Palm Avenue Residential Project

Noise Impact Assessment

Redlands, California

Prepared For:

Diversified Pacific
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ENVIRONMENTAL CONSULTANTS

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LIST OF ACRONYMS AND ABBREVIATIONS

Caltrans	California Department of Transportation
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
L_{dn}	Day/Night Noise Level
L_{eq}	Equivalent Noise Level
hp	Horsepower
OPR	Office of Planning and Research

OSHA	Occupational Safety and Health Administration
PPV	Peak particle velocity
Project	Palm Avenue Residential
RMS	Root mean square

1.0 INTRODUCTION

This report documents the results of a Noise Impact Assessment completed for the Palm Avenue Residential Project (Project), which includes the development of 30 residential units in Redlands, California. This report was prepared as a comparison of predicted Project noise levels to noise standards promulgated by the City of Redlands General Plan Healthy Community Chapter and the City's Municipal Code. The purpose of this report is to estimate Project-generated noise and to determine the level of impact the Project would have on the environment.

1.1 Project Location and Description

The Project site is located in the City of Redlands, located in south San Bernardino County (see Figure 1. *Project Vicinity*). The Project Site is an approximately 8.81-acre site located west of the West Palm Avenue/Cajon Street intersection. The square shaped site is generally bound by West Palm Avenue and Kingsbury Elementary School to the north, residential housing to the east and west, and Alvarado Street and residential housing to the south (see Figure 2. *Project Location*). The Project site currently contains two single-family units, a carriage house/barn. , a shed, and numerous orange trees.

The Project proposes to subdivide the site into 30 new single-family residential lots. A 37,418-square-foot park is also proposed at the northwestern corner of the site. Vehicle access to the site would be accommodated via West Palm Avenue (see Figure 3. *Site Plan*). The larger of the two residences, located in the central portion of the Project site, and associated carriage house/barn are proposed to remain. The smaller single-family house, located on the western boundary of the Project site, is also proposed to remain. The existing shed and the numerous orange trees would be removed.

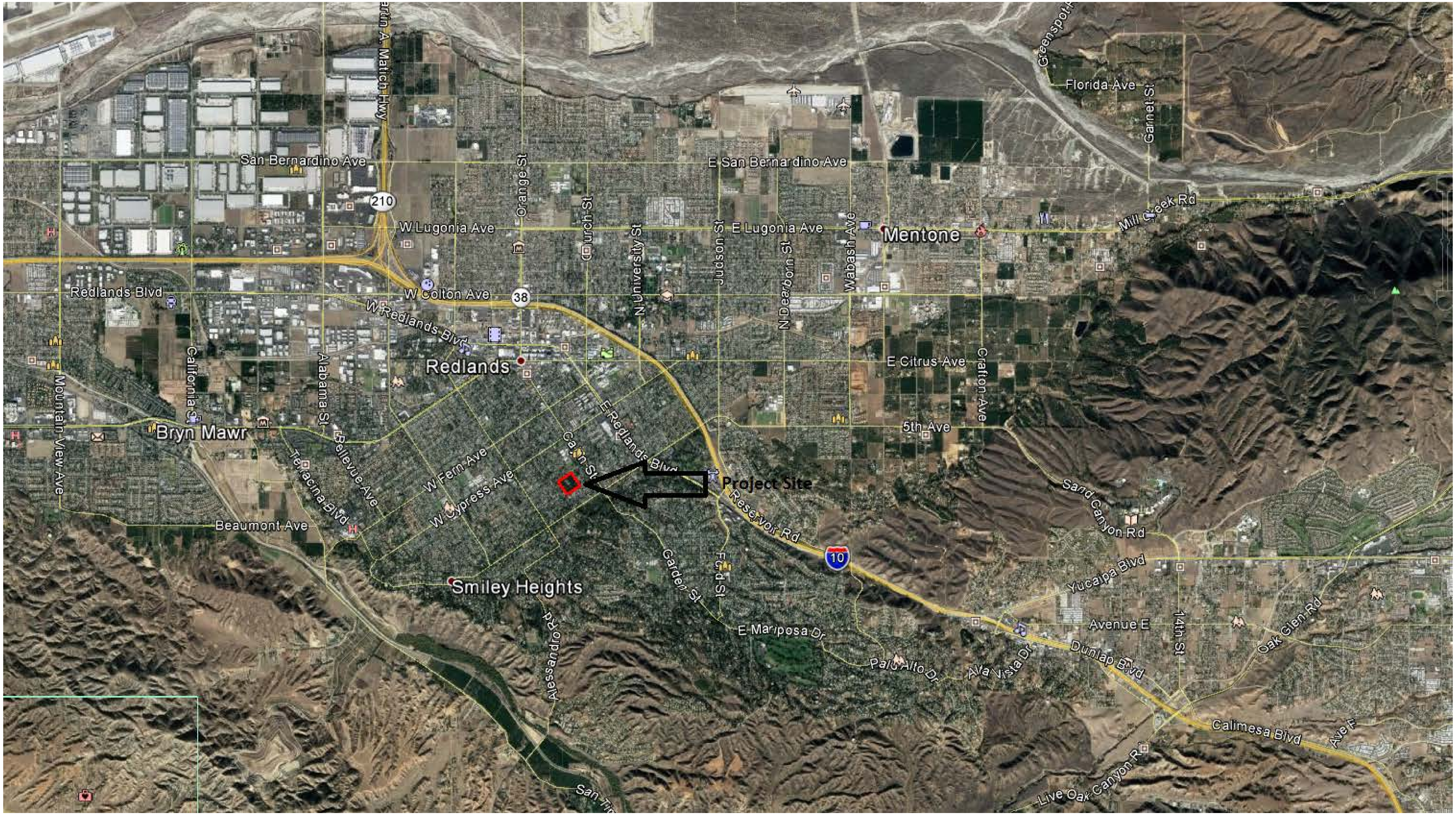
The Project site has a City of Redlands General Plan designation of Low-Density Residential. The Low-Density Residential designation is intended for single-family residential development at a density of up to six dwelling units per gross acre.

2.0 NOISE BACKGROUND

2.1 Fundamentals of Sound and Environmental Noise

2.1.1 Addition of Decibels

The decibel (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. When the standard logarithmic decibel is A-weighted (dBA), 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. When two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions (Federal Transit Administration [FTA] 2018). For example, a 65-dB source of sound, such as a truck, when joined by another 65-dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). Under the dB scale, three sources of equal loudness together would produce an increase of 5 dB.



