APPENDIX D – NOISE AND VIBRATION ASSESSMENT

Noise and Vibration Assessment

Redlands Marketplace Project

Prepared for:
City of Redlands
35 Cajon Street, Suite 20
Redlands, California 92373

Prepared by:
Kimley-Horn and Associates, Inc.
3801 University Avenue, Suite 300
Riverside, California 92501
951.543.9868

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Kimley»Horn

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LIST OF ABBREVIATED TERMS

APN	Assessor's Parcel Number
ADT	Average daily traffic
dBA	A-weighted sound level
CEQA	California Environmental Quality Act
CNEL	Community equivalent noise level
L_{dn}	Day-night noise level
dB	Decibel
L_{eq}	Equivalent noise level
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HVAC	Heating ventilation and air conditioning
Hz	Hertz
in/sec	Inches per second
L_{max}	Maximum noise level
μPa	Micropascals
L_{min}	Minimum noise level
PPV	Peak particle velocity
RMS	Root mean square
VdB	Vibration velocity level

1.0 INTRODUCTION

This report documents the results of a Noise and Vibration Assessment completed for the Redlands Marketplace Project (Project). The purpose of this Noise and Vibration Assessment is to evaluate the potential construction and operational noise and vibration levels associated with the Project and determine the level of impact the Project would have on the environment. Technical data is included in **Appendix A** and **Appendix B**.

1.1 Project Location

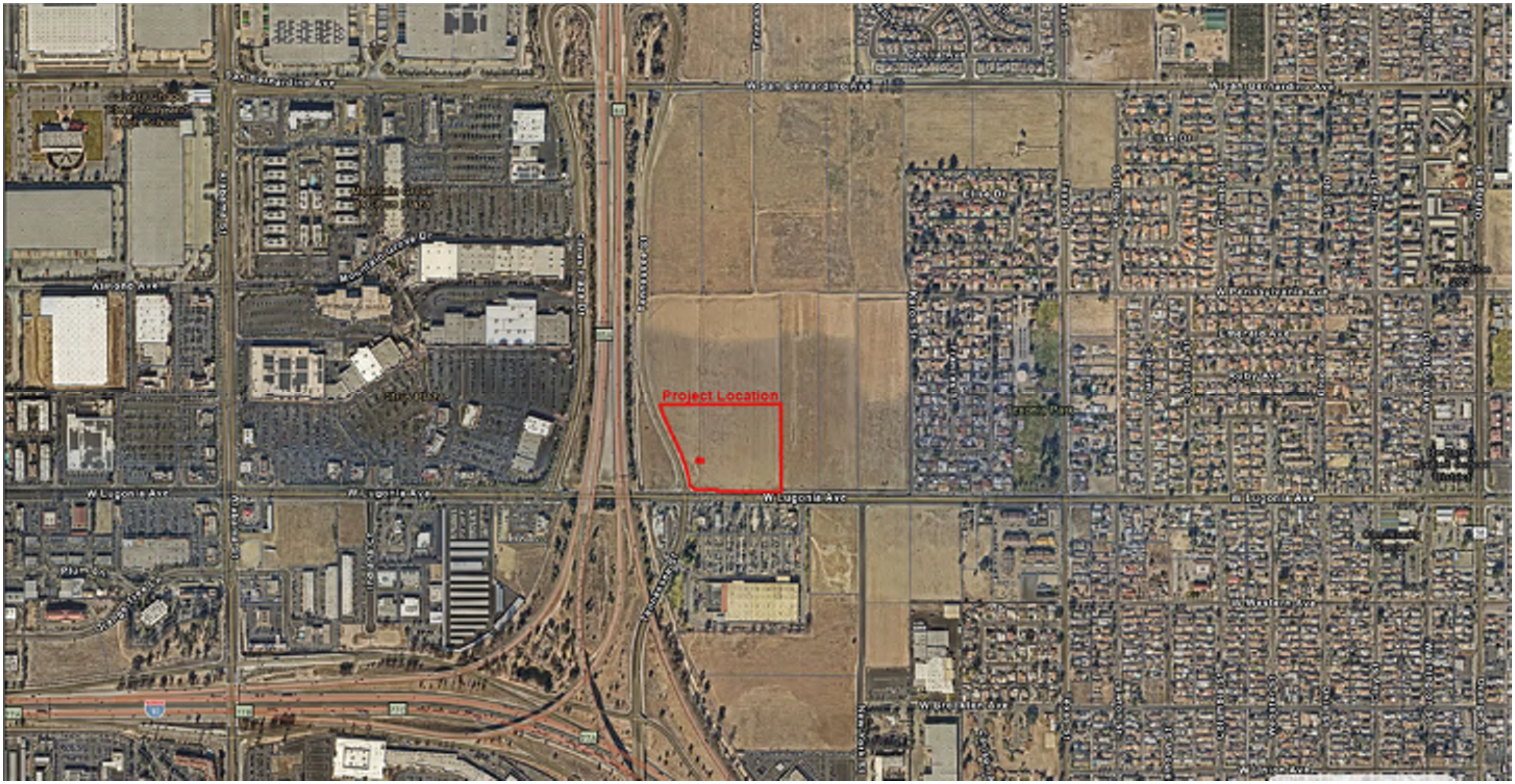
The project site is located at the northeast corner of West Lugonia Avenue and Tennessee Street (APN: 0167-171-16-0000) within the Special Development (EV/SD) District of the East Valley Corridor Specific Plan. The Project site located near the Interstate 210/10 interchange, approximately 300 feet east of Interstate 210 and approximately 2,000 feet north of Interstate 10, refer to **Exhibit 1: Local Vicinity Map.**

1.2 Project Description

The Project includes construction and operation of a shopping center consisting of four buildings designated for retail or food service uses, a major market, a drive-through facility, a parking lot, access roads, auxiliary structures, landscaping and a plaza space. The Project site would be constructed on undeveloped parcels adjacent to the northeastern side of the intersection between W Lugonia Avenue and Tennessee Street, on approximately 366,105 square feet of land, refer to **Exhibit 2: Conceptual Site Plan**.

1.3 Construction Schedule

The Project is anticipated to be developed in one phase. Construction is anticipated to occur over a duration of approximately 13 months, beginning in November 2025 and ending December 2026.



Source: Traffic Impact Study Scoping and VMT Screening Memorandum For Redlands Marketplace

Exhibit 1: Local Vicinity Map

City of Redlands

Redlands Marketplace

Not to Scale

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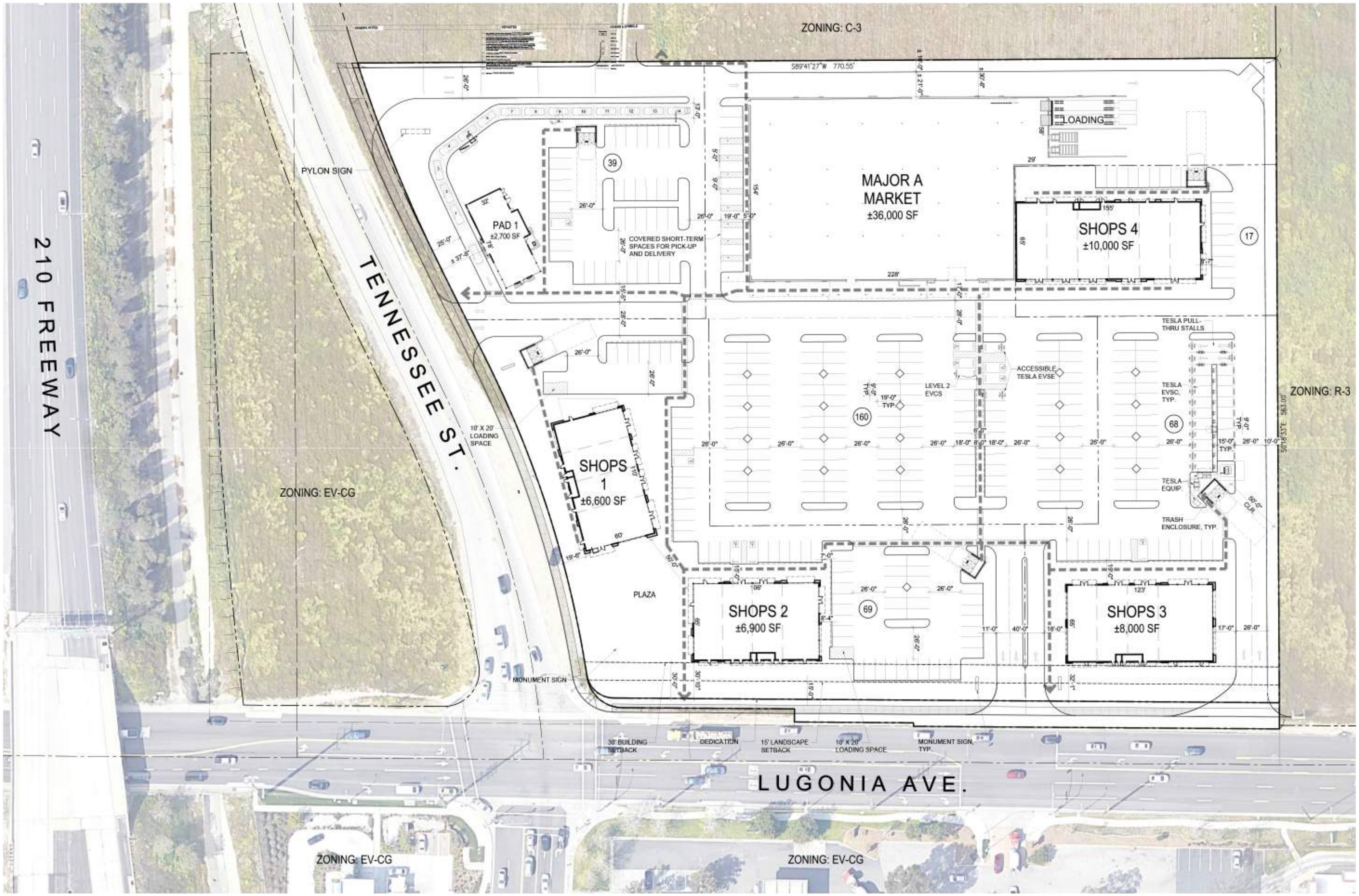

Source: KTGY *Conceptual Site Plan*. **July 29, 2025**

Exhibit 2: Conceptual Site Plan
City of Redlands
Redlands Marketplace

Not to Scale

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2.0 ACOUSTIC FUNDAMENTALS

2.1 Sound and Environmental Noise

Acoustics is the science of sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a medium (e.g., air) to human (or animal) ear. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or hertz (Hz).[1]

Noise is defined as loud, unexpected, or annoying sound.[2] The fundamental model consists of a noise source, a receptor, and the propagation path between the two.[3] The loudness of the noise source, obstructions, or atmospheric factors affecting the propagation path, determine the perceived sound level and noise characteristics at the receptor. Acoustics deal primarily with the propagation and control of sound.[4] A typical noise environment consists of ambient noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this ambient noise is the sound from individual local sources. These sources can vary from an occasional aircraft or train passing by to continuous noise from traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large range of numbers. To avoid this, the decibel (dB) scale was devised. The dB scale uses the hearing threshold of 20 micro-pascals (μPa) as a point of reference, defined as 0 dB.[5] Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The dB scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels correspond closely to human perception of relative loudness. **Table 1: Typical Noise Levels** provides typical noise levels.

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[1] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013. https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf, accessed July 2025.
[2] Harris, Cyril M., *Noise Control in Buildings: A Practical Guide for Architects and Engineers*, 1994.
[3] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.
[4] Ibid.
[5] Ibid.

Table 1: Typical Noise Levels

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

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.

Noise Descriptions

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Several rating scales have been developed to analyze the adverse effect of community noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise on people is largely dependent on the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The equivalent noise level (L_{eq}) represents the equivalent continuous sound pressure level over the measurement period, while the day-night noise level (L_{dn}) and Community Equivalent Noise Level (CNEL) are measures of sound energy during a 24-hour period, with dB weighted sound levels from 7:00 p.m. to 7:00 a.m. Most commonly, environmental sounds are described in terms of L_{eq} that has the same acoustical energy as the summation of all the time-varying events. Each is applicable to this analysis and defined in **Table 2: Definitions of Acoustical Terms**.

Table 2: Definitions of Acoustical Terms

Term	Definitions
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in μPa (or 20 micronewtons per square meter), where 1 pascal is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in dB as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g. 20 μPa). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in dB as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	The average acoustic energy content of noise for a stated period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
Maximum Noise Level (L_{max}) Minimum Noise Level (L_{min})	The maximum and minimum dBA during the measurement period.
Exceeded Noise Levels (L_{01}, L_{10}, L_{50}, L_{90})	The dBA values that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day-Night Noise Level (L_{dn})	A 24-hour average L_{eq} with a 10-dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity at nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.4 dBA L_{dn}.
Community Noise Equivalent Level (CNEL)	A 24-hour average L_{eq} with a 5-dBA weighting during the hours of 7:00 a.m. to 10:00 a.m. and a 10-dBA weighting added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA 24-hour L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol,* September 2013.

