KUNZMAN ASSOCIATES, INC.

CANYON HILLS – CHRISTENSEN PROPERTY

NOISE IMPACT ANALYSIS

March 6, 2014

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

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I. Executive Summary

A. Canyon Hills Noise Study Summary

Kunzman Associates, Inc. prepared a noise study report for the Canyon Hills – Christensen Property located in the City of Lake Elsinore. The analysis was conducted for a 74 single-family detached residential dwelling unit development proposed on a 20 acre site located adjacent to and south of Holland Road, west of Anna Lane and north of Corson Avenue, in the City of Lake Elsinore.

B. Construction Noise and Vibration

The anticipated distances to the 60 and 75 dBA L_{max} project construction noise contours were calculated using RCNM. Without mitigation, sensitive receptors up to 150 feet from the property line could experience noise levels over 75 dBA L_{max}. Unmitigated noise levels could also reach 60 dBA L_{max} up to 890 feet from the property line. Construction noise levels at these receptors would exceed City of Lake Elsinore standards. If construction equipment is operated within 150 feet of a residential property line between the hours of 7:00 AM and 7:00 PM the daytime standard of 75 dBA L_{max} may be exceeded; and if construction equipment is operated within 890 feet of a reisidential property line between the hours of 7:00 PM and 7:00 AM the City's nighttime standard of 60 dBA L_{max} may be exceeded.

Due to the proximity of adjacent single-family detached residential dwelling units, project construction activities may result in ground borne vibration that is annoying but would only occur during site grading and preparation activities. Construction vibration will not result in any structural damage.

C. Construction Noise Mitigation Measures

In addition to adherence to the City of Lake Elsinore Municipal Code limiting construction hours of operation, the following measures will minimize noise and vibration related impacts during demolition and construction activities.

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

2. 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.

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

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

5. When feasible, avoid the use of pavement breakers and vibratory rollers and packers near sensitive receptors.

6. Temporary noise barriers that provide at least 10 dBA in attenuation must be installed when project construction occurs within 150 feet of an existing residential property line. Any such barriers should break the line of sight from noise generators to sensitive receptors located immediately east of the project site. They should also be constructed as close to the sensitive receptor as possible to achieve the greatest attenuation effect and have no gaps or openings.

7. Because the City nighttime standard of 60 dBA Ldn would be exceeded at sensitive receptors up to 250 feet to the east, even with installation of temporary noise barriers, no construction should be performed at night (7:00 PM to 7:00 AM) Mondays through Fridays, and not at all on weekends or holidays.

D. <u>Traffic Noise Impacts to the Proposed Project</u>

Unmitigated future exterior noise levels in the back yards of single-family detached residential dwelling units that are adjacent to Holland Road are expected to reach up to 72.4 dBA Ldn and unmitigated future exterior noise levels at the façade of the proposed single-family detached residential dwelling units are expected to reach 69.3 dBA Ldn at the first floor and 71.5 dBA Ldn at second story receptors.

Buildout traffic noise levels would exceed the City's 65 dBA Ldn threshold for exterior noise at sensitive receptors. Therefore, mitigation is required. Construction of a six-foot high barrier at the top of the slope would reduce noise these levels to below 65 dBA Ldn. The proposed barrier however, will not reduce exterior noise levels at the second story of single-family detached residential dwelling units adjacent to Holland Road to below 65 dBA Ldn and it is not aesthetically desirable or reasonable to construct a barrier high enough to do so. Therefore, enhanced building construction methods and materials must be employed to achieve acceptable interior noise levels. These methods are presented below.

E. <u>Traffic Noise Impacts to the Proposed Project Mitigation Measures</u>

1. Mitigation is required in order to achieve exterior noise levels of 65 dBA Ldn at several proposed sensitive receptors adjacent to Holland Road. This mitigation can be provided by constructing a six foot wall at the top of slope of the residential lots adjacent to Holland Road and at the northern and western top of slope of the northernmost lot along the western site boundary. Barriers shall wrap around to protect the side yards of lots.

2. As it is usually not aesthetically desirable to construct barriers high enough to reduce interior noise levels at second story sensitive receptors, enhanced building construction methods and materials must be employed. Single-family detached residential dwelling units adjacent to Holland Road will require approximately 25 dBA of exterior to interior noise reduction to achieve acceptable interior noise levels. Methods 1 through 8 should be implemented to achieve 25 dBA of exterior to interior noise reduction.

F. <u>Off-Site Project Generated Traffic Noise Impacts</u>

The FHWA Traffic Noise Prediction Model - FHWA-RD-77-108 was used to model Existing and Existing Plus Project noise levels were modeled for each roadway segment analyzed in the traffic study prepared for the proposed project. Project generated increases in ambient noise levels along affected road segments were then calculated. In no case would project generated vehicle noise contribute more than 1 dBA Ldn to the ambient noise levels along affected road segments. This increase would not be noticeable. No mitigation is required.

II. Introduction and Setting

A. Purpose and Objectives

This study was performed to address the possibility of significant impacts due to noise. The objectives of the study include:

- documentation of existing noise conditions
- discussion of noise modeling methodology and procedures
- analysis of noise and vibration generated by the construction of the project
- analysis of noise and vibration generated by the typical operation of the project
- analysis and discussion of potential traffic noise impacts to the proposed project
- analysis of noise affecting nearby sensitive receptors due to increased traffic produced by the project
- recommendations for mitigation measures

B. Project Location

The project is located adjacent to and south of Holland Road, west of Anna Lane and north of Corson Avenue, in the City of Lake Elsinore. A vicinity map showing the project location is provided on Figure 1.

C. Project Description

The proposed development consists of 74 single-family detached residential dwelling units on an approximately 20 acre site. The proposed site plan is shown on Figure 2.

Figure 1
Project Location Map

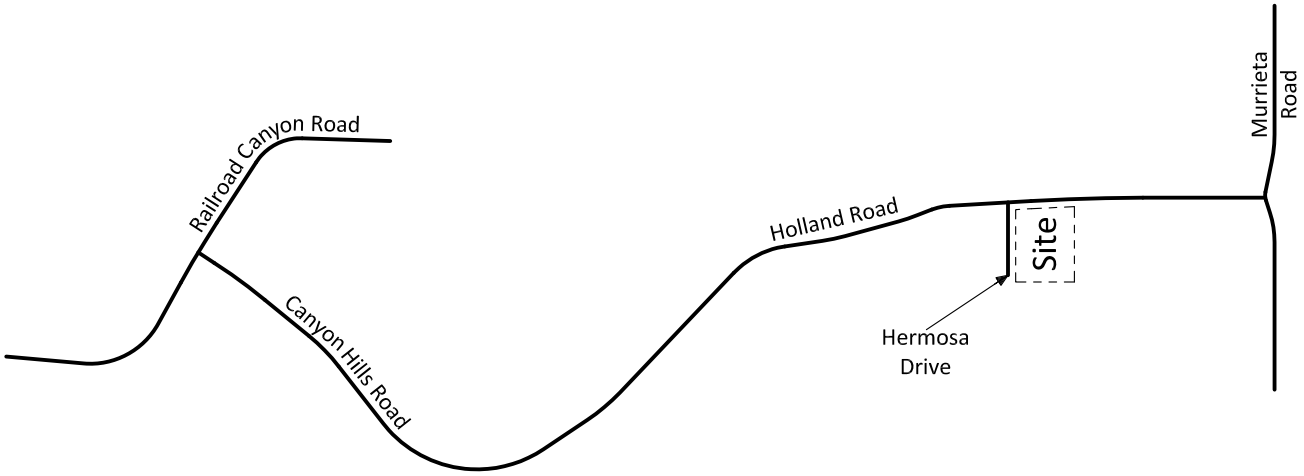

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Figure 2
Site Plan

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III. Definition of Terms

A. Noise/Sound Terminology

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 Table 1. 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 dBA or dBA.

