Appendix E

Noise & Vibration Assessment

4146 MITZI DRIVE RESIDENTIAL NOISE AND VIBRATION ASSESSMENT

San José, California

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I. INTRODUCTION

The project proposes to redevelop the 0.6-acre site at 4146 Mitzi Drive in San José, California. The proposed project would relocate the existing single-family structure located at the project site to construct a four-story apartment building comprising of 44 one-bedroom and studio units over a subterranean garage. After relocation, the existing structure would be converted into a multi-family building with six studio units. The proposed apartment building would include 61 vehicle stalls and a roof deck.

This report evaluates the project's potential to result in significant noise and 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 and vibration, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the Plan Consistency Section discusses noise and land use compatibility utilizing 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 of the project on sensitive receptors in the vicinity.

II. 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* (L_{dn} or *DNL*) 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 decibel increase increases by about 3 percent the percentage of the population highly annoyed. 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 or frequent intermittent vibration levels produce. The guidelines in Table 3 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

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 cause 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. 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.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and some old buildings” to “Modern industrial/commercial buildings”. 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.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at 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.

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, L_{dn} or DNL	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	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

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

Regulatory Background - Noise

The State of California, Santa Clara County, and the City of San José have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, California Building Code, Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan, and the City of San José General Plan are used to assess the potential significance of impacts. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines.
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) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

(b) Generation of excessive groundborne vibration or groundborne noise levels; or

(c) For a project located within the vicinity of a private airstrip or 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.

Pursuant to recent court decisions, the impacts of site constraints, such as exposure of the proposed project to excessive levels of noise and vibration, are not included in the Impacts and Mitigation

Section of this report. These items are discussed in a separate section addressing the project's consistency with the policies set forth in the City's General Plan.

2019 California Building Code, Title 24, Part 2.
The current version of the California Building Code (CBC) requires interior noise levels in multi-family residential units attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA DNL/CNEL in any habitable room.

Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan.
The Comprehensive Land Use Plan adopted by the Santa Clara County Airport Land Use Commission contains standards for projects within the vicinity of San José International Airport, which are relevant to this project:

4.3.2.1 Noise Compatibility Policies

Policy N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5 (2022 Aircraft Noise Contours).

Policy N-4 No residential or transient lodging construction shall be permitted within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL and there are no outdoor patios or outdoor activity areas associated with the residential portion of a mixed use residential project or a multi-unit residential project. (Sound wall noise mitigation measures are not effective in reducing noise generated by aircraft flying overhead.)

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-1.7 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.

EC-1.11 Require safe and compatible land uses within the Mineta San José International Airport noise zone (defined by the 65 CNEL contour as set forth in State law) and encourage aircraft operating procedures that minimize noise.

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 continuous vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, including ruins and ancient monuments or building that are documented to be structurally weakened, a continuous 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

continuous vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction. Equipment or activities typical of generating continuous vibration include but are not limited to: excavation equipment; static compaction equipment; vibratory pile drivers; pile-extraction equipment; and vibratory compaction equipment. Avoid use of impact pile drivers within 125 feet of any buildings, and within 300 feet of historical buildings, or buildings in poor condition. On a project-specific basis, this distance of 300 feet may be reduced where warranted by a technical study by a qualified professional that verifies that there will be virtually no risk of cosmetic damage to sensitive buildings from the new development during demolition and construction. Transient vibration impacts may exceed a vibration limit of 0.08 in/sec PPV only when and where warranted by a technical study by a qualified professional that verifies that there will be virtually no risk of cosmetic damage to sensitive buildings from the new development during demolition and construction.

Existing Noise Environment

The project site is located at 4146 Mitzi Drive in San José, California. Mitzi Drive bounds the site to the west, while Ranchero Way bounds the site to the south. Multi-family residential complexes share the property line to the north and east.

A noise monitoring survey was made by Illingworth & Rodkin, Inc. between Friday, July 19, 2019 and Wednesday, July 24, 2019. The monitoring survey included one long-term (LT-1) noise measurement and one short-term (ST-1) noise measurement. All measurement locations are shown in Figure 1. The existing noise environment at the project site results primarily from vehicular traffic on nearby roadways. Aircraft associated with Mineta San José International Airport are also audible at times.

Long-term noise measurement LT-1 was made approximately 75 feet from the center of the intersection of Mitzi Drive and Ranchero Way near the proposed location of the relocated historical house. Distant traffic was the primary source of noise affecting ambient noise levels, which typically ranged from 43 to 59 dBA L_{eq} during the day and from 38 to 51 dBA L_{eq} at night. The day-night average noise level from Saturday, July 20 through Tuesday, July 23, ranged from 50 to 51 dBA DNL. The daily trend in noise levels at LT-1 are shown in Figures 2 through 7.

Short-term noise measurement ST-1 was made over two consecutive 10-minute periods. This measurement was concurrent with the long-term noise data on Friday, July 19, 2019, between 12:20 p.m. and 12:40 p.m. The sound of light gusts of wind (10 to 15 mph) blowing through the palm trees was the predominant noise source at this location, with vehicle traffic from local roadways and occasional aircraft also contributing to the noise environment. Table 4 summarizes the data collected at the short-term measurement sites.

FIGURE 1 Noise Measurement Locations

Source: Google Earth 2019.

Noise Levels at Noise Measurement Site LT-1
75' from Center Intersection of Mitzi Dr. and Ranchero Way
Friday July 19, 2019

