160 EL CAMINO REAL HOTEL NOISE AND VIBRATION ASSESSMENT

San Bruno, California

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INTRODUCTION

The project proposes the construction of a 3-story boutique hotel at 160 El Camino Real in San Bruno, California. The hotel will be constructed on a vacant lot that previously consisted of a gas station and commercial building. The proposed building would include 28 units and an on-site basement parking garage.

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 two 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 existing noise conditions; and, 2) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the impacts of the project on sensitive receptors in the vicinity. A previous study[1] by Bollard Acoustical Consultants, Inc. evaluated the proposed project for noise and land use compatibility.

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

1 Bollard Acoustical Consultants, Inc. "Environmental Noise Analysis: San Bruno Hotel." Prepared for Sierra Meadows Resort. July 27, 2018.

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 to 30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a DNL of 60 to 70 dBA. Between a DNL of 70 to 80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the DNL is 60 dBA, approximately 30 to 35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

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

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

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

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

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

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

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

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

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

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

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

Regulatory Background – Noise

The State of California and the City of San Bruno have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (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. CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

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

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

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

Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport, November 2012. Noise compatibility policies established in this document were designed to protect the public health, safety, and welfare by minimizing the exposure of residents and occupants of future noise-sensitive development to excessive noise and to protect the public interest in providing for the orderly development of SFO by ensuring that new development in the Airport environs complies with all requirements necessary to ensure compatibility with aircraft noise in the area. The intent is to avoid the introduction of new incompatible land uses into the Airport's "noise impact area" so that the Airport will continue to be in compliance with the State Noise Standards for airports (California Code of Regulations, Title 21, Sections 5012 and 5014).[2] The following noise compatibility policies (NP) shall apply to the ALUCP and are applicable to this project:

NP-1: Noise Compatibility Zones. For the purposes of this ALUCP, the projected 2020 CNEL noise contour map from the Draft Environmental Assessment for the Proposed Runway Safety Area Program shall define the boundaries within which noise compatibility policies described in this Section shall apply.[3] Exhibit IV-5 depicts the noise compatibility zones. More detail is provided on Exhibit IV-6. The zones are defined by the CNEL 65, 70 and 75 dB contours.

NP-2: Airport Noise/Land Use Compatibility Criteria. The compatibility of proposed land uses located in the Airport noise compatibility zones shall be determined according to the noise/land use compatibility criteria shown in Table IV-1. The criteria indicate the maximum acceptable airport noise levels, described in terms of Community Noise Equivalent Level (CNEL), for the indicated land uses. The compatibility criteria indicate whether a proposed land use is "compatible," "conditionally compatible," or "not compatible" within each zone, designated by the identified CNEL ranges.

- "Compatible" means that the proposed land use is compatible with the CNEL level indicated in the table and may be permitted without any special requirements related to the attenuation of aircraft noise.

- "Conditionally compatible" means that the proposed land use is compatible if the conditions described in Table IV-1 are met.

- "Not compatible" means that the proposed land use is incompatible with aircraft noise at the indicated CNEL level.

NP-3: Grant of Avigation Easement. Any action that would either permit or result in the development or construction of a land use considered to be conditionally compatible with aircraft noise of CNEL 65 dB or greater shall be subject to this easement requirement. The determination of conditional compatibility shall be based on the criteria presented in Table IV-1 "Noise/Land Use Compatibility Criteria."

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2 In 2002, the San Mateo County Board of Supervisors declared that the Airport had eliminated its "noise impact area," as defined under state law -- California Code of Regulations, Title 21, Sections 5012 and 5014.

3 URS Corporation and BridgeNet International. Draft Environmental Assessment, Proposed Runway Safety Area Program, San Francisco International Airport, June 2011.

