4.F NOISE

This section describes the existing noise environment in the project area and identifies the potential for noise and vibration associated with implementation of the proposed project to adversely affect established sensitive land uses or land use activities. The impact analysis evaluates the potential noise and vibration impacts of the proposed project and identifies mitigation measures to avoid or reduce adverse impacts.

No comments pertaining to noise were received in response to the notice of preparation (NOP).

ENVIRONMENTAL SETTING

The following section includes an introduction to the key concepts and terms that are used in the evaluation of noise. The environmental setting of the project area and a description of the existing noise environment are also included below.

FUNDAMENTALS OF ENVIRONMENTAL NOISE AND VIBRATION

TERMINOLOGY

A brief description of the noise and vibration concepts and terminology used in this assessment is provided below.

- **Sound**. A vibratory disturbance transmitted by pressure waves through a medium such as air or water that is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale that indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion; rather, they combine logarithmically. For instance, if two identical noise sources each produce noise levels of 50 dBA (see definition immediately following), the combined sound level would be 53 dBA, not 100 dBA.
- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear. The dBA scale is the most widely used for environmental noise assessments.
- **C-Weighted Decibel (dBC).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear at very high noise levels. The C-weighting scale is flat and therefore includes more of the low-frequency sound energy than the A scale.

- **Maximum Sound Levels (L_{max}).** The maximum sound level measured during a given measurement period.
- **Equivalent Sound Level (L_{eq})**. The equivalent steady-state sound level that, in a stated period of time, would contain the same acoustical energy. The 1-hour A-weighted equivalent sound level (L_{eq} 1h) is the energy average of A-weighted sound levels occurring during a 1-hour period.
- **Day-Night Level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with a 10 dB penalty added to sound levels between 10:00 p.m. and 7:00 a.m.
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the sound levels occurring during the period from 10:00 p.m. to 7:00 a.m. L_{dn} and CNEL are typically within 1 dBA of each other and, for all intents and purposes, interchangeable.
- **Vibration Velocity Level (or Vibration Decibel Level, VdB).** The root-mean-square velocity amplitude for measured ground motion expressed in dB.
- **Peak Particle Velocity (PPV).** A measurement of ground vibration, defined as the maximum speed at which a particle in the ground is moving, expressed in inches per second (in/sec).

OVERVIEW OF NOISE AND SOUND

Noise is commonly defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Because noise is an environmental pollutant that can interfere with human activities, an evaluation of noise is necessary when considering the environmental impacts of a proposed project.

Sound is characterized by various parameters, including the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient (existing) sound level. Although the decibel scale, a logarithmic scale, is used to quantify sound intensity, it does not accurately describe how sound intensity is perceived by human hearing. The human ear is not equally sensitive to all frequencies in the entire spectrum; therefore, noise measurements are weighted more heavily toward frequencies to which humans are sensitive through a process referred to as A-weighting. Table 4.F-1 on the following page summarizes typical A-weighted sound levels for different noise sources.

TABLE 4.F-1. TYPICAL A-WEIGHTED SOUND LEVELS

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

Source: California Department of Transportation. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol.* September. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed: October 6, 2015.

Human sound perception, in general, is such that a change in sound level of 1 dB cannot typically be perceived by the human ear, a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level. A doubling of actual sound energy is required to result in a 3 dB (i.e., barely noticeable) increase in noise; in practice, for example, this means that the volume of traffic on a roadway would typically need to double to result in a noticeable increase in noise.[1]

[1] California Department of Transportation. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed: October 6, 2015.

The decibel level of a sound decreases (or attenuates) exponentially as the distance from the source of that sound increases. For a point source, such as a stationary compressor or construction equipment, sound attenuates at a rate of 6 dB per doubling of distance. For a line source, such as free-flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance. Atmospheric conditions, including wind, temperature gradients, and humidity, can change how sound propagates over distance and affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface, such as grass, attenuates at a greater rate than sound that travels over a hard surface, such as pavement. The increased attenuation is typically in the range of 1 to 2 dB per doubling of distance. Barriers, such as buildings and topography, which block the line of sight between a source and receiver also increase the attenuation of sound over distance.

In urban environments, simultaneous noise from multiple sources may occur. Because sound pressure levels in decibels are based on a logarithmic scale, they cannot be added or subtracted in the usual arithmetical way. Adding a new noise source to an existing noise source, with both producing noise at the same level, will not double the noise level. If the difference between two noise sources is 10 dBA or more, the higher noise source will dominate, and the resultant noise level will be equal to the noise level of the higher noise source. In general, if the difference between two noise sources is 0 to 1 dBA, the resultant noise level will be 3 dBA higher than the higher noise source, or both sources if the sources are equal. If the difference between two noise sources is 2 to 3 dBA, the resultant noise level will be 2 dBA above the higher noise source. If the difference between two noise sources is 4 to 10 dBA, the resultant noise level will be 1 dBA higher than the higher noise source.

Community noise environments are generally perceived as quiet when the 24-hour average noise level is below 45 dBA, moderate in the 45 to 60 dBA range, and loud above 60 dBA. Very noisy urban residential areas are usually around 70 dBA CNEL. Along major thoroughfares, roadside noise levels are typically between 65 and 75 dBA CNEL. Incremental increases of 3 to 5 dB to the existing 1-hour L_{eq}, or to the CNEL, are common standards for an adverse community reaction to a noise increase. However, there is evidence that incremental noise increase in this range may not be sufficiently protective in areas where noise-sensitive uses are located and CNEL is already high (i.e., above 60 dBA). In these areas, limiting noise increases to 3 dB or less is recommended.[2] Noise intrusions that cause short-term interior levels to rise above 45 dBA at night can disrupt sleep. According to the World Health Organization (WHO), sleep disturbance can occur when continuous indoor noise levels exceed 30 dBA (Leq) or when intermittent interior noise levels reach or exceed 45 dBA (Lmax), particularly if background

[2] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015.

noise is low. With a bedroom window slightly open (a reduction from outside to inside of 15 dB), the WHO criteria would suggest exterior continuous (ambient) nighttime noise levels should be 45 dBA (Leq) or below, and short-term events should not generate noise in excess of 60 dBA (Lmax). WHO also notes that maintaining noise levels within the recommended levels during the first part of the night is believed to be effective for the ability to fall asleep.[3] Exposure to noise levels greater than 85 dBA of 8 hours or longer can cause permanent hearing damage.

OVERVIEW OF GROUND-BORNE VIBRATION

The operation of heavy construction equipment, particularly pile-driving equipment and other impact devices (e.g., pavement breakers), creates seismic waves that radiate along the surface of the ground and downward. These surface waves can be felt as ground vibration. Vibration from the operation of this type of equipment can result in effects that range from annoyance for people to damage for structures.

Perceptible ground-borne vibration is generally limited to areas within a few hundred feet of construction activities. As seismic waves travel outward from a vibration source, they cause rock and soil particles to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is referred to as peak particle velocity (PPV), the commonly accepted descriptor of vibration amplitude.

Vibration amplitude attenuates (or decreases) over distance. This attenuation is a complex function of how energy is imparted into the ground as well as the soil or rock conditions through which the vibration is traveling (variations in geology can result in different vibration levels).

The following equation is used to estimate the vibration level at a given distance for typical soil conditions.[4] PPV_{ref} is the reference PPV at 25 feet (Table 4.F-2, on the following page).

$$PPV = PPV_{ref} \times (25/Distance)^{1.5}$$

Table 4.F-2, on the following page, summarizes typical vibration levels generated by construction equipment at a reference distance of 25 feet and other distances, as determined with use of the attenuation equation above.

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[3] World Health Organization, Guidelines for Community Noise, Chapter 3, p. 46, April 1999. Available online at http://www.who.int/docstore/peh/noise/guidelines2.html. Accessed April 4, 2017.

[4] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015.

TABLE 4.F-2. VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	PPV at 25 Feet	PPV at 50 Feet	PPV at 75 Feet	PPV at 100 Feet	PPV at 175 Feet
Pile driver (impact)	1.518	0.5367	0.2921	0.1898	0.0820
Pile driver (sonic)	0.734	0.2595	0.1413	0.0918	0.0396
Hoe ram	0.089	0.0315	0.0171	0.0111	0.0048
Large bulldozer	0.089	0.0315	0.0171	0.0111	0.0048
Loaded trucks	0.076	0.0269	0.0146	0.0095	0.0041
Jackhammer	0.035	0.0124	0.0067	0.0044	0.0019
Small bulldozer	0.003	0.0011	0.0006	0.0004	0.0002

Source: Source: Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06.* Office of Planning and Environment. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015. Accessed: October 6, 2015.

Tables 4.F-3 and 4.F-4, on the following page, summarize the guidelines developed by the California Department of Transportation (Caltrans) for damage and annoyance from the transient and continuous vibration that is usually associated with construction activity. Impact pile drivers, "pogo stick" compactors (small hand-held soil compactors), crack-and-seat equipment (equipment that breaks and re-seats pavement), excavation equipment, static compaction equipment, tracked vehicles, vehicles on highways, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment are typically associated with continuous vibration. The activities that are typically associated with single-impact (transient) or low-rate, repeated impact vibration include blasting and the use of drop balls or dropped metal plates.[5]

Ground-borne vibration can also be quantified by the root-mean-square (RMS) velocity amplitude, which is useful for assessing human annoyance. The RMS amplitude is expressed in terms of the velocity level in decibel units (VdB). The background vibration velocity level in residential areas is usually around 50 VdB or lower. The vibration velocity level threshold of perception for humans is approximately 65 VdB. Most perceptible indoor vibration is caused by sources within buildings, such as the operation of mechanical equipment, the movement of people, or the slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are heavy construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration from traffic is rarely perceptible.

[5] California Department of Transportation. 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013A.pdf. Accessed: October 6, 2015.

TABLE 4.F-3. GUIDELINES FOR VIBRATION DAMAGE POTENTIAL

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous/ Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Note: Transient sources create a single, isolated vibration event (e.g., blasting or drop balls). Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: California Department of Transportation. 2013. *Transportation and Construction Vibration Guidance Manual, Table 19*. September. Available: http://www.dot.ca.gov/hq/env/noise/pub/TCVGM_Sep13_FINAL.pdf. Accessed: October 6, 2015.

TABLE 4.F-4. GUIDELINES FOR VIBRATION ANNOYANCE POTENTIAL

	Maximum PPV (in/sec)	
Human Response	**Transient Sources**	**Continuous/ Frequent Intermittent Sources**
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Note: Transient sources create a single, isolated vibration event (e.g., blasting or drop balls). Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: California Department of Transportation. 2013. *Transportation and Construction Vibration Guidance Manual, Table 19*. September. Table 20. Available: http://www.dot.ca.gov/hq/env/noise/pub/TCVGM_Sep13_FINAL.pdf. Accessed: October 6, 2015

Table 4.F-5, on the following page, summarizes the typical ground-borne vibration velocity levels and the average human response to vibration that may be anticipated when a person is at rest in quiet surroundings. If the person is engaged in any type of physical activity, vibration tolerance increases considerably. The duration of the event has an effect on human response, as does its daily frequency of occurrence. Generally, as the duration and frequency of occurrence increase, the potential for adverse human response increases.

TABLE 4.F-5. TYPICAL LEVELS OF GROUND-BORNE VIBRATION

Human or Structural Response	Vibration Velocity Level (VdB)	Typical Sources (50 feet from source)
Standard for minor cosmetic damage to fragile buildings	100	Blasting from construction project
	95	Bulldozer or heavy-tracked construction equipment
Difficulty in reading computer screen	90	
	85	Upper range of commuter rail
Standard for residential annoyance for occasional events (e.g., commuter rail)	80	Upper range of rapid transit
Standard for residential annoyance for frequent events (e.g., rapid transit)	75	Typical commuter rail Bus or truck over bump
	70	Typical rapid transit
Approximate standard for human perception of vibration; limit for vibration-sensitive equipment	65	Typical bus or truck on public road
	60	
	55	Typical background vibration
	50	

Source: Federal Transit Administration. 2006. Transit Noise and Vibration Impact Assessment. FTA-VA-90-1003-06. Office of Planning and Environment. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015.

Ground-borne noise is a secondary component of ground-borne vibration. When a building structure vibrates, noise is radiated into the interior of the building. Typically, this is a low-frequency sound that can be perceived as a low rumble. The magnitude of the sound depends on the frequency characteristic of the vibration and the manner in which the room surfaces in the building radiate sound. Ground-borne noise is quantified by the A-weighted sound level inside the building. The sound level accompanying vibration is generally 25 to 40 dBA lower than the vibration velocity level in VdB. Ground-borne vibration levels of 65 VdB can result in ground-borne noise levels of up to 40 dBA, which can disturb sleep. Ground-borne vibration levels of 85 VdB can result in ground-borne noise levels of up to 60 dBA, which can be annoying to daytime noise-sensitive land uses, such as schools.[6]

[6] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment.

EXISTING NOISE LEVELS

Ambient noise in urban areas is typically dominated by vehicle traffic on local roadways. The existing ambient noise environment in the project vicinity is characterized by vehicular traffic on Third Street but also Muni buses and light-rail trains, construction activities on adjacent parcels, and events at AT&T Park. Muni vehicles on the KT: K-Ingleside/T-Third Street line pass by the project site on Third Street approximately 266 times per weekday,[7] which results in friction noise (i.e., noise from wheels on rails) and noise from warning horns.

At the project site, construction noise from the heavy-duty vehicles that are currently operating on surrounding parcels is present. Such noise is ongoing because of development in Mission Bay; however, it is assumed that much of the current construction activity that contributes to the existing ambient noise levels will end before future residents of the proposed project begin occupying project residences. For example, construction activities currently occurring at Mission Bay Block 1, adjacent to the project site, are expected to be completed in 2017. Note that construction activities at Mission Bay Blocks 4E, 9, and 9A, however, may occur concurrently with project construction (because construction of Mission Bay Block 4E is expected to be go through 2020, and construction of Mission Bay Blocks 9 and 9A is expected to go through 2022). Construction of these projects would contribute to ambient noise levels in the area for the duration of construction activities.

Noise at AT&T Park is generated by large cheering crowds and loudspeaker usage when baseball games or other large events are occurring (approximately 112–127 times per year, as discussed below). Noise levels from all of these sources were captured in the 24-hour measurements conducted for the project, the results of which are presented below under *Noise Measurement Survey*.

The San Francisco Department of Public Health (DPH) has developed a transportation noise map of the city, based on modeled baseline traffic volumes derived from the San Francisco County Transportation Authority Travel Demand Model and the Federal Highway Administration (FHWA) Traffic Noise Model.[8] The DPH map indicates the modeled L_{dn} noise on each street in the city. As shown on the map, the project site experiences L_{dn} noise from transportation sources in the 55 to 59 range in areas that are farthest from Third Street; L_{dn} noise is in the 70 to 74 range near Third Street.[9]

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[7] Transit511.org. 2015. Schedules and *Route Maps – KT Line*. Available: http://transit.511.org/schedules/index.aspx#m1=S&m2=rail&cid=SF. Accessed: November 6, 2015.

[8] San Francisco Department of Public Health. No date. *San Francisco Response to Noise Problems*. Available: https://www.sfdph.org/dph/EH/Noise/noiseresponse.asp. Accessed: March 9, 2016.

[9] San Francisco Department of Public Health. 2008. *Transportation Noise Map 2008*. Available: https://www.sfdph.org/dph/files/EHSdocs/ehsNoise/TransitNoiseMap.pdf. Accessed: March 9, 2016.

NOISE SENSITIVE LAND USES

Noise-sensitive land uses are generally defined as locations where people reside or areas where unwanted sound could adversely affect the use of the land. Noise-sensitive land uses typically include single- and multi-family residential areas, health care facilities, lodging facilities, and schools. Existing noise-sensitive land uses located within approximately 900 feet of the project site are shown in Table 4.F-6, below. Note that other receptors, such as University of California, San Francisco (UCSF) Medical Center and various schools and day-care facilities, are located in the general vicinity of the project (within approximately 900 to 5,000 feet of the project site) but are not included in this table because they would not be expected to experience negative effects from project-related noise at their locations due to the receptor's distance from project generated noise.

