Appendix H

Noise Study

17861 Cartwright Road Residential Project Addendum Noise Technical Report

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Acronyms and Abbreviations

μPa	microPascals
ADT	average daily traffic
ANSI	American National Standards Institute
City	City of Irvine
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
IBC EIR	Irvine Busines Complex Environmental Impact Report
in/s	inches per second
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_{eq}	equivalent sound level
L_{min}	minimum sound level
LT	long-term
Lv	vibration velocity levels
L_{xx}	percentile-exceeded sound level
PPPs	Plans, Programs, and Policies
PDFs	Project Design Features
project	17861 Cartwright Road Residential Project
RCNM	Roadway Construction Noise Model
SLM	sound level meter
ST	short-term

Chapter 1
Introduction

The purpose of this memorandum is to support the City of Irvine's (City's) environmental review process and to provide information regarding potential noise and vibration effects associated with the 17861 Cartwright Road Residential Project (project). The proposed project involves demolition of a one-story office/warehouse building and construction of a four-story building accommodating 60 condominium units and other associated improvements at 17861 Cartwright Road in Irvine, California. The analysis provided in this memorandum evaluates the potential for short- and long-term noise and vibration impacts associated with construction and operation of the project. The analysis includes a description of the environmental setting for the project, including existing noise conditions, as well as applicable laws and regulations. It also documents the assumptions, methodologies, and findings used to evaluate the impacts and presents measures that would mitigate those impacts.

Chapter 2
Project Description

The proposed project involves demolition of the existing one-story office/warehouse building and parking lot, and redevelopment of the site with one four-story building accommodating 60 condominium units and 107 parking spaces. Amenities would include an approximately 0.18-acre recreation courtyard with a pool and tot lot. According to the Park Plan (see Appendix B of the addendum to the environmental impact report prepared for the proposed project), the project would house approximately 88 residents. The proposed project would remove the southern driveway and use the northern driveway (currently shared with Yogurtland Franchising, Inc. at 17801 Cartwright Road) as the sole access point. The project would provide 13 new perpendicular parking spaces to be used exclusively by the adjacent tenant.

Chapter 3
Noise Fundamentals

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is often defined as sound that is objectionable because it is unwanted, disturbing, or annoying.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receptor, and the propagation path between the two. The loudness of the noise source and the obstructions or atmospheric factors, which affect the propagation path to the receptor, determine the sound level and the characteristics of the noise perceived by the receptor.

The following sections provide an explanation of key concepts and acoustical terms used in the analysis of environmental and community noise.

3.1 Frequency, Amplitude, and Decibels

Continuous sound can be described by *frequency* (pitch) and *amplitude* (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz, or thousands of Hz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

The amplitude of pressure waves generated by a sound source determines the loudness of that source. The amplitude of a sound is typically described in terms of *sound pressure level*, which refers to the root-mean-square pressure of a sound wave and can be measured in units called microPascals (µPa). One µPa is approximately one hundred-billionth (0.00000000001) of normal atmospheric pressure. Sound pressure levels for different kinds of noise environments can range from less than 100 to over 100,000,000 µPa. Because of this large range of values, sound is rarely expressed in terms of µPa. Instead, a logarithmic scale is used to describe the sound pressure level (also referred to simply as the sound level) in terms of decibels, abbreviated dB. Specifically, the decibel describes the ratio of the actual sound pressure to a reference pressure and is calculated as follows:

$$SPL = 20 \times \log_{10}\left(\frac{X}{20\mu Pa}\right)$$

where *X* is the actual sound pressure and 20 µPa is the standard reference pressure level for acoustical measurements in air. The threshold of hearing for young people is about 0 dB, which corresponds to 20 µPa.

3.1.1 Decibel Addition

Because decibels are logarithmic, sound pressure levels cannot be added or subtracted through ordinary arithmetic. On the dB scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, their combined sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one excavator produces a sound pressure level of 80 dB, two excavators would not produce 160 dB. Rather, they would combine to produce 83 dB. The cumulative sound level of any number of sources can be determined using decibel addition. The same decibel addition is used for A-weighted decibels described below.

3.2 Perception of Noise and A-Weighting

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound pressure level in that range. In general, people are most sensitive to the frequency range of 1,000 to 8,000 Hz and perceive sounds within that range better than sounds of the same amplitude at higher or lower frequencies. To approximate the response of the human ear, sound levels in various frequency bands are adjusted (or "weighted"), depending on human sensitivity to those frequencies. The resulting sound pressure level is expressed in A-weighted decibels, abbreviated dBA. When people make judgments regarding the relative loudness or annoyance of a sound, their judgments correlate well with the A-weighted sound levels of those sounds. Table 1 describes typical A-weighted sound levels for various noise sources.

Table 1. Typical Noise Levels in the Environment

Common Outdoor Noise Source	Sound Level (dBA)	Common Indoor Noise Source
	— 110 —	Rock band
Jet flying at 1,000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower at 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher in next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: California Department of Transportation 2013.

3.2.1 Human Response to Noise

Noise-sensitive receptors (also called "receivers") are locations where people reside or where the presence of unwanted sound may adversely affect the use of the land. The effects of noise on people can be listed in three general categories.

- Subjective effects of annoyance, nuisance, or dissatisfaction
- Interference with activities such as speech, sleep, learning, or working
- Physiological effects such as startling and hearing loss

In most cases, effects from sounds typically found in the natural environment (compared to an industrial or an occupational setting) would be limited to the first two categories: creating an annoyance or interfering with activities. (Further discussion of health-related effects is provided below.) No completely satisfactory method exists to measure the subjective effects of sound or the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard arises primarily from the wide variation in individual thresholds of annoyance and habituation to sound. Therefore, an important way of determining a person's subjective reaction to a new sound is by comparing it to the existing baseline or "ambient" environment to which that person has adapted. In general, the more the level or tonal (frequency) variations of a sound exceed the previously existing ambient sound level or tonal quality, the less acceptable the new sound will be, as judged by the exposed individual.

Studies have shown that under controlled conditions in an acoustics laboratory, a healthy human ear is able to discern changes in sound levels of 1 dBA. In the normal environment, the healthy human ear can detect changes of about 2 dBA; however, it is widely accepted that a doubling of sound energy, which results in a change of 3 dBA in the normal environment, is considered just noticeable to most people. A change of 5 dBA is readily perceptible, and a change of 10 dBA is perceived as being twice as loud. Accordingly, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) resulting in a 3-dBA increase in sound would generally be barely detectable.

3.3 Noise Descriptors

Because sound levels can vary markedly over a short period of time, various descriptors or noise "metrics" have been developed to quantify environmental and community noise. These metrics generally describe either the average character of the noise or the statistical behavior of the variations in the noise level. The most common of these metrics are described below.

Equivalent Sound Level (L_{eq}) is the most common metric used to describe short-term average noise levels. Many noise sources produce levels that fluctuate over time; examples include mechanical equipment that cycles on and off or construction work, which can vary sporadically. The L_{eq} describes the average acoustical energy content of noise for an identified period of time, commonly 1 hour. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustical energy over the duration of the exposure. For many noise sources, the L_{eq} will vary, depending on the time of day. A prime example is traffic noise, which rises and falls, depending on the amount of traffic on a given street or freeway.

Maximum Sound Level (L_{max}) and **Minimum Sound Level (L_{min})** refer to the maximum and minimum sound levels, respectively, that occur during the noise measurement period. More specifically, they describe the root-mean-square sound levels that correspond to the loudest and quietest 1-second intervals that occur during the measurement.

Percentile-Exceeded Sound Level (L_{xx}) describes the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10 percent of the time, and L_{90} is the sound level exceeded 90 percent of the time).

Community Noise Equivalent Level (CNEL) is a measure of the cumulative 24-hour noise level that considers not only the variation of the A-weighted noise level but also the duration and the time of day of the disturbance. The CNEL is derived from the 24 A-weighted 1-hour L_{eq}s that occur in a day, with "penalties" applied to the level occurring during the evening hours (7 p.m. to 10 p.m.) and nighttime hours (10 p.m. to 7 a.m.) to account for increased noise sensitivity during these hours. Specifically, the CNEL is calculated by adding 5 dBA to the evening L_{eq}, adding 10 dBA to the nighttime L_{eq}, and then taking the average value for all 24 hours.

