APPENDIX C

NOISE ANALYSIS

CITY OF SAN JOSÉ DOWNTOWN STRATEGY 2040 NOISE AND VIBRATION ASSESSMENT SAN JOSÉ, CALIFORNIA

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INTRODUCTION

The City of San José is proposing to update the Downtown Strategy to Year 2040, consistent with the Envision San José 2040 General Plan, while allowing an increase in the amount of allowed development. Retail and hotel capacity envisioned for Downtown would be the same as envisioned in the Downtown Strategy 2000 and 2040 General Plan. Residential capacity would be increased by transferring residential units from outlying areas beyond the general vicinity of Downtown. The increase in office development (or jobs) would be achieved by transferring 10,000 jobs from Coyote Valley development identified in the General Plan.

This report evaluates the plan's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses the results of the ambient surveys completed to document existing noise conditions; 2) the General Plan Consistency Section discusses the land use compatibility of the plan, with regard to noise and vibration, utilizing policies in the City's General Plan; and 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate impacts upon sensitive receivers, provides a discussion of each impact, and presents measures, where feasible, to mitigate the identified impacts to a less-than-significant level. Traffic noise levels are projected to substantially increase throughout the plan area and surrounding areas. The implementation of measures to reduce the effects of increased traffic noise over a permanent basis will not be able to reduce substantial noise increases to acceptable levels at all noise sensitive areas. This is a significant and unavoidable impact.

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.

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 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

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

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

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

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

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

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, May 2006.

Regulatory Background – Noise

This section describes the relevant guidelines, policies, and standards established by Federal and 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.

Federal Government

Department of Housing and Urban Development (HUD). HUD environmental criteria and standards are presented in 24 CFR Part 51. New residential construction qualifying for HUD financing proposed in high noise areas (exceeding 65 dBA DNL) must incorporate noise attenuation features to maintain acceptable interior noise levels. A goal of 45 dBA DNL is set forth for interior noise levels and attenuation requirements are geared toward achieving that goal. It is assumed that with standard construction any building will provide sufficient attenuation to achieve an interior level of 45 dBA DNL or less if the exterior level is 65 dBA DNL or less. Approvals in a "normally unacceptable noise zone" (exceeding 65 decibels but not exceeding 75 decibels) require a minimum of 5 decibels additional noise attenuation for buildings if the day-night average is greater than 65 decibels but does not exceed 70 decibels, or minimum of 10 decibels of additional noise attenuation if the day-night average is greater than 70 decibels but does not exceed 75 decibels.

State of California

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA DNL/CNEL in any habitable room.

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

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA 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.

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

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

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

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

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

(e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels;

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

Pursuant to recent court decisions, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration identified in Checklist Questions (a), (b), (e), and (f) are not included in the Impacts and Mitigation Section of this report. These items are discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

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

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

N-5 All property owners within the Airport Influence Area who rent or lease their property for residential use shall include in their rental/lease agreement with the tenant, a statement advising that they (the tenants) are living within a high noise area and the exterior noise level is predicted to be greater than 65 dB CNEL in a manner that is consistent with current state law including AB2776 (2002).

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.

N-7 Single-event noise levels (SENL) from single aircraft overflights are also to be considered when evaluating the compatibility of highly noise-sensitive land uses such as schools, libraries, outdoor theaters, and mobile homes. Single-event noise levels are especially important in the areas regularly overflown by aircraft, but which may not produce significant CNEL contours, such as the down-wind segment of the traffic pattern, and airport entry and departure flight corridors.

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 Jose International Airport, May 25, 2011, Amended November 16, 2016.

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.

    - For single family residential uses, use a standard of 60 dBA DNL for exterior noise in private usable outdoor activity areas, such as backyards.

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 Jose 2040 General Plan, Adopted November 1, 2011, As Amended on February 27, 2018.

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.

EC-1.8 Allow commercial drive-through uses only when consistency with the City's exterior noise level guidelines and compatibility with adjacent land uses can be demonstrated.

EC-1.9 Require noise studies for land use proposals where known or suspected loud intermittent noise sources occur which may impact adjacent existing or planned land uses. For new residential development affected by noise from heavy rail, light rail, BART or other single-event noise sources, implement mitigation so that recurring maximum instantaneous noise levels do not exceed 50 dBA L_{max} in bedrooms and 55 dBA L_{max} in other rooms.

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

EC-1.14 Require acoustical analyses for proposed sensitive land uses in areas with exterior noise levels exceeding the City's noise and land use compatibility standards to base noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency.

City of San José Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.30.700 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit or unless a project is located within one of the Downtown Zoning Districts.

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

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. 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).

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

Existing Noise Environment

San José's Downtown is located in the central part of the city and encompasses approximately three square miles generally bounded by Taylor Street to the north, San José State University and City Hall to the east, Interstate 280 (I-280) to the south, and the Diridon Station Area to the west. State Route 87 (SR 87) runs in a north/south direction through Downtown. The predominant noise sources contributing to ambient noise levels are transportation-related noise sources including vehicle traffic along highways and roadways, heavy-rail and light-rail trains, and aircraft

operations associated with Norman Y. Mineta San José International Airport (SJIA or SJC). Figure 1 is an aerial image showing the plan area and locations of recent noise measurements made by Illingworth & Rodkin, Inc. for projects within and around the plan area undergoing CEQA review for the City of San Jose.

Vehicle traffic along I-280 and SR 87 are the primary contributors to ambient noise levels in the plan area. Major arterial roadways include Taylor Street, Julian Street, The Alameda/Santa Clara Street, San Carlos Street, Autumn Street, Almaden Boulevard, Coleman Avenue, State Route 82/West Santa Clara Street, East Santa Clara Street, St. James Street, Julian Street, 1st Street, and 4th Street also contribute to the noise environment in and around the plan area. Table 5 summarizes the results of ambient noise measurements made by Illingworth & Rodkin, Inc. for projects within and around the plan area. As shown on Table 5, ambient noise levels in areas adjoining arterial and collector roadways typically range from 63 to 73 dBA DNL.

TABLE 5 Summary of Long-Term Noise Measurement Data (dBA)

Site	Noise Measurement Location, Date	DNL
LT-1	~ 35 feet from the center of the UPRR and ~ 135 feet from the center of N. Autumn Street, October 24-26, 2017.	72
LT-2	~ 20 feet from the center of N. Autumn Street, October 24-26, 2017.	70
LT-3	~ 100 feet from the center of W. Julian Street, October 24-26, 2017.	69
LT-4	~ 90 feet from the center of Stockton Avenue north of W. Julian Street, February 13-15, 2017.	65
LT-5	~ 45 feet from the center of W. Julian Street at Rhodes Court, February 13-15, 2017.	64
LT-6	~ 50 feet from the center of Park Avenue, February 21-23, 2018.	66
LT-7	~ 20 feet from the center of the near UPRR track, February 21-23, 2018.	71
LT-8	~ 45 feet from the center of W. San Carlos Street, February 21-23, 2018.	73
LT-9	~ 25 feet from the center of N. 4th Street, April 25-27, 2017.	68
LT-10	~ 25 feet from the center of E. St. John Street, April 25-27, 2017.	63
LT-11	~ 30 feet from the center of S. 1st Street, March 26-28, 2018.	72
LT-12	~ 75 feet from the center of S. Almaden Boulevard, October 24-26, 2017.	69
LT-13	~ 85 feet from the center of Park Avenue, October 24-26, 2017.	68
LT-14	~ 35 feet from the center of S. 1st Street, December 19-21, 2016.	70
LT-15	~ 35 feet from the center of E. Virginia Street, July 12-14, 2017.	69
LT-16	~ 35 feet from the center of S. Second Street, July 12-14, 2017.	69

Source: Illingworth & Rodkin, Inc.