TABLE 4.F-6. NOISE-SENSITIVE LAND USES IN THE PROJECT VICINITY

Land Use	Distance from Project Site	Location
Existing Sensitive Receptors		
1. Residential uses	100 to 250 feet to the west	Mission Bay Block Nos. 1, 2, 3W, 4W, 5, 11, 12E/W
2. Residential uses	650 feet to the west	Mission Bay Block Nos. N3A-1, N3A-2, N3A-3, N4A-1, N4A-2, N4A-3
3. Residential uses	400 feet to the south	Mission Bay Block Nos. 10, 10A.
4. Residential uses	500 feet to the southwest	Mission Bay Block No. 7W
5. Modern Family Education Childcare	600 feet to the west	Mission Bay Block No. 13E
6. University of California, San Francisco (UCSF) Cardiovascular Research Institute	900 feet to the south	Mission Bay Block Nos. 17AB, 17C
7. Residences and onsite day care	400 feet to the northwest	Mission Bay Block No. N2-2
8. Family house	450 feet to the southwest	Mission Bay Block No. 7E
9. Mercy housing/residential condos	600 feet and 880 feet west	Mission Bay Block Nos. 13E/W
Future Sensitive Receptors		
10. Residences and day care facilities associated with the proposed project	onsite	
11. Residences not associated with the proposed project	100 feet to the south and 100 feet to the west	Mission Bay Block Nos. 8, 9, 9A, 3E, 4E, 6E/W, 12W

In addition to the existing noise-sensitive land uses listed in Table 4.F-6, on the previous page, future development in the project area in both the near and long term will result in new noise-sensitive land uses in the project vicinity. Residential development on lots west and southwest of the project site (Mission Bay Block Nos. 8, 9, 9A, 3E, 4E, 6E/W, 12W) could result in residences being located adjacent to the site, at a closest distance of approximately 400 feet from the project site.

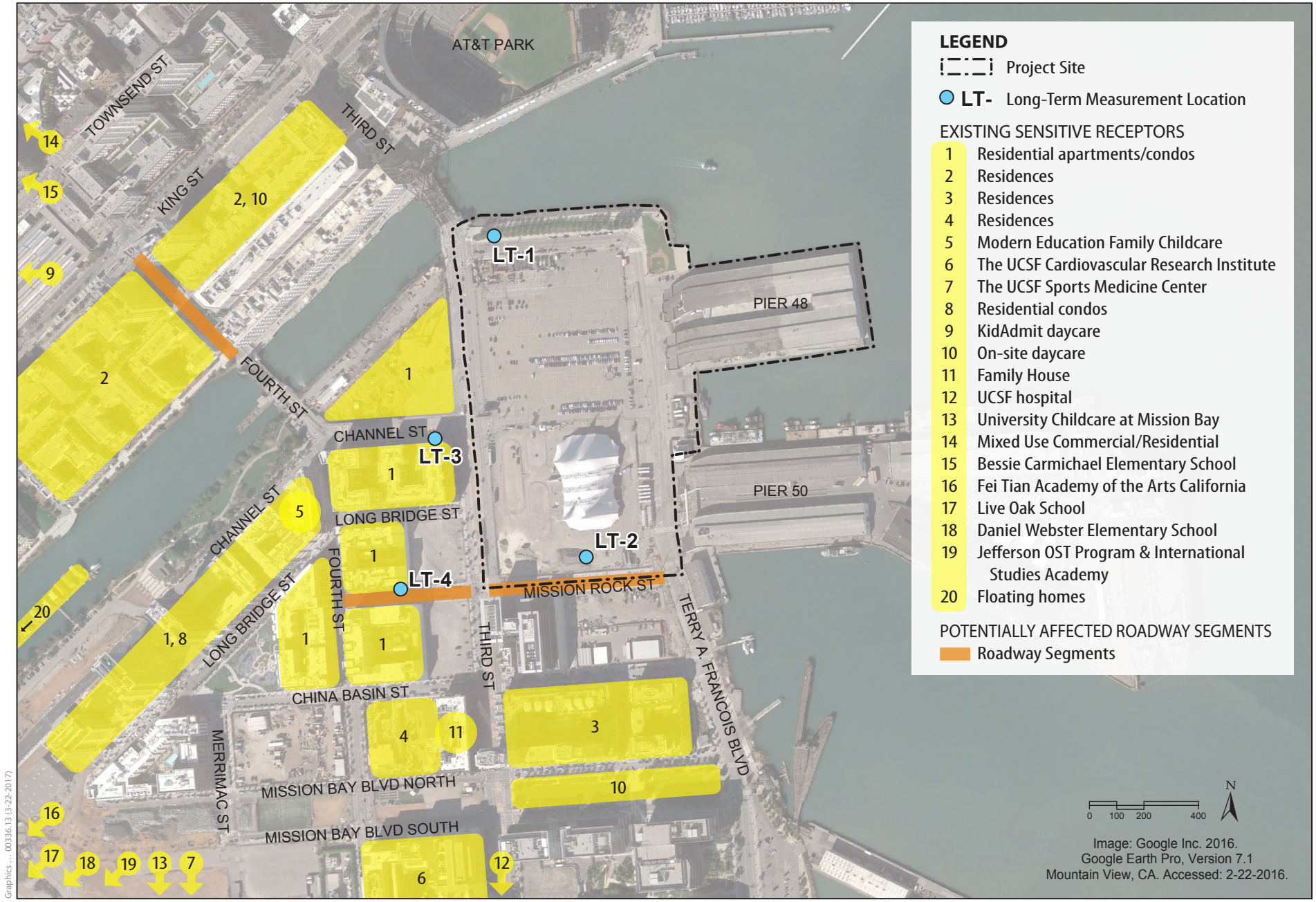
NOISE MEASUREMENT SURVEY

To quantify existing ambient noise levels in the project area, long-term, multi-day ambient noise measurements were conducted between August 27 and September 1, 2015, at locations on and around the project site. Measurement locations were selected to capture 24-hour noise levels in areas that are sensitive to noise throughout the day, such as residences.

The noise measurement sites are shown in Figure 4.F-1 on the following page. Table 4.F-7 (page 4.F-13) summarizes the results of the noise measurement survey. For the complete dataset of measured noise levels, please refer to Appendix 5, Noise Technical Memorandum.

Because of ongoing construction in the immediate vicinity of the project site at the time the noise measurement survey was conducted, the noise levels shown in the table below are most likely elevated relative to normal ambient noise levels when construction is not occurring. Specifically, it should be noted that pile driving at Mission Bay Block 1 was occurring during the noise measurements, resulting in high levels of noise. Because pile driving at this location would be occurring for several months, it was not possible to conduct the noise survey during daytime hours without the inclusion of noise from pile driving. As a result, L_{dn} levels measured do not represent typical daily average noise levels (when pile driving is not occurring). In addition to pile driving on Mission Bay Block 1, traffic noise on roadways surrounding the project site, primarily Third Street, was the main contributor to the ambient noise environment. In addition, noise from the Muni KT line was present throughout the project site during the noise survey.

Because of the proximity of the project site to AT&T Park, and because game-related noise may be audible at future residential outdoor use areas associated with the proposed project, ambient noise levels in the area during baseball games (as opposed to when no games were occurring) were measured to help characterize the existing noise environment.



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Seawall Lot 337 and Pier 48 Mixed-Use Project EIR
Case No. 2013.0208E

Figure 4F-1
Noise Measurement Locations

TABLE 4.F-7. NOISE LEVEL MEASUREMENTS AT SELECTED LOCATIONS ON AND AROUND THE PROJECT SITE

			Measured Noise Levels by Date											
			Fri. 8/28[a]			Sat. 8/29[b]			Sun. 8/30[c]			Mon. 8/31[d]		
Site	Site Description	Primary Noise Sources	24-hour (dBA L_{dn}) Noise	L_{max} (dBA)	L_{min} (dBA)	24-hour (dBA L_{dn}) Noise	L_{max} (dBA)	L_{min} (dBA)	24-hour (dBA L_{dn}) Noise	L_{max} (dBA)	L_{min} (dBA)	24-hour (dBA L_{dn}) Noise	L_{max} (dBA)	L_{min} (dBA)
LT-1	China Basin Park	Pile driving and other construction noise Vehicle traffic on Third Street and Terry A. Francois Boulevard Noise during baseball games on Friday, Saturday, and Sunday	76.0	98.6	57.6	78.5	100.4	58.6	74.4	99.6	58.2	74.3	102.4	57.8
LT-2	South Side of Project Site	Pile driving and other construction noise Vehicle traffic on Third Street and Mission Rock Street Vehicles and crowd noise in Parking Lot A Fire engine noise from San Francisco Fire Station No. 4 Light rail noise	65.6	84.1	48.9	63.9	88.9	48.9	64.6	84.3	49.4	66.9	89.7	50.7
LT-3	In front of Mission Bay Block 1 on Channel Street	Pile driving and other construction noise Vehicle traffic on Third Street and Channel Street Light rail noise	79.3	105.8	57	74.2	103.6	56.7	73.0	99.9	57.4	83.4	105.4	55.9
LT-4	In front of the Strata Apartments on Mission Rock Street	Pile driving and other construction noise Vehicle traffic on Third Street and Mission Rock Street	68.6	97.2	47.1	65.7	88.9	46.3	64.0	97.0	46.3	66.9	91.8	47.1

Notes: Noise measurements collected by ICF International. For the complete dataset of measured noise levels, please refer to Appendix 5.

[a] A baseball game occurred on this day at 7:15 p.m., during the 24-hour measurement.

[b] A baseball game occurred on this day at 1:05 p.m., during the 24-hour measurement.

[c] A baseball game occurred on this day at 1:05 p.m., during the 24-hour measurement.

[d] No baseball game occurred during the measurement on this day.

There are 81 regular-season, two to five preseason, and up to 12 postseason baseball games per year at AT&T Park. AT&T Park hosts approximately 145 nonbaseball-related special events per year, including a limited number of concerts (which may generate noise levels similar to or possibly slightly greater than noise from a baseball game), charity and private events (which may generate less noise than a game or concert), and other sporting events. To assess average 24-hour noise levels with the inclusion of noise from baseball games (or other similarly loud events), long-term, multi-day measurements were conducted to be consistent with land use compatibility standards, which are specified in terms of L_{dn}. This approach is considered to be more useful in assessing the contribution of baseball game or event noise than short-term measurements that isolate the maximum, minimum, or average noise levels that occur during a game.

During the measurement period (i.e., August 27 to September 1, 2015), baseball games occurred on the following dates:

- Friday, August 28, 2015, at 7:15 p.m.
- Saturday, August 29, 2015, at 1:05 p.m.
- Sunday, August 30, 2015, at 1:05 p.m.

REGULATORY FRAMEWORK

FEDERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

The Federal Noise Control Act of 1972 addressed the issue of noise and its threat to human health and welfare, particularly in urban areas. In response to the act, the U.S. Environmental Protection Agency (USEPA) published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (USEPA Levels). Table 4.F-8, on the following page, summarizes USEPA recommendations for noise-sensitive areas. Ideally, the yearly average L_{eq} should not exceed 70 dBA to prevent measurable hearing loss over a lifetime, and the L_{dn} should not exceed 55 dBA outdoors and 45 dBA indoors to prevent substantial activity interference and annoyance in noise-sensitive areas. In addition to the identified noise levels to protect public health, the USEPA Levels identify an increase of 5 dBA as an adequate margin of safety relative to a baseline noise exposure level of 55 dBA L_{dn} before a noticeable adverse community reaction would be expected.

TABLE 4.F-8. SUMMARY OF NOISE LEVELS IDENTIFIED BY USEPA AS REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY

Effect	Level	Area
Hearing loss	L_{eq} (24 hr) < 70 dBA[a]	All areas.
Outdoor activity interference and annoyance	L_{dn} < 55 dBA	Outdoor residential areas and farms as well as other outdoor areas where people spend varying amounts of time and places where quiet is a basis for use.
Outdoor activity interference and annoyance	L_{eq} (24 hr) < 55 dBA	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	L_{dn} < 45 dBA	Indoor residential areas.
Indoor activity interference and annoyance	L_{eq} (24 hr) < 45 dBA	Other indoor areas with human activities, such as schools, etc.

Source: U.S. Environmental Protection Agency. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. Available: http://nepis.epa.gov/Exe/ZyPDF.cgi/2000L3LN.PDF?Dockey=2000L3LN.PDF. Accessed: December 3, 2015.

a. Yearly average equivalent sound levels in decibels; the exposure period that results in hearing loss at the identified level is 40 years.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

The U.S. Department of Housing and Urban Development (HUD) has set guidelines for acceptable noise levels in residential areas. These guidelines are specified in Code of Federal Regulations (CFR) Title 24, Part 51, and are included below.

- **Acceptable**—65 dBA L_{dn} or less
- **Normally unacceptable**—Exceeding 65 dBA L_{dn} but not exceeding 75 dBA L_{dn}
- **Unacceptable**—Exceeding 75 dBA L_{dn}

The HUD guidelines also include a goal (not a standard) for interior noise levels not to exceed 45 dBA L_{dn}.[10] Sound-attenuating features, such as barriers, or sound-attenuating building materials shall be used to achieve the interior noise goal where feasible. Standard building construction generally provides 20 dB of sound attenuation; therefore, if the exterior noise

[10] 24 CFR, Section 51.103(c).

environment is classified as "acceptable" (e.g., 65 dBA L_{dn} or less), according to HUD guidelines, the interior noise environment should not exceed 45 dBA L_{dn}. The HUD guidelines also encourage the use of quieter construction equipment and methods.[11]

FEDERAL TRANSIT ADMINISTRATION

The Federal Transit Administration (FTA) guidance document *Transit Noise and Vibration Impact Assessment* (FTA 2006) provides guidelines for analyzing construction noise impacts. Table 4.F-9, below, summarizes the general assessment criteria for construction noise recommended by FTA. The City and County of San Francisco (City) uses these criteria, in part, to assess the significance of construction noise from impact equipment (pile drivers) that is conditionally exempt from the San Francisco Noise Ordinance (Noise Ordinance) (see discussion below under *Local*).

FTA recommends the guidelines specified in Table 4.F-9, below, for the assessment of construction noise. Note that the FTA guidelines for construction noise were developed in the context of transportation projects. However, it is reasonable to use these guidelines for the proposed mixed-use project because the guidelines address noise resulting from construction equipment, regardless of the project context. If the combined noise level in one hour from the two noisiest pieces of equipment exceeds these criteria, there may be an adverse community reaction.

TABLE 4.F-9. FTA GENERAL ASSESSMENT CRITERIA FOR CONSTRUCTION NOISE

	One-hour L_{eq} (dBA)	
Land Use	**Day**	**Night**
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: FTA 2006.

FTA also developed a methodology and general assessment criteria for evaluating vibration impacts from construction activity in its *Transit Noise Impact and Vibration Assessment*.[12] The FTA-promulgated criteria for assessing vibration effects produced by construction activity are shown in Table 4.F-10 on the following page.

[11] 24 CFR, Section 51.101(7).

[12] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015.

TABLE 4.F-10. FTA GENERAL ASSESSMENT CRITERIA FOR GROUND-BORNE VIBRATION IMPACT CRITERIA

	Impact Levels (VdB; relative to 1 micro-inch/second)		
Land Use Category	**Frequent Events[a]**	**Occasional Events[b]**	**Infrequent Events[c]**
Category 1: Buildings where vibration would interfere with interior operations	65[d]	65[d]	65[d]
Category 2: Residences and buildings where people normally sleep	72	75	80
Category 3: Institutional land uses with primarily daytime uses	75	78	83

Source: Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015.

a. "Frequent events" is defined as more than 70 vibration events from the same source per day.

b. "Occasional events" is defined as 30 to 70 vibration events from the same source per day.

c. "Infrequent events" is defined as fewer than 30 vibration events from the same source per day.

d. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels.

STATE

TITLE 24 OF THE CALIFORNIA CODE OF REGULATIONS, NOISE INSULATION STANDARDS

California Code of Regulations (CCR) Title 24, Part 2, Sound Transmission, establishes minimum noise insulation standards to protect persons within new hotels, motels, dormitories, long-term care facilities, apartment houses, and dwellings other than single-family residences. Under this regulation, interior noise levels attributable to exterior noise sources cannot exceed 45 dB in any habitable room. The noise metric is either the L_{dn} or the CNEL, consistent with the noise element of the local general plan.