The San Mateo County Airport Land Use Commission (the C/CAG Board) deems it necessary to: (1) ensure the unimpeded use of airspace in the vicinity of SFO; (2) to ensure that new noise-sensitive land uses within the CNEL 65 dB contour are made compatible with aircraft noise, in accordance with California Code of Regulations, Title 21, Section 5014; and (3) to provide notice to owners of real property near the Airport of the proximity to SFO and of the potential impacts that could occur on the property from airport/aircraft operations. Thus, C/CAG shall condition its approval of proposed development upon the owner of the subject property granting an avigation easement to the City and County of San Francisco, as the proprietor of SFO. The local government with the ultimate permitting and approval authority over the proposed development shall ensure that this condition is implemented prior to final approval of the proposed development. If the approval action for the proposed development includes construction of a building(s) and/or other structures, the local permitting authority shall require the grant of an avigation easement to the City and County of San Francisco prior to issuance of a building permit(s) for the proposed building or structure. If the proposed development is not built, then, upon notice by the local permitting authority, SFO shall record a notice of termination of the avigation easement.

The avigation easement to be used in fulfilling this condition is presented in Appendix G.

NP-4: Residential Uses Within CNEL 70 dB Contour. As described in Table IV-1, residential uses are not compatible in areas exposed to noise above CNEL 70 dB and typically should not be allowed in these high noise areas.

> *NP-4.1: Situations Where Residential Use Is Conditionally Compatible.* Residential uses are considered conditionally compatible in areas exposed to noise above CNEL 70 dB only if the proposed use is on a lot of record zoned exclusively for residential use as of the effective date of the ALUCP. In such a case, the residential use must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources. The property owner also shall grant an avigation easement to the City and County of San Francisco in accordance with Policy NP-3 prior to issuance of a building permit for the proposed building or structure.

Table IV-1 Noise/Land Use Compatibility Criteria

	COMMUNITY NOISE EQUIVALENT LEVEL (CNEL)			
LAND USE	**BELOW 65 dB**	**65-70 dB**	**70-75 dB**	**75 dB AND OVER**
Residential				
Residential, single family detached	Y	C	N *(a)*	N
Residential, multi-family and single family attached	Y	C	N *(a)*	N
Transient lodgings	Y	C	C	N
Public/Institutional				
Public and Private Schools	Y	C	N	N
Hospitals and nursing homes	Y	C	N	N
Places of public assembly, including places of worship	Y	C	N	N
Auditoriums, and concert halls	Y	C	C	N
Libraries	Y	C	C	N
Outdoor music shells, amphitheaters	Y	N	N	N
Recreational				
Outdoor sports arenas and spectator sports	Y	Y	Y	N
Nature exhibits and zoos	Y	Y	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N
Golf courses, riding stables, and water recreation	Y	Y	Y	Y
Commercial				
Offices, business and professional, general retail	Y	Y	Y	Y
Wholesale; retail building materials, hardware, farm equipment	Y	Y	Y	Y
Industrial and Production				
Manufacturing	Y	Y	Y	Y
Utilities	Y	Y	Y	Y
Agriculture and forestry	Y	Y *(b)*	Y *(c)*	Y *(c)*
Mining and fishing, resource production and extraction	Y	Y	Y	Y

Notes:

CNEL = Community Noise Equivalent Level, in A-weighted decibels.

Y (Yes) = Land use and related structures compatible without restrictions.

C (conditionally compatible) = Land use and related structures are permitted, provided that sound insulation is provided to reduce interior noise levels from exterior sources to CNEL 45 dB or lower and that an avigation easement is granted to the City and County of San Francisco as operator of SFO. See Policy NP-3.

N (No) = Land use and related structures are not compatible..

(a) Use is conditionally compatible only on an existing lot of record zoned only for residential use as of the effective date of the ALUCP. Use must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources. The property owners shall grant an avigation easement to the City and County of San Francisco prior to issuance of a building permit for the proposed building or structure. If the proposed development is not built, then, upon notice by the local permitting authority, SFO shall record a notice of termination of the avigation easement.

(b) Residential buildings must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources.

(c) Accessory dwelling units are not compatible.

SOURCES: Jacobs Consultancy Team 2010. Based on State of California General Plan Guidelines for noise elements of general plans; California Code of Regulations, Title 21, Division 2.5, Chapter 6, Section 5006; and 14 CFR Part 150, Appendix A, Table 1.
PREPARED BY; Ricondo & Associates, Inc., June 2012.