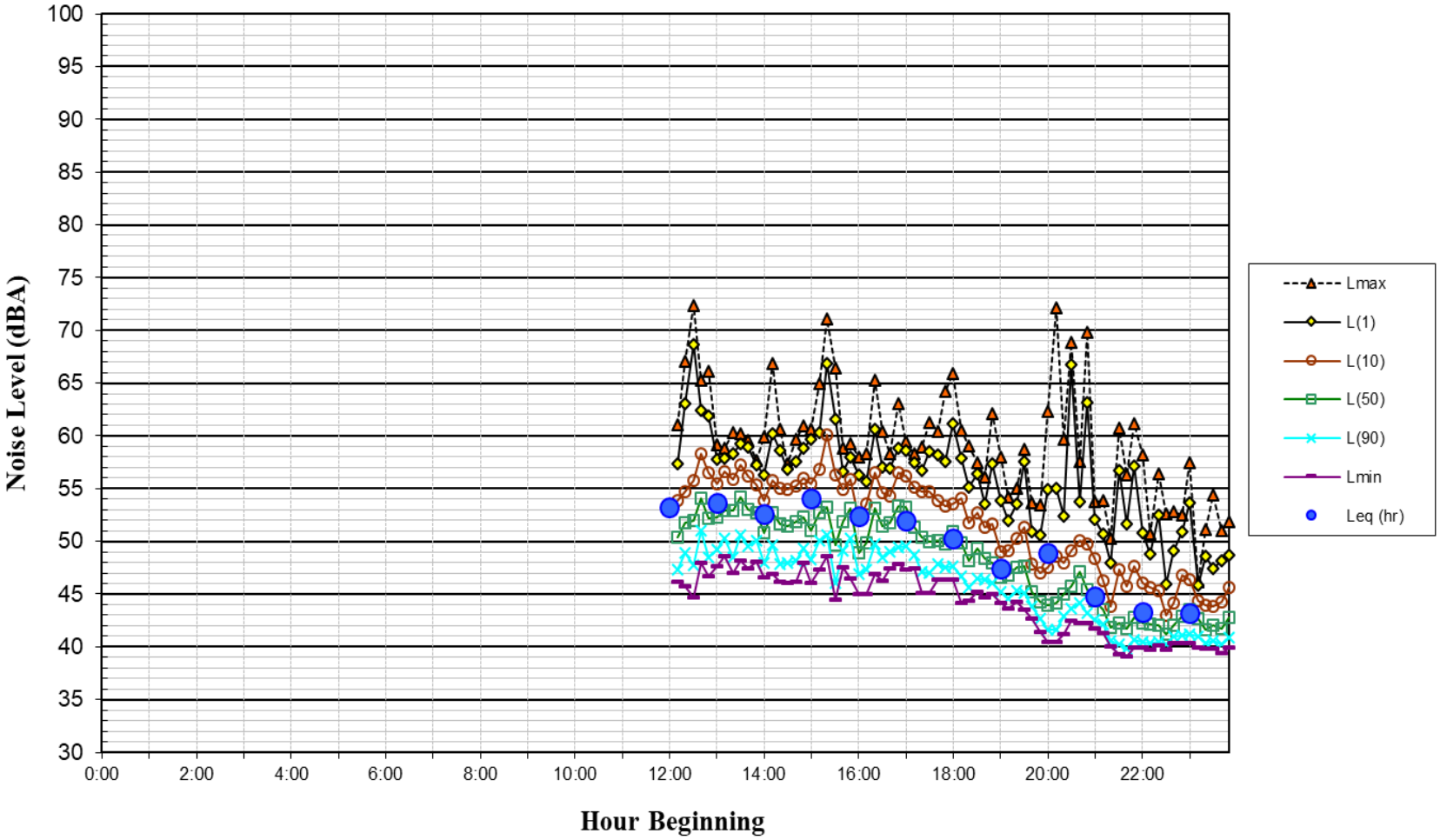


Figure 2

Noise Levels at Noise Measurement Site LT-1
75' from Center Intersection of Mitzi Dr. and Ranchero Way
Saturday, July 20, 2019

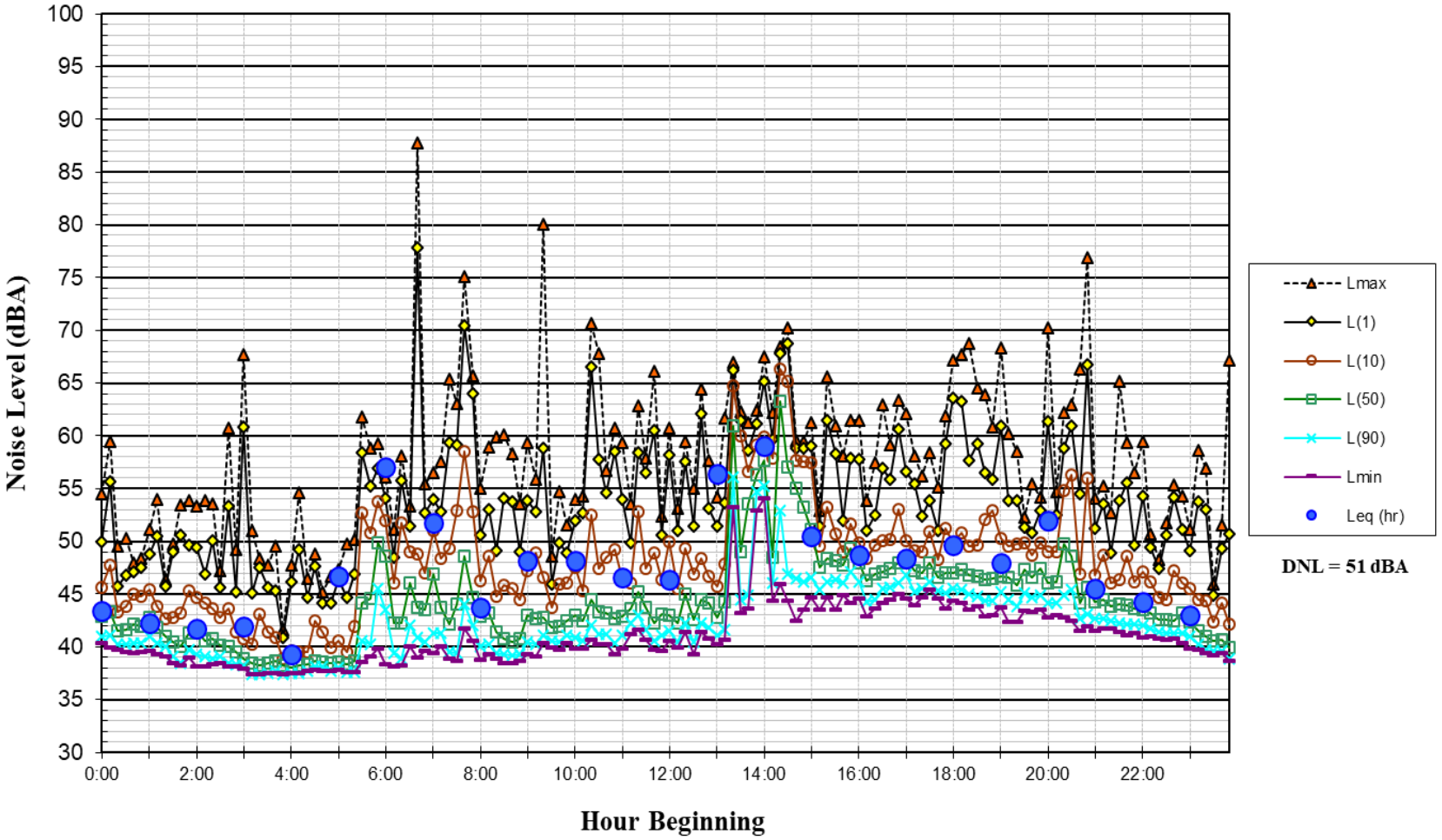


Figure 3

Noise Levels at Noise Measurement Site LT-1
75' from Center Intersection of Mitzi Dr. and Ranchero Way
Sunday, July 21, 2019

