2.10. Noise

This section addresses potential noise impacts that may result from construction and/or operation of the Safari Highlands Ranch (SHR) project. The following discussion addresses the existing noise conditions in the project area, identifies applicable regulations, evaluates the SHR project's consistency with applicable goals and policies, identifies and analyzes environmental impacts, and recommends measures to reduce or avoid adverse impacts anticipated from implementation of the project, as applicable.

The analysis in this section is based on noise measurements and modeling conducted by Michael Baker International (2016). Noise measurement data and computer modeling worksheets are included in **Appendix 2.10**.

The table below summarizes the noise impacts detailed in **Section 2.10.4**.

Summary of Noise Impacts

Threshold Number	Issue	Determination	Mitigation Measures	Impact After Mitigation
1	Excessive Noise Levels	Potentially Significant Impact	None feasible	Significant and Unavoidable Impact
2	Excessive Groundborne Vibration	Potentially Significant Impact	NOI-1	Less than Significant Impact
3	Permanent Increase in Ambient Noise Levels	Potentially Significant Impact	None feasible	Significant and Unavoidable Impact
4	Temporary Increase in Ambient Noise Levels	Potentially Significant Impact	NOI-2 and NOI-3	Less than Significant Impact
5	Excessive Noise Exposure (within 2 miles of public use airport)	Less than Significant Impact	None required	Less than Significant Impact
6	Excessive Noise Exposure (within vicinity of private airstrip)	Less than Significant Impact	None required	Less than Significant Impact

Fundamentals of Noise

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

Noise is a subjective reaction to different types of sounds. Noise is typically defined as airborne sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. A typical noise environment consists of a base of steady background noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. These sources can vary from an occasional aircraft or train passing by to virtually continuous noise from, for example, traffic on a major highway. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a large and awkward range of numbers. To avoid this, sound levels are described in decibel (dB) units. The decibel scale uses the hearing threshold (20 micropascals) as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The impacts of noise are not a function of loudness alone. The perceived loudness of sounds is dependent on many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

Addition of Decibels

The decibel 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, 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] 2006). Under the decibel scale, three sources of equal loudness together would produce an increase of 5 dB (Caltrans 2013a).

Typical noise levels associated with common noise sources are depicted in **Figure 2.10-1**.

Sound Propagation and Attenuation

Generally, 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 (Federal Highway Administration FHWA 2011). 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 (FHWA 2011). Similarly, a halving of the energy of a noise source would result in a 3 dB decrease. 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 3 dB per doubling of distance is assumed (FHWA 2011).

Noise levels may also be reduced by intervening structures or landforms; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA (FHWA 2006). 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. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more.

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 are measures of community noise. Each is applicable to this analysis and defined in **Table 2.10-1**.

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 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 2.10-1 Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in 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 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. For example, $L_{eq(1)}$ is the equivalent noise level over a one-hour period and $L_{eq(8)}$ corresponds to an eight-hour period.
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 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 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 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 L_{eq} would result in a measurement of 66.7 dBA CNEL.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends on its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

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, 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.

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 8 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.

Effects of Noise on Animals

Animals rely on meaningful sounds for communication, navigation, avoiding danger, and finding food against a background of noise. An increase in ambient noise levels could result in disturbance that may be qualified as causing damage (harming health, reproduction, survivorship, habitat use, distribution, abundance, or genetic distribution) or causing a detectable change in behavior. While recent studies have explored the potential effects of human-generated noise on wildlife, there are large gaps in the existing knowledge of the impact of noise on wildlife populations (FHWA 2004).

For instance, with invertebrates and lower vertebrates (fish, reptiles, amphibians), there is relatively little study on the effects of noise, with no clear indication of a strong adverse response, at least for the levels of noise likely to be encountered from road traffic. For reptiles and amphibians, effects appear to be localized and likely due to mortality or a barrier to movement. Recent studies on the effect on toads in burrows near roads strongly indicate that further study on this or similar behaviors is warranted. For birds, noise can apparently have a significant effect; however, the results are not universal, with some species being adversely affected, many unaffected, and still others becoming more common near even interstate highways. Mammals (particularly large species) may avoid noise; however, there is evidence (particularly for smaller species) that additional habitat and corridors for movement are provided by roadways (FHWA 2004).

Section 2.3, Biological Resources, addresses potential biological resources impacts that may result from all aspects of construction and operation of the project.

Fundamentals of Environmental Groundborne Vibration

Sources of groundborne 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).

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 is generally used to characterize potential for building damage, while RMS is best for characterizing human response to ground vibration.

Table 2.10-2 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. 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 2.10-2 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 2004

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

2.10.1. Existing Conditions

Introduction

The proposed SHR project site is located in an unincorporated area of northeastern San Diego County, approximately 30 miles north of downtown San Diego and 18 miles east of the Pacific Ocean. The property lies east of Rancho San Pasqual, northeast of the Rancho Vistamonte community, and just north of the San Diego Zoo Safari Park. Adjacent uses include single-family homes and open space to the west, open space to the north and east, and open space and the San Diego Zoo Safari Park to the south. The primary noise sources affecting the project vicinity include activities associated with residential uses.

Noise-Sensitive Receptors

Noise-sensitive land uses are those that may be subject to stress and/or interference from excessive noise. Noise-sensitive land uses in Escondido and the project area include the San Diego Zoo Safari Park, public and private schools, hospitals, churches, and museums. Typically, residential uses are also considered noise-sensitive receptors. Industrial and commercial land uses are generally not considered sensitive to noise.

Existing Ambient Noise Levels

Existing regional noise sources include traffic-related noise on roadways and highways, airplanes flying overhead, and noise associated with typical urban development (e.g., people talking, dogs barking, children playing, yard maintenance equipment operating). Sound is affected by distance from the source, surrounding obstacles, and atmospheric properties. Thus, regional noise sources would not typically interfere or combine with noise sources within or in close proximity to the project site.

The sound levels in most communities fluctuate, depending on the activity of nearby and distant noise sources, time of the day, or season of the year. To characterize the existing environment, noise measurements were taken at five locations in the project vicinity on August 11, 2016 (see **Figure 2.10-2**). The noise measurement sites were representative of typical existing noise exposure within and immediately adjacent to the project site. Ten-minute measurements were taken by Michael Baker International between 10:08 a.m. and 12:57 p.m. Short-term (L_{eq}) measurements are considered representative of the noise levels throughout the day. The average noise levels and sources of noise measured at each location are identified in **Table 2.10-3**. The existing daytime noise levels range from 63.6 to 67.1 dBA.

Table 2.10-3 Existing Noise Levels in the Project Vicinity

Site No.	Location	L_{eq} (dBA)	L_{max} (dBA)	Time
1	Old Battlefield Road, just north of West Zoo Road	65.3	92.8	10:08–10:18 a.m.
2	Along Vistamonte Avenue, near residential neighborhood	67.1	95.4	10:29–10:39 a.m.
3	At cul-de-sac on Timber Creek Lane, in residential neighborhood	65.4	94.8	10:45–10:55 a.m.
4	Adjacent to San Pasqual Union Elementary School, along Rockwood Road	63.6	87.1	11:01–11:11 a.m.
5	Along Cloverdale Road, approximately 540 feet south of Rockwood Road	65.7	84.5	11:20–11:30 a.m.

Source: Michael Baker International, August 11, 2016. See **Appendix 2.10**.

Existing Roadway Noise Levels

Existing roadway noise levels were calculated for the roadway segments in the project vicinity. This task was accomplished using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) and traffic volumes from the project transportation impact analysis (see **Appendix 2.10**). The model calculates the average noise level at specific locations based on traffic volumes, average speeds, roadway geometry, and site environmental conditions. The average vehicle noise rates (energy rates) used in the FHWA model have been modified to reflect average vehicle noise rates identified for California by the California Department of Transportation (Caltrans). The Caltrans data shows that California automobile noise is 0.8 to 1.0 dBA higher than national levels and that medium and heavy truck noise is 0.3 to 3.0 dBA lower than national levels.

Table 2.10-4 summarizes the modeled existing traffic noise levels at the specific noise receptors along each project roadway segment. Where more than one unit of the same land use exists on a single roadway segment, the unit nearest to the roadway is depicted. Noise measurement site numbers 1, 4, and 5 (see **Table 2.10-3**) are verified in terms of the existing traffic noise where noted in **Table 2.10-4**. The traffic noise levels listed in **Table 2.10-4** may differ from measured levels depicted in **Table 2.10-3** because they represent noise levels at different locations in the project vicinity and are also reported in different noise metrics (e.g., noise measurements are the L_{eq} values and traffic noise levels are reported in L_{dn} and CNEL).

