PRESENTATION HIGH SCHOOL MASTER PLAN NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

Presentation High School is a private school for girls located on an approximately 8.8-acre site at 2281 Plummer Avenue in suburban San José. The campus is bordered by Booksin Avenue on the west and Plummer Avenue on the east. The first phase of the Master Plan proposes to demolish the existing student center and chapel buildings and a portion of the existing main classroom building, and construct a new 14,330-square foot, two-level multi-purpose building and a new 15,822-square foot, two-level student union building. Subsequent phases would include the demolition the remainder of the existing main classroom building and construction of a new facilities building, a new science/arts building, a new chapel, a new classroom building, and a new administration/classroom building. As buildings are constructed, parking areas would be reconfigured and expanded, and a new plaza, courtyard areas, and landscaping would be installed. The enrollment at the school would increase from 750 students to 850 students, and the faculty would increase to 110 employees.

This report evaluates the project's potential to result in significant environmental noise or vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency section discusses land use compatibility utilizing noise and vibration-related policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the impacts to a less than significant level.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its

intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA DNL with open windows and 65-70 dBA DNL if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first

row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA DNL. At a DNL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the DNL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a DNL of 60-70 dBA. Between a DNL of 70-80 dBA, each additional decibel increases the percentage of the population highly annoyed by about 3 percent. People appear to respond more adversely to aircraft noise. When the DNL is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne

vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of 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. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting 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 frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, DNL or L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

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

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background – Noise

The State of California and the City of San José have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project

would expose people residing or working in the project area to excessive noise levels;

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Pursuant to recent court decisions, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise identified in Checklist Question (a) is not included in the Impacts and Mitigation Section of this report. This item is discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan. Checklist items (a) through (d) are applicable in the assessment of potential impacts resulting from the proposed project at off-site receptors. Checklist items (e) and (f) are not applicable to this project because the project is not located within an airport land use plan, is not within two miles of an airport, and is not in the vicinity of a private air strip.

CEQA does not define what noise level increase would be considered substantial. Typically, an increase in the DNL noise level resulting from the project at noise sensitive land uses of 3 dBA or greater would be considered a significant impact when projected noise levels would exceed those considered acceptable for the affected land use. An increase of 5 dBA DNL or greater would be considered a significant impact when projected noise levels would remain within those considered acceptable for the affected land use.

2016 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). The sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA DNL noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\,(1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people

through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The following policies are applicable to the proposed project:

EC-1.1 Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state, and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:

Interior Noise Levels

- The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL. Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this standard. For sites with exterior noise levels of 60 dBA DNL or more, an acoustical analysis following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency over the life of this plan.

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:

    - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San José

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE (DNL IN DECIBELS (DBA)) 55 60 65 70 75 80
1. Residential, Hotels and Motels, Hospitals and Residential Care[1]	
2. Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds	
3. Schools, Libraries, Museums, Meeting Halls, Churches	
4. Office Buildings, Business Commercial, and Professional Offices	
5. Sports Arena, Outdoor Spectator Sports	
6. Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters	

[1]Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

Normally Acceptable:

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

Conditionally Acceptable:

- Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

Unacceptable:

- New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

EC-1.2 Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain "Normally Acceptable;" or
- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the "Normally Acceptable" level.

EC-1.3 Mitigate noise generation of new nonresidential land uses to 55 dBA DNL at the property line when located adjacent to existing or planned noise-sensitive residential and public/quasi-public land uses.

EC-1.6 Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City's Municipal Code.

EC-1.7 Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City's Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

- For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

City of San José Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.30.700 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit. This code is not explicit in terms of the acoustical descriptor associated with the noise level limit. However, a reasonable interpretation of this standard, which is based on policy EC-1.3 of the City's General Plan, would identify the ambient base noise level criteria as a day-night average noise level (DNL).

Chapter 20.100.450 of the Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

Chapter 20.40.500 of the Municipal Code prohibits outdoor activity, including loading, sweeping, landscaping or maintenance, which occurs within 150 feet of any residentially zoned property, between the hours of 12:00 a.m. midnight and 6:00 a.m.

Regulatory Background – Vibration

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies to achieve the goal of minimizing vibration impacts on people, residences, and business operations in the City of San José. The following policies are applicable to the proposed project:

EC-2.3 Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to a building. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Existing Noise Environment

The project site is located at 2281 Plummer Avenue in San José, and is generally bordered by residential land uses. Figure 1 show the project site plan overlaid on an aerial image of the site vicinity. Single-family residences are located adjacent to the project site to the north and south, as well as to the west, opposite Booksin Avenue, and to the east, opposite Plummer Avenue. A rehabilitation and nursing healthcare center is located adjacent to the project site to the south, and a church and an elementary and middle school are located adjacent to the project site to the north.

A noise monitoring survey was performed to quantify and characterize ambient noise levels at the site and in the project vicinity between Tuesday, January 30, 2018 and Friday, February 2, 2018. The monitoring survey included two long-term noise measurements (LT-1 and LT-2) and four short-term measurements (ST-1 through ST-4), as shown in Figure 1. The noise environment at the site and at the nearby land uses in the project vicinity results primarily from school activities and vehicular traffic along Plummer Avenue and Booksin Avenue.

Long-term noise measurement LT-1 was made next to 2266 Plummer Avenue, approximately 25 feet east of the roadway centerline. This location was selected to quantify noise levels due to traffic along Plummer Avenue. Hourly average noise levels at this location ranged from 56 to 65 dBA L_{eq} during the day and from 45 to 65 dBA L_{eq} at night. The day-night average noise level from Tuesday, January 30, 2018 through Friday, February 2, 2018 ranged from 62 to 63 dBA DNL. The daily trends in noise levels at LT-1 are shown in Appendix A.

