Kunzman Associates, Inc.

HAWKS RIDGE PROJECT

NOISE IMPACT ANALYSIS

November 6, 2015

Traffic Engineering | Transportation Planning | Parking | Noise/Vibration | Expert Witness
Air Quality | Global Climate Change | Health Risk Assessment

KUNZMAN ASSOCIATES, INC.

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I. Introduction and Setting

A. Purpose and Objectives

The purpose of this report is to provide an assessment of the noise impacts that may occur with the development of the proposed Hawks Ridge project and to identify mitigation measures that may be necessary to reduce those impacts.

The Town of Yucca Valley is acting as the lead agency responsible for preparation of the noise impact analysis, in accordance with California Environmental Quality Act authorizing legislation.

Although this is a technical report, every effort has been made to write the report clearly and concisely. To assist the reader with those terms unique to noise analysis, a glossary of terms is provided in Appendix A of this report.

B. Project Location

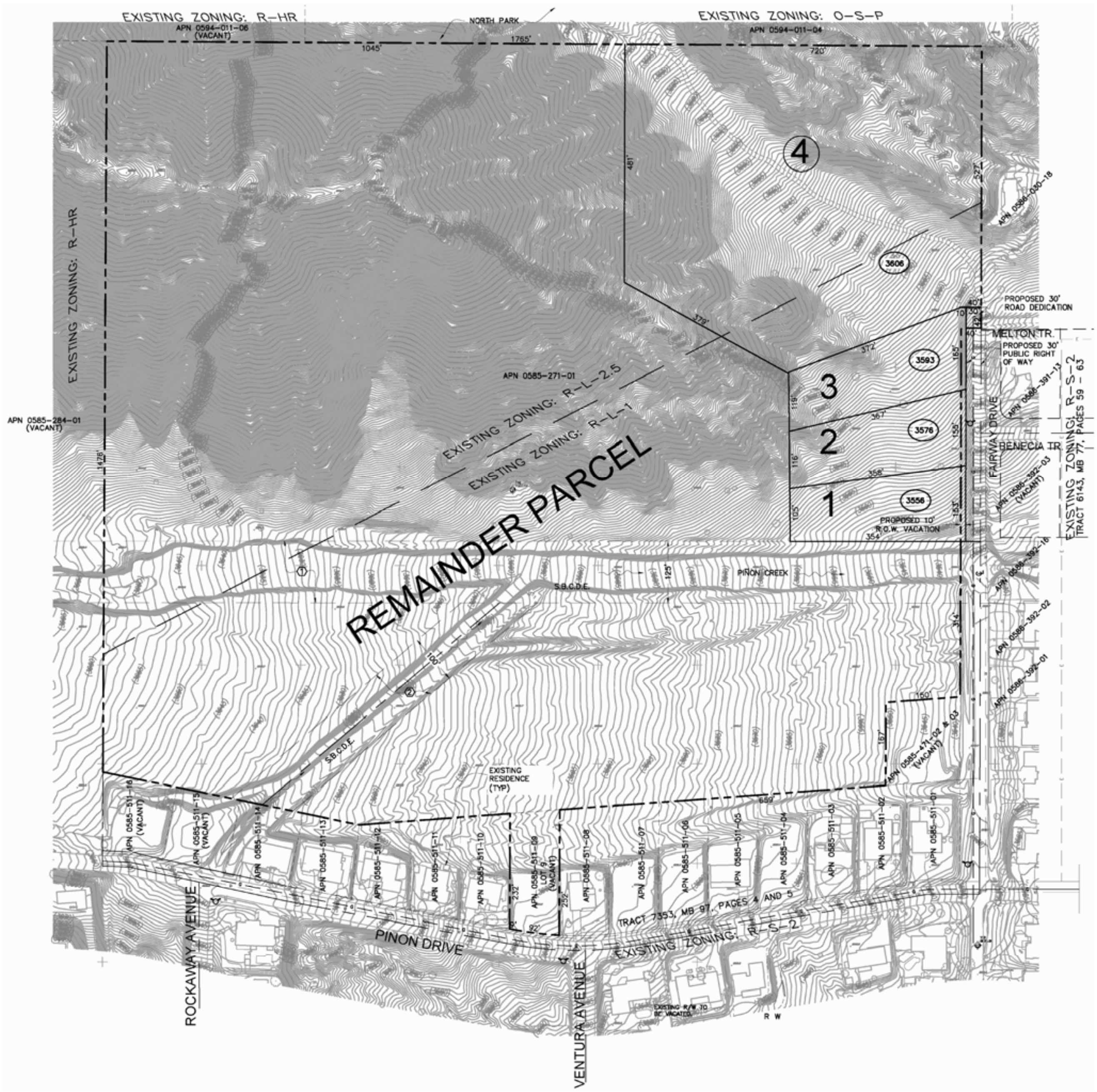
The project site is located north of Twentynine Palms Highway (SR-62) and west of Fairway Drive in the Town of Yucca Valley. The site is currently vacant. A flood channel runs adjacent and parallel to the southern boundary of the project site. A vicinity map showing the project location is provided on Figure 1.

