Appendix I

Noise/Vibration Assessment

905 NORTH CAPITOL AVENUE NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

The project proposes a residential development at 905 North Capitol Avenue in San José, California. The project site consists of two non-contiguous parcels that sit across Penitencia Creek Road from one another on the west side of Capitol Avenue. On the larger parcel to the north (2.12 acres), the project would construct 337 multi-family residential units and 336 parking spaces. The multi-family residential building would include five residential levels over two levels of parking. On the smaller parcel to the south (1.35 acres), the project would construct up to 36 townhomes, each with a two-car garage.

This report evaluates the project's potential to result in significant 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 groundborne vibration, summarizes applicable regulatory criteria, and discusses ambient noise conditions in the project vicinity; 2) the Plan Consistency Analysis 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 mitigation measures, where necessary, to mitigate project 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 p.m. to 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) 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 to 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 to 62 dBA DNL with open windows and 65 to 70 dBA DNL if the windows are closed. Levels of 55 to 60 dBA are common along collector streets and secondary arterials, while 65 to 70 dBA is a typical value for a primary/major arterial. Levels of 75 to 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 to 30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a DNL of 60 to 70 dBA. Between a DNL of 70 to 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 to 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.

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.

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.

Railroad and light rail operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains, and the type of railroad track. People’s response to ground vibration from rail vehicles has been correlated best with the average, root mean square

(RMS) velocity of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is 1 x 10-6 in/sec RMS, which equals 0 VdB, and 1 in/sec equals 120 VdB. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.

Typical background vibration levels in residential areas are usually 50 VdB or lower, well below the threshold of perception for most humans. Perceptible vibration levels inside residences are attributed to the operation of heating and air conditioning systems, door slams and foot traffic. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside residences. Table 4 illustrates some common sources of vibration and the association to human perception or the potential for structural damage.

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, April 2020.

TABLE 4 Typical Levels of Groundborne Vibration

Human/Structural Response	Velocity Level, VdB	Typical Events (50-foot setback)
Threshold, minor cosmetic damage	100	Blasting, pile driving, vibratory compaction equipment
		Heavy tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as reading a video or computer screen	90	
		Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, occasional events		Commuter rail, typical Bus or truck over bump or on rough roads
Residential annoyance, frequent events	70	Rapid transit, typical
Approximate human threshold of perception to vibration		Buses, trucks and heavy street traffic
	60	
		Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

Source: Transit Noise and Vibration Impact Assessment, US Department of Transportation Federal Transit Administration, September 2018.

Regulatory Background – Noise

This section describes the relevant guidelines, policies, and standards established by State Agencies, Santa Clara County, and the City of San José. 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 of California

State CEQA Guidelines. The California Environmental Quality Act (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;

(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.

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

Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan. The Comprehensive Land Use Plan (CLUP) 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

N-1 The Community Noise Equivalent Level (CNEL) method of representing noise levels shall be used to determine if a specific land use is consistent with the CLUP.

N-2 In addition to the other policies herein, the Noise Compatibility Policies presented in Table 4-1 shall be used to determine if a specific land use is consistent with this CLUP.

N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5 (not shown in this report).

N-6 Noise level compatibility standards for other types of land uses shall be applied in the same manner as the above residential noise level criteria. Table 4-1 presents acceptable noise levels for other land uses in the vicinity of the Airport.

City of San José

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.

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 International Airport noise zone (defined by the 65 CNEL contour as set forth in State law) and encourage aircraft operating procedures that minimize noise.

Table 4 - 1

NOISE COMPATIBILITY POLICIES

LAND USE CATEGORY	CNEL					
	55-60	60-65	65-70	70-75	75-80	80-85
Residential – low density Single-family, duplex, mobile homes	*	**	***	****	****	****
Residential – multi-family, condominiums, townhouses	*	**	***	****	****	****
Transient lodging - motels, hotels	*	*	**	****	****	****
Schools, libraries, indoor religious assemblies, hospitals, nursing homes	*	***	****	****	****	****
Auditoriums, concert halls, amphitheaters	*	***	***	****	****	****
Sports arena, outdoor spectator sports, parking	*	*	*	**	***	****
Playgrounds, neighborhood parks	*	*	***	****	****	****
Golf courses, riding stables, water recreation, cemeteries	*	*	*	**	***	****
Office buildings, business commercial and professional, retail	*	*	**	***	****	****
Industrial, manufacturing, utilities, agriculture	*	*	*	***	***	****
* Generally 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. Mobile homes may not be acceptable in these areas. Some outdoor activities might be adversely affected.					
** Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Outdoor activities may be adversely affected. Residential: Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.					
*** Generally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor activities are likely to be adversely affected.					
**** Unacceptable	New construction or development shall not be undertaken.					

Source: Based on General Plan Guidelines, Appendix C (2003), Figure 2 and Santa Clara County ALUC 1992 Land Use Plan, Table 1

Source: Comprehensive Land Use Plan Santa Clara County, Norman Y Mineta San José International Airport, May 25, 2011, Amended May 23, 2019.

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.

Source: Envision San José 2040 General Plan, Adopted November 1, 2011, As Amended on May 16, 2019.

Regulatory Background – Vibration

Federal Government

Federal Transit Administration. The Federal Transit Administration (FTA) has identified vibration impact criteria for sensitive buildings, residences, and institutional land uses near rail transit and railroads. These criteria are shown in Table 5. The thresholds for residences and buildings where people normally sleep (e.g., nearby residences) are 72 VdB for frequent events (more than 70 events of the same source per day), 75 VdB for occasional events (30 to 70 vibration events of the same source per day), and 80 VdB for infrequent events (less than 30 vibration events of the same source per day).

TABLE 5 Groundborne Vibration Impact Criteria

Land Use Category	Groundborne Vibration Impact Levels (VdB re 1 µinch/sec, RMS)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1 Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2 Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3 Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research should always require detailed evaluation to define the acceptable vibration levels. Ensuring low vibration levels in a building requires special design of HVAC systems and stiffened floors.

City of San José

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-2.1 Near light and heavy rail lines or other sources of ground-borne vibration, minimize vibration impacts on people, residences, and businesses through the use of setbacks and/or structural design features that reduce vibration to levels at or below the guidelines of the Federal Transit Administration. Require new development within 100 feet of rail lines to demonstrate prior to project approval that vibration experienced by residents and vibration sensitive uses would not exceed these guidelines.

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 905 North Capitol Avenue in the City of San José. The project site is surrounded by existing residential uses to the north, to the west, and to the east, opposite North Capitol Avenue. South of the project site is undeveloped land.

The noise environment at the site and in the surrounding area results primarily from vehicular traffic along nearby I-680 and North Capitol Avenue, as well as light rail train pass-bys along the VTA rail line. Occasional aircraft flyovers associated with San José International Airport have some contribution to the noise environment, as well.

A noise monitoring survey consisting of two long-term (LT-1 and LT-2) and one short-term (ST-1) noise measurements was made at the site between Tuesday, August 17, 2021, and Thursday, August 19, 2021. All measurement locations are shown in Figure 1.

Long-term noise measurement LT-1 was made approximately 65 feet west of the centerline of North Capitol Avenue. Hourly average noise levels at LT-1 typically ranged from 69 to 74 dBA L_{eq} during daytime hours (7:00 a.m. and 10:00 p.m.) and from 59 to 67 dBA L_{eq} during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level on Wednesday, August 18, 2021, was 73 dBA DNL. The daily trend in noise levels at LT-1 is shown in Figures A1 through A3 of Appendix A. Note that light rail service was suspended at the time of the noise survey. Therefore, the noise measurements do not include noise due to train pass-bys, but based on previous data taken along similar roadways, hourly and daily average noise levels measured at LT-1 would be dominated by vehicular traffic along North Capitol Avenue and would not be expected to increase by more than 1 dBA with the inclusion of VTA trains.

LT-2 was made at the rear of the project site, approximately 25 feet northeast of the centerline of Kestral Way. Hourly average noise levels at LT-2 typically ranged from 51 to 63 dBA L_{eq} during daytime hours and from 43 to 56 dBA L_{eq} during nighttime hours. The day-night average noise levels on Wednesday, August 18, 2021, was 60 dBA DNL. The daily trend in noise levels at LT-2 is shown in Figures A4 through A6 of Appendix A.

Short-term noise measurement was made on Tuesday, August 17, 2021, at 10:10 a.m. in a 10-minute interval. As shown in Figure 1, ST-1 was made from the sidewalk along Kestral Way. Results of the measurements are summarized in Table 6. Typical traffic noise levels from nearby Interstate 680 (I-680) ranged from 50 to 58 dBA, with no local traffic occurring within this 10-minute interval. Jet flyovers were about 55 to 63 dBA at ST-1, and general aviation generated levels of 56 dBA. The 10-minute L_{eq} measured at ST-1 was 55 dBA.

TABLE 6 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: ~20 feet south of the centerline of Kestral Way	8/17/2021, 10:10-10:20	63	61	58	54	52	55

Existing Vibration Environment

Vibration measurements could not be conducted at the time of this study. However, VTA vibration levels have been previously measured at other sites in the San José area, and these data are used in this analysis to credibly represent vibration levels expected at the site after VTA service resumes.

Observed and recorded vibration measurements of individual train activity near the San José Diridon Station were conducted on Friday, February 23, 2018.[1] The instrumentation used to conduct the measurements included a Roland model R-05 solid state recorder and seismic grade, low noise accelerometers firmly fixed to the ground. This system was capable of accurately measuring very low vibration levels. Vibration levels at location V-1 were measured at ground level and were set back at a distance of 30 feet from the nearest light rail (VTA) track. Levels at V-2 were made at distances of 60 feet from the nearest light rail (VTA) track.

A total of twenty-three (23) individual light rail train pass-bys (VTA) were observed and recorded at the two locations within the plan area (V-1 and V-2). All measurements were made in the corner parking lot of 214 Dupont Street in San José. While the ground material may vary from the proposed project site, levels should be within approximately 1 dB. Vibration levels were measured in the vertical axis because ground vibration is typically most dominant on this axis. Vibration levels measured at each measurement position during train pass-by events can be seen in Figures A7 and A8 of Appendix A.

