Appendix F

Noise/Vibration Assessment

SAN JOSÉ TRIBUTE HOTEL PROJECT
NOISE AND VIBRATION ASSESSMENT
SAN JOSÉ, CALIFORNIA

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INTRODUCTION

The San José Tribute Hotel Project is located at 211 S. 1st Street in San José, California. The project proposes to construct a new 176,000 square-foot, 24-story high rise hotel addition adjacent to the existing 4-story Four Points by Sheraton Hotel, the former historic Montgomery Hotel, in downtown San José. The proposed hotel tower would contain between 260 and 280 hotel guest rooms and indoor roof-top public amenities, including a swimming pool, spa, fitness center, and events lounge.

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

SETTING

Fundamentals of Environmental Noise

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

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

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a

method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

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

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

Effects of Noise

Sleep and Speech Interference

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

Annoyance

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

Fundamentals of Groundborne Vibration

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

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

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

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

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

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 has been correlated best with the velocity of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is 1×10^{-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	Virtually no risk of damage to normal buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

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

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

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

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

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

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

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

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

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

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

Pursuant to recent court decisions, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise 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.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The following policies are applicable to the proposed project:

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

Interior Noise Levels

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

Exterior Noise Levels

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

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

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

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

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

Normally Acceptable:

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

Conditionally Acceptable:

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

Unacceptable:

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

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

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

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

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

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

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

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

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.

City of San José Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.40.600 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. The code is not explicit in terms of the acoustical descriptor associated with the noise level limit. However, a reasonable interpretation of this standard, which is based on policy EC-1.3 of the City's General Plan, would identify the ambient base noise level criteria as a day-night average noise level (DNL).

Chapter 20.80.2030 of the Municipal Code establishes maximum noise level limits, operational limits, and allowable testing hours for generators (7:00 am and 7:00 pm Monday through Friday).

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.

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

4.3.2.1 Noise Compatibility Policies

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

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

Regulatory Background – Vibration

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

EC-2.1 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

The project site is located at 211 S. 1st Street in San José, California. Figure 1 shows the project site plan overlaid on an aerial image of the site vicinity. As shown on Figure 1, the project site is surrounded by a variety of land uses. The existing Casa del Pueblo Residential Tower is located adjacent to the project site to the west, with the United Food and Commercial Workers Union Local 5 building on S. Market Street just west of the apartments. The existing Fairmont Hotel Tower, with first floor commercial units, is located adjacent to the project site to the north. To the east, opposite S. 1st Street, are two multi-level commercial buildings; the U.S. Courthouse and the Camera 12 Cinemas. Adjacent to the project site to the south is the existing Four Points by Sheraton Hotel. Past the Sheraton Hotel is a parking lot and opposite W. San Carlos Street is the multi-story Westin Hotel with first floor commercial units.

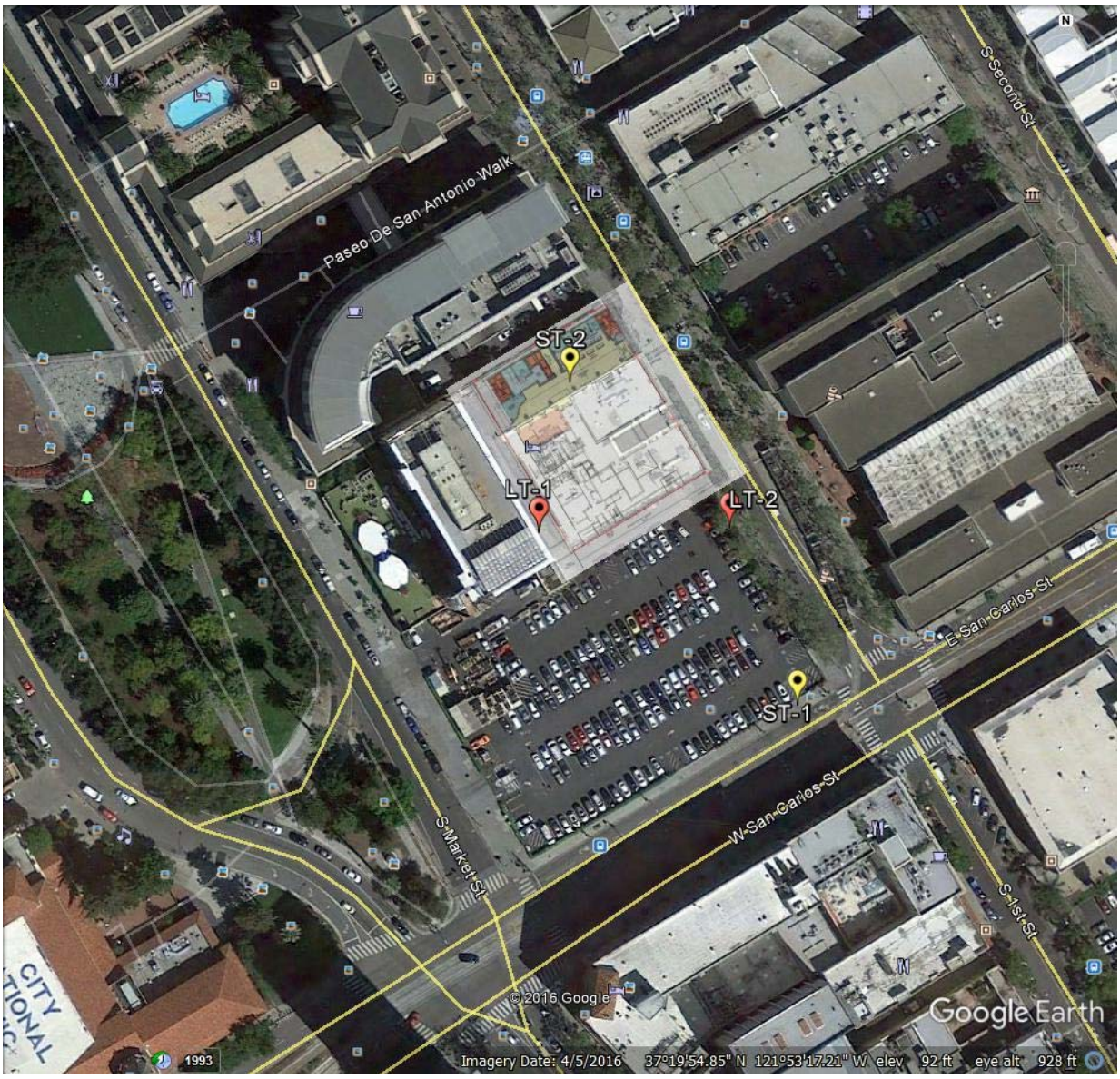
A noise monitoring survey was performed in the vicinity of the project site between Monday, December 19, 2016 and Wednesday, December 21, 2016. The monitoring survey included two long-term noise measurements (LT-1 and LT-2) and two short-term measurements (ST-1 and ST-2), as shown in Figure 1. The noise environment at the site and at the nearby land uses results primarily from vehicular traffic along S. 1st Street and W. San Carlos Street, as well as the Valley Transportation Authority (VTA) light-rail trains running along S. 1st Street and W. San Carlos Street. Occasional overhead aircraft associated with the Mineta San José International Airport also affects the noise environment at the site.