Table 2.10-4 Existing Traffic Noise Levels

Roadway Segment	Surrounding Uses & Distance from Roadway Centerline		L_{dn} (dB) at Specified Distance from Roadway Centerline	CNEL (dB) at Specified Distance from Roadway Centerline
Rockwood Road				
Site Access to Cloverdale Road	Golf Course (near noise measurement site #4)	35 feet	61.0	61.6
	School Building	100 feet	54.0	54.7
	Residential Outdoor Living Area	160 feet	51.0	51.6
Site Access to Vistamonte Avenue	Residential Outdoor Living Area	100 feet	53.2	53.9
Cloverdale Road				
Rockwood Road to San Pasqual Valley Road	Residential Outdoor Living Area (near noise measurement site #5)	40 feet	63.2	64.0
	Agriculture Operation	80 feet	58.7	59.4
San Pasqual Road				
San Pasqual Valley Road to Old Pasqual Road	Residential Outdoor Living Area	45 feet	63.3	64.0
	Agriculture Operation	45 feet	63.3	64.0
Old Pasqual Road to Ryan Drive	Residential Outdoor Living Area	35 feet	65.0	65.7
	Agriculture Operation	60 feet	61.4	62.1
Ryan Drive to Bear Valley Parkway	Golf Course	30 feet	72.1	72.8
	School Building	50 feet	67.8	68.5
	Residential Outdoor Living Area	35 feet	70.6	71.3
San Pasqual Valley Road				
Zoo Road to Cloverdale Road/San Pasqual Road Intersection	Zoo Entrance	2,655 feet	40.6	41.3
	Residential Outdoor Living Area (near noise measurement site #1)	100 feet	62.0	62.7
Cloverdale Road/San Pasqual Road Intersection to Summit Drive	Residential Outdoor Living Area	30 feet	71.8	72.5
	Agriculture Operation	30 feet	71.8	72.5
Bear Valley Parkway				
San Pasqual Valley Road to Sunset Drive	Residential Outdoor Living Area	30 feet	72.2	72.9
	Church Building	175 feet	60.5	61.3
Sunset Drive to San Pasqual Road	Residential Outdoor Living Area	35 feet	73.2	73.9
	School Building	175 feet	62.1	62.9

Notes: Traffic noise levels were calculated using the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). Refer to **Appendix 2.10** for noise modeling assumptions and results.

As shown, the existing traffic-generated noise level on project-vicinity roadways currently ranges from 40.6 to 73.2 dBA L_{dn}. As previously described, L_{dn} equals the 24-hour average noise level 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. As also shown, the traffic-generated noise level on project-vicinity roadways ranges from 41.3 to 73.9 dBA CNEL. As previously described, CNEL is 24-hour average noise level with a 5 dBA "weighting" during the hours of 7:00 p.m. to 10:00 p.m. and a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively.

2.10.2. Regulatory Framework

Federal

Occupational Safety and Health Administration

With the Occupational Safety and Health Act of 1970, Congress created the Occupational Safety and Health Administration (OSHA) to assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance.

State

California Environmental Quality Act

Primary environmental legislation in California is found in the California Environmental Quality Act (CEQA) and its implementing guidelines (CEQA Guidelines), which require that projects with potential adverse effects (or impacts) on the environment undergo environmental review, including noise analysis.

California Noise Control Act of 1973

California Health and Safety Code Sections 46000 through 46080, known as the California Noise Control Act, find that excessive noise is a serious hazard to public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. The act also finds that there is a continuous and increasing bombardment of noise in urban, suburban, and rural areas. The California Noise Control Act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the State to provide an environment for all Californians that is free from noise that jeopardizes their health or welfare.

California Noise Insulation Standards (CCR Title 24, Part 2, Chapter 2-35)

In 1974, the California Commission on Housing and Community Development adopted noise insulation standards for multi-family residential buildings (Title 24, Part 2, California Code of Regulations). Title 24 establishes standards for interior room noise (attributable to outside noise sources). The regulations also specify that acoustical studies must be prepared whenever a multi-family residential building or structure is proposed to be located near an existing or adopted freeway route, expressway, parkway, major street, thoroughfare, rail line, rapid transit line, or industrial noise source, and where such noise source or sources create an exterior CNEL (or L_{dn}) of 60 dBA or greater. Such acoustical analysis must demonstrate that the residence has been designed to limit intruding noise to an interior CNEL (or L_{dn}) of at least 45 dBA in any habitable room used for living, sleeping, eating, or cooking.

Local

City of Escondido General Plan

Upon annexation to the city, the project site would fall under the regulatory jurisdiction of the City of Escondido. The City's General Plan Community Protection Element establishes noise and land use compatibility standards and outlines goals and policies to achieve these standards. **Figure 2.10-3** summarizes the land use compatibility standards. The Community Protection Element (page VI-23) also includes standards for projects that could significantly alter existing noise levels. It states that "noise impacts of proposed projects on existing land uses should be evaluated in terms of potential for adverse community response based on a significant increase in existing noise levels. For example, if an area is currently below the maximum normally acceptable noise level, an increase in noise up to the maximum allowable level should not necessarily be allowed. Projects increasing noise levels by 5 dB or greater should be considered as generating a significant impact and should require mitigation." **Table 2.10-5** summarizes the exterior incremental environmental noise impact standards for noise-sensitive uses.

Table 2.10-5 Exterior Incremental Environmental Noise Impact Standards for Noise-Sensitive Uses

Residences and Buildings Where People Normally Sleep[1]		Institutional Land Uses with Primarily Daytime and Evening Uses[2]	
Existing L_{dn}	Allowable Noise Increment	Existing Peak Hour L_{eq}	Allowable Noise Increment
50	5	50	9
55	3	55	6
60	2	60	5
65	1	65	3
70	1	70	3
75	0	75	1
80	0	80	0

Source: Escondido 2012a
Notes: Noise levels are measured at the property line of the noise-sensitive use.
1. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
2. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material.

The City's General Plan Community Protection Element outlines goals and policies to achieve noise standards. Relevant goals and policies include:

GOAL 5: Protection of the community from excessive noise exposure.

Noise Policy 5.1

Require development to meet acceptable exterior noise level standards as established in Figure VI-12 [of the General Plan (**Figure 2.10-3** of this EIR)], and use the future noise contour map

(FigureVI-17 [of the General Plan]) as a guide for evaluating the compatibility of new noise sensitive uses with projected noise levels.

Noise Policy 5.2

Apply a CNEL of 60 dB or less for single family and 65 dB or less for multi-family as goals where outdoor use is a major consideration (back yards and single-family housing developments, and recreation areas in multifamily housing developments) as discussed in Figure VI-13 [of the General Plan], and recognize that such levels may not necessarily be achievable in all residential areas.

Noise Policy 5.3

Require noise attenuation for outdoor spaces in all developments where projected incremental exterior noise levels exceed those shown in Figure VI-14 [of the General Plan (**Table 2.10-5** of this EIR)].

Noise Policy 5.4

Require noise attenuation for new noise-sensitive uses which include residential, daycare facilities, schools, churches, transient lodging, hotels, motels, hospitals, health care facilities, and libraries if the projected interior noise standard of 45 dBA CNEL is exceeded.

Noise Policy 5.5

Require construction projects and new development to ensure acceptable vibration levels at nearby noise-sensitive uses based on Federal Transit Administrator criteria.

Noise Policy 5.6

Require the preparation of noise studies, as deemed necessary by the Planning Department, to analyze potential noise impacts associated with new development which could significantly alter existing noise levels in accordance with provisions outlined in Figure VI-14 [of the General Plan (**Table 2.10-5** of this EIR)].

Noise Policy 5.7

Encourage use of site and building design, noise barriers, and construction methods as outlined in Figure VI-15 [of the General Plan] to minimize impacts on and from new development.

Noise Policy 5.10

Require development projects that are subject to discretionary approval to assess potential construction noise impacts on nearby sensitive uses and to minimize impacts on these uses, to the extent feasible.

Noise Policy 5.11

Limit direct access from individual properties along Major Roads and Prime Arterials in residential areas in order to minimize gaps in noise barrier sound walls.

Noise Policy 5.12

Limit "through truck traffic" to designated routes to minimize noise impacts to residential neighborhoods and other noise-sensitive uses (see Mobility and Infrastructure Element).

Noise Policy 5.13

Limit the hours of operation for parks and active recreation uses in residential areas to minimize disturbance to residents.

Noise Policy 5.15

Coordinate with McClellan-Palomar Airport to distribute property disclosure statements for areas within the Airport Land Use Compatibility Plan.

Noise Policy 5.16

Work with McClellan-Palomar Airport to monitor aircraft noise, implement noise-reducing operation measures, as necessary, and promote pilot awareness of noise sensitive land uses.