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 dBA $L_{eq,}$ 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 (Ldn). 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. Ldn 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.

The difference in sound (noise) levels from the exterior to the interior of a structure indicates the sound transmitted loss through the window, door, or wall. A Sound Transmission Class (STC) rating specifies the noise level reduction that windows, doors, wall construction materials, and insulation provide. For example, if the exterior of a structure is exposed to 75 dBA and 45 dBA is measured on the interior of the structure, then a reduction of 30 dBA is achieved. Typically, higher STC ratings indicate greater interior noise reductions.

B. Vibration Terminology

The rumbling sound caused by the vibration of room surfaces is called groundborne noise. The annoyance potential of groundborne noise is usually characterized with the A-weighted sound level. Groundborne vibration related to human annoyance is generally related to root mean square (rms) velocity levels expressed in VdB. In contrast to airborne noise, groundborne noise is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually 50 VdB or lower, well below the threshold of perception for humans which is around 65 VdB. Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If the roadway is smooth, the vibration from traffic is rarely perceptible.

The peak particle velocity (PPV) which is defined as the maximum instantaneous positive or negative peak of the vibration signal is the descriptor most utilized in the analysis of vibratory impacts to buildings. Table 2 shows the peak particle velocities of some common construction equipment.

Table 1

Definitions of Acoustical Terms[1]

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.

[1] Adapted from: Cyril M. Harris; Handbook of Acoustical Measurement and Noise Control, 1991.

Table 2

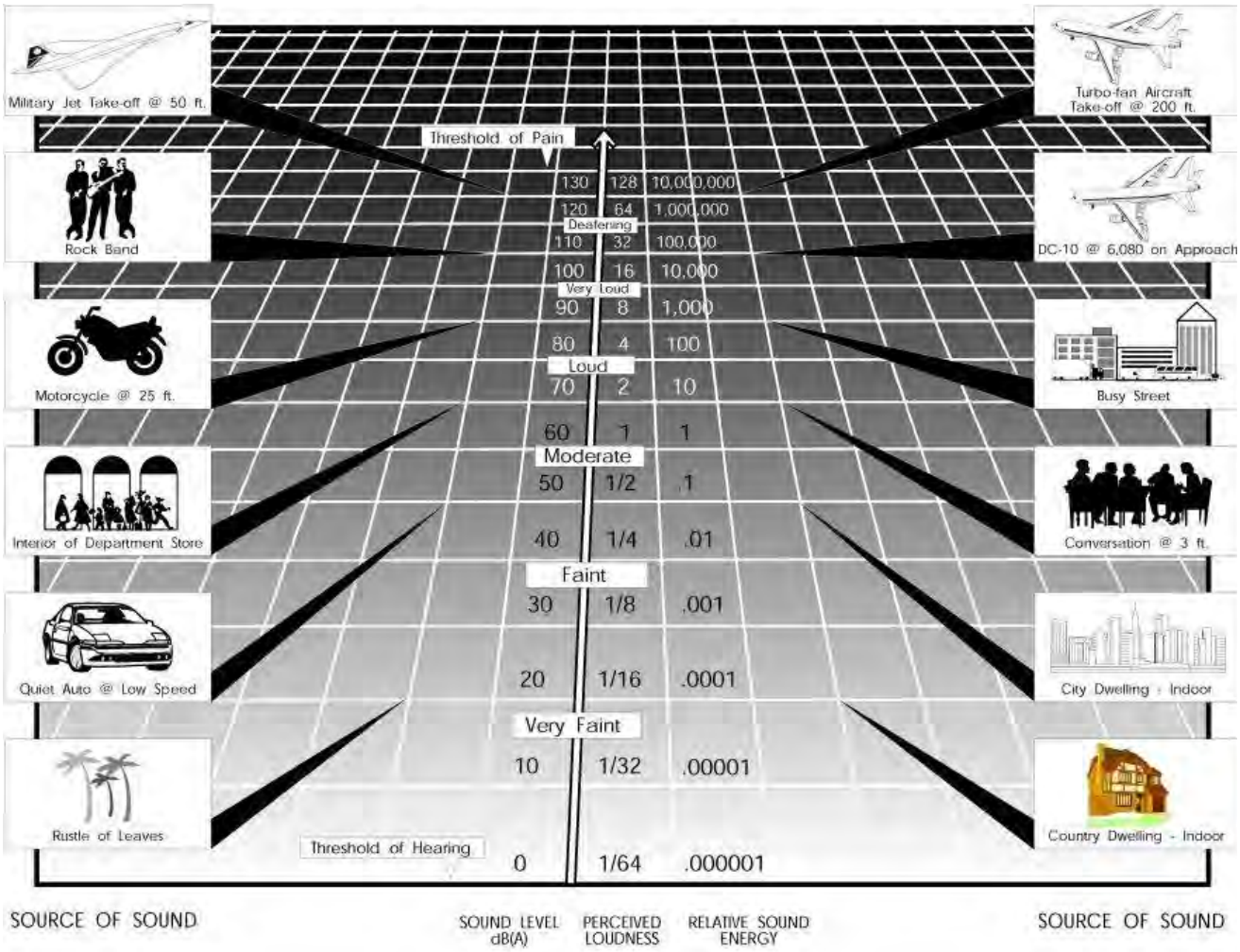
Construction Equipment Vibration Source Levels[1]

Equipment	Peak Partical Velocity in inches per second[2]		
	at 25 ft.	at 50 ft.	at 100 ft.
Clam Shovel Drop (slurry wall)	**0.202**	0.071	0.025
Vibratory Roller	**0.210**	0.074	0.026
Hoe Ram	**0.089**	0.031	0.011
Large Bulldozer	**0.089**	0.031	0.011
Caisson Drilling	**0.089**	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Jackhammer	0.035	0.012	0.004
Small Bulldozer	0.003	0.001	0.0004

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

[2] Bold values are considered annoying to people.

Figure 3
Common Noise Sources and Noise Levels



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IV. Existing Noise Environment

A. Sensitive Noise Receptors

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, and residential uses make up the majority of these areas. The project site is adjacent to several existing single-family detached residential neighborhoods to the south and east.

B. Existing Noise Levels

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 on February 4, 2014. One 15-minute noise measurement was taken between 9:42 AM and 9:57 AM. The ambient Leq was measured at 39 dBA. The noise measurement location is shown on Figure 4. Correlating ambient noise levels are presented in Table 3 and measurement output data is included within Appendix A.

Measurement locations are shown on Figure 4. Ambient noise levels are presented in Table 3 and measurement output data is included within Appendix A.

Primary noise sources in the project area consist of vehicular traffic on adjacent roadways, birds chirping and dogs barking.

Table 3

Ambient Noise Levels[1]

Name	Time Period	Measurement Period	Description	Existing Ambient Noise Levels (dBA)					
				L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}
M1	9:42 AM - 9:57 AM	15 min	Along southern property boundary	39.0	47.0	43.3	41.4	39.8	38.3

[1] Source: Site Visit, Kunzman Associates, Inc. (March 14, 2012).