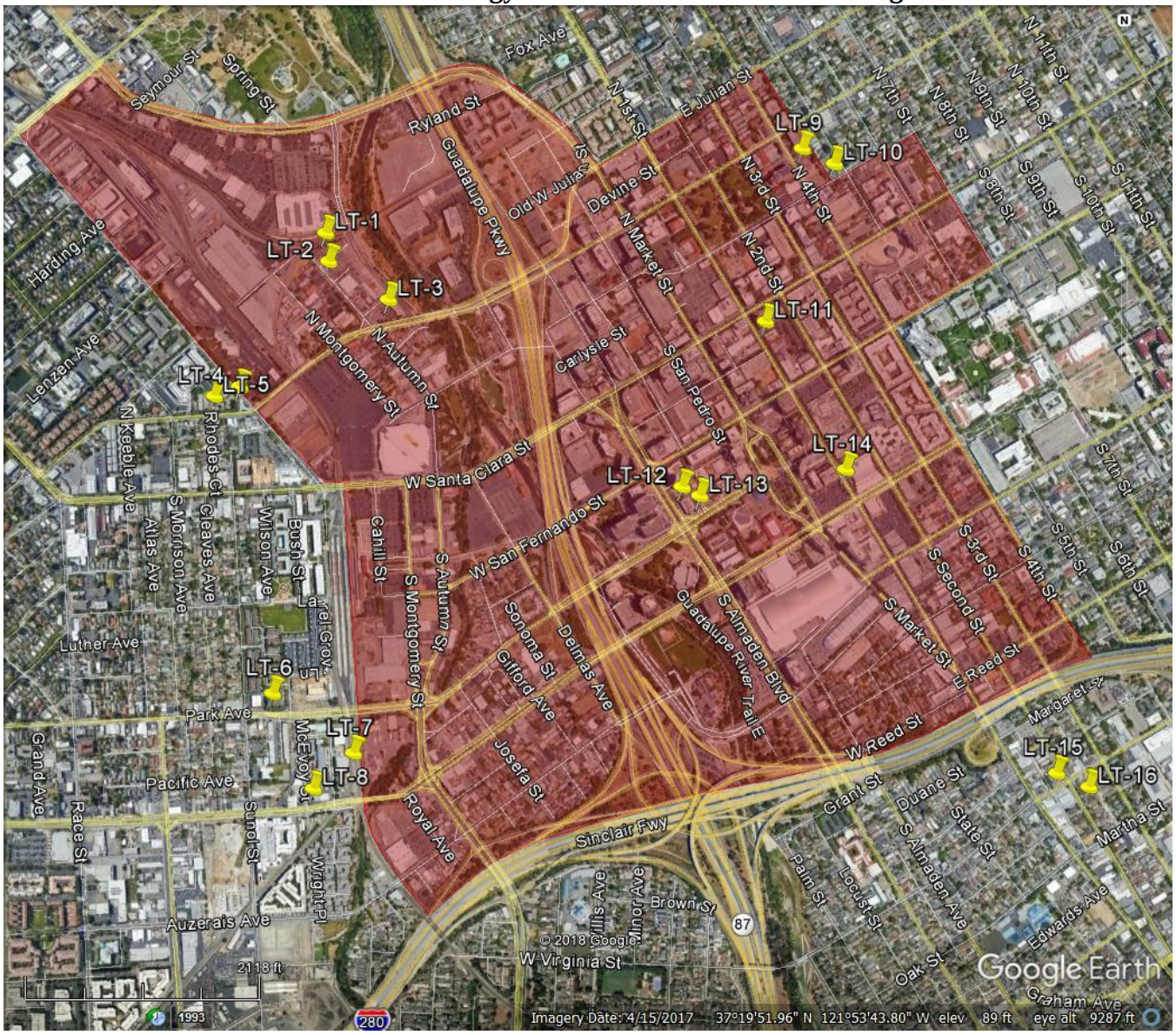
SoundPLAN Version 8.0, a three-dimensional ray-tracing computer program, was used to update the traffic noise contours calculated for the Envision San Jose 2040 General Plan with traffic data specific to the Downtown Strategy 2040 project. Existing traffic noise levels were calculated along major roadways, expressways, and highways in the plan area. Calculations accounted for the

source of noise (traffic), the frequency spectra of the noise source, and the topography of the area. In order to provide a worst-case assessment of existing and future traffic noise conditions throughout the plan area, the modeling did not incorporate existing barriers or buildings into the calculations. The geometric data used to create the model were based on GIS information provided by the City of San José. Existing peak-hour traffic data, provided by Hexagon Transportation Consultants, Inc. and observed vehicle mix data and travel speeds were also input into the model. For highways and expressways, traffic volumes and truck mix data input into the model was based on information published by the California Department of Transportation (Caltrans). The predicted noise levels were then compared to measured noise levels for calibration purposes and adjustments were made as necessary to the model. Contours presented in this report represent the primary noise sources in the plan area. Sources such as local industrial plants and stationary ground sources were not included because such sources only affect limited areas. Figure 2 provides existing traffic noise contours for the plan area.

Two VTA Light Rail train lines, Alum Rock to Santa Teresa and Mountain View to Winchester, converge and split just north of the Guadalupe Parkway (Route 87) and Interstate 280 interchange. Also converging at the Diridon train station are separate train lines that run northwest/southeast and are utilized by Caltrain, Altamont Commuter Express (ACE), Amtrak Capitol Corridor, and Union Pacific freight trains. Rail operations along the Valley Transportation Authority (VTA) rights-of-way and along Union Pacific Railroad rights-of-way also are substantial sources of noise in some areas of the plan area. The number of train passbys varies on a daily basis. Passenger and commuter train schedules are fairly consistent on weekdays with fewer passby events occurring on weekends. The number of freight trains passing through San Jose varies on a daily basis depending on the specific rail line and local demand. Day-night average noise levels vary throughout the community depending on the number of trains operating along a given line per day, the timing and duration of train pass-by events, and if trains must sound their warning whistles. Day-night average noise levels commonly range from 65 to 75 dBA DNL at land uses adjoining a railroad right-of-way. When railroad trains approach a passenger station or "at-grade" crossing, they are required to use their warning horn by sounding a short signal with the horn. When giving a warning to people and/or animals, they are required to produce a succession of sounds with the horn. Trains are required to sound a long signal followed by a short signal when approaching stations, curves, or other points where view may be obscured, and when approaching passenger or freight trains. When passing a standing train, the moving train is required to sound two long signals followed by a short signal followed by a long signal, the same requirement when signaling for at-grade crossings. Train warning whistles can generate maximum noise levels of approximately 105 dBA at 100 feet. Railroad and light-rail train noise contours are not included on Figure 2.

The Norman Y. Mineta San José International Airport (SJIA or SJC) is located approximately 3,500 feet beyond the northernmost boundary of the plan area. Noise exposure from airport operations is developed and reported in the CLUP. Existing conditions are best represented by the noise exposure maps published in the quarterly reports prepared for the airport. The most current map is from the 2_{nd} Quarter of 2017. The map, shown in Figure 3, depicts the 65 dBA CNEL noise contour that defines the noise impact boundary for new residential development.