C. Project Description

The site is proposed to be developed with four (4) single-family detached residential dwelling units. The proposed project will have access to Fairway Drive. Figure 1 shows the project location map and Figure 2 shows an aerial image of the site.

Figure 1
Project Location Map

Figure 2
Site Plan



II. Noise and Vibration Fundamentals

A. Noise Fundamentals

Sound is a pressure wave created by a moving or vibrating source that travels through an elastic medium such as air. Noise is defined as unwanted or objectionable sound. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in extreme circumstances, hearing impairment.

Commonly used noise terms are presented in Appendix B. The unit of measurement used to describe a noise level is the decibel (dB). The human ear is not equally sensitive to all frequencies within the sound spectrum. Therefore, the "A-weighted" noise scale, which weights the frequencies to which humans are sensitive, is used for measurements. Noise levels using A-weighted measurements are written dB(A) or dBA.

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in noise as the distance from the source increases. The manner in which noise reduces with distance depends on whether the source is a point or line source as well as ground absorption, atmospheric effects and refraction, and shielding by natural and manmade features. Sound from point sources, such as air conditioning condensers, radiates uniformly outward as it travels away from the source in a spherical pattern. The noise drop-off rate associated with this geometric spreading is 6 dBA per each doubling of the distance (dBA/DD). Transportation noise sources such as roadways are typically analyzed as line sources, since at any given moment the receiver may be impacted by noise from multiple vehicles at various locations along the roadway. Because of the geometry of a line source, the noise drop-off rate associated with the geometric spreading of a line source is 3 dBA/DD.

Decibels are measured on a logarithmic scale, which quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, a doubling of the energy of a noise source, such as a doubled traffic volume, would increase the noise levels by 3 dBA; halving of the energy would result in a 3 dBA decrease.

Figure 3 shows the relationship of various noise levels to commonly experienced noise events.

Average noise levels over a period of minutes or hours are usually expressed as dBAL_{eq}, or the equivalent noise level for that period of time. For example, $L_{eq(3)}$ would represent a 3-hour average. When no period is specified, a one-hour average is assumed.

Noise standards for land use compatibility are stated in terms of the Community Noise Equivalent Level (CNEL) and the Day-Night Average Noise Level (L_{dn}). CNEL is a 24-hour weighted average measure of community noise. CNEL is obtained by adding five decibels to sound levels in the evening (7:00 PM to 10:00 PM), and by adding ten decibels to sound levels at night (10:00 PM to 7:00 AM). This weighting accounts for the increased human sensitivity to noise during the evening and nighttime hours. L_{dn} is a very similar 24-hour average measure that weights only the nighttime hours.

It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA; that a change of 5 dBA is readily perceptible, and that an increase (decrease) of 10 dBA sounds twice (half) as loud. This definition is recommended by the California Department of Transportation's Traffic Noise Analysis Protocol for New Highway and Reconstruction Projects (2009).

B. Vibration Fundamentals

The way in which vibration is transmitted through the earth is called propagation. Propagation of earthborn vibrations is complicated and difficult to predict because of the endless variations in the soil through which waves travel. There are three main types of vibration propagation: surface, compression and shear waves. Surface waves, or Raleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. Compression waves, or P-waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. Shear waves, or S-waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or "side-to-side and perpendicular to the direction of propagation".