The A-weighted decibel (dBA) sound level scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustic energy as the summation of all the time-varying events.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within approximately plus or minus 1 dBA.[6] Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends on the distance between the receptor and the noise source.

A-Weighted Decibels

The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content.[7] However, within the usual range of environmental noise levels, the perception of loudness is relatively predictable and can be approximated by dBA values. There is a strong correlation between dBA and the way the human ear perceives sound. For this reason, the dBA has become the standard tool of environmental noise assessment. All noise levels reported in this document are in terms of dBA, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The dB scale is logarithmic, not linear, and therefore sound levels cannot be added or subtracted through ordinary arithmetic. Two sound levels 10 dB apart differ in acoustic energy by a factor of 10.[8] When the standard logarithmic dB is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound and twice as loud as a 60-dBA sound.[9] When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than one source under the same conditions.[10] Under the dB scale, three sources of equal loudness together would produce an increase of approximately 5 dBA.[11]

Sound Propagation and Attenuation

Sound spreads (propagates) uniformly outward in a spherical pattern, and the sound level decreases (attenuates) at a rate of approximately 6 dB for each doubling of distance from a stationary or point source. Sound from a line source, such as a highway, propagates outward in a cylindrical pattern. Sound levels attenuate at a rate of approximately 3 dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics.[12] No excess attenuation is assumed for hard surfaces like a parking lot or a water body. Soft surfaces, such as soft dirt or grass, can absorb sound; therefore, an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed when soft ground conditions exist between the source and receptor locations.[13] For stationary and line sources, an overall attenuation rate of 6 dB and 3 dB per doubling of distance, respectively, are assumed in this report.

[6] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013. https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf, accessed July 2025.
[7] Harris, Cyril M., *Noise Control in Buildings: A Practical Guide for Architects and Engineers*, 1994.
[8] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.
[9] FHWA, *Noise Fundamentals,* 2017. https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm, accessed July 2025.
[10] Ibid.
[11] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, April 2013.
[12] Ibid.
[13] Federal Highway Administration, *FHWA Traffic Noise Model User's Guide*, January 1998.

Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the noise source and receptor reduces the noise level by approximately 5 dBA, while a solid wall or berm can reduce noise levels by 5 to 15 dBA.[14] The way older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of approximately 20 dBA with closed windows.[15]

Federal Transit Administration Noise and Vibration Guidance

The Federal Transit Administration (FTA) has published the Transit Noise and Vibration Impact Assessment Manual (FTA Transit Noise and Vibration Manual) to provide guidance on procedures for assessing impacts at different stages of transit project development.[16] The report covers both construction and operational noise impacts and describes a range of measures for controlling excessive noise and vibration. In general, the primary concern regarding vibration relates to potential physical damage from construction. The guidance document establishes criteria for evaluating the potential for damage to various structural categories from vibration.

Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. Noise in the community has often been cited as a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from interference with human activities, including sleep, speech, recreation, and tasks that demand concentration or coordination. Hearing loss can occur at the highest noise intensity levels.

Noise environments and consequences of human activities are usually well represented by median noise levels during the day or night or over a 24-hour period. Environmental noise levels are generally considered low when the CNEL is below 60 dBA, moderate in the 60 to 70 dBA range, and high above 70 dBA.[17] Examples of low daytime levels are isolated, natural settings with noise levels as low as 20 dBA and quiet, suburban, residential streets with noise levels around 40 dBA.[18] Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA) and commercial locations (typically 60 dBA). People may consider louder environments adverse, but most will accept the higher levels associated with noisier urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA). Regarding increases in dBA, the following relationships should be noted:[19]

- Except in carefully controlled laboratory experiments, humans cannot perceive a 1-dBA change.

[14] Federal Highway Administration, *Highway Traffic and Construction Noise - Problem and Response*, April 2006.
[15] Federal Highway Administration, *Highway Traffic Noise: Analysis and Abatement Guidance*, page 31, December 2011.
[16] Federal Highway Administration, Highway Traffic and Construction Noise - Problem and Response, April 2006.
[17] Compiled from James P. Cowan, *Handbook of Environmental Acoustics,* 1994, and Cyril M. Harris, *Handbook of Noise Control*, 1979.
[18] Ibid.
[19] Compiled from California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013, and FHWA, *Noise Fundamentals,* 2017.

- Outside the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A minimum 5-dBA change is required before any noticeable change in community response would be expected. A 5-dBA increase is typically considered substantial.
- A 10-dBA change is subjectively heard as an approximate doubling in loudness and would almost certainly cause an adverse change in community response.

Effects of Noise on People

Hearing Loss. While physical damage to the ear from an intense noise impulse is rare, a degradation of auditory acuity can occur even within a community noise environment. Hearing loss occurs mainly due to chronic exposure to excessive noise but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over 8 hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.[20]

Annoyance. Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. A noise level of approximately 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance.[21]

2.2 Ground-Borne Vibration

Sources of ground-borne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.) or man-made causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions or heavy equipment used during construction). Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero.[22] Several different methods are typically used to quantify vibration amplitude. One is vibration decibels (VdB) (the vibration velocity level in decibel scale). Other methods are the peak particle velocity (PPV) and the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave and expressed in terms of inches-per-second (in/sec). The RMS velocity is defined as the average of the squared amplitude of the signal and is expressed in terms of VdB.[23] The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

[20] U.S. Department of Labor, *Occupational Safety and Health Standards*, *29 CFR 1910* (Occupational Noise Exposure).
[21] Federal Interagency Committee on Noise, *Federal Agency Review of Selected Airport Noise Analysis Issues*, August 1992.
[22] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018
[23] Ibid.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations displays people's reactions and the effects on buildings produced by continuous vibration levels. The human annoyance levels should be interpreted with care since vibration may be found to be annoying at much lower levels than those listed, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where ground-borne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

Ground vibration can be a concern in instances where buildings shake, and substantial rumblings occur. However, it is unusual for vibration from typical urban sources such as buses and heavy trucks to be perceptible.[24] Common sources for ground-borne vibration are planes, trains, and construction activities such as earth-moving, which requires the use of heavy-duty earth moving equipment.[25] For the purposes of this analysis, a PPV descriptor with units of in/sec was used to evaluate construction-generated vibration for building damage and human complaints.

Table 3: Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibrations

Maximum PPV (in/sec)	Caltrans Vibration Annoyance Potential Criteria	Caltrans Vibration Damage Potential Threshold Criteria	FTA Vibration Damage Criteria
0.008	--	Extremely fragile historic buildings, ruins, ancient monuments	--
0.08	Readily Perceptible	--	--
0.1	Begins to Annoy	Fragile buildings	--
0.12	--	--	Buildings extremely susceptible to vibration damage
0.2	Annoying	--	Non-engineered timber and masonry buildings
0.25	--	Historic and some old buildings	--
0.3	--	Older residential structures	Engineered concrete and masonry
0.4	Unpleasant	--	--
0.5	--	New residential structures, Modern industrial/commercial buildings	Reinforced-concrete, steel or timber (no plaster)

Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual, 2020 and Federal Transit administration, Transit Noise and Vibration Assessment Manual, 2018.

2.3 Ground-Borne Noise

Ground-borne noise specifically refers to the rumbling noise emanating from the motion of building room surfaces due to the vibration of floors and walls; therefore, it is perceptible only inside buildings. The relationship between ground-borne vibration and ground-borne noise depends on the frequency content of the vibration and the acoustical absorption characteristics of the receiving

24 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018.
25 Ibid.

room. For typical buildings, ground-borne vibration that causes low frequency noise (i.e., the vibration spectrum peak is less than 30 Hz) results in a ground-borne noise level that is approximately 50 decibels lower than the velocity level. For ground-borne vibration that causes mid-frequency noise (i.e., the vibration spectrum peak is between 30 and 60 Hz), the ground-borne noise level will be approximately 35 dB lower than the velocity level. For ground-borne vibration that causes high-frequency noise (i.e., the vibration spectrum peak is greater than 60 Hz), the ground-borne noise level will be approximately 20 dB lower than the velocity level. Therefore, for typical buildings, the ground-borne noise level is lower than the ground-borne vibration velocity level.

3.0 REGULATORY SETTING

To limit population exposure to physically or psychologically damaging, as well as intrusive, noise levels, the Federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise.

3.1 Federal

3.2 State of California

California Government Code

California Government Code Section 65302(f) mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines established by the State Department of Health Services.[26] The guidelines rank noise land use compatibility in terms of “normally acceptable,” “conditionally acceptable,” “normally unacceptable,” and “clearly unacceptable” noise levels for various land use types. Under these guidelines, single-family homes are located in “normally acceptable” exterior noise environments up to 60 CNEL and in “conditionally acceptable” exterior noise environments up to 70 CNEL. Multiple-family residential uses are located in “normally acceptable” exterior noise environments up to 65 CNEL and in “conditionally acceptable” exterior noise environments up to 70 CNEL. Schools, libraries, and churches are located in “normally acceptable” exterior noise environments up to 70 CNEL, as are office buildings and business, commercial, and professional uses.

Assembly Bill 1307

On September 7, 2023, Governor Newsom signed AB 1307, which added section 21085 to the Public Resources Code to read, in pertinent part, “for residential projects, the effects of noise generated by project occupants and their guests on human beings is not a significant effect on the environment.”[27]

3.3 Local

City of Redlands 2035 General Plan

The Redlands General Plan Healthy Community Element includes policies related to noise. The specific General Plan policies related to noise that are relevant to the proposed Project are identified in **Table 4: Redlands General Plan Policies**.

[26] State of California Governor’s Office of Planning and Research, *General Plan Guidelines, Appendix D: Noise Element Guidelines*, page 374, 2017, https://opr.ca.gov/docs/OPR_COMPLETE_7.31.17.pdf, accessed July 2025.
[27] AB 1307, Public Resources Code Section 21085.

Table 4:Redlands General Plan Policies	
Policy/Action Number	**Policy/Action**
Noise Policies	
Policy 7-P.40	Protect public health and welfare by eliminating existing noise problems where feasible and by preventing significant degradation of the future acoustic environment.
Policy 7-P.41	Ensure that new development is compatible with the noise environment by continuing to use potential noise exposure as a criterion in land use planning.
Land Use and Noise Compatibility Actions	
Action 7-A.135	Use the noise and land use compatibility matrix (Table 7-10) and Future Noise Contours map (Figure 7-9) as criteria to determine the acceptability of a given land use, including the improvement/construction of streets, railroads, freeways, and highways. Do not permit new noise-sensitive uses—including schools, hospitals, places of worship, and homes—where noise levels are "normally unacceptable" or higher, if alternative locations are available for the uses in the city.
Action 7-A.136	Require a noise analysis be conducted for all development proposals located where projected noise exposure would be other than "clearly" or "normally compatible" as specified in **Table 5**
Action 7-A.137	For all projects that have noise exposure levels that exceed the standards in **Table 5**, require site planning and architecture to incorporate noise-attenuating features. With mitigation, development should meet the allowable outdoor and indoor noise exposure standards in **Table 6**. When a building's openings to the exterior are required to be closed to meet the interior noise standard, mechanical ventilation shall be provided.
Action 7-A.138	Continue to maintain performance standards in the Municipal code to ensure that noise generated by proposed projects is compatible with surrounding land uses.
Source: *Redlands General Plan 2035*. https://www.cityofredlands.org/post/planning-division-general-plan	

Noise Compatibility

Table 7-10 of the General Plan Healthy Community Element (included as **Table 5: Noise/Land Use Compatibility** in this study) identifies the specific criteria to evaluate proposed developments based on exterior and interior noise level limits for land uses and requires a noise analysis to determine needed mitigation measures if necessary.