FIGURE 1 San Jose Downtown Strategy Plan Area and Noise Monitoring Locations



Source: Google Earth, 2018

FIGURE 2 San Jose Downtown Strategy Plan Area - Existing Traffic Noise Contours

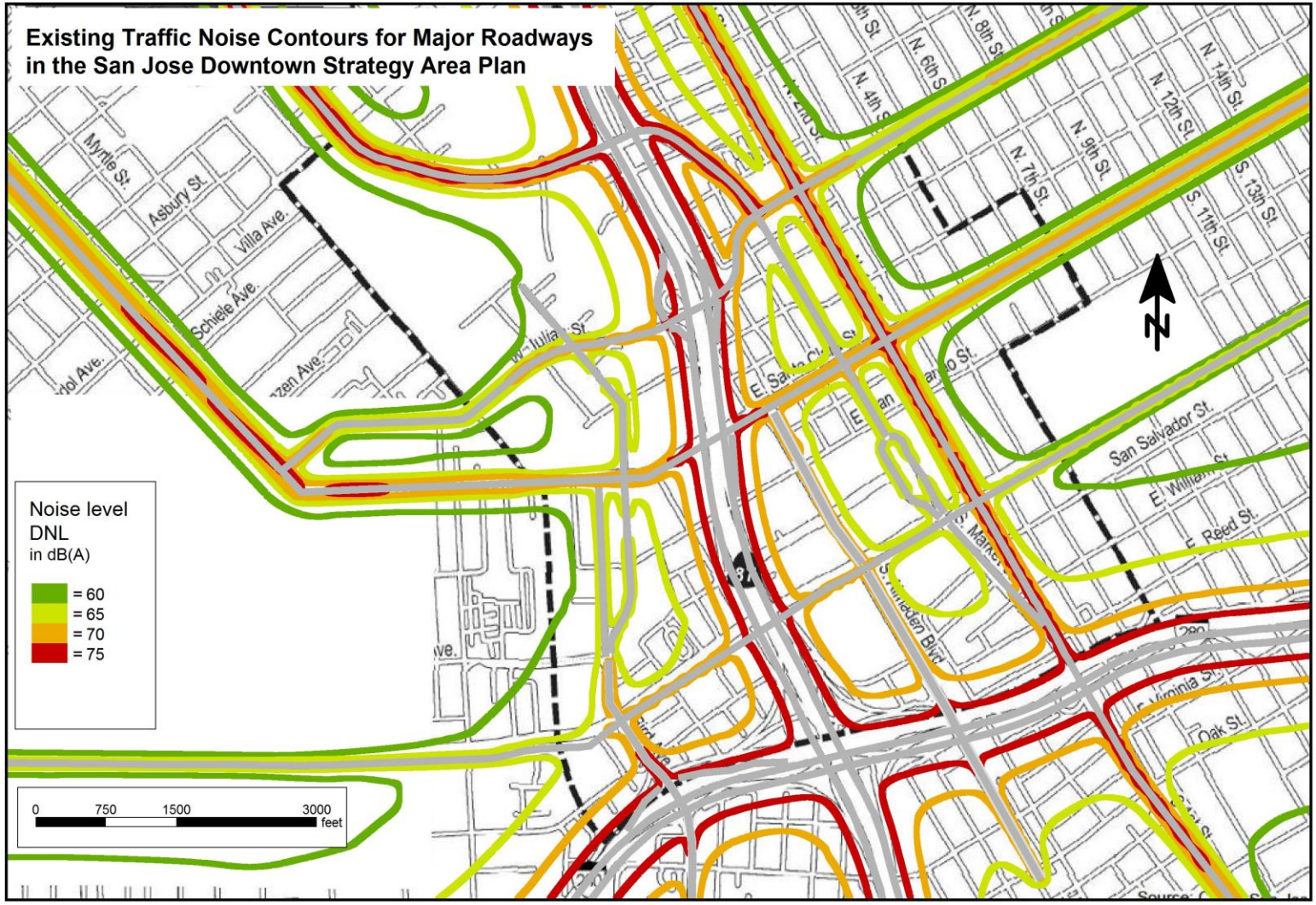
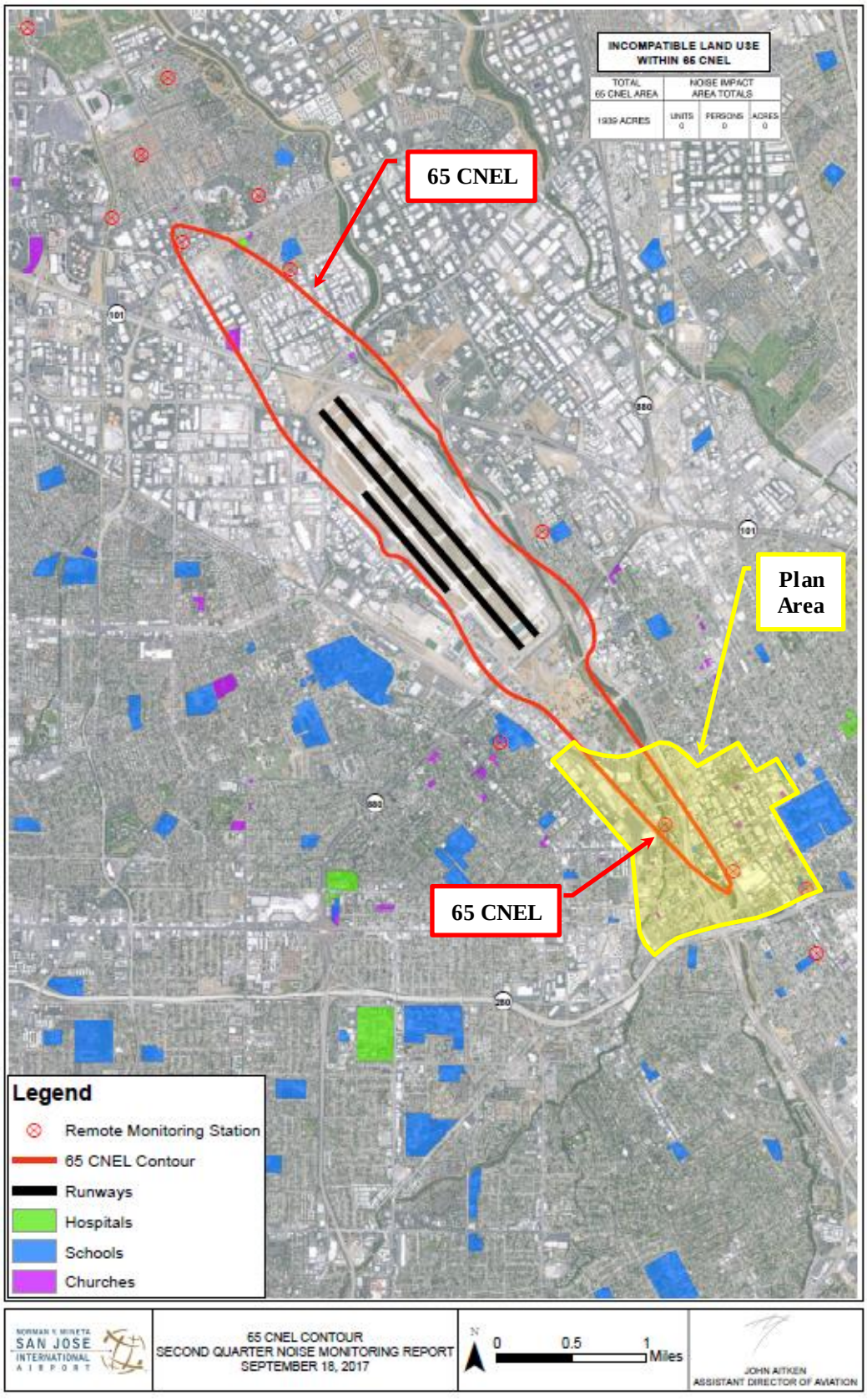


FIGURE 3 65 CNEL Noise Contour for SJIA (2017) Relative to Plan Area



GENERAL PLAN CONSISTENCY ANALYSIS – COMPATIBILITY OF NEW LAND USES WITH NOISE AND VIBRATION ENVIRONMENTS

Development facilitated by the Downtown Strategy 2040 Plan would include noise sensitive land uses located in varying noise environments. New noise-sensitive development is possible along major transportation corridors, railroad and light-rail corridors, in the vicinity of Norman Y. Mineta San José International Airport, and in the vicinity of stationary noise sources. Proposed land uses may also be sensitive to groundborne vibration from heavy-rail and light-rail trains.

Noise from Ground Transportation

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 hotel land use.

- The City's standard for interior noise at the proposed hotel land use is 45 dBA DNL.

Residential development is sensitive to community noise both outdoors and indoors during the daytime and nighttime. High-density/mixed-use residential, commercial, and industrial development is less noise sensitive than single family homes because uses are primarily indoors, and noise levels are mitigated with building design and construction. However, noise exposures along many roadways, heavy rail, rail transit corridors could exceed the 45 dBA DNL interior compatibility level and the 60 dBA DNL exterior compatibility level for multi-family housing.

Traffic noise contours were calculated for the Downtown Strategy 2040 Plan with SoundPLAN following the methodology described above for existing conditions. Figure 4, 5, and 6 provide the traffic noise contours for the Amended General Plan and the two project alternatives.

The City's noise thresholds of acceptability would likely be exceeded at development sites facilitated by the plan. Where exterior noise levels exceed 60 dBA DNL in new residential development areas, interior levels may exceed 45 dBA DNL. Interior noise levels are a function of the space but should generally be limited to 45 dBA DNL or less. Interior noise levels are about 15 dBA lower than exterior levels within residential units with the windows partially open and approximately 20 to 25 decibels lower than exterior noise levels with the windows closed, assuming typical California construction methods. Where exterior day-night average noise levels are 60 to 70 dBA DNL, interior noise levels can typically be maintained below 45 dBA DNL with the incorporation of an adequate forced air mechanical ventilation system in the residential units to allow residents the option of controlling noise by keeping the windows closed. Standard office construction methods typically provide about 25 to 30 decibels of noise reduction in interior spaces. The need for noise attenuation measures in building construction and project design for

non-sensitive land uses (e.g. commercial, industrial, and institutional) will be determined on a project by project basis at the time development is proposed. In all areas exceeding 70 dBA DNL, the inclusion of windows and doors with high Sound Transmission Class (STC) ratings, and the incorporation of forced-air mechanical ventilation systems, may be necessary to meet 45 dBA DNL.

