FOUNTAIN ALLEY PROJECT ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

The Fountain Alley project proposes the construction of a 21-story mixed use building located at 35 South 2nd Street in San José, California. The proposed building would include below-grade parking where truck loading and unloading would occur in addition to on-site parking spaces; ground-level lobby access for both offices and residential units; ground-level commercial retail; a second-floor gym; residential units located on floors 2 through 11; and offices on floors 12 through 21.

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 existing noise and vibration conditions; 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 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

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

Annoyance

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

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.

2019 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2019 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). The sections that pertain to this project are as follows:

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

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

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.

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.

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.

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.

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

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

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

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

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

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

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

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

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 4. 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 4 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 35 South 2nd Street in the downtown area of San José, California. The site is surrounded by mixed-use buildings, which have ground-level retail, commercial, and office and upper-floor residential, to the west, to the south, opposite Fountain Alley to the north, and opposite South 2nd Street to the east. The project site is currently developed with a surface parking lot.

The existing noise environment at the site results primarily from vehicular traffic along South 1st Street, South 2nd Street, and East Santa Clara Street. Secondary sources include local VTA light rail trains and buses that runs parallel to South 2nd Street. Aircraft associated with Mineta San José International Airport also contributes to the noise environment at times.

Due to the Shelter-in-Place restrictions in the Bay Area at the time of this study, traffic volumes along the surrounding roadways were reduced from typical conditions. A noise monitoring survey was not completed to document ambient noise levels during this unique time period because resultant noise levels would not be representative of typical ambient conditions. However, the project site and the surrounding area falls within the plan area for the *Downtown San José Strategy Plan 2040 EIR.*[1] Measurements and noise contours generated for the Downtown Strategy Plan and old noise measurements made at the project site in 2004 were reviewed to establish the existing noise environment.

As part of the ambient noise measurements made for the Downtown Strategy Plan, a long-term noise measurement was made 30 feet from the centerline of South 1st Street (LT-11) along the segment between East Santa Clara Street and East San Fernando Street starting March 16, 2018 and ending March 18, 2018. The day-night average noise level at LT-11 was estimated to be 72 dBA DNL during this timeframe. Additionally, the existing traffic noise contours, based on peak hour traffic volumes provided in 2015, were generated for the Plan Area. These are shown in Figure 1.

1 City of San José, "Downtown San José Strategy Plan 2040 Environmental Impact Report," December 2018.

I&R also made ambient noise measurements at the proposed project site in August 2005. These measurements included one long-term measurement (LT-1) and one short-term measurement (ST-1). Both measurements were made along the eastern boundary of the project site. These measurements, as well as LT-11, are shown in Figure 2. This noise monitoring survey was made from Monday, August 22, 2005 through Tuesday, August 23, 2005.

A VTA light rail track runs along the near side of South 2nd Street, with a bus lane and a traffic lane located on the far side of the street. LT-1 was located about 25 feet from the VTA line, about 50 feet from the bus lane, and about 60 feet from traffic lane. Typical hourly average noise levels at LT-1 ranged from 64 to 69 dBA L_{eq} during the day and from 58 to 68 dBA L_{eq} at night. The day-night average noise level over the course of the measurement period was 70 dBA DNL. The daily trend in noise levels at LT-1 is shown in Figure 3.

Measurement ST-1 was conducted at the site to identify and quantify noise levels generated by the various noise sources adjacent to the site. The 10-minute average noise level measured at ST-1 from 2:10 p.m. to 2:20 p.m. on August 22, 2005 was 69 dBA L_{eq} and included seven bus movements, three light rail movements, one aircraft overflight, and various traffic, parking lot and pedestrian noise. Buses and VTA light rail vehicles typically stopped in front of the site and idled for several seconds during passenger boarding before continuing up South 2nd Street. VTA vehicles made audible announcements of the stop location during arrival and sounded warning bells during arrival and departure from the station. Typical maximum noise levels measured during the short-term noise measurement are summarized in Table 5.

TABLE 5 Typical Maximum Noise Levels Measured at ST-1

Activity	Typical L_{max} Noise Level, dBA
VTA Movement	74 to 77
VTA Idling	60 to 65
VTA Bell	75
VTA Announcement	65
Bus Movement	70 to 75
Bus Idling	65 to 70
Parking Lot Noise	60 to 65
Aircraft	60 to 65

Existing Vibration Environment

Vibration measurements were measured along the VTA light rail line for a project located at 27 South 1st Street on Wednesday, March 28, 2018.[2] 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 were measured at the ground level approximately 60 feet from the light rail track on South 1st Street. This is the same train line that run along South 2nd Street.

[2] Illingworth & Rodkin, Inc., "27 South First Street Project Environmental Noise and Vibration Report," December 14, 2018.

A total of six (6) individual light rail train passbys were observed and recorded at the 60-foot vibration monitoring site during the testing period. Vibration levels were measured in the vertical axis because ground vibration is typically most dominant in this axis. Vibration spectra measured during each light rail train passby event are shown in Figure 4. Overall levels ranged from 59 to 64 VdB at a distance of 60 feet from the tracks.

