Eco Dome Campground

Noise Impact Study

County of San Bernardino, CA

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF EXHIBITS

LIST OF TABLES

1.0 Executive Summary

This report has been prepared to provide the calculated noise projections from the proposed Eco Dome Campground ("Project") located at 57899 Linn Road in the County of San Bernardino, CA. All calculations are compared to the County of San Bernardino's noise ordinance as well as the existing ambient condition.

1.1 Findings and Conclusions

One (1) baseline ambient measurement was performed over a 1-hour period at the project site and represents the ambient noise condition within the project vicinity. Ambient noise data indicate the hourly noise level was 40 dBA Leq.

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. Per Section 83.01.080 of the County of San Bernardino Municipal Code, Areas within the County shall be designated as "noise-impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Subdivision (d). Section 83.01.080 lists that noise levels may not exceed 55 dBA Leq (7AM to 10 PM), and 45 dBA Leq (10PM to 7AM) for residential uses, 55 dBA Leq anytime for professional services, 60 dBA Leq anytime for other commercial, and 70 dBA Leq anytime for industrial uses per 83.01.080(c)(2). The City's Lmax levels are 20 dB above the Leq limits, which is the noise standard for any period of time per 83.01.080(c)(2)(E). MD conducted a baseline noise survey per Section 83.01.080 at the nearest property line of an adjacent use. Per the County of San Bernardino zoning map, all adjacent uses are zoned residential or equivalent. As a worst-case, operational noise levels are compared to the nighttime residential limits. Therefore, per Section 83.01.080 the project only levels must not exceed 45 dBA Leq and 65 Lmax at night.

In order to meet the nighttime residential thresholds at the property line, **the backup generator must be 62 dBA at 23 ft (7 m) or shielded to achieve this level**. All other equipment on-site will be shielded. The proposed recreational activities are not inherently noise-producing, and therefore the loudest recreational-related noise would be shouting as close as 23 feet to the property line. Shouting is something that would occur less than one cumulative minute in an hour and is, therefore, an Lmax noise source. At 23 feet, the level would be 59 dBA Lmax.

2.0 Introduction

2.1 Purpose of Analysis and Study Objectives

The purpose of this noise impact study is 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 potentially applicable noise standards set forth by the State and/or Local agencies. Consistent with the County's Noise Guidelines, the project must demonstrate compliance with the applicable noise zoning ordinance and sound attenuation requirements.

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 impact (e.g. blowers and vacuums) from the project site to adjacent land uses
- An analysis of construction noise to adjacent uses

2.2 Site Location and Study Area

The project site is located at 57899 Linn Road, in the County of San Bernardino, CA as shown in Exhibit A. The land uses directly surrounding the project include Resource Conservation to the north, and Rural Living to the south, east, and west.

2.3 Proposed Project Description

The project site is located on 2.5 acres and consists of the following:

Accommodations/Amenities:

- Six (6) stand-alone geodesic domes

Support Buildings/Areas:

- One (1) central communal dome with games, yoga and full kitchen
- Bocce Ball Court
- Horseshoe pit

Infrastructure:

- Parking Lot – 8-spaces
- EV Charging Stations w/ solar canopy
- Invertor/Electrical Room
- Rainwater Capture