Long-term noise measurement LT-1 was made in the alleyway west of the existing Four Points by Sheraton Hotel, approximately 280 feet north of the W. San Carlos Street centerline. Hourly average noise levels at this location ranged from 62 to 84 dBA L_{eq} during the day, and from 59 to 66 dBA L_{eq} at night. The day-night average noise level on Tuesday, December 20, 2016 was 68 dBA DNL. Consistent daytime and nighttime noise levels are due to the constant operation of mechanical equipment near the alleyway between the Four Points by Sheraton Hotel and Casa del Pueblo Residential Tower. Mechanical equipment was also the likely cause of the high noise levels that occurred between 11:00 a.m. and 12:00 p.m. on Wednesday, December 21, 2016. The daily trend in noise levels at LT-1 is shown in Figure 2.

Long-term noise measurement LT-2 was made on S. 1st Street just south of the existing Four Points by Sheraton Hotel, approximately 35 feet west of the S. 1st Street centerline. Hourly average noise levels at this location ranged from 64 to 72 dBA L_{eq} during the day, and from 58 to 69 dBA L_{eq} at night. The day-night average noise level on Tuesday, December 20, 2016 was 70 dBA DNL. The daily trend in noise levels at LT-2 is shown in Figure 3.

Short-term noise measurement ST-1 was made on W. San Carlos Street near the corner of S. 1st Street, approximately 45 feet north of the W. San Carlos Street centerline and 65 feet west of the S. 1st Street centerline. The 10-minute average noise level measured at this location between 1:10 p.m. and 1:20 p.m. on Monday, December 19, 2016 was 67 dBA L_{eq}. During the measurement at ST-1, a VTA light-rail train turned from W. San Carlos Street onto S. 1st Street, producing maximum noise levels of 78 to 79 dBA L_{max}. Short-term noise measurement ST-2 was made in the entrance courtyard of the existing Four Points by Sheraton Hotel on S. 1st Street, approximately 85 feet west of the S. 1st Street centerline. The 10-minute average noise level measured at this location between 1:30 p.m. and 1:40 p.m. on Monday, December 19, 2016 was 62 dBA L_{eq}. Table 5 summarizes the results of the short-term measurement.