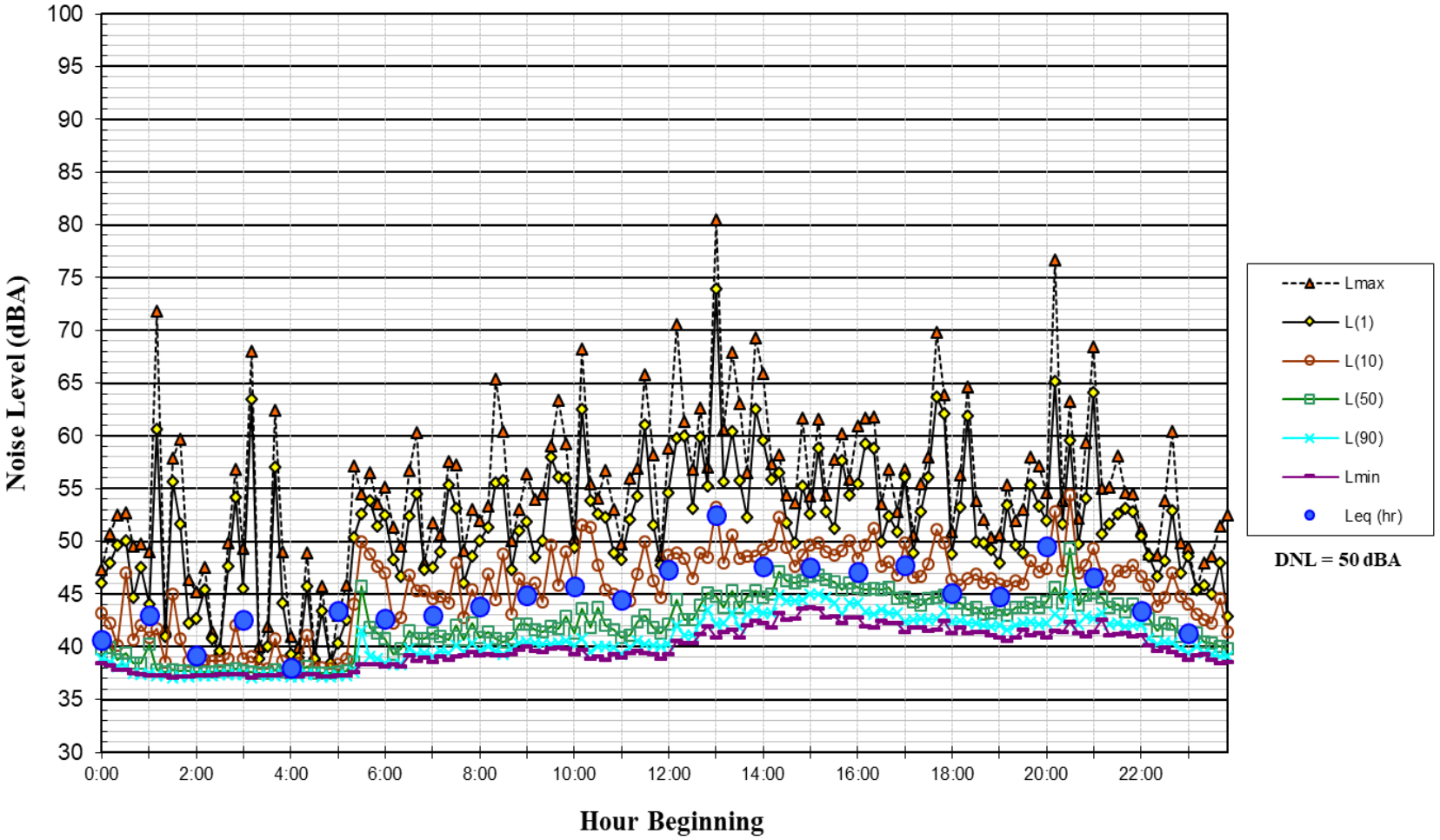


Figure 4

Noise Levels at Noise Measurement Site LT-1
75' from Center Intersection of Mitzi Dr. and Ranchero Way
Monday, July 22, 2019