- Backup Generator
- Refuse/Recycling
- Septic Tank

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

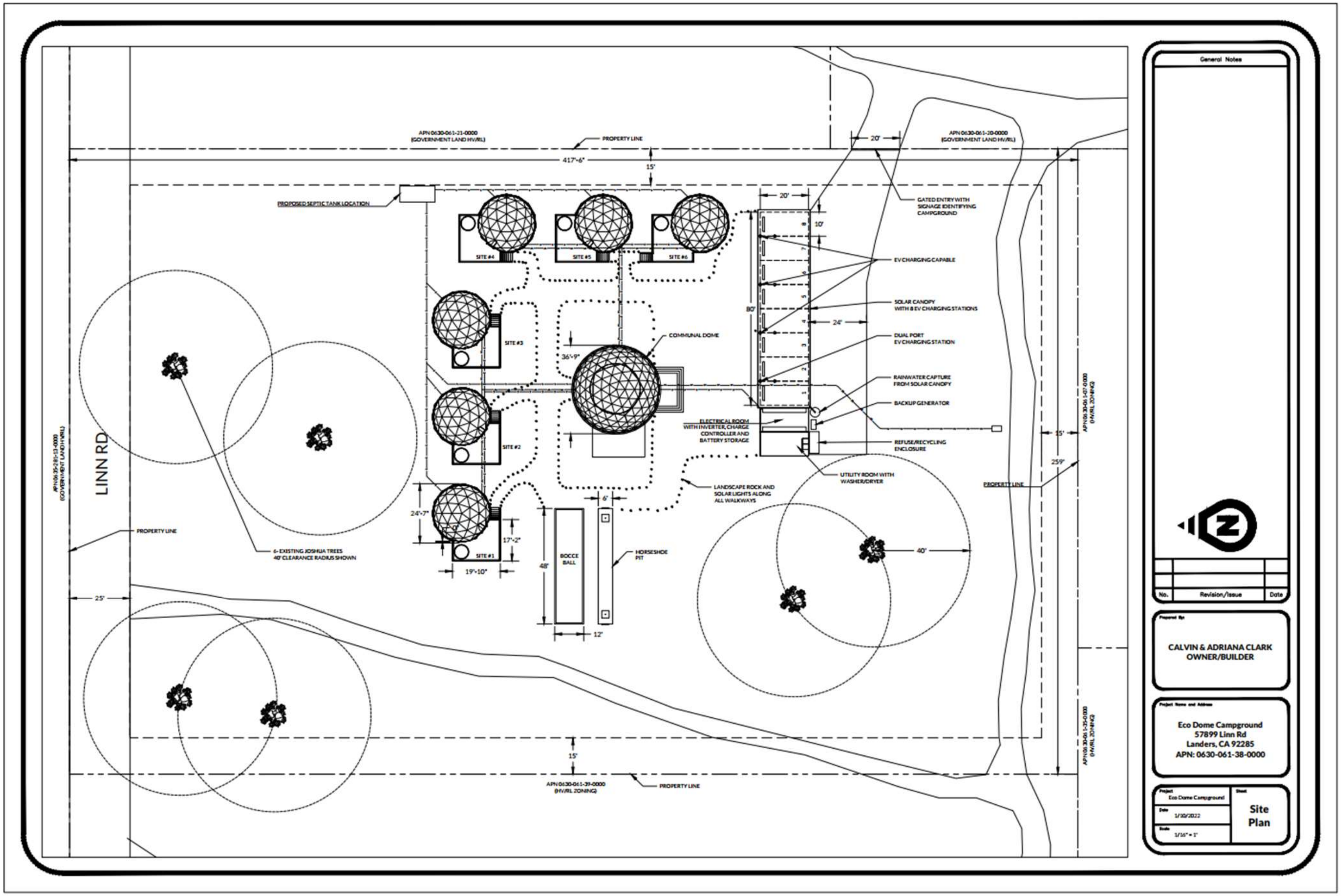
A noise study has been prepared which identifies the Project's potential impact to the adjacent uses and compares the noise level projections to the County's applicable noise ordinance. The site plan used for this is illustrated in Exhibit B.

Exhibit A

Location Map

Exhibit B

Site Plan



3.0 Fundamentals of Noise

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

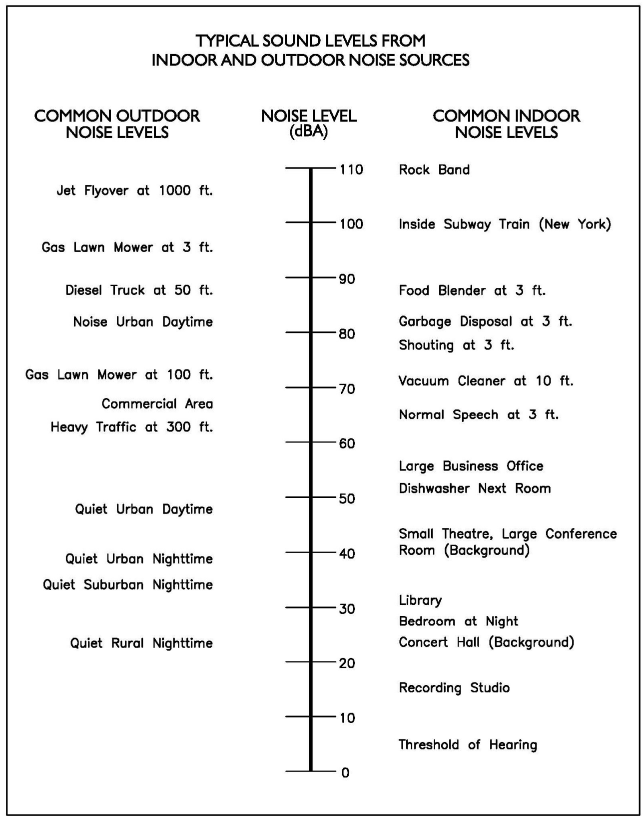
3.1 Sound, Noise, and Acoustics

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.

3.2 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 at 20 Hz to the high pitch of 20,000 Hz.

Exhibit C: Typical A-Weighted Noise Levels



3.3 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 (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.

3.4 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.

3.5 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, (A-weighted scale) 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). Typically, the human ear can barely perceive the change in the 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.

3.6 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 the addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after the 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, L99, etc.

Noise: *A*ny unwanted sound or sound which is undesirable because it interferes with speech and hearing, 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.

3.7 Traffic Noise Prediction

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

3.8 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.

