Appendix F

Valley Communications Center Noise Impact Study

MD Acoustics

November 28, 2022

Valley Communications Center
Noise Impact Study
City of San Bernardino, CA

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Date: 11/28/2022

MD ACOUSTICS
Sound Solutions for Planning and Design

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1.0 Introduction

1.1 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 compare results to City and CEQA thresholds. The assessment was conducted and compared to the noise standards set forth by the Federal, State and Local agencies. Consistent with the California Environmental Quality Act (CEQA) and CEQA Guidelines, a significant impact related to noise would occur if a proposed project is determined to result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable agencies.
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

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 the traffic noise impacts to the project site
- An analysis of the exterior noise limit compliance

1.2 Site Location and Study Area

The project site is located at the southeast corner of Rialto Avenue and Lenna Road intersection, west of San Bernardino International Airport, over a 6.49-acre lot, in the City of San Bernardino, as shown in Exhibit A.

According to the City's EIR (Appendix F), the project site is beyond the 65 dBA contour of the San Bernardino International Airport. Figures 1 through 12 from the Technical Memorandum show the noise contours for several scenarios and none of said contours lays over the proposed project site.

The City of San Bernardino General Plan classifies the land use designation of the site as Public Facilities. The project site surrounding land uses are Light Industrial (IL) and Office Industrial Park (OIP).

1.3 Proposed Project Description

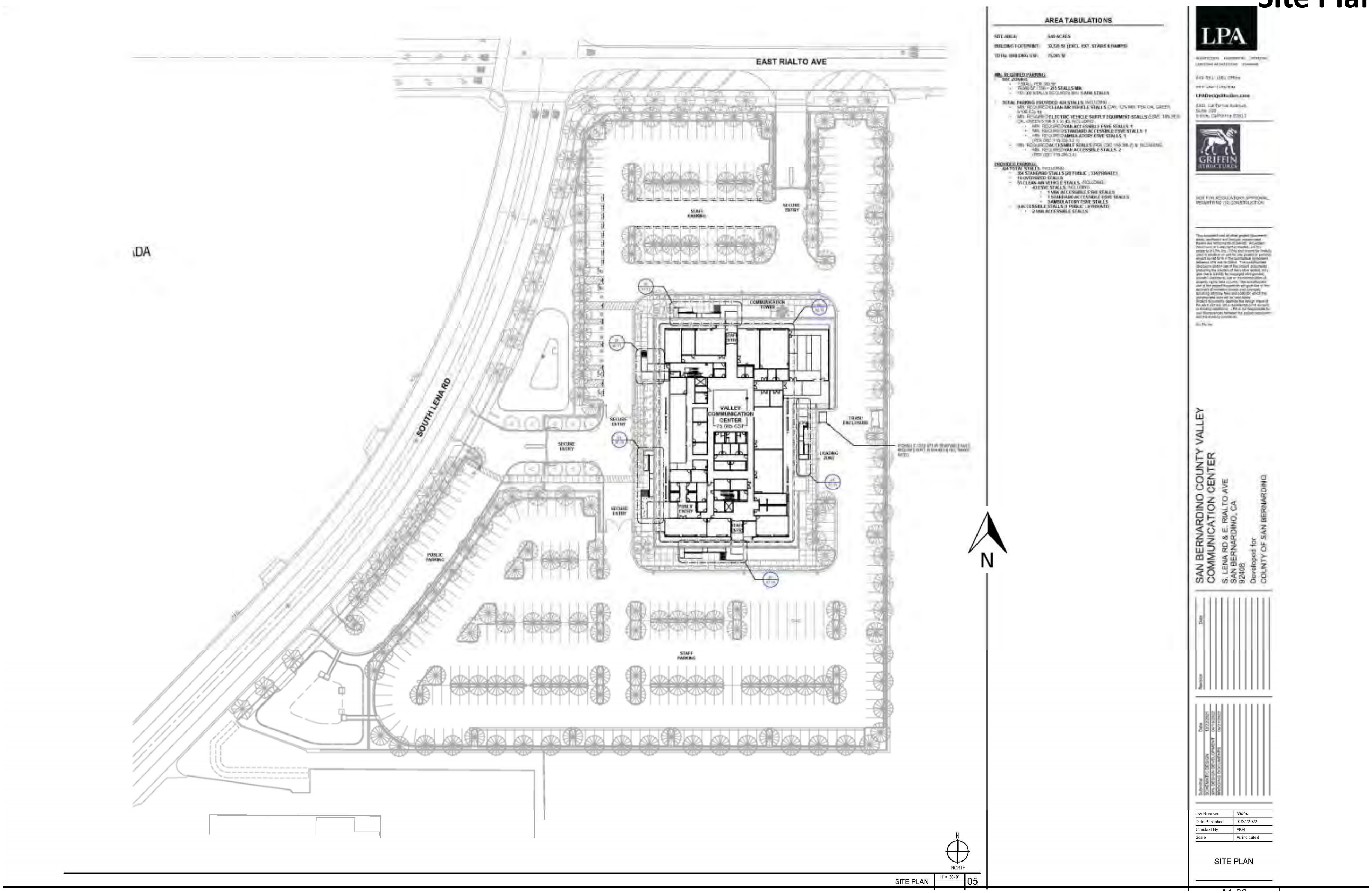
The Project proposes to develop a new three-story 75,085 square feet building to host the San Bernardino County emergency communications and operations center. The building will be occupied by the Sheriff-Coroner (SBCSD), Office of Emergency Management (OES), County Fire (SBCFD), Consolidated Fire Agencies (CONFIRE), Inland Counties Emergency Medical Agency (ICEMA), Radio Manage Facility (ISD), and building services. The project will be a mission-critical facility and must be operational 365/24/7, under extreme conditions as the primary emergency operations center (EOC) and emergency communications center (ECC) in the San Bernardino Valley. The facility will be capable of self-support and self-sufficiency over an extended duration of time and act as a stand-alone facility in the event of natural or manmade disasters. The operational model requires significant facility enhancements that include utility and technological system redundancies to assure continual operations. The site plan for the project is shown in Exhibit B.

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.

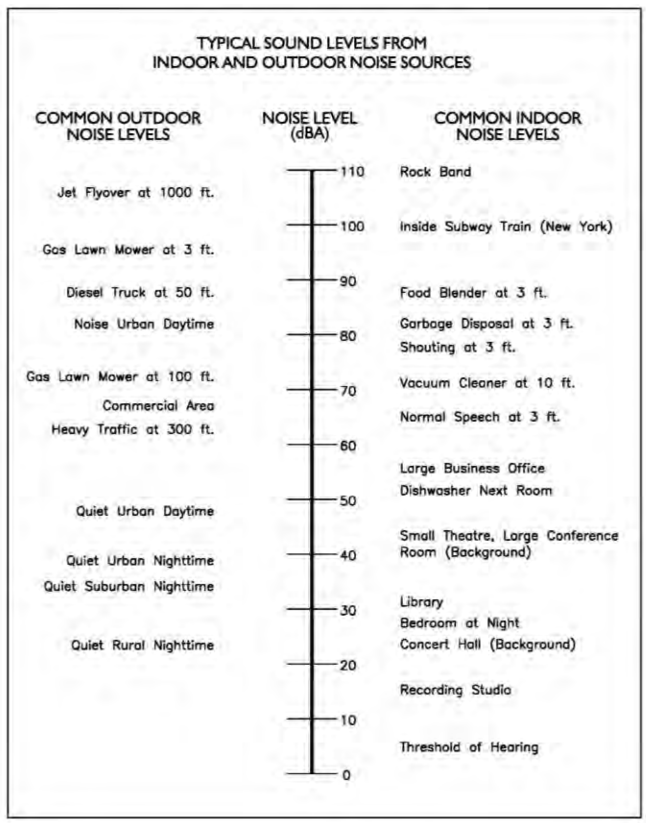
2.1 Sound, Noise and Acoustics

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 reference 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 within the City 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, 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 the compatibility of sensitive uses with various incremental levels of noise.

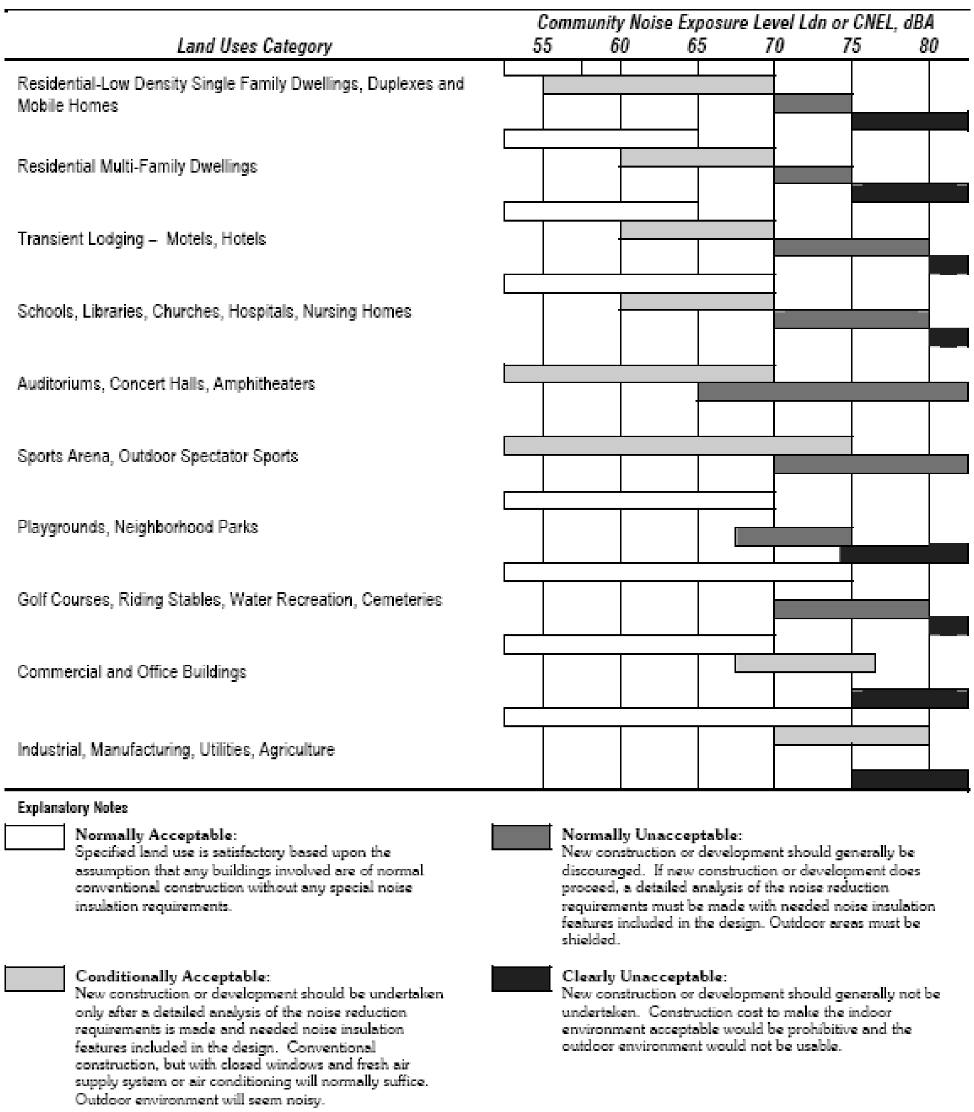
The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general plan.

4.3 City of San Bernardino Noise Regulations

City of San Bernardino General Plan Noise Element:

The City outlines their noise goals, policies and standards within the General Plan Noise Element. 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



Source: California Office of Noise Control

The following outlines the polices relevant to the proposed project:

Goal 14.1:

Ensure that residents are protected from excessive noise through careful land planning.

Policy

14.1.4: Prohibit the development of new or expansion of existing industrial, commercial, or other uses that generate noise impacts on housing, schools, health care facilities or other sensitive uses above a Ldn of 65 dB(A). (LU-1).

Goal 14.3:

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

Policy

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)

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

City of San Bernardino Municipal Code

Section 19.20.030.15 – Noise.

19.20.030.15 Noise.

A. In residential areas, no exterior noise level shall exceed 65dBA and no interior noise level shall exceed 45dBA.

B. All residential developments shall incorporate the following standards to mitigate noise levels:

1. Increase the distance between the noise source and receiver.
2. Locate land uses not sensitive to noise (i.e., parking lots, garages, maintenance facilities, utility areas, etc.) between the noise source and the receiver.
3. Bedrooms should be located on the side of the structure away from major rights-of-way.
4. Quiet outdoor spaces may be provided next to a noisy right-of-way by creating a U-shaped development which faces away from the right-of-way.

C. The minimum acceptable surface weight for a noise barrier is four pounds per square foot (equivalent to ¾-inch plywood). The barrier shall be of a continuous material which is resistant to sound including:

1. Masonry Block

2. Precast concrete
3. Earth berm or a combination of earth berm with block concrete.

D. Noise barriers shall interrupt the line-of-sight between noise source and receiver.

Section 8.54 Noise Control
8.54.020 Prohibited Acts.
It shall be unlawful for any person to engage in the following activities:
D. Using, operating, or permitting to be played, used or operated any radio receiving set, musical instrument, phonograph, or other sound amplification or production equipment for producing or reproducing sound in such a manner as to disturb the peace, quiet, or comfort of neighboring persons, or at any time with louder volume than is necessary for the convenient hearing of the person or persons who are in the room, vehicle, or other enclosure in which such machine or device is operated, and who are voluntary listeners thereto and that is:

1. Plainly audible across property boundaries;
2. Plainly audible through partitions common to two residences within a building;
3. Plainly audible at a distance of 50 feet in any direction from the source of the music or sound between the hours of 8:00 a.m. and 10:00 p.m.; or
4. Plainly audible at a distance of 25 feet in any direction from the source of the music or sound between the hours of 10:00 p.m. and 8:00 a.m.