Map Date: *8/23/2019*
Photo (or Base) Source: *Google Earth*

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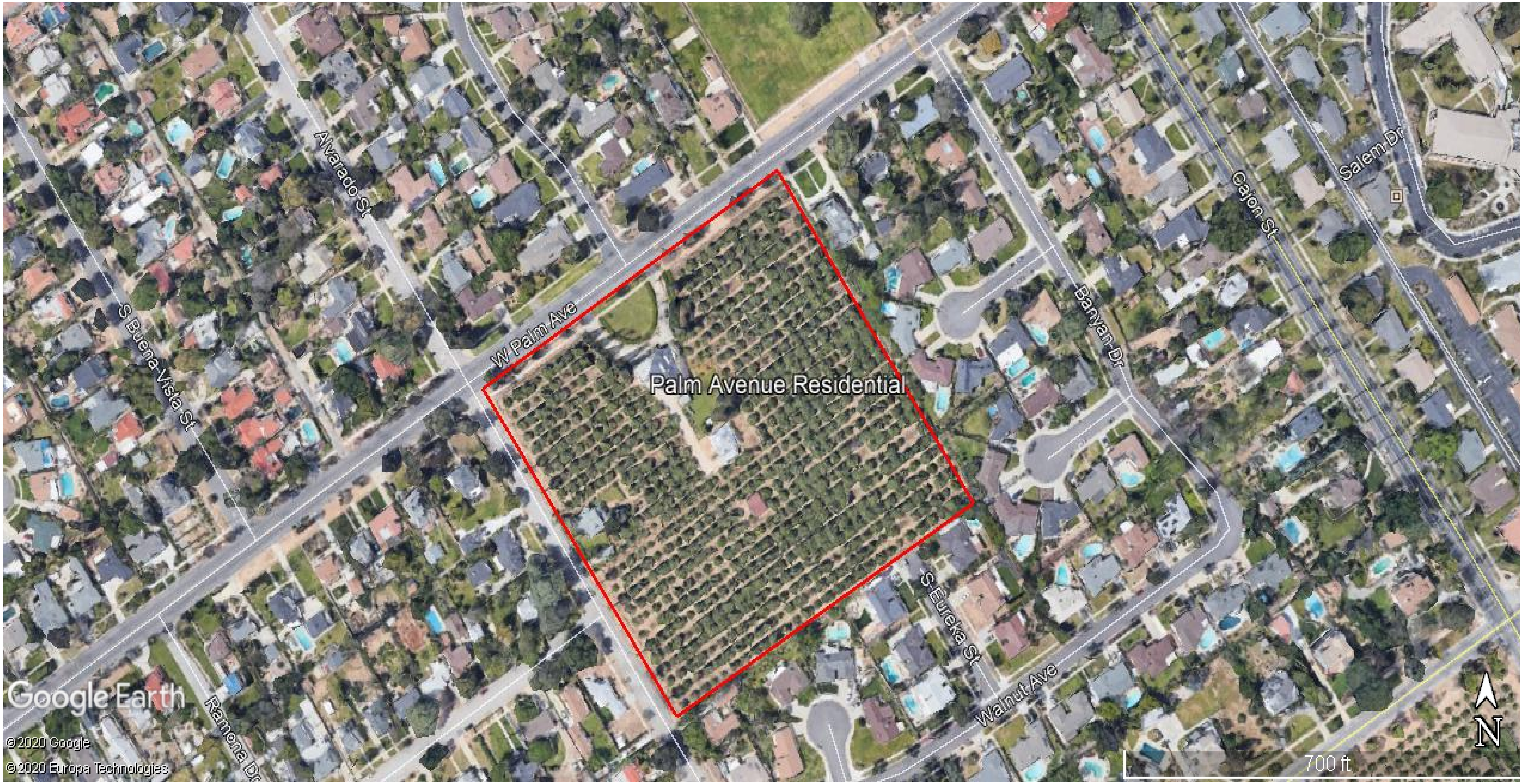
Figure 1. Project Vicinity

2019.016.001



Map Date: *5/7/2020*
Photo (or Base) Source: *Google Earth*

Figure 2. Project Location Map

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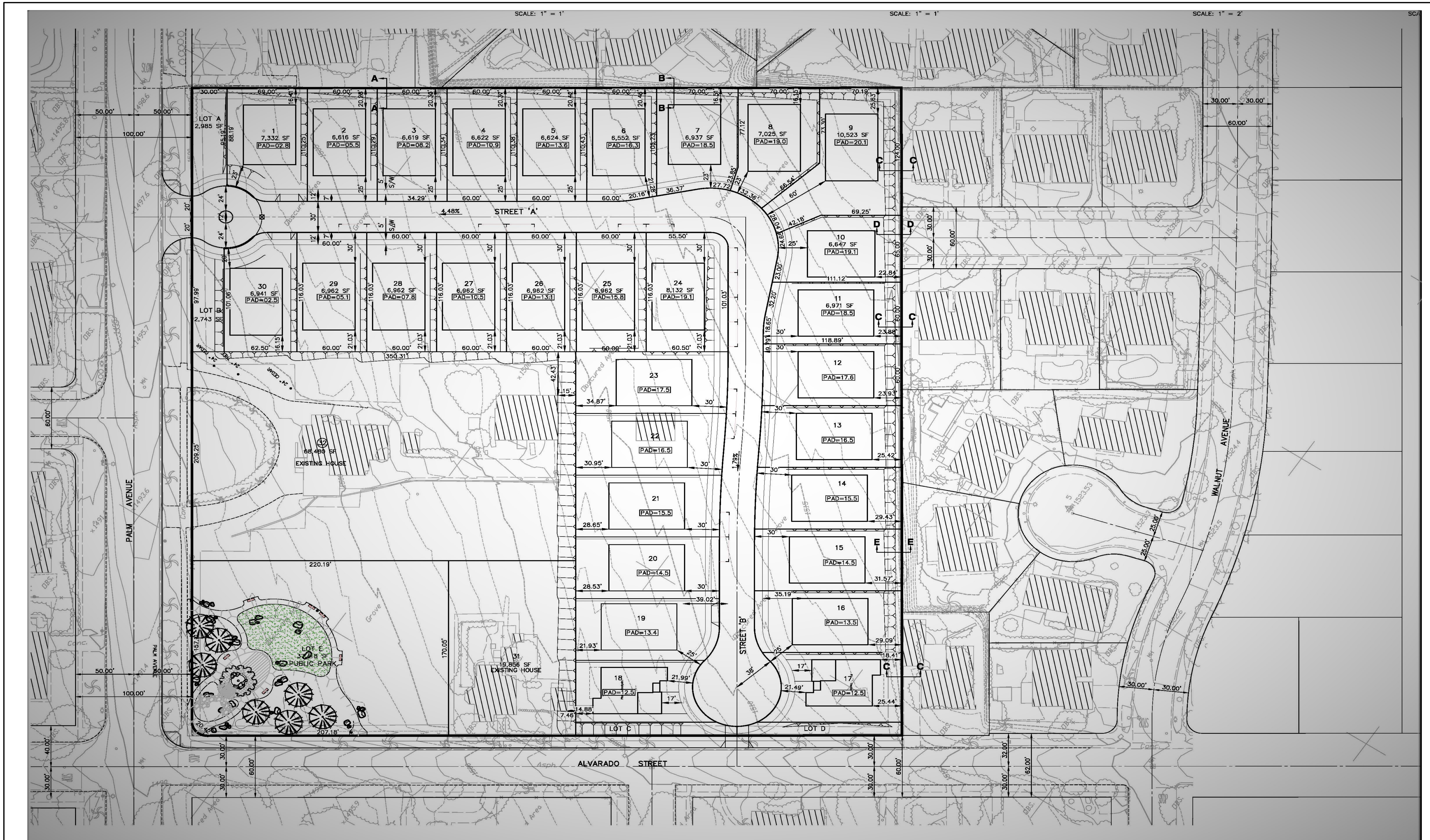