FIGURE 1 Existing (2015) Noise Contours for the Downtown Strategy Plan Area

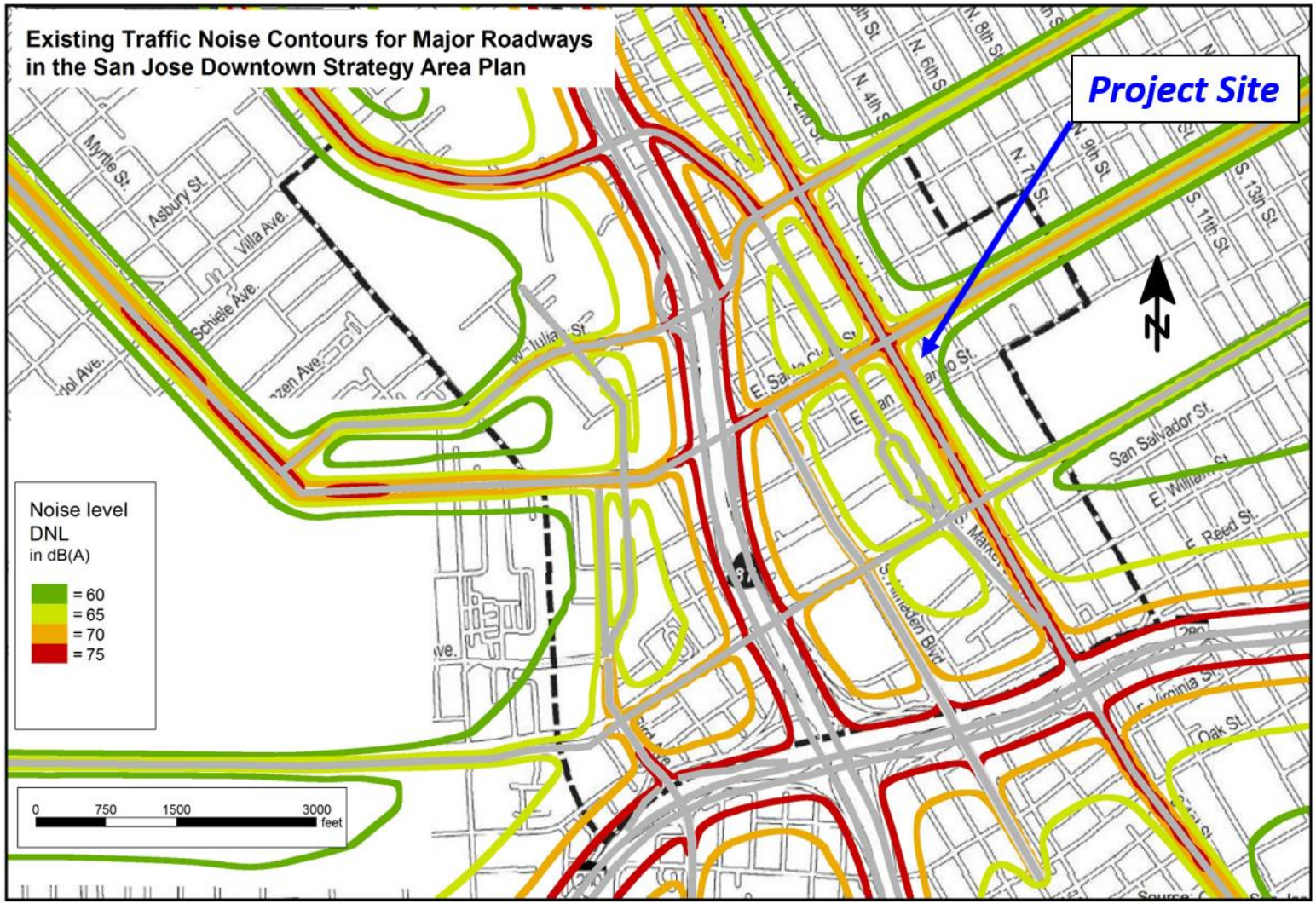
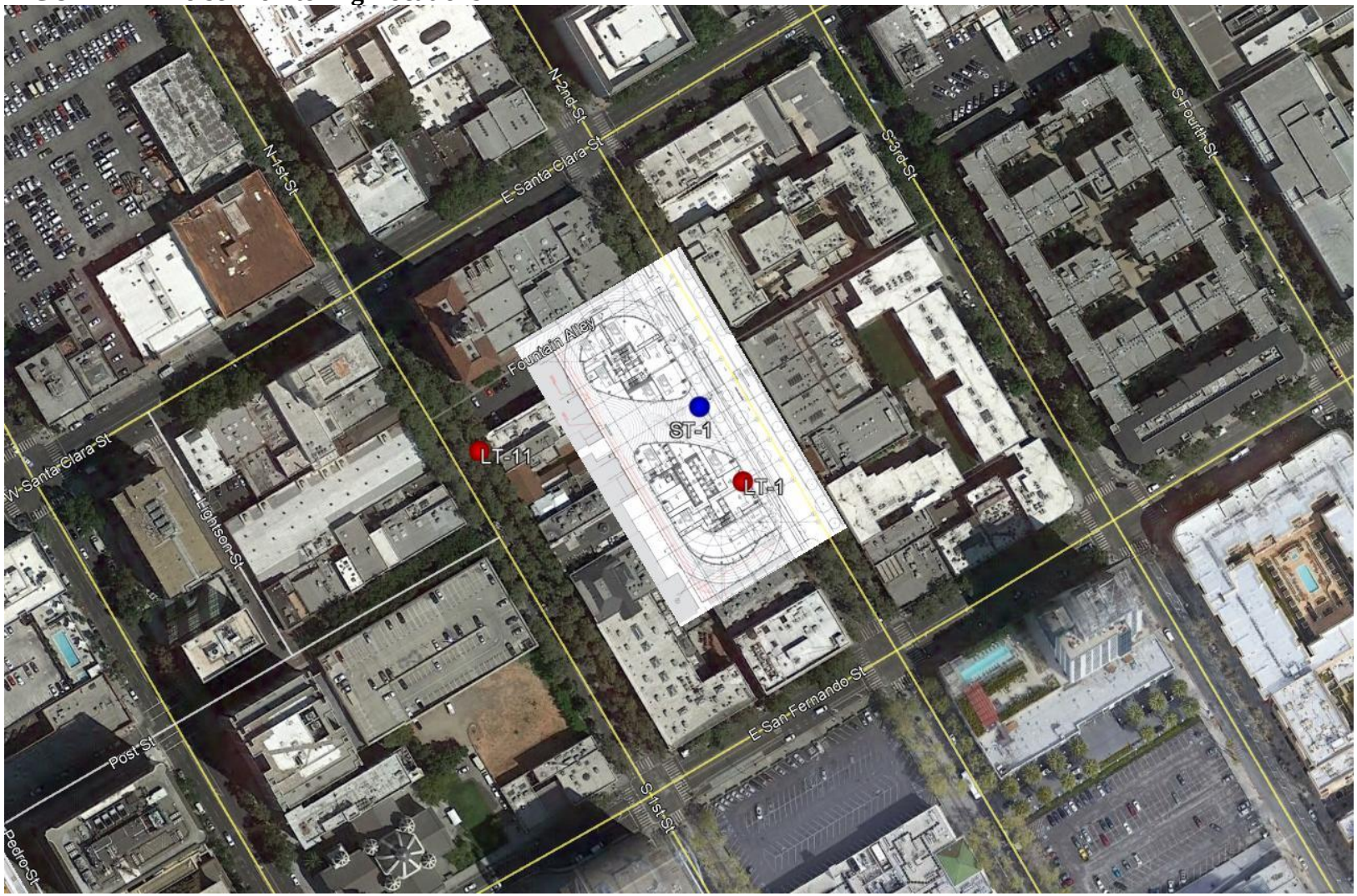


FIGURE 2 Noise Monitoring Locations



Source: Google Earth, 2021.

FIGURE 3 Daily Trend in Noise Levels at LT-1, Monday, August 22, 2005 through Tuesday, August 23, 2005