City of Escondido Municipal Code

Chapter 17, Article 12, Noise Abatement and Control (Noise Ordinance)

The Noise Ordinance establishes prohibitions for disturbing, excessive, or offensive noise and provisions such as sound level limits for the purpose of securing and promoting the public health, comfort, safety, peace, and quiet for citizens of Escondido. **Table 2.10-6** shows the allowable noise levels at any point on or beyond the boundaries of the property on which the sound is produced, as well as corresponding times of day for each zoning district. The noise standards apply to each property or portion of property substantially used for a particular type of land use reasonably similar to the land use types shown in **Table 2.10-6**. Where two or more dissimilar land uses occur on a single property, the more restrictive noise limits apply. Environmental noise is measured by the L_{eq} for the hours specified in **Table 2.10-6**. If the noise is continuous, the L_{eq} for any hour will be represented by any lesser period within that hour. If the noise is intermittent, the L_{eq} for any hour may be represented by a time period typical of the operating cycle, but the measurement period must be 15 minutes or longer. If the measured ambient level exceeds the permissible noise level, the allowable noise exposure standard is the ambient noise level. Section 17-228 establishes the methods for which any sound or noise measurement shall be measured within the city. These methods apply to both indoor and outdoor measurements. Section 17-229 establishes the maximum allowable exterior noise limits, based upon the classification of the receiving land use. These standards typically apply to stationary sources such as noise from mechanical equipment (including mechanical ventilation and air condition noise, pool pump noise) or event noise, as opposed to traffic noise. Noise restrictions are listed in Sections 17-230 through 17-241 of the Noise Ordinance, such as specific regulations pertaining to motor vehicles and burglar alarms.

Table 2.10-6 City of Escondido Exterior Sound Limit Levels

Zone	Time	Applicable Limit 1-Hour Average Sound Level (decibels)
Residential Zones	7:00 a.m. to 10:00 p.m.	50
	10:00 p.m. to 7:00 a.m.	45
Multi-Residential Zones	7:00 a.m. to 10:00 p.m.	55
	10:00 p.m. to 7:00 a.m.	50
Commercial Zones	7:00 a.m. to 10:00 p.m.	60
	10:00 p.m. to 7:00 a.m.	55
Light Industrial/Industrial Park Zones	Anytime	70
General Industrial Zones	Anytime	75

Chapter 17, Article 12, Sections 17-234 and 17-238, Construction Equipment and Grading

Sections 17-234 and 17-238 of the City's Noise Ordinance establish regulations for construction equipment and grading activities. Section 17-234 states that except for emergency work, the following applies to all construction equipment operating in the city:

a) It shall be unlawful for any person, including the City of Escondido, to operate construction equipment at any construction site, except on Monday through Friday during a week between the hours of 7:00 a.m. and 6:00 p.m. and on Saturdays between the hours of 9:00 a.m. and 5:00 p.m., and provided that the operation of such construction equipment complies with the requirements of subsection (c) of this section.

b) It shall be unlawful for any person, including the City of Escondido, to operate construction equipment at any construction site on Sundays and on days designated by the president, governor, or City Council as public holidays.

c) No construction equipment or combination of equipment, regardless of age or date of acquisition, shall be operated so as to cause noise in excess of a one-hour average sound level limit of 75 dB at any time, unless a variance has been obtained in advance from the City Manager.

Section 17-238 states:

a) It shall be unlawful for any person, including the City of Escondido, to do any authorized grading at any construction site, except on Mondays through Fridays during a week between the hours of 7:00 a.m. and 6:00 p.m. and, provided a variance has been obtained in advance from the City Manager, on Saturdays from 10:00 a.m. to 5:00 p.m.

b) For the purpose of this section, "grading" shall include, but not be limited to, compacting, drilling, rock crushing or splitting, bulldozing, clearing, dredging, digging, filling and blasting.

c) In addition, any equipment used for grading shall not be operated so as to cause noise in excess of a one-hour sound level limit of 75 dB at any time when measured at or within the property lines of any property which is developed and used in whole or in part for residential purposes, unless a variance has been obtained in advance from the City Manager.

Chapter 33, Article 47, Environmental Quality Regulations

The Environmental Quality Regulations implement the California Environmental Quality Act (CEQA) and the CEQA Guidelines by applying the provisions and procedures contained in CEQA to development projects proposed in Escondido. Subsection (a)(2) pertains to noise impacts, specifically noise impacts related to the widening of Mobility and Infrastructure Element streets. According to this subsection, the following incremental noise increases are generally not considered significant:

a) Short- or long-term increases, regardless of the extent, that do not result in noise increases in excess of general plan standards

b) Short- or long-term increases that result in a 3 dB(A) or less incremental increase in noise beyond the General Plan's noise standards

San Diego County Code

Chapter 4, Section 36.404, General Sound Level Limits

Many of the project-affected land uses in the vicinity of the project are located within the jurisdiction of the County of San Diego, which regulates noise through Chapter 4, Section 36.404, General Sound Level Limits, of the County Code. Based on the County's (2009) Guidelines for Determining Significance, Noise, a noise-sensitive land use is defined by an residence, school, hotel, resort, library, or similar facility where quiet is an important attribute of the environment. A significant impact would occur if a proposed project would result in the exposure of any existing noise-sensitive land use to exterior noise in excess of 60 dB CNEL or an increase of 10 decibels over pre-existing noise.

Additionally, the County's Report and Content Requirements for Noise include a statement that a "doubling of sound energy" is considered a significant impact at a "documented noise site." A doubling of sound energy is equivalent to a 3 dBA increase. A documented noisy site is a location near a noise-sensitive land use that already exceeds 60 dBA CNEL under pre-project conditions. (60 dBA CNEL is equivalent to 59.3 L_{dn}).

City of San Diego General Plan

Many of the project-affected land uses in the vicinity of the project are located within the jurisdiction of the City of San Diego, which regulates noise through the City's General Plan (2008). In accordance with the City's General Plan, direct and cumulative roadway noise impacts are considered significant if the project increases noise levels for a noise-sensitive land use by 3 dBA and if the project increases noise levels above an unacceptable noise level per the General Plan along a roadway segment.

2.10.3. Thresholds for Determination of Significance

City of Escondido Environmental Quality Regulations (Zoning Code Article 47) and Appendix G of the CEQA Guidelines as amended contain analysis guidelines related to the assessment of noise. For the purposes of this EIR, Appendix G of the CEQA Guidelines will apply to direct, indirect, and cumulative impacts analysis. A project would result in a significant impact if it would cause:

1. Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (or conflict with applicable noise thresholds specified in City of Escondido Zoning Code Article 47).
2. Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels.
3. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
4. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
5. For a project located within an airport land-use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels.
6. For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels.

2.10.4. Analysis of Project Effects and Determination of Significance

Thresholds 1 & 3: Would the project cause exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (or conflict with applicable noise thresholds specified in City of Escondido Zoning Code Article 47)?

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 sensitive receptors to the project site are the predominantly single-family residential neighborhoods located immediately west of the proposed project area (there are schools, golf courses, churches, and agricultural operations in these neighborhoods located on Rockwood Road and Bear Valley Parkway). The San Diego Zoo Safari Park is located just under a mile to the south of the project area.

Project Construction

Noise associated with construction of the project site would result in short-term and intermittent noise at nearby noise-sensitive properties. As previously discussed, the Escondido Municipal Code limits construction activities to Monday through Friday between the hours of 7:00 a.m. and 6:00 p.m. and on Saturdays between the hours of 9:00 a.m. and 5:00 p.m. In addition, the City's Noise Ordinance seeks to limit construction equipment that causes noise in excess of a one-hour average sound level limit of 75 dB at any time. As analyzed below in Threshold 4, without noise-reducing mitigation, the City's construction-related noise standard would be surpassed, resulting in a **potentially significant** impact. Implementation of mitigation measures **MM NOI-2** and **MM NOI-3** will reduce potentially significant impacts to a **less than significant** level; refer to Threshold 4.

Project Operations

Operational noise sources associated with the proposed project include mobile and stationary (i.e., mechanical equipment) sources.

Off-Site Vehicle Noise. Traffic noise could impact the existing sensitive receptors. Based on the City's General Plan Community Protection Element, the proposed project would result in a traffic noise impact if it exceeds 60 dBA L_{dn} at affected residences, 65 dBA L_{dn} at affected schools and churches, and 75 dBA L_{dn} at affected golf courses and agricultural operations (**Figure 2.10-3**). However, a review of **Table 2.10-4**, which summarizes the modeled existing traffic noise levels from the centerline of project vicinity roadways, shows traffic-generated noise levels already exceeding these thresholds at several locations under existing conditions. This modeled traffic-related noise is largely verified by the 10-minute ambient noise measurements conducted, which measured existing daytime noise levels in the existing residential neighborhoods west of the project area ranging from 63.6 to 67.1 dBA (see **Table 2.10-3**). The Community Protection Element states that "noise impacts of proposed projects on existing land uses should be evaluated in terms of potential for adverse community response based on a significant increase in existing noise levels." **Table 2.10-5** summarizes the Community Protection Element's exterior incremental environmental noise impact standards for noise-sensitive uses.

As previously stated, many of the affected land uses in the vicinity of the project are located within the jurisdictions of either the County of San Diego or the City of San Diego.