Map Date: *5/7/2020*
Photo (or Base) Source: *Google Earth*

Figure 3. Project Site Plan

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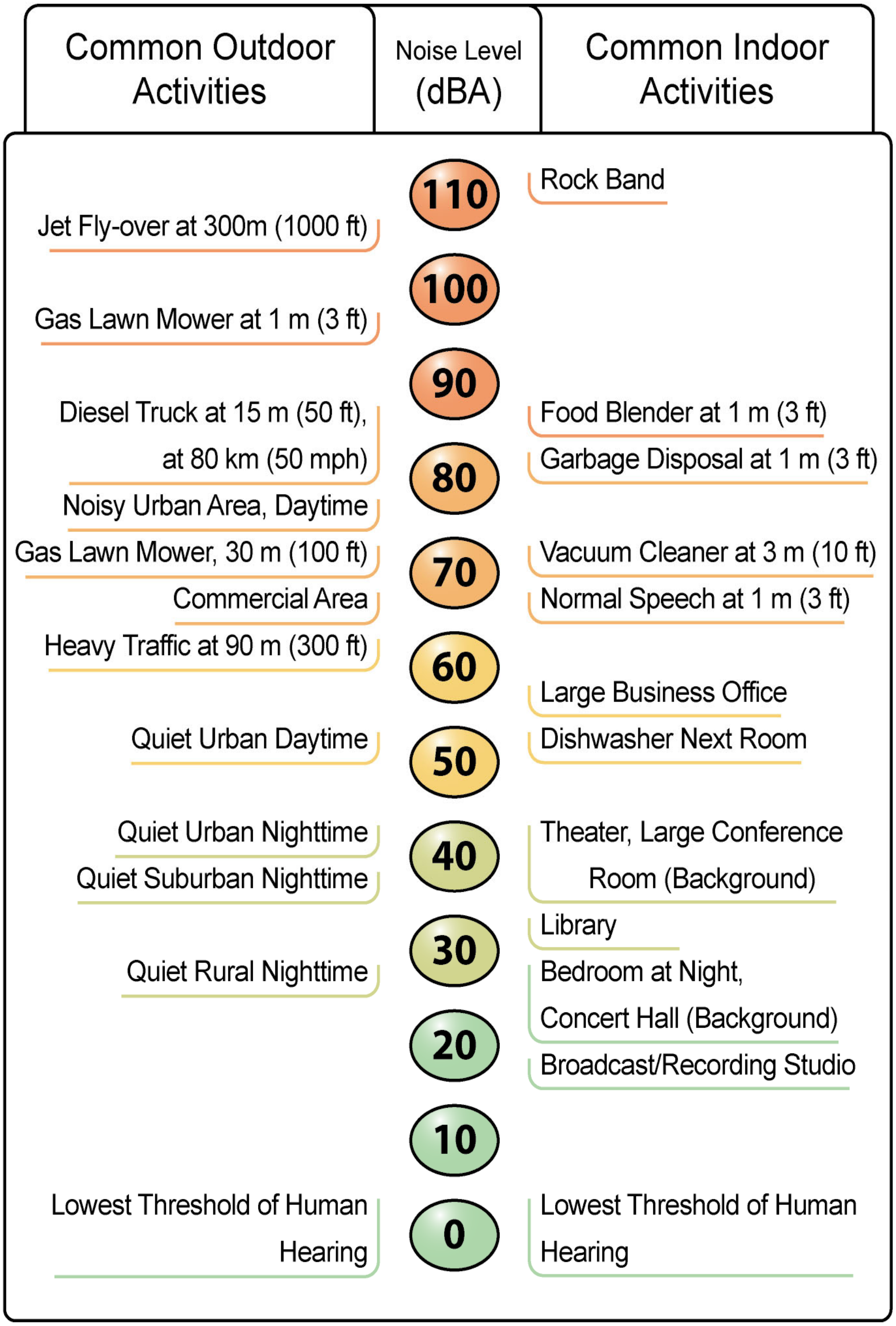
Typical noise levels associated with common noise sources are depicted in Figure 4.



Source: California Department of Transportation (Caltrans) 2012

Figure 4. Common Noise Levels

2.1.2 Sound Propagation and Attenuation

Noise can be generated by a number of sources, including mobile sources, such as automobiles, trucks and airplanes; and stationary sources, such as construction sites, machinery, and industrial operations. 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, often referred to as cylindrical spreading. 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 (Federal Highway Administration [FHWA] 2011). No excess attenuation is assumed for hard surfaces like a parking lot or a body of water. Soft surfaces, such as soft dirt or grass, can absorb sound, so an excess ground-attenuation value of 1.5 dB per doubling of distance is normally assumed.

Noise levels may also be reduced by intervening structures; generally, a single row of detached buildings between the receptor and the noise source reduces the noise level by about 5 dBA (FHWA 2006), while a solid wall or berm generally reduces noise levels by 10 to 20 dBA (FHWA 2011). However, noise barriers or enclosures specifically designed to reduce site-specific construction noise can provide a sound reduction 35 dBA or greater (Western Electro-Acoustic Laboratory, Inc. 2000). To achieve the most potent noise-reducing effect, a noise enclosure/barrier must physically fit in the available space, must completely break the "line of sight" between the noise source and the receptors, must be free of degrading holes or gaps, and must not be flanked by nearby reflective surfaces. Noise barriers must be sizable enough to cover the entire noise source, and extend length-wise and vertically as far as feasibly possible to be most effective. The limiting factor for a noise barrier is not the component of noise transmitted through the material, but rather the amount of noise flanking around and over the barrier. In general, barriers contribute to decreasing noise levels only when the structure breaks the line of sight between the source and the receiver.

The manner in which older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows (Caltrans 2002). The exterior-to-interior reduction of newer residential units is generally 30 dBA or more (Harris Miller, Miller & Hanson Inc. [HMMH] 2006). Generally, in exterior noise environments ranging from 60 decibels (dBA) Community Noise Equivalent Level (CNEL) to 65 dBA CNEL, interior noise levels can typically be maintained below 45 dBA, a typical residential interior noise standard, with the incorporation of an adequate forced-air mechanical ventilation system, and standard thermal-pane residential windows/doors with a minimum rating of Sound Transmission Class (STC) 28. (STC is an integer rating of how well a building partition attenuates airborne sound. In the U.S., it is widely used to rate interior partitions, ceilings, floors, doors, windows, and exterior wall configurations.) In exterior noise environments of 65 dBA CNEL or greater, a combination of forced-air mechanical ventilation and sound-rated construction methods is often required to meet the interior noise level limit. Attaining the necessary noise reduction from exterior-to-interior spaces is readily achievable in noise environments less than 75 dBA CNEL with proper wall construction techniques following California Building Code methods, the selections of proper windows and doors, and the incorporation of forced-air mechanical ventilation systems.

2.1.3 Noise Descriptors

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 L_{eq} is a measure of ambient noise, while the L_{dn} and Community Noise Equivalent Level (CNEL) are measures of community noise. Each is applicable to this analysis and defined in Table 1.

The 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 acoustical 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 about plus or minus 1 dBA. 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. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Table 1. Common Acoustical Descriptors

Descriptor	Definition
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 micropascals (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 decibels 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 micropascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hertz (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 decibels 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.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	A 24-hour average L_{eq} with a 10 dBA "weighting" added to noise during the hours of 10:00 pm to 7:00 am to account for noise sensitivity in the 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 pm to 10:00 pm and a 10 dBA "weighting" added to noise during the hours of 10:00 pm to 7:00 am 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	Noise that 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.

2.1.4 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. 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. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semicommercial 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 noise levels, the following relationships should be noted in understanding this analysis:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived by humans.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in level of at least 5 dBA is required before any noticeable change in community response would be expected. An increase of 5 dBA 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.

2.1.5 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 (OSHA) 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 eight hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

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. For ground vehicles, a noise level of about 55 dBA L_{dn} is the threshold at which a substantial percentage of people begin to report annoyance.

2.2 Fundamentals of Environmental Groundborne Vibration

2.2.1 Vibration Sources and Characteristics

Sources of earthborne 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).

Groundborne vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the peak particle velocity (PPV); another is the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration.

2.2.2 Vibration Sources and Characteristics

Table 2 displays the reactions of people and the effects on buildings produced by continuous vibration levels. The annoyance levels shown in the table 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 groundborne 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. For instance, heavy-duty trucks generally generate groundborne vibration velocity levels of 0.006 PPV at 50 feet under typical circumstances, which as identified in Table 2 is considered very unlikely to cause damage to buildings of any type. Common sources for groundborne vibration are planes, trains, and construction activities such as earth moving that requires the use of heavy-duty earth-moving equipment.