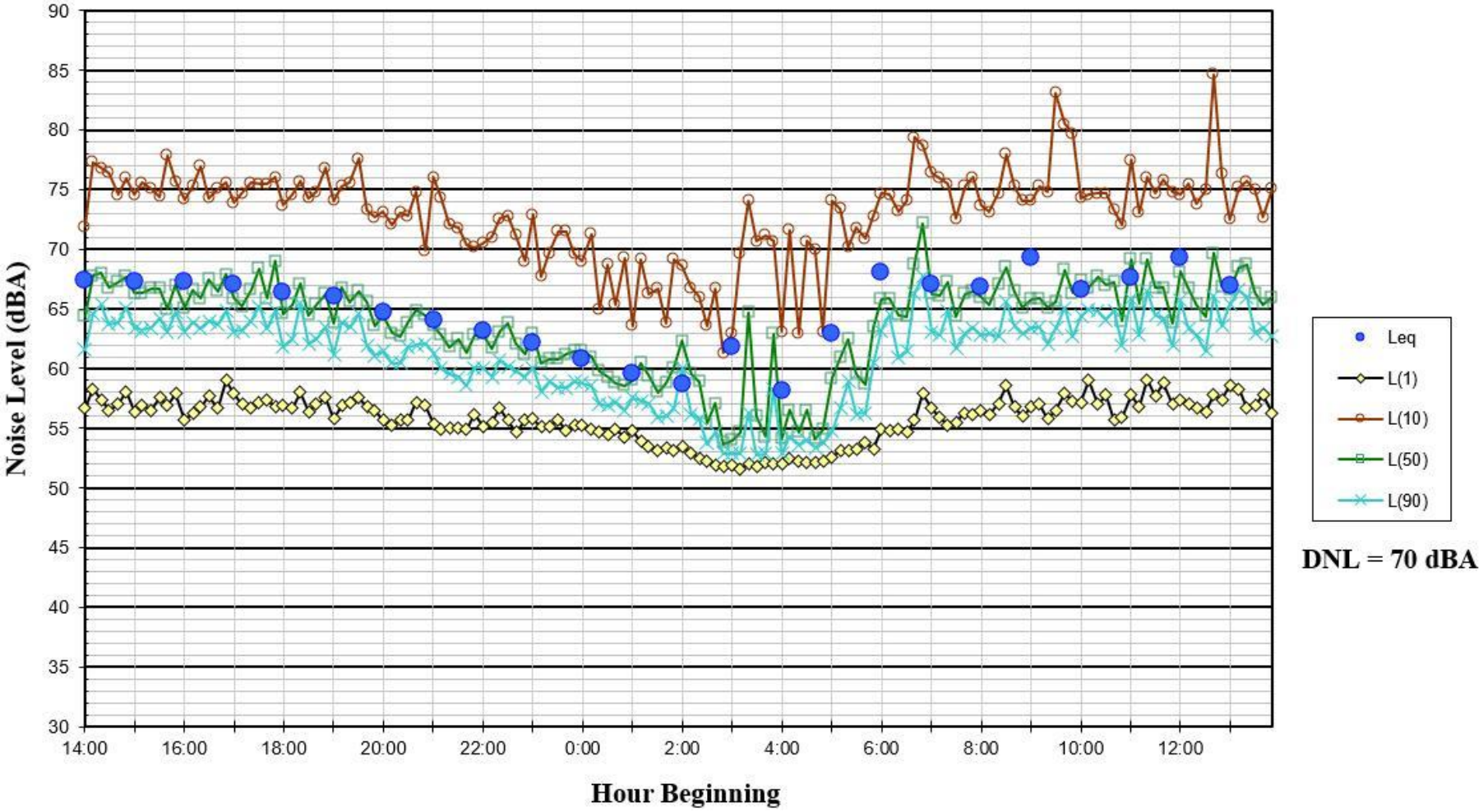
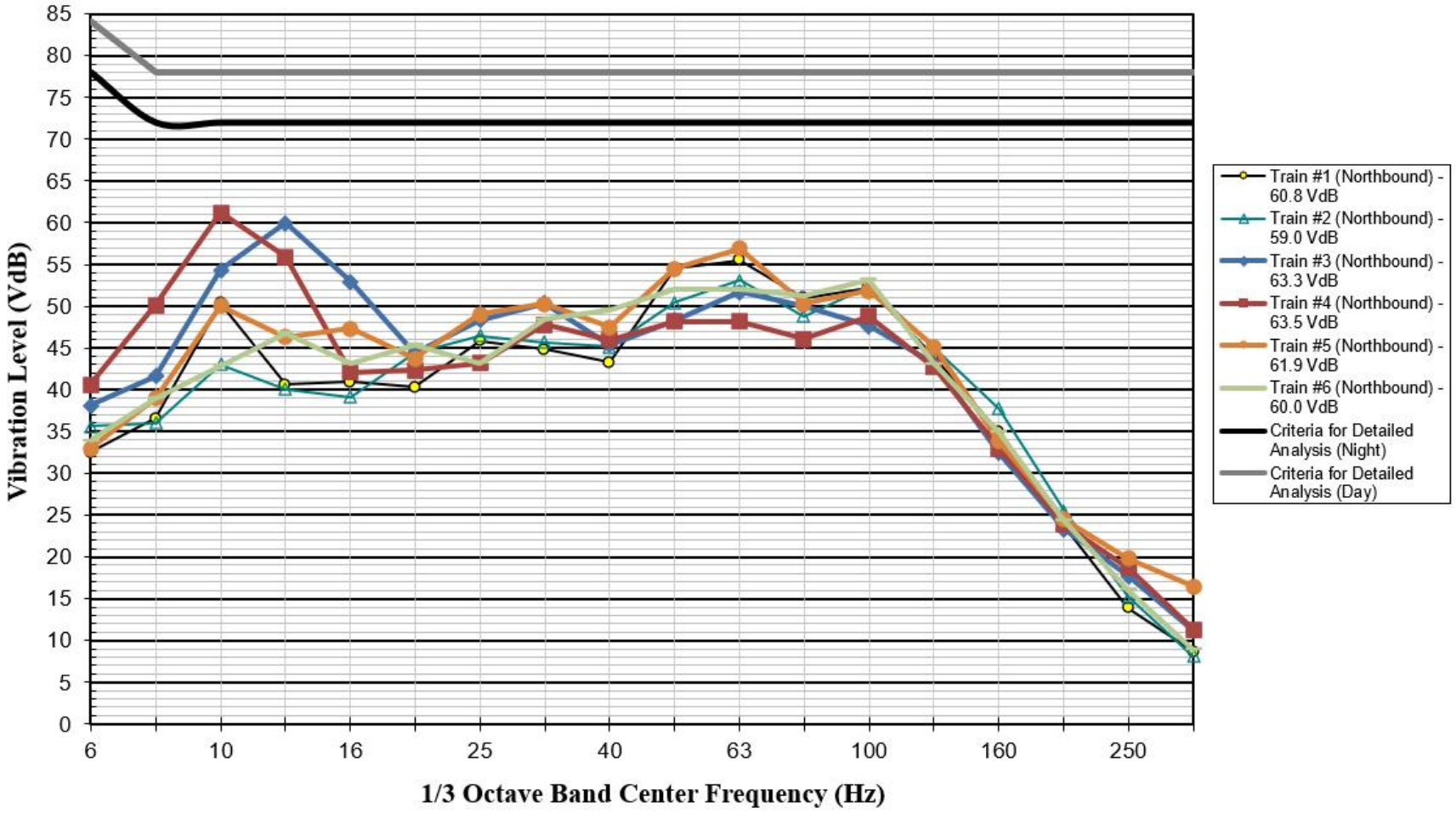


FIGURE 4 Vibration Levels from Light Rail Train Passbys



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 70 dBA DNL or less for the proposed commercial land uses.

- The Cal Green Code standards specify an interior noise environment attributable to exterior sources not to exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas of nonresidential uses during any hour of operation.

The future noise environment at the site would continue to result primarily from vehicular traffic and the VTA light rail. According to the traffic study completed for the *Downtown San José Strategy Plan 2040 EIR*,[1] the traffic noise level increase at the project site would be 2 dBA DNL under each of the 2040 cumulative buildout alternatives.

Future Exterior Noise Environment

The proposed project includes commercial retail uses on the ground floor, a gym on the second floor, residential units on floors two through 11, and commercial office space on floors 12 through 21, and a roof terrace.

Residential Land Uses

Common use outdoor areas associated with the residential component of the proposed project would include decks on the 11th floor located along the eastern and western façades and the roof terrace.

The eastern deck on the 11th floor would be set back approximately 55 to 95 feet from the centerline of South 2nd Street, with partial shielding provided by the building and the elevation of the deck above the ground. The center of the eastern deck, which is where most of the extended outdoor use would occur, would be approximately 90 feet from the centerline of the roadway. Along the edge of the eastern deck, future exterior noise levels would be up to 63 dBA DNL; however, at the center of the deck, future exterior noise levels would be below 60 dBA DNL.

The western deck on the 11th floor would be set back approximately 205 to 245 feet from the centerline of South 1st Street, with the center of the deck being approximately 235 feet from the centerline. In addition to the proposed building and elevation of the deck providing shielding, the adjacent buildings to the west would also provide partial shielding. The future noise levels at the western deck located on the 11th floor would be below 60 dBA DNL.

The roof terrace would be located along the entire roof of the proposed building, approximately 286.5 feet above the ground. At this height, and assuming most outdoor use to occur towards the center of the terrace, the future exterior noise levels at the roof terrace would be below 60 dBA DNL.

The future noise levels at the centers of the outdoor use areas associated with the residential component of the proposed project would meet the City's normally acceptable threshold of 60 dBA DNL.

Commercial Land Uses

The site plan shows a ground-level "urban room" located between the northern and southern lobbies of the proposed building. The center of the urban room would be set back approximately 105 feet from the centerline of South 2nd Street. The proposed building would provide some shielding for the outdoor use space, and the existing buildings located west of the project site would provide shielding from South 1st Street. The future exterior noise levels at the center of the urban room would be below 70 dBA DNL. This would be compatible with the City's normally acceptable threshold of 70 dBA DNL.

Future Interior Noise Environment

Residential Land Uses

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.

Residential units would be located on floors two through 11 of the proposed building. Units located along the eastern façade nearest South 2nd Street would be set back from the centerline of the roadway by approximately 55 feet. At this distance, the units facing South 2nd Street would be exposed to future exterior noise levels ranging from about 63 to 72 dBA DNL. Assuming windows to be partially open, future interior noise levels would range from 48 to 57 dBA DNL.

Units along the western façade would be partially shielded from South 1st Street by the existing buildings on the adjacent site. However, these buildings range from two- to four-stories in height. Therefore, some of the upper floors of the proposed building would have direct line-of-sight to South 1st Street. These upper floors would also have some direct exposure to SR 87, which is about 0.4 miles west of the nearest building façade. The residential units facing the western façade of the proposed building would be exposed to future exterior noise levels up to 65 dBA DNL. Assuming windows to be partially open, future interior noise levels would be up to 50 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.

