Rialto Retail Center Project

Noise Impact Study

City of Rialto, CA

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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 to compare the 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 are 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 935 S. Lilac Avenue, Rialto, CA 92376. The project site covers an area of 1.43 acres. The City of Rialto Zoning map classifies the land use designation of the site as Agricultural. The land uses surrounding the project site are Agricultural, Single Family Residential, and Multi-Family Residential. An aerial of the project site is shown in Exhibit A.

1.3 Proposed Project Description

The project proposes to demolish the existing residential building and develop two new commercial/retail buildings of 6.680 sqft each and an 84 space parking lot. The project will be constructed in two phases. Phase 1 consists of building one of the commercial/retail buildings and a 54 space parking lot and converting the existing residential building into a commercial/retail building. Pase 2 consists of demolishing the residential turned retail building and constructing the other commercial/retail building and the 84 space parking lot. This study will evaluate the impacts of the project as one phase, even though the project will be constructed in two. The Phase 2 site plan for the project will be used for this study. A copy of the site plan is shown in Exhibit B.

Exhibit A

Location Map

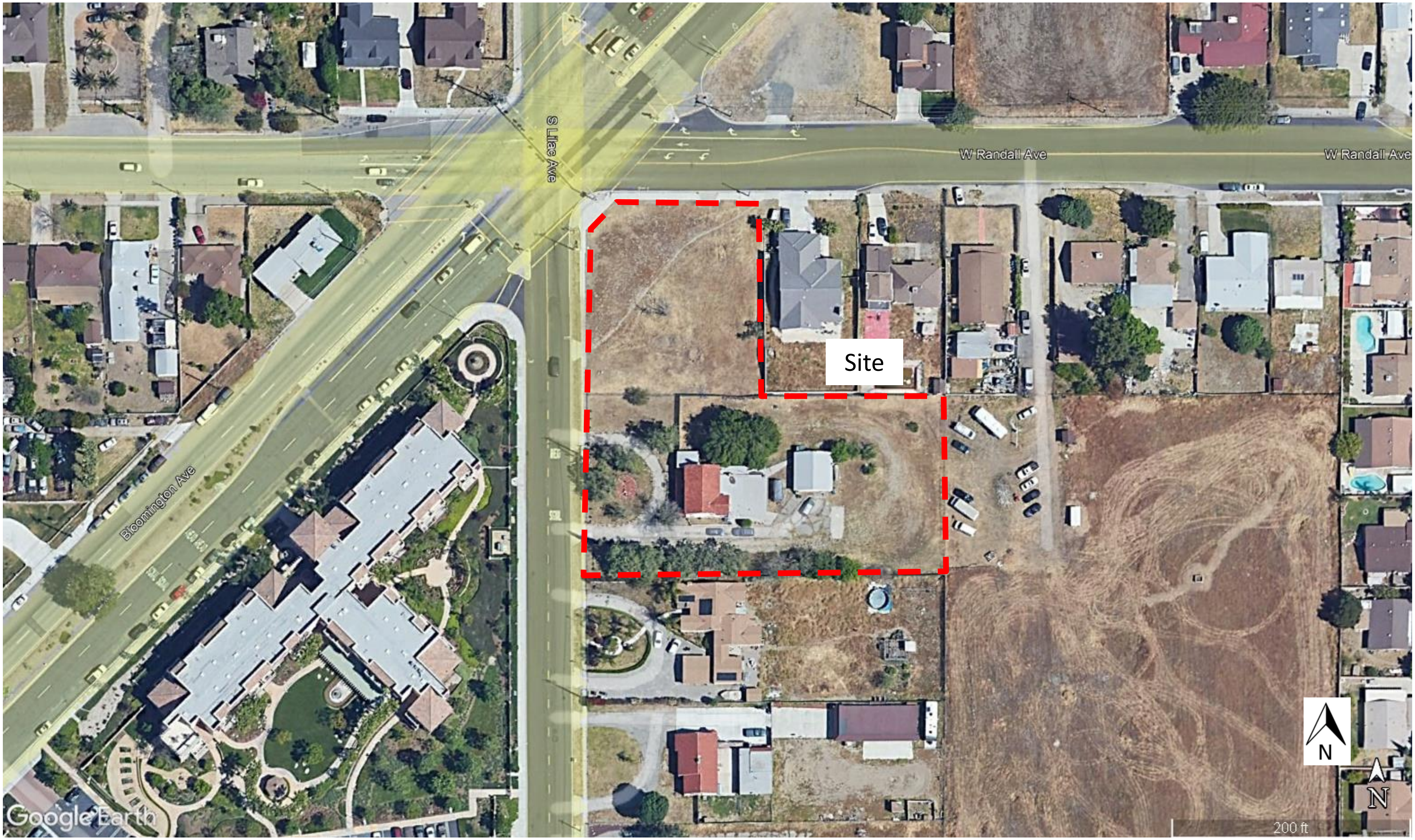
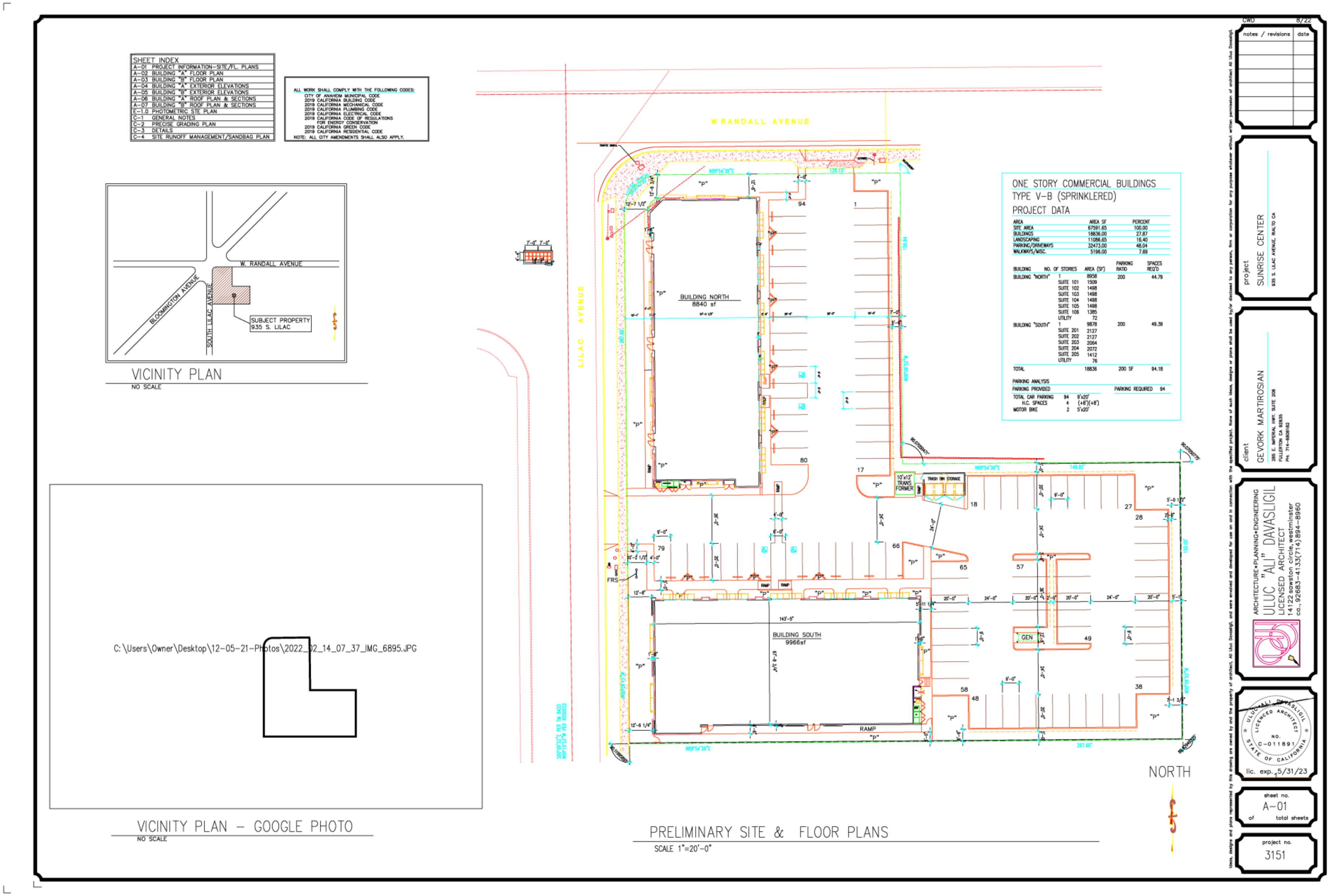


Exhibit B

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.

