Noise Impact Assessment

Yucaipa Valley Water District 10 to 11 Pressure Zone Project

Yucaipa, California

Prepared For:

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

Term	Description
ANSI	American National Standards Institute
City	City of Calimesa
CNEL	Community Noise Equivalent Level
County	Riverside County
dB	Decibel
dBA	Decibel is A-weighted
FHWA	Federal Highway Administration
FICON	Federal Interagency Commission on Noise
FTA	Federal Transit Administration
HMMH	Harris Miller, Miller & Hanson Inc.
Hz	Hertz
ITE	Institute of Transportation Engineers
L_{eq}	Measure of ambient noise

LIST OF ACRONYMS AND ABBREVIATIONS

Term	Description
L_{dn}	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
L_{max}	The maximum A-weighted noise level during the measurement period
L_{min}	The maximum and minimum A-weighted noise level during the measurement period
OPR	Office of Planning and Research
OSHA	Federal Occupational Safety and Health Administration
PPV	Peak particle velocity
Project	10 to 11 Pressure Zone Project
RMS	Root mean square
VdB	Vibration Velocity Level
WEAL	Western Electro-Acoustic Laboratory, Inc.
WRWRF	Wocholz Regional Water Recycling Facility
YVWD	Yucaipa Valley Water District

1.0 INTRODUCTION

This report documents the results of a Noise Impact Assessment completed for the Yucaipa Valley Water District 10 to 11 Pressure Zone Project (Project), which proposes the expansion of a recycled water system in the City of Calimesa, California. This assessment was prepared as a comparison of predicted Project noise levels to noise standards promulgated by the City of Calimesa General Plan Noise Element and the City of Calimesa Municipal Code. The purpose of this report is to estimate Project-generated noise levels and to determine the level of impact the Project would have on the environment.

1.1 Project Location and Description

The Yucaipa Valley Water District (YVWD) proposes the expansion of the recycled water system within the City of Calimesa, Riverside County, California. This Project would extend the Zone 11 system to make recycled water service available for current and future customers and developments in the area, including the approved Mesa Verde Estates Specific Plan and Summerwind Ranch at Oak Valley Specific Plan. Specifically, the Proposed Project consists of a booster station and two recycled water reservoirs at two separate locations in Calimesa, approximately 2.2 miles northwest of Highway 60, and approximately 3.7 miles southwest of the foothills of the San Bernardino National Forest (Sections 14, 15, 22, and 23 of Township 2 South, Range 2 West of the Yucaipa and El Casco, California USGS 7.5-minute topographic quadrangle maps). Additionally, pipelines are proposed to connect the booster station and two recycled water reservoirs to planned and existing recycled water infrastructure. The City of Calimesa covers approximately 23.2 square miles, bordered by the City of Beaumont to the south and City of Yucaipa to the north (see Figure 1-1). The topography in the region consists of gently to moderately rolling hills and ridgelines, separated by broad valleys and narrow ravines, all scattered with oak trees and scrub vegetation. These valleys and ravines act as natural drainage courses and contain several streambeds.

The new recycled water booster station (R-10.3 Recycled Water Booster) is proposed to be located adjacent to two existing boosters at YVWD's Wochholz Regional Water Recycling Facility (WRWRF) located at 880 West County Line Road in Calimesa (see Figure 1-2). The two existing boosters include the R-10.3.1 and R-10.3.2 recycled water tanks, each with a capacity of one million gallons. These two boosters on-site pump to Zone 12. The proposed new R-10.3 Recycled Water Booster would be designed to pump to Zone 11 within the recycled water system. The existing electrical system at the site would be upgraded to accommodate for the new pumping equipment. No emergency backup generator would be required. Approximately 0.6 acre would be disturbed for the construction of the new R-10.3 Recycled Water Booster station. Approximately 234 linear feet of pipeline would be installed to connect the proposed R-10.3 Recycled Water Booster to the water system in the approved Mesa Verde Estates Specific Plan area (see Figure 1-3).

The new recycled water reservoirs (R-11.4 Recycled Water Reservoir Complex) are proposed to be located on undeveloped YVWD-owned property northeast of the intersection of Condit Avenue and Sharon Way in Calimesa (Figure 1-2). The R-11.4 Reservoir Complex would consist of a 5-million-gallon reservoir and a 5.5-million-gallon reservoir. The approximately 11.7-acre property is currently undeveloped. The elevation of the reservoir site would need to be adjusted to meet the existing high-water level of the existing Zone 11, but it is assumed that cut and fill would be balanced onsite and no soil import or export would be required.

Approximately 1,500 linear feet of pipeline would be installed in Condit Avenue and Sharon Way in order to connect the proposed R-11.4 Recycled Water Reservoir Complex to an existing recycled water system in Singleton Road (Figure 1-3).

It is anticipated that construction would take 2 years and would begin in early-to mid-2023.

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Map Date: 10/26/2022

Sources:

Figure 1-1. Project Vicinity

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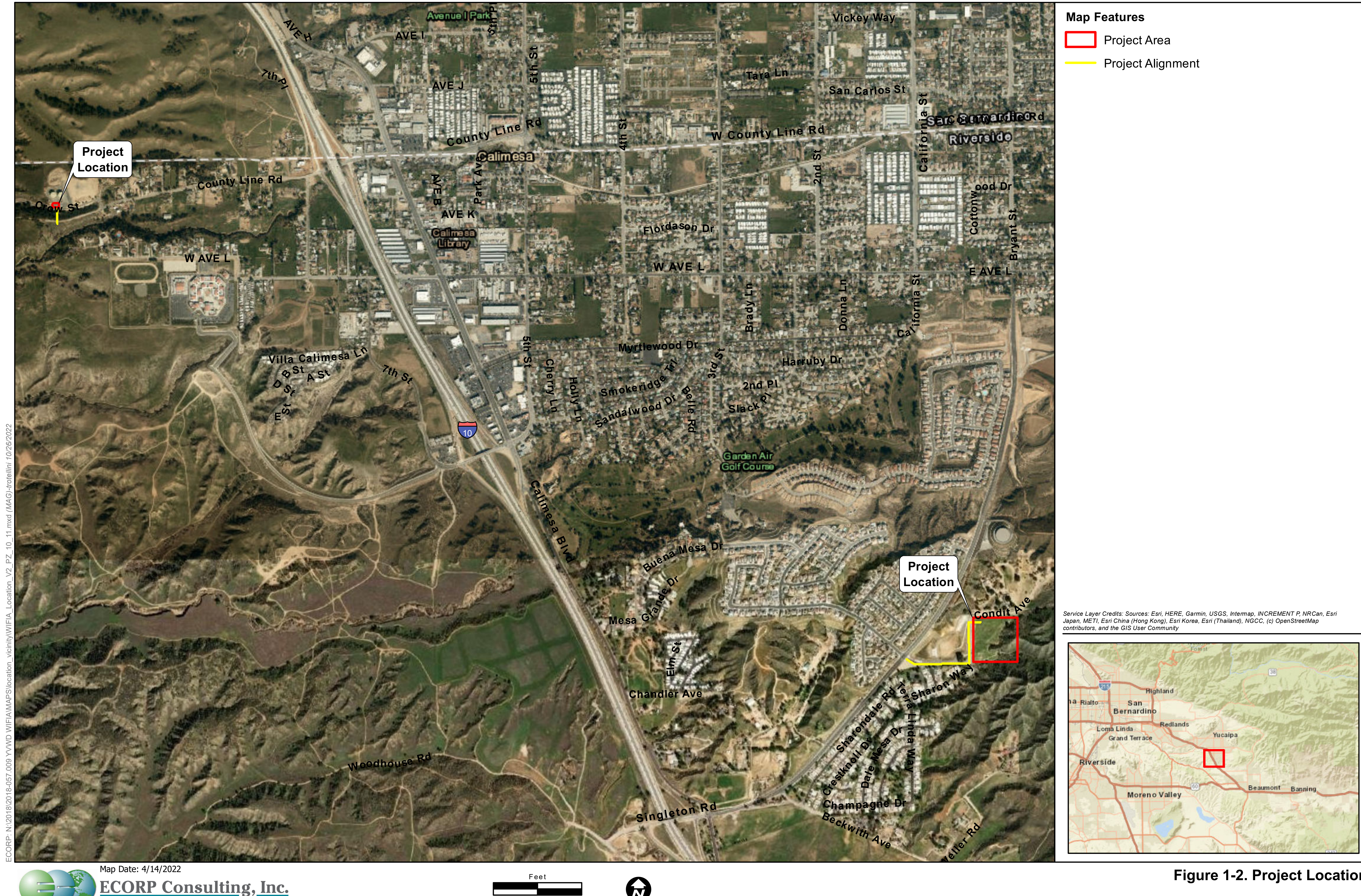
2018-057.009 YVWD WIFIA - Pressure Zone 10 to 11



Map Date: 4/14/2022

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Figure 1-2. Project Locations

2018-057.009 YVWD WIFIA - Pressure Zone 10 to 11

Map Features

- Project Area
- Project Alignment

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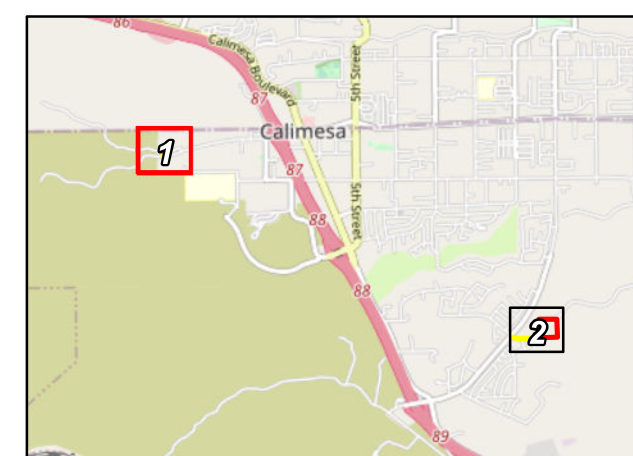

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Map Date: 10/26/2022

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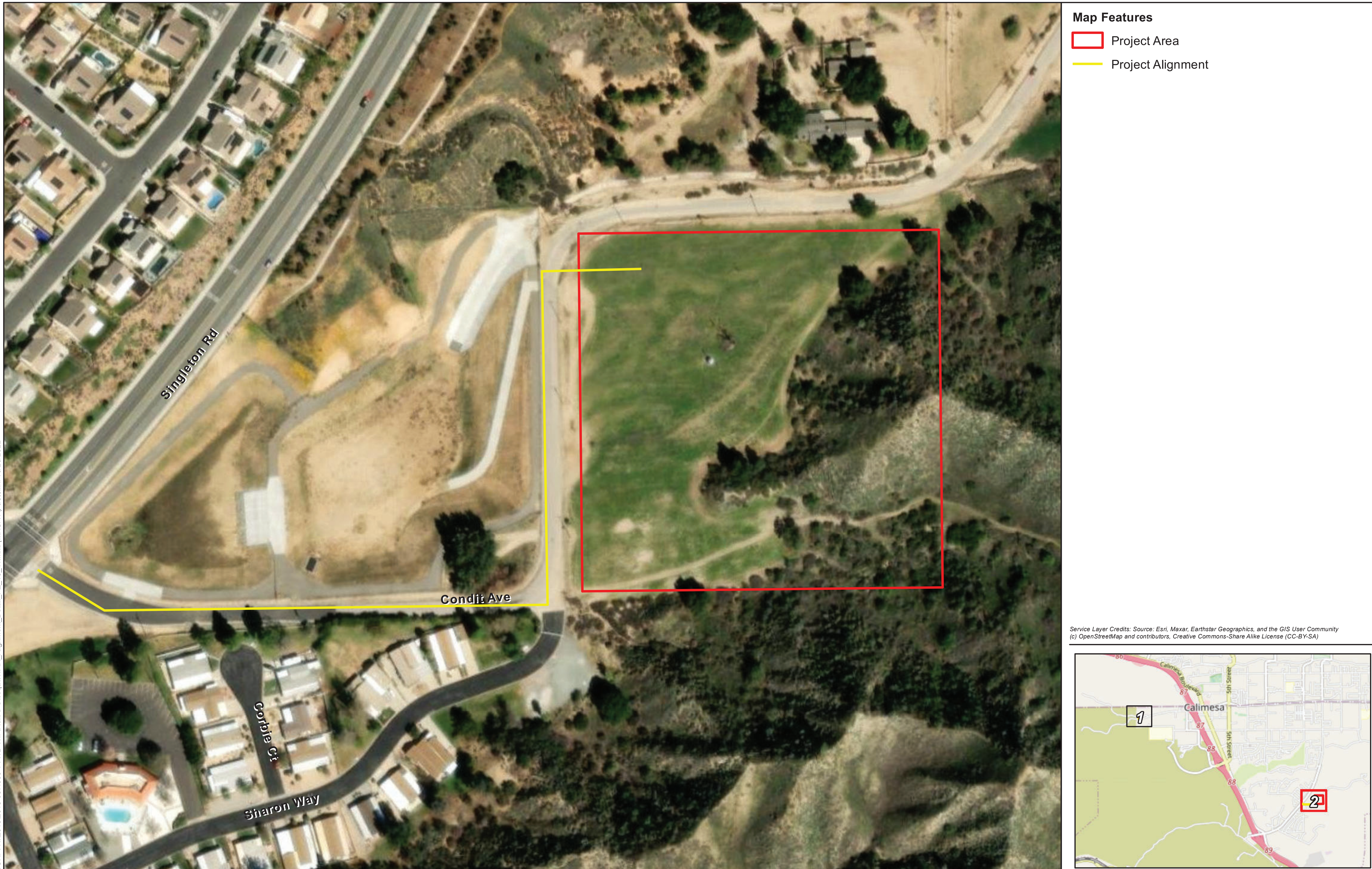
Scale in Feet
0 150