The Plan could facilitate the location of sensitive land uses within portions of the plan area adjacent to existing active railroad corridors and the VTA light rail. As discussed previously, day-night average noise levels vary throughout the plan area depending on the number of trains operating along a given line per day, the timing and duration of train passby events, and whether or not trains must sound their warning whistles. Another important factor to consider in determining noise levels in areas near railroad corridors and the VTA light rail is shielding provided by buildings or other barriers. Day-night average noise levels commonly range from 65 to 75 dBA DNL at land uses adjoining a railroad right-of-way. Railroad train noise levels would generally exceed 60 dBA DNL within about 350 feet of active railroad corridors (10 to 15 trains per day). Where residential development is located adjacent to at-grade rail crossings, these sensitive uses would be subject to maximum instantaneous noise levels (L_{max}) from train warning whistles that range from approximately 90 to 110 dBA L_{max}.

The implementation of General Plan Policies EC-1.1, EC-1.9, and EC-1.14, in conjunction with the Land Use Compatibility Guidelines, would require that the General Plan compatibility standards be used to determine where noise levels in the community are acceptable or unacceptable, and require noise attenuation measures to achieve the "normally acceptable" noise standards. Noise studies of new development proposals are required when existing or future noise levels from transportation or non-transportation noise sources exceed the "acceptable" levels for that use in order to determine the controls necessary to maintain consistency with the interior and exterior noise standards of the Noise Element. The interior noise limits set forth in the State Building Code are extended to residential, hotel, motel, residential care, and hospital land uses in San José.

Noise from Aircraft

The Downtown Strategy 2040 project would facilitate new residential development where existing and future aircraft noise levels associated with operations at Norman Y. Mineta San José International Airport may exceed 65 dBA CNEL. Future noise levels expected from aircraft are best represented by the 2027 CNEL Contours noise exposure map published as part of the Airport Master Plan. Figure 7 depicts the 65 dBA CNEL noise contour that defines the noise impact boundary for new residential development.

The Santa Clara County ALUC has jurisdiction over new land uses in the vicinity of airports, and establishes 65 dBA CNEL as the maximum allowable noise level considered compatible with residential uses. CLUP Policy N-4 would prohibit residential or transient lodging within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL and there are no outdoor patios or outdoor activity areas associated with the residential portion of a mixed use residential project or a multi unit residential project. In addition, CLUP Policy N-5 would require all property owners within the Airport Influence Area

(the 65 dB CNEL contour boundary) who rent or lease their property for residential use to disclose to the tenants that they are living within a high noise area as part of their rental/lease agreement. CLUP Policy N-7 would provide direction when siting highly noise-sensitive land uses such as schools, libraries, outdoor theaters, and mobile homes. This policy states that single-event noise levels (SENL) from single aircraft overflights are also to be considered when evaluating the compatibility of these highly noise-sensitive land.

The implementation of General Plan Policies EC-1.1, EC-1.9, and EC-1.11 would guide new development proposed for areas susceptible to noise associated with Norman Y. Mineta San José International Airport. Policy EC-1.1 would require that the General Plan compatibility standards be used to determine where noise levels in the community are acceptable or unacceptable, and require noise attenuation measures to achieve the "normally acceptable" noise level standards. This policy allows for noise levels to exceed the "normally acceptable" noise level standard in the environs of Mineta San José International Airport. The City will require that individual development projects undergo project-specific environmental review. General Plan Policy EC-1.9 would be implemented and would require that studies be conducted to mitigate loud intermittent noise sources such as aircraft. Policy EC-1.11 would be implemented and would require that incompatible land uses be located outside of the 65 dBA CNEL noise contour.

FIGURE 4 San Jose Downtown Strategy Plan Area – Amended 2040 General Plan Traffic Noise Contours

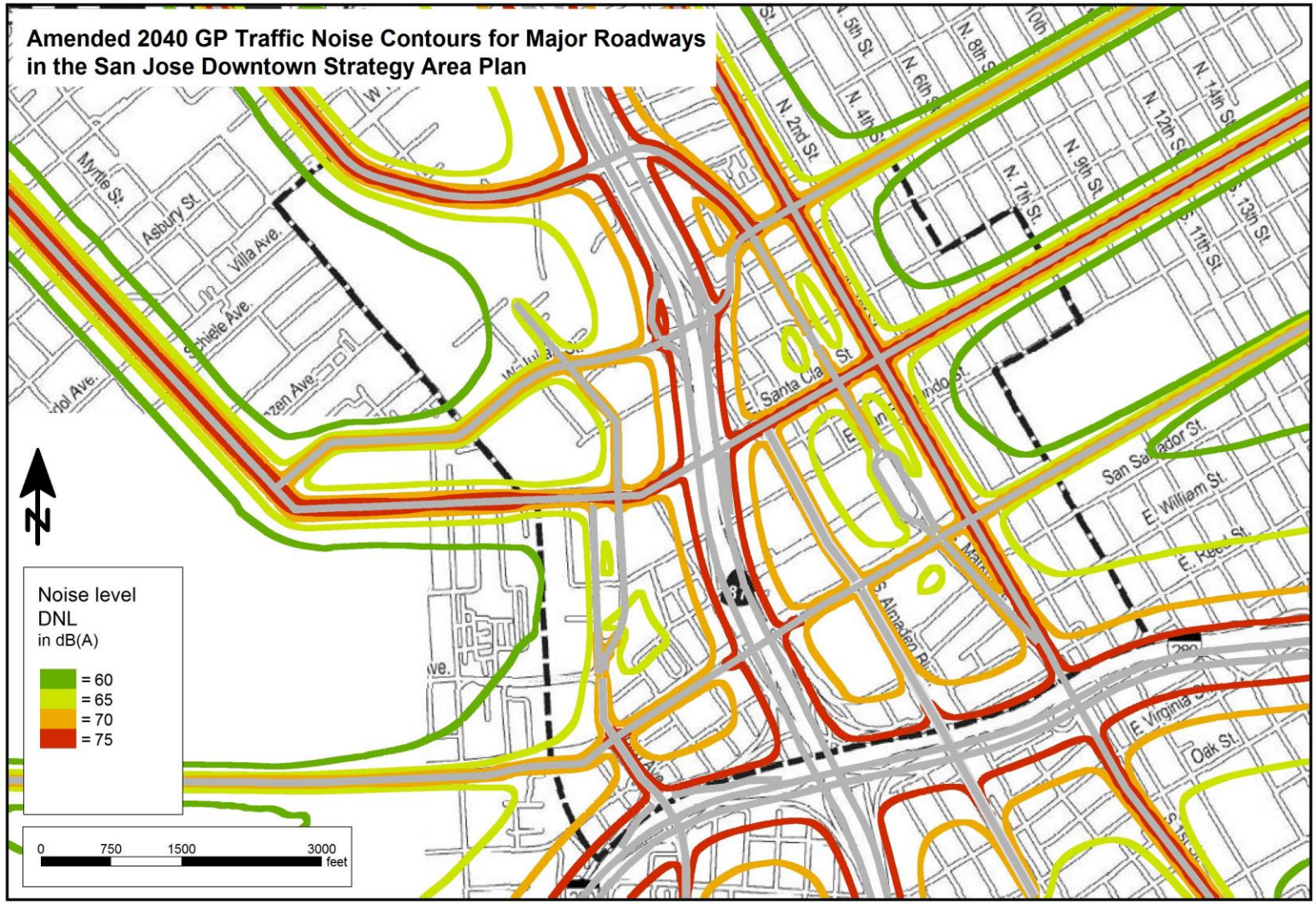


FIGURE 5 San Jose Downtown Strategy Plan Area - Amended 2040 General Plan (Alternative 1) Traffic Noise Contours