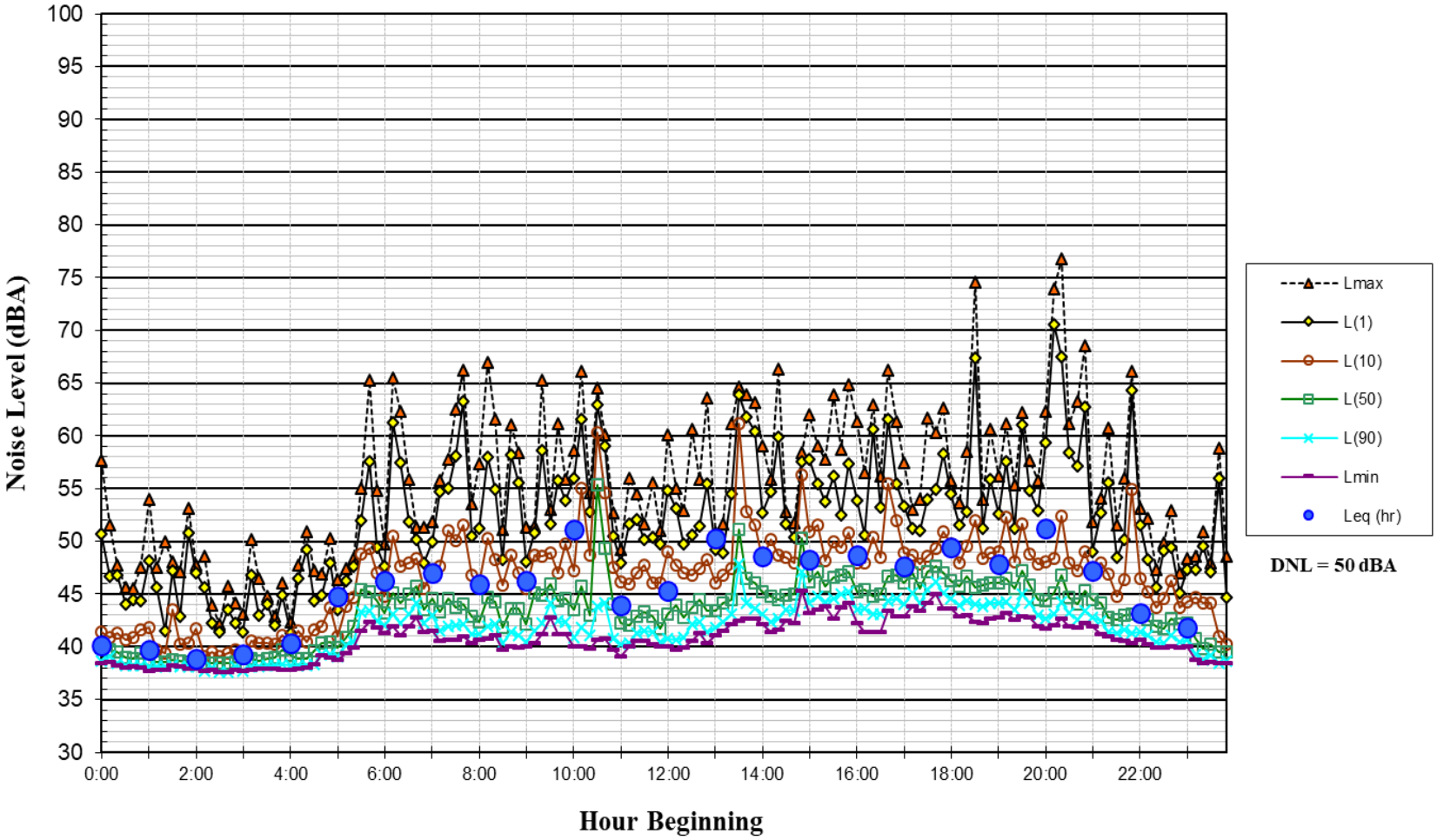
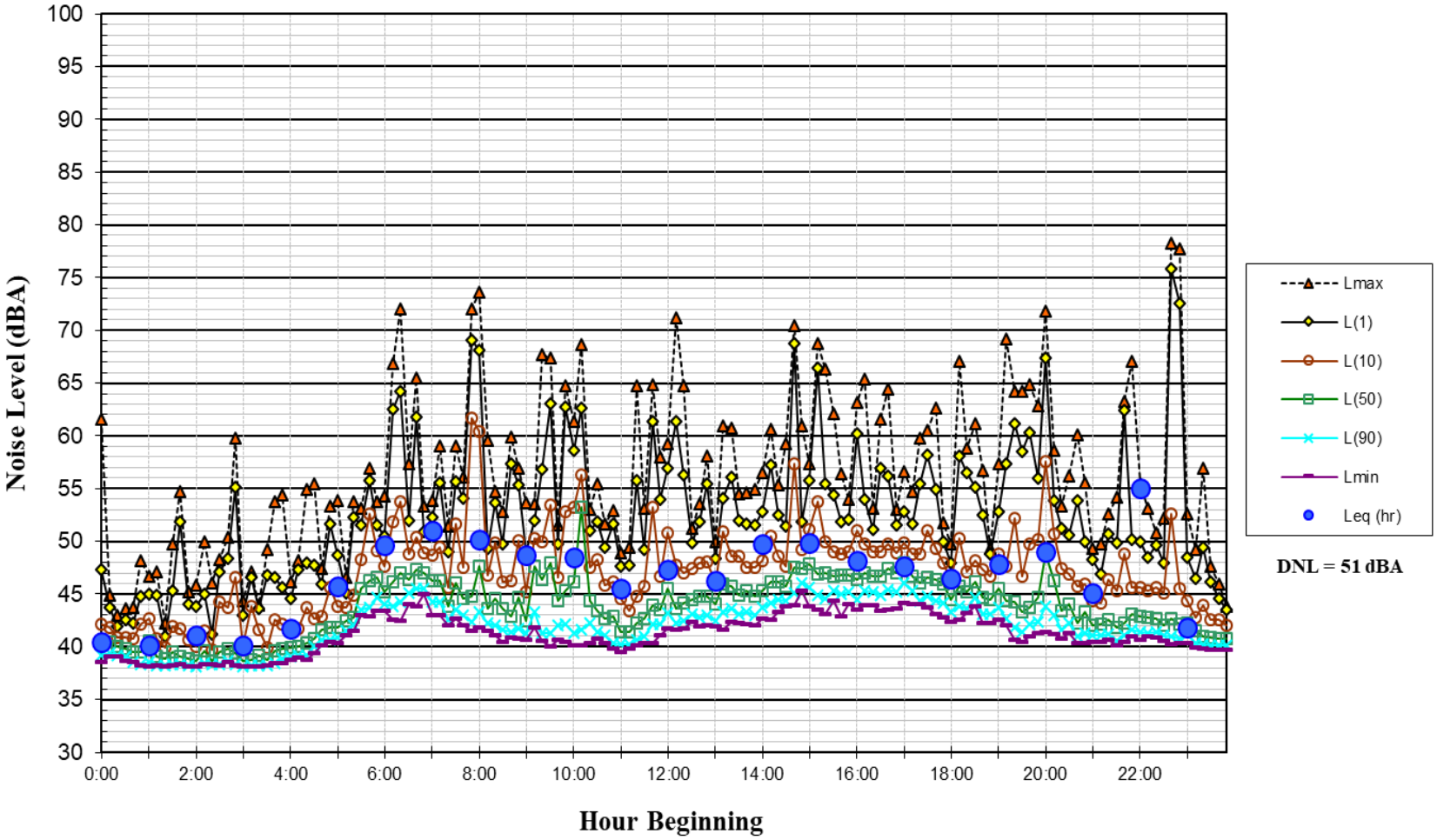


