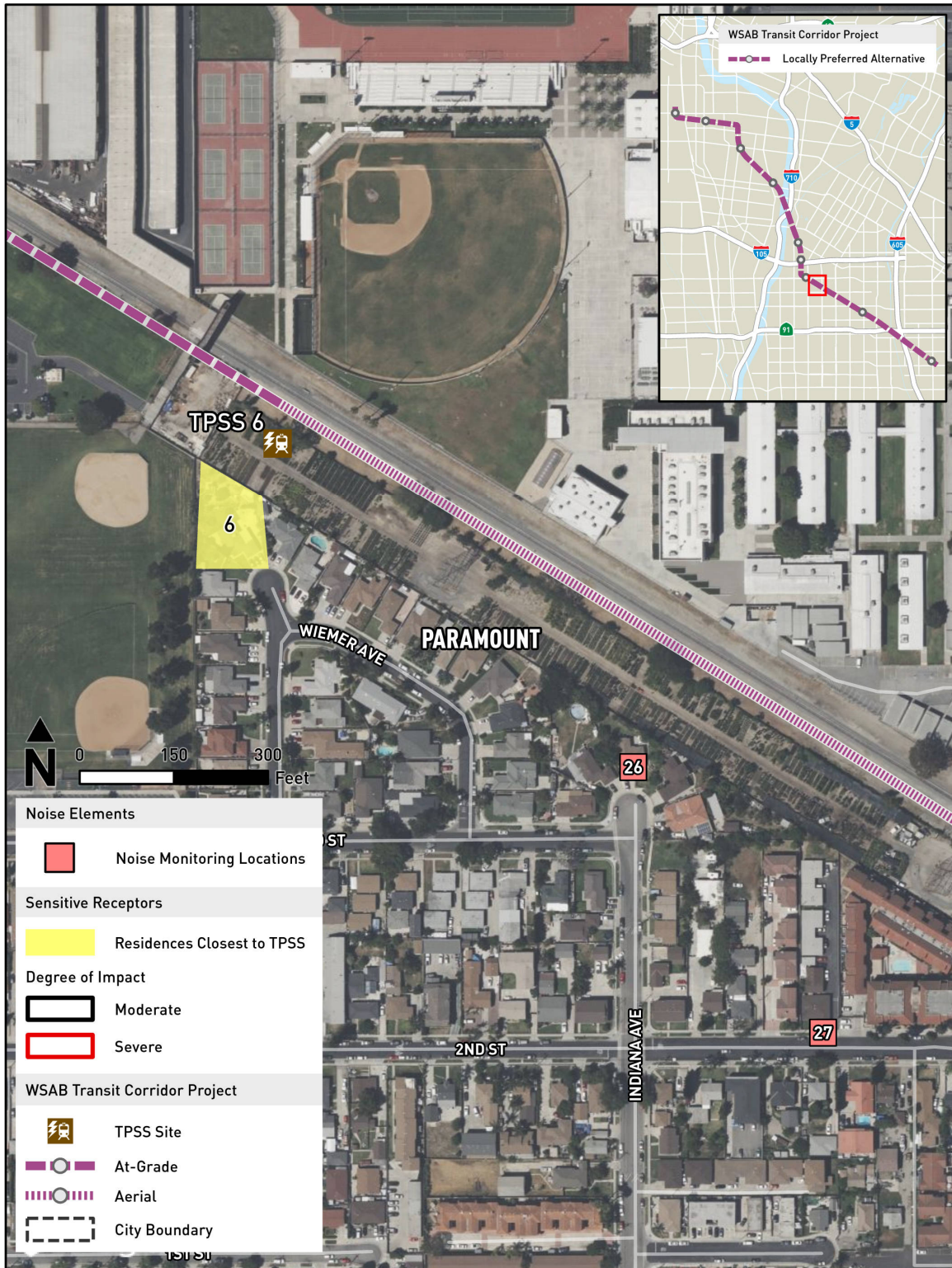
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Unmitigated Ancillary Equipment Clusters and Impacts



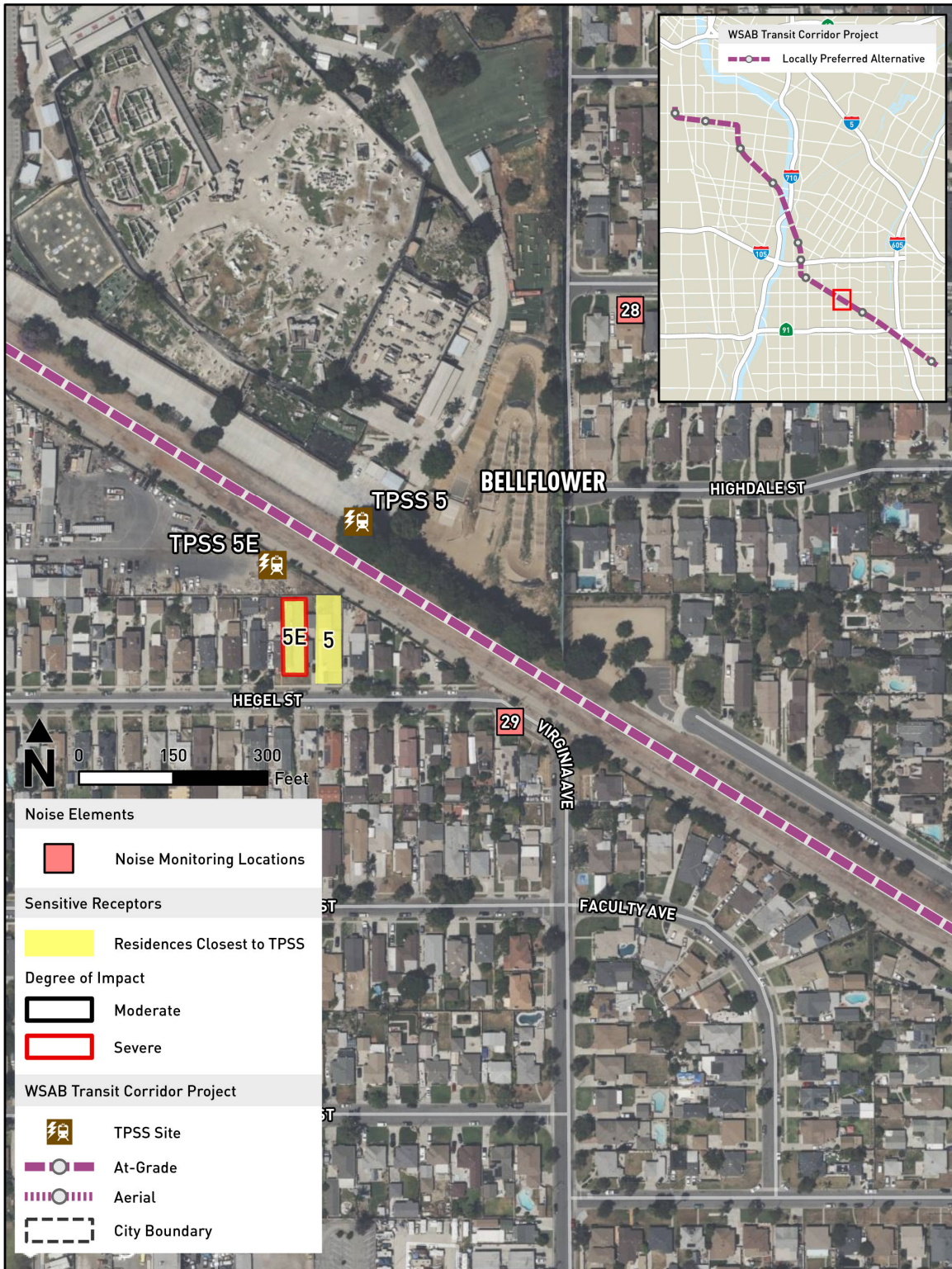
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Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



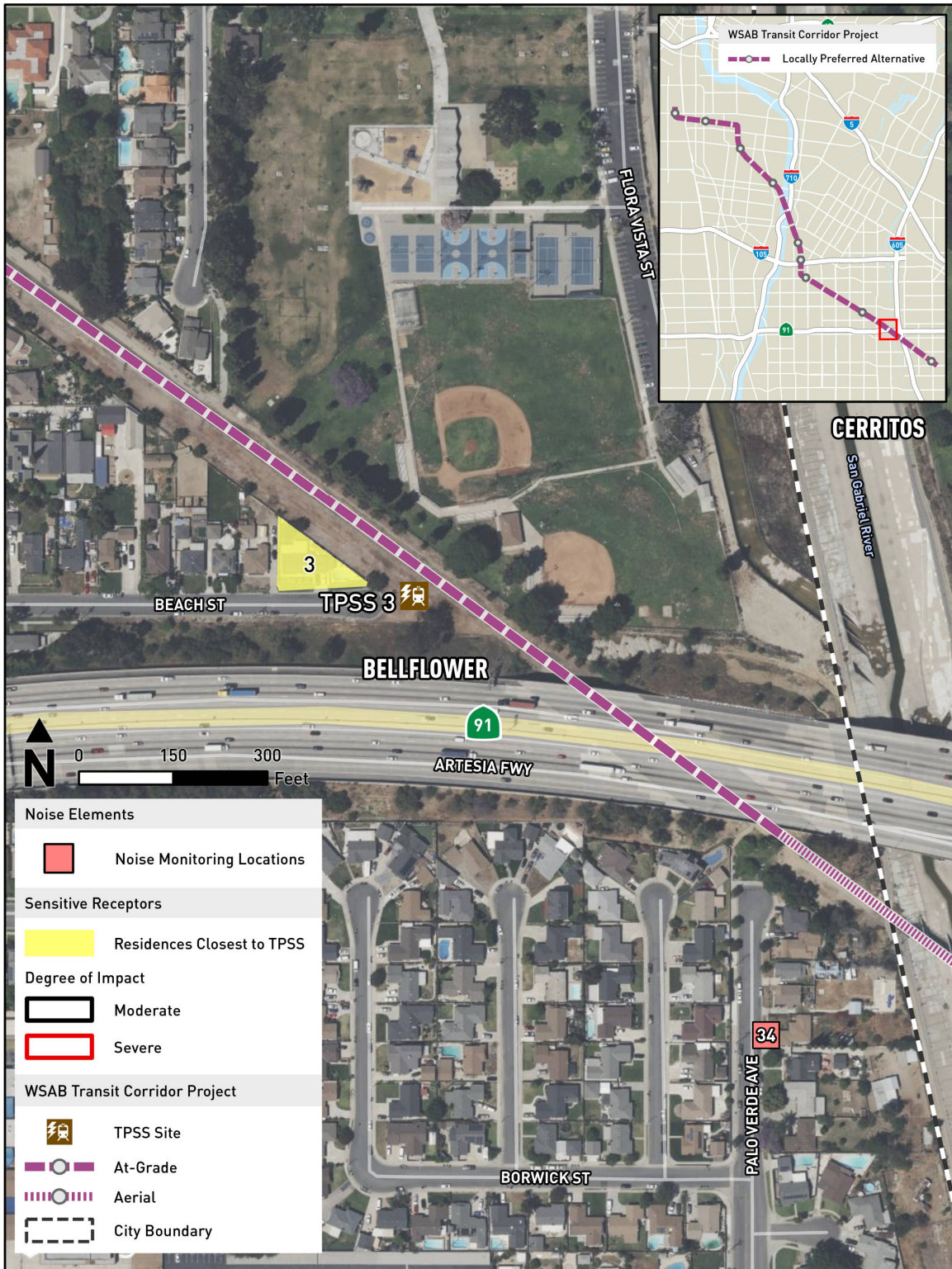
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Unmitigated Ancillary Equipment Clusters and Impacts



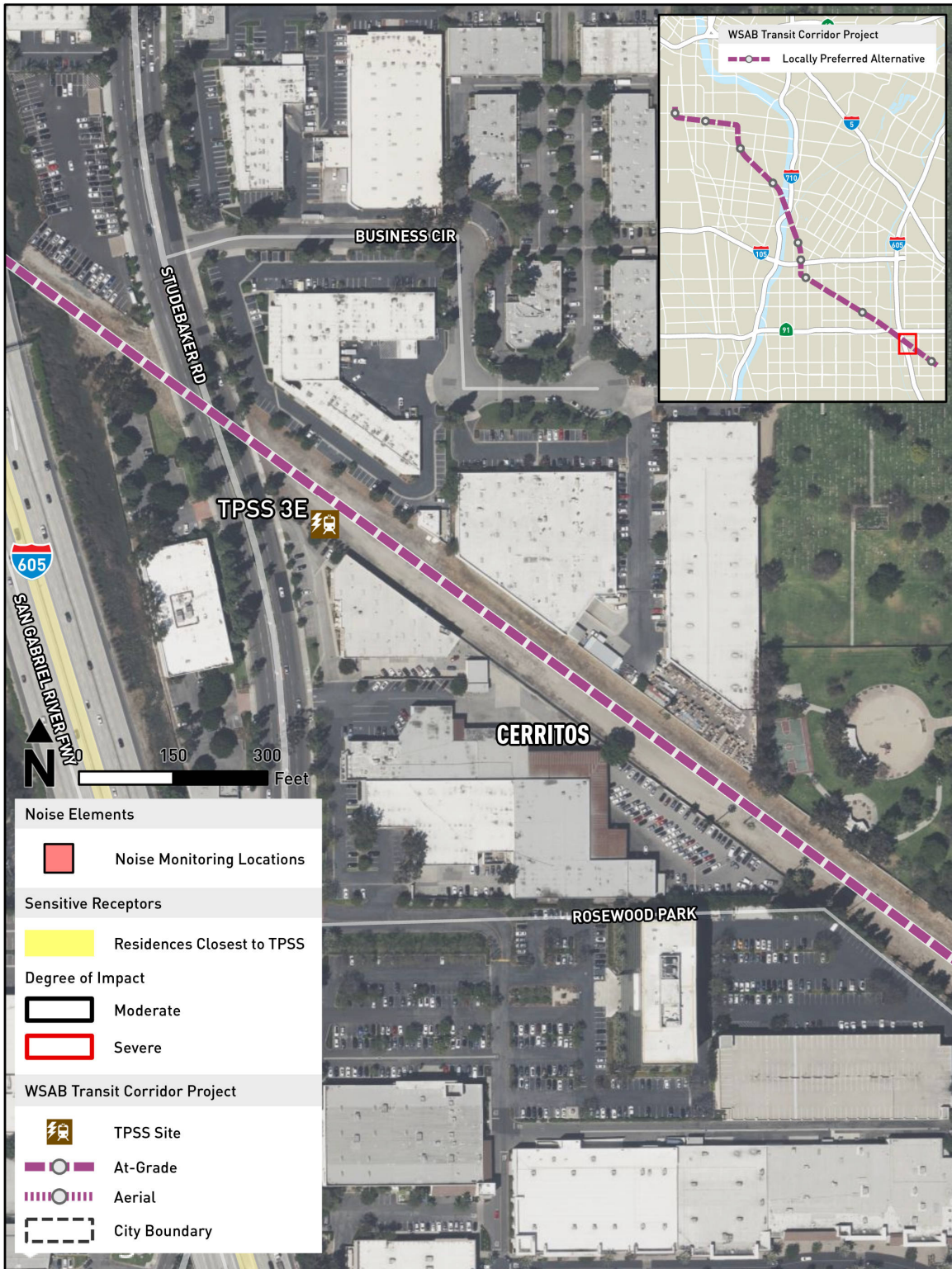
Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

Unmitigated Ancillary Equipment Clusters and Impacts



Appendix C

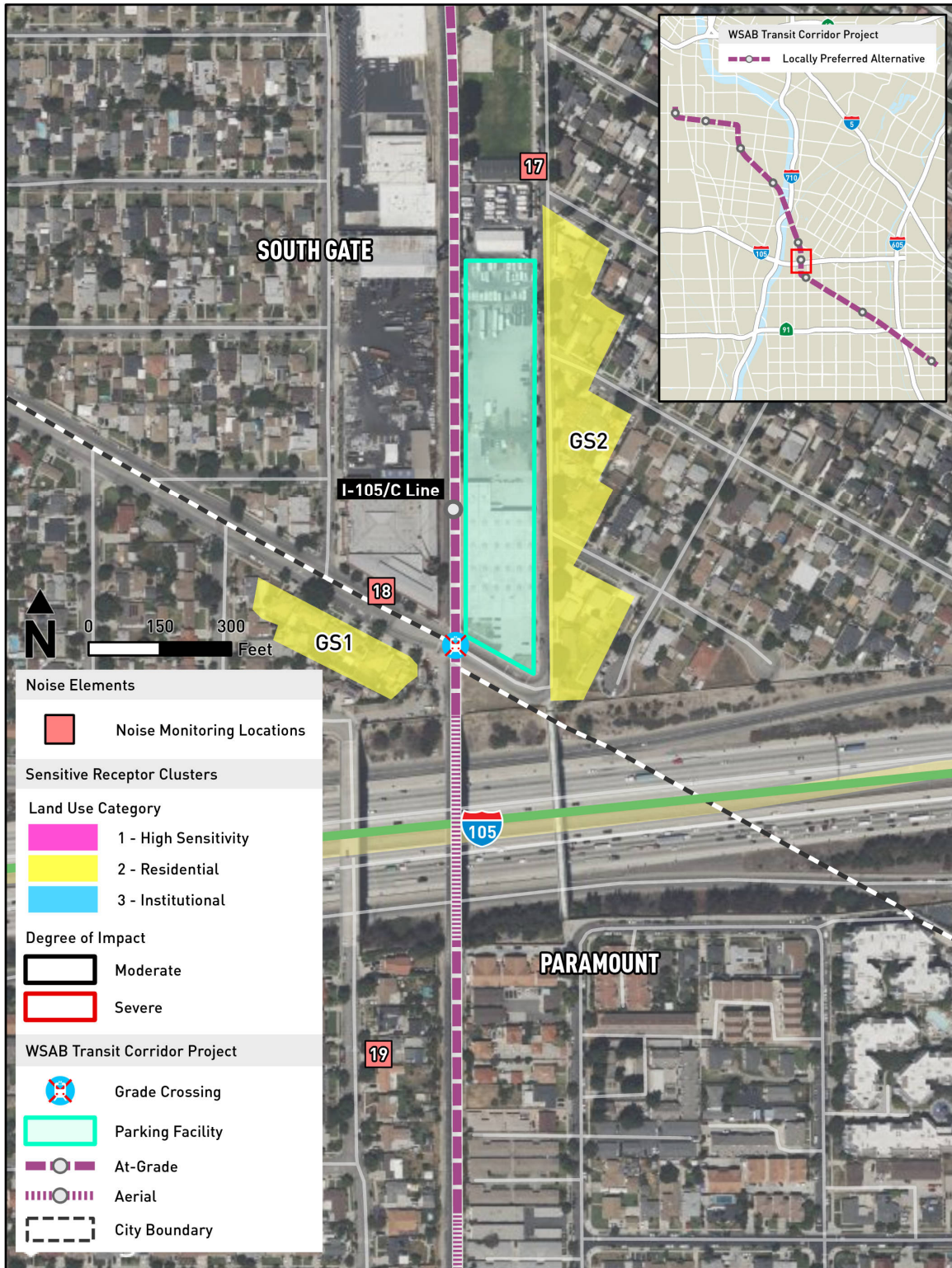
Unmitigated Ancillary Equipment Clusters and Impacts



APPENDIX D UNMITIGATED PARKING FACILITY CLUSTERS AND IMPACTS

Appendix D

Unmitigated Parking Facility Clusters and Impacts



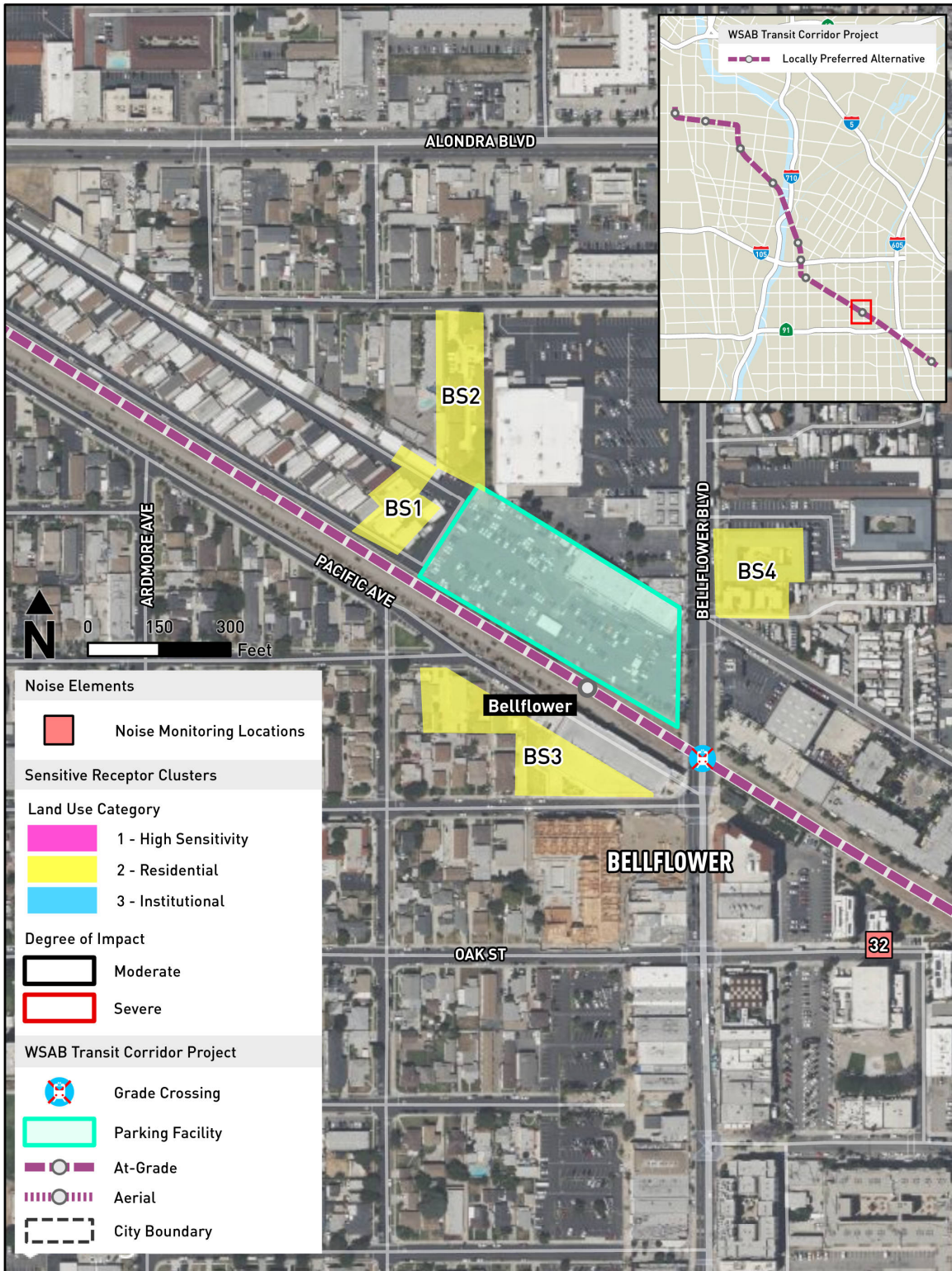
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Unmitigated Parking Facility Clusters and Impacts



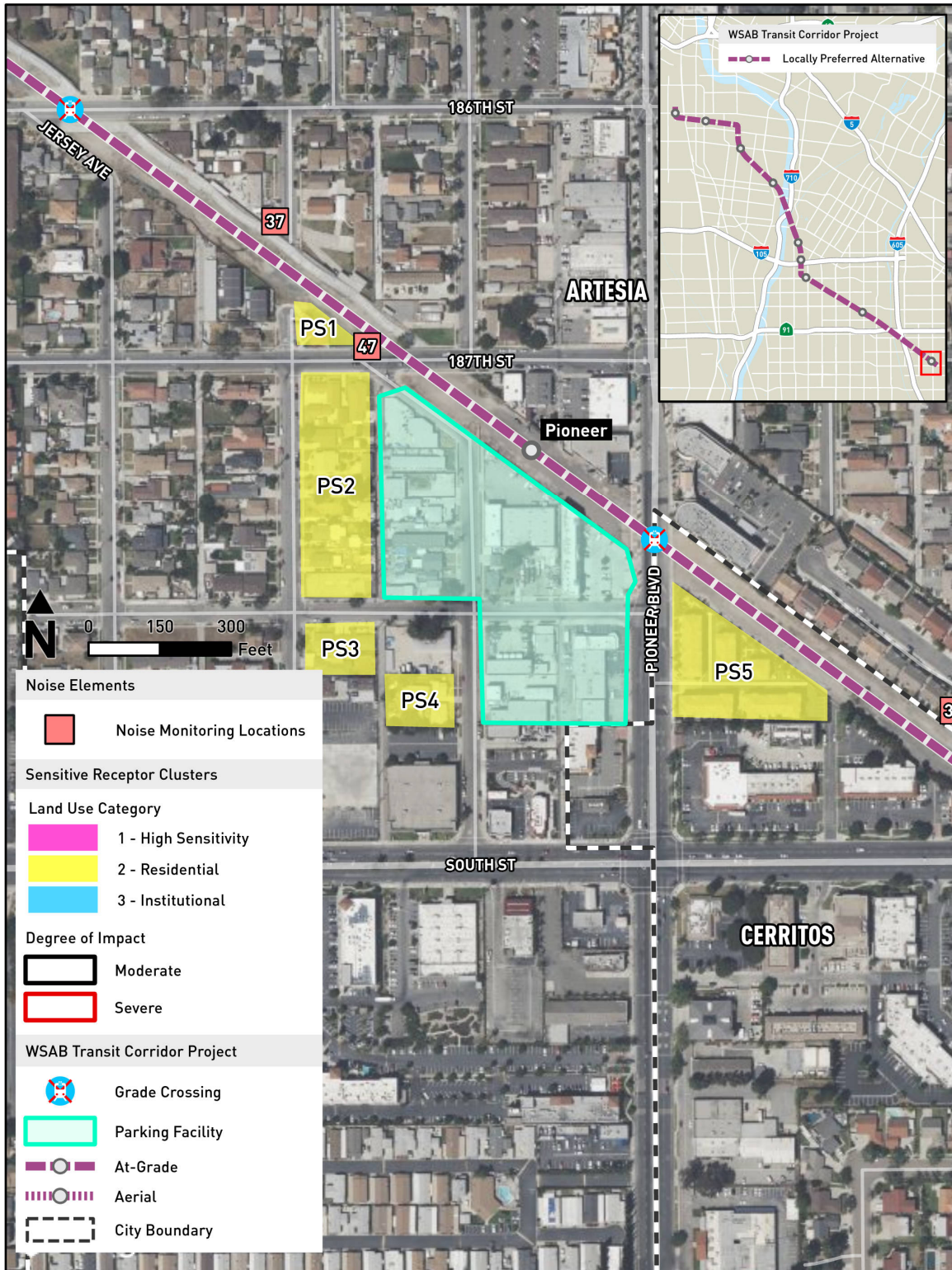
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Unmitigated Parking Facility Clusters and Impacts



Appendix D

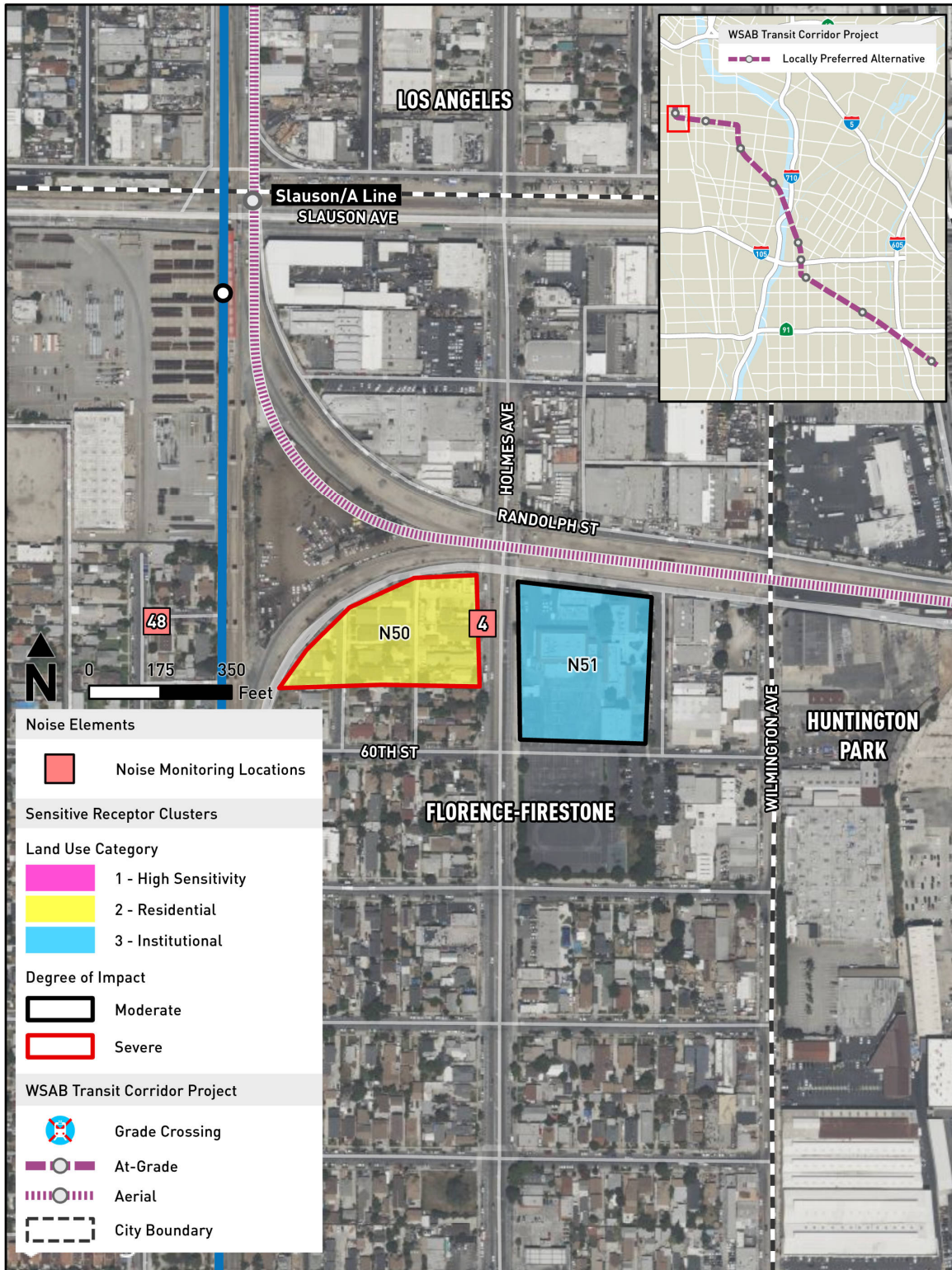
Unmitigated Parking Facility Clusters and Impacts



APPENDIX E UNMITIGATED FREIGHT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS

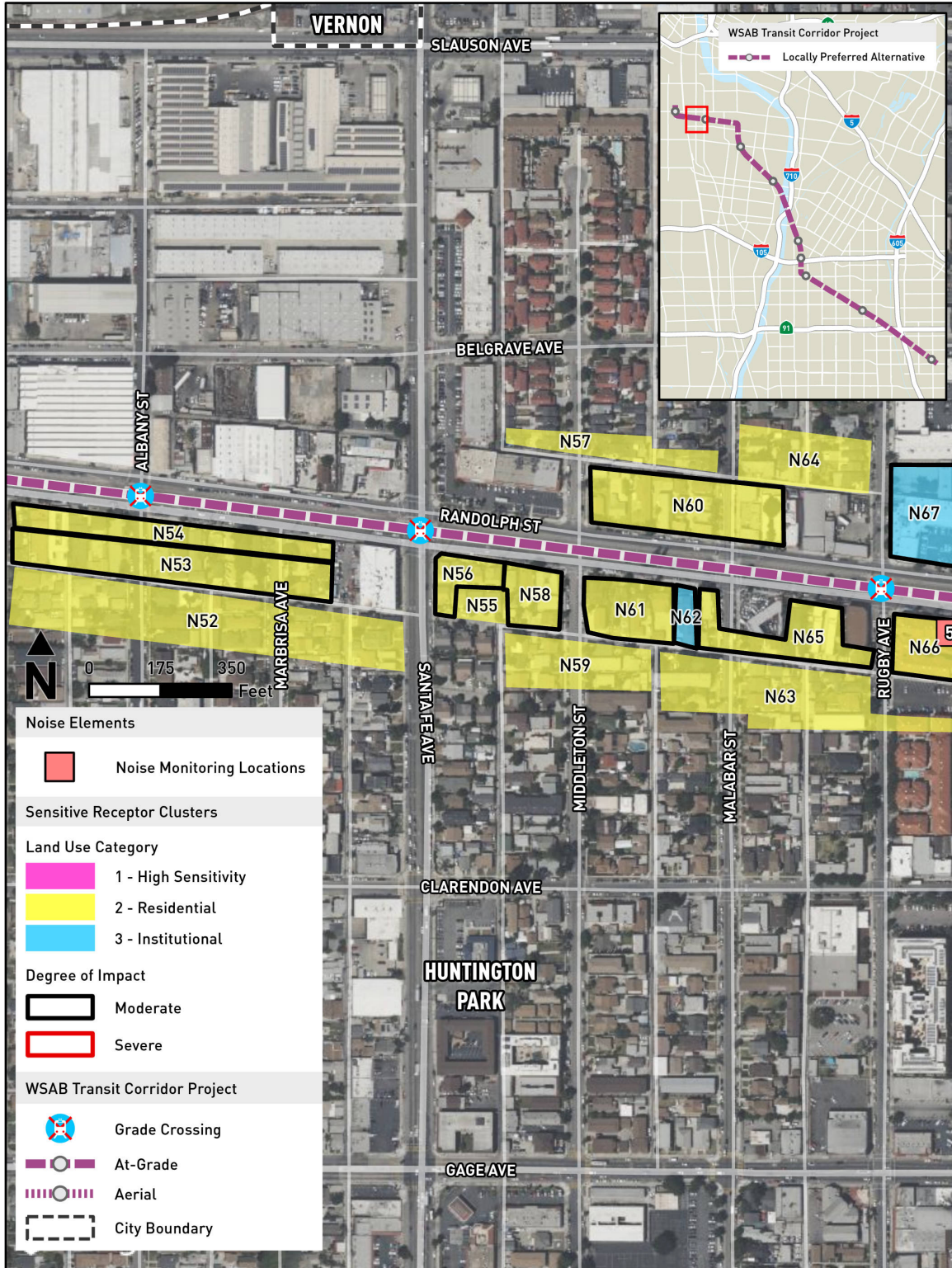
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Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



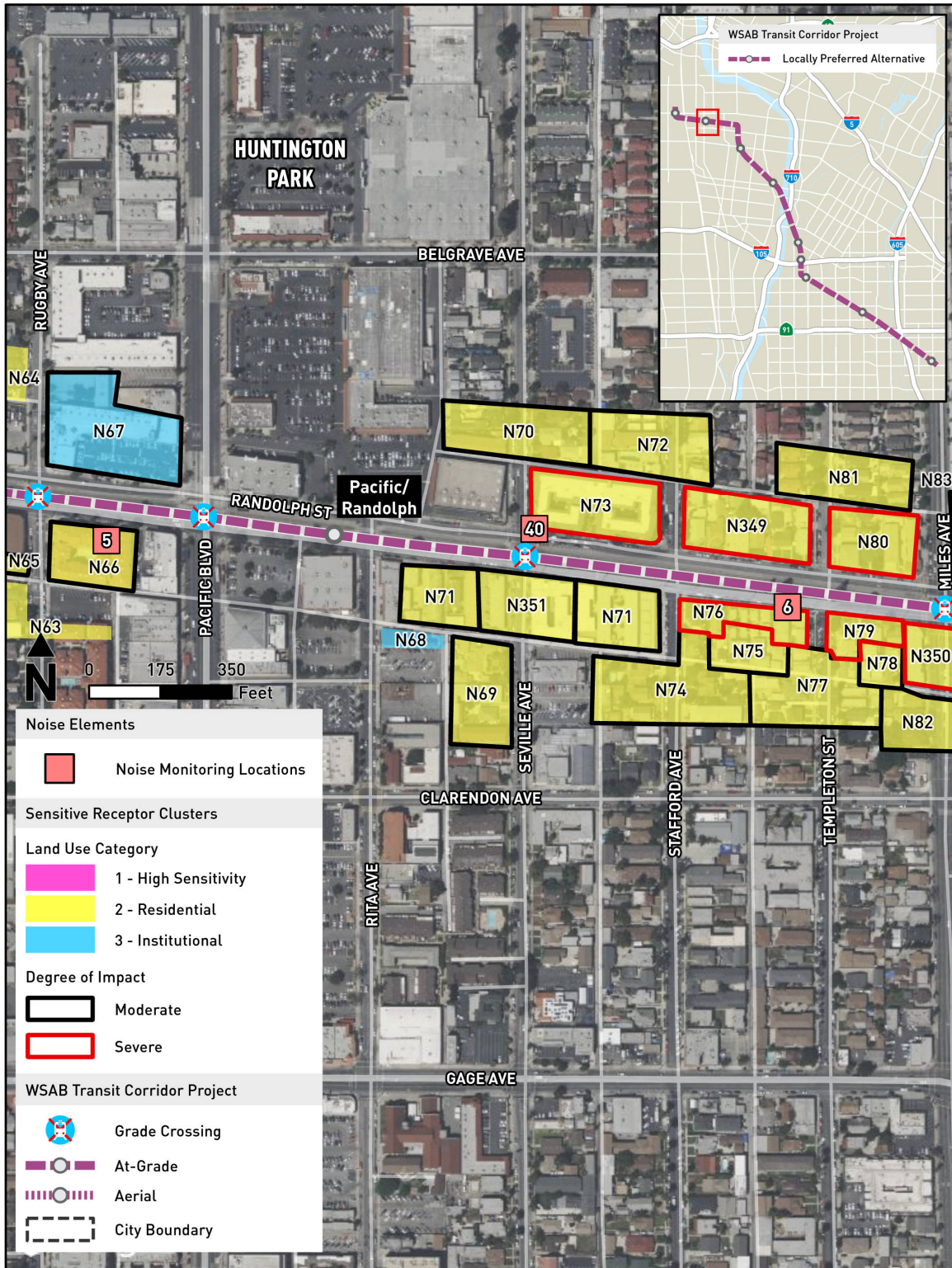
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Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



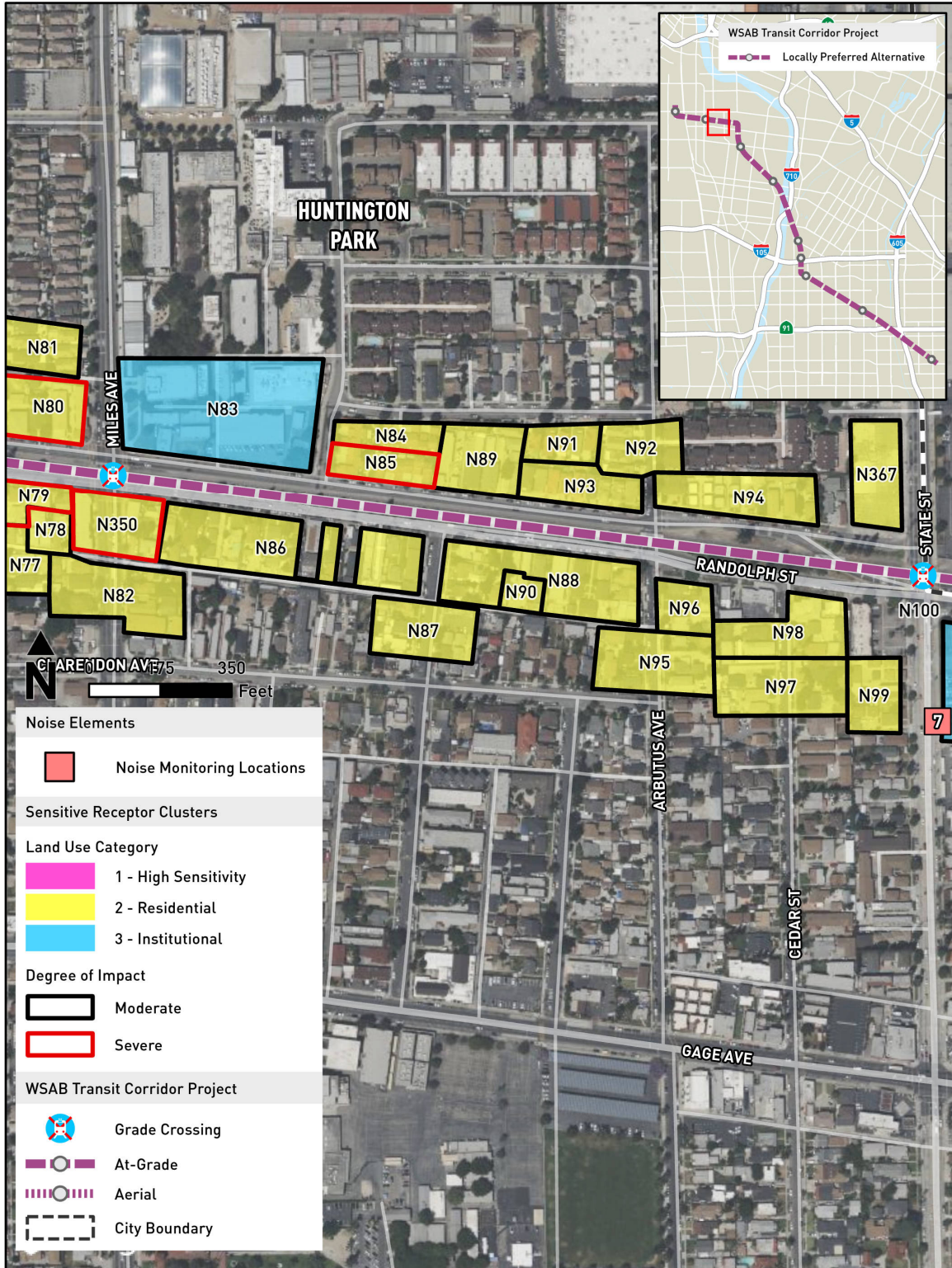
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Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



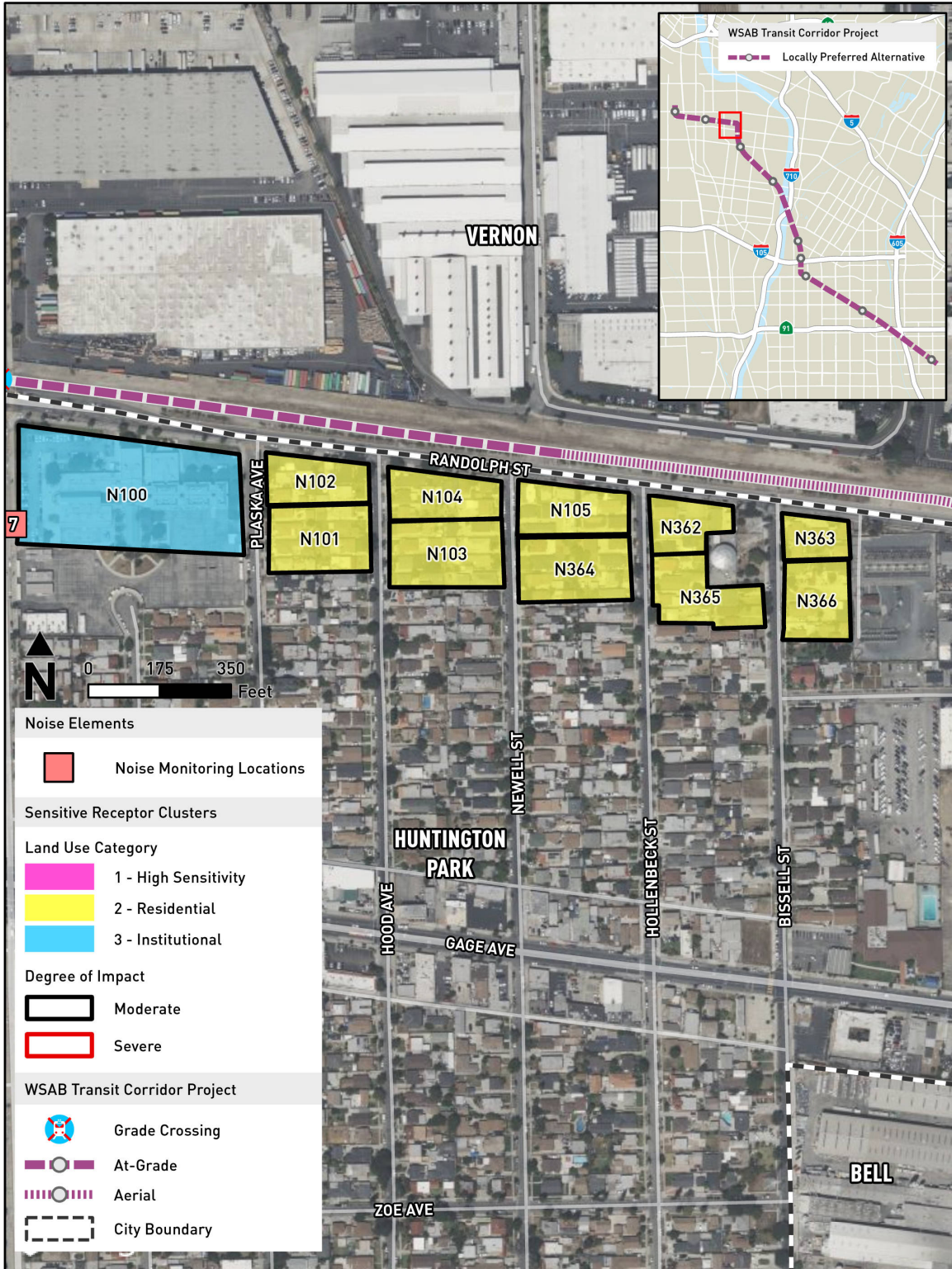
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Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



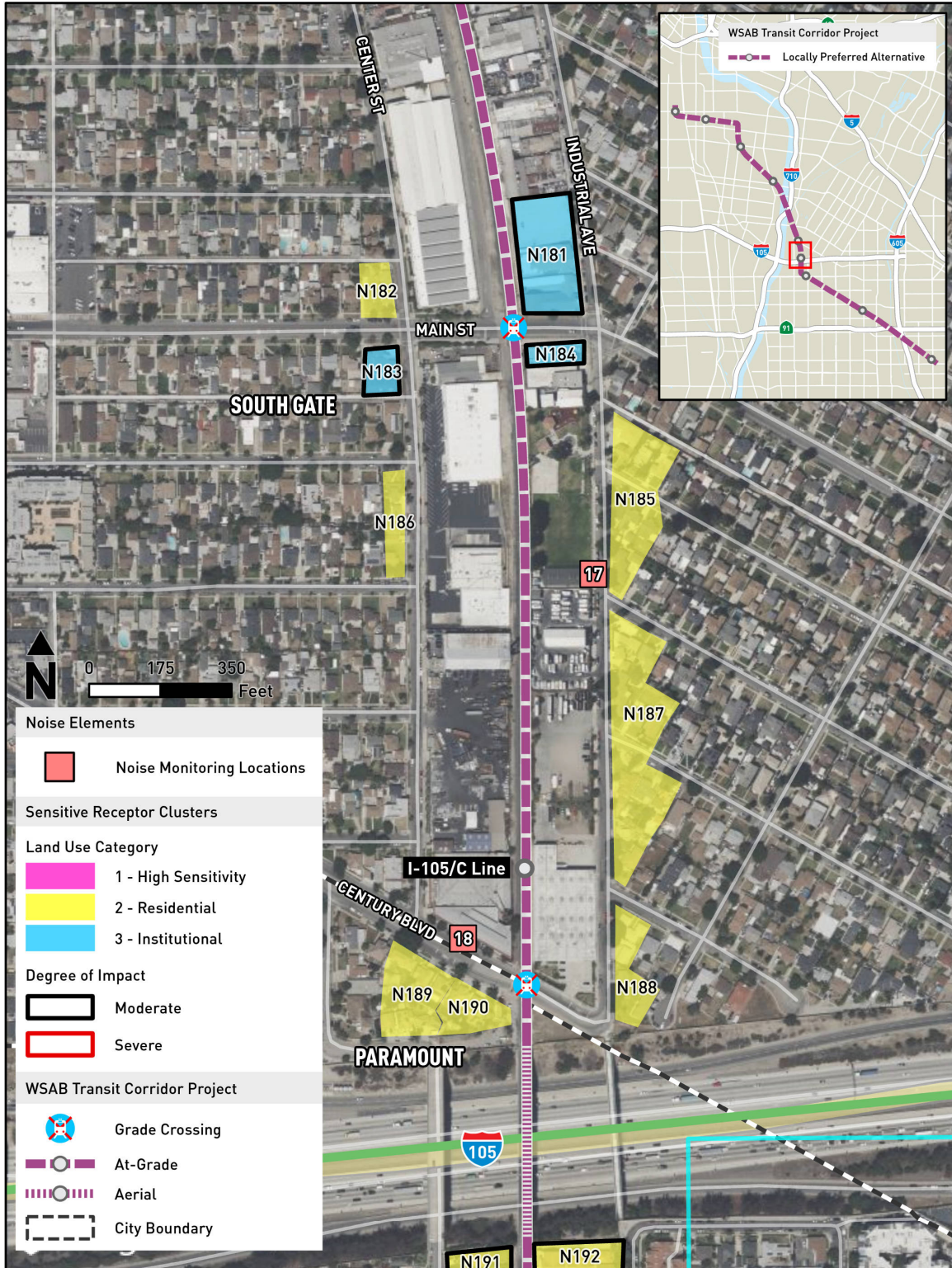
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Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