Day-Night Average Sound Level (L_{dn}) is a measure of the cumulative 24-hour noise that is very similar to CNEL (described above); the only difference is that L_{dn} does not apply a "penalty" to evening noise levels. The L_{dn} is derived from the 24 A-weighted 1-hour L_{eq}s that occur in a day. A

5-dBA "penalty" is added to the levels occurring during the nighttime hours (10 p.m. to 7 a.m.), and then the average is calculated for all 24 hours.

3.4 Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise is reduced with distance depends on the following important factors.

- **Geometric Spreading**. Sound from a single source (i.e., a *point source*) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. Highway noise is not a single stationary point source of sound. The movement of vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a *line source*) rather than from a point. This results in cylindrical spreading rather than the spherical spreading resulting from a point source. The change in sound level (i.e., attenuation) from a line source is 3 dBA per doubling of distance.
- **Ground Absorption**. Usually the noise path between the source and the observer is very close to the ground. The excess noise attenuation from ground absorption occurs due to acoustic energy losses on sound wave reflection. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 200 feet, prediction results based on this scheme are sufficiently accurate. For acoustically "hard" sites (i.e., sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receptor), no excess ground attenuation is assumed because the sound wave is reflected without energy losses. For acoustically absorptive or "soft" sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.
- **Atmospheric Effects**. Research by the California Department of Transportation (2013) and others has shown that atmospheric conditions can have a major effect on noise levels. Wind has been shown to be the single most important meteorological factor within approximately 500 feet, whereas vertical air temperature gradients are more important over longer distances. Other factors, such as air temperature, humidity, and turbulence, also have major effects. Receptors downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur because of temperature inversion conditions (i.e., increasing temperature with elevation, with cooler air near the surface—where the sound source tends to be—and the warmer air above that acts as a cap, causing a reflection of ground level–generated sound).
- **Shielding by Natural or Human-Made Features**. A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by this shielding depends on the size of the object, proximity to the noise source and receptor, surface weight, solidity, and the frequency content of the noise source. Natural terrain features (such as hills and dense woods) and human-made features (such as buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receptor, with the specific purpose of reducing noise. A barrier that

breaks the line of sight between a source and a receptor will typically result in at least 5 dB of noise reduction. A higher barrier may provide as much as 20 dB of noise reduction.

3.5 Environmental Vibration Fundamentals

Ground-borne vibration is an oscillatory motion of the soil with respect to the equilibrium position and can be quantified in terms of *velocity* or *acceleration*. The velocity describes the instantaneous speed of the motion, and acceleration is the instantaneous rate of change of the speed. Each of these measures can be further described in terms of *frequency* and *amplitude*.

In contrast to airborne sound, groundborne vibration is not a phenomenon that most people experience every day. The background vibration velocity level in residential areas is usually much lower than the threshold of human perception. Most perceptible indoor vibration is caused by sources within buildings, such as mechanical equipment while in operation, people moving, or doors slamming. Typical outdoor sources of perceptible groundborne vibration are heavy construction equipment (such as blasting and pile driving), railroad operations, and heavy trucks on rough roads. If a roadway is smooth, the groundborne vibration from traffic is rarely perceptible. Ground-borne vibration can be a serious concern for neighbors of nearby sources, causing buildings to shake and rumbling sounds to be heard. If a person is engaged in any type of physical activity, vibration tolerance increases considerably. Vibration can result in effects that range from annoyance to structural damage. Variations in geology and distance result in different vibration levels with different frequencies and amplitudes.

3.6 Vibration Descriptors

Various descriptors, or “metrics,” can be used to quantify groundborne vibration. The metrics used in the assessment of environmental impacts are generally focused on the short-term maximum vibration levels. The two metrics considered in this study are described below.

Peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak amplitude of the vibration velocity. The unit of measurement for PPV is inches per second (in/s).

Vibration velocity level (L_v) describes the root-mean-square (rms) velocity amplitude of the vibration. This rms value may be thought of as a “smoothed” or “magnitude-averaged” amplitude. The maximum L_v describes the maximum rms velocity amplitude that occurs over a 1-second period during a vibration measurement (in this way, L_v is analogous to the L_{max} metric used to describe maximum noise levels). L_v can be measured in in/s but is typically expressed on a logarithmic scale using decibels. To avoid confusion with decibels used to describe sound levels, the abbreviation “VdB” is used to denote vibration velocity level decibels. Specifically, a vibration velocity level (L_v), in decibels (VdB), is calculated as follows:

$$L_V = 20\log_{10}\left(\frac{V}{1\times10^{-6}\, in./s}\right),$$

where V is the actual 1-second rms velocity amplitude and 1×10^{-6} in/s is the standard reference velocity amplitude.

Chapter 4
Existing Noise Environment

The existing noise-sensitive receivers in the vicinity of the proposed project consist of multi-family residential uses to the east of the project site and a hotel with outdoor pool to the northwest. Multi-family residences have exterior balconies that front onto Cartwright Road (across from the project site). The hotel outdoor pool is shielded from the project site by one of the local commercial buildings to the northwest. All other land uses in the vicinity are mixed commercial/industrial and office uses.

In order to document existing noise levels in the study area, three short-term (ST) measurements and one long-term (LT) measurements were obtained in the project vicinity (see Figure 1) between Monday, September 28 and Wednesday, September 30, 2020. These locations were selected to document the existing noise levels at the closest noise-sensitive receptors to the east, northeast, and northwest. Each ST measurement was conducted over a period of at least 20 minutes. The LT measurements were conducted over a period of approximately 48 hours.

The instrumentation used to obtain the noise measurements consisted of a Type 1 Larson Davis (Model LxT) integrating sound level meter (SLM) for short-term noise measurements, a Type 2 Piccilo integrating SLMs for the long-term noise measurement, and a Larson Davis (Model CAL200) acoustical calibrator to field-calibrate all SLMs before and after each measurement for accuracy. The instruments are maintained to manufacturer specifications to ensure accuracy, in accordance with American National Standards Institute (ANSI) standard S1.4-2006. For all measurements, the SLM microphone was mounted at a height of 5 feet above the ground.

The existing noise environment in the project vicinity is generally dominated by traffic along Cartwright Road and Main Street to the north. Noise measurements indicate that the daytime ambient hourly noise levels were generally in the range of 60 to 64 dBA L_{eq} at land uses surrounding the project site (ST-1 through ST-3, LT2), with overall average daytime noise levels of 62 to 65 dBA. Noise levels measured at ST-1 were partially elevated due to a stationary noise source in the form of a hotel HVAC system. Evening ambient hourly noise levels were generally in the range of 57 to 61 dBA L_{eq}, while nighttime noise levels ranged from 52 to 63 dBA. The measured CNEL calculated during field measurements was 66 dBA CNEL. Additional details and a summary of the measurement results are provided in Table 2. Field photos and field data sheets are included in Appendix A.

Table 2. Measured Existing Noise Levels in Study Area

Location Number, Description (date, time)	Weekday Hourly L_{eq}, dBA		
	Daytime	Evening	Nighttime
ST-1, hotel pool (11:14, September 28, 2020)	60.0	--	--
ST-2, outdoor balcony of residence (11:49, September 28, 2020)	59.5	--	--
ST-3, outdoor balcony of residence (12:36, September 28, 2020)	63.7	--	--
LT-1, just south of project site approximately 20 feet from edge of pavement (10:00 – 10:00 September 28 – 29, 2020)	62.0 – 65.0	57.0 – 61.0	52.0 – 63.0

Notes: Daytime = 7 a.m. to 7 p.m.; Evening = 7 p.m. to 10 p.m.; Nighttime = 10 p.m. to 7 a.m.; ST = short-term; LT = long-term; dBA = A-weighted sound level, the sound pressure level in decibels as measured using the A-weighting filter network, which de-emphasizes the very low- and very high-frequency components of the sound in a manner similar to the frequency response of the human ear; L_{eq} = equivalent sound level, the average of the sound energy occurring over the measurement period. All measurements have been rounded to the nearest whole number.

Chapter 5
Regulatory Setting

5.1 State

California requires each local government entity to perform noise studies and implement a noise element as part of its general plan. The purpose of the noise element is to limit the exposure of the community to excessive noise levels; the noise element must be used to guide decisions concerning land use. The City of Irvine General Plan is discussed below.