4.0 Regulatory Setting

The proposed project is located in the County of San Bernardino, 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 that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

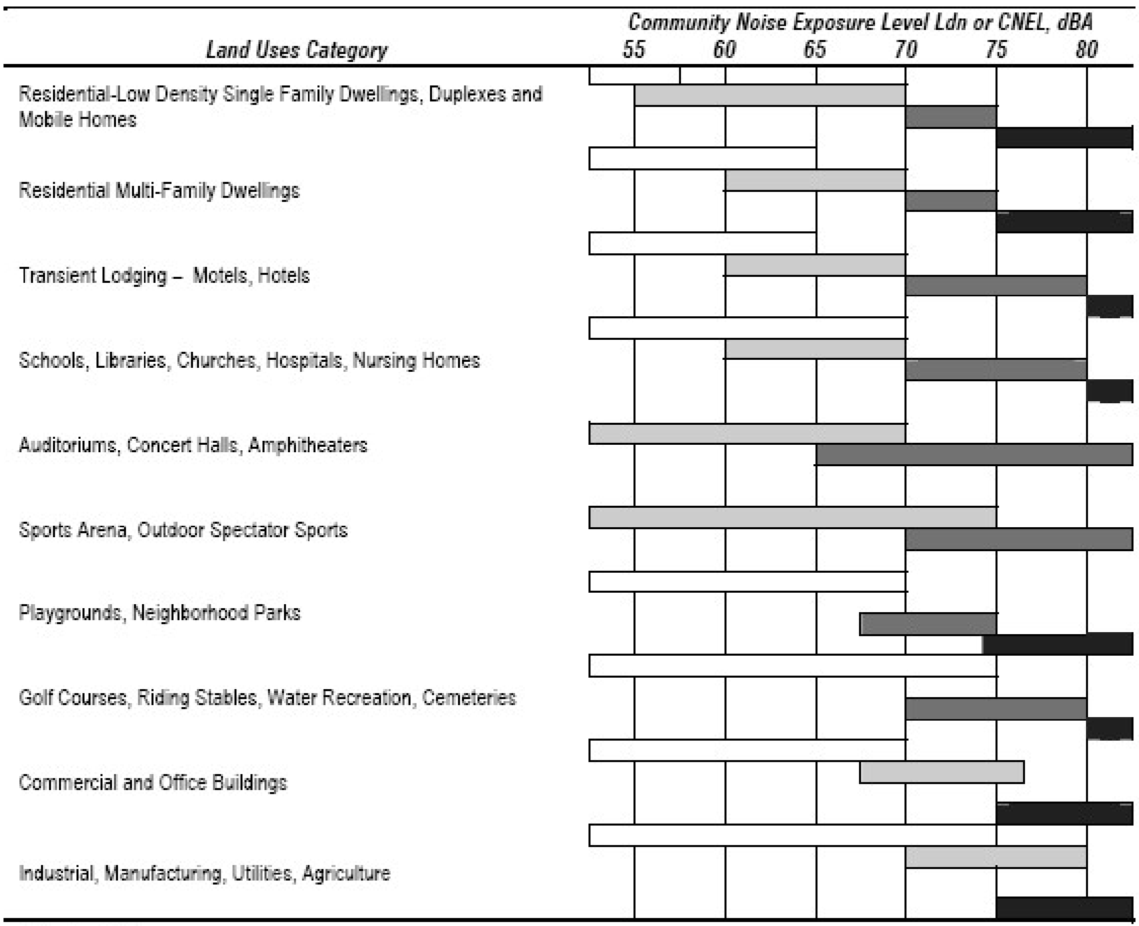
Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

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 the 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 California Building Code (CBC) which in some cases require 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



Explanatory Notes

Normally Acceptable:
Specified land use is satisfactory based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Normally Unacceptable:
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made with needed noise insulation features included in the design. Outdoor areas must be shielded.

Conditionally Acceptable:
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply system or air conditioning will normally suffice. Outdoor environment will seem noisy.

Clearly Unacceptable:
New construction or development should generally not be undertaken. Construction cost to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.

Source: California Office of Noise Control

4.3 County of San Bernardino Noise Regulations

County of San Bernardino Municipal Code

The County of San Bernardino outlines their noise regulations and standards within the Noise Element from the General Plan and Municipal Code. For purposes of this analysis, the County's General Plan and Noise Ordinance (Section 83.01.080) is used to evaluate the stationary noise impacts from the proposed project. The Noise Element outlines Goals and Polices and establishes Noise/Land Use Compatibility Criteria. This assessment will compare the project noise levels to the noise limits in Section 83.01.080 of the Municipal Code.

83.01.080 Noise.

This Section establishes standards concerning acceptable noise levels for both noise-sensitive land uses and for noise-generating land uses.

(a)Noise Measurement. Noise shall be measured:

(1) At the property line of the nearest site that is occupied by, and/or zoned or designated to allow the development of noise-sensitive land uses;

(2) With a sound level meter that meets the standards of the American National Standards Institute (ANSI Â§ SI4 1979, Type 1 or Type 2);

(3) Using the "A" weighted sound pressure level scale in decibels (ref. pressure = 20 micronewtons per meter squared). The unit of measure shall be designated as dB(A).

(b) Noise Impacted Areas. Areas within the County shall be designated as "noise-impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Subdivision (d) (Noise Standards for Stationary Noise Sources) and Subdivision (e) (Noise Standards for Adjacent Mobile Noise Sources), below. New development of residential or other noise-sensitive land uses shall not be allowed in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels to these standards. Noise-sensitive land uses shall include residential uses, schools, hospitals, nursing homes, religious institutions, libraries, and similar uses.

(c) Noise Standards for Stationary Noise Sources.