Long-term noise measurement LT-2 was made along the northern boundary of the project site, approximately 190 feet west of the Plummer Avenue centerline. This location was selected to quantify noise levels near the closest residential receptors. Hourly average noise levels at this location ranged from 47 to 68 dBA L_{eq} during the day and from 40 to 56 dBA L_{eq} at night. During the 2:00 p.m. hour on Wednesday, January 31, 2018, there was an instance where the average hourly noise level was 5 to 10 dB higher than the typical mid-day noise levels. This noise level was likely due to an atypical, long-lasting noise source in the area, such as landscape activities. Adjustments were made in the calculation of the DNL to exclude the atypical data and more accurately reflect typical mid-day noise levels. The day-night average noise level from Tuesday, January 30, 2018 through Friday, February 2, 2018 ranged from 55 to 56 dBA DNL. The daily trends in noise levels at LT-2 are shown in Appendix A.

Short-term noise measurements ST-1 through ST-3 were conducted on Tuesday, January 30, 2018 in ten-minute intervals starting at 12:10 p.m. and concluding at 1:00 p.m. ST-1 was made near the southeast corner of the project site, approximately 55 feet west of the Plummer Avenue centerline. This location was selected to quantify noise levels due to vehicle traffic on the southern side of the

project site. The 10-minute average noise level measured at this location was 54 dBA L_{eq}. During the measurement at ST-1, an aircraft passing overhead produced a maximum noise level of 58 dBA L_{max}. Short-term noise measurement ST-2 was made near the southeast corner of the school's theater, approximately 415 feet west of the Plummer Avenue centerline. This location was selected to quantify noise levels due to school activities near the closest sensitive receptors. The 10-minute average noise level measured at this location was 44 dBA L_{eq}. Short-term noise measurement ST-3 was made in front of 2262 Plummer Avenue, approximately 25 feet east of the roadway centerline. This location was selected to quantify noise levels due to vehicle traffic on the northern side of the project site, closer to the main roadway. The 10-minute average noise level measured at this location was 58 dBA L_{eq}. During the measurement at ST-3, a heavy-duty truck passing by produced maximum noise levels of 75 dBA L_{max}.

Short-term noise measurement ST-4 consisted of two consecutive 10-minute measurements between 12:50 p.m. and 1:10 p.m. on Friday, February 2, 2018. ST-4 was made near the center of the playing field on the western section of the project site, approximately 215 feet east of the Booksin Avenue centerline. This location was selected to quantify noise levels due to school activities on the playing field. The 10-minute average noise levels measured at this location were both 55 dBA L_{eq}. During the measurement at ST-4, school children on the playing field during the lunch period produced maximum noise levels ranging from 68 to 71 dBA L_{max}. Table 4 summarizes the results of the short-term measurements.

TABLE 4 Summary of Short-Term Noise Measurement Data (dBA)

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: Southeast corner of project site. (1/30/2018, 12:10 p.m. - 12:20 p.m.)	68	66	58	47	45	54
ST-2: Southeast corner of school's theater. (1/30/2018, 12:30 p.m. - 12:40 p.m.)	62	51	47	42	40	44
ST-3: In front of 2262 Plummer Ave. (1/30/2018, 12:50 p.m. - 1:00 p.m.)	75	69	61	47	43	58
ST-4a: Center of playing field. (2/2/2018, 12:50 p.m. - 1:00 p.m.)	71	65	57	53	50	55
ST-4b: Center of playing field. (2/2/2018, 1:00 p.m. - 1:10 p.m.)	66	63	57	53	50	55

FIGURE 1 Noise Measurement Locations

Source: Google Earth

PLAN CONSISTENCY ANALYSIS – NOISE AND LAND USE COMPATIBILITY

Noise and Land Use Compatibility Thresholds

The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for the proposed school use (Table EC-1).

- The California Green Building Code limits interior noise levels within new non-residential land uses to an hourly equivalent noise level ($L_{eq\,(1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

Future Exterior Noise Environment

The ambient noise environment at the project site ranges from 55 to 63 dBA DNL. The future noise environment at the project site would continue to result primarily from vehicular traffic along Plummer Avenue and Booksin Avenue. Traffic data was gathered for the proposed project by *Hexagon Transportation Consultants, Inc*. According to this traffic data, the future background plus project conditions are expected to increase traffic noise levels along the surrounding roadways by less than 1 dBA DNL. To estimate the future noise environment at the project site, this increase in noise levels due to increased traffic volumes is applied to the results of the existing measurements described above. Therefore, at 25 feet from the centerline of Plummer Avenue, the future unmitigated noise level would be up to 64 dBA DNL (LT-1) and at 190 feet from the centerline of Plummer Avenue, the future unmitigated noise level would be up to 57 dBA DNL (LT-2).

New outdoor use areas for the proposed project would include a ground floor courtyard between the classrooms, administration, science/arts, and chapel buildings (eastern courtyard), a ground floor courtyard between the student union, classrooms, chapel, and facilities buildings (middle courtyard), a ground floor courtyard between the multi-purpose and student union buildings (western courtyard), a 2nd floor outdoor deck on the east side of the student union building, and a 2nd floor outdoor deck between the multi-purpose and student union buildings. Typically, the exterior noise standards established by the City are evaluated at the center of each space.

The center of the ground floor eastern courtyard would be approximately 195 feet from the centerline of Plummer Avenue. The future exterior noise level at this courtyard would be up to 57 dBA DNL assuming no intervening shielding. The center of the ground floor middle courtyard would be approximately 350 feet from the centerline of Plummer Avenue. The future exterior noise levels at this courtyard would be up to 52 dBA DNL assuming no intervening shielding. The center of the 2nd floor outdoor deck on the east side of the student union building would be approximately 410 feet from the centerline of Plummer Avenue. The future exterior noise levels at this deck would be up to 50 dBA DNL assuming no intervening shielding. The ground floor western courtyard and 2nd floor outdoor deck between the multi-purpose and student union buildings would be approximately 525 feet from the centerline of Plummer Avenue. The future exterior noise levels at this courtyard and deck would be up to 48 dBA DNL assuming no intervening shielding. The ground floor courtyards and outdoor decks would be mostly shielded from transportation related noise sources by the proposed school buildings or perimeter. When accounting for the acoustical shielding, future exterior noise levels at the courtyards and 2nd floor decks proposed by the project would be well below the 60 dBA DNL. Exterior noise levels at the acoustically shielded outdoor use areas would be considered compatible with the proposed land use.