I. The creation of loud and excessive noise in connection with the loading or unloading of motor trucks and other vehicles.
K. The doing of automobile, automotive body or fender repair work, or other work on metal objects and metal parts in a residential district so as to cause loud and excessive noise which disturbs the peace, quiet, and repose of any person occupying adjoining or closely situated property or neighborhood
L. The operation or use between the hours of 10:00 p.m. and 8:00 a.m. of any pile driver, steam shovel, pneumatic hammers, derrick, steam or electric hoist, power driven saw, or any other tool or apparatus, the use of which is attended by loud and excessive noise, except with the approval of the City.
M. Creating excessive noise adjacent to any school, church, court, or library while the same is in use, or adjacent to any hospital or care facility, which unreasonably interferes with the workings of such institution, or which disturbs or unduly annoys patients in the hospital, provided conspicuous signs are displayed in such streets indicating the presence of a school, institution of learning, church, court, or hospital.
N. Making or knowingly and unreasonably permitting to be made any unreasonably loud, unnecessary, or unusual noise that disturbs the comfort, repose, health, peace and quiet, or which causes discomfort or annoyance to any reasonable person of normal sensitivity. The characteristics and conditions that may be considered in determining whether this section has been violated include, but are not limited to, the following:

1. The level of noise;
2. The level of background noise;
3. The proximity of the noise to sleeping facilities;
4. The nature and zoning of the areas within which the noise emanates;

5. The density of the inhabitation of the area within which the noise emanates;
6. The time of the day or night the noise occurs;
7. The duration of the noise;
8. Whether the noise is recurrent, intermittent, or constant; and
9. Whether the noise is produced by a commercial or noncommercial activity.

8.54.050 Controlled Hours of Operation

It shall be unlawful for any person to engage in the following activities other than between the hours of 8:00 a.m. and 8:00 p.m. in residential zones and other than between the hours of 7:00 a.m. and 8:00 p.m. in all other zones:

A. Operate or permit the use of powered model vehicles and planes.

B. Load or unload any vehicle, or operate or permit the use of dollies, carts, forklifts, or other wheeled equipment that causes any impulsive sound, raucous, or unnecessary noise within one thousand (1,000) feet of a residence.

C. Operate or permit the use of domestic power tools, or machinery or any other equipment or tool in any garage, workshop, house, or any other structure.

D. Operate or permit the use of gasolines or electric powered leaf blowers, such as commonly used by gardeners and other persons for cleaning lawns, yards, driveways, gutters, and other property.

E. Operate or permit the use of privately operated street/parking lot sweepers or vacuums, except that emergency work and/or work necessitated by unusual conditions may be performed with the written consent of the City Manager.

F. Operate or permit the use of electrically operated compressor, fan, and other similar devices.

Section 8.54.060 Exemptions

The following activities and noise sources shall be exempt from the provisions of this chapter:

A. The use of horns, sirens, or other signaling or warning devices by persons vested with legal authority to use the same, and in pursuit of their lawful duties, such as on ambulances, fire, police, or other governmental or official equipment.

B. Such noises as are an accompaniment and effect of a lawful business, commercial or industrial enterprise carried on in an area zoned for that purpose, except where there is evidence that such noise is a nuisance and that such a nuisance is a result of the employment of unnecessary and injurious methods of operation.

F. Any mechanical devices, apparatus, or equipment used, related to, or connected with emergency machinery, vehicle, or work.

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 the County's 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 Location

The noise monitoring location was selected based on the nearest sensitive receptors relative to the proposed onsite noise sources. One (1) short-term 1-hour noise measurement was conducted at or near the project site and is illustrated in Exhibit E. Appendix A includes photos, the field sheet, and measured noise data.

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, trip generation rates, and percentages correspond to the trip generation memorandum prepared by Integrated Engineering Group and City's General Plan (Appendix 14) traffic counts. The referenced traffic data was applied to the model and is shown in Appendix E. 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 1 indicates the roadway parameters and vehicle distribution utilized for this study. The daily trip count generated by the project is 440.

Table 1: Roadway Parameters and Vehicle Distribution

Roadway	Segment	Existing ADT[1]	Existing Plus Project ADT[2]	Speed (MPH)	Site Conditions
Rialto Ave	Lena and Tippecanoe	7,688	8,128	25	Hard
Vehicle Distribution (Truck Mix)					
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		75.5	14.0	10.5	97.42
Medium Trucks		48.9	2.2	48.9	1.84
Heavy Trucks		47.3	5.4	47.3	0.74

Notes:
[1] Traffic count from San Bernardino County General Plan, Final Environmental Report, Chapter IV Table IV-O-8.
[2] Trip generation rate based on Memorandum by Integrated Engineering Group.

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 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 various stationary on-site sources (parking spaces, and mechanical equipment on the roof). The model assumes approximately 424 parking spaces around the building. Additionally, the project developments of the site are included, which involve the elevations for noise sources and receivers and the project security and screening walls. The project security and screening walls include a six (6) foot tall wall on the site perimeter as shown in detail in Sheet A1.00 in Exhibit B Site Plan for the project.

The model also includes mechanical equipment located on the rooftop of the building. Sheet M2.04 from the project bridging documents shows the mechanical equipment roof plan. The equipment considered in the model consists of six (6) air handler units, three (3) water chillers, and four (4) water pumps. The worst-case scenario considers the mechanical equipment working continuously. In addition, the parking lot was modeled with 1 car movement per parking space per hour. Finally, all the mechanical equipment was included as a point source over the roof according to the mechanical roof plan Sheet M2.04 and a two (2) feet tall parapet was considered at the roof edge. The reference sound level data is provided in Appendix B and the model sources summary is in Table 2.

Table 2: Reference Sound Level Measurements for SoundPlan Model

Source	Source Type	Reference Level (Lw or SPL dBA)	Descriptor
Air Handler Unit	Point Source	90	Sound Power
Chillers	Point Source	85	3 ft
Parking	Area (SP Parking Tool)	77	1 car per hr
Water Pump	Point	78	5 ft

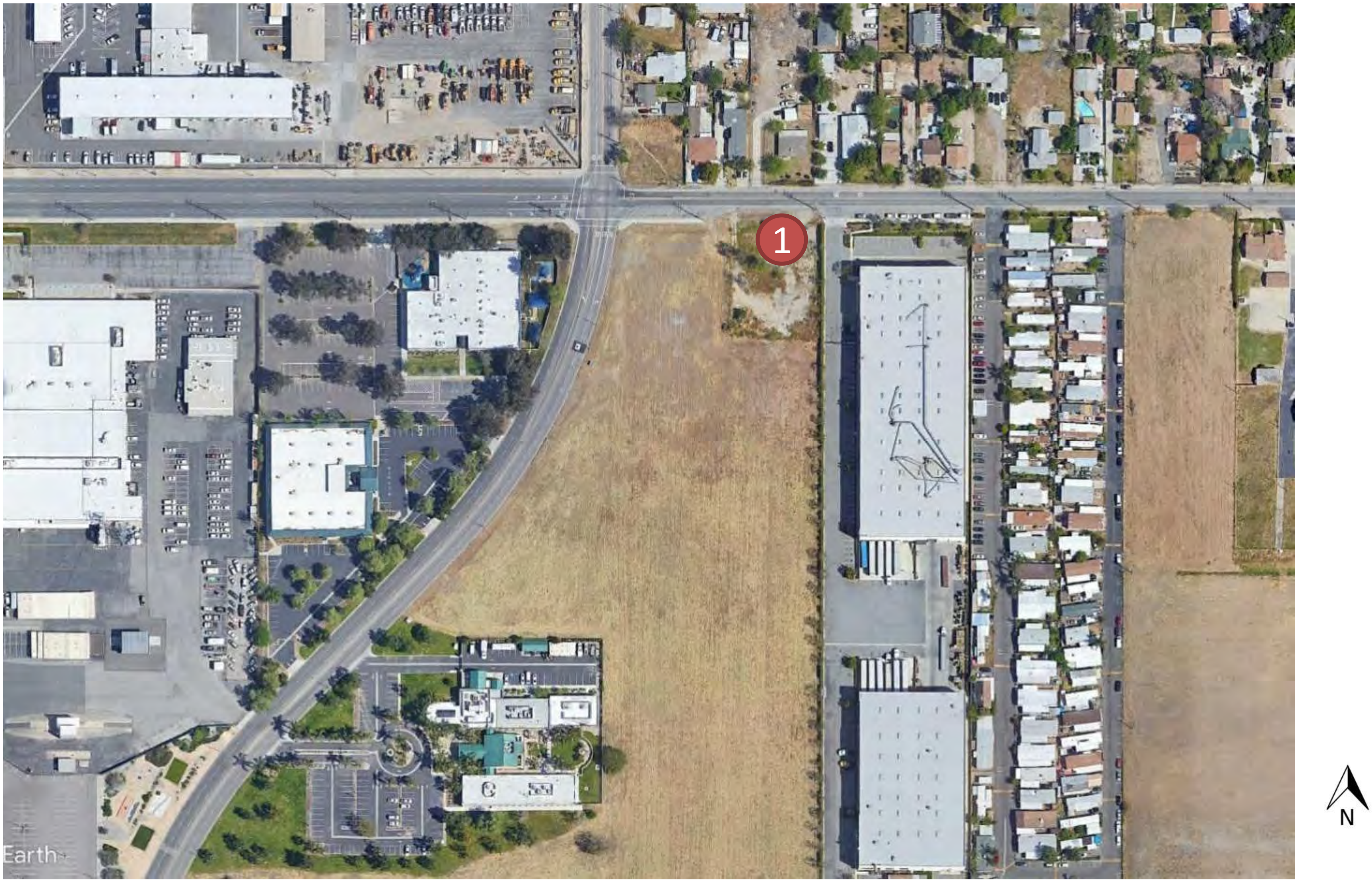
The SP model assumes that all noise sources are operating simultaneously (worst-case scenario), when in actuality the noise will be intermittent and lower in noise level. SP modeling inputs and outputs are provided in Appendix C.

Finally, the emergency generators operation was not considered in the model since the operation of said equipment is projected for an emergency situation, and according to City's Municipal Code Section 8.54.060 (F), noise from emergency generators should be exempt.

Exhibit E

Measurement Locations

 = Short-Term Monitoring Location



6.0 Existing Noise Environment

One (1) one-hour ambient noise measurement was conducted at the property site. The noise measurement was taken to determine the existing ambient noise levels. Noise data indicates that traffic along East Rialto Avenue is the primary source of noise impacting the site and the adjacent uses. This assessment utilizes the ambient noise data as a basis and compares project operational levels to said data.

6.1 Short-Term Noise Measurement Results

The results of the short-term noise data are presented in Table 3.

Table 3: Short-Term Noise Measurement Data[1]

Date	Time	1-Hour dB(A)							
		L_{EQ}	L_{MAX}	L_{MIN}	L_2	L_8	L_{25}	L_{50}	L_{90}
5/25/2022	4:21AM-5:21PM	64.5	94.8	48.1	68.3	63.6	59.3	55.4	51.6

Notes:
1. Short-term noise monitoring location (ST1) is illustrated in Exhibit E.

Noise data indicates the ambient equivalent noise level was 65 dBA Leq at the project site. Maximum hourly levels reached up to 94.8 dBA as a result of traffic along East Rialto Avenue. 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.

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

Sensitive receptors that may be affected by project operational noise include existing residences to the north, industrial uses to the east, and public spaces to the west and south. The worst-case stationary noise was modeled using SoundPLAN acoustical modeling software. Worst-case assumes that all the mechanical equipment and parking noise are always operational when in reality the noise will be intermittent and cycle on/off depending on the customer usage. Project operations are assumed to occur 24 hours continuously.

A total of four (4) receptors R1 – R4 were modeled to evaluate the proposed project's operational noise impact. R1, R3 and R4 represent the nearest industrial and public facilities receptors to the project site while R2 represents residential land use. Receiver 1 is 220 feet to the east, receiver 2 is 420 feet to the north, receiver 3 is 500 feet to the south, and receiver 4 is 560 feet to the west. A receptor is denoted by a yellow dot. All yellow dots represent either a property line or a sensitive receptor such as an outdoor sensitive area (e.g. courtyard, patio, backyard, etc).

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" operational noise levels at the property lines and/or sensitive receptor area. Operational noise levels are anticipated to range between 44 dBA to 47 dBA at adjacent uses (depending on the location). Exhibit C provides a scale that illustrates loudness associated with common noise levels.

Project Plus Ambient Operational Noise Levels
Table 4 demonstrates the project plus the ambient (measured average level) noise levels. Project plus ambient noise level projections are anticipated to measure 65 dBA Leq at nearby receptors (R1 – R4). The "project plus ambient" noise projections will not change the ambient noise levels.