Commercial Land Uses

Ground-level commercial retail uses and commercial offices on floors 12 through 21 are proposed as part of the project. Daytime hourly average noise levels at the ground level of the building exterior would range from 66 to 71 dBA L_{eq} at the eastern building façade, with day-night average noise levels up to 72 dBA DNL. On floors 12 through 21, the daytime hourly average noise levels would range from 57 to 62 dBA L_{eq}, with day-night average noise levels up to 63 dBA DNL.

Standard construction materials for commercial uses would provide about 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so that windows may be kept closed at the occupant's discretion and would provide an additional 5 dBA reduction. The standard construction materials in combination with forced-air mechanical ventilation would satisfy the daytime threshold of 50 dBA $L_{eq(1\text{-}hr)}$.

Spaces where lower noise levels would be desired, such as private offices and conference rooms, may benefit from additional noise control in order to meet a lower, more desirable interior noise level. Additional noise control could be accomplished by selecting higher sound-rated windows (STC 34 or greater along exterior façades).

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 would require windows and doors with a minimum rating of 31 STC with 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

A qualified acoustical specialist shall prepare a detailed analysis of interior residential noise levels resulting from all exterior sources during the design phase pursuant to requirements set forth in the State Building Code. The study will also establish appropriate criteria for noise levels inside the commercial spaces affected by environmental noise. The study will review the final site plan, building elevations, and floor plans prior to construction and recommend building treatments to reduce residential interior noise levels to 45 dBA DNL or lower. Treatments would include, but are not limited to, sound-rated windows and doors, sound-rated wall and window constructions, acoustical caulking, protected ventilation openings, etc. The specific determination of what noise insulation treatments are necessary shall be conducted on a unit-by-unit basis during final design of the project. Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans and approved design, prior to issuance of a building permit.

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 and heavy 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 4) 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 4 provide thresholds based on the number of train passbys 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

A discussion of recent light rail train activity was included in the *Downtown San José Strategy Plan 2040 EIR*.[1] This stated that vibration levels from light rail trains passing through the plan area would not exceed the "frequent events" category from FTA criteria shown in Table 4 at a distance of 60 feet from the tracks. Per Policy EC-2.1 of the City's General Plan, buildings proposed within 100 feet of the VTA tracks need to demonstrate compliance with the FTA standards.

The nearest building façade would be approximately 25 feet from the nearest VTA tracks. Propagating the measured vibration levels taken at 27 South 1st Street[2] to a distance of 25 feet using a fall-off rate of 3 dB per doubling of the distance, vibration levels are estimated to range from 63 to 67 VdB at the nearest building façade. Based on the number of events observed in a relatively short span of time in March 2018, sites along this light rail line would be subject to 70 or more events per day. This is not expected to change under future project conditions. The proposed mixed-use residential building would fall into Category 2, which has a threshold of 72

VdB for frequent events. With vibration levels up to 67 VdB at the nearest building façade, the proposed project is expected to meet the vibration threshold. The project would 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 proposes work hours from 7:00 a.m. to 10:00 p.m. Monday through Friday and from 7:00 a.m. to 7:00 p.m. on Saturdays. The hours lie outside the allowable construction hours and would require a permit from the City.

The ambient noise environment at the noise-sensitive receptors in the project vicinity along area roadways would be represented by LT-1 and ST-1. During daytime hours, the hourly average noise levels would range from 64 to 69 dBA L_{eq}. Noise levels in areas away from local roadways would be about 5 to 10 dBA less.

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 of the existing parking lot located at the site, substantial excavation to create the basement levels and foundations, utilities, 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 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 6) from the equipment. Table 7 shows the average noise level ranges, by construction phase. Hourly average noise levels generated by construction are about 75 to 89 dBA L_{eq} for mixed-use commercial office 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.

A detailed list of equipment expected to be used during each phase of project construction was provided and is summarized in Table 8. 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 level, as estimated at the property line of each surrounding land use, is also shown in Table 8. For overall construction noise levels, 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 noise-sensitive receptors, the collective worst-case hourly average noise level for each phase was centered at the geometrical center of the site and propagated to the nearest property line of the surrounding land uses. These noise level estimates are also shown in Table 8. Noise levels in Table 8 do not assume reductions due to intervening buildings or existing barriers. Note, for the phases requiring cement and mortar mixers, the table shows the total number expected during the phase; however, these would not all be operating at one time. At any given time, up to six cement and mortar mixers could be operational. For modeling worst-case scenario, six cement and mortar mixers were assumed for the trenching/foundation, building – superstructure/exterior, and sitework phases. Additionally, during pour days of the foundation, up to six trucks would be operational on site at any given time. During pour days of the decks/shear walls, up to 3 trucks would be operational. This is included in the noise level estimates of Table 8.

TABLE 6 Construction Equipment 50-Foot Noise Emission Limits

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

Notes:

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

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

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

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

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

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

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

TABLE 8 Estimated Construction Noise Levels at Nearby Land Uses

Phase of Construction	Time Duration	Construction Equipment (Quantity)	Calculated Hourly Average Noise Levels, L_{eq} (dBA)							
			Ambient Noise Levels = 64 to 69 dBA L_{eq}							
			West Res. & Comm. (75ft)		North Comm. (190ft)		South Res. & Comm. (200ft)		East Res. & Comm. (130ft)	
			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	6 days	Concrete/Industrial Saw (1) Excavator (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	82 dBA	Yes	74 dBA	Yes	74 dBA	Yes	78 dBA	Yes
Site Preparation	65 days	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2)	82-85 dBA[b]	Yes	74-77 dBA[b]	Yes	74-77 dBA[b]	Yes	78-81 dBA[b]	Yes
Grading/ Excavation	140 days	Excavator (2) Grader (1) Rubber-Tired Dozer (1) Concrete/Industrial Saw (2) Tractor/Loader/Backhoe (1)	85 dBA	Yes	77 dBA	Yes	77 dBA	Yes	80 dBA	Yes
Trenching/ Foundation	30 days	Tractor/Loader/Backhoe (1) Excavator (1) Crane (2) Cement & Mortar Mixer (774[a])	84 dBA	Yes	76 dBA	Yes	75 dBA	Yes	79 dBA	Yes
Building – Superstructure/ Exterior	440 days	Crane (2) Forklift (2) Generator Set (2) Aerial Lift (5) Cement & Mortar Mixer (5,006[a])	84 dBA	Yes	76 dBA	Yes	75 dBA	Yes	79 dBA	Yes
Building – Cores/ Elevators	330 days	Industrial Saw (1) Aerial Lift (5)	82-85 dBA[c]	Yes	74-77 dBA[c]	Yes	74-77 dBA[c]	Yes	78-81 dBA[c]	Yes
Sitework	50 days	Cement & Mortar Mixer (200[a]) Paving Equipment (1) Roller (1) Tractor/Loader/Backhoe (1)	85 dBA	Yes	77 dBA	Yes	76 dBA	Yes	80 dBA	Yes

[a] This represents total number of equipment; however, at any given time, up to five would be operational. Therefore, six cement and mortar mixers were modeled to represent worst-case conditions.
[b] Range of hourly average noise levels reflects the site preparation phase only and in combination with the demolition phase.
[c] Range of hourly average noise levels reflects the building cores/elevators phase only and in combination with the building – superstructure/exterior phase.

As shown in Table 8, 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 34 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 falls within the *Downtown San José Strategy Plan 2040 EIR* plan area, which included mitigation measures to reduce temporary construction noise levels at noise-sensitive receptors. The *Downtown San José Strategy Plan 2040 EIR* would 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.

Additionally, the City requires that reasonable noise reduction measures be incorporated into the construction plan and implemented during all phases of construction activity. Accordingly, the *Downtown San José Strategy Plan 2040 EIR* requires that all projects shall implement the following standard noise control measures:

- Construction will be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday for any on-site or off-site work within 500 feet of any residential unit. Construction outside of these hours may be approved through a development permit based on a site-specific "construction noise mitigation plan" and a finding by the Director of Planning, Building and Code Enforcement that the construction noise mitigation plan is adequate to prevent noise disturbance of affected residential uses.