(1) Noise Standards. Table 83-2 (Noise Standards for Stationary Noise Sources) describes the noise standard for emanations from a stationary noise source, as it affects adjacent properties:

<Table 1, Next Page>

Table 1: Table 83-2 Noise Standards for Stationary Standards

Sound Level Standards (dBA Leq)

Receiving Land Use Category	Noise Level [dB(A)]	
	7AM to 10PM	10PM to 7AM
Residential	55	45
Professional Services	55	55
Other Commercial	60	60
Light industry - I-R and I-L zone	70	70

Table 2: Noise Limit Categories

Location	Time Period	L_{50}	L_{25}	L_8	L_2	L_{max}
Residential	7 AM – 10 PM	55	60	65	70	75
	10 PM – 7 AM	45	50	55	60	65

County of San Bernardino County Noise Element The noise element of a general plan provides information on current noise levels in the County. This information is used to identify the most suitable locations for various land uses, especially those uses that are most sensitive to noise impacts.

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 14.3: Protect residents from the negative effects of "spill over" or nuisance noise.

Policies:

14.3.1 Require that construction activities adjacent to residential units be limited as necessary to prevent adverse noise impacts. (LU-1)

14.3.2 Require that construction activities employ feasible and practical techniques that minimize the noise impacts on adjacent uses. (LU-1)

14.3.3 Adopt and enforce a standard for exterior noise levels for all commercial uses that prevents adverse levels of discernible noise on adjoining residential properties. (A-1)

14.3.4 Adopt and enforce a standard for exterior noise levels from the use of leaf blowers, motorized lawn mowers, parking lot sweepers, or other high-noise equipment on commercial properties if their activity will result in noise that adversely affects abutting residential parcels. (A-1)

14.3.5 Require that the hours of truck deliveries to commercial properties abutting residential uses be limited unless there is no feasible alternative or there are overriding transportation benefits by scheduling deliveries at another hour. (LU-1)

14.3.6 Ensure that buildings are constructed soundly to prevent adverse noise transmission between differing uses located in the same structure and individual residences in multifamily buildings. (LU-1)

14.3.7 Require that commercial uses in structures containing residences on upper floors not be noise intensive. (LU-1)

14.3.8 Require common walls and floors between commercial and residential uses be constructed to minimize the transmission of noise and vibration. (LU-1)

4.4 Thresholds applied to Project

Per Section 83.01.080 of the County of San Bernardino Municipal Code, Areas within the County shall be designated as “noise-impacted” if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Table 1 and Table 2. Per the County of San Bernardino zoning map, all adjacent uses are zoned residential or equivalent. Therefore, per Section 83.01.080 the project-only noise levels must not exceed 45 dBA L_{eq} and 65 dBA L_{max}.

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 to the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

MD conducted the sound level measurements in accordance with Caltrans technical noise specifications and the County's noise ordinance. All measurements 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
- Temperature and sky conditions were observed and documented

The noise monitoring location was selected based on the distance of the project's stationary noise sources to the nearest sensitive on-site receptors and the ambient noise producers. One (1) long-term 1-hour noise measurement was conducted on the project site and represents ambient levels at the site. Appendix A includes photos, a field sheet, and measured noise data. Exhibit E illustrates the location of the measurement.

5.2 Stationary Noise Modeling

The future worst-case noise level projections were modeled using referenced sound level data for the stationary on-site sources. The backup generator is the only unshielded piece of equipment. Other sound producers such as the inverter and washer/dryer will be housed inside a building. To meet the city's nighttime noise limit, **the generator must be 62 dBA at 23 ft or must be shielded to meet those levels**.

None of the on-site recreational activities are inherently noise-producing. The loudest expected recreational noise from the site is shouting. The reference noise levels for the generator and shouting are in Table 3.

Table 3: Reference Sound Level Measurements

Source	Source Type	Reference Level (dBA)	Descriptor
Backup Generator	Leq	62	23 ft (7 m)
Shouting	Lmax	95	1 ft

5.3 FHWA Traffic Noise Prediction Model

Traffic noise from vehicular traffic was projected using a computer program that replicates the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108). The FHWA model arrives at the predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). Roadway volumes and percentages correspond to a maximum of 36 guests a day. The referenced traffic data was applied to the model which is in Appendix B. The following outlines the key adjustments made to the REMEL for the roadway inputs:

- Roadway classification – (e.g., freeway, major arterial, arterial, secondary, collector, etc.)
- Roadway Active Width – (distance between the center of the outermost travel lanes on each side of the roadway)
- Average Daily Traffic Volumes (ADT), Travel Speeds, Percentages of automobiles, medium trucks, and heavy trucks
- Roadway grade and angle of view
- Site Conditions (e.g., soft vs. hard)
- Percentage of total ADT which flows each hour throughout a 24-hour period

Table 4 indicates the roadway parameters and vehicle distribution utilized for this study.