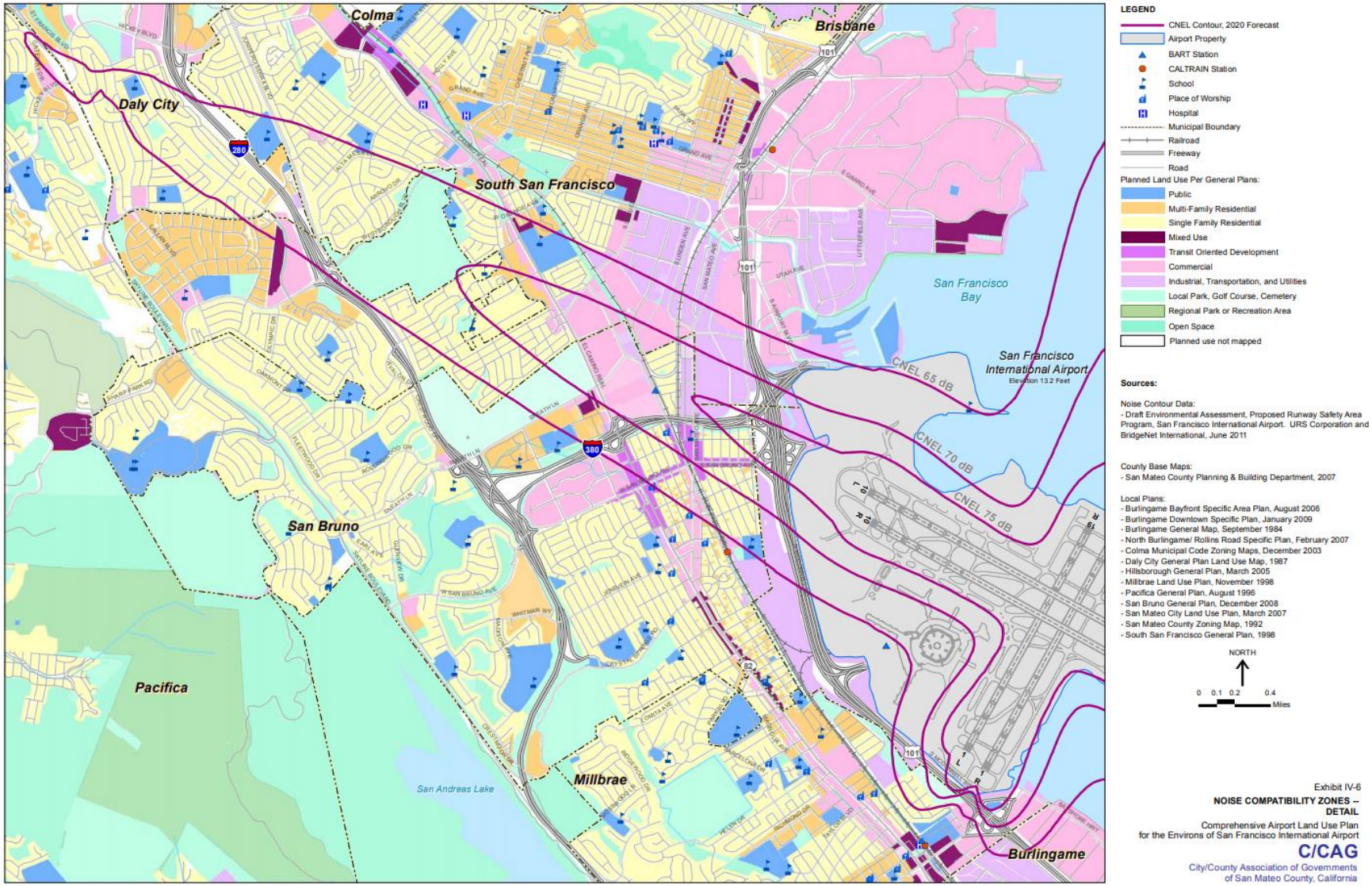

Exhibit IV-6

NOISE COMPATIBILITY ZONES -- DETAIL

Comprehensive Airport Land Use Plan
for the Environs of San Francisco International Airport

C/CAG

City/County Association of Governments
of San Mateo County, California

City of San Bruno General Plan. The City of San Bruno's General Plan includes a Noise section within the Health and Safety Element which provides guidelines to achieve the goal of maintaining an acceptable community noise level. The following general plan policies are applicable to the project:

> HS-38 Require developers to mitigate noise exposure to sensitive receptors from construction activities. Mitigation may include a combination of techniques that reduce noise generated at the source, increase the noise insulation at the receptor, or increase the noise attenuation rate as noise travels from the source to the receptor.