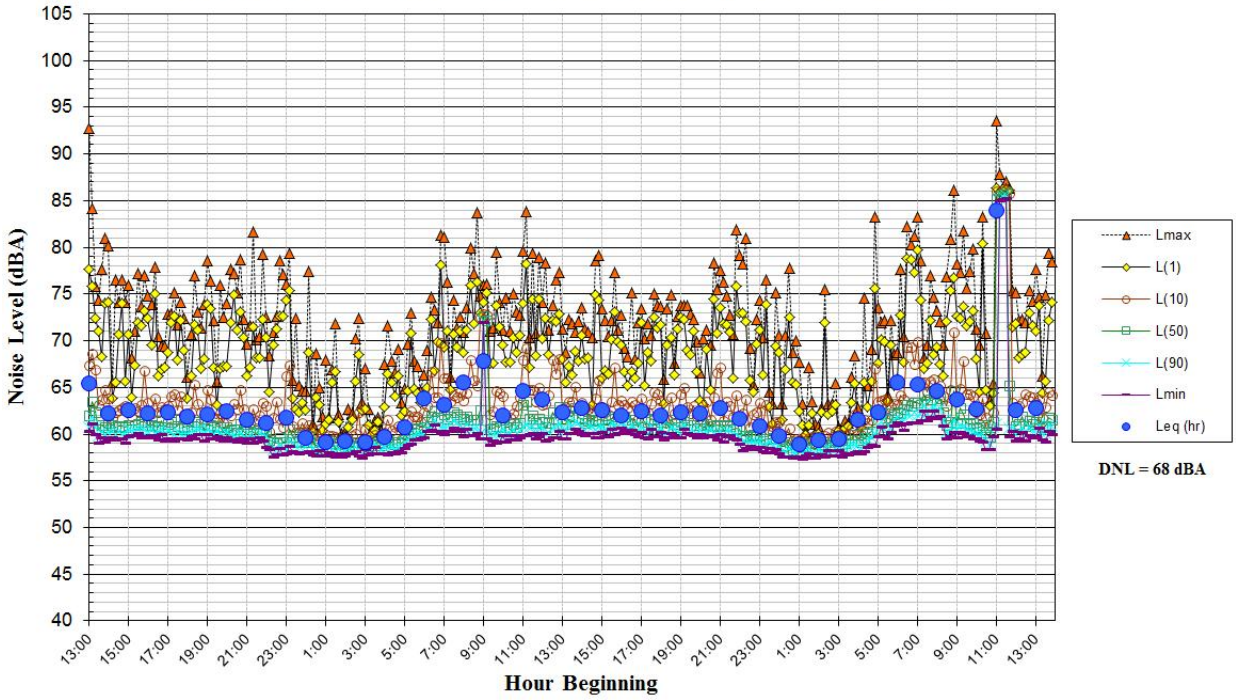
FIGURE 1 San José Tribute Hotel Noise Measurement Locations



Source: Google Earth

FIGURE 2 Long Term Noise Level Daily Trend for LT-1

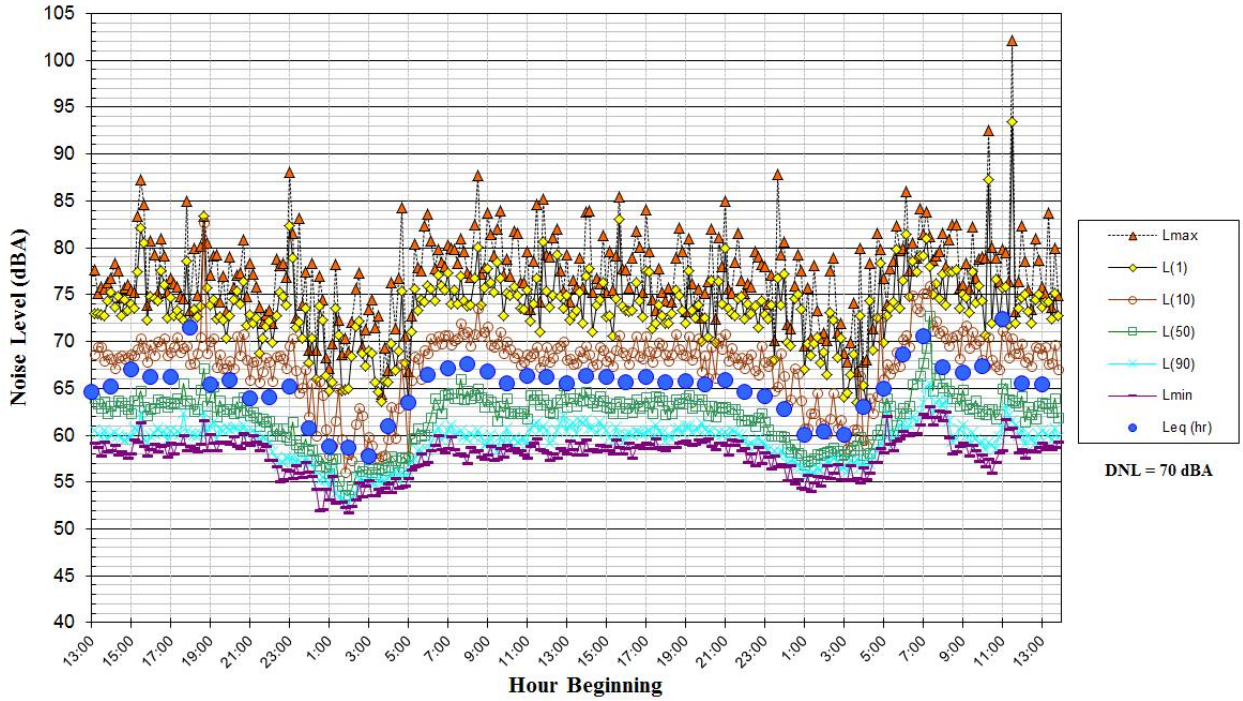
Noise Levels at Noise Measurement Site LT-1
Alleyway West of the Existing Hotel, 280 Feet North of W. San Carlos Street Centerline
Monday, December 19, 2016 through Wednesday, December 21, 2016