[1] Illingworth & Rodkin, Inc., "Dupont Street General Plan Amendment Project Environmental Noise and Vibration Report," December 14, 2018.

FIGURE 1 Aerial Image of the Project Site and Surrounding Area with the Noise Measurement Locations Identified

Source: Google Earth, 2021.

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

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 standard is 60 dBA DNL or less for the proposed residential land uses.

- The City's acceptable interior noise level standard is 45 dBA DNL or less for the proposed residential land uses.

- The City's acceptable exterior noise level standard is 65 dBA DNL or less for the proposed open space.

The future noise environment at the site would continue to result primarily from vehicular traffic along nearby I-680 and North Capitol Avenue. According to the *Envision San José 2040 General Plan Comprehensive Update EIR*,[2] the traffic noise level increase along North Capitol Avenue at the project site would be up to 1 dBA DNL by the year 2035. Additionally, the traffic study provided for the proposed project included peak hour traffic volumes, which would not result in an additional traffic noise increase at the project site. The number of daily light rail trains along North Capitol Avenue is not expected to change substantially under future conditions.

Future Exterior Noise Environment

Residential Uses

The site plan shows two courtyards and a roof deck located at the multi-family residential building. Private balconies, decks, and front yards would not be considered outdoor use areas subject to the exterior noise thresholds. Therefore, the townhomes would not have any proposed outdoor use areas subject to the City's thresholds.

The central courtyard in the multi-family residential building would be completely surrounded by the building. The future exterior noise levels at this outdoor use area would be below 60 dBA DNL. The courtyard located at the rear of the multi-family building would be shielded from traffic noise and light rail train noise along North Capitol Avenue by the proposed buildings and shielded from traffic noise along I-680 by existing residential buildings to the west. Future exterior noise levels at this outdoor use area would be below 60 dBA DNL.

The level 7 roof deck is located at the northwest corner of the multi-family building, and the center of this area would be set back approximately 365 feet from the centerline of North Capitol Avenue

[2] *Envision San José 2040 General Plan Comprehensive Update EIR*, State Clearinghouse Number 2009072096, File number PP09-011, June 2011.

and the train tracks. At this distance, future exterior noise levels at this outdoor use area would be below 60 dBA DNL.

Open Space

The site plan shows common use open space to the south of the townhomes that would be subject to the City's 65 dBA DNL exterior noise threshold.

The center of the nearest open space would be set back approximately 120 feet from the centerline of North Capitol Avenue and the light rail train tracks. At this distance and assuming partial shielding from the project buildings, the future exterior noise levels would be 69 dBA DNL. Relocating this outdoor use area to a location shielded by proposed on-site buildings would reduce exterior noise levels; however, based on the current site plan, relocating the open space would not be optimal. Since this space is intended to be open, constructing a sound wall or berm surrounding the open space would negatively impact the aesthetic appeal and would not be recommended for this project. While future exterior noise levels would exceed the normally acceptable threshold, the noise levels would fall within the conditionally acceptable range. Therefore, it is recommended that the City allow the open space under the conditionally acceptable noise level threshold.

With greater setbacks of 185 feet or more, the other open space areas would have future exterior noise levels at or below 65 dBA DNL.

The City's normally acceptable threshold for residential uses would be below the City's normally acceptable threshold at the center of all courtyards and roof decks. No additional noise controls are recommended for these outdoor areas.

Future Interior Noise Environment

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

The eastern façade of the multi-family residential building and the eastern façades of the townhomes nearest to North Capitol Avenue would be set back approximately 80 to 85 feet from the centerline of the roadway and train tracks. At these distances, the units facing North Capitol Avenue would be exposed to future exterior noise levels up to 73 dBA DNL. Assuming windows to be partially open, future interior noise levels in these units would be up to 58 dBA DNL.

Units located on the northern and southern façades of the multi-family building would have at least partial line-of-sight to the North Capitol Avenue, with setbacks of approximately 85 to 400 feet from the centerline. Units located along these façades would be exposed to future exterior noise levels ranging from 62 to 73 dBA DNL. Assuming windows to be partially open, future interior noise levels in these units would range from 47 to 58 dBA DNL.

Units located on the western façade and surrounding the interior courtyard of the multi-family building would be shielded from North Capitol Avenue. These units would be exposed to future exterior noise levels at or below 60 dBA DNL. Assuming windows to be partially open, future interior noise levels in these units would be at or below 45 dBA DNL.

While the townhome units located in the first row would have direct line-of-sight to North Capitol Avenue, the second, third, and fourth rows would have at least partial shielding due to the intervening buildings; however, the corner units would have partial exposure to the traffic noise. The corner units with some direct exposure would have setbacks up to 370 feet from the centerline of the roadway. These corner townhome units in each building would be exposed to future exterior noise levels ranging from 62 to 73 dBA DNL. Assuming windows to be partially open, future interior noise levels in these units would range from 47 to 58 dBA DNL.

To meet the interior noise requirements set forth by the City of San José of 45 dBA DNL, implementation of noise insulation features would be required.

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insulation features shall be incorporated into the proposed project to reduce interior noise levels to 45 dBA DNL or less at residential interiors:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all residential units on the project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

- Preliminary calculations indicate that residential units along the eastern building façade of the multi-family residential building and the first row of townhomes would require windows and doors with a minimum rating of 31 to 35 STC with adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA DNL.

- Preliminary calculations indicate that residential units within 260 feet of the centerline of North Capitol Avenue located along the northern and southern building façades of the multi-family residential building would require windows and doors with a minimum rating of 28 to 31 STC with adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA DNL. All remaining units located along these building façades would require adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA DNL.

- Preliminary calculations indicate that corner townhome units located in the second and third row buildings set back from North Capitol Avenue would require windows and doors with a minimum rating of 28 to 31 STC with adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA DNL. All remaining corner townhomes would require adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA DNL.

The implementation of these noise insulation features would reduce interior noise levels to 45 dBA DNL or less at residential uses.

Conditions of Approval

The project applicant shall prepare final design plans that incorporate building design and acoustical treatments to ensure compliance with State Building Codes and City noise standards. A project-specific acoustical analysis shall be prepared to ensure that the design incorporates controls to reduce interior noise levels to 45 dBA DNL or lower within the residential unit. The project applicant shall conform with any special building construction techniques requested by the City's Building Department, which may include sound-rated windows and doors, sound-rated wall constructions, and acoustical caulking.

LRT Vibration and Land Use Compatibility

The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of heavy and light rail vibration on people through appropriate land use policies in the City of San José. Policy EC-2.1 requires new development within 100 feet of light rail lines or other sources of groundborne vibration, to use setbacks and/or structural design features that reduce vibration to levels at or below the guidelines of the FTA.

The FTA vibration impact assessment criteria (summarized in Table 5) were used to evaluate vibration levels produced by trains passing the project area. The FTA vibration impact criteria are based on maximum overall levels for a single event. The impact criteria in Table 5 provide thresholds based on the number of train pass-bys in a given day: frequent events (more than 70 events of the same source per day), occasional events (30 to 70 vibration events of the same source per day), and infrequent events (less than 30 vibration events of the same source per day).

Future Vibration Environment

Light rail train pass-bys at Diridon Station produced vibration levels up to 67 VdB at a distance of 30 feet from the tracks. According to Table 5, light rail train vibration levels would not exceed the 72 VdB vibration limit for frequent events. This is not expected to change under future conditions. Therefore, the future residential development is expected to be compatible with the future vibration environment at the project site.

NOISE IMPACTS AND MITIGATION MEASURES

This section describes the significance criteria used to evaluate project impacts under CEQA, provides a discussion of each project impact, and presents mitigation measures, where necessary, to reduce project impacts to less-than-significant levels.

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 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 the project 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 0.08 in/sec PPV would have the potential to result in cosmetic damage to historic buildings, and 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. **This is a 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.

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 that is 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.

Project construction will occur from 7:00 a.m. to 10:00 p.m. While no construction is expected to occur during nighttime hours, a permit from the City would be required to operate outside the allowable hours since the project site is located within 500 feet of residences and within 200 feet of commercial or office uses.

Existing residences located along North Capitol Avenue would have existing ambient noise levels represented by LT-1 of the monitoring survey, which ranged from 69 to 74 dBA L_{eq} during daytime hours. The existing residences to the west of the project site and set back from the roadway by 465 feet or more would have ambient noise levels represented by LT-2, which ranged from 51 to 63 dBA L_{eq} during daytime hours.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The construction of the proposed project would involve demolition, excavation, trenching, and building construction. The hauling of excavated materials and construction materials would generate truck trips on local roadways, as well. For the proposed project, pile driving, which generates excessive noise levels, is not expected.

Construction activities for individual projects are typically carried out in phases. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating. The typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 7) from the equipment. Table 8 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction are about 72 to 88 dBA L_{eq} for residential buildings, measured at a distance of 50 feet from the center of a busy construction site. 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.

Construction of the multi-family building and the townhomes will start in early September 2022 and continue through the end of September 2024, and construction activities would be concurrent for both residential developments. Detailed lists of equipment expected to be used during each phase of both developments was provided for this analysis and are summarized in Tables 9 and 10. Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) was used to calculate the hourly average noise levels for each phase of construction, assuming every piece of equipment would operate simultaneously, which would represent the worst-case scenario. This construction noise model includes representative sound levels for the most common types of construction equipment and the approximate usage factors of such equipment that were developed based on an extensive database of information gathered during the construction of the Central Artery/Tunnel Project in Boston, Massachusetts (CA/T Project or "Big Dig"). The usage factors represent the percentage of time that the equipment would be operating at full power.