Exhibit F
Operational Noise Level Contours

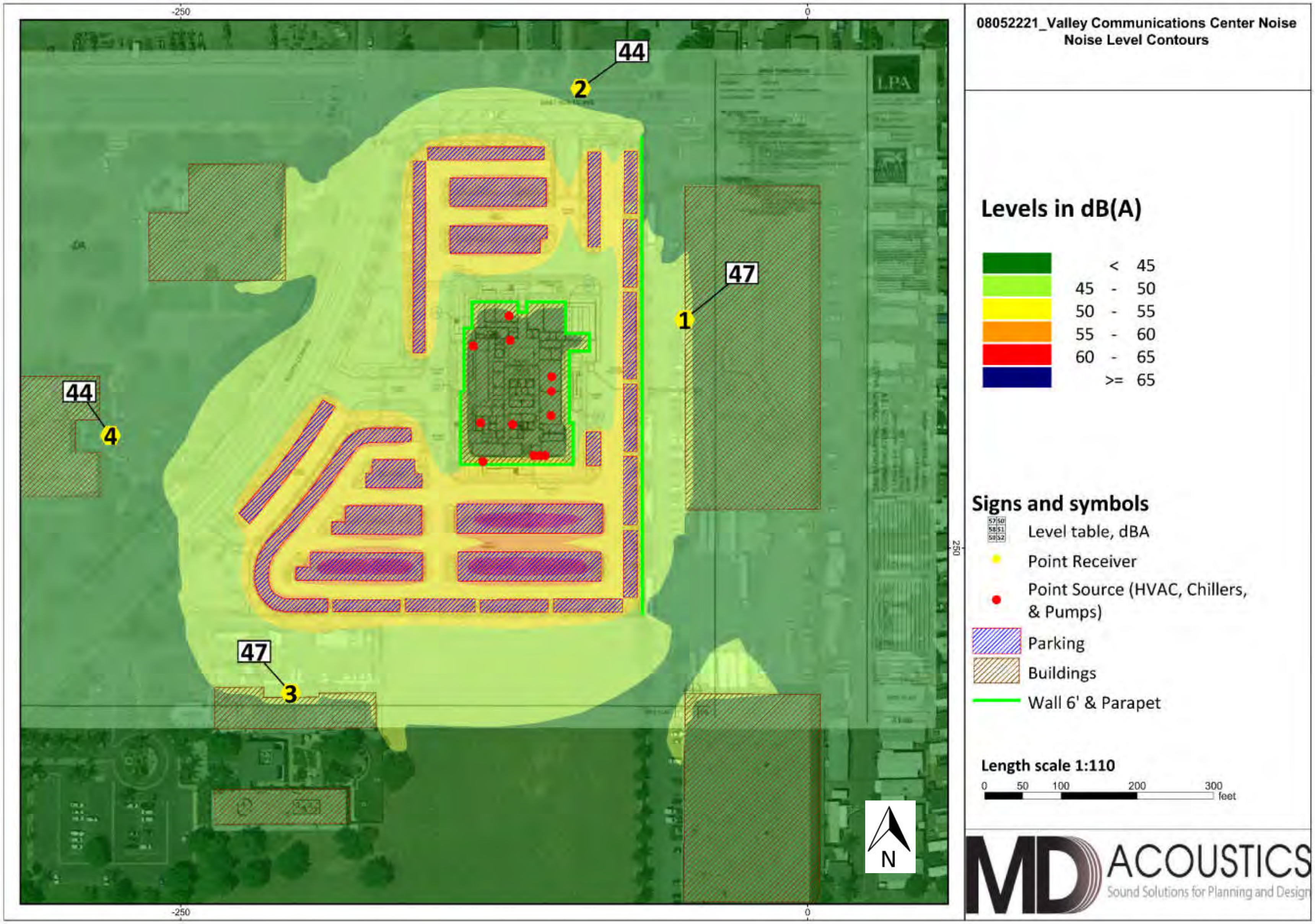


Table 4: Worst-Case Predicted Operational Noise Levels (dBA)

Receptor[1]	Land use and distance	Existing Ambient Noise Level (dBA, Leq)[2]	Project Noise Level (dBA, Leq)[3]	Total Combined Noise Level (dBA, Leq)	Noise Ordinance (dBA, Leq)[4]	Maximum Change in Noise Level as Result of Project
1	Industrial, 220' East	65	47	65	N/A	0
2	Residential, 420' North	65	44	65	65	0
3	Office, 500' South	65	47	65	N/A	0
4	Office, 560' West	65	44	65	N/A	0

Notes:
1. Receptors 1, 3, and 4 represent industrial and public land uses. Receptor 2 represents residential receptors
2. See Appendix A for the ambient noise measurements
3. See Exhibit F for the operational noise level projections at said receptors.
4. Per section 19.20.030.15 of the municipal code.

As shown in Table 4, the project would not exceed the City's exterior noise limit for residential land uses. In addition, the charter school located west of the project at the southwest corner of Lena and Rialto Avenue, will be within the 45 dB(A) noise contour limit. Finally, the noise level increase would be "Not Perceptible" at the analyzed receptors.

7.1.2 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 60 feet from the centerline of the analyzed roadway. The modeling is theoretical and does not consider 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 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 Year (without Project): This scenario refers to existing year traffic noise conditions.

Existing Year (Plus Project): This scenario refers to existing year + project traffic noise conditions.

Table 5 compares the without and with project scenarios 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 5, the project is anticipated to change the noise levels by 0.2 dB. Traffic noise calculation sheets are provided in Appendix E.

Since there is a small increase in traffic noise levels, the impact is considered less than significant as the noise levels at or near any existing proposed sensitive receptor would be 62.7 dBA CNEL or less and the change in noise level is 0.2 dBA or less. No further mitigation is required.

Table 5: Existing Scenario - Noise Levels Along Roadways (dBA CNEL)

Existing Without Project Exterior Noise Levels

Roadway	Segment	CNEL at 60 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
East Rialto Avenue	Lena Road and Tippecanoe	62.5	11	34	106	336

Existing With Project Exterior Noise Levels

Roadway	Segment	CNEL at 60 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
East Rialto Avenue	Lena Road and Tippecanoe	62.7	11	35	112	355

Change in Existing Noise Levels as a Result of Project

Roadway	Segment	CNEL at 50 Feet dBA[2]			
		Existing Without Project[1]	Existing With Project[1]	Change in Noise Level	Potential Significant Impact
East Rialto Avenue	Lena Road and Tippecanoe	62.5	62.7	0.2	No

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

7.1.3 Noise Impacts to On-Site Receptors Due to Project-Generated Traffic

The building façade considered for this project site is located approximately 260 feet from the center line of East Rialto Avenue and would fall beyond the 60 dBA CNEL or less contour. Therefore, the project would be normally acceptable per the City's Land Use Compatibility Matrix.

7.1.4 San Bernardino International Airport Noise Impacts to On-Site Receptors

The City's EIR Appendix F "Aircraft Noise Technical Memorandum", July 3, 2019, prepared by ESA consulting, shows that the project would fall beyond any noise contour line. Therefore, the project will not be impacted by SBIA noise contours.

7.2 Mitigation Measures

As designed, the project meets the requirements established by the City's Noise Ordinance for exterior noise. Additionally, considering the typical construction standard, the project will meet the City's interior noise ordinance. Also, the project is not located within any noise contours of the San Bernardino International Airport (SBIA). Therefore, at this point, no further mitigation is required.

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 6.

Table 6: 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 noise is considered a short-term impact and would be considered significant if construction activities are taken outside the allowable times (7 a.m. to 8 p.m.) as described in the City of San Bernardino Municipal Code Section 8.54.050. 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. All construction noise calculation sheets are provided in Appendix D.

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 the grading phase. A likely worst-case construction noise scenario during grading assumes the use of 1 grader, 1 dozer, 1 excavator, 1 scraper, and 1 backhoe operating at 400 feet from the nearest sensitive receptor (residential uses to the north). The distance is considered from the project site center.

Assuming a usage factor of 40 percent for each piece of equipment, unmitigated noise levels at 400 feet have the potential to reach 68 dBA L_{eq} at the nearest sensitive receptors during grading. Noise levels for the other construction phases would be lower, approximately from 59 to 67 dBA L_{eq}.

8.2 Construction Vibration

Construction activities can produce a 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 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 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 7 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 7: 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 8 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 8: 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 90 feet (residences to the north from the north PL), a large bulldozer would yield a worst-case 0.025 PPV (in/sec) which means the vibration would not be perceptible during grading along the northern property line of the project site and is below any threshold of damage. There is less than significant impact, and no mitigation is required. The vibration calculation sheets are provided in Appendix D.

8.3 Construction Noise Reduction Measures

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 and apply practical techniques to minimize noise. 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 Section 8.54.050.

2. During construction, the contractor shall ensure all construction equipment is equipped with appropriate noise attenuating devices, such as mufflers, silencers, and original equipment 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

City of San Bernardino: General Plan.

City of San Bernardino: EIR Appendix F “Aircraft Noise Technical Memorandum”, July 3, 2019, ESA consulting

City of San Bernardino: Municipal Code. Chapters 19.20 & 8.54.

Federal Highway Administration. Noise Barrier Design Handbook. June 2017.

Federal Transit Administration. Transit Noise and Vibration Impact Assessment Manual. September 2018

Appendix A:
Photographs and Field Measurement Data

1-Hour Noise Measurement Datasheet

Project Name:	Valley Communications Center Project
Project: #/Name:	0805-2022-021
Site Address/Location:	East Rialto Avenue and South Len
Date:	05/25/2022
Field Tech/Engineer:	Jason Schuyler

Site Observations:

Vacant Lot, dirt field. Meter was close to the NE corner of the project site. There is a warehouse to the East and the main source of noise is traffic from East Rialto Ave.

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

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

Site Id: ST1

MD ACOUSTICS

1-Hour Noise Measurement Datasheet - Cont.

Project Name: Valley Communications Center Project

Site Address/Location: East Rialto Avenue and South Len

Site Id: ST1

Figure 1: ST1 - Looking North

Figure 2: ST1 - Looking West

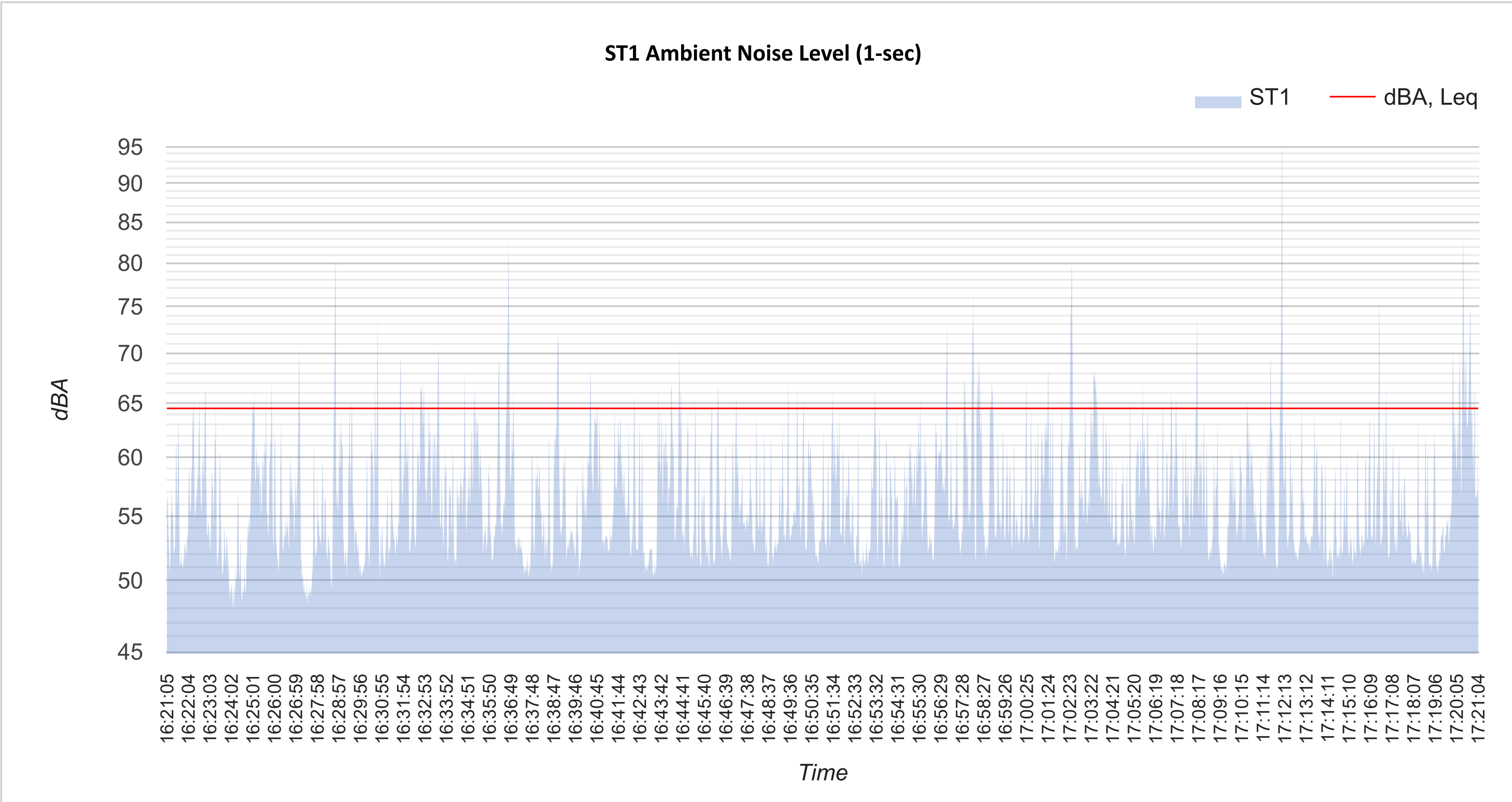
Figure 3: ST1 - Looking East

Table 1: Baseline Noise Measurement Summary

Location	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
ST1	4:21 PM	5:21 PM	64.5	94.8	48.1	68.3	63.6	59.3	55.4	51.6

1-Hour Noise Measurement Datasheet - Cont.