DNL = 68 dBA

FIGURE 3 Long Term Noise Level Daily Trend for LT-2

Noise Levels at Noise Measurement Site LT-2
On S. 1st Street just South of the Exisiting Hotel, 35 Feet West of S. 1st Street Centerline
Monday, December 19, 2016 through Wednesday, December 21, 2016



DNL = 70 dBA

TABLE 5 Summary of Short-Term Noise Measurement Data

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: On W. San Carlos Street, ~65ft from centerline. (12/19/2016, 1:10 p.m. - 1:20 p.m.)	81	79	70	63	59	67
ST-2: In entrance courtyard, ~85ft from S. 1st Street centerline. (12/19/2016, 1:30 p.m. - 1:40 p.m.)	71	67	64	61	60	62

GENERAL PLAN CONSISTENCY ANALYSIS – COMPATIBILITY OF PROJECT WITH NOISE ENVIRONMENT AFFECTING THE SITE

Noise and Land Use Compatibility

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

- The City's acceptable exterior noise level standard is 60 dBA DNL or less for the proposed hotel land use.

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

The ambient noise environment at the proposed project site ranges from 68 to 70 dBA DNL. The future noise environment at the project site would continue to result primarily from traffic along the surrounding roadways and downtown activities. Existing noise sources, including aircraft, bus and light rail movements, vehicular traffic, and other downtown activities, generate noise levels of 68 to 70 dBA DNL at the ground level façades of the proposed building. The noise level increase for the Central/Downtown section of the City estimated in the noise assessment conducted for the Envision San José 2040 General Plan Comprehensive Update[1] and Diridon Station Area Plan[2] was up to 2 dBA in the future. Transit activities are assumed to remain similar in the future and aircraft noise levels are anticipated to be about 60 dBA CNEL at the site in the future. All of these factors would result in future noise exposures of 70 to 72 dBA DNL at ground level facades for the proposed hotel.

Noise levels are anticipated to be 1 to 2 dBA higher at 2nd through 4th floor exposures than at ground level due to the reduction in shielding provided by the surrounding buildings, resulting in noise levels of about 72 to 74 dBA DNL. Above the 4th floor, noise levels drop off as the distance from the ground level noise source increases. From 5th through 12th floor exposures, noise levels would gradually decrease back to ground-floor levels of 70 to 72 dBA DNL. Above the 12th floor,

[1] Illingworth and Rodkin, Inc., "Envision San José 2040 General Plan Comprehensive Update Environmental Noise Assessment", December 2010.

[2] Diridon Station Area Plan Traffic Noise Analysis, Illingworth & Rodkin, Inc., April 30, 2012

noise levels would range from 69 down to 65 dBA DNL at top floors of the proposed buildings. Future exterior noise levels at the project site would exceed the exterior noise thresholds (60 dBA DNL) established in the Envision San José 2040 General Plan.

Future Exterior Noise Environment

Based on a review of the proposed site plan, there appear to be no sensitive outdoor spaces proposed as part of the project.

Future Interior Noise Environment

The City of San José General Plan requires that noise levels be maintained at 45 dBA DNL or less within hotels. Hotel rooms would be located at the 2nd through 5th floors, and then at the 7th through 23rd floors. The exterior traffic noise exposure the hotel facades would range from 65 to 74 dBA DNL. Mechanical equipment is located on the rooftop of the buildings adjoining the western, northern, and southern boundaries of the project. The hotel units along these building façades located above the elevation of the roofs of the adjoining buildings would be exposed to noise from the mechanical equipment that could elevate the overall noise level and be potentially disturbing due to tonal characteristics.

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Preliminary building plans indicate that the exterior of the building would consist primarily of cement plaster and aluminum clad window walls. Standard hotel construction with the windows and doors closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion. For the proposed project, the interior noise levels would range from 45 to 54 dBA DNL with windows and doors closed. This would exceed the City's threshold for interior noise.

For consistency with the General Plan the following Conditions of Approval will be implemented by the project applicant:

- Provide sound rated windows to maintain interior noise levels at acceptable levels. Preliminary calculations show that sound-rated windows with minimum STC[3] Ratings of 34 to 36 would be satisfactory for rooms facing S. 1st Street and W. San Carlos Street to achieve acceptable interior noise levels.

[3] **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all hotel rooms, so that windows can be kept closed to control noise.

- A qualified acoustical specialist shall prepare a detailed analysis of interior residential noise levels resulting from all exterior sources (transportation and non-transportation) during the final design phase of the project pursuant to requirements set forth in the General Plan and State Building Code. The study will review the final site plan, building elevations, and floor plans prior to construction and confirm building treatments necessary to reduce interior noise levels to 45 dBA DNL or lower, and address and adequately control the noise from rooftop equipment on the adjacent building. Treatments would include, but are not limited to, sound-rated windows and doors as specified above, acoustical caulking, protected ventilation openings, etc. The specific determination of what noise insulation treatments are necessary shall be conducted on a unit-by-unit basis during final design of the project. Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans and approved design, prior to issuance of a building permit.