Table 4: Roadway Parameters and Vehicle Distribution

Roadway	Existing ADT	2040 Plus Project ADT	Speed (MPH)	Site Conditions
Belfield Blvd	475	511	55	Soft
Linn Rd	265	301	55	Soft

Vehicle Distribution (Truck Mix) Canyon Hills Rd[2]				
Motor-Vehicle Type	**Daytime % (7AM to 7 PM)**	**Evening % (7 PM to 10 PM)**	**Night % (10 PM to 7 AM)**	**Total % of Traffic Flow**
Automobiles	77.5	12.9	9.6	97.42
Medium Trucks	84.8	4.9	10.3	1.84
Heavy Trucks	86.5	2.7	10.8	0.74

Notes:
[1] Per County Engineering Manager, Department of Public Works
[2] Per a max of 36 guests a day
[3] Vehicle distribution data is based on typical Southern California Mix data.

The following outlines key adjustments to the REMEL for Project site parameter inputs:

- Vertical and horizontal distances (Sensitive receptor distance from noise source)
- Noise barrier vertical and horizontal distances (Noise barrier distance from sound source and receptor)
- Traffic noise source spectra
- Topography

5.4 FHWA and FTA Construction Noise Model

The construction noise analysis utilizes the FHWA Roadway Construction Noise Model (RNCM) and the FTA construction noise assessment methodologies. Key inputs include average and minimum distance to the closest sensitive receiver, equipment types, % usage factor, and ground factor. The construction noise calculation output worksheet is located in Appendix C.

Exhibit E
Measurement Location

X = Measurement location

= Site boundary

6.0 Existing Noise Environment

One (1) 1-hour long-term ambient noise measurement was conducted on the project sit to represent the existing noise levels. The measurement measured the hour-by-hour Leq, Lmin, Lmax, and other statistical data (e.g. L2, L8…) over a 1-hour period. This assessment utilizes the ambient noise data as a basis and compares project operational levels to said data.

6.1 Long-Term Noise Measurement Results

The results of the long-term noise data are presented in Table 5.

Table 5: Long-Term Noise Measurement Data (dBA)

Date	Time	1-Hour dB(A)							
		L_{EQ}	L_{MAX}	L_{MIN}	L_2	L_8	L_{25}	L_{50}	L_{90}
12/6/2021	11:35PM-12:35PM	40.4	62.4	26.0	53.2	38.1	31.4	29.5	26.8
Notes:									
1. Long-term noise monitoring location (LT1) is illustrated in Exhibit E. 2. Quietest hourly ambient noise level highlighted in orange during operational hours.									

Noise data indicates the ambient noise level was 40 dBA Leq at the project site and surrounding area. Maximum levels reach 53 dBA. Additional field notes and photographs are provided in Appendix A.

7.0 Future Noise Environment Impacts

This assessment analyzes future noise impacts to and from the Project and compares the results to the City's Noise Standards. The analysis details the estimated exterior noise levels associated with traffic from adjacent roadways.

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 Project Generated Traffic

A worst-case Project-generated traffic noise level was modeled utilizing the FHWA Traffic Noise Prediction Model - FHWA-RD-77-108. Traffic noise levels were calculated 50 feet from the centerline of the analyzed roadway. The modeling is theoretical and does not take into account any existing barriers, structures, and/or topographical features that may further reduce noise levels. Therefore, the levels are shown for comparative purposes only to show the difference between with and without Project conditions. In addition, the noise contours for 55, 60, 65, and 70 dBA CNEL were calculated. The potential off-site noise impacts caused by an increase in traffic from the operation of the proposed Project on the nearby roadways were calculated for the following scenarios:

Existing without Project: This scenario refers to existing traffic noise conditions.

Existing Plus Project: This scenario refers to existing + Project traffic noise conditions.

Table 6 compares the without and with Project scenario and shows the change in traffic noise levels as a result of the proposed Project. It takes a change of 3 dB or more to hear a perceptible difference. As demonstrated in Table 6, the Project is anticipated to not generate change greater than 3 dB in the noise CNEL level.

Table 6: Existing Scenario - Noise Levels Along Roadways (dBA CNEL)

Existing Without Project Exterior Noise Levels

Roadway	Segment	CNEL at 50 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Belfield Blvd	North of Reche Rd	55.6	5	12	25	55
Linn Rd	West of Belfield Blvd	55.9	6	12	27	58

Existing With Project Exterior Noise Levels

Roadway	Segment	CNEL at 50 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Belfield Blvd	North of Reche Rd	53.1	4	8	17	37
Linn Rd	West of Belfield Blvd	53.6	4	9	19	40

Change in Noise Levels as a Result of Project

Roadway	Segment	CNEL at 50 Feet dBA[1,2]			
		Existing Without Project	Existing With Project	Change in Noise Level	Potential Significant Impact
Belfield Blvd	North of Reche Rd	55.6	55.9	0.3	No
Linn Rd	West of Belfield Blvd	53.1	53.6	0.5	No

Notes:
[1] Exterior noise levels calculated at 5 feet above ground level.
[2] Noise levels calculated from the centerline of the subject roadway.

Belfield Boulevard will increase 0.3 dB as a result of the project and Linn Rd will increase 0.5 dB as a result of the project. This is below a perceptible difference in ambient noise level. The impact is, therefore, less than significant.

7.1.2 Operational Noise Impacts to Off-Site Receptors

The only piece of equipment which isn't expected to be shielded inside a building is the backup generator. The backup generator is 112 feet away from the nearest property line to the east. The generator will not produce noise except in the case of a power outage. In order to meet the 45 dBA Leq nighttime residential noise limit, **the backup generator must have a noise level of 62 dBA at 23 feet** (7 meters). If the generator used for this project is above that level, it must be enclosed.