Future Interior Noise Environment

The State of California requires interior noise levels to be maintained at 50 dBA $L_{eq(1\text{-}hr)}$ or less during hours of operation at the proposed school land use. School buildings would be approximately 60 feet west of the Plummer Avenue centerline. At this distance, school uses along

the eastern façades of the proposed administration and science/art buildings would be exposed to future exterior noise levels ranging from 48 to 61 dBA $L_{eq(1\text{-}hr)}$ during daytime hours.

Interior noise levels would vary depending on the final design of the buildings (relative window area to wall area) and construction materials and methods. Standard construction materials for a school building, with sound-rated performance windows/doors, and the incorporation of an adequate forced air mechanical ventilation system, typically provide 25 to 30 dBA of noise reduction from exterior facades to interior spaces with windows closed. Assuming standard school construction methods with the windows and doors closed, interior noise levels are calculated to range from 23 to 36 dBA $L_{eq(1\text{-}hr)}$ during daytime hours, which would be below the Cal Green Code standard of 50 dBA $L_{eq(1\text{-}hr)}$.

Policy EQ3.0. P1 of the 2009 California Collaborative for High-Performance Schools Best Practices Manual states that unoccupied public school classrooms must have a maximum background noise level of no more than 45 dBA L_{eq}. However, it strongly encourages districts and designers to move beyond these prerequisites and achieve background noise levels of 35 dBA L_{eq} for all classrooms.

Although not required, this analysis recommends the attainment of the noise level thresholds contained in the 2009 California Collaborative for High-Performance Schools Best Practices Manual. To achieve the interior noise level thresholds, exterior noise levels would need to be reduce by at least 16 dBA to reach the 45 dBA L_{eq} interior classroom standard and reduced by at least 26 dBA to reach the encouraged 35 dBA L_{eq} interior classroom goal. Standard construction materials, sound-rated performance windows/doors, and the incorporation of an adequate forced air mechanical ventilation system would reduce levels to the 45 dBA L_{eq} interior classroom standard. Sound-insulating wall construction, high performance sound-rated windows/doors, and the incorporation of an adequate forced air mechanical ventilation system would reduce levels to the 35 dBA L_{eq} interior classroom goal.

The following available measures could be considered during final design to reduce interior noise levels to acceptable levels per the High-Performance Schools Best Practices Manual:

- Provide a suitable form of forced-air mechanical ventilation in buildings throughout the site, as determined by the local building official, so that windows can be kept closed to control interior noise and achieve acceptable or desired interior noise levels.

- Confirm the final specifications for noise insulation during the design of the project. In addition to sound-rated windows and doors, other treatments may include, but are not limited to; sound rated exterior wall construction methods, acoustical caulking, insulation, acoustical vents, etc.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Noise Levels in Excess of Standards:** A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.

- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings. Groundborne vibration levels exceeding 0.08 in/sec PPV would have the potential to result in cosmetic damage to sensitive historic structures.

- **Project-Generated Traffic Noise Increases:** A significant impact would be identified if traffic generated by the project would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.

- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: **Noise Levels in Excess of Standards.** The proposed project could generate noise levels in excess of standards established in the City's General Plan and Municipal Code at the nearby sensitive receptors. **This is a potentially significant impact.**

Construction Noise

Chapter 20.100.450 of the City's Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence. This analysis

assumes that construction activities will occur only during the allowable hours. Project construction will be consistent with the code limits and the impact is less-than-significant.

Mechanical Equipment Noise

The proposed project would include mechanical equipment, such as heating, ventilation, and air conditioning systems. Information regarding the number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. The design plan for Phase I indicates mechanical and utility rooms located on the interior of the ground floor of the multi-purpose building and student union as well as a facility building. Although not indicated on the plans, rooftop mechanical equipment is often used in similar buildings. Due to the number of variables inherent in the mechanical equipment needs of the project (number and types of units, size, housing, specs, location, etc.), the impacts of mechanical equipment noise on nearby noise-sensitive uses should be assessed during the final project design stage. Design planning should take into account the noise criteria associated with such equipment and utilize site planning to locate equipment in less noise-sensitive areas. Other controls could include, but shall not be limited to, fan silencers, enclosures, and screen walls.

The nearest noise-sensitive uses to the project site include the adjacent health care center to the south, the adjacent residences to the north, and the residences to the east opposite Plummer Avenue. Under the City's Noise Element and Municipal Codes, noise levels produced by the operation of the mechanical equipment would be limited to 55 dBA DNL at receiving noise-sensitive land uses. Given the close proximity of noise-sensitive uses to the project site and lack of sufficient details about the mechanical equipment, mechanical enclosures, and rooftop locations, there is the potential for noise from mechanical equipment to exceed 55 dBA DNL at noise-sensitive land uses in the immediate project vicinity. The final design plans should be reviewed by a qualified acoustical consultant to address any potential conflicts. This is a potentially significant impact.

Parking and Circulation Noise

Intermittent noise from vehicles accessing the parking lots must meet the project generated noise threshold established in the City's General Plan and Municipal Code. The surrounding noise-sensitive land uses are currently exposed to the parking lot noise and will continue to be exposed to the parking lot noise with the addition of parking spaces. The existing northern and southern parking lots have current day-night average noise level up to 56 dBA DNL on the school side of the existing noise barrier.

According to the site plan, the parking lot to the north of the proposed classrooms building and the parking lot south of the proposed science/arts building would be expanded to provide additional parking spaces. The northern parking lot would increase from approximately 88 to 110 spaces and the southern parking lot would increase from approximately 20 to 40 spaces. Despite the increase in parking spaces, the use of the parking areas would not change times or durations. Therefore, the total new parking spaces were compared to the existing parking spaces to calculate the relative increase in operational noise levels. The permanent noise level increase due to the project-generated parking space increase at the northern parking lot would be about 1 dBA at noise-

sensitive receptors to the north. The doubling of parking spaces within the southern parking lot would increase noise levels by about 3 dBA at noise-sensitive receptors to the south. The noise increase attributable to additional parking spaces would offset because the travel way would be moved about twice the distance away from the receptors. The minor changes made to the parking lots would not be substantial enough to increase the day-night average noise level given the few hours per day when the parking lot is heavily used. In addition, noise from the new parking areas would continue to be shielded by the existing 6-foot solid wall located between the school and adjacent properties, which is estimated to provide approximately 5 dBA of acoustical shielding. Therefore, parking lot noise levels with the project would not substantially increase with the project and would remain below the 55 dBA DNL threshold on the residential side of the noise barrier. This is a less-than-significant impact.