The County of San Diego defines a noise-sensitive land use as a residence, school, hotel, resort, library, or similar facility where quiet is an important attribute of the environment. A significant impact would occur if a proposed project would result in the exposure of any existing noise-sensitive land use to exterior noise in excess of 60 dB CNEL or an increase of 10 decibels over pre-existing noise. Where existing noise levels already exceed noise standards, an increase of 3 dBA is considered significant.

Based on the City of San Diego noise standards, a proposed project would result in a traffic noise impact if it exceeds 65 dBA CNEL (64.3 L_{dn}) at affected residences, churches, and/or schools and 75 dBA CNEL (74.3 L_{dn}) at affected golf courses and agricultural operations. Additionally, roadway noise impacts are considered significant if a project increases noise levels for a noise-sensitive land use (residences, schools, churches) by 3 dBA where existing noise levels already exceed noise standards.

Future traffic noise levels in the project vicinity were modeled based on the traffic volumes identified by Linscott, Law & Greenspan, Engineers (2017) (**Appendix 2.12**) to determine the noise level contours along area roadways. **Table 2.10-7** shows the calculated off-site roadway noise levels under existing traffic levels compared to future buildout of the project. The calculated noise levels at buildout at specific affected land uses were compared to the noise standards in the City's General Plan Community Protection Element, the San Diego County Code, or the City of San Diego's General Plan, whichever is appropriate.

Noise levels are measured at the property line of a noise-sensitive use. As shown in **Table 2.10-7**, predicted increases in off-site traffic noise levels associated with the project would exceed standards at the nearest residential yards (outdoor living areas) fronting onto Cloverdale Road (an estimated 4 homes located between Rockwood Road and San Pasqual Valley Road), thereby resulting in a significant impact. The affected residences are located within the jurisdiction of San Diego County. In the case of each of these significantly impacted noise receptors, traffic-generated noise levels already exceed the County's noise compatibility thresholds even without the project; therefore, a traffic noise increase of more than 3 dBA is considered **potentially significant**.

On-Site Vehicle Noise. Various noise events would occur periodically from vehicles on the project site once anticipated future development is constructed. The most continuous noise source would comprise automobile movements. Automobile movements in single-family residential neighborhoods located outside of major traffic arterial corridors, such as that anticipated in the residential community proposed by the project, typically generate a maximum noise level of approximately 58.1 dBA at a distance of 50 feet[1]. Accordingly, project-generated vehicle noise within the proposed SHR community would not exceed the City's land use compatibility standards of 60 dBA for residential land uses. The proposed project would result in a **less than significant** impact related to on-site vehicle activity in the SHR community.

[1] Based on the Federal Highway Administration noise model RD-77-108 and assumes an average daily traffic volume of 4,200 on a residential road.

Table 2.10-7 Existing plus Project Conditions Predicted Noise Levels

Roadway Segment	Affected Uses, Jurisdiction & Distance from Roadway Centerline	Ldn (dB) at Specified Distance from Roadway Centerline		Change	Noise Standard (dBA Ldn)[1]	Exceed Standard/ Significant Impact?
		Existing Conditions	Existing + Project Conditions			
Rockwood Road						
Site Access to Cloverdale Road	Golf Course at 35 Feet (Escondido)	61.0	65.3	4.3	5.0 dBA Increase	No
	School Building at 100 Feet (City of San Diego)	54.0	58.4	4.4	>65 dBA	No
	Residential Outdoor Living Area at 160 Feet (County of San Diego)	51.0	55.3	4.3	59.3 **OR** 10.0 dBA Increase	No
Site Access to Vistamonte Avenue	Residential Outdoor Living Area at 100 Feet (Escondido)	53.2	58.1	4.9	5.0 dBA Increase	No
Cloverdale Road						
Rockwood Road to San Pasqual Valley Road	Residential Outdoor Living Area at 40 Feet (County of San Diego)	63.2	66.5	**3.3**	3.0 dBA Increase	**Yes**
	Agriculture Operation at 80 Feet (City of San Diego)	58.7	61.9	3.2	>75 dBA	No
San Pasqual Road						
San Pasqual Valley Road to Old Pasqual Road	Residential Outdoor Living Area at 45 Feet (City of San Diego)	63.3	64.8	1.5	3.0 dBA Increase	No
	Agriculture Operation at 45 Feet (County of San Diego)	63.3	64.8	1.5	10.0 dBA Increase	No
Old Pasqual Road to Ryan Drive	Residential Outdoor Living Area at 35 Feet (City of San Diego)	65.0	66.5	1.5	3.0 dBA Increase	No
	Agriculture Operation at 60 Feet (County of San Diego)	61.4	62.9	1.5	10.0 dBA Increase	No
Ryan Drive to Bear Valley Parkway	Golf Course at 30 Feet (Escondido)	72.1	72.6	0.5	>75 dBA	No
	School Building at 50 Feet (Escondido)	67.8	68.3	0.5	3.0 dBA Increase	No
	Residential Outdoor Living Area at 35 Feet (County of San Diego)	70.6	71.2	0.6	3.0 dBA Increase	No

Table 2.10-7, continued

Roadway Segment	Affected Uses, Jurisdiction & Distance from Roadway Centerline	Ldn (dB) at Specified Distance from Roadway Centerline		Change	Noise Standard (dBA Ldn)[1]	Exceed Standard/ Significant Impact?
		Existing Conditions	Existing + Project Conditions			
San Pasqual Valley Road						
Zoo Road to Cloverdale Road/San Pasqual Road Intersection	Zoo Entrance at 2,655 Feet (City of San Diego)	40.6	40.9	0.3	3.0 dBA Increase	No
	Residential Outdoor Living Area at 100 Feet (City of San Diego)	61.7	62.1	0.4	3.0 dBA Increase	No
Cloverdale Road/San Pasqual Road Intersection to Summit Drive	Residential Outdoor Living Area at 30 Feet (County of San Diego)	71.8	72.9	1.1	3.0 dBA Increase	No
	Agriculture Operation at 30 Feet (County of San Diego)	71.8	72.2	0.4	10.0 dBA Increase	No
Bear Valley Parkway						
San Pasqual Valley Road to Sunset Drive	Residential Outdoor Living Area at 30 Feet (Escondido & San Diego County)	72.2	72.2	0.0	1.0 dBA Increase	No
	Church Building at 175 Feet (County of San Diego)	60.5	60.6	0.1	3.0 dBA Increase	No
Sunset Drive to San Pasqual Road	Residential Outdoor Living Area at 35 Feet (Escondido & San Diego County)	73.2	73.2	0.0	1.0 dBA Increase	No
	School Building at 175 Feet (Escondido)	62.1	62.3	0.1	>65 dBA	No

Note: Traffic noise levels were calculated using the FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77-108). Refer to Appendix 2.10 for noise modeling assumptions.

1. Noise standards for land uses in Escondido derived from the Community Protection Element, which identifies a standard of 60 dBA L_{dn} at single-family residences, 65 dBA L_{dn} at schools and churches, and 75 dBA L_{dn} at golf courses and agricultural operations, as measured at the property line (see **Figure 2.10-3**). Where existing noise levels are more than 5 dBA below Community Protection Element standards, an increase of 5 dBA or greater is considered significant. Where existing noise levels already exceed noise standards, noise standards are determined in accordance with Community Protection Element provisions outlined in the element's Figure VI-14, Exterior Incremental Environmental Noise Impact Standards for Noise-Sensitive Uses. See **Table 2.10-5**.
   Noise standards for land uses in San Diego County derived from the County Code, which identifies a standard of 60 dBA CNEL (59.3 dBA L_{dn}) at all noise-sensitive land uses. Where existing noise levels already exceed noise standards, an increase of 3 dBA is considered significant.
   Noise standards for land uses in the City of San Diego derived from the City's General Plan, which states that a proposed project would result in a traffic noise impact if it exceeds 65 dBA CNEL (64.3 L_{dn}) at affected residences, churches, and/or schools and 75 dBA CNEL (74.3 L_{dn}) at affected golf courses and agricultural operations. Where existing noise levels already exceed noise standards, an increase of 3 dBA is considered significant.

On-Site Stationary Noise Sources. Potential stationary noise sources related to long-term operation of future development on the project site would include mechanical equipment. Mechanical equipment (e.g., HVAC equipment) typically generates noise levels of approximately 50–60 dBA at 50 feet.

Noise from potential mechanical equipment associated with the project (mechanical ventilation/air conditioning, etc.) must be evaluated as part of the building plan submittal to ensure compliance with the noise limits of the Escondido Municipal Code, to the satisfaction of the City of Escondido Planning Division.

Therefore, any noise from mechanical equipment would be **less than significant**.