LOCAL

NOISE ORDINANCE

The Noise Ordinance (Article 29, San Francisco Police Code, Section 2900) specifically recognizes that adverse community effects, including physiological and psychological stress, sleep disturbance, and depression, can arise from persistent exposure to elevated levels of typical urban noise, including noise associated with transportation, construction activity, mechanical equipment, entertainment, and human and animal behavior. The Noise Ordinance regulates specific sources of noise and makes the following declaration:

> It shall be the policy of San Francisco to maintain noise levels in areas with existing healthful and acceptable levels of noise and to reduce noise levels, through all practicable means, in those areas of San Francisco where noise levels are above acceptable levels as defined by the World Health Organization's Guidelines on Community Noise.

The regulatory provisions below are included to address and limit disruptive noise intrusions.

Construction (Sections 2907 and 2908). The Noise Ordinance limits noise from powered construction equipment to a level of 80 dBA at a distance of 100 feet (or an equivalent level at some other distance). This limit does not apply to construction equipment used in connection with emergency work or impact tools and equipment (e.g., jackhammers, hoe rammers, impact wrenches), provided they have intake and exhaust mufflers, or pavement breakers or jackhammers that have been equipped with acoustically attenuating shields or shrouds. All such noise control features shall be recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection for attenuating noise. Also, construction activities are generally prohibited between the hours of 8:00 p.m. and 7:00 a.m. if the noise created would exceed the ambient noise level by 5 dBA at the nearest property line, unless a special permit is authorized by the Director of Public Works or the Director of Building Inspection.

Noise Limits (Section 2909). This section of the Noise Ordinance regulates noise from mechanical equipment and other similar sources. The Noise Ordinance (Section 2909(a) and (b)) limits noise from sources, which are defined as "any machine or device, music, or entertainment or any combination of same," located on residential or commercial/industrial property to 5 dBA or 8 dBA, respectively, above the local "ambient"[13] noise level at any point outside of the property line of a residential or commercial/industrial property. The Noise Ordinance also limits noise from sources located on public property[14] to 10 dBA above the local ambient noise level at a distance of 25 feet or more, unless the machine or device is being operated to serve or maintain the property. An additional low-frequency criterion applies to noise generated from a licensed "place of entertainment" (i.e., associated noise or music shall not exceed the low-frequency ambient noise level[15] by more than 8 C-weighted decibels [dBC]).[16]

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[13] Noise Ordinance Section 2901(a) states that "ambient" is the lowest sound level repeating itself during a minimum 10-minute period, as measured with a Type 1 precision sound-level meter, set on "slow" response and A-weighting. In no case shall ambient be considered or determined to be (1) less than 35 dBA for interior residential noise and (2) 45 dBA in all other locations.

[14] Noise Ordinance Section 2901(l) defines "public property" as property leased or owned by a government entity to which the public or a substantial group of persons has access, including, but not limited to, any street, highway, parking lot, plaza, transportation facility, school, place of amusement, park, or playground.

[15] Noise Ordinance Section 2901(f) defines "low-frequency ambient" as the lowest sound level repeating itself during a 10-minute period, as measured with a sound level meter using slow response and C-weighting. The minimum sound level shall be determined with the music or entertainment noise source at issue silent. However, in no case shall the local ambient be considered or determined to be less than (1) 45 dBC for interior residential noise or (2) 55 dBC in all other locations.

[16] C-weighted decibel (dBC) refers to an overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear at very high noise levels. The C-weighting scale is flat and therefore includes more of the low-frequency sound energy than the A scale.

Section 2909(d) of the Noise Ordinance limits noise, as measured from inside any sleeping or living room in any dwelling unit located on residential property, from a "fixed source"[17] to 45 dBA between the hours of 10:00 p.m. and 7:00 a.m. or 55 dBA between the hours of 7:00 a.m. and 10:00 p.m. with windows open, except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

GENERAL PLAN

The San Francisco General Plan (General Plan) contains policies for avoiding or mitigating transportation noise and includes guidelines for determining the compatibility of land uses with noise levels. According to these guidelines, the maximum "satisfactory, with no special insulation requirements" exterior noise level for residential land uses (including transient lodging such as hotels) is approximately 60 dBA L_{dn}. For office and most commercial land uses, the maximum "satisfactory, with no special insulation requirement," noise level is 70 dBA L_{dn}. If such uses are to be located in areas where noise levels exceed these guidelines, a detailed analysis of noise reduction requirements should be done, with noise insulation features included in the design. The General Plan guidelines are shown in full in Table 4.F-11 on the following page. The following General Plan Environmental Protection Element objectives and policies pertain to reducing noise impacts on land uses.

- Policy 9.2: Impose traffic restrictions to reduce transportation noise. Transportation noise levels vary according to the predominance of vehicle type, traffic volume, and traffic speed. Curtailing any of these variables ordinarily produces a drop in noise level. In addition to setting the speed limit, the City has the authority to restrict traffic on city streets, and it has done so on a number of streets. In addition, certain movement restraints can be applied to slow down traffic or divert it to other streets. These measures should be employed where appropriate to reduce noise.
- Policy 9.6: Discourage changes in streets which will result in greater traffic noise in noise-sensitive areas. Widening streets for additional traffic lanes or converting streets to one-way direction can induce higher traffic volume and faster speeds. Other techniques such as tow-away lanes and traffic light synchronization also facilitate heavier traffic flows. Such changes should not be undertaken on residential streets if they will produce an excessive rise in the noise level of those streets.

[17] Noise Ordinance Section 2901(e) states that a "fixed source" is a machine or device that is capable of creating a noise level at the property upon which it is regularly located, including, but not limited to, industrial and commercial machinery and equipment, pumps, fans, air-conditioning apparatus, or refrigeration machines.

TABLE 4.F-11. SAN FRANCISCO GENERAL PLAN LAND USE COMPATIBILITY GUIDELINES

LAND USE CATEGORY	Sound Levels and Land Use Consequences (see explanation below) L_{dn} Value in Decibels							
	55	60	65	70	75	80	85	
RESIDENTIAL All Dwellings, Group Quarters								
TRANSIENT LODGING Hotels, Motels								
SCHOOL CLASSROOMS, LIBRARIES, CHURCHES, HOSPITALS, NURSING HOMES, ETC.								
AUDITORIUMS, CONCERT HALLS, AMPHITHEATERS, MUSIC SHELLS								
SPORTS ARENA, OUTDOOR SPECTATOR SPORTS								
PLAYGROUNDS, PARKS								
GOLF COURSES, RIDING STABLES, WATER-BASED RECREATION AREAS, CEMETERIES								
OFFICE BUILDINGS Personal, Business, and Professional Services								
COMMERCIAL Retail, Movie Theatres, Restaurants								
COMMERCIAL Wholesale and Some Retail, Industrial/ Manufacturing, Transportation, Communications and Utilities								
MANUFACTURING Noise-Sensitive **COMMUNICATIONS** Noise-Sensitive								

Notes:

Satisfactory, with no special noise insulation requirements.

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

New construction or development should generally not be undertaken.

Source: City and County of San Francisco. 2004. *San Francisco General Plan*. Environmental Protection Element. Available: http://www.sf-planning.org/ftp/general_plan/I6_Environmental_Protection.htm. Accessed: December 3, 2015.

- Objective 10: Minimize the impact of noise on affected areas. The process of blocking excessive noise from our ears could involve extensive capital investment if undertaken on a systematic, citywide scale. Selective efforts, however, especially for new construction, are both desirable and justified.
- Policy 10.1: Promote site planning, building orientation and design, and interior layout that will lessen noise intrusion. Because sound levels drop as distance from the source increases, building setbacks can play an important role in reducing noise for the building occupants. (Of course, if provision of the setback eliminates livable rear yard space, the value of the setback must be weighed against the loss of the rear yard.) Buildings sited with their narrower dimensions facing the noise source and sited to shield or be shielded by other buildings also help reduce noise intrusion. Although walls with no windows or small windows cut down on noise from exterior sources, in most cases it would not be feasible or desirable to eliminate wall openings. However, interior layout can achieve similar results by locating rooms whose use require more quiet, such as bedrooms, away from the street noise. In its role of reviewing project plans and informally offering professional advice on site development, the Department of City Planning can suggest ways to help protect the occupants from outside noise, consistent with the nature of the project and size and shape of the building site.
- Policy 10.2: Promote the incorporation of noise insulation materials in new construction. State-imposed noise insulation standards apply to all new residential structures except detached single-family dwellings. Protection against exterior noise and noise within a building is also important in many nonresidential structures. Builders should be encouraged to take into account prevailing noise levels and to include noise insulation materials as needed to provide adequate insulation.
- Policy 10.3: Construct physical barriers to reduce noise transmission from heavy traffic carriers. If designed properly, physical barriers such as walls and berms along transportation routes can in some instances effectively cut down on the noise that reaches the areas beyond. There are opportunities for a certain amount of barrier construction, especially along limited access thoroughfares and transit rights-of-way (such as BART), but it is unlikely that such barriers can be erected along existing arterial streets in the city. Barriers are least effective for those hillside areas above the noise source. Where feasible, appropriate noise barriers should be constructed.
- Objective 11: Promote land uses that are compatible with various transportation noise levels. Because transportation noise is going to remain a problem for many years to come, attention must be given to the activities close to the noise. In general, the most noise-sensitive activities or land uses should ideally be the farthest removed from the noisy transportation facilities. Conversely, those activities that are not seriously affected by high outside noise levels can be located near these facilities.

MISSION BAY GOOD NEIGHBOR POLICY

The Mission Bay Good Neighbor Policy, which relates to construction noise in the Mission Bay area, applies to all Mission Bay development but does not apply outside of the Mission Bay area and, therefore, is not directly applicable to the proposed project. This policy specifies that:

> Pile driving or other extreme noise-generating activity (80 dBA at a distance of 100 feet) shall be limited to 8:00 a.m. to 5:00 p.m. Monday through Friday. No pile driving or other extreme noise-generating activity is permitted on Saturday, Sundays, or holidays. Requests for pile driving on Saturdays may be considered on a case-by-case basis by the Office of Community Investment and Infrastructure, with approval at the sole discretion of the executive director.

PORT OF SAN FRANCISCO GOOD NEIGHBOR STANDARDS

The Port Commission for the Port of San Francisco (Port) has adopted the following "good neighbor" standards for activities, including special events, that occur on the waterfront. Sponsors of events in this area will be required to meet these standards for bars, restaurants that sell alcohol, large fast-food restaurants, and assembly and entertainment uses (including special events), unless the Port Commission makes a specific finding that a particular condition is unnecessary or infeasible. Standards relevant to the project are as follows:

a. Any indoor and/or outdoor activity located within 300 feet of a residential unit shall, during the period from 10:00 p.m. to 6:00 a.m., ensure that sound levels emanating from such activities do not exceed the acceptable noise levels established by the San Francisco Noise Ordinance (Police Code, Article 29).

b. The tenant (or sponsor) shall post interior signs and request that patrons leaving the premises after 10:00 p.m. leave the establishment and the neighborhood in a quiet, peaceful, and orderly fashion and not litter or block driveways in the neighborhood. The tenant shall alert the San Francisco Police Department if exiting patrons are causing a disturbance.

e. The tenant (or sponsor) shall designate a neighborhood liaison contact person whose name and phone number shall be made available to the Port and neighborhood associations in the area.[18]

[18] Port of San Francisco. 2017. *Guidelines & Application for Special Events*, pp. 7 and 8. March 2. Available: http://sfport.com/sites/default/files/Real%20Estate/Docs/Special%20Events/Guidelines%20for%20Special%20Events%20%2803-02-2017%29.pdf.

ENVIRONMENTAL IMPACTS

This section provides the impact analysis related to noise for the proposed project. It describes the methods used to determine the impacts of the proposed project and lists the thresholds used to conclude whether an impact would be significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts accompany the discussion of each identified significant impact.

SIGNIFICANCE CRITERIA

The project would have a significant effect if it would result in any of the conditions listed below.

- Result in the 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.
- Result in the exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.
- Be substantially affected by existing noise levels.
- For a project located within an airport land use plan area, or, where such a plan has not been adopted, in an area within two miles of a public airport or public use airport, expose people residing or working in the area to excessive noise levels.
- For a project located in the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

METHODS FOR ANALYSIS

In *California Building Industry Association v. Bay Area Air Quality Management District*, decided in 2015,[19] the California Supreme Court held that CEQA does not generally require lead agencies to consider how existing environmental conditions might impact a project's users or residents, except when the project would significantly exacerbate an existing environmental condition. Accordingly, the significance criteria above related to exposure of persons to noise levels in excess of standards in the General Plan or Noise Ordinance, exposure of persons to excessive

[19] *California Building Industry Association v. Bay Area Air Quality Management District,* 62 Cal.4th 369. Opinion filed December 17, 2015.

ground-borne vibration or ground-borne noise levels, and people being substantially affected by existing noise levels are relevant only to the extent that the project would significantly exacerbate the existing noise environment. Thus, the analysis below evaluates whether the proposed project could significantly exacerbate the existing or future noise environment. An impact is considered significant if implementation of the proposed project would significantly exacerbate existing or future noise levels.

CONSTRUCTION

The City Noise Ordinance restricts increases in ambient noise levels to 5 dBA at the nearest property line between 8:00 p.m. and 7:00 a.m.; however, because there are no plans for nighttime construction as part of the proposed project, the project would be in compliance with this component of the Noise Ordinance. Noise levels associated with project-related construction activities were evaluated by assessing the noise-generation potential for each individual piece of equipment proposed for use on the site, and by summing the noise levels of the two loudest pieces of equipment, as discussed further below.

Per the City Noise Ordinance, noise from individual pieces of equipment was compared to the City's limit on construction equipment noise of 80 dBA at 100 feet. This equates to approximately 86 dBA at 50 feet. Per the FTA guidelines for impact equipment and combined equipment noise, modeled combined construction noise levels were compared to the FTA general assessment construction noise criterion of 90 dBA for the daytime 1-hour L_{eq} at residential receptor locations. These criteria are used to address whether the project would cause noise to increase in excess of standards established in the noise ordinance or applicable standards of other agencies. This is addressed under Impact NOI-1.

Also per the FTA guidelines, modeled combined construction noise levels were compared to the ambient noise levels in the area in order to determine if a 10 dBA above-ambient increase occurred. This criterion is used to address whether the project would result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. This is also addressed under Impact NOI-1.

Note that because construction noise is inherently variable, qualitative factors (e.g., duration and frequency of the noise, proximity to sensitive receptors) are also taken into consideration in the construction analysis for the proposed project, as applicable. Therefore, the criteria listed above are not strictly thresholds to be used for CEQA purposes, but rather quantitative information that is considered in combination with other qualitative factors to determine the significance of project generated noise.

The construction noise scenario modeled for this analysis assumes that the two loudest pieces of equipment would operate simultaneously. This is a reasonable worst-case scenario for maximum construction noise because it is unlikely that more than the two pieces of equipment would operate at the same time at the same location. A list of the construction equipment that is expected

to be used was provided by the project sponsor. Noise reference levels in FHWA's *Road Construction Noise Model User's Guide* were used to assess noise from equipment.[20] The sum of equipment noise from the two loudest pieces of equipment was then compared to the FTA Guidelines (the general assessment construction noise criterion of 90 dBA L_{eq}), as described above.

To determine if the project would result in a substantial temporary increase in noise related to construction, the ambient noise levels at the nearest sensitive receptor was compared to the combined construction noise level from the two loudest pieces of equipment at that receptor. For this project, the lowest 1-hour daytime L_{eq} from long-term noise measurement days can be conservatively used as an ambient noise level for this area as a point of comparison for modeled project-related construction noise. The temporary increase is considered substantial if the increase is greater than 10 dBA above the ambient noise level, which represents a perceived doubling of noise, as described above.