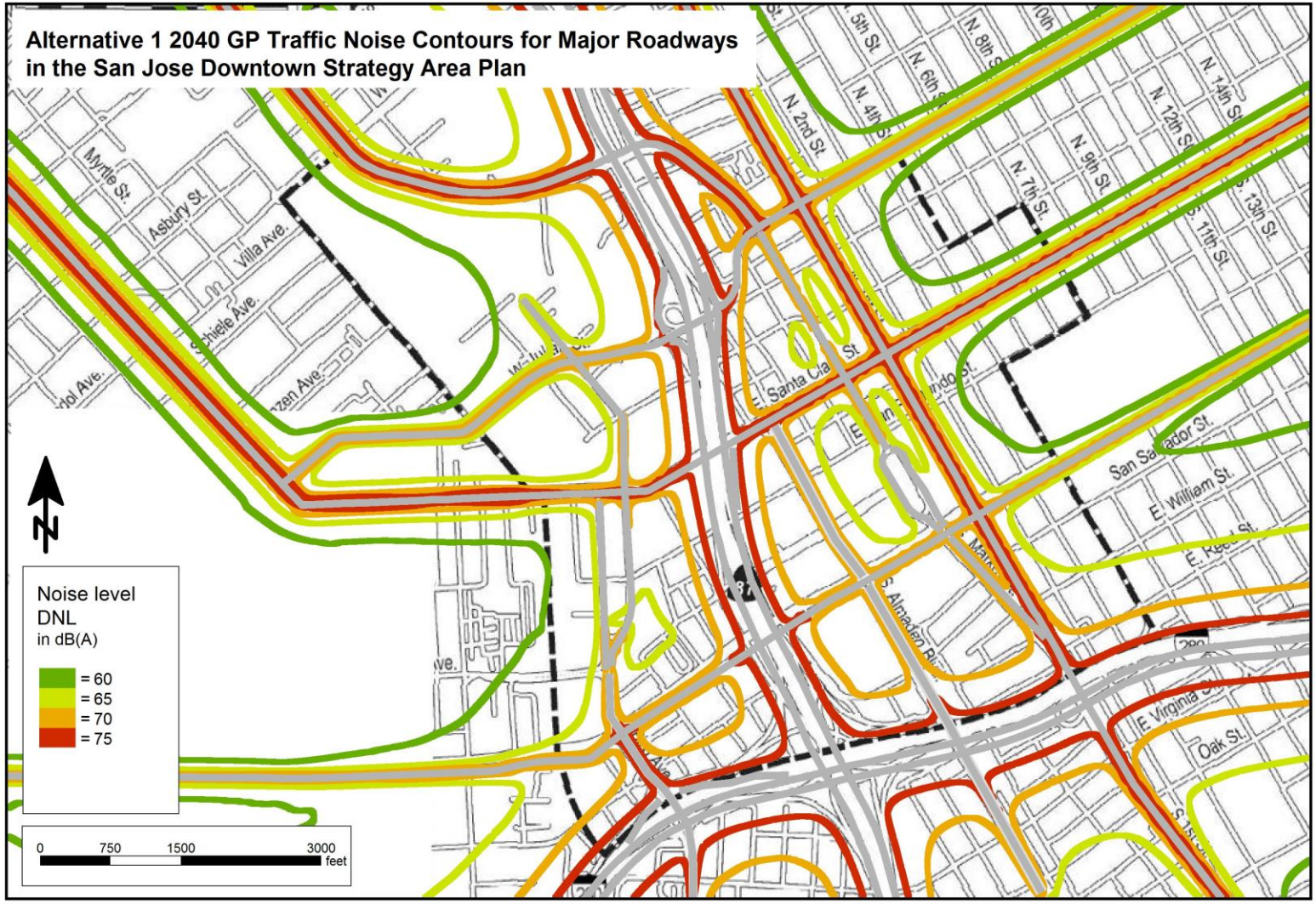


FIGURE 6 San Jose Downtown Strategy Plan Area - Amended 2040 General Plan (Alternative 2) Traffic Noise Contours

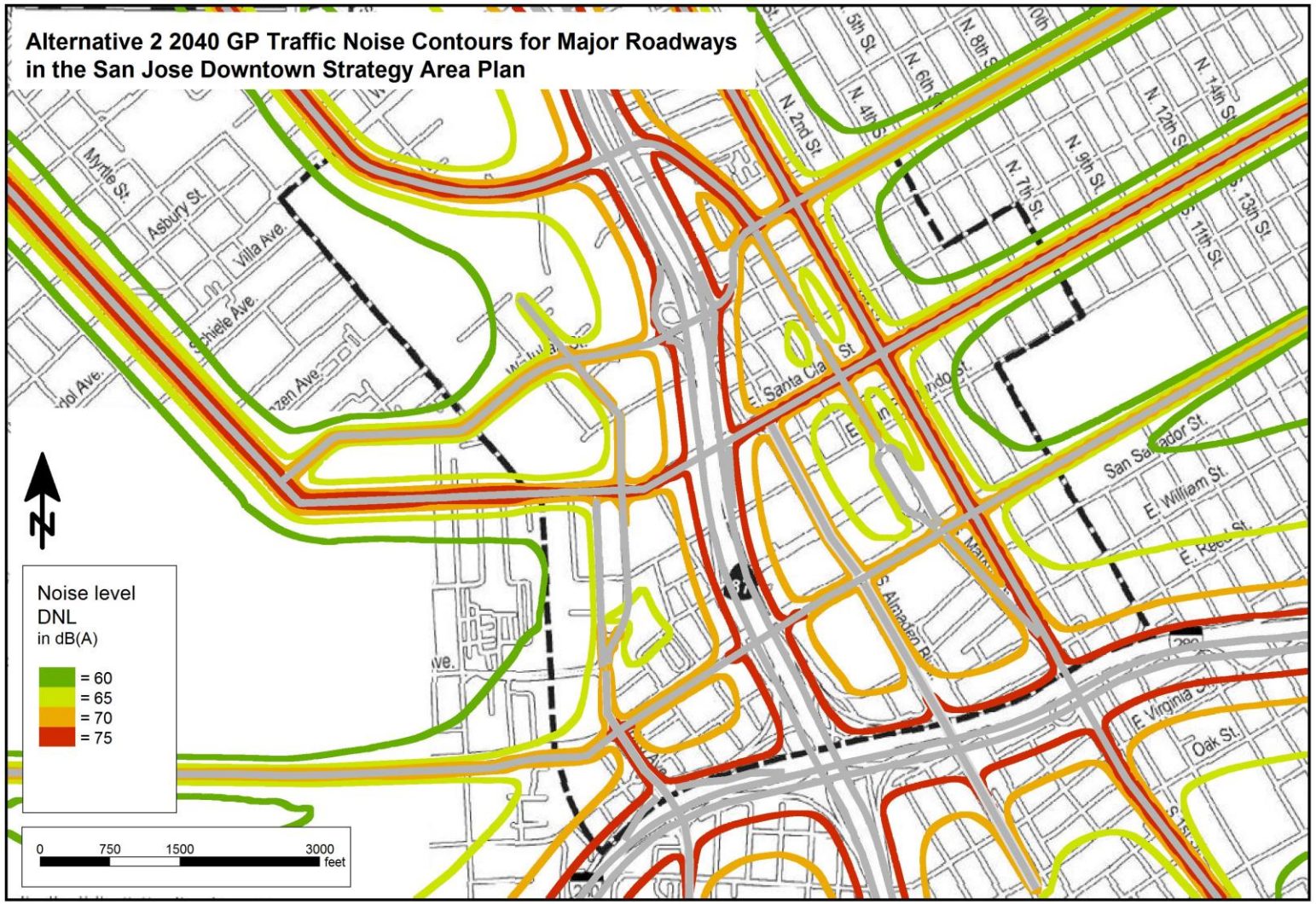
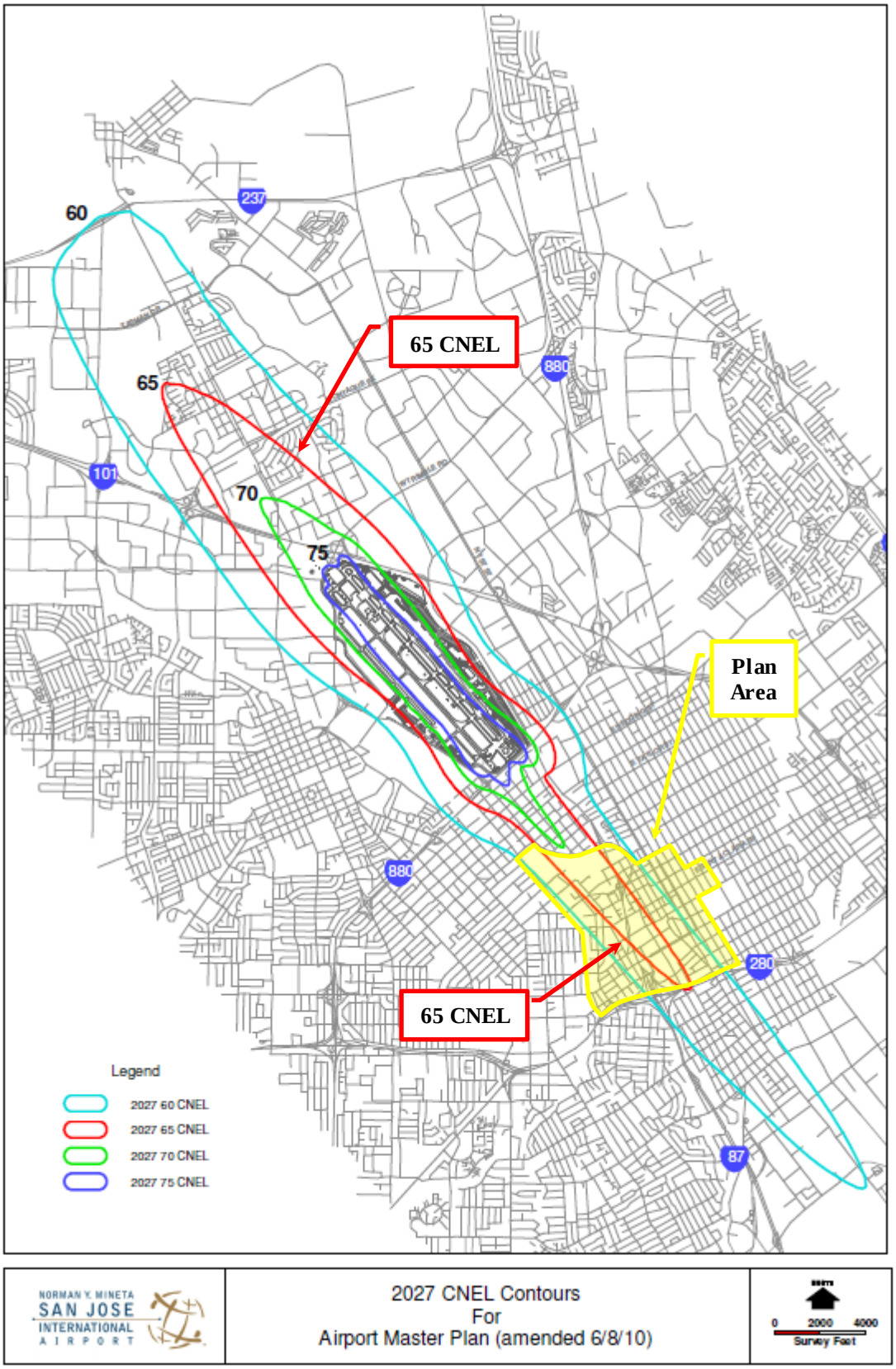