Mitigation Measures

Lead agencies have limited remedies at their disposal to effectively reduce traffic-related noise. While measures such as encouraging ridesharing, carpooling, and alternative modes of transportation could reduce vehicle volumes, such measures cannot be mandated of residents, nor are they shown to reduce vehicle trips to the extent needed to reduce vehicle noise levels below established thresholds.

Addressing traffic noise at the receiver rather than the source usually takes the form of noise barriers (i.e., sound walls). While the placement of sound walls along affected streets could reduce resulting noise at certain residential locations, the City of Escondido cannot ensure feasible implementation of noise barriers, as they would fall under County of San Diego jurisdiction and would also likely require property owner approval. Such barriers are therefore deemed infeasible.

Level of Significance After Mitigation

As discussed above, impacts related to traffic noise would be **significant and unavoidable**.

Threshold 2: Would the project cause exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?

Construction

Increases in groundborne vibration and noise 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. This impact discussion uses Caltrans's recommended standard of 0.2 inches per second peak particle velocity (PPV) with respect to the prevention of structural damage for normal buildings and intense annoyance of people within the buildings. A measurement of 0.2 inches per second PPV is roughly equivalent to 94 vibration decibels

(VdB), which is another unit for measuring ground vibration levels. If this groundborne vibration level threshold is exceeded, the result may be "architectural" damage to normal dwellings. Groundborne vibration levels associated with representative construction equipment are summarized in **Table 2.10-8**.

Table 2.10-8 Representative Vibration Source Levels for Construction Equipment (PPV)

Equipment	Peak Particle Velocity at 25 Feet (inches/second)	Peak Particle Velocity at 50 Feet (inches/second)	Peak Particle Velocity at 100 Feet (inches/second)
Pile Driver (impact) upper range	1.518	0.535	0.189
Pile Driver (typical)	0.644	0.227	0.080
Sonic Pile Driver upper range	0.734	0.259	0.091
Sonic Pile Driver (typical)	0.170	0.060	0.021
Large Bulldozer	0.089	0.031	0.011
Caisson Drilling	0.089	0.031	0.011
Loaded Trucks	0.076	0.026	0.009
Rock Breaker	0.059	0.020	0.007
Jackhammer	0.035	0.012	0.004
Small Bulldozer/Tractors	0.003	0.001	0.000

Source: FTA 2006; Caltrans 2004

At the nearest, project construction would occur 108 feet from an existing structure (residential units on Ferncreek Lane). This construction, involving a new project access road, would occur during the first phase of project construction. However, it is acknowledged that construction activities would occur throughout the project site and would not be concentrated at the point closest to the sensitive receptors.

As shown in **Table 2.10-8**, typical construction equipment would not result in a groundborne vibration velocity level above 0.2 inches per second (94 VdB) at a distance of 100 feet. Therefore, groundborne vibration impacts from construction equipment are **less than significant**.

Groundborne Vibration from Blasting

As stated in **Section 1.0, Project Description**, blasting may also be required in certain areas on-site to prepare the property for development. Although the precise extent of required blasting is unknown at this time, because of the hardness of on-site materials, a significant amount (estimated 50 percent) of the overall cut slopes would likely require some degree of blasting.

When a blast is detonated, only a portion of the energy is consumed in breaking up and moving the rock. The remaining energy is dissipated in the form of seismic waves expanding rapidly outward from the blast, either through the ground (as vibration) or through the air (as air overpressure or airblast). While a blaster can quite easily design blasts to stay well below any vibration or air overpressure levels that could cause damage, it is virtually impossible to design blasts that are not perceptible by people in the vicinity (Caltrans 2013b). As seismic waves travel outward from a blast, they excite the particles of rock and soil through which they pass, causing them to oscillate. Spherical spreading, imperfect coupling, and other factors cause seismic waves to dissipate rapidly with distance, normally by two-thirds for each doubling of distance from the source. The motion of particles at a given point in the earth is measured when blast vibration is recorded.

Although residential structures may not be as strongly constructed as engineered structures, it is unusual to find damage to them from blast vibration (Caltrans 2013b). In numerous instances, vibration levels far greater than the maximum levels recommended by the US Bureau of Mines or the Office of Surface Mining and Reclamation Enforcement failed to cause damage (Caltrans 2013b). With regard to residences, the main issue with blast vibration is the perception of some residents that, because they could hear and feel the blast vibration, the vibration must have caused some damage to their residence. It is not unusual for a homeowner to be unaware of cracks or other defects in his or her residence that have developed slowly because of settlement or thermal strains. When a nearby blast is detonated and the homeowner examines the structure more closely, it is not surprising that defects are attributed to the event (Caltrans 2013b).

While it is virtually impossible to design blasts that are not perceptible by people in the vicinity, a blasting technician can design blasts to stay well below a vibration level of 0.2 inches per second PPV (Caltrans 2013b). Most of the factors involved in blast design are interrelated or interactive; correcting one problem may prompt others. Blast vibration is affected by the list of variables identified in **Table 2.10-9**. These variables are in turn affected by blast design factors as indicated.

In the absence of a project blasting plan showing specific blast locations, frequency, and duration, it is possible that certain activities could exceed the threshold of 0.2 inches per second PPV, which would result in a **potentially significant** impact. Implementation of mitigation measure **MM NOI-1** would reduce potential significant impacts to a less than significant level because it would require vibration generated by blasting to be at or below 0.2 inches per second PPV.

Mitigation Measures

MM NOI-1 The project shall include the following requirements for construction activities:

- Per the City of Escondido code requirements, construction (including blasting) is permitted between the hours of 7 a.m. and 6 p.m. Monday through Friday and 9 a.m. and 5 p.m. on Saturday.
- Prior to construction-related blasting, the project applicant shall submit to the City of Escondido Engineering and Planning Divisions for approval of a blasting plan demonstrating that groundborne vibration generated by blasting is at or below a vibration level of 0.2 inches per second PPV at any residential structure.

- A blast signal (e.g., air horn) shall be used to notify nearby residents that blasting is about to occur per the California Code of Regulations, Title 8, Section 5291 Firing of Explosives regulations.
- Send a mailer to residences with information about when the blasting is scheduled and provide information about who to contact for more information or for complaints.
- All complaints shall be responded to and investigated as they occur.

Timing/Implementation: *Prior to ground-disturbing construction activities*

Enforcement/Monitoring: *City of Escondido Engineering and Planning Divisions*

Table 2.10-9 Blast Variables

Blast Variables	Discussion
Distance	As the distance from the blast increases, the vibration decreases. However, the blasting must be conducted where it is needed, and smaller charge weights may be necessary if blasting is needed in close proximity to structures.
Site Geology	As the distance between the blast and the recording point increases, geology plays a more dominant role in determining the frequency of the blast vibration and the speed at which the vibration dissipates.
Quantity of Explosive per Delay	The quantity of explosive per delay is one of the major variables in blast design for mitigating vibration. Blast design factors that can affect this include hole diameter and depth, the number of explosive decks, and the method of initiation. Generally, reducing this quantity will reduce the vibration generated, but the powder factor must remain high enough to adequately fracture the material.
Confinement of the Explosive Energy	Confinement is affected by burden and spacing, the quantity (and quality) of stemming, amount of subdrilling, and the location of the initiating device. Highly confined blasts, such as presplitting, generate higher vibration levels per unit weight of explosive. If a certain amount of throw or heave is acceptable or if means are employed to prevent excessive throw, reducing burdens can lower vibration levels appreciably. Bottom initiation will generally result in slightly more vibration than top initiation. However, any vibration benefit that might be gained from shooting from the top down or from reducing the amount of subdrilling can be offset by any additional blasts that may be required if the primary blast does not fracture rock to the full depth.
Powder Factor	The powder factor is affected by almost all blast design factors. The keys are to use as close to the optimum amount of explosive as possible and to distribute it through the material to be blasted in such a way that it will adequately fracture and shift the mass. If the powder factor is too low, it will not adequately fragment the material and a large portion of the available energy will be lost as seismic energy, resulting in excessive blast vibration. If the powder factor is too high, it can result in increased vibration intensities.
Explosive/Borehole Coupling	Although explosive/borehole coupling can affect vibration, the effect is minimal. For example, presplitting uses decoupled charges (there is an annular space between the charge and the wall of the borehole), but results in high vibration levels because the increased burden has a greater impact than the decoupling. Decoupling of explosive charges normally is not used to reduce vibration.

Table 2.10-9, continued

Blast Variables	Discussion
Spatial Distribution of the Energy Source	The spatial distribution of the energy source can affect vibration in terms of intensity and frequency. There are two examples of this. In the first example, two holes separated by a reasonable distance and detonated simultaneously will generate less vibration than one hole containing as much explosive as the two holes combined. The extent of this effect depends largely on the separation distance between the two holes. In a second example, a long column of explosive will generate less vibration than a spherical charge of the same weight.
Timing of Detonating Charges	Extending the delay time between blasts can reduce the amount of energy released per unit of time, reducing vibration to some extent.
Blast Orientation	Blast orientation is usually mandated by terrain and the physical layout of the rock. As a general rule, the highest vibration amplitudes will usually be in a direction opposite of that in which the rock is being heaved or thrown, although local geology may affect the actual direction of maximum intensity.