As discussed in Chapter 2, *Project Description*, seismic upgrades to Pier 48 would involve the replacement of piles, which would involve in-water pile driving. The scope of the seismic upgrade consists of approximately 106 new piles located below a new heavily reinforced concrete apron. This may result in in-water noise, which is discussed in detail in Section 4.L, *Biological Resources*, and airborne noise. Airborne noise associated with this in-water pile driving is assessed using the same methodology as the noise generated by pile driving on land, which, in the case of pile driving at Pier 48, takes into account that it would occur farther away from nearby noise-sensitive land uses than would pile driving on land, and shielding effects from the pier may further reduce noise effects from this activity in some instances, depending on where the pile driving is proposed to occur in relationship to nearby receptors at a given time Airborne noise from pile driving, including in-water pile-driving, is discussed later in this section. Vibration from construction equipment is assessed by using the source levels and criteria in Tables 4.F-2, 4.F-3, and 4.F-4, pages 4.F-6, 4.F-7, and 4.F-7. The damage threshold used to assess potential damage to buildings varies by building type, as shown in Table 4.F-3., page 4.F-7. The annoyance threshold used to assess potential annoyance-related vibration effects for this analysis is 0.10 in/sec PPV (the "strongly perceptible" level for continuous or frequent intermittent sources). Because pile driving would occur over an extended period of time, a "strongly perceptible" level of vibration is considered to be a reasonable threshold for assessing the significance of vibration relative to annoyance.

OPERATION

Noise-level measurements were taken at representative locations in the vicinity of the project area where new land uses would be located and where noise-sensitive land uses are currently located (see Table 4.F-7, page 4.F-13, and Figure 4.F-1, page 4.F-12). Noise measurements were

[20] Federal Highway Administration. 2006. *Roadway Construction Noise Model User's Guide*. Available: http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf. January. Washington, DC.

conducted to document the baseline ambient noise levels that existing noise-sensitive land uses currently experience from a variety of noise sources in the area. Traffic noise in the project vicinity was modeled by using intersection turning-movement data provided by the traffic engineer. This includes the modeling of existing traffic noise levels for relevant roadway segments, based on data from the traffic engineer, which serve as the baseline for comparison to future roadway segment traffic noise levels. The data were converted into average daily traffic (ADT) volumes for the 148 segments in the general vicinity of the project. Note that traffic noise increases with increasing traffic volumes, but a 10 percent increase in traffic equates to less than a 1 dB (approximately 0.4 percent) increase in noise. As discussed above under Overview of Noise and Sound, a less than 1 dB increase in noise is barely noticeable and is not considered to be a substantial increase in noise. Roadway segments that would experience less than a 10 percent increase in traffic are, therefore, not included in the analysis. All roadway segments where project-generated traffic would increase total roadway volumes by 10 percent or more (40 roadway segments out of 148 studied) were considered in the analysis.

To provide the most conservative approach to the analysis, an assessment of traffic volumes was conducted to determine which scenario would result in the greatest noise impact: a.m. peak-hour, p.m. peak-hour nongame-day, or p.m. peak-hour game-day traffic volumes. Nongame event traffic was not separately analyzed in Section 4.E, *Transportation*, and is therefore not separately analyzed from a noise perspective. Although none of the three scenarios was determined to have consistently higher traffic volumes on all segments, p.m. traffic levels on both game days and nongame days were generally higher than a.m. levels.[21] Further, in order to characterize the project's effect on traffic noise levels in the vicinity of the project site, it was determined that p.m. nongame-day traffic (rather than game-day traffic) should be assessed.

Note that some segments had higher traffic volumes and some had lower traffic volumes on game days than on nongame days; therefore, an absolute worst case was not apparent. However, there are approximately 83 to 98 game days per year (and thus 267 to 282 nongame days). Therefore, nongame days would be more representative of typical traffic conditions at the project site, based on the traffic scenarios analyzed in Section 4.E, *Transportation*, and nongame-day traffic would provide an accurate representation of the project's incremental increase to normal existing traffic noise (i.e., traffic noise levels that would occur on approximately 73 to 77 percent of days annually, based on 267 to 282 nongame days per year). Therefore, traffic noise modeling was based on p.m. nongame-day traffic volumes and conducted using the FHWA Traffic Noise Model.

[21] The p.m. traffic levels are generally higher on nongame days. On game days, traffic volumes for the a.m. condition were not collected. Detailed traffic volume data are available in the Transportation Impact Analysis in Appendix 4-1.

In general, traffic noise increases of 3 dBA are barely perceptible to people, while a 5 dBA increase is clearly noticeable.[22] The following thresholds are applied to determine the significance of project-related traffic noise increases: (1) An increase of more than 5 dBA is considered a significant traffic noise increase, and (2) in places where the existing or resulting noise environment is "conditionally acceptable," "conditionally unacceptable," or "unacceptable," based on the San Francisco Land Use Compatibility Chart for Community Noise (Table 4.F-11, page 4.F-20), any noise increase greater than 3 dBA is considered a significant traffic noise increase. A 5 dBA increase over ambient noise levels in any noise environment would be considered a substantial permanent increase in the ambient noise levels in the project vicinity because it would be clearly noticeable. A 3 dBA increase over ambient noise levels where the existing or resulting noise environment is "conditionally acceptable," "conditionally unacceptable," or "unacceptable" would be considered a substantial permanent increase in the ambient noise levels in the project vicinity because, although barely perceptible, it would add to an existing or resulting noise level that exceeds satisfactory standards for the applicable land use per the Land Use Compatibility Chart.

Noise from stationary sources includes noise generated by residential activity and commercial and other nonresidential uses. This would include primarily noise generated by heating, ventilation, and air-conditioning (HVAC) equipment and loading zone operations (e.g., truck delivery noise). Specific information regarding the HVAC equipment that would be used on the project site is not available. Therefore, information pertaining to typical HVAC equipment[23] has been used to evaluate potential impacts. Operation of HVAC equipment, other mechanical equipment, and delivery trucks at onsite loading docks at the proposed project buildings would be subject to Sections 2909(a) and (b) of the Noise Ordinance, which limit noise produced on residential and commercial properties to no more than 5 and 8 dBA, respectively, above the ambient noise levels at any point outside the property plane. Further, stationary operational noise (from mechanical equipment and delivery trucks) is limited by Section 2909(d) of the Noise Ordinance, which provides that residential interior noise cannot exceed 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 45 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.). Noise from loading zone operations was evaluated using data from a typical loading dock.[24]

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[22] California Department of Transportation. 2009. *Technical Noise Supplement*, pp. 2-48 and 2-49. Division of Environmental Analysis. November. Available: http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf. Accessed: January 31, 2017.

[23] Hoover and Keith. 2000. *Noise Control for Buildings, Manufacturing Plants, Equipment, and Products*. Houston, TX.

[24] Recon Environmental. 2015. *Noise Report, Lilac Hills Ranch*. Specific Plan, General Plan Amendment Rezone EIR. San Diego County, California. June 1.

LAND USE ASSUMPTIONS

As described in Chapter 2, *Project Description*, this environmental impact report (EIR) analyzes two land use assumptions: the High Commercial Assumption and the High Residential Assumption. These assumptions represent the two development programs that could be implemented under the flexible zoning proposed for Blocks H, I, and J. Construction noise and vibration is anticipated to be similar for both assumptions because they would involve the same types of construction activities and the same durations, equipment, and staging and construction locations. Accordingly, the construction noise and vibration impacts would be the same for both the High Commercial and High Residential Assumptions. Similarly, the impacts from light-rail noise and vibration, as well as noise from baseball games, on onsite land uses and the impacts from building noise on onsite and offsite land uses would be the same for both assumptions; thus, no distinctions are made between the two land use assumptions in the analysis of these impacts.

Because the land use mix between the High Commercial and High Residential Assumptions differs, the operational segment-by-segment traffic volumes vary slightly between the two assumptions. The differences, however, are small. With respect to traffic volumes under the High Commercial and High Residential Assumptions, no segment varies by more than 50 vehicles per hour, and most vary by a much smaller amount. The small differences between traffic volumes under the two assumptions would not result in any meaningful difference in traffic noise levels. As such, because the High Commercial Assumption was chosen for analysis in this section, only the High Commercial Assumption was modeled for traffic noise; however, the modeling results apply to both the High Commercial and High Residential Assumptions. The traffic volumes upon which this analysis is based are presented in the Transportation Impact Analysis (Appendix 4-1).

IMPACTS NOT EVALUATED IN DETAIL

The closest airports to the project site are Oakland International Airport and San Francisco International Airport, located approximately 9 and 10 miles away, respectively. The project site is not within the Airport Land Use Plan of either airport, and as indicated, it is more than two miles from the airports. There are no private airstrips in the vicinity of the project site. Therefore, occupants at the project site would not be exposed to excessive noise from any public airport or private airstrip activities. Impacts pertaining to public airports and private airstrips are not evaluated further.

PRIMARY EXISTING NOISE SOURCES

The following are noise sources that exist near the project site and vicinity and are part of the existing baseline noise environment. The project would not increase noise levels from these sources.

BASEBALL GAME NOISE AND NOISE FROM OTHER LARGE EVENTS AT AT&T PARK

During baseball season, games at AT&T Park result in several distinct types of noises, which are audible at the project site. These include crowd noise from cheering fans, music and commentary over the PA system, and parking lot and tailgating activities in the parking areas. As noted above, there are approximately 83 to 98 baseball games per year as well as a limited number of concerts (which are also noise-generating), charity and private events (which may generate less noise than a game or concert), and other sporting events. In total, there are approximately 145 nonbaseball-related special events per year, though only a few (about 20 percent of the number of game events) would generate noise levels similar to (or possibly slightly greater than [e.g., a rock concert]) noise levels generated during a baseball game. These events typically do not generate more noise than a baseball game and are considered similar to a baseball game for the purposes of this discussion.

When the project is operational, crowd noise and PA system noise from baseball games as well as noise from large noise-generating events would still be audible at the project site; however, with parking on Seawall Lot 337 removed, parking lot and tailgate activity noise would most likely be reduced because an interior parking structure would generally not be as conducive to tailgate activity and other surface lot noise. Parking lot and tailgate activity noise (should it occur) would largely be confined to the indoor parking structure.

As shown in Table 4.F-7 (page 4.F-13), 24-hour noise levels on baseball game days on the side of the project site closest to AT&T Park (LT-1) range from 74.4 to 78.5 dBA L_{dn}. Game-day noise would most likely be best represented by noise at noise monitoring site LT-1 on August 30, 2015 (74.4 dBA L_{dn}). This is, in part, because pile driving occurred on August 28, 2015, and noise levels on August 29, 2015 increased because of noise from an outdoor event at The Yard at Mission Rock, a temporary gathering space constructed of freight shipping containers that includes retail, bar, and restaurant uses. Thus, August 30 is considered to be the most representative measurement for a typical game day.

Given existing noise levels at the project site on game days, project residential and commercial land uses would experience noise levels during baseball games and other large events at AT&T Park that could be inconsistent with the City's General Plan land use compatibility standards. As shown in Table 4.F-11 (page 4.F-20), new construction is discouraged where noise levels are between 70 and 80 dBA L_{dn}, unless a detailed analysis of the noise reduction requirements and the needed noise insulation features is included in the design. However, new construction would be required to comply with CCR Title 24, which would ensure that interior noise levels at the new buildings would meet the 45 dBA L_{dn} standard at the time a building permit is issued. Development of the project would not result in an increase in the existing ambient noise environment from events at AT&T Park.

EXISTING LIGHT-RAIL NOISE EFFECTS ON ONSITE RECEPTORS

Proposed residential and commercial uses would be located in proximity to Third Street, Channel Street, Mission Rock Street,[25] and new internal project site roadways. Onsite land uses developed as a part of project implementation would be exposed to existing light-rail noise. The project would not result in an increase in Muni service or associated light-rail noise.

Proposed residential land uses could be exposed to light-rail noise; specifically, residential uses located in parcel D1 would be located as close as 50 feet away from Muni light-rail tracks on Third Street. Existing noise levels at this location are currently dominated by construction in the project vicinity and measured to be in the range of 73 to 83 dBA L_{dn}, as indicated by the data for noise monitoring site LT-3 in Table 4.F-7 (page 4.F-13).

Average noise levels in areas with large volumes of vehicle traffic and intermittent light-rail trips are frequently dominated by semi-continuous street traffic noise.[26] Because there is generally a high level of vehicle traffic in the project area, noise from intermittent streetcar operations would most likely not have a substantial effect on L_{dn} noise levels or noise-sensitive receptors associated with project development. Development of the project would not result in an increase in light-rail noise.

EXISTING LIGHT-RAIL VIBRATION EFFECTS ON ONSITE RECEPTORS

The Muni light-rail track is located immediately west of the southern half of the project site, in the center of Third Street. The current design for the project indicates that residential land uses would be located approximately 50 feet from the centerline of the existing light rail on Third Street. There are currently 138 outbound (southward) and 128 inbound (northward) weekday light-rail train passages per day on the track, for a total of 266 passages per weekday.[27]

Vibration impacts from the light-rail line on Third Street were assessed in the 1998 Mission Bay Subsequent EIR, which analyzed impacts from the Muni T line on multi-unit residential buildings within 50 feet of the light-rail track. That analysis concluded that, although vibration from the light rail could disturb occupants in small, wood-frame residential buildings, buildings with pile-supported foundations would attenuate vibration. The distance at which vibration impacts from light-rail operations would be significant for buildings on piles or spread-footing foundations was determined to be 25 feet. Similarly, the Mission Bay Subsequent EIR determined that vibration levels at distances as close as 50 feet from commercial buildings

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[25] City and County of San Francisco. 1998. *Mission Bay Subsequent Environmental Impact Report.* Available: https://archive.org/details/missionbaysubse1719sanf_0.

[26] URS Corporation. 2009. Noise and Vibration Settings Report for the San Francisco Muni Historic Streetcar Service to Fort Mason. April.

[27] Transit511.org. 2015. Schedules and *Route Maps – KT Line*. Available: http://transit.511.org/schedules/index.aspx#m1=S&m2=rail&cid=SF. Accessed: November 6, 2015.

would not exceed FTA's impact criteria for commercial land uses.[28] The closest portion of the project development would be located approximately 50 feet from the light-rail track, and the large multi-unit residential and commercial buildings would have foundations that would attenuate vibration impacts from the light rail. These conclusions are consistent with a more general approach, based on the FTA's *Transit Noise and Vibration Impact Assessment*, which can be applied to the project conditions.[29]

An approximate RMS velocity level can be determined by using the Generalized Ground Surface Vibration Curve in Figure 10-1 of the *Transit Noise and Vibration Impact Assessment*. The RMS velocity for a light-rail vehicle traveling 50 miles per hour (mph) at a distance of 50 feet from the track centerline would be approximately 73 VdB. Because the project site is located in an urban area, 30 mph is a more reasonable speed. An adjustment of -4.4 dB, which corresponds to a speed of 30 mph, can be applied to this value.[30] With the speed adjustment, the RMS velocity would be approximately 69 VdB at a distance of 50 feet from the track centerline (73 VdB - 4.4 VdB = 68.6 VdB). This level of ground-borne vibration would be below the impact levels specified by the FTA for frequent events (i.e., more than 70 vibration events from the same source per day) at residential buildings where people normally sleep (72 VdB) and other buildings with primarily daytime uses (75 VdB). Refer to Table 4.F-10 (page 4.F-17) for more details.

Because new land uses at the project site would be located at least 50 feet from the track centerline and would not include small, wood-frame buildings, light-rail vibration would not expose people to excessive ground-borne vibration, according to FTA guidelines. Development of the project would not result in an increase in Muni service or associated light-rail noise or vibration.

Impacts and Mitigation Measures

Impact NOI-1. Construction of the proposed project would generate noise levels in excess of standards or result in substantial temporary increases in ambient noise levels. (Significant and Unavoidable with Mitigation)

Construction Noise Impacts on Existing Land Uses

Construction of the project is expected to occur on four separate areas of the project site, with construction schedules in each area partially overlapping (see Figure 2-16 in Chapter 2, *Project Description*). The duration of construction, starting in spring 2017, is expected to be as short as 6

[28] City and County of San Francisco. 1998. *Mission Bay Subsequent Environmental Impact Report.* Available: https://archive.org/details/missionbaysubse1719sanf_0.

[29] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: December 21, 2015.