Airport Noise

Mineta San José International Airport is a public-use airport located approximately two miles northwest of the project site. The project site lies outside the 2027 60 dBA CNEL noise contour shown in the Norman Y. Mineta San José International Airport Master Plan Update Project for the airport. Noise levels resulting from aircraft would be less than 65 dBA CNEL at the project site and compatible with the proposed land use.

Vibration and Land Use Compatibility

The U.S. Department of Transportation, Federal Transit Administration's (FTA) vibration impact assessment criteria[4] were used to evaluate vibration levels produced by light-rail trains at the project site. 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).

The frequency of the VTA light-rail trains would place the level of train activity in the "frequent events" category and the applicable threshold is 72 VdB. According to the FTA Generalized Ground Surface Vibration Curves[4], vibration levels would be 72 VdB or less at a distance of 60 feet from the centerline of the S. 1st Street VTA light-rail train tracks. The nearest track switch (a movable section of special trackwork that enables a train to change direction depending on how the switch is set) is located approximately 250 feet from the project site, and far enough away that excess vibration due to the switch would not be of concern. Therefore, no switch adjustment was included in the calculations. Based on other adjustments for the speed of the light-rail train and building foundation and materials, the vibration levels within the building are calculated to be 68

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

VdB or less, which is below the 72 VdB threshold level. Persons at rest may perceive the vibration; however, vibration controls are not required.

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.

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 proposed 24-story hotel is an addition to the historic Four Points by Sheraton Hotel and both buildings will be owned by the same developer. Therefore, for the purpose of this study, the Four Points by Sheraton Hotel will be considered part of the proposed project and not a separate sensitive receptor. 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. The City of San Jose considers large or complex projects involving substantial noise-generating activities and lasting more than 12 months significant when within 500 feet of residential land uses or within 200 feet of commercial land uses or offices.

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

Mechanical Equipment

High-rise structures typically include various mechanical equipment for heating, ventilation, and air-conditioning needs. At the time of this analysis, the specific mechanical equipment has not been selected, nor were specific details such as manufacturer's noise data for such equipment available. A review of project site plans show electrical and maintenance rooms located inside the building on the basement level and generator, air and exhaust rooms located inside the building on the 6th floor. The plans also show various mechanical equipment surrounded by screen walls on the rooftop. Due to the number of variables inherent in the mechanical equipment needs of the project (number and types of units, locations, size, housing, specs, etc.), the impacts of mechanical equipment noise on nearby noise-sensitive uses should be assessed during the final project design stage. The most substantial noise-generating equipment would likely be the cooling towers and chillers. Design planning should take into account the noise criteria associated with such equipment and utilize site planning to locate equipment in less noise-sensitive areas. Other controls could include, but shall not be limited to, fan silencers, enclosures, and mechanical screening.

The nearest noise sensitive uses to the project site include the attached (less than 5 feet) Four Points by Sheraton Hotel to the south, the Casa del Pueblo Residential Tower approximately 30 feet west, and the Fairmont Hotel Tower approximately 40 feet north. There is also the Camera 12 Cinemas approximately 80 feet east and the U.S. Courthouse approximately 95 feet east of the project site. Under the City's Noise Element, noise levels produced by the operation of the mechanical equipment would be limited to 55 dBA DNL at receiving noise-sensitive land uses. Given the close proximity of noise-sensitive uses to the project site and lack of sufficient details about the

mechanical equipment, mechanical rooms, and rooftop screen wall, there is the potential for noise from mechanical equipment to exceed 55 dBA DNL at noise-sensitive land uses in the immediate project vicinity. The final design plans should be reviewed by a qualified acoustical consultant to address any potential conflicts. This is a potentially significant impact.

Truck Deliveries

Truck deliveries for the proposed hotel would also have the potential to generate noise. A loading dock is proposed in the western portion of the site, adjacent to the Casa del Pueblo Residential Tower. Typical noise levels generated by loading and unloading of truck deliveries would be similar to noise levels generated by truck movements in the existing alleyway, on local roadways, and by similar activities at surrounding uses. Peak noise levels from truck activities would therefore not increase the day-night average noise level. These infrequent deliveries are not anticipated to substantially increase ambient noise levels at the nearby noise-sensitive land uses.

Construction Noise

Construction activities would occur between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday and would not occur on weekends or holidays, as outlined in the Municipal Code. All construction would be conducted during allowable hours; therefore, the potential impact related to consistency with the Municipal Code standards would be less-than-significant.

Mitigation Measure 1:

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

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

- Ensure that noise-generating activities, such as maintenance activities and loading/unloading activities, are limited to the hours of 7:00 am and 9:00 pm.

Impact 2: **Exposure to Excessive Groundborne Vibration.** Construction-related vibration levels would exceed 0.08 in/sec PPV at the historic Montgomery Hotel, but would not be expected to exceed 0.2 in/sec PPV at nearby buildings of normal conventional construction. **This is a significant impact.**

The construction of the project would generate vibration levels exceeding the General Plan threshold of 0.08 in/sec PPV at the historic Montgomery Hotel when heavy equipment or impact

tools are used at the site. As discussed in detail below, such vibration levels would be capable of cosmetically damaging the adjacent historic hotel. Project-generated vibration levels would fall below the General Plan threshold of 0.2 in/sec PPV at other surrounding conventional buildings located 30 feet or more from the project site. Neither cosmetic, minor, or major damage would occur at conventional buildings in the project vicinity. 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.