Recreational activities such as bocce ball, horseshoes, and the use of the hot tubs do not produce a lot of noise. The loudest noise from these types of activities and camping, in general, would be shouting from campers. The hot tubs are as close as 23 feet to the eastern property line. At 1 foot, shouting can be up to 95 dBA. Over the soft site, the noise level at the property line would be 59 dBA Lmax at the eastern property line which is below the 65 Lmax City limit for nighttime residential.

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, which can be found in the FTA Noise and Vibration Manual. The data is presented in Table 7.

Table 7: Typical Construction Equipment Noise Levels[1]

Type	Lmax (dBA) at 50 Feet
Backhoe	80
Dozers	85
Truck	88
Excavator	86
Concrete Mixer	85
Grader	86
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 noise is considered a short-term impact and would be considered significant if construction activities are taken outside the allowable times as described in the City's Municipal Code Section 83.01.080(g)(3). Construction is anticipated to occur during the permissible hours according to the City'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. A likely worst-case construction noise scenario during grading assumes the use of a grader, a dozer, and a backhoe operating as close as 330 feet from the nearest existing sensitive receptor, the residence southeast of the project site.

Assuming a usage factor of 40 percent for each piece of equipment, unmitigated noise levels have the potential to reach 60 dBA L_{eq} and 63 dBA L_{max} at the nearest sensitive receptors.

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 0.005 inches per second peak particle velocity (PPV) at 25 feet which is not perceptible and below any risk of 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 8 (below) provide general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 8: 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 9 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 9: Vibration Source Levels for Construction Equipment

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 330 feet (distance to nearest structure from the property line), a large bulldozer would yield a worst-case 0.005 PPV (in/sec) which may be perceptible for short periods of time during grading along the south property line of the project site but is below any threshold of damage. The impact is less than significant, and no mitigation is required.

8.3 Construction Noise Reduction Policies

Construction operations must follow the City'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 policies should be taken:

1. During construction, the contractor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.
2. The contractor shall 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.
3. Idling equipment shall be turned off when not in use.
4. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

9.0 References

County of San Bernardino Municipal Code: Section 83.01.080 Noise

County of San Bernardino General Plan, Noise Element

Appendix A:
Field Measurement Data

1-Hour Noise Measurement Datasheet

Project Name: Eco Dome Campground - Noise

Project: #/Name: 0739-2022-008

Site Address / Location: 57899 Linn Rd, Landers, CA 92285

Date: 04/06/2022

Field Tech / Engineer: Jason Schuyler

Sound Meter: XL2, NTI **SN:** A2A-07095-E0

Settings: A-weighted, slow, 1-sec, 1-hour interval

Meteorological Cond.: Clear

Site Id: NT1

Site Observations:

Homeowner in distance doing construction

Site Topo: Flat

Ground Type: Desert

Noise Source(s) w/ Distance:

1500 ft from Belfield Rd

MD ACOUSTICS

1-Hour Noise Measurement Datasheet - Cont.