Mitigation Measure 1:

The following mitigation measures shall be included in the project to reduce the impact to a less-than-significant level:

- Prior to the issuance of building permits, mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's requirements. A qualified acoustical consultant shall be retained by the project applicant to review mechanical noise as the equipment systems are selected in order to determine specific noise reduction measures necessary to reduce noise to comply with the City's 55 dBA DNL noise limit at the shared property line. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/installation of noise barriers such as enclosures and parapet walls to block the line of sight between the noise source and the nearest receptors.

Impact 2: **Exposure to Excessive Groundborne Vibration due to Construction.** Construction-related vibration levels would exceed the 0.2 in/sec PPV threshold at nearest sensitive receptors. **This is a potentially significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include demolition, site preparation work, grading and excavation, trenching, paving, and new building framing and finishing. This analysis assumes the proposed project would not require pile driving, which can cause excessive vibration.

According to Policy EC-2.3 of the City of San José General Plan, a vibration limit of 0.08 in/sec PPV shall be used to minimize the potential for cosmetic damage to sensitive historical structures, and a vibration limit of 0.2 in/sec PPV shall be used to minimize damage at buildings of normal conventional construction. With no known historical buildings in the vicinity of the project site, a significant impact would occur if nearby buildings were exposed to vibration levels in excess of 0.2 in/sec PPV.

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock

drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)
Pile Driver (Impact)	upper range	1.158
	typical	0.644
Pile Driver (Sonic)	upper range	0.734
	typical	0.170
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

The nearest sensitive receptors would be the adjacent health care center located approximately 20 feet to the south of the project construction area. At this distance, vibration levels due to construction activities would be up to 0.27 in/sec PPV, which would be above the 0.2 in/sec PPV threshold. Other sensitive receptors near the project construction area include the adjacent residences located approximately 50 feet north and the residences opposite Plummer Avenue approximately 70 feet east. At these distances, vibration levels due to construction activities would be up to 0.1 in/sec PPV, which would be below the 0.2 in/sec PPV threshold. The adjacent school land uses would be located approximately 140 feet to the north of the project construction area. At this distance, vibration levels due to construction activities would be up to 0.03 in/sec PPV, which would be below the 0.2 in/sec PPV threshold. Although construction vibration levels would be below the threshold for most of the sensitive receptors and school land uses, construction vibration levels would be above the threshold at the nearest sensitive receptors to the south. This is a potentially significant impact.

Mitigation Measure 2:

The following measures are recommended to reduce vibration impacts from construction activities:

- Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or excavation using clam shell or chisel drops, within 30 feet of any adjacent

building.

- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

- The above vibration plan shall be submitted to the Supervising Planner at PBCE prior to issuance of a grading plan.

The implementation of these mitigation measures would reduce the impact to a less-than-significant level.

Impact 3: **Substantial Permanent Noise Increase.** Project-generated traffic and school activities would not cause a permanent noise level increases at existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

A significant noise impact would occur if traffic or activities generated by the project would substantially increase noise levels at sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater. Noise-sensitive land uses along Plummer Avenue are exposed to noise levels greater than 60 dBA DNL; therefore, a significant impact at these receptors would occur if project-generated noise would permanently increase noise levels by 3 dBA DNL. Noise-sensitive land uses along Elkhorn Court are exposed to noise levels less than 60 dBA DNL; therefore, a significant impact at these receptors would occur if project-generated noise would permanently increase noise levels by 5 dBA DNL.

Traffic Noise

The traffic data provided peak hour volumes for the project-generated traffic at local and major roadways in the immediate project vicinity. Traffic volume information was reviewed to calculate the permanent noise increase attributable to project-generated traffic. Traffic volumes under the Existing Plus Project, Background, and Background Plus Project scenarios were compared to the Existing scenario to calculate the relative increase in the hourly average traffic noise level (L_{eq}) attributable to the proposed project. The change in the DNL would be the same as the change in the peak hour L_{eq} given that the hourly distribution of traffic and mix of vehicles is expected to be similar to the existing traffic. As shown in Table 6, the permanent noise level increases due to this project-generated traffic would be less than 1 dBA DNL at noise-sensitive receptors in project vicinity. For reference, traffic volumes would have to double for noise levels to increase by 3 dBA DNL. Therefore, the proposed project would not cause a substantial permanent traffic noise level increase at the nearby noise-sensitive receptors.

TABLE 6 Traffic Noise Level Increase

Intersection	Existing Plus Project Noise Level Increase	Background Noise Level Increase	Background Plus Project Noise Level Increase
Booksin Ave, South of Curtner Ave	0.0	0.0	0.2
Plummer Ave, South of Curtner Ave	0.1	-0.1	0.1
Curtner Ave, Between Booksin Ave and Plummer Ave	0.0	0.2	0.2

School Activity Noise

The enrollment at the school would increase from 750 students to 850 students, and the faculty would increase to 110 employees. Despite the increase in school population, the schedule of classes, ringing of bells or alarms, outside activity time (lunch or gym class), and before or after school outdoor activities (sport practices) would not change times or durations. Therefore, the new school population was compared to the existing population to calculate the relative permanent noise increase. The permanent noise level increase due to the increase in students and faculty would be less than 1 dBA DNL at noise-sensitive receptors in project vicinity. Therefore, the proposed project would not cause a substantial permanent noise level increase at the nearby noise-sensitive receptors.

Mitigation Measure 3: None required.

Impact 4: Substantial Temporary Noise Increase due to Construction. Existing noise-sensitive land uses would be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a potentially significant impact**.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time. This analysis assumes the proposed project construction, with its four building phases, would occur for more than a year.