5.2 City of Irvine

The City maintains applicable noise thresholds and restrictions outlined in the Irvine Municipal Code. Other sources of the noise and vibration thresholds include the Noise Element in the *City of Irvine General Plan* (City of Irvine 2015).

5.2.1 Municipal Code

5.2.1.1 Construction Noise

The Irvine Municipal Code, Section 6-8-205, sets time limits on construction activity and restricts construction noise to:

> between 7:00 a.m. and 7:00 p.m. Mondays through Fridays, and 9:00 a.m. and 6:00 p.m. on Saturdays. No construction activities shall be permitted outside of these hours or on Sundays and federal holidays, except Columbus Day, unless a temporary waiver is granted by the Chief Building Official or his or her authorized representative. Trucks, vehicles, and equipment that are making or are involved with material deliveries, loading, or transfer of materials, equipment service, maintenance of any devices or appurtenances for or within any construction project in the City shall not be operated or driven on City streets outside of these hours or on Sundays and federal holidays unless a temporary waiver is granted by the City. Any waiver granted shall take impact upon the community into consideration. No construction activity and agricultural operations will be permitted outside of these hours except in emergencies including maintenance work on the City rights-of-way that might be required.

5.2.1.2 Operational Noise

The Irvine Municipal Code sets forth both interior and exterior noise standards for land uses located within the designated noise zones identified in Section 6-8-204. These noise zones and thresholds are included below.

A. The properties hereinafter described, whether within or without the City, are hereby assigned to the following noise zones:

   1. Noise zone 1: All hospitals, libraries, churches, schools and residential properties.
   2. Noise zone 2: All professional office and public institutional properties.
   3. Noise zone 3: All commercial properties excluding professional office properties.

4. Noise zone 4: All industrial properties.

B. Exterior and Interior Noise Standards

1. The following noise standards, unless otherwise specifically indicated, shall apply to all property within a designated noise zone.

Noise Standards dB(A) Noise Levels for a Period Not Exceeding (minutes/hour)

Noise Zone	Exterior/ Interior	Time Period	L50 (30 mins)	L25 (15 mins)	L8 (5 mins)	L2 (1 min)	Lmax (Anytime)
1	Exterior	7:00 a.m.—10:00 p.m.	55	60	65 1	70	75
		10:00 p.m.—7:00 a.m.	50	55	60	65 1	70
	Interior	7:00 a.m.—10:00 p.m.	—	—	55	60	65
		10:00 p.m.—7:00 a.m.	—	—	45	50	55
2	Exterior	Any time	55	60	65	70	75
	Interior	Any time	—	—	55	60	65
3	Exterior	Any time	60	65	70	75	80
	Interior	Any time	—	—	55	60	65
4	Exterior	Any time	70	75	80	85	90
	Interior	Any time	—	—	55	60	65

5.2.2 General Plan

The *City of Irvine General Plan* includes interior and exterior noise standards (Table 3) as well as a land use compatibility matrix (Table 4) for land uses located within the designated categories.

Table 3. Interior and Exterior Noise Standards Energy Average (CNEL)

Land Use Categories		Energy Average (CNEL)	
Categories	Uses	Interior[1]	Exterior[2]
Residential	Single-family, multiple-family	45[3] 55[4]	65[7]
	Mobile home	—	65[5]
Commercial/Industrial	Hotel, motel, transient lodging	45	65[6]
	Commercial, retail, bank, restaurant	55	—
	Office building, professional office, research & development	50	—
	Amphitheater, concert hall, auditorium, meeting hall	45	—
	Gymnasium (multipurpose)	50	—
	Health clubs	55	—
	Manufacturing, warehousing, wholesale, utilities	65	—
	Movie theater	45	—
Institutional	Hospital, school classroom	45	65
	Church, library	45	—
Open Space	Parks	—	65

Source: City of Irvine 2015.

1 Interior environment excludes bathrooms, toilets, closets, and corridors.

2 Outdoor environment is limited to private yards of single-family or multifamily residences; private patios accessed by means of exit from inside the unit; mobile home parks; hospital patios; park picnic areas; school playgrounds; and hotel and motel recreation areas.

3 Noise level requirement with closed windows. A mechanical ventilating system or other means of natural ventilation shall be provided pursuant to Appendix Chapter 12, Section 1208, of the UBC.

4 Noise level requirement with open windows, if they are used to meet the natural ventilation requirement.

5 Exterior noise level shall be such that interior noise level will not exceed 45 CNEL

6 Except those areas affected by aircraft noise.

7 Multi-family developments with balconies that do not meet the 65 CNEL are required to provide occupancy disclosure notices to all future tenants regarding potential noise impacts.

Table 4. Land Use Noise Compatibility

Land Use Categories		Energy Average (CNEL)						
Categories	Uses	<	55	60	65	70	75	80>
RESIDENTIAL	Single-family	A	A	B	B	C	D	D
RESIDENTIAL	Mobile home	A	A	B	B	C	C	D
COMMERCIAL Regional Community	Hotel, motel, transient lodging	A	A	A	A	B	B	C
COMMERCIAL Community INDUSTRIAL & INSTITUTIONAL	Office building, research & development, professional office, city office building	A	A	A	B	B	C	D
COMMERCIAL Recreation INSTITUTIONAL General	Amphitheater, concert hall auditorium, meeting hall	B	B	C	C	D	D	D
COMMERCIAL Recreation	Children's amusement park, miniature golf, go-cart track, health club, equestrian center	A	A	A	B	B	D	D
COMMERCIAL Community INDUSTRIAL General	Automobile service station, auto dealer, manufacturing, warehousing, wholesale, utilities	A	A	A	A	B	B	B
INSTITUTIONAL General	Hospital, church, library, school classrooms	A	A	B	C	C	D	D
OPEN SPACE	Parks	A	A	A	B	C	D	D
OPEN SPACE	Golf courses, nature centers, cemeteries, wildlife reserves, wildlife habitat	A	A	A	A	B	C	C
AGRICULTURAL	Agriculture	A	A	A	A	A	A	A

Source: City of Irvine 2015.

Zone A - Clearly Compatible Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Zone B - Normally Compatible New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Zone C - Normally Incompatible New construction or development should normally be discouraged. If new construction or development does proceed, a detailed analysis or noise reduction requirements must be made and needed noise insulation features must be included in the design

Zone D - Clearly Incompatible New construction or development should generally not be undertaken.

5.2.2.1 Groundborne Vibration

A significant vibration impact would occur if vibration generated by construction or operational activities related to the project would exceed limits specified in the Federal Transit Administration (FTA) guidelines *Transit Noise and Vibration Impact Assessment* (FTA 2018) at sensitive uses. The manual provides guidance for two types of potential impact: (1) damage to structures and (2) annoyance to people. Guideline criteria for each are provided in Table 5 and Table 6. It is noted that potential building damage is assessed using PPV, whereas potential annoyance is assessed using L_V.

Table 5. FTA Guideline Vibration Damage Criteria

Building Category (Structure and Condition)	PPV, in/s
I. Reinforced-concrete, steel, or timber buildings (no plaster)	0.5
II. Engineered concrete and masonry buildings (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings that are extremely susceptible to vibration damage	0.12

Source: Federal Transit Administration 2018.

Table 6. FTA Guideline Vibration Annoyance Criteria

	Ground-borne Vibration Level, Lv		
Land Use Category	Frequent Events (VdB)[1]	Occasional Events (VdB)[2]	Infrequent Events (VdB)[3]
Category 1: Buildings where vibration would interfere with interior operations	654	654	654
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime use	75	78	83

Source: Federal Transit Administration 2018.

1 "Frequent Events" is defined as more than 70 vibration events from the same source per day.

2 "Occasional Events" is defined as between 30 and 70 vibration events from the same source per day.

3 "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

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

For the purposes of analyzing the proposed project, it is assumed that compliance with the groundborne vibration thresholds would also achieve compliance with the groundborne noise thresholds. Because the vibration sources during construction, such as graders and bulldozers, would operate continuously for extended periods of time, the applicable vibration thresholds would be those for *frequent events*.

Chapter 6
Methodology

6.1 Construction Noise and Vibration

The evaluation of potential noise and vibration impacts associated with project construction was based on the construction equipment schedule and phasing assumptions developed by the City, along with the methods described below.