Project Name:	Valley Communications Center Project	**Site Topo:**	Flat	**Noise Source(s) w/ Distance:**	
Site Address/Location:	East Rialto Avenue and South Len	**Meteorological Cond.:**	86 F, Haze, 12 mph wind West direction	53 ft from E Rialto Ave CL	
Site Id:	ST1	**Ground Type:**	Soft Site, vacant lot		



MD ACOUSTICS

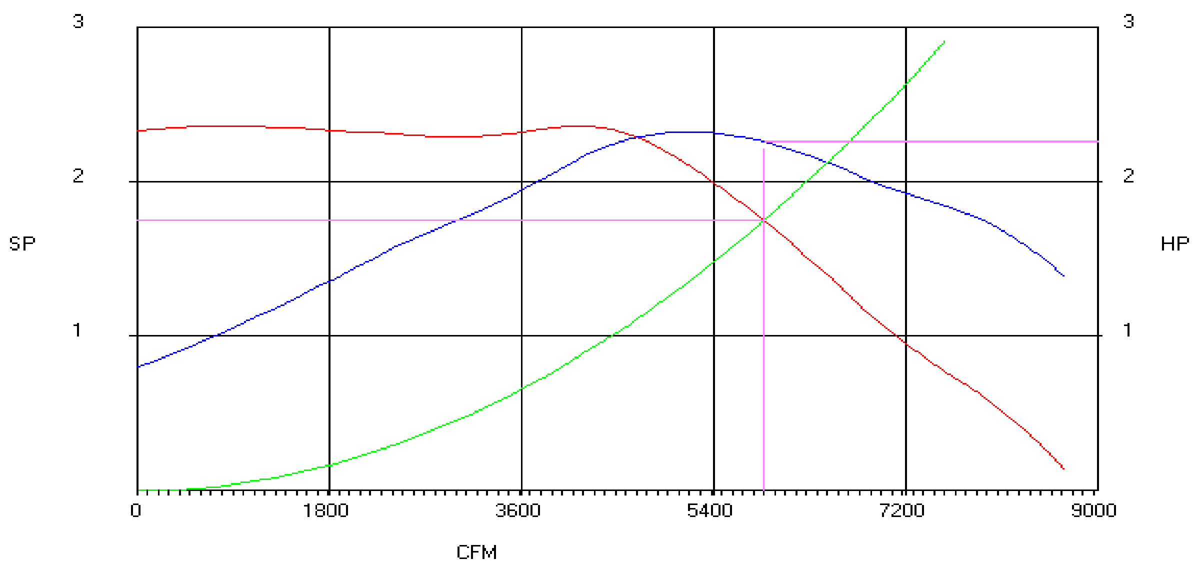
Appendix B:
Reference Sound Levels

| Fan Selection Documents

FAN CURVE

Ver. 9.20 May, 2020

Fan Duty:	RETURN	Wheel Type:	OLHE-ALUM
Fan Size:	222	Manufacturer:	ENERGY LABS
Fan Model:	PLENUM FAN	Maximum RPM:	2413
Fan Class:	2	Qty of Fans:	4
Wheel Width:	105%		



	CFM	SP	BHP	DrHP	RPM	ALT	TEMP	SE
Operating:	5875	1.75	2.26	N/A	1222	1125	70	71.5
Standard:		1.82	2.35			1125	70	

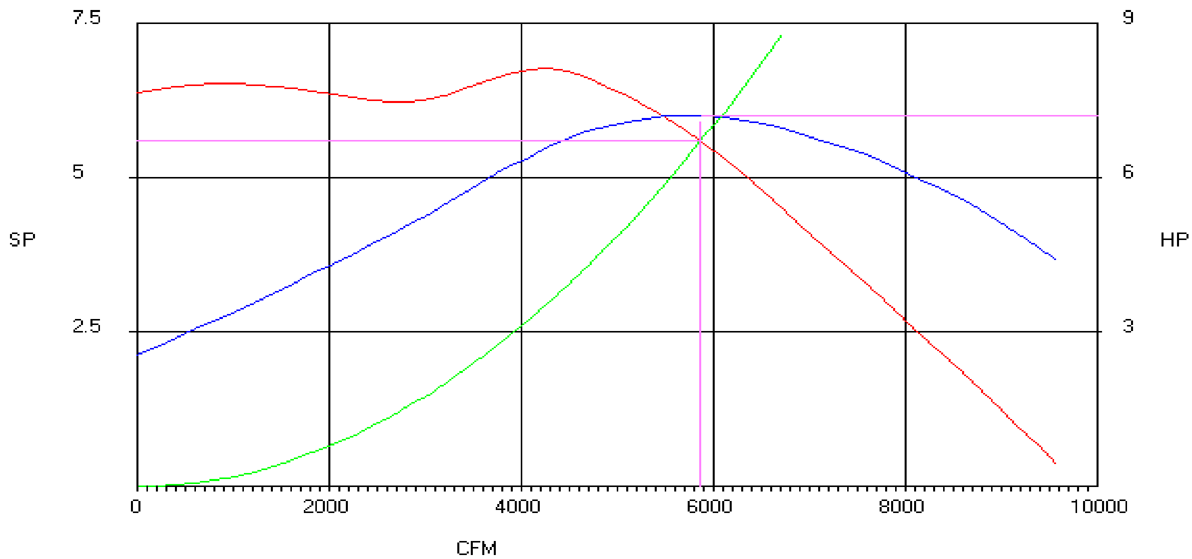
		63	125	250	500	1K	2K	4K	8K
Sound Power:	**Outlet**	74	79	78	74	75	75	71	63
	Inlet	74	87	73	73	72	69	64	64

- Ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311, and comply with the requirements of the AMCA certified ratings program.
- Operating performance and Sound information is for individual fans
- Performance ratings do not include the effect of appurtenances in the airstream
- Performance shown is for installation Type A (free inlet, free outlet)
- The sound power ratings are shown in decibels, referred to 1E-12 watts

FAN CURVE

Ver. 9.20 May, 2020

Fan Duty:	SUPPLY	Wheel Type:	OLHE-ALUM
Fan Size:	182	Manufacturer:	ENERGY LABS
Fan Model:	PLENUM FAN	Maximum RPM:	2959
Fan Class:	2	Qty of Fans:	4
Wheel Width:	105%		



	CFM	SP	BHP	DrHP	RPM	ALT	TEMP	SE
Operating:	5875	5.60	7.21	N/A	2457	1125	70	71.8
Standard:		5.83	7.51			1125	70	

		63	125	250	500	1K	2K	4K	8K
Sound Power:	**Outlet**	89	87	94	94	89	85	81	79
	Inlet	83	81	94	96	85	85	83	80

- Ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311, and comply with the requirements of the AMCA certified ratings program.
- Operating performance and Sound information is for individual fans
- Performance ratings do not include the effect of appurtenances in the airstream
- Performance shown is for installation Type A (free inlet, free outlet)
- The sound power ratings are shown in decibels, referred to 1E-12 watts

Model: TACA165BT3010FV-2P

	Sound pressure level								
Load factor	62.5 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Overall Sound Pressure Level Lp, dBA @ 1 m(3.3 ft)
100	57.5	67.5	74	79.5	80	78	75	74	85
75	74	64.5	71	78.5	79	76	67.5	51.5	83
50	67	60.5	63	69.5	68.5	66	55.5	41	74
25	60	48.5	53.5	54.5	55	52	41	30	60

IPLV CALCULATION TABLE - COOLING MODE AHRI 550 / 590

	IPLV			
Part Load	**100**	**75**	**50**	**25**
Cooling Capacity (Tons)	**150**	**112.5**	**75**	**37.5**
Power input (kW)	**148.31**	**79.13**	**32.95**	**11.44**
Part Load (kW/Ton)	**0.9887**	**0.7034**	**0.4394**	**0.3051**
Coefficients	**1**	**42**	**45**	**12**
IPLV (kW/Ton)	**0.4939**			

Chiller Performance in Cooling mode

	TACA165BT3010FV-2P							
Part Load	Cap (Tons)	Pwr (kW)	Eff (kW/Ton	Evap Inlet (°F)	Evap Outlet (°F)	Evap Flow (GPM)	Air Flow (SCFM)	Amb. (°F)
100	150	185.17	1.2345	54	42	298.78	15000	105.01
90	135	141.12	1.0453	52.8	42	298.78	13875	97.5
80	120	107.33	0.8945	51.6	42	298.78	11625	90
75	112.5	92.31	0.8205	51	42	298.78	10500	86.25
70	105	78.93	0.7518	50.4	42	298.78	10500	82.51
60	90	56.19	0.6243	49.2	42	298.78	9750	75
50	75	37.37	0.4983	48	42	298.78	8250	67.5
40	60	28.12	0.4686	46.8	42	298.78	10125	60.01
30	45	16.54	0.3676	45.6	42	298.78	8263	55
25	37.5	12.33	0.3289	45	42	298.78	8883	55
NPLV (kW/Ton)	0.5593							

Regulatory Compliance
Certified in accordance with the AHRI Air-Cooled Water-Chilling Packages Certification Program, which is based on AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI). Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Project:	Scottsdale Thomas and Loop		
Job Number:	0488-2021-01		
Site Address/Location:	20151 S. Ellsworth Road		
Date:	03/02/2021		
Field Tech/Engineer:	Robert Pearson		
Source/System:	Booster Pumps X2		
General Location:	5 feet from station		
Sound Meter:	NTI	**SN:**	A2A-16164-E0
Settings:	A-weighted, fast, 1-sec, 23-sec duration		
Meteorological Cond.:			

Site Observations:

Measurement taken 5' from the 8 pump station. Pumps 2 and 7 were running

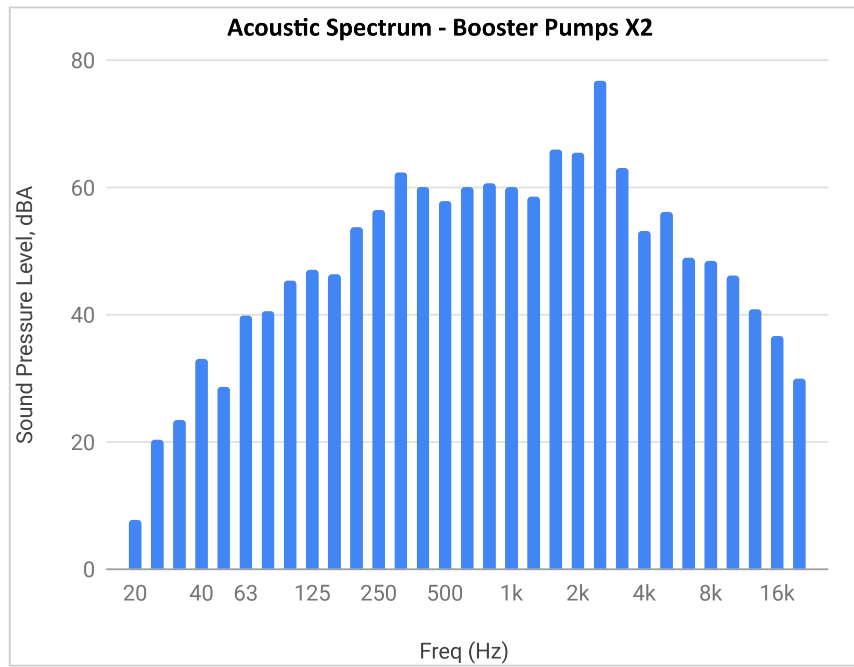
Leq	Lmin	Lmax
78.4	77.6	79.3

Ln 5	Ln 10	Ln 50	Ln 90	Ln 0	Ln 0
79.1	78.9	78.2	77.5	0.0	0.0

Table 1: Summary Measurement Data

Source/System	Overall Source	Overall	3rd Octave Band Data (dBA)																													
		dB(A)	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	12.5l	1.6k	2k	2.5k	3.15l	4k	5k	6.3k	8k	10k	12.5l	16k	20k
Booster Pumps X2	Booster Pumps	78.4	7.9	20.5	23.6	33.2	28.8	40.0	40.7	45.5	47.2	46.5	53.9	56.6	62.5	60.2	58.0	60.2	60.8	60.2	58.7	66.1	65.6	76.9	63.2	53.3	56.3	49.1	48.6	46.3	41.0	36.8	30.1