Construction activities associated with the project would include demolition of existing site improvements, site preparation, foundation work, and new building framing and finishing. According to construction information provided by the project design team, due to the density in the immediate area and proximity to other structures, piles will not be driven, but will be drilled instead. The drilled systems available for the shoring system (i.e. soldier pile and lagging using drilled holes and grouting) and the foundations (i.e. augercast piles) minimize vibration to the extent feasible for the historic hotel as drilled foundations produce substantially lower vibration levels as compared to foundations constructed utilizing impact or vibratory hammers. The use of other high vibration generating equipment will be avoided.

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. The vibration limits contained in this policy are conservative and designed to provide the ultimate level of protection for existing buildings in San José. According to the City of San José Historic Resources Inventory,[5] there is one historic building, the Montgomery Hotel, within 60 feet of the project site. This historic hotel was moved approximately 190 feet south of its original location in 1999 by the San José Redevelopment Agency and retrofitted and rebranded to Four Points by Sheraton in 2004. The proposed project would expand the existing historic hotel by attaching the proposed hotel tower. Heavy vibration generating construction equipment, such as vibratory rollers or clam shovel drops, would have the potential to produce vibration levels of 0.08 in/sec PPV or more at historic buildings within 60 feet of the project site. This same equipment would have the potential to produce vibration levels of 0.2 in/sec PPV or more at buildings of normal conventional construction located within 25 feet of the project site.

Table 7 presents typical vibration levels from construction equipment at 25 feet. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV at 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 7 also presents construction vibration levels at various distances from the construction equipment. Calculations were made to estimate vibration levels at distances of 5 feet from the hotel, as well as distances of 30, 40, and 60 feet from the site to represent other nearby buildings. 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.

[5] "City of San José Historic Resources Inventory." City of San José, February 8, 2016, www.sanjoseca.gov/DocumentCenter/View/35475 .

TABLE 7 Vibration Levels for Construction Equipment at Various Distances

Equipment		PPV at 5 ft. (in/sec)	PPV at 25 ft. (in/sec)	PPV at 30 ft. (in/sec)	PPV at 40 ft. (in/sec)	PPV at 60 ft. (in/sec)
Clam shovel drop		1.186	0.202	0.165	0.120	0.077
Hydromill (slurry wall)	in soil	0.047	0.008	0.007	0.005	0.003
	in rock	0.100	0.017	0.014	0.010	0.006
Vibratory Roller		1.233	0.210	0.172	0.125	0.080
Hoe Ram		0.523	0.089	0.073	0.053	0.034
Large bulldozer		0.523	0.089	0.073	0.053	0.034
Caisson drilling		0.523	0.089	0.073	0.053	0.034
Loaded trucks		0.446	0.076	0.062	0.045	0.029
Jackhammer		0.206	0.035	0.029	0.021	0.013
Small bulldozer		0.018	0.003	0.002	0.002	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., May 2018.

Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity of the historic Montgomery Hotel. Some activities would occur at distances of about 5 feet from the hotel, and at this distance, vibration levels due to construction are conservatively calculated to reach up to 1.2 in/sec PPV, which would exceed the 0.08 in/sec PPV threshold for historic buildings.

The US Bureau of Mines has analyzed the effects of blast-induced vibration on buildings in USBM RI 8507[6], and these findings have been applied to vibrations emanating from construction equipment on buildings[7]. As shown on Figure 4, these studies indicate an approximate 20% probability of "threshold damage" (referred to as cosmetic damage elsewhere in this report) at vibration levels of 1.2 in/sec PPV or less and no observations of "minor damage" or "major damage" at vibration levels of 1.2 in/sec PPV or less. Figure 4 presents the damage probability as reported in USBM RI 8507 and reproduced by Dowding assuming a maximum vibration level of 1.2 in/sec PPV. Based on these data, cosmetic or threshold damage would be manifested in the form of hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. However, minor damage (e.g., hairline cracking in masonry or the loosening of plaster) or major structural damage (e.g., wide cracking or shifting of foundation or bearing walls) to the Montgomery Hotel would not occur assuming a maximum vibration level of 1.2 in/sec PPV.

