2107 Old Woman Springs Road Development

Noise Impact Study

County of San Bernardino, CA

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

This noise assessment was prepared to evaluate the potential noise impacts for the project study area and to recommend noise mitigation measures, if necessary, to minimize the potential noise impacts. The assessment was conducted and compared to the noise standards set forth by the Federal, State and Local agencies. Consistent with the County's Noise Guidelines, the project must demonstrate compliance to the applicable noise criterion as outlined within the County's Noise Element and Municipal Code.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- A description of the local noise guidelines and standards
- An evaluation of the existing ambient noise environment
- An analysis of stationary noise impacts from the project site to adjacent land uses
- Construction noise and vibration evaluation

1.2 Site Location and Study Area

The project site is 640 acres of vacant land bounded on the west by Old Woman Springs Road, on the north by Luna Vista Road, on the East by Sage Avenue, and on the south by La Brisa Drive, in San Bernardino, California, as shown in Exhibit A. The parcel is located in Section 35, Township 2 North, Range 5 West, San Bernardino Baseline and Meridian (SBBM) USGE Yucca Valley North 7.5-minute topographical map.

1.3 Proposed Project Description

The Project proposes to develop the westerly approximately 225 acres of a 640-acre site located at 2107 Old Woman Springs Road in the unincorporated community of Flamingo Heights west of the Town of Yucca Valley. No development within the Pipes Canyon Wash portion of the site (approximately 350 acres), or the approximately 65 acres located east of the wash are proposed as part of this project.

The project is proposed as a destination "glamping" resort consisting of the following uses:

Accommodations: Up to 75 camp sites of three distinct types – approximately 10,000 square feet:
- Glamping Lofts
- Glamping Clusters
- Teepee

Support Buildings/Areas (all area calculations are preliminary subject to refinement during architectural program development:

- Reception Building/Store – 450 square feet
- Back of House (storage/maintenance yard) - 1,830 square feet
- Restaurant/Bar/Agave Farm – 5,400 square feet
- Recording Studio – 2,150 square feet
- Art Barn – 4,850 square feet
- Workshops – 3,230 square feet
- Yoga Deck – 1,000 square feet
- Pool/Patio – 3,000 square feet
- Fire Pits – Three total at 700 SF each - 2,100 square feet
- Restrooms – up to 18 common area restrooms at 45 SF per, total 775 square feet
- Sculpture Patio – 16,150 square feet

Infrastructure:

- Parking Lot/Helipad (up to 350 spaces in a D/G lot) – 149,700 square feet combined
- Retention Basin – to be determined
- Package Wastewater Treatment Plant (with leach field) - to be determined
- Dry Utilities - NA
- Wet Utilities - NA
- Temporary Parking Area – approximately 90.5 acres
- Amphitheatre with Lawn Seating
- Drive Aisle between Old Woman Springs Road and Reception area -

Trails/Paths/Gardens:

- Internal Paths/Walkways between buildings/ site activities – to be determined
- External Trails within the rest of the site (wash, east side of wash) – to be determined
- Gardens - 212,000 square feet

In addition, the project also includes a request to hold music festivals with up to 25,000 attendees over one or more weekends during the year. A Temporary Parking area has been identified on the Conceptual Site Plan consisting of approximately 90.5 acres. In addition, temporary restroom facilities would also be available for festival attendees. Exhibit B demonstrates the site plan for the project.

Exhibit A

Location Map

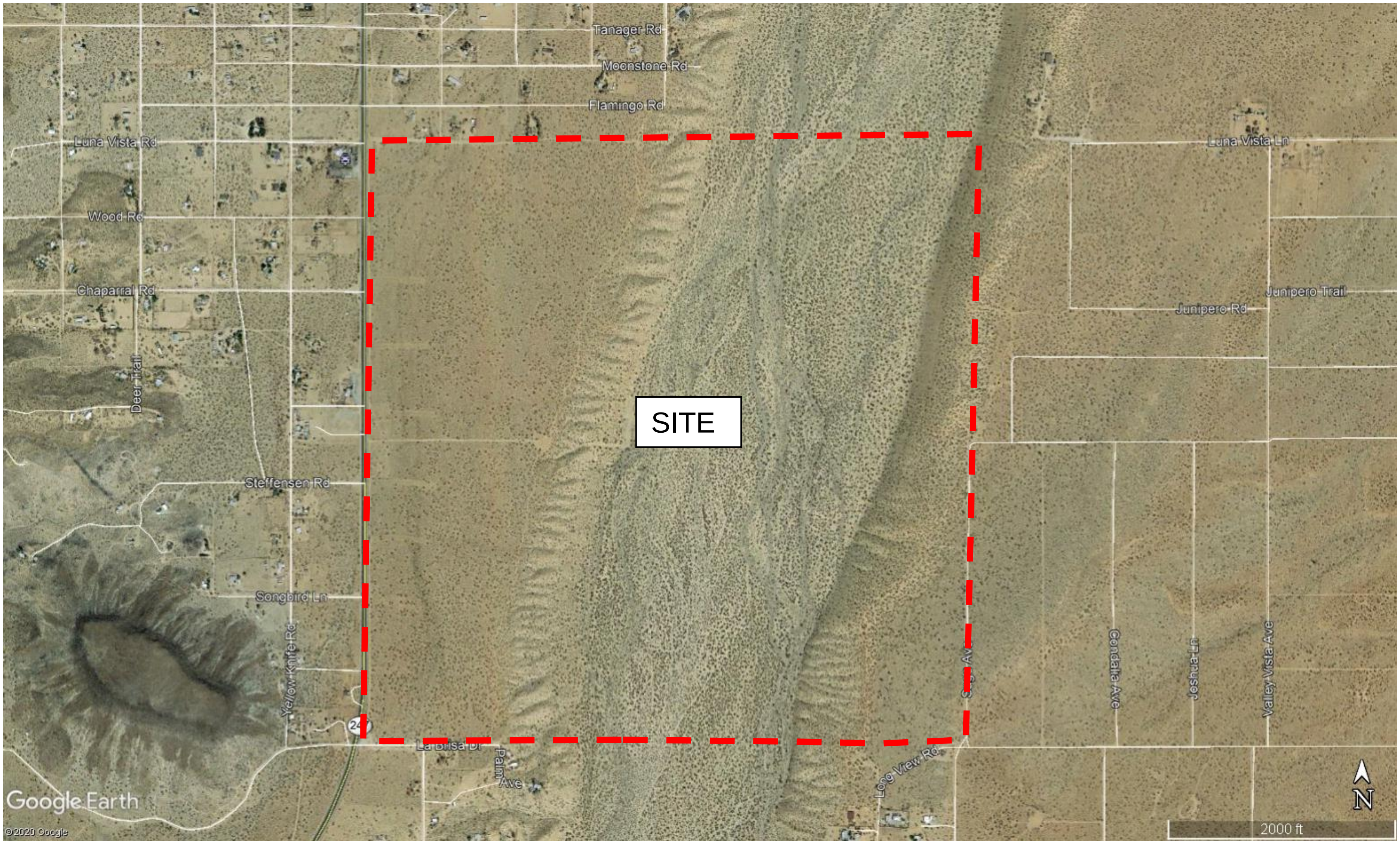
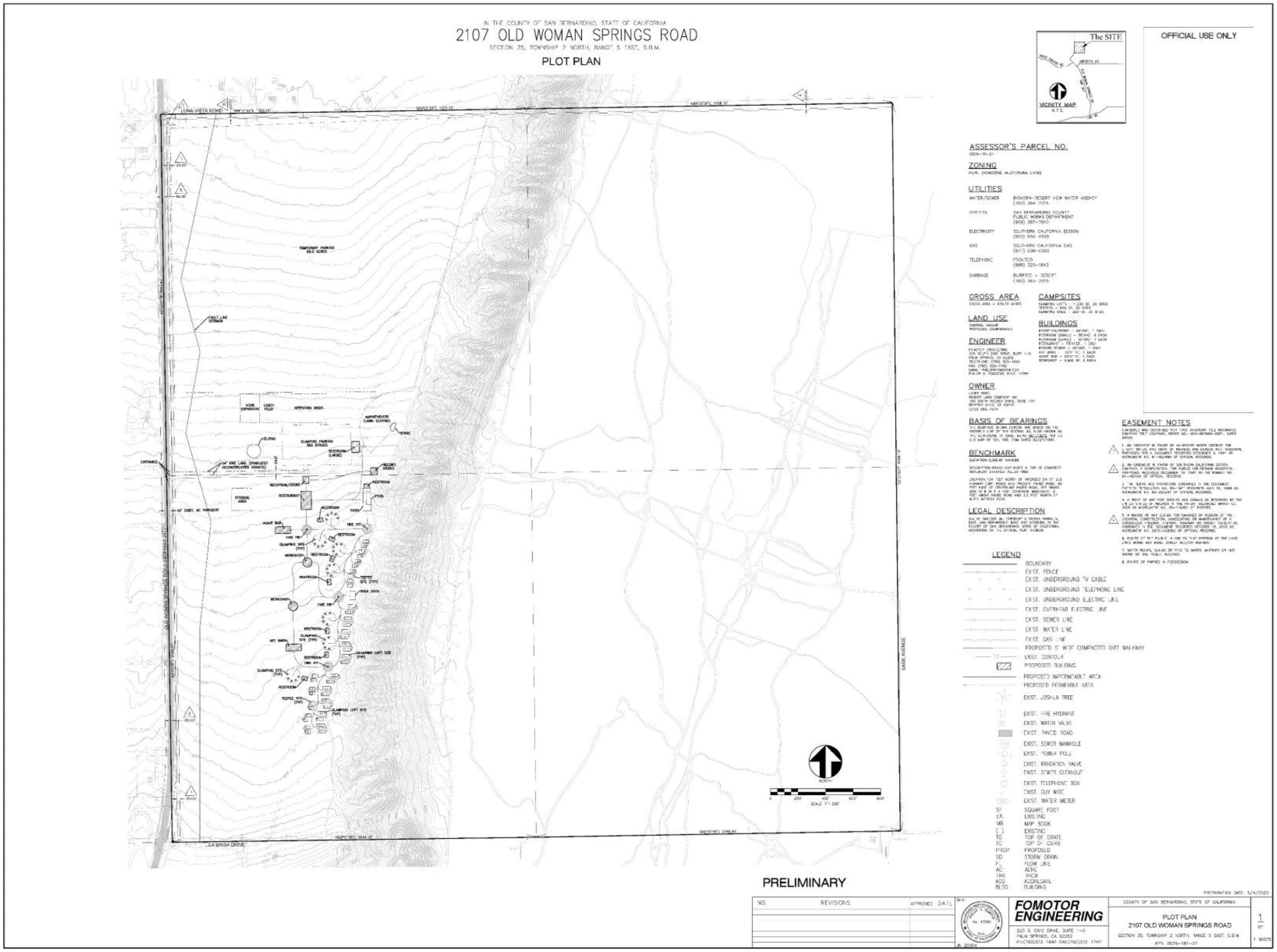