Table 5: Noise/Land Use Compatibility

Land Use Categories		Community Noise Equivalent Level (CNEL)						
Categories	**Uses**	< 60	65	70	75	80	85	>
RESIDENTIAL	Single Family, Duplex Multiple Family	A	C	C	C	D	D	D
RESIDENTIAL	Mobile Homes	A	C	C	C	D	D	D
COMMERCIAL Regional, District	Hotel, Motel, Transient Lodging	A	A	B	B	C	C	D
COMMERCIAL Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theater	A	A	A	A	B	B	C
COMMERCIAL INDUSTRIAL INSTITUTIONAL	Office Building, Research & Dev., Professional Offices, City Office Building	A	A	A	B	B	C	D
COMMERCIAL Recreation INSTITUTIONAL Civic Center	Amphitheater, Concert Hall, Auditorium, Meeting Hall	B	B	C	C	D	D	D
COMMERCIAL Recreation	Childrens Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	A	B	B	B
COMMERCIAL General, Special INDUSTRIAL, INSTITUTIONAL	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
INSTITUTIONAL General	Hospital, Church, Library, Schools Classroom	A	A	B	C	C	D	D
OPEN SPACE	Parks	A	A	A	B	C	D	D
OPEN SPACE	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C
AGRICULTURE	Agriculture	A	A	A	A	A	A	A

Zone A CLEARLY COMPATIBLE	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.
ZONE B NORMALLY COMPATIBLE	New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.
ZONE C NORMALLY INCOMPATIBLE	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.
ZONE D CLEARLY INCOMPATIBLE	New construction or development should generally not be undertaken.

Source: City of Redlands General Plan, Chapter 7 Healthy Community Element, Table 7-10

Interior and Exterior Noise Standards

Table 7-11 of the General Plan Healthy Community Element (included as **Table 6: Interior and Exterior Noise Standards** in this study) identifies an exterior (outdoor) noise standard of 60 dBA CNEL related to private yards of single-family, duplex, and multi-family residences as measured at the property line.

Table 6: Interior and Exterior Noise Standards

Land Use Categories	Community Noise Equivalent Level (CNEL) Energy Average CNEL	
Uses	Interior[1]	Exterior[2]
RESIDENTIAL		
Single Family, Duplex, Multiple Family	45[3]	60
Mobile Home	---	60[4]
COMMERCIAL, INDUSTRIAL, INSTITUTIONAL		
Hotel, Motel, Transient Lodging	45	65[5]
Commercial Retail, Bank Restaurant	55	---
Office Building, Research & Development, Professional Offices, City Office Building	50	---
Amphitheater, Concert Hall, Auditorium, Meeting Hall	45	---
Gymnasium (Multipurpose)	50	---
Sports Club	55	---
Manufacturing, Warehousing, Wholesale, Utilities	60	---
Movie Theaters	45	---
INSTITUTIONAL		
Hospital, Schools classrooms	45	60
OPEN SPACE		
Parks	---	60

Notes:
* CNEL (Community Noise Equivalent Level) - The average equivalent A-weighted sound level during a 24 hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7 pm to 10 pm and ten decibels to sound levels at night after 10 pm and before 7 am.
1. Indoor environment excluding bathrooms, toilets, closets, corridors.
2. Outdoor environment limited to private yard of single family as measured at the property line; multifamily private patio or balcony which is served by a means of exit from inside; mobile home park; hospital patio; park picnic area; school playground; hotel and recreational area.
3. Noise level requirement with open windows, if they are used to meet natural ventilation requirement.
4. Exterior noise level should be such that interior level will not exceed 45 CNEL.
5. Except those areas affected by aircraft noise.

See also Policy 9.0s

Source: Mestre Greve Associates.

Source: City of Redlands General Plan, Chapter 7 Healthy Community Element, Table 7-11

Measure U

The City of Redlands General Plan incorporates the implementing noise polices from Measure U. Measure U was certified by The City of Redlands in 1997 to address impacts from growth. The measures that are relevant to the proposed Project are identified in **Table 7: Measure U Policies**.

Table 7: Measure U Policies

Policy Number	Policy
Measure U Policy 9-0e	Use the criteria specified in **Table 5** to assess the compatibility of proposed land uses with the projected noise environment and apply the noise standards in **Table 6**, which prescribe interior and exterior noise standards in relation to specific land uses. Do not approve projects that would not comply with the standards in these tables. These tables are the primary tools which allow the City to ensure noise-integrated planning for compatibility between land uses and outdoor noise.
Measure U Policy 9-0f	Require a noise impact evaluation based on noise measurements at the site for all projects in Noise Referral Zones (B, C, or D) as shown on General Plan **Table 5** as part of the project review process. Should measurements indicate that unacceptable noise levels will be created or experienced, require mitigation measures based on a detailed technical study prepared by a qualified acoustical engineer (i.e., a Registered Professional Engineer in the State of California with a minimum of three years' experience in acoustics).
Measure U Policy 9-0i	Require construction of barriers to mitigate sound emissions where necessary or where feasible and encourage use of walls and berms to protect residential or other noise sensitive land uses that are adjacent to major roads, commercial, or industrial areas.
Measure U Policy 9-0t	Require proposed commercial projects near existing residential land use to demonstrate compliance with the Community Noise Ordinance prior to approval of the project.
Measure U Policy 9-0v	Consider the following impacts as possibly "significant": • An increase in exposure of four or more dB if the resulting noise level would exceed that described as clearly compatible for the affected land use, as established in General Plan **Table 5** and General Plan **Table 6**; • Any increase of six dB or more, due to the potential for adverse community response.
Measure U Policy 9-0w	Limit hours for all construction or demolition work where site-related noise is audible beyond the site boundary.
Source: City of Redlands General Plan, Chapter 7 Healthy Community Element	

City of Redlands Municipal Code

The City of Redlands Municipal Code establishes the following noise provisions relative to the Project:

Municipal Code Section 8.06.070: Exterior Noise Limits

A. Noise standards for the categories of land use identified in **Table 8: Maximum Permissible Sound Levels by Receiving Land Use**.

Table 8: Maximum Permissible Sound Levels by Receiving Land Use		
Receiving Land Use Category	**Time Period**	**Noise Level - dBA**
Single-Family Residential Districts	10:00 PM – 7:00 AM 7:00 AM – 10:00 PM	50 60
Multi-Family Residential Districts Public Space, Institutional	10:00 PM – 7:00 AM 7:00 AM – 10:00 PM	50 60
Commercial	10:00 PM – 7:00 AM 7:00 AM – 10:00 PM	60 65
Industrial	Any Time	75
Source: https://codelibrary.amlegal.com/codes/redlandsca/latest/redlands_ca/0-0-0-5243#JD_8.06.030		

Municipal Code Section 8.06.080: Interior Noise Standards

A. No person shall operate or cause to be operated any source of sound, or allow the creation of any noise, which causes the noise level when measured inside a neighboring receiving occupied building to exceed the standards identified in **Table 9: Maximum Permissible Interior Sound Levels by Receiving Land Use**.

Table 9: Maximum Permissible Interior Sound Levels by Receiving Land Use		
Receiving Land Use Category	**Time Period**	**Noise Level - dBA**
Single-Family Residential Districts	Any Time	45
Multi-Family Residential Districts Public Space, Institutional, Hotels	Any Time	45
Commercial	Any Time	50
Industrial	Any Time	60
Source: https://codelibrary.amlegal.com/codes/redlandsca/latest/redlands_ca/0-0-0-5243#JD_8.06.030		

Municipal Code Section 8.06.090: Noise Disturbances Prohibited

F. Construction and / or Demolition: Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 6:00 PM and 7:00 AM, including Saturdays, 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 by public service utilities, the city, or another governmental entity. All mobile or stationary internal combustion engine powered equipment or machinery shall be equipped with exhaust and air intake silencers in proper working order, or suitable to meet the standards set forth herein.

G. Vibration: Operating or permitting the operation of any device that creates a vibration which is above the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at one hundred fifty feet from the source if on a public space or public right of way.

Although it not defined in the municipal code, the vibration perception threshold is presumed to be a motion velocity of 0.01 inches per second.

4.0 EXISTING CONDITIONS

4.1 Existing Noise Sources

The City is impacted by various noise sources. The primary existing noise sources in the Project area are mobile noise sources from roadway and freeway traffic. Other noise sources are the various surrounding land uses (i.e. residential to the east and commercial to the south) that generate stationary-source noise.

Mobile Sources

Existing roadway noise levels were calculated for the roadway segments in the Project vicinity. This task was accomplished using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and existing traffic volumes provided by GTS (General Technologies and Solutions). The noise prediction model calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, and site environmental conditions. The average vehicle noise rates (also referred to as energy rates) used in the FHWA model have been modified to reflect average vehicle noise rates identified for California by the California Department of Transportation (Caltrans). The Caltrans data indicates that California automobile noise is 0.8 to 1.0 dBA higher than national levels and that medium and heavy truck noise is 0.3 to 3.0 dBA lower than national levels.

The average daily noise levels along roadway segments in proximity to the Project site are included in **Table 10: Existing Traffic Noise Levels**. **Table 10** shows the existing traffic-generated noise level on Project-vicinity roadways currently ranges from 54.6 dBA CNEL to 63.2 dBA CNEL 100 feet from the centerline. As previously described, CNEL is 24-hour average noise level with a 5 dBA "weighting" during the hours of 7:00 p.m. to 10:00 p.m. and a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively.

Table 10: Existing Traffic Noise Levels			
Roadway Segment		**ADT**	**dBA CNEL 100 Feet from Roadway Centerline**
Lugonia Avenue	West of Citrus Plaza Drive	5,640	59.6
	Between Citrus Plaza Drive and Tennessee Street	13,010	63.1
	Between Tennessee Street and Driveway 2	11,690	62.7
	Between Driveway 2 and New York Street	11,540	62.7
	Between New York Street and Texas Street	10,740	62.3
	Between Texas Street and Orange Street	9,360	61.7
	East of Orange Street	9,320	61.7
San Bernardino Avenue	East of Texas Street	7,190	61.7
	Between Texas Street and Tennessee Street	7,190	62.7
	Between Tennessee Street and Citrus Plaza Drive	1,378	54.6
	West of Citrus Plaza Drive	7,440	63.2
Tennessee Street	South of I-10 EB Ramp	9,410	61.8
	Between I-10 EB Ramp and I-10 WB Ramp	9,890	62.0
	Between I-10 WB Rap and Lugonia Avenue	9,370	61.7
	Between Lugonia Avenue and San Bernardino Ave	5,560	59.4
	North of San Bernardino Avenue	12,860	63.1
Citrus Plaza Drive	Between Lugonia Avenue and San Bernardino Ave.	7,020	59.2
	North of San Bernardino Avenue	3,610	56.4
ADT = average daily trips; dBA = A-weighted decibels; CNEL = community noise equivalent level			
Source: Based on traffic data from GTS. Refer to **Appendix B: Noise Modeling Data** for traffic noise modeling assumptions and results.			

Stationary Sources

The nearest sources of stationary noise in the Project vicinity are generated by the following existing uses: commercial uses to the south. Noise sources from commercial uses typically include mechanical equipment (e.g., HVAC and mechanical tools), truck idling, and truck maneuvering. The noise associated with these sources may represent a single-event noise occurrence or short-term noise.

4.2 Noise Measurements

To quantify existing ambient noise levels in the Project site area, Kimley-Horn conducted five short-term (10-minute) measurements on Tuesday, July 1, 2025; see **Appendix A: Noise Measurements** for additional details regarding ambient noise measurements. The noise measurement sites were selected to be representative of the existing ambient noise levels at the noise-sensitive uses immediately adjacent to the Project site. The 10-minute daytime measurements were taken between 1:34 PM and 2:59 PM. Measurements of L_{eq} are considered representative of the noise levels throughout the day. The noise levels measured at each location are listed in **Table 11: Noise Measurement Locations** and shown on **Exhibit 4: Noise Measurement Locations**.