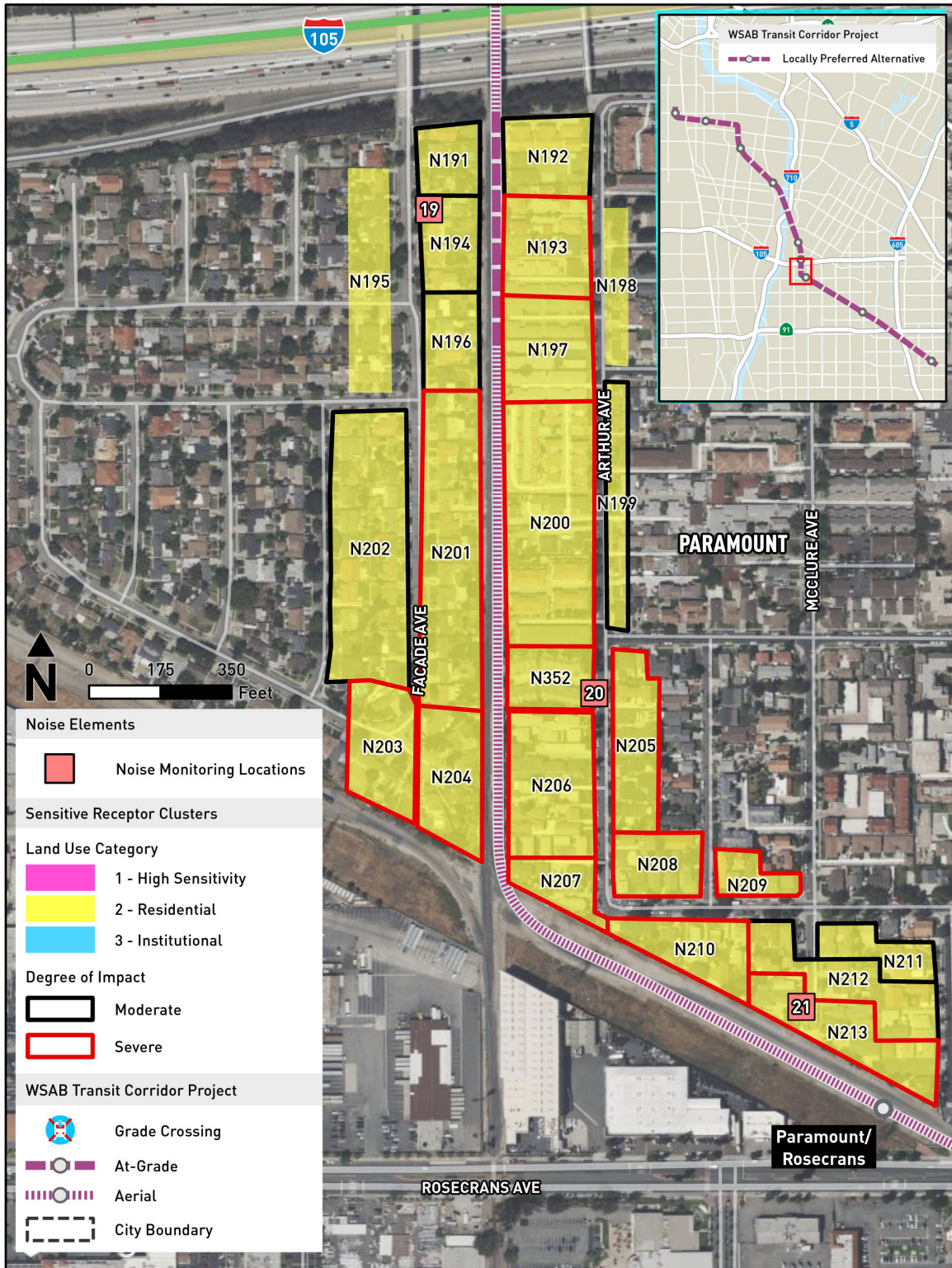
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Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



Appendix E

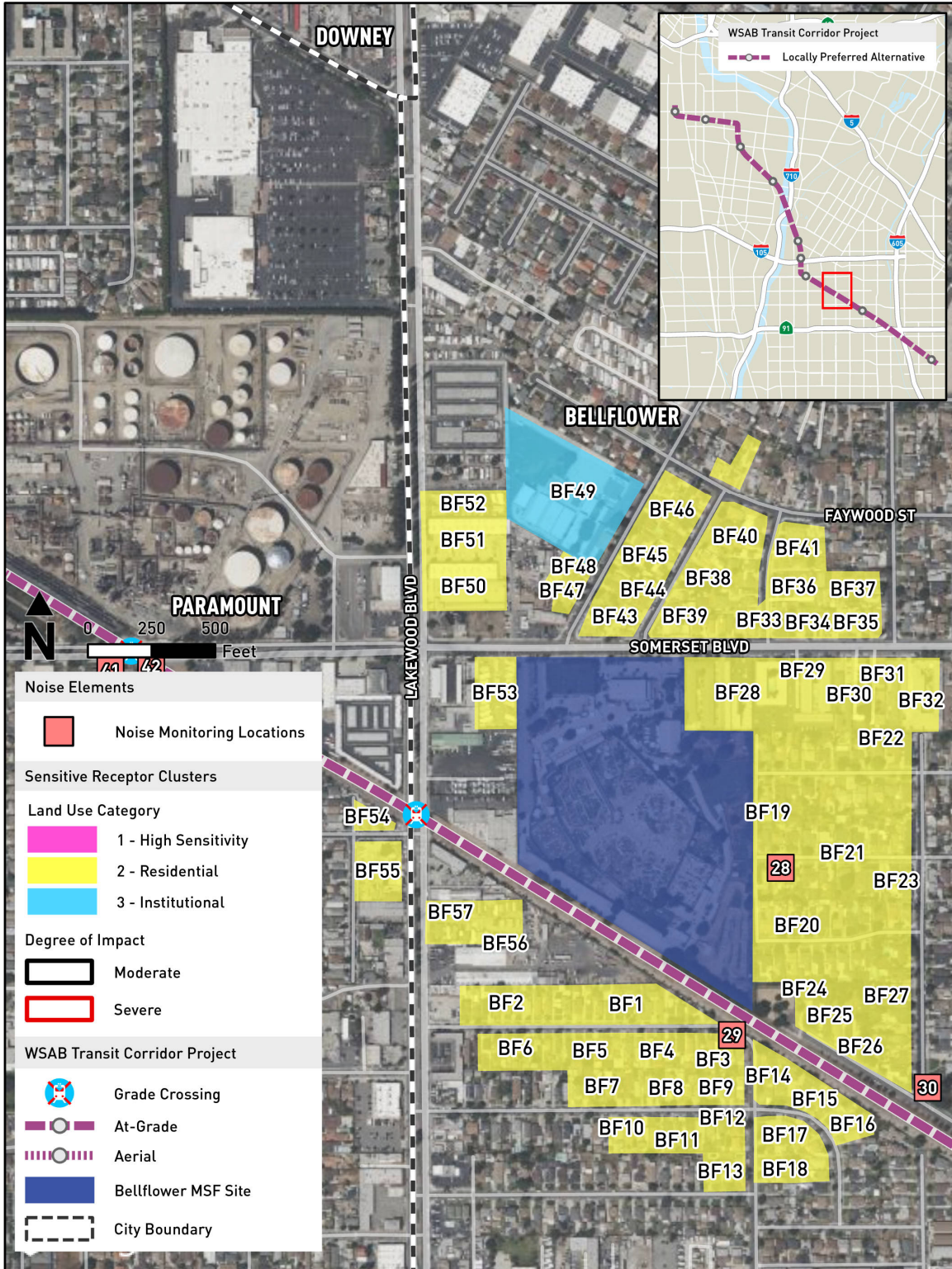
Unmitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



APPENDIX F UNMITIGATED MAINTENANCE AND STORAGE FACILITY NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS

Appendix F

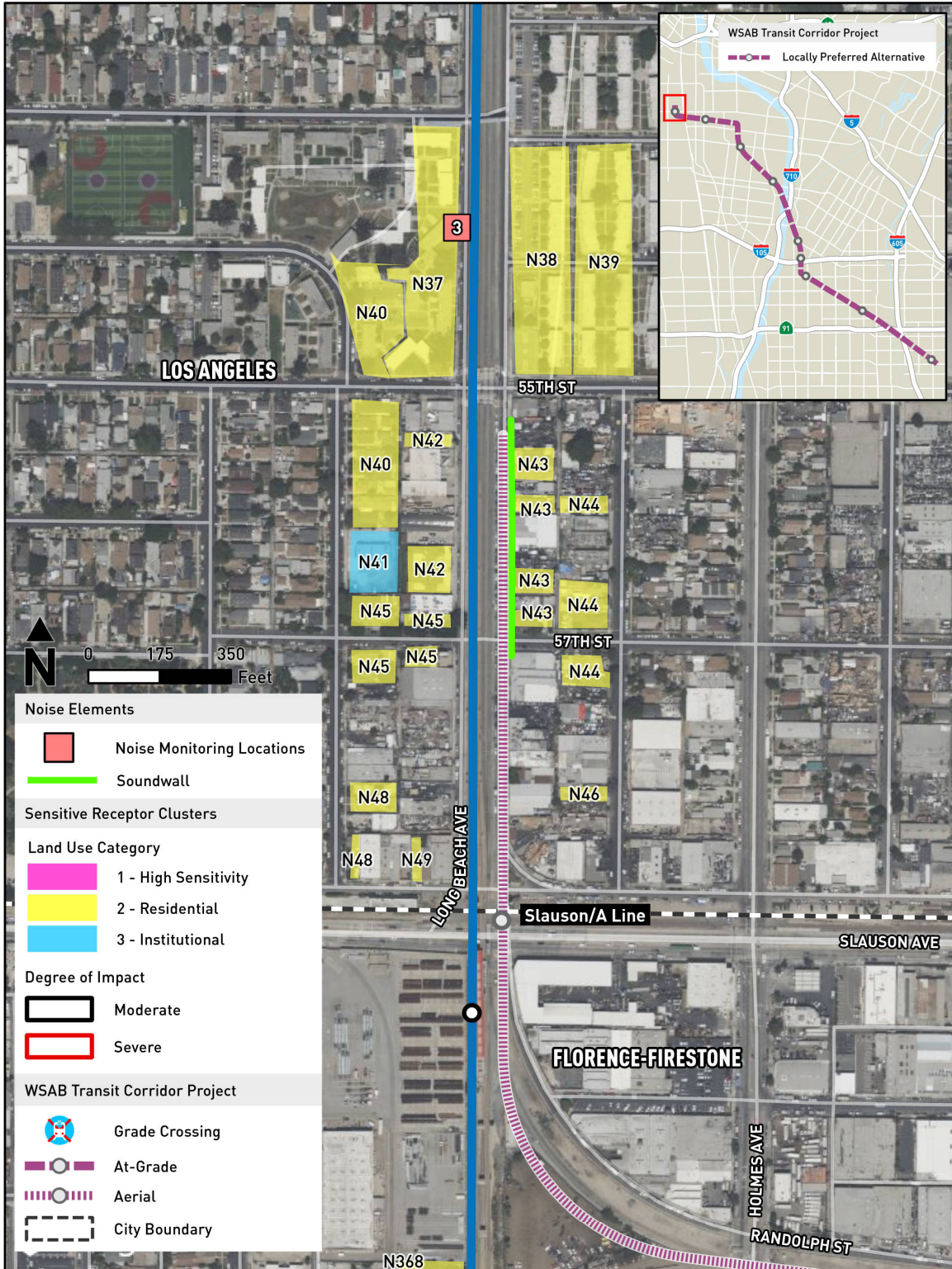
Unmitigated Maintenance and Storage Facility Noise Clusters, Noise Monitoring Locations and Impacts



APPENDIX G MITIGATED LRT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS

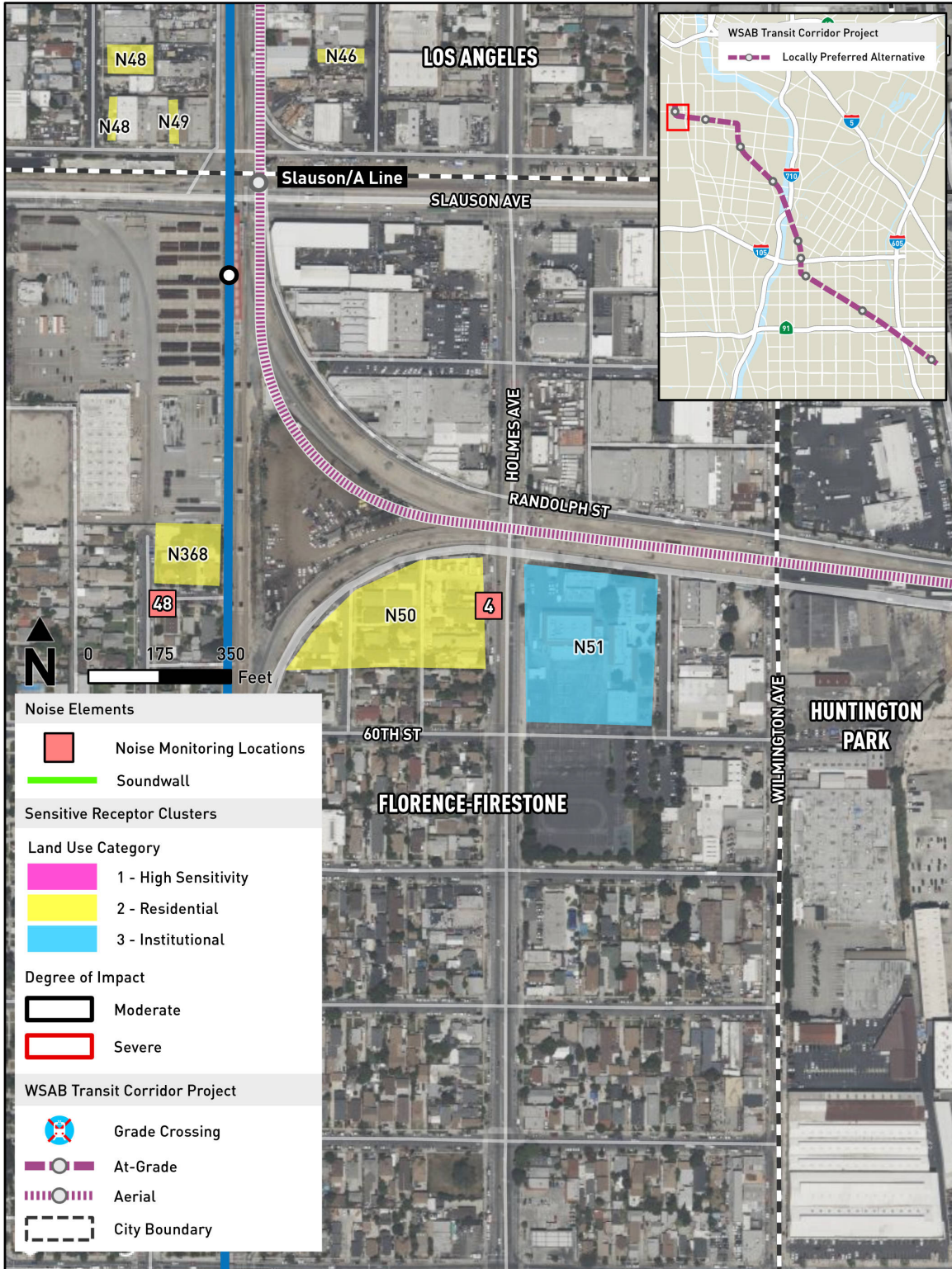
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



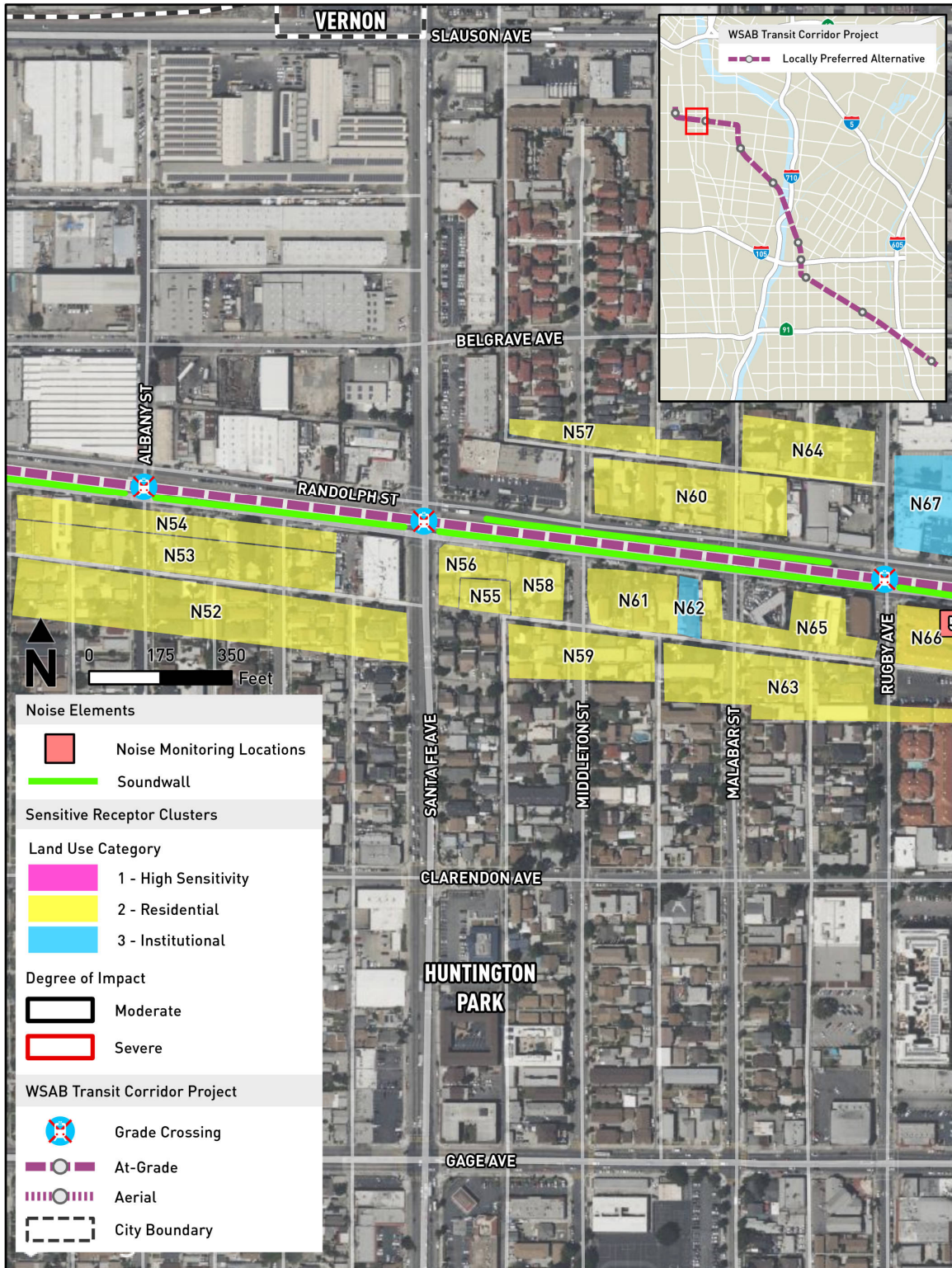
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



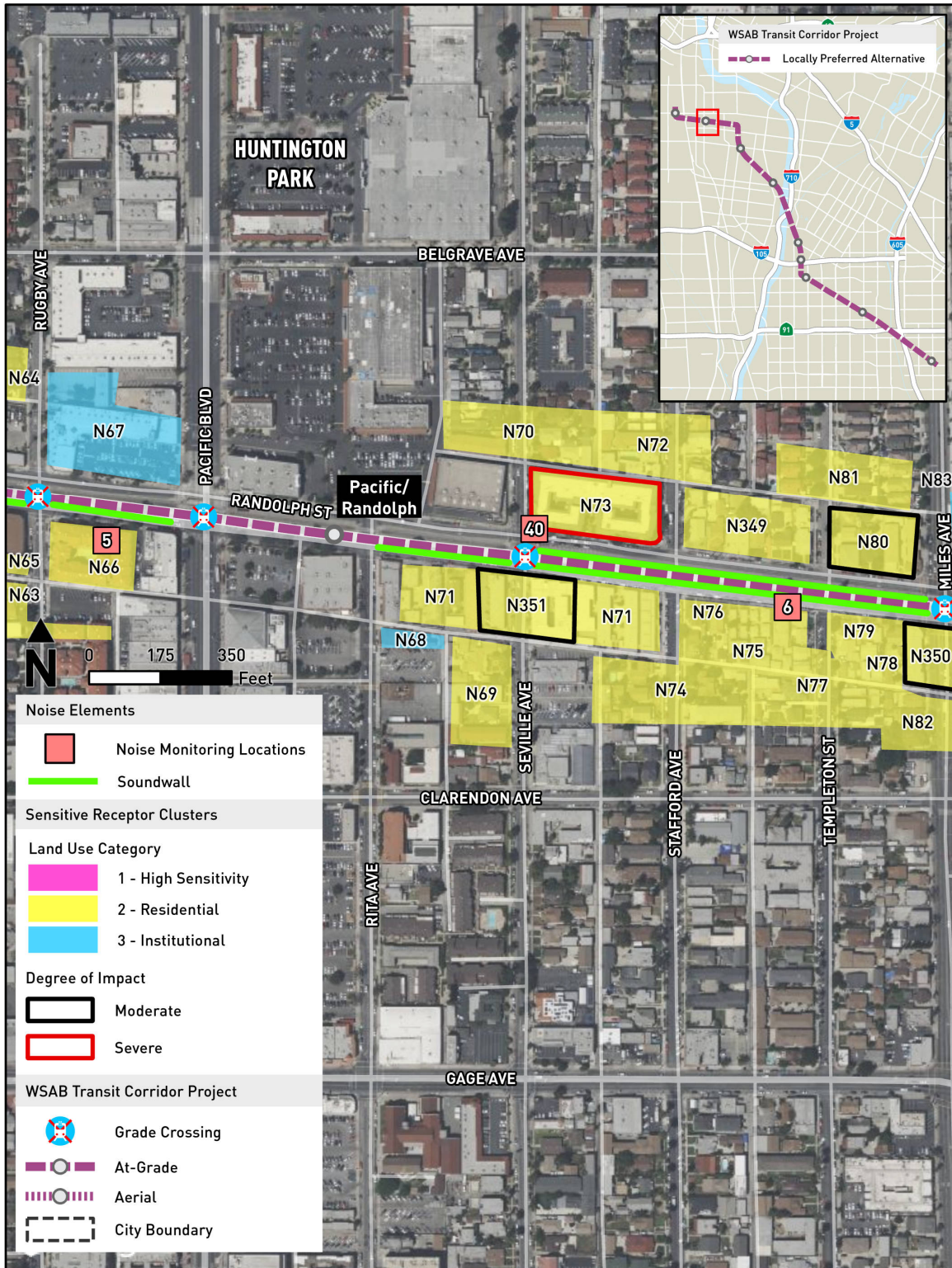
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



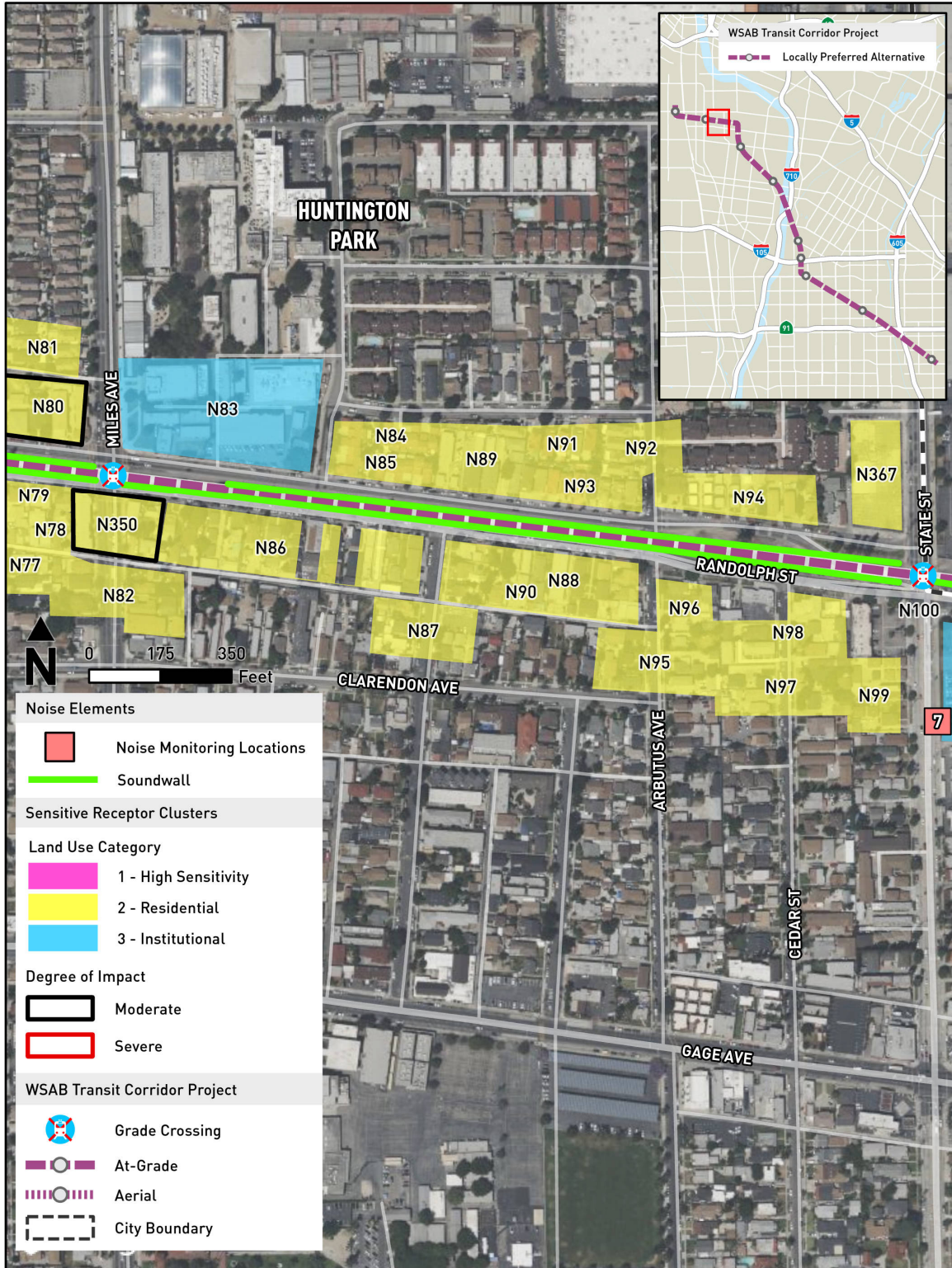
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



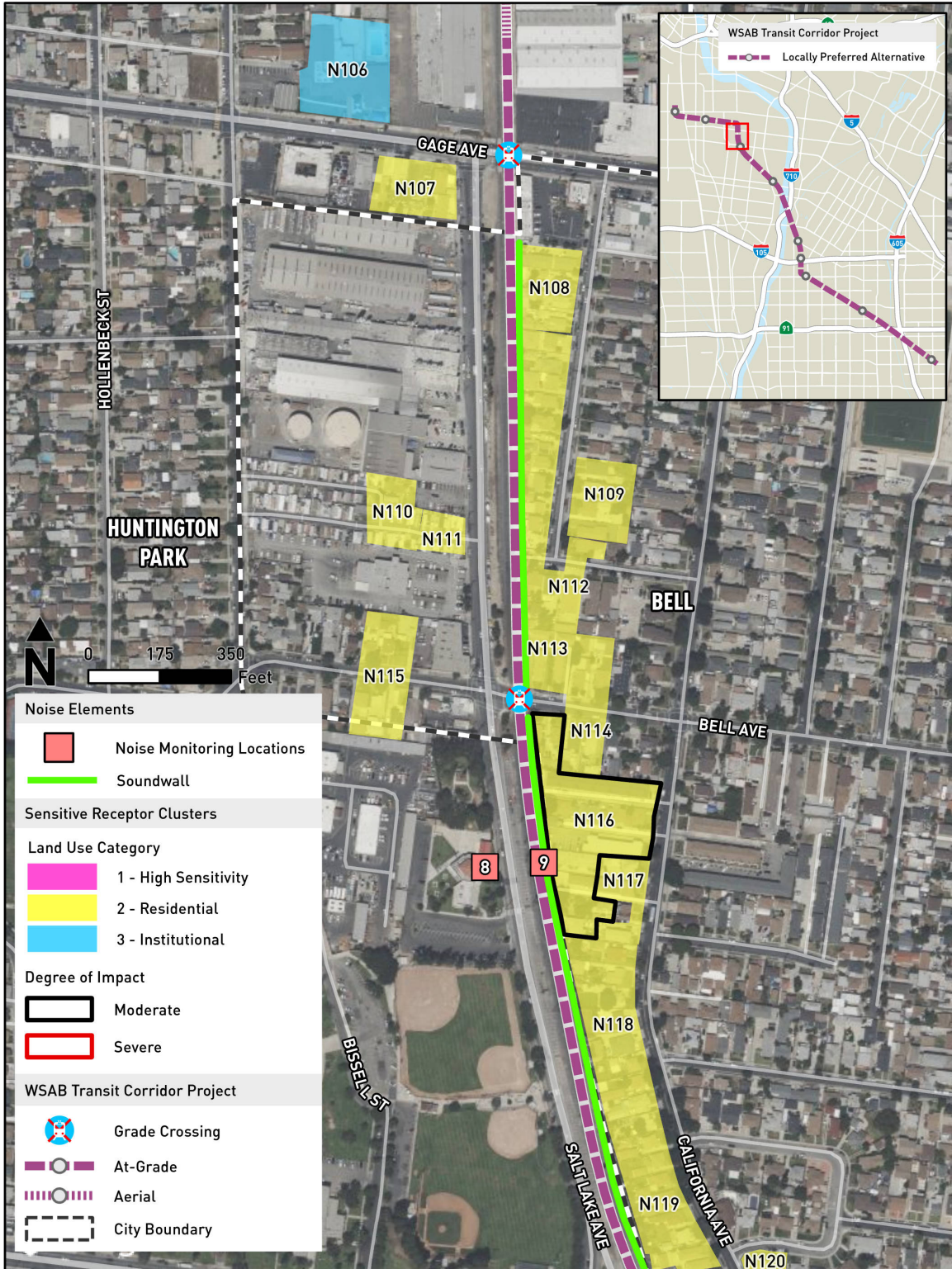
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



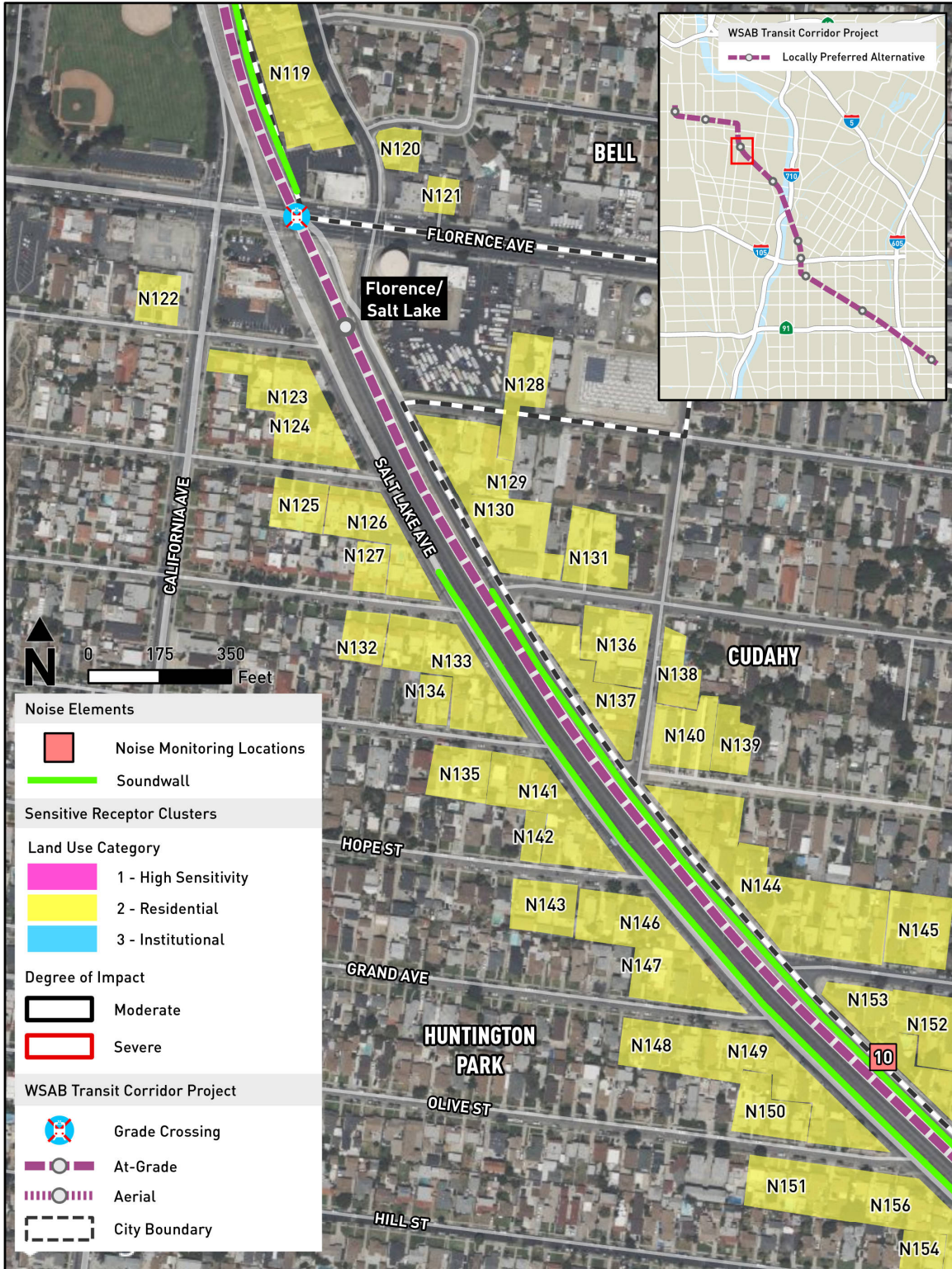
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



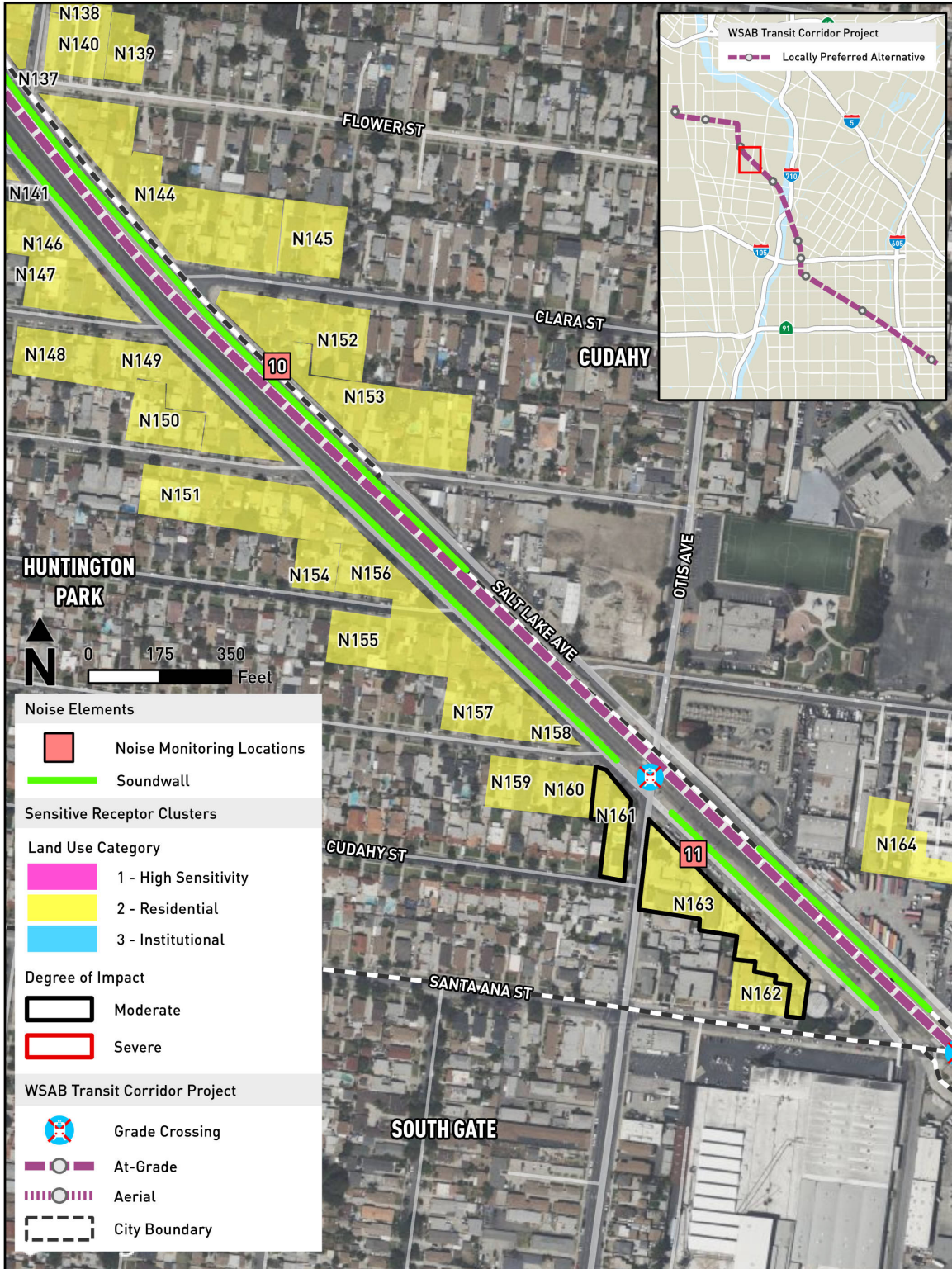
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



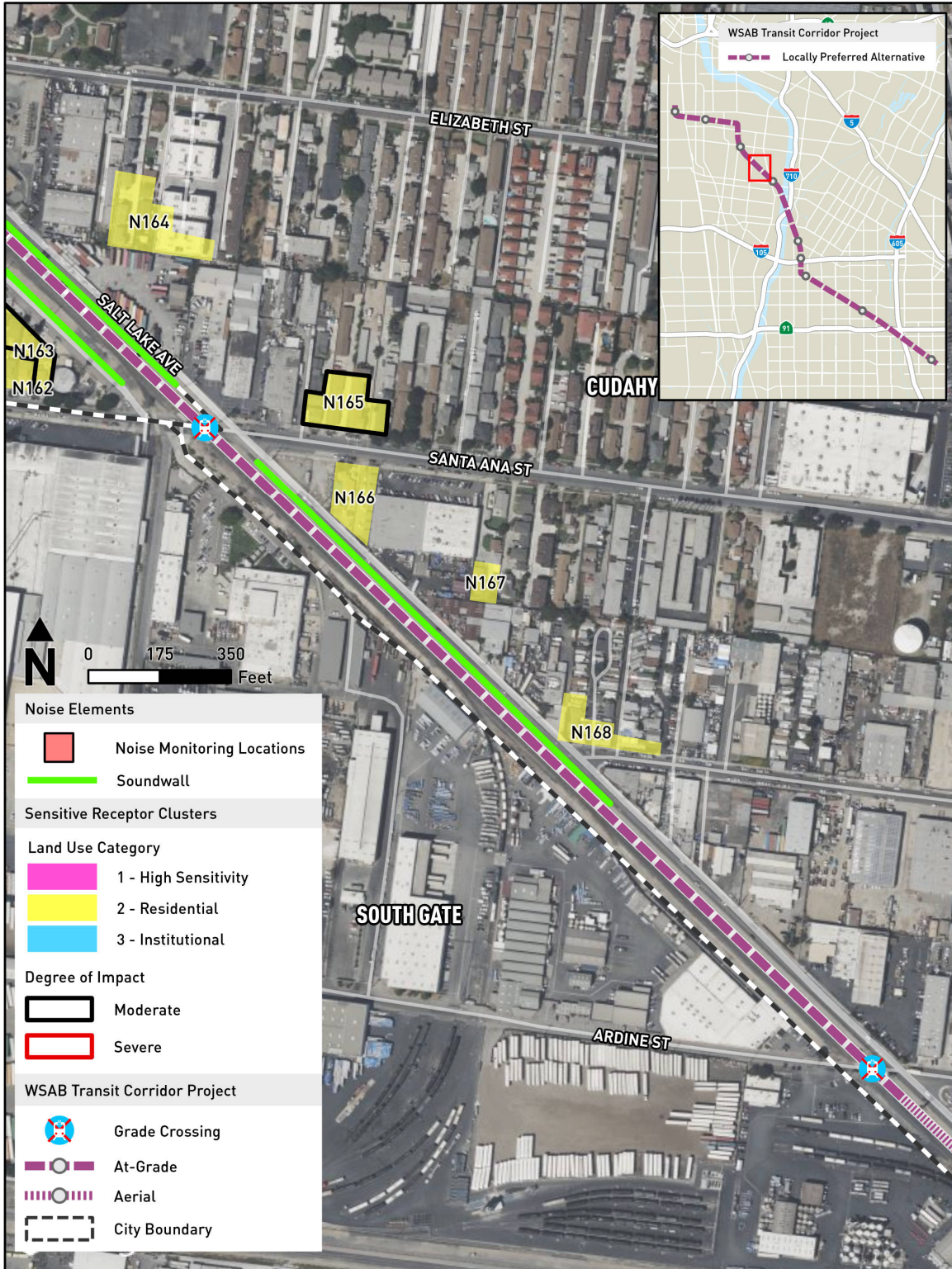
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



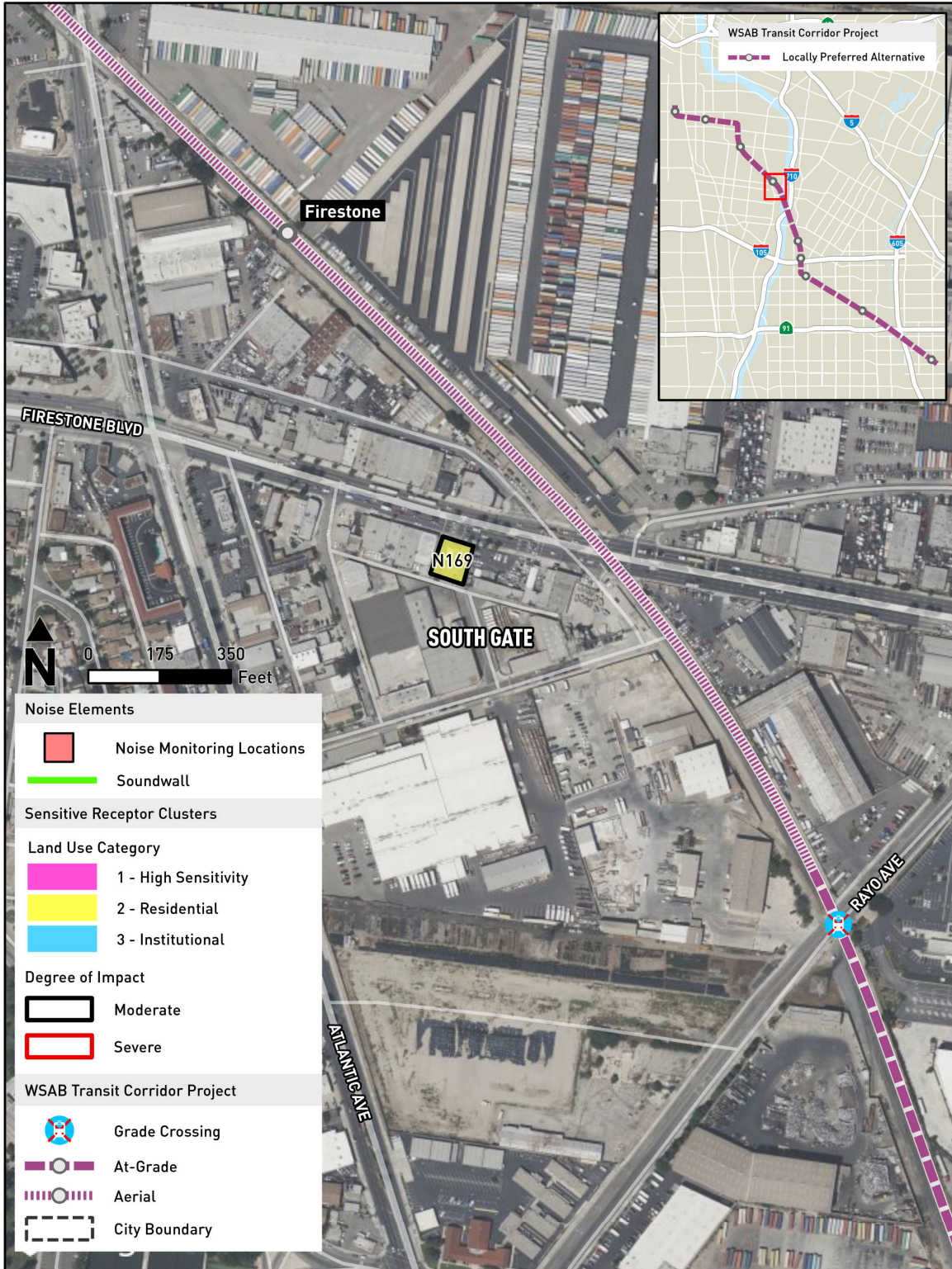
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



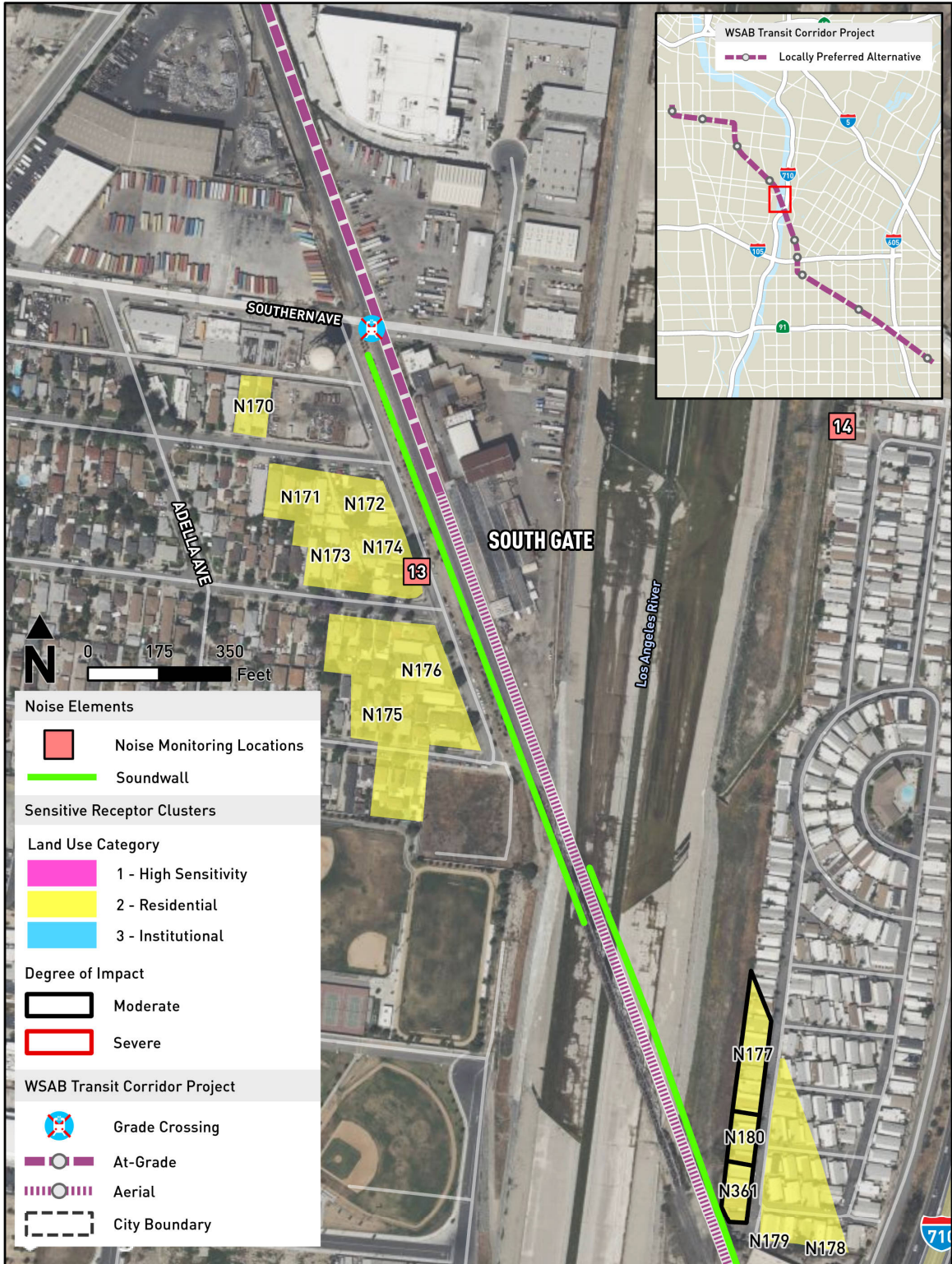
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