Figure 4
Ambient Noise Measurement Locations

Legend

⊗ = Noise Measurement Location

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V. Analytical Methodology and Model Parameters

A. Noise Modeling and Input

1. Federal Highway Administration (FHWA) Traffic Noise Prediction Model

Existing and Existing Plus Project noise levels were modeled for affected nearby road segments utilizing the FHWA Traffic Noise Prediction Model - FHWA-RD-77-108 in order to quantify the proposed project's contribution to increases in ambient noise levels.

The FHWA Traffic Noise Prediction Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Adjustments are then made to the REMEL to account for: total average daily trips (ADT), roadway classification, width, speed and truck mix, roadway grade and site conditions (hard or soft ground surface). Surfaces adjacent to all modeled roadways were assumed to have a "hard site" to predict worst-case, conservative noise levels. A hard site, such as pavement, is highly reflective and does not attenuate noise as quickly as grass or other soft sites. Possible reductions in noise levels due to intervening topography and buildings were not accounted for in this analysis.

Existing and Existing Plus Project traffic volumes were obtained from the project's traffic study (Kunzman Associates, Inc. 2014). The City of Lake Elsinore does not have published vehicle/truck mixes or Day/Evening/Night (D/E/N) for use in acoustical studies. Vehicle/truck mixes and D/E/N splits for use in acoustical studies published by the Riverside County Department of Industrial Hygiene were utilized for noise modeling. Existing Plus Project vehicle mixes were calculated by adding the proposed project trips to existing conditions.

2. Road Construction Noise Model (RCNM)

A worst-case construction noise scenario was modeled using the Federal Highway Administration's Roadway Construction Noise Model (RCNM). Modeling parameters and output are provided in Appendix B. RCNM utilizes standard noise emission levels for many different types of equipment and includes utilization percentage, impact, and shielding parameters.

3. SoundPLAN

SoundPLAN was utilized to model traffic noise associated with Holland Road. It is a three-dimensional noise modeling software that takes into account the shielding and reflective effects associated with intervening topography and nearby buildings. Roadway parameters utilized in the model include location, traffic volume, speed and vehicle mix (auto, medium truck and heavy truck). Because the City of Lake Elsinore does not have published mixes, day/evening/night mixes and truck mixes as recommended by the County of Riverside Department of Industrial Hygiene were utilized for modeling purposes.

VI. Applicable Standards

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 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.

2. Federal Transit Administration

The Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual (2006) provides guidance for the analysis of noise and vibration associated with federally-funded transit projects. Section 7 of the manual discusses basic ground-borne vibration concepts including terminology, applicable descriptors, analysis procedures, thresholds and recommended mitigation for groundborne noise and vibration. Groundborne vibration thresholds included in this manual are frequently utilized for state and local projects where local thresholds for the analysis of groundborne noise and vibration have not been adopted. As shown in Table 4, the FTA's maximum acceptable vibration standard for human annoyance in residences where people normally sleep is 80 VdB (less than 70 vibration events per day).

B. State Regulations

1. State of California Building Standards Code

The State of California has adopted noise standards in areas of regulation not preempted by the Federal government. State standards regulate noise levels of motor vehicles, sound transmission through buildings, occupational noise control, and noise insulation. Title 24 of the California Code of Regulations, also known as the California Building Standards Code, establishes building standards applicable to all occupancies throughout the state. The code provides acoustical regulations for both exterior-to-interior sound insulation, as well as sound and impact isolation between adjacent spaces of various occupied units. Title 24 regulations state that interior noise levels generated by exterior noise sources shall not exceed 45 dBA Ldn/CNEL, with windows closed, in any habitable room for general residential uses.

Section 1208A, Sound Transmission, of the California Building Code requires acoustical evaluation and insulated building design and construction when exterior noise levels exceed 60 Ldn. New residential construction must be acoustically designed and constructed to reduce the intrusion of transportation noise and local fixed noise sources. The California Building Code requires a minimum Sound Transmission Class of 50 (STC50) and Impact Isolation Class 50 (IIC50) for multi-family attached residential dwelling units.

2. State of California General Plan Guidelines 2003

Though not adopted by law, the State of California General Plan Guidelines 2003, published by the California Governor's Office of Planning and Research (OPR) (OPR Guidelines), provides guidance for the compatibility of projects within areas of specific noise exposure. The OPR Guidelines identify the suitability of various types of construction relative to a range of outdoor noise levels and provide each local community some flexibility in setting local noise standards that allow for the variability in community preferences. Findings presented in the Levels of Environmental Noise Document (EPA 1974) influenced the recommendations of the OPR Guidelines, most importantly in the choice of noise exposure metrics (i.e., Ldn or CNEL) and in the upper limits for the normally acceptable outdoor exposure of noise-sensitive uses.

The OPR Guidelines include a Noise and Land Use Compatibility Matrix which identifies acceptable and unacceptable community noise exposure limits for various land use categories. Where the "normally acceptable" range is used, it is defined as the highest noise level that should be considered for the construction of the buildings which do not incorporate any special acoustical treatment or noise mitigation. The "conditionally acceptable" or "normally unacceptable" ranges include conditions calling for detailed acoustical study or construction mitigation to reduce interior exposure levels prior to the construction or operation of the building under the listed exposure levels.

3. California Environmental Quality Act

The California Environmental Quality Act Guidelines (Appendix G) establishes thresholds for noise impact analysis. Two of these standards apply to what is referred to as a "substantial increase" in ambient noise levels. Neither the California Environmental Quality Act nor the City of Lake Elsinore General Plan Noise Element recognizes an official numerical increase as a "substantial increase". Industry-accepted standards for what is considered to be a "substantial increase" range from 3 dB to 12 dB. It should be noted that a change of 3 dB is considered to be "barely audible" to a trained ear and that a change of 5 dB is considered to be a readily audible change. Noise generated by transportation sources propagates differently than noise generated by point sources.

For purposes of this analysis, the following two thresholds were utilized to evaluate the project's potential to result in substantial increases in ambient noise levels.

Traffic Noise

Roadway noise impacts would be considered significant if the project increases noise levels at a noise sensitive land use by 3 dBA Ldn and if: (1) the existing noise levels already exceed the residential land use compatibility standard for "normally compatible" (65 dBA Ldn), or (2) the project increases noise levels from below the 65 dBA Ldn standard to above 65 dBA Ldn.

Stationary Noise

Project operations, including noise from loading and unloading activities, and parking lot noise etc., may produce an increase noise levels which disturbs the peace and quiet of adjacent residential areas or cause discomfort/annoyance to area residents. Caltrans considers a 5 dBA increase to be "readily audible", which seems to correlate most closely to "substantial increase." For the purposes of this report, a substantial permanent increase in ambient noise levels due to stationary noise sources shall be considered 5 dBA L_{eq}.

4. California Department of Transportation (Caltrans)

The Caltrans Transportation and Vibration Guidance Manual recommends a maximum vibration level standard of 0.2 in/sec PPV for the prevention of structural damage to typical residential buildings.

C. Local Regulations

1. General Plan Noise Element

The Public Safety and Welfare Element of the City of Lake Elsinore General includes the following goal regarding community noise:

- Maintain an environment for all City residents and visitors free of unhealthy, obtrusive, or otherwise excessive noise.