Table 11: Existing Noise Measurement Locations and Measurements

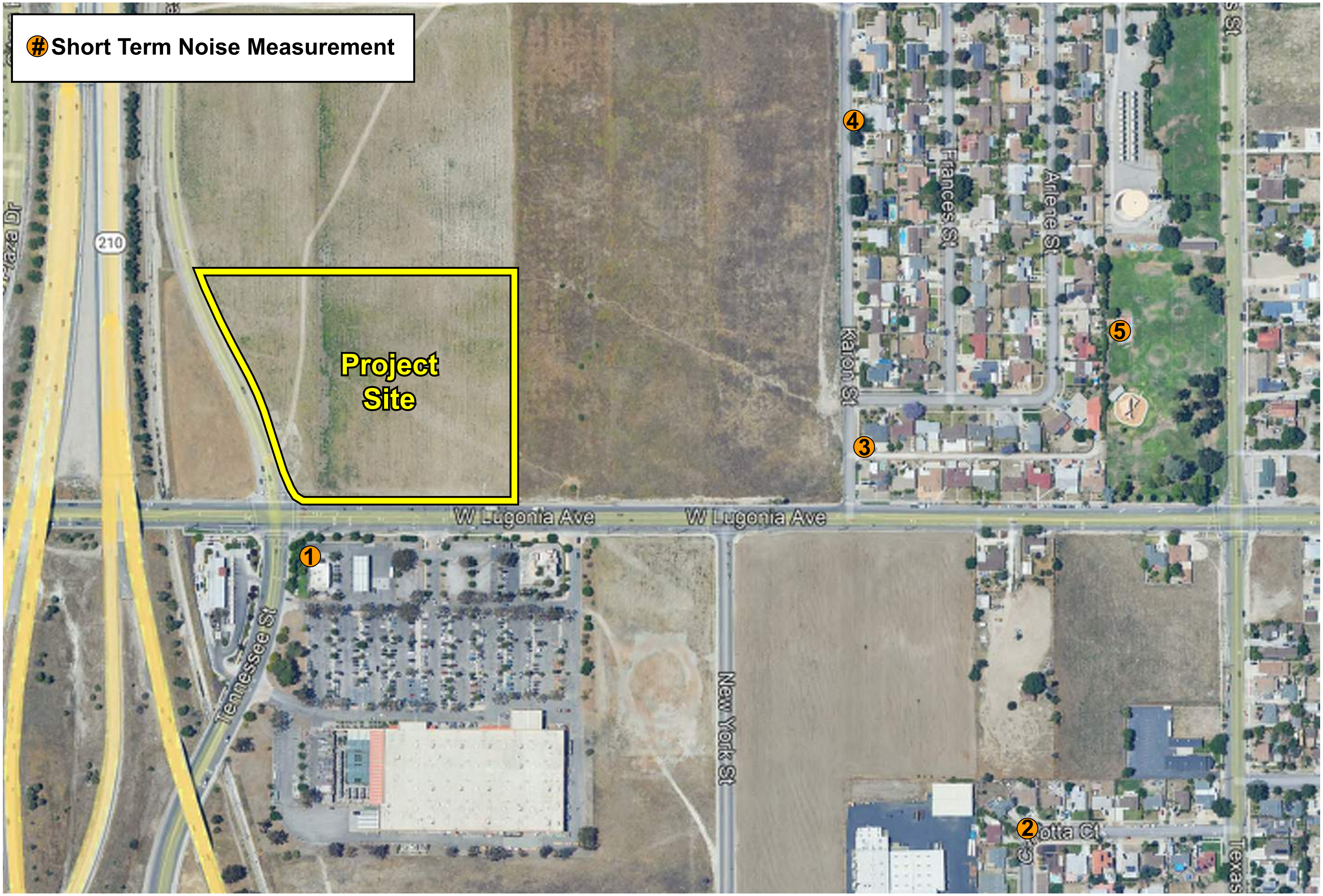
Site	Location	Measurement Period	Duration	L_{eq} (dBA) [1]
ST-1	7-Eleven at Tennessee St and Lugonia Ave	1:34 PM – 1:44 PM	10 minutes	66.8
ST-2	859 Carlotta Court	2:49 PM – 2:59 PM	10 minutes	50.6
ST-3	1329 Karon Street	1:52 PM – 2:02 PM	10 minutes	59.1
ST-4	1418 Karon Street	2:14 PM – 2:24 PM	10 minutes	59.1
ST-5	Texonia Park	2:32 PM – 2:42 PM	10 minutes	55.8

Source: Noise measurements taken by Kimley-Horn and Associates, July 1, 2025.
See **Appendix A** for noise measurement results.

4.3 Sensitive Receptors

Noise exposure standards and guidelines for various types of land uses reflect the varying noise sensitivities associated with each of these uses. Sensitive receptors as land uses that are adversely affected by various noise sources. Such land uses include residences, schools, libraries, hospitals, churches, offices, hotels, motels, and outdoor recreational areas. The nearest existing sensitive receptors to the Project site are residences approximately 860 feet to the east. Texonia Park, also to the east, is approximately 1,500 feet from the Project boundary.

In addition, two new developments are planned to be constructed adjacent to the Project. The Neighborhoods at Lugonia Village is a residential development that will be constructed east of the Project. Based on the site plans, the nearest future sensitive receptor would be apartments and townhomes that will be setback approximately 80 feet from the Project property line and will be shielded from noise by a 6-foot-tall retaining wall. The Tennessee Village is a mixed-use development that will be constructed to the north and will include apartments and commercial/retail uses. Based on the site plan, the apartments will be setback approximately 20 feet from the Project property line. The Tennessee Village apartments located along the Project property line will be shielded from noise by a six-foot-tall concrete block wall which will be constructed by the Project.



Source: Google Earth

Exhibit 3: Noise Measurement Locations
City of Redlands
Redlands Marketplace

Not to Scale

Kimley»Horn

5.0 SIGNIFICANCE CRITERIA AND METHODOLOGY

5.1 CEQA Thresholds

The City has not established local California Environmental Quality Act (CEQA) significance thresholds as described in Section 15064.7 of the State CEQA Guidelines. Therefore, significance determinations utilized in this section are from State CEQA Guidelines Appendix G. According to Section XIII of State CEQA Guidelines Appendix G, the Project would create a significant environmental impact if it would:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Generate excessive ground-borne vibration or ground-borne noise levels; and
- 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, expose people residing or working in the Project area to excessive noise levels.

Construction Noise

The City of Redlands does not establish quantitative construction noise standards and only limits the construction activities timeframe;[28] therefore, this analysis conservatively uses the FTA's threshold of 80 dBA (8-hour L_{eq}) for residential uses and 90 dBA (8-hour L_{eq}) for non-residential uses to evaluate construction noise impacts.[29] Construction noise levels that exceed these thresholds would result in a significant impact.

Operational Noise

On-Site Operations. With respect to on-site operational noise, the significance criteria used in the noise analysis is based on the City of Redlands Municipal Code Section 8.06.070(A): Exterior Noise Limits, which states that noise levels at the receiving land use may not exceed the permissible noise level based on the time of day. For residential and public spaces (Texonia Park) the permissible noise threshold would be 60 dBA during the day (7:00 AM to 10:00 PM) and 50 dBA at night (10:00 PM to 7:00 AM). For commercial uses to the south, the threshold would be 65 dBA during the day and 60 dBA at night. Noise levels that exceed these limits would result in a significant impact.

Off-Site Operations. The City has not established significance thresholds for traffic noise, however Measure U Policy 9-0V considers an increase of 4 dBA or more over the clearly compatible noise level for the affected land use (refer to **Table 5**) as significant. Therefore, if traffic noise increases by 4 dBA or more over existing noise levels and the resulting traffic noise exceeds the clearly compatible noise level for surrounding land uses, traffic noise would be considered significant impact.

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[28] Municipal Code Section 8.06.090 (F) Construction and/or Demolition

[29] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, Table 7-2, Page 179, September 2018.

Vibration

Increases in ground-borne vibration levels attributable to the Project would be primarily associated with short-term construction-related activities. Project construction could result in varying degrees of temporary ground-borne vibration, depending on the specific construction equipment used, the location of that equipment relative to the receptor, and the operations involved.

The City has not established significance thresholds for excessive ground-borne vibrations, therefore this analysis will use vibration thresholds identified by the FTA and Caltrans to determine impacts from construction related vibrations For a traditionally built structure, without assistance from qualified engineers, the FTA guidelines show that a vibration level of up to 0.20 in/sec PPV is considered safe and would not result in any vibration damage. FTA guidelines show that modern engineered buildings built with reinforced-concrete, steel or timber can withstand vibration levels up to 0.50 in/sec PPV and not experience vibration damage.

However, the City Municipal Code[30] includes a vibration threshold for human annoyance. The City of Redlands has defined "vibration perception threshold" as the minimum vibration necessary to cause a normal person to be aware of the vibration. The perception threshold is 0.01 in/sec PPV.

5.2 Methodology

Construction

Construction noise levels were based on typical noise levels generated by construction equipment published by the FTA and the FHWA. Construction noise is assessed in dBA L_{eq}. This unit is appropriate because L_{eq} can be used to describe noise level from operation of each piece of equipment separately, and levels can be combined to represent the noise level from all equipment operating during a given period.

Construction noise modeling was conducted using the FHWA Roadway Construction Noise Model (RCNM). Reference noise levels are used to estimate operational noise levels at nearby sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation for point sources of noise). For each construction activity, each piece of equipment operates as an individual point source. All construction equipment was assumed to be operating simultaneously, with the loudest pieces of equipment nearest the Project boundary and each piece of equipment separated by a 30-foot safety zone. To evaluate whether the Project would generate potentially significant construction noise levels at sensitive receiver locations, a construction-related noise threshold of 80 dBA for residential uses and 90 dBA for non-residential uses has been selected, refer to CEQA thresholds for construction above.

Operations

The analysis of the "Without Project" and "With Project" noise environments is based on noise prediction modeling and empirical observations. Reference noise[31] level data are used to estimate

[30] City of Redlands Municipal Code Section 8.06.090 (G) Vibration

[31] The reference noise levels are used to represent a worst-case noise environment as noise levels from stationary sources can vary throughout the day.

the Project's operational noise levels from stationary sources. Noise levels are collected from field noise measurements and other published sources from similar types of activities are used to estimate noise levels expected with the Project's stationary sources with the following formula for distance attenuation:

$$dBA_2 = dBA_1 + 20\ Log_{10}\left(\frac{d_1}{d_2}\right)$$

Where:
dBA_1 = Reference Noise Level
dBA_2 = Estimated Noise Level
d_1 = Reference Distance
d_2 = Approximate Receptor Location Distance

An analysis was also conducted to determine the Project's effect on traffic noise conditions at off-site land uses. "Without Project" traffic noise levels were compared to "With Project" traffic noise levels. The environmental baseline is the "Without Project" condition. The "Without Project" and "With Project" traffic noise levels in the Project vicinity were calculated using the FHWA Highway Noise Prediction model (FHWA-RD-77-108). The actual sound level at any receptor location is dependent upon such factors as the source-to-receptor distance and the presence of intervening structures (walls and buildings), barriers, and topography. The noise attenuating effects of changes in elevation, topography, and intervening structures were not included in the model. Therefore, the modeling effort is considered a worst-case representation of the roadway noise.

Vibration

Ground-borne vibration levels associated with Project construction-related activities were evaluated utilizing typical ground-borne vibration levels associated with construction equipment, obtained from FTA published data for construction equipment. Potential ground-borne vibration impacts related to building/structure damage and interference with sensitive existing operations were evaluated, considering the distance from construction activities to nearby land uses and typically applied criteria.

6.0 POTENTIAL IMPACTS AND MITIGATION

6.1 Project-Level Impacts

Threshold 6.1 ***Would the Project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?***

Construction

On-Site Construction Noise

Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g., site preparation, grading, building construction). Noise generated by construction equipment, including earth movers and material handlers, can reach high levels that can affect noise-sensitive uses near the construction site. Project construction activities would include site preparation, grading, excavation, paving, building construction, and architectural coating. Noise levels associated with individual Project construction equipment are listed in **Table 12: Project Construction Equipment Noise Levels**.[32] It should be noted that the noise level values shown in **Table 12** are for the equipment when operating at full power 50 feet from the sensitive receptor, without taking into account any intervening structures or topography that may reduce noise levels.

Table 12: Project Construction Equipment Noise Levels

Construction Phase	Equipment[1]	Typical Noise Level (dBA L_{max}) at 50 feet from Source	Usage Factor (%)
Site Preparation	Tractor	84	40
	Dozer	82	40
Grading	Grader	85	40
	Tractor	84	40
	Dozer	82	40
	Excavator	81	40
Building Construction	Tractor	84	40
	Crane	81	16
	Generator	81	50
	Welder	74	40
Paving	Roller	80	20
	Paver	77	50
Architectural Coating	Air Compressor	78	40

1. Equipment compiled based on contractor input.

Source: Noise level and usage factor source: Federal Highway Association, Roadway Construction Noise Model, User Guide 2005.

Construction noise was modeled to conservatively determine worst-case exterior construction noise levels for each phase of the Project. Construction noise modeling was conducted using the FHWA Roadway Construction Noise Model (RCNM) and includes all equipment running concurrently. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full power operation followed by 3 to 4 minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one

32 Federal Highway Association, *Roadway Construction Noise Model*, User Guide 2005.

minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts).

The construction equipment noise levels in **Table 12** are from the FHWA Roadway Construction Noise Model which uses data from the early 1990s and other measured data. Since that time, construction equipment has been required to meet more stringent emissions standards and the additional necessary exhaust systems also reduce noise from what is shown in the table.

The noise levels calculated in **Table 13: Project Construction Noise Levels** show the estimated maximum exterior construction noise levels at the nearest sensitive receptors. Please note that the timeline for the construction of adjacent future developments (discussed in Section 4.3 Sensitive Receptors) is unknown at this time and therefore may be constructed before or after construction of the Project begins. As a result, this analysis conservatively assumes all future developments have been constructed. Construction noise levels in **Table 13** analyze the following receptors: existing residential receptor (860 feet to the east), existing non-residential receptor (135 feet to the south), future residential receptor (80 feet to the east), and future mixed-use residential and non-residential receptors (20 feet to the north). Construction equipment was assumed to operate simultaneously to represent a worst-case noise scenario as construction activities would routinely be spread throughout the construction site and would operate at different intervals.