For each phase, the worst-case hourly average noise levels were estimated at the property line of each surrounding land use. Multiple pieces of equipment used simultaneously would add together creating a collective noise source. While every piece of equipment per phase would likely be scattered throughout the site, the noise-sensitive receptors surrounding the site would be subject to the collective noise source generated by all equipment operating at once. Therefore, to assess construction noise impacts at the receiving property lines of existing noise-sensitive receptors, the collective worst-case hourly average noise level for each phase was positioned at the geometrical center of the site and propagated to the nearest property line or building façades of the surrounding land uses. These noise level estimates are also shown in Tables 9 and 10. Noise levels in Tables 9 and 10 do not assume reductions due to intervening buildings or existing barriers. Noise levels during the overlapping phases are summarized in Table 10 only for the residences to the east and west of the project site. Since the residences to the north would be directly impacted by construction of the multi-family residential building and residences to the south by construction of the townhomes, the nearest source would dominate the noise exposure. However, residences to the east and west would be exposed to the combination of construction from both developments.

TABLE 7 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

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/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 8 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 9 Estimated Construction Noise Levels for the Multi-Family Building at Nearby Land Uses

Phase of Construction	Time Duration	Construction Equipment (Quantity)	Calculated Hourly Average Noise Levels, L_{eq} (dBA)							
			Ambient Noise Levels = 51 to 63 dBA L_{eq}		Ambient Noise Levels = 69 to 74 dBA L_{eq}					
			West Res. (215ft)		North Res. (110ft)		East Res. (290ft)		South Res. (645ft)	
			Level, dBA	Exceeds Ambient by 5 dBA or more?	Level, dBA	Exceeds Ambient by 5 dBA or more?	Level, dBA	Exceeds Ambient by 5 dBA or more?	Level, dBA	Exceeds Ambient by 5 dBA or more?
Demolition	9/1/2022-9/21/2022	Concrete/Industrial Saw (1) Excavator (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	73	Yes	79	Yes	71	No	64	No
Site Preparation	9/21/2022-9/28/2022	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	72	Yes	78	No	69	No	62	No
Shoring/ Excavation	9/28/2022-11/28/2022	Excavator (1) Tractor/Loader/Backhoe (2) Bore/Drill Rig (1)	72	Yes	77	No	69	No	62	No
Trenching/ Foundation	11/28/2022-12/28/2022	Tractor/Loader/Backhoe (2) Excavator (1)	71	Yes	77	No	69	No	62	No
Building – Exterior	12/28/2022-1/28/2024	Crane (1) Forklift (2) Welder (1)	63	No	69	No	61	No	54	No
Building – Interior/ Architectural Coating	11/28/2024-7/28/2024	Air Compressor (5) Aerial Lift (1)	68-70[a]	Yes	74-75[a]	No	66-67[a]	No	59-60[a]	No
Paving	7/28/2024-9/28/2024	Paver (1) Paving Equipment (1) Roller (1) Tractor/Loader/Backhoe (1)	72	Yes	78	No	70	No	63	No

[a] Range of noise levels reflect the building – interior/architectural coating phase and when overlapping with the building – exterior phase.

TABLE 10 Estimated Construction Noise Levels for Townhomes at Nearby Land Uses

Phase of Construction	Time Duration	Construction Equipment (Quantity)	Calculated Hourly Average Noise Levels, L_{eq} (dBA)							
			Ambient Noise Levels = 51 to 63 dBA L_{eq}		Ambient Noise Levels = 69 to 74 dBA L_{eq}					
			West Res. (215ft)		North Res. (370ft)		East Res. (350ft)		South Res. (385ft)	
			Level, dBA	Exceeds Ambient by 5 dBA or more?	Level, dBA	Exceeds Ambient by 5 dBA or more?	Level, dBA	Exceeds Ambient by 5 dBA or more?	Level, dBA	Exceeds Ambient by 5 dBA or more?
Demolition	9/1/2022-9/28/2022	Concrete/Industrial Saw (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)	75-77[a]	Yes	70	No	70-74[a]	No	70	No
Site Preparation	9/29/2022-10/3/2022	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	72-75[a]	Yes	67	No	68-72[a]	No	67	No
Grading/ Excavation	10/4/2022-10/25/2022	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2)	73-75[a]	Yes	69	No	69-73[a]	No	68	No
Trenching/ Foundation	10/26/2022-11/2/2022	Tractor/Loader/Backhoe (1) Excavator (1)	69-74[a]	Yes	64	No	65-71[a]	No	64	No
Building – Exterior	11/3/2022-9/5/2023	Crane (1) Forklift (2) Generator Set (1) Tractor/Loader/Backhoe (1) Welder (3)	71-74[a]	Yes	66	No	67-72[a]	No	66	No
Building – Interior/ Architectural Coating	9/6/2023-9/19/2023	Air Compressor (1)	61-65[a]	No	56	No	57-63[a]	No	56	No
Paving	9/20/2023-10/3/2023	Cement & Mortar Mixer (1) Paver (1) Paving Equipment (1) Roller (2) Tractor/Loader/Backhoe (1)	73-74[a]	Yes	68	No	69-71[a]	No	68	No

[a] Range of noise levels reflect the construction of the townhomes only and when combined with the construction of the multi-family residential building.

As shown in Tables 9 and 10, ambient levels at the surrounding uses would potentially be exceeded by 5 dBA L_{eq} or more at various times throughout construction. Project construction is expected to last for a period of approximately 25 months. Since project construction would last for a period of more than one year and considering that the project site is within 500 feet of existing residential uses and within 200 feet of existing commercial uses, this temporary construction impact would be considered significant in accordance with Policy EC-1.7 of the City's General Plan.

The proposed project shall enforce Policy EC-1.7 of the City's General Plan, which states the following:

> Construction operations within the City will be required to use available noise suppression devices and techniques and continue to 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.

Mitigation Measure 1a:

Construction Noise Logistics Plan: Prior to the issuance of any grading or building permits, the project applicant shall submit and implement a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting and notification of construction schedules, equipment to be used, and designation of a noise disturbance coordinator. The noise disturbance coordinator shall respond to neighborhood complaints and shall be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses. The noise logistic plan shall be submitted to the Director of Planning, Building and Code Enforcement or Director's designee prior to the issuance of any grading or demolition permits. As a part of the noise logistic plan, construction activities for the proposed project shall include, but are not limited to, the following best management practices:

- Construction activities shall be limited to the hours 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 (San José Municipal Code Section 20.100.450).

- Construct temporary noise barriers, where feasible, to screen mobile and stationary construction equipment. The temporary noise barrier fences provide 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 shall be strictly prohibited.

- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses.

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

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

- A temporary noise control blanket barrier shall 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.

- If impact pile driving is proposed, foundation pile holes shall be predrilled to minimize the number of impacts required to seat the pile. Pre-drilling foundation pile holes is a standard construction noise control technique. Pre-drilling reduces the number of blows required to seat the pile.

- 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 project applicant shall prepare a detailed construction 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.

- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.

- Designate a "disturbance coordinator" who shall be responsible for responding to any complaints about construction noise. The disturbance coordinator shall determine the cause of the noise complaint (e.g., bad muffler, etc.) and 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 it in the notice sent to neighbors regarding the construction schedule.

With the implementation of GP Policy EC-1.7, Municipal Code requirements, and the above measures, the temporary construction noise impact would be reduced to a less-than-significant level.

Impact 1b: **Permanent Noise Level Increase/Exceed Applicable Standards.** The proposed project is not expected to cause a substantial permanent traffic noise level increase or exceed applicable standards established in the City's General Plan at the existing noise-sensitive 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 nearby residential land uses to be 60 dBA DNL. Existing ambient levels, based on the measurements made in the project vicinity, exceed 60 dBA DNL. Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 3 dBA DNL.

While the City's Noise Element does not include thresholds for residential buildings, the City's Municipal Code has noise limits of 55 dBA at receiving residential uses and 60 dBA at receiving commercial uses. Exceeding these limits would not be considered a significant impact under CEQA; however, it is recommended that these limits be considered for design features in the proposed building.

Project Traffic Increase

The traffic study included peak hour turning movements for the existing traffic volumes and project trips at three intersections in the vicinity of the project site. The peak hour project trips were added to the existing traffic volumes to establish the existing plus project traffic scenario. By comparing the existing plus project traffic scenario to the existing scenario, the project would result in a noise level increase of less than 1 dBA DNL along all roadway segments included in the traffic study, as summarized in Table 11. The project would not result in a permanent noise increase of 3 dBA DNL or more at noise-sensitive receptors in the project vicinity.

TABLE 11 Estimated Noise Level Increases of Existing Plus Project Traffic Volumes Over Existing Volumes at Receptors in the Project Vicinity

Roadway	Segment	Estimated Noise Level Increase
North Capitol Avenue	North of Berryessa Road	0 dBA DNL
	Berryessa Road to Penitencia Creek Road	0 dBA DNL
	Penitencia Creek Road to Mabury Road	0 dBA DNL
	South of Mabury Road	0 dBA DNL
Berryessa Road	West of North Capitol Avenue	0 dBA DNL
	East of North Capitol Avenue	0 dBA DNL
Penitencia Creek Road	West of North Capitol Avenue	0 dBA DNL
	East of North Capitol Avenue	0 dBA DNL
Mabury Road	West of North Capitol Avenue	0 dBA DNL
	East of North Capitol Avenue	0 dBA DNL

Mechanical Equipment

The site plan shows heat pumps located on the rooftop of the multi-family residential building. Specification sheets were provided for units expected to be used for the proposed project. According to the manufacturer, an individual heat pump would generate noise levels up to 58 dBA at 5 feet. The heat pumps located on the rooftop of the multi-family building would be clustered together, with several units operating simultaneously at any given time. Assuming up to 10 units would be operating continuously for a 24-hour period, the combined noise level of all 10 would be 68 dBA at 5 feet. The nearest residential property plane would be approximately 60 feet from the location of the nearest operational heat pumps. Due to the heat pumps being set back a minimum distance of 25 feet from the edge of the roof, the building façade would provide partial shielding for the mechanical equipment units. Assuming worst-case conditions, which would not include shielding from the building, noise levels from the mechanical equipment would be up to 46 dBA L_{eq} and up to 53 dBA DNL at the nearest residential property plane. Table 12 summarizes rooftop equipment noise propagated to all nearby receptors, assuming no attenuation. Any shielding effects by the building would reduce noise levels further. This would meet the City's Municipal Code thresholds.