Source: Caltrans 2013b

Level of Significance After Mitigation

With the implementation of mitigation measure **MM NOI-1**, impacts from construction-generated groundborne vibration would be **less than significant**.

Operational

Operation of the project would not generate substantial levels of vibration due to the lack of vibration-generating sources and therefore is not analyzed.

Threshold 4: Would the project cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Temporary increases in ambient noise levels as a result of the project would predominantly be associated with construction activities. Construction activities would include demolition, site preparation, grading, construction of buildings, paving, and architectural coating. Site grading would disturb approximately 360 acres and require approximately 4,773,850 cubic yards of earthwork over the duration of construction.

Blasting may also be required in certain areas on-site to prepare the property for development. Rock crushing would also be required on-site to process rock removed with project grading and blasting activities in order to reduce the material for engineered fill.

During these activities, exterior noise levels could affect the residential neighborhoods in the vicinity of the construction site. At the nearest, project construction would occur 108 feet from an existing structure (residential units on Ferncreek Lane). This construction, involving a new project access road, would occur during the first phase of project construction. However, it is acknowledged that construction activities would occur throughout the project site and would not be concentrated at the point closest to the sensitive receptors. Demolition activities would occur in the north-central portion of the site.

High groundborne noise levels and other miscellaneous noise levels can be created by the operation of heavy-duty trucks, backhoes, dozers, excavators, scrapers, and other heavy-duty construction equipment. **Table 2.10-10** indicates the anticipated noise levels of construction equipment. The average noise levels presented in the table are based on the quantity, type, and acoustical use factor for each type of equipment that is anticipated to be used.

Table 2.10-10 Maximum Noise Levels Generated by Construction Equipment

Type of Equipment	Acoustical Use Factor[1] (percent)	L_{max} at 50 Feet (dBA)
Blasting	1	94
Crane	16	81
Dozer	40	82
Excavator	40	81
Generator	50	81
Grader	40	85
Other Equipment (greater than 5 horsepower)	50	85
Paver	50	77
Roller	20	80
Tractor	40	84
Truck	40	75
Truck	40	80
Welder	40	73

Source: Federal Highway Administration, Roadway Construction Noise Model (FHWA-HEP-05-054), dated January 2006.
Notes: Acoustical use factor (percent): Estimates the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation.

In order to estimate the worst-case construction noise levels that may occur at a noise-sensitive receptor, the combined construction equipment noise levels were calculated for the demolition, site preparation/blasting, grading and rock crushing, paving, building, and coating phases. The demolition phase would use concrete/industrial saws, excavators, and rubber-tired dozers. Blasting would be conducted using explosives. The grading phase would include mostly preparation activities, with rough grading followed by fine grading. Construction equipment used during this phase would include graders, excavators, scrapers, tractors, loaders, and water trucks. Rock crushing, which would be completed with a crusher, would also be required on-site to process rock removed with project grading. The building phase would involve forklifts, generators, tractors, and welders. The paving phase would use pavers, paving equipment, graders, surfacing equipment, and rollers. The application of architectural coatings would require air compressors.

Operating cycles for construction equipment used during these phases 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). These estimations of noise levels take into account the distance to the receptor, attenuation from molecular absorption, and anomalous excess attenuation.

The City's Noise Ordinance seeks to limit construction equipment that causes noise in excess of a one-hour average sound level limit of 75 dB at any time. In the case that construction activities are anticipated to exceed the one-hour average sound level limit of 75 dB, a variance must be obtained in advance from the City Manager in order for construction to proceed.

The anticipated short-term construction noise levels generated during demolition, grading, paving, building, and coating activities are presented in **Table 2.10-11**.

As shown in **Table 2.10-11**, uncontrolled construction-generated noise levels would exceed the City's standard at existing residences in the project vicinity during several different construction activities. It is noted that the Escondido Municipal Code limits construction activities to Monday through Friday between the hours of 7:00 a.m. and 6:00 p.m. and on Saturdays between the hours of 9:00 a.m. and 5:00 p.m. Nonetheless, without noise-reducing mitigation, the City's construction-related noise standard would be surpassed, resulting in a **potentially significant** impact. Implementation of mitigation measures **MM NOI-2** and **MM NOI-3** will reduce potentially significant impacts to a **less than significant** level.

Table 2.10-11 Construction Average L_{eq} (dBA) Noise Levels by Receptor Distance and Construction Phase

	Nearest Distance (ft.)	Construction Activities	Estimated Exterior Construction Noise Level without Mitigation	Exceed Criteria without Mitigation?	Estimated Exterior Construction Noise Level with Mitigation	Exceed Criteria with Mitigation?
Phase 1 Receivers						
Single-Family Residences on Ferncreek Lane (Rancho Vistamonte)	108	Demolition	77.0	Yes	74.0	No
		Blasting/Site Preparation	67.3	No	n/a	No
		Grading & Rock Crushing	77.9	Yes	74.9	No
		Road Construction	76.6	Yes	73.6	No
		Paving	77.0	Yes	74.0	No
Single-Family Residences on Sprucewood Lane (Rancho San Pasqual)	133	Demolition	75.2	Yes	72.2	No
		Blasting/Site Preparation	65.5	No	n/a	No
		Grading & Rock Crushing	76.6	Yes	73.6	No
		Road Construction	75.4	Yes	72.4	No
		Paving	75.5	Yes	72.5	No
Single-Family Residences on Wynwood Court (Rancho San Pasqual)	220	Demolition	71.0	No	68.0	No
		Blasting/Site Preparation	61.1	No	n/a	No
		Grading & Rock Crushing	74.1	No	71.1	No
		Road Construction	71.1	No	68.7	No
		Paving	71.8	No	68.8	No
Single-Family Residences on Walden Glen (Rancho Vistamonte)	327	Demolition	67.6	No	64.6	No
		Blasting/Site Preparation	57.7	No	n/a	No
		Grading & Rock Crushing	71.8	No	68.8	No
		Road Construction	68.6	No	65.6	No
		Paving	68.9	No	65.9	No

Table 2.10-11, continued

	Nearest Distance (ft.)	Construction Activities	Estimated Exterior Construction Noise Level without Mitigation	Exceed Criteria without Mitigation?	Estimated Exterior Construction Noise Level with Mitigation	Exceed Criteria with Mitigation?
Rural Residence on Rockwood Road (east of Phase 1)	390	Demolition	66.3	No	63.3	No
		Blasting/Site Preparation	56.2	No	n/a	No
		Grading & Rock Crushing	70.5	No	67.5	No
		Road Construction	67.2	No	64.2	No
		Paving	68.1	No	65.1	No
Safari Park (south of Phase 1)	700	Demolition	61.1	No	58.1	No
		Blasting/Site Preparation	51.1	No	n/a	No
		Grading & Rock Crushing	67.0	No	64.0	No
		Road Construction	63.1	No	60.1	No
		Paving	63.6	No	60.6	No
Phase 2, 3 & 4 Receivers						
Rural Residence on Barelin Road (east of Phase 2)	330	Blasting/Site Preparation	57.6	No	n/a	No
		Grading & Rock Crushing	71.9	No	68.9	No
		Building Construction	70.3	No	67.3	No
		Paving	69.6	No	66.6	No
		Painting	57.3	No	54.3	No
Rural Residences on Old Wagon Road (east of Phase 2 & north of Phase 3)	350	Blasting/Site Preparation	57.1	No	n/a	No
		Grading & Rock Crushing	72.6	No	69.6	No
		Building Construction	69.8	No	66.8	No
		Paving	69.1	No	66.1	No
		Painting	56.8	No	53.8	No

Table 2.10-11, continued

	Nearest Distance (ft.)	Construction Activities	Estimated Exterior Construction Noise Level without Mitigation	Exceed Criteria without Mitigation?	Estimated Exterior Construction Noise Level with Mitigation	Exceed Criteria with Mitigation?
Rural Residences on Old Wagon Road (North of Phase 4)	400	Blasting/Site Preparation	55.9	No	n/a	No
		Grading & Rock Crushing	71.6	No	68.6	No
		Building Construction	68.6	No	65.6	No
		Paving	68.0	No	65.0	No
		Painting	55.6	No	52.6	No

Source: Federal Highway Administration, Roadway Construction Noise Model (FHWA-HEP-05-054), dated January 2006 (see **Appendix 2.10**)
Notes: Construction equipment used during each phase derived from information submitted by the project applicant. A typical building can reduce noise levels by 20 dBA with the windows closed (HUD 2009, p. 14).