Table 13: Project Construction Noise Levels

Construction Activity	Maximum Construction Noise Level at Each Receptor (dBA L_{eq})				Noise Threshold Residential/ Non-Residential (dBA L_{eq})	Exceeded?
	Existing Residential Receptor (860 Feet to the East)[1]	Existing Non-Residential Receptor (135 Feet to the South)	Future Residential Receptor (80 feet to the East)[2]	Future Residential and Non-Residential Receptors (20 feet to the North)		
Site Preparation	62.2	74.2	69.6	**89.1**	80.0 / 90.0	**Yes**
Grading	62.0	76.2	69.9	**89.8**	80.0 / 90.0	**Yes**
Building Construction	61.4	75.5	69.2	**89.0**	80.0 / 90.0	**Yes**
Paving	58.4	71.7	64.9	**82.9**	80.0 / 90.0	**Yes**
Architectural Coating	49.0	65.1	59.6	**81.7**	80.0 / 90.0	**Yes**
Combined Building Construction, Paving, and Architectural Coating (these three activities are assumed to overlap during construction)	61.8	75.6	69.2	**89.0**	80.0 / 90.0	**Yes**

1. Does not include reductions from future intervening buildings or walls.
2. Includes reduction from retaining wall built as part of residential development.

Source: Federal Highway Administration, *Roadway Construction Noise Model,* 2006. Refer to **Appendix B** for noise modeling results for each construction phase.

The RCNM results are displayed as an 8-hour L_{eq}, which accounts for the percentage of time each individual piece of equipment operates under full power over an 8-hour workday. During an 8-hour period the construction equipment will move throughout the site. As construction equipment moves, the distances from the nearest receptor would change. However, as discussed under methodology, the loudest pieces of equipment were placed nearest the Project boundary in the model, and each piece of equipment separated by a 30-foot safety zone.

Table 13 shows that construction noise levels at the nearest existing sensitive receptors (residential uses to the east) would reach a maximum of 62.2 dBA L_{eq} and therefore do not exceed the 80 dBA L_{eq} exterior noise threshold. In addition, construction noise levels at the commercial uses to the south would reach a maximum of 76.2 dBA L_{eq} and therefore do not exceed the 90 dBA L_{eq} threshold for non-residential uses.

However, construction noise would exceed the 80 dBA L_{eq} exterior noise threshold for residential uses at the future development, Tennessee Village, located north of the Project site. As shown in **Table 13**, construction noise could reach 89.8 dBA L_{eq} during the grading phase of construction. As a result, mitigation would be required to reduce this potentially significant impact to a less than significant level. Mitigation measure (**MM**) **NOI-1** would require temporary construction noise barriers capable of reducing construction noise levels by a minimum of 10 dBA. **MM NOI-1** would only be required in the event that the Tennessee Village apartment buildings located within 80 feet of the Project property line are occupied during Project construction. Construction noise levels at any Tennessee Village apartments located more than 80 from the Project property line would not exceed the 80 dBA L_{eq} residential noise threshold and would not require mitigation.

Operations

Project implementation would result in the following sources of noise in the Project vicinity. The major noise sources associated with the Project would include:

- Mechanical equipment (i.e. trash compactors, air conditioners, etc.);
- Parking areas (i.e. car door slamming, car radios, engine start-up, and car pass-by); and
- Off-Site Traffic Noise.

The noise levels calculated in **Table 14: Operational Noise Levels** shows the estimated operational noise of each noise source and the combined noise level at each receptor.

Table 14: Operational Noise Levels

Receptor (Land Use/Direction)	Operational Noise (dBA)						Threshold (Daytime/ Nighttime) (dBA)	Exceeded?
	HVAC	Trash Compactors	Trucks and Loading Docks	Parking Lot	Reductions from Barriers	Combined Operational Noise		
Existing Residential /East	27.0	28.0	40.8	27.1	-10[1]	31.3	60/50	No
Existing Commercial /South	41.6	32.3	44.4	42.8	-2.2[2]	45.8	65/60	No
Future Residential /East	45.2	43.6	54.7	44.3	-10[1]	45.8	60/50	No
Future Mixed Use /North	52.0	49.4	65.1	46.3	-16.8[3]	48.6	60/50 65/60	No

1. Includes reductions from the retaining wall built east of the Project.
2. Includes reductions from walls around trash compactors and loading docks and the intervening building, shielding receptors to the south.
3. Includes reductions from walls surrounding the trash compactors and loading docks and the perimeter wall along the northern edge of the Project, shielding residential and commercial receptors to the north of the Project.

Source: Refer to **Appendix B** for noise modeling results for each construction phase.

On-Site Mechanical Equipment Noise

The Project is located approximately 860 feet west of existing residential properties and 90 feet north of existing commercial properties. Commercial buildings constructed on-site would be setback approximately 30 feet from the Project property boundary. Therefore, onsite Project buildings would be at least 890 feet from existing residential uses, 165 feet from existing commercial uses, 110 feet from future residential receptors to the east, and 50 feet from future residential and non-residential receptors to the north.

Potential stationary noise sources related to the operation of the Project would include mechanical equipment attached to the buildings. Mechanical equipment (e.g. heating ventilation and air conditioning [HVAC] equipment) typically generates noise levels of approximately 52 dBA at 50 feet.[33]

The Project also includes two trash compactors located in the northeast corner of the market, adjacent to the loading dock doors. Trash compactors generate noise levels of approximately 51 dBA at 50 feet.[34] These trash compactors are located approximately 1,025 feet from the existing residential properties to the east, 610 feet from existing commercial buildings to the south, 165 feet from future residential properties to the east, and 80 feet from future residential buildings to the north.

Refer to **Table 14: Operational Noise Levels** for a summary of mechanical equipment noise levels, including HVAC equipment and trash compactors, at each receptor.

Truck and Loading Dock Noise

The proposed market includes dock-high doors for truck loading/unloading. During loading and unloading activities, noise would be generated by the trucks' diesel engines, exhaust systems, and brakes during low gear shifting' braking activities; backing up toward the docks; dropping down the dock ramps; maneuvering away from the docks; and cargo handling equipment. Furthermore, loading dock doors would also be surrounded with protective aprons, gaskets, or similar improvements that, when a trailer is docked, would serve as a noise barrier between the interior warehouse activities and the exterior loading area. This would attenuate noise emanating from interior activities including interior loading and associated activities.

Loading dock noise is approximately 68 dBA at a distance of 30 feet.[35] This analysis assumes both dock doors are active at the same time. These loading docks are located approximately 976 feet from the existing residential properties to the east, 630 feet from existing commercial buildings to the south, 196 feet from future residential properties to the east, and 50 feet from future residential buildings to the north.

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[33] Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.

[34] David Evans and Associates, Noise Impact Analysis Wal-Mart Supercenter, City of Ontario, CA, March 30, 2007 https://content.ontarioca.gov/sites/default/files/migrated-files/Ontario-Files/Planning/Reports/environmental-reports/Walmart%2520EIR%2520appendix_f_-_noise_impact_analysis.pdf accessed 8-2-2025

[35] Loading dock reference noise level measurements conducted by Kimley-Horn on December 18, 2018.

Refer to **Table 14** for a summary of truck and loading dock noise levels at each receptor.

Parking Noise

Automobile parking stalls will be distributed throughout the site. Traffic associated with parking lots is typically not of sufficient volume to exceed community noise standards, which are based on a time-averaged scale such as the CNEL scale. The instantaneous maximum sound levels generated by a car door slamming, engine starting up, and car pass-bys range from 53 to 61 dBA[36] at 50 feet and may be an annoyance to adjacent noise-sensitive receptors. Conversations in parking areas may also be an annoyance to adjacent sensitive receptors. Sound levels of speech typically range from 33 dBA at 50 feet for normal speech to 50 dBA at 50 feet for very loud speech.[37] It should be noted that parking lot noises are instantaneous noise levels compared to noise standards in the hourly L_{eq} metric, which are averaged over the entire duration of a time period.

Based on peak p.m. traffic in the Traffic Impact Analysis, a net increase of 413 vehicles would access the parking lot in a single hour. Conservatively, modeling assumed that vehicles would park nearest to receptors being analyzed. Therefore, vehicles were analyzed when parking in the parking area nearest to each receptor, 905 feet from the existing residential properties to the east, 150 feet from existing commercial buildings to the south, 125 feet from future residential properties to the east, and 100 feet from future residential buildings to the north. Refer to **Table 14** for a summary of parking lot noise levels at each receptor.

Combined On-Site Operational Noise

Table 14 includes a combined on-site operational noise at each receptor. As shown in **Table 14**, the combined noise level at the existing residential property to the east would be 31.32 dBA, the combined noise level at the existing commercial property would be 45.81 dBA, the noise level at the Lugonia Village to the east would be 45.78 dBA and the noise level at the Tennessee Village to the north would 48.61 dBA.[38] Based on these results, Project noise levels would not exceed the daytime or nighttime noise thresholds for residential or commercial properties. As a result, on-site noise would not exceed the 50 dBA threshold for residential uses. Therefore, on-site operational noise would result in a less than significant impact.

Off-Site Traffic Noise

As shown in the trip generation table of the Redlands Marketplace Traffic Impact Analysis, the Project would generate 4,547 daily trips. Traffic noise levels on roadways primarily affected by Project-generated trips were calculated using the FHWA's Highway Noise Prediction Model (FHWA-RD-77-108). Traffic noise modeling was conducted for existing conditions with and without the Project, based on traffic volumes provided by GTS. **Table 15: Comparison of Traffic Noise Levels**, compares noise levels without the Project (existing land uses) to noise levels with Project related traffic volumes.

[36] Elliott H. Berger, Rick Neitzel, and Cynthia A. Kladden, *Noise Navigator Sound Level Database with Over 1700 Measurement Values*, July 6, 2010.
[37] Ibid.
[38] Note that decibel (dB) addition for noise is logarithmic.

Traffic noise significance is determined based on the allowable noise increase thresholds identified in Measure U Policy 9-0v which limits the allowable noise increase to 4 dBA if resulting noise level exceeds the clearly compatible nose level for the surrounding land uses. As shown in **Table 15,** a maximum increase of 0.2 dBA would occur due to traffic associated with the Project. Note that an increase of 3 dBA is barely perceptible to the human ear, as a result traffic noise associated with the Project would not be noticeable. Therefore "With Project" noise levels would be less than significant.

Table 15: Comparison of Traffic Noise Levels

Roadway Segment		Without Project		With Project		Increase Noise (dBA CNL)	Significant Impact
		ADT	dBA CNEL[1]	ADT	dBA CNEL[1]		
Lugonia Avenue	West of Citrus Plaza Drive	5,640	59.6	5,830	59.7	0.1	No
	Between Citrus Plaza Drive and Tennessee Street	13,010	63.1	13,200	63.2	0.1	No
	Between Tennessee Street and Driveway 2	11,690	62.7	12,120	62.9	0.2	No
	Between Driveway 2 and New York Street	11,540	62.7	12,120	62.9	0.2	No
	Between New York Street and Texas Street	10,740	62.3	11,320	62.5	0.2	No
	Between Texas Street and Orange Street	9,360	61.7	9,810	61.9	0.2	No
	East of Orange Street	9,320	61.7	9,600	61.8	0.1	No
San Bernardino Avenue	East of Texas Street	7,190	61.7	7,280	61.7	0	No
	Between Texas Street and Tennessee Street	7,190	62.7	9,550	62.9	0.2	No
	Between Tennessee Street and Citrus Plaza Drive	13,780	64.6	14,070	64.6	0	No
	West of Citrus Plaza Drive	7,440	63.2	7,490	63.3	0.1	No
Tennessee Street	South of I-10 EB Ramp	9,410	61.8	9,510	61.8	0	No
	Between I-10 EB Ramp and I-10 WB Ramp	9,890	62.0	10,180	62.1	0.1	No
	Between I-10 WB Rap and Lugonia Avenue	9,370	61.7	9,850	61.9	0.2	No
	Between Lugonia Avenue and San Bernardino Ave	5,560	59.4	5,560	59.4	0	No
	North of San Bernardino Avenue	12,860	63.1	12,960	63.2	0.1	No
Citrus Plaza Drive	Between Lugonia Avenue and San Bernardino Ave.	7,020	59.2	7,210	59.4	0.2	No
	North of San Bernardino Avenue	3,610	56.4	3,610	56.4	0	No

ADT = average daily trips; dBA = A-weighted decibels; CNEL = community noise equivalent level

1. Traffic noise levels are at 100 feet from the roadway centerline. The actual sound level at any receptor location is dependent upon such factors as the source-to-receptor distance and the presence of intervening structures, barriers, and topography.