Exhibit B
Site Plan



2.0 Fundamentals of Noise

This section of the report provides basic information about noise and presents some of the terms used in the report.

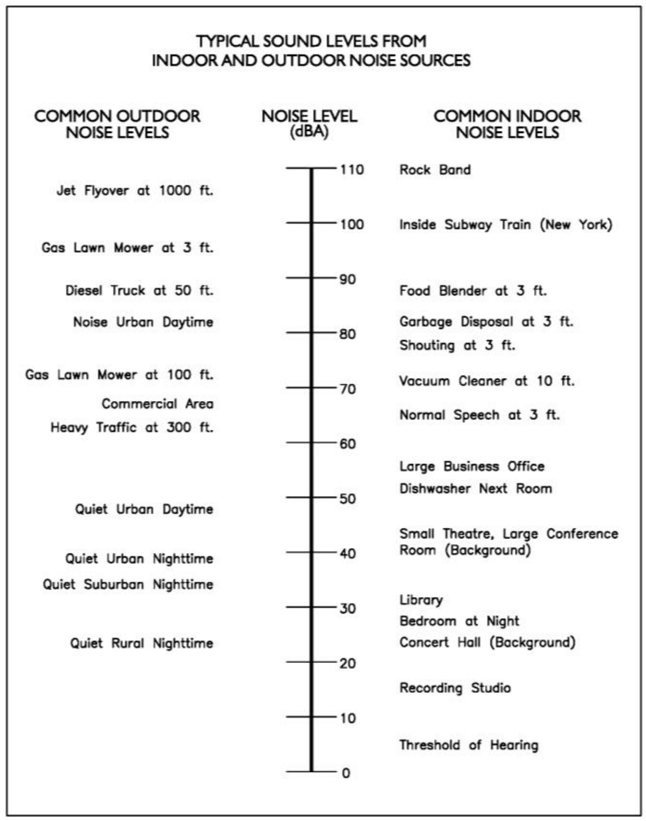
2.1 Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

Exhibit C: Typical A-Weighted Noise Levels



2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter ($\mu N/m^2$), also called micro-Pascal (μPa). One µPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels, abbreviated dB. Exhibit C illustrates references sound levels for different noise sources.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two sounds or equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3 dB increase. If two sounds differ by approximately 10 dB, the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighting is typically reported in terms of A-weighted decibel (dBA), a scale designed to account for the frequency-dependent sensitivity of the ear. Typically, the human ear can barely perceive a change in noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels.

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high-frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level: The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

Community Noise Equivalent Level (CNEL): The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB): A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A): A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ): The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room: Any room meeting the requirements of the Uniform Building Code, or other applicable regulations, which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

L(n): The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly L50, L90, and L99, etc.

Noise: *A*ny unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Outdoor Living Area: Outdoor spaces that are associated with residential land uses typically used for passive recreational activities or other noise-sensitive uses. Such spaces include patio areas, barbecue areas, jacuzzi areas, etc. associated with residential uses; outdoor patient recovery or resting areas associated with hospitals, convalescent hospitals, or rest homes; outdoor areas associated with places of worship which have a significant role in services or other noise-sensitive activities; and outdoor school facilities routinely used for educational purposes which may be adversely impacted by noise. Outdoor areas usually not included in this definition are: front yard areas, driveways, greenbelts, maintenance areas and storage areas associated with residential land uses; exterior areas at hospitals that are not used for patient activities; outdoor areas associated with places of worship and principally used for short-term social gatherings; and, outdoor areas associated with school facilities that are not typically associated with educational uses prone to adverse noise impacts (for example, school play yard areas).

Percent Noise Levels: See L(n).

Sound Level (Noise Level): The weighted sound pressure level obtained by use of a sound level meter having a standard frequency filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL): The dB(A) level which, if it lasted for one second, would produce the same A-weighted sound energy as the actual event.

2.7 Traffic Noise Prediction

Noise levels associated with traffic depends on a variety of factors: (1) volume of traffic, (2) speed of traffic, (3) auto, medium truck (2–3 axle) and heavy truck percentage (4 axle and greater), and sound propagation. The greater the volume of traffic, higher speeds and truck percentages equate to a louder volume in noise. A doubling of the Average Daily Traffic (ADT) along a roadway will increase noise levels by approximately 3 dB; reasons for this are discussed in the sections above.

2.8 Sound Propagation

As sound propagates from a source it spreads geometrically. Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at a rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 7.5 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet from a noise source. Wind, temperature, air humidity, and turbulence can further impact have far sound can travel.

3.0 Ground-Borne Vibration Fundamentals

3.1 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV – Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS – Known as root mean squared (RMS) can be used to denote vibration amplitude

VdB – A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-borne vibration levels of 0.3 inches per second without experiencing structural damage.

3.3 Vibration Propagation

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wavefront, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wavefront. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wavefront. 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 vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 Regulatory Setting

The proposed project is located in the County of San Bernandino, California and noise regulations are addressed through the efforts of various federal, state and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) originally was tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible for regulating noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible for regulating noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers. The Housing and Urban Development (HUD) is responsible for establishing noise regulations as it relates to exterior/interior noise levels for new HUD-assisted housing developments near high noise areas.

The federal government advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that “noise sensitive” uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

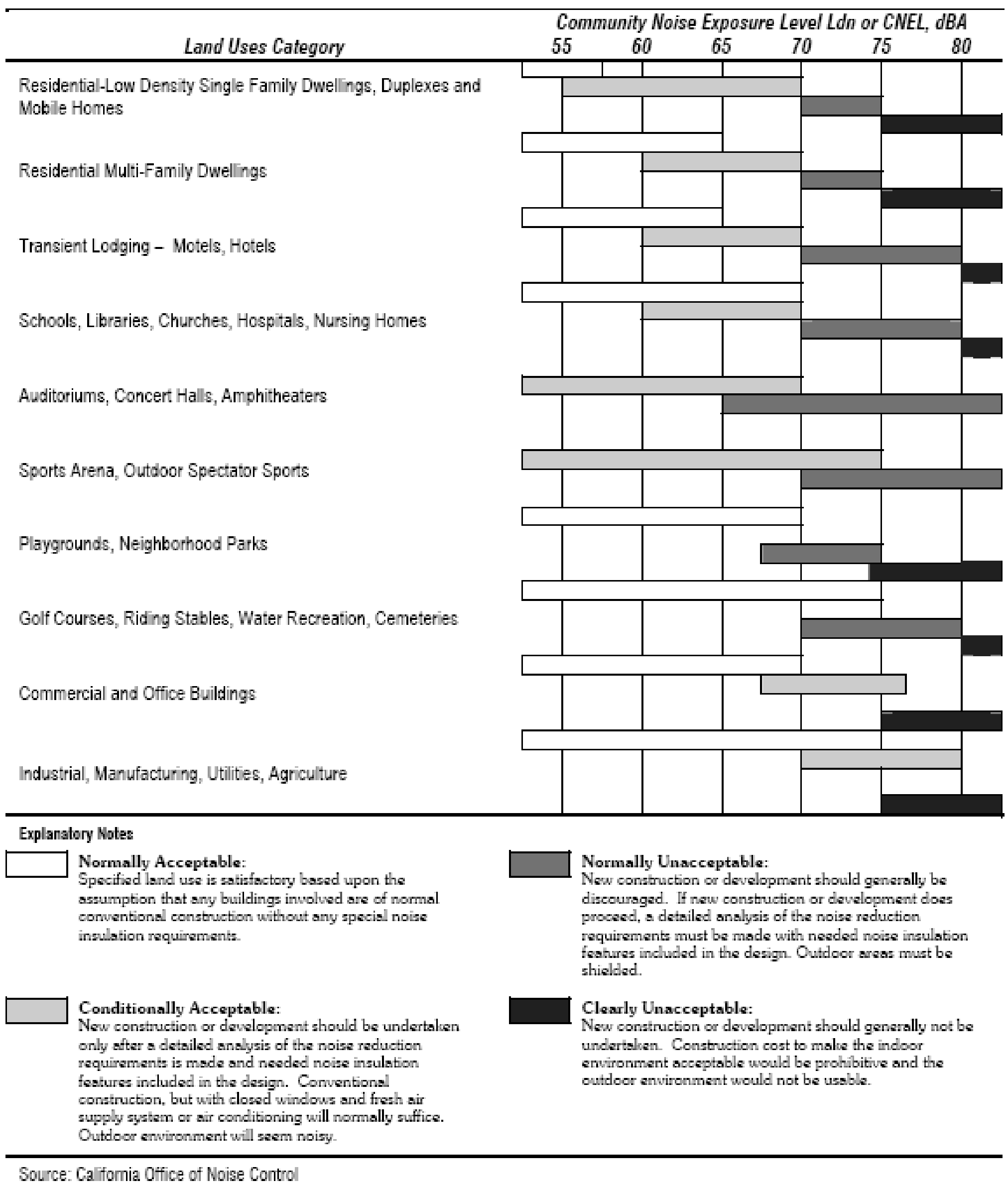
Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

4.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the “Land Use Compatibility for Community Noise Environments Matrix.” The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable as illustrated in Exhibit D.