Project Name: Eco Dome Campground - Noise

Site Address / Location: 57899 Linn Rd, Landers, CA 92285

Site Id: NT1

Table 1: Baseline Noise Measurement Summary

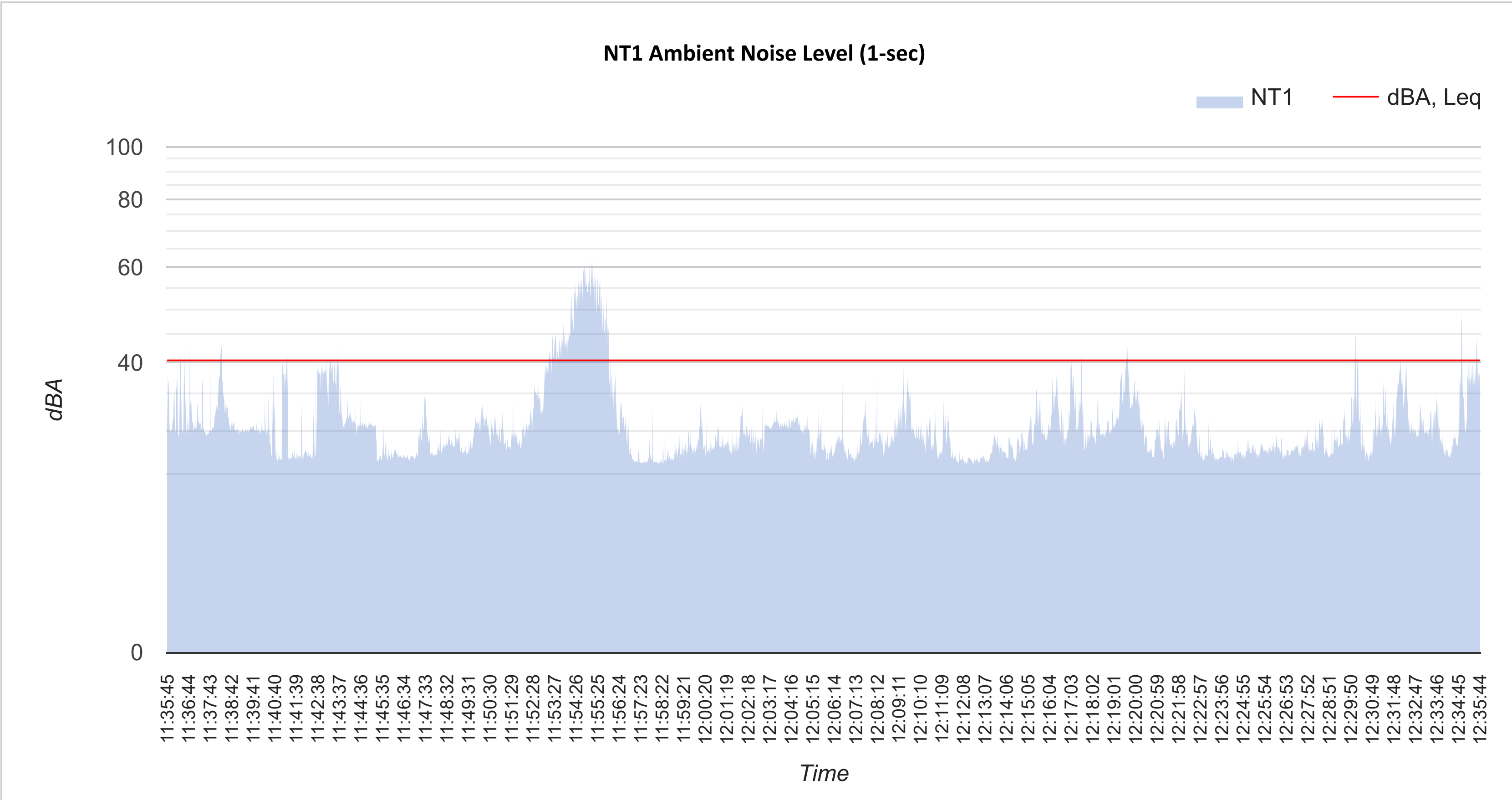
Location	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
NT1	11:35 AM	12:35 PM	40.4	62.4	26.0	50.9	38.1	31.4	29.4	26.7

1-Hour Noise Measurement Datasheet - Cont.

Project Name: Eco Dome Campground - Noise

Site Address / Location: 57899 Linn Rd, Landers, CA 92285

Site Id: NT1



MD ACOUSTICS

Appendix B:

Traffic Counts and Calculations

Claire Pincock <claire@mdacoustics.com>

Traffic Count Request

Johnson, Jeremy - DPW <Jeremy.Johnson@dpw.sbcounty.gov> Fri, Apr 8, 2022 at 5:47 PM
To: Claire Pincock <claire@mdacoustics.com>

Belfield Blvd has an average ADT of 475 (north of Reche Rd)

Linn Rd has an average ADT of 265 (west of Belfield Blvd)

Jeremy Johnson, PE

Engineering Manager
Department of Public Works
Phone: 909-387-8186

825 E Third Street

San Bernardino, CA 92415

SAN BERNARDINO COUNTY

Our job is to create a county in which those who reside and invest can prosper and achieve well-being.

www.SBCounty.gov

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: Eco Dome
ROADWAY: Belfield Blvd
LOCATION: 50 ft from centerline

JOB #: 0739-22-08
DATE: 22-Apr-22
ENGINEER: M. Dickerson

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 475
SPEED = 55
PK HR % = 10
NEAR LANE/FAR LANE DIS 0
ROAD ELEVATION = 0.0
GRADE = 1.0 %
PK HR VOL = 48

RECEIVER INPUT DATA

RECEIVER DISTANCE = 50
DIST C/L TO WALL = 50
RECEIVER HEIGHT = 5.0
WALL DISTANCE FROM RECEIVER 0
PAD ELEVATION = 0.5
ROADWAY VIEW: LF ANGLE= -90
RT ANGLE= 90
DF ANGLE= 180

SITE CONDITIONS

AUTOMOBILES = 15
MEDIUM TRUCKS = 15
HEAVY TRUCKS = 15
(10 = HARD SITE, 15 = SOFT SITE)

WALL INFORMATION

HTH WALL 0.0
AMBIENT= 0.0
BARRIER = 0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCK	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	55.4	53.5	51.7	45.6	54.3	54.9
MEDIUM TRUCKS	45.3	43.7	37.4	35.8	44.3	44.5
HEAVY TRUCKS	45.3	43.8	34.8	36.0	44.4	44.5
NOISE LEVELS (dBA)	56.1	54.3	51.9	46.5	55.1	55.6

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	55.4	53.5	51.7	45.6	54.3	54.9
MEDIUM TRUCKS	45.3	43.7	37.4	35.8	44.3	44.5
HEAVY TRUCKS	45.3	43.8	34.8	36.0	44.4	44.5
NOISE LEVELS (dBA)	56.1	54.3	51.9	46.5	55.1	55.6

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	5	12	25	55
LDN	5	11	23	50

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Eco Dome	JOB #:	0739-22-08
ROADWAY:	Belfield Blvd	DATE:	22-Apr-22
LOCATION:	50 ft from centerline	ENGINEER:	M. Dickerson