City of San Bruno Municipal Code. San Bruno's Noise Ordinance is contained in Title 6 of the San Bruno Municipal Code. The ordinance places limits on noise levels in residential zones, limits construction activity noise levels and hours near residential zones, establishes machinery noise level limits, and addresses amplified sounds. The following ordinances are applicable to the project:

> 6.16.030 Ambient noise level limits. Where the ambient noise level is less than designated in this section, the respective noise level in this section shall govern.
>
> Sound Level A, decibels
>
> Residential zone, time ten p.m. to seven a.m., forty-five decibels; seven a.m. to ten p.m., sixty decibels. (Ord. 1354 § 1; prior code § 16-4.3)
>
> 6.16.050 Noise levels exceeding ambient base level. Any noise level exceeding the zone ambient base level at the property plane of any property, or exceeding the zone ambient base level on any adjacent residential area zone line or at any place of other property (or, if a condominium or apartment house, within any adjoining apartment) by more than ten decibels shall be deemed to be prima facie evidence of a violation of the provisions of this chapter. However, during the period of seven a.m. to ten p.m. the ambient base level may be exceeded by twenty decibels for a period not to exceed thirty minutes during any twenty-four-hour period.
>
> 6.16.060 Machinery noise levels. No person shall operate any machinery, equipment, pump, fan, air conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property plane of any property to exceed the ambient base noise level by more than ten decibels. However, during the period of seven a.m. to ten p.m. the ambient noise level may be exceeded by twenty decibels for a period not to exceed thirty minutes during any twenty-four-hour period.
>
> 6.16.070 Construction of buildings and projects. No person shall, within any residential zone, or within a radius of five hundred feet therefrom, operate equipment or perform any outside construction or repair work on any building, structure, or other project, or operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction-type device which shall exceed, between the hours of seven a.m. and ten p.m., a noise level of eighty-five decibels as measured at one hundred feet, or exceed between

the hours of ten p.m. and seven a.m. a noise level of sixty decibels as measured at one hundred feet, unless such person shall have first obtained a permit therefor from the director of public works. No permit shall be required to perform emergency work.

Regulatory Background – Vibration

California Department of Transportation. Caltrans identifies a vibration threshold of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.25 in/sec PPV for historic and some old buildings (see Table 3).

Existing Noise Environment

The project site is located at the southeast corner of El Camino Real and San Luis Avenue in San Bruno, California. Residential land uses bound the project site to the northeast and mixed-use land uses bound the project site to the southeast. Additional commercial and residential land uses are located across San Luis Avenue to the north and El Camino Real to the southwest.

The existing noise environment at the project site results primarily from vehicular traffic noise along El Camino Real. Additional noise sources would include distant Caltrain and BART operations, aircraft associated with San Francisco International Airport, and distant vehicle traffic along U.S 101.

Due to regional shelter-in-place restrictions implemented by the State of California at the time of this study, traffic volumes along the surrounding roadways were substantially reduced and not representative of typical conditions. A noise monitoring survey was not completed to document ambient noise levels during this study because resultant noise levels would not be representative of typical existing conditions.

Instead, a previous study by Bollard Acoustical Consultants, Inc. quantified the existing noise environment in 2018. In that study, the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (TNM) was used to predict traffic noise levels at the project site and a short-term noise measurement at the corner of El Camino Real and San Luis Avenue validated the results. At a distance of 50 feet from the centerline of El Camino Real, noise levels would be up to 72 dBA L_{dn}.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

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

- A significant noise impact would be identified if the project would generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site.
    - A significant noise impact would be identified if construction-related noise would exceed 85 dBA at a distance of 100 feet between the hours of 7 a.m. and 10 p.m. or would exceed 60 dBA at a distance of 100 feet between the hours of 10 p.m. and 7 a.m.
    - A significant permanent noise level increase would occur if project-generated traffic would result in: a) a noise level increase of 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) a noise level increase of 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.
    - A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan.
- A significant impact would be identified if the construction of the project would generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings and groundborne vibration levels exceeding 0.25 in/sec PPV would have the potential to result in cosmetic damage to historic buildings.
- A significant noise impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

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

Based on General Plan Policy HS-38, developers are required to mitigate noise exposure to sensitive receptors resulting from construction activities. Mitigation may include reducing construction noise at the source, as the sound is being transmitted through the air, and at the receptor. Municipal Code Section 6.16.070 prohibits noise from non-emergency operation of construction equipment from exceeding 85 dBA at a distance of 100 feet between the hours of 7

a.m. and 10 p.m., and from exceeding 60 dBA at a distance of 100 feet from 10 p.m. until 7 a.m. unless a permit is obtained from the director of public works.