Exhibit D: Land Use Compatibility Guidelines



4.3 County of San Bernardino Noise Regulations

The County of San Bernardino outlines their noise regulations and standards within the Municipal Code and the Noise Element of the County of San Bernardino General Plan.

County of San Bernardino – Noise Ordinance

Chapter 83.01 from the County's municipal code outlines the noise ordinance. MD's provided excerpts of the ordinance that relates to this project.

Section 8.01.080 – Noise

No person shall create any sound, or allow the creation of any sound, on any property that causes the exterior sound level on any other occupied property to exceed the sound level standards set forth in Table 1.

Table 1: Noise Standards for Stationary Noise Sources

Affected Land Uses (Receiving Noise)	7AM - 10PM (Leq)	10:00PM - 7AM (Leq)
Residential	55 dB(A)	45 dB(A)
Professional Services	55 dB(A)	55 dB(A)
Other Commercial	60 dB(A)	60 dB(A)
Industrial	70 dB(A)	70 dB(A)

Exempt Noise.

The following sources of noise shall be exempt from the regulations of this Section:

(1) Motor vehicles not under the control of the commercial or industrial use
(2) Emergency equipment, vehicles, and devices.
(3) Temporary construction, maintenance, repair, or demolition activities between 7:00 am and 7:00 pm, except Sundays and Federal Holidays.

County of Jurupa Valley – Noise Element

Goals, Policies, and Implementation Measures

Policies, goals and implementation program measures from the Noise Element that would mitigate potential impacts on noise include the following.

Goal N1. The County will abate and avoid excessive noise exposures through noise mitigation measures incorporated into the design of new noise-generating and new noise-sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits.

Policies

N1.1 Designate areas within San Bernardino County as "noise impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Chapter 83.01 of the Development Code.

N1.2 Ensure that new development of residential or other noise-sensitive land uses is not permitted in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels to the standards of Noise-sensitive land uses include residential uses, schools, hospitals, nursing homes, places of worship and libraries.

N1.3 When industrial, commercial, or other land uses, including locally regulated noise sources, are proposed for areas containing noise-sensitive land uses, noise levels generated by the proposed use will not exceed the performance standards of Table N-2 within outdoor activity areas. If outdoor activity areas have not yet been determined, noise levels shall not exceed the performance standards listed in Chapter 83.01 of the Development Code at the boundary of areas planned or zoned for residential or other noise-sensitive land uses.

Programs

1. Require an acoustical analysis prior to approval of proposed development of new residential or other noise-sensitive land uses in a noise-impacted area or a new noise generating use in an area that could affect existing noise-sensitive land uses. The appropriate time for requiring an acoustical analysis is during the environmental review process so that noise mitigation may be an integral part of the project design. The acoustical analysis shall:

    a) Be the responsibility of the applicant.
    b) Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.
    c) Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions;
    d) Include estimated noise levels in terms of the descriptors shown in Figures II-8 and II-9 of the Noise Background Report for existing and projected future (20 years hence) conditions, with a comparison made to the adopted policies of the Noise Element.
    e) Include recommendations for appropriate mitigation to achieve compliance with the adopted policies and standards of the Noise Element. Where the noise source in question consists of intermittent single events, the report must address the effects of maximum noise levels in sleeping rooms in terms of possible sleep disturbance.
    f) Include estimates of noise exposure after the prescribed mitigation measures have been implemented. If compliance with the adopted standards and policies of the Noise Element will not be achieved, acoustical information to support a statement of overriding considerations for the project must be provided.

N1.4 Enforce the state noise insulation standards (California Administrative Code, Title 24) and Chapter 35 of the California Building Code (CBC)6.

N1.5 Limit truck traffic in residential and commercial areas to designated truck routes; limit construction, delivery, and through-truck traffic to designated routes; and distribute maps of approved truck routes to County traffic officers.

N1.6 Enforce the hourly noise-level performance standards for stationary and other locally regulated sources, such as industrial, recreational, and construction activities as well as mechanical and electrical equipment.

Programs

1. Develop and implement a noise ordinance that will:

   a) Be consistent with this element of the General Plan.
   b) Include the development standards provided in this element in the Development Code.

N1.7 Prevent incompatible land uses, by reason of excessive noise levels, from occurring in the future.

Programs

1. Examine the existing and projected future noise environment when considering amendments to the circulation system.
2. Periodically review and update the Noise Element to ensure that noise exposure information and specific policies are consistent with changing conditions within the County and with noise control regulations enacted after the adoption of this element.
3. Provide sufficient noise exposure information so that existing and potential noise impacts will be identified and addressed in the project review processes
4. Compile and publish a list of standardized noise mitigation measures.

Goal N2. The County will strive to preserve and maintain the quiet environment of mountain, desert and other rural areas.

Policies

N2.1 The County will require appropriate and feasible on-site noise attenuating measures that may include noise walls, enclosure of noise-generating equipment, site planning to locate noise sources away from sensitive receptors, and other comparable features.

N2.2 The County will continue to work aggressively with federal agencies, including the branches of the military, the U.S. Forest Service, BLM, and other agencies to identify and work cooperatively to reduce potential conflicts arising from noise generated on federal lands and facilities affecting nearby land uses in unincorporated County areas.

5.0 Study Method and Procedure

The following section describes the noise modeling procedures and assumptions used for this assessment.

5.1 Noise Measurement Procedure and Criteria

Noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as the first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

MD conducted the sound level measurements in accordance to County's noise ordinance, the Federal Highway Transportation (FHWA) and Caltrans (TeNS) technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA). The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed 5-feet above the ground for all measurements
- Sound level meters were calibrated (Larson Davis CAL 200) before and after each measurement
- Following the calibration of equipment, a windscreen was placed over the microphone
- Frequency weighting was set on "A" and slow response
- Results of the long-term noise measurements were recorded on field data sheets
- During any short-term noise measurements, any noise contaminations such as barking dogs, local traffic, lawn mowers, or aircraft fly-overs were noted
- Temperature and sky conditions were observed and documented

5.2 Noise Measurement Locations

Noise monitoring locations were selected based on the project site's boundary. One (1) long-term 24-hour noise measurement was conducted at the site and is illustrated in Exhibit E. Appendix A includes photos, field sheet, and measured noise data.

5.3 Stationary Noise Modeling

SoundPLAN (SP) acoustical modeling software was utilized to model future worst-case stationary noise impacts to the adjacent land uses. SP is capable of evaluating multiple stationary noise source impacts at various receiver locations. SP's software utilizes algorithms (based on the inverse square law and reference equipment noise level data) to calculate noise level projections. The software allows the user to input specific noise sources, spectral content, sound barriers, building placement, topography, and sensitive receptor locations.

The future worst-case noise level projections were modeled using referenced sound level data for the stationary amphitheater stage speakers based on previous festival noise measurements (Hullabaloo festival in Flagstaff, AZ).

Amphitheater stage speakers were modeled as three (3) point sources (loudspeakers and subs) with a reference noise level of 86.5 dBA at 30 feet from the stage. This would be considered normal loudness for a small outdoor amphitheater. MD modeled the stage using JBL professional loudspeaker system, however there are many equivalent systems similar to JBL's pro series.

The SP model assumes the noise level during a festival (worst-case scenario), when in actuality the noise will be lower in noise level. The amphitheater stage is approximately 1,800 feet (east) from the nearest residence and is oriented towards the northwest.

In addition, the model incorporates the existing topographic conditions. Input and output calculations are provided in Appendix C.