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	511	
SPEED =	55	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	51	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		50
DIST C/L TO WALL =		50
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER		0
PAD ELEVATION =		0.5
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	15
MEDIUM TRUCKS =	15
HEAVY TRUCKS =	15

(10 = HARD SITE, 15 = SOFT SITE)

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCK	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	55.7	53.8	52.0	45.9	54.6	55.2
MEDIUM TRUCKS	45.6	44.1	37.7	36.2	44.6	44.8
HEAVY TRUCKS	45.6	44.1	35.1	36.4	44.7	44.8
NOISE LEVELS (dBA)	56.4	54.6	52.2	46.8	55.4	55.9

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	55.7	53.8	52.0	45.9	54.6	55.2
MEDIUM TRUCKS	45.6	44.1	37.7	36.2	44.6	44.8
HEAVY TRUCKS	45.6	44.1	35.1	36.4	44.7	44.8
NOISE LEVELS (dBA)	56.4	54.6	52.2	46.8	55.4	55.9

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	6	12	27	58
LDN	5	11	25	53

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT:	Eco Dome	JOB #:	0739-22-08
ROADWAY:	Linn Rd	DATE:	22-Apr-22
LOCATION:	50 ft from centerline	ENGINEER:	M. Dickerson

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	265	
SPEED =	55	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	27	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		50
DIST C/L TO WALL =		50
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER		0
PAD ELEVATION =		0.5
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	15
MEDIUM TRUCKS =	15
HEAVY TRUCKS =	15

(10 = HARD SITE, 15 = SOFT SITE)

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCK	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	52.8	50.9	49.2	43.1	51.7	52.3
MEDIUM TRUCKS	42.7	41.2	34.8	33.3	41.8	42.0
HEAVY TRUCKS	42.7	41.3	32.3	33.5	41.9	42.0
NOISE LEVELS (dBA)	53.6	51.8	49.4	43.9	52.5	53.1

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	52.8	50.9	49.2	43.1	51.7	52.3
MEDIUM TRUCKS	42.7	41.2	34.8	33.3	41.8	42.0
HEAVY TRUCKS	42.7	41.3	32.3	33.5	41.9	42.0
NOISE LEVELS (dBA)	53.6	51.8	49.4	43.9	52.5	53.1

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	4	8	17	37
LDN	3	7	16	34

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: Eco Dome
ROADWAY: Linn Rd
LOCATION: 50 ft from centerline

JOB #: 0739-22-08
DATE: 22-Apr-22
ENGINEER: M. Dickerson

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	301	
SPEED =	55	
PK HR % =	10	
NEAR LANE/FAR LANE DIS	0	
ROAD ELEVATION =	0.0	
GRADE =	1.0	%
PK HR VOL =	30	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		50
DIST C/L TO WALL =		50
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER		0
PAD ELEVATION =		0.5
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	15
MEDIUM TRUCKS =	15
HEAVY TRUCKS =	15

(10 = HARD SITE, 15 = SOFT SITE)

WALL INFORMATION

HTH WALL	0.0	
AMBIENT=	0.0	
BARRIER =	0	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCK	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	50.12	- -
MEDIUM TRUCKS	4.0	50.02	- -
HEAVY TRUCKS	8.0	50.06	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	53.4	51.5	49.7	43.7	52.3	52.9
MEDIUM TRUCKS	43.3	41.8	35.4	33.9	42.3	42.6
HEAVY TRUCKS	43.3	41.9	32.8	34.1	42.4	42.5
NOISE LEVELS (dBA)	54.1	52.3	49.9	44.5	53.1	53.6

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	53.4	51.5	49.7	43.7	52.3	52.9
MEDIUM TRUCKS	43.3	41.8	35.4	33.9	42.3	42.6
HEAVY TRUCKS	43.3	41.9	32.8	34.1	42.4	42.5
NOISE LEVELS (dBA)	54.1	52.3	49.9	44.5	53.1	53.6

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	4	9	19	40
LDN	4	8	17	37

Appendix C:

Construction Noise Modeling Output

Receptor - Residetial to the South

Construction Phase Equipment Item	# of Items	Item Lmax at 50 feet, dBA[1]	Edge of Site to Receptor, feet	Center of Site to Receptor, feet	Item Usage Percent[1]	Ground Factor[2]	Usage Factor	Receptor Item Lmax, dBA	Recptor. Item Leq, dBA
GRADE									
1. Graders	1	85	330	410	40	0.66	0.40	63.2	56.7
2. Rubber Tired Dozers	1	82	330	410	40	0.66	0.40	60.2	53.7
3. Tractors/Loaders/Backhoes	1	84	330	410	40	0.66	0.40	62.2	55.7
								63.2	60.3

[1]FHWA Construction Noise Handbook: Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

VIBRATION LEVEL IMPACT			
Project:	Eco Dome		Date: 4/22/22
Source:	Large Bulldozer		
Scenario:	Unmitigated		
Location:	Residence to the South		
Address:	Linn Rd, Landers, CA		
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 =	330.00	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 =	**0.005**	IN/SEC	OUTPUT IN RED