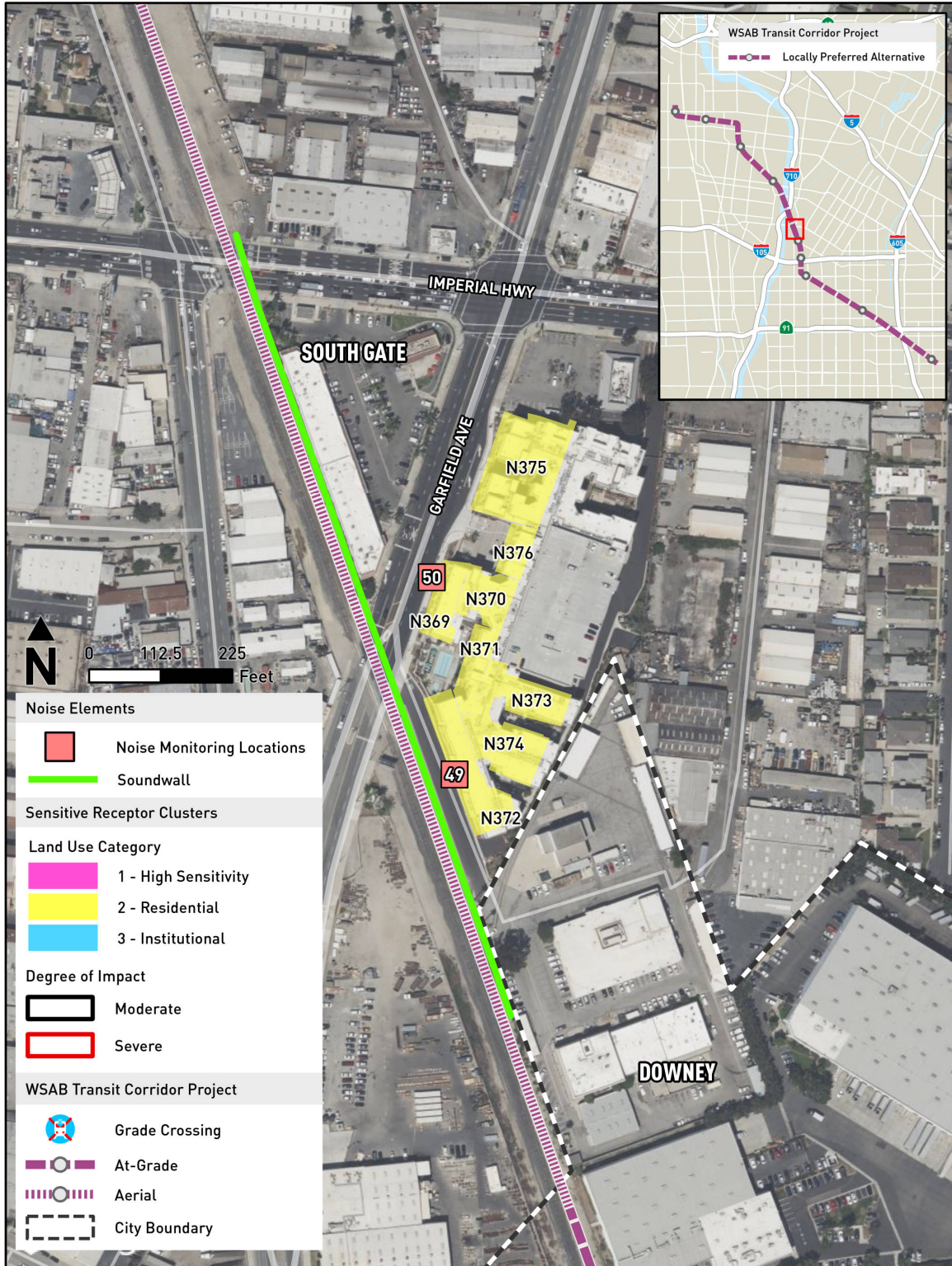
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



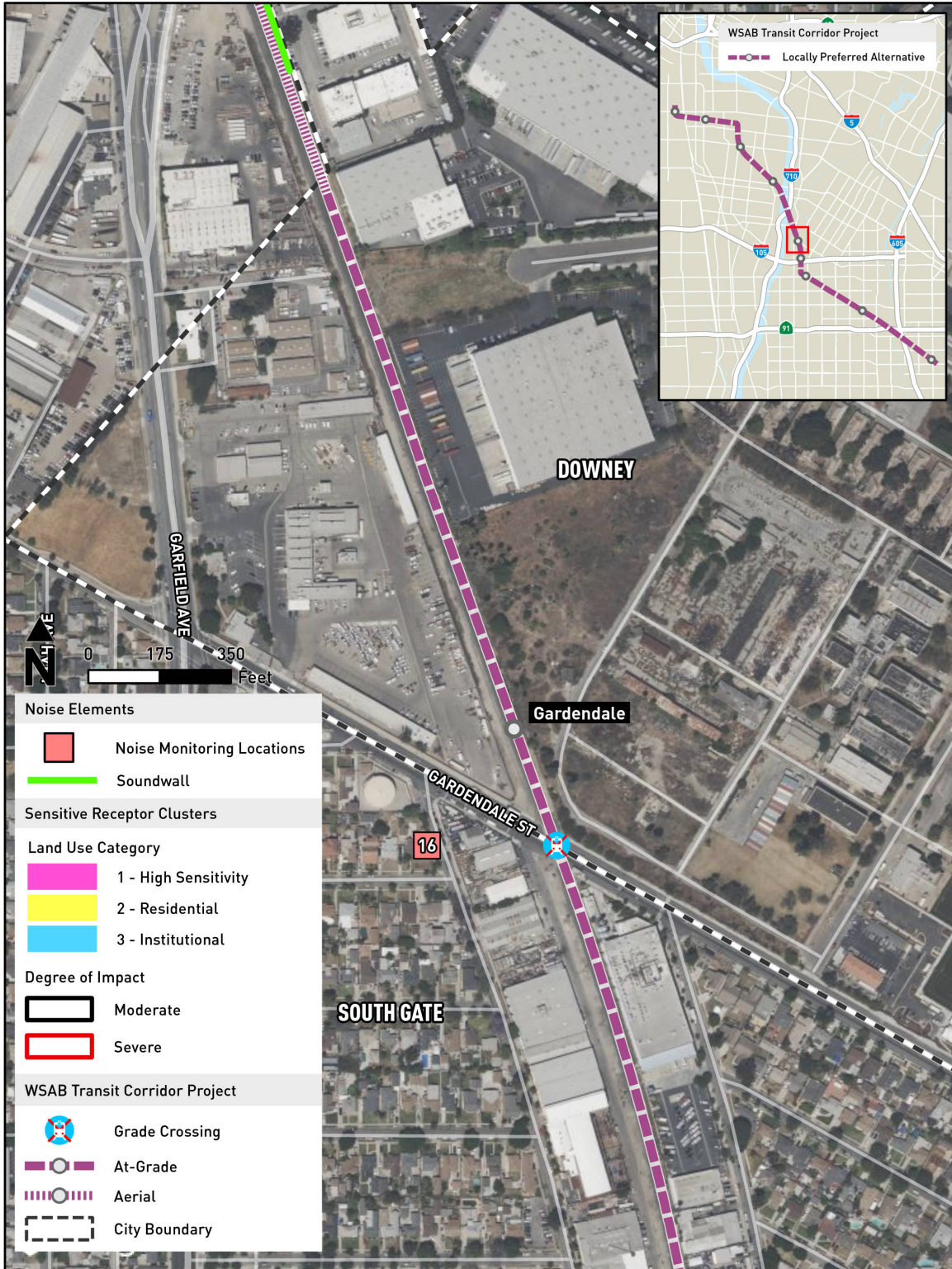
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



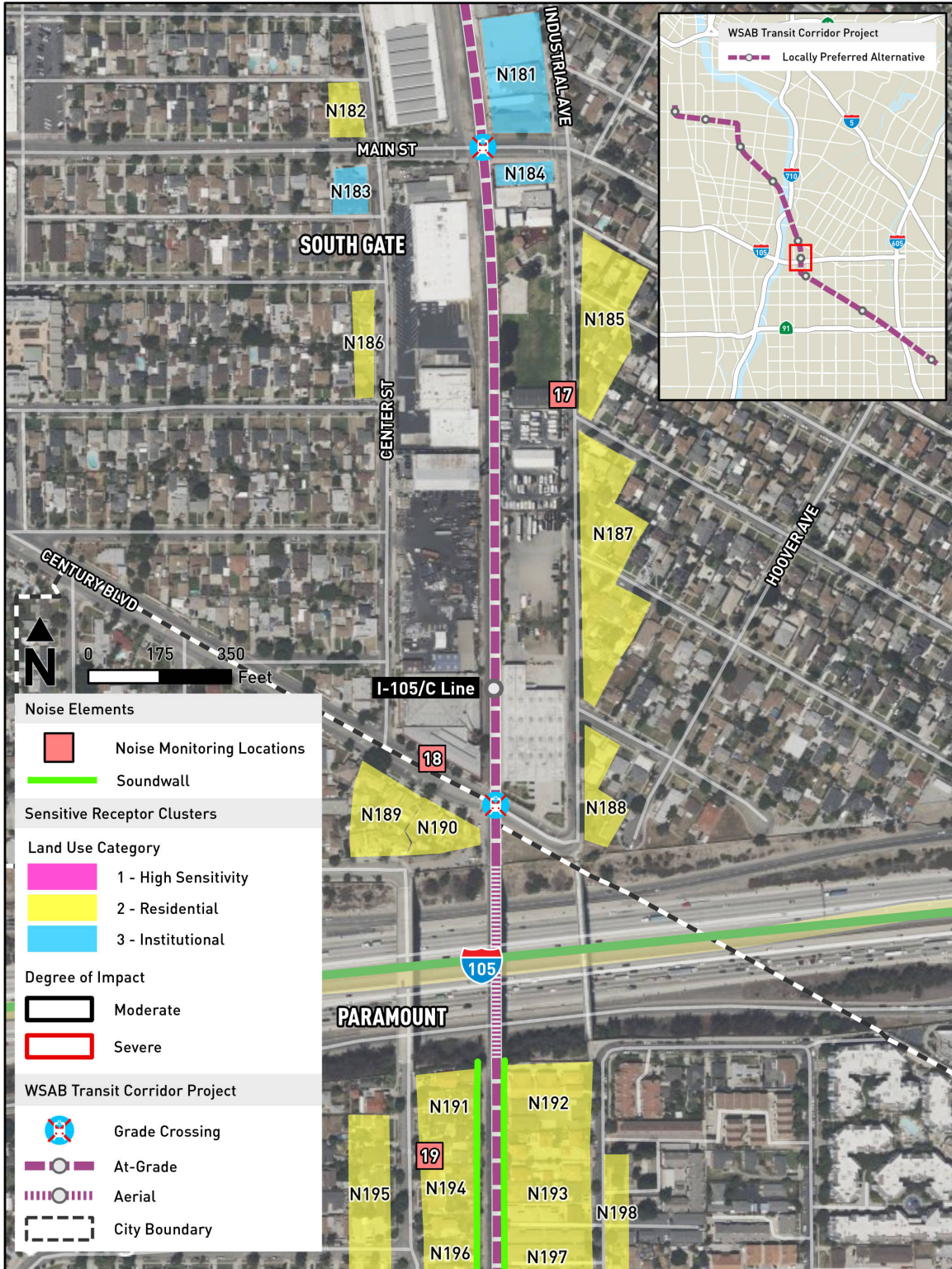
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



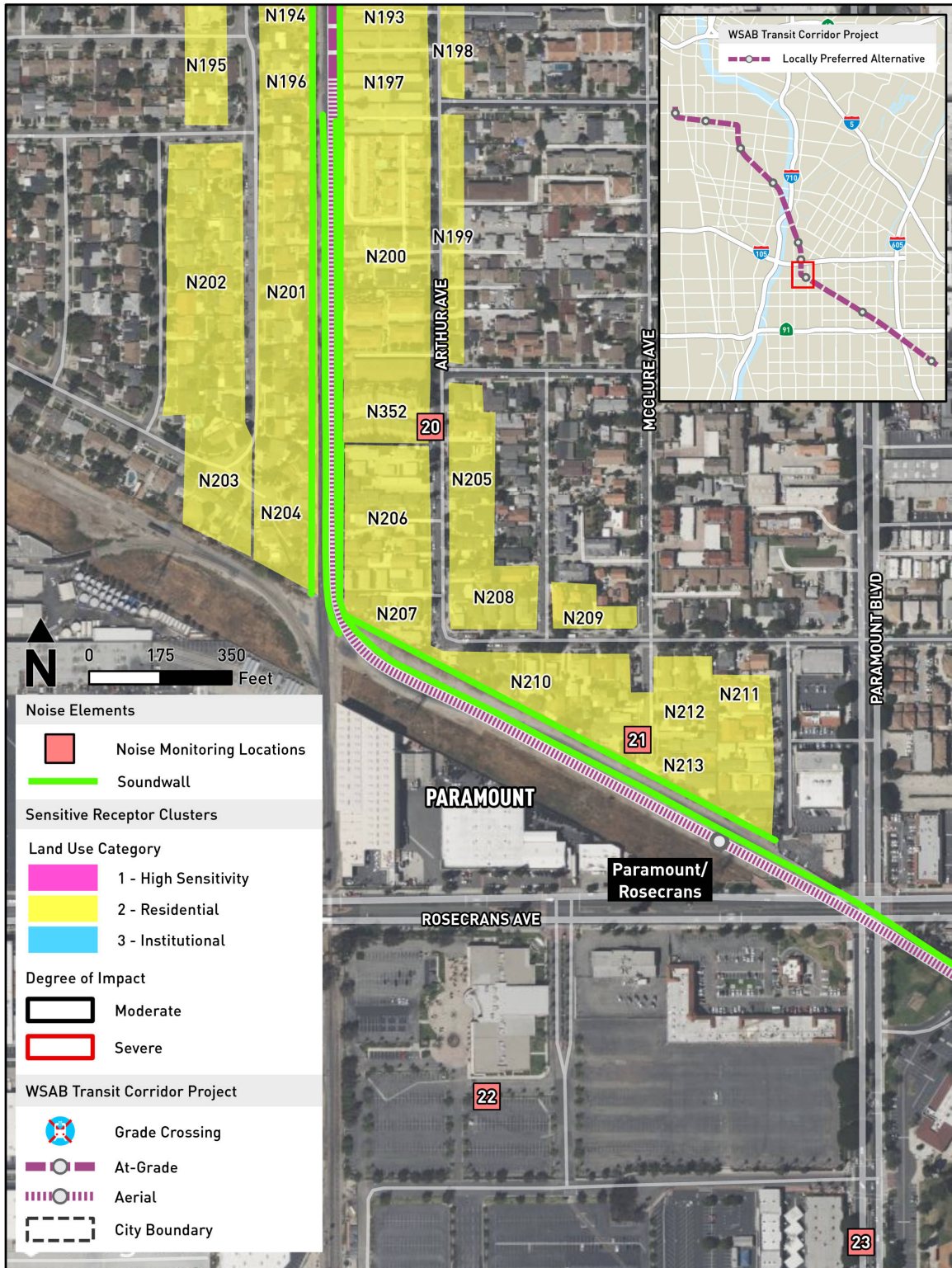
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



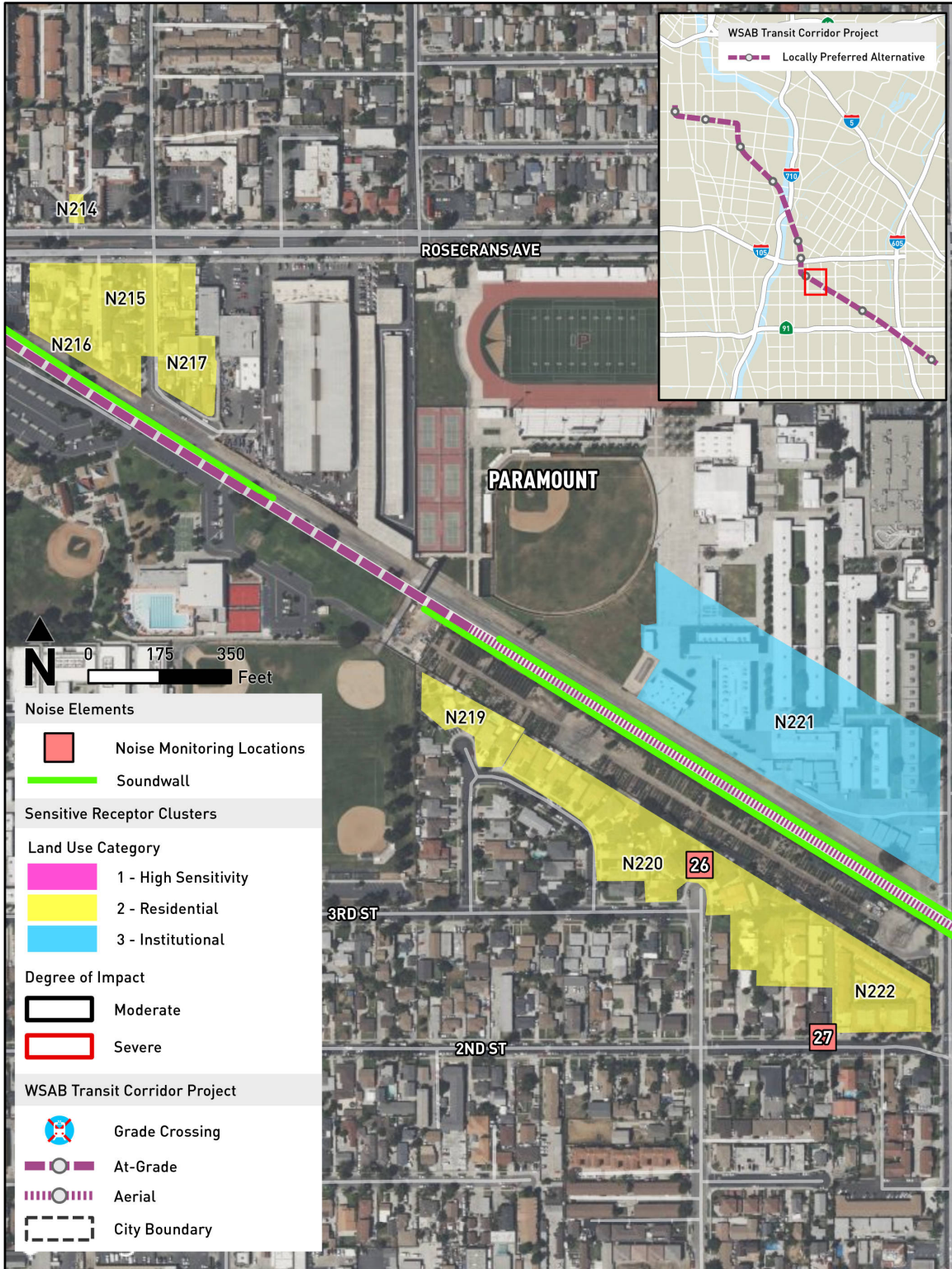
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



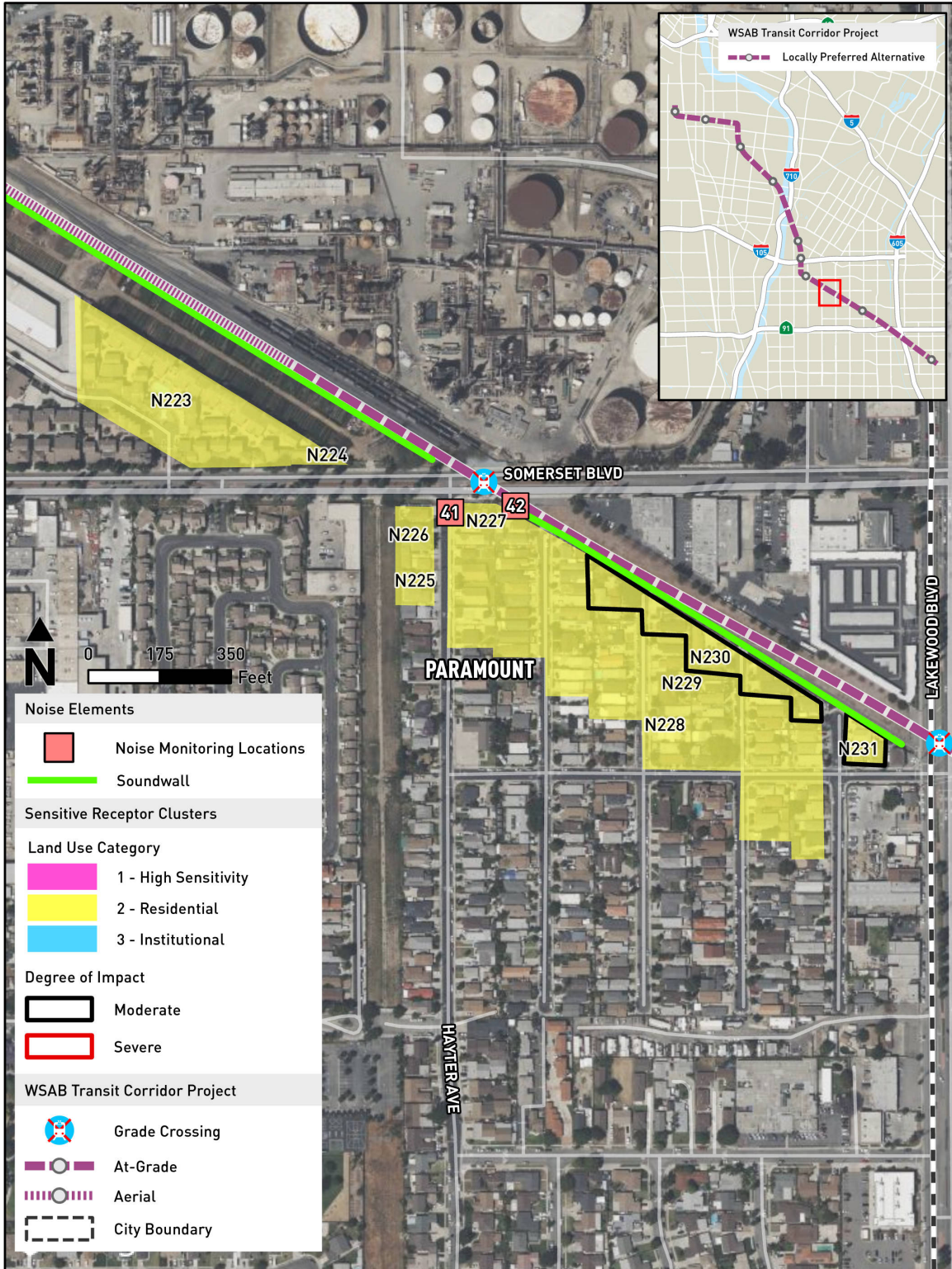
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



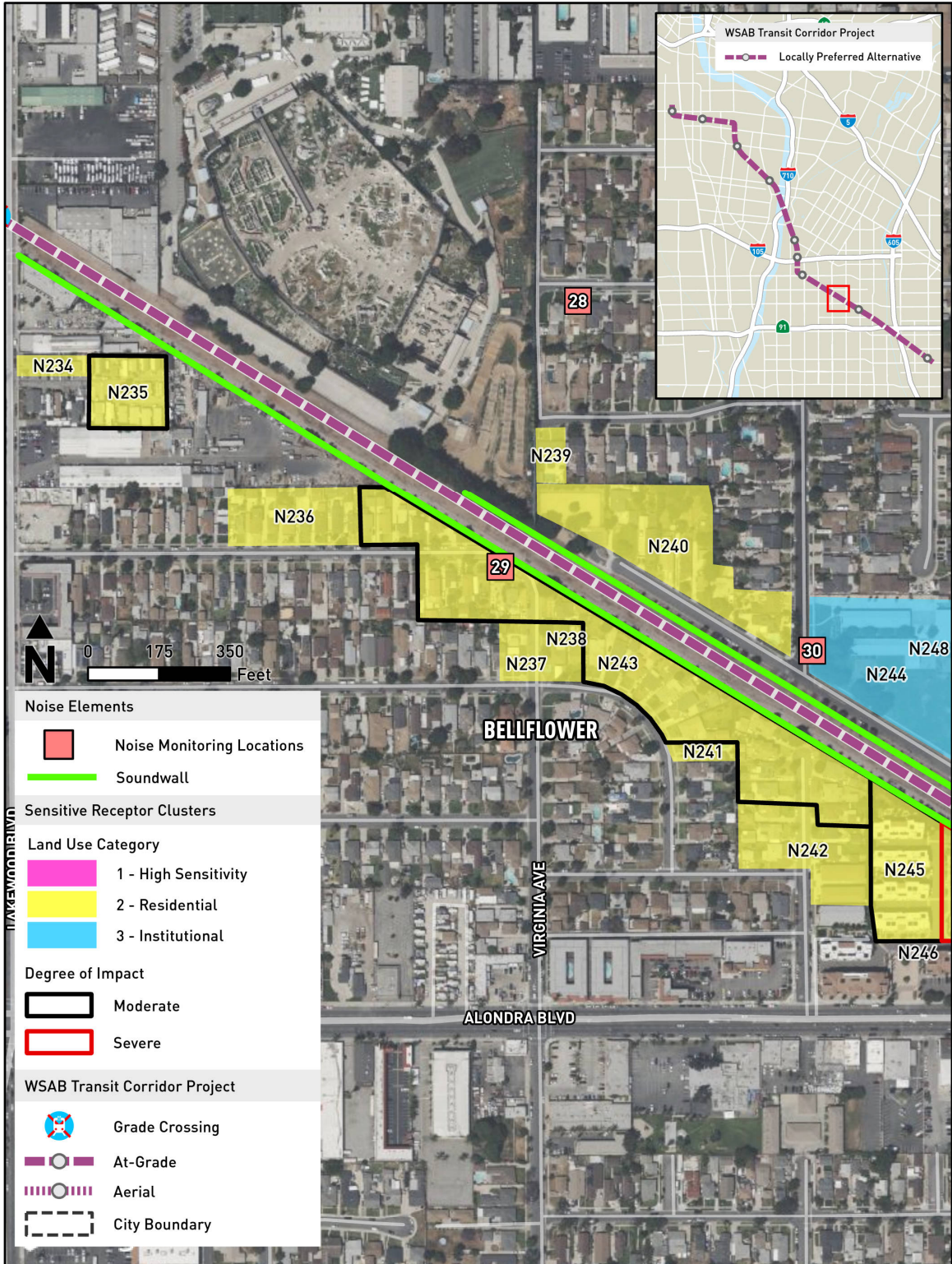
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



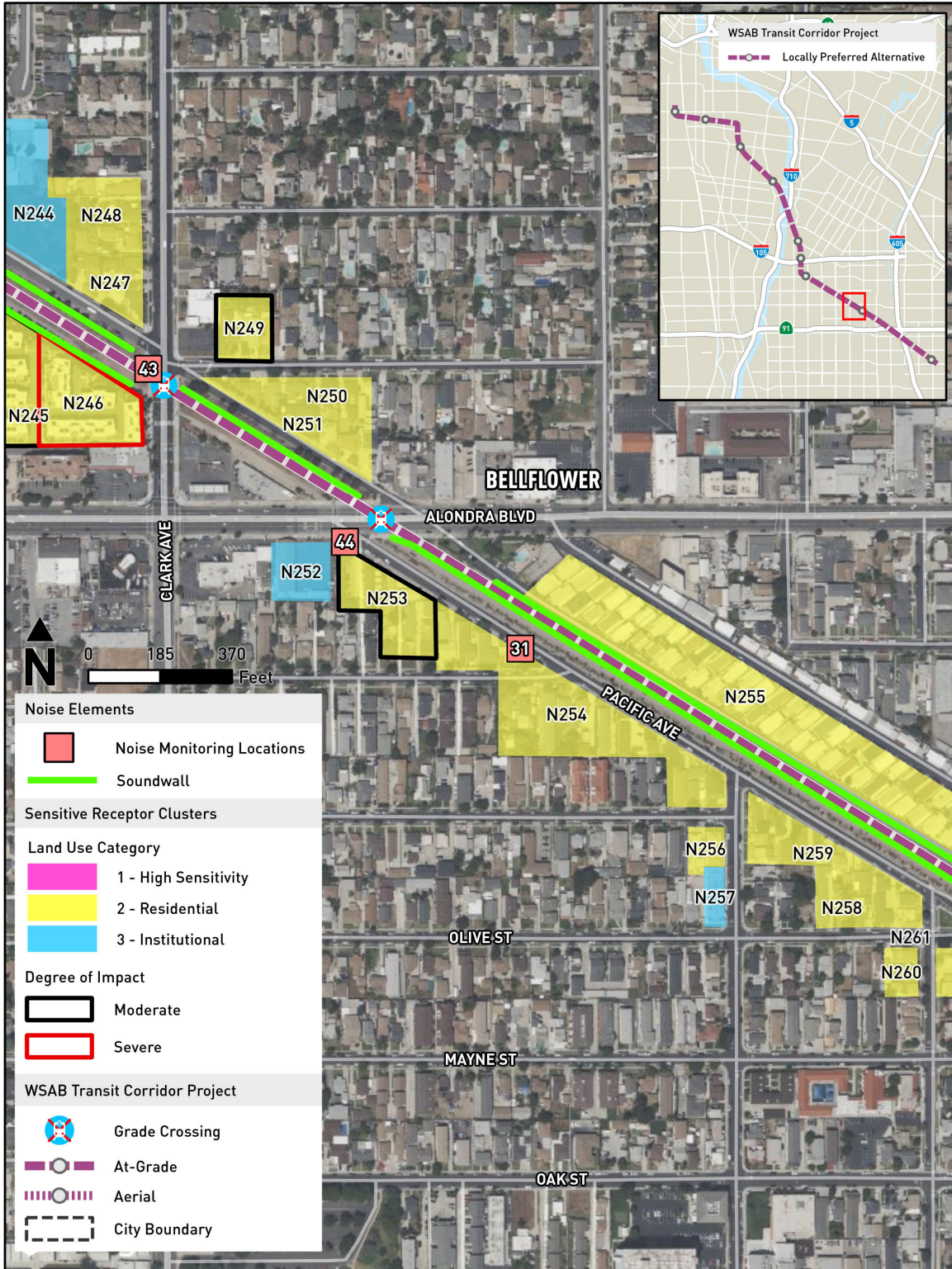
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



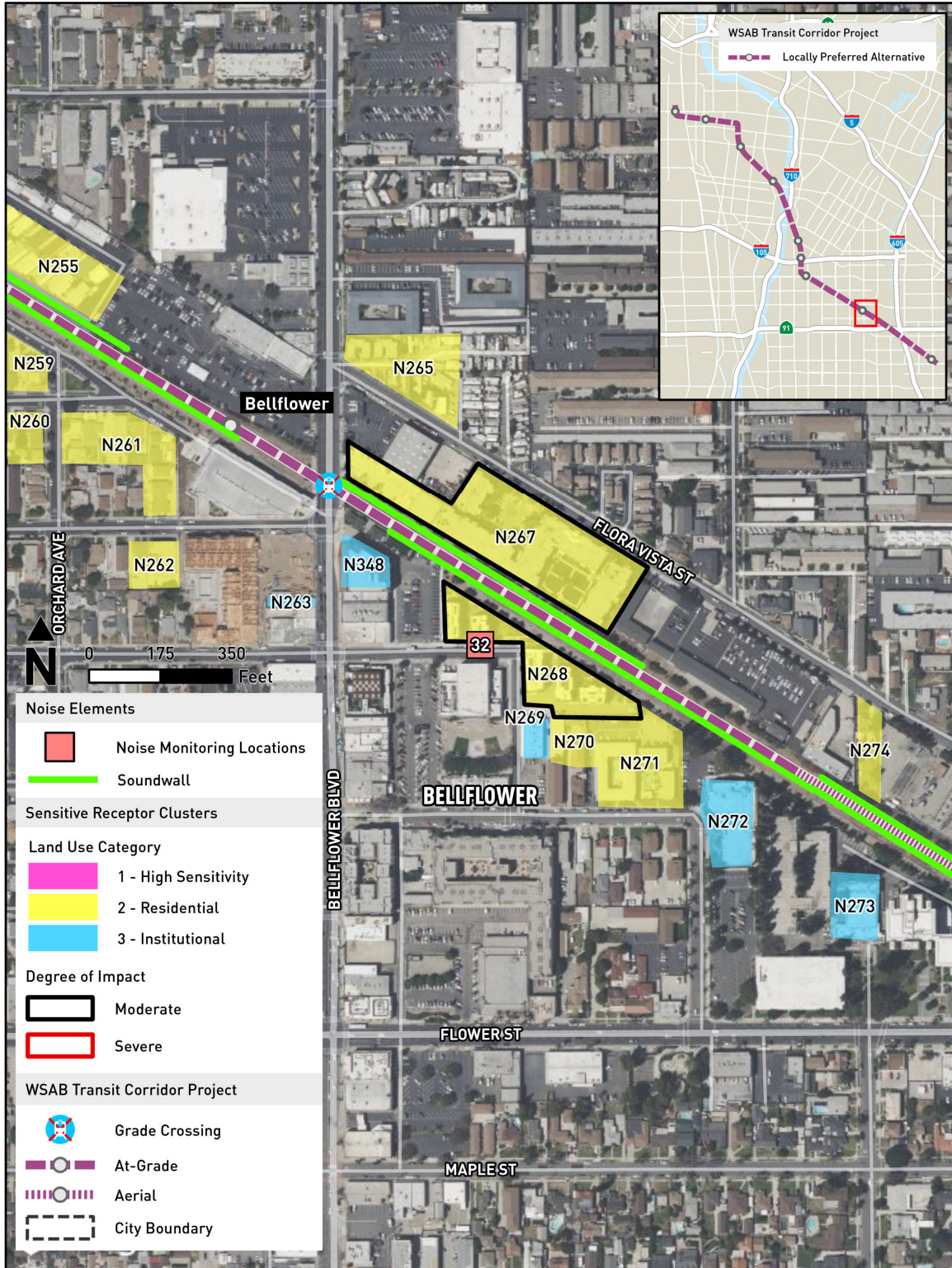
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



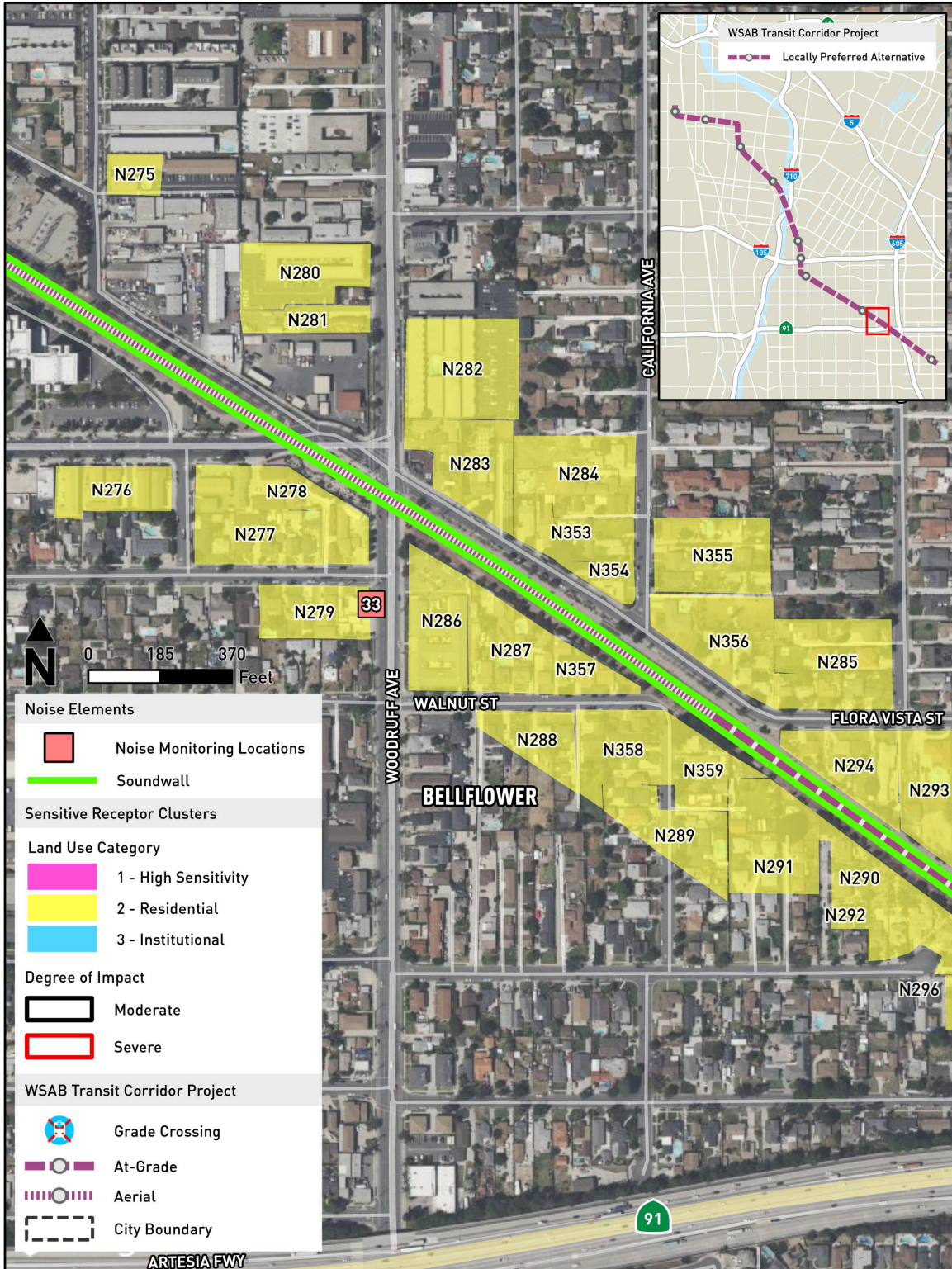
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



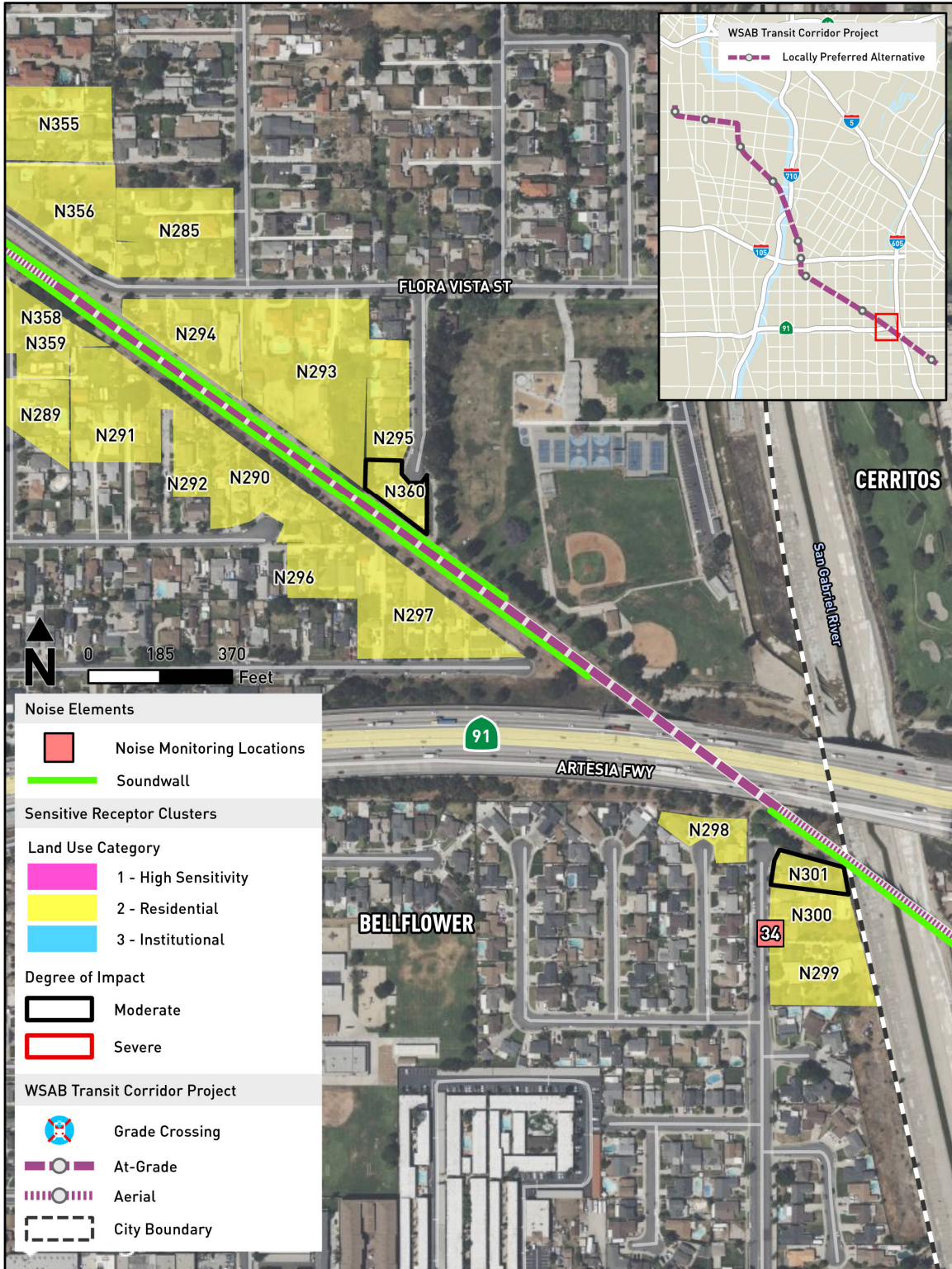
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



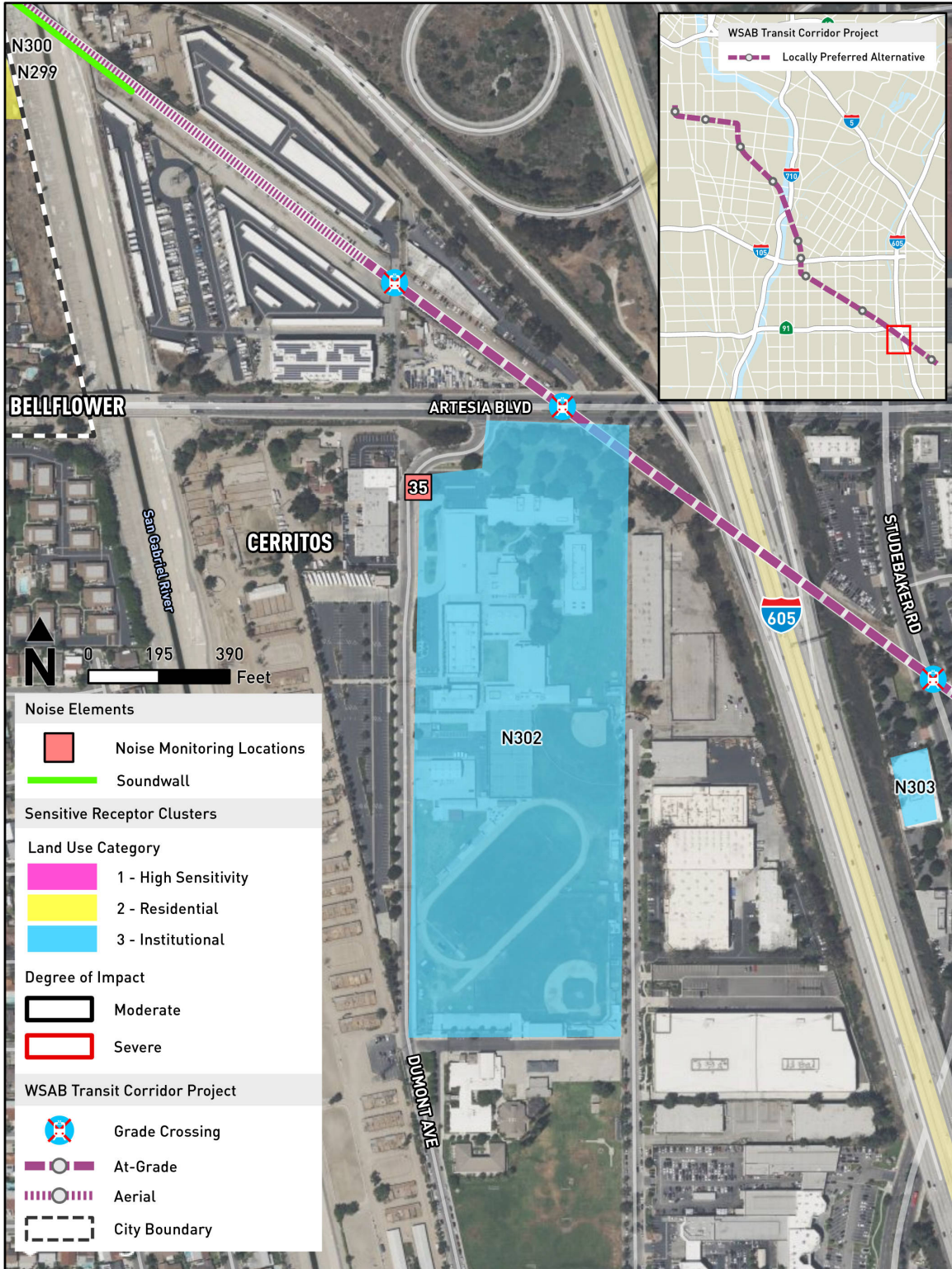
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



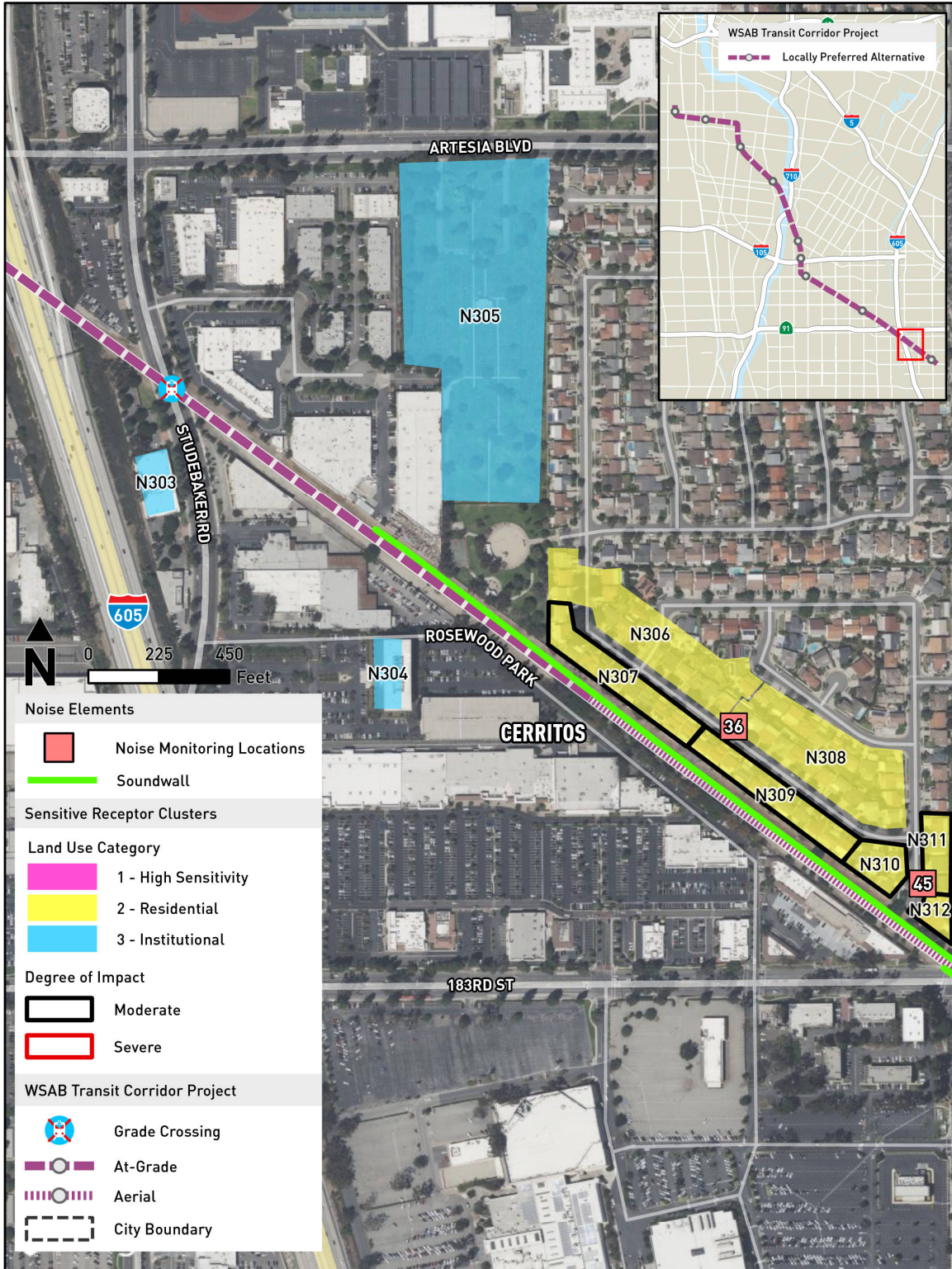
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