As vibration waves propagate from a source, the energy is spread over an ever-increasing area such that the energy level striking a given point is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and void spaces. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Construction operations generally include a wide range of activities that can generate groundborne vibration. In general, blasting and demolition of structures generate the highest vibrations. Vibratory compactors or rollers, pile drivers, and pavement breakers can generate perceptible amounts of vibration at up to 200 feet. Heavy trucks can also generate groundborne vibrations, which can vary depending on vehicle type, weight, and pavement conditions. Potholes, pavement joints, discontinuities, or the differential settlement of pavement all increase the vibration levels from vehicles passing over a road surface. Construction vibration is normally of greater concern than vibration from normal traffic flows on streets and freeways with smooth pavement conditions.

Typically, particle velocity or acceleration (measured in gravities) is used to describe vibration. Table 1 shows the peak particle velocities (PPV) of some common construction equipment and Table 2 shows typical human reactions to various levels of PPV as well as the effect of PPV on buildings.

Table 1

Vibration Source Levels for Construction Equipment[1]

Equipment	Peak Particle Velocity (inches/second) at 25 feet	Approximate Vibration Level LV (dVB) at 25 feet
Pile driver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Pile driver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

[1] Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

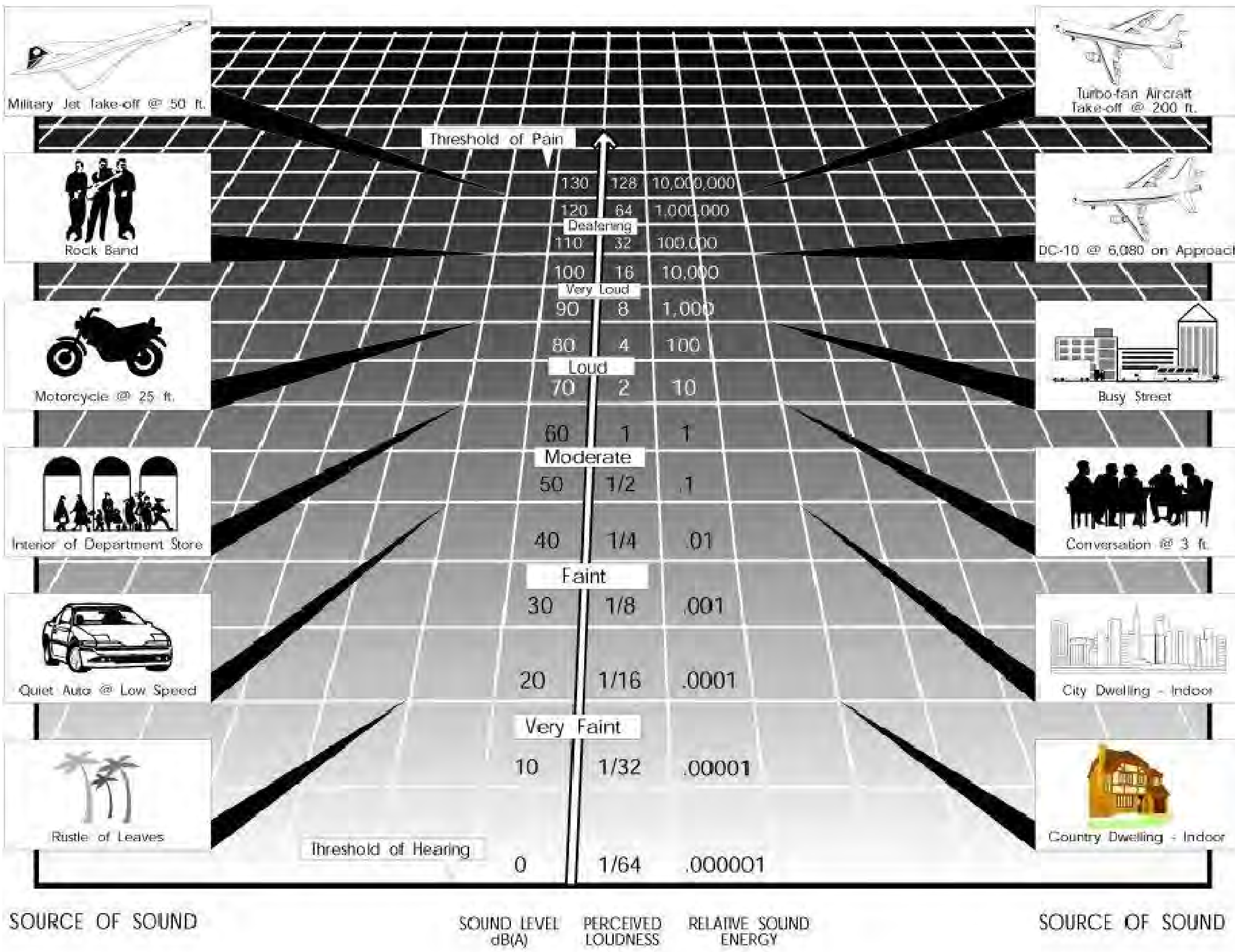
Table 2

Typical Human Reaction and Effect on Buildings Due to Groundborne Vibration[1]

Vibration Level Peak Particle Velocity (PPV)	Human Reaction	Effect on Buildings
0.006–0.019 in/sec	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08 in/sec	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10 in/sec	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e., not structural) damage to normal buildings
0.20 in/sec	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwelling – houses with plastered walls and ceilings
0.4–0.6 in/sec	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

[1] Source: Caltrans, 2002

Figure 3
Common Noise Sources and Noise Levels



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III. Existing Noise Environment

A. Existing Land Uses and Sensitive Receptors

The project site is bordered on the east by Fairway Drive. A single-family detached residential dwelling unit is located approximately 45 feet from the eastern property line and north of Fairway Drive. Single-family detached residential dwelling units are located just east of Fairview Drive, approximately 113 feet from the proposed eastern property line, and to the south of the project site along Pinon Drive, approximately 550 feet from the proposed development's southern property line.