Figure 1: Booster Pumps X2

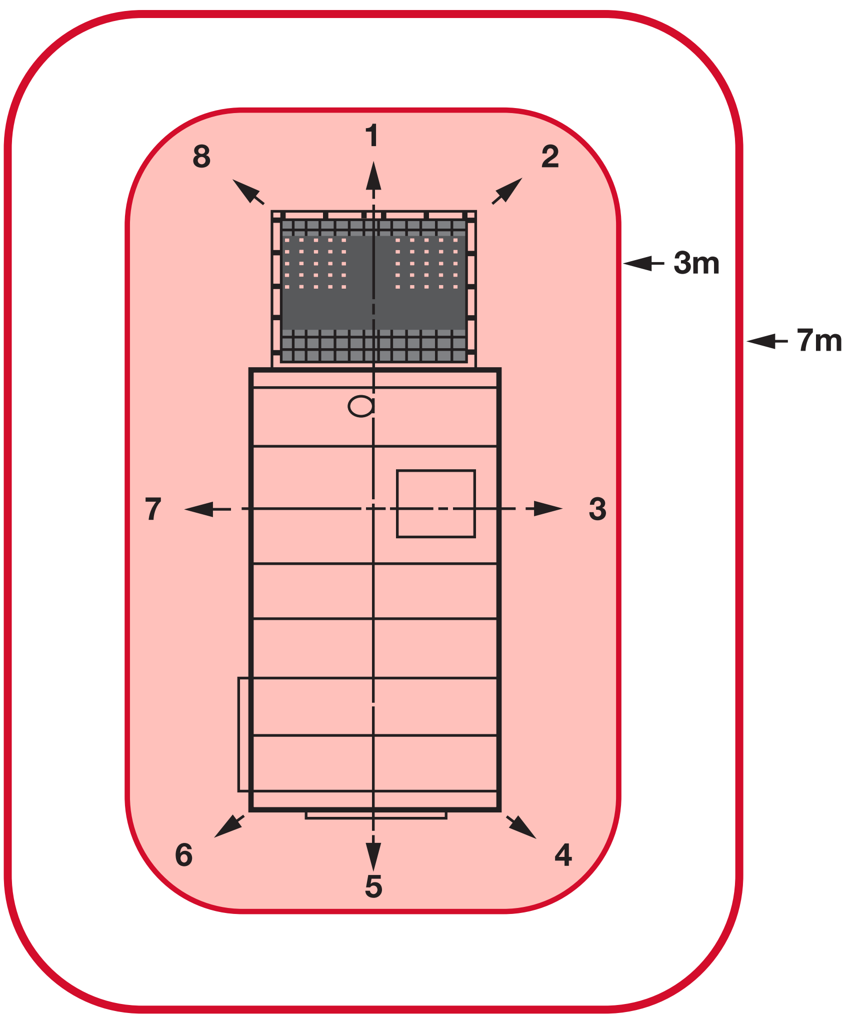


Submittal Data

SOUND EMISSIONS DATA

IDLC1000-2M

Sound Pressure Level @ 7 meters dB(A)										
Enclosure		Microphone Position								
		1	2	3	4	5	6	7	8	Average
Open	No Exhaust	92	93	93	94	91	94	94	95	93
HPE Level 0	External Mount Industrial Grade Silencer	88	90	89	90	89	90	91	91	90
HPE Level 1	External Mount Critical Grade Silencer	75	78	78	82	76	80	80	81	79
HPE Level 2	External Mount Hospital Grade Silencer	71	72	74	72	66	72	73	74	72



Notes:

1. Position 1 faces the radiator 7m from the exterior of the machine. The positions proceed clockwise around the genset.
2. Data measured at full load using standard radiator package.
3. Sound pressure levels are subject to instrumentation, installation, product variability and testing conditions.
4. Sound data for open unit does not include exhaust noise.

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

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CA Office
1197 Los Angeles Ave, Ste C-256
Simi Valley, CA 93065
p. (805) 426-4477

Project: Car idle Ref Level
Site Location: Gilbert, AZ
Date: 9/18/2018
Field Tech/Engineer: Robert Pearson
Source/System: Hyundai Sonata

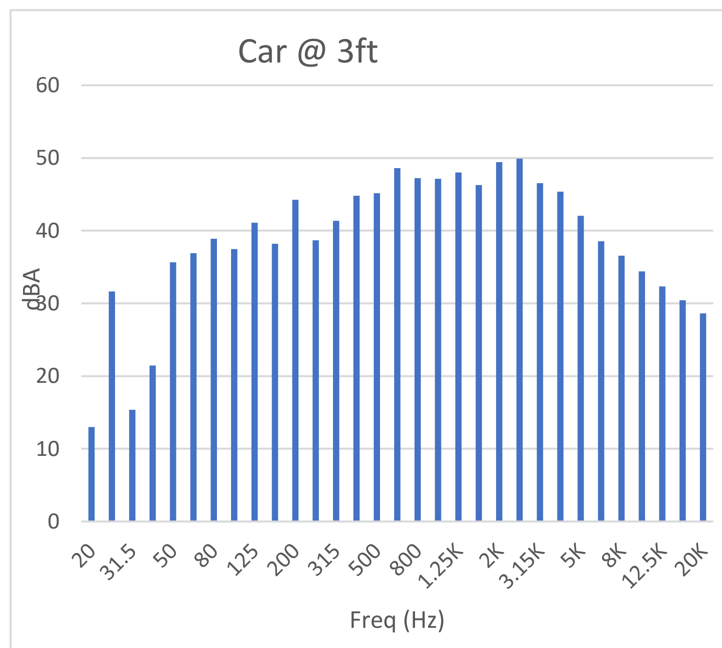
Site Observations:
Clear sky, measurements were performed at 3ft of source. Two measurments taken one in the front and one in the back and then Averaged out.

Location: Parking Lot
Sound Meter: NTi XL2 **SN:** A2A-05967-E0
Settings: A-weighted, slow, 1-sec, 10-sec duration
Meteorological Cond.: 90 degrees F, 0 mph wind

Table 1: Summary Measurement Data

Source	System	Overall dB(A)	3rd Octave Band Data (dBA)																													
			20	25	32	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1K	1.25K	1.6K	2K	2.5K	3.15K	4K	5K	6.3K	8K	10K	12.5K	16K	20K
Hyundai Sonata	Motor/Tailpipe	58.7	13	32	15	21	36	37	39	37	41	38	44	39	41	45	45	49	47	47	48	46	49	50	47	45	42	39	37	34	32	30	29

Figure 1: Example Measurement Position



Appendix C:

Sound Plan model inputs and outputs

Valley Communications Center Noise
Octave spectra of the sources in dB(A) - 002: 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)
Chiller	Point				93.4	93.4	0.0	0.0		0	100%/24h	Trane Model TACA165BT3010FV-2P	65.5	75.5	82.0	87.5	88.0	86.0	83.0	82.0	
Chiller	Point				93.4	93.4	0.0	0.0		0	100%/24h	Trane Model TACA165BT3010FV-2P	65.5	75.5	82.0	87.5	88.0	86.0	83.0	82.0	
Chiller	Point				93.4	93.4	0.0	0.0		0	100%/24h	Trane Model TACA165BT3010FV-2P	65.5	75.5	82.0	87.5	88.0	86.0	83.0	82.0	
HVAC	Point				88.1	88.1	0.0	0.0		0	100%/24h	HVAC	62.9	70.3	80.6	81.8	82.0	81.4	78.2	4.9	
HVAC	Point				88.1	88.1	0.0	0.0		0	100%/24h	HVAC	62.9	70.3	80.6	81.8	82.0	81.4	78.2	4.9	
HVAC	Point				88.1	88.1	0.0	0.0		0	100%/24h	HVAC	62.9	70.3	80.6	81.8	82.0	81.4	78.2	4.9	
HVAC	Point				88.1	88.1	0.0	0.0		0	100%/24h	HVAC	62.9	70.3	80.6	81.8	82.0	81.4	78.2	4.9	
HVAC	Point				88.1	88.1	0.0	0.0		0	100%/24h	HVAC	62.9	70.3	80.6	81.8	82.0	81.4	78.2	4.9	
HVAC	Point				88.1	88.1	0.0	0.0		0	100%/24h	HVAC	62.9	70.3	80.6	81.8	82.0	81.4	78.2	4.9	
Pump	Point				89.9	89.9	0.0	0.0		0	100%/24h	Booster Pump x2	55.1	62.8	75.6	76.0	76.4	89.2	76.0	64.5	54.3
Pump	Point				89.9	89.9	0.0	0.0		0	100%/24h	Booster Pump x2	55.1	62.8	75.6	76.0	76.4	89.2	76.0	64.5	54.3
Pump	Point				89.9	89.9	0.0	0.0		0	100%/24h	Booster Pump x2	55.1	62.8	75.6	76.0	76.4	89.2	76.0	64.5	54.3
Parking	PLot	185.88			57.5	80.2	0.0	0.0		0	.5	Typical spectrum	63.6	75.2	67.7	72.2	72.3	72.7	70.0	63.8	51.0
Parking	PLot	123.88			55.6	76.5	0.0	0.0		0	.5	Typical spectrum	59.9	71.5	64.0	68.5	68.6	69.0	66.3	60.1	47.3
Parking	PLot	145.94			55.4	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	181.70			56.4	79.0	0.0	0.0		0	.5	Typical spectrum	62.3	73.9	66.4	70.9	71.0	71.4	68.7	62.5	49.7
Parking	PLot	140.01			55.5	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	234.08			57.9	81.6	0.0	0.0		0	.5	Typical spectrum	64.9	76.5	69.0	73.5	73.6	74.0	71.3	65.1	52.3
Parking	PLot	76.42			55.2	74.0	0.0	0.0		0	.5	Typical spectrum	57.3	68.9	61.4	65.9	66.0	66.4	63.7	57.5	44.7
Parking	PLot	316.38			57.6	82.6	0.0	0.0		0	.5	Typical spectrum	66.0	77.6	70.1	74.6	74.7	75.1	72.4	66.2	53.4
Parking	PLot	363.74			58.1	83.7	0.0	0.0		0	.5	Typical spectrum	67.1	78.7	71.2	75.7	75.8	76.2	73.5	67.3	54.5
Parking	PLot	412.00			58.3	84.5	0.0	0.0		0	.5	Typical spectrum	67.8	79.4	71.9	76.4	76.5	76.9	74.2	68.0	55.2
Parking	PLot	435.39			58.3	84.7	0.0	0.0		0	.5	Typical spectrum	68.0	79.6	72.1	76.6	76.7	77.1	74.4	68.2	55.4
Parking	PLot	143.57			55.4	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	222.92			56.7	80.2	0.0	0.0		0	.5	Typical spectrum	63.6	75.2	67.7	72.2	72.3	72.7	70.0	63.8	51.0
Parking	PLot	379.60			57.9	83.7	0.0	0.0		0	.5	Typical spectrum	67.1	78.7	71.2	75.7	75.8	76.2	73.5	67.3	54.5
Parking	PLot	528.36			58.9	86.1	0.0	0.0		0	.5	Typical spectrum	69.5	81.1	73.6	78.1	78.2	78.6	75.9	69.7	56.9

Valley Communications Center Noise
Octave spectra of the sources in dB(A) - 002: Outdoor SP

Name	Source type	l or A m,m²	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	KI dB	KT dB	LwMax dB(A)	DO-Wall dB	Time histogram	Emission spectrum	63Hz dB(A)	125Hz dB(A)	250Hz dB(A)	500Hz dB(A)	1kHz dB(A)	2kHz dB(A)	4kHz dB(A)	8kHz dB(A)	16kHz dB(A)
Parking	PLot	684.60			58.7	87.0	0.0	0.0		0	.5	Typical spectrum	70.4	82.0	74.5	79.0	79.1	79.5	76.8	70.6	57.8
Parking	PLot	657.71			58.8	87.0	0.0	0.0		0	.5	Typical spectrum	70.4	82.0	74.5	79.0	79.1	79.5	76.8	70.6	57.8
Parking	PLot	146.05			55.4	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	643.96			58.9	87.0	0.0	0.0		0	.5	Typical spectrum	70.4	82.0	74.5	79.0	79.1	79.5	76.8	70.6	57.8
Parking	PLot	126.89			56.0	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	143.74			55.4	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	135.82			55.7	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	143.28			55.4	77.0	0.0	0.0		0	.5	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7