5.4 FHWA Roadway Construction Noise Model

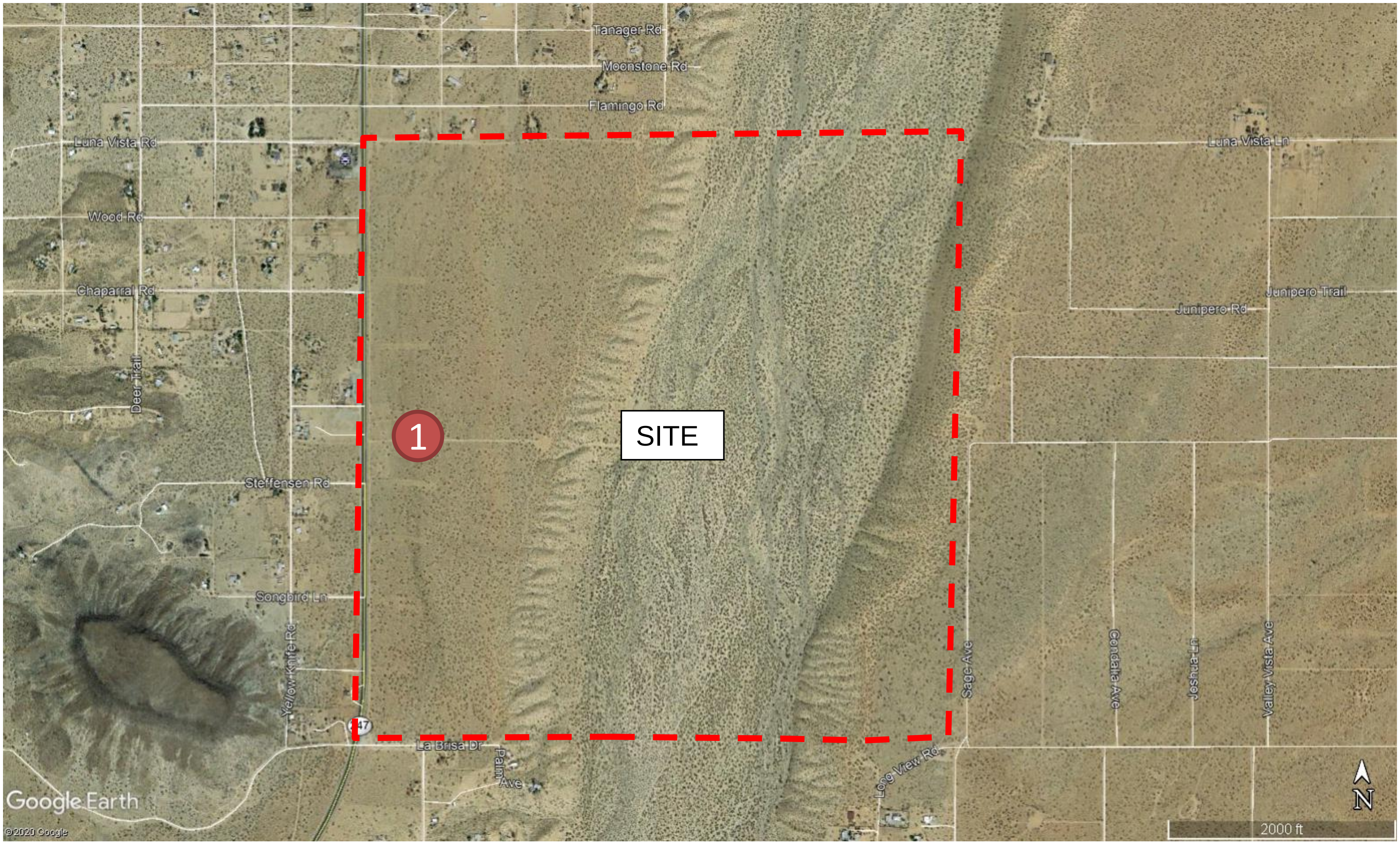
The construction noise analysis utilizes the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RNCM), together with several key construction parameters. Key inputs include distance to the sensitive receiver, equipment usage, % usage factor, and baseline parameters for the project site.

The project was analyzed based on the different construction phases. Construction noise is expected to be loudest during the grading, concrete and building phases of construction. The construction noise calculation output worksheet is located in Appendix D. The following assumptions relevant to short-term construction noise impacts were used:

- It is estimated that construction will occur over a 9-month time period. Construction noise is expected to be the loudest during the grading, concrete, and building phases.

Exhibit E

Measurement Locations



6.0 Existing Noise Environment

One twenty-four (24) hour ambient noise measurement was conducted at the project site. Noise measurements were taken to determine the existing ambient noise levels. Noise data indicates that traffic along Old Woman Springs Road is the primary sources of noise impacting the site and the surrounding area. Therefore, this assessment will utilize the ambient noise data as a basis and compare levels to said data.

6.1 Long-Term Noise Measurement Results

The results of the long-term noise data are presented in Table 2.

Table 2: Long-Term Noise Measurement Data[1]

Date	Time	1-Hour dB(A) Leq							
		L_{EQ}	L_{MAX}	L_{MIN}	L_2	L_8	L_{25}	L_{50}	L_{90}
7/15/2020	10AM-11AM	45.9	65.9	29.6	50.8	49.8	49.1	44.4	38.8
7/15/2020	11AM-12PM	47.4	66.8	29.8	53.5	51.4	49.7	45.8	41.0
7/15/2020	12PM-1PM	49.1	67.3	30.3	56.1	53.8	52.8	46.1	40.6
7/15/2020	1PM-2PM	48.7	56.3	42.6	55.0	53.5	51.6	47.2	40.9
7/15/2020	2PM-3PM	49.7	69.2	31.3	55.2	54.2	52.4	48.7	43.1
7/15/2020	3PM-4PM	49.6	71.0	31.2	54.5	53.3	52.1	47.8	43.7
7/15/2020	4PM-5PM	50.4	71.0	31.1	55.9	55.2	53.6	48.2	44.3
7/15/2020	5PM-6PM	49.4	68.2	30.3	54.5	54.2	52.8	47.2	42.6
7/15/2020	6PM-7PM	48.7	68.3	30.8	54.3	53.3	51.9	46.5	42.5
7/15/2020	7PM-8PM	49.6	69.7	31.1	54.8	54.4	52.0	47.7	43.2
7/15/2020	8PM-9PM	48.8	70.7	30.0	57.9	52.2	50.5	45.9	40.3
7/15/2020	9PM-10PM	50.6	72.9	31.7	59.7	55.1	52.8	46.0	38.8
7/15/2020	10PM-11PM	47.2	65.1	30.5	54.9	52.6	50.7	43.5	36.9
7/15/2020	11PM-12AM	46.7	75.4	30.0	54.4	53.7	51.2	41.1	33.6
7/16/2020	12AM-1AM	44.2	74.2	30.4	52.6	50.6	48.8	38.5	33.0
7/16/2020	1AM-2AM	43.5	70.0	29.9	51.6	51.5	49.6	34.9	31.7
7/16/2020	2AM-3AM	42.8	62.1	29.5	50.5	49.5	47.8	34.1	31.1
7/16/2020	3AM-4AM	44.5	63.8	29.2	53.5	50.9	49.1	33.7	30.4
7/16/2020	4AM-5AM	49.7	74.4	29.3	57.5	52.4	51.6	43.9	31.9
7/16/2020	5AM-6AM	49.9	74.7	29.7	57.6	54.4	53.4	47.6	38.5
7/16/2020	6AM-7AM	48.7	69.3	29.6	56.1	52.9	52.3	45.9	39.0
7/16/2020	7AM-8AM	48.4	68.9	29.1	55.8	54.6	51.2	45.9	39.7
7/16/2020	8AM-9AM	45.5	63.7	29.1	51.0	49.9	49.2	42.7	37.9
7/16/2020	9AM-10AM	45.4	67.4	29.2	54.8	50.1	47.0	42.0	38.0
CNEL		54.2							

Notes:
1. Long-term noise monitoring location is illustrated in Exhibit E. The quietest hourly day noise interval is highlighted in orange when project operations could occur.

Noise data indicates the ambient noise level ranges between 45.4 dBA Leq to 50.6 dBA Leq during daytime hours. Additional field notes and photographs are provided in Appendix A.

7.0 Future Noise Environment Impacts and Mitigation

This assessment analyzes future noise impacts as a result of the project. The analysis details the estimated exterior noise levels. Stationary noise impacts are analyzed from the on-site noise sources such as noise from festivals.

7.1 Future Exterior Noise

The following outlines the exterior noise levels associated with the proposed project.

7.1.1 Noise Impacts to Off-Site Receptors Due to Stationary Sources

Adjacent uses that may be affected by project operational noise include commercial and residential uses to the west (approximately 150 to 600 feet from the project's western boundary). The worst-case stationary noise was modeled using SoundPLAN acoustical modeling software. Worst-case assumes that music festival is operating between 7AM to 10PM. Project operations are anticipated to occur between 7AM to 10PM and is compared to the County's daytime (7AM to 10PM) commercial and residential stationary noise limit of 55 dBA.

A total of five (5) receptors were modeled to evaluate the proposed project's operational impact. A receptor is denoted by a yellow dot. The dot represents an adjacent sensitive receptor such as an outdoor sensitive area/building facade or a calibration point (point where sound pressure levels are confirmed to match manufacturer's noise data). Receptors 1 represents a calibration point, Receptors 2-3 represent commercial uses, and Receptors 4-5 represent the nearest residential receptors.

This study compares the Project's operational noise levels to two (2) different noise assessment scenarios: 1) Project Only operational noise level projections, 2) Project plus ambient noise level projections.

Project Operational Noise Levels

Exhibit F shows the "project only" festival operational noise levels at the properties and adjacent areas. Exhibit F shows the noise contours at the project site and illustrates how the noise will propagate at the site. Operational noise levels at the adjacent uses are anticipated to range between 35.8 dBA to 46.8 dBA Leq (depending on the location).

The "project only" noise projections to the adjacent uses are below the County's daytime 55 dBA residential and commercial limit, as outlined within the County's noise ordinance (see Section 4.3).

Project Plus Ambient Operational Noise Levels

Table 3 demonstrates the project plus the ambient noise levels. Project plus ambient noise level projections are anticipated to range between 45.9 to 49.2 dBA Leq at receptors (R2 – R5). The project plus ambient noise condition is below the County's 55 dBA commercial and residential noise limit without mitigation and therefore is less than significant.

Table 3: Worst-case Predicted Operational Leq Noise Level[1]

Receptor[1]	Existing Ambient Noise Level (dBA, Leq(h))[2]	Project Noise Level (dBA, Leq(h))[3]	Total Combined Noise Level (dBA, Leq(h))	Daytime (7AM - 10PM) Stationary Noise Limit (dBA, Leq (h))	Change in Noise Level as Result of Project
1	45.4	86.5	86.5	**N/A**	N/A
2		42.9	47.3	**55.0**	1.9
3		46.8	49.2		3.8
4		45.0	48.2		2.8
5		35.8	45.9		0.5

Notes:
1. Receptors 1 is a calibration point, 2 - 3 are commercial areas and 4-5 is residential.
2. The quietest hourly noise interval was selected (45.4 dBA).
3. See Exhibit F for the operational noise level projections at said receptors.