The State of California defines sensitive receptors as those land uses that require serenity or are otherwise adversely affected by noise events or conditions. Schools, libraries, churches, hospitals, single and multiple-family residential, including transient lodging, motels and hotel uses make up the majority of these areas. Sensitive receptors that may be affected by project generated noise include the surrounding single-family detached residential dwelling units surrounding the site. In addition, the Town of Yucca Valley Municipal Code identifies noise-sensitive land uses as residential uses, schools, hospitals, nursing homes, religious institutions, libraries, and similar uses.

B. Ambient Noise Measurements

An American National Standards Institute (ANSI Section SI4 1979, Type 1) Larson Davis model LxT sound level meter was used to document existing ambient noise levels. One 10-minute daytime noise measurement was taken between 11:37 AM and 12:27 PM on July 9, 2015. Measurement output data is included in Appendix C.

As shown on Figure 4, the noise measurement was taken adjacent to the project site near the north end of Fairway Drive. Ambient noise levels reached up to 51.9 $dBAL_{eq}$ and 64.9 dBA_{Lmax}. The dominant noise source was from vehicles traveling on Fairway Drive. Distant dog barking was also audible.

Figure 4
Noise Measurement Location Map

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IV. Regulatory Setting

The proposed project is not expected to result in any traffic related or land use compatibility related noise impacts. Therefore, the following regulations are limited to those that apply to construction and vibration impacts.

A. Federal Regulations

1. Federal Noise Control Act of 1972

The U.S. Environmental Protection Agency (EPA) Office of Noise Abatement and Control was originally established to coordinate federal noise control activities. After its inception, EPA's Office of Noise Abatement and Control issued the Federal Noise Control Act of 1972, establishing programs and guidelines to identify and address the effects of noise on public health, welfare, and the environment. In response, the EPA published Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (Levels of Environmental Noise). The Levels of Environmental Noise recommended that the Ldn should not exceed 55 dBA outdoors or 45 dBA indoors to prevent significant activity interference and annoyance in noise-sensitive areas.

In addition, the Levels of Environmental Noise identified five (5) dBA as an "adequate margin of safety" for a noise level increase relative to a baseline noise exposure level of 55 dBA Ldn (i.e., there would not be a noticeable increase in adverse community reaction with an increase of five dBA or less from this baseline level). The EPA did not promote these findings as universal standards or regulatory goals with mandatory applicability to all communities, but rather as advisory exposure levels below which there would be no risk to a community from any health or welfare effect of noise.