Policy EC-1.7 of the City's General Plan requires that all construction operations within the City use best available noise suppression devices and techniques and to limit construction hours near residential uses per the Municipal Code allowable hours, which are between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday and none on weekends when construction occurs within 500 feet of a residential land use. Further, the City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading,

excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

While noise thresholds for temporary construction are not provided in the City's General Plan or Municipal Code, the Fundamentals section of this report provides a threshold of 45 dBA for speech interference indoors. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant if project construction activities exceeded 60 dBA L_{eq} at nearby residences and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

The noise-sensitive receptors (residences) to the east of the project site would have existing daytime ambient noise levels similar to the noise levels recorded at LT-1. Based on these data, the average hourly noise level during construction hours would range from 56 to 65 dBA L_{eq}. The noise-sensitive receptors to the north and south of the project site would have existing daytime ambient noise levels similar to the data collected at LT-2. Average hourly noise levels during construction hours range from 47 to 68 dBA L_{eq} at commercial receptors in the project vicinity.

Construction activities generate considerable amounts of noise, especially during earth-moving activities and during the construction of the building's foundation when heavy equipment is used. Typical hourly average construction-generated noise levels for school buildings are about 75 to 89 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.), as shown in Table 7. The typical range of maximum instantaneous noise levels would be 70 to 90 dBA L_{max} at a distance of 50 feet, as shown in Table 8.

TABLE 7 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 8 Construction Equipment 50-Foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

[1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

[3] Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

The proposed project is expected to take over a year to complete. Construction activities would include demolition, site preparation, excavation, grading, trenching, building construction, paving, and architectural coating. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. The hauling of excavated materials and construction materials would generate truck trips on local roadways as well.

The typical hourly average construction-generated noise levels for school buildings from Table 7 were used to estimate the range of construction noise levels expected at the nearby existing land uses. The estimates were calculated by measuring from the nearby receptors to the center of the closest proposed building.

Hourly average noise levels due to construction activities during busy construction periods outdoors would range from about 75 to 89 dBA L_{eq} at a distance of 50 feet. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. The nearest noise-sensitive land uses are approximately 80 feet and 150 feet from the center of the closest project building. At these distances, hourly average noise levels during busy construction periods would range from 71 to 85 dBA L_{eq} at the adjacent health care center and residences to the south, from 67 to 81 dBA L_{eq} at the residences to the east opposite Plummer Avenue, and from 65 to 79 dBA L_{eq} at the adjacent residences to the north. Construction noise levels at these noise-sensitive receptors would be expected to exceed 60 dBA L_{eq} and exceed the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive residential uses in the project vicinity for a period exceeding one year.

Construction noise levels from the project site would be expected to exceed thresholds at nearby noise-sensitive receptors. In addition, assuming project construction would last for a period of more than one year and considering that the project site is within 500 feet of existing residences, Policy EC-1.7 of the City's General Plan would consider this temporary construction impact to be potentially significant.

Mitigation Measure 4:

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Construction activities will be conducted in accordance with the provisions of the City's General Plan and the Municipal Code, which limits temporary construction work within 500 feet of residential land uses to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday. Construction is prohibited on weekends at sites located within 500 feet of residential units. Further, the City shall require the construction crew to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following available controls:

- In accordance with Policy EC-1.7 of the City's General Plan, utilize the best available noise suppression devices and techniques during construction activities.

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- A temporary noise control blanket barrier could be erected, if necessary, along building facades facing construction sites. This mitigation would only be necessary if conflicts occurred which were irresolvable by proper scheduling. Noise control blanket barriers can be rented and quickly erected.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

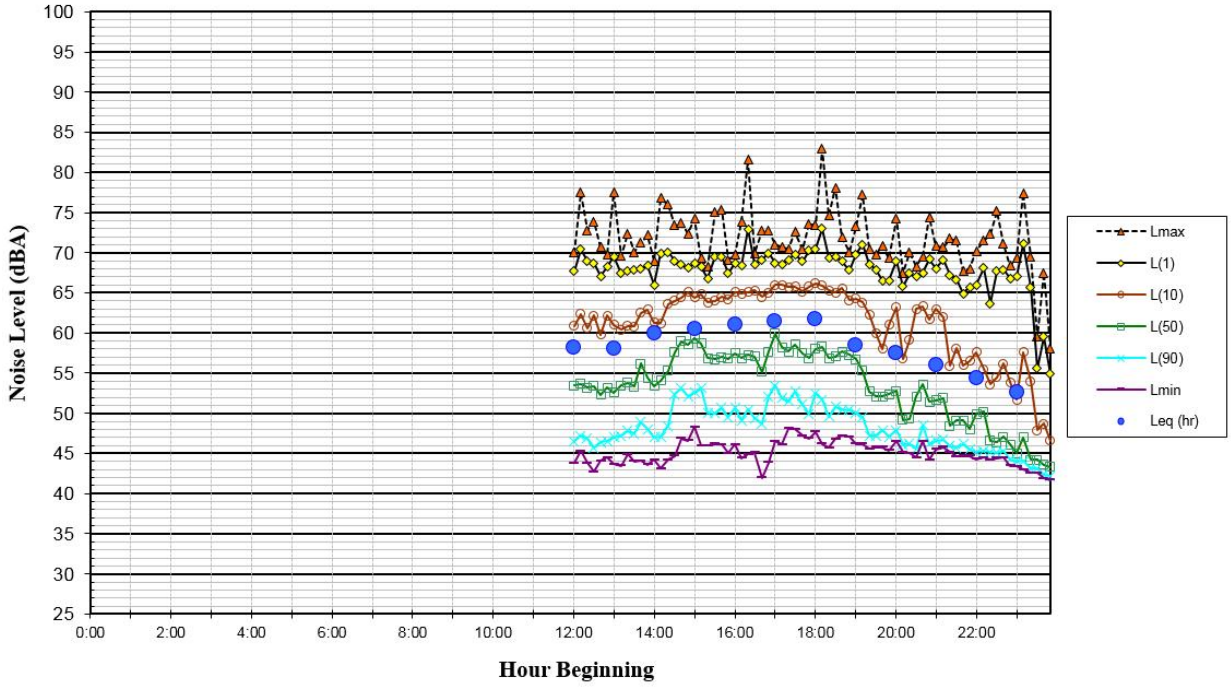
- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities and notify in writing all adjacent business, residences, and other noise-sensitive land uses of the construction schedule. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