- The contractor shall use "new technology" power construction equipment with state-of-the-art noise shielding and muffling devices. All internal combustion engines used on the project site shall be equipped with adequate mufflers and shall be in good mechanical condition to minimize noise created by faulty or poorly maintained engines or other components.

- The unnecessary idling of internal combustion engines shall be prohibited. Staging areas and stationary noise-generating equipment shall be located as far as possible from noise-sensitive receptors such as residential uses (a minimum of 200 feet, where feasible).

- The surrounding neighborhood within 500 feet shall be notified early and frequently of the construction activities.

- A "noise disturbance coordinator" shall be designated to respond to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaints (e.g., beginning work too early, bad muffler, etc.) and institute reasonable measures warranted to correct the problem. A telephone number for the disturbance coordinator would be conspicuously posted at the construction site.

Adherence to the Municipal Code requirements would minimize impacts to neighboring properties from temporary increases in ambient noise levels resulting from future construction activities. Larger projects within the *Downtown San José Strategy Plan 2040 EIR* plan area that are expected to last over one year in duration, such as the proposed project, may result in a substantial temporary noise increase at adjacent land uses and would require a "construction noise logistics plan," in accordance with GP Policy EC-1.7. As stated in the *Downtown San José Strategy Plan 2040 EIR*, typical construction noise logistics plan would include, but not be limited to, the following measures to reduce construction noise levels as low as practical:

- Utilize 'quiet' models of air compressors and other stationary noise sources where technology exists;

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

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

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

- Prohibit all unnecessary idling of internal combustion engines;

- If impact driving is proposed, multiple-pile drivers shall be considered to expedite construction. Although noise levels generated by multiple pile drivers would be higher than the noise generated by a single pile driver, the total duration of pile driving activities would be reduced; *(not applicable)*

- If impact pile driving is proposed, temporary noise control blanket barriers shall shroud pile drivers or be erected in a manner to shield the adjacent land uses. Such noise control blanket barriers can be rented and quickly erected; *(not applicable)*

- If impact pile driving is proposed, foundation pile holes shall be pre-drilled 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. Notify all adjacent land uses of the construction schedule in writing; *(not applicable)*

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

With the implementation of GP Policy EC-1.7, Municipal Code requirements, and the above measures included in the *Downtown San José Strategy Plan 2040 EIR*, the temporary construction noise impact would be reduced to a less-than-significant level.

Mitigation Measure 1a: No further mitigation required.

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

According to Policy EC-1.2 of the City's General Plan, a significant permanent noise increase would occur if the project would increase noise levels at noise-sensitive receptors by 3 dBA DNL or more where ambient noise levels exceed the "normally acceptable" noise level standard. Where ambient noise levels are at or below the "normally acceptable" noise level standard, noise level increases of 5 dBA DNL or more would be considered significant. The City's General Plan defines the "normally acceptable" outdoor noise level standard for the 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. For reference, a 3 dBA DNL noise increase would be expected if the project would double existing traffic volumes along a roadway.

The traffic study included peak hour turning movements for the existing traffic volumes and background volumes, with and without the proposed project, at five intersections in the vicinity of the project site. The project trips were added to the existing volumes to obtain existing plus project traffic volumes. By comparing the existing plus project traffic scenario to the existing scenario, the project's contribution to the overall noise level increase was determined to be 2 dBA DNL or less along each roadway segment in the project vicinity. Therefore, the project would not result in a permanent noise increase of 3 dBA DNL or more at noise-sensitive receptors in the project vicinity. This is a less-than-significant impact.

Mitigation Measure 1b: None required.

Impact 1c: **Noise Levels in Excess of Standards.** The proposed project is not expected to generate noise in excess of standards established in the City's General Plan at the nearby residential receptors. This is a **less-than-significant impact**.

Under the City's Noise Element, noise levels from nonresidential building equipment shall not exceed a noise level of 55 dBA DNL at receiving noise-sensitive land uses. Noise-sensitive receptors surrounding the site would include existing mixed-use residences to the north, to the south, to the west, and to the east of the site, opposite South 2nd Street. While the proposed project does include a residential component, the mixed-use building equipment would be used by both the residential and commercial uses; conservatively, Policies EC-1.3 and EC-1.6 shall be enforced for the proposed project.

Mechanical Equipment

High-rise structures typically include various mechanical equipment for heating, ventilation, and air-conditioning (HVAC) needs, as well as an emergency generator, cooling tower, etc. The site plan shows emergency generator rooms, electrical rooms, a water tank, and exhaust fans within the below-grade parking structure. Additionally, two air handling units (AHU), electrical rooms, and a cooling tower are shown on the roof. Both AHUs and the cooling tower would have enclosures surrounding the equipment. At the time of this analysis, the specific mechanical equipment had not been selected, nor were specific details, such as manufacturer's noise data for such equipment, available.

The equipment rooms would be located below-grade on the northern side of the building. The ground-level site plan shows generator exhaust vents within emergency generator exhaust rooms. The emergency generator for the proposed project would be a Rolls Royce diesel generator set, model MTU 16V400 DS2000, which has a capacity of 2,000 kW. From the manufacturer's specification information, standby full load would generate noise levels of about 99 dBA at a distance of 23 feet (7 meters). The applicant also provided specifications for a 2,000kW indoor critical grade silencer, which is planned for the project. This MTU Onsite Energy muffler would provide average attenuation of 25 to 34 dBA. The below-grade location and building exterior façade would provide an additional 20 dBA attenuation. Assuming the proposed project would include a conditional use permit with established monthly testing hours, noise levels from the emergency generator would not be subject to City noise thresholds when operating during emergencies. However, operational noise levels would be subject to the City's thresholds during the monthly testing, which typically occurs for one to two hours. The northern boundary would be the nearest property line shared with a commercial receptor, which would be a distance of 25 feet from the ground-level exhaust rooms. At this distance, hourly average noise levels would be up to 53 dBA L_{eq}, and day-night average noise levels, assuming two hours for testing, would be 43 dBA DNL. The nearest residential receptor would be 70 feet from the ground-level exhaust rooms. At this distance, hourly average noise levels would be up to 44 dBA L_{eq}, and day-night average noise levels, assuming two hours for testing, would be below 35 dBA DNL. All other receptors would be farther away and would be exposed to lower noise levels (see Table 9). Therefore, the noise exposure on the exterior of the building at the shared property lines would be below 55 dBA DNL, meeting the City's residential and commercial thresholds.

TABLE 9 Estimated Operational Noise Levels for Monthly Tests of the Emergency Generator Equipped with a Silencer

Receptor	Distance from Center of the Noise Source	Hourly Average Noise Level	Day-Night Average Noise Level
Western Residential Property Plane	70 feet	34 to 44 dBA L_{eq}	34 dBA DNL
Eastern Residential Property Plane	80 feet	34 to 43 dBA L_{eq}	32 dBA DNL
Northern Commercial Property Plane	25 feet	44 to 53 dBA L_{eq}	43 dBA DNL
Southern Residential Property Plane	330 feet	22 to 31 dBA L_{eq}	20 dBA DNL

The mechanical equipment rooms on the roof would also provide at least 20 dBA reduction due to the elevation of the noise-generating sources and the enclosures shown on the site plan. The center of the AHU noise source would be 75 feet or more from the nearest surrounding property lines, and the center of the cooling tower noise source would be 50 feet or more from the nearest property line.

Typical heating pumps would generate noise ranging from 56 to 66 dBA at a distance of 3 feet. Assuming up to 10 heating pumps would run simultaneously during a continuous 24-hour period, the day-night average noise levels would be up to 62 dBA DNL at a distance of 3 feet, which includes a conservative 20 dBA reduction. At the nearest residential property plane, the mechanical equipment noise would be below 50 dBA DNL. Table 10 summarizes the estimated noise levels due to the rooftop AHU units at the property planes of the surrounding land uses.