6.1.1 Noise

Construction-related noise was analyzed using data and modeling methodologies from the Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) (Federal Highway Administration 2008), which predicts noise levels at nearby receptors by analyzing the type of equipment, the distance from source to receptor, usage factor, and the presence or absence of intervening shielding between source and receptor. RCNM is the most recent and comprehensive construction noise model developed and published by the federal government. Although the proposed project is not specifically a roadway construction project, the model is broad enough to be applicable, providing noise data for all of the equipment types typically required during conventional construction. Therefore, it is considered appropriate for use in analyzing the proposed project.

Project construction would be broken down into phases. Each phase of construction was assessed (refer to Appendix B), and the worst-case noise levels were identified during the paving phase, which assumed a combination of pavers and a vibratory roller. Noise levels during all phases were then analyzed at nearby noise sensitive land uses. To reflect the assumed distribution of equipment across the site, source-to-receptor distances used in the analysis were the acoustical average distances between the construction site and each receptor. [1]

Noise levels were conservatively assumed to decrease at a rate of 6 dB per doubling of distance, which is the standard assumption for acoustically hard (i.e., reflective) surfaces such as asphalt or concrete.

6.1.2 Vibration

Construction-related vibration was analyzed using data and modeling methodologies provided by the FTA guidance manual (FTA 2018). Although the proposed project is not a transit project, the model provides vibration data for all of the equipment types typically required during conventional construction as well as methods for estimating the propagation of groundborne vibration over distance. Therefore, it is considered appropriate for use in analyzing the proposed project. Because

[1] The acoustical average distance is used to represent noise sources that are mobile or distributed over an area (such as the project site); it is calculated by multiplying the shortest distance between the receiver and the noise source area by the farthest distance and then taking the square root of the product.

vibration is of concern at structures, as opposed to areas of outdoor use, the distances used in the analysis are the closest distances from the construction areas to the nearest buildings.

The following equation from the guidance manual was used to estimate PPV for the assessment of potential building damage impacts:

$$PPV_{rec} = PPV_{ref} \times (25/D)^{1.5}$$

where PPV_{rec} is the PPV at a receptor; PPV_{ref} is the reference PPV at 25 feet from the equipment; D is the distance from the equipment to the receiver, in feet; and 1.5 is a default value related to the vibration attenuation rate through the ground.

The following equation from the guidance manual was used to estimate L_v for the assessment of potential annoyance to people:

$$L_{v,rec} = L_{v,ref} - 30 \times \log(D/25)$$

where $L_{v,rec}$ is the L_v at a receptor; $L_{v,ref}$ is the reference L_v at 25 feet from the equipment; and D is the distance from the equipment to the receiver, in feet.

The project would not require high-impact construction methods, such as pile driving or blasting. Therefore, the highest groundborne vibration levels would be associated with conventional heavy construction equipment such as bulldozers, excavators, rollers and backhoes. FTA provides vibration source data for this type of equipment of 0.089 to 0.2 in/s PPV at a reference distance of 25 feet.

6.2 Operational Noise

6.2.1 Traffic Noise

The analysis of traffic noise in the study area was based on data from the transportation impact analysis for the proposed project (LSA 2020). The analysis was conducted using a proprietary traffic noise model, with calculations based on data from the FHWA Traffic Noise Model, Version 2.5, Look-Up Tables (FHWA 2004). The inputs used in the traffic noise modeling included average daily traffic (ADT) volumes, assumed traffic mix and daily distribution (the percentage of automobiles versus medium trucks and heavy trucks during each hour of the day), and traffic speeds based on the posted speed limits. To quantify the effects of the proposed project, traffic noise was analyzed at a reference distance of 50 feet from the roadway centerline using four different scenarios: (1) existing, (2) existing with project, (3) short-term without project, (4) short-term with project, (5) buildout without project, and (6) buildout with project, which is consistent with the project traffic study.

6.2.2 Onsite Operations

Onsite noise sources are generally consistent with residential uses, including dogs barking, people talking, and other community noise sources. Onsite noise would also be generated by stationary noise sources such as mechanical equipment, specifically HVAC systems associated with the proposed residential project. The analysis conducted assumed that all HVAC equipment such as air handling units, fans, and generators would be located in on the roof.

Chapter 7
Impacts Analysis

7.1 Construction

7.1.1 Noise

Two types of short-term noise impacts could occur during project construction. First, construction vehicles would incrementally increase noise levels on access roads. This would include construction worker vehicles and haul trucks traveling to and from the project site. Although there would be a relatively high single-event noise level, which could cause an intermittent noise nuisance (e.g., passing trucks at 50 feet would generate up to 77 dBA), the effect on longer-term ambient noise levels would be small. Therefore, there would be no impacts related to the short-term noise associated with commuting construction workers and transporting equipment and materials to the project site.

The second category of construction noise would be noise generated during on-site project construction. Construction would occur only during the periods permitted by the City's Municipal Code (7 a.m. to 7 p.m. Monday through Friday, 9 a.m. to 6 p.m. Saturdays, and no time on Sundays). Detailed construction noise analysis tables are provided in Appendix B of this report. The results are summarized in Table 7.

Table 7. Predicted Construction Noise at the Closest Noise Sensitive Land Uses

	Noise Level (dBA L_{eq})	
Construction Phase	ST-1 (Hotel Pool[1])	ST-2 (Closest Residential Use)
Demolition[2]	**55**	**73**
Grading	53	70
Utilities[2]	52	69
Building Construction[2]	47	64
Street Paving	49	67

[1] Construction analysis included an estimated 10 dB reduction in noise from shielding in the form of 3-story intervening structure.

[2] Construction equipment identified by the project applicant included the use of a skid steer loader. The RCNM model does not include this specific model of equipment. Therefore, conservatively a front-end loader was substituted.

Short-term location ST-2 is considered the worst-case scenario. Therefore ST-3 was not included as any representative noise level would be lower.

Loudest Phase of construction is **bolded.**

The predicted construction noise levels at all of the closest noise sensitive land uses ranged from 64 to 73 dBA L_{eq}, with the demolition phase being the loudest phase of construction. Noise levels of this magnitude would be noticeable as measured daytime noise levels in the vicinity of ST-2/ LT-1: 60 dBA L_{eq} and from 62 to 65 dBA L_{eq}, respectively. Construction would comply with the time requirements outlined in the Irvine Municipal Code and would not occur outside of 7:00 a.m. to 7:00 p.m. Monday through Friday and 9:00 a.m. to 6:00 p.m. on Saturdays.

7.1.2 Vibration

Heavy construction equipment would generate groundborne vibration that could affect nearby structures or residents. Each of the potential types of construction impact (building damage and human annoyance) is discussed in further detail below.

7.1.2.1 Potential Building Damage

The closest structure is to the north of the project site and is constructed of non-engineered timber and masonry. Based on the construction equipment list provided by the applicant, the project would include the use of a vibratory roller during the paving phase. The FTA Transit Noise and Vibration Manual lists a vibratory roller at a reference level of 0.21 ppv at a distance of 25 feet from the source. Table 8 shows the vibration level at the closest sensitive receptor. As shown in the table, the predicted PPV is well below the applicable threshold for potential building damage. Therefore, impacts would be less than significant.

Table 8. Predicted Construction Vibration (PPV) at the Closest Sensitive Structures

Analysis Location	Applicable Criterion, PPV, in/s	Maximum Predicted PPV, in/s
Closest sensitive structure (commercial building) north of project site approximately 45 feet	0.2	0.09

7.1.2.2 Human Annoyance

The vibration velocity levels (L_v) at the nearest residential buildings were calculated to assess the potential for annoyance to people at those locations. The results are summarized in Table 9. As shown in the table, the predicted L_v at the closest sensitive location would exceed the annoyance vibration threshold for occasional events. While the vibration level exceeds the 75 VdB threshold, vibration levels of this this magnitude would occur only when construction equipment is located at the edge of the project site (within 45 feet). Additionally, construction would occur during the daytime when these residences would not likely be occupied or sleeping, which would minimize any impacts. Any vibration associated with construction would cease once construction was completed. As such, impacts could occur and would require implementation of PDF 9-1 as presented below in Chapter 8 and outlined in the Irvine Busines Complex Environmental Impact Report (IBC EIR).