[30] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. Table 10-1. Available: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf. Accessed: December 21, 2015.

or as long as 10 (or more) years. In general, the greatest construction noise impacts would occur during the site preparation and grading, infrastructure, and foundation and building phases because these phases would involve the loudest construction equipment and most intense activity. These phases would occur throughout much of the construction period because construction would be staggered across four areas (each area would have a site preparation and grading phase, an infrastructure phase, etc.). Interior building improvements, which would involve either no heavy-duty construction equipment or a few large pieces, would occur at the middle and end of the construction period for vertical improvements in each area. Once the building façades are in place, noise from interior building work would generally be contained within building envelopes and would not be expected to be excessive. Construction noise levels would fluctuate, depending on the construction phase, equipment type, duration of use, distance between noise source and listener, and the presence or absence of barriers. Construction-related material haul trips would raise ambient noise levels along truck routes, depending on the number of haul trips made and the types of vehicles used. It is estimated that there could be up to 143 haul trips on a worst-case construction day. Although the routes of the trucks would vary, most would travel on Third Street between the project site and Mariposa Street and take Interstate 280 south to US 101. In addition, certain types of construction, such as impact pile driving (with approximately 4,600 total piles for the buildings, pile-supported streets, and China Basin Park area and an additional 106 piles for Pier 48 construction), would generate persistent, time-varying noise levels, which can be highly annoying.

Given the information provided by the project sponsor, it is anticipated that construction of the project would require the equipment shown in Table 4.F-12 on the following page. For each equipment type in Table 4.F-12, the corresponding L_{max} values at a distance of 50 feet from the source are shown, based on the FHWA *Road Construction Noise Model User's Guide*. L_{max} values at 100 feet, also shown in Table 4.F-12, were calculated by subtracting 6 dBA from the L_{max} values at 50 feet, based on geometric attenuation for a point source of 6 dB per doubling of distance.

GENERATION OF NOISE LEVELS IN EXCESS OF CITY NOISE ORDINANCE LIMITS

The San Francisco Noise Ordinance limits noise from individual pieces of powered construction equipment to a level of 80 dBA L_{max} at a distance of 100 feet, except for impact equipment (note that L_{max} is the maximum noise that would occur; the average or L_{eq} noise levels are the steady-state sound levels and would be even lower). As shown in Table 4.F-12, individually, all nonimpact equipment that is anticipated to be used for project construction would have a maximum noise level that would be below 80 dBA at 100 feet and would not violate the Noise Ordinance. Because the nearest offsite sensitive land use is 100 feet west of the project site (see Table 4.F-6, page 4.F-10), the maximum noise from each individual piece of nonimpact construction equipment would be less than 80 dBA at the nearest sensitive land use. Noise from

TABLE 4.F-12. TYPICAL CONSTRUCTION NOISE EMISSION LEVELS FOR PROJECT CONSTRUCTION EQUIPMENT

Equipment	L_{max} at 50 feet (dBA)[a]	L_{max} at 100 feet (dBA)[b]
Air Compressor	78	72
Backhoe	78	72
Berm Machine[c]	85	79
Concrete Mixer Truck	79	73
Concrete Pump Truck	81	75
Crane	81	75
Dozer	82	76
Drill[d]	84	78
Dump Truck	76	70
Excavator	81	75
Forklift[e]	84	78
Front-end Loader	79	73
Generator	81	75
Jet Grout Rig[f]	85	79
Jet Grout Pump[g]	81	75
Roller	80	74
Paver	77	71
Pickup Truck	75	69
Pile Driver (Impact)	101	95
Pile Driver (Vibratory)	101	95
Scraper	84	78
Trencher[h]	80	74
Water Truck[i]	76	70
Welder	74	68

Source: Federal Highway Administration. 2006. *Roadway Construction Noise Model User's Guide*. Available: http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf. January. Washington, DC.
Mesikepp, Sam. Hathaway Dinwiddie Construction Company. August 31, 2016—written communication.
Notes:

a. These values represent the loudest noise levels generated by each equipment type at a distance of 50 feet.
b. These values were calculated by subtracting 6 dBA from each L_{max} value at 50 feet, based on geometric attenuation for a point source.
c. Represented by All Other Equipment > 5 horsepower from FHWA *User's Guide*.
d. Represented by Auger Drill Rig from FHWA *User's Guide*.
e. Represented by Tractor from FHWA *User's Guide*.
f. Represented by All Other Equipment > 5 horsepower from FHWA *User's Guide*.
g. Represented by Pump from FHWA *User's Guide*.
h. Represented by Slurry Trenching Machine from FHWA *User's Guide*.
i. Represented by Dump Truck from FHWA *User's Guide*.

impact equipment, such as pile drivers, is not limited in this way by the Noise Ordinance as long as appropriate noise control features, as recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection, are in place.

Note that the piles used for the Seawall Lot 337 portion of the proposed project would be steel H-piles, an average range of 175 to 230 feet in length, and each pile would require approximately 10 blows per foot of pile length. For example, a 230-foot-long pile would require approximately 2,300 blows. Given the number of piles and the lengths proposed for the project, impact pile driving would be a substantial contributor to the noise environment during project construction. However, as discussed in Chapter 2, *Project Description*, all impact equipment used for project construction would be equipped with the appropriate noise control features as required by the City Noise Ordinance; noise from impact equipment equipped with such features would be in compliance with the City Noise Ordinance regardless of the noise levels generated. Additionally, according to the City Noise Ordinance, construction activities are generally prohibited between the hours of 8:00 p.m. and 7:00 a.m. if the noise created exceeds the ambient noise level by 5 dBA at the nearest property line. If noise is generated between the hours of 8:00 p.m. and 7:00 a.m. that exceeds the ambient noise level by 5 dBA, a violation would occur. However, to ensure that the 5 dBA requirement would not be exceeded (i.e., to comply with the City Noise Ordinance), project construction would not occur between the hours of 8:00 p.m. and 7:00 a.m., as described in Chapter 2, *Project Description*. Thus the project would comply with the City's Noise Ordinance, and impacts related to compliance with local standards related to construction noise from nonimpact equipment would be ***less than significant***.

GENERATION OF COMBINED CONSTRUCTION EQUIPMENT NOISE LEVELS IN EXCESS OF THE FTA ASSESSMENT CRITERIA

Because the Noise Ordinance does not include a combined construction equipment noise standard or establish a noise limit for impact equipment, modeled combined construction noise (including noise from impact equipment) is considered by comparing noise levels that would be generated by project construction to FTA guidance criteria (described in the *Methods for Analysis* section). Comparing construction noise levels to the FTA guidelines will help ensure appropriate noise protection for nearby noise-sensitive land uses.

To address the issue of combined noise levels (including noise from impact equipment), a reasonable worst-case scenario, combining noise levels from the two loudest pieces of equipment operating simultaneously at the same location, is presented below. Simultaneous operation of a pile driver (impact or vibratory) and a jet grout rig (refer to Table 4.F-12 on the previous page) would result in the noise levels shown in Table 4.F-13, on the following page. Note that it is unlikely that these two loudest pieces of equipment would be operating in the same location simultaneously for any substantial amount of time; however, the analysis below provides a reasonable worst case.

TABLE 4.F-13. CALCULATED CONSTRUCTION NOISE EMISSION LEVELS

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Pile Driver Sound Level (dBA) at 50 feet =	101	0.2	94.0
Jet Grout Rig[a] Sound Level (dBA) at 50 feet =	85	0.5	82.0
Distance between Source and Receiver (feet)	**Geometric Attenuation (dB)**	**Calculated L_{max} Sound Level (dBA)**	**Calculated L_{eq} Sound Level (dBA)[b]**
50	0	101	94
100	-6	95	88
200	-12	89	82
266	-15	87	80
300	-16	86	79
400	-18	83	76
500	-20	81	74
600	-22	80	73
685	-23	78	72
700	-23	78	71
800	-24	77	70
900	-25	76	69
1,000	-26	75	68
1,200	-28	74	67
1,400	-29	72	65
1,600	-30	71	64
1,800	-31	70	63
2,000	-32	69	62
2,500	-34	67	60
3,000	-36	66	59

a. Represented by all other equipment > 5 horsepower, from FHWA User's Guide.

b. The combined L_{eq} sound level is compared to the FTA general assessment construction noise criteria (90 dBA daytime 1-hour L_{eq}) to assess impacts from combined construction noise.

Combined noise levels from the two loudest pieces of equipment operating simultaneously could be as high as 95 dBA L_{max} and 88 dBA L_{eq} at the residential uses on Mission Bay Block 1 and Block 2 (at approximately 100 feet), as shown in Table 4.F-13. As discussed above, the City uses the FTA general assessment construction noise criterion (90 dBA daytime 1hour L_{eq}) to assess potential impacts from combined construction noise. Therefore, at the residential uses on Mission Bay Block 1 (which represent the nearest sensitive receptors), noise levels would be up to approximately 88

dBA L_{eq} and therefore would not result in noise levels in excess of the FTA criterion of 90 dBA L_{eq}. Because noise levels at a distance of 100 feet would not exceed the applicable FTA criteria, combined construction noise would not exceed the 90 dBA L_{eq} criterion at other nearby sensitive receptors that are located even farther away. Construction noise impacts related to an exceedance of the FTA criteria for combined construction noise would be ***less than significant.***

GENERATION OF A SUBSTANTIAL TEMPORARY INCREASE IN NOISE BASED ON THE FTA ASSESSMENT CRITERIA

As described above, combined construction noise levels at the nearest sensitive land use (Mission Bay Blocks 1 and 2) could be up to 88 dBA L_{eq}. To determine if a substantial temporary increase in noise would occur, ambient noise measurements from the field survey were compared to this combined construction noise level to determine if a 10 dB increase over ambient conditions at the nearest sensitive receptor would occur. A 10 dB increase is considered a substantial temporary increase.[31]

Figure 6 in Appendix 5 displays the hourly L_{eq} data from the long-term measurements that were used to calculate the L_{dn} values reported in Table 4.F-7, page 4.F-13. The lowest 1-hour daytime L_{eq} from the long-term noise measurements located near noise-sensitive receptors can be conservatively used as an ambient noise level for this area (the 1-hour daytime L_{eq} long-term noise measurements include an hourly L_{eq} for each hour included in the measurement). The lowest 1-hour L_{eq} during normal daytime hours (7:00 a.m. to 8:00 p.m.) near Mission Bay Block 2 (LT-3) was 68.6 dBA L_{eq}, which occurred on Sunday, August 30, 2015 (at 8:00 a.m.). This ambient noise level can be compared to expected construction noise levels to assess the significance of potential noise effects related to a substantial temporary increase in noise. Because construction noise would occur for approximately 6 years, construction noise may not be considered temporary by those most affected.

As discussed previously, pile driving was occurring during the noise field survey and will continue for several months. As such, it was not possible to conduct the long-term (24-hour) noise survey without the inclusion of noise from pile driving during most of the daytime hours. The lowest 1-hour L_{eq} conservatively represents a reasonable ambient noise level for the project area because it is likely that pile driving was not occurring during that hour (noise levels with pile driving occurring would have been much higher); it is also likely that the noise source responsible for the measured noise level was traffic in the area. As such, an ambient noise level of 69 dBA L_{eq} (from measurement location LT-3 during the 8:00 a.m. hour on Tuesday, August 30, 2015, as discussed above) was used in this analysis.

[31] Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. Accessed: October 6, 2015.

A comparison of the modeled combined construction noise level of approximately 88 dBA L_{eq} at Mission Bay Block 2 to the ambient noise level of 69 dBA L_{eq} indicates that project construction could result in noise levels approximately 19 dB greater than the existing ambient condition (not including current temporary construction noise in the area). Because construction noise would exceed the ambient noise level by more than 10 dB, the project is expected to result in a substantial increase in ambient noise in the project area for the duration of project construction. Construction is anticipated to occur until 2023. Thus, the impact related to a substantial temporary increase in noise would be significant.

CONSTRUCTION NOISE IMPACTS ON ONSITE LAND USES

Construction noise would affect new onsite receptors because onsite buildings would be occupied while construction would be occurring on other parts of the project site.

GENERATION OF NOISE LEVELS IN EXCESS OF CITY NOISE ORDINANCE LIMITS

As noted above in the discussion of construction noise impacts on existing land uses, project-related construction activities would not be expected to violate the section of the City's Noise Ordinance pertaining to individual pieces of construction equipment generating noise levels greater than 80 dBA at a distance of 100 feet. As also discussed above, construction activities would not occur between the hours of 8:00 p.m. and 7:00 a.m., and all impact equipment used for project construction would be equipped with the appropriate noise control features, as required by the City Noise Ordinance. Therefore, project construction would comply with the City Noise Ordinance. Impacts related to compliance with local standards would be ***less than significant***.

GENERATION OF COMBINED CONSTRUCTION EQUIPMENT NOISE LEVELS IN EXCESS OF THE FTA ASSESSMENT CRITERIA

Although project construction would often occur more than 100 feet away from an occupied onsite use, resulting in noise levels of less than 90 dBA L_{eq}, it is possible that onsite construction could occur closer than 100 feet away from onsite occupied uses. As discussed above, at a distance of 50 feet, combined construction equipment noise levels could be up to 94 dBA L_{eq}. It is possible that construction activity could occur within 50 feet of occupied onsite uses. As such, it is possible that noise levels at occupied onsite uses could be in excess of the FTA criteria of 90 dBA at residential uses. This impact would be significant.

GENERATION OF A SUBSTANTIAL TEMPORARY INCREASE IN NOISE BASED ON THE FTA ASSESSMENT CRITERIA

As described above, combined construction noise levels at future onsite residences (the occupants of which may be in the buildings prior to the completion of construction) could be in the range of 88 dBA L_{eq} to 94 dBA L_{eq} (if the residences are approximately 50 to 100 feet from construction activities). Although construction may be occurring when the residents move into the onsite buildings, the ambient noise level in the vicinity of the project site is considered to be the noise level without constant construction. As described above for offsite receptors, the ambient noise level near the project site was conservatively estimated to be approximately 69 dBA

L_{eq}. A comparison of the modeled combined construction noise level of approximately 88 to 94 dBA L_{eq} at 50 to 100 feet from construction activity, respectively, to the ambient noise level of 69 dBA L_{eq} indicates that project construction could result in noise levels that would be 19 to 25 dB greater than the existing condition. Because construction noise would exceed the ambient noise level at onsite residences by more than 10 dB, the project would result in a substantial increase in ambient noise. In addition, construction activities would occur for approximately 6 years. Thus, the impact related to a substantial temporary increase in construction noise for onsite receptors would be significant.

MITIGATION MEASURE. Noise from construction equipment, including impact and nonimpact equipment, would not violate the City's Noise Ordinance. However, construction activities associated with project-related development could expose onsite sensitive receptors to noise levels that would be in excess of the 90 dBA L_{eq} FTA daytime criterion. Further, construction noise could result in a substantial (more than 10 dB) temporary increase in ambient noise levels at both onsite and offsite receptors. Mitigation Measure M-NOI-1, described below, and Mitigation Measure M-NOI-3.1, on page 4.F-60, would reduce noise effects associated with project construction at both onsite and offsite receptors. Although this measure would reduce construction noise levels, as well as the severity of construction noise impacts on sensitive receptors, because of the project's close proximity to offsite receptors (and potentially occupied onsite receptors during construction), it would not be possible to guarantee that the increase in ambient noise levels during construction would be less than 10 dB. In addition, it would not be possible to guarantee that noise levels at onsite occupied residences would be below 90 dBA L_{eq} during project construction because the project phasing is not sufficiently detailed at this time to determine whether the project's buildings could shield future residents from future construction noise. Therefore, even with incorporation of Mitigation Measures M-NOI-1 and M-NOI-3.1, which would reduce the severity of this impact, construction noise impacts would be ***significant and unavoidable***.

M-NOI-1: *Prepare and Implement a Construction Noise Control Plan to Reduce Construction Noise at Noise-Sensitive Land Uses.* The project sponsor shall develop a noise control plan that requires the following:

- Construction contractors shall specify noise-reducing construction practices that will be employed to reduce construction noise from construction activities. The measures specified by the project sponsor shall be reviewed and approved by the City prior to the issuance of building permits. Measures that can be used to limit noise include, but are not limited to, those listed below.
    - Locate construction equipment as far as feasible from noise-sensitive uses.