In order to implement this goal, the City of Lake Elsinore has adopted a slightly modified version of the Noise and Land Use Compatibility Guidelines from the State of California. As shown in Table 5, residential land uses are considered to be "Clearly Compatible" in areas with ambient noise levels of up to 60 dBA Ldn, (assuming that any buildings involved are of normal conventional construction) and "Normally Compatible[1]" up to 70 dBA Ldn. A 65 dBA Ldn exterior level is the threshold where noise begins to substantially interfere with enjoyment of any outdoor recreational amenity such as a yard, patio, spa/pool, etc. A level up to 65 dB Ldn exterior, and 45 dB Ldn interior would therefore be the appropriate noise standard for the proposed single-family detached residential dwelling units.

2. Municipal Code

Noises crossing boundaries between land uses are regulated by Section 17.176.060 of the Lake Elsinore Municipal Code. These noise standards are expressed in terms of a mean (50th percentile) noise level, which is the noise level allowed for up to 30 minutes. Some short-term noise levels may exceed the 50th percentile standard, up to a maximum of 20 dB above the allowable mean. This code is not intended to apply to construction activities but to neighbor to neighbor noise and will apply to each of the residential lots proposed by the project.

Section 17.176.080 of the City of Lake Elsinore Municipal Code prohibits the operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between weekday hours of 7:00 PM and 7:00 AM, or at any time on weekends or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work of public service utilities or by variance issued by the City. Further, where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum noise levels at affected properties will not exceed those listed in Table 5.

[1] "Normally Compatible" means that any new construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed nose insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Table 4

Groundborne Vibration and Noise Impact Criteria[1]

Land Use Category	Groundborne Vibration Impact Levels (VdB)		Groundborne Noise Impact Levels (dBA)	
	Frequent Events[2]	Infrequent Events[3]	Frequent Events[2]	Infrequent Events[3]
Category 1: Buildings where low ambient vibration is essential for interior vibrations	65 VdB[4]	65 VdB[4]	NA[5]	NA[5]
Category 2: Residences and buildings where people normally sleep	72 VdB	80 VdB	35 dBA	43dBA
Category 3: institutional land uses with primarily daytime use	75 VdB	83 VdB	40 dBA	48 dBA

[1] Source: United States Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Assessment, 1995.

[2] "Frequent Events" is defined as more than 70 vibration events per day.

[3] "Infrequent Events" is defined as fewer than 70 vibration events per day.

[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes.

[5] NA – Not Applicable

Table 5

Noise and Land Use Compatibility Matrix[1]

Land Use Categories		Day-Night Noise Level (dBA L_{dn})						
Categories	Uses	< 55	60	65	70	75	80 >	
Residential	Single Family, Duplex, Multiple Family	A	A	B	B	C	D	D
	Mobile Homes	A	A	B	C	C	D	D
Commercial - Regional District	Hotels, Motels, Transient Lodging	A	A	B	B	C	C	D
Commercial - Regional Village - District Special	Commercial, Retail, Bank, Restaurant, Movie Theatre	A	A	A	A	B	B	C
Commercial Industrial Institutional	Office Building, Research and Development, Professional Offices, City Office Building	A	A	A	B	B	C	D
Commercial - Regional	Amphitheatre, Concert Hall	B	B	C	C	D	D	D
Institutional -Civic Center	Auditorium, Meeting Hall							
Commercial - Recreation	Children's Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	B	B	D	D
Commercial - General, Special Industrial Institutional	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B
Institutional General	Hospital, Church, Library, Schools, Classroom	A	A	B	C	C	D	D
Open Space	Parks	A	A	A	B	C	D	D
	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C
Agriculture	Agriculture	A	A	A	A	A	A	A

Zone A **Clearly Compatible**	Specified land uses is satisfactory based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation or requirements.
Zone B **Normally Compatible**	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 normally suffice. Outdoor environment will seem noisy.
Zone C **Normally Incompatible**	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.
Zone D **Clearly Incompatible**	New construction or development should generally not be undertaken.

[1] Source: City of Lake Elsinore General Plan Public Safety and Welfare Element.

VII. Impact Analysis

A. Construction Noise Impacts

1. Project Generated Construction Noise Levels

Construction noise varies 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 construction activities are shown in Table 6.

The initial phase of construction would involve mass grading of the site, along with site development activities. This includes construction of internal roadways which involves fine grading, trenching, and paving activities. Following site preparation activities, the project would include construction of buildings. Construction of the buildings would require the following phases: site development, building construction, architectural coatings application, and paving associated with buildings. Mass site grading is expected to produce the highest construction noise levels and is estimated to require several graders, dozers, excavators, scrapers, and pickup trucks. The grading phase of construction is anticipated to last two to three months.

Noise levels were calculated utilizing the Road Construction Noise Model (RCNM) provided by the FHWA. Unmitigated noise levels could reach a maximum noise level of up to 81.0 L_{eq} and 85.0 dBA L_{max} at 50 feet, which is the closest to the nearest sensitive receptor the loudest piece of equipment (a grader) is likely to be working for any length of time. Noise levels will lower substantially as construction moves away from the property line. For example, a noise level that is 85 dBA at the source can be expected to drop to 79 dBA at a distance of 100 feet from the source and to 73 dBA at a distance of 200 feet from the source.

Project construction would generate trips from construction worker travel, the arrival and departure of trucks moving soil, delivering construction materials, and the removal of debris generated by on-site demolition activities resulting temporary increases in ambient noise levels. Although each haul truck would result in single noise events reaching up to 80 dBA at a distance of 50 feet (FHWA), fill material would be transported from the adjacent Planning Areas of 32, 28A, and 28B minimizing the need to utilize the roadway and thereby minimizing the potential to affected sensitive receptors along the roadway.

2. Consistency with Applicable Standards

City of Lake Elsinore General Plan

The City's General Plan does not contain any specific language pertaining to construction.

City of Lake Elsinore Municipal Code

Section 17.176.080 of the City of Lake Elsinore Municipal Code restricts construction which creates a noise disturbance across a residential or commercial real property line at night and on weekends or holidays. The code also sets a maximum allowed construction noise level of 75 dBA L_{max} in single-family residential areas between 7:00 AM and 7:00 PM. The code also sets a limit of 60 dBA L_{max} in those same areas to apply between the hours of 7:00 PM and 7:00 AM. The anticipated distances to the 60 and 75 dBA L_{max} project construction noise contours were calculated using RCNM. Without mitigation, sensitive receptors up to 150 feet from the property line could experience noise levels over 75 dBA L_{max}. Unmitigated noise levels could also reach 60 dBA L_{max} up to 890 feet from the property line. Construction noise levels at these receptors would exceed City of Lake Elsinore standards. If construction equipment is operated within 150 feet of a residential property line between the hours of 7:00 AM and 7:00 PM the daytime standard of 75 dBA L_{max} may be exceeded; and if construction equipment is operated within 890 feet of a residential property line between the hours of 7:00 PM and 7:00 AM the City's nighttime standard of 60 dBA L_{max} may be exceeded.

Project construction noise would be minimized with implementation of construction mitigation measures found in Section VII.