TABLE 12 Estimated Operational Noise Levels for the Rooftop Equipment

Receptor	Distance from Rooftop Equipment	Hourly L_{eq}, dBA	DNL, dBA	Noise Level Increase, dBA DNL
North Residences	60 feet	46	53	0
West Residences	100 feet	42	48	0
South Future Townhomes	110 feet	41	48	N/A[a]
East Residences	180 feet	37	43	0

[a] Future residential townhomes (on-site receptors) would not be subject to a noise level increase since they are not existing receptors.

Based on the estimated noise levels in Table 12, mechanical equipment noise levels would not exceed the City's Municipal Code threshold of 55 dBA DNL at the existing or future residential land uses surrounding the proposed multi-family building. For all existing receptors, the noise level increase due to rooftop mechanical equipment noise would not be measurable or detectable (0 dBA DNL increase).

In addition to the heat pumps located on the rooftop, exhaust fans located within the parking structure of the multi-family residential building would have outlets located on level 1 in the southwestern corner of the proposed building. Cook EWD Wall Exhaust Fans are expected to be used in the proposed building. When operating at full speed, noise levels would be up to 76 dBA at a distance of 5 feet and up to 65 dBA at 5 feet when operating at 35% speed; however, the fans in the proposed building would almost always run at 20% speed, which would generate noise levels even lower. The nearest residential property line would be approximately 50 feet from the location of the exhaust fan outlet. According to the site plan, the outlet would be facing south, which would indicate a minimum 5 dBA reduction due to the building façade. Assuming worst-case conditions, 24-hour continuous operation of the fan at full speed would generate noise levels below 40 dBA L_{eq} and below 46 dBA DNL during typical operations of 20% speed and noise levels up to 51 dBA L_{eq} and 57 dBA DNL when operating at full speed. Estimated noise levels are summarized in Table 13.

TABLE 13 Estimated Operational Noise Levels for the Rooftop Equipment

Receptor	Distance from Exhaust Outlet	Exhaust Operating at 35% Speed		Noise Level Increase, dBA DNL
		Hourly L_{eq}, dBA	DNL, dBA	
North Residences	115 feet	<20[b]	<20[b]	0
West Residences	50 feet	40	51	1
South Future Townhomes	210 feet	33	39	N/A[a]
East Residences	460 feet	<20[b]	<20[b]	0

[a] Future residential townhomes (on-site receptors) would not be subject to a noise level increase since they are not existing receptors.
[b] A conservative 25 dBA reduction was applied to the noise levels due to the intervening building.

Based on the estimated noise levels in Table 13, noise levels from the exhaust fans at the parking garage would not exceed the City's Municipal Code threshold of 55 dBA DNL at the existing or future residential land uses surrounding the proposed multi-family building. For the nearest residences located west of the project site, which have direct line-of-sight to the exhaust outlet, a 1 dBA DNL increase over existing ambient noise levels would occur, while the noise level increase at all other existing receptors surrounding the site would not be measurable or detectable (0 dBA DNL increase).

The roof plan of the townhomes shows mechanical equipment located in the attic, as well as roof vents and solar panels on the rooftop. Solar panels would not generate measurable noise levels at the property line. Therefore, the dominating mechanical noise would be the heating pumps, which would be the same units used at the multi-family building. Assuming worst case conditions, the heat pumps would cycle on and off continuously over a 24-hour period. Assuming all eight units would be running simultaneously at any given time, hourly average noise levels would be up to 67 dBA L_{eq} at

a distance of 5 feet. The nearest existing residential property line would be approximately 85 feet from the location of the mechanical equipment in the townhome buildings. Table 14 summarizes the estimated noise levels from the mechanical equipment noise generated at the proposed townhomes. While being located in the attic would provide at least partial shielding, under worst-case conditions of no assumed attenuation, noise levels from the mechanical equipment would be up to 42 dBA L_{eq} and 49 dBA DNL at the nearest residential property plane.

TABLE 14 Estimated Operational Noise Levels for the Townhomes

Receptor	Distance from Rooftop Equipment	Hourly L_{eq}, dBA	DNL, dBA	Noise Level Increase, dBA DNL
North Future Multi-Family Residences	70 feet	44	51	N/A[a]
West Residences	85 feet	42	49	0
South Residences	345 feet	30	37	0
East Residences	190 feet	35	42	0

[a] Future residential townhomes (on-site receptors) would not be subject to a noise level increase since they are not existing receptors.

Based on the estimated noise levels in Table 14, mechanical equipment noise levels would not exceed the City's Municipal Code threshold of 55 dBA DNL at the existing or future residential land uses surrounding the proposed multi-family building. For all existing receptors, the noise level increase due to mechanical equipment noise generated at the townhomes would not be measurable or detectable (0 dBA DNL increase).

Total Combined Project-Generated Noise

The operational noise levels produced by the proposed project combined (i.e., traffic, mechanical equipment) would result in an increase of 1 dBA DNL or less at all existing noise-sensitive receptors in the project vicinity. Therefore, the proposed project would not result in a substantial increase over ambient noise levels in the project vicinity. Further, operational noise levels due to mechanical equipment at the proposed multi-family residential building and townhomes would not exceed 55 dBA DNL at the nearest existing or future residential receptors surrounding the site. This would be a less-than-significant impact.

Mitigation Measure 1b: None required.

Impact 2: Exposure to Excessive Groundborne Vibration. Construction-related vibration levels would potentially exceed applicable vibration thresholds at nearby sensitive land uses. **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, foundation work, and new building framing and finishing. Pile

driving equipment, which can cause excessive vibration, is not expected to be required for the proposed project.

According to the City's Historic Resource Inventory,[3] historical structures are located at 681 North Capitol Avenue and 1171 North Capitol Avenue, both of which are more than 1,500 feet from the project site. No other historical buildings are located in the vicinity of the project site.

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 0.20 in/sec PPV shall be used to minimize damage at buildings of normal conventional construction. 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.

Table 15 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 15 also summarizes the distances to the 0.08 in/sec PPV threshold for historical buildings and to the 0.2 in/sec PPV threshold for all other buildings. Since no historical buildings are located within 60 feet of the site, the 0.08 in/sec PPV threshold would not be exceeded at any historical buildings during project construction and is not discussed further.

[3] www.sanjoseca.gov/your-government/departments/planning-building-code-enforcement/planning-division/historic-preservation/historic-resources-inventory

TABLE 15 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Minimum Distance to Meet 0.08 in/sec PPV (feet)	Minimum Distance to Meet 0.2 in/sec PPV (feet)
Clam shovel drop		0.202	59	26
Hydromill (slurry wall)	in soil	0.008	4	2
	in rock	0.017	7	3
Vibratory Roller		0.210	61	27
Hoe Ram		0.089	28	13
Large bulldozer		0.089	28	13
Caisson drilling		0.089	28	13
Loaded trucks		0.076	24	11
Jackhammer		0.035	12	6
Small bulldozer		0.003	2	<1

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., August 2021.

Table 16 summarizes the vibration levels at nearest surrounding buildings in the project vicinity. Vibration levels are highest close to the source and then attenuate with increasing distance at the rate $\left({}^{D_{ref}}/_{D}\right)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet. While construction noise levels increase based on the cumulative equipment in use simultaneously, construction vibration levels would be dependent on the location of individual pieces of equipment. That is, equipment scattered throughout the site would not generate a collective vibration level, but a vibratory roller, for instance, operating near the project site boundary would generate the worst-case vibration levels for the receptor sharing that property line. Further, construction vibration impacts are assessed based on damage to buildings on receiving land uses, not receptors at the nearest property lines. Therefore, the distances used to propagate construction vibration levels (as shown in Table 16), which are different than the distances used to propagate construction noise levels (as shown in Tables 9 and 10), were estimated under the assumption that each piece of equipment from Table 15 was operating along the nearest boundary of the project site, which would represent the worst-case scenario.

Project construction activities would potentially generate vibration levels up to 0.27 in/sec PPV at the nearest single-family residences adjoining the project site to the west and to the north. A study completed by the US Bureau of Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507.[4] The findings of this study have been applied to buildings affected by construction-generated vibrations.[5] As reported in USBM RI 8507[4] and reproduced by Dowding,[5] Figure 2 presents the damage probability, in terms of "threshold damage," "minor damage," and "major damage," at varying vibration levels. Threshold damage, which is described as cosmetic damage in this report, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline

[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.

cracking in masonry or the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls.

As shown in Figure 2, maximum vibration levels of 0.2 in/sec PPV or lower would result in virtually no measurable damage. With maximum vibration levels of 0.3 in/sec PPV, there would be less than 5% chance of threshold or cosmetic damage, which no minor or major damage would be expected at the buildings immediately adjoining the project site.

Heavy vibration-generating construction equipment, such as vibratory rollers or clam shovel drops, would have the potential to produce vibration levels up to 0.278 in/sec PPV at residential buildings adjoining the project site. At all other structures in the project vicinity, construction would not generate vibration levels exceeding 0.03 in/sec PPV. At these locations, and in other surrounding areas where vibration would not be expected to cause cosmetic damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby businesses, perceptible vibration can be kept to a minimum.