TABLE 10 Estimated Operational Noise Levels for 10 AHUs Operating Simultaneously, Assuming a Conservative 20 dBA Reduction

Receptor	Distance from Center of the Noise Source	Hourly Average Noise Level	Day-Night Average Noise Level
Western Residential Property Plane	75 feet	below 30 dBA L_{eq}	35 dBA DNL
Eastern Residential Property Plane	135 feet	below 25 dBA L_{eq}	29 dBA DNL
Northern Commercial Property Plane	150 feet	below 25 dBA L_{eq}	28 dBA DNL
Southern Residential Property Plane	200 feet	below 25 dBA L_{eq}	26 dBA DNL

The cooling tower, which would be exposed on top for exhaust purposes, would be located along the southern façade of the building. While the number of units and types of units were not available at the time of this study, the worst-case scenario would include up to five chillers generating a collective noise level of 56 dBA at 210 feet. Assuming the equipment operates continuously over a 24-hour period, the day-night average noise levels would be at or below 55 dBA DNL at the nearest

residential property plane, with the inclusion of the 20 dBA reduction. Table 11 summarizes the estimated noise levels due to the cooling tower at the property planes of the surrounding land uses.

TABLE 11 Estimated Operational Noise Levels for the Cooling Tower, Assuming a Conservative 20 dBA Reduction

Receptor	Distance from Center of the Noise Source	Hourly Average Noise Level	Day-Night Average Noise Level
Western Residential Property Plane	75 feet	45 dBA L_{eq}	51 dBA DNL
Eastern Residential Property Plane	135 feet	40 dBA L_{eq}	46 dBA DNL
Northern Commercial Property Plane	365 feet	31 dBA L_{eq}	38 dBA DNL
Southern Residential Property Plane	50 feet	49 dBA L_{eq}	55 dBA DNL

Mechanical equipment noise levels are not anticipated to exceed the General Plan threshold of 55 dBA DNL at noise-sensitive land uses near the project site. This is a less-than-significant impact.

The final design plans should be reviewed by a qualified acoustical consultant to address any potential conflicts with the General Plan or Municipal Code. For noise-generating land uses, the *Downtown San José Strategy Plan 2040 EIR* states the following:

> The implementation of General Plan Policies EC-1.2, EC-1.3, and EC-1.9 would reduce potential impacts associated with new noise-producing land uses facilitated by the plan to a less-than-significant level. Policy EC-1.2 limits noise generation by requiring use of noise attenuation measures, such as acoustical enclosures and sound barriers, where feasible, to avoid substantial increases to ambient noise. General Plan Policy EC-1.3 would be implemented and would require new projects to mitigate noise generation to 55 dBA DNL at the property line. Lastly, General Plan Policy EC-1.9 would be implemented and would require that studies be conducted to mitigate loud intermittent noise sources associated with new projects.

The implementation of this mitigation measure would reduce noise levels originating from the project site to a less-than-significant level.

Truck Loading and Unloading

The site plan shows truck loading and unloading activities occurring within the below-grade parking structure. The loading area would be accessed through the entrance to the ramp of the parking structure along South 2nd Street. Noise due to loading and unloading activities would be well-shielded from the surrounding noise-sensitive receptors. Assuming all deliveries and on-site maintenance activities would occur during daytime hours between 7:00 a.m. and 10:00 p.m., a noise increase above existing conditions is not expected. Further, existing truck traffic occurs along South 2nd Street. Truck deliveries occurring at the proposed project site are not expected to generate

levels exceeding 55 dBA DNL or existing ambient conditions at the nearby noise-sensitive land uses. This would be a less-than-significant impact.

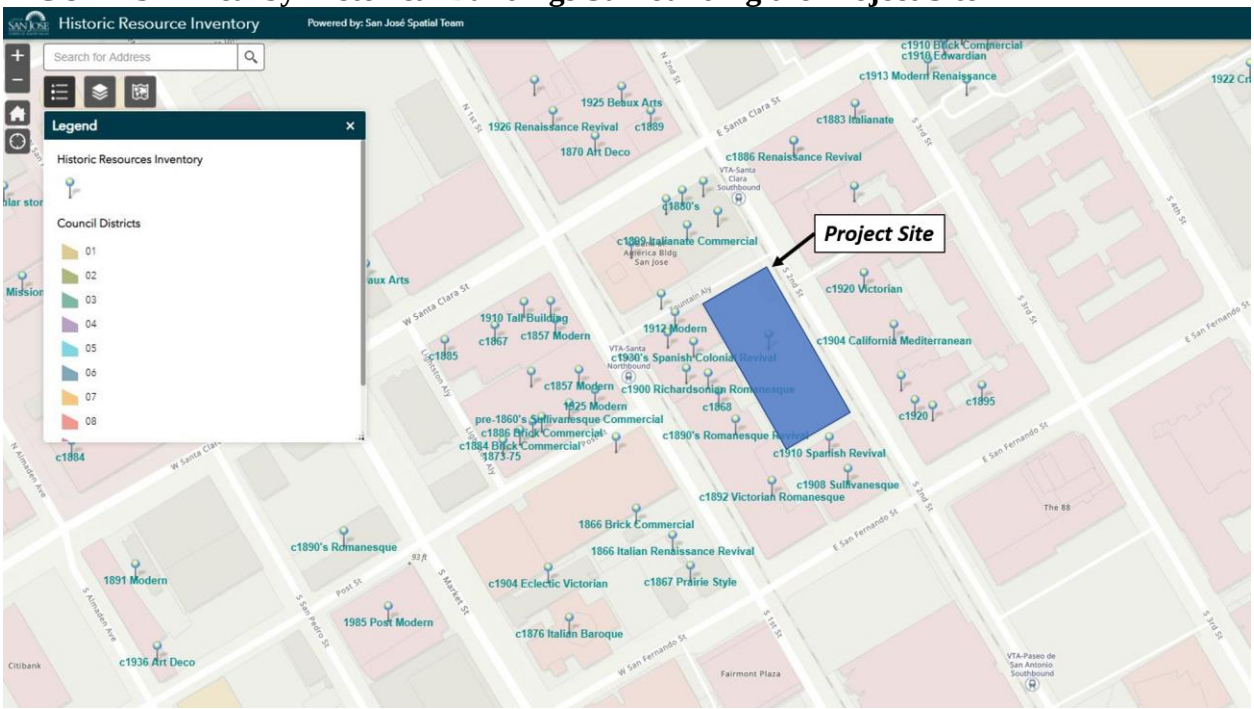
Mitigation Measure 1c: No further mitigation required.

Impact 2: Exposure to Excessive Groundborne Vibration. Construction-related vibration levels could potentially exceed applicable vibration thresholds at nearby sensitive land uses, especially during vibratory pile driving. **This is a 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.

The San José Historic Commercial District surrounds and includes the project site, according to the City's Historic Resource Inventory.[3] Figure 5 shows an aerial shot taken from the Historic Resource Inventory, identifying the project site and the surrounding historical structures.

FIGURE 5 Nearby Historical Buildings Surrounding 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

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

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 12 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 12 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.

TABLE 12 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	58	26
Hydromill (slurry wall)	in soil	0.008	3	1
	in rock	0.017	6	2
Vibratory Roller		0.210	60	27
Hoe Ram		0.089	28	12
Large bulldozer		0.089	28	12
Caisson drilling		0.089	28	12
Loaded trucks		0.076	24	10
Jackhammer		0.035	12	5
Small bulldozer		0.003	1	<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., February 2021.

The nearest building of normal conventional construction would be more than 200 feet from the project site, as shown in Figure 5. These buildings would not be exposed to vibration levels exceeding 0.2 in/sec PPV. Therefore, the buildings designated as historical are the focus of this study.

Table 13 summarizes the vibration levels at the historical buildings immediately adjoining the site to the north, to the south, and to the west, as well as the historical buildings opposite South 2nd Street to the east. 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 13), which are different than the distances used to propagate construction noise levels (as shown in Table 8), were estimated under the assumption that each piece of equipment from Table 12 was operating along the nearest boundary of the project site, which would represent the worst-case scenario.

Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity of the historical building located adjoining the project site. As shown in Table 12, the 0.08 in/sec PPV threshold would potentially be exceeded within about 60 feet of the surrounding buildings, and due to the close proximity of the buildings to the west of the project site (about 5 feet), the use of most construction equipment along the shared property line would potentially exceed the City's threshold, as shown in Table 13.