Figure 5

Noise Levels at Noise Measurement Site LT-1
75' from Center Intersection of Mitzi Dr. and Ranchero Way
Tuesday, July 23, 2019



DNL = 51 dBA

Figure 6

Noise Levels at Noise Measurement Site LT-1
75' from Center Intersection of Mitzi Dr. and Ranchero Way
Wednesday, July 24, 2019

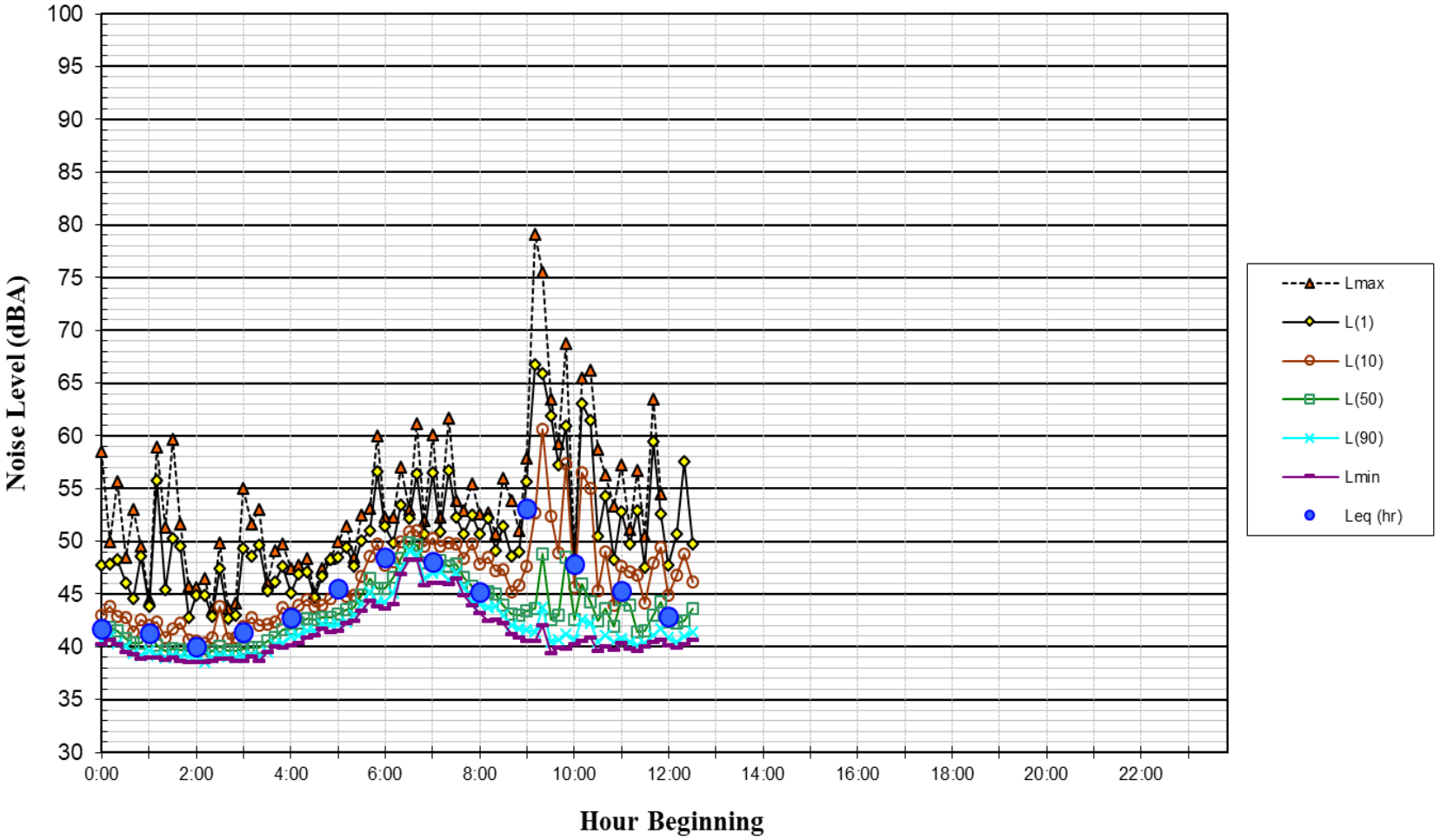


Figure 7

TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location (Date, Time)	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1a: Northeast corner of 4146 Mitzi Drive (7/19/19, 12:20-12:30 p.m.)	63	59	52	48	45	50
ST-1b: Northeast corner of 4146 Mitzi Drive (7/19/19, 12:30-12:40 p.m.)	60	57	52	48	44	49

III. PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The future noise environment at the project site would continue to result primarily from vehicular traffic along Mitzi Drive, Ranchero Way, and distant roadways. A traffic report was completed for the proposed project on November 29, 2018 by *Hexagon Transportation Consultants, Inc*.[1] Traffic noise levels along local roadways, including Mitzi Drive, Ranchero Way, and Piper Drive, are expected to increase by up to 1 dBA. Therefore, future noise levels would range from 51 to 52 dBA DNL at a distance of 75 feet from the centerline of the intersection of Mitzi Drive and Ranchero Way.

Future Exterior Noise Environment

The exterior noise threshold established in the City's General Plan for new multi-family residential projects is 60 dBA DNL at usable outdoor activity areas, excluding private balconies and porches.

One rooftop deck is planned as a common use space located above the fourth floor of the new residential building. Noise levels at the rooftop deck would be at or below exterior noise levels expected at LT-1, which would range from approximately 51 to 52 dBA DNL under future conditions. This would be below 60 dBA DNL and compatible with the City's General Plan threshold for exterior noise levels at multi-family residential land uses.

Future Interior Noise Environment

The State of California and the City of San José require that interior noise levels be maintained at 45 dBA DNL or less for residential land uses.

The proposed residential units facing the intersection of Mitzi Drive and Ranchero Way, within the relocated historic building, would be exposed to future exterior noise levels up to 52 dBA DNL. The southern façade of the proposed apartment building would also be exposed to future exterior noise levels up to 52 dBA DNL under worst-case conditions. Noise levels at the remaining residences would decrease with greater setbacks from Mitzi Drive and Ranchero Way.