- Require that all construction equipment powered by gasoline or diesel engines have sound control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.
- Idling of inactive construction equipment for prolonged periods shall be prohibited (i.e., more than 5 minutes).
- Prohibit gasoline or diesel engines from having unmuffled exhaust systems.
- Use noise-reducing enclosures around noise-generating equipment that has the potential to disturb nearby land uses.
- Ensure that equipment and trucks used for project construction utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, intake silencers, ducts, engine enclosures, acoustically attenuating shields or shrouds) wherever feasible.
- Monitor the effectiveness of noise attenuation measures by taking noise measurements. A plan for noise monitoring shall be provided to the City for review prior to the commencement of each construction phase.

- Impact tools (e.g., jack hammers, pavement breakers, rock drills) used for project construction shall be "quiet" gasoline-powered compressors or electrically powered compressors, and electric rather than gasoline- or diesel-powered engines shall be used to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where the use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used; which could achieve a reduction of 5 dBA. Quieter equipment shall be used when feasible, such as drills rather than impact equipment.
- Construction contractors shall be required to use "quiet" gasoline-powered compressors or electrically powered compressors and electric rather than gasoline- or diesel-powered forklifts for small lifting.
- Stationary noise sources, such as temporary generators, shall be located as far from nearby receptors as possible; they shall be muffled and enclosed within temporary enclosures and shielded by barriers, which could reduce construction noise by as much as 5 dB, or other measures, to the extent feasible.
- Prior to the issuance of the building permit, along with the submission of construction documents, the project sponsor shall submit to the Planning

Department and Department of Building Inspection a list of measures for responding to and tracking complaints pertaining to construction noise. These measures shall include:

- Identification of measures that will be implemented to control construction noise.
- A procedure and phone numbers for notifying the Department of Building Inspection, the Department of Public Health, or the Police Department of complaints (during regular construction hours and off hours).
- A sign posted onsite describing noise complaint procedures and a complaint hotline number that shall be answered at all times during construction.
- Designation of an onsite construction complaint and enforcement manager for the project.
- A plan for notification of neighboring residents and nonresidential building managers within 300 feet of the project construction area at least 30 days in advance of extreme noise-generating activities (defined as activities that generate noise levels of 90 dBA or greater) about the estimated duration of the activity and the associated control measures that will be implemented to reduce noise levels.

Impact NOI-2. Operation of the proposed project could result in the exposure of persons to or generation of noise levels in excess of the San Francisco Noise Ordinance or a substantial temporary, periodic or permanent increase in ambient noise levels in the project vicinity, above levels existing without the project. (Significant and Unavoidable)

TRAFFIC NOISE IMPACTS ON OFFSITE LAND USES

The project would lead to an increase in traffic in the vicinity of the project site, as detailed in Section 4.E, *Transportation*. As discussed in the *Methods for Analysis* section, when assessing traffic noise impacts, the following thresholds are applied to determine the significance of project-related traffic noise increases: (1) An increase of more than 5 dBA is considered a significant traffic noise increase, regardless of the existing ambient noise level, and (2) in places where the existing or resulting noise environment is "conditionally acceptable," "conditionally unacceptable," or "unacceptable," based on the San Francisco Land Use Compatibility Chart for Community Noise (Table 4.F-11, page 4.F-20), any noise increase greater than 3 dBA is considered a significant traffic noise increase. According to the General Plan Noise Element, a noise level of up to 60 dBA L_{dn} is considered satisfactory for residential land uses, and a noise level of 70 dBA L_{dn} is considered satisfactory for office and most commercial uses.

For residential receptors located adjacent to a roadway, the 60 dBA L_{dn} "satisfactory" noise standard from the City Noise Element would apply. Standard construction can typically provide an exterior-to-interior noise reduction of up to 20 dB.[32] A noise reduction in the range of 25 to 35 dB is achievable with upgraded acoustical treatments and the Noise Element of the General Plan allows noise levels at residential land uses to be up to 70 dBA L_{dn} if all needed noise insulation features are included in the design of the building. However, this analysis uses the 60 dBA L_{dn} allowable noise level of the City Noise Element as the basis for the analysis of project traffic effects on residential uses (where up to a 5 dB increase is allowable for roadways segments with resultant noise levels below this noise level, and a 3 dB increase is allowed for roadways segments with resultant noise levels above this noise level).

The proposed project would be subject to the California Building Standards Code (Title 24), which establishes uniform noise insulation standards. The Title 24 acoustical requirement for residential structures (including hotels) is incorporated into the Port of San Francisco Building Code and requires structures to be designed to prevent the intrusion of exterior noise so that the noise level with windows closed attributable to exterior sources does not exceed 45 L_{dn} in any habitable room. Title 24 allows the project sponsor to choose between a prescriptive or performance-based acoustical requirement for nonresidential uses. Both compliance methods require wall, floor/ceiling, and window assemblies to meet certain sound transmission class or outdoor/indoor sound transmission class ratings to ensure that adequate interior noise standards are achieved. In compliance with Title 24, the Port would review the final building plans to ensure that the building wall, floor/ceiling, and window assemblies meet Title 24 acoustical requirements. If determined necessary by the Port, a detailed acoustical analysis of the exterior wall and window assemblies may be required. However, as long as noise levels at the exterior of a residential building comply with the 60 dBA L_{dn} standard, it is likely that interior noise levels would comply with the Title 24 allowable interior noise level of 45 dBA using standard construction materials.

An initial analysis was conducted using a reference distance of 50 feet from each roadway segment centerline. Refer to Appendix 5 for these modeling results. Modeling demonstrated that noise levels along two segments would increase by 3 dB or more in areas where with-project noise levels affecting residential uses would exceed 60 dBA L_{dn}. In addition, project-generated traffic would increase noise levels by 5 dB or more along one segment where existing and existing plus-project noise levels were modeled to be 60 dBA L_{dn} or less. This impact would be significant.

Table 4.F-14 on the following page presents existing noise levels and the project-generated noise increases that would occur along the affected roadway segments.

[32] Federal Highway Administration. 2011. *Highway Traffic Noise: Analysis and Abatement Guidance*. December.

TABLE 4.F-14. DIRECT TRAFFIC NOISE LEVELS AND POTENTIAL IMPACTS AT 50 FEET FROM ROADWAY CENTERLINE

Roadway	Segment	Receptor Land Use Type	Compatibility Standard (dBA L_{dn})	Existing dBA L_{dn} at 50-foot Distance	Existing plus-Project (2020) dBA L_{dn} at 50-foot Distance	Difference (dB)	Significant Impact Due To
Segments where with-project noise levels are > 60 dBA L_{dn} and the increase in noise from existing conditions is > 3 dB (exceed standard and significant permanent increase)							
Fourth Street	King Street to Fourth Street Bridge	R	60	57	61	4	> 3 dB increase in areas > 60 dBA L_{dn}
Mission Rock Street	Terry A. Francois Boulevard to Third Street	R	60	50	62	12	> 3 dB increase in areas > 60 dBA L_{dn}
Segments where with-project noise levels are < 60 dBA L_{dn} but the increase in noise from existing conditions is > 5 dB (significant permanent increase)							
Mission Rock Street	Third Street to Fourth Street	R	60	48	58	10	Greater than 5 dB increase (regardless of existing noise level)

Notes:

Refer to Appendix 5 for the full modeling results. Although values presented in this table are rounded to the nearest value, impact determinations were made prior to rounding to ensure an accurate presentation of impacts, as shown in Appendix 5.

Note that an increase of 5 dB is clearly noticeable in any environment and therefore considered to be significant regardless of existing noise levels; an increase of 3 dB, although barely noticeable, is considered a substantial increase in degraded noise environments (e.g. existing noise levels of greater than 60 dBA L_{dn})

R = residential (including hotel use)

As shown in Table 4.F-14, on the previous page, project-added traffic would result in a substantial permanent increase in noise (a 5 dB increase in any environment or a 3 dB increase in areas where existing or resulting noise levels are greater than 60 dBA L_{dn}) along three segments: Fourth Street from King Street to Fourth Street Bridge, Mission Rock Street from Terry A. Francois Boulevard to Third Street, and Mission Rock Street from Third Street to Fourth Street.

No noise-sensitive land uses are currently located along the segment of Mission Rock Street between Terry A. Francois Boulevard and Third Street. This area is proposed for residential development as Blocks 9 and 9A of the Mission Bay Redevelopment Plan, which would be located along the south side of this roadway segment. Such development would be designed to comply with Title 24 and applicable City noise regulations. The segment of Mission Rock Street between Third Street and Fourth Street has residential uses located on both sides of the street. The segment of Fourth Street from King Street to the Fourth Street Bridge also has residential uses on both sides of the street. These uses are relatively new development and most likely also include noise attenuation measures to ensure compliance with Title 24 and with City noise regulations.

Although it is likely that the residential developments located along segments where a project-related substantial permanent increase in traffic noise may occur would not experience unacceptable interior noise levels, the proposed project's traffic would still result in a substantial permanent increase in ambient noise levels along the three segments. Although mitigation in the form of sound walls were considered to reduce the project's traffic noise impacts, it was determined that this mitigation was infeasible in this dense urban area, with residential buildings located close to roadways. Mitigation Measure M-AQ-2.3, on page 4.G-63, requires preparation of a transportation demand management plan with a goal of reducing one-way vehicle trips by 20 percent. This mitigation measure could reduce the amount of traffic on roadway segments that experience a significant traffic noise increase, but it would be speculative to quantify the precise number of vehicle trips (and hence vehicle-related noise) reduced along any given segment. Because these impacts could not be reduced to less-than-significant levels, traffic noise impacts related to a substantial permanent increase in noise would be ***significant and unavoidable with mitigation***.

NOISE FROM ONSITE OUTDOOR USE AREAS TO OFFSITE LAND USES

The proposed project would include development of a number of public open spaces, including Mission Rock Square and China Basin Park (along with other proposed outdoor spaces). The proximity of existing and proposed future residential uses to these types of open space uses would pose the potential for residents to be disturbed or annoyed by noise from outdoor space activities. It is not known at this time what specific events may occur and what the associated noise levels would be. However, promoters of any proposed outdoor events on the site's outdoor plaza that would use amplified sound or music would be required to obtain a permit

from the City prior to the event. Section 1060.1 of the Police Code requires a permit to conduct, operate, or maintain a place of entertainment, limited live performance locale or one-time event within the City and County of San Francisco. The Entertainment Commission may deny a permit on a finding that the use will generate noise that would substantially interfere with the public health, safety and welfare or the peaceful enjoyment of neighboring property.

Concerts in the proposed open spaces would require the promoter to obtain a Limited Live Performance Permit from the San Francisco Entertainment Commission. This permit process requires a public hearing and includes a requirement for neighborhood outreach. Article 1, Section 47.2 of the Police Code, while generally focused on truck-mounted amplification equipment, regulates the use of any sound amplifying equipment, whether truck-mounted or otherwise. Hours of operation are restricted to between 9:00 a.m. and 10:00 p.m., unless permitted by the San Francisco Entertainment Commission.

Rather than permits for individual events, the project sponsor may seek to obtain approval on an annual or other periodic basis of a schedule of planned events and, subsequently, an event plan, which would include conditions of approval that would govern hours of operation and noise levels, similar to the requirements that otherwise would be imposed by individual event permits issued pursuant to the Police Code.

Events in the proposed open spaces would also be subject to the Port of San Francisco's adopted Good Neighbor Standards, as described above under *Regulatory Framework.* However, due to uncertainties as to the nature and extent of future outdoor events at the project site (including if amplified speech or music would occur at such events), the potential for the use of amplified sound equipment could result in noise levels in excess of standards established in the San Francisco General Plan or San Francisco Noise Ordinance. This would be a ***significant impact***.

MITIGATION MEASURE. Sensitive receptors may be subject to noise levels in excess of Section 2909 of the City's Police Code as a result of events with amplified sound in the project's public open spaces. Implementation of Mitigation Measure M-NOI-2.1: Noise Control Plan for Outdoor Amplified Sound, shown below, would reduce this impact but, due to the close proximity of residences to the public open spaces and uncertainties regarding the frequency, duration and character of events with amplified sound, this impact would continue to be considered significant and unavoidable with mitigation. Section 2909 of the City's Police Code establishes a not-to-exceed (except through a variance) noise standard for fixed sources of noise and from events subject to regulation by the Entertainment Commission. Event noise generated from a public property would be limited to 10 dBA above the local ambient noise level at a distance of 25 feet or more; event noise generated from a commercial property would be limited to 8 dBA above the local ambient at any point outside the property plane. In addition, compliance with Section 2909(d) would limit noise from outdoor activities in residential interiors to 45 dBA between 10:00 p.m. and 7:00 a.m. or 55 dBA between 7:00 a.m.

and 10:00 p.m. with windows open. Any variance to these limits granted pursuant to Section 2910 of the Police Code could only be approved through the Entertainment Commission hearing process required by Section 1060.1 of the Police Code or an approved event plan. Mitigation Measure M-NOI-2.1 would also require compliance with the Port's adopted "Good Neighbor" standards, unless the Port Commission makes a specific finding that a particular condition is unnecessary or infeasible. However, because a variance to the code may be sought and it is likely the following mitigation measure would not guarantee that the standards in the Noise Ordinance would be met with implementation of Mitigation Measure M-NO-2.1, Noise Control Plan for Outdoor Amplified Sound, and with compliance with Sections 47.2, 1060.1 and 2909 of the Police Code, periodic and temporary noise increases associated with special events would be reduced but, because their frequency, duration and character are not known at this time (e.g., some events could seek waivers from Police Code provisions and/or continue later than 10:00 p.m.), this impact would remain ***significant and unavoidable*** under CEQA, even though such Police Code exceedances would be subject to review and permitted**.**

M-NOI-2.1: *Noise Control Plan for Special Outdoor Amplified Sound.* To reduce potential impacts related to noise generated by events in project outdoor use areas, the project sponsor shall develop and implement a Noise Control Plan for operations at the proposed entertainment venues to reduce the potential for noise impacts from public address and/or amplified music. This Noise Control Plan shall contain the following elements:

- The project sponsor shall comply with noise controls and restrictions in applicable entertainment permit requirements for outdoor concerts, and shall comply with the Port of San Francisco's "Good Neighbor" standards, unless the Port Commission makes a specific finding that a particular condition is unnecessary or infeasible.
- Speaker systems shall be directed away from the nearest sensitive receptors to the degree feasible.
- In order to limit or prevent sleep disturbance, events with amplified sound shall, to the extent reasonable and appropriate given the nature and context of the event, end at 10:00 p.m.

STATIONARY OPERATIONAL NOISE IMPACTS ON OFFSITE LAND USES

Noise from stationary mechanical equipment would include onsite noise generated by HVAC units, emergency generators, and other building equipment. Operation of HVAC equipment at the proposed project buildings would be subject to Sections 2909(a) and (b) of the Noise Ordinance, which limit noise produced on residential or commercial properties to no more than 5 and 8 dBA, respectively, above the ambient at any point outside the property plane. Further, stationary operational noise is limited by Section 2909(d) of the Noise

Ordinance, which provides that noise from stationary equipment at residential interiors cannot exceed 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 45 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.). Depending on the size of the equipment, HVAC equipment can produce sound levels in the range of 70 to 75 dBA at 50 feet.[33] If HVAC equipment is located 50 feet from the property line, noise levels could be as high as 75 dBA at the property line. The property-line noise level could be higher or lower than this if the actual distance is less than or greater than 50 feet. With the ambient sound level at about 69 dBA, the potential exists for both the 5 dB and 8 dB property-line noise limits to be exceeded. This would be a ***significant*** impact.

At a distance of 100 feet, the distance to the residential uses at Mission Bay Block 1, noise from project HVAC equipment would be in the range of 64 to 69 dBA, assuming attenuation of 6 dB from the 50-foot HVAC noise levels, based on distance alone. Exterior-to-interior noise reduction is typically about 10 dB with windows open and up to about 25 dB with windows closed.[34] This indicates that interior noise at the nearest residences could be as high as approximately 59 dBA with windows open and 44 dBA with windows closed. This also indicates that HVAC noise from new project buildings (without the incorporation of attenuation measures) could result in an exceedance of the 55 dBA daytime (7:00 a.m. to 10:00 p.m.) and 45 dBA nighttime (10:00 p.m. to 7:00 a.m.) Noise Ordinance interior limits at nearby existing buildings. This would be a ***significant*** impact.