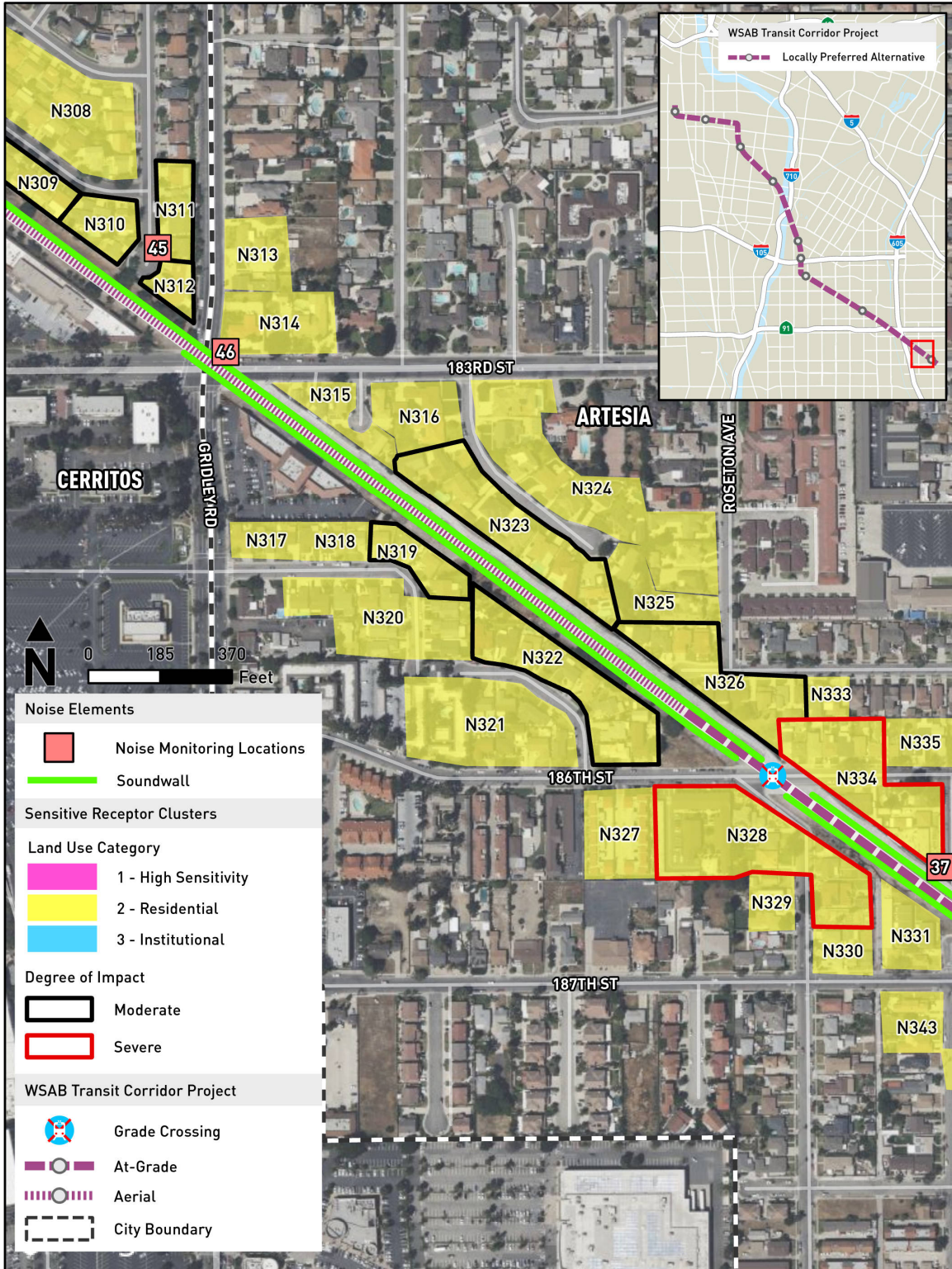
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Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



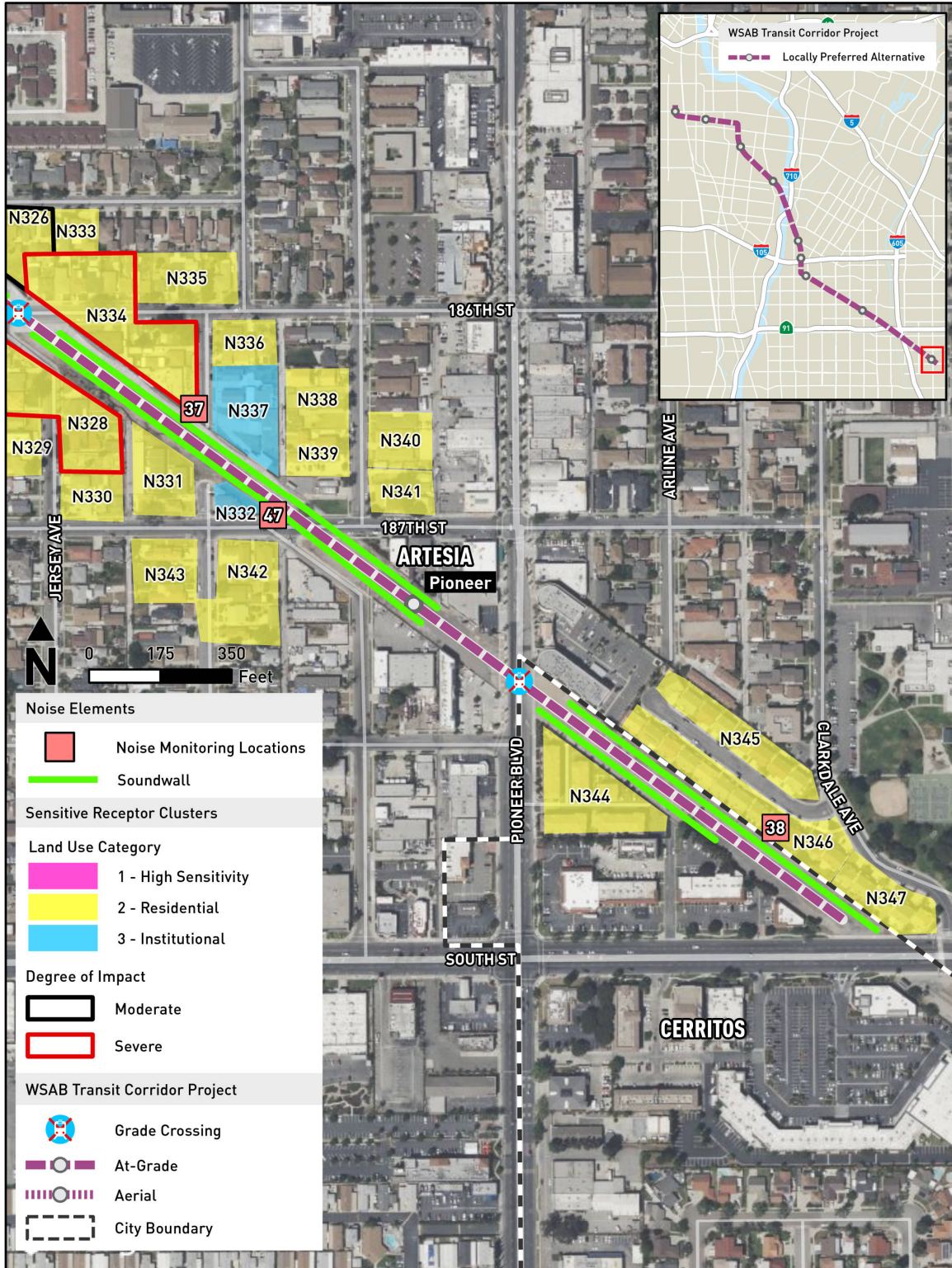
Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



Appendix G

Mitigated LRT Noise Clusters, Noise Monitoring Locations and Impacts



APPENDIX H MITIGATED VIBRATION CLUSTERS

Appendix H

Mitigated Vibration Clusters



Appendix H

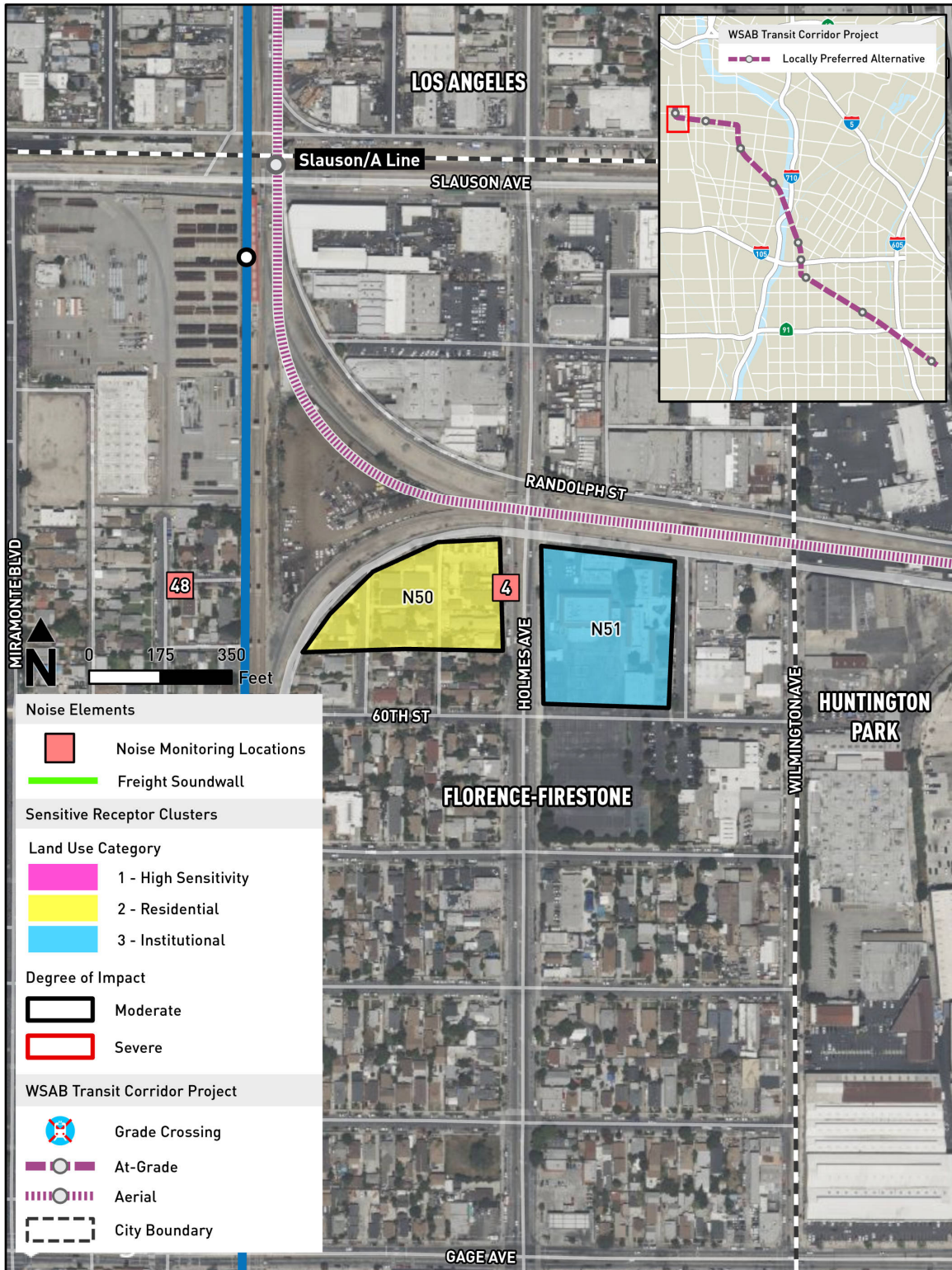
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APPENDIX I MITIGATED FREIGHT NOISE CLUSTERS, NOISE MONITORING LOCATIONS AND IMPACTS

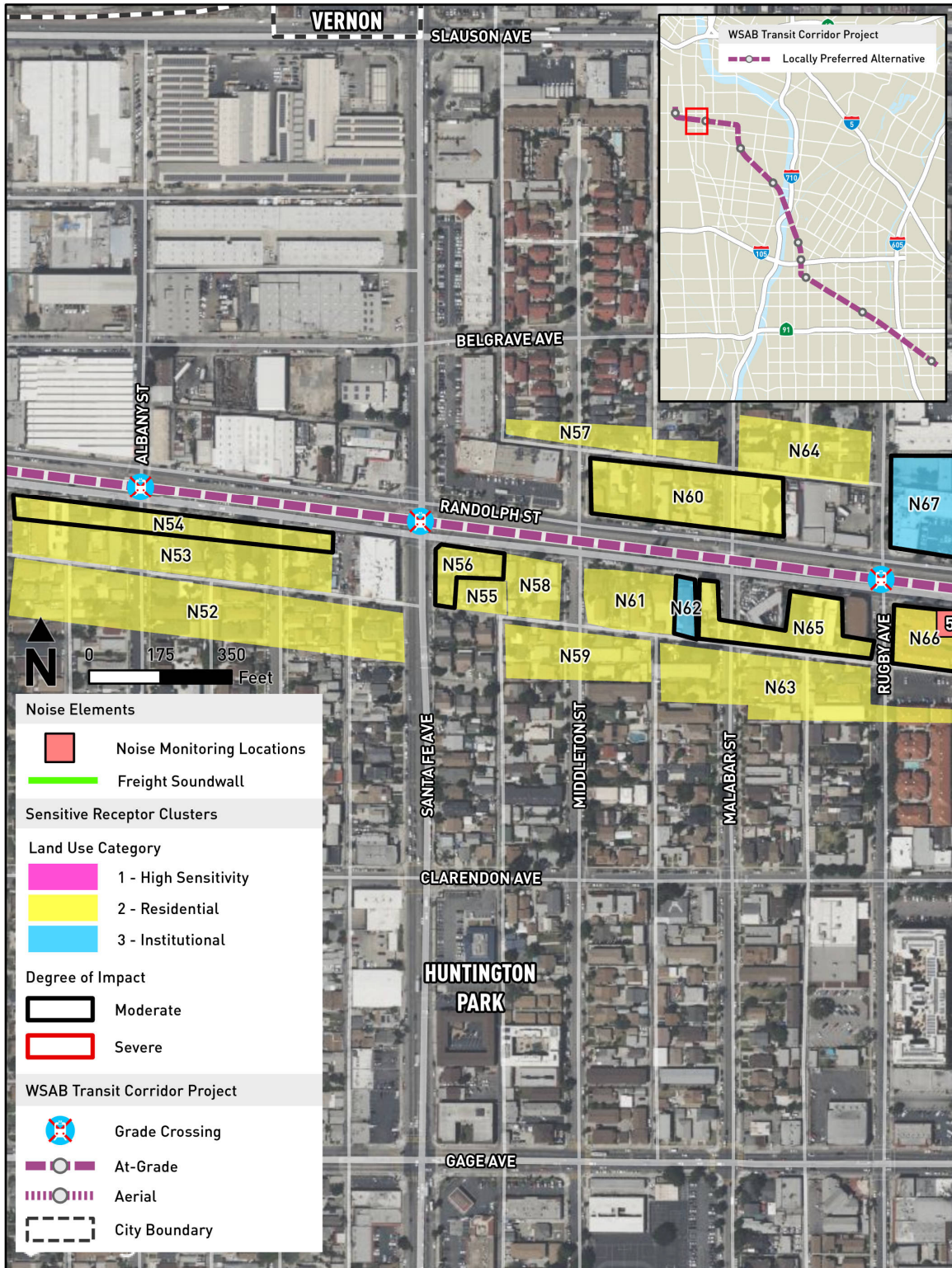
Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



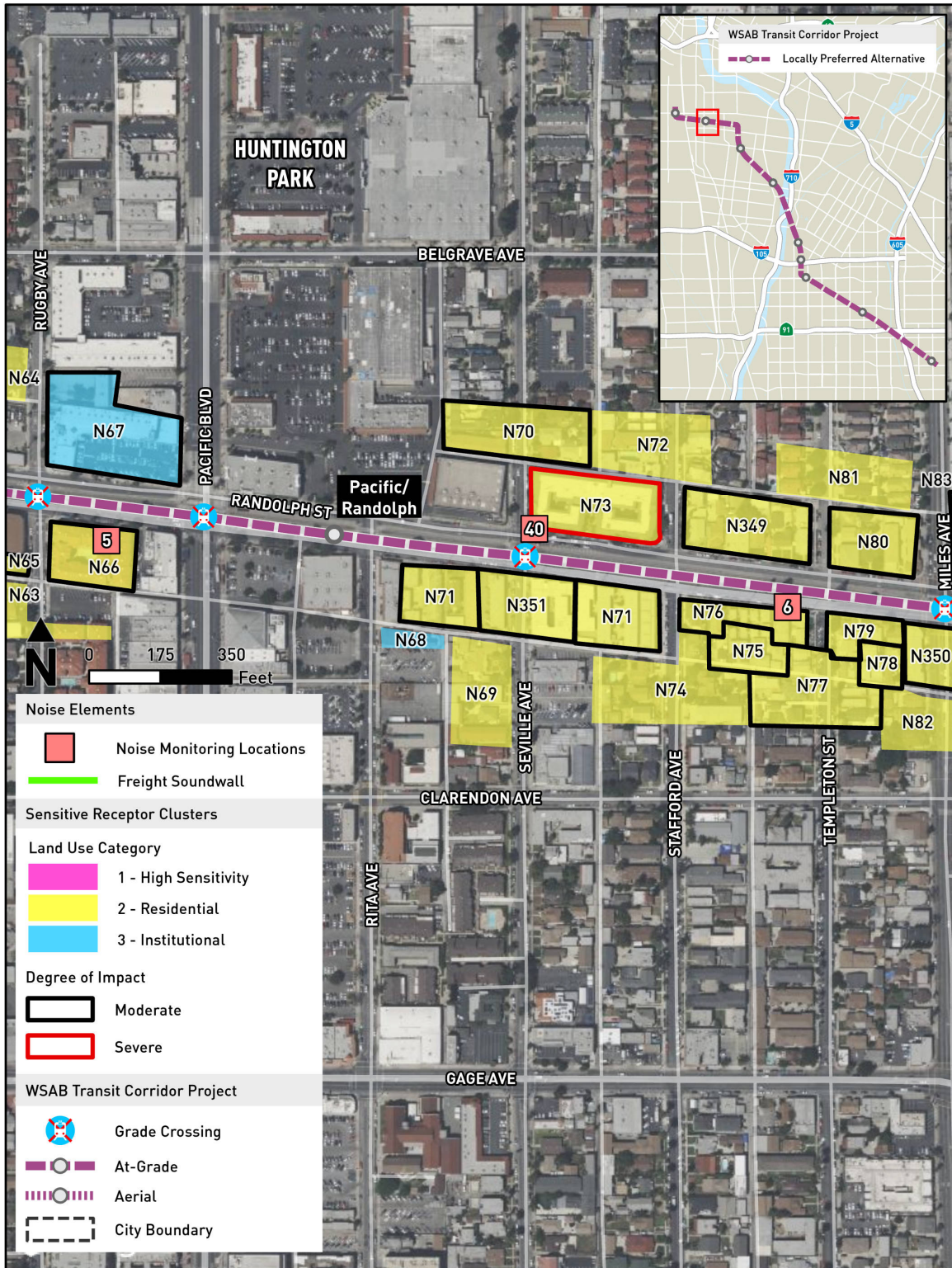
Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



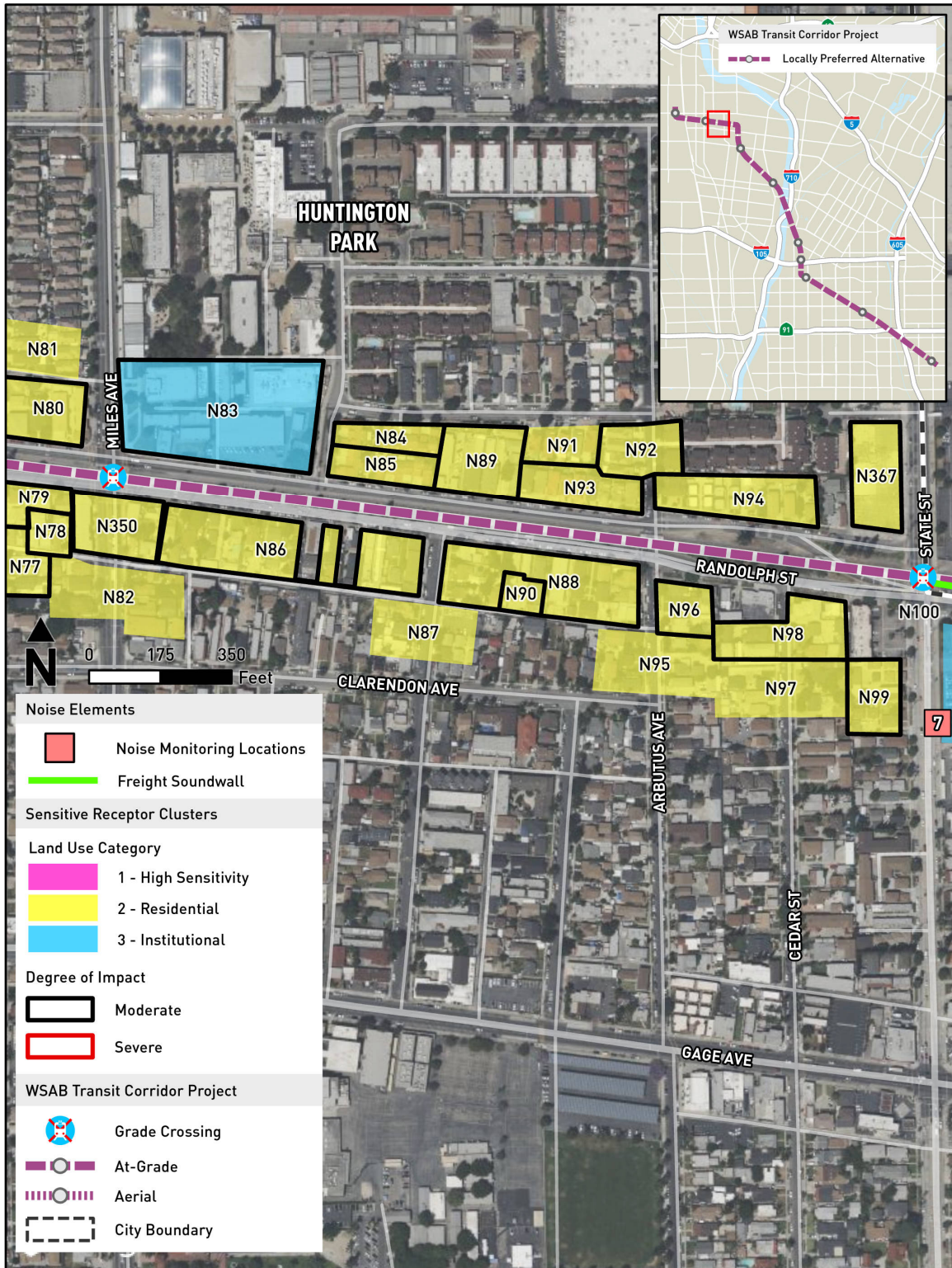
Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



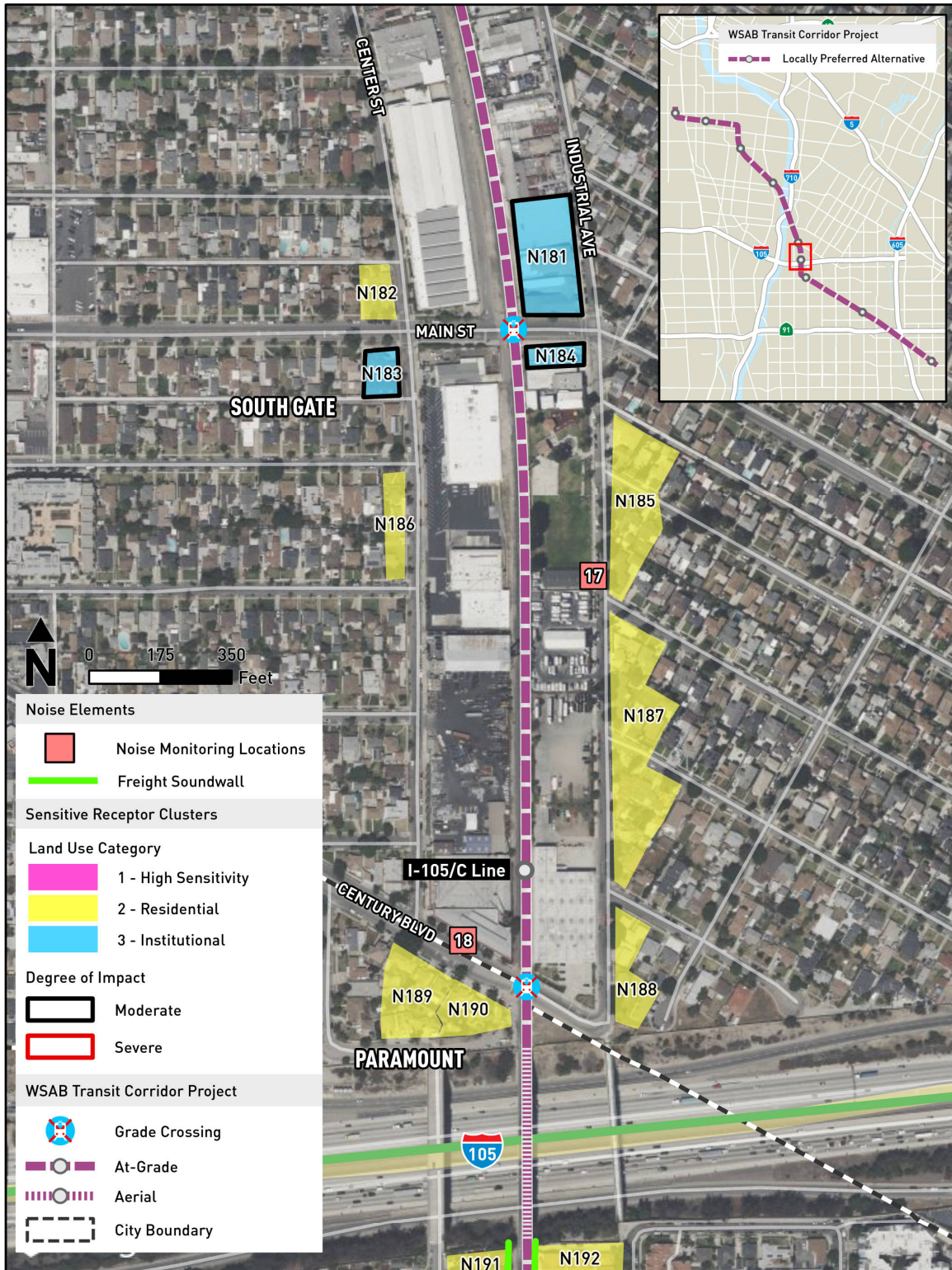
Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



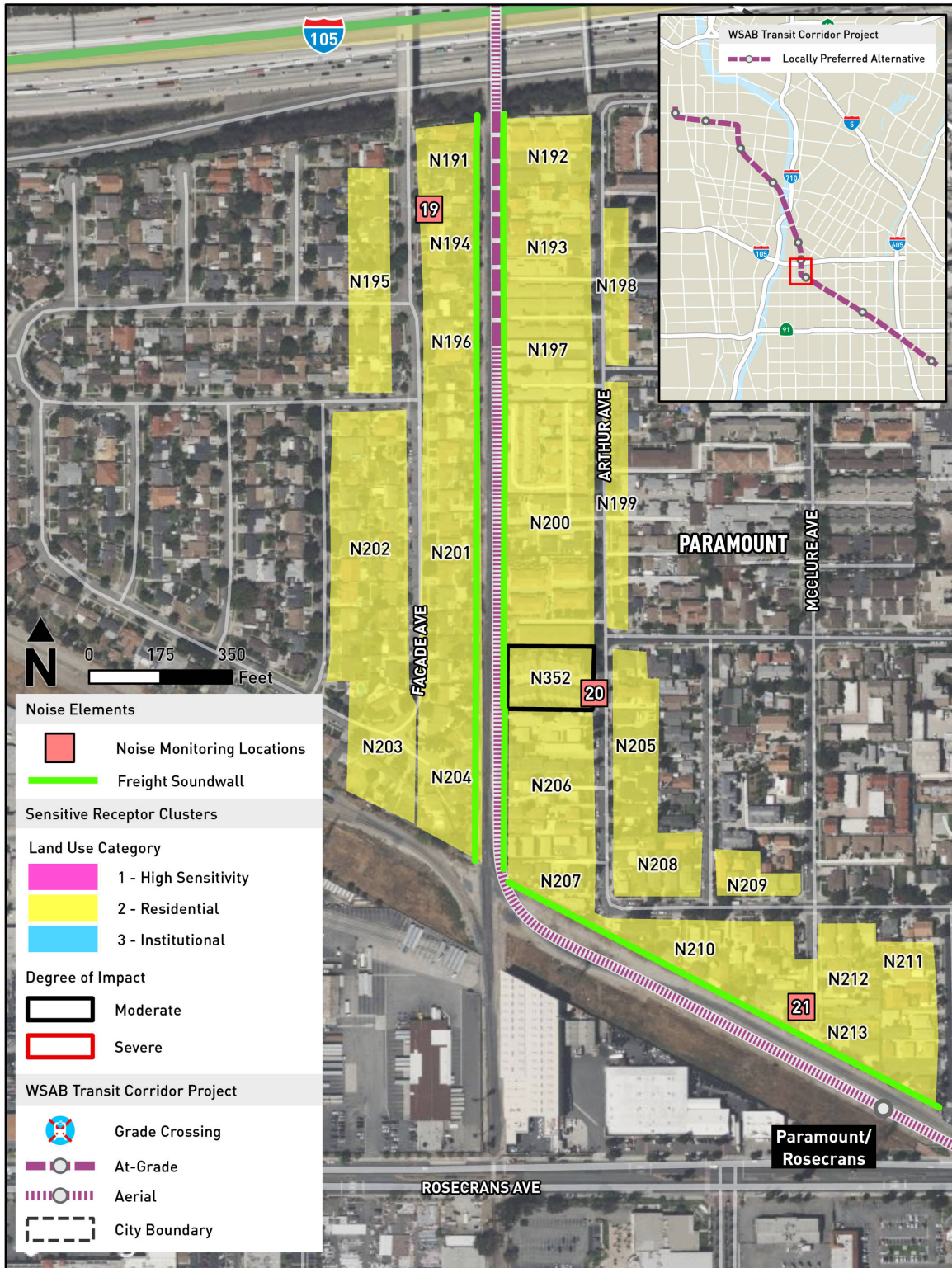
Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



Appendix I

Mitigated Freight Noise Clusters, Noise Monitoring Locations and Impacts



APPENDIX J NOISE CALCULATIONS

Light Rail Noise Calculations

Unmitigated Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Near Track (feet)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (1-1.5 dBA)	Embedded Track (+3 dBA)	Aerial (+4 dBA)	Crossover (+5 dBA)	Quacker (+1 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Adjustment to LRT	Existing Noise Exposure Cat 1 or 2 (Ldn, Cat 3 (Leq))	Audible Warning Noise	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at 50 Feet)	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at Receptor)	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn, Cat 3 (Leq)))		
																			Moderate	Severe	Impact?
N37	MFR		2	250	15	No	No	Yes	No	No	No	4	D	70.5	0	59	52	52	65	70	No
N38	MFR		2	200	15	No	No	Yes	No	No	No	4	D	70.5	0	59	53	53	65	70	No
N39	MFR		2	240	15	No	No	Yes	No	No	No	4	D	70.5	0	59	52	52	65	70	No
N40	SFR		2	240	15	No	No	Yes	Yes	No	No	9	DE	70.5	0	64	57	57	65	70	No
N41	Greater Holy Saint John Baptist Church		3	260	15	No	No	Yes	Yes	No	No	9	DE	72.5	0	61	53	53	70	76	No
N42	SFR/MFR		2	100	15	No	No	Yes	Yes	No	No	9	DE	70.5	0	64	61	61	65	70	No
N43	SFR		2	25	15	No	No	Yes	Yes	Yes	No	10	DEF	70.5	0	65	68	68	65	70	Moderate
N44	SFR		2	160	15	No	No	Yes	Yes	Yes	No	10	DEF	70.5	0	65	60	60	65	70	No
N45	SFR		2	120	15	No	No	Yes	Yes	Yes	No	10	DEF	70.5	0	65	61	61	65	70	No
N46	SFR		2	120	15	No	No	Yes	Yes	Yes	No	10	DEF	70.5	0	65	61	61	65	70	No
N48	SFR		2	240	15	No	No	Yes	Yes	Yes	No	10	DEF	70.5	0	65	58	58	65	70	No
N49	SFR		2	160	15	No	No	Yes	Yes	Yes	No	10	DEF	70.5	0	65	60	60	65	70	No
N50	SFR/MFR		2	65	15	No	No	Yes	No	No	Yes	14	DG	65.4	0	69	68	68	61	66	Severe
N51	Lillian Street Elementary		3	75	25	No	No	Yes	No	No	No	4	D	67.4	0	60	58	58	67	73	No
N52	SFR/MFR		2	210	35	Yes	No	Yes	No	No	No	-1.5	AC	68.0	0	61	55	55	63	68	No
N53	SFR/MFR		2	110	35	No	No	No	No	No	No	0	H	68.0	34	62	59	59	63	68	No
N54	SFR		2	55	35	No	No	Yes	No	No	No	3	CH	68.0	41	65	65	63	68	Moderate	
N55	SFR		2	120	35	Yes	No	Yes	No	No	No	-1.5	ACH	68.0	31	61	57	57	63	68	No
N56	SFR		2	35	35	No	Yes	No	No	No	No	3	CH	68.0	39	65	65	65	63	68	Moderate
N57	SFR/MFR		2	230	35	No	No	No	No	No	No	0	None	68.0	0	62	56	56	63	68	No
N58	SFR/MFR		2	50	35	No	No	No	No	No	No	0	H	68.0	29	62	62	62	63	68	No
N59	SFR/MFR		2	220	35	No	No	No	No	No	No	0	None	68.0	0	62	56	56	63	68	No
N60	SFR/MFR		2	65	35	No	No	No	No	No	No	0	None	68.0	0	62	61	61	63	68	No
N61	SFR		2	70	35	No	No	No	No	No	No	0	None	68.0	0	62	61	61	63	68	No
N62	Templo Asambleas De		3	70	35	No	No	No	No	No	No	0	None	68.0	0	59	57	57	65	71	No
N63	SFR/MFR		2	215	35	No	No	No	No	No	No	0	H	68.0	27	62	56	56	63	68	No
N64	SFR/MFR		2	230	25	No	No	Yes	No	No	Yes	4	CFH	68.0	28	64	57	57	63	68	No
N65	SFR/MFR		2	50	25	No	Yes	No	No	Yes	No	4	CFH	68.0	37	64	64	64	63	68	Moderate
N66	SFR/MFR		2	40	20	No	Yes	No	No	Yes	No	4	CFH	68.0	42	62	63	63	63	68	Moderate
N67	UEI College		3	160	20	No	Yes	No	No	Yes	No	4	CFH	64.2	43	58	53	53	65	71	No
N68	Huntington Park Iglesia Pentecostes		3	200	25	No	No	No	No	Yes	No	1	F	63.8	0	57	51	51	65	70	No
N69	SFR/MFR		2	200	20	No	No	Yes	No	No	Yes	4	CFH	61.8	28	62	56	56	59	64	No
N70	SFR/MFR		2	240	20	No	Yes	No	No	Yes	No	4	CFH	61.8	27	62	55	55	59	64	No
N71	MFR		2	35	20	No	Yes	No	No	Yes	No	1	FH	61.8	36	60	60	59	64	Moderate	
N72	SFR/MFR		2	230	25	No	No	No	No	Yes	No	-1	F	61.8	0	61	54	54	59	64	No
N73	MFR		2	60	35	no	yes	no	no	no	no	3	CH	61.8	42	65	65	65	59	64	Severe
N74	SFR/MFR		2	200	35	No	No	No	Yes	No	No	5	E	61.8	0	67	61	61	59	64	Severe
N75	MFR		2	100	35	Yes	No	No	No	Yes	No	0.5	AE	61.8	0	63	60	60	59	64	Moderate
N76	SFR/MFR		2	50	35	No	No	No	Yes	No	No	5	E	61.8	0	67	67	67	59	64	Severe
N77	SFR/MFR		2	130	35	No	No	No	Yes	No	No	5	E	61.8	0	67	67	67	59	64	Severe
N78	SFR/MFR		2	100	35	Yes	No	Yes	No	Yes	No	3.5	ACEH	61.8	34	66	63	63	59	64	Moderate
N79	SFR/MFR		2	50	35	No	no	No	Yes	42	No	5	EH	61.8	42	67	67	67	59	64	Severe
N80	SFR/MFR		2	80	35	No	Yes	No	Yes	No	No	8	CEH	61.8	40	70	68	68	59	64	Severe
N81	SFR		2	230	35	No	No	No	Yes	No	No	5	E	61.8	0	67	61	61	59	64	Moderate
N82	SFR/MFR		2	210	35	No	Yes	No	No	No	No	3	CH	61.8	28	65	59	59	59	64	Moderate
N83	Huntington Park High School		3	70	35	No	No	No	No	No	No	3	CH	61.8	38	62	60	60	65	70	No
N84	SFR/MFR		2	130	35	Yes	No	No	No	No	No	-4.5	A	61.8	0	58	54	54	59	64	No
N85	SFR/MFR		2	70	35	No	No	No	No	No	No	0	None	61.8	0	62	61	61	59	64	Moderate
N86	SFR/MFR		2	50	35	No	no	No	No	No	No	0	H	61.8	0	62	62	62	59	64	Moderate
N87	SFR		2	210	35	No	No	No	No	No	No	0	None	61.8	0	62	56	56	64	69	No
N88	SFR/MFR		2	48	35	No	no	No	No	No	No	0	None	61.8	0	62	63	63	59	64	Moderate
N89	SFR/MFR		2	80	35	No	No	No	No	No	No	0	None	63.1	0	62	60	60	65	Moderate	
N90	SFR		2	110	35	Yes	No	No	No	No	No	-4.5	A	63.1	0	58	55	55	60	65	No
N91	SFR		2	170	35	Yes	No	No	No	No	No	-4.5	A	63.1	0	58	53	53	60	65	No
N92	SFR/MFR		2	155	35	No	No	No	No	No	No	0	None	63.1	0	62	58	58	60	65	No
N93	SFR		2	85	35	No	No	No	No	No	No	0	None	63.1	0	62	60	60	60	65	Moderate
N94	SFR/MFR		2	100	35	No	No	No	No	No	No	0	H	63.1	38	62	59	59	60	65	No
N367	MFR		2	100	35	No	No	No	No	No	No	0	H	63.1	48	62	59	60	60	65	Moderate
N95	SFR/MFR		2	210	35	No	No	No	No	No	No	0	None	63.1	0	62	56	56	60	65	No
N96	SFR		2	30	35	No	No	No	No	No	No	0	None	63.1	0	62	60	60	60	65	Moderate
N97	SFR/MFR		2	250	35	No	No	No	No	No	No	0	None	63.1	0	62	55	55	60	65	No
N98	SFR/MFR		2	165	35	No	No	No	No	No	No	0	H	63.1	42	62	57	57	60	65	No
N99	SFR/MFR		2	200	35	No	Yes	No	No	No	No	3	CH	63.1	40	65	59	59	60	65	No
N100	San Antonio Elementary		3	120	35	No	No	No	No	No	No	3	CH	65.1	44	62	58	58	65	71	No
N101	SFR		2	120	35	No	No	No	No	No	No	0	None	63.1	0	62	59	59	60	65	No
N102	SFR		2	80	35	No	No	No	No	No	No	0	None	63.1	0	62	60	60	60	65	Moderate
N103	SFR		2	205	35	No	No	No	No	No	No	0	None	63.1	0	62	56	56	60	65	No
N104	SFR		2	80	35	No	No	No	No	No	No	0	None	63.1	0	62	60	60	60	65	Moderate
N105	SFR/MFR		2	80	35	No	No	no	No	No	No	0	None	63.1	0	62	60	60	60	65	Moderate
N106	Southeast Rio Family YMCA		3	290	35	No	No	Yes	No	No	No	3	CH	68.8	28	62	54	54	68	74	No
N107	SFR		2	130	35	No	Yes	No	No	No	No	3	CH	66.8	46	65	61	61	62	67	No
N108	SFR		2	20	35	No	Yes	No	Yes	No	No	8	CEH	66.8	29	70	74	74	62	67	Severe
N109	SFR		2	145	35	Yes	No	No	Yes	No	No	0.5	AE	66.8	0	63	58	58	62	67	No
N110	SFR		2	220	35	No	No	No	Yes	No	No	5	E	66.8	0	67	61	61	62	67	No
N111	SFR		2	120	35	No	No	No	Yes	No	No	5	E	66.8	0	67	64	64	62	67	Moderate
N112	SFR/MFR		2	65	35	No	No	No	No	No	No	0	H	66.8	23	62	61	61	62	67	No
N113	SFR/MFR		2	25	35	No	Yes	No	Yes	No	No	8	CEH	66.8	44	70	73	73	62	67	Severe
N114	SFR		2	110	35	No	No	No	No	No	No	3	CH	66.8	34	65	62	62	62	67	Moderate
N115	SFR/MFR		2	270	35	No	Yes	No	No	No	No	3	CH	66.8	27	65	58	58	62	67	No
N116	SFR/MFR		2	25	35	No	Yes	No	Yes	No	No	3	CH	64.0	44	65	68	68	65	68	Severe
N117	SFR/MFR		2	125	35	Yes	No	No	No	No	No	-4.5	A	64.0	0	58	54	54	60	66	No
N118	SFR		2	25	35	No	No	No	No	No	No	0	None	64.0	0	62	65	65	60	66	Moderate
N119	SFR		2	35	35	No	no	No	No	Yes	No	1	FH	64.0	44	63	65	65	60	66	

Unmitigated Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Near Track Distance (feet)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (1-1.5 dBA)	Embedded Track (+3 dBA)	Aerial (+4 dBA)	Crossover (+5 dBA)	Quacker (+1 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Adjustment to LRT	Existing Noise Exposure Cat 1 or 2 (Ldn, Cat 3 (Leq))	Audible Warning Noise	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at 50 Feet)	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at Receptor)	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn, Cat 3 (Leq)))				
																			Moderate	Severe	Impact?		
N122	SFR	2	350	20	No	No	Yes	No	No	Yes	No		4 CFH	63.1	37	62	53	53	60	65	No		
N123	SFR	2	100	20	No	No	No	No	No	Yes	No		1 F	63.1	0	59	56	60	65	60	65	No	
N124	SFR	2	145	20	Yes	No	No	No	No	Yes	No		-3.5 AF	63.1	0	54	49	60	65	60	65	No	
N125	SFR	2	210	25	No	No	No	No	No	Yes	No		1 F	63.1	0	61	54	60	65	60	65	No	
N126	SFR	2	100	25	No	No	No	No	No	Yes	No		1 F	63.1	0	61	58	60	65	60	65	No	
N127	SFR	2	130	25	Yes	No	No	No	No	Yes	No		-3.5 AF	63.1	0	56	52	60	65	60	65	No	
N128	SFR/MFR	2	270	20	No	No	No	No	No	Yes	No		1 F	63.1	0	59	51	60	65	60	65	No	
N129	SFR/MFR	2	100	20	Yes	No	No	No	No	No	No		-3.5 AF	63.1	0	54	51	60	65	60	65	No	
N130	SFR	2	60	20	No	No	No	No	No	Yes	No		1 F	63.1	0	59	58	60	65	60	65	No	
N131	SFR	2	180	25	No	No	No	No	No	Yes	No		1 F	63.1	0	61	55	60	65	60	65	No	
N132	SFR	2	245	35	No	No	No	No	No	No	No		0 None	63.1	0	62	56	60	65	60	65	No	
N133	SFR	2	110	35	No	No	No	No	No	No	No		0 None	63.1	0	62	59	60	65	60	65	No	
N134	SFR	2	175	35	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	58	52	60	65	60	65	No	
N135	SFR	2	200	40	No	No	No	No	No	No	No		0 None	63.1	0	64	58	60	65	60	65	No	
N136	SFR/MFR	2	110	35	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	55	55	60	65	60	65	No	
N137	SFR	2	60	35	No	No	No	No	No	No	No		0 None	63.1	0	62	60	65	60	65	60	Moderate	
N138	SFR	2	260	35	No	No	No	No	No	No	No		0 None	63.1	0	62	55	60	65	60	65	No	
N139	SFR	2	250	35	No	No	No	No	No	No	No		0 None	63.1	0	62	55	60	65	60	65	No	
N140	MFR	2	115	35	No	No	No	No	No	No	No		0 None	63.1	0	62	59	60	65	60	65	No	
N141	SFR	2	85	40	No	No	No	No	No	No	No		0 None	63.1	0	64	61	60	65	60	65	Moderate	
N142	SFR	2	160	40	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	59	54	60	65	60	65	No	
N143	SFR	2	260	45	No	No	No	No	No	No	No		0 None	63.1	0	65	57	60	65	60	65	No	
N144	SFR	2	70	45	No	No	No	No	No	No	No		0 None	63.1	0	65	63	60	65	60	65	Moderate	
N145	SFR	2	240	45	No	No	No	No	No	No	No		0 None	63.1	0	65	58	60	65	60	65	No	
N146	SFR	2	100	45	No	No	No	No	No	No	No		0 None	63.1	0	65	62	60	65	60	65	Moderate	
N147	SFR	2	130	45	No	No	No	No	No	No	No		-4.5 A	63.1	0	60	56	60	65	60	65	No	
N148	SFR	2	250	55	No	No	No	No	No	No	No		0 None	63.1	0	66	59	60	65	60	65	No	
N149	SFR	2	100	55	No	No	No	No	No	No	No		0 None	63.1	0	66	63	60	65	60	65	Moderate	
N150	SFR	2	150	55	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	62	57	60	65	60	65	No	
N151	SFR	2	240	55	No	No	No	No	No	No	No		0 None	63.1	0	66	60	60	65	60	65	Moderate	
N152	SFR	2	120	55	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	62	58	60	65	60	65	No	
N153	SFR	2	65	55	No	No	No	No	No	No	No		0 None	63.1	0	65	60	60	65	60	65	Severe	
N154	SFR	2	140	55	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	62	57	60	65	60	65	No	
N155	SFR	2	200	55	No	No	No	No	No	No	No		0 None	63.1	0	66	60	60	65	60	65	Moderate	
N156	SFR	2	90	55	No	No	No	No	No	No	No		0 None	63.1	0	66	64	60	65	60	65	Moderate	
N157	SFR	2	140	55	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	62	57	60	65	60	65	No	
N158	SFR	2	90	55	No	No	No	No	No	No	No		0 None	63.1	0	66	64	58	64	Severe	64	Severe	
N159	SFR	2	205	55	No	No	No	No	No	No	No		0 None	63.1	0	66	60	60	65	60	65	Moderate	
N160	SFR	2	140	55	No	No	No	No	No	No	No		0 None	63.1	0	66	62	62	58	64	Moderate	64	Severe
N161	SFR	2	110	55	No	No	No	No	No	No	No		0 H	63.1	36	66	63	64	58	64	Moderate	64	Severe
N162	SFR	2	170	55	No	No	No	Yes	No	No	No		5 EH	63.1	36	71	66	66	58	64	Severe	64	Severe
N163	SFR/MFR	2	95	55	No	No	No	No	No	No	No		5 EH	63.1	35	71	69	69	58	64	Severe	64	Severe
N164	SFR/MFR	2	180	55	No	No	No	Yes	No	No	No		5 F	63.1	40	74	66	66	58	64	Severe	64	Severe
N165	MFR	2	185	55	No	Yes	No	No	No	No	No		3 CH	63.1	40	69	64	64	58	64	Severe	64	Severe
N166	MFR	2	70	55	No	No	No	No	No	No	No		0 H	63.1	37	66	65	58	64	Severe	64	Severe	
N167	SFR	2	140	55	Yes	No	No	No	No	No	No		-4.5 A	63.1	0	62	57	58	64	Severe	64	Severe	
N168	Mobile Homes	2	70	55	No	No	No	No	No	No	No		0 None	63.1	0	66	65	58	64	Severe	64	Severe	
N169	Motel	2	230	50	No	No	Yes	No	No	No	No		4 D	63.0	0	70	63	63	60	65	60	Moderate	
N170	SFR	2	305	55	No	No	No	No	No	No	No		0 H	58.7	38	67	63	63	60	65	60	Moderate	
N171	SFR	2	250	55	No	No	No	No	No	No	No		0 None	58.7	0	66	59	63	60	65	60	Moderate	
N172	SFR	2	125	55	No	No	No	No	No	No	No		0 None	58.7	0	66	62	62	57	63	Moderate	63	Moderate
N173	SFR	2	240	55	No	No	No	No	No	No	No		0 None	58.7	0	66	60	60	65	60	65	Moderate	
N174	SFR	2	140	55	No	No	No	No	No	No	No		0 None	58.7	0	66	62	62	57	63	Moderate	63	Moderate
N175	SFR	2	240	55	No	No	No	No	No	No	No		0 None	58.7	0	66	60	60	65	60	65	Moderate	
N176	MFR	2	145	55	No	No	No	No	No	No	No		0 None	58.7	0	66	62	62	57	63	Moderate	63	Moderate
N177	Thunderbird Villa Mo	2	140	55	No	No	No	Yes	No	No	No		4 D	57.4	0	70	66	66	56	62	Severe	62	Severe
N178	Thunderbird Villa Mo	2	175	55	No	No	No	No	No	No	No		0 None	57.4	0	66	61	61	56	62	Moderate	62	Moderate
N179	Thunderbird Villa Mo	2	90	55	No	No	No	No	No	No	No		0 None	57.4	0	66	64	64	56	62	Severe	62	Severe
N180	Thunderbird Villa Mo	2	110	55	No	No	Yes	No	No	No	No		4 D	57.4	0	70	67	67	56	62	Severe	62	Severe
N181	Trinity Bible Church	3	20	35	No	Yes	No	No	No	No	No		3 CH	75.3	62	62	66	67	70	78	No	78	No
N182	SFR	2	280	35	No	No	No	No	No	No	No		0 None	59.3	0	62	55	57	63	60	65	60	No
N183	Apostolic Assembly South Gate	3	280	35	No	No	No	No	No	No	No		0 None	66.6	0	59	51	51	67	72	No	72	No
N184	American Indian Bible Church	3	80	35	No	Yes	No	No	No	No	No		3 CH	79.7	62	62	60	64	70	78	No	78	No
N185	SFR	2	210	25	No	No	No	No	No	No	No		0 None	59.9	0	60	53	60	63	60	65	60	No
N186	SFR	2	300	25	No	No	No	No	No	No	No		0 None	59.3	0	60	52	52	60	63	60	65	No
N187	SFR	2	220	15	No	No	No	No	No	Yes	No		5 F	59.9	0	60	54	58	63	60	65	60	No
N188	SFR	2	220	15	No	No	Yes	No	No	Yes	No		4 CFH	60.3	28	59	53	58	64	60	65	60	No
N189	SFR	2	185	15	No	Yes	No	No	No	Yes	No		4 CFH	61.2	31	59	53	58	64	60	65	60	No
N190	SFR	2	100	15	No	Yes	No	No	Yes	No	Yes		4 CFH	63.7	40	59	56	56	60	65	60	65	No
N191	SFR	2	60	25	No	No	No	No	Yes	No	Yes		1 F	64.0	0	61	60	60	66	60	65	Moderate	
N192	SFR	2	26	25	No	No	No	No	Yes	No	No		1 F	64.0	0	61	66	60	66	60	65	Moderate	
N193	SFR	2	15	25	No	No	No	No	Yes	No	No		1 F	64.0	0	61	66	60	66	60	65	Moderate	
N194	SFR	2	65	25	No	No	No	No	Yes	No	Yes		1 F	64.0	0	61	59	59	60	66	60	65	No
N195	SFR	2	230	25	No	No	No	No	No	Yes	No		1 F	64.0	0	61	54	60	66	60	65	No	
N196	SFR	2	70	25	No	No	No	No	Yes	No	Yes		1 F	64.0	0	61	59	60	66	60	65	No	
N197	SFR	2	15	25	No	No	No	No	Yes	No	No		1 F	64.0	0	61	66	60	66	60	65	Severe	
N198	SFR	2	200	25	No	No	No	No	0 None	64.0	0		0 None	64.0	0	60	60	60	66	60	65	No	
N199	SFR	2	285	25	No	No	Yes	No	No	No	No		4 D	54.1	0	64	56	56	65	61	Moderate	61	Moderate
N200																							