Source: Based on traffic data from GTS. Refer to **Appendix B: Noise Modeling Data** for traffic noise modeling assumptions and results.

Mitigation Measures:

MM NOI-1 If Project construction occurs after the Tennessee Village mixed-use development, located north of the Project, is occupied, 12-foot-high temporary construction noise barriers capable of reducing construction noise levels by a minimum of 10 dBA shall be placed along the northern perimeter of the Project site. MM NOI-1 would only be required in the event that the Tennessee Village apartment buildings located within 80 feet of the Project property line are occupied during Project construction. Construction noise levels at any Tennessee Village apartments located more than 80 from the Project property line would not exceed the 80 dBA L_{eq} residential noise threshold and would not require mitigation.

Level of Significance: Less than significant impact with mitigation incorporated.

Threshold 6.2 ***Would the Project generate excessive ground-borne vibration or ground-borne noise levels?***

Construction Vibration

Construction can generate varying degrees of ground vibration, depending on the construction procedures and equipment. Operation of construction equipment generates vibrations that spread through the ground and diminish with distance from the source. Construction on the Project site would have the potential to result in varying degrees of temporary ground-borne vibration, depending on the specific construction equipment used and the operations involved.

The FTA has published standard vibration velocities for construction equipment operations. In general, the FTA architectural damage criterion for continuous vibrations (i.e., 0.2 in/sec) appears to be conservative. The types of construction vibration impacts include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience any cosmetic damage (e.g., plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. For example, for a building that is constructed with reinforced concrete with no plaster, the FTA guidelines show that a vibration level of up to 0.20 in/sec is considered safe and would not result in any construction vibration damage.

Table 16: Typical Construction Equipment Vibration Levels lists vibration levels at 25 feet (reference level) for typical construction equipment and at 20 feet, the distance from the Project boundary to the nearest structures, future residential and commercial buildings to be built as part of the Tennessee Village. Ground-borne vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. As indicated in **Table 16**, based on FTA data, vibration velocities from typical heavy construction equipment operations that would be used during Project construction range from0.0002 to 0.0067 in/sec PPV at 140 feet from the source of activity.

Table 16: Typical Construction Equipment Vibration Levels		
Equipment	**Peak Particle Velocity at 25 Feet (in/sec)**	**Peak Particle Velocity at 20 Feet (in/sec)[1]**
Large Bulldozer	0.089	0.1244
Caisson Drilling	0.089	0.1244
Loaded Trucks	0.076	0.1062
Jackhammer	0.035	0.0489
Small Bulldozer/Tractors	0.003	0.0042
[1] Calculated using the following formula: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$, where: PPV_{equip} = the peak particle velocity in in/sec of the equipment adjusted for the distance; PPV_{ref} = the reference vibration level in in/sec from Table 7-4 of the Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018; D = the distance from the equipment to the receiver.		
Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018.		

Table 16 shows that at 20 feet the vibration velocities from construction equipment would not exceed 0.1244 in/sec PPV, which is below the FTA's 0.20 in/sec PPV threshold for building damage and the annoyance threshold, see **Table 3**. It is also acknowledged that construction activities would occur throughout the Project site and would not be concentrated at the point closest to the nearest structure. Therefore, vibration impacts associated with Project construction would be less than significant.

Operational Vibration

The Project would include truck delivery activity at the Project site, delivering stock to the businesses onsite. These movements would generally be low-speed (i.e., less than 15 miles per hour) and would occur over new, smooth surfaces. For perspective, Caltrans has studied the effects of propagation of vehicle vibration on sensitive land uses and notes that "heavy trucks, and quite frequently buses, generate the highest earthborn vibrations of normal traffic." Caltrans further notes that the highest traffic-generated vibrations are along freeways and state routes. Their study finds that "vibrations measured on freeway shoulders (five meters from the centerline of the nearest lane) have never exceeded 0.08 inches per second, with the worst combinations of heavy trucks and poor roadway conditions (while such trucks were moving at freeway speeds). This level coincides with the maximum recommended safe level for ruins and ancient monuments (and historic buildings)."[39] Since the Project's truck movements would be at low speed (not at freeway speeds) and would be over smooth surfaces (not under poor roadway conditions), Project-related vibration associated with truck activity would not result in excessive ground-borne vibrations; no vehicle-generated vibration impacts would occur. The Project would not create or cause any vibration impacts due to operations.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

Threshold 6.3 ***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 of public use airport, would the Project expose people residing or working in the Project area to excessive noise levels?***

[39] California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol ("TeNS")*, September 2013.

Airport-related noise levels are primarily associated with aircraft engine noise made while aircraft are taking off, landing, or running their engines while still on the ground. The nearest airports to the Project are the San Bernardino International Airport (SBD) and Redlands Municipal Airport (REI) approximately 3 miles to the northwest and northeast of the Project site, respectively. The Project site is located outside the SBD 60 dBA CNEL airport noise contour[40] as well as outside the REI 60 dBA CNEL noise contour.[41] Therefore, the project would not be adversely affected by airport/airfield noise, nor would the project contribute to or result in adverse airport/airfield noise impacts.

Mitigation Measures: No mitigation is required.

Level of Significance: Less than significant impact.

6.2 Cumulative Noise Impacts

Cumulative Construction Noise

The Project's construction activities would not result in a temporary increase in ambient noise levels. Construction noise would be periodic and temporary noise impacts that would cease upon the completion of construction activities. The Project would contribute to other proximate construction project noise impacts if other construction activities were conducted concurrently. However, based on the noise analysis above, the Project's construction-related noise impacts would be less than significant and would comply with the City of Redlands Municipal Code and General Plan.

Construction activities at other planned and approved projects near the Project Site would be required to comply with applicable City regulations related to noise and would take place during daytime hours on the days permitted by the applicable Municipal Code, and projects requiring discretionary City approvals would be required to evaluate construction noise impacts, comply with the City's standard conditions of approval, and implement mitigation, if necessary, to minimize noise impacts. Construction noise impacts are by nature localized. Based on the fact that noise dissipates as it travels away from its source, noise impacts would be limited to the Project site and vicinity. Therefore, Project construction would not result in a cumulatively considerable contribution to significant cumulative impacts and impacts in this regard are not cumulatively considerable.

Cumulative Operational Noise

Onsite operational noise would not result in an incremental increase in noise within the Project vicinity. Furthermore, as discussed under operations, the operational noise generated by the Project would be less than significant and would not result in cumulatively considerable impact. Similar to the Project, other planned and approved projects that exceed the City's noise thresholds would be required to mitigate noise impacts at nearby sensitive receptors. As noise sources are generally localized, there is a limited potential of other projects to contribute to cumulative noise impacts.

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[40] Inland Valley Development Agency, *Airport Gateway Specific Plan Draft Program EIR*, page 4-410 https://www.sanbernardino.gov/DocumentCenter/View/1180/AGSP-Draft-EIR-PDF, accessed July 11, 2025

[41] Redlands, Redlands Airport Land Use Compatibility Plan, https://www.cityofredlands.org/sites/main/files/file-attachments/noise_contours_map.pdf?1554245660, accessed July 11, 2025

No known past, present, or reasonably foreseeable projects would combine with the operational noise levels generated by the Project to increase noise levels above acceptable standards because each project must comply with applicable City regulations that limit operational noise. Therefore, the Project, together with other projects, would not create a significant cumulative impact, and even if there was such a significant cumulative impact, the Project would not make a cumulatively considerable contribution to significant cumulative operational noises.

Given that noise dissipates as it travels away from its source, operational noise impacts from on-site activities and other stationary sources would be limited to the Project site and vicinity. Thus, cumulative operational noise impacts from related projects, in conjunction with Project specific noise impacts, would not be cumulatively significant.

7.0 REFERENCES

1. California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, September 2013.
2. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, 2020.
3. City of Redlands, *Redlands General Plan 2035. https://www.cityofredlands.org/post/planning-division-general-plan,* accessed July 11, 2025.
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7. Federal Highway Administration, *FHWA Traffic Noise Model User's Guide*, January 1998.
8. Federal Highway Administration, *Highway Traffic and Construction Noise - Problem and Response*, April 2006.
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10. Federal Highway Administration, *Special Report - Measurement, Prediction, and Mitigation*, Chapter 4 Mitigation, 2017.
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14. FHWA, *Noise Fundamentals*, 2017. https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm, accessed July 2025.
15. FHWA, *Special Report – Measurement, Prediction, and Mitigation, Chapter 4 Mitigation*, https://www.fhwa.dot.gov/environment/noise/construction_noise/special_report/hcn00.cfm, accessed July 2025.
16. GTS (General Technologies and Solutions), *Redlands Marketplace Traffic Impact Study Scoping and Vehicle Miles Traveled (VMT) Screening Memorandum*. May 20, 2025.
17. Harris, Cyril M., *Noise Control in Buildings: A Practical Guide for Architects and Engineers*, 1994.

18. James P. Cowan, *Handbook of Environmental Acoustics*, 1994.

19. Kariel, H. G., *Noise in Rural Recreational Environments*, Canadian Acoustics 19(5), 3-10, 1991.

20. State of California Governor's Office of Planning and Research, *General Plan Guidelines*, *Appendix D: Noise Element Guidelines*, page 374, 2017, https://opr.ca.gov/docs/OPR_COMPLETE_7.31.17.pdf, accessed July 2025.

21. U.S. Department of Labor, *Occupational Safety and Health Standards*, 29 CFR 1910 (Occupational Noise Exposure).

Appendix A

NOISE MEASUREMENTS

Noise Measurement Field Data

Project:	Redlands Marketplace	**Job Number:**	09593004
Site No.:	1	**Date:**	7/1/2025
Analyst:	Dharma and Coryn	**Time:**	1:34 p.m. - 1:44 p.m.
Location:	7-Eleven at Tennessee Street and West Lugonia Avenue		
Noise Sources:	traffic, cars braking, plane		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
66.8	62.2	79.0	93.5

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	92
Wind (mph):	9
Sky:	Clear
Bar. Pressure (inHg):	29.78
Humidity:	22%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	ST-1.147.s	Computer's File Name	LxTse_0007061-20250701 133438-ST-1.147.ldbin
Meter	LxT SE 0007061	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2025-07-01 13:34:38	Duration	0:10:00.0		
End Time	2025-07-01 13:44:38	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2025-07-01 13:31:58	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	66.8 dB		
LAE	94.6 dB	SEA	--- dB
EA	319.1 µPa²h		
LA_{peak}	93.5 dB	2025-07-01 13:44:30	
LAS_{max}	79.0 dB	2025-07-01 13:41:47	
LAS_{min}	62.2 dB	2025-07-01 13:40:20	
LA_{eq}	66.8 dB		
LC_{eq}	77.1 dB	LC_{eq} - LA_{eq}	10.3 dB
LAI_{eq}	67.7 dB	LAI_{eq} - LA_{eq}	0.9 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
66.8 dB	66.8 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
66.8 dB	66.8 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	66.8 dB		77.1 dB		--- dB	
$Ls_{(max)}$	79.0 dB	2025-07-01 13:41:47	--- dB	None	--- dB	None
$LS_{(min)}$	62.2 dB	2025-07-01 13:40:20	--- dB	None	--- dB	None
$L_{Peak(max)}$	93.5 dB	2025-07-01 13:44:30	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	69.1 dB
LAS 10.0	68.0 dB
LAS 33.3	66.6 dB
LAS 50.0	66.1 dB
LAS 66.6	65.5 dB
LAS 90.0	64.2 dB

Noise Measurement Field Data

Project:	Redlands Marketplace	**Job Number:**	09593004
Site No.:	2	**Date:**	7/1/2025
Analyst:	Dharma and Coryn	**Time:**	2:49 p.m. - 2:59 p.m.
Location:	859 Carlotta Court		
Noise Sources:	cars passing by, birds chriping, dogs barking		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
50.6	47.1	61.2	83.5

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	93
Wind (mph):	9
Sky:	Clear
Bar. Pressure (inHg):	29.77
Humidity:	19%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	ST-1.152.s	Computer's File Name	LxTse_0007061-20250701 144911-ST-1.152.ldbin
Meter	LxT SE 0007061	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2025-07-01 14:49:11	Duration	0:10:00.0		
End Time	2025-07-01 14:59:11	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2024-07-11 10:35:45	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	50.6 dB		
LAE	78.4 dB	SEA	--- dB
EA	7.7 µPa²h		
LA_{peak}	83.5 dB	2025-07-01 14:56:18	
LAS_{max}	61.2 dB	2025-07-01 14:49:21	
LAS_{min}	47.1 dB	2025-07-01 14:50:00	
LA_{eq}	50.6 dB		
LC_{eq}	64.0 dB	LC_{eq} - LA_{eq}	13.4 dB
LAI_{eq}	52.7 dB	LAI_{eq} - LA_{eq}	2.1 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
50.6 dB	50.6 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
50.6 dB	50.6 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	50.6 dB		64.0 dB		--- dB	
$Ls_{(max)}$	61.2 dB	2025-07-01 14:49:21	--- dB	None	--- dB	None
$LS_{(min)}$	47.1 dB	2025-07-01 14:50:00	--- dB	None	--- dB	None
$L_{Peak(max)}$	83.5 dB	2025-07-01 14:56:18	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	52.5 dB
LAS 10.0	51.5 dB
LAS 33.3	50.5 dB
LAS 50.0	50.1 dB
LAS 66.6	49.7 dB
LAS 90.0	49.1 dB