It is assumed that Seawall Lot 337 would include eight emergency generators, and Pier 48 would include two (for a total of 10 generators); however, the locations of the generators are not currently known with certainty. To provide a reasonable worst-case analysis, this analysis assumes that the locations of the generators would be at the perimeter of the project site. Under this assumption, the distances from the generators to the nearest sensitive land uses would be those shown in Table 4.F-6 (page 4.F-10).

Emergency generators create temporary and periodic noise from testing. Sound levels from generators vary, depending on the type of generator and the noise attenuation that has been incorporated into the design and placement. As described in Chapter 2, *Project Description*, emergency generators would operate an average of 50 hours per year. Given the temporary and periodic nature of emergency generator testing, generators would not permanently increase ambient noise levels; however, the generators would be subject to the interior noise standard from the City's Noise Ordinance of 55 dBA daytime and 45 dBA nighttime for residential land uses. Without accounting for noise attenuation, a single emergency generator (assuming the generators are not tested concurrently) may generate a sound level of up to 75 dBA at the

[33] Hoover and Keith. 2000. *Noise Control for Buildings, Manufacturing Plants, Equipment, and Products*. Houston, TX.

[34] Federal Highway Administration. 2011. *Highway Traffic Noise: Analysis and Abatement Guidance*. December.

nearest sensitive land use (residential uses at Mission Bay Block 1).[35] Given the analysis discussed above, noise in the residential sleeping or living rooms of offsite uses (e.g., in the Mission Bay Block 1 residences) could exceed 45 dBA between 10:00 p.m. and 7:00 a.m. and/or 55 dBA between 7:00 a.m. and 10:00 p.m. (Noise Ordinance Section 2909[d]). Further, these noise levels could also result in increases in ambient noise levels of 5 dB or more at property line of the equipment generating the noise (Noise Ordinance Section 2909[a]). This impact could be significant. However, compliance with Section 2909 of the Municipal Code could be accomplished by incorporating a variety of attenuation measures to reduce noise levels to below the 55 dBA daytime and 45 dBA nighttime interior standards and ensure that any noise increase from stationary equipment at the property line would not exceed the 5 dB and 8 dB limits above ambient noise levels, as determined by a qualified acoustical consultant.

Acoustical treatments may include, but are not limited to:

- Construction of enclosures around noise-generating mechanical equipment
- Installation of relatively quiet models of mechanical equipment
- Use of muffler or silencers on equipment exhaust fans
- Orientation or shielding of equipment to protect sensitive uses to the greatest extent feasible
- Placement of barriers around the equipment
- Limiting the testing of emergency generators to daytime hours (8:00 a.m. to 6:00 p.m.)
- Limiting the testing of emergency generators such that only one generator is tested at a given time to limit the effects of additive noise from the equipment.

STATIONARY OPERATIONAL NOISE IMPACTS ON ONSITE LAND USES

Project buildings would include HVAC equipment that could affect proposed project residences. As discussed above, stand-by emergency power generators may also be located in several buildings associated with the project. As discussed above, noise from stationary mechanical equipment can produce sound levels in the range of 70 to 75 dBA at 50 feet. Thus, it is possible that HVAC equipment or emergency generator testing at proposed project buildings could result in excessive noise. CCR Title 24 requires new residences to incorporate noise insulation to attenuate existing exterior noise such that interior noise levels are below 45 dBA L_{dn}. As required by Mitigation Measure M-NOI-2.2, stationary equipment would be subject to the City Noise Ordinance (specifically, Section 2909[a], 2909[b], and 2909[d], which limit the project-related increase in noise to 5 dB and 8 dB for residential and commercial/industrial uses at the property

[35] This value assumes an L_{max} of 81 dBA for a generator (see Table 4.F-11) and an attenuation of 6 dBA over a distance of 100 feet.

line, respectively, and interior noise levels to 45 dBA between 10:00 p.m. and 7:00 a.m. and 55 dBA between 7:00 a.m. and 10:00 p.m.). Mitigation Measure M-NOI-2.2 requires compliance with the City Noise Ordinance through acoustical treatments to attenuate noise from stationary sources (e.g., installing construction enclosures or barriers around equipment, using quiet models of equipment, incorporating mufflers or silencers on exhaust fans, etc.) such that interior noise limits are met under both existing and future noise conditions, accounting for foreseeable changes in noise conditions in the future (i.e., changes in onsite building configurations and locations of sensitive residential receptors). Acoustical treatments required by Mitigation Measure M-NOI-2.2 would ensure that project equipment noise levels would comply with Police Code Section 2909 requirements with respect to both existing offsite and future onsite land uses. Therefore, with implementation of Mitigation Measures M-NOI-2.2, potential noise impacts resulting from stationary equipment would be ***less than significant*** for onsite uses.

MITIGATION MEASURE. As specified in Mitigation Measure M-NOI-2.2: Stationary Equipment Noise Controls, application of such noise attenuation measures would ensure that noise from stationary equipment would not exceed the limits of the City's Noise Ordinance Section 2909(a) and (b) limits of 5 dBA and 8 dBA at residential and commercial property lines, respectively, or the Section 2909(d) interior noise limit of 55 dBA daytime and 45 dBA nighttime for residential land uses at the Mission Bay Block 1 and new project residential buildings. Therefore, with incorporation of Mitigation Measure M-NOI-2.2: Stationary Equipment Noise Controls, noise from onsite stationary mechanical equipment would be ***less than significant.***

M-NOI-2.2: Stationary Equipment Noise Controls

Noise attenuation measures shall be incorporated into all stationary equipment (including HVAC equipment and emergency generators) installed on all buildings that include such stationary equipment as necessary to meet noise limits specified in Section 2909 of the Police Code. Interior noise limits shall be met under both existing and future noise conditions, accounting for foreseeable changes in noise conditions in the future (i.e., changes in onsite building configurations). Noise attenuation measures could include provision of sound enclosures/barriers, addition of roof parapets to block noise, increasing setback distances from sensitive receptors, provision of louvered vent openings, location of vent openings away from adjacent residential uses, and restriction of generator testing to the daytime hours.

TRUCK DELIVERY NOISE IMPACTS ON OFFSITE LAND USES

Truck deliveries to commercial uses and the Pier 48 industrial use, specifically analyzed as a proposed brewery use, associated with the proposed project would be anticipated to occur daily. Trucks used to pick up and deliver supplies at the project site would generate

intermittent noise (e.g., from engine idling, trailer-mounted refrigeration units, pallets dropping, the operation of forklifts, beeping from backup warning signals). Refer to Figure 2-15, *Proposed Parking Plan,* for the location of proposed loading docks. State law currently prohibits heavy-duty diesel delivery trucks from idling more than 5 minutes.[36] It is currently assumed that truck deliveries would occur 7 days per week, 24 hours per day. A maximum of 877 truck deliveries per day could occur throughout the project site (e.g., at the Pier 48 facility and along Terry A. Francois Boulevard and the future Long Bridge and Exposition Streets).

Although the City Noise Ordinance does not specifically regulate noise from delivery trucks, the Fixed Residential Interior Noise Limits, Section 2909(d), which are used to assess HVAC and generator noise impacts (i.e., noise levels above 45 dBA between 10:00 p.m. and 7:00 a.m. and 55 dBA between 7:00 a.m. and 10:00 p.m.), provide a reasonable standard for CEQA purposes for assessing noise from delivery trucks at a single location at sensitive receptors. Sections 2909(a) and (b) can also be used to assess truck delivery noise at a particular location. A significant impact related to a substantial temporary increase in noise would occur if noise were to be generated from a stationary source located on residential or commercial/industrial property that was 5 dB or 8 dB, respectively, above the ambient noise level at any point outside of the property line of the residential or commercial/industrial property where the noise is generated from. Typical hourly noise levels for loading dock operations range from 55 to 60 dBA L_{eq} and from 80 to 84 dBA L_{max} at a distance of 50 feet.[37]

The offsite residential land uses closest to a potential loading location would be the future residential development in Block 9A of the Mission Bay Redevelopment Plan area (see Figure 2-15, *Proposed Parking Plan*), immediately south of the project site along Mission Rock Street (although there are no immediate plans for construction at Block 9A), and the Mission Bay Block 1 residential uses, directly west of the project site. The future Block 9A development would be more than 100 feet away from the nearest potential delivery location, near the intersection of Terry A. Francois Boulevard and Mission Rock Street. The Mission Bay Block 1 development would be even farther away from the nearest potential loading dock location (more than 200 feet west of the loading dock location near the Long Bridge Street and Third Street intersection). At the Block 9A location, potential noise levels would be reduced from the range listed above (55 to 60 dBA L_{eq}) to approximately 52 to 57 dBA L_{eq} because of attenuation over distance alone. In addition, buildings within Block 9A would be shielded from the nearby delivery location by Block H of the proposed project, thereby further reducing noise levels. Because exterior noise levels at this location would be a maximum of approximately 57 dBA L_{eq} (not considering intervening buildings) and exterior noise levels are generally reduced at

[36] California Air Resources Board. 2006. Final Regulation Order – Requirements to Reduce Idling Emissions from New and In-Use Trucks, Beginning in 2008. October 16.

[37] Recon Environmental. 2015. Noise Report, Lilac Hills Ranch. Specific Plan, General Plan Amendment Rezone EIR. San Diego County, California. June 1.

interior locations by 20 dB (with standard construction materials) to up to 35 dB (with upgraded acoustical treatments),[38] interior noise levels at these residences would be less than the 45 dBA nighttime limit.

At the Mission Bay Block 1 residential uses, noise from the loading docks would be reduced to approximately 49 to 54 dBA L_{eq} at the façade of the closest building because of attenuation over distance alone. Because standard construction can typically provide an exterior-to-interior noise reduction of up to 20 dB,[39] interior noise levels would be much lower than the 49 to 54 dBA L_{eq} range. Further, because the ambient noise level in the project vicinity is estimated to be approximately 69 dBA L_{eq}, noise from loading docks at the aforementioned offsite residential receptors would not result in a 5 dB increase above ambient noise levels and, thus, would not result in a substantial temporary or permanent increase in noise in these areas. No other loading dock locations at the project site would affect existing or proposed offsite sensitive land uses. Based on the above, impacts related to truck deliveries would be ***less than significant***.

TRAFFIC NOISE IMPACTS ON ONSITE LAND USES

Implementation of the proposed project would introduce new noise-sensitive land uses (residential and commercial) to an area where future noise levels may exceed levels in the Land Use Compatibility Chart of the General Plan. Further, the project would increase traffic in the area, and traffic noise levels would subsequently increase to levels above existing conditions. Because the project would add traffic to adjacent roadway segments, some of which have high existing noise levels, future noise levels at proposed project residences must be analyzed and compared to applicable thresholds (as described in the *Methods for Analysis* section).

As with the analysis for *Traffic Noise Impacts on Offsite Land Uses*, presented above, this analysis uses the 60 dBA L_{dn} "satisfactory" noise level of the City Noise Element as the basis for the analysis (where up to a 5 dB increase is allowable for roadways segments with resultant noise levels below this noise level, and a 3 dB increase is allowed for roadway segments with resultant noise levels above this noise level). At this time, the exact distance between the roadway centerline and the proposed onsite residences is not known. However, a reasonable worst-case distance of 50 feet was modeled to ensure any potential impacts would be identified (refer to Table 4.F-15 on the following page for modeled noise levels at future onsite project receptors).

Under both the High Residential and High Commercial land use assumptions, proposed project residences would be located along Third Street and Mission Rock Street.

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[38] Federal Highway Administration. 2011. *Highway Traffic Noise: Analysis and Abatement Guidance*. December.

[39] Federal Highway Administration. 2011. *Highway Traffic Noise: Analysis and Abatement Guidance*. December.

TABLE 4.F-15. DIRECT TRAFFIC NOISE LEVELS AND POTENTIAL IMPACTS AT A DISTANCE OF 50 FEET FROM ONSITE RECEPTORS

Roadway	Segment	Existing dBA L_{dn} at 50-foot Distance	Existing plus-Project (2020) dBA L_{dn} at 50-foot Distance	Difference (dB)	Possibility of Significant Impact?	Impact Due To
Mission Rock Street	Terry A. Francois Boulevard to Third Street	50	62	12	**Yes**	Substantial Permanent Increase
Third Street	Terry A. Francois Boulevard to Channel Street	61	63	2	No	NA
Third Street	Channel Street to Mission Rock Street	61	63	2	No	NA
Third Street	Mission Rock Street to Mission Bay Boulevard	61	62	1	No	NA

Notes:

Bold = possibility of significant impact

Note that an increase of 5 dBA is clearly noticeable in any environment and therefore potentially significant regardless of existing noise levels; an increase of 3 dBA, although barely noticeable, is considered a substantial increase in degraded noise environments (e.g., existing or resulting noise levels greater than 60 dBA L_{dn}).

Proposed residential uses located along the segments of Third Street adjacent to the project site (refer to Table 4.F-15, on the previous page) may experience noise levels greater than the City Noise Element "satisfactory" level of 60 dBA L_{dn} (i.e., ranging from 62 to 63 dBA L_{dn}). However, the project's contribution to the noise levels along these segments ranges from 1 to 2 dB, which is less than the allowable increase of 3 dB and would not be perceptible. As such, project traffic noise along these segments would be less than significant. Noise levels along Mission Rock Street from Terry A. Francois Boulevard to Third Street would also be in excess of 60 dBA L_{dn} (approximately 62 dBA L_{dn}), resulting in the exposure of proposed residences along these segments to noise levels in excess of the "satisfactory" level as well. Along this segment, the project-related increase in traffic noise was modeled to be 12 dB. This would be a ***significant*** impact.

CCR Title 24 requires new residences to incorporate noise insulation features to reduce interior noise levels below 45 dBA L_{dn} according to existing noise conditions, not future projected noise conditions. Therefore, to ensure new sensitive receptors are not substantially affected by project-generated traffic noise, future project residences along Mission Rock Street from Terry A. Francois Boulevard to Third Street must be designed to meet the interior noise standard in CCR Title 24 given the anticipated 12 dBA L_{dn} increase in noise levels in this area. Mitigation Measure M-NOI-2.3: Design of Future Noise-Sensitive Uses requires that a noise study be prepared by a qualified acoustician for the project's residential uses proposed along Mission Rock Street in order to determine what noise attenuation measures are necessary to incorporate into building design in order to meet the CCR Title 24 interior noise standard given the projected 12 dB increase in noise along that segment.

MITIGATION MEASURE. Mitigation Measure M-NOI-2.3 requires that noise attenuation measures be incorporated into these units as necessary to ensure that interior noise levels would be maintained at acceptable levels, even with future traffic noise increases. With incorporation of noise attenuation approaches into the project design as necessary in order to meet the 45 dBA interior noise standard of Title 24, as specified in Mitigation Measure M-NOI-2.3, impacts to future residents in buildings on Mission Rock Boulevard between Terry A. Francois Boulevard and Third Street would be reduced to a ***less-than-significant*** level.

M-NOI-2.3: Design of Future Noise-Sensitive Uses.

Prior to issuance of a building permit for a residential building on Mission Rock Boulevard between Terry A. Francois Boulevard and Third Street, a noise study shall be conducted by a qualified acoustician to determine the need to incorporate noise attenuation measures into the building design in order to meet Title 24's interior noise limit for residential uses as well as the City's (Article 29, Section 2909(d)) 45 dBA (L_{dn}) interior noise limit for residential uses. This evaluation shall account for the projected increase in traffic noise as a result of

project traffic along Mission Rock Boulevard between Terry A. Francois Boulevard and Third Street and any new shielding benefits provided by surrounding buildings that exist at the time of development, future cumulative traffic noise increases on adjacent roadways, existing and planned stationary sources (i.e., emergency generators, HVAC, etc.), and future noise increases from all known cumulative projects located with direct line-of-sight to the project building.

Although designing the project to ensure compliance with applicable noise standards would ensure that individual onsite residences would not experience excessive noise, the proposed project's traffic would still result in a substantial permanent increase in ambient noise levels along the segment of Mission Rock Boulevard between Terry A. Francois Boulevard and Third Street (the 12 dB increase which is in excess of the allowable 3 dB). This substantial permanent increase in ambient noise that is expected to occur along the segment of Mission Rock Street from Terry A. Francois Boulevard to Third Street could not be reduced to less-than-significant levels because no feasible mitigation measures would be able to reduce the 12 dB increase resulting from the project's traffic along this segment to less than the allowable 3 dB increase. Therefore, although traffic noise impacts to future project residences would be less than significant with implementation of Mitigation Measure M-NOI-2.3 and M-AQ-2.3 could reduce traffic noise levels by reducing vehicle trips, traffic noise impacts related to a substantial permanent increase in ambient noise would be ***significant and unavoidable*** because it cannot be stated with certainty that M-AQ-2.3 would reduce vehicle trips to the degree necessary to reduce traffic noise levels to less than significant.