Mitigation Measures

Noise source control is the most effective method of controlling construction noise. Source controls, which limit noise, are the easiest to oversee on a construction project. Mitigation at the source reduces the problem everywhere, not just along one single path or for one receiver. Noise path controls are the second method of controlling noise. Barriers or enclosures can substantially reduce the nuisance effect in some cases. Path control measures include moving equipment farther away from the receiver; enclosing especially noisy activities or stationary equipment; erecting noise enclosures, barriers, or curtains; and using landscaping as a shield and dissipater.

Noise barriers or enclosures can provide a sound reduction 20 dBA or greater (FHWA 2011). 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 these cases, the enclosure/barrier system must either be very tall or have some form of roofed enclosure to protect upper-story receptors.

Because the City's construction-related noise standards would be surpassed, the following mitigation measures are required.

MM NOI-2 The project shall include the following requirements for construction activities:

- Per the City of Escondido code requirements, construction is permitted between the hours of 7 a.m. and 6 p.m. Monday through Friday and 9 a.m. and 5 p.m. on Saturday.
- Construction contracts must specify that all construction equipment, fixed or mobile, shall be equipped with properly operating and maintained mufflers and other state-required noise attenuation devices.
- A sign, legible at a distance of 50 feet, shall be posted at the project construction site providing a contact name and a telephone number where residents can inquire about the construction process and register complaints. This sign shall indicate the dates and duration of construction activities. In conjunction with this required posting, a noise disturbance coordinator will be identified to address construction noise concerns received. The coordinator shall be responsible for responding to any local complaints about construction noise. When a complaint is received, the disturbance coordinator shall notify the City within 24 hours of the complaint and determine the cause of the noise complaint (starting too early, malfunctioning muffler, etc.) and shall implement reasonable measures to resolve the complaint, as deemed acceptable by the City. All signs posted at the construction site shall include the contact name and the telephone number for the noise disturbance coordinator.

- Construction noise reduction methods shall include shutting off idling equipment, maximizing the distance between construction equipment staging areas and occupied residential areas, and using electric air compressors and similar power tools.
- During construction, stationary construction equipment, such as generators and compressors, shall be located on the site as far away from adjacent residential properties as feasible, or placed such that emitted noise is directed away from sensitive noise receivers.
- During construction, all operating rock crushing equipment shall be placed 500 feet from an existing residence, at the minimum.

Timing/Implementation: *Prior to ground-disturbing construction activities*

Enforcement/Monitoring: *City of Escondido Engineering and Planning Divisions*

MM NOI-3 In order to reduce construction noise, a temporary noise barrier or enclosure shall be used to break the line of sight between the construction equipment and the nearest residences, whether they are existing or future residences. The temporary noise barrier shall have a sound transmission class (STC) of 35 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. In order to achieve this, the barrier may consist of steel tubular framing, welded joints, a layer of 18-ounce tarp, a 2-inch-thick fiberglass blanket, a half-inch-thick weatherwood asphalt sheathing, and 7/16-inch sturdy board siding. In addition, to avoid objectionable noise reflections, the source side of the noise barrier shall be lined with an acoustic absorption material meeting a noise reduction coefficient rating of 0.70 or greater in accordance with American Society for Testing and Materials Test Method C423.

Timing/Implementation: *Prior to ground-disturbing construction activities*

Enforcement/Monitoring: *City of Escondido Engineering and Planning Divisions*

Level of Significance After Mitigation

As previously described, noise barriers or enclosures can provide a sound reduction 20 dBA or greater (FHWA 2011). However, as noted, 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. Because of the project site's size and varying topography, coupled with the sizable fleet of construction equipment and the fact that individual pieces of equipment would be traversing different areas of the site simultaneously, it cannot be guaranteed that noise barriers would attenuate all construction-generated noise to levels below the City's standard. **Table 2.10-11** accounts for a sound reduction of 3 dBA attributable to mitigation measures **MM NOI-2** and **MM NOI-3**. This noise reduction value is derived from the FHWA (2006) Roadway Noise Construction Model, which applies a 3 dBA noise reduction for noise barriers that have gaps and otherwise barely breaks the line of sight between the noise source and the receptor. As shown in **Table 2.10-11**, the City's construction noise standard of 75 dBA would not be exceeded with the implementation of mitigation. Therefore, impacts would be **less than significant** with mitigation incorporated.

Threshold 5: For a project located within an airport land-use plan or, where such a plan has not been adopted, within 2 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?

The County of San Diego is the owner and operator of McClellan-Palomar Airport, a public facility that accommodates smaller civil aircraft, located approximately 18.5 miles west of the project site. An Airport Land Use Compatibility Plan (ALUCP) was adopted that identifies issues and provides guidance regarding land uses surrounding the facility. An Airport Influence Area is established in the ALUCP based on the airport's size and current and future operations with compatibility criteria including noise, safety, airspace protection, and overflight considerations that may affect or restrict land uses. The project area is not located within the Airport Influence Area for McClellan-Palomar Airport (Escondido 2012a). Therefore, people living in the project area would not be exposed to excessive noise levels from aircraft. As such, project impacts would be **less than significant**.

Threshold 6: For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

The nearest private airport facilities to the project include the helipad at Palomar Medical Center located 7 miles to the west and the Lake Wohlford Resort airstrip located 4 miles to the north. Blackington Airport, a private airstrip located in the Valley Center community, is located approximately 16 miles to the north. A total of 12 single-engine airplanes are based at Blackington Airport for recreational use. Due to the distance from the project site and the limited scale, operations at these facilities would not expose the project to excessive noise levels (Escondido 2012b). As such, project impacts would be **less than significant**.

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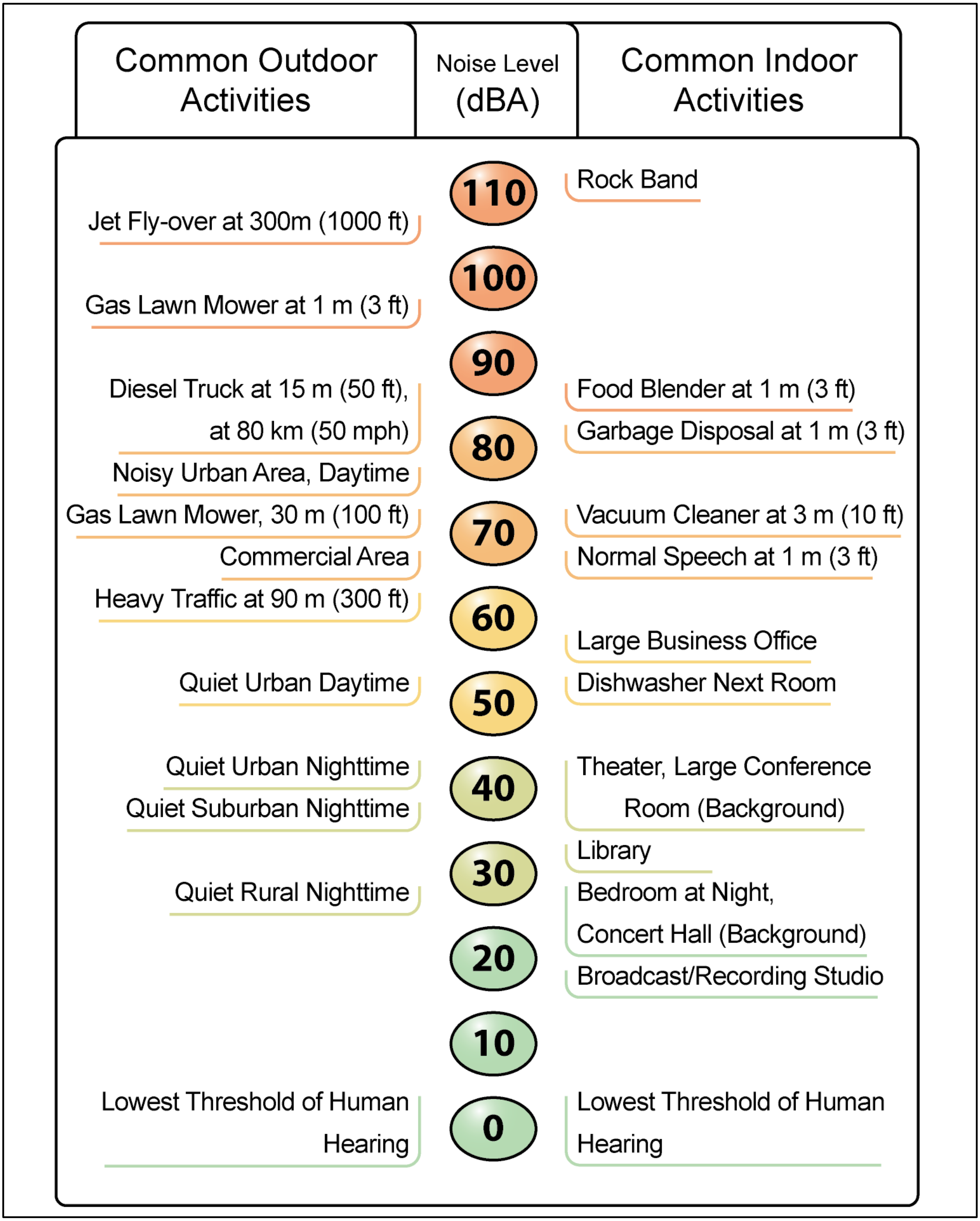