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

Construction of the entire project is expected to take approximately 11 to 12 months. The proposed project would be built in several phases including site preparation, grading and excavation, trenching, exterior building, interior building and architectural coating, and paving. The typical range of maximum instantaneous noise levels for the proposed project would be 78 to 85 dBA L_{max} at a distance of 50 feet (see Table 4). Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

FHWA's Roadway Construction Noise Model (RCNM) was used to calculate the hourly average noise levels for each phase of construction, assuming every piece of equipment would operate simultaneously, which would represent the worst-case scenario. This construction noise model includes representative sound levels for the most common types of construction equipment and the approximate usage factors of such equipment that were developed based on an extensive database of information gathered during the construction of the Central Artery/Tunnel Project in Boston, Massachusetts (CA/T Project or "Big Dig").

For each phase, the worst-case hourly average noise level, as estimated at the property line of each surrounding land use, is shown in Table 5. The maximum noise level at a distance of 100 feet was also calculated for each construction phase for comparison with San Bruno Municipal Code 6.16.070. Construction would occur throughout the site, and therefore, hourly average noise levels at each of the receiving land uses would vary depending on the location of the active construction site. For the purposes of estimating the worst-case scenario, noise levels in Table 5 were calculated assuming the majority of construction would take place near the center of the proposed project site.

The nearest residences are located approximately 35 feet northeast of the center of the project site. Additional residences are located as close as 70 feet to the southeast as part of a mixed-use development, 145 feet to the north, across San Luis Avenue, and 210 feet to the southwest, across El Camino Real. Commercial buildings are located as close as 70 feet to the south as part of a mixed-use development and 120 feet to the northwest, across San Luis Avenue. A hotel is located approximately 150 feet to the southwest, across El Camino Real.

TABLE 4 Construction Equipment 50-Foot Noise Emission Limits

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

Notes:

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

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

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

TABLE 5 Estimated Construction Noise Levels at Nearby Land Uses

Phase of Construction	Time Duration (no. of days)	Construction Equipment (Quantity)	Calculated L_{max} (dBA) at 100 feet	Calculated Hourly Average Noise Levels, L_{eq} (dBA)				
				Residential Northeast (35 ft)	Mixed-Use Southeast (70 ft)	Commercial Northwest (120 ft)	Residential North (145 ft)	Residential Southwest (210 feet)
Site Preparation	2	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	79	86	80	76	74	71
Grading & Excavation	4	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	79	86	80	76	74	71
Trenching & Foundation	4	Tractor/Loader/Backhoe (1) Excavator (1)	75	81	75	71	69	66
Building Exterior	200	Crane (1) Forklift (1) Generator Set (1) Tractor/Loader/Backhoe (1) Welder (3)	75	84	78	74	72	69
Building Interior & Architectural Coating	10	Air Compressor (1)	72	77	71	66	64	61
Paving	10	Cement and Mortar Mixers (1) Paver (1) Paving Equipment (1) Roller (1) Tractor/Loader/Backhoe (1)	74	84	78	73	72	69

Construction noise levels are anticipated to comply with the City of San Bruno's Municipal Code and would occur over a temporary period. Implementation of the following construction best management practices would further reduce the impact of construction noise on sensitive receptors in the site vicinity resulting in compliance with General Plan Policy HS-38.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following available controls:

- Limit construction hours to between 7:00 a.m. and 7:00 p.m., Monday through Friday

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

- 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 as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

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

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

- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any 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 best management practices would reduce construction noise levels emanating from the site 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 impact would be less-than-significant.