B. Traffic Noise Impacts to the Proposed Project

1. Traffic Noise Impacts to the Proposed Project

Buildout noise levels along Holland Road were modeled using SoundPLAN, which utilizes the algorithms found in the Federal Highway Administration's (FHWA) Traffic Noise Model. As shown on Figure 5, unmitigated future exterior noise levels in the back yards of single-family detached residential dwelling units that are adjacent to Holland Road are expected to reach up to 72.4 dBA Ldn and unmitigated future exterior noise levels at the façade of the proposed single-family detached residential dwelling units are expected to reach 69.3 dBA Ldn at the first floor and 71.5 dBA Ldn at second story receptors. Exterior noise levels at single-family detached residential dwelling units not adjacent to Holland Road would not exceed 65 dBA Ldn. Unmitigated buildout traffic noise levels for selected representative sensitive receptors along Holland Road are shown on Figures 5 and 6 and mitigated noise levels are shown on Figures 7 and 8.

2. Consistency with Applicable Standards

City of Lake Elsinore General Plan

Buildout traffic noise levels would exceed the City's 65 dBA Ldn threshold for exterior noise at sensitive receptors. Therefore, mitigation is required. Construction of a six-foot high barrier at the top of the slope as shown on Figures 7 and 8 would reduce noise these levels to below 65 dBA Ldn. The proposed barrier will not reduce exterior noise levels at the second story of single-family detached residential dwelling units

adjacent to Holland Road to below 65 dBA Ldn and it is not aesthetically desirable or reasonable to construct a barrier high enough to do so. Therefore, enhanced building construction methods and materials must be employed to achieve acceptable interior noise levels. These methods are presented in Section VII of this report. Exterior noise levels with construction of a 6-foot barrier for selected representative sensitive receptors are shown on Figure 7 and noise level contours with construction of a barrier are shown on Figure 8.

C. Project Generated Traffic Noise Impacts to Sensitive Receptors

1. Off-Site Project Generated Traffic Noise Impacts

The FHWA Traffic Noise Prediction Model - FHWA-RD-77-108 was used to model Existing and Existing Plus Project noise levels were modeled for each roadway segment analyzed in the traffic study prepared for the proposed project (Kunzman Associates, Inc., 2014). Project generated increases in ambient noise levels along affected road segments were then calculated. Modeling output is included in this report as Appendix C.

The Existing traffic noise modeling resulted in noise levels ranging between 64.7 and 72.8 dBA Ldn at 50 feet from the centerline of the affected road segments; and the Existing Plus Project traffic noise model resulted in noise levels ranging from 66.6 to 72.9 dBA Ldn at 50 feet. The results of the Existing and Existing Plus Project noise models are shown in Table 7.

2. Consistency with Applicable Standards

California Environmental Quality Act - Substantial Increase

As can be seen in Table 7, in all cases, project generated vehicle noise would contribute less than 1 dBA Ldn to the ambient noise levels along affected road segments. This increase would not be noticeable. No mitigation is required.

D. Vibration Impacts

1. Project Generated Vibration

Table 2 shows the peak particle velocities of some common construction equipment and haul trucks (loaded trucks). The most vibration-causing piece of equipment that will likely be used on-site is the vibratory roller. This machine can cause vibration strong enough to annoy people over 100 feet away. Due to the proximity of adjacent single-family detached residential dwelling units, project construction activities may result in ground borne vibration that is annoying but would only occur during site grading and preparation activities. Construction vibration will not result in any structural damage.

Based on Caltrans data, haul trucks would not be anticipated to exceed 0.10 in/sec peak particle velocity (ppv) at 10 feet (Caltrans 2002). Predicted vibration levels at the

nearest off-site structures, which are located in excess of 25 feet from the traveled roadway segments, would not be anticipated to exceed even the most conservative threshold of 0.2 inch/second ppv.

2. Consistency with Applicable Standards

The City of Lake Elsinore does not have standards or guidelines regarding ground-borne vibration. Vibration impacts will be reduced through implementation of construction mitigation measures provided in Section VII. Project construction will not result in any structural damage.

Table 6

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.

Table 7

FHWA-RD-77-108 Traffic Noise Model Results[1]

Modeled Noise Levels (dBA CNEL)					
Roadway	Segment	Existing	Existing Plus Project	Increase	Substantial
Canyon Hills Road	Site to Murrieta Road	66.4	66.6	0.2	No
	Site to Railroad Canyon Road	64.7	64.9	0.2	No
Railroad Canyon Road	South of Canyon Hills Road	72.8	72.9	0.1	No
Murrieta Road	North of Canyon Hills Road	69.1	69.2	0.1	No
	South of Canyon Hills Road	67.9	67.9	0.0	No

[1] FHWA Spreadsheet Analysis (Summary of Appendix C)