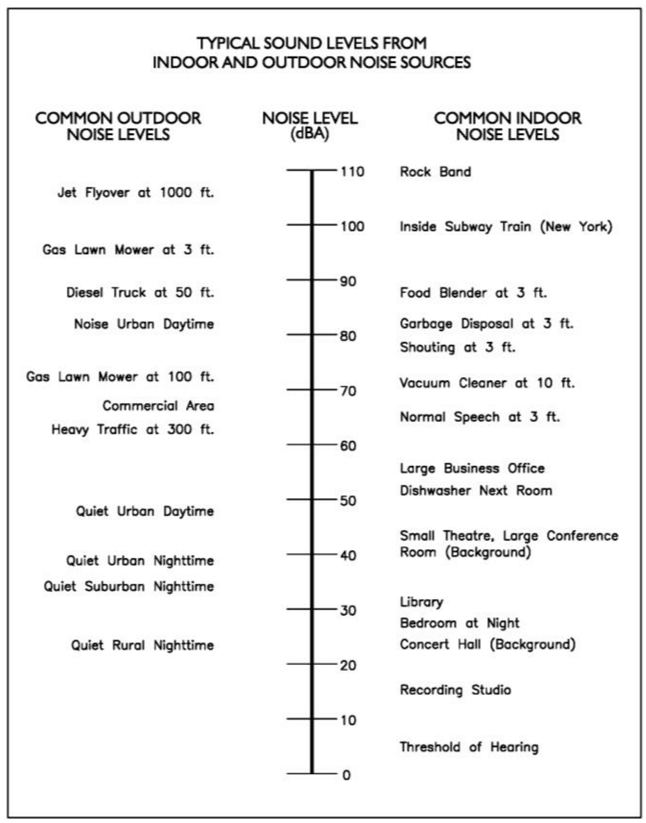
2.1 Sound, Noise and Acoustics

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.

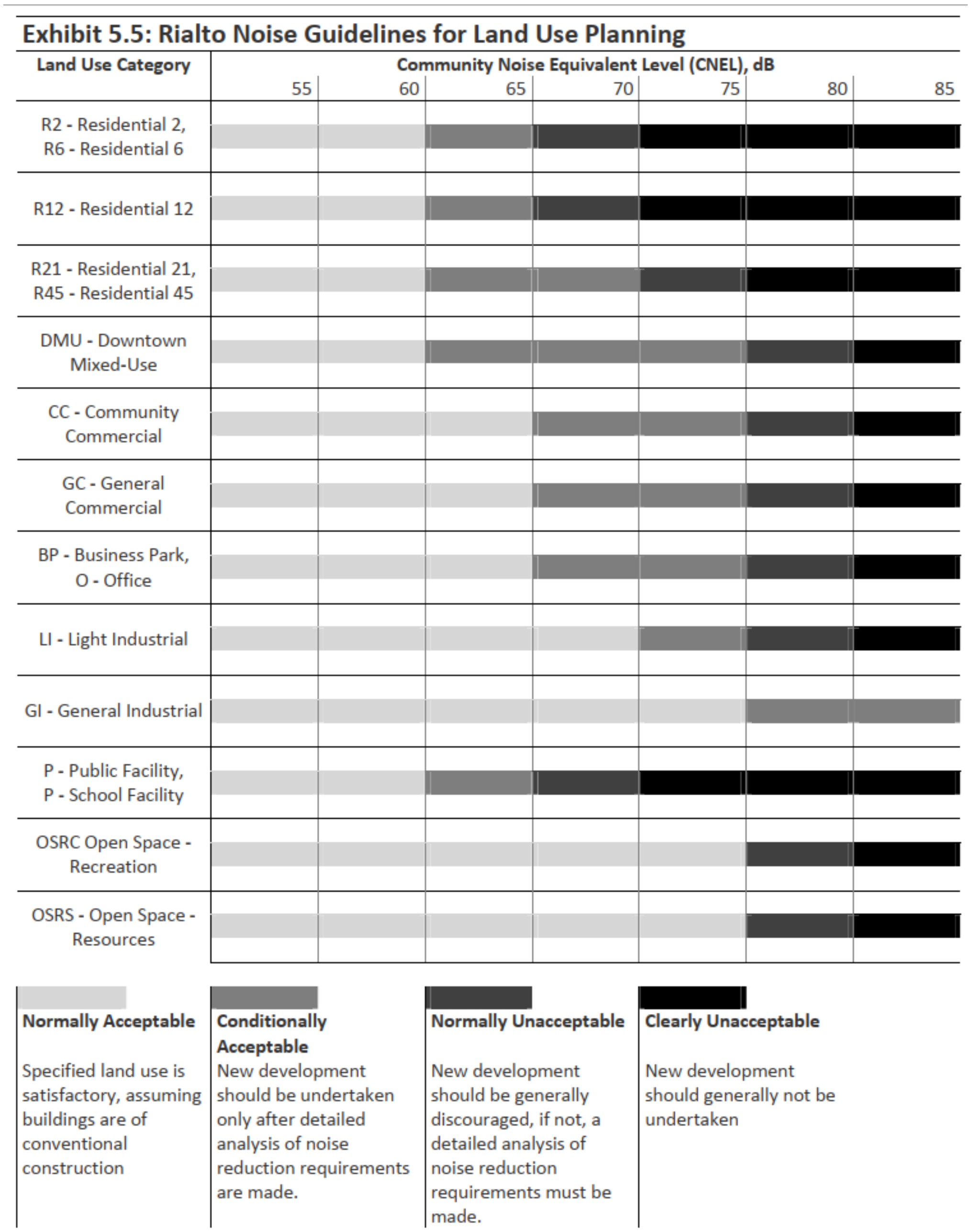
Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

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. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable as illustrated in Exhibit D.

Exhibit D: Land Use Compatibility Guidelines



4.3 City of Rialto Noise Regulations

The project is located in the Foothill Boulevard Specific Plan. Section 18.111.080 (F) references Chapter 9.50 of the Rialto Municipal Code. The City of Rialto outlines their noise regulations and standards within the Safety and Noise Element of the City's General Plan and the Noise Control section located in the City's Municipal Code.

City of Rialto General Plan

General Plan Noise Element goals and policies applicable to the proposed project are presented below.
Goal 5-10: Minimize the impact of point sources and ambient noise levels throughout the community.

Policy 5-10.2: Consider noise impacts as part of the development review process, particularly the location of parking, ingress/egress/loading, and refuse collection areas relative to surrounding residential development and other noise-sensitive land uses.

Policy 5-10.2: Ensure that acceptable noise levels are maintained near schools, hospitals, and other noise sensitive areas in accordance with the Municipal Code and noise standards contained in Exhibit 5-5.

Policy 5-10.5: Require all exterior noise sources (construction operations, air compressors, pumps, fans and leaf blowers) to use available noise suppression devices and techniques to reduce exterior noise to acceptable levels that are compatible with adjacent land uses.

Goal 5-11: Minimize the impacts of transportation-related noise.

Policy 5-11.3: Require development of truck-intensive uses to minimize noise impacts on adjacent uses through appropriate site design.

Exhibit 5-5 of the General Plan is presented in Table 2 below. The Project must comply with these guidelines on the Project site and surrounding uses.