In 1981, EPA administrators determined that subjective issues such as noise would be better addressed at lower levels of government. Consequently, in 1982 responsibilities for regulating noise control policies were transferred to State and local governments. However, noise control guidelines and regulations contained in EPA rulings in prior years remain in place by designated Federal agencies, allowing more individualized control for specific issues by designated Federal, State, and local government agencies.

B. State Regulations

1. California Department of Transportation (Caltrans)

The California Department of Transportation (Caltrans) has published one of the seminal works for the analysis of groundborne noise and vibration relating to transportation-, and construction-induced vibrations and although the project is not subject to these regulations, it serves as useful tools to evaluate vibration impacts. These guidelines recommend that a standard of 0.2 inches per section (in/sec) PPV not be exceeded for the protection of normal residential buildings (Caltrans 2002).

Caltrans guidance will be used for this analysis considering that the Town of Yucca Valley has not established significance criteria for the evaluation of groundborne vibration.

C. Local Regulations

1. Town of Yucca Valley General Plan

General Plan Goals, Policies and Implementation Measures

The following General Plan Noise Element goal and policy apply to the proposed project.

Goal N1
A noise environment where excessive noise from stationary, transportation-related, and temporary sources of noise are appropriately managed.

Policy N 1-18
Enforce standards on the hours of operation for nonemergency construction.

2. Town of Yucca Valley Municipal Code

Per Section 9.34.080F of the Town of Yucca Valley Municipal Code temporary construction, maintenance, and demolition noise is exempt from the noise regulations set forth in the Municipal Code between the hours of 7:00 AM and 10:00 PM except on Sundays and Federal Holidays.

Section 9.34.090 of the Town of Yucca Valley Municipal Code states that no ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to 0.2 inches per second measured at or beyond the lot line. Vibration sources exempt from this regulation include temporary construction, maintenance, or demolition activities between 7:00 AM and 10:00 PM.

V. Impact Analysis

A. Noise Impacts

The following discussion includes an analysis of the project's consistency with applicable noise standards and a determination if it is likely to result in substantial increases in ambient noise levels.

1. Construction Noise

An existing single-family detached residential dwelling unit located approximately 45 feet east of the project site may be affected by short-term noise impacts associated with the transport of workers, the movement of construction materials to and from the project site, ground clearing, excavation, grading, and building activities.

Project generated construction noise will vary depending on the construction process, type of equipment involved, location of the construction site with respect to sensitive receptors, the schedule proposed to carry out each task (e.g., hours and days of the week) and the duration of the construction work.

Typical noise sources and noise levels associated with the site grading phase of construction are shown in Table 3. 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. A worst-case construction noise scenario assuming the use of this equipment was calculated using the Federal Highway Administration's Roadway Construction Noise Model (RCNM) (see Appendix D). This scenario included a grader, a dozer, an excavator, a scraper and a dump truck operating between 50-200 feet from the nearest sensitive receptor. Assuming a use factor of 40 percent for each piece of equipment, unmitigated noise levels could reach 81.9 dBA L_{eq} and 85 dBAL_{max} at the nearest residential structure.

As stated previously, project construction is subject to the Town of Yucca Valley Municipal Code which states that temporary construction noise is exempt from the noise regulations set forth within the Town of Yucca Valley Municipal Code between the hours of 7:00 AM and 10:00 PM except on Sundays and Federal Holidays.

Project construction will comply with the allowed hours of operation listed in Section 9.34.090 of the Town of Yucca Valley Municipal Code. Recommended measures to minimize construction noise at sensitive receptors are included Section VI of this report.

2. Traffic Noise Impacts to the Proposed Project

There are no adjacent or nearby acoustically significant roadways. The project would not be significantly affected by vehicle traffic noise. No additional analysis is necessary. No mitigation is required.

3. Noise Impacts to Off-Site Receptors Due to Project Generated Traffic

The proposed development is projected to generate approximately 38 daily vehicle trips, 3 of which will occur during the morning peak hour and 4 of which will occur during the evening peak hour. The proposed project would not generate enough vehicle traffic to result in noticeable increases in ambient noise levels. No additional analysis is needed. No mitigation is required.

B. Vibration Impacts

This impact discussion analyzes the potential for the proposed project to cause an exposure of persons to the generation of excessive groundborne vibration or groundborne noise levels. Vibration levels in the project area may be influenced by construction. A vibration impact would generally be considered significant if it involves any construction-related or operations-related impacts in excess of 0.2 +inches per second (in/sec) PPV.