Unmitigated Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Near Track (feet)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (1.5 dBA)	Embedded Track (+3 dBA)	Aerial (+4 dBA)	Crossover (+5 dBA)	Quacker (+1 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Adjustment to LRT	Existing Noise Exposure Cat 1 or 2 (Ldn, Cat 3 (Leq))	Audible Warning Noise	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at 50 Feet)	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at Receptor)	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn, Cat 3 (Leq)))		
																			Moderate	Severe	Impact?
N211	SFR	2	260	25	No	No	No	No	No	No	No	4 D	0	54.9	0	64	56	56	55	61	Moderate
N212	SFR	2	140	25	No	No	No	No	No	No	No	4 D	0	56.2	0	64	59	64	59	62	Moderate
N213	SFR	2	55	25	No	No	No	No	No	No	No	4 D	0	60.8	0	64	63	63	58	64	Moderate
N214	MFR	2	335	35	No	No	No	No	No	No	No	4 D	0	62.3	0	66	58	59	65	64	Moderate
N215	SFR	2	100	35	No	No	No	No	No	No	No	0 None	0	58.0	0	62	59	57	62	Moderate	
N216	SFR	2	70	35	No	No	No	No	No	No	No	0 None	0	58.0	0	62	61	61	57	62	Moderate
N217	SFR	2	180	35	No	No	No	No	No	No	No	0 None	0	58.0	0	62	57	57	62	Moderate	
N219	SFR	2	120	55	No	No	No	No	No	No	No	0 None	0	58.0	0	66	63	63	57	62	Moderate
N220	SFR	2	130	55	No	No	No	No	No	No	No	0 None	0	58.0	0	66	62	57	62	Severe	
Paramount High School			3	85	55	No	No	No	No	No	No	0 None	0	53.7	0	63	61	61	60	66	Moderate
N222	SFR	2	135	55	No	No	No	No	No	No	No	0 None	0	66.4	0	66	62	62	62	67	Moderate
N223	SFR	2	135	55	No	No	No	No	No	No	No	0 None	0	56.0	0	66	62	62	56	62	Severe
N224	SFR	2	135	55	No	No	No	No	No	No	No	0 H	0	66.4	23	66	62	62	67	Moderate	
N225	SFR	2	220	55	No	No	No	No	No	No	No	0 None	0	51.7	0	66	60	54	60	Severe	
N226	SFR	2	125	55	No	No	Yes	No	No	No	No	3 CH	0	62.7	32	69	65	59	65	Severe	
N227	SFR	2	20	55	No	No	Yes	No	Yes	No	No	8 CEH	0	66.4	38	74	78	78	62	67	Severe
N228	SFR	2	200	55	No	No	No	No	Yes	No	No	5 E	0	51.7	0	71	65	54	60	Severe	
N229	SFR	2	100	55	No	No	No	No	Yes	No	No	-5 E	0	51.7	0	71	68	54	60	Severe	
N230	SFR	2	30	55	No	No	No	Yes	No	No	No	5 E	0	51.7	0	71	74	54	60	Severe	
N231	SFR	2	60	55	No	No	Yes	No	No	No	No	3 CH	0	56.0	35	69	69	56	62	Severe	
N234	Mobile Homes	2	160	55	Yes	No	Yes	No	No	No	No	-1.5 AC	0	52.0	0	65	60	54	60	Severe	
N235	Mobile Homes	2	60	55	No	No	No	No	No	No	No	0 None	0	52.0	0	66	66	54	60	Severe	
N236	SFR	2	100	55	No	No	No	No	No	No	No	0 None	0	52.0	0	66	63	54	60	Severe	
N237	SFR	2	160	55	No	No	No	No	No	No	No	0 None	0	52.0	0	66	61	54	60	Severe	
N238	SFR	2	95	55	Yes	No	No	No	No	No	No	-4.5 A	0	52.0	0	62	59	54	60	Moderate	
N239	SFR	2	170	55	No	No	No	No	No	No	No	0 None	0	48.1	0	66	61	53	59	Severe	
N240	SFR	2	100	55	No	No	No	No	No	No	No	0 None	0	48.1	0	66	63	53	59	Severe	
N241	SFR	2	155	55	No	No	No	No	No	No	No	0 None	0	52.0	0	66	61	54	60	Severe	
N242	SFR	2	215	55	No	No	No	No	No	No	No	0 None	0	52.0	0	66	60	54	60	Severe	
N243	SFR	2	60	55	No	No	No	No	No	No	No	0 None	0	52.0	0	66	66	54	60	Severe	
Adventist Union School			3	230	55	No	No	No	No	No	No	0 None	0	53.2	0	63	56	60	66	No	
N245	MFR	2	70	55	No	No	No	No	No	No	No	0 None	0	51.2	0	66	65	54	60	Severe	
N246	MFR	2	70	55	No	No	Yes	No	No	No	No	3 CH	0	62.4	40	69	68	59	65	Severe	
N247	SFR	2	110	55	No	No	Yes	No	No	No	No	3 CH	0	62.4	30	69	66	59	65	Severe	
N248	MFR	2	170	55	No	No	No	No	No	No	No	0 H	0	62.4	24	66	61	59	65	Moderate	
N249	SFR	2	165	55	No	No	Yes	No	No	No	No	3 CH	0	59.5	29	69	64	58	63	Severe	
N250	SFR	2	165	55	Yes	No	No	No	No	No	No	-4.5 A	0	59.5	0	62	57	58	63	No	
N251	SFR	2	85	55	No	No	Yes	No	No	No	No	3 CH	0	59.5	33	69	67	58	63	Severe	
Door Christian Fellowship Church			3	150	55	No	Yes	No	No	No	No	3 CH	0	61.5	34	66	61	64	69	No	
N253	SFR	2	100	45	No	No	Yes	No	No	No	No	3 CH	0	66.0	33	61	61	67	Moderate		
N254	SFR	2	100	45	No	No	No	Yes	No	No	No	5 E	0	59.5	0	70	67	58	63	Severe	
N255	Aztec Mobile Home	2	35	35	No	No	No	Yes	No	No	No	5 E	0	59.5	0	67	69	58	63	Severe	
N256	SFR	2	215	35	No	No	No	No	No	No	No	0 None	0	59.5	0	62	56	58	63	No	
Greek Apostolic Church			3	290	35	No	No	No	No	No	No	0 None	0	61.5	0	59	51	64	69	No	
N258	SFR/MFR	2	150	35	Yes	No	No	No	No	No	No	-4.5 A	0	59.5	0	58	53	53	63	No	
N259	SFR	2	100	35	No	No	No	No	No	No	No	0 None	0	59.5	0	62	59	58	63	Moderate	
N260	SFR	2	220	25	No	No	No	No	Yes	No	No	1 F	0	59.5	0	61	54	54	58	63	No
N261	SFR/MFR	2	90	20	No	No	No	No	No	Yes	No	1 FH	0	59.5	35	59	56	58	63	No	
N262	MFR	2	305	20	No	No	No	No	No	Yes	No	1 F	0	59.5	0	59	51	58	63	No	
Kingdom Causes Bellflower			3	245	20	No	No	No	No	Yes	No	1 F	0	66	0	55	48	66	72	No	
N265	MFR	2	270	20	No	No	No	No	No	Yes	No	1 F	0	56.0	0	59	51	56	62	No	
N267	MFR	2	35	30	No	No	No	No	No	No	No	0 H	0	56.0	37	61	63	56	62	Severe	
N268	MFR	2	50	45	No	No	No	No	No	No	No	0 None	0	56.0	0	65	65	56	62	Severe	
Open Door Worship Center			3	200	55	No	No	No	No	No	No	0 None	0	58	0	63	57	62	67	No	
N270	MFR	2	140	55	No	No	No	No	No	No	No	0 None	0	56.0	0	66	62	56	62	Severe	
N271	SFR	2	130	55	No	No	No	No	No	No	No	0 None	0	56.0	0	66	62	56	62	Severe	
N272	Bristol Civic Auditorium	3	70	55	No	No	No	No	No	No	No	0 None	0	58	0	63	61	62	67	No	
Bellflower Health Center			3	120	55	No	No	No	No	No	No	0 None	0	58	0	63	59	62	67	No	
N274	SFR	2	125	55	No	No	No	No	No	No	No	0 None	0	56.0	0	66	62	56	62	Severe	
N275	MFR	2	285	55	No	No	No	No	No	No	No	0 None	0	56.0	0	66	56	62	Moderate		
N276	MFR	2	220	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	64	64	69	Moderate	
N277	SFR	2	130	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	66	64	69	Moderate	
N278	SFR/MFR	2	60	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	70	64	69	Severe	
N279	SFR	2	245	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	63	63	64	69	No
N280	MFR	2	320	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	64	64	69	No	
N281	MFR	2	235	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	64	64	69	Moderate	
N282	MFR	2	205	55	No	No	Yes	No	No	No	No	4 D	0	69.4	0	70	64	64	69	Moderate	
N283	SFR	2	110	55	No	No	No	No	No	No	No	0 None	0	57.7	0	66	63	57	62	Severe	
N284	SFR	2	175	55	No	No	No	No	No	No	No	0 None	0	57.7	0	66	61	57	62	Moderate	
N285	SFR	2	185	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	66	57	62	Severe	
N286	Bel Tooren Villa Conv	2	115	55	No	No	No	No	No	No	No	0 None	0	69.4	0	63	63	64	69	No	
N287	SFR	2	50	55	No	No	No	No	No	No	No	0 None	0	57.7	0	66	66	57	62	Severe	
N288	SFR	2	220	55	No	No	No	No	No	No	No	0 None	0	57.7	0	66	60	57	62	Moderate	
N289	SFR	2	200	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	65	57	62	Severe	
N290	SFR	2	50	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	71	57	62	Severe	
N291	SFR	2	100	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	68	57	63	Severe	
N292	SFR	2	160	55	Yes	No	No	No	No	No	No	-4.5 A	0	57.7	0	62	57	57	62	Moderate	
N293	SFR	2	230	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	65	57	62	Severe	
N294	SFR	2	65	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	70	57	62	Severe	
N295	SFR	2	135	55	No	No	No	No	Yes	No	No	5 E	0	57.7	0	71	67	57	62	Severe	
N296	SFR	2	150	55	Yes	No	No	Yes	No	No	No	0.5 AE	0	57.7	0	67	62	57	62	Severe	

Unmitigated Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Near Track Distance (feet)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (1.5 dBA)	Embedded Track (+3 dBA)	Aerial (+4 dBA)	Crossover (+5 dBA)	Quacker (+1 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Adjustment to LRT	Existing Noise Exposure Cat 1 or 2 (Ldn, Cat 3 (Leq))	Audible Warning Noise	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at 50 Feet)	LRT Noise Exposure Cat 2 (Ldn, Cat 3 (Leq) at Receptor)	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn, Cat 3 (Leq)))		
																			Moderate	Severe	Impact?
N297	SFR	2	60	55	No	No	No	No	No	No	No	0	None	57.7	0	66	66	66	57	62	Severe
N298	SFR	2	95	55	No	No	No	No	No	No	No	0	None	57.7	0	66	66	66	57	63	Severe
N299	SFR	2	210	55	No	No	No	Yes	No	No	No	4	D	57.7	0	70	64	64	57	62	Severe
N300	SFR	2	140	55	No	No	No	Yes	No	No	No	4	D	57.7	0	70	66	66	57	62	Severe
N301	SFR	2	70	55	No	No	No	Yes	No	No	No	4	D	57.7	0	70	69	69	57	62	Severe
N302	Valley Christian High School	3	180	55	No	No	Yes	No	No	No	No	3	CH	61.4	29	66	60	60	64	69	No
N303	Rio Hondo Metal Health Clinic	3	160	55	No	No	Yes	No	No	No	No	3	CH	61.4	32	66	61	61	64	69	No
N304	Fremont College	3	200	55	No	No	No	No	No	No	No	0	None	53.2	0	63	57	57	60	66	No
N305	Artesia Cemetery	3	220	55	No	No	No	No	No	No	No	0	None	53.2	0	63	56	56	60	66	No
N306	SFR	2	210	55	No	No	No	No	No	No	No	0	None	51.2	0	66	60	60	54	60	Severe
N307	SFR	2	70	55	No	No	No	No	No	No	No	0	None	51.2	0	66	65	65	54	60	Severe
N308	SFR	2	210	55	No	No	No	Yes	No	No	No	4	D	51.2	0	70	64	64	54	60	Severe
N309	SFR	2	70	55	No	No	No	Yes	No	No	No	4	D	51.2	0	70	69	69	54	60	Severe
N310	SFR	2	55	55	No	No	Yes	No	No	No	No	4	D	51.2	0	70	70	70	54	60	Severe
N311	SFR	2	140	55	No	No	Yes	No	No	No	No	4	D	51.2	0	70	66	66	54	60	Severe
N312	SFR	2	50	55	No	No	Yes	No	No	No	No	4	D	53.1	0	70	70	70	54	60	Severe
N313	SFR	2	175	55	No	No	Yes	No	No	No	No	4	D	65.8	0	70	65	65	61	67	Moderate
N314	SFR	2	70	55	No	No	No	Yes	No	No	No	4	D	65.8	0	70	69	69	61	67	Severe
N315	SFR	2	45	50	No	No	Yes	No	No	No	No	4	D	65.8	0	70	70	70	61	67	Severe
N316	SFR	2	130	50	Yes	No	No	No	No	No	No	-4.5	A	51.2	0	61	57	57	54	60	Moderate
N317	SFR	2	220	45	No	No	No	No	No	No	No	0	None	51.2	0	65	58	58	54	60	Moderate
N318	SFR	2	110	45	No	No	No	No	No	No	No	0	None	51.2	0	65	61	61	54	60	Severe
N319	SFR	2	50	45	No	No	No	No	No	No	No	0	None	51.2	0	65	65	65	54	60	Severe
N320	SFR	2	110	45	Yes	No	No	No	No	No	No	-4.5	A	51.2	0	60	57	57	54	60	Moderate
N321	SFR	2	210	40	No	No	No	No	No	No	No	0	None	48.0	0	64	57	57	53	59	Moderate
N322	SFR	2	40	40	No	no	No	No	No	No	No	0	H	48.0	27	64	65	65	53	59	Severe
N323	SFR	2	45	45	No	No	No	No	No	No	No	0	None	48.0	0	65	65	65	53	59	Severe
N324	SFR	2	200	45	No	No	No	No	No	No	No	0	None	48.0	0	65	59	59	53	59	Severe
N325	SFR	2	140	40	No	No	No	No	No	No	No	0	None	48.0	0	64	59	59	53	59	Severe
N326	SFR	2	50	40	No	no	No	No	No	No	No	0	H	48.0	32	64	64	64	53	59	Severe
N327	MFR	2	210	30	No	yes	No	No	No	No	No	3	CH	48.0	26	64	58	58	53	59	Moderate
N328	SFR/MFR	2	45	30	No	yes	No	Yes	No	No	No	8	CEH	48.0	38	69	70	70	53	59	Severe
N329	SFR	2	190	30	No	no	No	No	No	No	No	0	None	48.0	0	61	55	55	53	59	Moderate
N330	SFR	2	190	30	Yes	no	No	Yes	No	No	No	0.5	AE	48.0	0	62	56	56	53	59	Moderate
N331	SFR/MFR	2	35	20	No	no	No	No	Yes	No	No	5	EH	48.0	11	63	64	64	53	59	Severe
N332	Artesia Historical Mu	3	45	20	No	no	No	Yes	No	No	No	5	EH	50	12	59	59	59	58	65	Moderate
N333	SFR	2	175	40	Yes	No	no	No	No	No	No	-4.5	AH	48.0	30	59	54	54	53	59	Moderate
N334	SFR	2	40	30	No	yes	No	Yes	No	No	No	8	CEH	48.0	40	69	70	70	53	59	Severe
N335	SFR/MFR	2	300	30	No	yes	No	No	Yes	No	No	3	CH	48.0	24	64	56	56	53	59	Moderate
N336	SFR	2	180	30	No	No	No	No	Yes	No	No	5	E	48.0	0	66	61	61	53	59	Severe
N337	Wan Yuen Temple	3	55	20	No	no	No	Yes	No	No	No	5	EH	50	6	59	59	59	58	65	Moderate
N338	SFR/MFR	2	160	20	No	No	No	No	Yes	No	No	6	EF	48.0	0	64	59	59	53	59	Severe
N339	SFR/MFR	2	90	20	No	no	No	No	Yes	Yes	No	6	EFH	48.0	1	64	61	61	53	59	Severe
N340	SFR	2	200	20	No	No	No	No	Yes	Yes	No	6	EF	48.0	0	64	58	58	53	59	Moderate
N341	SFR	2	110	15	No	No	No	Yes	Yes	Yes	No	6	EFH	48.0	4	61	61	61	53	59	Moderate
N342	SFR	2	80	15	No	No	no	No	Yes	Yes	No	6	EFH	48.0	5	61	59	59	53	59	Severe
N343	SFR	2	200	15	No	No	No	No	Yes	Yes	No	6	EF	48.0	0	61	55	55	53	59	Moderate
N344	SFR	2	40	15	No	Yes	No	Yes	No	No	No	8	CEH	52.0	35	63	64	64	54	60	Severe
N345	SFR	2	165	15	Yes	No	No	Yes	No	No	No	0.5	AE	52.0	0	56	50	50	54	60	No
N346	SFR	2	40	15	No	No	No	Yes	No	No	No	5	E	52.0	0	60	61	61	54	60	Severe
N347	SFR	2	45	15	No	No	No	No	No	No	No	0	None	52.0	0	55	56	56	54	60	Moderate
N348	Mayne Events Center/Los Angeles County Fire Museum	3	60	20	No	No	No	No	No	Yes	No	1	FH	66	51	55	54	56	66	72	No
N349	SFR	2	75	35	No	No	Yes	No	Yes	No	No	8	CE	61.8	0	70	69	69	64	Severe	Severe
N350	SFR/MFR	2	50	35	No	No	Yes	No	No	No	No	3	CH	61.8	42	65	65	65	64	Severe	Severe
N351	MFR	2	35	20	No	No	Yes	No	No	Yes	No	4	CFH	61.8	46	62	63	63	59	64	Moderate
N352	MFR	2	22	25	No	No	Yes	No	No	No	No	4	D	60.7	0	64	67	67	58	64	Severe
N353	SFR	2	105	55	No	No	No	No	No	No	No	0	None	57.7	0	66	63	63	57	62	Severe
N354	SFR	2	100	55	No	No	No	No	No	No	No	0	None	57.7	0	66	63	63	57	62	Severe
N355	SFR	2	185	55	No	No	No	No	No	No	No	0	None	57.7	0	66	61	61	57	62	Moderate
N356	SFR	2	105	55	No	No	No	No	No	No	No	0	None	57.7	0	66	63	63	57	62	Severe
N357	SFR	2	45	55	No	No	No	No	No	No	No	0	None	57.7	0	66	67	67	57	62	Severe
N358	SFR	2	100	55	No	No	No	No	No	No	No	0	None	57.7	0	66	63	63	57	62	Severe
N359	SFR	2	60	55	No	No	No	No	No	No	No	0	None	57.7	0	66	66	66	57	62	Severe
N360	SFR	2	40	55	No	No	No	No	Yes	No	No	5	E	57.7	0	71	72	72	57	62	Severe
N361	Thunderbird Villa Mo	2	30	55	No	No	No	No	No	No	No	0	None	57.4	0	66	69	69	56	62	Severe
N362	SFR	2	80	35	No	No	No	No	No	No	No	0	None	63.1	0	62	60	60	60	65	Moderate
N363	SFR	2	80	35	No	No	Yes	No	No	No	No	4	D	63.1	0	66	64	60	60	65	Moderate
N364	SFR	2	190	35	No	No	No	No	No	No	No	0	None	63.1	0	62	57	57	60	65	No
N365	SFR	2	215	35	No	No	No	No	No	No	No	0	None	63.1	0	62	56	56	60	65	No
N366	SFR	2	190	35	No	No	No	Yes	No	No	No	4	D	63.1	0	66	61	61	60	65	Moderate
N368	SFR	2	250	20	No	No	Yes	No	No	No	Yes	14	DG	56.8	0	72	65	65	56	62	Severe

A = first row of intervening buildings.

B = second row of intervening buildings.

C = embedded track on grade.

D = aerial structure with slab track.

E = jointed track or crossover.

F = quacker noise.

G = wheel squeal noise.

H = audible warning noise.

Cat 2	Moderate	90
Cat 2	Severe	114
Cat 3	Moderate	3
Cat 3	Severe	0
Cat 2 Total		204
Cat 3 Total		3
Total		207

Unmitigated Design Option Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Near Track Distance (feet)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (-1.5 dBA)	Embedded Track (+3 dBA)	Aerial (+4 dBA)	Crossover (+5 dBA)	Quacker (+1 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Adjustment to LRT	Existing Noise Exposure Cat 1 or 2 (Ldn, Cat 3 (Leq))	Audible Warning Noise	LRT Noise Exposure or 2 (Ldn, Cat 3 (Leq)) at 50 Feet	LRT Noise Exposure Cat 1 or 2 (Ldn, Cat 3 (Leq)) at Receptor	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn, Cat 3 (Leq)))		Impact?
																			Moderate	Severe	
N322	SFR		2	40	No	No	No	No	No	No	No	0	H	48.0	5	64	65	65	53	59	Severe
N323	SFR		2	45	No	No	No	No	No	No	No	0	None	48.0	0	65	65	65	53	59	Severe
N324	SFR		2	200	45	No	No	No	No	No	No	0	None	48.0	0	65	59	53	59	Severe	
N325	SFR		2	140	40	No	No	No	No	No	No	0	None	48.0	0	64	59	59	53	59	Severe
N326	SFR		2	50	40	No	No	No	No	No	No	0	H	48.0	10	64	64	64	53	59	Severe
N327	MFR		2	210	30	No	No	No	No	No	No	0	H	48.0	4	61	55	55	53	59	Moderate
N328	SFR/MFR		2	45	30	No	No	No	Yes	No	No	5	EH	48.0	16	66	67	67	53	59	Severe
N329	SFR		2	190	30	No	No	No	No	No	No	0	None	48.0	0	61	55	55	53	59	Moderate
N330	SFR		2	180	30	Yes	No	No	No	Yes	No	0.5	AE	48.0	0	62	56	56	53	59	Moderate
N331	SFR/MFR		2	35	20	No	No	No	Yes	No	No	5	EH	48.0	41	63	64	64	53	59	Severe
N332	Artesia Historical Museum		3	45	20	No	No	Yes	No	Yes	No	8	CEH	50	42	62	62	63	58	65	Moderate
N333	SFR		2	175	40	Yes	No	No	No	No	No	-4.5	AH	48.0	8	59	54	54	53	59	Moderate
N334	SFR		2	40	30	No	No	No	Yes	No	No	5	EH	48.0	18	66	67	67	53	59	Severe
N335	SFR/MFR		2	300	30	No	No	No	No	No	No	0	H	48.0	2	61	53	53	53	59	Moderate
N336	SFR		2	180	30	No	No	No	Yes	No	No	5	E	48.0	0	66	61	61	53	59	Severe
N337	Wan Yuen Temple		3	55	20	No	No	No	Yes	No	No	5	EH	50	36	59	59	59	58	65	Moderate
N338	SFR/MFR		2	160	20	No	No	No	Yes	Yes	No	6	EF	48.0	0	64	59	59	53	59	Severe
N339	SFR/MFR		2	90	20	No	No	No	Yes	Yes	No	6	EFH	48.0	31	64	61	61	53	59	Severe
N340	SFR		2	200	20	No	No	No	No	Yes	Yes	6	EF	48.0	0	64	58	58	53	59	Moderate
N341	SFR		2	110	15	No	No	Yes	No	Yes	Yes	9	CEFH	48.0	34	64	61	61	53	59	Severe
N342	SFR		2	80	15	No	No	Yes	No	Yes	Yes	9	CEFH	48.0	35	64	62	62	53	59	Severe
N343	SFR		2	200	15	No	No	No	Yes	Yes	No	6	EF	48.0	0	61	55	55	53	59	Moderate
N344	SFR		2	40	15	No	No	Yes	No	Yes	No	8	CEH	52.0	35	63	64	64	54	60	Severe

A = first row of intervening buildings.
 B = second row of intervening buildings.
 C = embedded track on grade.
 D = aerial structure with slab track.
 E = jointed track or crossover.
 F = quacker noise.
 G = wheel squeal noise.
 H = audible warning noise.

Mitigated Light Rail Noise

Cluster Number	Receiver Description	FTA Receiver Category	Distance (ft)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (1.5 dBA)	Embedded Track (1.5 dBA)	Aerial (4.5 dBA)	Crossover (1.5 dBA)	Quarrier (1.5 dBA)	Wheel Spawl (1.0 dBA)	Low Impact Frog (1.5 dBA)	Soundwall Height (ft)	Soundwall Noise Reduction (dBA)	Total Adjustment (dBA)	Mitigation	Existing Noise Exposure Cat 1 or 2 (Leq) at 30 Feet	Aesthetic Warning Bell Stop/Bell Shout	LRT Noise Exposure or 2 (Leq) at 30 Feet	LRT Noise Exposure Cat 1 or 2 (Leq) at Receiver	Unmitigated Combined Noise Exposure	Mitigated LRT Noise Exposure	Mitigated Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Leq), Cat 3 (Leq))		
																								Moderate	Severe	Impact?
N37	MFR	2	250	15	No	No	No	Yes	No	No	No	0	0	4	None	70.5	0	59	53	53	53	52	65	70	No	
N38	MFR	2	200	15	No	No	No	Yes	No	No	No	0	0	4	None	70.5	0	59	53	53	53	53	65	70	No	
N39	MFR	2	240	15	No	No	No	Yes	No	No	No	0	0	4	None	70.5	0	59	52	52	52	52	65	70	No	
N40	SFR	2	240	15	No	No	No	Yes	Yes	No	No	0	0	4	NO-2	70.5	0	52	52	52	52	52	65	70	No	
N41	Greater Holy Saint John Baptist Church	3	200	15	No	No	No	Yes	Yes	No	No	Yes	0	0	4	NO-2	70.5	0	56	48	48	48	48	65	70	No
N42	SFR/MFR	2	100	15	No	No	No	Yes	No	No	No	0	0	4	NO-2	70.5	0	56	56	56	56	56	65	70	No	
N43	SFR	2	25	15	No	No	No	Yes	Yes	Yes	No	Yes	4	11	5	NO-2	70.5	0	60	63	68	52	52	65	70	No
N44	SFR	2	150	15	No	No	No	Yes	Yes	Yes	No	Yes	0	0	5	NO-2	70.5	0	60	56	56	56	56	65	70	No
N45	SFR	2	120	15	No	No	No	Yes	Yes	Yes	Yes	Yes	0	0	5	NO-2	70.5	0	60	56	56	56	56	65	70	No
N46	SFR	2	140	15	No	No	No	Yes	Yes	Yes	No	Yes	0	0	5	NO-2	70.5	0	60	56	56	56	56	65	70	No
N48	SFR	2	240	15	No	No	No	Yes	Yes	Yes	Yes	Yes	0	0	5	NO-2	70.5	0	60	53	53	53	53	65	70	No
N49	SFR	2	160	15	No	No	No	Yes	Yes	Yes	No	Yes	0	0	5	NO-2	70.5	0	55	60	60	55	55	65	70	No
N50	SFR/MFR	2	65	15	No	No	No	Yes	No	No	Yes	No	0	0	4	NO-3	65.4	0	59	58	68	58	58	65	70	No
N51	Lujan Street Elementary	2	75	25	No	No	No	Yes	No	No	No	0	0	4	None	67.4	0	60	58	68	58	58	67	73	No	
N52	SFR/MFR	2	210	35	Yes	No	Yes	No	No	No	No	8	4	-1.5	NO-1	68.0	0	61	55	55	55	51	63	68	No	
N53	SFR/MFR	2	110	35	No	No	No	No	No	No	No	8	4	0	NO-3	68.0	34	62	59	59	55	55	63	68	No	
N54	SFR	2	35	35	No	No	No	Yes	No	No	No	8	4	3	NO-1	68.0	41	65	65	65	61	61	63	68	No	
N55	SFR	2	120	35	Yes	No	Yes	No	No	No	No	8	4	-1.5	NO-1	68.0	31	61	57	57	49	49	63	68	No	
N56	SFR	2	55	25	No	No	No	Yes	No	No	No	8	5	3	NO-1	68.0	39	65	65	65	60	60	63	68	No	
N57	SFR/MFR	2	230	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	56	48	48	63	68	No		
N58	SFR/MFR	2	50	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	29	62	62	62	54	54	63	68	No	
N59	SFR/MFR	2	220	25	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	56	48	48	63	68	No		
N60	SFR/MFR	2	65	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	61	61	53	53	63	68	No	
N61	SFR	2	70	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	61	61	53	53	63	68	No	
N62	Tamara Asanbles De Ocasion	3	70	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	27	59	49	49	65	65	71	76	No	
N63	SFR/MFR	2	215	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	27	62	56	48	48	63	68	No		
N64	SFR/MFR	2	230	25	No	No	Yes	No	No	Yes	No	8	8	4	NO-1	68.0	28	64	57	49	49	63	68	No		
N65	SFR/MFR	2	50	25	No	No	Yes	No	No	Yes	No	8	8	4	NO-1	68.0	27	64	56	48	48	63	68	No		
N66	SFR/MFR	2	40	20	No	No	No	Yes	No	Yes	No	8	3	4	NO-1	68.0	42	62	56	48	48	63	68	No		
N67	UJI Cottage	3	160	20	No	No	Yes	No	No	Yes	No	8	0	4	None	68.2	43	58	53	53	60	60	63	68	No	
N68	Huntington Park Iglesia Pentecostes	3	200	35	No	No	No	No	No	No	No	8	8	3	NO-1	68.0	41	57	43	43	65	65	71	76	No	
N69	SFR/MFR	2	200	20	No	No	Yes	No	Yes	No	No	8	8	4	NO-1	68.0	28	62	56	48	48	59	64	69	No	
N70	SFR/MFR	2	240	20	No	No	Yes	No	Yes	No	No	8	8	4	NO-1	68.0	28	62	56	48	48	59	64	69	No	
N71	MFR	2	35	20	No	No	No	No	No	Yes	No	8	8	1	NO-1	68.0	36	59	60	60	52	52	59	64	No	
N72	SFR/MFR	2	230	25	No	No	No	No	Yes	No	Yes	8	8	1	NO-1	68.0	41	61	54	54	46	46	59	64	No	
N49	SFR	2	75	25	No	No	Yes	Yes	Yes	Yes	Yes	8	8	3	NO-1	68.0	65	65	56	56	65	65	69	74	No	
N74	SFR/MFR	2	200	35	No	No	No	No	Yes	No	Yes	8	8	0	NO-1	68.0	29	62	48	48	61	61	67	72	No	
N75	MFR	2	100	35	Yes	No	No	No	No	No	Yes	8	8	-4.5	NO-1	68.0	29	58	55	60	47	47	59	64	No	
N76	SFR/MFR	2	50	35	No	No	No	No	Yes	No	Yes	8	8	0	NO-1	68.0	27	62	62	62	54	54	61	66	No	
N77	SFR/MFR	2	130	35	No	No	No	No	Yes	No	No	8	8	0	NO-1	68.0	0	58	63	50	50	59	64	No		
N78	SFR/MFR	2	100	35	Yes	No	Yes	No	Yes	No	Yes	8	8	-1.5	NO-1	68.0	34	63	58	50	59	59	64	No		
N79	SFR/MFR	2	50	35	No	No	No	Yes	No	Yes	No	8	8	0	NO-1	68.0	42	64	58	50	59	59	64	No		
N80	SFR/MFR	2	80	35	No	No	No	No	Yes	No	Yes	8	4	3	NO-1	68.0	40	63	68	59	59	59	64	Moderate		
N81	SFR	2	230	25	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	61	61	48	48	59	64	No	
N82	SFR/MFR	2	210	35	No	No	No	No	No	No	No	8	8	3	NO-1	68.0	28	65	59	51	51	59	64	No		
N83	Huntington Park High School	3	70	35	No	No	Yes	No	No	No	No	8	0	3	None	68.0	28	62	60	60	49	49	65	70	No	
N84	SFR/MFR	2	130	35	No	No	No	No	No	No	No	8	8	-4.5	NO-1	68.0	31	58	44	44	66	66	72	77	No	
N85	SFR/MFR	2	70	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	61	61	53	53	59	64	No	
N86	SFR/MFR	2	50	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	32	62	62	62	54	54	61	66	No	
N87	SFR	2	210	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	62	62	48	48	58	63	No	
N88	SFR/MFR	2	48	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	63	63	55	55	59	64	No	
N89	SFR/MFR	2	80	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	60	60	52	52	60	65	No	
N90	SFR	2	110	35	No	No	No	No	No	No	No	8	8	-4.5	NO-1	68.0	0	58	47	47	65	65	71	76	No	
N91	SFR	2	170	35	Yes	No	No	No	No	No	No	8	8	-4.5	NO-1	68.0	0	58	53	53	45	45	60	65	No	
N92	SFR/MFR	2	155	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	58	58	50	50	60	65	No	
N93	SFR	2	85	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	60	60	50	50	60	65	No	
N94	SFR/MFR	2	100	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	38	62	59	59	52	52	60	65	No	
N95	MFR	2	100	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	60	60	52	52	60	65	No	
N96	SFR	2	100	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	60	60	52	52	60	65	No	
N97	SFR/MFR	2	240	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	0	62	62	62	47	47	65	70	No	
N98	SFR/MFR	2	165	35	No	No	No	No	No	No	No	8	8	0	NO-1	68.0	42	61	57	57	50	50	60	65	No	
N99	SFR/MFR	2	200	35	No	No	Yes	No	No	No	No	8	8	3	NO-1	68.0	40	65	59	59	57	57	60	65	No	
N100	San Antonio Elementary	2	130	35	No	No	No	No	No	No	No	12	11	3	NO-1	68.0	44	62	59	47	47	61	66	No		
N101	SFR	2	120	35	No	No	No	No	No	No	No	10	10	0	NO-1	68.0	0	49	59	49	62	62	71	76	No	
N102	SFR	2	80	35	No	No	No	No	No	No	No	10	10	0	NO-1	68.0	0	62	60	60	50	50	60	65	No	
N103	SFR	2	205	35	No	No	No	No	No	No	No	10	10	0	NO-1	68.0	0	62	60	60	50	50	60	65	No	
N104	SFR	2	80	35	No	No	No	No	No	No	No	10	10	0	NO-1	68.0	0	62	60	60	50	50	60	65	No	
N105	SFR/MFR	2	80	35	No	No	No	No	No	No	No	10	10	0	NO-1	68.0	0	62	60	60	50	50	60	65	No	
N106	SFR	2	80	35	No	No	No	No	No	No	No	10	10	0	NO-1	68.0	0	62	60	60	50	50	60	65	No	

Mitigated Light Rail Noise

Cluster Number	Receiver Description	FTR Receptor Category	Distance (ft)	Speed (mph)	Intervening First Row (1-5 dB)	Intervening Second Row (1-5 dB)	Embedded Track (ft)	Aerial (ft)	Crossover (ft)	Quarrier (1-1.5 dB)	Wheel Spawl (1-10 dB)	Low Impact Frog (1-5 dB)	Soundwall Height (ft)	Soundwall Noise Reduction (dB)	Total Adjustment (dB)	Mitigation	Existing Noise Exposure Cat 1 or 2 (Leq) at 300ft	Aesthetic Warning Bell Stop/Start Shout	LRT Noise Exposure Cat 1 or 2 (Leq) at 300ft	LRT Noise Exposure Cat 1 or 2 (Leq) at 300ft	LRT Noise Exposure Cat 1 or 2 (Leq) at 300ft	Unmitigated Combined Noise Exposure	Mitigated LRT Noise Exposure	Mitigated Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Leq), Cat 3 (Leq))		
																									Moderate	Severe	Impact?
N155	SFR	2	200	55	No	No	No	No	No	No	No	8	6	0	NOC-1	63.1	0	66	60	66	60	54	54	60	65	No	
N156	SFR	2	90	55	No	No	No	No	No	No	No	8	7	0	NOC-1	61.1	0	66	60	64	64	54	57	60	65	No	
N157	SFR	2	140	55	No	No	No	No	No	No	No	8	5	-4.5	NOC-1	61.1	0	62	61	62	61	57	57	61	64	No	
N158	SFR	2	90	55	No	No	No	No	No	No	No	8	8	0	NOC-1	61.1	0	66	64	64	64	56	56	58	64	No	
N159	SFR	2	205	55	No	No	No	No	No	No	No	8	6	0	NOC-1	61.1	0	66	60	64	64	54	54	58	64	No	
N160	SFR	2	140	55	No	No	No	No	No	No	No	8	5	0	NOC-1	61.1	0	66	60	62	62	57	57	61	64	No	
N161	SFR	2	110	55	No	No	No	No	No	No	No	8	1	0	NOC-1	61.1	0	66	63	63	62	62	62	58	64	Moderate	
N162	SFR	2	170	55	No	No	No	No	No	No	No	8	1	0	NOC-1	61.1	0	66	61	64	64	56	56	58	64	No	
N163	SFR/MFR	2	95	55	No	No	No	Yes	No	Yes	No	8	3	0	NOC-1	61.1	0	66	61	64	61	61	58	64	Moderate		
N164	SFR/MFR	2	180	55	No	No	No	Yes	No	Yes	No	8	8	0	NOC-1	61.1	0	66	63	66	63	53	53	58	64	No	
N165	MFR	2	185	55	No	No	Yes	No	No	No	Yes	8	5	1	NOC-1	61.1	0	69	61	64	64	59	59	64	64	Moderate	
N166	MFR	2	70	55	No	No	No	No	No	No	No	8	5	0	NOC-1	61.1	0	66	61	66	66	56	56	58	64	No	
N167	SFR	2	140	55	Yes	No	No	No	No	No	No	8	8	-4.5	NOC-1	61.1	0	62	60	64	64	49	49	58	64	No	
N168	Mobile Homes	2	70	55	No	No	No	No	No	No	No	8	12	0	NOC-1	61.1	0	66	65	65	65	53	53	58	64	No	
N169	Motel	2	230	50	No	No	No	Yes	No	No	No	0	0	4	None	68.0	0	63	63	63	63	63	63	68	Moderate		
N170	SFR	2	305	50	No	No	No	No	No	No	No	8	5	0	NOC-1	58.7	0	66	59	59	54	54	57	63	No		
N171	SFR	2	230	50	No	No	No	No	No	No	No	8	8	0	NOC-1	58.7	0	66	64	64	59	51	51	57	63	No	
N172	SFR	2	135	55	No	No	No	No	No	No	No	8	9	0	NOC-1	58.7	0	66	62	62	63	53	53	57	63	No	
N173	SFR	2	240	55	No	No	No	No	No	No	No	8	7	0	NOC-1	58.7	0	66	60	60	53	53	57	63	No		
N174	SFR	2	140	55	No	No	No	No	No	No	No	6	7	0	NOC-1	58.0	0	66	63	63	55	55	61	68	No		
N175	SFR	2	240	55	No	No	No	No	No	No	No	6	7	0	NOC-1	58.7	0	66	60	60	53	53	57	63	No		
N176	MFR	2	145	55	No	No	No	No	No	No	No	6	7	0	NOC-1	58.7	0	66	63	63	55	57	63	No			
N177	Thunderbird Villa Mobile Home Estates	2	140	55	No	No	Yes	No	No	No	No	8	9	4	NOC-1	57.4	0	70	66	66	57	57	66	62	Moderate		
N178	Thunderbird Villa Mobile Home Estates	2	175	55	No	No	No	No	No	No	No	8	8	0	NOC-1	57.4	0	70	61	61	53	53	56	62	No		
N179	Thunderbird Villa Mobile Home Estates	2	90	55	No	No	No	No	No	No	No	8	9	0	NOC-1	57.4	0	70	66	66	55	55	56	64	No		
N180	Thunderbird Villa Mobile Home Estates	2	110	55	No	No	Yes	No	No	No	No	8	9	4	NOC-1	57.4	0	70	67	67	58	58	56	62	Moderate		
N181	Thunderbird Villa Mobile Home Estates	2	30	55	No	No	No	No	No	No	No	8	11	0	None	57.4	0	66	60	60	58	58	56	62	Moderate		
N181	Trinity Bible Church	2	29	55	No	No	Yes	No	No	No	No	0	0	3	None	57.3	0	62	67	67	70	78	78	70	78	No	
N182	SFR	2	280	35	No	No	No	No	No	No	No	0	0	0	None	59.3	0	55	55	55	55	57	57	63	No		
N183	Agostini Assembly South East	1	280	35	No	No	No	No	No	No	No	0	0	0	None	59.6	0	59	55	55	55	57	57	63	No		
N184	American Indian Bible Church	1	80	35	No	No	Yes	No	No	No	No	0	0	3	None	59.7	0	62	64	64	60	60	60	66	64	No	
N185	SFR	2	210	25	No	No	No	No	No	No	No	0	0	0	None	59.9	0	60	53	53	53	53	53	58	63	No	
N186	SFR	2	200	25	No	No	No	No	No	No	No	0	0	0	None	59.9	0	60	53	53	53	53	53	58	63	No	
N187	SFR	2	220	25	No	No	No	Yes	No	Yes	No	0	0	0	NOC-2	59.9	0	55	49	49	49	49	49	58	63	No	
N188	SFR	2	220	25	No	No	Yes	No	No	Yes	No	0	0	0	NOC-2	59.9	0	55	49	49	49	49	49	58	63	No	
N189	SFR	2	185	25	No	No	Yes	No	No	Yes	No	0	0	4	None	60.3	28	59	53	53	53	53	53	58	64	No	
N190	SFR	2	100	45	No	No	Yes	No	No	Yes	No	0	0	4	None	63.7	0	59	56	56	56	56	56	60	66	No	
N191	SFR	2	70	25	No	No	No	No	Yes	No	No	14	11	1	NOC-1	64.0	0	61	59	59	48	48	60	66	No		
N192	SFR	2	20	25	No	No	No	No	No	Yes	No	14	12	1	NOC-1	64.0	0	61	64	64	54	54	60	66	No		
N193	SFR	2	15	25	No	No	No	No	Yes	No	Yes	14	12	1	NOC-1	64.0	0	64	66	66	54	54	60	66	No		
N194	SFR	2	80	25	No	No	No	No	No	Yes	No	14	11	1	NOC-1	64.0	0	61	58	58	47	47	60	66	No		
N195	SFR	2	230	25	No	No	No	No	Yes	No	Yes	14	11	1	NOC-1	64.0	0	61	61	61	49	49	60	66	No		
N196	SFR	2	70	25	No	No	No	No	Yes	No	Yes	14	11	1	NOC-1	64.0	0	61	59	59	48	48	60	66	No		
N197	SFR	2	13	25	No	No	No	No	Yes	No	Yes	14	12	1	NOC-1	64.0	0	61	64	64	54	54	60	66	No		
N198	SFR	2	280	25	No	No	No	No	No	No	No	14	11	0	NOC-1	64.0	0	61	61	61	41	41	60	66	No		
N199	SFR	2	285	25	No	No	No	Yes	No	No	No	8	8	4	NOC-1	64.1	0	64	56	56	48	48	55	61	No		
N200	SFR	2	29	25	No	No	Yes	No	Yes	No	Yes	8	11	4	NOC-1	64.4	0	64	56	56	47	47	56	62	No		
N201	SFR	2	22	25	No	No	Yes	No	No	No	No	8	12	4	NOC-1	60.7	0	64	67	67	55	55	58	64	No		
N202	SFR	2	85	25	No	No	No	Yes	No	No	No	8	9	4	NOC-1	58.5	0	64	61	61	52	52	57	63	No		
N203	SFR	2	240	25	No	No	Yes	No	Yes	No	Yes	8	8	4	NOC-1	58.8	0	64	64	64	49	49	55	61	No		
N203	SFR	2	190	20	No	No	Yes	No	Yes	No	Yes	6	6	4	NOC-1	58.0	0	62	56	56	48	48	56	62	No		
N204	SFR	2	65	20	No	No	Yes	No	Yes	No	Yes	6	10	4	NOC-1	60.1	0	62	60	60	50	50	58	63	No		
N205	SFR	2	280	25	No	No	Yes	No	Yes	No	Yes	6	7	4	NOC-1	59.0	0	62	62	62	47	47	56	62	No		
N206	SFR	2	15	20	No	No	Yes	No	Yes	No	Yes	6	12	4	NOC-1	60.0	0	62	58	58	47	47	55	61	No		
N207	SFR	2	75	20	No	No	Yes	No	Yes	No	Yes	6	10	4	NOC-1	62.4	0	62	60	60	50	50	58	63	No		
N208	SFR	2	170	20	No	No	Yes	No	Yes	No	Yes	6	8	4	NOC-1	59.5	0	62	60	60	48	48	56	62	No		
N209	SFR	2	280	25	No	No	Yes	No	Yes	No	Yes	6	7	4	NOC-1	54.4	0	64	56	56	49	49	55	61	No		
N210	SFR	2	80	20	No	No	Yes	No	Yes	No	Yes	6	8	4	NOC-1	60.4	0	64	62	62	51	51	58	64	No		
N211	SFR	2	280	25	No	No	Yes	No	Yes	No	Yes	6	7	4	NOC-1	54.9	0	64	56	56	49	49	55	61	No		
N212	SFR	2	140	25	No	No	Yes	No	No	No	No	6	8	4	NOC-1	56.2	0	64	59	59	51	51	56	62	No		
N213	SFR	2	55	30	No	No	Yes	No	Yes	No	Yes	6	10	4	NOC-1	60.8	0	64	64	64	53	53	61	67	No		
N214	MFR	2	335	35	No	No	Yes	No	No	No	No	4	5	4	NOC-1	62.3	0	58	58	58	59	51	51	56	62	No	
N215	SFR	2	100	35	No	No	No	No	No	No	No	4	6	0	NOC-1	58.0	0	62	59	59	53	53	57	63	No		
N216	SFR	2	70	35	No	No	No	No	No	No	No	4	7	0	NOC-1	58.0	0	62	61	61	54	54	57	63	No		
N217	SFR	2	100	35	No	No	No	No	No	No	No	4	5	0	NOC-1	58.0	0	62	59	59	54	54	57	63	No		
N219	SFR	2	130	55	No	No	No	No	No	No	No	8	8	0	NOC-1	58.0	0	66	63	63	55	55	57	63	No		
N220	SFR	2	130	55	No	No	No	No	No	No	No	8	8	0	NOC-1	58.0	0	66	63	63	55	55	57	63	No		
N221	Paramount High School	3	85	55	No	No	No	No	No	No	No	8	10	0	NOC-1	57.0	0	63	61	61	51						