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

Peak hour turning movements were provided for the intersections at El Camino Real and Crystal Springs Avenue and El Camino Real and San Felipe Avenue. Existing traffic conditions were compared to existing plus project traffic conditions. Upon comparison of these traffic conditions, a traffic noise increase of 0 dBA DNL was estimated for each roadway segment. Considering the size of the project in comparison to the traffic volumes of local roadways, this is a less-than-significant impact.

Mitigation Measure 1b: **None required.**

Impact 1c: **Noise Levels in Excess of Standards.** The proposed project could generate noise in excess of standards established in the City's Municipal Code at the nearest sensitive receptors. The incorporation of a mitigation measure to limit the duration of monthly generator testing activities would result in **a less-than-significant** noise impact**.**

Mechanical Equipment

The proposed hotel would include mechanical equipment, such as heating, ventilation, and air conditioning (HVAC) systems and an emergency generator. The site plans indicate an enclosed mechanical room in the underground parking structure. Additional mechanical equipment and exhaust air shafts are shown on the roof. Fiber cement wood panels with a height of approximately 7 feet would surround the rooftop mechanical equipment to the north, south, and west. A 3-foot parapet would also surround the rooftop and shield exhaust air shafts. The generator is proposed outside the building on the north corner of the property. Specific information regarding the number, type, size, and noise level data of the proposed mechanical equipment was not available at the time of this study.

Section 6.16.050 of the City's Municipal Code prohibits the generation of noise which would exceed ambient zone base levels by 10 dBA at the property plane of any property. The ambient zone base level of 60 dBA is used for residential zones such as those surrounding the site. This regulation allows for the ambient zone base level to be exceeded by 20 dBA for a period not to exceed 30 minutes during any 24-hour period. These noise limits do not normally apply to emergency operations.

Typical commercial HVAC units are anticipated to generate noise levels of 50 to 60 dBA at a distance of 30 feet. The property line of the nearest residence would be approximately 50 feet northeast of the rooftop mechanical equipment. At this distance, and considering the fiber cement

wood panels and rooftop parapet, mechanical equipment would be below 50 dBA DNL at the property line of the nearest residence. All other residences would be further away from the mechanical equipment and would be exposed to lower noise levels.

The emergency generator would be located near the northern corner of the building at ground level, approximately 5 feet from the nearest residential property line. This analysis assumes that the proposed generator would be rated at approximately 150 Kilowatts (kW), would be powered by a 200 horsepower (hp) diesel engine, and would be fitted with a manufacturer's acoustical enclosure. Based on file data, sound pressure levels from the generator would be approximately 76 to 78 dBA at 5 feet assuming a Level I or Level II acoustical enclosure.

The generator would be tested periodically and would provide emergency power to the building in the event of a power failure. The testing schedule is not known at this time, but testing typically takes place monthly for less than one hour. Based on the above testing assumptions, the generator would produce a noise level of 76 to 78 dBA at the residential property line to the north, which would exceed the ambient base noise level of 60 dBA by 16 to 18 decibels. However, if testing were to be limited to the daytime period only (seven a.m. to ten p.m.), and would not exceed thirty minutes during any twenty-four-hour period, the infrequent testing noise would comply with the requirement of the San Bruno General Plan.

Truck Deliveries

A yellow-curb commercial loading and unloading space is proposed on El Camino Real in order to accommodate truck deliveries. Deliveries would consist of linen drop-off and pick-up, with limited food, office, and sanitary product deliveries. The hotel will coordinate efforts to have deliveries occur within a set time during the middle of the day. Delivery times will be posted at the yellow-curb loading space. Based on the size of the hotel, it is anticipated that one to two deliveries may be required per day. In comparison to the existing traffic noise levels produced along El Camino Real, truck deliveries would not be anticipated to increase traffic noise levels near the project site.

Mitigation Measure 1c:

It is expected that mechanical equipment noise for the proposed project would meet the City's applicable noise limits. However, testing of the proposed generator could exceed the ambient noise environment at the nearest sensitive receptors by more than 10 dBA. In order to comply with Section 6.16.050 of the City's Municipal Code, testing of the generator should be limited to 30 minutes or less during any 24-hour period. The inclusion of this time restriction on generator testing would result in a less-than-significant impact.

Impact 2: **Generation of Excessive Groundborne Vibration due to Construction.** Construction-related vibration levels at buildings to the east and southeast of the project site may exceed values recommended by the California Department of Transportation. This is a **potentially significant impact**.