The project was compared to the existing condition (45.4 dBA, Leq) for comparative purposes to the quietest measured hourly interval during operating hours (9AM-10AM) to show the change in noise level. Table 3 provides the anticipated change in noise level as a result of the proposed project. The existing noise levels are anticipated to change between 0.5 to 3.8 dBA, Leq depending on location.

Table 4 provides the characteristics associated with changes in noise levels.

Table 4: Change in Noise Level Characteristics[1]

Changes in Intensity Level, dBA	Changes in Apparent Loudness
1	Not perceptible
3	Just perceptible
5	Clearly noticeable
10	Twice (or half) as loud

https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

When comparing the change in noise level to acoustic characteristics outlined in Table 4, the noise level increase would be "Not Perceptible" to "Just Perceptible" at the receptors depending on location.

7.1.2 Noise Impacts to On/Off-Site Receptors Due to Project Generated Traffic

The proposed project generates less than 100 peak hour trips and therefore does not require a traffic study. Per the memo provided by Integrated Engineering Group, 8/3/2020 (*Pre-Application Development Review for Parcel No. 0629-181-01-0000, Located at 2107 Old Woman Springs Road in the Unincorporated Community of Flamingo Heights, San Bernardino County*), see Appendix B.

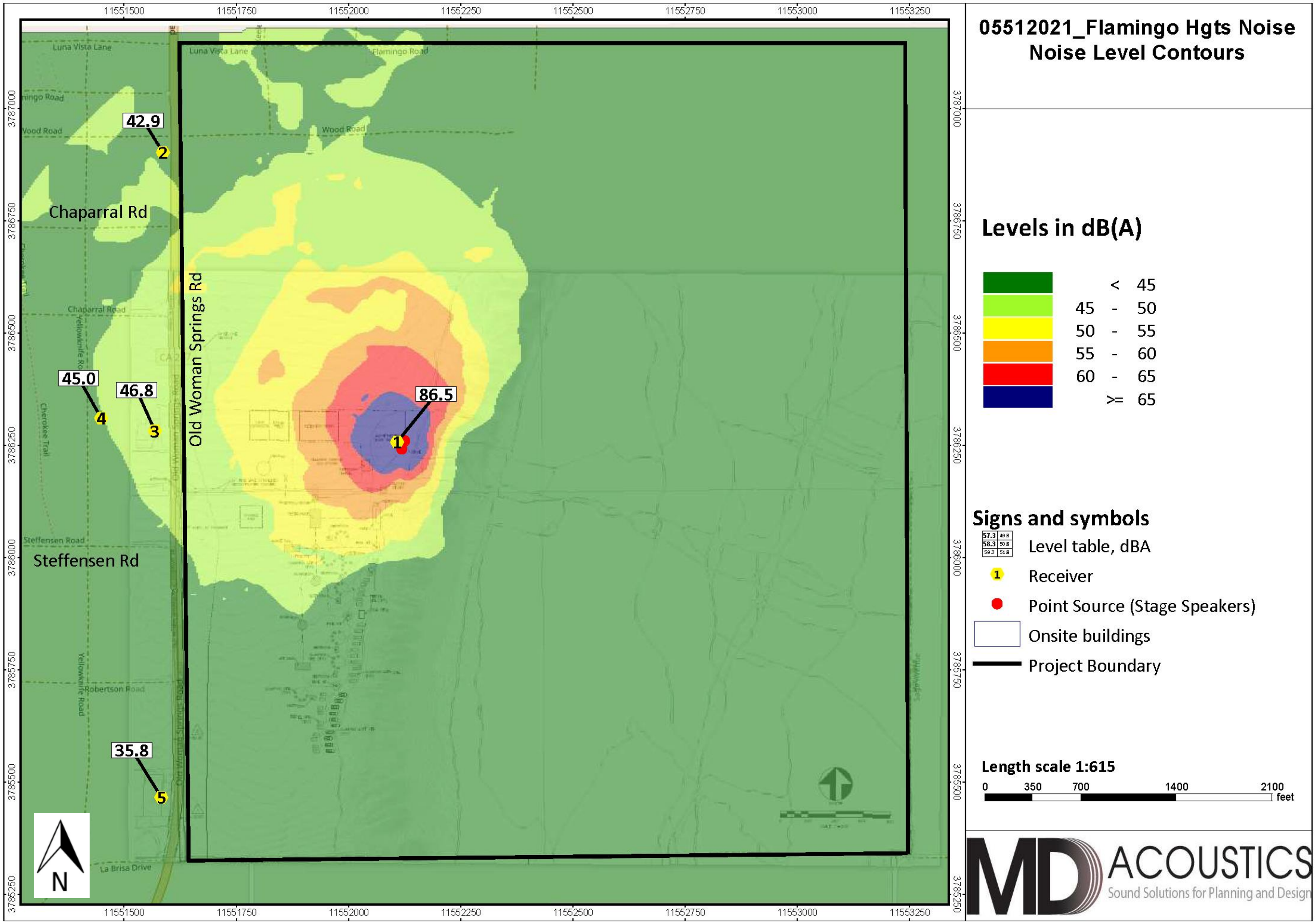
Traffic along the subject roadways would need to double in average daily traffic volumes to see a 3 dBA increase in noise level. Since the project generates a nominal amount of traffic relative to the existing ADTs, the project's traffic noise level increase would be nominal and therefore less than significant.

7.2 Mitigation Measures

The project complies with the County's noise regulations as designed and therefore no mitigation measures are required.

Exhibit F

Future Daytime Operational Noise Levels



8.0 Construction Noise Impact

The degree of construction noise may vary for different areas of the project site and also vary depending on the construction activities. Noise levels associated with the construction will vary with the different phases of construction.

8.1 Construction Noise

The Environmental Protection Agency (EPA) has compiled data regarding the noise generated characteristics of typical construction activities. The data is presented in Table 5.

Table 5: Typical Construction Equipment Noise Levels[1]

Type	Lmax (dBA) at 50 Feet
Backhoe	80
Truck	88
Concrete Mixer	85
Pneumatic Tool	85
Pump	76
Saw, Electric	76
Air Compressor	81
Generator	81
Paver	89
Roller	74

Notes:
[1] Referenced Noise Levels from FTA noise and vibration manual.

Construction is considered exempt but a short-term impact and would be considered significant if construction activities are taken outside the allowable times as described in the County's Municipal Code Section 83.01.080 (g)(3). Construction is anticipated to occur during the permissible hours according to the County's Municipal Code. Construction noise will have a temporary or periodic increase in the ambient noise level above the existing within the project vicinity. Furthermore, noise reduction measures are provided to further reduce construction noise. The impact is considered less than significant however construction noise level projections are provided.

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. Noise levels will be loudest during grading phase. A likely worst-case construction noise scenario during grading assumes the use of 1-grader, 1-dozer, 2-excavators, and 2-backhoes operating at 800 feet from the nearest sensitive uses to the west.

Assuming a usage factor of 40 percent for each piece of equipment, unmitigated noise levels at 800 feet have the potential to reach 60 dBA L_{eq} at the nearest sensitive uses during building construction.

8.2 Construction Vibration

Construction activities can produce vibration that may be felt by adjacent land uses. The construction of the proposed project would not require the use of equipment such as pile drivers, which are known to generate substantial construction vibration levels. The primary vibration source during construction may be from a bulldozer. A large bulldozer has a vibration impact of 0.089 inches per second peak particle velocity (PPV) at 25 feet which is perceptible but below any risk to architectural damage.

The fundamental equation used to calculate vibration propagation through average soil conditions and distance is as follows:

$$PPV_{equipment} = PPV_{ref}\ (100/D_{rec})^{n}$$

Where: PPV_{ref} = reference PPV at 100ft.
D_{rec} = distance from equipment to receiver in ft.
n = 1.1 (the value related to the attenuation rate through ground)

The thresholds from the Caltrans Transportation and Construction Induced Vibration Guidance Manual in Table 6 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 6: Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Table 19, Transportation and Construction Vibration Guidance Manual, Caltrans, Sept. 2013.
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 7 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

<Table 7, next page>

Table 7: 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.

At a distance of 800 feet (distance of nearest structure from the nearest area of disturbance on the site), a large bulldozer would yield a worst-case 0.002 PPV (in/sec) which is not percible and below any threshold of significance. The impact is less than significant and no mitigation is required.

8.3 Construction Noise Reduction Measures

Construction operations must follow the County's General Plan and the Noise Ordinance, which states that construction, repair or excavation work performed must occur within the permissible hours. To further ensure that construction activities do not disrupt the adjacent land uses, the following measures should be taken:

1. Construction should occur during the permissible hours as defined in 83.01.080 (g)(3) of the Municipal Code.

2. During construction, the contractor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.

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

4. Idling equipment should be turned off when not in use.

5. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

9.0 References

State of California General Plan Guidelines: 1998. Governor's Office of Planning and Research

County of San Bernardino: General Plan Noise Element. Section 7.