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Assuming windows to be

[1] Hexagon Transportation Consultants, Inc., "4146 Mitzi Drive Residential Development," November 29, 2018.

partially open for ventilation, the interior noise levels for the proposed project would be up to 37 dBA DNL at the units facing the intersection of Mitzi Drive and Ranchero Way and at or below 37 dBA DNL for all other units. This is below 45 dBA DNL and compatible with the State of California and City of San José criteria for interior noise levels for residential land uses, assuming standard residential construction.

Should quieter noise levels be desired, the inclusion of forced-air mechanical ventilation is often the method selected to reduce interior noise levels by closing the windows to control noise. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces.

IV. NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site and that would exceed applicable noise standards presented in the General Plan or Municipal Code at existing noise-sensitive receptors surrounding the project site.

    - A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. The City of San José considers large or complex projects involving substantial noise-generating activities and lasting more than 12 months significant when within 500 feet of residential land uses or within 200 feet of commercial land uses or offices.

    - A significant permanent noise level increase would occur if project-generated traffic would result in: a) a noise level increase of 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) a noise level increase of 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.

    - 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.

- A significant impact would be identified if the construction of the project would generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant noise impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

Impact 1a: Temporary Construction Noise.
Existing noise-sensitive land uses would be exposed to a temporary increase in ambient noise levels due to project construction activities. The incorporation of construction best management practices as project conditions of approval would result in a **less-than-significant** temporary noise impact.

The potential for temporary noise impacts due to project construction activities would 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. Policy EC-1.7 of the City's General Plan requires that all construction operations within the City to 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 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.

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. The highest noise levels would be generated during grading, excavation, and foundation construction. The hauling of excavated materials and construction materials would generate truck trips on local roadways, as well.

A detailed list of construction equipment and phasing information was not available at the time of this study. Construction activities for individual projects are typically carried out in stages. 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, depending on the amount of equipment in operation and the location at which the equipment is operating at any given time. Typical construction noise levels are shown in Tables 5 and 6. Table 5 shows the maximum instantaneous noise levels for individual pieces of equipment as measured at a distance of 50 feet, and Table 6 shows the hourly average noise levels, by construction phase, when measured at a distance of 50 feet from the center of a busy construction site. Most demolition and construction noise falls within the range of 80 to 90 dBA L_{max} at a distance of 50 feet from the source, and typical hourly average noise levels would range from 65 to 88 dBA L_{eq} during construction of residential housing. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

TABLE 5 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.

TABLE 6 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.

Due to the size of the proposed project, it is expected that construction activities would occur for a period exceeding one year. Since the project site is located within 500 feet of existing residential land uses, this is a potentially significant impact.

Mitigation Measure 1a:

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.

- Utilize ‘quiet’ models of air compressors and other stationary noise sources where technology exists.

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

- Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from adjacent land uses. 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.

- Locate staging areas and construction material areas as far away as possible from adjacent land uses.

- Prohibit all unnecessary idling of internal combustion engines.

- 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.

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

The potential short-term noise impacts associated with project construction activities would be mitigated by the reasonable noise reduction measures identified above, incorporated into the construction plan and implemented during all phases of construction activity. With the implementation of these measures as project conditions of approval, and recognizing that noise

generated by construction activities would occur over a temporary period, the temporary increase in ambient noise levels would be less-than-significant.

Impact 1b: Permanent Noise Level Increase.
The proposed project is not expected to cause a substantial permanent noise level increase at the existing residential land uses in the project vicinity. This is a **less-than-significant impact.**

According to Policy EC-1.2 of the City's General Plan, a significant permanent noise increase would occur if the project would increase noise levels at noise-sensitive receptors by 3 dBA DNL or more where ambient noise levels exceed the "normally acceptable" noise level standard. Where ambient noise levels are at or below the "normally acceptable" noise level standard, noise level increases of 5 dBA DNL or more would be considered significant. The City's General Plan defines the "normally acceptable" outdoor noise level standard for the residential land uses to be 60 dBA DNL. Existing ambient levels are less than 60 dBA DNL along Mitzi Drive and Ranchero Way. Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 5 dBA DNL. For reference, a 5 dBA DNL noise increase would be expected if the project would triple existing traffic volumes along a roadway.

The traffic study included peak hour turning movements for the existing traffic volumes at six intersections in the vicinity of the project site: Williams Road/Ranchero Way, Piper Drive/Saratoga Avenue, Mitzi Drive/Saratoga Avenue, Piper Drive/Mitzi Drive, Mitzi Drive/Ranchero Way, and Williams Road/Saratoga Avenue. Additionally, the traffic study included project trips. When combined, the existing plus project scenario was calculated. By comparing the existing plus project traffic scenario to the existing scenario, the project's contribution to the overall noise level increase was determined to an increase of less to 1 dBA DNL along each roadway segment in the project vicinity. Therefore, the project would not result in traffic volumes tripling. The proposed project would not result in a permanent noise increase of 5 dBA DNL or more. This is a less-than-significant impact.

Mitigation Measure 1b: None required.

Impact 1c: Cumulative Noise Increase.
The proposed project would not make a cumulatively considerable contribution to future noise levels at residential land uses in the vicinity. **This is a less-than-significant impact.**

A significant impact would occur if the cumulative traffic noise level increase was 3 dBA DNL or greater for future levels exceeding 60 dBA DNL or was 5 dBA DNL or greater for future levels at or below 60 dBA DNL and if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA DNL or more attributable solely to the proposed project.

Cumulative traffic noise level increases were calculated by comparing the cumulative (no project) traffic volumes and the cumulative plus project volumes to existing traffic volumes. Up to a 1 dBA DNL increase was calculated along the roadway segments in the project vicinity, while all other roadway segments resulted in a less than 1 dBA DNL increase. The estimated cumulative noise increase would be less than 3 dBA DNL along each roadway segment included in the traffic study. This would be a less-than-significant impact.

Mitigation Measure 1c: None required.

Impact 1d: Noise Levels in Excess of Standards.
The proposed project would not generate noise in excess of standards established in the City's General Plan at the nearby sensitive receptors. While exceeding the City's Municipal Code threshold of 55 dBA DNL may occur, implementation of measures as a project condition of approval would reduce noise levels to below 55 dBA DNL. This is a **less-than-significant impact**.