Table 9. Guideline Building Annoyance Criteria and Impact Distances

Analysis Location	Applicable Criterion, Lv (VdB)	Maximum Predicted Lv (VdB)
Closest sensitive structure (residence) north of project site, on Mary Lane	75	83

7.2 Project Operation

7.2.1 Traffic

The project would generate new vehicle trips that would add to traffic on surrounding streets and change the associated traffic noise. Table 10 and Table 11 summarize the predicted noise levels both with and without the project, from the roadway segments considered in the project traffic study. The project would not result in a noticeable increase of traffic noise levels from the no project condition during any of the analyzed time frames. Relevant project-related noise increases are predicted to be between 0 to 0.9 dB, which would generally be considered imperceptible. The 0.9 db increase would occur under the existing condition (existing relative to the existing plus project) at noise sensitive receptors along Cartwright Road and would result in an increase from 60.2 to 61.1 dBA CNEL. It should be noted that this noise level would not exceed the 65 dBA CNEL exterior noise standard identified in the *City of Irvine General Plan*. Therefore, the impact of project traffic noise on the surrounding community would not be significant.

Table 10. Estimated Approved Traffic Noise Levels

Roadway Segment	Estimated Traffic Noise Levels at 50 feet from Roadway Centerline (dB CNEL)											
	Existing	Existing + Project	Increase over Existing	Short-Term without Project	Short-Term with Project	Increase over Short-Term without Project	Long-Term without Project	Long-Term with Project	Increase over Long-Term without Project	Buildout without Project	Buildout with Project	Increase over Buildout without Project
Jamboree Road												
Main Street to I-405 NB ramps	76.5	76.5	--	76.5	76.5	--	76.9	76.9	--	76.8	76.8	--
I-405 NB ramps to I-405 SB ramps	76.6	76.6	--	76.8	76.8	--	77.4	77.4	--	77.2	77.2	--
Main Street												
MacArthur to Gillette	71.7	71.8	0.1	72.0	72.1	0.1	72.1	72.1	--	71.9	71.9	--
Gillette to Von Karman	71.7	71.9	0.1	72.4	72.4	--	72.5	72.5	--	72.3	72.3	--
Von Karman to Cartwright	69.9	69.9	--	71.0	71.0	--	71.2	71.2	--	71.0	71.0	--
Cartwright to Jamboree	69.9	69.9	--	70.7	70.7	--	70.9	70.9	--	70.8	70.8	--
Cartwright Road												
South of Main	60.2	61.1	0.9	63.0	63.0	--	63.4	63.5	0.1	63.2	63.2	--

NB = northbound

SB = southbound

Table 11. Estimated Pending Traffic Noise Levels

	Estimated Traffic Noise Levels at 50 feet from Roadway Centerline (dB CNEL)											
Roadway Segment	Existing	Existing + Project	Increase over Existing	Short-Term without Project	Short-Term with Project	Increase over Short-Term without Project	Long-Term without Project	Long-Term with Project	Increase over Long-Term without Project	Buildout without Project	Buildout with Project	Increase over Buildout without Project
Jamboree Road												
Main Street to I-405 NB ramps	76.5	76.5	--	76.5	76.5	--	76.9	76.9	--	76.9	76.9	--
I-405 NB ramps to I-405 SB ramps	76.6	76.6	--	76.8	76.8	--	77.4	77.4	--	77.3	77.3	--
Main Street												
MacArthur to Gillette	71.7	71.8	0.1	72.1	72.1	--	72.1	72.1	--	71.9	71.9	--
Gillette to Von Karman	71.7	71.9	0.1	72.3	72.3	--	72.5	72.5	--	72.3	72.3	--
Von Karman to Cartwright	69.9	69.9	--	70.9	70.9	--	71.2	71.2	--	71.1	71.1	--
Cartwright to Jamboree	69.9	69.9	--	70.6	70.6	--	70.9	71.0	0.1	70.8	70.8	--
Cartwright Road												
South of Main	60.2	61.1	0.9	63.1	63.0	-0.1	63.5	63.5	--	63.3	63.3	--

NB = northbound

SB = southbound

7.2.2 Onsite Operations

7.2.2.1 HVAC Noise

As part of the project, noise-generating mechanical equipment at the project site would include up to 65 HVAC units that would generate noise when the equipment is in operation throughout the day. The HVAC systems would be on the roof of the 4th floor (approximately 200 square feet lateral distance to the nearest noise sensitive receptor). Based on the specifications sheet provided by the project applicant, the HVAC systems anticipated to be used for the project would have a sound power of 75 dBA. The closest noise sensitive receptors to the project are third- and fourth-floor balconies adjacent to the project site. Based on the number of units and the manufacturer's specifications, noise levels generated by a single HVAC system would be approximately 43 dBA at 50 feet. Given this reference noise level, the simultaneous operation of all 65 HVAC systems on the rooftop would generate a composite noise level of approximately 62 dBA at 50 feet. Given this composite noise level and the distance from the approximate center of the project building's balconies, the resulting noise level at this nearest receptor was estimated to be approximately 50 dBA L_{eq}. The standard set by Irvine Municipal Code is an exceedance of 55 dBA L_{50} during daytime hours and 50 dBA L_{50} during the nighttime. The noise from the onsite HVAC systems would not exceed this threshold.[2] Also, it should be noted that this noise level estimate is conservative as it assumes every HVAC system is running concurrently and does not account for any noise attenuation that may be provided by screening from individual pieces of equipment or parapets at the rooftop.

7.2.2.2 Vibration

Once the proposed project is operational, there would be no substantial sources of groundborne vibration at the project site. It is possible that site maintenance would occasionally require mechanized equipment, but such equipment would be no larger than the construction equipment analyzed above. Therefore, there would be no vibration impacts from onsite project operations.

7.2.2.3 Aircraft Noise

The closest airport is John Wayne Airport approximately 3,600 feet to the west. Based on the 2013 Airport Contour Map for John Wayne Airport, the project site is well outside of the 65 dBA CNEL contour. In addition, the project would not change the operations at any airport or airstrip, and it would not alter the aircraft noise exposure at any existing noise-sensitive land uses. As such, while the project site would be subject to some aircraft noise, it would be outside any contour that would result in any form of impact. Therefore, the impact would be less than significant.

[2] The City's metric outlined in the Municipal Code is an L_{50} metric while the noise level calculated for HVAC system noise is L_{eq}. For the purposes of this analysis, these metrics are considered the equivalent.

Chapter 8
Applicable PPPs and PDFs from the IBC EIR

The analysis above identifies that the project could exceed the vibration thresholds outlined for annoyance. Therefore, a number of Plans, Programs, and Policies (PPPs) and Project Design Features (PDFs) (listed below) would be required to be implanted in order to be consistent with the findings of the IBC.

PPP 9-1 **Control of Construction Hours:** Construction activities occurring as part of the project shall be subject to the limitations and requirements of Section 6-8-205(a) of the Irvine Municipal Code, which states that construction activities may occur between 7:00 a.m. and 7:00 p.m. Mondays through Fridays, and 9:00 a.m. and 6:00 p.m. on Saturdays. No construction activities shall be permitted outside of these hours or on Sundays and federal holidays unless a temporary waiver is granted by the Chief Building Official or his or her authorized representative. Trucks, vehicles, and equipment that are making, or are involved with, material deliveries, loading, or transfer of materials, equipment service, maintenance of any devices or appurtenances for or within any construction project in the City shall not be operated or driven on City streets outside of these hours or on Sundays and federal holidays unless a temporary waiver is granted by the City. Any waiver granted shall take impact upon the community into consideration. No construction activity will be permitted outside of these hours except in emergencies including maintenance work on the City rights-of-way that might be required.

PPP 9-2 **Acoustical Report:** Prior to the issuance of building permits for each structure or tenant improvement other than a parking structure, the applicant shall submit a final acoustical report prepared to the satisfaction of the Director of Community Development. The report shall show that the development will be sound attenuated against present and projected noise levels, including roadway, aircraft, helicopter, and railroad, to meet City interior and exterior noise standards. The final acoustical report shall include all information required by the City's Acoustical Report Information Sheet (Form 42-48). In order to demonstrate that all mitigation measures have been incorporated into the project, the report shall be accompanied by a list identifying the sheet(s) of the building plans that include the approved mitigation measures (City of Irvine Standard Condition 3.5).

An acoustical report (Noise and Vibration Impact Analysis [Appendix I]) was prepared for the proposed project. The report identifies the specific mitigation measures that are required to minimize on-site noise. As well as explicit mitigation measures, the Noise and Vibration Impact Analysis includes a number of important design assumptions that are potentially critical to mitigating noise impacts; these assumptions are also reiterated below to ensure their inclusion as part of the final project design. The following mitigation measures are required:

- Mechanical ventilation equipment (e.g., an air-conditioning system) shall be provided to all dwelling units throughout the project.