Figure 1-3. Project Alignment Detail
Sheet 1 of 2
2018-057.009 WIFIA Projects - Pressure Zone 10 to 11



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Map Date: 10/26/2022

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Scale in Feet
0 150

Figure 1-3. Project Alignment Detail Sheet 2 of 2

2018-057.009 WIFIA Projects - Pressure Zone 10 to 11

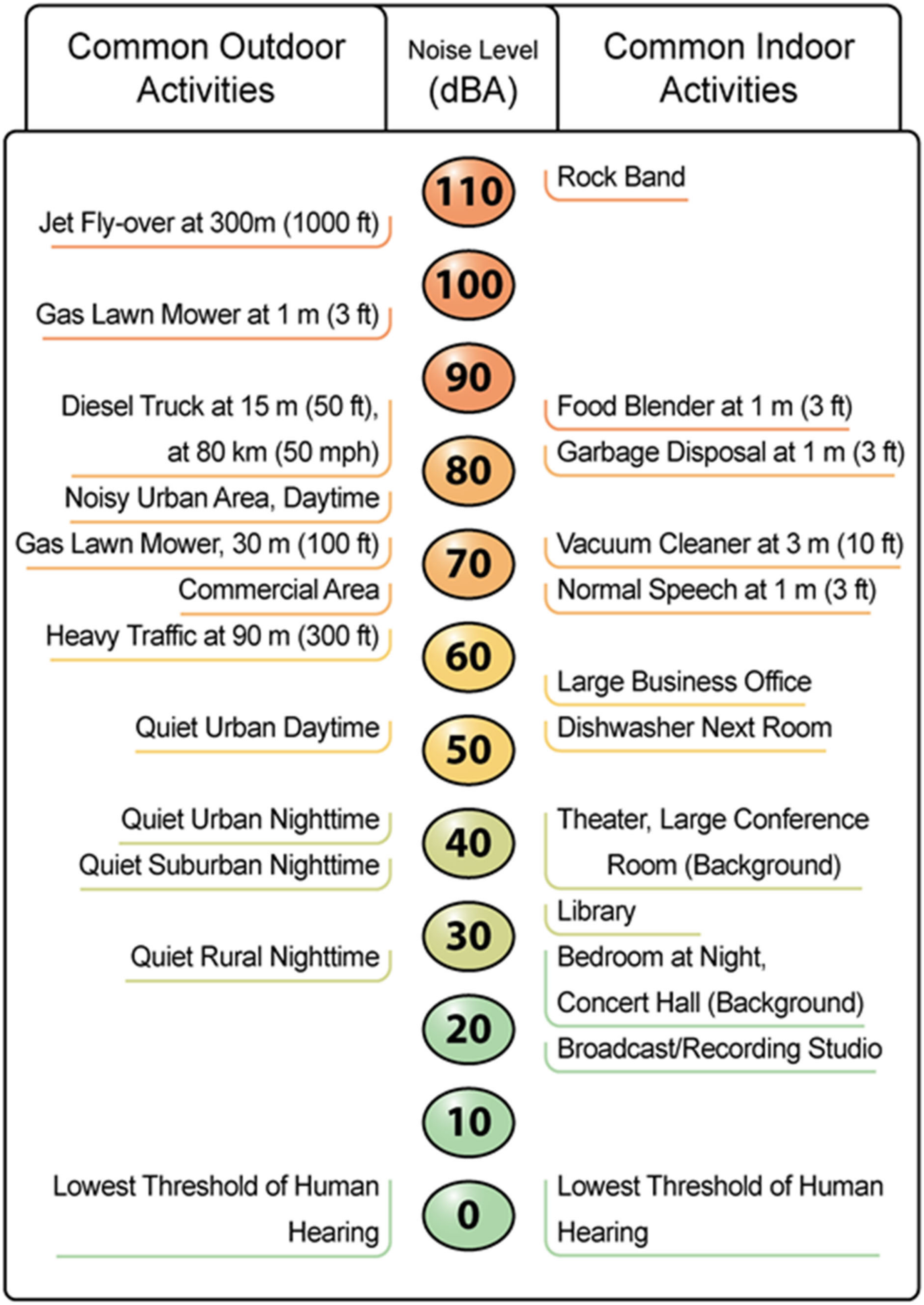
2.0 ENVIRONMENTAL NOISE AND GROUNDBORNE VIBRATION ANALYSIS

2.1 Fundamentals of Noise and Environmental Sound

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 three 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 three dB). Under the decibel scale, three sources of equal loudness together would produce an increase of five dB.

Typical noise levels associated with common noise sources are depicted in Figure 2-1.



Source: California Department of Transportation (Caltrans) 2020a

Figure 2-1. 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 six dB for each doubling of distance from a stationary or point source (FHWA 2017). 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 three dB for each doubling of distance from a line source, such as a roadway, depending on ground surface characteristics (Federal Highway Administration [FHWA] 2017). 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. For line sources, an overall attenuation rate of three dB per doubling of distance is assumed (FHWA 2011).

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 five 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. [WEAL] 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 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. 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 dBA Community Noise Equivalent Level (CNEL) to 65 dBA CNEL, interior noise levels can typically be maintained below 45 dBA, a typically residential interior noise standard, with the incorporation of an adequate forced air mechanical ventilation system in each residential building, 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 decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. 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 CNEL (Community Noise Equivalent Level) are measures of community noise. Each is applicable to this analysis and defined in Table 2-1.

Table 2-1. 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, 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 Leq 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 Leq 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 in the nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour Leq would result in a measurement of 66.4 dBA Ldn.
Community Noise Equivalent Level, CNEL	A 24-hour average Leq 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. The logarithmic effect of these additions is that a 60 dBA 24-hour Leq 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.
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.

The A weighted decibel 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 ±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 ±1 to 2 dBA.

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 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 A-weighted noise levels (dBA), 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

2.1.5.1 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.

2.1.5.2 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.

2.2 Fundamentals of Environmental Groundborne Vibration

2.2.1 Vibration Sources and Characteristics

Sources of earthborne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or manmade causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous (e.g., factory machinery) or transient (e.g., explosions).