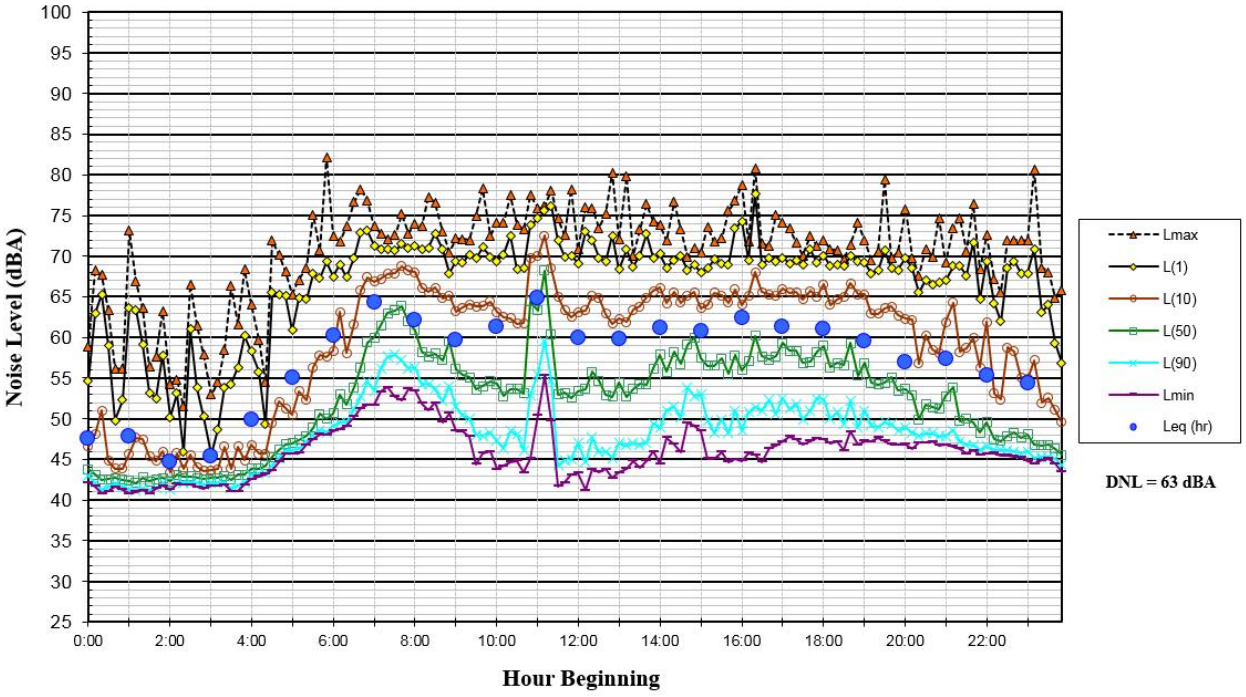
Implementation of the above measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures, and recognizing that noise generated by construction activities would occur over a short-term period, the temporary increase in ambient noise levels would be less-than-significant.

APPENDIX A: Daily Trend in Long Term Noise Levels

Noise Levels at Noise Measurement Site LT-1
Next to 2266 Plummer Ave, ~25 Feet East of Plummer Ave Centerline
Tuesday, January 30, 2018

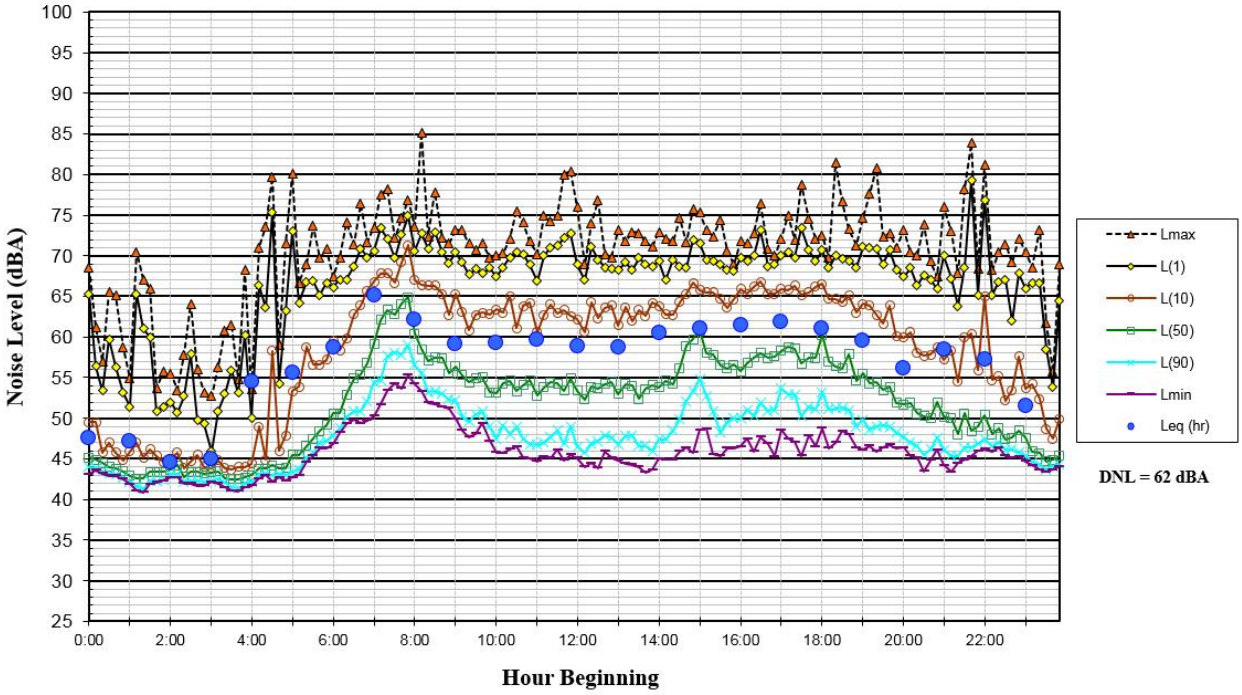


Noise Levels at Noise Measurement Site LT-1
Next to 2266 Plummer Ave, ~25 Feet East of Plummer Ave Centerline
Wednesday, January 31, 2018