FIGURE 7 65 CNEL Noise Contour for SJIA (2027) Relative to Plan Area



Vibration from Ground Transportation

The U.S. Department of Transportation, Federal Transit Administration's (FTA) vibration impact assessment criteria[1] are used by the City of San José to evaluate the compatibility of proposed projects with vibration levels produced by heavy-rail and light-rail trains. The FTA vibration impact criteria are based on maximum overall levels for a single event. The impact criteria for groundborne vibration are shown in Table 6. Note that there are criteria for 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).

TABLE 6 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.

Ground vibration from heavy-rail trains passing through the plan area could exceed the guidelines set forth by the FTA if new buildings housing sensitive uses such as residences are constructed within approximately 100 feet of the tracks. For light-rail trains, recent data suggests that vibration levels from light-rail trains passing through the plan area would not exceed the "frequent events" category at a distance of 60 feet of the tracks. Employment areas such as offices and R&D facilities can also be sensitive to ground-borne vibration. The specific locations of proposed buildings and

[1]U.S. Department of Transportation, Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006, FTA-VA-90-1003-06.

their sensitivities to vibration levels are not known at this time, however, such uses located in these areas could be exposed to ground vibration levels exceeding FTA guidelines.

The implementation of General Plan Policy EC-2.1 would require new development within 100 feet of rail lines to utilize setbacks and/or structural design features that reduce vibration and to demonstrate prior to project approval that vibration experienced by residents and vibration sensitive uses would not exceed the Federal Transit Administration's guidelines for compatible vibration levels.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

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

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

- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.08 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.

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

- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA $L_{eq,}$ and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses. Where noise from construction activities exceeds 70 dBA L_{eq} and the ambient noise environment by at least 5 dBA L_{eq} at commercial land uses in the project vicinity for a period exceeding one year, the impact would be considered significant.

Impact 1: **Noise Levels in Excess of Standards.** New noise-generating land uses or the siting of new sensitive receivers could result in noise levels that would exceed the City's noise thresholds of acceptability or Municipal Code noise limits at sensitive receivers in the vicinity.

Mixed-use development projects often include residential uses located above or in proximity to commercial uses, and are located in areas served by rail and bus transit, or along major. Under the Envision San José 2040 General Plan, the Village land use designation includes proposed mixed-use residential development throughout San José. Many of the proposed Village location are along major roadways, the existing light rail corridor, proposed light rail stations, and proposed BART stations. Office, commercial, retail, or other noise-generating uses developed under the 2040 General Plan, and facilitated by the Downtown Strategy 2040 Plan, could substantially increase noise levels at noise-sensitive land uses or could expose receivers to noise levels that exceed the City's General Plan policies and Municipal Code noise limits.

Future operations at existing and proposed noise-producing land uses are dependent on many variables and information which are currently unavailable to allow meaningful projections of noise. Noise conflicts may be caused by noise sources such as outdoor dining areas or bars, mechanical equipment, outdoor maintenance areas, truck loading docks and delivery activities, public address systems, and parking lots (e.g., opening and closing of vehicle doors, people talking, car alarms). Development under the proposed Plan would introduce new noise-generating sources adjacent to existing noise-sensitive areas and new noise-sensitive uses adjacent to existing noise sources.

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 limit 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.

New noise-generating projects implemented by the plan or the siting of noise sensitive receptors would be subject to the City's Municipal Code, mitigating the possibility that existing or proposed residences and other noise-sensitive land uses would not be exposed to excessive noise. Compliance with the City's Municipal Code noise limits would result in a less than significant impact.

Impact 2: **Exposure to Excessive Groundborne Vibration.** Demolition and construction activities facilitated by the Downtown Strategy 2040 Plan may expose persons and buildings to excessive vibration levels.

Demolition and construction activities required for projects implemented by the Downtown Strategy 2040 Plan may generate perceptible vibration levels and levels that could affect nearby structures when heavy equipment or impact tools (e.g. jackhammers, pile drivers, hoe rams) are

used in the vicinity of nearby sensitive land uses. Building damage generally falls into three categories. 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.

Policy EC-2.3 of the City of San José General Plan establishes a vibration limit of 0.08 in/sec PPV to minimize the potential for cosmetic damage to sensitive historic structures, and a vibration limit of 0.2 in/sec PPV to minimize damage at buildings of normal conventional construction.

Table 7 presents typical vibration levels that could be expected from construction equipment at a distances of 25 feet to 100 feet. Vibration levels would be higher at distances less than 25 feet and lower at distances greater than 100 feet. Vibration levels would also vary depending on soil conditions, construction methods, and equipment used. Vibration levels are highest close to the source, and then attenuate with increasing distance at the rate $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet.

TABLE 7 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	PPV at 50 ft. (in/sec)	PPV at 100 ft. (in/sec)
Pile Driver (Impact)	upper range	1.158	0.540	0.252
	typical	0.644	0.300	0.140
Pile Driver (Sonic)	upper range	0.734	0.342	0.160
	typical	0.170	0.079	0.037
Clam shovel drop		0.202	0.094	0.044
Hydromill (slurry wall)	in soil	0.008	0.004	0.002
	in rock	0.017	0.008	0.004
Vibratory Roller		0.210	0.098	0.046
Hoe Ram		0.089	0.042	0.019
Large bulldozer		0.089	0.042	0.019
Caisson drilling		0.089	0.042	0.019
Loaded trucks		0.076	0.035	0.017
Jackhammer		0.035	0.016	0.008
Small bulldozer		0.003	0.001	0.001

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006, as modified by Illingworth & Rodkin, Inc., July 2018.