Ground 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.

PPV is generally accepted as the most appropriate descriptor for evaluating the potential for building damage. For human response, however, an average vibration amplitude is more appropriate because it takes time for the human body to respond to the excitation (the human body responds to an average vibration amplitude, not a peak amplitude). Because the average particle velocity over time is zero, the RMS amplitude is typically used to assess human response. The RMS value is the average of the amplitude squared over time, typically a 1- sec. period (FTA 2018).

Table 2-2 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 2-2 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 which requires the use of heavy-duty earth moving equipment.

Table 2-2. 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	Threshold at which there is a risk of architectural damage to extremely fragile historic buildings, ruins, ancient monuments
0.1	92	Level at which continuous vibrations may begin to annoy people, particularly those involved in vibration sensitive activities	Threshold at which there is a risk of architectural damage to fragile buildings. Virtually no risk of architectural damage to normal buildings
0.25	94	Vibrations may begin to annoy people in buildings	Threshold at which there is a risk of architectural damage to historic and some old buildings
0.3	96	Vibrations may begin to feel severe to people in buildings	Threshold at which there is a risk of architectural damage to older residential structures
0.5	103	Vibrations considered unpleasant by people subjected to continuous vibrations	Threshold at which there is a risk of architectural damage to new residential structures and Modern industrial/commercial buildings

Source: Caltrans 2020b

3.0 EXISTING ENVIRONMENTAL NOISE SETTING

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 hospitals, historic sites, cemeteries, and certain 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 existing noise sensitive receptors to the R-10.3 Recycled Water Booster Project component and associated pipeline are residences located approximately 327 feet (100 meters) distant. The nearest sensitive receptors to the R-11.4 Recycled Water Reservoir Complex Project component and associated pipeline are residences located approximately 62 feet (19 meters) distant.

3.2 Existing Ambient Noise Environment

The most common and significant source of noise in the City of Calimesa is mobile noise generated by transportation-related sources. Motor vehicle noise is characterized by the number of vehicles generating engine and tire noise on local roads and freeways, which often creates a higher sustained noise level in proximity to areas sensitive to noise exposure. Transit associated with bus service in the city is a small part of the transportation noise environment. Railway noise affects a small portion of Calimesa near the rail lines in San Timoteo Canyon. Other sources of noise are the various land uses (i.e., industrial facilities, agricultural uses, residential and commercial) that generate stationary-source noise.

3.2.1 Existing Ambient Noise Measurements

The American National Standards Institute (ANSI) Standard 12.9-2013/Part 3 "Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-Term Measurements with an Observer Present" provides a table of approximate background sound levels in L_{dn}, daytime L_{eq}, and nighttime L_{eq}, based on land use and population density. The ANSI standard estimation divides land uses into six distinct categories. Descriptions of these land use categories, along with the typical daytime and nighttime levels, are provided in Table 3-1. At times, one could reasonably expect the occurrence of periods that are both louder and quieter than the levels listed in the table. ANSI notes, "95% prediction interval [confidence interval] is on the order of +/- 10 dB." The majority of the Project Area would be considered ambient noise Category 5 or 6.

Table 3-1. ANSI Standard 12.9-2013/Part 3 A-weighted Sound Levels Corresponding to Land Use and Population Density						
Category	**Land Use**	**Description**	**People per Square Mile**	**Typical L_{dn}**	**Daytime L_{eq}**	**Nighttime L_{eq}**
1	Noisy Commercial & Industrial Areas and Very Noisy Residential Areas	Very heavy traffic conditions, such as in busy, downtown commercial areas; at intersections for mass transportation or other vehicles, including elevated trains, heavy motor trucks, and other heavy traffic; and at street corners where many motor buses and heavy trucks accelerate.	63,840	67 dBA	66 dBA	58 dBA
2	Moderate Commercial & Industrial Areas and Noisy Residential Areas	Heavy traffic areas with conditions similar to Category 1, but with somewhat less traffic; routes of relatively heavy or fast automobile traffic, but where heavy truck traffic is not extremely dense.	20,000	62 dBA	61 dBA	54 dBA
3	Quiet Commercial, Industrial Areas and Normal Urban & Noisy Suburban Residential Areas	Light traffic conditions where no mass-transportation vehicles and relatively few automobiles and trucks pass, and where these vehicles generally travel at moderate speeds; residential areas and commercial streets, and intersections, with little traffic, compose this category.	6,384	57 dBA	55 dBA	49 dBA
4	Quiet Urban & Normal Suburban Residential Areas	These areas are similar to Category 3, but for this group, the background is either distant traffic or is unidentifiable; typically, the population density is one-third the density of Category 3.	2,000	52 dBA	50 dBA	44 dBA
5	Quiet Residential Areas	These areas are isolated, far from significant sources of sound, and may be situated in shielded areas, such as a small wooded valley.	638	47 dBA	45 dBA	39 dBA
6	Very Quiet Sparse Suburban or rural Residential Areas	These areas are similar to Category 4 but are usually in sparse suburban or rural areas; and, for this group, there are few if any nearby sources of sound.	200	42 dBA	40 dBA	34 dBA

Source: The American National Standards Institute (ANSI) 2013

4.0 REGULATORY FRAMEWORK

4.1 Federal

4.1.1 Occupational Safety and Health Act of 1970

OSHA regulates onsite noise levels and protects workers from occupational noise exposure. To protect hearing, worker noise exposure is limited to 90 decibels with A-weighting (dBA) over an eight-hour work shift (29 Code of Regulations 1910.95). Employers are required to develop a hearing conservation program when employees are exposed to noise levels exceeding 85 dBA. These programs include provision of hearing protection devices and testing employees for hearing loss on a periodic basis.

4.1.2 U.S. Environmental Protection Agency Office of Noise Abatement and Control

The U.S. Environmental Protection Agency (USEPA) Office of Noise Abatement and Control was originally established to coordinate Federal noise control activities. In 1981, USEPA administrators determined that subjective issues such as noise would be better addressed at more local levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to State and local governments. However, documents and research completed by the EPA Office of Noise Abatement and Control continue to provide value in the analysis of noise effects.

4.2 State

4.2.1 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.

4.2.2 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.

4.2.3 California Department of Transportation

In 2020, the California Department of Transportation (Caltrans) published the Transportation and Construction Vibration Manual (Caltrans 2020b). The manual provides general guidance on vibration issues associated with the construction and operation of projects concerning human perception and structural damage. Table 2-2 presents recommendations for levels of vibration that could result in damage to structures exposed to continuous vibration.