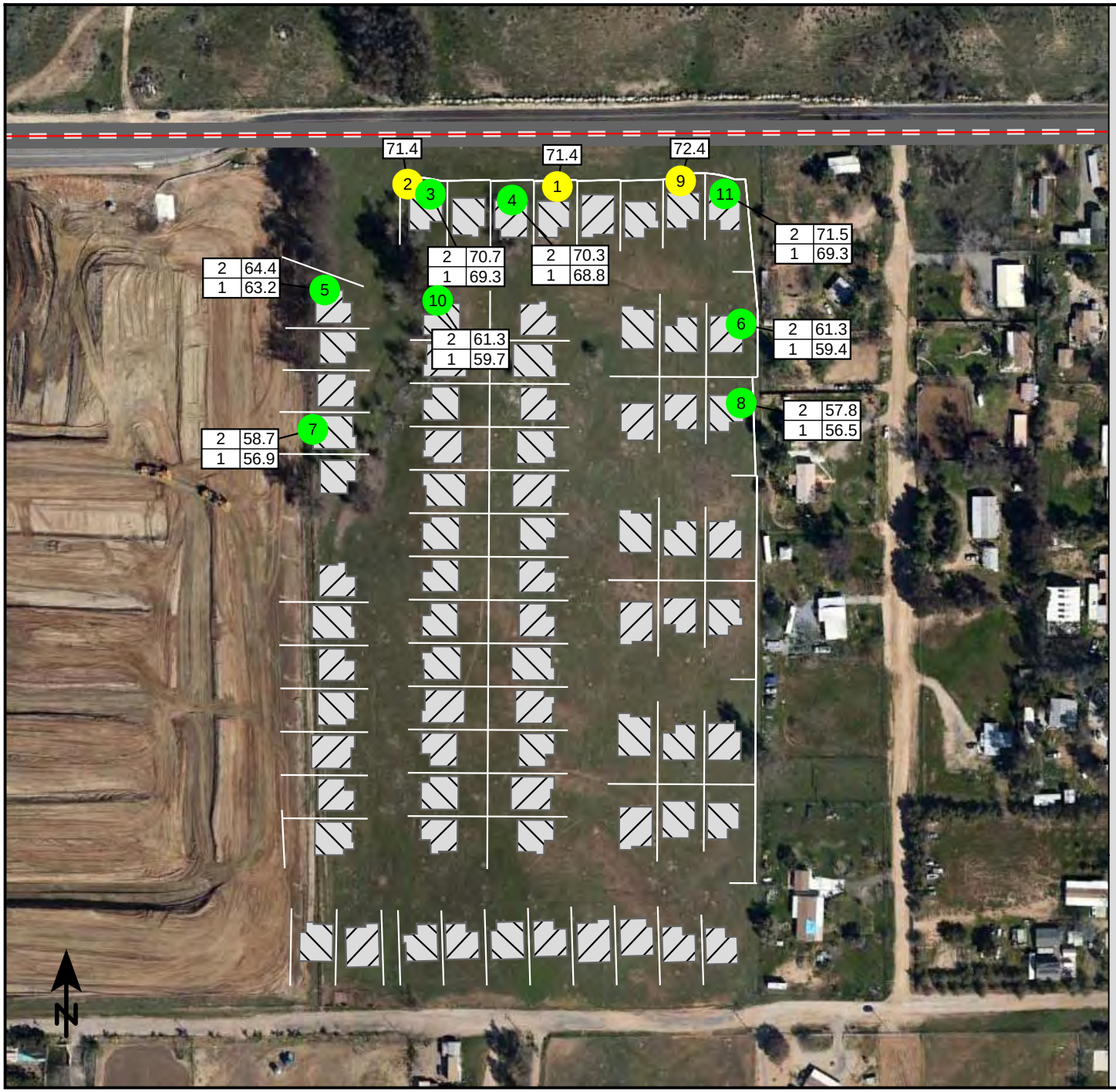

Figure 5

Unmitigated Traffic Noise Levels (CNEL)

Signs and symbols

- Proposed Building
- Receiver
- Receiver at Building
- Roadway Emission Line
- Roadway Surface
- CNEL by Floor

1 : 2667

0 12.5 25 50 75 100 m

Figure 6

Unmitigated Traffic Noise Level Contours (CNEL)

Signs and symbols

Proposed Building

Roadway Emission Line

Roadway Surface

Levels in dB(A)

<= 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
> 70

1 : 2667

0 12.5 25 50 75 100 m

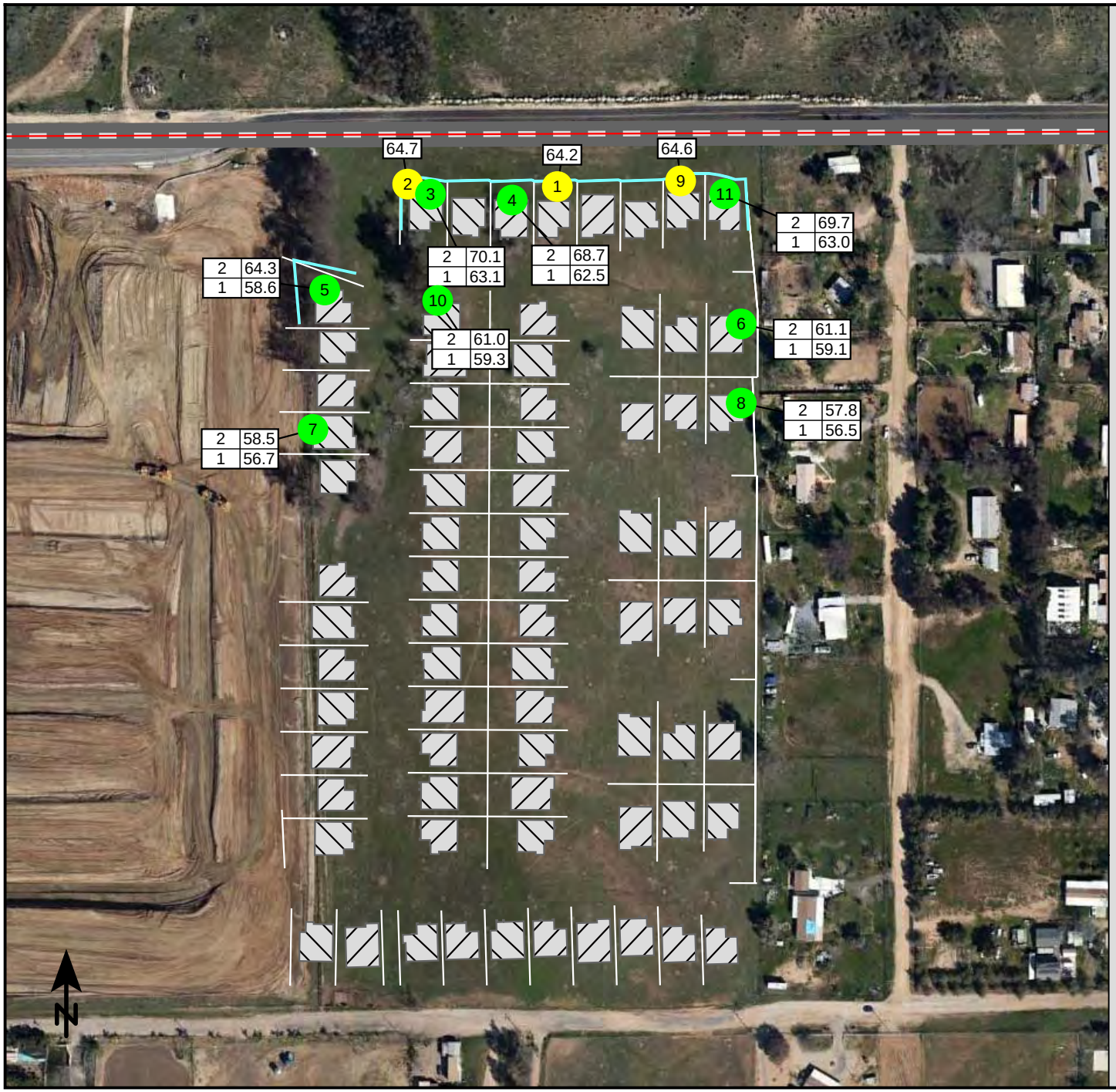

Figure 7

Mitigated Traffic Noise Levels (CNEL)

Signs and symbols

- Proposed 6 ft Barrier
- Proposed Building
- Receiver
- Receiver at Building
- Roadway Emission Line
- Roadway Surface
- CNEL by Floor

1 : 2667

0 12.5 25 50 75 100 m

Note: The proposed barrier was modeled atop an approximately 6.5-9.5 foot high 2:1 slope, which acts as a berm to further shield noise levels.

Figure 8

Mitigated Traffic Noise Level Contours (CNEL)

Signs and symbols

- Proposed 6 ft Barrier
- Proposed Building
- Roadway Emission Line
- Roadway Surface

Levels in dB(A)

	<= 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	> 70

1 : 2667

0 12.5 25 50 75 100 m

Note: The proposed barrier was modeled atop an approximately 6.5-9.5 foot high 2:1 slope, which acts as a berm to further shield noise levels.

VIII. Mitigation Measures

A. Construction Measures

In addition to adherence to the City of Lake Elsinore Municipal Code limiting construction hours of operation, the following measures will minimize noise and vibration related impacts during demolition and construction activities.

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

9. 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.

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

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

12. When feasible, avoid the use of pavement breakers and vibratory rollers and packers near sensitive receptors.

13. Temporary noise barriers that provide at least 10 dBA in attenuation must be installed when project construction occurs within 150 feet of an existing residential property line. Any such barriers should break the line of sight from noise generators to sensitive receptors located immediately east of the project site. They should also be constructed as close to the sensitive receptor as possible to achieve the greatest attenuation effect and have no gaps or openings.

14. Because the City nighttime standard of 60 dBA Ldn would be exceeded at sensitive receptors up to 250 feet to the east, even with installation of temporary noise barriers, no construction should be performed at night (7:00 PM to 7:00 AM) Mondays through Fridays, and not at all on weekends or holidays.