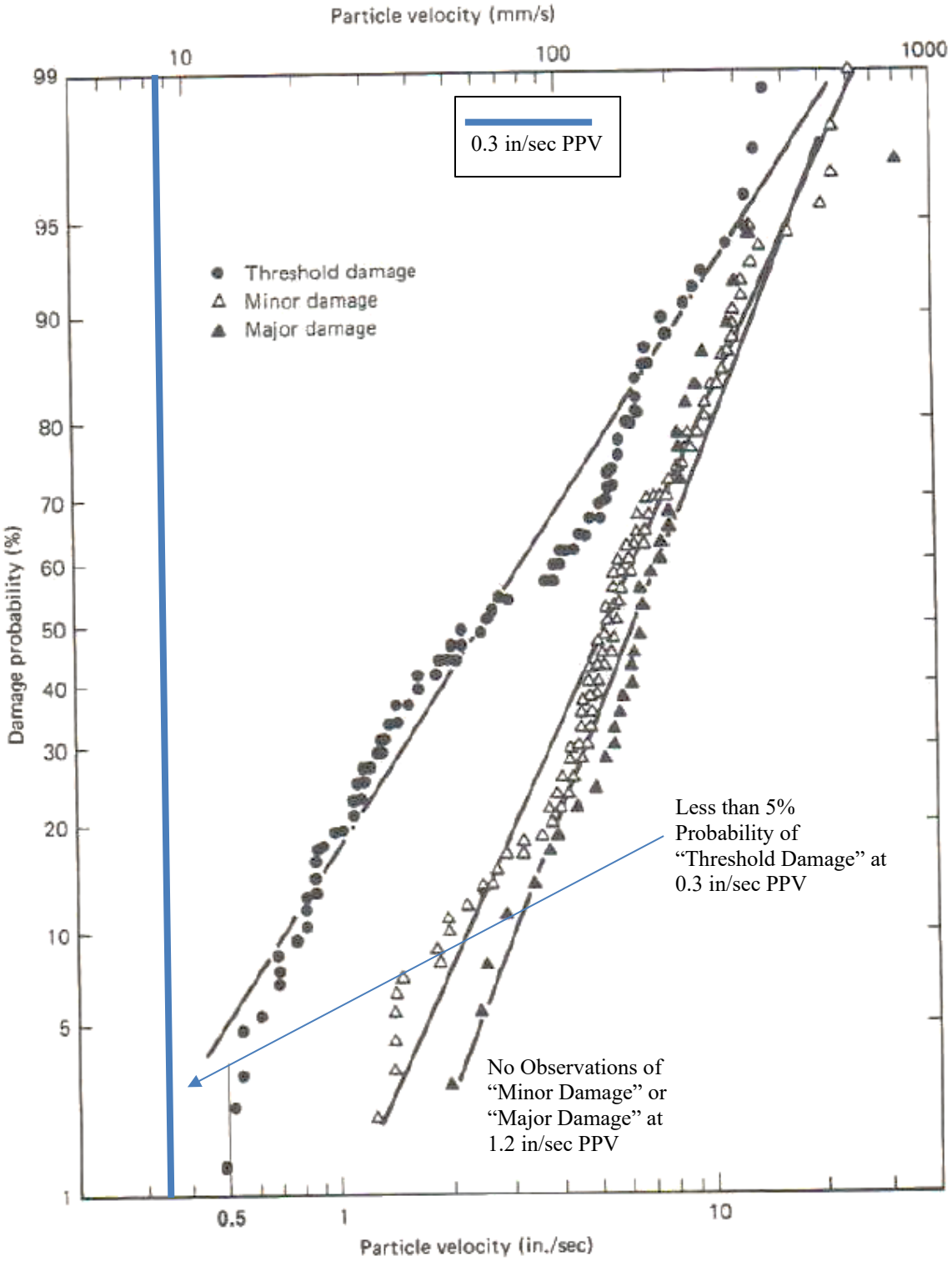
In summary, the construction of the project would potentially generate vibration levels exceeding the General Plan threshold of 0.2 in/sec PPV at nonhistorical properties in the project vicinity. This would be a potentially significant impact.

TABLE 16 Vibration Source Levels for Construction Equipment

Equipment		PPV (in/sec)			
		West Residences (20ft)	**North Residences (25ft)**	**East Residences (130ft)**	**South Residences (310ft)**
Clam shovel drop		**0.258**	**0.202**	0.033	0.013
Hydromill (slurry wall)	in soil	0.010	0.008	0.001	0.001
	in rock	0.022	0.017	0.003	0.001
Vibratory Roller		**0.268**	**0.210**	0.034	0.013
Hoe Ram		0.114	0.089	0.015	0.006
Large bulldozer		0.114	0.089	0.015	0.006
Caisson drilling		0.114	0.089	0.015	0.006
Loaded trucks		0.097	0.076	0.012	0.005
Jackhammer		0.045	0.035	0.006	0.002
Small bulldozer		0.004	0.003	0.0005	0.0002

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., August 2021.

FIGURE 2 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

Mitigation Measure 2:

Construction Vibration Monitoring, Treatment, and Reporting Plan: The project applicant shall implement a construction vibration monitoring plan to document conditions prior to, during, and after vibration generating construction activities. All plan 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 include, but not be limited to, the following measures:

- The report shall include a description of measurement methods, equipment used, calibration certificates, and graphics as required to clearly identify vibration-monitoring locations.

- A list of all heavy construction equipment to be used for this project and the anticipated time duration of using the equipment that is known to produce high vibration levels (clam shovel drops, vibratory rollers, hoe rams, large bulldozers, caisson drillings, loaded trucks, jackhammers, etc.) shall be submitted to the Director of Planning or Director's designee of the Department of Planning, Building, and Code Enforcement by the contractor. This list shall be used to identify equipment and activities that would potentially generate substantial vibration and to define the level of effort required for continuous vibration monitoring. Phase demolition, earth-moving, and ground impacting operations so as not to occur during the same time period.

- Prohibit the use of heavy vibration-generating construction equipment within 30 feet of adjacent buildings.

- Use a smaller vibratory roller, such as the Caterpillar model CP433E vibratory compactor, when compacting materials within 30 feet of adjacent buildings. Only use the static compaction mode when compacting materials within 15 feet of buildings.

- Document conditions at all structures located within 30 feet of construction prior to, during, and after vibration generating construction activities. All plan 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. Specifically:

    - Vibration limits shall be applied to vibration-sensitive structures located within 30 feet of all construction activities identified as sources of high vibration levels.

    - Performance of a photo survey, elevation survey, and crack monitoring survey for each structure of normal construction within 30 feet of all construction activities identified as sources of high vibration levels. Surveys shall be performed prior to any construction activity, in regular intervals during construction, and after project completion of vibration generating construction activities, and shall include internal and external crack monitoring in the structures, settlement, and distress, and shall document the condition of the foundations, walls and other structural elements in the interior and exterior of said structures.

- Avoid dropping heavy equipment and use alternative methods for breaking up existing pavement, such as a pavement grinder, instead of dropping heavy objects, within 30 feet of adjacent buildings.

- The contractor shall alert heavy equipment operators to the close proximity of the adjacent structures so they can exercise extra care.

- 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.

- Develop a vibration monitoring and construction contingency plan to identify structures where monitoring would be conducted, set up a vibration monitoring schedule, define structure-specific vibration limits, and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies shall be identified for when vibration levels approached the limits.

- At a minimum, vibration monitoring shall be conducted during demolition and excavation activities.

- Conduct a post-construction survey on structures where either monitoring has indicated high vibration levels or complaints of damage has been made. Make appropriate repairs or compensation where damage has occurred as a result of construction activities.

Implementation of this mitigation measure would reduce the impact to a less-than-significant level.

Impact 3: **Excessive Aircraft Noise.** The project site is located about 3.6 miles from Norman Y. Mineta International Airport, and the noise environment attributable to aircraft is considered normally acceptable under the Santa Clara County ALUC noise compatibility policies for residential land uses. This is a **less-than-significant** impact.

Norman Y. Mineta San José International Airport is a public-use airport located approximately 3.6 miles southwest of the project site. According to the City's new Airport Master Plan Environmental Impact Report,[6] the project site lies well outside the 60 dBA CNEL/DNL contour line (see Figure 3). According to Policy EC-1.11 of the City's General Plan, the required safe and compatible threshold for exterior noise levels would be at or below 65 dBA CNEL/DNL for aircrafts. Therefore, the proposed project would be compatible with the City's exterior noise standards for aircraft noise.

Assuming standard construction materials for aircraft noise below 60 dBA DNL, the future interior noise levels resulting from aircraft would below 45 dBA DNL. Therefore, future interior noise at the proposed building would be compatible with aircraft noise. This would be a less-than-significant impact.

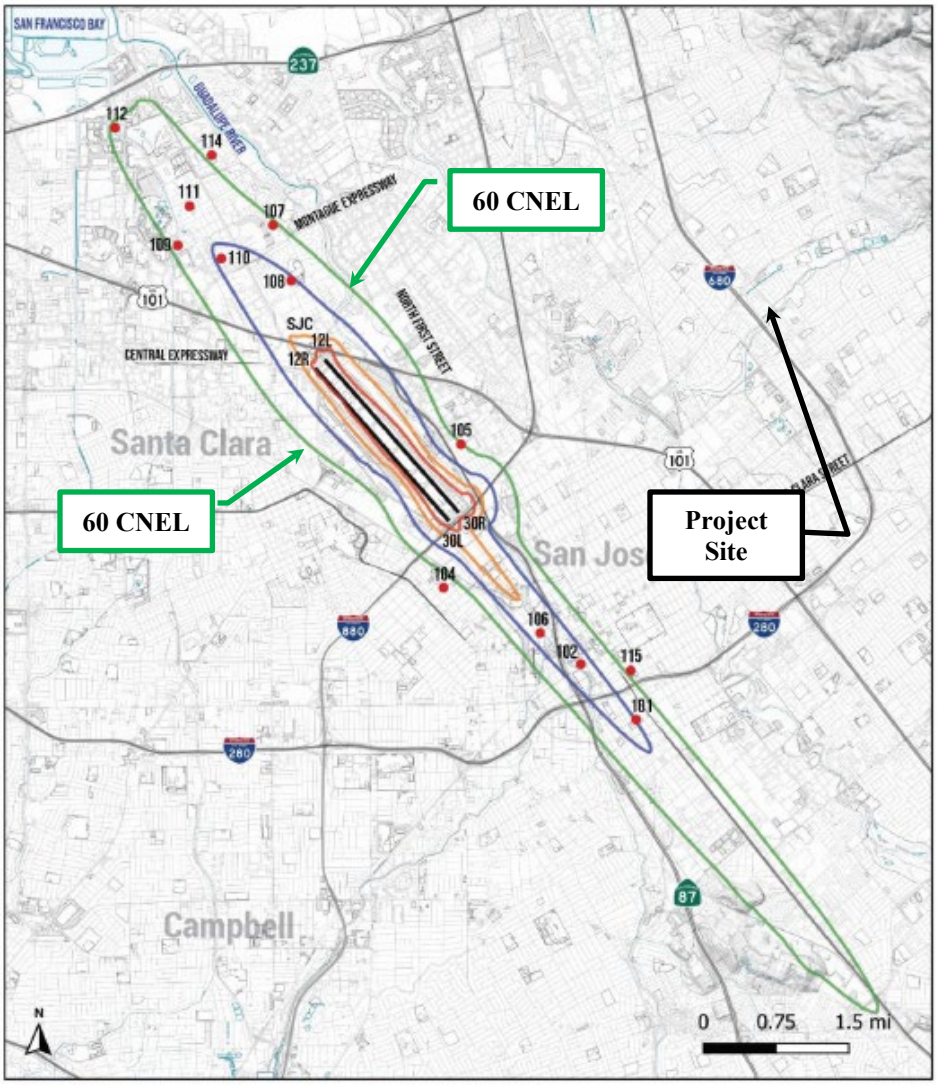
[6] David J. Powers & Associates, Inc., Integrated Final Environmental Impact Report, Amendment to Norman Y. Mineta San Jose International Airport Master Plan, April 2020.