City of Rialto Municipal Code

the City of Rialto Municipal Code does not identify specific exterior noise level standards. Therefore, the County of San Bernardino Development Code standards are used in this noise study to evaluate potential impacts.

Section 9.50.050(B) of the The City of Rialto does state that loading activities within 1000 ft of a residence to between the hours of 7AM and 8PM. The project is within 1000 ft of a residence, so loading must occur during these daytime hours.

Section 9.50.070 restricts construction activity to 6AM to 7PM Monday through Friday and 8AM to 5PM on Saturday from May through September. From October through April, construction is restricted to 7AM to 5:30PM Monday through Friday and 8AM to 5PM on Saturday.

County of San Bernardino – Noise Ordinance

Section 83.01.080(c)(1) No person shall create any sound, or allow the creation of any sound, on any property that causes the exterior sound level on any other occupied property to exceed the sound level standards set forth in Table 1.

Table 1: San Bernardino County Allowable Exterior Noise Level

Sound Level Standards (dBA Lmax)

General Plan Land Use Designation	Maximum Decibel Level	
	7 a.m. - 10 p.m.	10 p.m. - 7 a.m.
Residential	55	45
Professional Services	55	55
Other Commercial	60	60
Industrial	70	70

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. Three (3) short-term 15-minute 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 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). The model assumes approximately 94 parking spaces with 1 car movement per parking space per hour. Additionally, the project developments of the site are included, which involves 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 at the residential property to the east as seen in Exhibit B Site Plan for the project.

Table 2: Reference Sound Level Measurements for SoundPlan Model

Source	Source Type	Reference Level (Lw or SPL dBA)	Descriptor
Parking	Area (SP Parking Tool)	77	1 car per hr

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 B.

5.4 FHWA Roadway Construction Noise Model

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

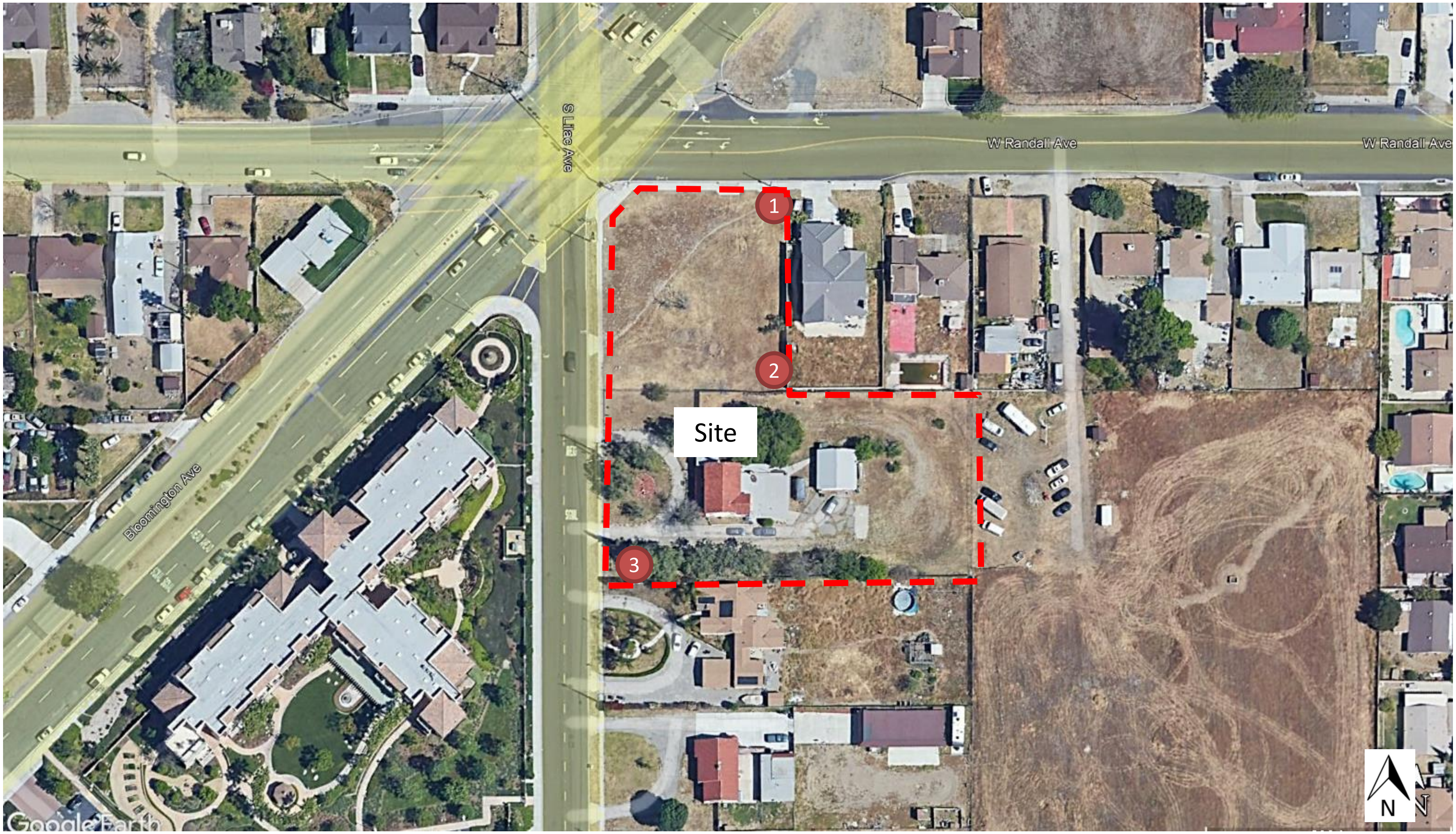
The project was analyzed based on the different construction phases. Construction noise is expected to be loudest during the grading, concrete, and building phases of construction. The construction noise calculation output worksheet is located in Appendix C. The following assumptions relevant to short-term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

- It is estimated that construction will occur in one phase. Construction noise is expected to be the loudest during the grading, concrete, and building phases.

Exhibit E

Measurement Locations

X = Measurement location



6.0 Existing Noise Environment

Three (3) 15-minute ambient noise measurements were conducted at the property site. The noise measurement was taken to determine the existing ambient noise levels. Noise data indicates that traffic along Bloomington 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}
11/30/22	9:51AM-10:06AM	66.5	87.0	45.1	74.5	67.4	61.2	56.3	49.1
11/30/22	10:30AM-10:45AM	57.8	68.3	42.6	65.3	62.6	58.0	54.1	48.7
11/30/22	10:12AM-10:27AM	64.2	76.2	44.5	72.4	69.4	63.0	60.1	53.4

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

Noise data indicates the ambient noise level ranged from 58 dBA Leq to 66 dBA Leq at the project site. Maximum hourly levels reached up to 87 dBA as a result of traffic along Bloomington 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 east, 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 - R4 represent the residential land uses. 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 36 dBA to 41 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 range between 58 to 67 dBA Leq at nearby receptors (R1 – R4).

Exhibit F

Project Operational Noise Levels (Leq)

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

Receptor[1]	Existing Ambient Noise Level (dBA, Leq)[2]	Project Noise Level (dBA, Leq)[3]	Total Combined Noise Level (dBA, Leq)	Nighttime (10PM – 7AM) Noise Limit (dBA, Leq)[4]	Change in Noise Level as Result of Project
1	67	41	67	45	0
2	58	38	58		0
3		36	58		0
4	64	37	64		0

Notes:
1. Receptors 1 - 4 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 83.01.080(c)(1) of the County of San Bernardino municipal code.

As shown in Table 4, the project does not exceed the County's exterior noise limit. The predicted exterior noise level at the residential properties ranged from 36 to 41 dBA, Leq which does not exceed County's residential nighttime exterior limit of 45 dBA.

Table 4 provides the anticipated change in noise level as a result of the proposed project. The ambient noise level is anticipated to increase by 0 dBA at the residential properties.

Table 5 provides the characteristics associated with changes in noise levels.