B. Operational Noise Measures

3. Mitigation is required in order to achieve exterior noise levels of 65 dBA Ldn at several proposed sensitive receptors adjacent to Holland Road. This mitigation can be provided by constructing a six foot wall at the top of slope of the residential lots adjacent to Holland Road and at the northern and western top of slope of the northernmost lot

along the western site boundary. Barriers shall wrap around to protect the side yards of lots as shown on Figures 7 and 8.

4. As it is usually not aesthetically desirable to construct barriers high enough to reduce interior noise levels at second story sensitive receptors, enhanced building construction methods and materials must be employed. Single-family detached residential dwelling units adjacent to Holland Road will require approximately 25 dBA of exterior to interior noise reduction to achieve acceptable interior noise levels. The methods required to achieve this attenuation are shown as Mitigation Methods 1 through 6 in Table 8.

Table 8

Typical Noise Attenuation Methods to Insulate the Noise Receiver[1]

Noise Level Reduction	Typical Mitigation Methods
15-20 dBA	1. Air conditioning or mechanical ventilation. 2. Double-paned glass. 3. Solid core doors with weather stripping and seals.
20-25 dBA	*Mitigation 1, 2, and 3 plus* 4. Stucco or brick veneer exterior walls or wood siding w/one-half inch thick fiberboard underlayer. 5. Glass portions of windows/doors not to exceed 20 percent. 6. Exterior vents facing noise source shall be baffled.
25-30 dBA	*Mitigation 1 through 6 plus* 7. Interior sheetrock of exterior wall attached to studs by resilient channels or double walls. 8. Window assemblies, doors, wall construction materials, and insulation shall have a lab-tested STC rating of 30 or greater.

[1] Source: City of San Diego General Plan, March 2008

IX. References

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2003 State of California General Plan Guidelines

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1994 Municipal Code – Chapter 17.176, Noise Control

Riverside, County of

2003 General Plan Circulation Element

2009 Requirements for determining and mitigating traffic noise impacts to residential structures. Department of Health – Office of Industrial Hygiene

Appendices

Appendix A –Noise Measurement Data Sheets

Appendix B – RCNM Noise Modeling Sheets

Appendix C – FHWA Traffic Noise Prediction Model - FHWA-RD-77-108 Output

APPENDIX A

Noise Measurement Data Sheets

Noise Measurement Data

Summary	Canyon Hills
Filename	LxT_Data.141
Serial Number	3099
Model	SoundTrack LxT®
Firmware Version	2.112
User	Roma Stromberg
Location	S of the site
Start	02/04/2014 9:42:11
Stop	02/04/2014 9:57:24
Duration	0:15:13.8
Run Time	0:15:08.0
Pause	0:00:00.0
Pre Calibration	02/04/2014 9:36:56
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	C Weighting
Detector	Slow
Preamp	PRMLxT1L
Microphone Correction	Off
Integration Method	Exponential
Overload	0.0 dB

Results

LASeq	39.0 dB		
LASE	66.9 dB		
EAS	0.542 µPa²h		
EAS8	25.450 µPa²h		
EAS40	127.250 µPa²h		
LCpeak (max)	02/04/2014 9:55:50	92.9 dB	
LASmax	02/04/2014 9:52:34	47.0 dB	
LASmin	02/04/2014 9:54:41	33.6 dB	
SEA	-99.9 dB		

LCSeq	64.5 dB	**Statistics**	
LASeq	39.0 dB	**LAS1.67**	43.3 dB
LCSeq - LASeq	25.5 dB	**LAS8.33**	41.4 dB
LAIeq	42.1 dB	**LAS25.00**	39.8 dB
LAeq	39.0 dB	**LAS50.00**	38.3 dB
LAIeq - LAeq	3.1 dB	**LAS66.67**	37.5 dB
# Overloads	0	**LAS90.00**	35.9 dB
Overload Duration	0.0 s		

APPENDIX B

RCNM Noise Modeling Sheets

Report date: 2/27/2014
Case Description: Canyon Hills Construction Noise

Receptor 1

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
50'	Residential	60	60	55

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Backhoe	No	40		77.6	100	0
Dozer	No	40		81.7	75	0
Excavator	No	40		80.7	125	0
Pickup Truck	No	40		75	50	0

Results

	Calculated (dBA)		
Equipment	*Lmax	Leq	Day Lmax
Grader	85	81	N/A
Backhoe	71.5	67.6	N/A
Dozer	78.1	74.2	N/A
Excavator	72.8	68.8	N/A
Pickup Truck	75	71	N/A
Total	85	82.5	N/A

*Calculated Lmax is the Loudest value.

APPENDIX C

FHWA Traffic Noise Prediction Model
– FHWA-RD-77-108 Output

FHWA Sound32 Spreadsheet

Existing Traffic Noise

Project: **5590a**
Road: **Holland/Canyon Hills Road**
Segment: **Site to Railroad Canyon Road**

	DAYTIME			EVENING			NIGHTTIME			ADT	16300.00
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	SPEED	40.00
INPUT PARAMETERS										DISTANCE	45.00
Vehicles per hour	499.87	6.11	2.38	92.37	0.27	0.27	69.41	6.11	2.38	% A	97.40
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	1.84
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	0.74
ADJUSTMENTS											
Flow	20.66	1.54	-2.57	13.33	-11.99	-11.99	12.09	1.54	-2.57		
Distance	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	66.41
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	64.24
LEQ	63.41	53.24	53.98	56.08	39.71	44.56	54.84	53.24	53.98	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	64.24		EVENING LEQ	56.46		NIGHT LEQ	58.84		Use hour?	no
										GRADE dB	0.00
	CNEL		66.41								

FHWA Sound32 Spreadsheet

Existing Plus Project Traffic Noise

Project: **5590a**
Road: **Holland/Canyon Hills Road**
Segment: **Site to Railroad Canyon Road**

	DAYTIME			EVENING			NIGHTTIME				
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT	16652.00
										SPEED	40.00
										DISTANCE	45.00
INPUT PARAMETERS											
Vehicles per hour	510.45	6.14	2.48	94.74	0.26	0.10	70.48	6.40	2.59	% A	97.39
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	1.84
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	0.75
ADJUSTMENTS											
Flow	20.75	1.55	-2.38	13.44	-12.25	-16.18	12.15	1.73	-2.20		
Distance	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	66.56
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	64.33
LEQ	63.50	53.25	54.17	56.19	39.45	40.37	54.90	53.43	54.35	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	64.33		EVENING LEQ	56.39		NIGHT LEQ	59.04		Use hour?	no
										GRADE dB	0.00
	CNEL		66.56								

FHWA Sound32 Spreadsheet

Existing Traffic Noise

Project: **5590a**
Road: **Holland/Canyon Hills Road**
Segment: **Site to Murrieta Road**

	DAYTIME			EVENING			NIGHTTIME			ADT	4300.00
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	SPEED	40.00
										DISTANCE	45.00
INPUT PARAMETERS											
Vehicles per hour	124.52	2.58	4.30	23.11	0.11	0.18	17.20	2.69	4.48	% A	92.00
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	3.00
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	5.00
ADJUSTMENTS											
Flow	14.63	-2.21	0.01	7.31	-16.01	-13.79	6.03	-2.03	0.19		
Distance	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	64.76
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	60.36
LEQ	57.37	49.49	56.56	50.06	35.69	42.75	48.78	49.67	56.73	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	60.36		EVENING LEQ	50.93		NIGHT LEQ	58.06		Use hour?	no
										GRADE dB	0.00
	CNEL		64.76								