The City of San Bruno does not specify a construction vibration limit. For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for new

residential and modern commercial/industrial structures, 0.3 in/sec PPV for older residential structures, and a limit of 0.25 in/sec PPV for historic and some old buildings (see Table 3). The 0.3 in/sec PPV vibration limit would be applicable to properties in the vicinity of the project site.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include preparation work, foundation work, and new building framing and finishing. Pile driving is not anticipated as a method of construction. The nearest buildings are located as close as 5 feet from the shared property line to the southeast and 10 feet from the shared property line to the northeast. A commercial building to the northwest is approximately 60 feet from the project site, and a historic structure at 125 San Luis Avenue is approximately 105 feet from the project site. Table 6 presents typical vibration levels that could be expected from construction equipment at a reference distance of 25 feet and calculated levels at other distances representative of buildings in the vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

As indicated in Table 6, vibration levels would have the potential to exceed the California Department of Transportation's recommended limit of 0.3 in/sec PPV at the nearest buildings to the southeast and northeast when construction activities are occurring along shared property lines. Construction vibration levels would decrease as construction activities move towards the interior of the site. This is a potentially significant impact.

TABLE 6 Vibration Source Levels for Construction Equipment

Equipment		PPV (in/sec)				
		Reference at 25 ft.	**Mixed Use Southeast 5 ft.**	**Residential Northeast 10 ft.**	**Commercial Northwest 60 ft.**	**Historic Structure North 105 ft.**
Clam shovel drop		0.202	**1.186**	**0.553**	0.077	0.042
Hydromill (slurry wall)	in soil	0.008	0.047	0.022	0.003	0.002
	in rock	0.017	0.100	0.047	0.006	0.004
Vibratory Roller		0.210	**1.233**	**0.575**	0.080	0.043
Hoe Ram		0.089	**0.523**	0.244	0.034	0.018
Large bulldozer		0.089	**0.523**	0.244	0.034	0.018
Caisson drilling		0.089	**0.523**	0.244	0.034	0.018
Loaded trucks		0.076	**0.446**	0.208	0.029	0.016
Jackhammer		0.035	0.206	0.096	0.013	0.007
Small bulldozer		0.003	0.018	0.008	0.001	0.001

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, FTA Report No. 0123, September 2018, as modified by Illingworth & Rodkin, Inc., January 2021.

Mitigation Measure 2:

The following measures shall be implemented where vibration levels due to construction activities would exceed 0.30 in/sec PPV at nearby buildings:

- Construction Vibration Monitoring, Treatment, and Reporting Plan: The project proponent shall implement a construction vibration monitoring plan to document conditions prior to, during, and after vibration generating construction activities. All plan tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry-accepted standard methods. The construction vibration monitoring plan shall include, but not be limited to, the following measures:

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

    - A list of all heavy construction equipment to be used for this project and the anticipated time duration of using the equipment that is known to produce high vibration levels shall be submitted 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.

    - Document conditions at all structures located within 25 feet of construction prior to, during, and after vibration generating construction activities. Perform a photo survey, elevation survey, and crack monitoring survey prior to any construction

activity, in regular intervals during construction, and after project completion, and shall include internal and external crack monitoring in structures, settlement, and distress, and shall document the condition of foundations, walls and other structural elements in the interior and exterior of said structures.

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

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

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

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

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

- Use a smaller vibratory roller, such as the Caterpillar model CP433E vibratory compactor, when compacting materials within 30 feet of adjacent commercial buildings. Only use the static compaction mode when within 10 feet of the adjacent mixed-use and residential buildings.

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

- 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 mitigation measures would reduce a potential impact to a less-than-significant level.

Impact 3: **Excessive Aircraft Noise Levels.** The proposed project would not be located within any aircraft noise contours identified by the San Francisco International Airport Comprehensive Airport Land Use Plan (SFO CLUP). This is a **less-than-significant impact.**

San Francisco International Airport is located approximately 2,500 feet east of the project site. Based on the SFO CLUP, the project site would be located outside of all indicated 2020 noise contours of the airport (see Figure 1).

Mitigation Measure 3: **None required.**

FIGURE 1 San Francisco International Airport 2020 Noise Contours Relative to Project Site