4.3 Local

4.3.1 City of Calimesa General Plan

Chapter 9 of the City of Calimesa General Plan addresses noise-related issues within the community. Noise goals and policies are in place to work to maintain a community free from excessive noise. The following policies are applicable to the Proposed Project:

Policy N-10: When making decisions regarding changes to the General Plan or Zoning Maps, or regarding the suitability of a proposed use, the standards in [Table 4-1] (below) shall apply.

Table 4-1. Noise Standards for New Uses Affected by Traffic and Railroad Noise

Land Use Designation	Completely Compatible	Tentatively Compatible	Normally Incompatible	Completely Incompatible
All Residential (Single-, And Multi-Family)	Less than 60 dBA	60-70 dBA	70-75 dBA	Greater than 75 dBA
All Nonresidential (Commercial, Industrial & Institutional)	Less than 70 dBA	70-75 dBA	Greater than 75 dBA	(1)
Public Parks (Lands on which public parks are located or planned)	Less than 65 dBA	65-70 dBA	70-75 dBA	Greater than 75 dBA

Source: City of Calimesa 2014
Notes: *An exterior noise level up to 65 dBA will be allowed, provided exterior noise levels are substantially mitigated through the reasonable use of best available noise reduction technology and interior noise does not exceed 45 dBA with windows and doors closed.
(1): To be determined as part of the project review process

4.3.2 City of Calimesa Municipal Code

The City regulates construction noise in its Municipal Code. Chapter 8.15.080 of the City of Calimesa's Municipal Code states: "Construction equipment can operate Monday through Friday from 7:00 a.m. to 7:00 p.m., Saturday and Sundays from 10:00 a.m. to 5:00 p.m. and holidays, as set forth in section 8.15.080(A). No equipment, or a combination of equipment regardless of age or date of acquisition, shall be operated so as to cause noise at a level in excess of 75 decibels for more than eight hours during any 24-hour period when measured at or within the property lines of any property which is developed and used either in part or in whole for residential purposes. Should the Project exceed the standards of the Municipal Code, it is under the jurisdiction of Code Enforcement to respond to any complaints regarding noise from the project construction.

5.0 IMPACT ASSESSMENT

5.1 Thresholds of Significance

The impact analysis provided below is based on the following California Environmental Quality Act Guidelines Appendix G thresholds of significance. The Project would result in a significant noise-related impact if it would produce:

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, the City and County noise standards were used, where applicable, for evaluation of Project-related noise impacts and are discussed further below.

5.2 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). Groundborne vibration levels associated with construction-related activities for the Project were evaluated utilizing typical groundborne vibration levels associated with construction equipment. Potential groundborne vibration impacts related to structural damage and human annoyance were evaluated, taking into account the distance from construction activities to nearby structures and typically applied criteria for structural damage and human annoyance. Operational noise is addressed qualitatively.

5.3 Impact Analysis

5.3.1 Project Noise

5.3.1.1 Would the Project Result in Short-Term Construction-Generated Noise in Excess of 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., land clearing, grading, excavation, 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 land uses in the vicinity of the construction site.

The nearest existing noise sensitive receptors to the R-10.3 Recycled Water Booster Project component and associated pipeline are residences located approximately 327 feet (100 meters) distant. The nearest sensitive receptors to the R-11.4 Recycled Water Reservoir Complex Project component and associated pipeline are residences located approximately 62 feet (19 meters) distant. As previously described, Chapter 8.15.080 of the City of Calimesa's Municipal Code states: "Construction equipment can operate Monday through Friday from 7:00 a.m. to 7:00 p.m., Saturday and Sundays from 10:00 a.m. to 5:00 p.m. and holidays, as set forth in section 8.15.080(A). The Project would be required to comply with this Municipal Code requirement.

Onsite Construction Noise

To estimate the worst-case onsite construction noise levels that may occur at the nearest noise-sensitive receptor in the Project vicinity in order to evaluate the potential health-related effects (physical damage to the ear) from construction noise, the construction equipment noise levels were calculated using the Roadway Noise Construction Model and compared against the thresholds for construction noise are addressed in the City's Municipal Code. As stated in Chapter 8.15.080 of the City of Calimesa's Municipal Code, no equipment, or a combination of equipment regardless of age or date of acquisition, shall be operated so as to cause noise at a level in excess of 75 dB for more than eight hours during any 24-hour period when measured at or within the property lines of any property which is developed and used either in part or in whole for residential purposes.

The anticipated short-term construction noise levels generated for both the R-10.3 Recycled Water Booster component and associated pipeline with the nearest sensitive receptors 327 feet distant and the R-11.4 Recycled Water Reservoir Complex component and associated pipeline with the nearest sensitive receptors 62 feet distant were calculated using the Roadway Noise Construction Model. Construction at both of the Project Sites would include excavation, site preparation, grading, building construction, pipeline installation, and paving. It is acknowledged that the majority of construction equipment is not situated at any one location during construction activities, but rather spread throughout the construction site and at various distances from sensitive receptors. The anticipated short-term construction noise levels generated for the necessary equipment is presented in Table 5-1.

Table 5-1. Construction Average (dBA) Noise Levels at Nearest Receptor- Project Site			
Equipment	**Estimated Exterior Construction Noise Level at Nearest Residences**	**Construction Noise Standards (dBA L_{eq})**	**Exceeds Standards?**
R-10.3 Recycled Water Booster & Pipeline			
Excavation			
Combined Excavation Equipment	**65.4**	*75*	**No**
Site Preparation			
Combined Site Preparation Equipment	**69.4**	*75*	**No**
Grading			
Combined Grading Equipment	**73.0**	*75*	**No**
Facility Implementation			
Combined Facility Implementation Equipment	**73.4**	*75*	**No**
Paving			
Combined Pipeline Installation Equipment	**71.4**	*75*	**No**
R-11.4 Recycled Water Reservoir Complex & Pipeline			
Excavation			
Combined Excavation Equipment	**79.8**	*75*	**Yes**
Site Preparation			
Combined Site Preparation Equipment	**88.2**	*75*	**Yes**
Grading			
Combined Grading Equipment	**88.2**	*75*	**Yes**
Facility Implementation			
Combined Implementation Equipment	**89.2**	*75*	**Yes**
Paving			
Combined Paving Equipment	**87.1**	*75*	**Yes**

Source: Construction noise levels were calculated by ECORP Consulting using the FHWA Roadway Noise Construction Model (FHWA 2006). Refer to Attachment A for Model Data Outputs.

Notes: Construction equipment used during construction derived from the Roadway Construction Emissions Model and California Emissions Estimator Model. These models are designed to calculate air pollutant emissions from construction activity and contains default construction equipment and usage parameters for typical construction projects based on several construction surveys conducted in order to identify such parameters.

L_{eq} = The equivalent energy noise level, is 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.