FHWA Sound32 Spreadsheet

Existing Plus Project Traffic Noise

Project: **5590a**
Road: **Holland/Canyon Hills Road**
Segment: **Site to Murrieta Road**

	DAYTIME			EVENING			NIGHTTIME				
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT	4652.00
										SPEED	40.00
										DISTANCE	45.00
INPUT PARAMETERS											
Vehicles per hour	135.26	2.72	4.37	25.10	0.11	0.18	18.68	2.83	4.55	% A	92.38
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	2.92
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	4.70
ADJUSTMENTS											
Flow	14.99	-1.98	0.08	7.67	-15.78	-13.72	6.39	-1.80	0.26		
Distance	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	64.91
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	60.60
LEQ	57.73	49.72	56.63	50.42	35.92	42.82	49.13	49.90	56.80	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	60.60		EVENING LEQ	51.24		NIGHT LEQ	58.19		Use hour?	no
										GRADE dB	0.00
	CNEL		64.91								

FHWA Sound32 Spreadsheet

Existing Traffic Noise

Project: **5590a**
Road: **Railroad Canyon Road**
Segment: **South of Canyon Hills Road**

	DAYTIME			EVENING			NIGHTTIME				
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT	30800.00
										SPEED	40.00
										DISTANCE	50.00
INPUT PARAMETERS											
Vehicles per hour	891.92	18.48	30.80	165.55	0.77	1.28	123.20	19.25	32.08	% A	92.00
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	3.00
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	5.00
ADJUSTMENTS											
Flow	23.18	6.34	8.56	15.86	-7.46	-5.24	14.58	6.52	8.74		
Distance	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	72.85
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	68.46
LEQ	65.47	57.58	64.65	58.15	43.78	50.85	56.87	57.76	64.83	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	68.46		EVENING LEQ	59.03		NIGHT LEQ	66.15		Use hour?	no
										GRADE dB	0.00
	CNEL		72.85								

FHWA Sound32 Spreadsheet

Existing Plus Project Traffic Noise

Project: **5590a**
Road: **Railroad Canyon Road**
Segment: **South of Canyon Hills Road**

	DAYTIME			EVENING			NIGHTTIME				
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT	31152.00
										SPEED	40.00
										DISTANCE	50.00
INPUT PARAMETERS											
Vehicles per hour	902.62	18.62	30.87	167.52	0.78	1.29	124.63	19.40	32.16	% A	92.06
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	2.99
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	4.95
ADJUSTMENTS											
Flow	23.23	6.37	8.57	15.91	-7.43	-5.23	14.63	6.55	8.75		
Distance	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	72.87
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	68.49
LEQ	65.52	57.62	64.66	58.20	43.81	50.86	56.92	57.79	64.84	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	68.49		EVENING LEQ	59.07		NIGHT LEQ	66.17		Use hour?	no
										GRADE dB	0.00
	CNEL		72.87								

FHWA Sound32 Spreadsheet

Existing Traffic Noise

Project: **5590a**
Road: **Murrieta Road**
Segment: **North of Holand Road**

	DAYTIME			EVENING			NIGHTTIME			ADT	10400.00
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	SPEED	40.00
INPUT PARAMETERS										DISTANCE	40.00
Vehicles per hour	301.17	6.24	10.40	55.90	0.26	0.43	41.60	6.50	10.83	% A	92.00
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	3.00
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	5.00
ADJUSTMENTS											
Flow	18.46	1.63	3.84	11.15	-12.18	-9.96	9.86	1.80	4.02		
Distance	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	69.10
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	64.71
LEQ	61.72	53.84	60.90	54.41	40.04	47.10	53.12	54.01	61.08	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	64.71		EVENING LEQ	55.28		NIGHT LEQ	62.40		Use hour?	no
										GRADE dB	0.00
	CNEL		69.10								

FHWA Sound32 Spreadsheet

Existing Plus Project Traffic Noise

Project: **5590a**
Road: **Murrieta Road**
Segment: **North of Holand Road**

	DAYTIME			EVENING			NIGHTTIME				
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT	10646.00
										SPEED	40.00
										DISTANCE	40.00
INPUT PARAMETERS											
Vehicles per hour	308.66	6.34	10.45	57.29	0.26	0.44	42.62	6.60	10.88	% A	92.12
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	2.98
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	4.91
ADJUSTMENTS											
Flow	18.57	1.69	3.86	11.25	-12.11	-9.94	9.97	1.87	4.04		
Distance	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	69.15
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	64.78
LEQ	61.83	53.91	60.92	54.51	40.10	47.12	53.23	54.08	61.10	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	64.78		EVENING LEQ	55.37		NIGHT LEQ	62.44		Use hour?	no
										GRADE dB	0.00
	CNEL		69.15								

FHWA Sound32 Spreadsheet

Existing Traffic Noise

Project: **5590a**
Road: **Murrieta Road**
Segment: **South of Holand Road**

	DAYTIME			EVENING			NIGHTTIME			ADT	7800.00
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	SPEED	40.00
										DISTANCE	40.00
INPUT PARAMETERS											
Vehicles per hour	225.88	4.68	7.80	41.93	0.20	0.33	31.20	4.88	8.13	% A	92.00
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	3.00
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	5.00
ADJUSTMENTS											
Flow	17.21	0.38	2.59	9.90	-13.43	-11.21	8.62	0.55	2.77		
Distance	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	67.85
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	63.46
LEQ	60.47	52.59	59.65	53.16	38.79	45.85	51.87	52.77	59.83	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	63.46		EVENING LEQ	54.03		NIGHT LEQ	61.16		Use hour?	no
										GRADE dB	0.00
	CNEL		67.85								

FHWA Sound32 Spreadsheet

Existing Plus Project Traffic Noise

Project: **5590a**
Road: **Murrieta Road**
Segment: **South of Holand Road**

	DAYTIME			EVENING			NIGHTTIME				
	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	AUTOS	M.TRUCKS	H.TRUCKS	ADT	7906.00
										SPEED	40.00
										DISTANCE	40.00
INPUT PARAMETERS											
Vehicles per hour	229.10	4.72	7.82	42.52	0.20	0.33	31.63	4.92	8.15	% A	92.07
Speed in MPH	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00		
Left angle	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00	-90.00		
Right angle	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	% MT	2.99
NOISE CALCULATIONS											
Reference levels	67.36	76.31	81.16	67.36	76.31	81.16	67.36	76.31	81.16	% HT	4.95
ADJUSTMENTS											
Flow	17.27	0.42	2.61	9.96	-13.39	-11.20	8.67	0.59	2.78		
Distance	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	LEFT	-90.00
Finite Roadway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	RIGHT	90.00
Barrier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Grade	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	CNEL	67.88
Constant	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	-25.00	DAY LEQ	63.50
LEQ	60.53	52.63	59.66	53.22	38.82	45.86	51.93	52.80	59.84	Day hour	89.00
										Absorbtive?	no
	DAY LEQ	63.50		EVENING LEQ	54.08		NIGHT LEQ	61.18		Use hour?	no
										GRADE dB	0.00
	CNEL		67.88								

Kunzman Associates, Inc.

OVER 35 YEARS OF EXCELLENT SERVICE

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