Mitigation Measure 3: **None required.**

FIGURE 3 2037 CNEL Noise Contours for SJIA Relative to Project Site

Figure 5
Scenario 2: With Project 2037 Noise Contour Map

SAN JOSE INTERNATIONAL AIRPORT | Environmental Impact Report FINAL | October 2019



NORMAN Y. MINETA SAN JOSE INTERNATIONAL AIRPORT

- Noise Monitoring Station
- 101 Site ID
- Runway
- 75 dBA and Greater CNEL Contour
- 70 dBA and Greater CNEL Contour
- 65 dBA and Greater CNEL Contour
- 60 dBA and Greater CNEL Contour

Figure 5 Scenario 2: With Project 2037 Noise Contour Map

Source: BridgeNet International 2019

Cumulative Impacts

Cumulative noise impacts would include either cumulative traffic noise increases under future conditions or temporary construction noise from cumulative construction projects. While the traffic study did not include cumulative traffic volumes, it did include background and background plus project traffic volumes, which would include all planned projects. These scenarios were used for the cumulative impact assessment.

A significant cumulative traffic noise increase would occur if two criteria are met: 1) 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 2) 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.

When the background and background plus project volumes were compared to the existing volumes, a noise level increase of 1 dBA DNL or less was calculated along every roadway segment, with and without the project. Therefore, cumulative traffic noise increases would occur due to the proposed project.

From the City's website,[7] there are no planned or approved projects located within 1,000 feet of the proposed project site. Therefore, no cumulative construction impacts would occur in the project vicinity.