Table 5: Change in Noise Level Characteristics[1]

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

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

It takes a change of 3 dBA for the human ear to perceive a difference. The change in noise level is anticipated to increase by 0 dBA. Therefore, the project falls within the "Not Perceptible" category.

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 6AM to 7PM Monday through Friday and 8AM to 5PM on Saturday from May through September. From October through April, construction is restricted to 7AM to 5:30PM Monday through Friday and 8AM to 5PM on Saturday as described in the City of Rialto Municipal Code Section 9.50.070. 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 C.

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, and 1 backhoe operating at 72 feet from the nearest sensitive receptor (residential uses to the east). 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 72 feet have the potential to reach 83 dBA L_{eq} at the nearest sensitive receptors during grading. Noise levels for the other construction phases would be lower, approximately from 79 to 80 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 16 feet (residences to the south from the south PL), a large bulldozer would yield a worst-case 0.145 PPV (in/sec) which means the vibration would not be perceptible during grading along the southern 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 C.

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 9.50.070.

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

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 Rialto: General Plan.

City of Rialto: Municipal Code. Section 9.50.070.

County of San Bernardino Municipal Code.

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

15-Minute Continuous Noise Measurement Datasheet

Project Name:	Rialto Retail Noise	**Site Observations:**	
Project: #/Name:	0816-2021-001	Temps in the low 60's and warming into 70F by the time I left. Winds 0-1 MPH from the NW. Partly Cloudy	
Site Address/Location:	935 S Lilac Avenue		
Date:	11/30/2022		
Field Tech/Engineer:	Jason Schuyler / Robert Pearson		

Sound Meter:	XL2, NTI	**SN:** A2A-08562-E0	
Settings:	A-weighted, slow, 1-sec, 15-minute interval		
Site Id:	NM1, NM2, NM3		

MD ACOUSTICS

15-Minute Continuous Noise Measurement Datasheet - Cont.

Project Name: Rialto Retail Noise

Site Address/Location: 935 S Lilac Avenue

Site Id: NM1, NM2, NM3

Figure 1: NM1

Figure 2: NM2

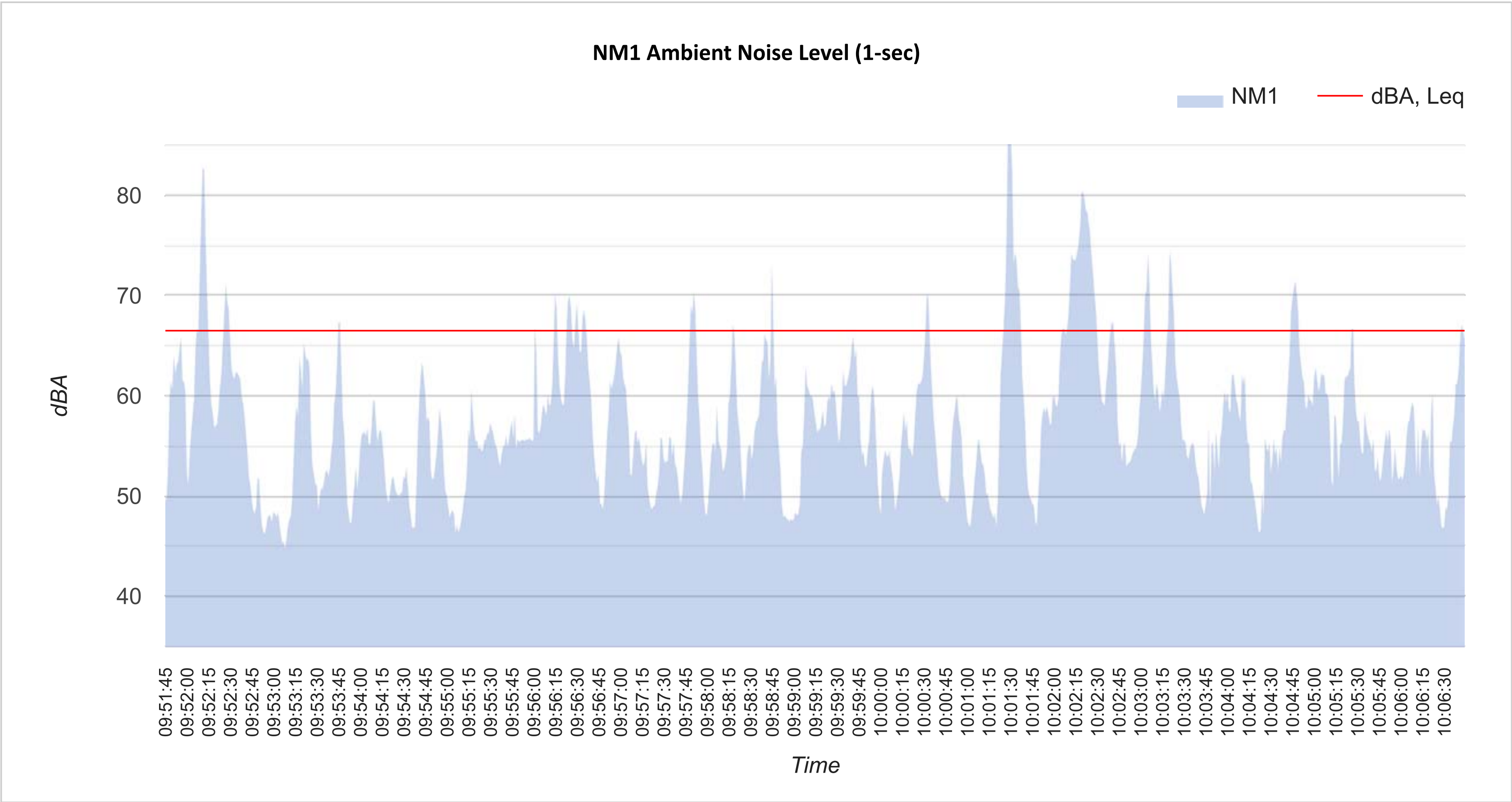
Figure 3: NM3

Table 1: Baseline Noise Measurement Summary

Location	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
NM1	9:51 AM	10:06 AM	66.5	87.0	45.1	74.5	67.4	61.2	56.3	49.1
NM2	10:30 AM	10:45 AM	57.8	68.3	42.6	65.3	62.6	58	54.1	48.7
NM3	10:12 AM	10:27 AM	64.2	76.2	44.5	72.4	69.4	63	60.1	53.4