Mitigated Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Distance (feet)	Speed (mph)	Intervening First Row (1-5 dB(A))	Intervening Second Row (1-5 dB(A))	Embedded Track (1-5 dB(A))	Aerial (1-5 dB(A))	Crossover (1-5 dB(A))	Quarter (1-5 dB(A))	Wheel Spawl (1-10 dB(A))	Low Impact Frog (1-5 dB(A))	Soundwall Height (ft)	Soundwall Noise Reduction (dB(A))	Total Adjustment (dB(A))	Mitigation	Existing Noise Exposure Cat 1 or 2 (Leq) Cat 3 (Leq)	Audible Warning Noise with CPUC Bell Stop/Bell Shout	LRT Noise Exposure Cat 1 or 2 (Leq) Cat 3 (Leq) at 50 Feet	LRT Noise Exposure Cat 1 or 2 (Leq) Cat 3 (Leq) at Receptor	Unmitigated Combined Noise Exposure	Mitigated LRT Noise Exposure	Mitigated Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Leq), Cat 3 (Leq))			
																								Moderate	Severe	Impact?	
N280	MFR	2	230	55	No	No	No	Yes	No	No	No	4	5	4	NO-1	69.4	0	70	62	62	64	57	57	64	69	No	
N281	MFR	2	235	55	No	No	No	Yes	No	No	No	4	5	4	NO-1	69.4	0	70	64	64	64	59	59	64	69	No	
N282	MFR	2	235	55	No	No	No	Yes	No	No	No	4	5	4	NO-1	69.4	0	70	64	64	64	59	59	64	69	No	
N283	SFR	2	110	55	No	No	No	No	No	No	No	4	7	0	NO-1	57.7	0	66	63	63	56	56	57	62	60	No	
N284	SFR	2	175	55	No	No	No	No	No	No	No	4	5	0	NO-1	57.7	0	66	63	63	56	56	57	62	60	No	
N285	SFR	2	185	55	No	No	No	No	Yes	No	No	8	9	0	NO-1	57.7	0	66	63	63	56	56	57	62	60	No	
N286	Bar Tooren Villa Convalescent Hospital	2	115	55	No	No	No	No	No	No	No	10	10	0	NO-1	69.4	0	66	63	63	53	53	64	69	No		
N287	SFR	2	50	55	No	No	No	No	No	No	No	10	11	0	NO-1	57.7	0	66	63	63	56	56	57	62	60	No	
N288	SFR	2	225	55	No	No	No	No	No	No	No	10	10	0	NO-1	57.7	0	66	60	60	50	50	57	62	60	No	
N289	SFR	2	200	55	No	No	No	No	Yes	No	Yes	10	9	0	NO-1	57.7	0	66	60	60	55	55	57	62	60	No	
N290	SFR	2	50	55	No	No	No	No	Yes	No	Yes	10	10	0	NO-1	57.7	0	66	66	66	51	51	57	62	60	No	
N291	SFR	2	100	55	No	No	No	No	No	Yes	Yes	10	9	0	NO-1	57.7	0	66	64	64	54	54	57	62	60	No	
N292	SFR	2	160	55	Yes	No	No	No	No	No	No	10	9	-4.5	NO-1	57.7	0	62	62	62	57	57	48	48	57	62	No
N293	SFR	2	230	55	No	No	No	No	No	No	No	10	9	0	NO-1	57.7	0	66	66	66	51	51	57	62	60	No	
N294	SFR	2	65	55	No	No	No	No	Yes	No	Yes	10	9	0	NO-1	57.7	0	66	65	65	55	55	57	62	60	No	
N295	SFR	2	150	55	No	No	No	No	Yes	No	Yes	10	9	0	NO-1	57.7	0	66	64	64	53	53	57	62	60	No	
N296	SFR	2	150	55	Yes	No	No	No	No	No	No	10	9	-4.5	NO-1	57.7	0	62	62	62	48	48	37	62	60	No	
N297	SFR	2	60	55	No	No	No	No	No	No	No	10	10	0	NO-1	57.7	0	66	66	66	56	56	57	62	60	No	
N298	SFR	2	55	55	No	No	No	No	No	No	No	10	10	0	NO-1	57.7	0	66	64	64	54	54	57	62	60	No	
N353	SFR	2	105	55	No	No	No	No	No	No	No	8	9	0	NO-1	57.7	0	66	63	63	54	54	57	62	60	No	
N354	SFR	2	180	55	No	No	No	No	No	No	No	8	9	0	NO-1	57.7	0	66	63	63	54	54	57	62	60	No	
N355	SFR	2	180	55	No	No	No	No	No	No	No	8	8	0	NO-1	57.7	0	66	63	63	53	53	57	62	60	No	
N356	SFR	2	105	55	No	No	No	No	No	No	No	8	9	0	NO-1	57.7	0	66	63	63	54	54	57	62	60	No	
N357	SFR	2	45	55	No	No	No	No	No	No	No	10	11	0	NO-1	57.7	0	66	67	67	56	56	57	62	60	No	
N358	SFR	2	100	55	No	No	No	No	No	No	No	10	10	0	NO-1	57.7	0	66	63	63	53	53	57	62	60	No	
N359	SFR	2	60	55	No	No	No	No	No	No	No	10	10	0	NO-1	57.7	0	66	66	66	56	56	57	62	60	No	
N360	SFR	2	140	55	No	No	No	No	Yes	No	Yes	10	10	0	NO-1	57.7	0	66	67	67	57	57	57	62	Moderate		
N368	SFR	2	95	55	No	No	No	No	No	No	No	10	10	0	NO-1	57.7	0	66	64	64	54	54	57	62	60	No	
N399	SFR	2	210	55	No	No	No	Yes	No	No	No	10	10	4	NO-1	57.7	0	70	64	64	54	54	57	62	60	No	
N300	SFR	2	140	55	No	No	No	No	Yes	No	No	10	10	4	NO-1	57.7	0	70	66	66	56	56	57	62	60	No	
N301	SFR	2	70	55	No	No	Yes	No	No	No	No	10	11	4	NO-1	57.7	0	70	69	69	58	58	57	62	Moderate		
N302	Valley Christian High School	3	180	55	No	No	No	No	No	No	No	0	0	3	None	61.4	29	66	60	60	60	60	64	69	No		
N303	San Nicolas Medical Health Clinic	3	160	55	No	No	Yes	No	No	No	No	0	0	3	None	61.4	29	66	60	60	60	64	69	No			
N304	Fremont College	3	200	55	No	No	No	No	No	No	No	0	0	0	None	53.2	0	63	57	57	57	60	66	66	No		
N305	Artesia Cemetery	3	220	55	No	No	No	No	No	No	No	0	0	0	None	53.2	0	63	56	56	56	60	66	66	No		
N306	SFR	2	210	55	No	No	No	No	No	No	No	12	10	0	NO-1	53.2	0	66	60	60	50	50	54	60	No		
N307	SFR	2	70	55	No	No	NO-1	No	No	No	No	12	11	0	NO-1	51.2	0	65	65	64	54	54	60	Moderate			
N308	SFR	2	210	55	No	No	No	Yes	No	No	No	12	11	4	NO-1	51.2	0	70	64	64	53	53	54	60	No		
N309	SFR	2	70	55	No	No	No	Yes	No	No	No	12	11	4	NO-1	51.2	0	70	69	69	58	58	54	60	Moderate		
N310	SFR	2	55	55	No	No	No	Yes	No	No	No	12	12	4	NO-1	51.2	0	70	70	70	58	58	54	60	Moderate		
N311	SFR	2	140	55	No	No	No	Yes	No	No	No	10	10	4	NO-1	51.2	0	70	66	66	56	56	54	60	Moderate		
N312	SFR	2	50	55	No	No	No	Yes	No	No	No	12	12	4	NO-1	53.1	0	70	70	70	58	58	54	60	Moderate		
N313	SFR	2	175	55	No	No	No	Yes	No	No	No	10	10	4	NO-1	65.8	0	70	65	65	55	55	61	67	No		
N314	SFR	2	70	55	No	No	No	No	Yes	No	No	10	11	4	NO-1	65.8	0	70	69	69	58	58	61	67	No		
N315	SFR	2	45	50	No	No	No	Yes	No	No	No	10	12	4	NO-1	65.8	0	70	70	70	58	58	61	67	No		
N316	SFR	2	130	50	Yes	No	No	No	No	No	No	10	10	-4.5	NO-1	51.2	0	61	57	57	47	47	44	60	No		
N317	SFR	2	220	45	No	No	No	No	No	No	No	10	10	0	NO-1	51.2	0	65	61	61	48	48	54	60	No		
N318	SFR	2	110	45	No	No	No	No	No	No	No	10	10	0	NO-1	51.2	0	65	61	61	51	51	54	60	No		
N319	SFR	2	50	45	No	No	No	No	No	No	No	10	10	0	NO-1	51.2	0	65	65	65	55	55	54	60	Moderate		
N320	SFR	2	110	45	Yes	No	No	No	No	No	No	10	10	-4.5	NO-1	51.2	0	60	57	57	47	47	54	60	No		
N321	SFR	2	210	40	No	No	No	No	No	No	No	10	8	0	NO-1	48.0	0	64	57	57	49	49	53	59	No		
N322	SFR	2	40	40	No	No	No	No	No	No	No	10	8	0	NO-1	48.0	27	64	65	65	57	57	53	59	Moderate		
N323	SFR	2	45	45	No	No	No	No	No	No	No	10	11	0	NO-1	48.0	0	65	65	65	54	54	53	59	Moderate		
N324	SFR	2	200	45	No	No	No	No	No	No	No	10	10	0	NO-1	48.0	0	65	59	59	49	49	53	59	No		
N325	SFR	2	140	40	No	No	No	No	No	No	No	10	9	0	NO-1	48.0	0	64	59	59	50	50	53	59	No		
N326	SFR	2	50	40	No	No	No	No	No	No	No	10	10	0	NO-1	48.0	32	64	64	64	54	54	53	59	Moderate		
N327	MFR	2	210	30	No	No	Yes	No	No	No	No	6	6	3	None	48.0	26	64	58	58	52	52	53	59	No		
N328	SFR/MFR	2	45	30	No	No	Yes	No	No	No	No	10	7	3	NO-1	48.0	38	64	61	61	63	63	63	59	Severe		
N329	SFR	2	180	30	No	No	No	No	No	No	No	10	9	0	NO-1	48.0	0	61	55	55	46	46	53	59	No		
N330	SFR	2	180	30	Yes	No	No	No	Yes	No	Yes	8	8	-4.5	NO-1	48.0	0	57	51	51	38	38	43	53	59	No	
N331	SFR/MFR	2	35	20	No	No	Yes	No	Yes	No	Yes	8	9	0	NO-1	48.0	11	58	50	50	44	44	50	53	59	No	
N332	Artesia Historical Museum	3	45	20	No	No	No	No	NO-1	Yes	Yes	8	8	0	NO-1	50.0	12	54	45	45	46	48	58	65	No		
N333	SFR	2	175	40	Yes	No	No	No	No	No	No	8	8	-4.5	NO-1	48.0	30	59	54	54	46	46	53	59	No		
N334	SFR	2	40	30	No	No	Yes	No	Yes	No	Yes	10	7	3	NO-1	48.0	40	64	65	67	63	63	53	59	Severe		
N335	SFR/MFR	2	300	30	No	No	Yes	No	No	No	No	10	5	3	NO-1	48.0	24	51	56	51	51	53	53	59	No		
N336	SFR	2	180	30	No	No	No	No	No	No	Yes	8	8	0	NO-1	48.0	0	61	56	56	48	48	53	59	No		
N337	Wan-Yan Temple	3	55	20	No	No	No	No	Yes	No	Yes	8	8	0	NO-1	50.0	8	54	46	46	38	38	46	65	No		
N338	SFR/MFR	2																									

Mitigated Design Option Light Rail Noise

Cluster Number	Receptor Description	FTA Receptor Category	Distance (feet)	Speed (mph)	Intervening First Row (4.5 dBA)	Intervening Second Row (-1.5 dBA)	Embedded Track (+3 dBA)	Aerial (+4 dBA)	Crossover (+5 dBA)	Quicker (+1 dBA)	Wheel Spinal (+10 dBA)	Low Impact Frog (-5 dBA)	Soundwall Height (ft)	Soundwall	Total Adjustment (dBA)	Mitigation	Existing Noise Exposure Cat 1 or 2 (dBA, Cat 3 (Leq))	Audible Warning Noise with CPAC Bell Stop/Bell Shroud	LRT Noise Exposure Cat 1 or 2 (dBA, Cat 3 (Leq) at 50 Feet	LRT Noise Exposure Cat 1 or 2 (dBA, Cat 3 (Leq) at Receptor	Unmitigated Combined Noise Exposure	Mitigated LRT Noise Exposure	Mitigated Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Leq), Cat 3 (Leq))		Impact?
																								Moderate	Severe	
N322	SFR	2	40	No	No	No	No	No	No	No	No	No	10	10.0	0	NOI-1	48.0	5	64	65	65	55	53	59	Moderate	
N323	SFR	2	45	No	No	No	No	No	No	No	No	No	10	11.0	0	NOI-1	48.0	0	65	65	65	54	54	59	Moderate	
N324	SFR	2	200	No	No	No	No	No	No	No	No	No	10	10.0	0	NOI-1	48.0	0	65	65	65	49	49	53	59	No
N325	SFR	2	140	No	No	No	No	No	No	No	No	No	10	9.0	0	NOI-1	48.0	0	64	64	64	50	50	53	59	No
N326	SFR	2	50	No	No	No	No	No	No	No	No	No	10	10.0	0	NOI-1	48.0	10	64	64	64	54	54	53	59	Moderate
N327	M/R	2	210	No	No	No	No	No	No	No	No	No	8	8.0	0	NOI-1	48.0	4	61	61	61	47	47	53	59	No
N328	SFR/M/R	2	45	No	No	No	No	Yes	No	No	Yes	No	10	9.0	0	NOI-1NOI-2	48.0	16	62	70	70	53	53	53	59	Moderate
N329	SFR	2	190	No	No	No	No	Yes	No	No	Yes	No	8	10.0	0	NOI-1	48.0	0	61	61	61	45	45	53	59	No
N330	SFR	2	180	Yes	No	No	Yes	No	Yes	No	Yes	No	8	10.0	-4.5	NOI-1NOI-2	48.0	0	57	56	56	41	41	51	59	No
N331	SFR/M/R	2	35	No	No	No	No	Yes	No	No	Yes	No	8	12.0	0	NOI-1NOI-2	48.0	41	58	64	64	47	48	53	59	No
N332	Archie Historical Museum	3	45	No	Yes	No	Yes	No	Yes	No	Yes	No	8	8.0	3	NOI-1NOI-2	50.0	42	57	57	59	49	50	58	61	No
N333	SFR	2	175	No	No	No	No	No	No	No	No	No	8	10.0	-4.5	NOI-1	48.0	8	59	54	54	44	44	53	59	No
N334	SFR	2	40	No	No	No	No	Yes	No	No	Yes	No	10	12.0	0	NOI-1NOI-2	48.0	18	61	62	70	50	50	53	59	No
N335	SFR/M/R	2	300	No	No	No	No	No	No	No	No	No	8	9.0	0	NOI-1	48.0	2	61	61	61	44	44	53	59	No
N336	SFR	2	180	No	No	No	No	No	No	No	Yes	No	8	10.0	0	NOI-1NOI-2	48.0	0	61	66	66	46	46	53	59	No
N337	Woo Yuen Temple	3	55	No	No	No	No	Yes	No	No	Yes	No	8	12.0	0	NOI-1NOI-2	50.0	36	54	59	64	43	43	58	65	No
N338	SFR/M/R	2	160	No	No	No	No	Yes	No	Yes	No	Yes	8	10.0	1	NOI-1NOI-2	48.0	0	59	54	59	44	44	53	59	No
N339	SFR/M/R	2	90	No	No	No	No	No	Yes	Yes	No	Yes	8	11.0	0	NOI-1NOI-2	48.0	31	59	56	61	45	45	53	59	No
N340	SFR	2	200	No	No	No	No	Yes	No	Yes	No	Yes	8	10.0	1	NOI-1NOI-2	48.0	0	59	58	58	43	43	53	59	No
N341	SFR	2	110	No	No	Yes	No	Yes	No	Yes	No	Yes	8	7.0	4	NOI-1NOI-2	48.0	34	59	56	58	49	49	53	59	No
N342	SFR	2	80	No	Yes	No	Yes	No	Yes	No	Yes	No	8	1.0	4	NOI-1NOI-2	48.0	35	59	57	59	56	56	53	59	Moderate
N343	SFR	2	200	No	No	No	No	Yes	No	Yes	No	Yes	0	0.0	1	NOI-2	48.0	0	56	50	50	50	50	53	59	No
N344	SFR	2	40	No	No	Yes	No	Yes	No	No	Yes	No	8	9.0	3	NOI-1NOI-2	52.0	35	58	64	64	50	50	54	60	No

NOI-1 = Soundwall
NOI-2 = Low Impact Frog
NOI-3 = Wayside Wheel Lubrication

Freight Rail Noise Calculations

Unmitigated Relocated Freight Noise

Cluster Number	Receptor Description	FTA Receptor Category	Relocated Track Distance (feet)	Existing Track Distance	Hom	Reference Noise Level Area	Intervening First Row (< 5 dBs)	Intervening Second Row (1.5 dBs)	Total Adjustment (dB)	Existing Freight Noise	Existing Freight Pass-by	Existing Noise Level	Existing Noise Level	Existing Noise Exposure Plus Freight Cat 1 or 2 (Eqn. Cat 3 Use)		Freight Noise Only	Freight Noise Exposure Passby	Freight Noise Combined	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Eqn. Cat 3 Use))		Impact?
														LRT Noise	Exposure Plus Freight Cat 1 or 2 (Eqn. Cat 3 Use)					Moderate	Severe	
N50	SFR/MFR	2	65	75	Yes	Randolph	No	No	0	63	52	64	65.4	68	68	64	53	64	69	63	68	Severe
N51	Lillian Street Elementary	3	110	90	Yes	Randolph	Yes	No	0	72	58	72	67.4	73	73	58	71	71	70	70	77	Moderate
N52	SFR/MFR	2	240	230	Yes	Randolph	No	No	-4.5	58	43	59	68	69	59	58	47	59	60	63	68	No
N53	SFR/MFR	2	140	130	Yes	Randolph	No	No	0	61	50	61	68	69	59	61	49	61	63	63	69	Moderate
N54	SFR	2	80	70	Yes	Randolph	No	No	0	64	52	64	68	69	65	63	52	63	67	64	69	Moderate
N55	SFR	2	150	140	Yes	Randolph	Yes	No	-4.5	63	45	63	68	69	57	60	49	63	62	63	69	No
N56	SFR	2	95	85	Yes	Randolph	No	No	0	63	51	63	68	69	65	62	51	63	67	64	69	Moderate
N57	SFR/MFR	2	210	220	Yes	Randolph	No	No	0	59	47	59	68	69	56	59	48	59	61	63	68	No
N58	SFR/MFR	2	90	80	Yes	Randolph	No	No	0	63	43	63	68	69	62	62	51	63	66	64	69	Moderate
N59	SFR/MFR	2	250	240	Yes	Randolph	No	No	0	58	47	59	68	69	56	58	47	58	60	63	68	No
N60	SFR/MFR	2	45	55	Yes	Randolph	No	No	0	65	53	65	68	70	61	66	54	66	67	64	69	Moderate
N61	SFR	2	90	80	Yes	Randolph	No	No	0	63	52	63	68	69	61	62	51	63	65	64	69	Moderate
N62	Fungio Asamblea De Oracion	3	100	90	Yes	Randolph	No	No	0	72	58	72	64.2	73	73	57	71	71	70	76	Moderate	
N63	SFR/MFR	2	250	240	Yes	Randolph	No	No	0	58	47	59	68	69	56	58	47	58	60	63	68	No
N64	SFR/MFR	2	210	220	Yes	Randolph	No	No	0	59	47	59	68	69	57	59	48	59	61	63	68	No
N65	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	64	52	64	68	69	64	63	52	63	66	64	69	Moderate
N66	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	64	52	64	68	69	63	63	52	63	66	64	69	Moderate
N67	UEI College	3	140	150	Yes	Randolph	No	No	0	70	55	70	64.2	71	71	53	70	70	70	70	75	Moderate
N68	Huntington Park Iglesia Penitenciosas	3	240	230	Yes	Randolph	No	No	0	68	53	68	63.8	69	69	51	68	68	69	74	No	
N69	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	58	47	59	61.8	64	56	58	47	59	60	60	65	Moderate
N70	SFR/MFR	2	227	217	Yes	Randolph	No	No	0	58	47	58	67	69	57	59	47	59	61	64	69	Moderate
N71	MFR	2	80	70	Yes	Randolph	No	No	0	64	52	64	61.8	66	60	63	52	63	65	61	67	Moderate
N72	SFR/MFR	2	210	220	Yes	Randolph	No	No	0	59	47	59	61.8	64	54	59	48	59	60	60	65	Moderate
N73	MFR	2	60	70	Yes	Randolph	No	No	0	64	52	64	61.8	66	64	53	61	63	65	61	67	Severe
N74	SFR	2	60	70	Yes	Randolph	No	No	0	64	52	64	61.8	66	69	64	53	65	70	61	67	Severe
N75	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	63	52	64	61.8	66	66	63	52	63	67	61	67	Severe
N76	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	64	52	64	61.8	66	69	63	52	63	66	61	67	Severe
N77	MFR	2	245	235	Yes	Randolph	No	No	0	58	47	58	61.8	64	56	58	47	58	60	61	67	Severe
N78	SFR/MFR	2	135	125	Yes	Randolph	Yes	No	-4.5	61	45	61	61.8	65	63	61	50	61	65	60	66	Moderate
N79	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	63	52	64	61.8	66	67	63	52	63	69	61	67	Severe
N80	SFR/MFR	2	55	70	Yes	Randolph	No	No	0	64	52	64	61.8	66	68	65	53	63	67	61	67	Severe
N81	SFR	2	215	225	Yes	Randolph	No	No	0	58	47	59	61.8	64	61	59	48	59	63	60	65	Moderate
N82	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	58	47	59	61.8	64	59	58	47	59	62	60	65	Moderate
N83	Huntington Park High School	3	150	60	Yes	Randolph	No	No	0	74	59	74	63.8	74	74	60	74	60	75	70	78	Moderate
N84	SFR/MFR	2	120	130	Yes	Randolph	No	No	0	61	61	61	61.8	65	54	61	50	62	60	66	66	Moderate
N85	SFR/MFR	2	50	60	Yes	Randolph	No	No	0	64	53	65	61.8	66	61	65	54	65	67	62	67	Severe
N86	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	63	52	64	61.8	66	62	63	52	63	66	61	67	Moderate
N87	SFR	2	245	235	Yes	Randolph	No	No	0	58	47	58	61.8	64	56	58	47	58	60	60	65	Moderate
N88	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	64	52	64	61.8	66	63	63	52	63	66	61	67	Moderate
N89	SFR/MFR	2	60	70	Yes	Randolph	No	No	0	64	52	64	63.1	67	60	64	53	65	66	62	67	Moderate
N90	SFR	2	145	135	Yes	Randolph	Yes	No	-4.5	61	45	61	63.1	65	59	60	49	61	62	61	66	Moderate
N91	SFR	2	160	170	Yes	Randolph	Yes	No	-4.5	60	44	60	63.1	65	53	60	49	60	61	61	66	Moderate
N92	SFR/MFR	2	130	140	Yes	Randolph	No	No	0	61	49	61	63.1	65	58	61	50	61	63	61	66	Moderate
N93	SFR	2	60	70	Yes	Randolph	No	No	0	64	52	64	63.1	67	60	64	53	65	66	62	67	Moderate
N94	SFR/MFR	2	80	90	Yes	Randolph	No	No	0	62	51	62	63.1	64	60	63	52	63	65	63	67	Moderate
N95	MFR	2	85	95	Yes	Randolph	No	No	0	64	51	63	63.1	66	60	63	52	63	65	61	67	Moderate
N96	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	58	47	59	63.1	64	56	58	47	59	61	60	66	Moderate
N97	SFR	2	110	100	Yes	Randolph	No	No	0	62	51	62	63.1	66	60	62	50	62	64	61	67	Moderate
N98	SFR/MFR	2	280	270	Yes	Randolph	No	No	0	58	46	58	63.1	64	55	58	46	58	60	60	66	Moderate
N99	SFR/MFR	2	120	110	Yes	Randolph	No	No	0	62	50	62	63.1	66	57	61	50	62	63	61	67	Moderate
N100	San Antonio Elementary	3	150	120	Yes	Randolph	No	No	0	71	56	71	65.1	72	72	58	70	70	70	76	Moderate	
N101	SFR	2	240	200	Yes	Randolph	No	No	0	59	48	59	63.1	65	59	58	47	59	62	61	66	Moderate
N102	SFR	2	110	80	Yes	Randolph	No	No	0	63	52	63	63.1	66	60	62	50	62	64	62	67	Moderate
N103	SFR	2	215	200	Yes	Randolph	No	No	0	59	48	59	63.1	65	58	47	59	60	61	66	66	Moderate
N104	SFR	2	120	85	Yes	Randolph	No	No	0	63	51	63	63.1	66	60	61	50	62	64	62	67	Moderate
N105	SFR/MFR	2	110	80	Yes	Randolph	No	No	5	63	57	64	63.1	67	60	62	50	62	64	62	67	Moderate
N106	SFR	2	120	90	No	Randolph	No	No	0	62	51	62	63.1	66	60	61	50	62	64	61	67	Moderate
N107	SFR	2	95	105	No	Randolph	No	No	0	62	51	63	63.1	66	64	61	50	61	66	61	67	Moderate
N108	SFR	2	215	185	Yes	Randolph	Yes	No	-0.5	59	49	60	63.1	65	57	59	48	59	61	61	66	Moderate
N109	SFR	2	250	225	No	Randolph	Yes	No	-4.5	58	43	59	63.1	64	56	58	47	58	60	60	66	Moderate
N110	SFR	2	225	195	No	Randolph	Yes	No	-4.5	59	43	59	63.1	65	61	59	47	59	63	61	66	Moderate
N111	Trinity Bible Church	3	55	35	Yes	Facade	No	No	0	81	66	81	75.3	82	82	67	79	65	79	70	80	Moderate
N112	SFR	2	270	280	Yes	Facade	No	No	0	52	43	52	59.3	60	55	52	43	53	57	58	63	No
N113	Apostolic Assembly South Gate	3	270	290	Yes	Facade	No	No	0	72	57	72	66.6	73	73	51						

Mitigated Relocated Freight Noise

Cluster Number	Receptor Description	FTA Receptor Category	Relocated Track Distance (feet)	Existing Track Distance	Horn	Reference Noise Level Area	Intervening First Row (-4.5 dBA)	Intervening Second Row (-1.5 dBA)	Total Adjustment (dBA)	Freight Soundwall Reduction	Existing Noise Exposure Plus Freight Cat 1 or 2 (Ldn), Cat 3 (Leq)	LRT Noise	Freight Noise Horn Only	Freight Noise Exposure Passby	Freight Noise Combined	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact?
																	Moderate	Severe	
N50	SFR/MFR	2	65	75	Yes	Randolph	No	No	0	0	68	58	64	53	64	65	63	68	Moderate
N51	Lillian Street Elementary	3	110	90	Yes	Randolph	No	No	0	0	73	58	71	57	71	70	77	Moderate	
N52	SFR/MFR	2	240	230	Yes	Randolph	Yes	No	-4.5	0	69	51	58	47	59	59	63	68	No
N53	SFR/MFR	2	140	130	Yes	Randolph	No	No	0	0	69	55	61	49	61	62	63	69	No
N54	SFR	2	80	70	Yes	Randolph	No	No	0	0	69	61	63	52	63	65	64	69	Moderate
N55	SFR	2	150	140	Yes	Randolph	Yes	No	-4.5	0	69	49	60	49	61	61	63	69	No
N56	SFR	2	95	85	Yes	Randolph	No	No	0	0	69	60	62	51	63	64	64	69	Moderate
N57	SFR/MFR	2	210	220	Yes	Randolph	No	No	0	0	69	48	59	48	59	59	63	68	No
N58	SFR/MFR	2	90	80	Yes	Randolph	No	No	0	0	69	54	62	51	63	64	69	No	
N59	SFR/MFR	2	250	240	Yes	Randolph	No	No	0	0	69	48	58	47	58	59	63	68	No
N60	SFR/MFR	2	45	55	Yes	Randolph	No	No	0	0	70	53	66	54	66	64	69	Moderate	
N61	SFR	2	90	80	Yes	Randolph	No	No	0	0	69	53	62	51	63	63	64	69	No
N62	Templo Asamblea De Oracion	3	100	90	Yes	Randolph	No	No	0	0	73	49	71	57	72	72	70	76	Moderate
N63	SFR/MFR	2	250	240	Yes	Randolph	No	No	0	0	69	48	58	47	58	59	63	68	No
N64	SFR/MFR	2	210	220	Yes	Randolph	No	No	0	0	69	49	59	48	59	59	63	68	No
N65	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	0	69	56	63	52	63	64	69	Moderate	
N66	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	0	69	60	63	52	63	65	64	69	Moderate
N67	UEI College	3	140	150	Yes	Randolph	No	No	0	0	71	53	70	56	70	70	75	Moderate	
N68	Huntington Park Iglesia Pentecostes	3	240	230	Yes	Randolph	No	No	0	0	69	43	68	53	68	68	69	74	No
N69	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	0	64	48	58	47	59	59	60	65	No
N70	SFR/MFR	2	217	227	Yes	Randolph	No	No	0	0	64	55	59	47	59	60	65	Moderate	
N71	MFR	2	80	70	Yes	Randolph	No	No	0	0	66	52	63	52	63	64	61	67	Moderate
N72	SFR/MFR	2	210	220	Yes	Randolph	No	No	0	0	64	46	59	48	59	59	60	65	No
N73	MFR	2	60	70	Yes	Randolph	No	No	0	0	66	65	64	53	65	68	61	67	Severe
N349	SFR	2	60	70	Yes	Randolph	No	No	0	0	66	56	64	53	65	65	61	67	Moderate
N350	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	0	66	62	63	52	63	65	61	67	Moderate
N351	MFR	2	80	70	Yes	Randolph	No	No	0	0	66	61	63	52	63	65	61	67	Moderate
N74	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	0	64	48	58	47	59	59	60	65	No
N75	MFR	2	130	120	Yes	Randolph	Yes	No	-4.5	0	65	47	61	50	61	61	66	Moderate	
N76	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	0	66	54	63	52	63	64	61	67	Moderate
N77	SFR/MFR	2	160	150	Yes	Randolph	No	No	0	0	64	50	60	49	60	61	60	66	Moderate
N78	SFR/MFR	2	135	125	Yes	Randolph	Yes	No	-4.5	0	65	50	61	50	61	60	66	Moderate	
N79	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	0	66	55	63	52	63	64	61	67	Moderate
N80	SFR/MFR	2	55	70	Yes	Randolph	No	No	0	0	66	59	65	53	65	66	61	67	Moderate
N81	SFR	2	215	225	Yes	Randolph	No	No	0	0	64	48	59	48	59	59	60	65	No
N82	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	0	64	51	58	47	59	59	60	65	No
N83	Huntington Park High School	3	50	60	Yes	Randolph	No	No	0	0	74	60	74	60	75	70	78	Moderate	
N84	SFR/MFR	2	120	130	Yes	Randolph	No	No	0	0	65	46	61	50	62	62	60	66	Moderate
N85	SFR/MFR	2	50	60	Yes	Randolph	No	No	0	0	66	53	65	54	65	66	62	67	Moderate
N86	SFR/MFR	2	85	75	Yes	Randolph	No	No	0	0	66	55	63	52	63	64	61	67	Moderate
N87	SFR	2	245	235	Yes	Randolph	No	No	0	0	64	48	58	47	58	59	60	65	No
N88	SFR/MFR	2	80	70	Yes	Randolph	No	No	0	0	66	55	63	52	63	64	61	67	Moderate
N89	SFR/MFR	2	60	70	Yes	Randolph	No	No	0	0	67	52	64	53	65	65	62	67	Moderate
N90	SFR	2	145	135	Yes	Randolph	Yes	No	-4.5	0	65	47	60	49	61	61	66	Moderate	
N91	SFR	2	160	170	Yes	Randolph	Yes	No	-4.5	0	65	45	60	49	60	60	61	66	No
N92	SFR/MFR	2	130	140	Yes	Randolph	No	No	0	0	65	50	61	50	61	61	61	66	Moderate
N93	SFR	2	60	70	Yes	Randolph	No	No	0	0	67	52	64	53	65	65	62	67	Moderate
N94	SFR/MFR	2	80	90	Yes	Randolph	No	No	0	0	66	52	63	52	63	64	61	67	Moderate
N367	MFR	2	85	95	Yes	Randolph	no	no	0	0	66	58	63	52	63	64	61	67	Moderate
N95	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	0	64	48	58	47	59	59	60	66	No
N96	SFR	2	110	100	Yes	Randolph	No	No	0	0	66	52	60	62	62	61	67	Moderate	
N97	SFR/MFR	2	280	270	Yes	Randolph	No	No	0	0	64	47	58	46	58	58	60	66	No
N98	SFR/MFR	2	120	110	Yes	Randolph	No	No	0	0	66	50	61	50	62	62	61	67	Moderate
N99	SFR/MFR	2	240	230	Yes	Randolph	No	No	0	0	64	58	58	47	59	61	60	66	Moderate
N100	San Antonio Elementary	3	150	120	Yes	Randolph	No	No	0	3	72	49	70	55	70	66	70	76	No
N101	SFR	2	240	200	Yes	Randolph	No	No	0	0	65	49	58	47	59	59	61	66	No
N102	SFR	2	110	80	Yes	Randolph	No	No	0	7	66	50	62	50	62	56	62	67	No
N103	SFR	2	235	200	Yes	Randolph	No	No	0	0	65	47	58	47	59	59	61	66	No
N104	SFR	2	120	85	Yes	Randolph	No	No	0	2	66	50	61	50	62	60	62	67	No
N105	SFR/MFR	2	110	80	Yes	Randolph	No	No	0	3	67	50	62	50	62	60	62	67	No
N362	SFR	2	120	90	no	Randolph	No	No	0	6	66	52	61	50	62	57	61	67	No
N363	SFR	2	125	95	no	Randolph	No	No	0	8	66	55	61	50	61	57	61	67	No
N364	SFR	2	215	185	yes	Randolph	No	No	0	1	65	50	59	48	59	58	61	66	No
N365	SFR	2	250	225	no	Randolph	No	No	0	2	64	49	58	47	58	57	60	66	No

Mitigated Relocated Freight Noise

Cluster Number	Receptor Description	FTA Receptor Category	Relocated Track Distance (feet)	Existing Track Distance	Horn	Reference Noise Level Area	Intervening First Row (-4.5 dBA)	Intervening Second Row (-1.5 dBA)	Total Adjustment (dBA)	Freight Soundwall Reduction	Existing Noise Exposure Plus Freight Cat 1 or 2 (Ldn), Cat 3 (Leq)	LRT Noise	Freight Noise Horn Only	Freight Noise Exposure Passby	Freight Noise Combined	Combined Noise Exposure	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact?
																	Moderate	Severe	
N366	SFR	2	225	195	no	Randolph	No	No	0	6	65	53	59	47	59	56	61	66	No
N181	Trinity Bible Church	3	55	35	Yes	Façade	no	no	0	0	82	67	79	65	79	79	70	80	Moderate
N182	SFR	2	270	280	Yes	Façade	No	no	0	0	60	55	52	43	53	57	58	63	No
N183	Apostolic Assembly South Gate	3	270	290	Yes	Façade	No	no	0	0	73	51	72	58	72	72	70	77	Moderate
N184	American Indian Bible Church	3	120	100	Yes	Façade	no	no	0	0	79	64	75	61	76	76	70	80	Moderate
N185	SFR	2	240	230	Yes	Façade	No	No	0	0	61	53	53	43	53	56	58	64	No
N186	SFR	2	290	290	Yes	Façade	No	No	0	0	60	52	52	43	52	55	58	63	No
N187	SFR	2	250	235	Yes	Façade	No	No	0	0	61	49	52	43	53	54	58	64	No
N188	SFR	2	250	230	Yes	Façade	No	No	0	0	61	53	52	43	53	56	58	64	No
N189	SFR	2	160	165	Yes	Façade	No	No	0	0	62	53	54	45	55	57	59	65	No
N190	SFR	2	70	80	Yes	Façade	No	No	0	0	65	56	58	49	58	60	61	66	No
N191	SFR	2	35	55	Yes	Façade	No	No	0	5	65	48	61	52	61	57	61	66	No
N192	SFR	2	60	40	Yes	Façade	No	No	0	9	66	53	59	49	59	54	61	67	No
N193	SFR	2	60	40	Yes	Façade	No	No	0	8	66	54	59	49	59	55	61	67	No
N194	SFR	2	40	60	Yes	Façade	No	No	0	4	65	48	60	51	61	57	61	66	No
N195	SFR	2	240	260	Yes	Façade	Yes	No	-4.5	0	64	43	53	43	53	53	60	66	No
N196	SFR	2	55	70	Yes	Façade	No	No	0	2	65	48	59	50	60	58	61	66	No
N197	SFR	2	55	35	Yes	Façade	No	No	0	9	66	54	59	50	60	55	61	67	No
N198	SFR	2	320	300	Yes	Façade	Yes	No	-4.5	0	64	41	51	42	52	60	66	No	
N199	SFR	2	320	300	Yes	Façade	Yes	No	-4.5	1	54	48	51	42	52	52	55	61	No
N352	MFR	2	55	45	Yes	Façade	No	No	0	3	61	55	59	50	60	59	58	64	Moderate
N200	SFR	2	52	30	Yes	Façade	No	No	0	6	62	57	59	50	60	58	59	65	No
N201	SFR	2	60	80	Yes	Façade	No	No	0	6	59	52	59	49	59	56	57	63	No
N202	SFR	2	220	230	Yes	Façade	Yes	No	-4.5	3	55	49	53	44	54	53	55	61	No
N203	SFR	2	170	165	Yes	Façade	No	No	0	3	56	48	54	45	55	53	56	62	No
N204	SFR	2	40	50	Yes	Façade	Yes	No	-4.5	7	60	50	60	51	61	55	58	63	No
N205	SFR	2	325	320	Yes	Façade	Yes	No	-4.5	0	54	47	51	42	52	53	55	61	No
N206	SFR	2	50	55	Yes	Façade	No	No	0	6	60	55	59	50	60	57	58	63	No
N207	SFR	2	28	30	Yes	Façade	No	No	0	6	62	50	62	53	62	57	59	65	No
N208	SFR	2	183	185	Yes	Façade	Yes	No	-4.5	0	56	48	54	45	54	55	56	61	No
N209	SFR	2	265	270	Yes	Façade	Yes	No	-4.5	0	54	49	52	43	53	54	55	61	No
N210	SFR	2	40	50	Yes	Façade	No	No	0	9	60	53	60	51	61	55	58	64	No
N211	SFR	2	225	235	Yes	Façade	Yes	Yes	-6	10	55	49	53	44	53	50	55	61	No
N212	SFR	2	150	155	Yes	Façade	Yes	No	-4.5	10	56	51	55	45	55	52	56	62	No
N213	SFR	2	35	45	Yes	Façade	No	No	0	10	61	53	61	52	61	55	58	64	No

**Grade Crossing, TPSS,
Parking Facility, and
MSF Noise Calculations**

Grade Crossing Signal Bell Noise

Cluster Number	Receptor Description	FTA Receptor Category	Grade Crossing	Distance to Grade Crossing (feet)	Intervening First Row (-4.5 dBA)	Closed	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Grade Crossing Noise Adjusted per CPUC Min	Grade Crossing Noise Bell Stop and Bell Shroud	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact?
											Moderate	Severe	
N52	SFR/MFR	2	Albany St.	200	Yes	No	-5	68.0	40	28	63	68	No
N53	SFR/MFR	2	Albany St.	95	Yes	No	-5	68.0	46	34	63	68	No
N54	SFR	2	Albany St.	45	No	No	0	68.0	53	41	63	68	No
N55	SFR	2	Santa Fe Ave	135	Yes	No	-5	68.0	43	31	63	68	No
N56	SFR	2	Santa Fe Ave	55	No	No	0	68.0	51	39	63	68	No
N58	SFR/MFR	2	Santa Fe Ave	180	No	No	0	68.0	41	29	63	68	No
N63	SFR/MFR	2	Rugby Ave	210	No	No	0	68.0	39	27	63	68	No
N64	SFR/MFR	2	Rugby Ave	200	No	No	0	68.0	40	28	63	68	No
N65	SFR/MFR	2	Rugby Ave	70	No	No	0	68.0	49	37	63	68	No
N66	SFR/MFR	2	Rugby Ave	40	No	No	0	68.0	54	42	63	68	No
N67	UEI College	3	Rugby Ave	45	No	No	0	64.2	55	43	65	71	No
None	None	None	Pacific Blvd.	None	None	None	None	None	None	None	None	None	None
N69	SFR/MFR	2	Seville Ave	185	No	No	0	61.8	40	28	59	64	No
N70	SFR/MFR	2	Seville Ave	210	No	No	0	61.8	39	27	59	64	No
N71	MFR	2	Seville Ave	75	No	No	0	61.8	48	36	59	64	No
N73	MFR	2	Seville Ave	40	No	No	0	61.8	54	42	59	64	No
N351	MFR	2	Seville Ave	25	No	No	0	61.8	58	46	59	64	No
N78	SFR/MFR	2	Miles Ave	100	Yes	No	-5	61.8	46	34	59	64	No
N79	SFR/MFR	2	Miles Ave	40	No	No	0	61.8	54	42	59	64	No
N80	SFR/MFR	2	Miles Ave	50	No	No	0	61.8	52	40	59	64	No
N82	SFR/MFR	2	Miles Ave	200	No	No	0	61.8	40	28	59	64	No
N83	Huntington Park High School	3	Miles Ave	80	No	No	0	63.8	50	38	65	70	No
N83	Huntington Park High School	3	Miles Ave	90	No	No	0	63.8	49	37	65	70	No
N86	SFR/MFR	2	Miles Ave	120	No	No	0	61.8	44	32	59	64	No
N350	SFR/MFR	2	Miles Ave	40	No	No	0	61.8	54	42	59	64	No
N94	SFR/MFR	2	State St/Boyle Ave	240	No	No	0	63.1	38	38	60	65	No
N367	MFR	2	State St/Boyle Ave	80	No	No	0	63.1	48	48	60	65	No
N98	SFR/MFR	2	State St/Boyle Ave	160	No	No	0	63.1	42	42	60	65	No
N99	SFR/MFR	2	State St/Boyle Ave	190	No	No	0	63.1	40	40	60	65	No
N100	San Antonio Elementary	3	State St/Boyle Ave	160	No	No	0	65.1	44	44	66	71	No
N106	Southeast Rio Family YMCA	3	Gage Ave	260	No	No	0	68.8	40	28	68	74	No
N107	SFR	2	Gage Ave	100	No	No	0	66.8	46	46	62	67	No
N108	SFR	2	Gage Ave	180	No	No	0	66.8	41	29	62	67	No

Grade Crossing Signal Bell Noise

Cluster Number	Receptor Description	FTA Receptor Category	Grade Crossing	Distance to Grade Crossing (feet)	Intervening First Row (-4.5 dBA)	Closed	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Grade Crossing Noise Adjusted per CPUC Min	Grade Crossing Noise Bell Stop and Bell Shroud	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact?
											Moderate	Severe	
N112	SFR/MFR	2	Bell Ave	330	No	No	0	66.8	35	23	62	67	No
N113	SFR/MFR	2	Bell Ave	30	No	No	0	66.8	56	44	62	67	No
N114	SFR	2	Bell Ave	100	No	No	0	66.8	46	34	62	67	No
N115	SFR/MFR	2	Bell Ave	230	No	No	0	66.8	39	27	62	67	No
N116	SFR/MFR	2	Bell Ave	30	No	No	0	64.0	56	44	60	66	No
N119	SFR	2	Florence Ave	130	No	No	0	64.0	44	44	60	66	No
N120	SFR	2	Florence Ave	220	No	No	0	64.0	39	39	60	66	No
N121	MFR	2	Florence Ave	280	No	No	0	64.0	37	37	60	66	No
N122	SFR	2	Florence Ave	285	No	No	0	63.1	37	37	60	65	No
N161	SFR	2	Otis Ave.	80	No	No	0	61.1	48	36	58	64	No
N163	SFR/MFR	2	Otis Ave.	90	No	No	0	61.1	47	35	58	64	No
N162	SFR	2	Santa Ana St	300	No	No	0	61.1	36	36	58	64	No
N163	SFR/MFR	2	Santa Ana St	280	No	No	0	61.1	37	37	58	64	No
N165	MFR	2	Santa Ana St	200	No	No	0	61.1	40	40	58	64	No
N166	MFR	2	Santa Ana St	280	No	No	0	61.1	37	37	58	64	No
None	None	None	Ardine St	None	None	None	None	None	None	None	None	None	None
None	None	None	Rayo Ave	None	None	None	None	None	None	None	None	None	None
N170	SFR	2	Southern Ave	250	No	No	0	58.7	38	38	57	63	No
None	None	None	Miller Wy.	None	None	None	None	None	None	None	None	None	None
None	None	None	Gardendale St.	None	None	None	None	None	None	None	None	None	None
N181	Trinity Bible Church	3	Main St	20	No	No		75.3	62	62	70	78	No
N184	American Indian Bible Church	3	Main St	20	No	No		74.7	62	62	70	78	No
N188	SFR	2	Century Blvd	200	No	No	0	60.3	40	28	58	64	No
N189	SFR	2	Century Blvd	140	No	No	0	61.2	43	31	58	64	No
N190	SFR	2	Century Blvd	50	No	No	0	63.7	52	40	60	65	No
N224	SFR	2	Somerset Blvd	330	No	No	0	66.4	35	23	62	67	No

Grade Crossing Signal Bell Noise

Cluster Number	Receptor Description	FTA Receptor Category	Grade Crossing	Distance to Grade Crossing (feet)	Intervening First Row (-4.5 dBA)	Closed	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Grade Crossing Noise Adjusted per CPUC Min	Grade Crossing Noise Bell Stop and Bell Shroud	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact?
											Moderate	Severe	
N226	SFR	2	Somerset Blvd	125	No	No	0	62.7	44	32	59	65	No
N227	SFR	2	Somerset Blvd	60	No	No	0	66.4	50	38	62	67	No
N231	SFR	2	Lakewood Blvd	85	No	No	0	56.0	47	35	56	62	No
N246	MFR	2	Clark Ave	50	No	No	0	62.4	52	40	59	65	No
N247	SFR	2	Clark Ave	150	No	No	0	62.4	42	30	59	65	No
N248	MFR	2	Clark Ave	310	no	No	0	62.4	36	24	59	65	No
N249	SFR	2	Clark Ave	165	No	No	0	59.5	41	29	58	63	No
N251	SFR	2	Clark Ave	105	No	No	0	59.5	45	33	58	63	No
N251	SFR	2	Alondra Blvd	140	No	No	0	59.5	43	31	58	63	No
N252	Door Christian Fellowship Church	3	Alondra Blvd	120	No	No		61.5	46	34	64	69	No
N253	SFR	2	Alondra Blvd	115	No	No	0	66.0	45	33	61	67	No
N261	SFR/MFR	2	Bellflower Blvd	350	No	No	0	59.5	35	35	58	63	No
N267	MFR	2	Bellflower Blvd	280	No	No	0	56.0	37	37	56	62	No
N348	Mayne Events Center/Los Angeles Cou	3	Bellflower Blvd	70	No	No	0	66.0	51	51	66	72	No
None	None	None	Private Crossing (Extra Space Storage)	None	None	None	None	None	None	None	None	None	None
N302	Valley Christian High School	3	Artesia Blvd	221	No	No	0	61.4	41	29	64	69	No
N303	Rio Hondo Metal Health Clinic	3	Studebaker Rd	162	No	No	0	61.4	44	32	64	69	No
N322	SFR	2	186th St	230	No	No	0	48.0	39	27	53	59	No
N326	SFR	2	186th St	130	No	No	0	48.0	44	32	53	59	No
N327	MFR	2	186th St	240	Yes	No	-5	48.0	38	26	53	59	No
N328	SFR/MFR	2	186th St	61	No	No	0	48.0	50	38	53	59	No
N333	SFR	2	186th St	150	yes	no	-5	48.0	42	30	53	59	No
N334	SFR	2	186th St	50	No	No	0	48.0	52	40	53	59	No
N335	SFR/MFR	2	186th St	300	yes	No	-5	48.0	36	24	53	59	No

Grade Crossing Signal Bell Noise

Cluster Number	Receptor Description	FTA Receptor Category	Grade Crossing	Distance to Grade Crossing (feet)	Intervening First Row (-4.5 dBA)	Closed	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Grade Crossing Noise Adjusted per CPUC Min	Grade Crossing Noise Bell Stop and Bell Shroud	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact?
											Moderate	Severe	
N331	SFR/MFR	2	187th St	45	No	Yes	0	48.0	13	11	53	59	No
N332	Artesia Historical Museum	3	187th St	50	No	Yes	0	50.0	14	12	58	65	No
N337	Wan Yuen Temple	3	187th St	100	No	Yes	0	50.0	8	6	58	65	No
N339	SFR/MFR	2	187th St	140	No	Yes	0	48.0	3	1	53	59	No
N341	SFR	2	187th St	95	No	Yes	0	48.0	6	4	53	59	No
N342	SFR	2	187th St	90	No	Yes	0	48.0	7	5	53	59	No
N344	SFR	2	Pioneer Blvd	85	No	No	0	52.0	47	35	54	60	No