As shown in Table 5-1, the threshold of 75 dBA L_{eq} would be exceeded at the nearest sensitive receptors to the R-11.4 Recycled Water Reservoir Complex and associated pipeline component construction site. It is noted that construction noise was modeled on a worst-case basis. It is very unlikely that all pieces of construction equipment would be operating at the same time for the various phases of Project construction as well as at the point closest to residences.

Mitigation is required to reduce construction noise to levels below this threshold. Temporary noise barriers or enclosures can provide a sound reduction of 35 dBA or greater (WEAL 2000). To be effective, 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 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. In the case of Project construction, construction noise mitigation would only be necessary at the R-11.4 Recycled Water Reservoir Complex and associated pipeline construction site since that is the component of the Project that is predicted to exceed City noise standards during construction. The following best management practices at the R-11.4 Recycled Water Reservoir Complex and associated pipeline construction site are recommended.

Measure NOI-1: The following measures shall be applied to Project construction at the R-11.4 Recycled Water Reservoir Complex and associated pipeline:

1. All construction equipment, fixed or mobile, will be equipped with properly operating and maintained mufflers, consistent with manufacturer standards.

2. All stationary construction equipment will be placed so that emitted noise is directed away from the noise sensitive receptors nearest the Project Site.

3. As applicable, shut off all equipment when not in use.

4. Equipment staging shall be located in areas that create the greatest distance between construction-related noise/vibration sources and sensitive receptors surrounding the Project Site.

5. All other portable stationary noise sources (e.g., jackhammers, pneumatic equipment, excavators, drill rigs) will be screened from sensitive receptors in a manner that breaks the line of sight between the construction equipment and these residences. Temporary noise barriers/enclosures shall have a sound transmission class (STC) of 10 or greater in accordance with American Society for Testing and Materials Test Method E90, or at least 2 pounds per square foot to ensure adequate transmission loss characteristics. The temporary noise barrier can consist of a solid plywood fence at least 7/16-inch in thickness and/or flexible sound curtains, such as an 18-ounce tarp or a 2-inch-thick fiberglass blanket, attached to chain link fencing. The length, height, and location of the temporary noise barrier shall be adequate to assure proper acoustical performance. Specifically, the barrier must completely break the line of sight between the construction site and the residences south of Condit Avenue, must be

free of degrading holes or gaps and must not be flanked by nearby reflective surfaces. All noise control barrier walls/enclosures shall be designed to preclude structural failure due to such factors as winds, shear, shallow soil failure, earthquakes, and erosion. .

6. No amplified music and/or voice will be allowed on the construction site.

Timing/Implementation:	*During R-11.4 Recycled Water Reservoir Complex and Associated Pipeline Construction*
Monitoring/Enforcement:	*Yucaipa Valley Water District*

Implementation of mitigation measures NOI-1 would substantially reduce construction-generated noise levels. As previously described, noise barriers or enclosures such as that recommended in mitigation measure NOI-1 can provide a sound reduction 35 dBA or greater (WEAL 2000), which would be a reduction robust enough to maintain construction noise levels less than 75 dBA. Therefore, Project construction activities would not expose persons to and generate noise levels in excess of the City's threshold, and therefore would not result in noise-related health effects.

Offsite Construction Worker Traffic Noise

Project construction would result in minimal additional traffic on adjacent roadways over the time period that construction occurs. According to the Roadway Construction Emissions Model and California Emissions Estimator Model, which were used to predict the number of construction related automobile trips, the maximum number of construction-related trips traveling to and from the R-10.3 Recycled Water Booster component at 880 West County Line Road during a single construction phase would not be expected to exceed 105 daily trips in total (76 construction worker trips and 29 haul truck trips). The maximum number of construction-related trips traveling to and from the R-11.4 Recycled Water Reservoir Complex component at the northeast of the intersection of Condit Avenue and Sharon Way would not be expected to exceed 216 daily trips in total (170 construction worker trips and 46 haul truck trips). The worker trips would largely occur within two distinct segments of the day, the morning and afternoon, while the haul trips would occur intermittently throughout the workday.

According to the Caltrans *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (2013), doubling of traffic on a roadway is required to result in an increase of 3 dB (outside of the laboratory, a 3-dBA change is considered a just-perceivable difference). The majority of this construction-related traffic trips would access the R-10.3 Recycled Water Booster Project Site via West County Line Road and the R-11.4 Recycled Water Reservoir Complex from Singleton Road. According to the City of Calimesa General Plan, both West County Line Road and Singleton Road are classified as a Secondary Arterial roadways. Arterials are major through roads that are expected to carry large volumes of traffic. Arterials are often divided into primary and secondary arterials. The Calimesa General Plan defines Secondary Arterials as "roadways that provide a 72-foot curb-to-curb within an 88-foot-right-of-way. This is a sufficient width to provide two through lanes in each direction (plus a center left turn lane) without parking, or one lane in each direction (plus a center left turn lane) with parking. Secondary Arterials would function in a similar manner to Major Arterials except that Secondary Arterials carry less total traffic, less non-local through traffic, and a relatively greater proportion of local traffic. Secondary Arterials are typically spaced at half-mile intervals between Major Arterials, or where appropriate, depending on geographic and land use conditions." The addition of 105 daily trips on the Secondary Arterial, West County Line Road and 216 daily trips on the Secondary Arterial, Singleton Road would not result in a doubling of traffic on any of these facilities as they are major through roads that carry large volumes of traffic. Therefore, Project construction's contribution to existing traffic noise would not be perceptible.

Additionally, it is noted that construction is temporary, and the trips generated from construction would cease upon completion of the Project.

5.3.1.2 Would the Project Result in a Substantial Permanent Increase in Ambient Noise Levels in Excess of County or City Standards During Operations?

As previously described, 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. The nearest existing noise sensitive receptors to the R-10.3 Recycled Water Booster Project component and associated pipeline are residences located approximately 327 feet (100 meters) distant. The nearest sensitive receptors to the R-11.4 Recycled Water Reservoir Complex Project component and associated pipeline are residences located approximately 62 feet (19 meters) distant.

Operational noise sources associated with the Project would largely come from the installation of the new booster pumps at the R-10.3 Recycled Water Booster component at 880 West County Line Road.

Operational Offsite Traffic Noise

Project operations would result in minimal additional traffic on adjacent roadways. The only visitors to the site would be repair or maintenance workers, whose presence at the site would be required infrequently and inconsistently. According to the California Department of Transportation (Caltrans) *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (2013), doubling of traffic on a roadway is required to result in an increase of 3 dB (outside of the laboratory, a 3-dBA change is considered a just-perceivable difference). Proposed Project operations would not result in a doubling of traffic on vicinity roadways, and therefore its contribution to existing traffic noise would not be perceptible.