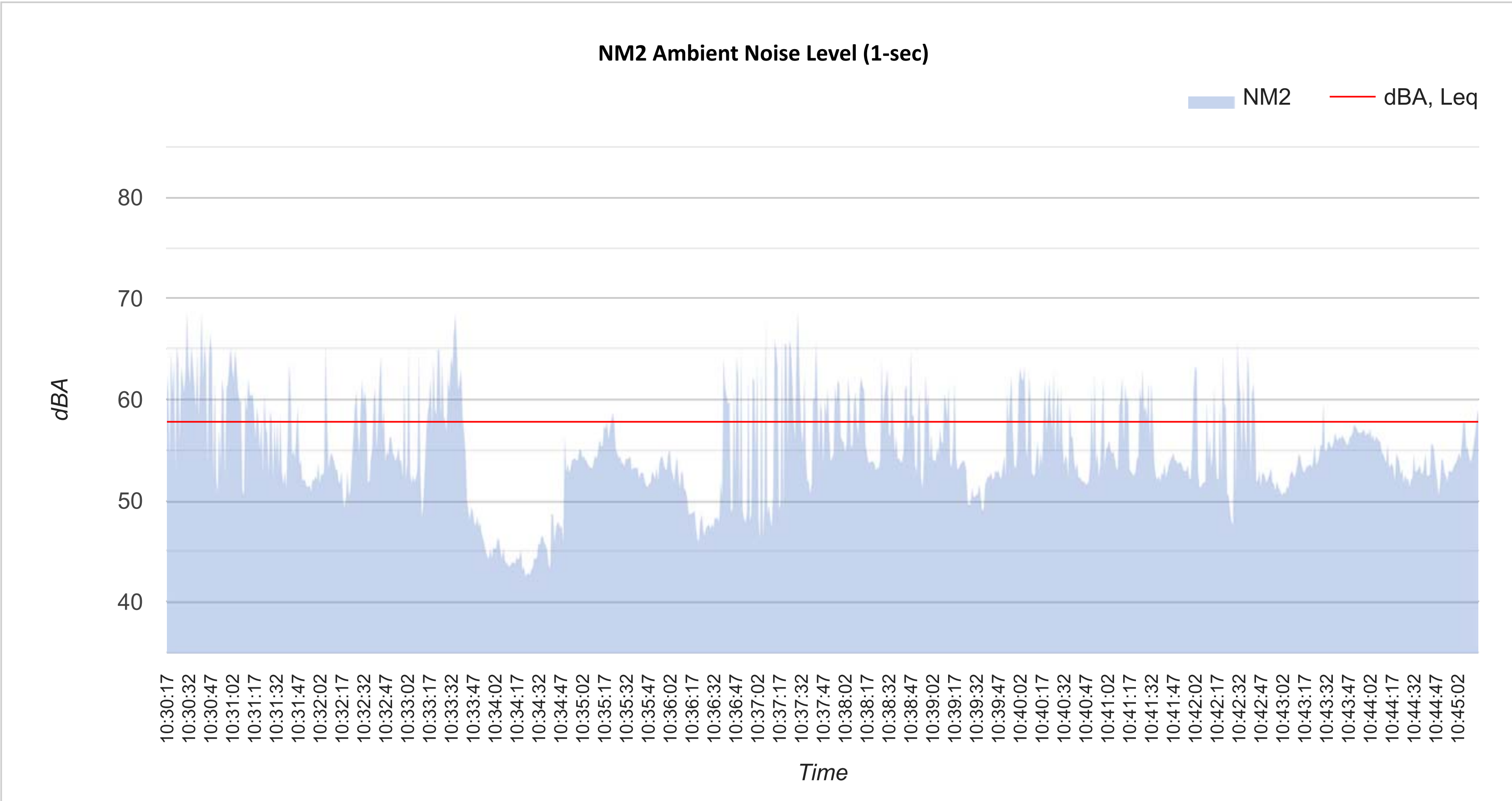
15-Minute Continuous Noise Measurement Datasheet - Cont.

Project Name:	Rialto Retail Noise	**Site Topo:**	Buildings 1-2 stories tall	**Noise Source(s) w/ Distance:**
Site Address/Location:	935 S Lilac Avenue	**Meteorological Cond.:**	67F Winds 0-1MPH	road noise and residential noise
Site Id:	NM1	**Ground Type:**	loose powdery dirt with piles of rock	



15-Minute Continuous Noise Measurement Datasheet - Cont.

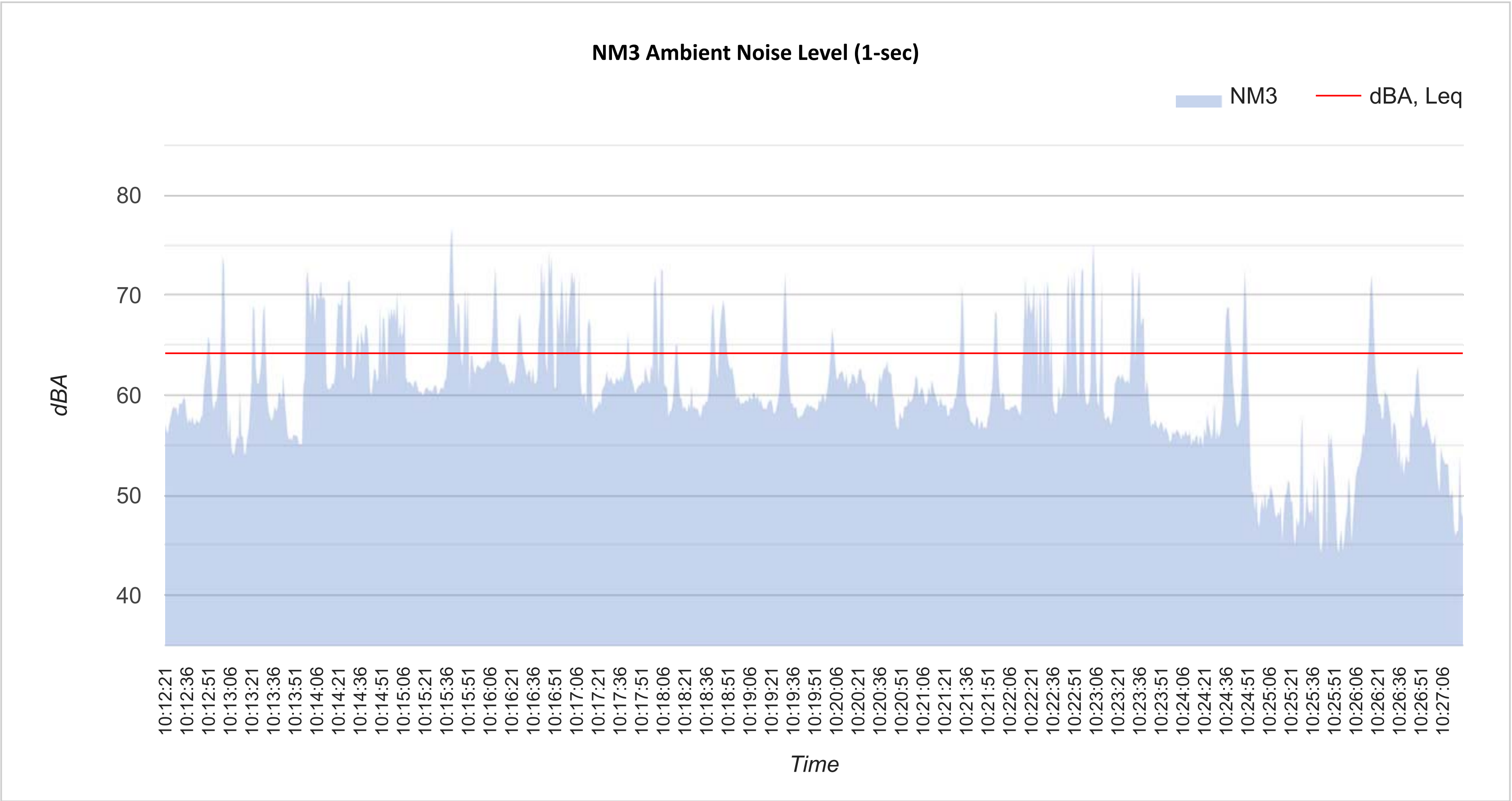
Project Name:	Rialto Retail Noise	**Site Topo:**	Buildings 1-2 stories tall	**Noise Source(s) w/ Distance:**
Site Address/Location:	935 S Lilac Avenue	**Meteorological Cond.:**	67F Winds 0-1MPH	road noise and residential noise
Site Id:	NM2	**Ground Type:**	open soil lot, flat w/ some buildings 1-2 story	



MD ACOUSTICS

15-Minute Continuous Noise Measurement Datasheet - Cont.