- At residential units adjacent to Cartwright Road, windows and doors that are directly exposed to traffic on Cartwright Road shall have a minimum STC rating of 24 to 28.
- At residential units adjacent to the north boundary of the project site, north-facing windows and doors shall have a minimum STC rating of 24 to 28.
- Occupancy disclosure notices shall be provided to all future tenants in units with balconies/decks adjacent to Cartwright Road regarding potential noise impacts (consistent with PDF 9-3, below).

PDF 9-1 As described in the proposed zoning for the project, applicants for individual projects that involve vibration-intensive construction activities, such as pile drivers, jack hammers, and vibratory rollers, occurring near sensitive receptors shall submit a noise vibration analysis prior to their application being deemed complete by the City. If construction-related vibration is determined to exceed the Federal Transit Administration vibration-annoyance criteria of 78 vibration dB during the daytime, additional requirements, such as use of less vibration-intensive equipment or construction techniques, shall be implemented during construction (e.g., drilled piles to eliminate use of vibration-intensive pile driver).

PDF 9-2 Prior to issuance of grading permits, the project applicant shall incorporate the following measures as a note on the grading plan cover sheet to ensure that the greatest distance between noise sources and sensitive receptors during construction activities has been achieved.

- Construction equipment, fixed or mobile, shall be equipped with properly operating and maintained noise mufflers consistent with manufacturers' standards.
- Construction staging areas shall be located away from off-site sensitive uses during the later phases of project development.
- The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site, whenever feasible.
- Construction of sound walls that have been incorporated into the project design prior to construction of the building foundation; or installation of temporary sound blankets (fences typically composed of polyvinylchloride-coated outer shells with adsorbent inner insulation) placed along the boundary of the project site during construction activities.

PDF 9-3 As described in the proposed zoning for the project, prior to issuance of the certificate of occupancy, the project applicant shall submit evidence to the satisfaction of the Director of Community Development that occupancy disclosure notices for units with patios and/or balconies that do not meet the 65 dBA CNEL are provided to all future tenants pursuant to the City's Noise Ordinance.

Chapter 9
Summary and Conclusions

Noise and vibration analyses were conducted for the development at 17861 Cartwright Road. The analyses address potential effects from both project construction and operation. All evaluated effects were determined to have either a less-than-significant impact or require mitigation to reduce impacts to a less-than-significant level. The PPPs, and PDFs from the IBC EIR listed in Chapter 8 will be included in the project to reduce noise levels. With the inclusion of these PPPs and PDFs, no new impacts would occur.

Chapter 10
References

California Department of Transportation. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol.* Final. CT-HWANP-RT-13-069.25.2. Sacramento, CA. Prepared for California Department of Transportation (Sacramento CA)] .

City of Irvine. 2015. *City of Irvine General Plan.* June. Available: https://www.cityofirvine.org/community-development/current-general-plan.

LSA. 2020. *Traffic Study.* Final. 00820914-PCPU. Tustin CA. Prepared by LSA (Irvine CA)] .

Federal Highway Administration (FTA). 2004, Federal Highway Administration's Traffic Noise Model (TNM) (FHWA 2004)

———. 2008. Roadway Construction Noise Model (RCNM)

Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual.* Final. FTA Report No 0123. Washington, DC. Prepared by John A. Volpe National Transportation System Center (Cambridge MA)] .

Appendix A

Field Data Sheets and Photos for Ambient Noise Measurements

Summary

File Name on Meter	LxT_Data.893
File Name on PC	SLM_0004005_LxT_Data_893.00.ldbin
Serial Number	0004005
Model	SoundTrack LxT®
Firmware Version	2.402
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2020-09-28 11:14:07
Stop	2020-09-28 11:38:18
Duration	00:24:10.9
Run Time	00:20:01.2
Pause	00:04:09.7
Pre Calibration	2020-09-28 09:08:34
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	A Weighting			
Detector	Slow			
Preamp	PRMLxT1L			
Microphone Correction	FF:RI			
Integration Method	Linear			
Overload	127.6 dB			
	A	**C**	**Z**	
Under Range Peak	**76.1**	73.1	78.1	dB
Under Range Limit	**23.6**	23.9	29.1	dB
Noise Floor	14.4	14.8	20.0	dB

Results

LA_{eq}	60.0 dB	
LAE	90.8 dB	
EA	133.793 µPa²h	
EA8	3.208 mPa²h	
EA40	16.039 mPa²h	
$LA_{peak\ (max)}$	2020-09-28 11:37:26	91.1 dB
LAS_{max}	2020-09-28 11:18:29	70.1 dB
LAS_{min}	2020-09-28 11:23:03	58.1 dB
SEA	-99.9 dB	

Summary

File Name on Meter	LxT_Data.894
File Name on PC	SLM_0004005_LxT_Data_894.00.ldbin
Serial Number	0004005
Model	SoundTrack LxT®
Firmware Version	2.402
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2020-09-28 11:48:47
Stop	2020-09-28 12:09:58
Duration	00:21:11.2
Run Time	00:20:00.2
Pause	00:01:11.0
Pre Calibration	2020-09-28 09:08:30
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	FF:RI		
Integration Method	Linear		
Overload	127.6 dB		
	A	**C**	**Z**
Under Range Peak	**76.1**	73.1	78.1 dB
Under Range Limit	**23.6**	23.9	29.1 dB
Noise Floor	14.4	14.8	20.0 dB

Results

LA_{eq}	59.5 dB	
LAE	90.3 dB	
EA	120.147 µPa²h	
EA8	2.883 mPa²h	
EA40	14.415 mPa²h	
$LA_{peak\ (max)}$	2020-09-28 12:03:17	89.4 dB
LAS_{max}	2020-09-28 12:06:23	73.5 dB
LAS_{min}	2020-09-28 11:57:27	51.0 dB
SEA	-99.9 dB	

Summary

File Name on Meter	LxT_Data.895
File Name on PC	SLM_0004005_LxT_Data_895.00.ldbin
Serial Number	0004005
Model	SoundTrack LxT®
Firmware Version	2.402
User	
Location	
Job Description	
Note	

Measurement

Description	
Start	2020-09-28 12:14:30
Stop	2020-09-28 12:36:07
Duration	00:21:36.5
Run Time	00:20:00.3
Pause	00:01:36.2
Pre Calibration	2020-09-28 09:08:30
Post Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRMLxT1L		
Microphone Correction	FF:RI		
Integration Method	Linear		
Overload	127.6 dB		
	A	**C**	**Z**
Under Range Peak	**76.1**	73.1	78.1 dB
Under Range Limit	**23.6**	23.9	29.1 dB
Noise Floor	14.4	14.8	20.0 dB

Results

LAeq	63.7 dB	
LAE	94.5 dB	
EA	311.443 µPa²h	
EA8	7.473 mPa²h	
EA40	37.364 mPa²h	
LApeak (max)	2020-09-28 12:15:47	102.0 dB
LASmax	2020-09-28 12:15:47	86.4 dB
LASmin	2020-09-28 12:29:58	51.4 dB
SEA	-99.9 dB	

Photograph 1. ST-1

Photograph 2. ST-1

Photograph 3. ST-2

Photograph 4. ST-3

Photograph 5. ST-3

Appendix B

Construction Noise Analysis

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/11/2020
Case Description: Demo

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
apts	Residential	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	165	0
Front End Loader	No	40		79.1	165	0
All Other Equipment > 5 HP	No	50	85		165	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator		70.3	66.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader		68.7	64.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP		74.6	71.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	74.6	73.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
hotel pool	Commercial	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	425	10
Front End Loader	No	40		79.1	425	10
All Other Equipment > 5 HP	No	50	85		425	10

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator		52.1	48.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader		50.5	46.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP		56.4	53.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	56.4	55.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/11/2020

Case Description: grading

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
apts	Residential	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	180	0
Scraper	No	40		83.6	180	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader		68	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper		72.5	68.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	72.5	69.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
hotel pool	Commercia	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	400	10
Scraper	No	40		83.6	400	10

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader		51	47.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Scraper		55.5	51.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	55.5	52.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/11/2020