Operational Onsite Stationary Noise

While the installation of the new booster pumps would result in an increase in noise, the new booster pumps would be located on a property with existing booster pumps already operating. Therefore, the Project noise source would emit a sound power with the same amplitude and frequency as already emitted at the R-10.3 Recycled Water Booster site. According to the Caltrans *Technical Noise Supplement to the Traffic Noise Analysis Protocol* (2013), the addition of a new noise source to other existing noise sources emitting the same level of sound would result in the increase of ambient noise of 3 dBA, at the source. As previously described, a 3-dBA change is considered a just-perceivable difference outside of the laboratory. It is further noted that the nearest sensitive receptors to the new boosters would be located more than 530 feet distant.

Therefore, the proposed new boosters at the R-10.3 Recycled Water Booster component at 880 West County Line Road would result in a negligible increase in noise levels beyond what is already being experienced.

5.3.2 Project Groundborne Vibration

5.3.2.1 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 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. 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 at 25 feet distant are summarized in Table 5-2.

Table 5-2. Representative Vibration Source Levels 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
Hoe Ram	0.089
Jackhammer	0.035
Small Bulldozer/Tractor	0.003
Vibratory Roller	0.210

Source: FTA 2018; Caltrans 2020b

The City does not have a numeric threshold associated with construction vibrations. However, a discussion of construction vibration is included for full disclosure purposes. For comparison purposes, the Caltrans (2020b) recommended standard of 0.3 inches per second PPV 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. Consistent with FTA recommendations for calculating vibration generated from construction equipment, construction vibration was measured from the center of the

Project Site (FTA 2018). The nearest structure of concern to either of the two Project construction sites are residences 68 feet south of Condit Avenue. These structures could be potentially impacted by construction occurring at the R-11.4 Recycled Water Reservoir Complex and associated pipeline site.

Based on the representative vibration levels presented for various construction equipment types in Table 5-2 and the construction vibration assessment methodology published by the FTA (2018), it is possible to estimate the potential Project construction vibration levels. The FTA provides the following equation:

$$[PPVequip = PPVref \times (25/D)^{1.5}].$$

Table 5-3 presents the expected Project related vibration levels at a distance of 68 feet.

Table 5-3. Onsite Construction Vibration Levels at 68 Feet

Receiver PPV Levels (in/sec)[1]					Peak Vibration	Threshold	Exceed Threshold
Large Bulldozer, Caisson Drilling, & Hoe Ram	**Loaded Trucks**	**Jackhammer**	**Small Bulldozer**	**Vibratory Roller**			
0.02	0.02	0.01	0.00	0.05	**0.05**	0.3	**No**

Notes: [1]Based on the Vibration Source Levels of Construction Equipment included on Table 5-2 (FTA 2018). Distance to the nearest structure of concern is approximately 68 feet.

As shown in Table 5-3, vibration as a result of onsite construction activities on the Project Site would not exceed 0.3 PPV at the nearest structures. Thus, onsite Project construction would not exceed the threshold.

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

Project operations would result in minimal additional traffic on adjacent roadways. The only visitors to the site would be repair or maintenance workers, whose presence at the site would be required infrequently and inconsistently. The maintenance associated with the Project would not result in measurable amounts of vibration. Therefore, the Project would result in negligible groundborne vibration impacts during operations.

5.3.3 Excess Airport Noise

5.3.3.1 Would the Project Expose People Residing or Working in the Project area to Excessive Airport Noise?

The Project Site is located approximately ten miles southwest of the Redlands Municipal Airport. According to Figure 3B, *Aircraft Noise Concerns*, of the Redlands Municipal Airport Land Use Compatibility Plan, the

Project Site is located outside of noise contours. Thus, the Proposed Project would not expose people working on the Project Site to excess airport noise levels.

6.0 REFERENCES

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LIST OF ATTACHMENTS

ATTACHMENT A

Federal Highway Administration Roadway Construction Noise Model Outputs – Project Construction

Roadway Construction Noise Model Outputs: R-10.3 Recycled Water Booster & Pipeline

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/7/2022
Case Description: **YVWD 10 to 11 Pressure Zone - R-10.3 Recycled Water Booster & Pipeline**

Description	**Land Use**
Demolition/Excavation	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		327	0
Excavator	No	40		80.7	327	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Tractor		67.7	63.7
Excavator		64.4	60.4
	Total	67.7	**65.4**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/7/2022
Case Description: **YVWD 10 to 11 Pressure Zone - R-10.3 Recycled Water Booster & Pipeline**

Description	**Land Use**
Site Preparation	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		327	0
Excavator	No	40		80.7	327	0
Grader	No	40	85		327	0
Tractor	No	40	84		327	0

Results

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Tractor		67.7	63.7
Excavator		64.4	60.4
Grader		68.7	64.7
Tractor		67.7	63.7
	Total	68.7	**69.4**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	11/7/2022
Case Description:	**YVWD 10 to 11 Pressure Zone - R-10.3 Recycled Water Booster & Pipeline**

Description	**Land Use**
Grading	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		327	0
Tractor	No	40	84		327	0
Tractor	No	40	84		327	0
Excavator	No	40		80.7	327	0
Excavator	No	40		80.7	327	0
Excavator	No	40		80.7	327	0
Grader	No	40	85		327	0
Roller	No	20		80	327	0
Roller	No	20		80	327	0
Dozer	No	40		81.7	327	0
Scraper	No	40		83.6	327	0
Scraper	No	40		83.6	327	0

Results

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Tractor		67.7	63.7
Tractor		67.7	63.7
Tractor		67.7	63.7
Excavator		64.4	60.4
Excavator		64.4	60.4
Excavator		64.4	60.4
Grader		68.7	64.7
Roller		63.7	56.7
Roller		63.7	56.7
Dozer		65.4	61.4
Scraper		67.3	63.3
Scraper		67.3	63.3
	Total	68.7	**73**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	11/7/2022
Case Description:	**YVWD 10 to 11 Pressure Zone - R-10.3 Recycled Water Booster & Pipeline**

Description	**Land Use**
Implementation	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		327	0
Tractor	No	40	84		327	0
Scraper	No	40		83.6	327	0
Scraper	No	40		83.6	327	0
Gradall	No	40		83.4	327	0
Pavement Scarafier	No	20		89.5	327	0
Grader	No	40	85		327	0
Generator	No	50		80.6	327	0
Gradall	No	40		83.4	327	0
Crane	No	16		80.6	327	0

Results

	Calculated (dBA)	
Equipment	***Lmax**	**Leq**
Tractor	67.7	63.7
Tractor	67.7	63.7
Scraper	67.3	63.3
Scraper	67.3	63.3
Gradall	67.1	63.1
Pavement Scarafier	73.2	66.2
Grader	68.7	64.7
Generator	64.3	61.3
Gradall	67.1	63.1
Crane	64.2	56.3
Total	73.2	**73.4**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/7/2022
Case Description: **YVWD 10 to 11 Pressure Zone - R-10.3 Recycled Water Booster & Pipeline**