The buildings of normal conventional construction adjacent the project site include the Casa del Pueblo Residential Tower approximately 30 feet west of the site and the Fairmont Hotel Tower approximately 40 feet north of the site. At these distances, vibration levels would be up to 0.17

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

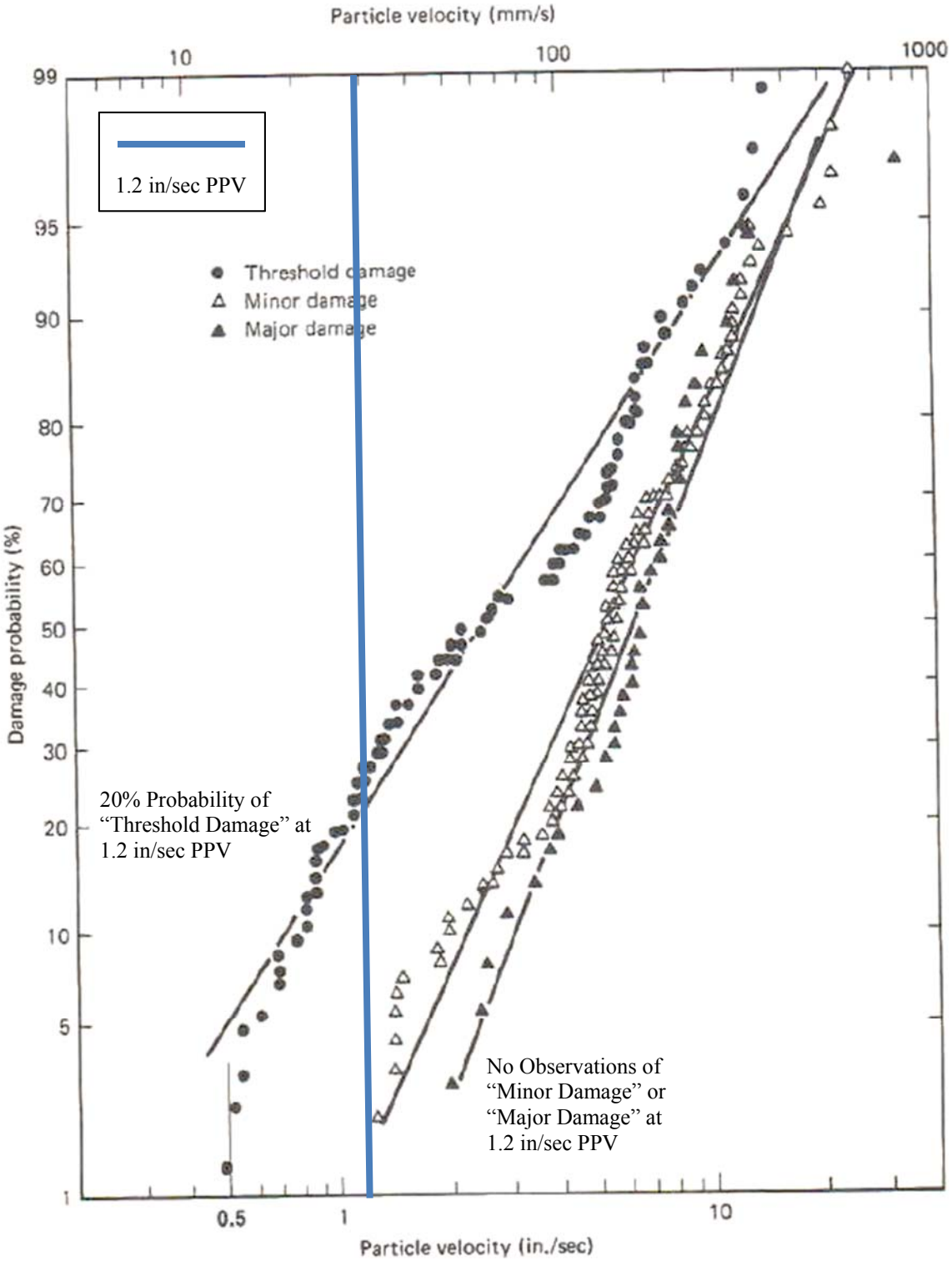
7 Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

in/sec PPV, which is below the 0.2 in/sec PPV threshold for normal buildings. The commercial land uses surrounding the project site include the Camera 12 Cinemas approximately 80 feet east and the U.S. Courthouse approximately 95 feet east of the project site. At these distances, vibration levels would be up to 0.06 in/sec PPV, which is below the 0.2 in/sec PPV threshold for conventional buildings.

At these locations, and in other surrounding areas where vibration would not be expected to cause structural damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby businesses, perceptible vibration can be kept to a minimum.

In summary, the construction of the project would generate vibration levels exceeding the General Plan threshold of 0.08 in/sec PPV at the historic Montgomery Hotel, and such vibration levels would be capable of cosmetically damaging the hotel building. Project-generated vibration levels would fall below the General Plan threshold of 0.2 in/sec PPV at other surrounding buildings of normal conventional construction located 30 feet or more from the project site, and no damage would occur at these buildings as a result of the project.

FIGURE 4 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996 as modified by Illingworth & Rodkin, Inc., May 2018.

Mitigation Measure 2:

- Prohibit impact, sonic, or vibratory pile driving methods. Drilled piles cause lower vibration levels where geological conditions permit their use.

- Limit other vibration-inducing equipment to the extent feasible. 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 required for continuous vibration monitoring.

- A construction vibration-monitoring plan shall be implemented to document conditions at the historic Montgomery Hotel prior to, during, and after vibration generating construction activities. All plan tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry accepted standard methods. The vibration monitoring plan, including a vibration velocity limit (as determined based on a detailed review of the building), method (including locations and instrumentation) for monitoring vibrations during construction, and method for alerting responsible persons who have the authority to halt construction should limits be exceeded or damaged observed. The vibration limits shall be reduced if movement or cracking is detected.