Valley Communications Center Noise
Contribution level - 002: Outdoor SP

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Receiver R1 Fl G Lr,lim dB(A) Leq,d 46.7 dB(A)						
Pump	Default industrial noise	Point		28.5	0.0	
Pump	Default industrial noise	Point		28.8	0.0	
Pump	Default industrial noise	Point		29.7	0.0	
Parking	Default parking lot noise	PLot		29.3	0.0	
Parking	Default parking lot noise	PLot		29.3	0.0	
Parking	Default parking lot noise	PLot		15.0	0.0	
Parking	Default parking lot noise	PLot		9.1	0.0	
Parking	Default parking lot noise	PLot		5.4	0.0	
Parking	Default parking lot noise	PLot		21.6	0.0	
Parking	Default parking lot noise	PLot		19.5	0.0	
Parking	Default parking lot noise	PLot		19.0	0.0	
Parking	Default parking lot noise	PLot		12.1	0.0	
Parking	Default parking lot noise	PLot		6.7	0.0	
Parking	Default parking lot noise	PLot		12.8	0.0	
Parking	Default parking lot noise	PLot		25.8	0.0	
Parking	Default parking lot noise	PLot		29.3	0.0	
Parking	Default parking lot noise	PLot		35.3	0.0	
Parking	Default parking lot noise	PLot		30.2	0.0	
Parking	Default parking lot noise	PLot		25.3	0.0	
Parking	Default parking lot noise	PLot		29.0	0.0	
Parking	Default parking lot noise	PLot		25.6	0.0	
Parking	Default parking lot noise	PLot		29.8	0.0	
Parking	Default parking lot noise	PLot		30.5	0.0	
Parking	Default parking lot noise	PLot		25.1	0.0	
Parking	Default parking lot noise	PLot		7.3	0.0	
Parking	Default parking lot noise	PLot		24.2	0.0	
Chiller	Default industrial noise	Point		39.3	0.0	
Chiller	Default industrial noise	Point		39.8	0.0	
Chiller	Default industrial noise	Point		40.2	0.0	
HVAC	Default industrial noise	Point		29.3	0.0	
HVAC	Default industrial noise	Point		29.2	0.0	
HVAC	Default industrial noise	Point		26.0	0.0	
HVAC	Default industrial noise	Point		28.5	0.0	
HVAC	Default industrial noise	Point		26.3	0.0	
HVAC	Default industrial noise	Point		26.0	0.0	
Receiver R2 Fl G Lr,lim dB(A) Leq,d 44.1 dB(A)						
Pump	Default industrial noise	Point		20.2	0.0	
Pump	Default industrial noise	Point		20.2	0.0	
Pump	Default industrial noise	Point		20.2	0.0	
Parking	Default parking lot noise	PLot		18.4	0.0	
Parking	Default parking lot noise	PLot		19.2	0.0	
Parking	Default parking lot noise	PLot		20.9	0.0	
Parking	Default parking lot noise	PLot		19.4	0.0	

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Parking	Default parking lot noise	PLot		17.7	0.0	
Parking	Default parking lot noise	PLot		17.7	0.0	
Parking	Default parking lot noise	PLot		13.3	0.0	
Parking	Default parking lot noise	PLot		4.6	0.0	
Parking	Default parking lot noise	PLot		0.8	0.0	
Parking	Default parking lot noise	PLot		6.5	0.0	
Parking	Default parking lot noise	PLot		26.7	0.0	
Parking	Default parking lot noise	PLot		19.2	0.0	
Parking	Default parking lot noise	PLot		20.9	0.0	
Parking	Default parking lot noise	PLot		25.4	0.0	
Parking	Default parking lot noise	PLot		27.1	0.0	
Parking	Default parking lot noise	PLot		31.4	0.0	
Parking	Default parking lot noise	PLot		34.5	0.0	
Parking	Default parking lot noise	PLot		35.4	0.0	
Parking	Default parking lot noise	PLot		36.8	0.0	
Parking	Default parking lot noise	PLot		34.6	0.0	
Parking	Default parking lot noise	PLot		30.9	0.0	
Parking	Default parking lot noise	PLot		22.8	0.0	
Parking	Default parking lot noise	PLot		15.5	0.0	
Chiller	Default industrial noise	Point		28.8	0.0	
Chiller	Default industrial noise	Point		30.2	0.0	
Chiller	Default industrial noise	Point		31.1	0.0	
HVAC	Default industrial noise	Point		31.4	0.0	
HVAC	Default industrial noise	Point		29.3	0.0	
HVAC	Default industrial noise	Point		27.7	0.0	
HVAC	Default industrial noise	Point		23.5	0.0	
HVAC	Default industrial noise	Point		23.4	0.0	
HVAC	Default industrial noise	Point		22.7	0.0	
Receiver R3 Fl G Lr,lim dB(A) Leq,d 47.4 dB(A)						
Pump	Default industrial noise	Point		33.3	0.0	
Pump	Default industrial noise	Point		33.2	0.0	
Pump	Default industrial noise	Point		33.0	0.0	
Parking	Default parking lot noise	PLot		35.6	0.0	
Parking	Default parking lot noise	PLot		35.1	0.0	
Parking	Default parking lot noise	PLot		39.3	0.0	
Parking	Default parking lot noise	PLot		34.1	0.0	
Parking	Default parking lot noise	PLot		28.7	0.0	
Parking	Default parking lot noise	PLot		24.8	0.0	
Parking	Default parking lot noise	PLot		24.6	0.0	
Parking	Default parking lot noise	PLot		26.1	0.0	
Parking	Default parking lot noise	PLot		28.9	0.0	
Parking	Default parking lot noise	PLot		32.3	0.0	
Parking	Default parking lot noise	PLot		40.5	0.0	
Parking	Default parking lot noise	PLot		22.8	0.0	
Parking	Default parking lot noise	PLot		19.5	0.0	

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Parking	Default parking lot noise	PLot		11.8	0.0	
Parking	Default parking lot noise	PLot		2.5	0.0	
Parking	Default parking lot noise	PLot		1.0	0.0	
Parking	Default parking lot noise	PLot		5.1	0.0	
Parking	Default parking lot noise	PLot		22.2	0.0	
Parking	Default parking lot noise	PLot		25.0	0.0	
Parking	Default parking lot noise	PLot		24.3	0.0	
Parking	Default parking lot noise	PLot		28.1	0.0	
Parking	Default parking lot noise	PLot		31.8	0.0	
Parking	Default parking lot noise	PLot		16.6	0.0	
Chiller	Default industrial noise	Point		33.8	0.0	
Chiller	Default industrial noise	Point		32.3	0.0	
Chiller	Default industrial noise	Point		31.6	0.0	
HVAC	Default industrial noise	Point		27.1	0.0	
HVAC	Default industrial noise	Point		27.1	0.0	
HVAC	Default industrial noise	Point		30.4	0.0	
HVAC	Default industrial noise	Point		29.3	0.0	
HVAC	Default industrial noise	Point		30.4	0.0	
HVAC	Default industrial noise	Point		33.5	0.0	
Receiver R4 Fl G Lr,lim dB(A) Leq,d 44.1 dB(A)						
Pump	Default industrial noise	Point		27.4	0.0	
Pump	Default industrial noise	Point		27.1	0.0	
Pump	Default industrial noise	Point		26.8	0.0	
Parking	Default parking lot noise	PLot		29.7	0.0	
Parking	Default parking lot noise	PLot		30.0	0.0	
Parking	Default parking lot noise	PLot		32.7	0.0	
Parking	Default parking lot noise	PLot		30.5	0.0	
Parking	Default parking lot noise	PLot		26.9	0.0	
Parking	Default parking lot noise	PLot		18.8	0.0	
Parking	Default parking lot noise	PLot		17.6	0.0	
Parking	Default parking lot noise	PLot		18.9	0.0	
Parking	Default parking lot noise	PLot		21.3	0.0	
Parking	Default parking lot noise	PLot		23.2	0.0	
Parking	Default parking lot noise	PLot		35.5	0.0	
Parking	Default parking lot noise	PLot		17.4	0.0	
Parking	Default parking lot noise	PLot		5.5	0.0	
Parking	Default parking lot noise	PLot		2.0	0.0	
Parking	Default parking lot noise	PLot		13.5	0.0	
Parking	Default parking lot noise	PLot		17.2	0.0	
Parking	Default parking lot noise	PLot		20.0	0.0	
Parking	Default parking lot noise	PLot		22.9	0.0	
Parking	Default parking lot noise	PLot		26.2	0.0	
Parking	Default parking lot noise	PLot		26.4	0.0	
Parking	Default parking lot noise	PLot		28.3	0.0	
Parking	Default parking lot noise	PLot		32.9	0.0	

Valley Communications Center Noise
Contribution level - 002: Outdoor SP

Source	Source group	Source ty	Tr. lane	Leq,d dB(A)	A dB	
Parking	Default parking lot noise	PLot		2.4	0.0	
Chiller	Default industrial noise	Point		32.4	0.0	
Chiller	Default industrial noise	Point		32.2	0.0	
Chiller	Default industrial noise	Point		32.3	0.0	
HVAC	Default industrial noise	Point		28.5	0.0	
HVAC	Default industrial noise	Point		28.6	0.0	
HVAC	Default industrial noise	Point		30.8	0.0	
HVAC	Default industrial noise	Point		28.6	0.0	
HVAC	Default industrial noise	Point		30.3	0.0	
HVAC	Default industrial noise	Point		30.1	0.0	

Valley Communications Center Noise
Contribution spectra - 002: 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 R1 Fl G Lr,lim dB(A) Leq,d 46.7 dB(A)																													
Chiller	Leq,d	39.3					18.3			25.8			30.5			34.7			34.4			30.1			23.0			13.6	
Chiller	Leq,d	39.8					18.9			26.5			31.0			35.2			34.9			30.5			23.5			14.5	
Chiller	Leq,d	40.2					19.3			26.8			31.4			35.5			35.3			30.9			23.9			15.2	
HVAC	Leq,d	26.0					11.1			14.6			21.6			20.1			18.5			14.9			9.7			-70.9	
HVAC	Leq,d	28.5					12.5			16.6			24.0			22.8			21.4			17.8			10.2			-70.0	
HVAC	Leq,d	26.3					10.8			14.7			21.8			20.5			18.9			15.2			8.8			-72.3	
HVAC	Leq,d	26.0					10.4			14.3			21.6			20.3			18.8			15.0			7.9			-73.8	
HVAC	Leq,d	29.2					13.5			17.4			24.6			23.4			22.0			18.3			11.7			-67.6	
HVAC	Leq,d	29.3					13.5			17.5			24.8			23.6			22.1			18.5			11.7			-67.6	
Pump	Leq,d	29.7	-16.5	-13.5	-4.0	-8.6	2.4	2.9	5.4	6.8	5.7	11.6	13.8	19.1	16.2	13.3	14.8	15.7	14.2	11.8	18.5	16.9	26.9	11.7	0.0	0.7	-9.6	-14.1	-21.0
Pump	Leq,d	28.8	-16.7	-13.8	-4.3	-8.9	2.0	2.5	4.9	6.3	5.1	11.0	13.2	18.5	15.5	12.6	14.0	14.8	13.4	10.9	17.6	15.9	25.9	10.7	-1.1	-0.4	-10.7	-14.5	-21.5
Pump	Leq,d	28.5	-16.9	-13.9	-4.5	-9.1	1.8	2.3	4.7	6.0	4.9	10.8	12.9	18.2	15.2	12.3	13.7	14.6	13.1	10.6	17.3	15.6	25.6	10.4	-1.4	-0.8	-11.0	-14.8	-21.9
Parking	Leq,d	29.0					15.0			24.3			16.0			20.4			21.1			21.7			18.3			6.5	
Parking	Leq,d	25.3					11.4			20.7			12.3			16.7			17.3			17.8			14.0			1.6	
Parking	Leq,d	30.2					16.6			26.1			17.5			21.7			22.3			22.1			18.0			7.1	
Parking	Leq,d	35.3					21.3			31.1			22.5			26.7			27.5			27.2			22.9			12.2	
Parking	Leq,d	29.3					15.2			24.6			16.1			20.7			21.6			22.0			17.9			5.9	
Parking	Leq,d	25.6					11.9			20.8			12.0			16.9			17.9			18.6			14.5			-0.9	
Parking	Leq,d	24.2					10.0			19.3			11.0			15.5			16.6			17.0			13.8			1.1	
Parking	Leq,d	7.3					0.6			4.9			-7.2			-5.8			-5.4			-5.4			-12.0			-32.0	
Parking	Leq,d	25.1					11.6			20.2			11.2			16.1			17.8			18.1			13.7			-3.0	
Parking	Leq,d	30.5					16.6			25.8			17.4			21.9			22.6			23.1			19.5			6.0	
Parking	Leq,d	29.8					16.0			25.1			16.5			21.2			22.1			22.7			18.9			4.6	
Parking	Leq,d	25.8					10.6			20.6			12.5			17.4			18.0			19.1			14.9			1.4	
Parking	Leq,d	5.4					-1.9			2.7			-9.3			-6.8			-5.8			-5.6			-11.3			-28.6	
Parking	Leq,d	9.1					2.1			6.5			-5.6			-4.0			-3.1			-1.5			-7.9			-27.0	
Parking	Leq,d	15.0					5.4			9.6			-2.7			-1.4			-1.6			11.7			3.7			-21.2	
Parking	Leq,d	29.3					15.3			24.1			15.4			20.1			22.2			22.5			18.7			4.2	
Parking	Leq,d	29.3					15.7			24.3			15.3			20.2			22.2			22.6			17.3			2.2	
Parking	Leq,d	21.6					7.6			16.5			8.1			13.2			13.9			15.2			9.9			-4.2	
Parking	Leq,d	12.8					5.1			9.4			-2.6			-1.0			-0.5			6.3			-2.0			-25.0	
Parking	Leq,d	6.7					-3.0			1.1			-11.4			-10.3			-11.2			3.3			-2.8			-26.9	
Parking	Leq,d	12.1					0.5			7.3			-2.8			1.5			2.2			6.5			2.0			-17.9	
Parking	Leq,d	19.0					5.7			14.1			4.9			10.0			12.0			12.3			6.2			-10.3	
Parking	Leq,d	19.5					6.4			14.9			5.9			10.9			12.0			12.4			6.8			-8.0	