The Downtown Strategy 2040 Plan would facilitate the development of various projects in a variety of settings. With regard to groundborne vibration, there are two categories of construction projects; those including impact or vibratory pile driving techniques for foundation systems, and those that rely on alternate methods (e.g. CIDH piers, mat slab foundations) which produce substantially lower vibration levels. The severity of the vibration impact is determined by the proximity of the project with respect to buildings and receptors. The sensitivity of buildings is also an important factor in evaluating impacts due to groundborne vibration.

The California Department of Transportation published a Transportation and Construction Guidance Manual in 2013. The Manual developed a synthesis of various vibration criteria to assess the damage potential for representative categories of structures and effects upon people. The guideline criteria, summarized in Table 8 below, refine the categories and thresholds set forth in Policy EC-2.3, establishing seven separate categories. The first two categories (Categories 1 and 2) address human perceptibility of vibration only. The five remaining categories (Categories 3-7) address human perceptibility and potential for damage to buildings described as "Extremely fragile historic buildings, ruins, ancient monuments", "Fragile buildings", "Historic and some old buildings", "Older residential structures", "New residential structures", and "Modern industrial/commercial buildings". Most, if not all buildings in the downtown area would fall into Categories 5-7. The goal in establishing vibration limits is to mitigate potential vibration impacts associated with demolition and construction activities to a less-than-significant level by establishing safe limits to protect structures from potential damage and to minimize vibration impacts on people and businesses. The vibration limits contained in Policy EC-2.3 utilized criteria from literature available to the City in 2008 that are conservative, and given the broad categories, are now believed to be too general for buildings in the Downtown Strategy 2040 plan area. Given that the new guideline criteria best accomplish the goal to identify and mitigate construction vibration impacts, it is recommended that these criteria be utilized to implement General Plan Policy EC-2.3 for projects facilitated by the Downtown Strategy 2040 Plan.

TABLE 8 Construction Vibration Annoyance and Damage Potential Threshold Criteria

Category	Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
1	0.01	Barely perceptible	No effect
2	0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
3	0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
4	0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
5	0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
6	0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
7	0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

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

For projects that produce vibration levels falling under Categories 1 and 2, the primary issue related to construction vibration is human perceptibility and the potential for annoyance. Vibration levels may be perceptible, however, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the

highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby businesses, perceptible vibration can be kept to a minimum.

For projects that produce vibration levels exceeding the thresholds for Categories 3-7, construction vibration would be expected to cause both human annoyance and the possibility of cosmetic damage.

For projects impacting receptors in Categories 6 and 7 that do not involve impact or vibratory pile driving, the following best available controls shall be implemented:

- A list of all heavy construction equipment to be used for this project known to produce high vibration levels (tracked vehicles, vibratory compaction, jackhammers, hoe rams, etc.) shall be submitted to the City 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 for reducing vibration levels below the thresholds.

- Place operating equipment on the construction site as far as possible from vibration-sensitive receptors.

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

- Avoid using vibratory rollers and tampers near sensitive areas.

- Select demolition methods not involving impact tools.

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

- Avoid dropping heavy objects or materials.

For projects impacting receptors in Categories 6 and 7 where pile driving will occur, in addition to the controls above, implement the following best available controls:

- Notify neighbors within 500 feet of the construction site of the construction schedule and that there could be noticeable vibration levels resulting from pile driving.

- Foundation pile holes shall be pre-drilled to minimize the number of impacts required to seat the pile.

- Jet or partially jet piles into place to minimize the number of impacts required to seat the pile.

- A construction vibration monitoring plan shall be implemented to document conditions prior to, during, and after pile driving. 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 should be implemented to include the following tasks:

    - Identification of sensitivity to ground-borne vibration of nearby structures. A vibration survey (generally described below) would need to be performed.

    - Performance of a photo survey, elevation survey, and crack monitoring survey for each of these structures. Surveys shall be performed prior to any pile driving activity, in regular interval during pile driving, and after 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.

    - Development of 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 pile driving. Alternative construction methods would be identified for when vibration levels approach the limits that are stated in the General Plan such as Policy EC-2.3.

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

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

    - The results of all vibration monitoring shall be summarized and submitted in a report shortly after substantial completion of each phase identified in the project schedule. The report will include a description of measurement methods, equipment used, calibration certificates, and graphics as required to clearly identify vibration-monitoring locations. An explanation of all events that exceeded vibration limits will be included together with proper documentation supporting any such claims.

    - 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.

For all projects that could generate vibration levels exceeding the thresholds for Categories 3, 4, and 5, implement all of the applicable controls outlined above.

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

Impact 3: **Project-Generated Traffic Noise.** The anticipated increase in vehicular traffic would result in increased traffic noise, and in several cases, the increases would be substantial.

Increases in traffic noise gradually degrade the environment in areas sensitive to noise. According to CEQA, "a substantial increase" is necessary to cause a significant environmental impact. An increase of 3 dBA DNL is considered substantial in noise sensitive areas along the roadways analyzed in the plan area as noise exposures at a distance of 75 feet from the roadway centerline generally exceed 60 dBA DNL. Vehicular traffic on roadways in the city would increase as development occurs and the city's population increases. These projected increases in traffic would, over time, increase noise levels throughout the community. Proposed roadway modifications could increase or decrease traffic noise levels depending on the circumstances of each project. Traffic noise levels within the study area were projected for General Plan build-out in the year 2040, the Downtown Strategy 2040 Plan, and two Downtown Strategy 2040 Plan alternatives to determine noise impacts resulting from changes in vehicular traffic volumes.

Traffic noise levels were calculated for the year 2040 and compared to existing conditions to quantify the noise increase attributable to the development facilitated by General Plan build-out in the year 2040, the Downtown Strategy 2040 Plan, and two Downtown Strategy 2040 Plan alternatives. These data are summarized in Table 9. Table 9 shows the study area intersection, and the noise level increases expected on the north, south, east, and west legs of the intersection. Noise levels would increase substantially (i.e., by 3 dBA DNL or more, as indicated in red font) along segments of Santa Clara Street, Autumn Street, San Carlos Street, Bird Avenue, Julian Street, Almaden Boulevard, Race Street, The Alameda, King Road, First Street, Fruitdale Avenue, Alma Avenue, Naglee Avenue, and Keyes Street. Noise levels along Interstate 280 and State Route 87 are expected to increase 1 to 2 dBA DNL. For the most part, the noise increases expected under the Downtown Strategy 2040 Plan, and two Downtown Strategy 2040 Plan alternatives were within 1 dBA of the noise levels predicted for the General Plan build-out in the year 2040.

The General Plan build-out was found to result in a significant and unavoidable impact with regard to permanent noise increases due to traffic. In order to reduce the impact to the extent feasible, General Plan Policy EC-1.4 was recommended to include appropriate noise attenuation techniques in the design of new arterial streets projected to adversely impact noise sensitive uses. A combination of mitigation measures such as the repaving of area roadways with a "quiet pavement", replacement or construction of noise barriers, traffic calming, and sound insulation could be implemented to reduce the effects of increased traffic noise generated by development under the proposed General Plan.

Case studies have shown that the replacement of dense grade asphalt (standard type) with open-grade or rubberized asphalt can reduce traffic noise levels along local roadways by 2 to 3 dBA DNL. A possible noise reduction of 2 dBA would be expected using conservative engineering assumptions, and future traffic noise increases could be mitigated to a less than significant level

by repaving roadways with "quieter pavements." To be a permanent mitigation, subsequent repaving would also have to use "quieter" pavements.

In situations where private outdoor use areas are located adjacent to the roadway, new or larger noise barriers could be constructed to provide the additional necessary noise attenuation in private use areas. Typically, increasing the height of an existing barrier results in approximately one dBA of attenuation per one foot of additional barrier height. The design of such noise barriers would require additional analysis. Traffic calming could also be implemented to reduce noise levels expected with the project. Each five-mph reduction in average speed provides approximately one dBA of noise reduction on an average basis (L_{eq}/DNL). Traffic calming measures that regulate speed improve the noise environment by smoothing out noise levels.