County of San Bernardino : Municipal Code Chapter 83.01

Integrated Engineering Group (IEG) – Traffic Trip Gen Memo – 8/3/2020

Appendix A:

Photographs and Field Measurement Data

MD ACOUSTICS
Sound Solutions for Planning and Design
www.mdacoustics.com

AZ Office
4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

24-Hour Continuous Noise Measurement Datasheet

Project: Flamingo Heights
Site Address/Location: 2107 Old Woman Springs Road, CA
Date: 7/15/2020-7/16/2020
Field Tech/Engineer: Jason Schuyler & Robert Pearson

Site Observations: Clear Sky HOT, desert conditions little to no wind. Cold at night in the mid 40'sF

General Location:
Sound Meter: Piccolo 2 **SN:** 80206
Settings: A-weighted, slow, 1-min, 24-hour duration
Meteorological Con.: 77 degrees F, 2 to 5 mph wind, eastern direction
Site ID: LT-1

Site Topo: Flat
Ground Type: Soft site, Open raw ground with a road

Noise Source(s) w/ Distance:
C/L of rd is 150ft from meter

Figure 1: LT-1 Monitoring Location

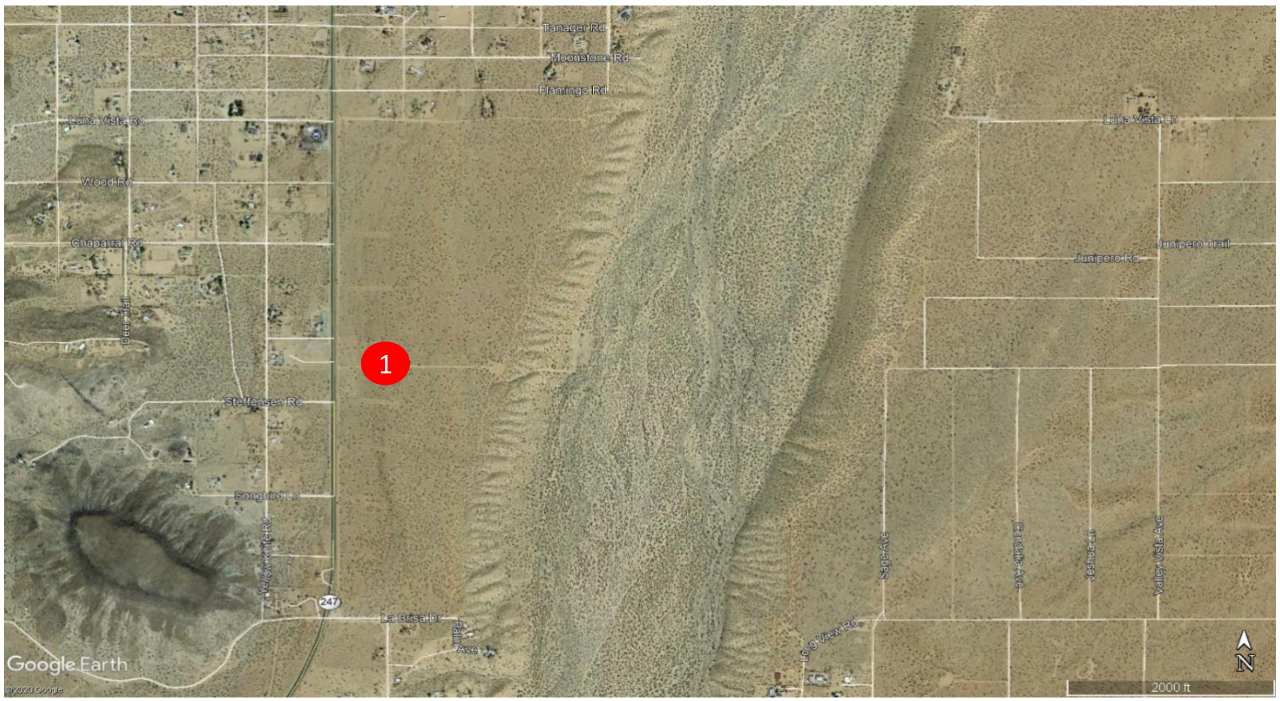


Figure 2: LT-1 Photo

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24-Hour Noise Measurement Datasheet - Cont.

Project: Flamingo Heights **Day:** 1 of 1
Site Address/Location: 2107 Old Woman Springs Road, CA
Site ID: LT-1

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
7/15/2020	10:07 AM	11:07 AM	45.9	65.9	29.6	50.8	49.8	49.1	44.4	38.8
7/15/2020	11:07 AM	12:07 PM	47.4	66.8	29.8	53.5	51.4	49.7	45.8	41.0
7/15/2020	12:07 PM	1:07 PM	49.1	67.3	30.3	56.1	53.8	52.8	46.1	40.6
7/15/2020	1:07 PM	2:07 PM	48.7	56.3	42.6	55.0	53.5	51.6	47.2	40.9
7/15/2020	2:07 PM	3:07 PM	49.7	69.2	31.3	55.2	54.2	52.4	48.7	43.1
7/15/2020	3:07 PM	4:07 PM	49.6	71.0	31.2	54.5	53.3	52.1	47.8	43.7
7/15/2020	4:07 PM	5:07 PM	50.4	71.0	31.1	55.9	55.2	53.6	48.2	44.3
7/15/2020	5:07 PM	6:07 PM	49.4	68.2	30.3	54.5	54.2	52.8	47.2	42.6
7/15/2020	6:07 PM	7:07 PM	48.7	68.3	30.8	54.3	53.3	51.9	46.5	42.5
7/15/2020	7:07 PM	8:07 PM	49.6	69.7	31.1	54.8	54.4	52.0	47.7	43.2
7/15/2020	8:07 PM	9:07 PM	48.8	70.7	30.0	57.9	52.2	50.5	45.9	40.3
7/15/2020	9:07 PM	10:07 PM	50.6	72.9	31.7	59.7	55.1	52.8	46.0	38.8
7/15/2020	10:07 PM	11:07 PM	47.2	65.1	30.5	54.9	52.6	50.7	43.5	36.9
7/15/2020	11:07 PM	12:07 AM	46.7	75.4	30.0	54.4	53.7	51.2	41.1	33.6
7/16/2020	12:07 AM	1:07 AM	44.2	74.2	30.4	52.6	50.6	48.8	38.5	33.0
7/16/2020	1:07 AM	2:07 AM	43.5	70.0	29.9	51.6	51.5	49.6	34.9	31.7
7/16/2020	2:07 AM	3:07 AM	42.8	62.1	29.5	50.5	49.5	47.8	34.1	31.1
7/16/2020	3:07 AM	4:07 AM	44.5	63.8	29.2	53.5	50.9	49.1	33.7	30.4
7/16/2020	4:07 AM	5:07 AM	49.7	74.4	29.3	57.5	52.4	51.6	43.9	31.9
7/16/2020	5:07 AM	6:07 AM	49.9	74.7	29.7	57.6	54.4	53.4	47.6	38.5
7/16/2020	6:07 AM	7:07 AM	48.7	69.3	29.6	56.1	52.9	52.3	45.9	39.0
7/16/2020	7:07 AM	8:07 AM	48.4	68.9	29.1	55.8	54.6	51.2	45.9	39.7
7/16/2020	8:07 AM	9:07 AM	45.5	63.7	29.1	51.0	49.9	49.2	42.7	37.9
7/16/2020	9:07 AM	10:07 AM	45.4	67.4	29.2	54.8	50.1	47.0	42.0	38.0

DNL: 54.2

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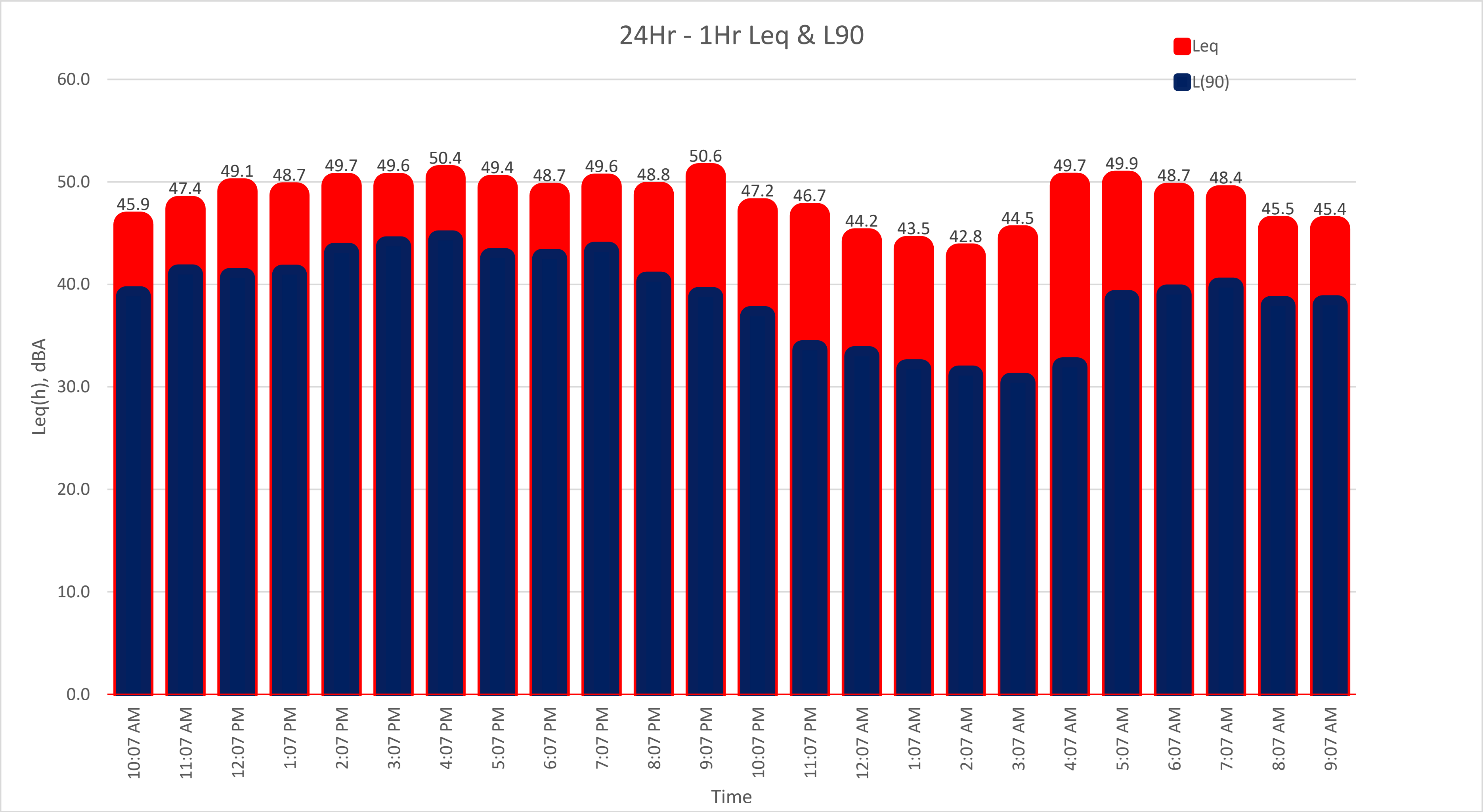
Simi Valley, CA 93065

24-Hour Continuous Noise Measurement Datasheet - Cont.