Valley Communications Center Noise
Contribution spectra - 002: Outdoor SP

Source	Time slice	Sum dB(A)	25Hz dB(A)	31.5Hz dB(A)	40Hz dB(A)	50Hz dB(A)	63Hz dB(A)	80Hz dB(A)	100Hz dB(A)	125Hz dB(A)	160Hz dB(A)	200Hz dB(A)	250Hz dB(A)	315Hz dB(A)	400Hz dB(A)	500Hz dB(A)	630Hz dB(A)	800Hz dB(A)	1kHz dB(A)	1.25kHz dB(A)	1.6kHz dB(A)	2kHz dB(A)	2.5kHz dB(A)	3.15kHz dB(A)	4kHz dB(A)	5kHz dB(A)	6.3kHz dB(A)	8kHz dB(A)	10kHz dB(A)
36	Leq,d																												
37	Leq,d																												
38	Leq,d																												
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69	Leq,d																												
70	Leq,d																												

Receiver R2 Fl G Lr,lim dB(A) Leq,d 44.1 dB(A)

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)
Chiller	Leq,d	28.8					10.2			16.9			20.8			24.4			23.4			18.4			9.6			-5.3	
Chiller	Leq,d	30.2					11.5			18.2			22.0			25.7			25.0			20.0			11.4			-2.7	
Chiller	Leq,d	31.1					12.1			18.8			22.8			26.6			25.9			21.1			12.7			-1.0	
HVAC	Leq,d	27.7					9.7			14.2			22.3			22.2			21.5			18.3			10.0			-75.5	
HVAC	Leq,d	23.5					7.0			11.1			18.7			17.9			16.7			12.9			3.7			-83.4	
HVAC	Leq,d	23.4					6.8			11.0			18.7			17.9			16.6			12.8			3.7			-83.8	
HVAC	Leq,d	22.7					6.5			10.5			17.9			17.2			15.9			12.0			2.5			-86.2	
HVAC	Leq,d	29.3					10.0			14.9			23.4			23.7			23.5			20.7			12.9			-71.8	
HVAC	Leq,d	31.4					10.7			15.8			24.7			25.4			25.9			23.9			16.9			-66.5	
Pump	Leq,d	20.2	-23.7	-20.9	-11.6	-16.3	-5.5	-5.1	-2.9	-1.6	-2.8	3.1	5.2	10.4	7.5	4.5	5.9	6.6	5.1	2.5	9.1	7.3	16.9	1.2	-11.3	-11.8	-23.6	-30.1	-41.0
Pump	Leq,d	20.2	-23.7	-20.9	-11.6	-16.4	-5.5	-5.1	-2.9	-1.6	-2.8	3.1	5.2	10.4	7.4	4.5	5.9	6.6	5.1	2.5	9.1	7.2	16.9	1.2	-11.3	-11.9	-23.7	-30.1	-41.1
Pump	Leq,d	20.2	-23.8	-21.0	-11.6	-16.4	-5.5	-5.1	-2.9	-1.6	-2.8	3.1	5.2	10.4	7.4	4.5	5.9	6.6	5.1	2.5	9.1	7.2	16.9	1.2	-11.3	-11.9	-23.7	-30.1	-41.1
Parking	Leq,d	34.5					20.4			29.9			18.7			24.3			27.0			27.5			24.7			15.0	
Parking	Leq,d	31.4					16.6			26.1			14.7			20.3			23.8			25.7			22.1			12.3	
Parking	Leq,d	27.1					12.7			22.1			9.4			16.0			19.3			21.4			17.8			5.8	
Parking	Leq,d	25.4					11.7			20.7			7.2			14.2			18.2			18.8			15.7			1.1	
Parking	Leq,d	20.9					7.9			16.3			2.4			8.7			14.1			14.5			10.7			-6.6	
Parking	Leq,d	35.4					21.3			31.0			19.5			25.1			28.0			28.5			24.8			15.1	
Parking	Leq,d	15.5					2.7			10.9			-3.1			2.9			9.1			9.3			2.9			-13.0	
Parking	Leq,d	22.8					11.0			18.9			4.8			11.2			15.8			15.8			8.8			-11.9	
Parking	Leq,d	30.9					17.1			26.5			13.2			19.3			23.9			24.4			19.4			5.6	
Parking	Leq,d	34.6					20.8			30.3			17.4			23.4			27.4			28.1			23.5			11.3	
Parking	Leq,d	36.8					22.7			32.5			20.4			26.2			29.4			30.0			26.0			15.3	
Parking	Leq,d	19.2					6.5			14.6			0.6			6.9			12.8			13.1			6.4			-11.4	
Parking	Leq,d	17.7					6.7			14.2			0.1			5.9			10.1			10.0			3.1			-17.9	
Parking	Leq,d	19.4					8.9			16.0			1.9			7.5			11.7			11.4			4.0			-18.8	
Parking	Leq,d	20.9					10.6			17.5			3.4			9.1			13.3			13.0			5.2			-19.4	
Parking	Leq,d	19.2					8.1			14.8			0.4			5.1			12.9			12.8			5.7			-16.1	
Parking	Leq,d	18.4					7.7			13.8			-0.5			3.2			12.3			12.3			4.7			-18.8	
Parking	Leq,d	17.7					5.4			13.1			-0.9			5.5			11.3			11.6			4.4			-16.1	
Parking	Leq,d	26.7					15.0			22.7			8.8			15.1			19.7			19.8			12.6			-8.9	
Parking	Leq,d	6.5					-1.1			4.5			-10.1			-6.5			-4.5			-7.0			-17.1			-44.4	
Parking	Leq,d	0.8					-5.3			-1.2			-15.3			-13.6			-13.8			-14.9			-23.1			-47.6	
Parking	Leq,d	4.6					-5.8			-1.7			-15.3			-13.5			-13.3			2.0			-6.2			-32.1	
Parking	Leq,d	13.3					2.3			9.5			-4.7			0.9			5.0			6.9			-0.5			-24.6	
36	Leq,d																												

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)
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69	Leq,d																												
70	Leq,d																												
Receiver R3 Fl G Lr,lim dB(A)	Leq,d 47.4 dB(A)																												
Chiller	Leq,d	33.8					12.0			19.3			24.3			29.1			29.3			25.2			16.6			0.3	

Valley Communications Center Noise
Contribution spectra - 002: 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)
Chiller	Leq,d	32.3					11.1			18.4			23.4			27.8			27.6			23.0			13.9			-3.2	
Chiller	Leq,d	31.6					10.8			18.0			22.9			27.1			26.8			22.0			12.8			-4.8	
HVAC	Leq,d	30.4					9.1			14.1			23.2			24.2			25.1			23.5			16.3			-71.1	
HVAC	Leq,d	29.3					9.6			14.5			23.4			23.7			23.5			20.7			12.1			-75.6	
HVAC	Leq,d	30.4					10.1			15.2			24.2			24.7			24.9			22.4			14.3			-72.6	
HVAC	Leq,d	33.5					10.9			16.3			25.6			26.8			28.0			27.4			22.3			-58.6	
HVAC	Leq,d	27.1					8.0			12.8			21.6			21.7			21.2			17.9			8.6			-81.5	
HVAC	Leq,d	27.1					8.2			12.9			21.4			21.6			21.3			18.1			8.6			-82.1	
Pump	Leq,d	33.0	-22.4	-19.5	-10.1	-12.4	-1.3	-0.6	1.9	3.6	2.8	9.3	11.9	17.8	15.4	13.1	15.3	16.8	16.1	14.4	21.8	20.8	31.4	16.7	5.1	5.5	-5.5	-11.8	-22.5
Pump	Leq,d	33.2	-22.4	-19.4	-10.0	-12.3	-1.2	-0.5	2.0	3.7	2.9	9.4	12.0	17.9	15.5	13.3	15.4	16.9	16.2	14.5	21.9	21.0	31.6	16.8	5.2	5.7	-5.3	-11.5	-22.1
Pump	Leq,d	33.3	-22.2	-19.3	-9.9	-12.2	-1.1	-0.4	2.2	3.8	3.0	9.5	12.1	18.0	15.6	13.4	15.5	17.0	16.3	14.6	22.0	21.1	31.7	16.9	5.4	5.9	-5.1	-11.3	-21.8
Parking	Leq,d	5.1					-1.2			3.0			-10.3			-8.5			-8.4			-9.7			-18.4			-44.3	
Parking	Leq,d	1.0					-5.4			-1.2			-14.1			-12.4			-11.6			-13.1			-22.1			-49.6	
Parking	Leq,d	2.5					-5.6			-1.4			-14.4			-12.7			-10.8			-2.7			-12.0			-41.4	
Parking	Leq,d	11.8					-1.4			3.0			-10.9			3.7			5.4			7.6			-1.3			-29.0	
Parking	Leq,d	19.5					6.3			14.1			0.0			8.3			12.1			14.7			7.6			-13.6	
Parking	Leq,d	22.2					10.9			18.3			4.4			10.7			15.3			15.1			7.1			-18.4	
Parking	Leq,d	16.6					4.2			12.2			-1.9			4.3			10.2			10.3			3.6			-14.4	
Parking	Leq,d	31.8					18.5			27.6			14.3			20.4			24.4			25.2			20.3			6.6	
Parking	Leq,d	28.1					15.0			23.7			10.5			16.9			21.4			21.7			14.8			-6.0	
Parking	Leq,d	24.3					12.9			20.5			6.5			12.7			17.2			17.4			10.0			-12.8	
Parking	Leq,d	25.0					13.7			21.1			7.2			13.4			18.0			17.9			10.2			-14.2	
Parking	Leq,d	22.8					9.2			17.8			3.8			10.6			15.4			17.7			11.2			-8.8	
Parking	Leq,d	28.7					15.6			24.6			11.1			17.3			21.4			21.9			17.0			2.6	
Parking	Leq,d	34.1					20.7			29.9			16.9			23.0			26.8			27.4			22.9			10.1	
Parking	Leq,d	39.3					25.6			35.0			22.6			28.5			31.9			32.5			28.4			17.4	
Parking	Leq,d	35.1					21.5			31.1			17.3			23.6			28.1			28.5			22.9			6.7	
Parking	Leq,d	35.6					21.2			31.3			17.6			24.0			28.8			29.2			23.9			8.7	
Parking	Leq,d	24.8					7.3			19.0			5.7			12.5			18.9			19.9			13.4			-6.2	
Parking	Leq,d	40.5					26.7			36.1			24.3			30.0			33.0			33.6			29.7			19.5	
Parking	Leq,d	32.3					18.5			27.9			16.2			21.9			24.9			25.5			21.7			11.6	
Parking	Leq,d	28.9					15.0			24.3			11.6			17.7			21.9			22.5			18.1			6.0	
Parking	Leq,d	26.1					10.4			21.5			8.1			15.2			19.4			19.8			14.9			0.4	
Parking	Leq,d	24.6					8.4			19.4			6.6			13.9			18.3			18.6			13.3			-4.2	
36	Leq,d																												
37	Leq,d																												

Valley Communications Center Noise
Contribution spectra - 002: 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)
38	Leq,d																												
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Receiver R4 Fl G Lr,lim dB(A) Leq,d 44.1 dB(A)																													
Chiller	Leq,d	32.4					9.2			16.1			22.8			27.6			28.0			24.0			14.9			-4.1	
Chiller	Leq,d	32.2					8.1			15.4			22.6			27.5			27.9			23.9			14.8			-4.2	