Design Option 186th Street Closed and 187th Street Open

N322	SFR	2	186th St	230	No	yes	0	48	-1.4	5	53	59	No
N326	SFR	2	186th St	130	No	yes	0	48	3.5	10	53	59	No
N327	MFR	2	186th St	240	Yes	yes	0	48	-1.8	4	53	59	No
N328	SFR/MFR	2	186th St	61	No	yes	0	48	10.1	16	53	59	No
N331	SFR/MFR	2	187th St	45	No	no	0	48	52.8	41	53	59	No
N332	Artesia Historical Museum	3	187th St	50	No	no	0	50	53.9	42	58	65	No
N333	SFR	2	186th St	150	yes	yes	0	48	2.3	8	53	59	No
N334	SFR	2	186th St	50	No	yes	0	48	11.8	18	53	59	No
N335	SFR/MFR	2	186th St	300	yes	yes	0	48	-3.7	2	53	59	No
N337	Wan Yuen Temple	3	187th St	100	No	no	0	50	47.9	36	58	65	No
N339	SFR/MFR	2	187th St	140	No	no	0	48	42.9	31	53	59	No
N341	SFR	2	187th St	95	No	no	0	48	46.3	34	53	59	No
N342	SFR	2	187th St	90	No	no	0	48	46.7	35	53	59	No
N344	SFR	2	Pioneer Blvd	85	No	No	0	52	47.2	35	54	60	No
N348	Mayne Events Center/Los Angeles Cou	3	Bellflower Blvd	70	No	No	0	66	51.0	39	66	72	No
N349	SFR	2	Seville Ave	40	No	No	0	61.8	53.8	42	59	64	No

Traction Power Substation (TPSS) Noise

TPSS Site	FTA Receptor Category	Representative Receptor	Location	Civil Station	Closet Residence	Distance (ft.)	Existing Noise (dBA, L _{dn})	TPSS Noise (dBA, L _{dn})	Noise Impact Criteria (Cat 2 (Ldn), Cat 3 (Leq))		Impact
									Moderate	Severe	
17 Slauson	2	368	South of Slauson Ave and west of Randolph St within Union Pacific Railroad property.	670+50	SFR to southwest	115	56.8	49	56	62	No
16	None	None	West of Regent St and north of Randolph St within private property.	694+25	None	None	None	None	None	None	None
15	2	71	North of Randolph St and west of Seville Ave within private property.	729+00	MFR to the southeast	130	61.8	48	59	64	No
15(e)	2	349	East of Stafford Ave and north of Randolph St within private property.	737+75	SFR to the west, east, and south	15	61.8	67	59	64	Severe
14	2	102	East of State St and north of Randolph St within Union Pacific Railroad property	768+46	SFR to the southeast	190	63.1	45	60	65	No
14	3	100	East of State St and north of Randolph St within Union Pacific Railroad property	768+46	San Antonio Elementary School	170	65.1	39	66	71	No
13	2	363	North of Randolph Ave and Bissel Pl within Union Pacific Railroad property	787+00	None	None	None	None	None	None	None
12	2	130	North of Walnut St and east of Salt Lake Ave within private property.	834+75	SFR to the south	100	63.1	50	60	65	No
11	2	167	North of Cecilia St and east of Salt Lake Ave within private property.	887+00	SFR to the north	50	61.1	56	58	64	No
10	None	None	South of Firestone Blvd and east of Branyon Ave within private property.	938+75	None	None	None	None	None	None	None
9e	None	None	Southeast of the Rio Hondo Channel and north of Meadow Rd within private property.	998+75	None	None	None	None	None	None	None
9	None	None	Between Miller Way and the Interstate 710 Freeway and north of the existing tracks within private property.	987+75	None	None	None	None	None	None	None
8(e)	2	Site 16	South of Gardendale and adjacent to the west side of Dakota Ave within private property.	1052+25	SFR to the west	120	56.4	49	56	62	No
8	None	Site 16	North of Laurel St within a vacant, private-owned property.	1044+75	None	None	None	None	None	None	None
7(e1)	2	187	West of Industrial Ave and Lincoln Ave within private property in the proposed parking facility.	1073+40	SFR to the east	140	59.9	47	58	63	No
7	2	190	North of Century Blvd and east of Center St within private property.	1080+00	SFR to the south	220	63.7	44	60	65	No
7(e2)	2	207	South of Rose Street and just west of Arthur Ave within Metro-owned property	1110+50	SFR to the north	20	62.4	64	59	65	Moderate
6	2	219	South of Paramount High School's tennis courts and just east of the existing pedestrian bridge within public-owned property	1140+00	SFR to the south	80	58.0	52	57	62	No
5(e)	2	236	North of Hegel St and south of the Bellflower Bike Trail within private property.	1195+50	SFR to south, southwest and southeast	30	52.0	61	54	60	Severe
5	2	236	North of Hegel St and the Bellflower Bike Trail within private property.	1196+50	SFR to the south	110	52.0	50	54	60	No
4	2	261	West of Bellflower Blvd within private property within the proposed parking facility.	1243+50	SFR to the south	150	59.5	47	58	63	No
3	2	297	South of Flora Vista Park and just east of Beach St. within Metro-owned property.	1301+50	SFR to the northwest	100	57.7	50	57	62	No
3(e)		None	East of Studebaker Rd within Metro-owned property.	1345+00	None	None	None	None	None	None	None
2	2	315	Southeast of the crossing at Gridley Rd and 183rd St within Metro-owned property.	1376+25	SFR to the north	60	65.8	55	61	67	No
1	2	343	Between Corby Ave and Pioneer Blvd north of 188th St impacting a private property within the proposed parking structure.	1405+00	SFR to the west	100	48.0	50	53	59	No

Parking Facility Noise

Parking Facility	Cluster	Land Use	FTA Receptor Category	Receptor Distance (ft)	Intervening Building	Representative Monitor Site	Existing Noise Level (dBA, Ldn or Leq)	Parking Facility Number of Spaces	Parking Facility Noise Level at 50 feet (dBA, Leq)	Parking Facility Noise Level at receptor (dBA, Leq)	Noise Impact Criteria		
											Moderate	Severe	Impact?
Firestone Station	None	None	None	None	None	None	None	600	54	None	None	None	None
	GS1	SFR	2	210	No	18	56	360	52	39	56	62	No
	GS2	SFR	2	100	No	17	54.9	360	52	46	55	61	No
Paramount/Rosecrans Station	PRS1	Bianchi Stadium 11 Theatre	3	240	No	P1	59.4	490	53	40	63	68	No
Bellflower Station	BS1	SFR/MFR	2	150	No	28	59.5	260	51	41	58	63	No
	BS2	SFR/MFR	2	180	No	29	56	260	51	39	56	62	No
	BS3	SFR/MFR	2	200	No	28	59.5	260	51	39	58	63	No
	BS4	SFR/MFR	2	180	No	29	56	260	51	39	56	62	No
Pioneer Station	PS1	SFR/MFR	2	290	No	34	48	1,100	57	42	53	59	No
	PS2	SFR/MFR	2	150	No	34	48.0	1,100	57	47	53	59	No
	PS3	SFR/MFR	2	220	No	34	48.0	1,100	57	44	53	59	No
	PS4	SFR/MFR	2	160	No	34	48.0	1,100	57	47	53	59	No
	PS5	SFR/MFR	2	180	No	35	52.0	1,100	57	46	54	60	No

Bellflower MSF Noise

Cluster Number	Receptor Description	FTA Receptor Category	Distance to Source (feet)	Intervening First Row (-4.5 dBA)	Intervening Second Row (-1.5 dBA)	Crossover (+5 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Project Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Noise Impact Criteria			
											Mod	Severe	Impact?	
Car Wash Noise														
BF1	SFR		2	720	No				0	52	15.9	54.1	60.1	No
BF2	SFR		2	880	Yes				-4.5	52	9.6	54.1	60.1	No
BF3	SFR		2	880	No				0	52	14.1	54.1	60.1	No
BF4	SFR		2	880	Yes				-4.5	52	9.6	54.1	60.1	No
BF5	SFR		2	940	Yes				-4.5	52	9.1	54.1	60.1	No
BF6	SFR		2	1050	Yes				-4.5	52	8.1	54.1	60.1	No
BF7	SFR		2	1040	Yes				-4.5	52	8.2	54.1	60.1	No
BF8	SFR		2	1015	Yes				-4.5	52	8.4	54.1	60.1	No
BF9	SFR		2	1000	Yes				-4.5	52	8.5	54.1	60.1	No
BF10	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF11	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF12	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF13	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF14	SFR		2	980	No				0	52	13.2	54.1	60.1	No
BF15	SFR		2	1071	No				0	52	12.4	54.1	60.1	No
BF16	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF17	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF18	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF19	SFR		2	230	No				0	48.1	25.8	52.8	59.2	No
BF20	SFR		2	320	No				0	48.1	22.9	52.8	59.2	No
BF21	SFR		2	500	Yes				-4.5	48.1	14.5	52.8	59.2	No
BF22	SFR		2	630	Yes				-4.5	48.1	12.5	52.8	59.2	No
BF23	SFR		2	760	Yes				-4.5	48.1	10.9	52.8	59.2	No
BF24	SFR		2	780	Yes				-4.5	48.1	10.7	52.8	59.2	No
BF25	SFR		2	800	Yes				-4.5	48.1	10.5	52.8	59.2	No
BF26	SFR		2	880	Yes				-4.5	48.1	9.6	52.8	59.2	No
BF27	SFR		2	950	Yes				-4.5	48.1	9.0	52.8	59.2	No
BF28	SFR		2	250	No				0	48.1	25.1	52.8	59.2	No
BF29	MFR		2	440	No				0	48.1	20.2	52.8	59.2	No
BF30	MFR		2	590	Yes				-4.5	48.1	13.1	52.8	59.2	No
BF31	MFR		2	730	Yes				-4.5	48.1	11.3	52.8	59.2	No
BF32	MFR		2	870	Yes				-4.5	48.1	9.7	52.8	59.2	No
BF33	SFR		2	580	Yes				-4.5	48.1	13.3	52.8	59.2	No
BF34	SFR		2	750	Yes				-4.5	48.1	11.0	52.8	59.2	No
BF35	SFR		2	830	Yes				-4.5	48.1	10.1	52.8	59.2	No
BF36	SFR		2	870	Yes				-4.5	48.1	9.7	52.8	59.2	No
BF37	SFR		2	915	Yes				-4.5	48.1	9.3	52.8	59.2	No
BF38	SFR		2	730	Yes				-4.5	48.1	11.3	52.8	59.2	No
BF39	SFR		2	620	Yes				-4.5	48.1	12.7	52.8	59.2	No
BF40	SFR		2	880	Yes				-4.5	48.1	9.6	52.8	59.2	No
BF41	SFR		2	920	Yes				-4.5	48.1	9.2	52.8	59.2	No
BF42	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF43	SFR		2	650	No				0	48.1	16.8	52.8	59.2	No
BF44	SFR		2	740	Yes				-4.5	48.1	11.1	52.8	59.2	No
BF45	SFR		2	855	Yes				-4.5	48.1	9.9	52.8	59.2	No
BF46	SFR		2	965	Yes				-4.5	48.1	8.8	52.8	59.2	No
BF47	SFR		2	860	No				0	48.1	14.3	52.8	59.2	No
BF48	SFR		2	930	Yes				-4.5	48.1	9.2	52.8	59.2	No
BF49	Albert Baxter Eleme		3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF50	MFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF51	MFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF52	Mobile Homes		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF53	Mobile Homes		2	800	No				0	48.1	15.0	52.8	59.2	No
BF54	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF55	SFR		2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF56	Mobile Homes		2	770	Yes				-4.5	52	10.8	54.1	60.1	No
BF57	Mobile Homes		2	940	Yes				-4.5	52	9.1	54.1	60.1	No

Bellflower MSF Noise

Cluster Number	Receptor Description	FTA Receptor Category	Distance to Source (feet)	Intervening First Row (-4.5 dBA)	Intervening Second Row (-1.5 dBA)	Crossover (+5 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Project Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Noise Impact Criteria		
											Mod	Severe	Impact?
Yards and Shops													
BF1	SFR		2	600	No	N/A	N/A	0	52	43.0	54.1	60.1	No
BF2	SFR		2	740	Yes	N/A	N/A	-4.5	52	36.7	54.1	60.1	No
BF3	SFR		2	800	No	N/A	N/A	0	52	40.5	54.1	60.1	No
BF4	SFR		2	780	Yes	N/A	N/A	-4.5	52	36.2	54.1	60.1	No
BF5	SFR		2	820	Yes	N/A	N/A	-4.5	52	35.8	54.1	60.1	No
BF6	SFR		2	900	Yes	N/A	N/A	-4.5	52	35.0	54.1	60.1	No
BF7	SFR		2	920	Yes	N/A	N/A	-4.5	52	34.8	54.1	60.1	No
BF8	SFR		2	920	Yes	N/A	N/A	-4.5	52	34.8	54.1	60.1	No
BF9	SFR		2	849	Yes	N/A	N/A	-4.5	52	35.5	54.1	60.1	No
BF10	SFR		2	1100	Yes	N/A	N/A	-4.5	52	33.2	54.1	60.1	No
BF11	SFR		2	1100	Yes	N/A	N/A	-4.5	52	33.2	54.1	60.1	No
BF12	SFR		2	1130	Yes	N/A	N/A	-4.5	52	33.0	54.1	60.1	No
BF13	SFR		2	1200	Yes	N/A	N/A	-4.5	52	32.5	54.1	60.1	No
BF14	SFR		2	870	No	N/A	N/A	0	52	39.8	54.1	60.1	No
BF15	SFR		2	960	No	N/A	N/A	0	52	38.9	54.1	60.1	No
BF16	SFR		2	1175	Yes	N/A	N/A	-4.5	52	32.6	54.1	60.1	No
BF17	SFR		2	1200	Yes	N/A	N/A	-4.5	52	32.5	54.1	60.1	No
BF19	SFR		2	220	No	N/A	N/A	0	48.1	51.7	52.8	59.2	No
BF20	SFR		2	220	No	N/A	N/A	0	48.1	51.7	52.8	59.2	No
BF21	SFR		2	500	Yes	N/A	N/A	-4.5	48.1	40.1	52.8	59.2	No
BF22	SFR		2	640	Yes	N/A	N/A	-4.5	48.1	37.9	52.8	59.2	No
BF23	SFR		2	730	Yes	N/A	N/A	-4.5	48.1	36.8	52.8	59.2	No
BF24	SFR		2	630	Yes	N/A	N/A	-4.5	48.1	38.1	52.8	59.2	No
BF25	SFR		2	700	Yes	N/A	N/A	-4.5	48.1	37.1	52.8	59.2	No
BF26	SFR		2	760	Yes	N/A	N/A	-4.5	48.1	36.4	52.8	59.2	No
BF27	SFR		2	820	Yes	N/A	N/A	-4.5	48.1	35.8	52.8	59.2	No
BF28	SFR		2	250	No	N/A	N/A	0	48.1	50.6	52.8	59.2	No
BF29	MFR		2	500	No	N/A	N/A	0	48.1	44.6	52.8	59.2	No
BF30	MFR		2	650	Yes	N/A	N/A	-4.5	48.1	37.8	52.8	59.2	No
BF31	MFR		2	780	Yes	N/A	N/A	-4.5	48.1	36.2	52.8	59.2	No
BF32	MFR		2	875	Yes	N/A	N/A	-4.5	48.1	35.2	52.8	59.2	No
BF33	SFR		2	600	Yes	N/A	N/A	-4.5	48.1	38.5	52.8	59.2	No
BF34	SFR		2	770	Yes	N/A	N/A	-4.5	48.1	36.3	52.8	59.2	No
BF35	SFR		2	840	Yes	N/A	N/A	-4.5	48.1	35.6	52.8	59.2	No
BF36	SFR		2	820	Yes	N/A	N/A	-4.5	48.1	35.8	52.8	59.2	No
BF37	SFR		2	920	Yes	N/A	N/A	-4.5	48.1	34.8	52.8	59.2	No
BF38	SFR		2	880	Yes	N/A	N/A	-4.5	48.1	35.2	52.8	59.2	No
BF39	SFR		2	720	No	N/A	N/A	0	48.1	41.4	52.8	59.2	No
BF40	SFR		2	870	Yes	N/A	N/A	-4.5	48.1	35.3	52.8	59.2	No
BF41	SFR		2	930	Yes	N/A	N/A	-4.5	48.1	34.7	52.8	59.2	No
BF42	SFR		2	1200	Yes	N/A	N/A	-4.5	48.1	32.5	52.8	59.2	No
BF43	SFR		2	650	No	N/A	N/A	0	48.1	42.3	52.8	59.2	No
BF44	SFR		2	720	Yes	N/A	N/A	-4.5	48.1	36.9	52.8	59.2	No
BF45	SFR		2	840	Yes	N/A	N/A	-4.5	48.1	35.6	52.8	59.2	No
BF46	SFR		2	950	Yes	N/A	N/A	-4.5	48.1	34.5	52.8	59.2	No
BF47	SFR		2	810	No	N/A	N/A	0	48.1	40.4	52.8	59.2	No
BF48	SFR		2	890	Yes	N/A	N/A	-4.5	48.1	35.1	52.8	59.2	No
BF49	Albert Baxter Eleme		3	950	Yes	N/A	N/A	-4.5	48.1	34.5	57.8	64.2	No
BF50	MFR		2	920	No	N/A	N/A	0	48.1	39.3	52.8	59.2	No
BF51	MFR		2	1065	Yes	N/A	N/A	-4.5	48.1	33.5	52.8	59.2	No
BF52	Mobile Homes		2	1200	Yes	N/A	N/A	-4.5	48.1	32.5	52.8	59.2	No
BF53	Mobile Homes		2	670	No	N/A	N/A	0	48.1	42.0	52.8	59.2	No
BF54	SFR		2	1010	Yes	N/A	N/A	-4.5	52	34.0	54.1	60.1	No
BF55	SFR		2	1000	Yes	N/A	N/A	-4.5	52	34.0	54.1	60.1	No
BF56	Mobile Homes		2	570	No	N/A	N/A	0	52	43.4	54.1	60.1	No
BF57	Mobile Homes		2	740	Yes	N/A	N/A	-4.5	52	36.7	54.1	60.1	No

Bellflower MSF Noise

Cluster Number	Receptor Description	FTA Receptor Category	Distance to Source (feet)	Speed (mph)	Intervening First Row (-4.5 dBA)	Intervening Second Row (-1.5 dBA)	Crossover (+5 dBA)	Wheel Squeal (+10 dBA)	Total Adjustment (dBA)	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Project Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Noise Impact Criteria			
												Moderate	Severe	Impact?	
Train Movements															
BF1	SFR		2	120	5 No	No	Yes	Yes		15	52	42.1	54.1	60.1	No
BF2	SFR		2	320	5 Yes	No	No	Yes		5.5	52	28.3	54.1	60.1	No
BF3	SFR		2	130	5 No	No	No	Yes		10	52	36.8	54.1	60.1	No
BF4	SFR		2	190	5 Yes	No	No	Yes		5.5	52	30.6	54.1	60.1	No
BF5	SFR		2	335	10 Yes	No	No	No		-4.5	52	24.1	54.1	60.1	No
BF6	SFR		2	490	10 Yes	No	No	No		-4.5	52	22.5	54.1	60.1	No
BF7	SFR		2	410	10 Yes	No	No	No		-4.5	52	23.3	54.1	60.1	No
BF8	SFR		2	330	5 Yes	No	No	Yes		5.5	52	28.2	54.1	60.1	No
BF9	SFR		2	260	5 Yes	No	No	Yes		5.5	52	29.2	54.1	60.1	No
BF10	SFR		2	600	10 Yes	No	No	No		-4.5	52	21.6	54.1	60.1	No
BF11	SFR		2	500	5 Yes	No	No	Yes		5.5	52	26.4	54.1	60.1	No
BF12	SFR		2	420	5 Yes	No	No	Yes		5.5	52	27.2	54.1	60.1	No
BF13	SFR		2	570	5 Yes	No	No	Yes		5.5	52	25.8	54.1	60.1	No
BF14	SFR		2	240	5 No	No	No	Yes		10	52	34.1	54.1	60.1	No
BF15	SFR		2	100	10 No	No	No	Yes		10	52	43.9	54.1	60.1	No
BF16	SFR		2	100	10 No	No	No	Yes		10	52	43.9	54.1	60.1	No
BF17	SFR		2	300	5 Yes	No	No	No		-4.5	52	18.6	54.1	60.1	No
BF18	SFR		2	400	5 Yes	No	No	Yes		5.5	52	27.4	54.1	60.1	No
BF19	SFR		2	170	5 No	No	No	Yes		10	48.1	35.6	52.8	59.2	No
BF20	SFR		2	270	5 No	No	No	Yes		10	48.1	33.6	52.8	59.2	No
BF21	SFR		2	460	5 Yes	No	No	Yes		5.5	48.1	26.8	52.8	59.2	No
BF22	SFR		2	590	5 Yes	No	No	Yes		5.5	48.1	25.7	52.8	59.2	No
BF23	SFR		2	680	5 Yes	No	No	Yes		5.5	48.1	25.1	52.8	59.2	No
BF24	SFR		2	220	5 No	No	Yes	Yes		15	48.1	39.5	52.8	59.2	No
BF25	SFR		2	100	10 Yes	No	Yes	Yes		10.5	48.1	44.4	52.8	59.2	No
BF26	SFR		2	100	10 Yes	No	No	Yes		5.5	48.1	39.4	52.8	59.2	No
BF27	SFR		2	150	10 Yes	No	No	Yes		5.5	48.1	37.6	52.8	59.2	No
BF28	SFR		2	160	5 No	No	No	Yes		10	48.1	35.8	52.8	59.2	No
BF29	MFR		2	420	5 No	No	No	Yes		10	48.1	31.7	52.8	59.2	No
BF30	MFR		2	580	5 Yes	No	No	Yes		5.5	48.1	25.8	52.8	59.2	No
BF31	MFR		2	730	5 Yes	No	No	Yes		5.5	48.1	24.8	52.8	59.2	No
BF32	MFR		2	820	5 Yes	No	No	Yes		5.5	48.1	24.3	52.8	59.2	No
BF33	SFR		2	300	5 No	No	No	Yes		10	48.1	33.1	52.8	59.2	No
BF34	SFR		2	610	5 Yes	No	No	Yes		5.5	48.1	25.5	52.8	59.2	No
BF35	SFR		2	740	5 Yes	No	No	Yes		5.5	48.1	24.7	52.8	59.2	No
BF36	SFR		2	580	5 Yes	No	No	Yes		5.5	48.1	25.8	52.8	59.2	No
BF37	SFR		2	750	5 Yes	No	No	Yes		5.5	48.1	24.6	52.8	59.2	No
BF38	SFR		2	360	5 Yes	No	No	Yes		5.5	48.1	27.8	52.8	59.2	No
BF39	SFR		2	160	5 Yes	No	No	Yes		5.5	48.1	31.3	52.8	59.2	No
BF40	SFR		2	500	5 Yes	No	No	Yes		5.5	48.1	26.4	52.8	59.2	No
BF41	SFR		2	610	5 Yes	No	No	Yes		5.5	48.1	25.5	52.8	59.2	No
BF42	SFR		2	800	5 Yes	No	No	Yes		5.5	48.1	24.4	52.8	59.2	No
BF43	SFR		2	150	5 No	No	No	Yes		10	48.1	36.1	52.8	59.2	No
BF44	SFR		2	290	5 Yes	No	No	Yes		5.5	48.1	28.8	52.8	59.2	No
BF45	SFR		2	420	5 Yes	No	No	Yes		5.5	48.1	27.2	52.8	59.2	No
BF46	SFR		2	565	5 Yes	No	No	Yes		5.5	48.1	25.9	52.8	59.2	No
BF47	SFR		2	240	5 No	No	No	Yes		10	48.1	34.1	52.8	59.2	No
BF48	SFR		2	390	5 Yes	No	No	Yes		5.5	48.1	27.5	52.8	59.2	No
BF49	Albert Baxter Eleme		3	460	5 Yes	No	No	Yes		5.5	48.7	27.1	57.9	64.3	No
BF50	MFR		2	300	5 No	No	No	Yes		10	48.1	33.1	52.8	59.2	No
BF51	MFR		2	470	5 Yes	No	No	Yes		5.5	48.1	26.7	52.8	59.2	No
BF52	Mobile Homes		2	655	5 Yes	No	No	Yes		5.5	48.1	25.2	52.8	59.2	No
BF53	Mobile Homes		2	50	5 No	No	No	Yes		10	48.1	40.9	52.8	59.2	No
BF54	SFR		2	470	10 Yes	No	No	No		-4.5	52	22.7	54.1	60.1	No
BF55	SFR		2	490	5 Yes	No	No	Yes		5.5	52	26.5	54.1	60.1	No
BF56	Mobile Homes		2	170	5 No	No	No	Yes		10	52	35.6	54.1	60.1	No
BF57	Mobile Homes		2	310	5 Yes	No	No	Yes		5.5	52	28.5	54.1	60.1	No

Bellflower MSF Noise

Cluster Number	Receptor Description	FTA Receptor Category	Existing Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Project Noise Exposure Cat 1 or 2 (Ldn), Cat 3 (Leq)	Noise Impact Criteria		Impact?
					Moderate	Severe	
Combined Noise Level							
BF1	SFR	2	52	45.6	54.1	60.1	No
BF2	SFR	2	52	37.3	54.1	60.1	No
BF3	SFR	2	52	42.0	54.1	60.1	No
BF4	SFR	2	52	37.3	54.1	60.1	No
BF5	SFR	2	52	36.1	54.1	60.1	No
BF6	SFR	2	52	35.2	54.1	60.1	No
BF7	SFR	2	52	35.1	54.1	60.1	No
BF8	SFR	2	52	35.6	54.1	60.1	No
BF9	SFR	2	52	36.4	54.1	60.1	No
BF10	SFR	2	52	33.5	54.1	60.1	No
BF11	SFR	2	52	34.0	54.1	60.1	No
BF12	SFR	2	52	34.0	54.1	60.1	No
BF13	SFR	2	52	25.8	54.1	60.1	No
BF14	SFR	2	52	40.8	54.1	60.1	No
BF15	SFR	2	52	45.1	54.1	60.1	No
BF16	SFR	2	52	44.2	54.1	60.1	No
BF17	SFR	2	52	32.6	54.1	60.1	No
BF18	SFR	2	52	27.4	54.1	60.1	No
BF19	SFR	2	48.1	51.8	52.8	59.2	No
BF20	SFR	2	48.1	51.8	52.8	59.2	No
BF21	SFR	2	48.1	40.3	52.8	59.2	No
BF22	SFR	2	48.1	38.2	52.8	59.2	No
BF23	SFR	2	48.1	37.1	52.8	59.2	No
BF24	SFR	2	48.1	41.8	52.8	59.2	No
BF25	SFR	2	48.1	45.1	52.8	59.2	No
BF26	SFR	2	48.1	41.2	52.8	59.2	No
BF27	SFR	2	48.1	39.8	52.8	59.2	No
BF28	SFR	2	48.1	50.7	52.8	59.2	No
BF29	MFR	2	48.1	44.8	52.8	59.2	No
BF30	MFR	2	48.1	38.1	52.8	59.2	No
BF31	MFR	2	48.1	36.5	52.8	59.2	No
BF32	MFR	2	48.1	35.5	52.8	59.2	No
BF33	SFR	2	48.1	39.6	52.8	59.2	No
BF34	SFR	2	48.1	36.7	52.8	59.2	No
BF35	SFR	2	48.1	35.9	52.8	59.2	No
BF36	SFR	2	48.1	36.2	52.8	59.2	No
BF37	SFR	2	48.1	35.2	52.8	59.2	No
BF38	SFR	2	48.1	35.9	52.8	59.2	No
BF39	SFR	2	48.1	41.8	52.8	59.2	No
BF40	SFR	2	48.1	35.8	52.8	59.2	No
BF41	SFR	2	48.1	35.2	52.8	59.2	No
BF42	SFR	2	48.1	24.4	52.8	59.2	No
BF43	SFR	2	48.1	43.2	52.8	59.2	No
BF44	SFR	2	48.1	37.5	52.8	59.2	No
BF45	SFR	2	48.1	36.2	52.8	59.2	No
BF46	SFR	2	48.1	26.0	52.8	59.2	No
BF47	SFR	2	48.1	41.3	52.8	59.2	No
BF48	SFR	2	48.1	35.8	52.8	59.2	No
BF49	Albert Baxter Eleme	3	48.7	27.1	57.9	64.3	No
BF50	MFR	2	48.1	33.1	52.8	59.2	No
BF51	MFR	2	48.1	26.7	52.8	59.2	No
BF52	Mobile Homes	2	48.1	25.2	52.8	59.2	No
BF53	Mobile Homes	2	48.1	44.5	52.8	59.2	No
BF54	SFR	2	52	22.7	54.1	60.1	No
BF55	SFR	2	52	26.5	54.1	60.1	No
BF56	Mobile Homes	2	52	44.1	54.1	60.1	No
BF57	Mobile Homes	2	52	37.3	54.1	60.1	No

APPENDIX K DANTE VALVE COMPANY VIBRATION ASSESSMENT

West Santa Ana Branch Transit Corridor

Dante Valve Vibration Assessment



Metro®

Dante Valve Vibration Assessment

Prepared for:



Metro[®]

Los Angeles County
Metropolitan Transportation Authority

Prepared by:



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March 2024

TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	1
2	DANTE VALVE EXISTING VIBRATION MONITORING	2
2.1	Measured Vibration Levels	6
2.2	Ground Attenuation (LSTM)	14
2.3	Measurement Description.....	14
2.4	Measurement Results.....	16
3	TRAIN VIBRATION	17
3.1	Coupling Loss	18
3.2	Modeling Assumptions	18
3.3	Predicted Ground-borne Vibration Levels	18
4	CONSTRUCTION VIBRATION	19
4.1	Vibration Model	19
4.2	Vibration Criteria.....	20
4.3	Vibration Modeling Results.....	21
5	VIBRATION CONTROL MEASURES	21
6	CONCLUSION	22
6.1	Operations	22
6.2	Construction	23
	APPENDIX A: LSTM MEASUREMENTS	24

List of Figures

Figure 2-1.	Dante Valve Company Location.....	2
Figure 2-2.	CNC Room Vibration Monitor	3
Figure 2-3.	Test Stand Vibration Monitor	4
Figure 2-4.	Test Stand Area	5
Figure 2-5.	Vibration Monitor Location in Test Stand Area	6
Figure 2-6.	Tuesday, 2/28/23 Test Stand Area, Velocity in/sec rms	8
Figure 2-7.	Wednesday, 3/1/23 Test Stand Area, Velocity in/sec rms	9
Figure 2-8.	Thursday, 3/2/23 Test Stand Area, Velocity in/sec rms	10
Figure 2-9.	Tuesday, 2/28/23 CNC Room, Velocity in/sec rms	11
Figure 2-10.	Wednesday, 3/1/23 CNC Room, Velocity in/sec rms	12
Figure 2-11.	Thursday, 3/1/23 CNC Room, Velocity in/sec rms.....	13
Figure 2-12.	Schematic of Vibration Propagation Measurement Site.....	14
Figure 2-13.	Aerial View of the Dante Valve Company Measurement Site	15
Figure 2-14.	Photograph of Impact Hammer (left) and Accelerometers (right)	16

List of Tables

Table 2.1. Measured Existing Vibration Levels..... 7
 Table 3.1. 1/3 Octave Force Density Levels..... 17
 Table 3.2. Predicted Ground-borne Vibration Levels at Dante Valve Facilities..... 19
 Table 4.1. FTA Construction Vibration Damage Risk Criteria..... 20
 Table 4.2. Equipment Vibration Emission Levels..... 21
 Table 4.3. Predicted Construction Vibration Levels 21

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
CNC	Computer Numerical Control
EIS/EIR	environmental impact statement/environmental impact report
FDL	force density level
FTA	Federal Transit Administration
GBV	ground-borne vibration
in/sec	inches per second
LRT	light rail transit
LSTM	line source transfer mobility
mph	miles per hour
MSF	maintenance and storage facility
PPV	peak particle velocity
rms	root mean square
VdB	vibration decibels
WSAB	West Santa Ana Branch

1 EXECUTIVE SUMMARY

To address comments received from Dante Valve Company on the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR), a vibration assessment was conducted at the Dante Valve Company at 15230 Lakewood Boulevard, Bellflower. The purpose of the assessment was to determine the potential effects of the West Santa Ana Branch (WSAB) light rail transit (LRT) train operations on the existing operations at this location where Dante Valve Company finishes high-pressure valves that are used to carry steam, water, and air inside ships for the U.S. Navy. The Computer Numerical Control (CNC) machines cut the threading in the end of the valves and then the valves are tested on the Test Stand. The testing involves screwing the valve to one of three test stands: air, water, or steam. The valve is closed, and air, water, or steam is pushed into to the valve until it reaches the desired pressure level or fails. Representatives of Dante Valve Company expressed concerned that LRT operation could interfere with the valve test but had no concerns about the CNC operations. Representatives of Dante Valve Company did not provide vibration sensitivity levels and there are no set vibration levels published for the test equipment. The assessment consisted of the following:

- Vibration monitoring of the Dante Valve Company activities during normal operations at the Test Stand and the room that houses the CNC machines
- Measurement of the ground attenuation, referred to as the line source transfer mobility (LSTM), at different distances from the proposed track locations
- Prediction of the train vibration levels at the Test Stand and CNC locations
- Comparison of the predicted train vibration levels with the existing ambient levels

The results of the vibration assessment are as follows:

Predicted Vibration Levels at the Test Stand area – three-car train on tangent track at 55 miles per hour (mph)	72 vibration decibels (VdB)
Predicted Vibration Levels at the Test Stand Area – three-car train on lead track to maintenance and storage facility (MSF) at 20 mph	77 VdB
Predicted Vibration Levels at the CNC – three-car train on tangent track at 55 mph	67 VdB
Predicted Vibration Levels at Test Stand Area – 20 mph w/low impact crossover	67 VdB
Predicted Vibration Levels at Test Stand Area – three-car train on tangent track at 55 mph with ballast mat	70 VdB

The measured maximum existing vibration levels at the Test Stand area and CNC are 75 VdB and 80 VdB, respectively. Without mitigation, the predicted levels from train operations through the crossover to the MSF of 77 VdB would exceed the existing vibration level at the Test Stand area but not the vibration levels in the CNC room. With a low impact crossover, the vibration levels will be reduced to 67 VdB, which is lower than the existing levels at the Test Stand area and CNC; therefore, vibration impacts will not occur. Train operations on the tangent track, resulting in vibration levels of 72 VdB without mitigation, will be lower than the existing vibration levels at the Test Stand area and CNC, also indicating that vibration

impacts will not occur. However, ballast mat is proposed as mitigation in this location for impacts to other properties. With ballast mat mitigation along the tangent track, these levels will be reduced to 70 VdB.

2 DANTE VALVE EXISTING VIBRATION MONITORING

Measurements of the existing vibration levels were taken at the Dante Valve Company at 15230 Lakewood Boulevard, Bellflower, between 11:00 a.m. on Monday, February 27, 2023, and 11:00 a.m. on Friday, March 3, 2023. Data used in this report is from 12:00 p.m. on February 28, 2023, through 11:59 p.m. March 2, 2023, to ensure recording at least three full days of vibration levels. Measurements were conducted at two locations on the Dante Valve Company property. Location 1 was in the Testing Stand area under the high-pressure air test stand. Location 2 was inside the CNC room along the southern wall adjacent to the Test Stand area. A map of the track alignment is shown in Figure 2-1. Figure 2-2 and Figure 2-3 show the vibration monitor locations on a diagram that includes the CNC Room and Test Stand area, respectively. Photos of the Test Stand area and the outside wall of the CNC Room are also shown on Figure 2-4 and Figure 2-5.

Figure 2-1. Dante Valve Company Location

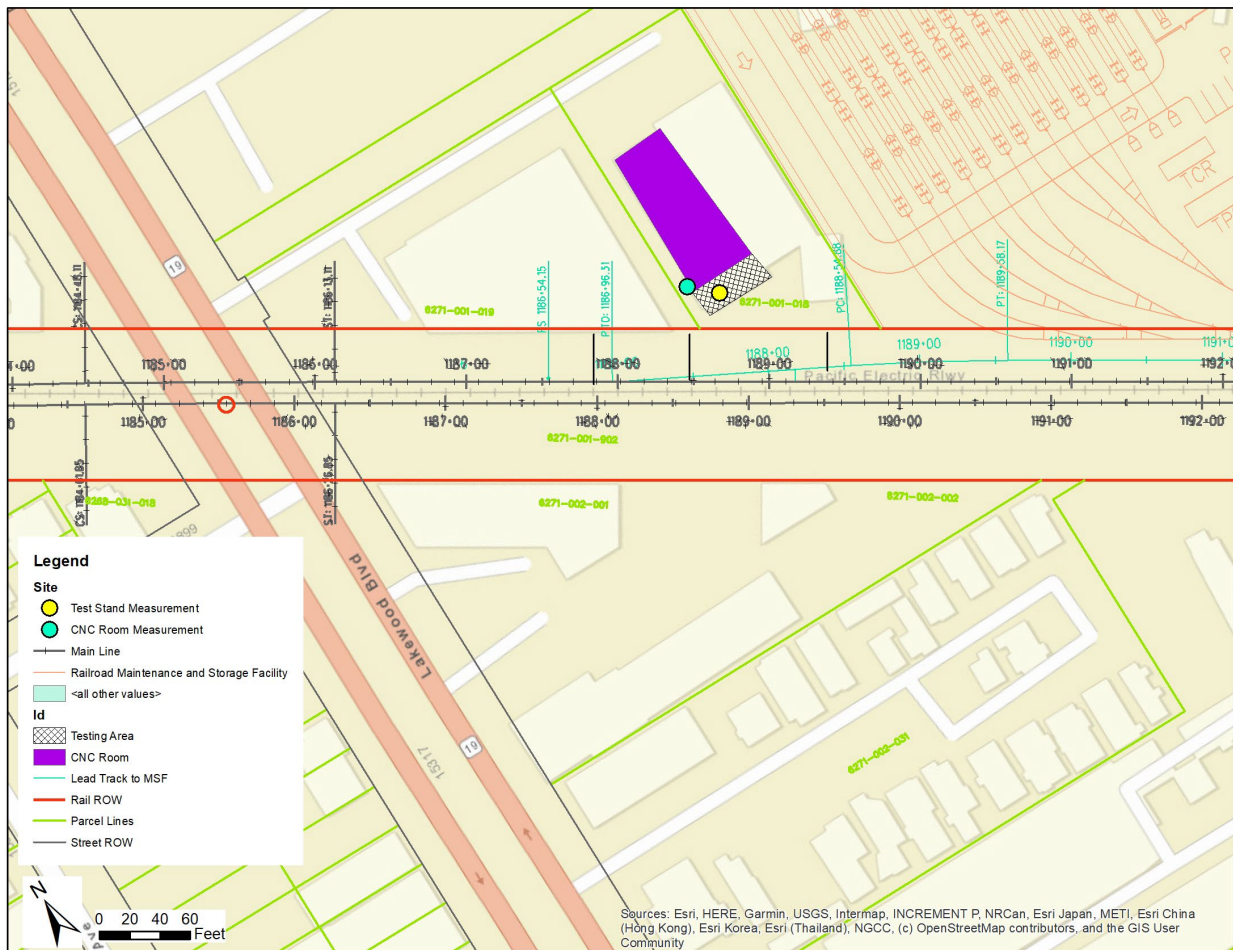


Figure 2-2. CNC Room Vibration Monitor

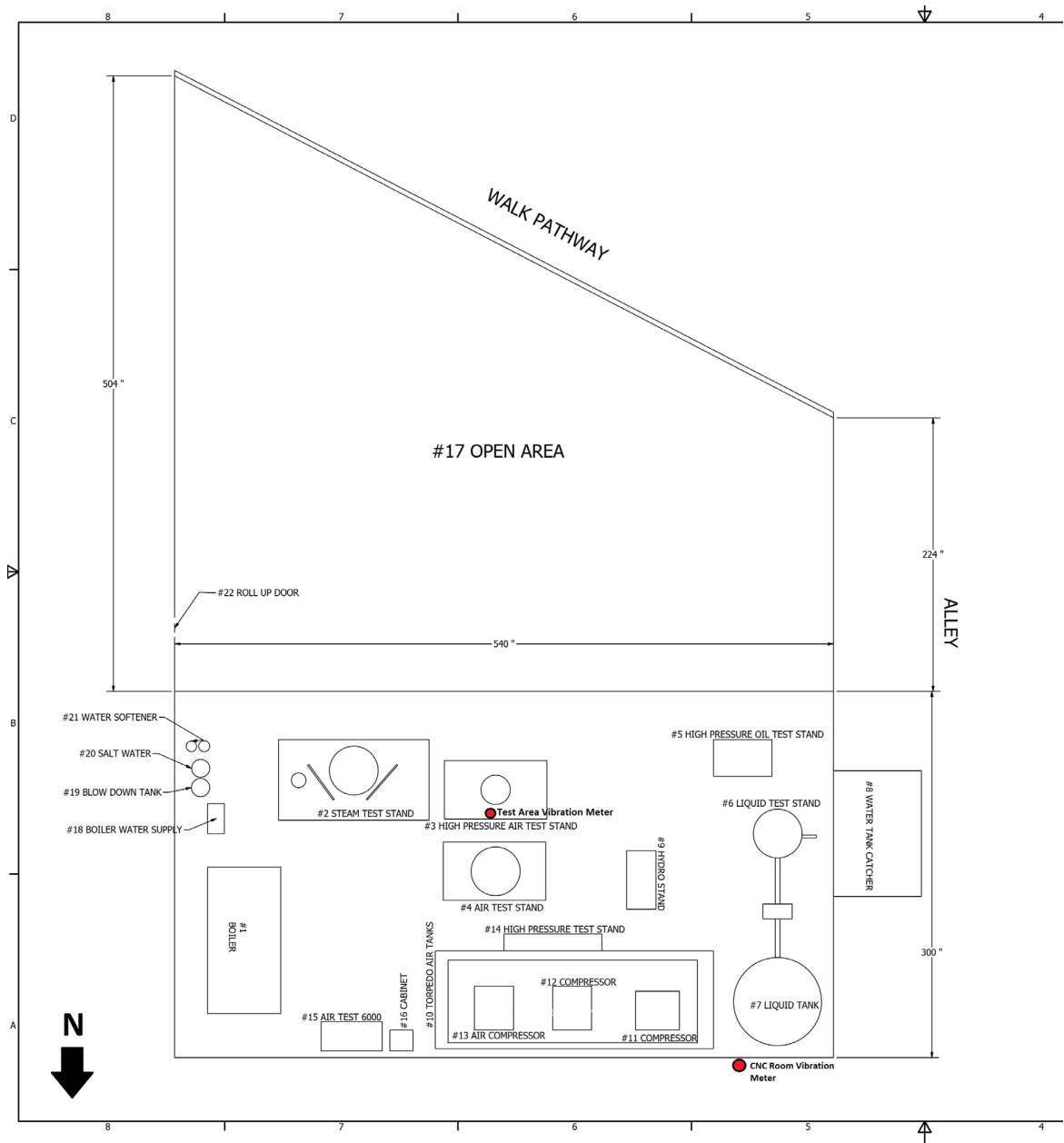


Figure 2-3. Test Stand Vibration Monitor

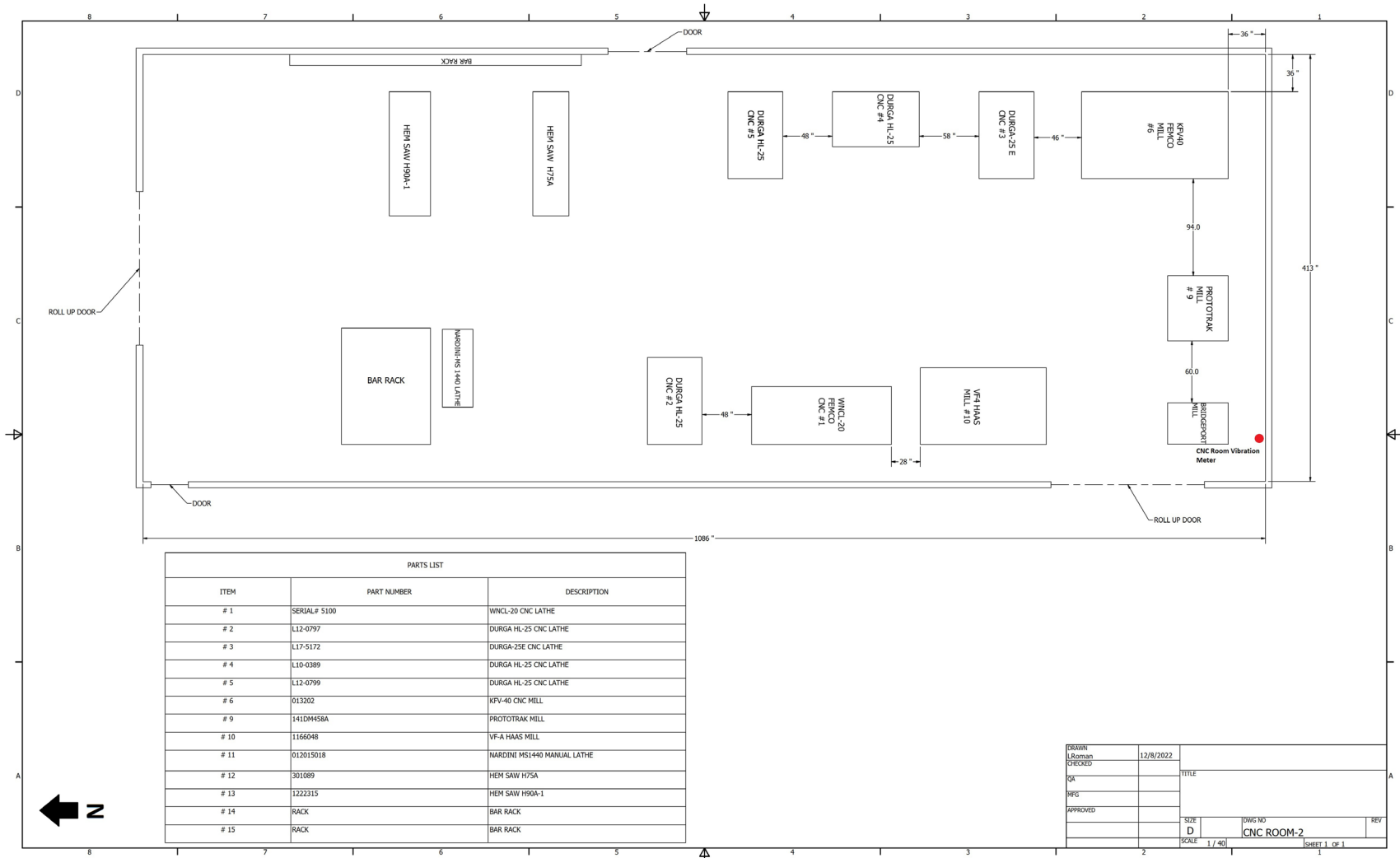


Figure 2-4. Test Stand Area



Figure 2-5. Vibration Monitor Location in Test Stand Area



2.1 Measured Vibration Levels

Root mean square (rms) vibration velocity levels were recorded on Tuesday, February 28, 2023, through Thursday, March 2, 2023, for each minute in the Test Stand area and CNC area of the Dante Valve Company facilities. The measured vibration levels in the Test Stand area are shown on Figure 2-6 through Figure 2-8. The measured CNC levels are shown on Figure 2-9 through Figure 2-11. Table 2.1 summarizes the three days of measurements during the work hours of 8 a.m. to 5 p.m. and non-work hours. The levels in the Test Stand area range from an average of 54 VdB to a maximum of 75 VdB during work hours, and during non-work hours an average of 46 VdB to a maximum of 66 VdB. During work hours, the existing vibration levels in the CNC room range from an average of 59 VdB to a maximum of 80 VdB. During non-work hours, the average is 53 VdB with a maximum of 67 VdB. The existing vibration levels in the CNC area are higher than the Test Stand area due to the activities within the shop itself and not an outside source. The higher level in the CNC room is due to operation of the milling machines, as well as foot and cart traffic.