Project: Flamingo Heights **Day:** 1 of 1
Site Address/Location: 2107 Old Woman Springs Road, CA
Site ID: LT-1



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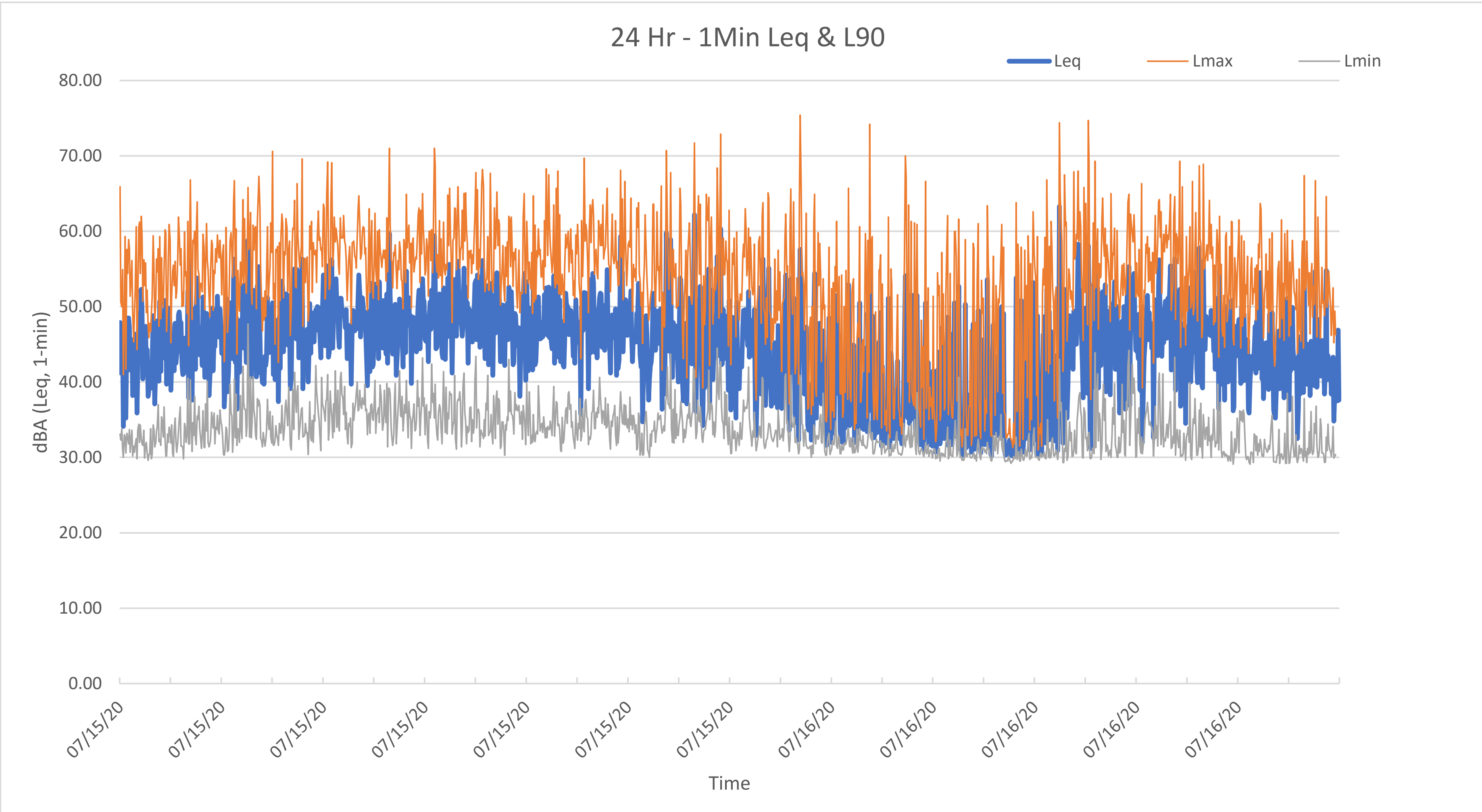

Appendix B:

Integrated Engineering Group (IEG) Memo

INTEGRATED ENGINEERING GROUP
TRANSPORTATION PLANNING AND ENGINEERING

MEMORANDUM

REGISTERED PROFESSIONAL ENGINEER
GEORGE J. GHOSSAIN
No. 2786
Exp. 6-30-22
TRAFFIC
STATE OF CALIFORNIA

Date: August 3, 2020

To: Steve Valdez, County of San Bernardino

From: George Ghossain P.E., MCSE, MPA, Principal Engineer

SUBJECT: PRE-APPLICATION DEVELOPMENT REVIEW FOR PARCEL NO. 0629-181-01-0000, LOCATED AT 2107 OLD WOMAN SPRINGS ROAD IN THE UNINCORPORATED COMMUNITY OF FLAMINGO HEIGHTS, SAN BERNARDINO COUNTY

Dear Steve:

Integrated Engineering Group (IEG) is pleased to submit this trip generation memorandum (memo) for the proposed camp site located within the County of San Bernardino. The proposed project includes 20 clamping lofts, 20 teepee sites and 35 glamping sites. The objective of this memo is to demonstrate that the proposed land use and intensity qualify the project to be exempt from the requirement of preparing a traffic impact study (TIS) consistent with the guidelines set by the County of San Bernardino Transportation Traffic Study Guidelines dated July 9, 2019.

PROJECT DESCRIPTION AND LOCATION

the RoBott Land Company is proposing a campsite development at the westerly approximately 225 acres of a 640-acre site located at 2107 Old Woman Springs Road in the unincorporated community of Flamingo Heights west of the Town of Yucca Valley.

Figure 1 shows the Project site plan.

Appendix C:

SoundPlan Input/Output

Flamingo Hgts Noise
Octave spectra of the sources in dB(A) - Situation 1: Outdoor SP

Name	Source type	I or A	Li	R'w	L'w	Lw	KI	KT	LwMax	DO-Wall	Time histogram	Emission spectrum	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	16kHz
		m,m²	dB(A)	dB	dB(A)	dB(A)	dB	dB	dB(A)	dB			dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
	Point				106.8	106.8	0.0	0.0		0	100%/24h	SRX828SP	102.0	105.0							
	Point				111.0	111.0	0.0	0.0		0	100%/24h	VRX932LAP 12"	69.9	80.0	89.1	93.7	100.7	105.4	106.2	104.6	97.5
	Point				111.0	111.0	0.0	0.0		0	100%/24h	VRX932LAP 12"	69.9	80.0	89.1	93.7	100.7	105.4	106.2	104.6	97.5

Flamingo Hgts Noise
Contribution level - Situation 1: Outdoor SP

Source	Source group	Source ty	Tr. lane	Ldn dB(A)	A dB	
Receiver Receiver 1 Fl G dB(A) Ldn 86.5 dB(A)						
	Default industrial noise	Point		78.7	0.0	
	Default industrial noise	Point		77.1	0.0	
	Default industrial noise	Point		85.1	0.0	
Receiver Receiver 2 Fl G dB(A) Ldn 42.9 dB(A)						
	Default industrial noise	Point		32.6	0.0	
	Default industrial noise	Point		34.0	0.0	
	Default industrial noise	Point		41.8	0.0	
Receiver Receiver 3 Fl G dB(A) Ldn 46.8 dB(A)						
	Default industrial noise	Point		40.5	0.0	
	Default industrial noise	Point		37.6	0.0	
	Default industrial noise	Point		44.9	0.0	
Receiver Receiver 4 Fl G dB(A) Ldn 45.0 dB(A)						
	Default industrial noise	Point		38.4	0.0	
	Default industrial noise	Point		35.4	0.0	
	Default industrial noise	Point		43.3	0.0	
Receiver Receiver 5 Fl G dB(A) Ldn 35.8 dB(A)						
	Default industrial noise	Point		28.9	0.0	
	Default industrial noise	Point		25.2	0.0	
	Default industrial noise	Point		34.3	0.0	