Project Name:	Rialto Retail Noise	**Site Topo:**	Flat desert conditions small hou	**Noise Source(s) w/ Distance:**
Site Address/Location:	935 S Lilac Avenue	**Meteorological Cond.:**	67F Winds 0-1MPH	road noise and residential noise
Site Id:	NM3	**Ground Type:**	loose powdery dirt with piles of rock	



MD ACOUSTICS

Appendix B:

Sound Plan model inputs and outputs

Rialto Retail Noise
Octave spectra of the sources in dB(A) - 001 - Rialto Retail: Outdoor SP

Name	Source type	I 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	59.61			55.3	73.0	0.0	0.0		0	100%/24h	Typical spectrum	56.4	68.0	60.5	65.0	65.1	65.5	62.8	56.6	43.8
Parking	PLot	74.50			55.3	74.0	0.0	0.0		0	100%/24h	Typical spectrum	57.3	68.9	61.4	65.9	66.0	66.4	63.7	57.5	44.7
Parking	PLot	187.36			55.4	78.2	0.0	0.0		0	100%/24h	Typical spectrum	61.5	73.1	65.6	70.1	70.2	70.6	67.9	61.7	48.9
Parking	PLot	65.69			54.8	73.0	0.0	0.0		0	100%/24h	Typical spectrum	56.4	68.0	60.5	65.0	65.1	65.5	62.8	56.6	43.8
Parking	PLot	249.07			57.6	81.6	0.0	0.0		0	100%/24h	Typical spectrum	64.9	76.5	69.0	73.5	73.6	74.0	71.3	65.1	52.3
Parking	PLot	237.54			56.9	80.7	0.0	0.0		0	100%/24h	Typical spectrum	64.1	75.7	68.2	72.7	72.8	73.2	70.5	64.3	51.5
Parking	PLot	155.71			55.1	77.0	0.0	0.0		0	100%/24h	Typical spectrum	60.3	71.9	64.4	68.9	69.0	69.4	66.7	60.5	47.7
Parking	PLot	168.71			55.9	78.2	0.0	0.0		0	100%/24h	Typical spectrum	61.5	73.1	65.6	70.1	70.2	70.6	67.9	61.7	48.9
Parking	PLot	173.73			55.8	78.2	0.0	0.0		0	100%/24h	Typical spectrum	61.5	73.1	65.6	70.1	70.2	70.6	67.9	61.7	48.9
Parking	PLot	125.65			55.0	76.0	0.0	0.0		0	100%/24h	Typical spectrum	59.4	71.0	63.5	68.0	68.1	68.5	65.8	59.6	46.8

Rialto Retail Noise
Contribution level - 001 - Rialto Retail: Outdoor SP

Source	Source group	Source type	Tr. lane	Leq,d dB(A)	A dB
Receiver R1 Fl G Lr,lim dB(A) Leq,d 41.1 dB(A)					
Parking	Default parking lot noise	PLot		34.4	0.0
Parking	Default parking lot noise	PLot		33.1	0.0
Parking	Default parking lot noise	PLot		29.3	0.0
Parking	Default parking lot noise	PLot		27.3	0.0
Parking	Default parking lot noise	PLot		28.3	0.0
Parking	Default parking lot noise	PLot		25.2	0.0
Parking	Default parking lot noise	PLot		25.7	0.0
Parking	Default parking lot noise	PLot		28.2	0.0
Parking	Default parking lot noise	PLot		29.3	0.0
Parking	Default parking lot noise	PLot		36.0	0.0
Receiver R2 Fl G Lr,lim dB(A) Leq,d 37.7 dB(A)					
Parking	Default parking lot noise	PLot		30.3	0.0
Parking	Default parking lot noise	PLot		32.3	0.0
Parking	Default parking lot noise	PLot		30.4	0.0
Parking	Default parking lot noise	PLot		26.8	0.0
Parking	Default parking lot noise	PLot		26.2	0.0
Parking	Default parking lot noise	PLot		23.8	0.0
Parking	Default parking lot noise	PLot		25.0	0.0
Parking	Default parking lot noise	PLot		18.7	0.0
Parking	Default parking lot noise	PLot		22.1	0.0
Parking	Default parking lot noise	PLot		26.1	0.0
Receiver R3 Fl G Lr,lim dB(A) Leq,d 36.0 dB(A)					
Parking	Default parking lot noise	PLot		27.7	0.0
Parking	Default parking lot noise	PLot		29.1	0.0
Parking	Default parking lot noise	PLot		30.4	0.0
Parking	Default parking lot noise	PLot		26.7	0.0
Parking	Default parking lot noise	PLot		24.7	0.0
Parking	Default parking lot noise	PLot		21.6	0.0
Parking	Default parking lot noise	PLot		23.3	0.0
Parking	Default parking lot noise	PLot		16.8	0.0
Parking	Default parking lot noise	PLot		19.6	0.0
Parking	Default parking lot noise	PLot		22.5	0.0
Receiver R4 Fl G Lr,lim dB(A) Leq,d 36.5 dB(A)					
Parking	Default parking lot noise	PLot		22.4	0.0
Parking	Default parking lot noise	PLot		17.7	0.0
Parking	Default parking lot noise	PLot		26.9	0.0
Parking	Default parking lot noise	PLot		35.3	0.0
Parking	Default parking lot noise	PLot		22.6	0.0
Parking	Default parking lot noise	PLot		17.1	0.0
Parking	Default parking lot noise	PLot		19.1	0.0
Parking	Default parking lot noise	PLot		14.0	0.0
Parking	Default parking lot noise	PLot		10.9	0.0
Parking	Default parking lot noise	PLot		18.0	0.0

Source	Time slice	Sum	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	12.5kHz	16kHz	20kHz
		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 41.1 dB(A)																													
Parking	Leq,d	25.2	7.3	7.3	7.3	16.3	16.3	16.3	7.4	7.4	7.4	11.9	11.9	11.9	11.7	11.7	11.7	12.6	12.6	12.6	9.1	9.1	9.1	-3.4	-3.4	-3.4	-29.9	-29.9	-29.9
Parking	Leq,d	25.7	7.9	7.9	7.9	16.8	16.8	16.8	7.7	7.7	7.7	12.2	12.2	12.2	12.1	12.1	12.1	13.4	13.4	13.4	9.5	9.5	9.5	-3.2	-3.2	-3.2	-30.6	-30.6	-30.6
Parking	Leq,d	28.2	10.0	10.0	10.0	19.1	19.1	19.1	9.6	9.6	9.6	14.7	14.7	14.7	14.9	14.9	14.9	15.6	15.6	15.6	12.8	12.8	12.8	0.2	0.2	0.2	-24.7	-24.7	-24.7
Parking	Leq,d	29.3	10.8	10.8	10.8	20.7	20.7	20.7	11.8	11.8	11.8	16.2	16.2	16.2	15.7	15.7	15.7	16.0	16.0	16.0	12.4	12.4	12.4	0.5	0.5	0.5	-23.9	-23.9	-23.9
Parking	Leq,d	36.0	19.6	19.6	19.6	28.2	28.2	28.2	18.8	18.8	18.8	22.0	22.0	22.0	21.4	21.4	21.4	21.5	21.5	21.5	17.5	17.5	17.5	6.2	6.2	6.2	-14.0	-14.0	-14.0
Parking	Leq,d	34.4	14.5	14.5	14.5	24.6	24.6	24.6	16.7	16.7	16.7	21.3	21.3	21.3	21.8	21.8	21.8	22.2	22.2	22.2	19.5	19.5	19.5	8.3	8.3	8.3	-17.4	-17.4	-17.4
Parking	Leq,d	33.1	14.5	14.5	14.5	23.7	23.7	23.7	15.0	15.0	15.0	19.6	19.6	19.6	19.8	19.8	19.8	21.5	21.5	21.5	17.5	17.5	17.5	6.7	6.7	6.7	-15.9	-15.9	-15.9
Parking	Leq,d	29.3	10.0	10.0	10.0	19.2	19.2	19.2	10.9	10.9	10.9	16.0	16.0	16.0	16.5	16.5	16.5	18.0	18.0	18.0	14.3	14.3	14.3	2.4	2.4	2.4	-25.3	-25.3	-25.3
Parking	Leq,d	27.3	9.1	9.1	9.1	17.9	17.9	17.9	9.3	9.3	9.3	13.8	13.8	13.8	14.3	14.3	14.3	14.8	14.8	14.8	12.5	12.5	12.5	0.2	0.2	0.2	-29.3	-29.3	-29.3
Parking	Leq,d	28.3	10.1	10.1	10.1	19.0	19.0	19.0	10.3	10.3	10.3	14.9	14.9	14.9	15.5	15.5	15.5	15.9	15.9	15.9	12.5	12.5	12.5	1.5	1.5	1.5	-23.4	-23.4	-23.4
Remaining contrib. of src "Parking"	Leq,d																												
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Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Receiver R2 Fl G Lr,lim dB(A) Leq,d 37.7 dB(A)																													
Parking	Leq,d	23.8	6.0	6.0	6.0	15.2	15.2	15.2	6.6	6.6	6.6	10.8	10.8	10.8	10.2	10.2	10.2	10.4	10.4	10.4	7.0	7.0	7.0	-5.5	-5.5	-5.5	-32.8	-32.8	-32.8
Parking	Leq,d	25.0	7.5	7.5	7.5	16.5	16.5	16.5	7.6	7.6	7.6	11.6	11.6	11.6	11.3	11.3	11.3	11.5	11.5	11.5	8.0	8.0	8.0	-4.5	-4.5	-4.5	-31.2	-31.2	-31.2
Parking	Leq,d	18.7	4.1	4.1	4.1	10.6	10.6	10.6	-2.0	-2.0	-2.0	4.1	4.1	4.1	4.8	4.8	4.8	5.5	5.5	5.5	0.0	0.0	0.0	-12.9	-12.9	-12.9	-40.4	-40.4	-40.4
Parking	Leq,d	22.1	4.4	4.4	4.4	13.7	13.7	13.7	4.0	4.0	4.0	9.4	9.4	9.4	8.5	8.5	8.5	8.4	8.4	8.4	3.7	3.7	3.7	-11.3	-11.3	-11.3	-42.9	-42.9	-42.9
Parking	Leq,d	26.1	11.3	11.3	11.3	18.4	18.4	18.4	7.1	7.1	7.1	10.8	10.8	10.8	11.3	11.3	11.3	12.0	12.0	12.0	7.0	7.0	7.0	-6.7	-6.7	-6.7	-30.9	-30.9	-30.9