  The construction vibration monitoring plan should be implemented to include the following tasks:

  - Identification of sensitivity to ground-borne vibration of the Montgomery Hotel. A vibration survey (generally described below) would need to be performed by a qualified acoustical consultant, licensed historical architect, or licensed Professional Structural Engineer in the State of California.

  - Performance of a photo survey, elevation survey, and crack monitoring survey for the historic Montgomery Hotel. Surveys shall be performed prior to, in regular intervals during, and after completion of vibration generating construction activities and shall include internal and external crack monitoring in the structure, settlement, and distress and shall document the condition of the foundation, walls and other structural elements in the interior and exterior of said structure.

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

  - If vibration levels approach limits, suspend construction and implement contingencies to either lower vibration levels or secure the affected structure.

- Conduct a post-survey on the structure where either monitoring has indicated high levels or complaints of damage. Make appropriate repairs in accordance with the Secretary of the Interior's Standards 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.

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

Impact 3: **Project-Generated Traffic Noise.** The proposed project would not result in a permanent noise level increase at the existing noise sensitive land uses due to project-generated traffic. **This is a less-than-significant impact.**

A significant impact would result if traffic generated by the project would substantially increase noise levels at sensitive receptors 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. Residences surrounding the project site have existing noise levels of 68 dBA DNL or greater; therefore, a significant impact would occur if project-generated traffic would permanently increase noise levels by 3 dBA DNL. For reference, a 3 dBA DNL noise increase would be expected if the project would double existing traffic volumes along a roadway.

Traffic noise levels from S. 1st Street and W. San Carlos Street dominate the noise environment in the immediate project vicinity. The project traffic study[8] provided AM and PM project trip assignments at the S. 1st Street and W. San Carlos Street intersection next to the project site. Traffic volume information was reviewed to calculate the permanent noise increase attributable to project-generated traffic. Traffic volumes under the Existing Plus Project scenario were compared to the Existing scenario to calculate the relative increase in the hourly average traffic noise level (L_{eq}) attributable to the proposed project. The change in the DNL would be the same as the change in the peak hour L_{eq}. After analyzing the traffic volumes, traffic noise levels due to the hotel addition would increase less than 1 dBA DNL. This increase would not be considered substantial and would result in a **less-than-significant** impact.

Mitigation Measure 3: **None required.**

[8] Hexagon Transportation Consultants, Inc., Four Points Hotel Expansion Traffic Operations Analysis, January 2017.

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

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

According to Policy EC-1.7 of the General Plan, the City considers construction noise impacts to be significant if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

Construction activities for individual projects are typically carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 8 and 9. Table 8 shows the average noise level ranges, by construction phase, and Table 9 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls with the range of 80 to 90 dBA at a distance of 50 feet from the source.

TABLE 8 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

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

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

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

TABLE 9 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.

Construction activities generate considerable amounts of noise, especially during earth-moving activities and during the construction of the building's foundation when heavy equipment is used. The highest noise levels would be generated during grading, excavation, and foundation construction. The hauling of excavated materials and construction materials would generate truck trips on local roadways, as well. The erection of large buildings from steel structures could also cause considerable noise for fairly long durations. The construction of the proposed project would involve grading and excavating to lay foundations, trenching, building erection, and paving. Due to the density in the immediate area and proximity to other structures, pile driving, which can cause excessive vibration, would be unlikely and piles would likely be drilled in instead.

Noise sensitive uses bordering the site include the attached (less than 5 feet) Four Points by Sheraton Hotel to the south, the Casa del Pueblo Residential Tower approximately 30 feet west, and the Fairmont Hotel Tower approximately 40 feet north. There is also the Camera 12 Cinemas approximately 80 feet east and the U.S. Courthouse approximately 95 feet east of the project site. At the nearest receptors, noise levels due to construction activities would well exceed ambient noise levels for a period of time greater than 12 months. Senior residents at the Casa del Pueblo Residential Tower would likely be home during daytime construction hours and exposed to noise levels exceeding 90 dBA L_{eq} at the exterior façade of the building. This is a potentially significant impact.

Mitigation Measure 4:

Policy EC-1.7 of the City's General Plan states that for large or complex projects within 500 feet of residential land uses or within 200 feet of commercial land uses or offices involving substantial noise-generating activities lasting more than 12 months, 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.

Modification, placement, and operation of construction equipment are possible means for minimizing the impact on the existing sensitive receptors. Construction equipment should be well-maintained and used judiciously to be as quiet as possible. Additionally, construction activities for the proposed project should include the following best management practices to reduce noise from construction activities near sensitive land uses:

- Construction activities shall be limited to the hours between 7:00 am and 7:00 pm, Monday through Friday, unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

- Construct solid plywood fences around construction sites adjacent to operational businesses, residences, or other noise-sensitive land uses.

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

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

- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

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

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

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

- Offer to relocate residents of the Casa del Pueblo Residential Tower having direct line of sight to the construction site for the duration of construction. Develop and release a Relocation Plan to the existing residents prior to initiating construction. The Plan would describe the process to temporarily relocate residents, describe the alternative housing options, and describe the proposed timing of relocation.

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

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

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