TYPICAL COMMUNITY NOISE LEVELS

Figure 2.10-1

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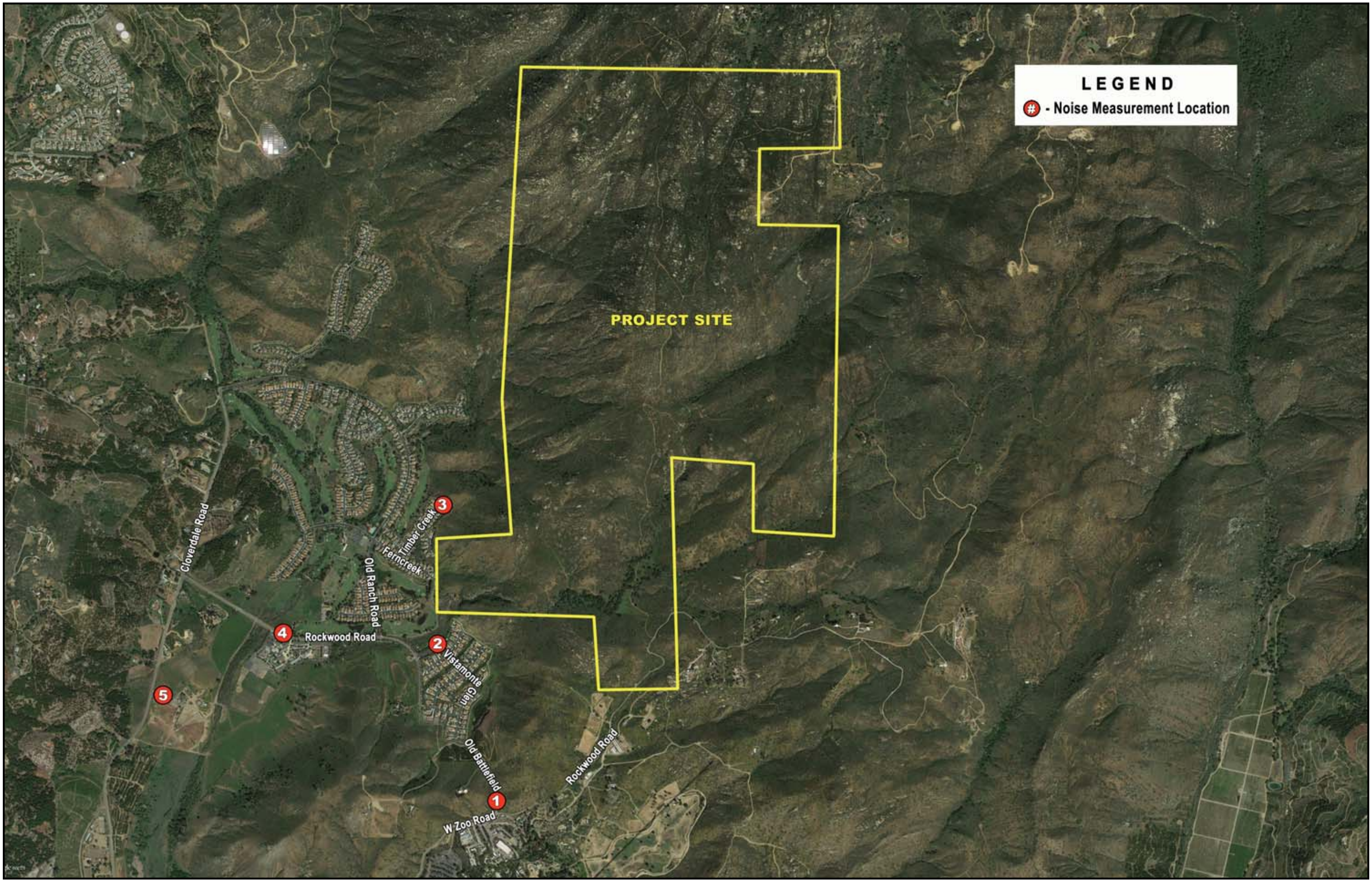

Michael Baker INTERNATIONAL

Source:
153095Figures.indd

N
Not to Scale

Safari Highlands Ranch and Citywide SOI Update ▪ Environmental Impact Report

NOISE MEASUREMENT LOCATIONS

Figure 2.10-2

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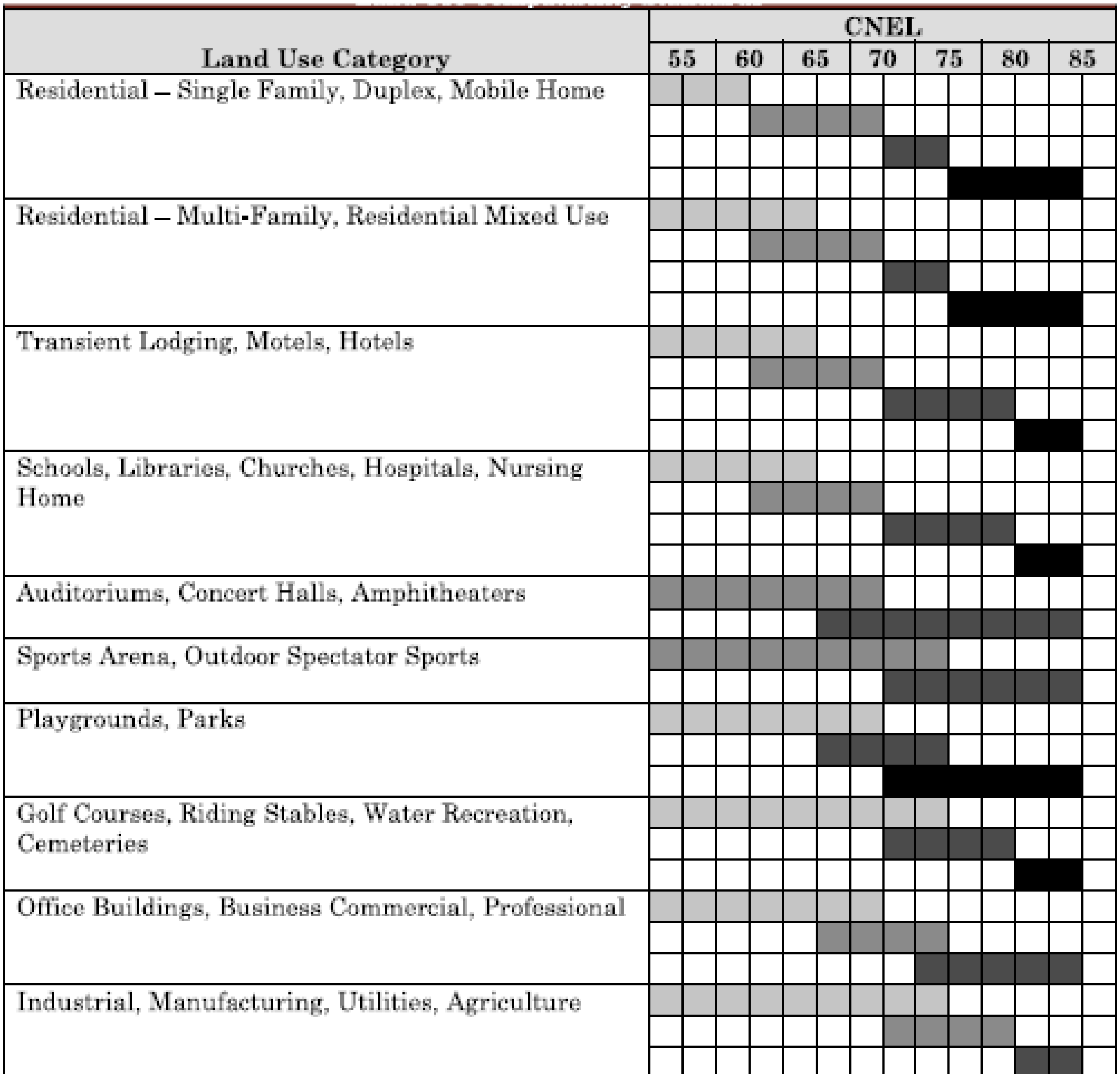

Normally Acceptable	Specified land use is satisfactory, based upon the assumption that buildings involved are of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will usually suffice.
Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made with noise insulation features included in the design.
Clearly Unacceptable	New construction or development should generally not be undertaken.

SOURCE: City of Escondido 2012.

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Source: Escondido, 2012a.
153095Figures.indd

GENERAL PLAN LAND USE COMPATIBILITY STANDARDS

Figure 2.10-3

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