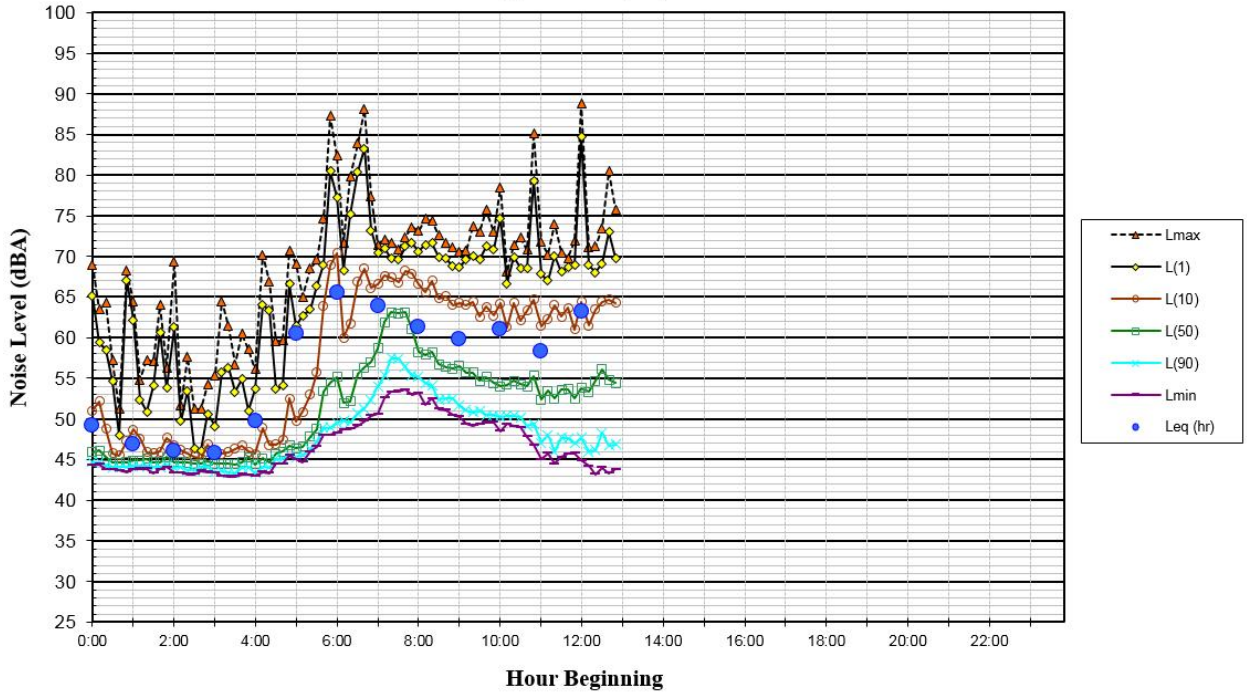
DNL = 63 dBA

Noise Levels at Noise Measurement Site LT-1
Next to 2266 Plummer Ave, ~25 Feet East of Plummer Ave Centerline
Thursday, February 1, 2018