Rialto Retail Noise
Contribution spectra - 001 - Rialto Retail: Outdoor SP

Source	Time slice	Sum	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	12.5kHz	16kHz	20kHz
		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)
Parking	Leq,d	30.3	11.5	11.5	11.5	20.7	20.7	20.7	13.5	13.5	13.5	17.8	17.8	17.8	17.8	17.8	17.8	17.4	17.4	17.4	14.1	14.1	14.1	1.3	1.3	1.3	-30.5	-30.5	-30.5
Parking	Leq,d	32.3	14.1	14.1	14.1	23.3	23.3	23.3	14.5	14.5	14.5	18.6	18.6	18.6	18.7	18.7	18.7	20.1	20.1	20.1	16.8	16.8	16.8	5.9	5.9	5.9	-17.3	-17.3	-17.3
Parking	Leq,d	30.4	11.2	11.2	11.2	20.4	20.4	20.4	12.0	12.0	12.0	16.4	16.4	16.4	17.2	17.2	17.2	19.4	19.4	19.4	16.0	16.0	16.0	4.8	4.8	4.8	-20.4	-20.4	-20.4
Parking	Leq,d	26.8	8.1	8.1	8.1	17.1	17.1	17.1	8.8	8.8	8.8	13.5	13.5	13.5	14.0	14.0	14.0	14.5	14.5	14.5	11.8	11.8	11.8	-0.4	-0.4	-0.4	-30.3	-30.3	-30.3
Parking	Leq,d	26.2	7.8	7.8	7.8	16.8	16.8	16.8	9.0	9.0	9.0	13.2	13.2	13.2	13.4	13.4	13.4	13.3	13.3	13.3	11.0	11.0	11.0	-1.2	-1.2	-1.2	-30.7	-30.7	-30.7
Remaining contrib. of src "Parking"	Leq,d																												
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Receiver R3 Fl G Lr,lim dB(A) Leq,d 36.0 dB(A)																													
Parking	Leq,d	21.6	4.7	4.7	4.7	13.8	13.8	13.8	5.0	5.0	5.0	8.5	8.5	8.5	7.1	7.1	7.1	6.5	6.5	6.5	1.0	1.0	1.0	-12.5	-12.5	-12.5	-41.1	-41.1	-41.1
Parking	Leq,d	23.3	6.3	6.3	6.3	15.4	15.4	15.4	6.7	6.7	6.7	10.4	10.4	10.4	9.1	9.1	9.1	8.4	8.4	8.4	2.7	2.7	2.7	-10.5	-10.5	-10.5	-38.3	-38.3	-38.3
Parking	Leq,d	16.8	0.3	0.3	0.3	9.6	9.6	9.6	-0.4	-0.4	-0.4	2.6	2.6	2.6	1.2	1.2	1.2	0.9	0.9	0.9	-4.6	-4.6	-4.6	-19.1	-19.1	-19.1	-52.5	-52.5	-52.5
Parking	Leq,d	19.6	1.9	1.9	1.9	12.3	12.3	12.3	2.9	2.9	2.9	6.1	6.1	6.1	4.4	4.4	4.4	3.7	3.7	3.7	-1.8	-1.8	-1.8	-17.3	-17.3	-17.3	-52.9	-52.9	-52.9
Parking	Leq,d	22.5	7.1	7.1	7.1	14.3	14.3	14.3	3.6	3.6	3.6	8.8	8.8	8.8	9.1	9.1	9.1	8.9	8.9	8.9	2.2	2.2	2.2	-12.7	-12.7	-12.7	-44.0	-44.0	-44.0
Parking	Leq,d	27.7	8.7	8.7	8.7	17.7	17.7	17.7	10.4	10.4	10.4	15.4	15.4	15.4	15.6	15.6	15.6	15.6	15.6	15.6	10.0	10.0	10.0	-4.5	-4.5	-4.5	-38.6	-38.6	-38.6
Parking	Leq,d	29.1	11.6	11.6	11.6	20.8	20.8	20.8	12.1	12.1	12.1	16.0	16.0	16.0	16.0	16.0	16.0	15.2	15.2	15.2	9.8	9.8	9.8	-2.2	-2.2	-2.2	-26.6	-26.6	-26.6
Parking	Leq,d	30.4	12.1	12.1	12.1	21.2	21.2	21.2	12.8	12.8	12.8	17.1	17.1	17.1	17.7	17.7	17.7	18.0	18.0	18.0	13.7	13.7	13.7	3.0	3.0	3.0	-21.0	-21.0	-21.0
Parking	Leq,d	26.7	8.1	8.1	8.1	17.0	17.0	17.0	8.4	8.4	8.4	13.9	13.9	13.9	14.3	14.3	14.3	14.7	14.7	14.7	10.4	10.4	10.4	-2.3	-2.3	-2.3	-32.3	-32.3	-32.3
Parking	Leq,d	24.7	5.9	5.9	5.9	15.3	15.3	15.3	7.4	7.4	7.4	11.9	11.9	11.9	12.1	12.1	12.1	12.2	12.2	12.2	7.4	7.4	7.4	-6.0	-6.0	-6.0	-37.2	-37.2	-37.2
Remaining contrib. of src "Parking"	Leq,d																												