For the purposes of this analysis, the PPV descriptor with units of inches per second is used to evaluate construction-generated vibration for building damage and human complaints.

Table 2. Human Reaction and Damage to Buildings for Continuous or Frequent Intermittent Vibration Levels

Peak Particle Velocity (inches/second)	Approximate Vibration Velocity Level (VdB)	Human Reaction	Effect on Buildings
0.006–0.019	64–74	Range of threshold of perception	Vibrations unlikely to cause damage of any type
0.08	87	Vibrations readily perceptible	Recommended upper level to which ruins and ancient monuments should be subjected
0.1	92	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Virtually no risk of architectural damage to normal buildings
0.2	94	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to normal dwellings
0.4–0.6	98–104	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Architectural damage and possibly minor structural damage

Source: Caltrans 2013

2.3 Existing Environmental Noise Setting

2.3.1 Noise Sensitive Land Uses

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as parks, historic sites, cemeteries, and recreation areas are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. The nearest noise-sensitive land uses consist of the three single-family residences that are currently on the Project site. The closest offsite noise sensitive receptors include residences in all directions. The residences to the east and south are located directly adjacent to the Project site.

2.3.2 Existing Ambient Noise Environment

The area surrounding the Project site is impacted by various noise sources. It is subject to typical urban noise such as noise generated by traffic and day-to-day outdoor activities. Mobile sources of noise, especially cars and trucks traversing Palm Avenue, are the most common source of noise in the immediate vicinity of the Project site. Other types of noise are typical of residential land uses, such as radios, dogs barking, lawnmowers and other equipment.

As previously described, the Project site is currently occupied by two single-family houses, a carriage house/barn, a shed, and numerous orange trees. The site is generally bound by West Palm Avenue to the north, with residences and Kingsbury Elementary School beyond, Alvarado Street to the west, with residences beyond, and residences to the south and east. In order to quantify existing ambient noise levels in the Project area, ECORP Consulting conducted three short-term noise measurements on August 22, 2019. The noise measurements are representative of typical existing noise exposure within and immediately adjacent to the Project site during the middle of a weekday (see Attachment A for Noise Measurement Locations). The 10-minute measurements were taken between 11:10 am and 12:00 pm. Short-term (L_{eq}) and are shown in Table 3.

Table 3. Existing (Baseline) Noise Measurements

Location Number	Location	L_{eq} dBA	L_{min} dBA	L_{max} dBA	Time
1	Along sidewalk/driveway on West Palm Avenue, north of residence.	**60.2**	39.1	77.0	11:10 am- 11:20 am
2	Cul-de-sac along Banyan Drive adjacent to residence.	**49.5**	39.7	59.6	11:30 am- 11:40 am
3	At the end of the cul-de-sac on Walnut Avenue.	**40.3**	33.7	48.5	11:50 am – 12:00 pm

Source: Measurements were taken by ECORP Consulting with a Larson Davis SoundExpert LxT precision sound level meter, which satisfies the American National Standards Institute for general environmental noise measurement instrumentation. Prior to the measurements, the SoundExpert LxT sound level meter was calibrated according to manufacturer specifications with a Larson Davis CAL200 Class I Calibrator. See Attachment A for noise measurement outputs.

As shown in Table 3, the ambient recorded noise levels ranged from 40.3 dBA to 60.2 dBA L_{eq} near the Project site (see Attachment A for noise measurement locations). The noise most commonly in the Project vicinity is produced by automotive vehicles (cars, trucks, buses, motorcycles) traversing Palm Avenue. Traffic moving along streets produces a sound level that remains relatively constant and is part of the Project area's minimum ambient noise level. Vehicular noise varies with the volume, speed and type of traffic. Slower traffic produces less noise than fast moving traffic. Trucks typically generate more noise than cars. Infrequent or intermittent noise also is associated with vehicles, including sirens, vehicle alarms, slamming of doors, garbage and honking of horns. These noises add to urban noise and are regulated by a variety of agencies.

3.0 REGULATORY FRAMEWORK

3.1 State

3.1.1 State of California General Plan Guidelines

The State of California regulates vehicular and freeway noise affecting classrooms, sets standards for sound transmission and occupational noise control, and identifies noise insulation standards and airport noise/land-use compatibility criteria. The State of California General Plan Guidelines (State of California 2003), published by the Governor's Office of Planning and Research (OPR), also provides guidance for the acceptability of projects within specific CNEL/L_{dn} contours. The guidelines also present adjustment factors that may be used in order to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

3.1.2 State Office of Planning and Research Noise Element Guidelines

The State OPR Noise Element Guidelines include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The Noise Element Guidelines contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL.

3.2 Local

3.2.1 City of Redlands General Plan Healthy Community Chapter

The Healthy Community Chapter of the General Plan provides policy direction for minimizing noise impacts on the community and for coordinating with surrounding jurisdictions and other entities regarding noise control. By identifying noise-sensitive land uses and establishing compatibility guidelines for land use and noise, noise considerations will influence the general distribution, location, and intensity of future land use. The result is that effective land use planning and mitigation can alleviate the majority of noise problems.

The most basic planning strategy to minimize adverse impacts on new land uses due to noise is to avoid designating certain land uses at locations within Redlands that would negatively affect noise-sensitive land uses. Uses such as schools, hospitals, child care, senior care, congregate care, churches, and all types of residential use should be located outside of any area anticipated to exceed acceptable noise levels as defined by the Healthy Community Chapter Noise and Land Use Compatibility Guidelines and Interior and Exterior Noise Standards, or should be protected from noise through sound attenuation measures such as site and architectural design and sound walls. The City of Redlands has adopted these guidelines in a modified form as a basis for planning decisions based on noise considerations. These guidelines are shown in Table 4. In the case that the noise levels identified at a proposed project site fall within levels considered normally acceptable, the project is considered compatible with the existing noise environment.

The Project site has a City of Redlands General Plan designation of Low Density Residential. The Low Density Residential General Plan designation areas are intended for single-family residential development of six dwelling units per gross acre.

Table 4. Land Use Compatibility for Community Noise Environments

Land Use Category		Community Noise Exposure (CNEL)			
Categories	**Uses**	**Clearly Compatible (A)**	**Normally Compatible (B)**	**Normally Incompatible (C)**	**Clearly Incompatible (D)**
Residential	Single Family, Duplex Multiple Family	< - 60	N/A	61 - 75	76 ->
Residential	Mobile Homes	< - 60	N/A	61 - 75	76 ->
Commercial (Regional District)	Hotel, Motel, Transient Lodging	< - 65	66 - 75	76 - 85	86 - >
Commercial (Regional, Village District, Special)	Commercial Retail, Bank, Restaurant, Movie Theater	< - 75	76 - 85	86 - >	N/A
Commercial (Industrial Institutional)	Office Building, Research & Dev., Professional Offices, City Office Building	< - 70	71 - 80	81 - 85	86 - >
Commercial (Recreation) Institutional (Civic Center)	Amphitheater, Concert Hall, Auditorium, Meeting Hall	N/A	< - 65	66 - 75	76 - >
Commercial (Recreation)	Children's Amusement Park, Minatare Golf Course, Go-cart Track, Equestrian Center, Sports Club	< - 75	76 ->	N/A	N/A
Commercial (General, Special) Industrial, Institutional	Automobile Service Station, Auto Dealership, Manufacturing Warehouse, Wholesale, Utilities	< - 75	76- >	N/A	N/A
Institutional (General)	Hospital, Church, Library, Schools Classroom	< - 65	66 - 70	71- 80	81 - >
Open Space	Parks	< - 70	71 - 75	76 - 80	81 - >
Open Space	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	< - 75	76 - 80	81 - >	N/A
Agriculture	Agriculture	N/A	N/A	N/A	N/A

Source: City of Redlands 2017a

Notes:

NA: Not Applicable

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.*

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.*

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.*

Clearly Incompatible – *New construction or development should generally not be undertaken.*

Table 5 shows the interior and exterior noise standards for the various land uses in the city.