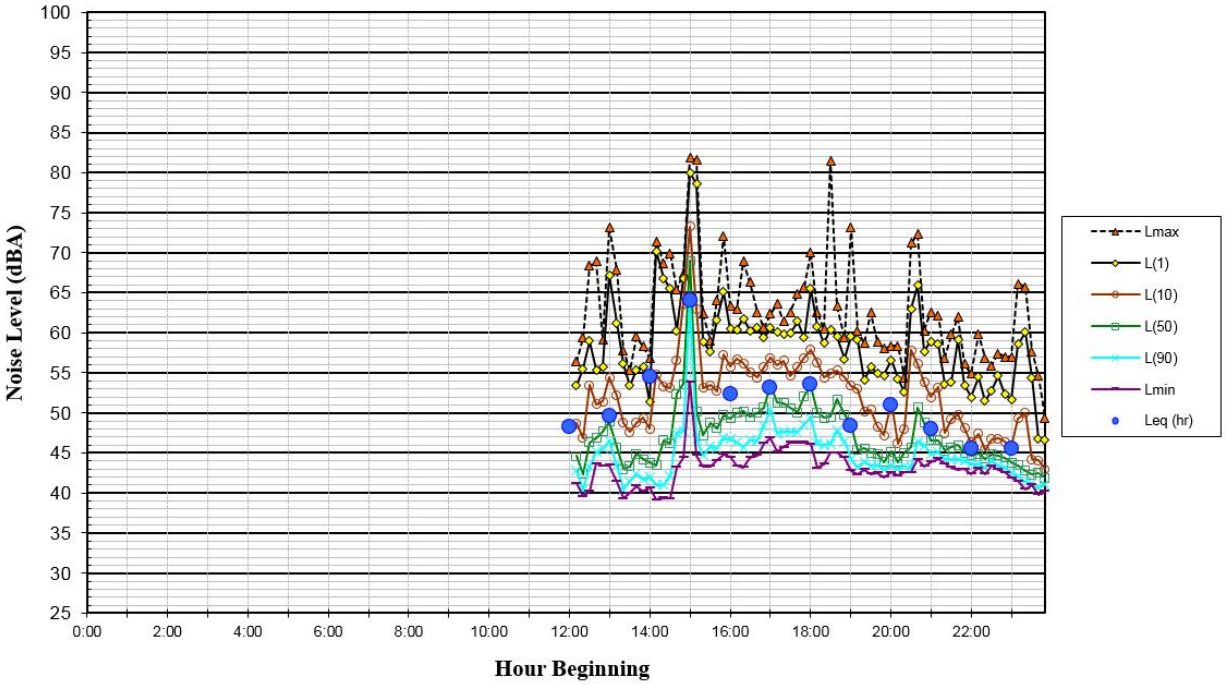


DNL = 62 dBA

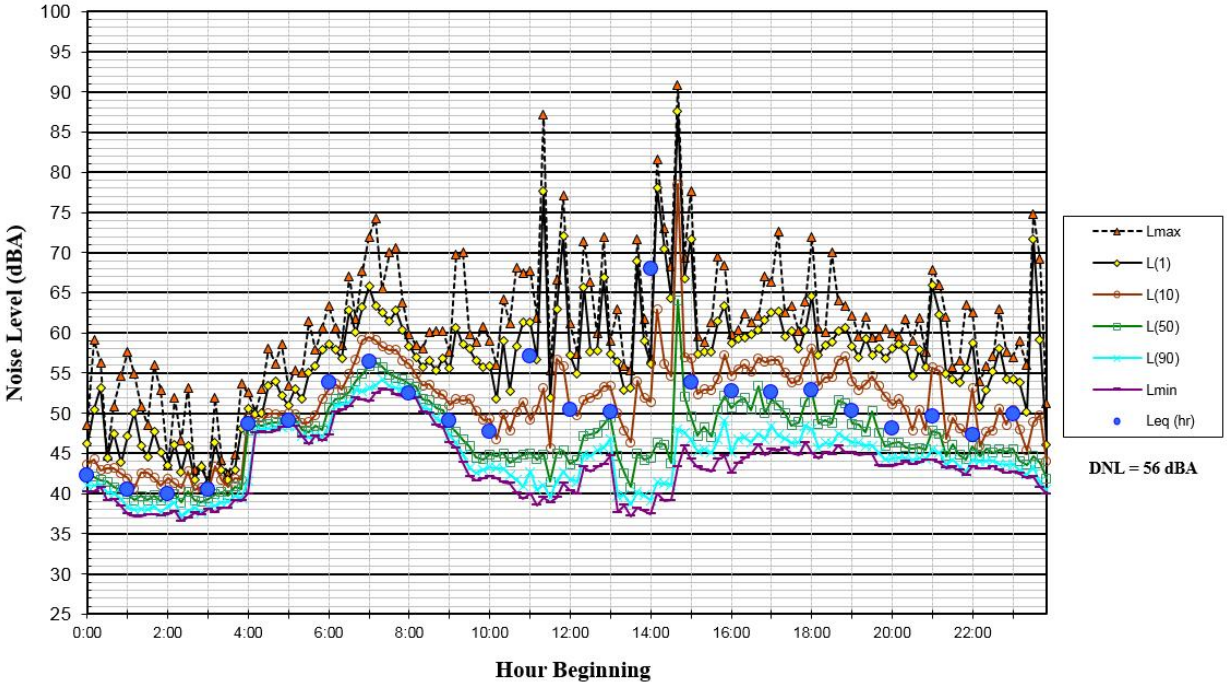
Noise Levels at Noise Measurement Site LT-1
Next to 2266 Plummer Ave, ~25 Feet East of Plummer Ave Centerline
Friday, February 2, 2018



Noise Levels at Noise Measurement Site LT-2
Along Northern Fence Line, ~190 Feet West of Plummer Ave Centerline
Tuesday, January 30, 2018

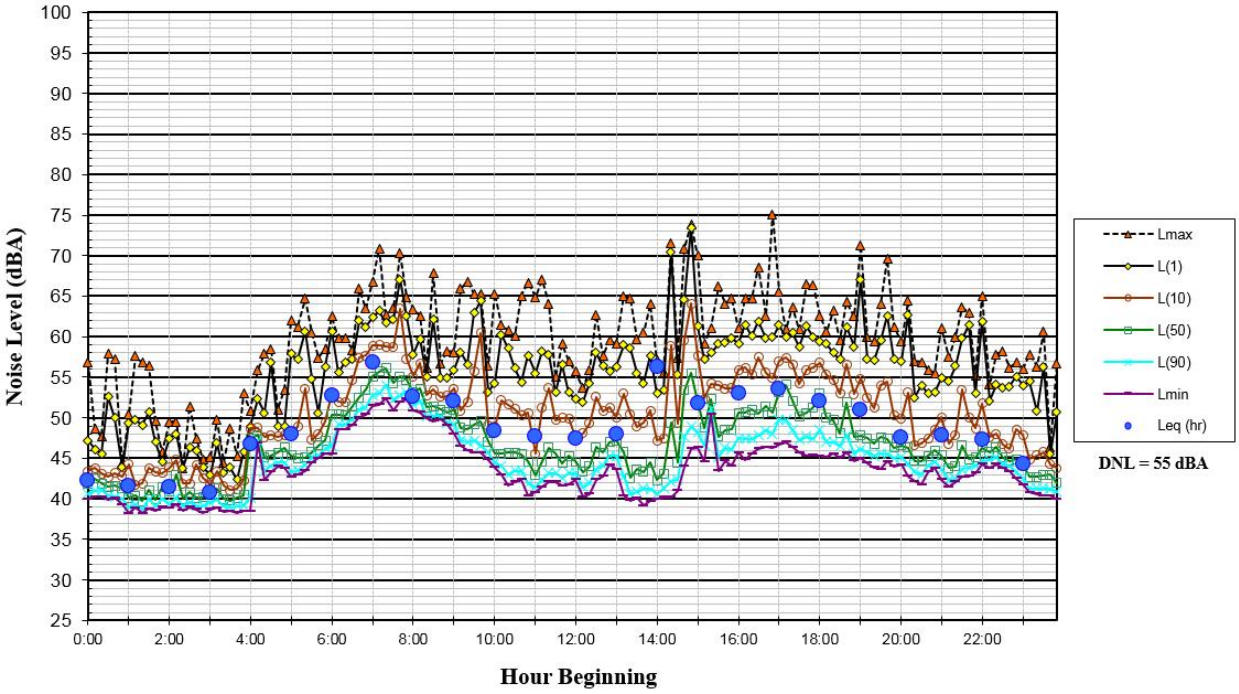


Noise Levels at Noise Measurement Site LT-2
Along Northern Fence Line, ~190 Feet West of Plummer Ave Centerline
Wednesday, January 31, 2018



DNL = 56 dBA

Noise Levels at Noise Measurement Site LT-2
Along Northern Fence Line, ~190 Feet West of Plummer Ave Centerline
Thursday, February 1, 2018



DNL = 55 dBA

Noise Levels at Noise Measurement Site LT-2
Along Northern Fence Line, ~190 Feet West of Plummer Ave Centerline
Friday, February 2, 2018