Valley Communications Center Noise
Contribution spectra - 002: 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)
Chiller	Leq,d	32.3					8.1			15.4			22.7			27.5			28.0			24.0			15.0			-4.0	
HVAC	Leq,d	30.8					7.3			12.2			23.2			24.2			25.2			24.9			18.0			-68.8	
HVAC	Leq,d	28.6					6.9			11.5			22.2			22.8			23.1			20.7			12.0			-77.7	
HVAC	Leq,d	30.3					7.3			12.2			23.2			24.2			25.0			23.4			16.1			-71.2	
HVAC	Leq,d	30.1					6.7			11.9			23.0			24.0			24.8			23.2			15.7			-71.9	
HVAC	Leq,d	28.6					6.4			11.2			22.1			22.8			23.2			21.0			12.5			-77.4	
HVAC	Leq,d	28.5					6.0			10.9			19.9			22.8			23.3			22.3			13.9			-76.2	
Pump	Leq,d	26.8	-24.6	-21.7	-12.3	-16.8	-5.8	-5.2	-2.8	-1.3	-2.2	4.2	8.8	14.5	12.0	9.5	11.3	12.5	11.4	9.3	16.2	14.6	24.5	8.8	-3.9	-4.9	-17.8	-26.5	-40.3
Pump	Leq,d	27.1	-24.5	-21.6	-12.2	-16.8	-5.7	-5.1	-2.7	-1.2	-2.0	4.3	9.0	14.7	12.1	9.6	11.5	12.7	11.6	9.5	16.4	14.9	24.8	9.1	-3.5	-4.4	-17.3	-25.9	-39.5
Pump	Leq,d	27.4	-24.5	-21.6	-12.1	-16.7	-5.6	-5.0	-2.6	-1.0	-1.9	4.5	9.1	14.8	12.3	9.8	11.7	12.9	11.9	9.8	16.7	15.2	25.1	9.5	-3.1	-4.0	-16.7	-25.2	-38.7
Parking	Leq,d	20.0					7.7			15.2			1.3			8.6			13.9			13.7			7.1			-18.3	
Parking	Leq,d	17.2					3.5			10.9			-3.0			5.1			12.3			11.9			3.5			-23.0	
Parking	Leq,d	13.5					1.7			8.7			-5.4			0.9			7.6			7.3			-0.9			-26.6	
Parking	Leq,d	2.0					-5.9			-2.3			-14.7			-9.8			-9.7			-3.6			-13.9			-42.9	
Parking	Leq,d	5.5					-7.6			-3.9			-15.7			-11.9			-11.6			4.0			-5.6			-36.6	
Parking	Leq,d	22.9					10.0			17.8			3.8			12.1			16.6			17.2			9.6			-13.1	
Parking	Leq,d	2.4					-9.7			-5.8			-19.6			-15.6			-14.4			0.7			-8.4			-37.3	
Parking	Leq,d	32.9					17.8			27.3			15.6			21.8			26.5			27.2			22.3			9.1	
Parking	Leq,d	28.3					14.7			22.9			9.8			16.9			21.8			22.8			16.2			-3.0	
Parking	Leq,d	26.4					13.5			21.5			7.5			15.2			20.0			20.5			13.4			-7.9	
Parking	Leq,d	26.2					13.3			21.2			7.2			15.2			19.8			20.4			13.0			-9.2	
Parking	Leq,d	17.4					3.6			11.0			-1.0			6.1			12.3			12.1			4.1			-20.7	
Parking	Leq,d	26.9					12.1			21.3			9.3			15.5			20.9			21.4			15.5			-1.6	
Parking	Leq,d	30.5					15.7			24.5			12.3			18.5			24.6			25.4			19.5			2.6	
Parking	Leq,d	32.7					18.1			26.9			13.2			20.7			26.9			27.2			21.3			4.6	
Parking	Leq,d	30.0					16.2			24.3			12.2			18.6			23.8			24.8			17.7			-3.5	
Parking	Leq,d	29.7					16.0			24.0			10.5			17.8			23.7			24.7			17.4			-4.3	
Parking	Leq,d	18.8					4.5			12.1			-0.9			6.5			13.5			13.9			5.9			-19.4	
Parking	Leq,d	35.5					20.4			29.8			17.3			24.1			29.5			30.0			24.6			9.6	
Parking	Leq,d	23.2					8.4			17.0			3.2			10.9			17.7			17.9			11.6			-6.4	
Parking	Leq,d	21.3					7.2			15.4			1.4			9.4			15.8			15.9			9.2			-10.7	
Parking	Leq,d	18.9					6.0			13.9			-0.1			6.5			12.5			13.5			6.3			-15.5	
Parking	Leq,d	17.6					4.9			12.6			-1.4			5.3			11.1			12.0			5.3			-19.0	
36	Leq,d																												
37	Leq,d																												
38	Leq,d																												

Valley Communications Center Noise
Contribution spectra - 002: 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)
39	Leq,d																												
40	Leq,d																												
41	Leq,d																												
42	Leq,d																												
43	Leq,d																												
44	Leq,d																												
45	Leq,d																												
46	Leq,d																												
47	Leq,d																												
48	Leq,d																												
49	Leq,d																												
50	Leq,d																												
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64	Leq,d																												
65	Leq,d																												
66	Leq,d																												
67	Leq,d																												
68	Leq,d																												
69	Leq,d																												
70	Leq,d																												

Appendix D:

Construction Noise Modeling Output

Construction Noise Levels at Senstive Receptors by Phase

Activity	Leq at 400 FT (North)	Lmax at 400 FT (North)
Site Preparation	67	69
Grading	68	72
Building Construction	63	67
Architectural Coating	59	63

Equipment Summary	Reference (dBA) 50 ft Lmax
Rock Drills	96
Jack Hammers	82
Pneumatic Tools	85
Pavers	80
Dozers	85
Scrapers	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
Welders	73
Excavators	85
Conc/Ind Saws	90
Trucks	86

Site Preparation

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	Dozer	85	2	40	400	0.5	0	65.4	61.5	1397542.49
2	Excavators	85	3	40	400	0.5	0	67.2	63.2	2096313.73
3	Concrete/Industrial Saws	90	1	20	400	0.5	0	67.4	60.4	1104854.35
							Lmax*	69	Leq	67
							Lw	103	Lw	98

Source: MD Acoustics, LLC - Sept. 2021.
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	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
60	18.3	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
70	21.3	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
80	24.4	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
90	27.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
100	30.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
110	33.5	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
120	36.6	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
130	39.6	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
140	42.7	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
150	45.7	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
160	48.8	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
170	51.8	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
180	54.9	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
190	57.9	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
200	61.0	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
210	64.0	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
220	67.1	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
230	70.1	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
240	73.1	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
250	76.2	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
260	79.2	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
270	82.3	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
280	85.3	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
290	88.4	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
300	91.4	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
310	94.5	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
320	97.5	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
330	100.6	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
340	103.6	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
350	106.7	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
360	109.7	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
370	112.8	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30

Grading

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	Calculated (dBA) Leq	Energy
1	Grader	86	1	40	400	0.5	0	63.4	59.4	879700.875
2	Dozer	85	1	40	400	0.5	0	62.4	58.4	698771.243
3	Tractor/Backhoe	80	2	40	400	0.5	0	60.4	56.5	441941.738
4	Scrapers	87	2	40	400	0.5	0	67.4	63.5	2214955.57
5	Excavators	86	2	40	400	0.5	0	66.4	62.5	1759401.75
							Lmax*	**72**	**Leq**	**68**
							Lw	**100**	**Lw**	**99**

Source: MD Acoustics, LLC - Sept. 2021.

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	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
60	18.3	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
70	21.3	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
80	24.4	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
90	27.4	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
100	30.5	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
110	33.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
120	36.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
130	39.6	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
140	42.7	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
150	45.7	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
160	48.8	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
170	51.8	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
180	54.9	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
190	57.9	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
200	61.0	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
210	64.0	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
220	67.1	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
230	70.1	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
240	73.1	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
250	76.2	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
260	79.2	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
270	82.3	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
280	85.3	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
290	88.4	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
300	91.4	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
310	94.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
320	97.5	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
330	100.6	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
340	103.6	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
350	106.7	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
360	109.7	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
370	112.8	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31

Building Construction

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	Forklift/Tractor	80	3	40	400	0.5	0	62.2	58.2	662912.607
2	Tractor/Backhoe	80	3	40	400	0.5	0	62.2	58.2	662912.607
3	Cranes	82	1	40	400	0.5	0	59.4	55.4	350215.226
4	Generator	80	1	40	400	0.5	0	57.4	53.4	220970.869
5	Welders	73	1	40	400	0.5	0	50.4	46.4	44089.4848
							Lmax*	67	Leq	63
							Lw	99	Lw	95

Source: MD Acoustics, LLC - Sept. 2021.

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**	**63**	**62**	**61**	**60**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**
60	18.3	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
70	21.3	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
80	24.4	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
90	27.4	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
100	30.5	0.5	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40
110	33.5	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	**40**	39
120	36.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
130	39.6	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
140	42.7	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
150	45.7	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36
160	48.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
170	51.8	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
180	54.9	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
190	57.9	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
200	61.0	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
210	64.0	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
220	67.1	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
230	70.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
240	73.1	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
250	76.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
260	79.2	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
270	82.3	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
280	85.3	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
290	88.4	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
300	91.4	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
310	94.5	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
320	97.5	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
330	100.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
340	103.6	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
350	106.7	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
360	109.7	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
370	112.8	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26

Architectural Coating

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	Calculated (dBA) Leq	Energy
1	Air Compressor	86	1	40	400	0.5	0	63.4	59.4	879700.875
							Lmax*	63	Leq	59
							Lw	95	Lw	91

Source: MD Acoustics, LLC - Sept. 2021.
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**	**59**	**58**	**57**	**56**	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**	**46**	**45**	**44**
60	18.3	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
70	21.3	0.5	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41
80	24.4	0.5	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39
90	27.4	0.5	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38
100	30.5	0.5	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
110	33.5	0.5	51	50	49	48	47	46	45	44	43	42	41	40	39	38	**37**	36
120	36.6	0.5	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35
130	39.6	0.5	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34
140	42.7	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
150	45.7	0.5	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
160	48.8	0.5	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
170	51.8	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
180	54.9	0.5	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31
190	57.9	0.5	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30
200	61.0	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
210	64.0	0.5	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29
220	67.1	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
230	70.1	0.5	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28
240	73.1	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
250	76.2	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
260	79.2	0.5	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
270	82.3	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
280	85.3	0.5	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
290	88.4	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
300	91.4	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
310	94.5	0.5	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
320	97.5	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
330	100.6	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
340	103.6	0.5	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
350	106.7	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
360	109.7	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
370	112.8	0.5	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23

VIBRATION LEVEL IMPACT

Project:	Valley Communications Center	Date: 7/14/22
Source:	Large Bulldozer	
Scenario:	Unmitigated	
Location:	80 feet north of project site	
Address:	Rialto Ave & Lena Rd, San Bernardino 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 =	80.00	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 =	**0.025**	IN/SEC	OUTPUT IN RED

Appendix E:

Traffic Noise Modeling Output

FHWA-RD-77-108 ROADWAY TRAFFIC NOISE PREDICTION MODEL (CNEL) - CALVENO

PROJECT: Valley Communications Center
ROADWAY: East Rialto Avenue
SEGMENT: Lena Road and Tippecanoe
LOCATION: City of San Bernardino
SCENARIO: Existing

JOB #: 0805-2022-21
DATE: 12-Jul-22
ENGINEER: F. Irarrazabal

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT = 7,688
SPEED = 25
PK HR % = 10
NEAR LANE/FAR LANE DIST = 44
ROAD ELEVATION = 0
GRADE = 0
PK HR VOL = 769

RECEIVER INPUT DATA

RECEIVER DISTANCE = 60
DIST C/L TO WALL = 0
RECEIVER HEIGHT = 5
WALL DISTANCE FROM RECEIVER = 60
PAD ELEVATION = 0
ROADWAY VIEW: LF ANGLE -90
RT ANGLE 90
DF ANGLE 180

SITE CONDITIONS

AUTOMOBILES 10
MED TRUCKS 10 (HARD SITE=10, SOFT SITE=15)
HVY TRUCKS 10

WALL INFORMATION

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

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVE	NIGHT	DAILY
AUTOMOBILES	0.755	0.140	0.105	0.974
MEDIUM TRUCKS	0.489	0.022	0.489	0.018
HEAVY TRUCKS	0.473	0.054	0.473	0.007

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES =	2.00	55.9	- -
MEDIUM TRUCKS=	4.00	55.8	- -
HEAVY TRUCKS =	8.01	55.9	0.0

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	58.3	56.3	55.0	49.0	57.4	58.1
MEDIUM TRUCKS	52.8	48.9	41.4	50.1	56.3	56.3
HEAVY TRUCKS	55.0	50.9	47.5	52.2	58.4	58.5
VEHICULAR NOISE	60.7	58.0	55.9	55.4	62.2	**62.5**

NOISE CONTOUR (FT)				
NOISE LEVELS	**70 dBA**	**65 dBA**	**60 dBA**	**55 dBA**
CNEL	11	34	106	336
LDN	10	32	100	316

FHWA-RD-77-108 ROADWAY TRAFFIC NOISE PREDICTION MODEL (CNEL) - CALVENO

PROJECT:	Valley Communications Center	JOB #:	0805-2022-21
ROADWAY	East Rialto Avenue	DATE:	12-Jul-22
SEGMENT	Lena Road and Tippecanoe	ENGINEER:	F. Irrarazabal
LOCATION:	City of San Bernardino	SCENARIO:	Existing + Project

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	8,128
SPEED =	25
PK HR % =	10
NEAR LANE/FAR LANE DIST =	44
ROAD ELEVATION =	0
GRADE =	0
PK HR VOL =	813

RECEIVER INPUT DATA

RECEIVER DISTANCE =		60
DIST C/L TO WALL =		0
RECEIVER HEIGHT =		5
WALL DISTANCE FROM RECEIVER =		60
PAD ELEVATION =		0
ROADWAY VIEW:	LF ANGLE	-90
	RT ANGLE	90
	DF ANGLE	180

SITE CONDITIONS

AUTOMOBILES	10
MED TRUCKS	10
HVY TRUCKS	10

(HARD SITE=10, SOFT SITE=15)

WALL INFORMATION

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

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVE	NIGHT	DAILY
AUTOMOBILES	0.755	0.140	0.105	0.974
MEDIUM TRUCKS	0.489	0.022	0.489	0.018
HEAVY TRUCKS	0.473	0.054	0.473	0.007

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES =	2.00	55.9	- -
MEDIUM TRUCKS=	4.00	55.8	- -
HEAVY TRUCKS =	8.01	55.9	0.0

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	58.6	56.6	55.3	49.3	57.7	58.3
MEDIUM TRUCKS	53.0	49.1	41.7	50.4	56.5	56.6
HEAVY TRUCKS	55.2	51.2	47.8	52.4	58.6	58.7
VEHICULAR NOISE	61.0	58.2	56.1	55.6	62.5	**62.7**

NOISE CONTOUR (FT)				
NOISE LEVELS	**70 dBA**	**65 dBA**	**60 dBA**	**55 dBA**
CNEL	11	35	112	355
LDN	11	33	106	334