Table 2.1. Measured Existing Vibration Levels

Measurement	Maximum Velocity, in/sec (rms)	Average Velocity, in/sec (rms)	Maximum Velocity (VdB)	Average Velocity (VdB)
Test Stand Area – Work Hours	0.0054	0.0005	75 VdB	54 VdB
CNC Area – Work Hours	0.0104	0.0009	80 VdB	59 VdB
Test Stand Area – Non-Work Hours	0.0020	0.0003	66 VdB	46 VdB
CNC Area – Non-Work Hours	0.0022	0.0004	67 VdB	53 VdB

Notes: in/sec = inches per second; rms = root mean square; VdB = vibration decibels

Figure 2-6. Tuesday, 2/28/23 Test Stand Area, Velocity in/sec rms

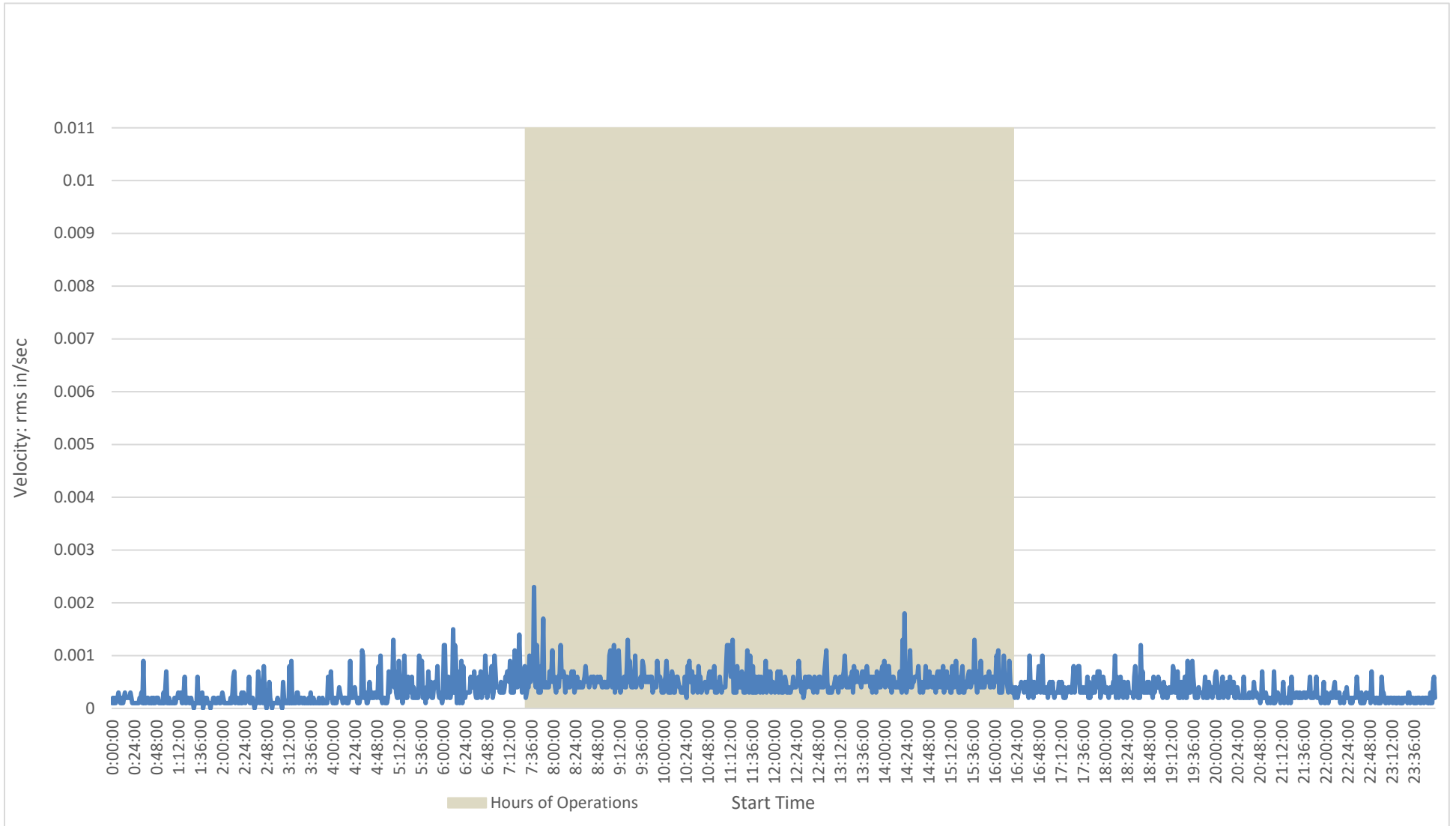


Figure 2-7. Wednesday, 3/1/23 Test Stand Area, Velocity in/sec rms

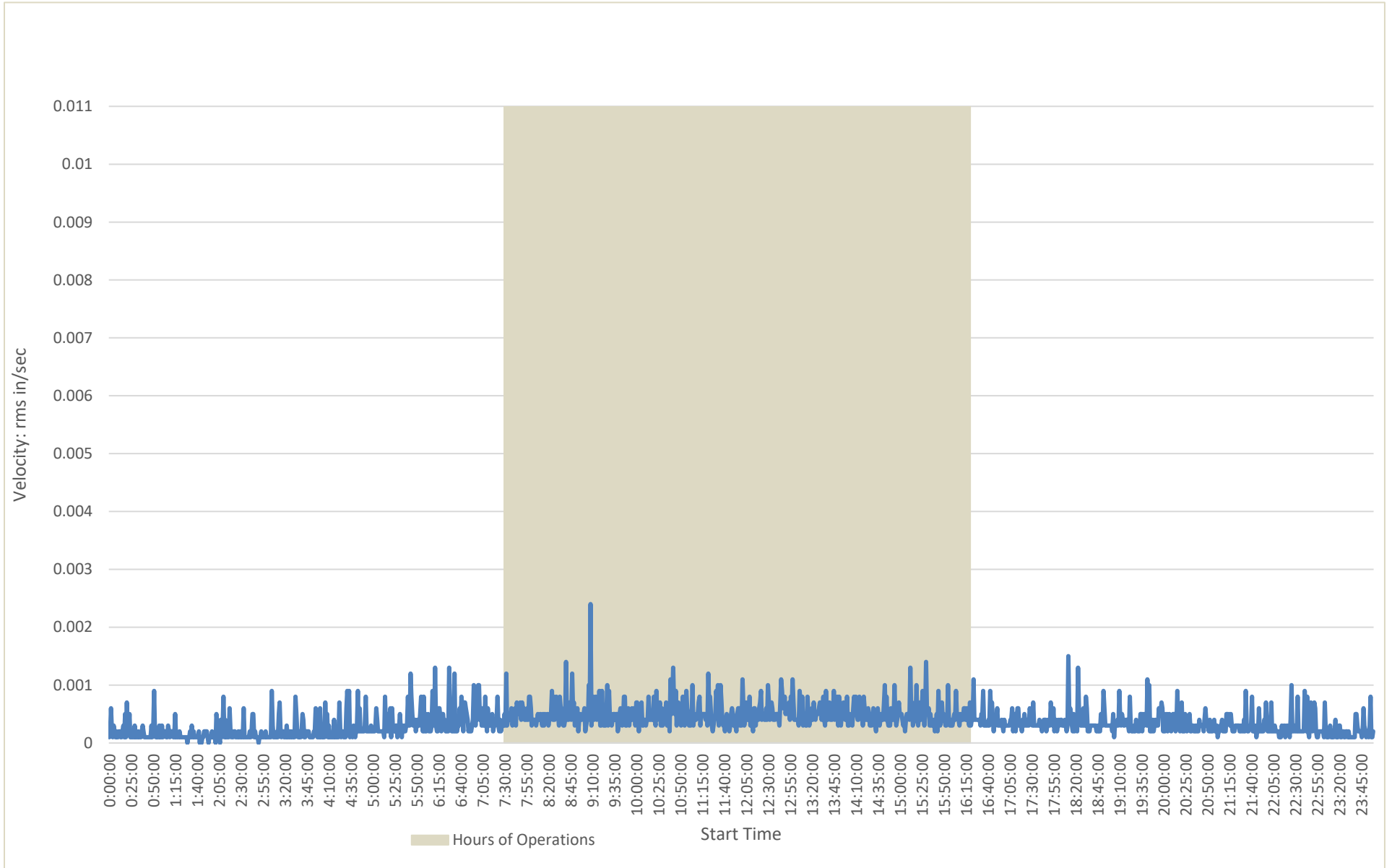


Figure 2-8. Thursday, 3/2/23 Test Stand Area, Velocity in/sec rms

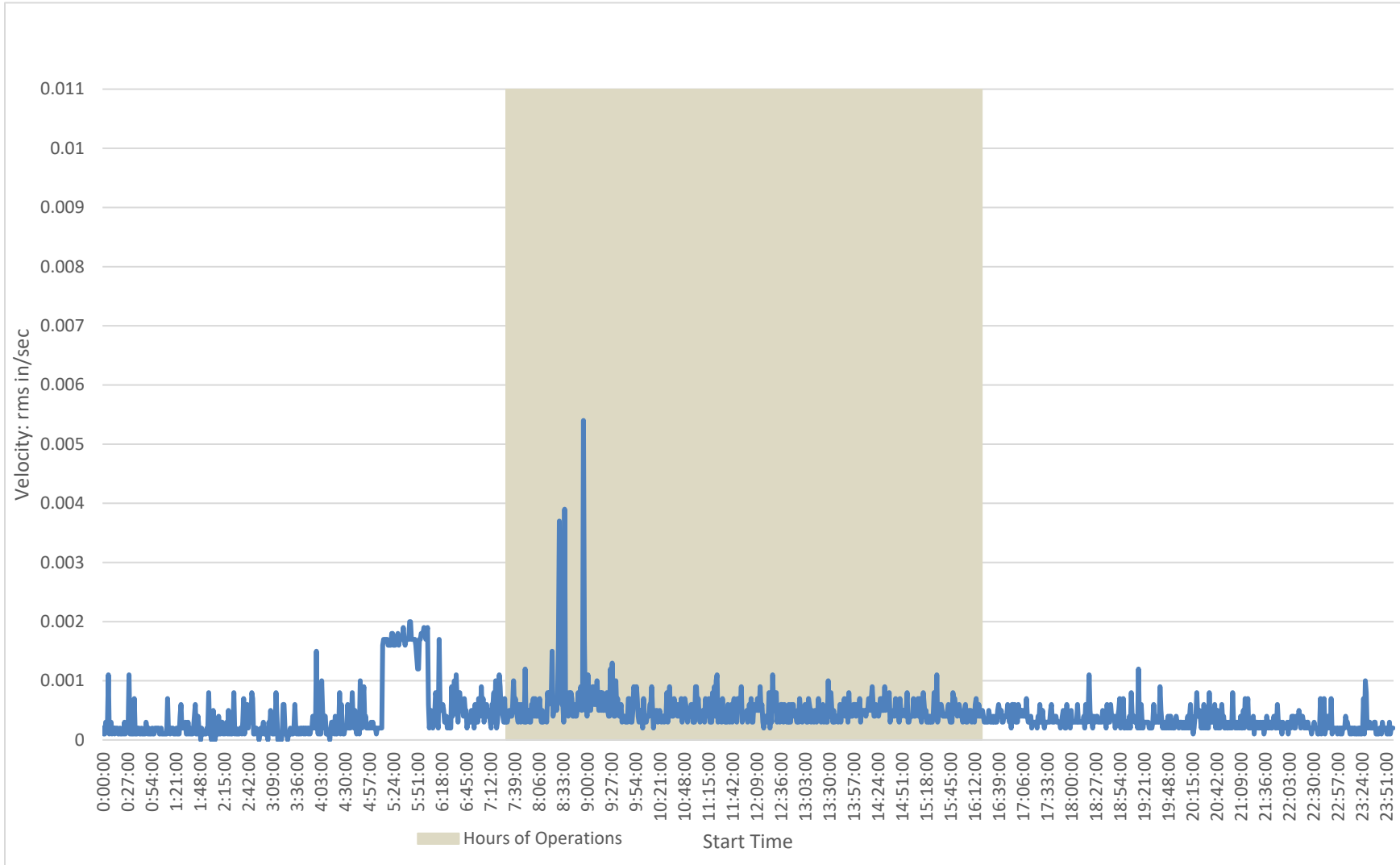


Figure 2-9. Tuesday, 2/28/23 CNC Room, Velocity in/sec rms

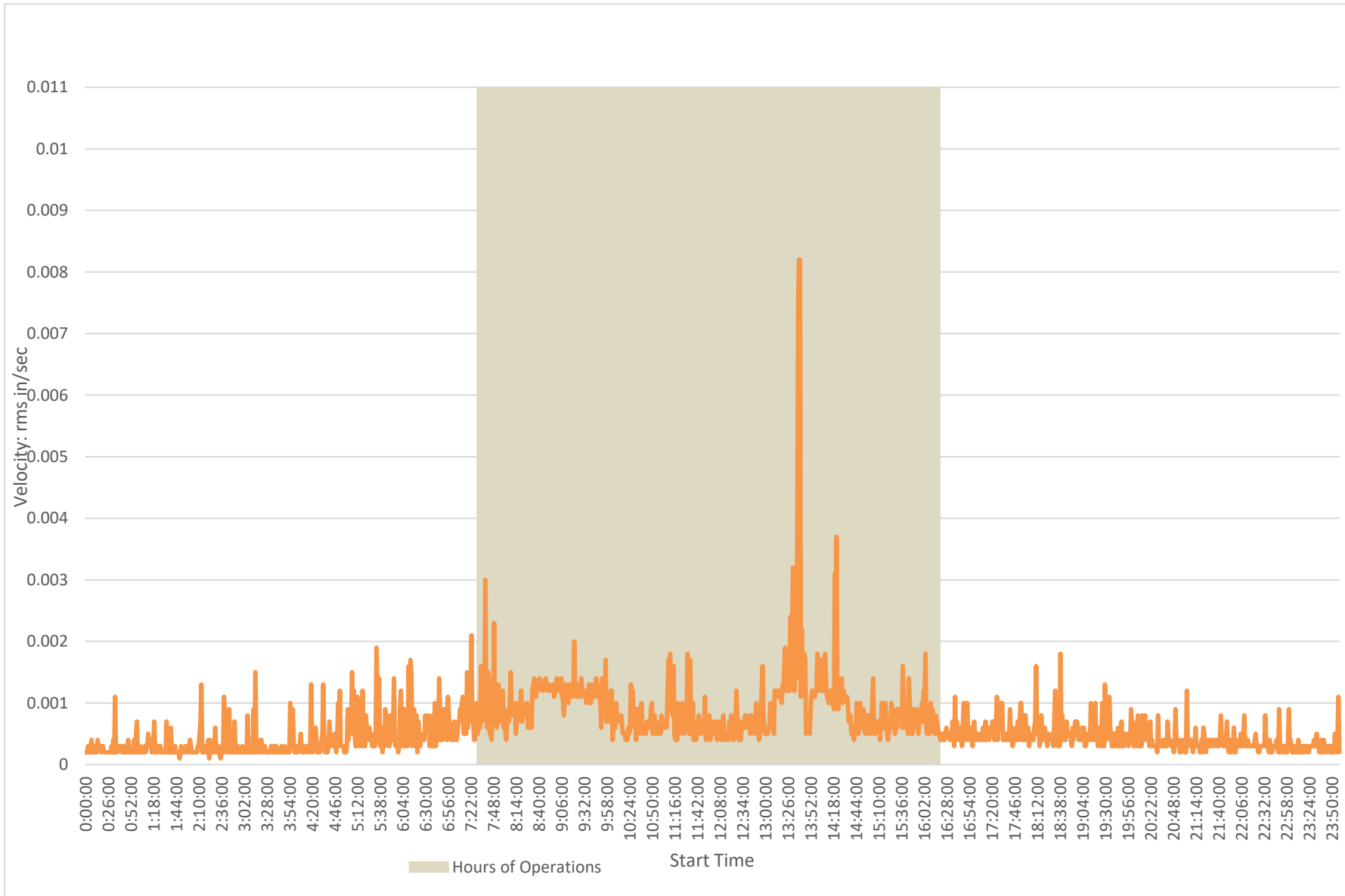


Figure 2-10. Wednesday, 3/1/23 CNC Room, Velocity in/sec rms

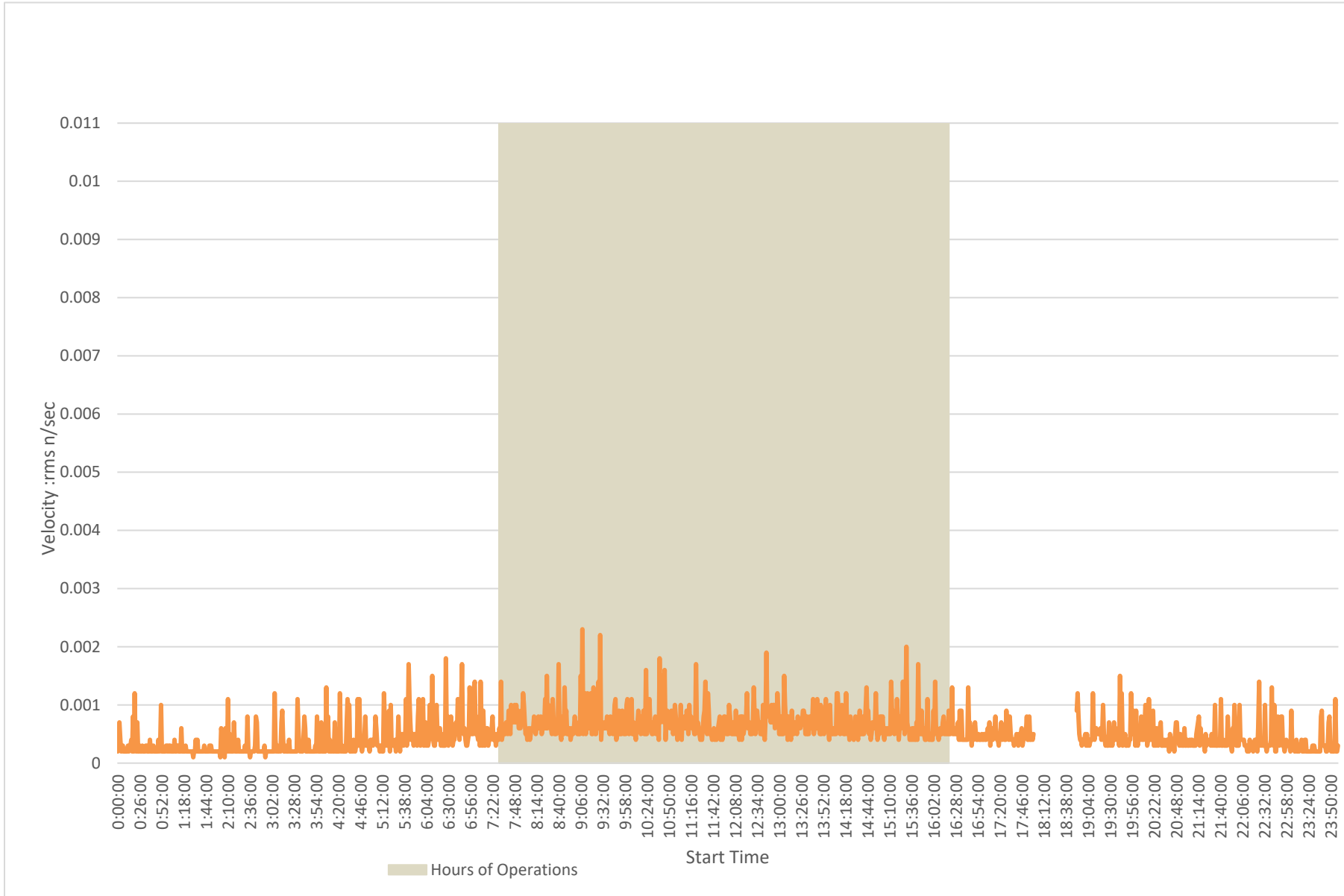
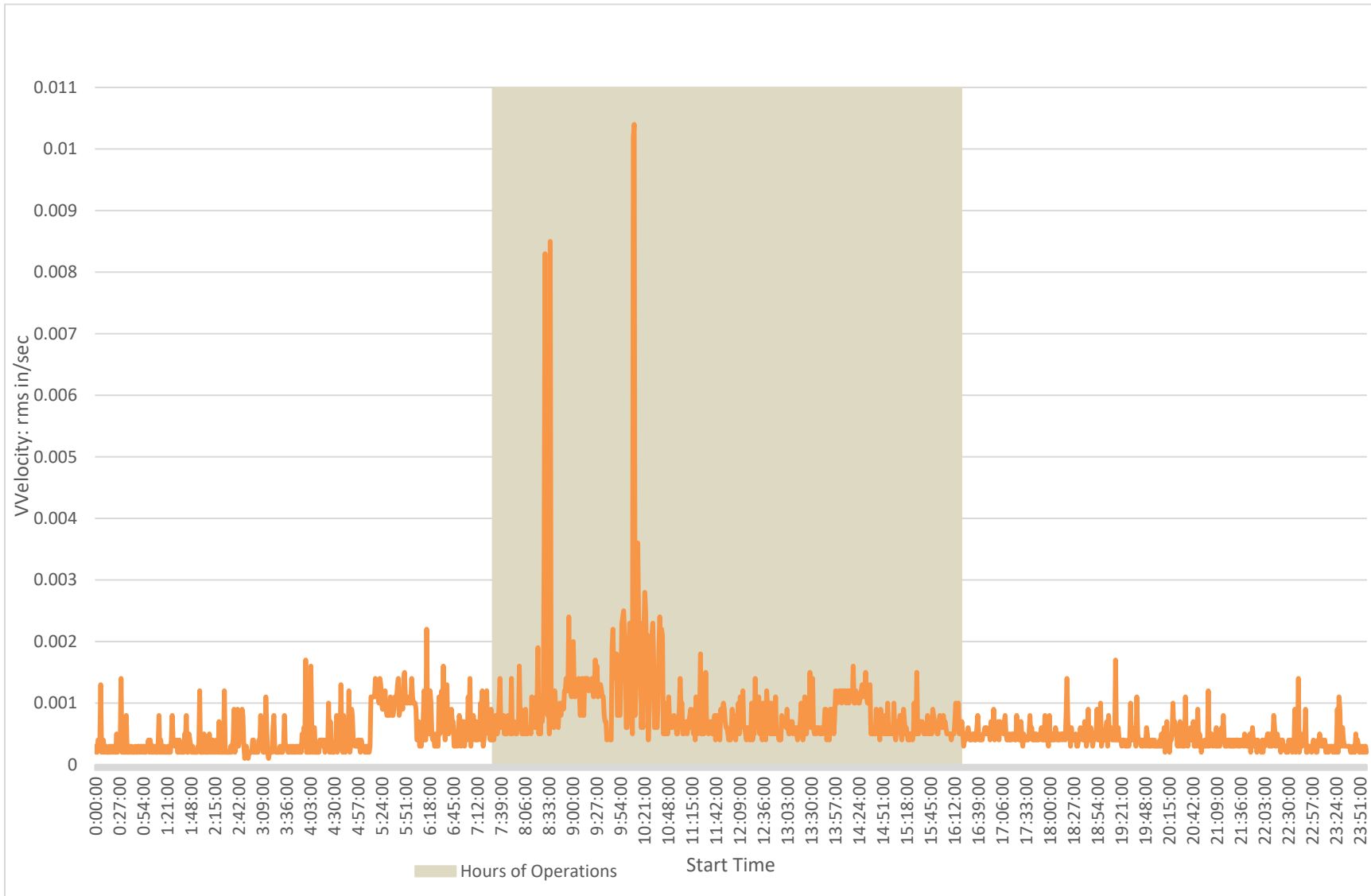


Figure 2-11. Thursday, 3/1/23 CNC Room, Velocity in/sec rms



2.2 Ground Attenuation (LSTM)

The vibration propagation measurement and the resulting LSTM were completed from tests conducted on April 15, 2023, at the Dante Valve Company, located at 15230 Lakewood Boulevard, Bellflower. The measurement was conducted to determine how efficiently vibration propagates through the ground from the existing railroad right-of-way to the adjacent Dante Valve Company parcel. The results were used to aid in the prediction of ground-borne vibration at the Dante Valve Company site from proposed WSAB light rail train operations within the right-of-way.

2.3 Measurement Description

A vibration propagation test is used to determine the site-specific LSTM, which is a measure of how efficiently vibration travels through soil. The field test procedure for determining the LSTM is shown schematically in Figure 2-12. The measurement consists of dropping a heavy weight onto the ground surface and measuring the force imparted to the ground and the vibration response at sensors several distances from the dropped weight.

As shown in Figure 2-12, the weight is dropped along a line of discrete impact points to approximate the distributed line source of a light rail vehicle. The accelerometer sensors that measure the vibration response are placed along a line perpendicular to the line of impact points.

Figure 2-12. Schematic of Vibration Propagation Measurement Site

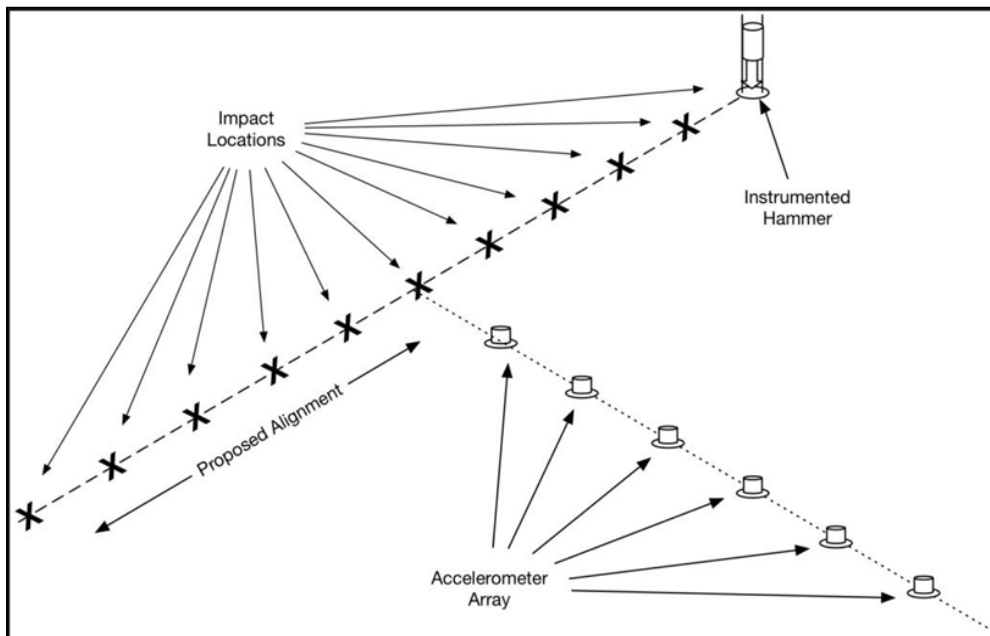


Figure 2-13 shows an aerial view of the measurement site at the Dante Valve Company. Accelerometers were placed at distances of 25 feet, 35 feet, 50 feet, 75 feet, 100 feet, and 150 feet from the line of impacts. The 25-foot and 35-foot measurement positions were located within the right-of-way, and the 35-foot measurement point was located about 1 foot outside the Dante Valve Company property wall. The remaining measurement positions were located on the Dante Valve Company property. The hammer impact positions were located at the approximate location of the proposed light rail tracks, 36 feet from the Dante Valve Company property wall. Impact points were spaced 15 feet apart and extended 45 feet west of the accelerometer line and 75 feet east of the accelerometer line. The data from the impact points at 60 feet and 75 feet east of the accelerometer line were weighted double in the LSTM calculation to account for the fact that there were no data collected at impact points 60 feet and 75 feet to the west of the accelerometer line on Lakewood Boulevard.

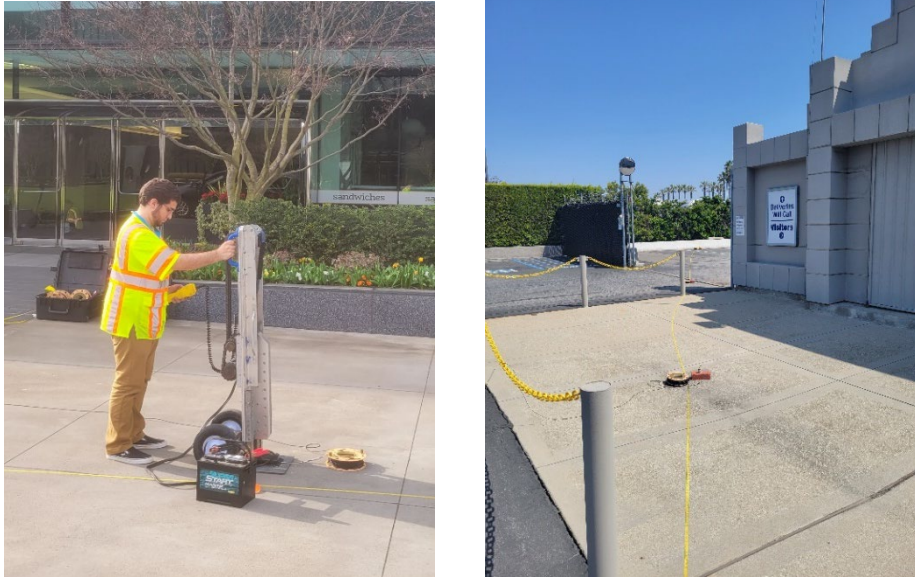
The location of the most sensitive equipment on the Dante Valve Company property is indicated in Figure 2-13. The vibration propagation test was not performed at this location within the property because an approximately 12-foot-thick solid property wall did not allow for the passage of cables between the sensitive area and the project right-of-way as necessary to collect the data.

Figure 2-13. Aerial View of the Dante Valve Company Measurement Site



Figure 2-14 shows photographs of the impact hammer used to complete the measurements and the line of accelerometers on the Dante Valve Company property. The accelerometers used for the measurement were PCB model 393B05 with a nominal sensitivity of 10 volts/acceleration of gravity. The data were collected using a computer-based data acquisition system.

Figure 2-14. Photograph of Impact Hammer (left) and Accelerometers (right)



2.4 Measurement Results

The results of the vibration propagation test are presented in terms of the LSTM and the coherence. The coherence is a measure of the quality of the LSTM results and varies between 0 and 1. A coherence value close to 1 indicates that the vibration response and the force generated by the dropped weight are closely related. A coherence less than about 0.2 indicates a relatively weak relationship between the exciting force and the vibration response. Low coherence results may occur when the ambient vibration is relatively high, the distance between the dropped weight and the sensor are relatively large, or when the soil is a relatively poor transmitter of vibration at certain frequencies.

High LSTM levels indicate that vibrations are transmitted more efficiently through the soil. The frequency range with the highest LSTM values is important because it indicates the frequency range where vibration is transmitted most efficiently. If the frequency range with high LSTM values coincides with the frequency range in which the train produces the most energy, higher vibration would result at sensitive receivers.

In Appendix A, Figure A-1 shows the measured LSTM values, and Figure A-2 shows the measured coherence values for the vibration propagation measurement at the Dante Valve Company. Table A.1 also presents the measured LSTM values.

Best fit coefficients of the measured data in each 1/3 octave band can be used to estimate the LSTM at various distances using the equation:

$$LSTM = A + B * \log(distance)$$

where A and B are the best fit coefficients and distance is the distance between the light rail tracks and the sensitive receiver.

The best fit coefficients for each 1/3 octave band are provided in Appendix A in Table A.2.

3 TRAIN VIBRATION

The predictions of ground-borne vibration from train operations follow the Detailed Vibration Assessment procedure of the Federal Transit Administration (FTA) Guidance Manual. This is an empirical method based on testing of the vibration propagation characteristics of the soil in the project corridor and measurements of the vibration characteristics of a similar light rail vehicle. The vibration propagation test is used to determine the LSTM. The vibration characteristics of the light rail vehicles are quantified by the force density level (FDL). The basic relationship used for the vibration predictions is as follows:

$$L_v = LSTM + FDL + \text{Building Adj.}$$

- L_v = Predicted vibration level inside the space
- LSTM = Measured line surface transfer mobility
- FDL = Force density level
- Coupling Loss = Adjustment to account for attenuation or amplification as vibration travels from the soil into the Dante Valve Company foundation

The FDL characterizes the vibration forces generated by the train and track structure. It is ideal to measure the FDL at a site with existing train operations that has the same vehicle and track structure as the proposed project. For this analysis, a reasonable assumption for the FDL was made using the measurements conducted for a two-car train operating on the existing Metro L (Gold) Line. The L Line vehicles operating as a two-car train operated at 53 mph on ballast and on tie track similar to that proposed for the WSAB Project. The FDL for a three-car train would be negligibly higher (less than 1 VdB) than reported in Table 3.1.

Table 3.1. 1/3 Octave Force Density Levels

1/3 Octave Band Center Frequency, Hz ¹	6.3	8	10	12.5	16	20	25	31.5	40	50	63	80
FDL at 53 mph, VdB ²	18	25	32	31	21	25	25	32	29	31	32	32

Notes: ¹ Frequency in Hertz (Hz).

² Level in decibels of the force density relative to 11b/ft^{1/2}.

FDL = force density level; Hz = Hertz; VdB = vibration decibel

3.1 Coupling Loss

The propagation of vibration from the soil into the building foundation and through the building structure is complex and dependent on the specific design and construction of the building. The FTA Guidance Manual provides some generic adjustments for masonry foundation on spread footings to account for the coupling loss between the ground and the 8-inch concrete slab supporting the Test Stand area and CNC.

3.2 Modeling Assumptions

The modeling assumptions used are as follows:

- 59 feet distance from the centerline of the tangent track to the Test Stand area
- 52 feet distance from the centerline of the MSF lead track to the Test Stand area
- 75 feet from tangent track to CNC equipment area
- Three-car train operating at 55 mph on tangent track
- Three-car train operating at 20 mph on lead track
- Ballast and tie track
- 2-car ballast and tie FDL used in the L Line Phase 2B environmental impact statement collected at the LA State Historic Park just north of the Chinatown Station
- Recommended FTA coupling loss to Test Stand area and CNC foundations

3.3 Predicted Ground-borne Vibration Levels

The operations at Dante Valve Company generally match those of a workshop, for which the FTA identifies an impact criterion of 90 VdB. Because equipment-specific vibration sensitivity is not available for the testing operations completed in the Test Stand area, a more protective comparison was made of predicted levels to currently experienced levels measured in that location.

The unmitigated and mitigated ground-borne vibration levels (GBV) predicted at the Dante Valve Company Test Stand area and CNC area using the assumptions documented above are shown in Table 3.2 along with the measured maximum existing levels.

Table 3.2. Predicted Ground-borne Vibration Levels at Dante Valve Facilities

Location/Scenario	Existing Ambient Vibration Levels	GBV
Unmitigated Levels		
Predicted Vibration Levels at CNC (75 ft) – Tangent Track 55 mph	80 VdB	67 VdB
Predicted Vibration Levels at Test Stand Area (52 ft) – Tangent Track 55 mph	75 VdB	72 VdB
Predicted Vibration Levels at Test Stand Area (52 ft) – Crossover Track 20 mph	75 VdB	77 VdB
Mitigated Levels		
Predicted Vibration Levels from Tangent Track at Test Stand Area w/Ballast Mat ¹	75 VdB	70 VdB
Predicted Vibration Levels at Test Stand Area from Crossover Track with Low Impact Crossover	75 VdB	67 VdB
Predicted Vibration Levels from Tangent Track at CNC Area w/Ballast Mat ¹	80 VdB	67 VdB

Notes: ¹ Ballast mat is included as part of Mitigation Measure VIB-3, which addresses vibration impacts at other properties.

CNC = Computer Numerical Control; GBV = ground-borne vibration; VdB = vibration decibels

The measured maximum existing vibration levels at the Test Stand area and CNC is 75 VdB and 80 VdB, respectively. The predicted levels from the train operations through the crossover to the MSF of 77 VdB would exceed the existing vibration level in the Test Stand area. With mitigation consisting of a low impact crossover, the vibration levels will be reduced to 67 VdB, lower than the maximum existing levels at the Test Stand area of 75 VdB. Train operations on the tangent track of 72 VdB without mitigation will be lower than the maximum existing vibration levels at the Test Stand area and CNC. A ballast mat was previously proposed in this location as part of Mitigation Measure VIB-1; the use of a ballast mat will lower vibration levels to 70 VdB.

4 CONSTRUCTION VIBRATION

Vibration estimates were predicted for construction of the LRT guideway at its closest distance of 52 feet to the Test Stand area. Construction of the light rail transit guideway will use equipment similar to heavy-earth moving equipment and cranes. The FTA has provided guidance for assessing construction vibration associated with transit projects. The vibration criteria are based on potential damage risk to buildings, as shown in Table 4.1. Typical equipment to be used during construction of project elements are listed in Table 4.2 along with the predicted vibration levels at 25 feet.

4.1 Vibration Model

The primary concern regarding construction vibration relates to risk of damage. Vibration is generally assessed in terms of peak particle velocity (PPV) for risk of building damage. PPV in inches/second (in/sec) is the appropriate vibration metric for evaluating the potential of

building damage and is often used when monitoring construction vibration because it relates to the stresses that are experienced by the building structure.

The FTA analytical/empirical construction vibration prediction model was used to estimate vibration level propagation from construction equipment to vibration-sensitive locations. The vibration model is based on a combination of previous works, including measured equipment vibration emission data from several reference sources and projects. The fundamental equation used in the model is based on propagation relationships of vibration through average soil conditions and distance, as follows:

$$PPV_{receiver} = PPV_{ref} \times (25/Dist_{receiver})^n$$

where:

PPV_{receiver} = predicted PPV at the receiver

PPV_{ref} = reference PPV of equipment at 25 feet

Dist_{receiver} = distance from the receiver to the equipment in feet

n = 1.5 (the vibration attenuation rate through the soil)

Where PPV = peak particle velocity.

The suggested value for “n” in the FTA Guidance Manual is 1.5. The value for “n” can lie between 1.0 and 2.0, and a value of 1.5 is commonly used in general vibration prediction models for distances less than 100 feet.

4.2 Vibration Criteria

In most cases, the primary concern regarding construction vibration relates to potential architectural or structural damage effects to structures and not to interference with existing activities. The potential for damage to building structures associated with construction vibration is normally assessed using FTA vibration damage criteria, as shown in Table 4.1. A damage risk level of 0.5 in/sec PPV has been selected as a conservative criterion that will protect the Dante Valve Company facilities during construction of the WSAB Project. In response to Dante Valve Company’s concerns raised in comments on the Draft EIS/EIR, Project Measure VIB PM-1 was developed to limit construction-phase vibration levels at Dante Valve Company. Project Measure VIB PM-1 establishes a requirement that in no case may vibration levels, in any direction, for all construction activities, exceed 0.5 in/sec PPV at this location to protect the facility and at-grade test equipment.

Table 4.1. FTA Construction Vibration Damage Risk Criteria

Building Category		PPV (in/sec)
I.	Reinforced-concrete, steel, or timber (no plaster)	0.5
II.	Engineered concrete and masonry (no plaster)	0.3
III.	Historic buildings that have average sensitivity to vibration damage and non-engineered timber and masonry buildings	0.2
IV.	Buildings extremely susceptible to vibration damage	0.12

Source: FTA 2018

Note: FTA = Federal Transit Administration

in/sec = inches per second; PPV = peak particle velocity

4.3 Vibration Modeling Results

Construction vibration levels were estimated using the above-described vibration model, which is consistent with the Draft EIS/EIR vibration analysis. Equipment vibration emission levels used for these estimates are shown in Table 4.2. Jack hammers and vibratory rollers would generate the highest ground vibration levels of all the equipment anticipated to be used near the Dante Valve Company facilities during construction. The vibration estimates were made at the closest expected location of construction activity to the Test Stand area, a distance of 50 feet from the transit guideway. The estimated construction vibration at these distances is compared to the damage risk criteria of 0.5 in/sec PPV in Table 4.3. These estimated worst-case construction vibration levels are lower than the 0.5 in/sec PPV damage risk criteria.

Table 4.2. Equipment Vibration Emission Levels

Equipment	Vibration Level at 25 feet (in/sec PPV)
Large Bulldozer	0.089
Caisson Drilling	0.089
Jack Hammer	0.35
Loaded Truck	0.076
Vibratory Roller	0.210

Source: FTA 2018

Note: in/sec = inches per second; PPV = peak particle velocity

Table 4.3. Predicted Construction Vibration Levels

Receiver	Distance (feet)	Reference Equipment Vibration Levels (in/sec PPV)	Predicted Vibration Level at Receiver (in/sec PPV)	Damage Risk Criteria (in/sec PPV)
Test Stand area	50	Vibratory Roller	0.07	0.5
Test Stand area	50	Jack Hammer	0.01	0.5

Note: in/sec = inches per second; PPV = peak particle velocity

5 VIBRATION CONTROL MEASURES

Per Mitigation Measure VIB-3 (Vibration Control Plan), the contractor will be required to prepare a Vibration Control Plan prior to the start of construction. Mitigation Measure VIB-3 has been revised to provide that vibration levels will be calculated at the closest distance between construction activities and vibration-sensitive facilities, such as Dante Valve Company, and compared with the FTA vibration damage risk criteria. If the damage risk criteria are exceeded, vibration control measures will be identified and implemented as required.

VIB-3 Vibration Control Plan. Metro's contractor will prepare a Vibration Control Plan demonstrating how the Federal Transit Administration building damage risk criteria and the Federal Transit Administration vibration annoyance criteria will be achieved. The Vibration Control Plan will include a list of the major pieces of construction

equipment that will be used and predictions of the vibration levels at the closest sensitive receivers (residences, hotels, schools, churches, temples, historic properties, and similar facilities). The Vibration Control Plan will need to be approved by Metro prior to initiating construction. Where the construction cannot be performed to meet the Metro vibration criteria, the contractor will investigate alternative means and methods of construction measures that will result in lower vibration levels.

As part of the Vibration Control Plan, the contractor will prepare a Vibration Monitoring Plan that specifies construction activities requiring monitoring, monitoring locations, warning levels and limits at each location, equipment, procedures, schedule of measurements, and reporting methods to be used. Vibration levels will be monitored in real time. If limits are exceeded, the activity causing the exceedance will be immediately halted. Work on that activity will be suspended until such time as alternative construction methods can be used and additional abatement measures can be implemented as specified in the Vibration Control Plan. Vibration monitoring data will be submitted to the Project Engineer weekly. Monitoring plan reporting will indicate whether the vibration monitoring data exceeds the damage risk criterion at any monitored sites.

In addition to Mitigation Measure VIB-3, Project Measure VIB PM-1 was developed to establish limits on vibration levels and types of equipment that may be used adjacent to vibration-sensitive facilities, including the Dante Valve Company.

Per the requirements of VIB-3 and VIB PM-1, the contractor will use reasonable vibration-reduction methods, including the following:

- In proximity to Dante Valve Company, use of construction methods that produce less vibration, as required in Project Measure VIB PM-1 and recommended in Mitigation Measure VIB-4
- Scheduling of construction activities, limiting usage times, and providing advance notice to minimize disruption of activities from vibrations at the Dante Valve Company facility

6 CONCLUSION

6.1 Operations

No impact with mitigation. Without mitigation, the predicted levels from train operations through the crossover to the MSF of 77 VdB would exceed the existing vibration level at the Test Stand area but not the existing vibration levels in the CNC room. With a low impact switch, the vibration levels will be reduced to 67 VdB, which is lower than the existing levels at the Test Stand area and CNC. Train operations on the tangent track, resulting in vibration levels of 72 VdB without mitigation, will be lower than the existing vibration levels at the Test Stand area and CNC. However, ballast mat is proposed as mitigation in this location for impacts to other properties. With ballast mat under the tangent track, these levels will be reduced to 70 VdB.

6.2 Construction

No impact. The vibration estimates were made at the closest expected location of construction activity to the Test Stand area, a distance of 50 feet and inclusive of the commitments in PM VIB-1. These estimated worst-case construction vibration levels are lower than the 0.5 in/sec PPV damage risk criteria (Table 4.3). Although not required under the California Environmental Quality Act, to address Dante Valve Company's concerns, Mitigation Measure VIB-3 requires Metro's contractor for the Project to prepare a Vibration Control Plan demonstrating how the FTA building damage risk criteria will not be exceeded.

APPENDIX A: LSTM MEASUREMENTS

Figure A-1. Measured LSTM at Dante Valve Company

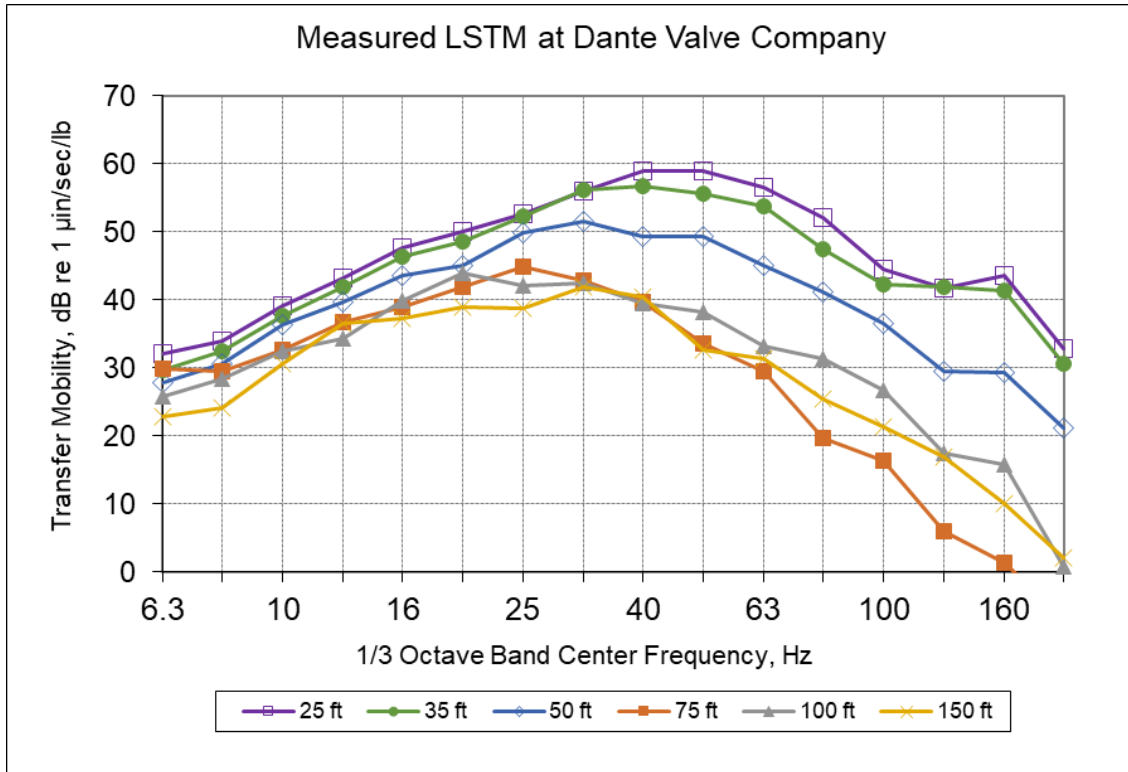


Figure A-2. Measured Coherence at Dante Valve Company

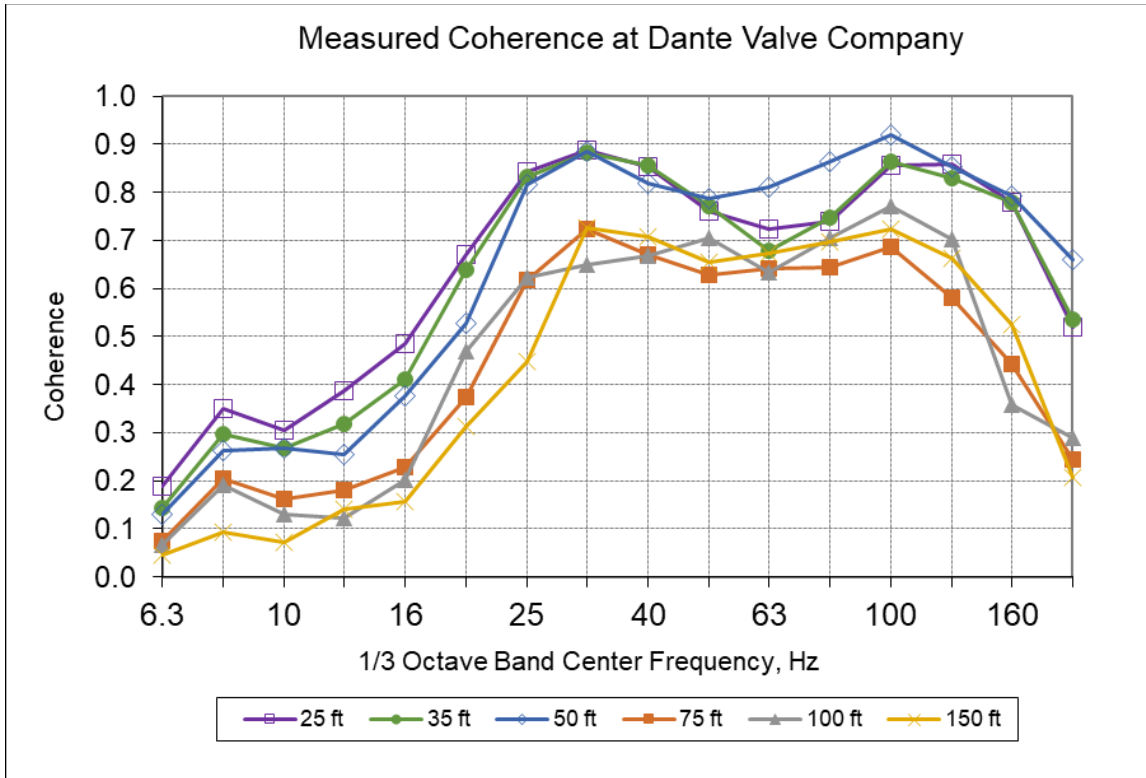


Table A.1. Measured LSTM Values

Distance (ft)	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
25 ft	32	34	39	43	48	50	53	56	59	59	57	52	44	42	44	33
35 ft	30	32	38	42	46	49	52	56	57	56	54	47	42	42	41	31
50 ft	28	31	36	40	43	45	50	52	49	49	45	41	37	30	29	21
75 ft	30	29	33	37	39	42	45	43	40	34	30	20	16	6	1	-7
100 ft	26	28	32	34	40	44	42	43	40	38	33	31	27	17	16	1
150 ft	23	24	31	36	37	39	39	42	41	33	31	25	21	17	10	2

Notes: * in dB re 1 micro-inch/sec/lb.
 Re: Cross Spectrum Acoustics May 2023
 ft = feet; Hz = hertz; LSTM = line source transfer mobility

Table A.2. LSTM Coefficients

Coeff.	6.3 Hz	8 Hz	10 Hz	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
A	46.6	50.1	55.2	58.2	67.2	68.7	81.3	88.1	97.9	110.9	108.5	103.8	92.0	99.1	114.2	103.2
B	-10.4	-11.4	-11.4	-10.9	-14.0	-13.4	-19.4	-22.2	-28.3	-37.1	-37.6	-37.9	-34.1	-41.3	-50.9	-50.4

Notes:
 Re: Cross Spectrum Acoustics May 2023
 Hz = hertz; LSTM = line source transfer mobility