Table 5. Interior and Exterior Noise Standards

Land Use Categories	Interior[1] CNEL	Exterior[2] CNEL
Residential		
Single Family, Duplex, Multiple Family	45[3]	60
Mobile Home	---	60[4]
Commercial, Industrial, Institutional		
Hotel, Motel, Transit Lodging	45	65[3]
Commercial Retail, Bank, Restaurant	50	---
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		
Hospitals, Schools classrooms	45	60
Open Space		
Parks	---	60

Source: City of Redlands 2017a
Notes:
1. Indoor environment excludes bathrooms, toilets, closets, corridors.
2. Outdoor environment limited to private yard of single family as measures at property line; multifamily private patio or balcony that is served by 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 window, if they are used to meet natural ventilation requirements.
4. Exterior noise levels should be such that interior level will not exceed 45 CNEL
5. Expect those areas affected by aircraft noise.

The Healthy Community Chapter also contains principles and implementation policies that must be used to guide decisions concerning land uses that are common sources of excessive noise levels. The following relevant and applicable principles and implementation policies from the City of Redlands' Healthy Community Chapter have been identified for the Project.

Principle 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.

Principle 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.

Policy 9.0e: Use the criteria specified in the General Plan (Table 4) to assess the compatibility of proposed land uses with the projected noise environment and apply the noise standards in the General Plan (Table 5), 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 the General Plan (Table 5).

Policy 9.0i: Require construction of noise barriers to mitigate sound emissions where necessary or when feasible, and encourage the use of walls and berms to protect residential or other noise sensitive land uses that are adjacent to major roads, commercial or industrial areas.

Policy 9.0s: Require mitigation to ensure that indoor noise levels for residential living spaces not exceed 45 dB L_{dn}/CNEL due to the combined effects of all exterior noise sources.

3.2.2 City of Redlands Municipal Code

The City of Redlands' regulations with respect to noise are included in Title 8 of the Health and Safety Code, specifically Chapter 8.06, Community Noise Control. The Noise Control provides noise standards within the city and the following references are those portions of the Noise Control that may be applicable to the Project.

Section 8.06.070 provides exterior noise limits for various land uses within the city and is presented in Table 6. As shown, the maximum permissible sound levels at the exterior of a single-family residential district, such as that proposed by the Project, is 60 dBA during the daytime and 50 dBA during the nighttime. Table 6 also addresses public spaces, such as the park proposed by the Project, where maximum permissible sound levels are the same as single-family residential districts.

Table 6. Maximum Permissible Sound Levels by Receiving Land Use.

Receiving Land Use Category	Time Period	Noise Level-dBA
Single-family residential district	10:00 pm - 7:00 am	50
	7:00 am - 10:00 pm	60
Multi-family residential districts; public space; industrial	10:00 pm - 7:00 am	50
	7:00 am - 10:00 pm	60
Commercial	10:00 pm - 7:00 am	60
	7:00 am - 10:00 pm	65
Industrial	Anytime	75

Source: City of Redlands Municipal Code

Section 8.06.080 provides interior noise limits for various land uses within the city and is presented in Table 7.

Table 7. Maximum Permissible Interior Sound Levels by Receiving Land Use.

Receiving Land Use Category	Time Period	Noise Level-dBA
Single-family residential district	Anytime	45
Multi-family residential districts, institutional, hotels	Anytime	45
Commercial	Anytime	50
Industrial	Anytime	60

Source: City of Redlands Municipal Code

Additionally, Section 8.06.100 *Residential Air Conditioning or Handling Equipment,* states that it is unlawful to operate any air conditioning or air handling equipment that exceeds sound levels presented in Table 6 above. Lastly, Section 8.06.120 states that the noise standards shall not apply to noise sources associated with new construction, remodeling, rehabilitation or grading of any private property, provided such activities take place between the house of 7:00 am and 8:00 pm on weekdays, including Saturdays, with no activity taking place at any time on Sundays or federal holidays. All motorized equipment used in such activities shall be equipped with functioning mufflers.

4.0 NOISE IMPACT ASSESSMENT

4.1 Thresholds of Significance

Criteria for determining the significance of noise impacts were developed based on information contained in the California Environmental Quality Act Guidelines Appendix G. According to the guidelines, a project may have a significant effect on the environment if it would result in the following conditions:

1) Generation of 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.
2) Generation of excessive groundborne vibration or groundborne noise levels.
3) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

For purposes of this analysis and where applicable, the City of Redlands noise standards were used for evaluation of Project-related noise impacts.

4.2 Methodology

This analysis of the existing and future noise environments is based on noise prediction modeling and empirical observations. In order to estimate the worst-case construction noise levels that may occur at the nearest noise-sensitive receptors in the Project vicinity, predicted construction noise levels were calculated utilizing the FHWA's Roadway Construction Model (2006). Operational noise levels are addressed qualitatively. Groundborne vibration levels associated with construction-related activities for the Project were evaluated utilizing typical groundborne vibration levels associated with construction equipment, obtained from the Caltrans guidelines set forth above. Potential groundborne vibration impacts related to structural damage and human annoyance were evaluated, taking into account the distance from construction activities to nearby land uses.

4.2.1 Impact Analysis

Project Construction Noise

Would the Project Result in Short-Term Construction-Generated Noise in Excess of City Standards?

Construction noise associated with the Proposed Project would be temporary and would vary depending on the nature of the activities being performed. Noise generated would primarily be associated with the operation of off-road equipment for onsite construction activities as well as construction vehicle traffic on area roadways. Construction noise typically occurs intermittently and varies depending on the nature or phase of construction (e.g., building construction, paving). Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other primary sources of acoustical disturbance would be random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts). During construction, exterior noise levels could negatively affect sensitive receptors in the vicinity of the construction site.

Table 8 indicates the anticipated noise levels of construction equipment. The average noise levels presented in Table 8 are based on the quantity, type, and acoustical use factor for each type of equipment that is anticipated to be used.

Table 8. Maximum Noise Levels Generated by Construction Equipment

Type of Equipment	Maximum Noise (L_{max}) at 50 Feet (dBA)	Maximum 8-Hour Noise (L_{eq}) at 50 Feet (dBA)
Crane	80.6	72.6
Dozer	81.7	77.7
Excavator	80.7	76.7
Generator	80.6	77.6
Grader	85.0	81.0
Paver	77.2	74.2
Roller	80.0	73.0
Tractor	84.0	80.0
Dump Truck	76.5	72.5
Concrete Pump Truck	81.4	74.4
Welder	74.0	70.0

Source: FHWA Roadway Construction Noise Model v. 1.1 (FHWA-HEP-05-054), dated January 2006.

Nearby noise-sensitive land uses consist of two single-family residences located on the Project site, as well as single-family residences directly adjacent to the site. Due to this close proximity, vicinity residences would experience noise levels in excess of what is presented in Table 8 over the course of construction.