1. Construction Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the construction-site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. Table 2 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Primary sources of vibration during construction would be from bulldozers and vibratory rollers. A vibratory roller could produce a PPV of 0.21 inch per second at 25 feet and a large bulldozer could produce up to 0.089 PPV at 25 feet. As shown in Table 2, the threshold at which there may be a risk of architectural damage to normal houses with plastered walls and ceilings is 0.20 PPV in/second. The nearest existing structure to the project site is approximately 45 feet away, vibration levels associated with project construction at this distance are estimated to be 0.09 PPV and not expected to result in any vibration related damage. Ground borne vibration related to construction may be perceptible at the nearest sensitive receptor during grading that may occur along the project's eastern property line. Impacts would be temporary and would not be significant.

Temporary construction, maintenance, or demolition activities between 7:00 AM and 10:00 PM are exempt from Section 9.34.090 of the Town of Yucca Valley Municipal Code, which states that no ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to 0.2 inches per second measured at or beyond the lot line.

Project construction vibration would not exceed applicable regulations or result in structural damage to nearby structures. No further analysis is necessary. No mitigation is required.

Table 3

Typical Construction Equipment Noise Levels[1]

Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 ft.)	Suggested Maximum Sound Levels for Analysis (dBA at 50 ft.)
Rock Drills	83-99	96
Jack Hammers	75-85	82
Pneumatic Tools	78-88	85
Pumps	74-84	80
Dozers	77-90	85
Scrapers	83-91	87
Haul Trucks	83-94	88
Cranes	79-86	82
Portable Generators	71-87	80
Rollers	75-82	80
Tractors	77-82	80
Front-End Loaders	77-90	86
Hydraulic Backhoe	81-90	86
Hydraulic Excavators	81-90	86
Graders	79-89	86
Air Compressors	76-89	86
Trucks	81-87	86

[1] Source: Bolt, Beranek & Newman; Noise Control for Buildings and Manufacturing Plants, 1987.

VI. Measures to Reduce Impacts

A. Construction Noise Reduction Measures

In addition to adherence to the Town of Yucca Valley Municipal Code limiting the construction hours of operation, the following measures are recommended to minimize construction noise and vibrations, emanating from the proposed project:

1. During all project site excavation and grading on-site, construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturer standards.

2. The contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise sensitive receptors nearest the project site.

3. Equipment shall be shut off and not left to idle when not in use.

4. The contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise/vibration sources and sensitive receptors nearest the project site during all project construction.

5. The project proponent shall mandate that the construction contractor prohibit the use of music or sound amplification on the project site during construction.

6. The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment.

7. Jackhammers, pneumatic equipment and all other portable stationary noise sources shall be shielded and noise shall be directed away from sensitive receptors.

8. For the duration of construction activities, the construction manager shall serve as the contact person should noise levels become disruptive to local residents. A sign should be posted at the project site with the contact phone number.

VII. References

Bolt, Beranek & Newman

1987 Noise Control for Buildings and Manufacturing Plants.

California Department of Transportation

2002 Transportation Related Earthborne Vibrations (Caltrans Experiences), Technical Advisory, Vibration TAV-02-01-R9601. February 20.

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Appendices

Appendix A – List of Acronyms

Appendix B – Definitions of Acoustical Terms

Appendix C – Larson Davis Model 820-SLM Output

Appendix D – RCNM Noise Modeling Output

APPENDIX A

List of Acronyms

LIST OF ACRONYMS

ADT	Average Daily Trips
ANSI	American National Standard Institute
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
D/E/N	Day / Evening / Night
dB	Decibel
dBA or dB(A)	Decibel "A-Weighted"
dBA/DD	Decibel per Double Distance
dBA L_{eq}	Average Noise Level over a Period of Time
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
L_{02},L_{08},L_{50},L_{90}	A-weighted Noise Levels at 2 percent, 8 percent, 50 percent, and 90 percent, respectively, of the time period
L_{dn}	Day-Night Average Noise Level
$L_{eq(x)}$	Equivalent Noise Level for '"x" period of time
L_{eq}	Equivalent Noise Level
L_{max}	Maximum Level of Noise (measured using a sound level meter)
L_{min}	Minimum Level of Noise (measured using a sound level meter)
LOS C	Level of Service C
OPR	California Governor's Office of Planning and Research
PPV	Peak Particle Velocities
RCNM	Road Construction Noise Model
REMEL	Reference Energy Mean Emission Level
RMS	Root Mean Square