Residences could also be provided with sound insulation treatments if further study finds that interior noise levels within the affected residential units would exceed 45 dBA DNL because of the projected increase in traffic noise. Treatments to the homes may include the replacement of existing windows and doors with sound-rated windows and doors and the provision of a suitable form of forced-air mechanical ventilation to allow the occupants the option of controlling noise by closing the windows. The specific treatments for each affected residential unit would be identified on a case-by-case basis.

Each of these mitigation measures involves other non-acoustical considerations. Other engineering issues may dictate continued use of dense grade asphalt. Noise barriers and sound insulation treatments must be done on private property necessitating agreements with each property owner. The implementation of measures associated with this policy will not be able to reduce substantial noise increases to acceptable levels at all noise sensitive areas. The Downtown Strategy 2040 Plan, and two Downtown Strategy 2040 Plan alternatives, would similarly result in a significant and unavoidable impact.

TABLE 9 Traffic Noise Level Increases Above Existing Conditions by Future Traffic Scenario

Intersection	DT 2040 GP Noise Level Increase				Amended DT 2040 GP Noise Level Increase				DT 2040 GP Alternative 1 Noise Level Increase				DT 2040 GP Alternative 2 Noise Level Increase			
	North	South	East	West	North	South	East	West	North	South	East	West	North	South	East	West
Montgomery Street and Santa Clara Street	--	1	3	3	--	1	3	3	--	1	3	3	--	1	3	3
Autumn Street and Santa Clara Street	8	8	3	3	8	9	3	3	8	9	3	3	8	9	3	3
Bird Avenue and San Carlos Street	2	2	4	4	1	2	4	4	1	2	4	4	2	2	4	4
Bird Avenue and I-280 (N)	2	1	2	2	3	1	2	2	3	2	2	2	2	1	2	2
SR 87 and Santa Clara Street	--	1	2	2	--	1	2	2	--	1	2	2	--	1	2	2
SR 87 and Julian Street (W)	1	1	3	4	1	1	3	4	1	1	3	4	1	1	3	4
SR 87 and Julian Street (E)	3	1	3	2	3	1	3	3	3	1	3	3	3	1	3	3
Almaden Boulevard and San Carlos Street	2	3	4	4	2	3	4	4	2	3	4	4	2	3	4	4
Market Street and San Carlos Street	2	2	5	4	2	2	5	4	2	2	5	4	2	2	5	4
Race Street and The Alameda	4	3	3	3	4	3	3	3	4	3	3	3	4	3	3	3
King Road and Alum Rock Avenue	4	3	2	2	4	3	2	2	4	3	2	2	4	3	2	2
I-880 and First Street (N)	3	2	2	0	3	2	2	0	3	2	2	0	3	2	2	0
I-880 and First Street (S)	2	1	5	3	2	1	5	3	2	1	5	3	2	1	5	3
Bird Avenue and I-280 (S)	1	1	1	3	1	0	1	4	1	1	1	4	1	1	1	3
Bascom Avenue and Moorpark Avenue	2	2	1	2	2	2	1	2	2	2	1	2	2	2	1	2
Bascom Avenue and Fruitdale Avenue	2	2	3	1	2	2	4	1	2	2	4	1	2	2	4	1
Monterey Road and Curtner Avenue	2	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1
First Street and Alma Avenue	2	2	3	3	2	2	3	3	3	2	3	3	3	2	4	3
First Street and Keyes Street	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3
I-280 and Eleventh Street (N)	1	1	0	0	2	1	1	0	1	1	1	0	2	1	1	0
I-280 and Eleventh Street (S)	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	1
I-280 and Tenth Street (N)	1	1	2	2	1	1	2	2	1	1	1	1	1	1	2	2
I-280 and Tenth Street (S)	1	1	1	1	1	1	2	2	1	1	2	2	1	1	2	2
The Alameda and Naglee Avenue	2	2	3	4	2	2	3	4	2	2	3	4	2	2	3	4
The Alameda and Hedding Street	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
The Alameda and I-880 (S)	1	1	0	1	1	2	0	1	1	2	0	1	1	2	0	1
The Alameda and I-880 (N)	3	2	2	0	3	2	2	0	3	2	2	0	2	2	2	0
Coleman Avenue and I-880 (N)	2	2	2	0	2	2	2	0	2	2	2	0	2	2	2	0
Coleman Avenue and I-880 (S)	2	2	2	0	2	2	2	0	2	2	2	1	2	2	2	0
US 101 and Oakland Road (N)	2	2	1	2	2	1	2	3	2	2	1	2	2	2	1	2
US 101 and Oakland Road (S)	2	2	0	1	1	2	0	2	2	2	0	1	1	2	0	1

Source: Illingworth & Rodkin, Inc.

Impact 4: **Construction Noise.** Construction noise would cause a temporary or periodic increase in noise exposure above ambient noise levels.

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. Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive residential uses in the project vicinity for a period exceeding one year, the impact would be considered significant. For commercial uses, a significant impact would be identified if construction noise were to exceed 70 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} for a period exceeding one year. Additionally, the City considers significant construction noise impacts to have occurred 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, according to Policy EC-1.7 of the General Plan.

Major noise-generating construction activities associated with new projects would include removal of existing pavement and structures, site grading and excavation, installation of utilities, the construction of building foundations, cores, and shells, paving, and landscaping. The highest noise levels would be generated during the demolition of existing structures when impact tools are used (e.g., jackhammers, hoe rams) and during the construction of building foundations when impact pile driving is required to support the structure. Site grading and excavation activities would also generate high noise levels as these phases often require the simultaneous use of multiple pieces of heavy equipment such as dozers, excavators, scrapers, and loaders. Lower noise levels result from building construction activities when these activities move indoors and less heavy equipment is required to complete the tasks. Construction equipment would typically include, but would not be limited to, earth-moving equipment and trucks, pile driving rigs, mobile cranes, compressors, pumps, generators, paving equipment, and pneumatic, hydraulic, and electric tools. Table 10 shows the maximum noise level ranges for different construction equipment. Table 11 presents the typical range of hourly average noise levels generated by distinct phases of construction measured at 50 feet from a busy construction site.

Typical hourly average construction-generated noise levels are about 77 to 89 dBA L_{eq} measured at 50 feet from the site during busy construction periods. Large pieces of earth-moving equipment, such as graders, scrapers, and dozers, generate maximum noise levels of 85 to 90 dBA Lmax at 50 feet. During each stage of construction, there would be a different mix of equipment operating and noise levels would vary based on the amount of equipment on site and the location of the activity. Construction noise levels drop off at a rate of about 6 dbas per doubling of distance between the noise source and receptor. Intervening structures or terrain would result in lower noise levels at distant receivers.

The City of San José does not establish quantitative noise limits for demolition or construction activities occurring in the City. According to San José Municipal Code, the legal hours of

construction within 500 feet of a residential unit are limited to the hours of 7:00 a.m. to 7:00 p.m. on Monday through Friday.

Noise generated by small infill projects facilitated by the plan would likely have relatively short overall construction durations, with the noisiest phases of construction (e.g., demolition, foundations, project infrastructure, building core and shell) limited to a timeframe of one year or less. These phases of construction are not anticipated to generate noise levels in excess of 60 dBA L_{eq} and the ambient noise environment by 5 dBA L_{eq} or more at sensitive land uses in the area over extended periods of time (beyond one construction season). Interior construction, landscaping, and finishing activities would not be expected to result in noise levels in excess of 60 dBA L_{eq}. Large construction projects facilitated by the plan may result in a substantial temporary noise increase at adjacent noise-sensitive land uses. As a result, noise levels from these projects could exceed 60 dBA L_{eq} and the ambient noise environment by 5 dBA L_{eq} or more, and last over one year in duration.

The potential short-term noise impacts associated with construction facilitated by the Downtown Strategy 2040 plan area would be mitigated by General Plan Policy EC-1.7. This policy states:

> 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.

A 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 pile 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.

- 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.

- 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;

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

The potential short-term noise impacts associated with construction facilitated by the plan would be mitigated by the implementation of the above policy that requires reasonable noise reduction measures be incorporated into the construction plan and implemented during all phases of construction activity to minimize the exposure of neighboring properties. Policy EC-1.7 in combination with the limitations on hours set forth in the Municipal Code, would reduce the impact to a less-than-significant level.

TABLE 10 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.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

TABLE 11 Typical Ranges of Noise Levels at 50 Feet from Construction Sites (dBA L_{eq})

	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: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1, p. 2-104.