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[3] and reproduced by Dowding,[4] Figure 6 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 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 6, maximum vibration levels of 0.2 in/sec PPV or lower would result in virtually no measurable damage. With maximum vibration levels of 1.2 in/sec PPV, there would be about 20% 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 of 0.08 in/sec PPV or more at historic buildings within 60 feet of the project site.

Neither cosmetic, minor, or major damage would occur at historical or conventional buildings located 60 feet or more from the project site. 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

[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.

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.

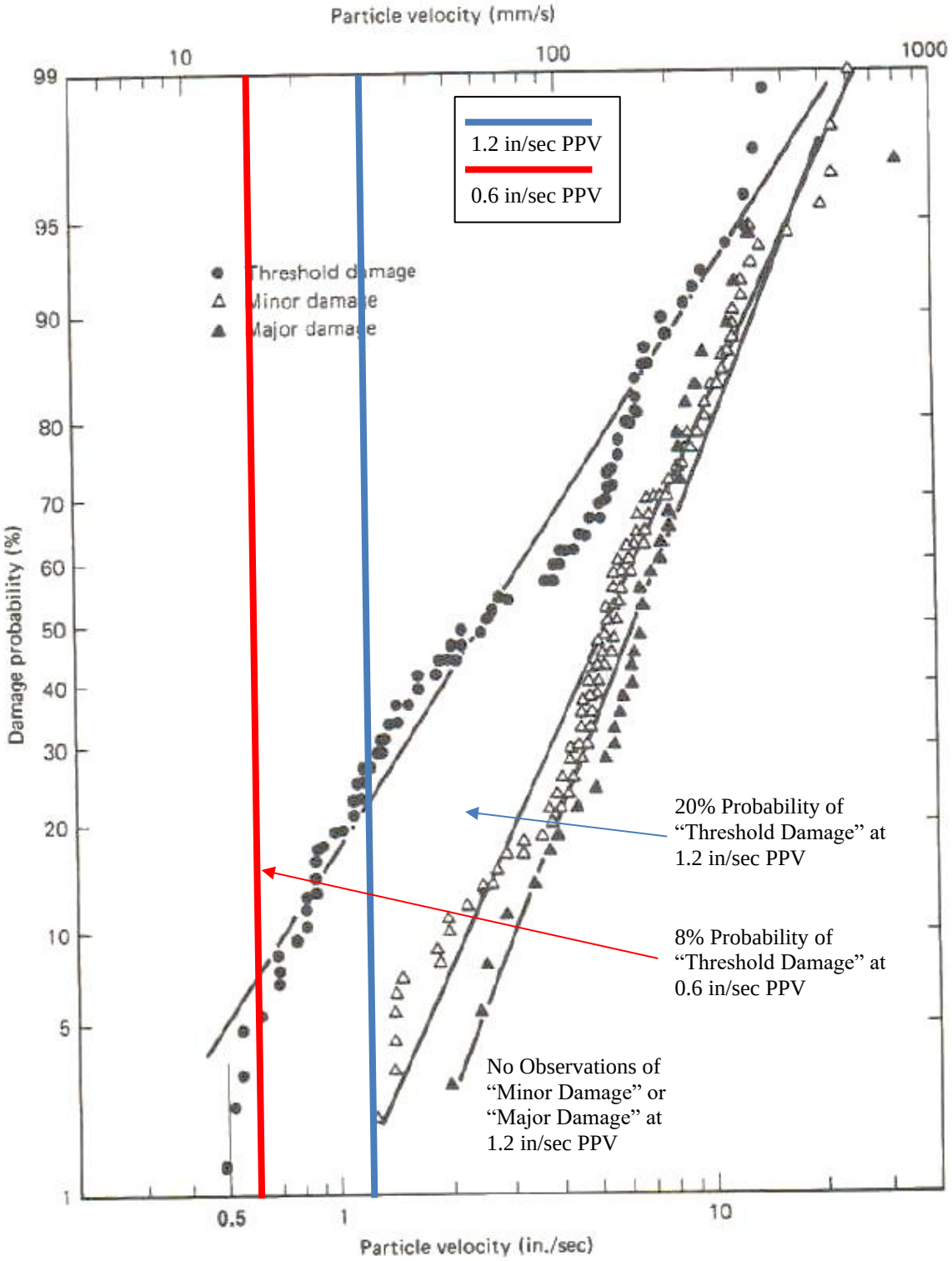
In summary, the construction of the project would generate vibration levels exceeding the General Plan threshold of 0.08 in/sec PPV at historic properties within 60 feet of the site. Such vibration levels would be capable of cosmetically damaging the adjacent buildings.

TABLE 13 Vibration Source Levels for Construction Equipment

Equipment		PPV (in/sec)			
		West Historical Building (5ft)	North Historical Building (30ft)	South Historical Building (25ft)	East Historical Building (85ft)
Clam shovel drop		**1.186**	**0.165**	**0.202**	0.053
Hydromill (slurry wall)	in soil	0.047	0.007	0.008	0.002
	in rock	**0.100**	0.014	0.017	0.004
Vibratory Roller		**1.233**	**0.172**	**0.210**	0.055
Hoe Ram		**0.523**	0.073	**0.089**	0.023
Large bulldozer		**0.523**	0.073	**0.089**	0.023
Caisson drilling		**0.523**	0.073	**0.089**	0.023
Loaded trucks		**0.446**	0.062	0.076	0.020
Jackhammer		**0.206**	0.029	0.035	0.009
Small bulldozer		0.018	0.002	0.003	0.001

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., February 2021.

FIGURE 6 Probability of Cracking and Fatigue from Repetitive Loading



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

Mitigation Measure 2:

The project shall implement the following measures, in addition to the best practices specified in Mitigation Measure 1a of this report, to minimize the impacts of groundborne vibration.

Construction Vibration Monitoring, Treatment, and Reporting Plan: The project proponent 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.

- Where possible, use of the heavy vibration-generating construction equipment shall be prohibited within 60 feet of any adjacent building.

- Document conditions at all historic structures located within 60 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 60 feet of any construction activities identified as sources of high vibration levels.

    - Performance of a photo survey, elevation survey, and crack monitoring survey for each historic structure within 60 feet of construction activities. Surveys shall be performed prior to any construction activity, in regular intervals during construction, and after project completion, and shall include internal and external crack monitoring in structures, settlement, and distress, and shall document the condition of foundations, walls and other structural elements in the interior and exterior of said structures.

- 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.

- If vibration levels approach limits, suspend construction and implement contingency measures to either lower vibration levels or secure the affected structures.

- 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.

- 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. The survey will be submitted to the City of San José Department of Parks, Recreation, and Neighborhood Services.

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 less than 2 miles from Norman Y. Mineta International Airport but the noise environment attributable to aircraft is considered normally acceptable under the Santa Clara County ALUC noise compatibility policies for office land uses. This is a **less-than-significant** impact.

Norman Y. Mineta San José International Airport is a public-use airport located approximately 1.7 miles northwest of the project site. According to the City's new Airport Master Plan Environmental Impact Report,[6] the project site lies just outside the 60 dBA CNEL/DNL contour line (see Figure 7). 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 aircraft. 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.