Description	**Land Use**
Paving	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Concrete Mixer Truck	No	40		78.8	327	0
Concrete Mixer Truck	No	40		78.8	327	0
Concrete Mixer Truck	No	40		78.8	327	0
Concrete Mixer Truck	No	40		78.8	327	0
Paver	No	50		77.2	327	0
Pavement Scarafier	No	20		89.5	327	0
Roller	No	20		80	327	0
Roller	No	20		80	327	0
Roller	No	20		80	327	0
Tractor	No	40	84		327	0
Tractor	No	40	84		327	0

Results

Calculated (dBA)

Equipment	***Lmax**	**Leq**
Concrete Mixer Truck	62.5	58.5
Concrete Mixer Truck	62.5	58.5
Concrete Mixer Truck	62.5	58.5
Concrete Mixer Truck	62.5	58.5
Paver	60.9	57.9
Pavement Scarafier	73.2	66.2
Roller	63.7	56.7
Roller	63.7	56.7
Roller	63.7	56.7
Tractor	67.7	63.7
Tractor	67.7	63.7
Total	73.2	**71.4**

*Calculated Lmax is the Loudest value.

ROADWAY CONSTRUCTION NOISE MODEL OUTPUTS: R-11.4 RECYCLED WATER RESERVOIR COMPLEX & PIPELINE

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/7/2022
Case Description: **YVWD 10 to 11 Pressure Zone - R-11.4 Recycled Water Reservoir Complex**

Description	**Land Use**
Demolition/Excavation	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		62	0
Excavator	No	40		80.7	62	0

Results

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Tractor		82.1	78.2
Excavator		78.8	74.9
	Total	82.1	**79.8**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	11/7/2022
Case Description:	**YVWD 10 to 11 Pressure Zone - R-11.4 Recycled Water Reservoir Complex**

Description	**Land Use**
Site Preparation	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Excavator	No	40		80.7	62	0
Dozer	No	40		81.7	62	0
Dozer	No	40		81.7	62	0
Dozer	No	40		81.7	62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Scraper	No	40		83.6	62	0

Results

Calculated (dBA)

Equipment		***Lmax**	**Leq**
Tractor		82.1	78.2
Tractor		82.1	78.2
Tractor		82.1	78.2
Tractor		82.1	78.2
Tractor		82.1	78.2
Excavator		78.8	74.9
Dozer		79.8	75.8
Dozer		79.8	75.8
Dozer		79.8	75.8
Scraper		81.7	77.7
	Total	82.1	**88.2**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/7/2022
Case Description: **YVWD 10 to 11 Pressure Zone - R-11.4 Recycled Water Reservoir Complex**

Description	**Land Use**
Grading	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Excavator	No	40		80.7	62	0
Excavator	No	40		80.7	62	0
Excavator	No	40		80.7	62	0
Grader	No	40	85		62	0
Roller	No	20		80	62	0
Roller	No	20		80	62	0
Dozer	No	40		81.7	62	0
Dozer	No	40		81.7	62	0
Scraper	No	40		83.6	62	0
Scraper	No	40		83.6	62	0

Results

Calculated (dBA)

Equipment	***Lmax**	**Leq**
Tractor	82.1	78.2
Tractor	82.1	78.2
Tractor	82.1	78.2
Tractor	82.1	78.2
Excavator	78.8	74.9
Excavator	78.8	74.9
Excavator	78.8	74.9
Grader	83.1	79.2
Roller	78.1	71.1
Roller	78.1	71.1
Dozer	79.8	75.8
Dozer	79.8	75.8
Scraper	81.7	77.7
Scraper	81.7	77.7
Total	83.1	**88.2**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	11/7/2022
Case Description:	**YVWD 10 to 11 Pressure Zone - R-11.4 Recycled Water Reservoir Complex**

Description	**Land Use**
Implementation	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Compressor (air)	No	40		77.7	62	0
Crane	No	16		80.6	62	0
Gradall	No	40		83.4	62	0
Gradall	No	40		83.4	62	0
Generator	No	50		80.6	62	0
Generator	No	50		80.6	62	0
Pavement Scarafier	No	20		89.5	62	0
Scraper	No	40		83.6	62	0
Scraper	No	40		83.6	62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0
Welder / Torch	No	40		74	62	0
Scraper	No	40		83.6	62	0
Gradall	No	40		83.4	62	0
Gradall	No	40		83.4	62	0

Results

Calculated (dBA)

Equipment	***Lmax**	**Leq**
Compressor (air)	75.8	71.8
Crane	78.7	70.7
Gradall	81.5	77.6
Gradall	81.5	77.6
Generator	78.8	75.8
Generator	78.8	75.8
Pavement Scarafier	87.6	80.6
Scraper	81.7	77.7
Scraper	81.7	77.7
Tractor	82.1	78.2
Tractor	82.1	78.2
Tractor	82.1	78.2
Welder / Torch	72.1	68.2
Scraper	81.7	77.7
Gradall	81.5	77.6
Gradall	81.5	77.6
Total	87.6	**89.2**

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/7/2022
Case Description: **YVWD 10 to 11 Pressure Zone - R-11.4 Recycled Water Reservoir Complex**

Description	**Land Use**
Paving	Residential

Description	**Impact Device**	**Usage(%)**	**Equipment Spec Lmax (dBA)**	**Actual Lmax (dBA)**	**Receptor Distance (feet)**	**Estimated Shielding (dBA)**
Concrete Mixer Truck	No	40		78.8	62	0
Concrete Mixer Truck	No	40		78.8	62	0
Paver	No	50		77.2	62	0
Pavement Scarafier	No	20		89.5	62	0
Pavement Scarafier	No	20		89.5	62	0
Roller	No	20		80	62	0
Roller	No	20		80	62	0
Roller	No	20		80	62	0
Scraper	No	40		83.6	62	0
Tractor	No	40	84		62	0
Tractor	No	40	84		62	0

Results

	Calculated (dBA)	
Equipment	***Lmax**	**Leq**
Concrete Mixer Truck	76.9	73
Concrete Mixer Truck	76.9	73
Paver	75.4	72.3
Pavement Scarafier	87.6	80.6
Pavement Scarafier	87.6	80.6
Roller	78.1	71.1
Roller	78.1	71.1
Roller	78.1	71.1
Scraper	81.7	77.7
Tractor	82.1	78.2
Tractor	82.1	78.2
Total	87.6	**87.1**

*Calculated Lmax is the Loudest value.