[7] https://gis.sanjoseca.gov/maps/devprojects/

APPENDIX A

FIGURE A1 Daily Trend in Noise Levels for LT-1 on Tuesday, August 17, 2021

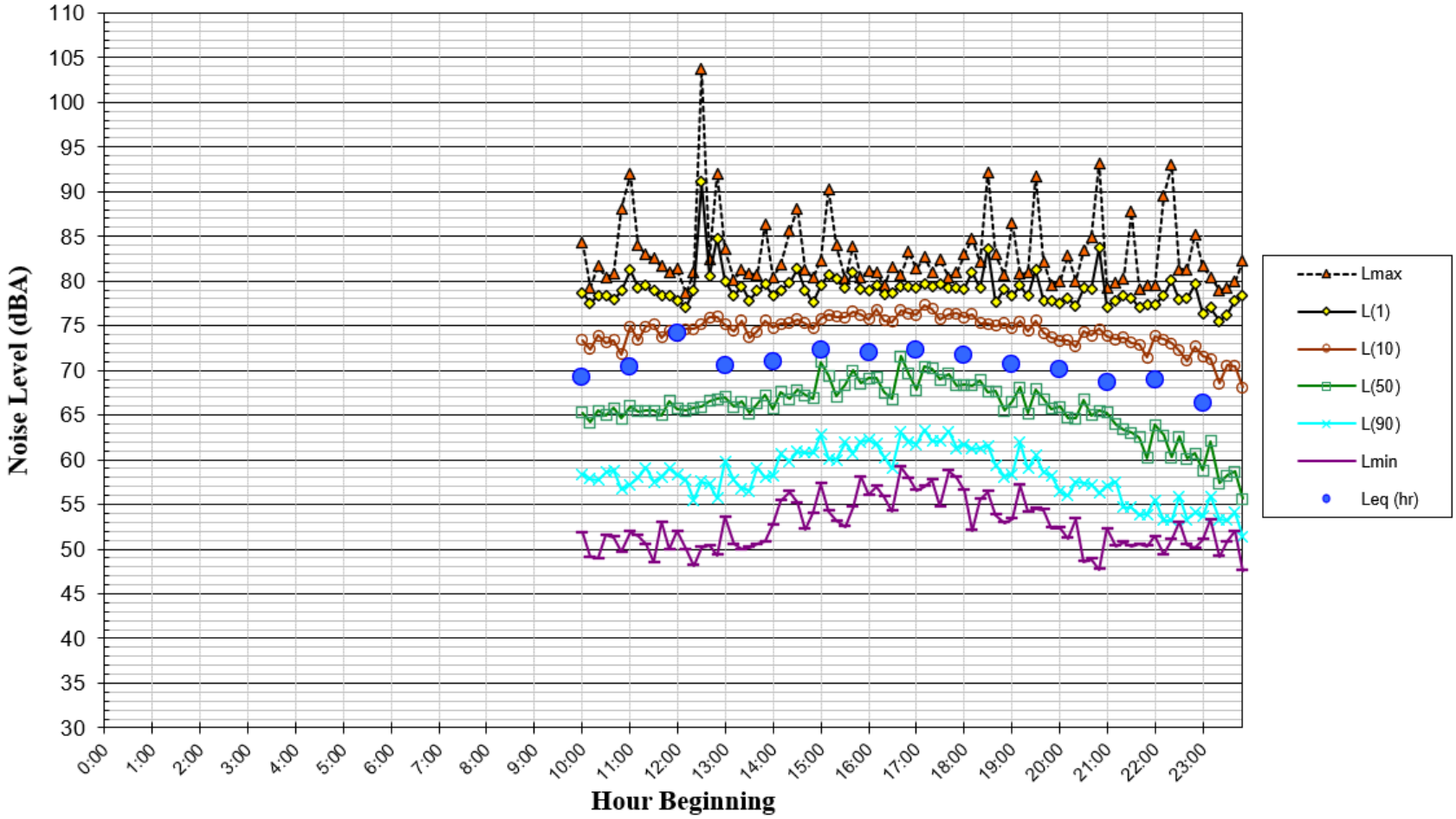


FIGURE A2 Daily Trend in Noise Levels for LT-1 on Wednesday, August 18, 2021

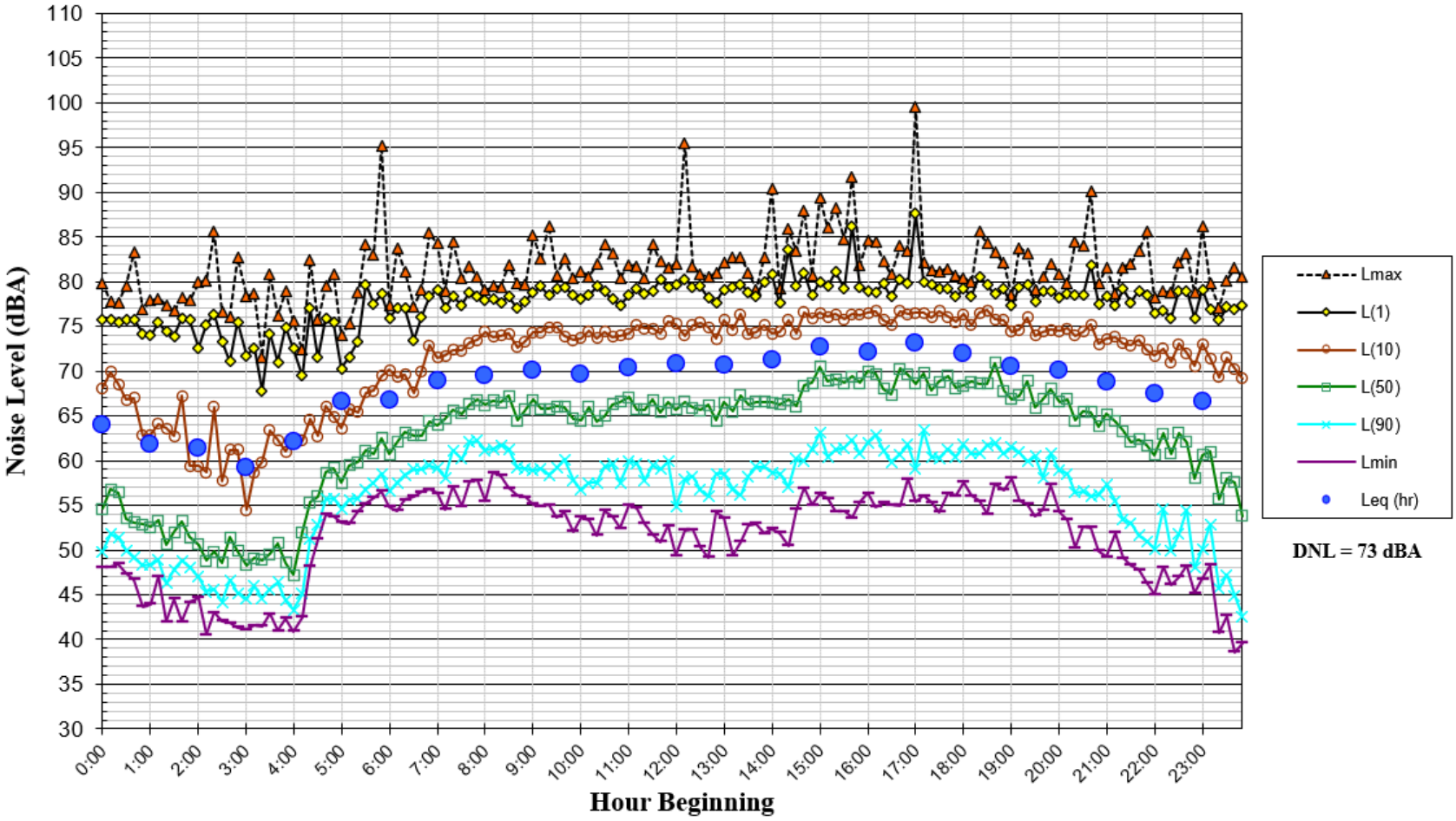


FIGURE A3 Daily Trend in Noise Levels for LT-1 on Thursday, August 19, 2021

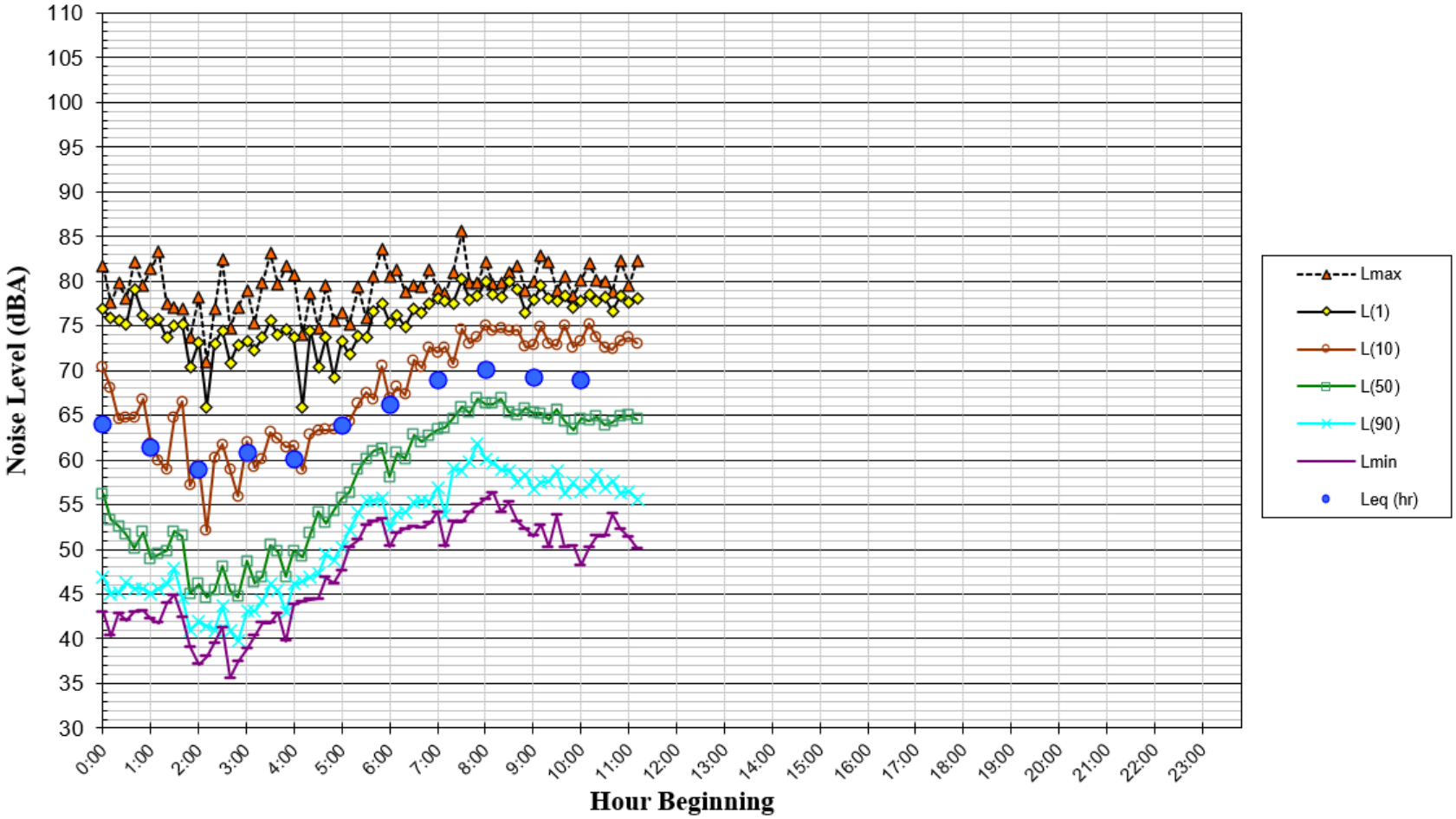


FIGURE A4 Daily Trend in Noise Levels for LT-2 on Tuesday, August 17, 2021