Case Description: building construction

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
apts	Residential	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	180	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Front End Loader		68	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	68	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
hotel pool	Commercia	10	10	10

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
			Equipment			
Front End Loader	No	40		79.1	400	10

Results

Equipment		Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq	Noise Limit Exceedance (dBA) Day Lmax	Leq	Evening Lmax	Leq	Night Lmax	Leq
Front End Loader		51	47.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	51	47.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/11/2020
Case Description: utilities

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
apts	Residential	10	10	10

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
			Equipment			
Excavator	No	40		80.7	180	0
Front End Loader	No	40		79.1	180	0
Backhoe	No	40		77.6	180	0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	69.6	65.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	68	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	66.4	62.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	69.6	69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
hotel pool	Commercia	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	400	10
Front End Loader	No	40		79.1	400	10
Backhoe	No	40		77.6	400	10

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	52.6	48.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	51	47.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	49.5	45.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	52.6	52	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/11/2020

Case Description: Street Paving

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
apts	Residential	10	10	10

	Impact		Equipment Spec Lmax	Actual Lmax	Receptor Distance	Estimated Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Paver	No	50		77.2	180	0
Roller	No	20		80	180	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver		66.1	63.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		68.9	61.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	68.9	65.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
hotel pool	Commercia	10	10	10

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	400	10
Roller	No	20		80	400	10

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Paver		49.2	46.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		51.9	44.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	51.9	48.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Appendix C

Traffic Noise Modeling

This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

**** Type in yellow cells only.**

Existing

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Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number **#**	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				74,700	5	Generic - Average Roadway ("Varia	50	50	**75.8**	**76.5**	**75.1**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				76,300	5	Generic - Average Roadway ("Varia	50	50	**75.9**	**76.6**	**75.2**
3	**Main Street**	**MacArthur to Gillette**	S				33,800	5	Generic - Average Roadway ("Varia	45	50	**71.1**	**71.7**	**70.3**
4	**Main Street**	**Gillette to Von Karman**	S				33,800	5	Generic - Average Roadway ("Varia	45	50	**71.1**	**71.7**	**70.3**
5	**Main Street**	**Von Karman to Cartwright**	S				22,300	5	Generic - Average Roadway ("Varia	45	50	**69.3**	**69.9**	**68.5**
6	**Main Street**	**Cartwright to Jamboree**	S				22,300	5	Generic - Average Roadway ("Varia	45	50	**69.3**	**69.9**	**68.5**
7	**Cartwright Road**	**south of Main**	S				3,200	4	Generic - Local (From Local/Lodi)	40	50	**59.8**	**60.2**	**58.1**
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This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

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Existing with Project

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				74,800	5	Generic - Average Roadway ("Varia	50	50	**75.9**	**76.5**	**75.1**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				76,300	5	Generic - Average Roadway ("Varia	50	50	**75.9**	**76.6**	**75.2**
3	**Main Street**	**MacArthur to Gillette**	S				33,900	5	Generic - Average Roadway ("Varia	45	50	**71.1**	**71.7**	**70.3**
4	**Main Street**	**Gillette to Von Karman**	S				33,900	5	Generic - Average Roadway ("Varia	45	50	**71.1**	**71.7**	**70.3**
5	**Main Street**	**Von Karman to Cartwright**	S				22,500	5	Generic - Average Roadway ("Varia	45	50	**69.3**	**70.0**	**68.6**
6	**Main Street**	**Cartwright to Jamboree**	S				22,500	5	Generic - Average Roadway ("Varia	45	50	**69.3**	**70.0**	**68.6**
7	**Cartwright Road**	**south of Main**	S				3,500	4	Generic - Local (From Local/Lodi)	40	50	**60.2**	**60.6**	**58.5**
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This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

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Short-Term

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				75,200	5	Generic - Average Roadway ("Varia	50	50	**75.9**	**76.5**	**75.1**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				80,600	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.8**	**75.4**
3	**Main Street**	**MacArthur to Gillette**	S				36,400	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.0**	**70.6**
4	**Main Street**	**Gillette to Von Karman**	S				39,200	5	Generic - Average Roadway ("Varia	45	50	**71.7**	**72.4**	**71.0**
5	**Main Street**	**Von Karman to Cartwright**	S				28,700	5	Generic - Average Roadway ("Varia	45	50	**70.4**	**71.0**	**69.6**
6	**Main Street**	**Cartwright to Jamboree**	S				26,500	5	Generic - Average Roadway ("Varia	45	50	**70.0**	**70.7**	**69.3**
7	**Cartwright Road**	**south of Main**	S				6,100	4	Generic - Local (From Local/Lodi)	40	50	**62.6**	**63.0**	**60.9**
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This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

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Short-Term With Project

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Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	Height min. 7 ft. max. 32 ft.	Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				75,300	5	Generic - Average Roadway ("Varia	50	50	**75.9**	**76.5**	**75.1**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				80,600	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.8**	**75.4**
3	**Main Street**	**MacArthur to Gillette**	S				36,500	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				39,300	5	Generic - Average Roadway ("Varia	45	50	**71.7**	**72.4**	**71.0**
5	**Main Street**	**Von Karman to Cartwright**	S				28,700	5	Generic - Average Roadway ("Varia	45	50	**70.4**	**71.0**	**69.6**
6	**Main Street**	**Cartwright to Jamboree**	S				26,500	5	Generic - Average Roadway ("Varia	45	50	**70.0**	**70.7**	**69.3**
7	**Cartwright Road**	**south of Main**	S				6,100	4	Generic - Local (From Local/Lodi)	40	50	**62.6**	**63.0**	**60.9**
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This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

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Short-Term With Pending

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				74,600	5	Generic - Average Roadway ("Varia	50	50	**75.8**	**76.5**	**75.1**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				79,600	5	Generic - Average Roadway ("Varia	50	50	**76.1**	**76.8**	**75.4**
3	**Main Street**	**MacArthur to Gillette**	S				36,700	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				39,000	5	Generic - Average Roadway ("Varia	45	50	**71.7**	**72.3**	**70.9**
5	**Main Street**	**Von Karman to Cartwright**	S				29,100	5	Generic - Average Roadway ("Varia	45	50	**70.4**	**71.1**	**69.7**
6	**Main Street**	**Cartwright to Jamboree**	S				26,200	5	Generic - Average Roadway ("Varia	45	50	**70.0**	**70.6**	**69.2**
7	**Cartwright Road**	**south of Main**	S				6,200	4	Generic - Local (From Local/Lodi)	40	50	**62.6**	**63.1**	**61.0**
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This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

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Short-Term With Project - Pending

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Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				74,600	5	Generic - Average Roadway ("Varia	50	50	**75.8**	**76.5**	**75.1**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				79,600	5	Generic - Average Roadway ("Varia	50	50	**76.1**	**76.8**	**75.4**
3	**Main Street**	**MacArthur to Gillette**	S				36,800	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				39,100	5	Generic - Average Roadway ("Varia	45	50	**71.7**	**72.4**	**70.9**
5	**Main Street**	**Von Karman to Cartwright**	S				28,100	5	Generic - Average Roadway ("Varia	45	50	**70.3**	**70.9**	**69.5**
6	**Main Street**	**Cartwright to Jamboree**	S				26,100	5	Generic - Average Roadway ("Varia	45	50	**70.0**	**70.6**	**69.2**
7	**Cartwright Road**	**south of Main**	S				6,100	4	Generic - Local (From Local/Lodi)	40	50	**62.6**	**63.0**	**60.9**
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Long-Range

ICF INTERNATIONAL

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Distance feet, min. 33 max. 1000	Sound Levels at Receiver Locations dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				81,900	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.9**	**75.5**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				92,200	5	Generic - Average Roadway ("Varia	50	50	**76.8**	**77.4**	**76.0**
3	**Main Street**	**MacArthur to Gillette**	S				36,600	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				40,300	5	Generic - Average Roadway ("Varia	45	50	**71.8**	**72.5**	**71.1**
5	**Main Street**	**Von Karman to Cartwright**	S				29,700	5	Generic - Average Roadway ("Varia	45	50	**70.5**	**71.2**	**69.8**
6	**Main Street**	**Cartwright to Jamboree**	S				28,200	5	Generic - Average Roadway ("Varia	45	50	**70.3**	**70.9**	**69.5**
7	**Cartwright Road**	**south of Main**	S				6,700	4	Generic - Local (From Local/Lodi)	40	50	**63.0**	**63.4**	**61.3**
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Long-Range With Project