Source	Time slice	Sum	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	12.5kHz	16kHz	20kHz
		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)
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Receiver R4 Fl G Lr,lim dB(A)	Leq,d 36.5 dB(A)																												
Parking	Leq,d	17.1	4.0	4.0	4.0	10.8	10.8	10.8	-2.6	-2.6	-2.6	-1.4	-1.4	-1.4	-1.8	-1.8	-1.8	-2.1	-2.1	-2.1	-7.2	-7.2	-7.2	-18.1	-18.1	-18.1	-42.9	-42.9	-42.9
Parking	Leq,d	19.1	5.4	5.4	5.4	12.8	12.8	12.8	-1.0	-1.0	-1.0	0.0	0.0	0.0	0.7	0.7	0.7	0.3	0.3	0.3	-5.5	-5.5	-5.5	-17.5	-17.5	-17.5	-43.7	-43.7	-43.7
Parking	Leq,d	14.0	1.6	1.6	1.6	6.6	6.6	6.6	-3.2	-3.2	-3.2	-1.1	-1.1	-1.1	-3.7	-3.7	-3.7	-3.4	-3.4	-3.4	-8.1	-8.1	-8.1	-20.8	-20.8	-20.8	-51.9	-51.9	-51.9
Parking	Leq,d	10.9	-1.5	-1.5	-1.5	3.9	3.9	3.9	-6.4	-6.4	-6.4	-5.4	-5.4	-5.4	-7.7	-7.7	-7.7	-7.2	-7.2	-7.2	-11.3	-11.3	-11.3	-22.2	-22.2	-22.2	-48.5	-48.5	-48.5
Parking	Leq,d	18.0	5.8	5.8	5.8	11.0	11.0	11.0	0.7	0.7	0.7	1.8	1.8	1.8	-0.7	-0.7	-0.7	-0.2	-0.2	-0.2	-4.6	-4.6	-4.6	-16.2	-16.2	-16.2	-44.0	-44.0	-44.0
Parking	Leq,d	22.4	9.0	9.0	9.0	14.3	14.3	14.3	3.9	3.9	3.9	5.2	5.2	5.2	4.5	4.5	4.5	10.5	10.5	10.5	4.9	4.9	4.9	-7.8	-7.8	-7.8	-29.9	-29.9	-29.9
Parking	Leq,d	17.7	4.3	4.3	4.3	10.3	10.3	10.3	-0.8	-0.8	-0.8	0.9	0.9	0.9	-0.4	-0.4	-0.4	4.3	4.3	4.3	-2.5	-2.5	-2.5	-17.9	-17.9	-17.9	-46.0	-46.0	-46.0
Parking	Leq,d	26.9	10.2	10.2	10.2	18.7	18.7	18.7	5.8	5.8	5.8	10.8	10.8	10.8	13.9	13.9	13.9	14.2	14.2	14.2	9.9	9.9	9.9	-1.2	-1.2	-1.2	-28.3	-28.3	-28.3
Parking	Leq,d	35.3	16.8	16.8	16.8	26.1	26.1	26.1	14.6	14.6	14.6	20.2	20.2	20.2	23.0	23.0	23.0	23.6	23.6	23.6	20.0	20.0	20.0	10.6	10.6	10.6	-10.9	-10.9	-10.9
Parking	Leq,d	22.6	9.2	9.2	9.2	16.0	16.0	16.0	3.9	3.9	3.9	5.6	5.6	5.6	4.8	4.8	4.8	3.6	3.6	3.6	-1.0	-1.0	-1.0	-10.6	-10.6	-10.6	-31.3	-31.3	-31.3
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												

Rialto Retail Noise
Contribution spectra - 001 - Rialto Retail: Outdoor SP

Source	Time slice	Sum 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)	12.5kHz dB(A)	16kHz dB(A)	20kHz dB(A)
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												
Remaining contrib. of src "Parking"	Leq,d																												

Appendix C:

Construction Noise Modeling Output

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	Leq	Energy
1	Grader	86	1	40	72	0.5	0	82.0	78.1	63996137.2
2	Dozer	85	1	40	72	0.5	0	81.0	77.1	50833938.7
3	Excavator	86	1	40	72	0.5	0	82.0	78.1	63996137.2
4	Tractor/Backhoe	80	1	40	72	0.5	0	76.0	72.1	16075102.9
							Lmax*	**85**	**Leq**	**83**
							Lw	**116**	**Lw**	**115**

Source: MD Acoustics, July 2018.

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**	**83**	**82**	**81**	**80**	**79**	**78**	**77**	**76**	**75**	**74**	**73**	**72**	**71**	**70**	**69**	**68**
60	18.3	0.5	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66
70	21.3	0.5	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
80	24.4	0.5	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
90	27.4	0.5	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62
100	30.5	0.5	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60
110	33.5	0.5	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59
120	36.6	0.5	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58
130	39.6	0.5	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58
140	42.7	0.5	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57
150	45.7	0.5	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56
160	48.8	0.5	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
170	51.8	0.5	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
180	54.9	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
190	57.9	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
200	61.0	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
210	64.0	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
220	67.1	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
230	70.1	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
240	73.1	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
250	76.2	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
260	79.2	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
270	82.3	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
280	85.3	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
290	88.4	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
300	91.4	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
310	94.5	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
320	97.5	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
330	100.6	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
340	103.6	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
350	106.7	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
360	109.7	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
370	112.8	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46

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	Cranes	82	1	40	72	0.5	0	78.0	74.1	25477321.1
2	Forklift/Tractor	80	1	40	72	0.5	0	76.0	72.1	16075102.9
3	Generator	80	1	40	72	0.5	0	76.0	72.1	16075102.9
4	Tractor/Backhoe	80	1	40	72	0.5	0	76.0	72.1	16075102.9
							Lmax*	**80**	**Leq**	**79**
							Lw	**112**	**Lw**	**110**

Source: MD Acoustics, July 2018.

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**	**79**	**78**	**77**	**76**	**75**	**74**	**73**	**72**	**71**	**70**	**69**	**68**	**67**	**66**	**65**	**64**
60	18.3	0.5	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62
70	21.3	0.5	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60
80	24.4	0.5	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59
90	27.4	0.5	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57
100	30.5	0.5	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56
110	33.5	0.5	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
120	36.6	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
130	39.6	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
140	42.7	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
150	45.7	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
160	48.8	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
170	51.8	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
180	54.9	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
190	57.9	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
200	61.0	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
210	64.0	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
220	67.1	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
230	70.1	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
240	73.1	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
250	76.2	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
260	79.2	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
270	82.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
280	85.3	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
290	88.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
300	91.4	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
310	94.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
320	97.5	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
330	100.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
340	103.6	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
350	106.7	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
360	109.7	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42
370	112.8	0.5	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42

Paving

No.	Equipment Description	Reference (dBA) 50 ft Lmax	Quantity	Usage Factor[1]	Distance to Receptor (ft)	Ground Effect	Shielding (dBA)	Calculated (dBA) Lmax	Calculated (dBA) Leq	Energy
Noise Level Calculation Prior to Implementation of Noise Attenuation Requirements										
1	Pavers	86	1	40	72	0.5	0	82.0	78.1	63996137.2
2	Rollers	80	1	40	72	0.5	0	76.0	72.1	16075102.9
3	Paving Equipment	80	1	40	72	0.5	0	76.0	72.1	16075102.9
							Lmax*	83	Leq	80
							Lw	115	Lw	111

Source: MD Acoustics, July 2018.

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**	**80**	**79**	**78**	**77**	**76**	**75**	**74**	**73**	**72**	**71**	**70**	**69**	**68**	**67**	**66**	**65**
60	18.3	0.5	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
70	21.3	0.5	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61
80	24.4	0.5	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60
90	27.4	0.5	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58
100	30.5	0.5	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57
110	33.5	0.5	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56
120	36.6	0.5	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55
130	39.6	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
140	42.7	0.5	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54
150	45.7	0.5	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53
160	48.8	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
170	51.8	0.5	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52
180	54.9	0.5	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
190	57.9	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
200	61.0	0.5	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50
210	64.0	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
220	67.1	0.5	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
230	70.1	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
240	73.1	0.5	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
250	76.2	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
260	79.2	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
270	82.3	0.5	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
280	85.3	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
290	88.4	0.5	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
300	91.4	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
310	94.5	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
320	97.5	0.5	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
330	100.6	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
340	103.6	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
350	106.7	0.5	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
360	109.7	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43
370	112.8	0.5	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43

VIBRATION LEVEL IMPACT			
Project:	Rialto Retail		Date: 12/14/22
Source:	Large Bulldozer		
Scenario:	Unmitigated		
Location:	Adjacent residences		
Address:	Rialto 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 =	16.00	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 =	**0.145**	IN/SEC	OUTPUT IN RED