Noise Measurement Field Data

Project:	Redlands Marketplace	**Job Number:**	09593004
Site No.:	3	**Date:**	7/1/2025
Analyst:	Dharma and Coryn	**Time:**	1:52 p.m. - 2:02 p.m.
Location:	1329 Karon Street		
Noise Sources:	roadway traffic, highway traffic		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
59.1	54.9	72.4	87.0

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	92
Wind (mph):	9
Sky:	Clear
Bar. Pressure (inHg):	29.78
Humidity:	22%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	ST-1.148.s	Computer's File Name	LxTse_0007061-20250701 135245-ST-1.148.ldbin
Meter	LxT SE 0007061	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2025-07-01 13:52:45	Duration	0:10:00.0		
End Time	2025-07-01 14:02:45	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2024-07-11 10:35:45	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	59.1 dB		
LAE	86.9 dB	SEA	--- dB
EA	54.2 µPa²h		
LA_{peak}	87.0 dB	2025-07-01 14:01:07	
LAS_{max}	72.4 dB	2025-07-01 14:01:07	
LAS_{min}	54.9 dB	2025-07-01 13:53:29	
LA_{eq}	59.1 dB		
LC_{eq}	69.0 dB	LC_{eq} - LA_{eq}	9.9 dB
LAI_{eq}	60.3 dB	LAI_{eq} - LA_{eq}	1.2 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
59.1 dB	59.1 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
59.1 dB	59.1 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	59.1 dB		69.0 dB		--- dB	
$L_{S(max)}$	72.4 dB	2025-07-01 14:01:07	--- dB	None	--- dB	None
$L_{S(min)}$	54.9 dB	2025-07-01 13:53:29	--- dB	None	--- dB	None
$L_{Peak(max)}$	87.0 dB	2025-07-01 14:01:07	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	62.4 dB
LAS 10.0	61.0 dB
LAS 33.3	58.6 dB
LAS 50.0	57.8 dB
LAS 66.6	57.3 dB
LAS 90.0	56.3 dB

Noise Measurement Field Data

Project:	Redlands Marketplace	**Job Number:**	09593004
Site No.:	4	**Date:**	7/1/2025
Analyst:	Dharma and Coryn	**Time:**	2:14 p.m. - 2:24 p.m.
Location:	1418 Karon Street		
Noise Sources:	cars passing by/braking, highway traffic		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
59.1	52.5	71.9	85.1

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	92
Wind (mph):	10
Sky:	Clear
Bar. Pressure (inHg):	29.78
Humidity:	22%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	ST-1.150.s	Computer's File Name	LxTse_0007061-20250701 141436-ST-1.150.ldbin
Meter	LxT SE 0007061	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2025-07-01 14:14:36	Duration	0:10:00.0		
End Time	2025-07-01 14:24:36	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2024-07-11 10:35:45	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	59.1 dB		
LAE	86.9 dB	SEA	--- dB
EA	54.2 µPa²h		
LA_{peak}	85.1 dB	2025-07-01 14:16:04	
LAS_{max}	71.9 dB	2025-07-01 14:16:03	
LAS_{min}	52.5 dB	2025-07-01 14:22:29	
LA_{eq}	59.1 dB		
LC_{eq}	68.2 dB	LC_{eq} - LA_{eq}	9.1 dB
LAI_{eq}	60.4 dB	LAI_{eq} - LA_{eq}	1.3 dB

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise	LDN	LDay	LNight	
	59.1 dB	59.1 dB	0.0 dB	
	LDEN	LDay	LEve	LNight
	59.1 dB	59.1 dB	--- dB	--- dB

Any Data	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	59.1 dB		68.2 dB		--- dB	
$L_{S(max)}$	71.9 dB	2025-07-01 14:16:03	--- dB	None	--- dB	None
$L_{S(min)}$	52.5 dB	2025-07-01 14:22:29	--- dB	None	--- dB	None
$L_{Peak(max)}$	85.1 dB	2025-07-01 14:16:04	--- dB	None	--- dB	None

Overloads	Count	Duration	OBA Count	OBA Duration
	0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	64.3 dB
LAS 10.0	60.8 dB
LAS 33.3	57.9 dB
LAS 50.0	57.2 dB
LAS 66.6	56.4 dB
LAS 90.0	54.7 dB

Noise Measurement Field Data

Project:	Redlands Marketplace	**Job Number:**	09593004
Site No.:	5	**Date:**	7/1/2025
Analyst:	Dharma and Coryn	**Time:**	2:32 p.m. - 2:42 p.m.
Location:	Texonia Park		
Noise Sources:	water tank operations, car/haul trucks passing by, airplane, dogs barking		
Comments:			

Results (dBA):

Leq:	Lmin:	Lmax:	Peak:
55.8	50.5	70.9	88.0

Equipment	
Sound Level Meter:	LD SoundExpert LxT
Calibrator:	CAL200
Response Time:	Slow
Weighting:	A
Microphone Height:	5 feet

Weather	
Temp. (degrees F):	92
Wind (mph):	9
Sky:	Clear
Bar. Pressure (inHg):	29.77
Humidity:	19%

Photo:

Kimley»Horn

Measurement Report

Report Summary

Meter's File Name	ST-1.151.s	Computer's File Name	LxTse_0007061-20250701 143258-ST-1.151.ldbin
Meter	LxT SE 0007061	Firmware	2.404
User		Location	
Job Description			
Note			

Start Time	2025-07-01 14:32:58	Duration	0:10:00.0		
End Time	2025-07-01 14:42:58	Run Time	0:10:00.0	Pause Time	0:00:00.0
Pre-Calibration	2024-07-11 10:35:45	Post-Calibration	None	Calibration Deviation	---

Results

Overall Metrics

LA_{eq}	55.8 dB		
LAE	83.6 dB	SEA	--- dB
EA	25.3 µPa²h		
LA_{peak}	88.0 dB	2025-07-01 14:35:29	
LAS_{max}	70.9 dB	2025-07-01 14:35:29	
LAS_{min}	50.5 dB	2025-07-01 14:33:44	
LA_{eq}	55.8 dB		
LC_{eq}	65.1 dB	LC_{eq} - LA_{eq}	9.3 dB
LAI_{eq}	57.8 dB	LAI_{eq} - LA_{eq}	2.0 dB

Exceedances

Exceedances	Count	Duration
LAS > 85.0 dB	0	0:00:00.0
LAS > 115.0 dB	0	0:00:00.0
LApeak > 135.0 dB	0	0:00:00.0
LApeak > 137.0 dB	0	0:00:00.0
LApeak > 140.0 dB	0	0:00:00.0

Community Noise

LDN	LDay	LNight	
55.8 dB	55.8 dB	0.0 dB	
LDEN	**LDay**	**LEve**	**LNight**
55.8 dB	55.8 dB	--- dB	--- dB

Any Data

	A		C		Z	
	Level	Time Stamp	Level	Time Stamp	Level	Time Stamp
L_{eq}	55.8 dB		65.1 dB		--- dB	
$LS_{(max)}$	70.9 dB	2025-07-01 14:35:29	--- dB	None	--- dB	None
$LS_{(min)}$	50.5 dB	2025-07-01 14:33:44	--- dB	None	--- dB	None
$L_{Peak(max)}$	88.0 dB	2025-07-01 14:35:29	--- dB	None	--- dB	None

Overloads

Count	Duration	OBA Count	OBA Duration
0	0:00:00.0	0	0:00:00.0

Statistics

LAS 5.0	59.0 dB
LAS 10.0	56.3 dB
LAS 33.3	53.4 dB
LAS 50.0	52.8 dB
LAS 66.6	52.3 dB
LAS 90.0	51.6 dB

Appendix B

NOISE DATA

Project: **Redlands Marketplace**
Construction Noise Impact on Sensitive Receptors

Parameters

Construction Hours:	Daytime hours (7 am to 7 pm)	8
	Evening hours (7 pm to 10 pm)	0
	Nighttime hours (10 pm to 7 am)	0
Leq to L10 factor		3

	Receptor (Land Use)	Distance to Receptor(feet)	Distance to Property Line (feet)	Shielding	Direction
1	Existing Residential	860	860	0	E
2	Future Tennessee Village (North)	20	1	0	N
3	Future Lugonia Village (East)	80	1	10	E
4	Existing Commercial	135	90	0	S

Construction Noise Levels by Phase (Leq)

Site Prep	Grading	Building Construction	Paving	Architectural Coating	Combined
62.2	62.0	61.4	58.4	49.0	61.8
89.1	89.8	89.0	82.9	81.7	89.0
69.6	69.9	69.2	64.9	59.6	69.2
74.2	76.2	75.5	71.7	65.1	75.6