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER			Total Daily Traffic Volumes **(ADT)**	Traffic Mix		Vehicle Speed	Sound Levels at Receiver Locations			
				Present 1=yes	Height min. 7 ft. max. 32 ft.	Distance 35 ft. or 100 ft.		Number #	Description	mph max. 80	Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				81,900	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.9**	**75.5**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				92,200	5	Generic - Average Roadway ("Varia	50	50	**76.8**	**77.4**	**76.0**
3	**Main Street**	**MacArthur to Gillette**	S				36,600	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				40,300	5	Generic - Average Roadway ("Varia	45	50	**71.8**	**72.5**	**71.1**
5	**Main Street**	**Von Karman to Cartwright**	S				29,700	5	Generic - Average Roadway ("Varia	45	50	**70.5**	**71.2**	**69.8**
6	**Main Street**	**Cartwright to Jamboree**	S				28,200	5	Generic - Average Roadway ("Varia	45	50	**70.3**	**70.9**	**69.5**
7	**Cartwright Road**	**south of Main**	S				6,700	4	Generic - Local (From Local/Lodi)	40	50	**63.0**	**63.4**	**61.3**
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Long-Range Pending

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				82,600	5	Generic - Average Roadway ("Varia	50	50	**76.3**	**76.9**	**75.5**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				92,100	5	Generic - Average Roadway ("Varia	50	50	**76.8**	**77.4**	**76.0**
3	**Main Street**	**MacArthur to Gillette**	S				36,600	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				40,400	5	Generic - Average Roadway ("Varia	45	50	**71.9**	**72.5**	**71.1**
5	**Main Street**	**Von Karman to Cartwright**	S				30,000	5	Generic - Average Roadway ("Varia	45	50	**70.6**	**71.2**	**69.8**
6	**Main Street**	**Cartwright to Jamboree**	S				28,300	5	Generic - Average Roadway ("Varia	45	50	**70.3**	**70.9**	**69.5**
7	**Cartwright Road**	**south of Main**	S				6,800	4	Generic - Local (From Local/Lodi)	40	50	**63.0**	**63.5**	**61.4**
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Long-Range With Project Pending

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				82,600	5	Generic - Average Roadway ("Varia	50	50	**76.3**	**76.9**	**75.5**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				92,100	5	Generic - Average Roadway ("Varia	50	50	**76.8**	**77.4**	**76.0**
3	**Main Street**	**MacArthur to Gillette**	S				36,700	5	Generic - Average Roadway ("Varia	45	50	**71.4**	**72.1**	**70.7**
4	**Main Street**	**Gillette to Von Karman**	S				40,500	5	Generic - Average Roadway ("Varia	45	50	**71.9**	**72.5**	**71.1**
5	**Main Street**	**Von Karman to Cartwright**	S				30,000	5	Generic - Average Roadway ("Varia	45	50	**70.6**	**71.2**	**69.8**
6	**Main Street**	**Cartwright to Jamboree**	S				28,300	5	Generic - Average Roadway ("Varia	45	50	**70.3**	**70.9**	**69.5**
7	**Cartwright Road**	**south of Main**	S				6,800	4	Generic - Local (From Local/Lodi)	40	50	**63.0**	**63.5**	**61.4**
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Buildout

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Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				80,500	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.8**	**75.4**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				88,900	5	Generic - Average Roadway ("Varia	50	50	**76.6**	**77.2**	**75.8**
3	**Main Street**	**MacArthur to Gillette**	S				35,100	5	Generic - Average Roadway ("Varia	45	50	**71.2**	**71.9**	**70.5**
4	**Main Street**	**Gillette to Von Karman**	S				38,500	5	Generic - Average Roadway ("Varia	45	50	**71.6**	**72.3**	**70.9**
5	**Main Street**	**Von Karman to Cartwright**	S				28,800	5	Generic - Average Roadway ("Varia	45	50	**70.4**	**71.0**	**69.6**
6	**Main Street**	**Cartwright to Jamboree**	S				27,100	5	Generic - Average Roadway ("Varia	45	50	**70.1**	**70.8**	**69.4**
7	**Cartwright Road**	**south of Main**	S				6,400	4	Generic - Local (From Local/Lodi)	40	50	**62.8**	**63.2**	**61.1**
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Buildout With Project

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number **#**	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	Jamboree Road	Main Street to I-405 NB Ramps	S				80,500	5	Generic - Average Roadway ("Varia	50	50	76.2	76.8	75.4
2	Jamboree Road	I-405 NB Ramps to I-405 SB Ramps	S				88,900	5	Generic - Average Roadway ("Varia	50	50	76.6	77.2	75.8
3	Main Street	MacArthur to Gillette	S				35,100	5	Generic - Average Roadway ("Varia	45	50	71.2	71.9	70.5
4	Main Street	Gillette to Von Karman	S				38,500	5	Generic - Average Roadway ("Varia	45	50	71.6	72.3	70.9
5	Main Street	Von Karman to Cartwright	S				28,800	5	Generic - Average Roadway ("Varia	45	50	70.4	71.0	69.6
6	Main Street	Cartwright to Jamboree	S				27,100	5	Generic - Average Roadway ("Varia	45	50	70.1	70.8	69.4
7	Cartwright Road	south of Main	S				6,400	4	Generic - Local (From Local/Lodi)	40	50	62.8	63.2	61.1
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Buildout Pending

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER Present 1=yes	BARRIER Height min. 7 ft. max. 32 ft.	BARRIER Distance 35 ft. or 100 ft.	Total Daily Traffic Volumes **(ADT)**	Traffic Mix Number #	Traffic Mix Description	Vehicle Speed mph max. 80	Sound Levels at Receiver Locations: Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				81,800	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.9**	**75.5**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				90,500	5	Generic - Average Roadway ("Varia	50	50	**76.7**	**77.3**	**75.9**
3	**Main Street**	**MacArthur to Gillette**	S				35,200	5	Generic - Average Roadway ("Varia	45	50	**71.3**	**71.9**	**70.5**
4	**Main Street**	**Gillette to Von Karman**	S				38,800	5	Generic - Average Roadway ("Varia	45	50	**71.7**	**72.3**	**70.9**
5	**Main Street**	**Von Karman to Cartwright**	S				29,200	5	Generic - Average Roadway ("Varia	45	50	**70.4**	**71.1**	**69.7**
6	**Main Street**	**Cartwright to Jamboree**	S				27,400	5	Generic - Average Roadway ("Varia	45	50	**70.2**	**70.8**	**69.4**
7	**Cartwright Road**	**south of Main**	S				6,500	4	Generic - Local (From Local/Lodi)	40	50	**62.8**	**63.3**	**61.2**
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Buildout With Project Pending

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Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER			Total Daily Traffic Volumes **(ADT)**	Traffic Mix		Vehicle Speed	Sound Levels at Receiver Locations			
				Present 1=yes	Height min. 7 ft. max. 32 ft.	Distance 35 ft. or 100 ft.		Number #	Description	mph max. 80	Distance feet, min. 33 max. 1000	dB Ldn	dB CNEL	dBA Leq1h (loudest hour)
1	**Jamboree Road**	**Main Street to I-405 NB Ramps**	S				81,800	5	Generic - Average Roadway ("Varia	50	50	**76.2**	**76.9**	**75.5**
2	**Jamboree Road**	**I-405 NB Ramps to I-405 SB Ramps**	S				90,500	5	Generic - Average Roadway ("Varia	50	50	**76.7**	**77.3**	**75.9**
3	**Main Street**	**MacArthur to Gillette**	S				35,300	5	Generic - Average Roadway ("Varia	45	50	**71.3**	**71.9**	**70.5**
4	**Main Street**	**Gillette to Von Karman**	S				38,900	5	Generic - Average Roadway ("Varia	45	50	**71.7**	**72.3**	**70.9**
5	**Main Street**	**Von Karman to Cartwright**	S				29,200	5	Generic - Average Roadway ("Varia	45	50	**70.4**	**71.1**	**69.7**
6	**Main Street**	**Cartwright to Jamboree**	S				27,400	5	Generic - Average Roadway ("Varia	45	50	**70.2**	**70.8**	**69.4**
7	**Cartwright Road**	**south of Main**	S				6,500	4	Generic - Local (From Local/Lodi)	40	50	**62.8**	**63.3**	**61.2**
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