The City of Redlands restricts the time that construction can take place but does not promulgate numeric thresholds pertaining to the noise associated with construction. Specifically, Section 8.06.120 of the City's Municipal Code states that the noise standards shall not apply to noise sources associated with new construction, remodeling, rehabilitation, or grading of any private property provided such activities take place between the hours of 7:00 am and 8:00 pm on weekdays, including Saturdays, with no activity taking place at any time on Sundays or federal holidays. It is typical to regulate construction noise in this manner since construction noise is temporary, short term, intermittent in nature, and would cease on completion of the project. Furthermore, the City of Redlands is a developing urban community and construction noise is generally accepted as a reality within the urban environment. Additionally, construction would occur throughout the Project site and would not be concentrated at one point. Therefore, noise generated during construction activities, as long as conducted within the permitted hours, would not conflict with City noise standards.

Project Operational Noise

Would the Project Result in a Substantial Permanent Increase in Ambient Noise Levels in Excess of City Standards?

Project Land Use Compatibility

The City of Redlands General Plan Healthy Community Chapter provides the City with a tool to gauge the compatibility of new land uses (the Proposed Project) relative to existing noise levels. Policy 9.0e of the Healthy Community Chapter states that projects are required to use the criteria specified in the General Plan (see Table 4) to assess the compatibility of proposed new land uses with the projected noise environment and apply the noise standards in the General Plan (see Table 5), which prescribe interior and exterior noise standards in relation to specific land uses. The criteria to assess the compatibility of proposed new land uses with the projected noise environment, as shown in Table 4, identifies clearly compatible, normally compatible, normally incompatible, and clearly incompatible noise levels for various land uses, including single-family residential uses such as those proposed by the Project. In the case that the noise levels identified at the Project site fall within levels considered normally compatible, the Project is considered compatible with the existing noise environment. As shown in Table 4, a clearly compatible noise level for locating residential uses is anything 60 dBA CNEL and under. A clearly compatible noise level for locating park uses is anything under 75 dBA CNEL. Additionally, the Interior and Exterior Noise Standards contained in the Healthy Community Chapter (see Table 5) limit exterior noise levels at single-family residences to 60 dBA CNEL and interior noise level within single-family residences to 45 dBA CNEL.

The predominate noise source in the Project vicinity is generated by traffic on Palm Avenue. According to the City General Plan EIR (Table 3.12-4; 2017b), the segment of Palm Avenue between Cajon Street and Center Street currently emits traffic noise at levels that attenuate to the acceptable exterior standard of 60 dBA CNEL at 148 feet from centerline. (65 dBA CNEL is experienced at 69 feet from centerline.) Additionally, the City of Redlands expects future (2035) traffic on Palm Avenue to generate noise that attenuates to 60 dBA CNEL at 167 feet from centerline (Table 3.12-8; 2017b). (65 dBA CNEL will be experienced at 78 feet from centerline.)

The Project park feature is proposed directly adjacent to Palm Avenue and would therefore be subject to noise levels just above 65 dBA CNEL. This noise level is less than 75 dBA CNEL and is therefore considered clearly compatible for the location of a park.

The nearest two houses (Lots 1 and 30) have exterior living space (yards) that are proposed 80 feet from Palm Avenue centerline. Therefore, portions of Lots 1 and 30 would potentially be exposed to noise levels in excess of the 60 dBA CNEL residential standard, yet less than 65 dBA CNEL. According to the General Plan Healthy Community Chapter, these portions of Lots 1 and 30 would be considered Normally Incompatible for residential uses, if left unmitigated, and therefore require an analysis of the needed noise reducing features included in the design. Noise path controls can be an effective method in controlling noise affecting an exterior environment. Barriers or enclosures can provide a substantial reduction in the nuisance effect in some cases. To be effective, a noise enclosure/barrier must physically fit in the available space, must break the line of sight between the noise source and the receptors, must be largely free of holes or gaps, and must not be flanked by nearby reflective surfaces. Noise barriers must be sizable enough to cover the entire noise receptor and extend lengthwise and vertically as far as feasibly possible to be most effective. The limiting factor for a noise barrier is not the component of noise transmitted through the material, but rather the amount of noise flanking around and over the barrier. Policy 9.0i of the General Plan supports the construction of noise barriers to mitigate sound emissions where necessary or when feasible and encourages the use of walls and berms to protect residential or other noise sensitive land uses that are adjacent to major roads, such as Palm Avenue.

Lots 1 and 30 are proposed for single-story residences flanked on their northern boundaries by 5-foot 4-inch high CMU masonry walls, which partially block the line of sight between the side yards of these residences and Palm Avenue. Lot 1 is further encompassed by a 5-foot 4-inch CMU masonry wall along its eastern property line, which also blocks the line of sight with Palm Avenue. The western property line of Lot 30 would also be exposed to noise generated on Palm Avenue, and tubular steel fencing is proposed for this property line. The following mitigation is recommended.

NOI-1: The Project improvement and building plans will include the following requirements for construction activities:

The proposed barriers spanning the north and eastern boundaries of Lot 1 and north and western boundaries of Lot 30 shall be constructed to six feet in height in order to break the "line of sight" between the Lots and Palm Avenue. The barriers shall be constructed of CMU block, or material of similar density and use, with no visible gaps between construction materials or at the base of the wall.

As previously described, a solid wall generally reduces noise levels by 10 to 20 dBA (FHWA 2011). Since portions of Lots 1 and 30 would potentially be exposed to noise levels in excess of the 60 dBA CNEL standard, yet less than 65 dBA CNEL without a noise barrier, the 10 to 20 dBA reduction provided by a noise barrier would reduce the noise experienced to levels below the 60 dBA CNEL standard.

Thus, with implementation of recommended mitigation measure NOI-1, the Proposed Project would be compatible with the existing and future ambient noise environment.

Project Operations – Onsite Noise Sources

In addition to the analysis of Project compatibility with the existing and future predicted ambient noise environment, this analysis also evaluates the effects of Project noise on the surrounding existing land uses. Noise-sensitive land uses are locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would each be considered noise-sensitive and may warrant unique measures for protection from intruding noise. Nearby noise-sensitive land uses consist of single-family residences directly adjacent to the site.

The main operational noise source associated with the Proposed Project would be that of operational stationary sources. Potential stationary noise sources related to long-term operation of a residential neighborhood on the Project site would include mechanical equipment and other typical sources specific to residential neighborhoods such as barking dogs, internal traffic circulation, radios, and people talking. According to field measurements conducted by ECORP, mechanical heating, ventilation, and air conditioning equipment generates noise levels less than 45 dBA at 20 feet, which is less than City daytime and nighttime thresholds for residential uses as presented in Section 8.60.070 of the City's Municipal Code. Additionally, per field measurements conducted by ECORP within a typical residential neighborhood, noise levels range from 52.6 to 54.5 dBA CNEL. The Proposed Project places residential uses adjacent to other residential uses. The most basic planning strategy to minimize adverse impacts on new land uses due to noise is to avoid designating certain land uses at locations within the city that would negative affect noise sensitive land uses. The Project site and adjacent surrounding land uses have a General Plan designation of Low Density Residential. The Low Density Residential General Plan designation is intended for single-family residential development of up to six dwelling units per gross acre. The proposed park has the potential to generate stationary noise and impact the surrounding residents. However, the proposed park feature is intended as a 'pocket park' to memorialize Redlands history and preserve existing orange trees. The pocket park would contain planted areas to create a natural landscape using boulders, subtle berms, grasses and groundcover. The park would not include playground equipment or other components that would result in substantial amounts of noise. According to previous noise measurements conducted by ECORP staff at substantially more intensive park uses than proposed by the Project, active playground noise can reach 60 dBA at 40 feet, while noise associated with outdoor active recreation (pick-up basketball game and bystanders) can reach 56 dBA at 50 feet. These noise levels would fall below the City standard at nearby existing residences and since the proposed park would not include playground equipment or sports facilities, it would generate even less noise than cited. Thus, the park component of the Project would emit noise levels less than City daytime and nighttime thresholds for residential uses as presented in Section 8.60.070 of the City's Municipal Code.