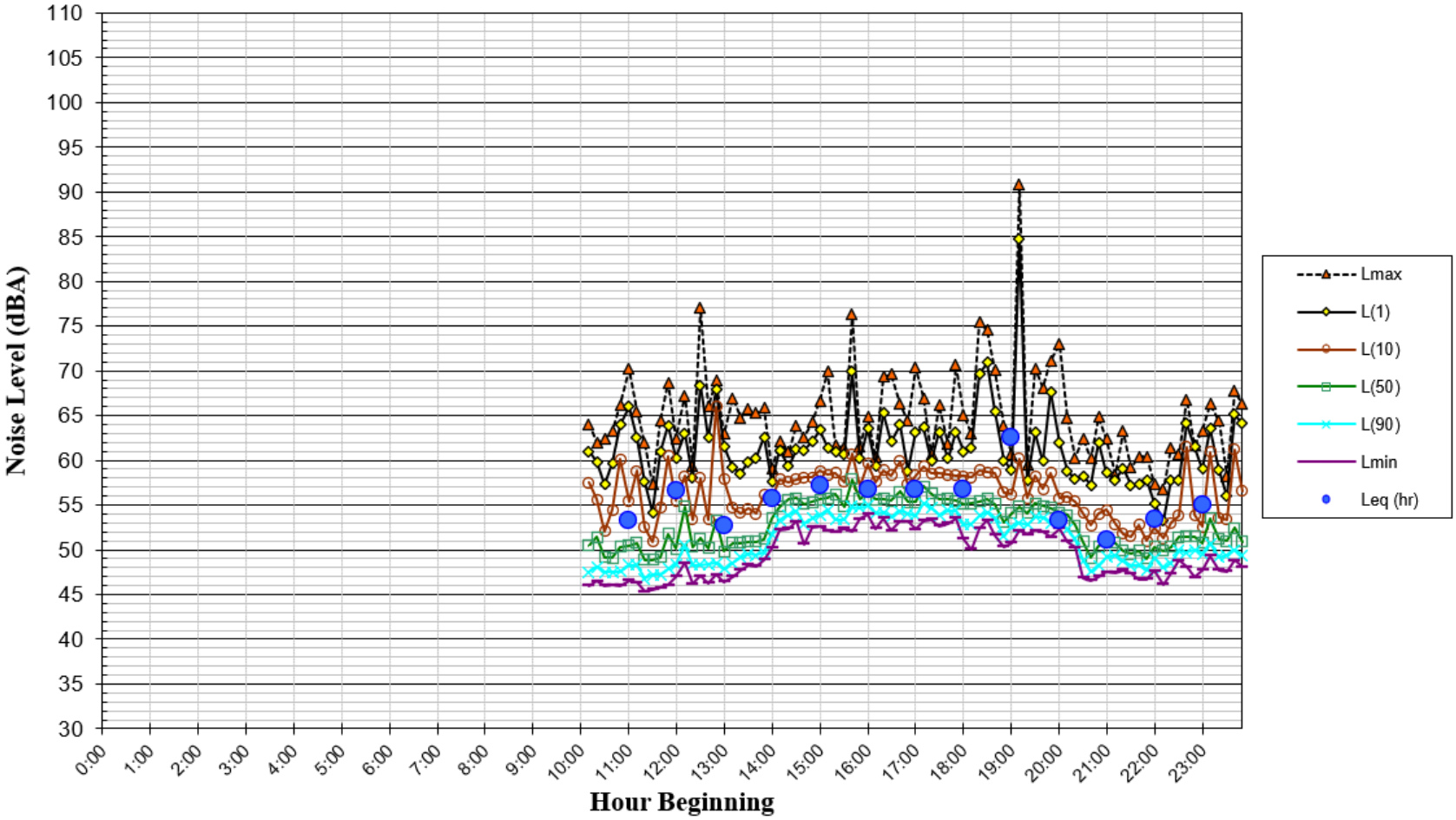


FIGURE A5 Daily Trend in Noise Levels for LT-2 on Wednesday, August 18, 2021

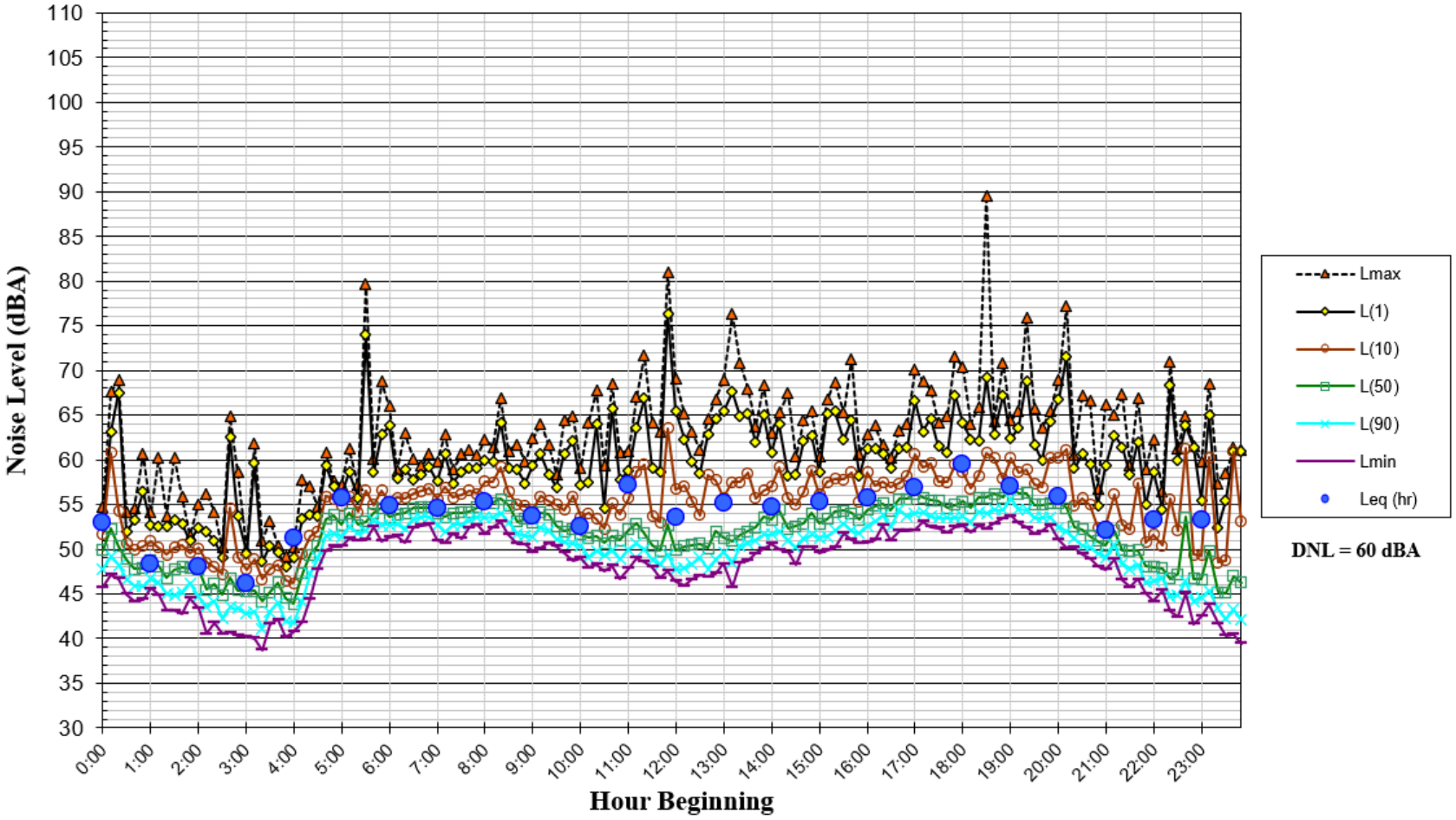


FIGURE A6 Daily Trend in Noise Levels for LT-2 on Thursday, August 19, 2021

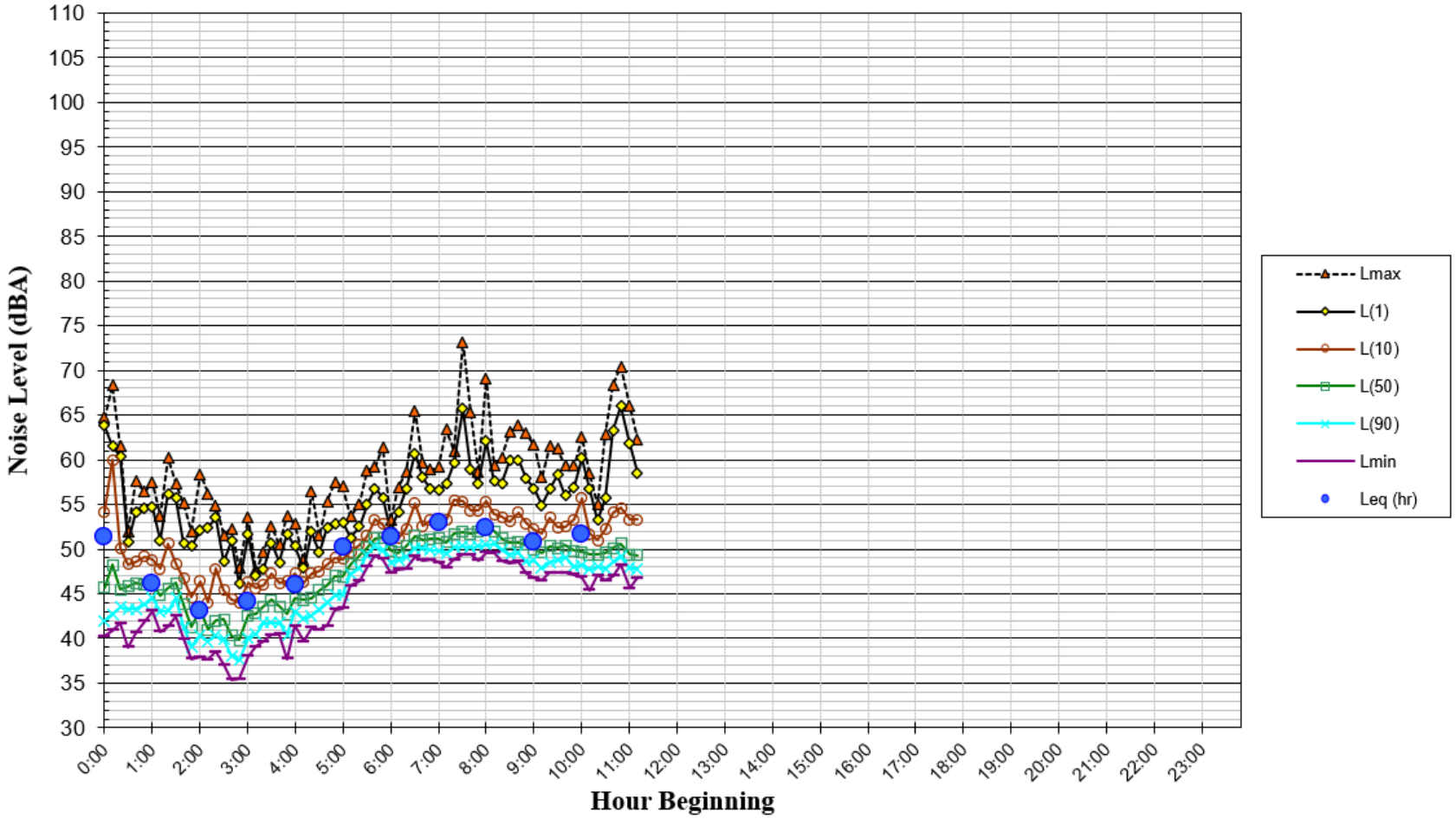


FIGURE A7 VTA Light Rail Train Vibration Levels at V-1

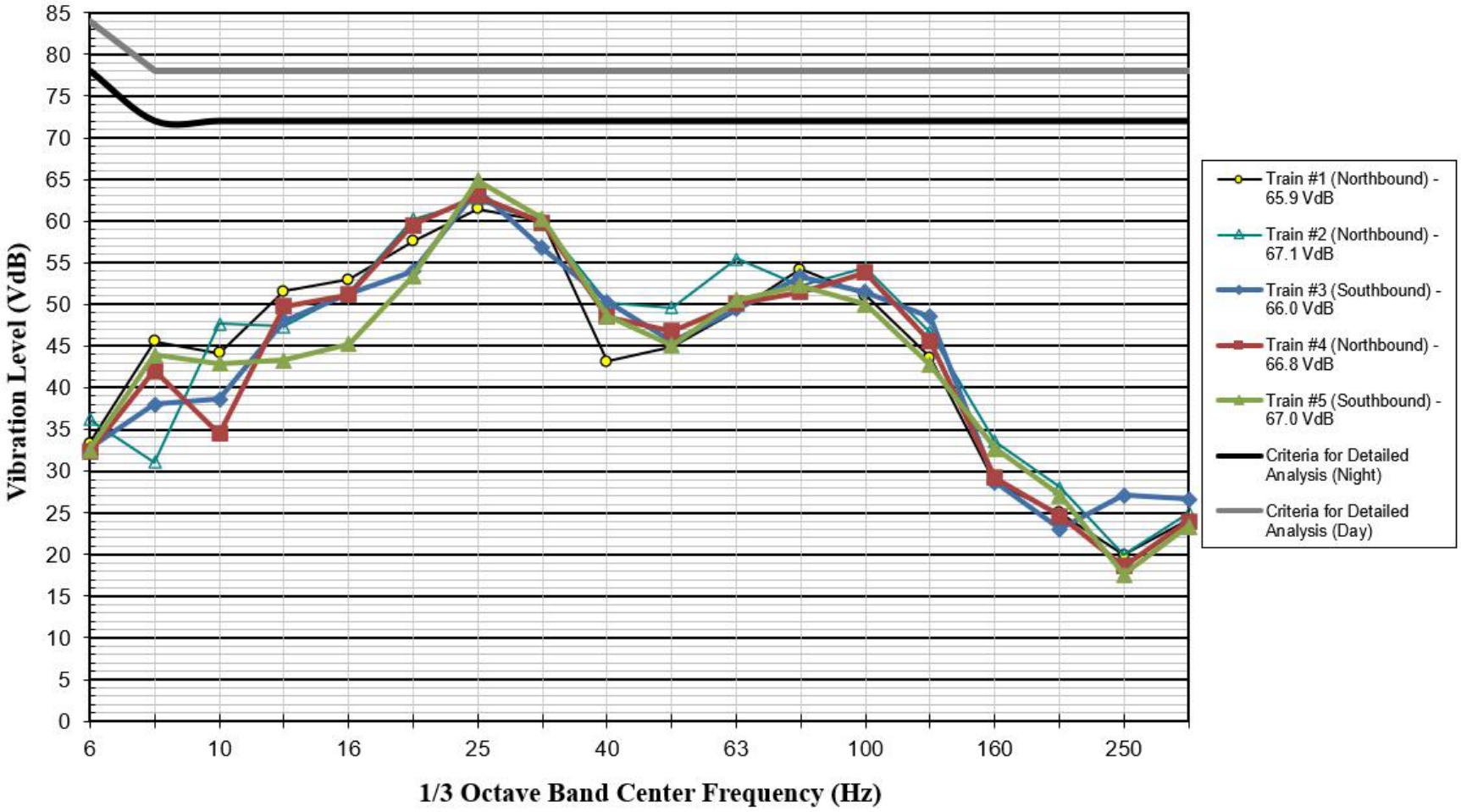


FIGURE A8 VTA Light Rail Train Vibration Levels at V-2