Mitigation Measure 3: **None required.**

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

FIGURE 7 2037 CNEL Noise Contours for SJIA Relative to Project Site

Figure 5
Scenario 2: With Project 2037 Noise Contour Map

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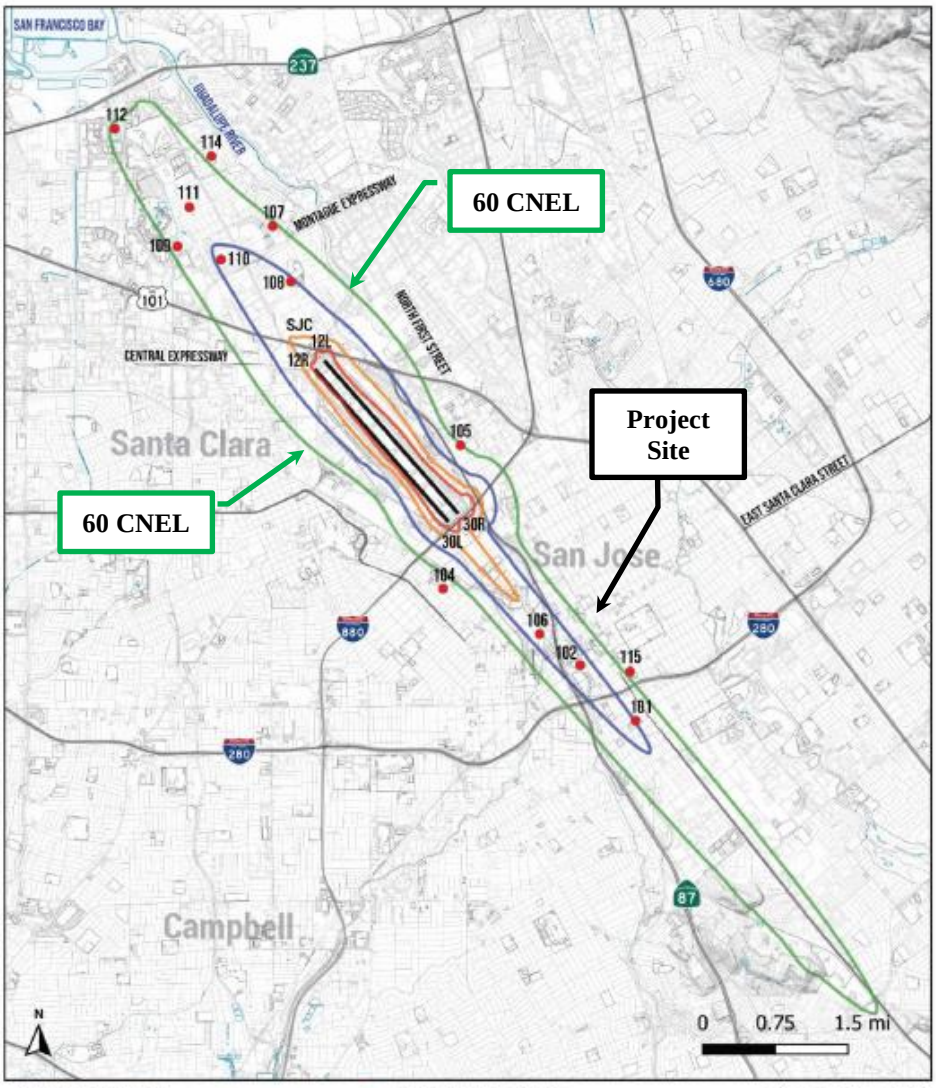

NORMAN Y. MINETA SAN JOSE INTERNATIONAL AIRPORT

- 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 temporary construction noise from cumulative construction projects. Cumulative traffic noise increases due to the proposed project was studied in the *Downtown San José Strategy Plan 2040 EIR.* Therefore, no further cumulative traffic noise increases would occur due to the proposed project.

From the City's website,[7] the following planned or approved projects are located within 1,000 feet of the proposed project:

- **Fountain Alley Office** – this project is located at 26 South 1st Street, which adjoins the Fountain Alley site to the west. This project is approved but not yet constructed. This project includes a six-story building with 91,992 square feet of commercial office and retail space. These sites would share receptors in the immediate vicinity of both sites, including both residential and commercial uses. While the construction schedule is unknown at this time, construction could occur simultaneously or concurrently.

- **27 West** – this project is located at 27 South 1st Street, which is about 215 feet west of the project site. This project has been approved and consists of a 22-story mixed-use building with 374 residential units and 35,712 square feet of retail space. Noise-sensitive receptors adjoining the Fountain Alley site to the west would have direct line-of-sight to construction activities on the 27 West site. While the construction schedule is unknown at this time, construction could occur simultaneously or concurrently.

- **Eterna Tower** – this project is located at 17 East Santa Clara Street, which is about 250 feet north of the project site. This project is currently under review and consists of a mixed-use building with approximately 2,500 square feet of commercial space and 200 residential units (25% restricted affordable units for low-income residents). Noise-sensitive receptors located north of the Fountain Alley site would be considered shared receptors with the Eterna Tower site. While the construction schedule is unknown at this time, construction could occur simultaneously or concurrently.

- **19 North 2nd Street** – this project is located approximately 340 feet north of the Fountain Alley project site. This mixed-use project would include 210 residential units and 37,240 square feet of commercial space. This project is currently in the planning review phase. Noise-sensitive receptors directly impacted by construction at this site would not be shared receptors at the Fountain Alley site. Cumulative construction is therefore not assumed.

- **Miro (SJSC Towers)** – this project is located at 157 East Santa Clara Street, which is located approximately 790 feet northeast of the project site. This project is currently under construction and near completion. Construction of this project should be completed prior to construction of Fountain Alley. This would not result in a cumulative construction impact.

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

- **Hotel Clariana** – this project is located at 27 South 4th Street, which is about 410 feet east of the project site. This project is currently under review and would consist of a five-story hotel and seven-story condominium building. Construction dates for this project have not been confirmed but would be expected to last for more than one year. Due to this site being east of South 3rd Street, the two project sites would not share receptors. A cumulative construction impact is not assumed.

- **BDG Mixed-Use** – this project site is located at 148 to 150 East Santa Clara Street, 17 South 4th Street, and 130 to 134 East Santa Clara Street. This project is about 515 feet east of the Fountain Alley project site. This project is in the planning review phase and would consist of a would consist of a six-story mixed-use building with ground-level retail/restaurant uses and office space on the upper floors. Noise-sensitive receptors directly impacted by construction at this site would not be shared receptors at the Fountain Alley site. Cumulative construction is therefore not assumed.

- **Icon-Echo** – this project is located at 147 East Santa Clara Street and would include the construction of two towers: a residential tower with 415 units and an office tower with 525,000 of office space. This project is currently in the planning review phase and not expected to start before January 2023. However, due to the location of this project site with respect to the Fountain Alley site, shared receptors are not expected. While some disruption may occur due to traffic lane closures or possibly redirected traffic, no existing receptors would be directly affected by construction at both project sites. This would not result in a cumulative construction impact.

- **Post & San Pedro Tower** – this project is located at 171 Post Street and would include construction of a 21-story mixed-use building with up to 230 residential units and ground floor retail space. The Post & San Pedro Tower is approximately 965 feet from the Fountain Alley project site. This project has been approved, but construction has not started. Noise-sensitive receptors directly impacted by construction at this site would not be shared receptors at the Fountain Alley site. Cumulative construction is therefore not assumed.

- **City View Plaza** – this project is located at 150 Almaden Boulevard and would include construction of three 19-story buildings with up to 3.8 million square feet of office and commercial space. The City View Plaza project site is approximately 930 feet from the Fountain Alley project site. This project has been approved, but construction has not started. Noise-sensitive receptors directly impacted by construction at this site would not be shared receptors at the Fountain Alley site. Cumulative construction is therefore not assumed.

The existing residential land uses located along North 1st Street, west of the Fountain Alley project site, would be considered sensitive receptors during construction activities at the Fountain Alley, Fountain Alley Office, and 27 West sites. Additionally, existing uses to the north of the Fountain Alley project site would be shared by the Fountain Alley Office and Eterna Tower projects. However, cumulative construction activities are not assumed at this time. Each of the identified project sites are located within the boundary of the *Downtown San José Strategy Plan 2040 EIR*. According to the Strategy Plan, implementation of the construction noise and vibration mitigation

measures in combination with Policies EC-1.7 and EC-2.3 of the City's General Plan and the construction allowable hours identified in the City's Municipal Code would reduce construction occurring within the Plan Area to a less-than-significant impact. Each individual project includes measures to further reduce noise and vibration levels emanating from the individual sites. With the implementation of construction noise and vibration mitigation measures included in the *Downtown San José Strategy Plan 2040 EIR* and the construction noise and vibration mitigation measures from the individual projects, construction noise and vibration levels would be reduced as much as possible at all surrounding sensitive receptors during construction of each individual project. Therefore, potential cumulative construction impacts would be less-than-significant.