The City's General Plan does not include policies specifically addressing mechanical noise generated by residential land uses; since no General Plan policies would be violated, this would be considered a less-than-significant impact. However, the residential mechanical noise should be addressed with respect to the City's Municipal Code threshold of 55 dBA DNL to minimize disturbance to the existing residences surrounding the project site.

Residential buildings typically require various mechanical equipment, such as air conditioners, exhaust fans, and air handling equipment for ventilation of the buildings. However, at this stage of project design, specific mechanical equipment for the proposed building has not been selected. At the time of this study, site plans indicate that HVAC units would be located along the eastern rooftop of the four-story apartment building within an enclosed space. Given the proposed HVAC location, the distance to the shared property line to the north could be approximately 5 feet, and the distance to the shared property line to the west could be approximately 15 feet. While the elevation of the rooftop would provide partial shielding, the impact of the mechanical equipment noise on the nearby noise-sensitive receptors cannot be assessed due to the variant knowns, such as the number and types of units, size, enclosure specifications, source noise levels, and precise locations. Conservatively, mechanical equipment noise for the proposed project has the potential to exceed 55 dBA DNL at the nearby sensitive uses. While exceeding this threshold would not result in a significant impact, measures shall be implemented as a project condition of approval to minimize noise disturbance at adjacent sensitive uses.

As a project condition of approval, mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's 55 dBA DNL requirement at nearby noise-sensitive land uses. A qualified acoustical consultant shall be retained by the project applicant to review mechanical noise as the equipment systems are selected to determine specific noise reduction measures necessary to reduce noise to comply with the City's Municipal Code noise level limit at the shared property lines. 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 mechanical equipment screens, enclosures, and parapet walls, to block the line-of-sight between the noise

source and the nearest receptors. Other alternate measures may be optimal, such as locating equipment in less noise-sensitive areas, such as along the building façades farthest from adjacent neighbors, where feasible.

Mitigation Measure 1d: No further mitigation required.

Impact 2: Generation of Excessive Groundborne Vibration. Construction-related vibration levels would exceed 0.2 in/sec PPV at adjacent buildings of normal conventional construction. This is a **potentially significant impact**.

The project proposes the relocation of an existing historic structure on-site. An assessment of potential damage to the existing historic structure during the relocation process is beyond the scope of this report. Any minor or major damage that results from excessive vibration during the relocation of the historic structure should be repaired according to recommendations in the Existing Conditions and Preservation Plan prepared by *Strata Design Studio*.[2] The remainder of this section assesses potential impacts of construction vibration on existing neighboring structures.

The construction of the project may generate vibration when heavy equipment or impact tools are used. Construction activities would include the relocation of an existing structure, site preparation work, excavation of the basement parking level, foundation work, and new building framing and finishing. Pile driving is not anticipated as a foundation construction technique.

Policy EC-2.3 of the City of San José General Plan establishes a vibration limit of 0.08 in/sec PPV to minimize the potential for cosmetic damage to sensitive historic structures, and a vibration limit of 0.2 in/sec PPV to minimize damage at buildings of normal conventional construction. These thresholds are applicable for neighboring structures apart from the considered project. The vibration limits contained in this policy are conservative and designed to provide the ultimate level of protection for existing buildings in San José. As discussed in detail below, vibration levels exceeding these thresholds would be capable of cosmetically damaging adjacent buildings. Cosmetic damage (also known as threshold damage) is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage is defined as hairline cracking in masonry or the loosening of plaster. Major structural damage is defined as wide cracking or the shifting of foundation or bearing walls.

A review of the City of San José Historic Resource Inventory[3] did not identify historic structures within a 500-foot vicinity. Therefore, a significant impact would result at nearby buildings of normal conventional construction if groundborne vibration levels attributable to project construction would exceed 0.20 in/sec PPV.

Table 7 presents typical vibration levels from construction equipment at 25 feet. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration

[2] John S. Tabuena-Frolli, "On-Site House Move: Historic Sylvester & Kate Graves House Existing Conditions & Preservation Plan." *Strata Design Studio*, March 12, 2019.
[3] City of San José Historic Resources Inventory, https://www.sanjoseca.gov/DocumentCenter/View/35475

levels of 0.09 in/sec PPV at 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 7 also presents construction vibration levels at various distances from the construction equipment. Calculations were made to estimate worst-case vibration levels at the existing multi-family residential structure 10 feet to the north of the shared property line. Vibration levels were also calculated at a distance of 70 feet from the site to represent the existing structure to the east. Vibration levels are highest close to the source, and then attenuate with increasing distance at the rate $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet, and D_{ref} is the reference distance of 25 feet.

TABLE 7 Vibration Levels for Construction Equipment at Various Distances

Equipment		Reference PPV at 25 ft. (in/sec)	PPV at 10 ft. (in/sec)	PPV at 70 ft. (in/sec)
Clam shovel drop		0.202	0.553	0.065
Hydromill (slurry wall)	In soil	0.008	0.022	0.003
	In rock	0.017	0.047	0.005
Vibratory Roller		0.210	0.575	0.068
Hoe Ram		0.089	0.244	0.029
Large bulldozer		0.089	0.244	0.029
Caisson drilling		0.089	0.244	0.029
Loaded trucks		0.076	0.208	0.024
Jackhammer		0.035	0.096	0.011
Small bulldozer		0.003	0.008	0.001

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., July 2019.

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 of existing properties adjoining the site. Some activities would occur at distances as close as 10 feet, and at this distance, vibration levels due to construction are conservatively calculated to reach up to 0.58 in/sec PPV, which would exceed the 0.2 in/sec PPV threshold for buildings of normal conventional construction.

The US Bureau of Mines has analyzed the effects of blast-induced vibration on buildings in USBM RI 8507,[4] and these findings have been applied to vibrations emanating from construction equipment on buildings.[5] As shown in Figure 8, these studies indicate an approximate 5 to 8% probability of "threshold damage" (referred to as cosmetic damage described above) at vibration levels of 0.58 in/sec PPV or less and no observations of "minor damage" or "major damage." Figure 8 presents the damage probability, as reported in USBM RI 8507 and reproduced by Dowding, assuming a maximum vibration level of 0.58 in/sec PPV. Based on these data, cosmetic or threshold damage would be manifested in the form of hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. However, minor damage

[4] Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.

[5] Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

(e.g., hairline cracking in masonry or the loosening of plaster) or major structural damage (e.g., wide cracking or shifting of foundation or bearing walls) would not occur, assuming a maximum vibration level of 0.58 in/sec PPV.