The Project is consistent with the types, intensity, and patterns of land use envisioned for the Project area. Operation of the Project would not result in a significant noise-related impact associated with onsite sources.

Project Operations – Offsite Traffic Noise

Project operation would also result in additional traffic on adjacent roadways, thereby increasing vehicular noise in the Project area. West Palm Avenue would provide the main access to the Project site. According to 2017 Redlands Traffic Counts identified in the City's General Plan Transportation Chapter, Palm Avenue between Hibiscus Drive (0.35 miles from the Project site) and Redlands Boulevard has a daily traffic volume of approximately 4,409 cars per day. Per the 10th Edition of the Institute of Transportation Engineers' Trip Generation Manuel (2017), a single-family home generates approximately 9.44 trips per day. Thus, the Project is anticipated to result in 283 average daily trips. According to Caltrans *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (2013), doubling of traffic on a roadway would result in an increase of 3 dB (a barely perceptible increase). The Project would not result in a doubling of traffic, thus its contribution to existing traffic noise would not be perceptible.

Project Groundborne Vibration

Would the Project Expose Structures to Substantial Groundborne Vibration During Construction?

Excessive groundborne vibration impacts result from continuously occurring vibration levels. Increases in groundborne vibration levels attributable to the Proposed Project would be primarily associated with short-term, construction-related activities. Construction on the Project Site would have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and the operations involved. Ground vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance.

Construction-related ground vibration is normally associated with impact equipment such as pile drivers, jackhammers, and the operation of some heavy-duty construction equipment, such as dozers and trucks. It is noted that pile drivers would not be necessary during Project construction as such equipment is not generally necessary for single-family residential construction. Vibration decreases rapidly with distance and it is acknowledged that construction activities would occur throughout the Project Site and would not be concentrated at the point closest to sensitive receptors. Groundborne vibration levels associated with construction equipment are summarized in Table 9.

Table 9. Vibration Source Amplitudes for Construction Equipment

Equipment Type	Peak Particle Velocity at 25 Feet (inches per second)
Large Bulldozer	0.089
Caisson Drilling	0.089
Loaded Trucks	0.076
Rock Breaker	0.082
Jackhammer	0.035
Small Bulldozer/Tractor	0.003

Source: FTA 2018; Caltrans 2013

The City does not regulate vibration associated with construction. However, a discussion of construction vibration is included for full disclosure purposes. For comparison purposes, the Caltrans's (2004) recommended standard of 0.2 inches per second peak particle velocity with respect to the prevention of structural damage for older residential buildings is used as a threshold. This is also the level at which vibrations may begin to annoy people in buildings.

It is acknowledged that construction activities would occur throughout the Project Site and would not be concentrated at the point closest to the nearest structure. The nearest structures of concern to the construction site are single-family residences located approximately 30 feet away. Based on the vibration levels presented in Table 9, ground vibration generated by heavy-duty equipment would not be anticipated to exceed approximately 0.089 inches per second peak particle velocity at 25 feet. Thus, structures located at 30 feet would not be negatively affected.

Would the Project Expose Structures to Substantial Groundborne Vibration During Operations?

Project operations would not include the use of any stationary equipment that would result in excessive groundborne vibration levels.

Airport Noise

Would the Project Expose People Residing or Working in the Project Area to Excessive Airport Noise Levels?

The Project site is located approximately 3.11 miles northeast of the Redlands Municipal Airport. The Project site is located outside of the 70 dBA CNEL noise contour per the Existing Noise Level Contours Map in the City's General Plan Draft EIR (2017b). Implementation of the Proposed Project would not affect airport operations nor result in increased exposure of noise-sensitive receptors to aircraft noise. Thus, would not expose people residing or working in the Project area to excessive airport noise levels.

Cumulative Noise Impacts

Cumulative Construction Noise

Construction activities associated with the Proposed Project and other construction projects in the area may overlap, resulting in construction noise in the area. However, construction noise impacts primarily affect the areas immediately adjacent to the construction site. Construction noise for the Proposed Project was determined to be less than significant following compliance with the City Municipal Code. Cumulative development in the vicinity of the Project site could result in elevated construction noise levels at sensitive receptors in the Project area. However, each project would be required to comply with the applicable City Municipal Code limitations on construction. Therefore, the Project would not contribute to cumulative impacts during construction.

Cumulative Operational Noise

Cumulative noise impacts would occur primarily as a result of increased traffic on local roadways due to the Project and other projects in the vicinity. Long-term noise sources associated with development at the Project, combined with other cumulative projects, could cause local noise level increases. Noise levels associated with the Proposed Project and related cumulative projects together could result in higher noise levels than considered separately. However, traffic noise increase as a result of the Project would not be perceivable and would not be expected to exceed City standards. Project traffic would not result in a significant increase in traffic noise on a Project level, so the Project's contribution to cumulative impacts would also be less than significant. Additionally, due to the fact that use of the site would remain unchanged in terms of the land use, it can be assumed that the ambient noise on the site would remain the same.

5.0 REFERENCES

Caltrans. 2013. Transportation- and Construction-Induced Vibration Guidance Manual.

———. 2012. IS/EA Annotated Outline. http://www.dot.ca.gov/ser/vol1/sec4/ch31ea/chap31ea.htm.

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City of Redlands. 2017a. City of Redlands General Plan 2035.

———. 2017b. City of Redlands General Plan Update and Climate Action Plan Final Environmental Impact Report.

———.2019. City of Redlands Municipal Code.

FHWA. 2006-8. Roadway Construction Noise Model version 1.1.

FTA. 2018. Transit Noise and Vibration Impact Assessment Manual.

HMMH. 2006. Transit Noise and Vibration Impact Assessment, Final Report.

Institute of Transportation Engineers. 2017. 10th Edition Trip Generation Manual.

Western Electro-Acoustic Laboratory, Inc. 2000. *Sound Transmission Sound Test* Laboratory *Report No. TL 96-186*.

ATTACHMENT A

Existing (Baseline) Noise Measurements – Project Site Vicinity

Site Number: 1
Recorded By: Jerry Aguirre
Job Number: 2019-016.001
Date: 8/22/2019
Time: 11:10 a.m.
Location: Along sidewalk/ driveway on West Palm Avenue, north of residence.
Source of Peak Noise: Vehicles on West Palm Avenue, people talking and car alarms.

Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
60.2	39.1	77.0	98.1

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**6/04/2018**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**5/31/2018**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**6/04/2018**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**5/31/2018**	

Weather Data			
Est.	**Duration:** 10 minutes		**Sky:** Clear
	Note: dBA Offset = 0.05		**Sensor Height (ft):** 3.5 feet
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	1-3 mph	85°	29.75

Photo of Measurement Location

Summary

File Name on Meter	LxT_Data.133
File Name on PC	SLM_0005120_LxT_Data_133.00.ldbin
Serial Number	0005120
Model	SoundExpert® LxT
Firmware Version	2.302
User	Jerry Aguirre
Location	Redlands, CA
Job Description	Palm Avenue Residential
Note	

Measurement

Description	
Start	2019-08-07 04:43:37
Stop	2019-08-07 04:53:37
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre Calibration	2019-08-07 04:34:05
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting		
Peak Weight	Z Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Low		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	Bin Max		
Overload	122.9 dB		
	A	**C**	**Z**
Under Range Peak	79.2	76.2	**81.2** dB
Under Range Limit	**27.2**	26.5	31.9 dB
Noise Floor	17.0	17.4	22.8 dB

Results

LAeq	60.2 dB	
LAE	88.0 dB	
EA	69.663 µPa²h	
LZpeak (max)	2019-08-07 04:48:44	98.1 dB
LASmax	2019-08-07 04:43:58	77.0 dB
LASmin	2019-08-07 04:45:23	39.1 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedance Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 135.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 137.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 140.0 dB (Exceedance Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**
	70.2	-99.9	60.2	70.2	-99.9	-99.9

LCeq	65.4 dB
LAeq	60.2 dB
LCeq - LAeq	5.2 dB
LAIeq	64.3 dB
LAeq	60.2 dB
LAIeq - LAeq	4.1 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	60.2		65.4			
Ls(max)	77.0	2019/08/07 4:43:58				
Ls(min)	39.1	2019/08/07 4:45:23				
LPeak(max)					98.1	2019/08/07 4:48:44

# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	8.0
OBA Overload Duration	18.4 s

Statistics

LAS5.00	66.8 dB
LAS10.00	63.4 dB
LAS33.30	54.6 dB
LAS50.00	49.5 dB
LAS66.60	46.1 dB
LAS90.00	42.1 dB

Site Number: 2
Recorded By: Jerry Aguirre
Job Number: 2019-016.001
Date: 8/22/2019
Time: 11:30 a.m.
Location: Cul-de-sac along Banyan Drive adjacent to residence.
Source of Peak Noise: Vehicles on Banyan Drive and dogs barking

Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
49.5	39.7	59.6	89.0

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**6/04/2018**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**5/31/2018**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**6/04/2018**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**5/31/2018**	

Weather Data			
Est.	**Duration:** 10 minutes		**Sky:** Clear
	Note: dBA Offset = 0.05		**Sensor Height (ft): 3**.5 feet
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	1-3 mph	85°	29.75

Photo of Measurement Location

Summary

File Name on Meter	LxT_Data.134
File Name on PC	SLM_0005120_LxT_Data_134.00.ldbin
Serial Number	0005120
Model	SoundExpert® LxT
Firmware Version	2.302
User	Jerry Aguirre
Location	Redlands, CA
Job Description	Palm Avenue Residential
Note	

Measurement

Description	
Start	2019-08-07 05:06:11
Stop	2019-08-07 05:16:11
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre Calibration	2019-08-07 04:34:05
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting		
Peak Weight	Z Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	Off		
Integration Method	Linear		
OBA Range	Low		
OBA Bandwidth	1/1 and 1/3		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	Bin Max		
Overload	122.9 dB		
	A	**C**	**Z**
Under Range Peak	79.2	76.2	**81.2** dB
Under Range Limit	**27.2**	26.5	31.9 dB
Noise Floor	17.0	17.4	22.8 dB

Results

LAeq	45.9 dB	
LAE	73.6 dB	
EA	2.569 µPa²h	
LZpeak (max)	2019-08-07 05:11:19	89.0 dB
LASmax	2019-08-07 05:16:08	59.6 dB
LASmin	2019-08-07 05:14:04	39.7 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedance Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 135.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 137.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 140.0 dB (Exceedance Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**
	55.9	-99.9	45.9	55.9	-99.9	-99.9

LCeq	61.2 dB
LAeq	45.9 dB
LCeq - LAeq	15.3 dB
LAIeq	47.9 dB
LAeq	45.9 dB
LAIeq - LAeq	2.0 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	45.9		61.2			
LS(max)	59.6	2019/08/07 5:16:08				
LS(min)	39.7	2019/08/07 5:14:04				
LPeak(max)					89.0	2019/08/07 5:11:19

# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAS5.00	52.5 dB
LAS10.00	48.6 dB
LAS33.30	41.9 dB
LAS50.00	41.2 dB
LAS66.60	40.7 dB
LAS90.00	40.2 dB

Site Number: 3			
Recorded By: Jerry Aguirre			
Job Number: 2019-016.001			
Date: 8/22/2019			
Time: 11:50 a.m.			
Location: At the end of the cul-de-sac on Walnut Avenue.			
Source of Peak Noise: Lawn mower, people talking and vehicles on adjacent streets.			
Noise Data			
Leq (dB)	**Lmin (dB)**	**Lmax (dB)**	**Peak (dB)**
40.3	33.7	48.5	91.9

Equipment						
Category	**Type**	**Vendor**	**Model**	**Serial No.**	**Cert. Date**	**Note**
Sound	Sound Level Meter	**Larson Davis**	**LxT SE**	**0005120**	**6/04/2018**	
	Microphone	**Larson Davis**	**377B02**	**174464**	**5/31/2018**	
	Preamp	**Larson Davis**	**PRMLxT1L**	**042852**	**6/04/2018**	
	Calibrator	**Larson Davis**	**CAL200**	**14105**	**5/31/2018**	

Weather Data			
Est.	**Duration:** 10 minutes		**Sky:**Clear
	Note: dBA Offset = 0.05		**Sensor Height (ft):** 3.5 feet
	Wind Ave Speed (mph)	**Temperature (degrees Fahrenheit)**	**Barometer Pressure (hPa)**
	1-3 mph	88°	29.75

Photo of Measurement Location

Summary

File Name on Meter	LxT_Data.135
File Name on PC	SLM_0005120_LxT_Data_135.00.ldbin
Serial Number	0005120
Model	SoundExpert® LxT
Firmware Version	2.302
User	Jerry Aguirre
Location	Redlands, CA
Job Description	Palm Avenue Residential
Note	

Measurement

Description	
Start	2019-08-07 05:23:45
Stop	2019-08-07 05:33:45
Duration	00:10:00.0
Run Time	00:10:00.0
Pause	00:00:00.0
Pre Calibration	2019-08-07 04:34:05
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Slow			
Preamp	PRMLxT1L			
Microphone Correction	Off			
Integration Method	Linear			
OBA Range	Low			
OBA Bandwidth	1/1 and 1/3			
OBA Freq. Weighting	A Weighting			
OBA Max Spectrum	Bin Max			
Overload	122.9 dB			
	A	**C**	**Z**	
Under Range Peak	79.2	76.2	**81.2**	dB
Under Range Limit	**27.2**	26.5	31.9	dB
Noise Floor	17.0	17.4	22.8	dB

Results

LAeq	40.3 dB	
LAE	68.1 dB	
EA	0.714 µPa²h	
LZpeak (max)	2019-08-07 05:26:05	91.9 dB
LASmax	2019-08-07 05:29:11	48.5 dB
LASmin	2019-08-07 05:33:39	33.7 dB
SEA	-99.9 dB	

LAS > 85.0 dB (Exceedance Counts / Duration)	0	0.0 s
LAS > 115.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 135.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 137.0 dB (Exceedance Counts / Duration)	0	0.0 s
LZpeak > 140.0 dB (Exceedance Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**
	50.3	-99.9	40.3	50.3	-99.9	-99.9

LCeq	55.7 dB
LAeq	40.3 dB
LCeq - LAeq	15.4 dB
LAIeq	41.5 dB
LAeq	40.3 dB
LAIeq - LAeq	1.2 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	40.3		55.7			
LS(max)	48.5	2019/08/07 5:29:11				
LS(min)	33.7	2019/08/07 5:33:39				
LPeak(max)					91.9	2019/08/07 5:26:05

# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s

Statistics

LAS5.00	44.8 dB
LAS10.00	44.0 dB
LAS33.30	40.2 dB
LAS50.00	38.5 dB
LAS66.60	37.1 dB
LAS90.00	34.9 dB