APPENDIX B

Definitions of Acoustical Terms

Term	Definition
Decibel, dB	A logarithmic unit of noise level measurement that relates the energy of a noise source to that of a constant reference level; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hertz	In a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. 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.
Root Mean Square (RMS)	A measure of the magnitude of a varying noise source quantity. The name derives from the calculation of the square root of the mean of the squares of the values. It can be calculated from either a series of lone values or a continuous varying function.
Fast/Slow Meter Response	The fast and slow meter responses are different settings on a sound level meter. The fast response setting takes a measurement every 100 milliseconds, while a slow setting takes one every second.
L_{02}, L_{08}, L_{50}, L_{90}	The A-weighted noise levels that are equaled or exceeded by a fluctuating sound level, 2 percent, 8 percent, 50 percent, and 90 percent of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	A level of steady state sound that in a stated time period, and a stated location, has the same A-weighted sound energy as the time-varying sound.
L_{max}, L_{min}	L_{max} is the RMS (root mean squared) maximum level of a noise source or environment measured on a sound level meter, during a designated time interval, using fast meter response. L_{min} is the minimum level.
Ambient Noise Level	The all-encompassing noise environment associated with a given environment, at a specified time, usually a composite of sound from many sources, at many directions, near and far, in which usually no particular sound is dominant.
Offensive/ Offending/ Intrusive Noise	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of sound depends on its amplitude, duration, frequency, and time of occurrence, and tonal information content as well as the prevailing ambient noise level.

APPENDIX C

Larson Davis Model 820-SLM Output

Summary	NM1
Filename	LxT_Data.014
Serial Number	3099
Model	SoundTrack LxT®
Firmware Version	2.301
User	Roma Stromberg
Measurement Description	
Start	2015/07/09 11:37:34
Stop	2015/07/09 11:47:34
Duration	0:10:00.0
Run Time	0:10:00.0
Pause	0:00:00.0

Pre Calibration	2015/07/09 9:13:52
Post Calibration	None
Calibration Deviation	---

Overall Settings		
RMS Weight	A Weighting	
Peak Weight	A Weighting	
Detector	Slow	
Preamp	PRMLxT1L	
Microphone Correction	Off	
Integration Method	Linear	
OBA Range	Normal	
OBA Bandwidth	1/1 and 1/3	
OBA Freq. Weighting	A Weighting	
OBA Max Spectrum	Bin Max	
Overload	121.7	dB

Results				
LAeq	51.9	dB		
LAE	79.7	dB		
EA	10.370	µPa²h		
EA8	497.782	µPa²h		
EA40	2.489	mPa²h		
LApeak (max)	2015/07/09 11:39:18		84.5	dB
LASmax	2015/07/09 11:46:01		64.9	dB
LASmin	2015/07/09 11:47:31		36.2	dB
SEA	-99.9	dB		

			Statistics		
LCeq	69.2	dB	**LAS2.00**	60.0	dB
LAeq	51.9	dB	**LAS8.00**	56.0	dB
LCeq - LAeq	17.3	dB	**LAS10.00**	55.1	dB
LAIeq	54.6	dB	**LAS25.00**	52.0	dB
LAeq	51.9	dB	**LAS50.00**	48.9	dB
LAIeq - LAeq	2.7	dB	**LAS90.00**	43.8	dB

APPENDIX D

RCNM Noise Modeling Output

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/28/2015
Case Description: 6177 Hawks Ridge

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential	Residential	65	65	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Dozer	No	40		81.7	100	0
Dump Truck	No	40		76.5	125	0
Excavator	No	40		80.7	150	0
Scraper	No	40		83.6	200	0

Equipment		Calculated (dBA) *Lmax	Leq	Results Day Lmax
Grader		85	81	N/A
Dozer		75.6	71.7	N/A
Dump Truck		68.5	64.5	N/A
Excavator		71.2	67.2	N/A
Scraper		71.5	67.6	N/A
	Total	85	81.9	N/A

*Calculated Lmax is the Loudest value.

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