In summary, the construction of the project would generate vibration levels exceeding the threshold of 0.2 in/sec PPV at the residential structure to the north when construction is located within 30 feet of the structure and such vibration levels would be capable of cosmetically damaging these buildings. Project-generated vibration levels would fall below the 0.2 in/sec PPV threshold at structures located 30 feet or further from construction. This is a potentially significant impact.

Mitigation Measure 2:

The project applicant shall prepare and implement a construction vibration monitoring plan to document vibration generating construction activities. The vibration plan shall address vibration impacts to sensitive historic structures of 0.08 in/sec PPV. All tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry accepted standard methods. The construction vibration monitoring plan shall implement but is not limited to the following measures during construction:

- Comply with the City's Municipal Code, which limits construction hours at sites within 500 feet of residential land uses to between 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.

- Place operating equipment on the construction site as far as possible from vibration-sensitive receptors. The project contractor shall avoid using vibratory rollers, packers, and other heavy vibration-generating equipment within 30 feet of sensitive areas surrounding the site, whenever possible.

- Use smaller equipment to minimize vibration levels below the limits.

- Modify/design or identify alternative construction methods to reduce vibration levels below the limits.

- Avoid dropping heavy objects or materials near property lines shared with sensitive receptors.

- The contractor shall alert heavy equipment operators to sensitive adjacent structures (i.e., structures within 30 feet of the construction activities) so they can exercise caution.

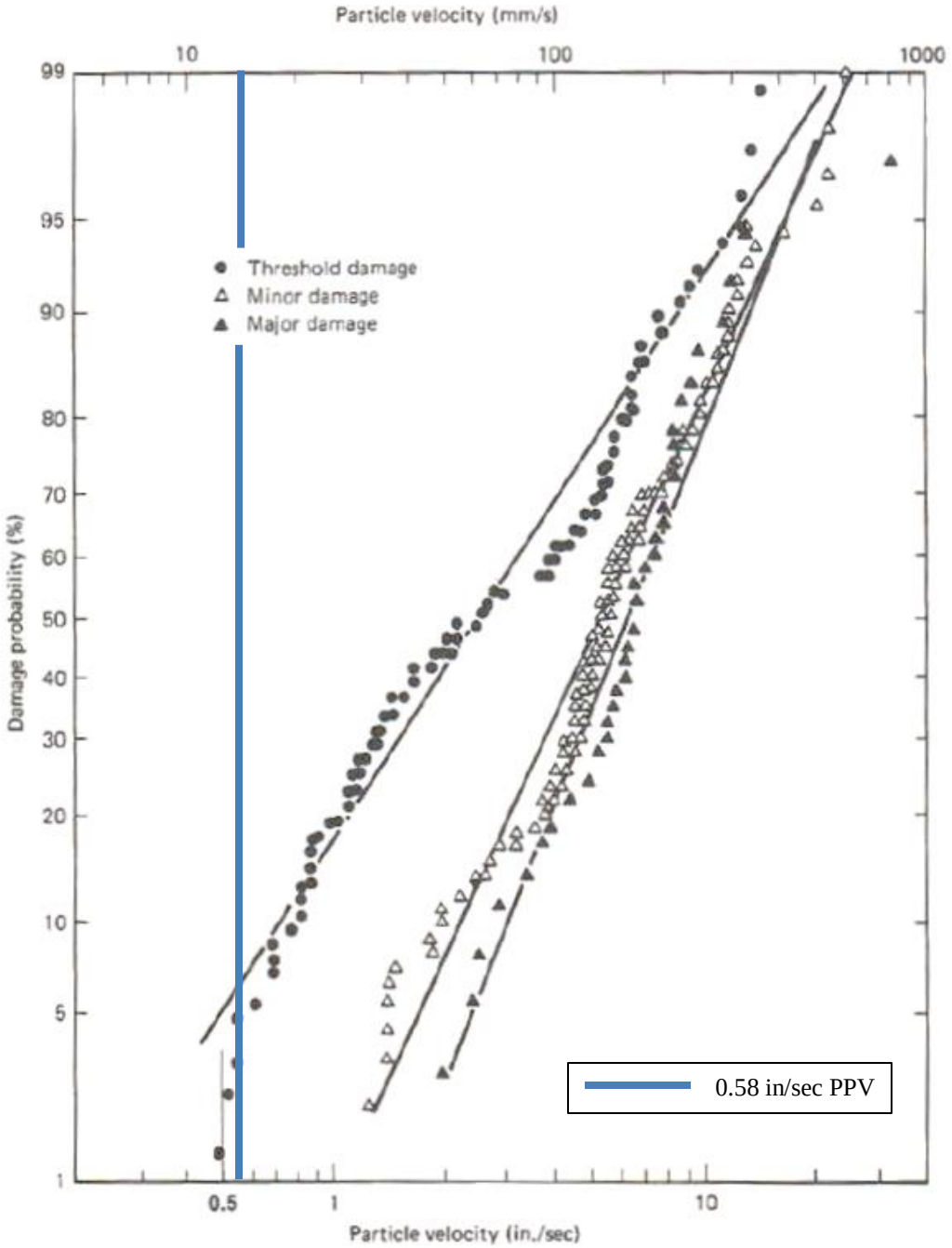
- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

- The contractor shall retain a qualified firm to conduct a pre- and post-construction cosmetic crack survey of the buildings adjacent to the northern and western boundaries

and shall repair or compensate where damage has occurred as a result of construction. The survey will be provided to the City of San José Department of Planning, Building, and Code Enforcement.

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

FIGURE 8 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996 as modified by Illingworth & Rodkin, Inc., July 2019.

Impact 3: **Excessive Aircraft Noise.**
The project site is located approximately 4.5 miles from a public airport or public use airport and would not expose people residing or working in the project area to excessive aircraft noise. **This is a less-than-significant impact.**

The Norman Y. Mineta San José International Airport is located over 4.5 miles to the northeast and the Moffett Federal Airfield is located over 7.75 miles to the northwest. The project site lies outside the area of influence for each of these airports. Noise from aircraft would not substantially increase ambient noise levels at the project site, and exterior and interior noise levels resulting from aircraft would be compatible with the proposed project. This is a less-than-significant impact.

Mitigation Measure 3: **None required.**