					RECEPTOR 1			**RECEPTOR 2**			**RECEPTOR 3**			**RECEPTOR 4**		
Construction Phase	**Equipment Type**	**No. of Equip.**	**Acoustical Usage Factor**	**Reference Noise Level at 50ft per Unit, Lmax**	**Distance (feet)**	**Noise Level at Receptor 1, Lmax**	**Noise Level at Receptor 1, Leq**	**Distance (feet)**	**Noise Level at Receptor 2, Lmax**	**Noise Level at Receptor 2, Leq**	**Distance (feet)**	**Noise Level at Receptor 3, Lmax**	**Noise Level at Receptor 3, Leq**	**Distance (feet)**	**Noise Level at Receptor 4, Lmax**	**Noise Level at Receptor 4, Leq**
Site Prep																
	Tractor	1	40%	84	860	59.3	55.3	20.0	92.0	88.0	80.0	69.9	65.9	135.0	75.4	71.4
	Tractor	1	40%	84	890	59.0	55.0	50	84.0	80.0	110	67.2	63.2	165	73.6	69.7
	Tractor	1	40%	84	920	58.7	54.7	80	79.9	75.9	140	65.1	61.1	195	72.2	68.2
	Tractor	1	40%	84	950	58.4	54.4	110	77.2	73.2	170	63.4	59.4	225	70.9	67.0
	Dozer	1	40%	82	980	55.9	51.9	140	72.8	68.8	200	59.7	55.7	255	67.5	63.6
	Dozer	1	40%	82	1,010	55.6	51.6	170	71.1	67.1	230	58.4	54.5	285	66.6	62.6
	Dozer	1	40%	82	1,040	55.3	51.4	200	69.7	65.7	260	57.4	53.4	315	65.7	61.7
	Combined LEQ						**62.2**			**89.1**			**69.6**			**74.2**
Grading																
	Grader	1	40%	85	860	60.3	56.3	20.0	93.0	89.0	80.0	70.9	66.9	135.0	76.4	72.4
	Tractor	1	40%	84	890	59.0	55.0	50	84.0	80.0	110	67.2	63.2	165	73.6	69.7
	Tractor	1	40%	84	920	58.7	54.7	80	79.9	75.9	140	65.1	61.1	195	72.2	68.2
	Tractor	1	40%	84	950	58.4	54.4	110	77.2	73.2	170	63.4	59.4	225	70.9	67.0
	Dozer	1	40%	82	980	55.9	51.9	140	72.8	68.8	200	59.7	55.7	255	67.5	63.6
	Excavator	1	40%	81	1,010	54.6	50.6	170	70.1	66.1	230	57.4	53.5	285	65.6	61.6
	Combined LEQ						**62.0**			**89.8**			**69.9**			**76.2**
Building Construction																
	Tractor	1	40%	84	860	59.3	55.3	20.0	92.0	88.0	80.0	69.9	65.9	135.0	75.4	71.4
	Tractor	1	40%	84	890	59.0	55.0	50	84.0	80.0	110	67.2	63.2	165	73.6	69.7
	Tractor	1	40%	84	920	58.7	54.7	80	79.9	75.9	140	65.1	61.1	195	72.2	68.2
	Generator	1	50%	81	950	55.0	52.0	110	73.8	70.7	170	60.0	57.0	225	67.5	64.5
	Crane	1	16%	81	980	54.8	46.8	140	71.7	63.7	200	58.6	50.6	255	66.4	58.5
	Front End Loader	1	40%	79	1,010	53.0	49.0	170	68.5	64.5	230	55.8	51.9	285	64.0	60.0
	Front End Loader	1	40%	79	1,040	52.7	48.8	200	67.1	63.1	260	54.8	50.8	315	63.1	59.1
	Front End Loader	1	40%	79	1,070	52.5	48.5	230	65.8	61.9	290	53.8	49.9	345	62.3	58.3
	Combined LEQ						**61.4**			**89.0**			**69.2**			**75.5**
Paving																
	Roller	1	20%	80	860	55.3	48.3	20.0	88.0	81.0	80.0	65.9	58.9	135.0	71.4	64.4
	Roller	1	20%	80	890	55.0	48.0	50	80.0	73.0	110	63.2	56.2	165	69.6	62.6
	Tractor	1	40%	84	920	58.7	54.7	80	79.9	75.9	140	65.1	61.1	195	72.2	68.2
	Paver	1	50%	77	950	51.6	48.6	110	70.4	67.3	170	56.6	53.6	225	64.1	61.1
	Paver	1	50%	77	980	51.4	48.3	140	68.3	65.2	200	55.2	52.1	255	63.0	60.0
	Paver	1	50%	77	1,010	51.1	48.1	170	66.6	63.6	230	53.9	50.9	285	62.1	59.1
	Paver	1	50%	77	1,040	50.8	47.8	200	65.2	62.1	260	52.9	49.9	315	61.2	58.2
	Combined LEQ						**58.4**			**82.9**			**64.9**			**71.7**
Architectural Coating																
	Compressor (air)	1	40%	78	860	53.0	49.0	20.0	85.7	81.7	80.0	63.6	59.6	135.0	69.1	65.1
	Combined LEQ						**49.0**			**81.7**			**59.6**			**65.1**
Combined																
	Tractor	1	40%	84	860	59.3	55.3	20.0	92.0	88.0	80.0	69.9	65.9	135.0	75.4	71.4
	Tractor	1	40%	84	890	59.0	55.0	50	84.0	80.0	110	67.2	63.2	165	73.6	69.7
	Tractor	1	40%	84	920	58.7	54.7	80	79.9	75.9	140	65.1	61.1	195	72.2	68.2
	Generator	1	50%	81	950	55.0	52.0	110	73.8	70.7	170	60.0	57.0	225	67.5	64.5
	Crane	1	16%	81	980	54.8	46.8	140	71.7	63.7	200	58.6	50.6	255	66.4	58.5
	Roller	1	20%	80	1,010	53.9	46.9	170	69.4	62.4	230	56.7	49.8	285	64.9	57.9
	Roller	1	20%	80	1,040	53.6	46.6	200	68.0	61.0	260	55.7	48.7	315	64.0	57.0
	Front End Loader	1	40%	79	1,070	52.5	48.5	230	65.8	61.9	290	53.8	49.9	345	62.3	58.3
	Front End Loader	1	40%	79	1,100	52.3	48.3	260	64.8	60.8	320	53.0	49.0	375	61.6	57.6
	Front End Loader	1	40%	79	1,130	52.0	48.0	290	63.8	59.9	350	52.2	48.2	405	60.9	57.0
	Compressor (air)	1	40%	78	1,160	50.4	46.4	320	61.6	57.6	380	50.1	46.1	435	58.9	54.9
	Paver	1	50%	77	1,190	49.7	46.7	350	60.3	57.3	410	48.9	45.9	465	57.8	54.8
	Paver	1	50%	77	1,220	49.5	46.4	380	59.6	56.6	440	48.3	45.3	495	57.3	54.3
	Paver	1	50%	77	1,250	49.2	46.2	410	58.9	55.9	470	47.7	44.7	525	56.8	53.8
	Paver	1	50%	77	1,280	49.0	46.0	440	58.3	55.3	500	47.2	44.2	555	56.3	53.3
						0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Combined LEQ							**61.8**			**89.0**			**69.2**			**75.6**

Distance Attenuation - Point Source

$$dBA_2 = dBA_1 + 20\ Log_{10}\left(\frac{d_1}{d_2}\right)$$

where:
- dBA_1 = Reference Noise Level
- dBA_2 = Estimated Noise Level
- d_1 = Reference Distance
- d_2 = Approximate Receptor Location Distance

Existing Residential (east of Project)

	Reference Level		Measured Level					
Revised Distances	**Noise level**	**Distance in feet**	**Distance in feet**	**Noise level**	**Reduction from onsite barriers**		**Reduction from Perimter Wall**	**Total Combined**
	dBA_1	**d_1**	**d_2**	**dBA_2**				
HVAC	52	50	890	27.0	0			
Trash Compactors (1)	51	50	1025	24.8	0			
Trash Compactors (2)	51	50	1025	24.8	0			
Truck/Loading Dock (1)	68	30	976	37.8	0			
Truck/Loading Dock (2)	68	30	976	37.8	0			
Parking	52.3	50	905	27.1	0			
				41.31631			10	**31.31630727**

Existing Non-Residential (South of Project)

	Reference Level		Measured Level					
Revised Distances	**Noise level**	**Distance in feet**	**Distance in feet**	**Noise level**	**Reduction from onsite barriers**		**Reduction from Perimter Wall**	**Total Combined**
	dBA_1	**d_1**	**d_2**	**dBA_2**				
HVAC	52	50	165	41.6	0	41.6		
Trash Compactors (1)	51	50	610	29.3	8	21.3		
Trash Compactors (2)	51	50	620	29.1	8	21.1		
Truck/Loading Dock (1)	68	30	635	41.5	8	33.5		
Truck/Loading Dock (2)	68	30	645	41.4	8	33.4		
Parking	52.3	50	150	42.8	0	42.8		
				47.981		**45.80722**	0	**45.80721862**

Lugonia Village (east of Project)

	Reference Level		Measured Level					
Revised Distances	**Noise level**	**Distance in feet**	**Distance in feet**	**Noise level**	**Reduction from onsite barriers**		**Reduction from Perimter Wall**	**Total Combined**
	dBA_1	**d_1**	**d_2**	**dBA_2**				
HVAC	52	50	110	45.2	0			
Trash Compactors (1)	51	50	165	40.6	0			
Trash Compactors (2)	51	50	165	40.6	0			
Truck/Loading Dock (1)	68	30	196	51.7	0			
Truck/Loading Dock (2)	68	30	196	51.7	0			
Parking	52.3	50	125	44.3	0			
				55.78268			10	**45.78268307**

Tennessee Village (Residential North of Project)

	Reference Level		Measured Level					
Revised Distances	**Noise level**	**Distance in feet**	**Distance in feet**	**Noise level**	**Reduction from onsite barriers**		**Reduction from Perimter Wall**	**Total Combined**
	dBA_1	**d_1**	**d_2**	**dBA_2**				
HVAC	52	50	50	52.0	0	52.0		
Trash Compactors (1)	51	50	80	46.9	8	38.9		
Trash Compactors (2)	51	50	90	45.9	8	37.9		
Truck/Loading Dock (1)	68	30	55	62.7	8	54.7		
Truck/Loading Dock (2)	68	30	65	61.3	8	53.3		
Parking	52.3	50	100	46.3	0	46.3		
				65.45339		**58.60599**	10	**48.60599124**

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Redlands Marketplace
Project Number:
Scenario: Existing
Ldn/CNEL: CNEL

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at	Distance to Contour			
#	Roadway	Segment	Lanes	Width	Volume	(mph)	Factor	Trucks	Trucks	100 Feet	70 CNEL	65 CNEL	60 CNEL	55 CNEL
1	Lugonia Ave	West of Citrus Plaza Dr	4	12	5640	40	0	2.0%	1.0%	59.6	-	-	90	286
2		Between Citrus Plaza Dr and Tennessee St	4	0	13010	40	0	2.0%	1.0%	63.1	-	65	206	651
3		Between Tennessee St and Driveway 2	5	0	11690	40	0	2.0%	1.0%	62.7	-	59	187	593
4		Between Driveway 2 and New York St	5	0	11540	40	0	2.0%	1.0%	62.7	-	59	185	585
5		Between New York St and Texas Ave	3	0	10740	40	0	2.0%	1.0%	62.3	-	53	168	532
6		Between Texas Ave and Orange St	4	0	9360	40	0	2.0%	1.0%	61.7	-	47	148	468
7		East of Orange St	3	5	9320	40	0	2.0%	1.0%	61.7	-	46	147	464
8	San Bernardino Ave	East of Texas St	2	0	7190	45	0	2.0%	1.0%	61.7	-	46	147	465
		Between Texas St and Tennessee St	2	12	8970	45	0	2.0%	1.0%	62.7	-	58	184	583
		Between Tennessee St and Citrus Plaza Dr	4	0	1378	45	0	2.0%	1.0%	54.6	-	-	-	90
		West of Citrus Plaza Dr	6	16	7440	50	0	2.0%	1.0%	63.2	-	67	211	666
	Tennessee St	South of I-10 EB Ramp	4	12	9410	40	0	2.0%	1.0%	61.8	-	-	151	477
		Between I-10 EB Ramp and I-10 WB Ramp	4	12	9890	40	0	2.0%	1.0%	62.0	-	50	159	501
		Between I-10 WB Ramp and Lugonia Ave	4	0	9370	40	0	2.0%	1.0%	61.7	-	47	148	469
		Between Lugonia Ave and San Bernardino Ave	2	0	5560	40	0	2.0%	1.0%	59.4	-	-	87	274
		North of San Bernardino Ave	4	12	12860	40	0	2.0%	1.0%	63.1	-	65	206	652
	Citrus Plaza Dr	Between Lugonia Ave and San Bernardino Ave	4	12	7020	35	0	2.0%	1.0%	59.2	-	-	84	265
		North of San Bernardino Ave	4	24	3610	35	0	2.0%	1.0%	56.4	-	-	-	139

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.

FHWA Highway Noise Prediction Model (FHWA-RD-77-108) with California Vehicle Noise (CALVENO) Emission Levels

Project Name: Redlands Marketplace
Project Number:
Scenario: Existing Plus Project
Ldn/CNEL: CNEL

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

								Vehicle Mix		Distance from Centerline of Roadway				
				Median	ADT	Speed	Alpha	Medium	Heavy	CNEL at	Distance to Contour			
#	**Roadway**	**Segment**	**Lanes**	**Width**	**Volume**	**(mph)**	**Factor**	**Trucks**	**Trucks**	**100 Feet**	**70 CNEL**	**65 CNEL**	**60 CNEL**	**55 CNEL**
1	Lugonia Ave	West of Citrus Plaza Dr	4	12	5830	40	0	2.0%	1.0%	59.7	-	-	93	296
2		Between Citrus Plaza Dr and Tennessee St	4	0	13200	40	0	2.0%	1.0%	63.2	-	66	209	661
3		Between Tennessee St and Driveway 2	5	0	12120	40	0	2.0%	1.0%	62.9	-	61	194	615
4		Between Driveway 2 and New York St	5	0	12120	40	0	2.0%	1.0%	62.9	-	61	194	615
5		Between New York St and Texas Ave	3	0	11320	40	0	2.0%	1.0%	62.5	-	56	177	561
6		Between Texas Ave and Orange St	4	0	9810	40	0	2.0%	1.0%	61.9	-	49	155	491
7		East of Orange St	3	5	9600	40	0	2.0%	1.0%	61.8	-	48	151	478
8	San Bernardino Ave	East of Texas St	2	0	7280	45	0	2.0%	1.0%	61.7	-	47	149	470
		Between Texas St and Tennessee St	2	12	9550	45	0	2.0%	1.0%	62.9	-	62	196	620
		Between Tennessee St and Citrus Plaza Dr	4	0	14070	45	0	2.0%	1.0%	64.6	-	92	292	923
		West of Citrus Plaza Dr	6	16	7490	50	0	2.0%	1.0%	63.3	-	67	212	670
	Tennessee St	South of I-10 EB Ramp	4	12	9510	40	0	2.0%	1.0%	61.8	-	-	152	482
		Between I-10 EB Ramp and I-10 WB Ramp	4	12	1080	40	0	2.0%	1.0%	52.4	-	-	-	55
		Between I-10 WB Ramp and Lugonia Ave	4	0	9850	40	0	2.0%	1.0%	61.9	-	49	156	493
		Between Lugonia Ave and San Bernardino Ave	2	0	5560	40	0	2.0%	1.0%	59.4	-	-	87	274
		North of San Bernardino Ave	4	12	12960	40	0	2.0%	1.0%	63.2	-	66	208	657
	Citrus Plaza Dr	Between Lugonia Ave and San Bernardino Ave	4	12	7210	35	0	2.0%	1.0%	59.4	-	-	86	272
		North of San Bernardino Ave	4	24	3610	35	0	2.0%	1.0%	56.4	-	-	-	139

[1] Distance is from the centerline of the roadway segment to the receptor location.
"-" = contour is located within the roadway right-of-way.