Flamingo Hgts Noise
Contribution spectra - Situation 1: Outdoor SP

Source	Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Receiver Receiver 1 Fl G dB(A) Ldn 86.5 dB(A)																													
3	Ldn	85.1	34.2	44.8	59.1	71.0	74.3	79.9	75.6	77.4	79.6																		
2	Ldn	77.1	-2.8	12.4	21.2	28.6	33.9	39.0	40.7	44.7	48.6	53.0	49.5	50.1	52.2	54.1	55.6	57.6	59.4	66.0	66.6	67.2	68.2	68.5	68.1	66.4	66.3	65.1	62.2
1	Ldn	78.7	-0.2	15.1	23.9	31.3	36.4	41.1	42.6	45.9	48.9	51.3	50.9	51.7	53.8	55.6	57.2	59.3	61.1	67.6	68.2	68.9	69.9	70.2	69.7	68.0	67.8	66.6	63.6
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Receiver Receiver 2 Fl G dB(A) Ldn 42.9 dB(A)																													
3	Ldn	41.8	-7.0	3.7	18.0	29.8	33.0	38.5	30.4	32.0	34.0																		
2	Ldn	34.0	-35.0	-19.7	-10.9	-3.5	1.4	6.1	3.7	6.8	9.4	13.3	13.8	14.4	16.8	18.4	19.6	21.3	22.5	28.1	27.7	26.0	23.2	17.7	8.1	-7.9	-29.8	-63.6	
1	Ldn	32.6	-35.5	-20.3	-11.5	-4.1	1.1	5.8	3.4	6.7	9.4	13.1	12.5	12.9	15.3	16.9	18.2	19.9	21.1	26.7	26.2	24.5	21.8	16.2	6.6	-9.4	-31.5	-65.5	
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Receiver Receiver 3 Fl G dB(A) Ldn 46.8 dB(A)																													
3	Ldn	44.9	-4.6	6.1	20.4	32.3	35.6	41.3	33.5	35.6	37.9																		
2	Ldn	37.6	-34.4	-19.2	-10.4	-3.0	2.4	7.4	5.6	9.4	12.9	17.6	13.8	15.4	18.1	19.8	21.2	23.1	24.6	30.7	30.9	30.2	29.1	26.0	20.2	10.1	-3.4	-26.2	-60.5
1	Ldn	40.5	-31.4	-16.2	-7.4	0.0	5.0	9.7	7.5	10.6	13.3	17.1	17.8	18.5	21.2	23.0	24.3	26.2	27.7	33.7	33.9	33.2	32.0	28.8	22.9	12.6	-0.6	-22.4	-56.4
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Receiver Receiver 4 Fl G dB(A) Ldn 45.0 dB(A)																													
3	Ldn	43.3	-6.0	4.6	18.9	30.8	34.0	39.7	31.8	33.8	36.2																		
2	Ldn	35.4	-35.8	-20.6	-11.8	-4.4	1.0	6.0	4.0	7.8	11.2	15.8	12.0	13.7	16.4	18.1	19.5	21.3	22.8	28.8	28.9	28.0	26.5	22.9	16.3	3.5	-14.2	-41.8	-83.2
1	Ldn	38.4	-33.1	-17.8	-9.0	-1.6	3.4	8.1	5.8	8.8	11.5	15.4	16.1	16.8	19.5	21.2	22.6	24.4	25.9	31.8	31.9	31.0	29.4	25.6	18.7	6.9	-10.7	-38.1	-79.2
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Receiver Receiver 5 Fl G dB(A) Ldn 35.8 dB(A)																													
3	Ldn	34.3	-16.0	-5.3	9.0	20.8	24.3	30.3	22.4	24.6	28.6																		
2	Ldn	25.2	-49.3	-34.0	-25.2	-17.9	-13.3	-7.4	-9.6	-8.0	-2.7	5.6	5.6	5.9	8.4	10.0	11.2	12.8	14.0	19.5	18.9	16.9	13.7	7.5	-3.3	-21.1	-45.8	-83.8	
1	Ldn	28.9	-39.7	-24.4	-15.6	-8.3	-3.0	2.0	-0.1	3.8	7.6	12.7	8.8	9.3	11.8	13.4	14.6	16.3	17.5	23.0	22.5	20.6	17.6	11.5	1.0	-16.3	-40.2	-77.0	
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												
Remaining contrib. of src ""	Ldn																												

Appendix D:
Construction Calculations

Activity	L_{eq} at 800 feet dBA	L_{Max} at 800 feet dBA
Grading	58	58
Building Construction	55	57
Paving	57	60

Equipment Summary	Reference (dBA) 50 ft Lmax
Rock Drills	96
Jack Hammers	82
Pneumatic Tools	85
Pavers	80
Dozers	85
Scrappers	87
Haul Trucks	88
Cranes	82
Portable Generators	80
Rollers	80
Tractors	80
Front-End Loaders	86
Hydraulic Excavators	86
Graders	86
Air Compressors	86
Trucks	86

Grading

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
	Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements									
1	Grader	86	1	40	800	0.5	0	55.9	51.9	155510.613
2	Dozer	85	1	40	800	0.5	0	54.9	50.9	123526.471
3	Excavator	86	2	40	800	0.5	0	58.9	54.9	311021.227
4	Tractor/Backhoe	80	2	40	800	0.5	0	52.9	48.9	78125
							Lmax*	**58**	**Leq**	**58**
							Lw	**88**	**Lw**	**90**

Source: MD Acoustics, August. 2020.

1- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	15.2	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
60	18.3	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
70	21.3	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
80	24.4	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
90	27.4	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
100	30.5	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
110	33.5	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
120	36.6	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
130	39.6	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
140	42.7	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
150	45.7	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
160	48.8	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
170	51.8	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
180	54.9	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
190	57.9	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
200	61.0	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
210	64.0	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
220	67.1	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
230	70.1	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
240	73.1	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
250	76.2	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
260	79.2	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
270	82.3	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
280	85.3	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
290	88.4	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
300	91.4	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
310	94.5	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
320	97.5	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
330	100.6	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
340	103.6	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
350	106.7	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
360	109.7	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
370	112.8	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22

Building Construction

		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Leq	Energy
1	Cranes	82	1	40	800	0.5	0	51.9	47.9	61909.8903
2	Forklift/Tractor	80	3	40	800	0.5	0	54.7	50.7	117187.5
3	Generator	80	1	40	800	0.5	0	49.9	45.9	39062.5
4	Tractor/Backhoe	80	3	40	800	0.5	0	54.7	50.7	117187.5
							Lmax*	**57**	**Leq**	**55**
							Lw	**88**	**Lw**	**87**

Source: MD Acoustics, July. 2020.

1- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**	**46**	**45**	**44**	**43**	**42**	**41**	**40**
60	18.3	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
70	21.3	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
80	24.4	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
90	27.4	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
100	30.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
110	33.5	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	**33**	32
120	36.6	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
130	39.6	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
140	42.7	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
150	45.7	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
160	48.8	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
170	51.8	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
180	54.9	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
190	57.9	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
200	61.0	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
210	64.0	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
220	67.1	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
230	70.1	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
240	73.1	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
250	76.2	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
260	79.2	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
270	82.3	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
280	85.3	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
290	88.4	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
300	91.4	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
310	94.5	0.5	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
320	97.5	0.5	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
330	100.6	0.5	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
340	103.6	0.5	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
350	106.7	0.5	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
360	109.7	0.5	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
370	112.8	0.5	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19

Paving

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
		Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements								
1	Pavers	86	2	40	800	0.5	0	58.9	54.9	311021.227
2	Rollers	80	2	40	800	0.5	0	52.9	48.9	78125
3	Paving Equipment	80	2	40	800	0.5	0	52.9	48.9	78125
							Lmax*	60	Leq	57
							Lw	92	Lw	88

Source: MD Acoustics, Aug. 2020.

1- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

Feet	Meters	Ground Effect	No Shielding Leq dBA	1 dBA Shielding Leq dBA	2 dBA Shielding Leq dBA	3 dBA Shielding Leq dBA	4 dBA Shielding Leq dBA	5 dBA Shielding Leq dBA	6 dBA Shielding Leq dBA	7 dBA Shielding Leq dBA	8 dBA Shielding Leq dBA	9 dBA Shielding Leq dBA	10 dBA Shielding Leq dBA	11 dBA Shielding LeqdBA	12 dBA Shielding Leq dBA	13 dBA Shielding Leq dBA	14 dBA Shielding Leq dBA	15 dBA Shielding Leq dBA
50	**15.2**	**0.5**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**	**46**	**45**	**44**	**43**	**42**
60	18.3	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
70	21.3	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
80	24.4	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
90	27.4	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
100	30.5	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
110	33.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	**34**	33
120	36.6	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
130	39.6	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
140	42.7	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
150	45.7	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
160	48.8	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
170	51.8	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
180	54.9	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
190	57.9	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
200	61.0	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
210	64.0	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
220	67.1	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
230	70.1	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
240	73.1	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
250	76.2	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
260	79.2	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
270	82.3	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
280	85.3	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
290	88.4	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
300	91.4	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
310	94.5	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
320	97.5	0.5	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
330	100.6	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
340	103.6	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
350	106.7	0.5	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
360	109.7	0.5	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
370	112.8	0.5	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20

VIBRATION LEVEL IMPACT

Project:	Old Woman Spring Rd		Date: 8/28/20
Source:	Large Bulldozer		
Scenario:	Unmitigated		
Location:	Project Site		
Address:			
PPV = PPVref(25/D)^n (in/sec)			

DATA INPUT

Equipment = Type	2	Large Bulldozer	INPUT SECTION IN BLUE
PPVref =	0.089	Reference PPV (in/sec) at 25 ft.	
D =	800.00	Distance from Equipment to Receiver (ft)	
n =	1.10	Vibration attenuation rate through the ground	

Note: Based on reference equations from Vibration Guidance Manual, California Department of Transportation, 2006, pgs 38-43.

DATA OUT RESULTS

PPV =	**0.002**	IN/SEC	OUTPUT IN RED