TRUCK DELIVERY NOISE IMPACTS ON ONSITE LAND USES

With respect to delivery trucks, if deliveries and associated unloading/loading activities occur in proximity to future residential buildings and during the nighttime hours, future residents could be subject to sleep disturbance by noise from these activities. As described above for offsite noise effects from truck deliveries, typical hourly noise levels from loading dock operations range from 55 to 60 dBA L_{eq} and 80 to 84 dBA L_{max} at a distance of 50 feet.[40] As described in the discussion of truck delivery impacts on offsite land uses, although the City Noise Ordinance does not specifically regulate noise from delivery trucks, the Fixed Residential Interior Noise Limits, Section 2909(d), which are used to assess HVAC and generator noise impacts (i.e., noise levels above 45 dBA between 10:00 p.m. and 7:00 a.m. and 55 dBA between 7:00 a.m. and 10:00 p.m.), provide a reasonable standard for CEQA purposes for assessing noise from delivery trucks at a specific location at sensitive receptors. Sections 2909(a) and (b) can also be used to assess truck delivery noise. A significant impact related to a substantial temporary

[40] Recon Environmental. 2015. *Noise Report, Lilac Hills Ranch*. Specific Plan, General Plan Amendment Rezone EIR. San Diego County, California. June 1.

increase in noise would occur if noise were to be generated from a stationary source located on residential or commercial/industrial property that was 5 dB or 8 dB, respectively, above the ambient noise level at any point outside of the property line of the residential or commercial/industrial property generating the noise.

Some onsite residential land uses would be located immediately adjacent to potential truck delivery locations on the project site (along Exposition Street, Terry A. Francois Boulevard, Bridgeview Street, and Long Bridge Street). Because these residences may be closer than 50 feet from delivery trucks, noise levels could reach a maximum (L_{max}) of 80 to 84 dBA. Average noise levels would be in the range of 55 to 60 dBA L_{eq}. Although the ambient noise level from future onsite project uses cannot be defined, the current ambient noise level in the project vicinity is estimated to be approximately 69 dBA L_{eq}. Temporary and short-duration truck deliveries would not be expected to result in noise levels that would be 5 dB above ambient noise levels. Further, exterior noise levels are generally reduced at interior locations by at least 20 dB with standard construction materials. In addition, the California Air Resources Board limits the idling of diesel trucks (over 10,000 pounds) to no more than 5 minutes, and this rule would help minimize truck idling noise in loading areas.

However, audible warnings are required by Cal-OSHA to be at least 5 dBA above ambient noise levels. These devices are highly directional in nature, and when in reverse, the trucks and the warning alarm would be directed towards the loading area and adjacent commercial-office structures. Audible warnings are, of course, intended to warn persons who are behind the vehicle when it is backing up, and could cause sleep disturbance if they occur during the nighttime (including early morning) hours near residential uses, a potentially significant noise impact. Therefore, interior noise levels from truck delivery operations would result in a substantial temporary or permanent increase in noise in excess of the applicable standards; in addition, onsite residential uses would be substantially affected by future noise levels at the project site.

Locating loading areas on the sides of commercial-office buildings that face away from residential buildings to the extent feasible or designing loading areas with noise shielding (preferably enclosures) or restricting these activities to the daytime hours (7:00 a.m. to 8:00 p.m.), as specified in Mitigation Measure M-NOI-2.4: Design of Future Noise-Generating Uses, first bullet, would reduce the significant impact related to the potential for sleep disturbance of future residents from this noise source to a ***less-than-significant*** level.

MITIGATION MEASURE. Noise associated with trash or refuse facilities for both future residential and commercial-office uses could disturb or annoy any future nearby residents. If such facilities were to operate during nighttime hours, those operations could result in sleep disturbance, resulting in a significant impact. Such noise is typically associated with trash-dumping activities, operation of trash compactors and garbage truck collection activities (including truck noise, operation of motors that lift trash containers, banging of containers

during trash collection activities, and audible warnings when trucks reverse). Trash and refuse facilities should be located to minimize noise impacts to residential buildings. They can also be designed to avoid or minimize the potential for noise disturbance or annoyance at future residences with incorporation of appropriate noise-shielding measures, as specified in Mitigation Measure M-NOI-2.4, first bullet. This would reduce significant noise conflicts from this future use to a ***less-than-significant*** level.

Noise associated with parking cars includes engines starting and car doors slamming. Such noise can cause annoyance at adjacent residential uses if it is concentrated in one area (i.e., a surface parking lot located adjacent to residences), and if it occurs during the evening or nighttime hours, it could cause sleep disturbance, resulting in a significant impact. Parking is proposed in a parking garage located between Mission Rock Street and Long Bridge Street, with residential land use to the garage's south under the High Commercial Land Use assumption and to the south and north under the High Residential Land Use assumption. Under both land use assumptions, residential dwellers could be subject to car noise in the parking garage. Parking facilities can be designed to avoid or minimize the potential for such parking-related noise disturbance or annoyance at future residences with incorporation of appropriate noise-shielding measures into any future parking structures, as specified in Mitigation Measure M-NOI-2.4, second bullet. This would reduce significant noise conflicts from this future use to a ***less-than-significant*** level.

M-NOI-2.4 Design of Future Noise-Generating Uses near Residential Uses.

Future land uses shall be designed to minimize the potential for sleep disturbance (defined as exceeding 45 dBA at residential interiors during the hours of 10 p.m. to 7 a.m.) at any future adjacent residential uses. Design approaches including, but not limited to, the following shall be incorporated into future development plans to minimize the potential for noise conflicts of future uses on the project site:

- Design of Future Noise-Generating Uses. To reduce potential conflicts between sensitive receptors and new noise-generating land uses located adjacent to these receptors, exterior facilities such as loading areas/docks, trash enclosures, and surface parking lots shall be located on the sides of buildings facing away from existing or planned sensitive receptors (e.g., residences). If this is not feasible, these types of facilities shall be enclosed or equipped with appropriate noise shielding.
- Design of Future Above-Ground Parking Structure on Block D2. For parking garage on Block D2, the sides of the parking structures facing adjacent or nearby existing or planned residential uses shall be designed to shield residential receptors from noise associated with parking cars.

Impact NOI-3. Construction of the project would expose persons to or generate excessive ground-borne vibration or ground-borne noise levels related to annoyance. Construction of the project could expose persons to or generate excessive ground-borne vibration or ground-borne noise levels related to damage to buildings. (Significant and Unavoidable with Mitigation for Annoyance; Less than Significant with Mitigation for Building Damage.)

This impact discussion addresses issues related to ground-borne vibration from construction activity. Ground-borne vibration generated by traffic traveling on roadways is usually below the threshold of perception at adjacent land uses, unless there are severe discontinuities, such as large potholes, in the roadway surface. This analysis assumes that roadways in the project area are or will be reasonably maintained, with no severe discontinuities. Therefore, no analysis of vibration generated by the project's operational traffic is provided. Construction-related vibration is discussed below. The damage threshold used to assess potential damage to historic buildings is 0.25 in/sec PPV (per Table 4.F-3, page 4.F-7), and the annoyance threshold used to assess potential annoyance-related vibration effects is 0.10 in/sec PPV (or the "strongly perceptible" level for continuous or frequent intermittent sources).

CONSTRUCTION VIBRATION IMPACTS ON OFFSITE RECEPTORS

Construction of the project would require the use of impact devices (e.g., pile drivers, impact hammers/hoe rams, jackhammers), which could generate substantial vibration. During construction of project buildings and foundations, pile driving would be required to drive building foundations into the ground. Note that the adjacent Pier 50 office building, which would be more than 100 feet from pile-driving activities, is considered a potentially historic building; this is the closest potentially historic building located offsite (Caltrans category of "Historic and Some Old Buildings" from Table 4.F-3, page 4.F-7). Another historic building, San Francisco Fire Department Engine Co. No. 30, is also located nearby, approximately 250 feet south of the anticipated pile-driving activities.

PIER 48 PILE DRIVING

As discussed in Chapter 2, *Project Description*, pile driving would be required for the seismic upgrade and structural rehabilitation of the aprons around Pier 48 as well as for the buildings and streets at Seawall Lot 337. The Pier 48 seismic work requires 106 new piles located below a new heavily reinforced concrete apron. As part of the seismic work, approximately 675 existing 24-inch round creosote-treated wood piles would be extracted with a vibratory extractor to make way for the new piles. The new pile scope includes both precast concrete and cylindrical steel-cased piles. Approximately 62 precast concrete piles would be installed. These are anticipated to be 30 feet in length and either 18 or 24 inches square. Their installation would require approximately 100 blows per pile and approximately three to four piles per day are expected to be installed over the course of about two months.

Approximately 44 steel-cased, concrete-filled piles would also be installed. These are anticipated to be approximately 120 feet in length, either 4 feet or 6 feet in diameter, and would not require impact pile driving as the steel casings are installed with a vibratory hammer. After the casings are installed, each pile would be drilled to remove soil, and the soil replaced with reinforced concrete. This scope would require about 12 months to complete, with an average one to two piles being completed per day.

SEAWALL LOT 337 PILE DRIVING

The buildings and streets at Seawall Lot 337 would require pile driving. For the buildings, steel H-piles, an average range of 175 to 230 feet in length, would be installed with a pile driver. In total, for all of the proposed buildings on Seawall Lot 337, approximately 3,880 piles would be required. For the streets, steel H-piles measuring approximately 175 feet in length would be installed with a pile driver. Approximately 500 total piles would be needed to support the streets. Steel H-piles would also be installed to support the Promenade and boardwalk at China Basin Park. It is assumed that approximately 200 piles with a length of 175 feet would be required in this area. During the early phases of the construction periods, an average of six to 10 piles would be installed per day.

Other equipment used during project construction, such as jackhammers, can also result in ground-borne vibration but to a lesser extent than pile driving (vibration levels at 50 feet for a pile driver and jackhammer are 0.26 in/sec PPV and 0.012 in/sec PPV, respectively).

Ground-borne vibration rarely causes damage to modern buildings. Potential damage to extremely fragile historic buildings could occur at 0.08 in/sec PPV, damage to fragile buildings could occur at 0.1 in/sec PPV, and damage to some historic and old buildings could occur at 0.25 in/sec PPV (see Table 4.F-3, page 4.F-7). The adjacent Pier 50 office building, which would be located more than 100 feet away from pile-driving activities, is considered a potentially historic building; the damage threshold for this building would be 0.25 in/sec PPV. Note that another historic building, San Francisco Fire Department Engine Co. No. 30, is also located nearby, approximately 250 feet south of the anticipated pile-driving activities. Worst-case vibration levels at a distance of 100 feet (at the Pier 50 office building) from pile driving would be approximately 0.19 in/sec PPV, which is less than the damage threshold of 0.25 in/sec PPV for old or historic buildings. At greater distances, including at the San Francisco Fire Department Building located 250 feet away, vibration levels would be even lower. Therefore, vibration associated with project construction is not predicted to result in impacts on surrounding buildings.

As shown in Table 4.F-2 (page 4.F-6), the in/sec PPV values at 50 feet for a pile driver and jackhammer are 0.2595 and 0.0124 in/sec PPV, respectively. Given the data in Table 4.F-4 (page 4.F-7), the PPV value (in/sec) for a pile driver at a distance of 50 feet would be considered more than strongly perceptible but less than severe. In addition, the operation of heavy-duty,

nonimpact construction equipment could also generate localized ground-borne vibration and noise at buildings adjacent to the construction site. The PPV (in/sec) values at 50 feet for some of the nonimpact equipment required for project construction would be 0.0315, 0.0269, and 0.0011 in/sec PPV, respectively, for a large bulldozer, loader truck, and a small bulldozer. For example, the ground vibration levels that could be generated by a large bulldozer and a loaded truck would be between Caltrans' annoyance-potential characterizations of "barely perceptible" and "distinctly perceptible" (see Table 4.F-4, page 4.F-7). Note that a vibration level in excess of the "strongly perceptible" (0.10 in/sec PPV) level is considered to be a significant impact for the purposes of this analysis.

There are several offsite industrial and nonresidential land uses directly east and south of the project site (such as the Public Safety Building south of Mission Rock Street and uses at the Pier 50 office building). Such land uses are not typically considered to be sensitive to ground-borne vibration; thus, impacts on these land uses would be less than significant. The nearest existing offsite land uses that could be considered sensitive to ground vibration are located approximately 100 feet west of the project site (i.e., Mission Bay Block 1 residential uses located along Third and Fourth Streets between Channel and Long Bridge Streets). At this distance, ground vibration from vibratory pile driving, jackhammering, and nonimpact construction activities is predicted to be less than 0.10 in/sec PPV (i.e., less than strongly perceptible.) Vibration from impact pile driving, however, would exceed the 0.10 in/sec strongly perceptible threshold at 100 feet, as shown in Table 4.F-2 (page 4.F-6).

A distance of 100 feet would be a reasonable worst-case scenario because this assumes that pile driving would occur on the boundary of the project site. Pile driving would occur throughout the project site, including near the project boundary. Approximately 4,600 total piles for the buildings, pile-supported streets, and Pier 48 would be installed as part of project construction. Although pile driving could occur at the boundary of the project site, pile driving near the boundary would occur only for a short period of time compared with the total pile-driving period for the project; most of the time, it would be occurring more than 100 feet from Mission Bay Block 1. Nevertheless, because pile driving could occur as close as 100 feet from nearby residences, it could result in vibration that would exceed the 0.10 in/sec "strongly perceptible" threshold at the closest residences. Pile driving would be less than strongly perceptible (approximately 0.037 in/sec PPV and therefore less than significant) at the next-nearest sensitive land use, the residences on the western side of Mission Bay Block 1 (300 feet west of the project site). However, because vibration from pile driving would be greater than "strongly perceptible" at some sensitive receptors, vibration impacts from pile driving on the project site would be significant.

MITIGATION MEASURE. Implementation of Mitigation Measure M-NOI-3.1, Pile-Driving Control Measures – Annoyance, would reduce potential vibration impacts on residences of the Mission Bay Block 1 residences by requiring the use of "quiet" pile-driving technology and limiting pile

driving to areas where the least disturbance of existing sensitive land uses would occur. However, pile driving is expected to occur close to the project boundary and Mitigation Measure M-NOI-3.1 may not be feasible at all times. The use of "quiet" pile-driving technology may not be possible because of site-specific soil conditions or specific technical or structural limitations at the project site. Specifically, pile driving would occur along Third Street and Mission Rock Street; the project boundary on Third Street is approximately 100 feet from the residential uses at Mission Bay Block 1. Thus, absent the use of "quiet" pile-driving technology, vibration from pile driving at these residences would be "strongly perceptible" and significant. No other feasible mitigation actions are available to further reduce vibration impacts on these sensitive receptors from pile driving. Therefore, this impact is ***significant and unavoidable with mitigation***.

M-NOI-3.1: *Pile-Driving Control Measures – Annoyance.* To reduce impacts associated with pile driving, a set of site-specific vibration attenuation measures shall be implemented under the supervision of a qualified acoustical consultant during the project construction period. These attenuation measures shall include as feasible, in consideration of technical and structural requirements and conditions, the following control strategy, as well as any other effective strategies to the extent necessary to achieve a PPV vibration level at neighboring properties of less than the strongly perceptible level of 0.10 in/sec.

The project sponsor shall require the construction contractor to limit pile-driving activity so that the PPV vibration level at neighboring uses is less than 0.10 in/sec to the extent it is practical and necessary and, to the extent it is practical, implement "quiet" pile-driving technology, such as predrilling piles, using sonic pile drivers, or using more than one pile driver to shorten the total duration of pile driving.

CONSTRUCTION VIBRATION IMPACTS ON ONSITE RECEPTORS

Impact pile driving would occur in proximity to Pier 48 and have the potential to result in vibration-related damage. Because Pier 48 fits in the Caltrans vibration building category of "Historic and Some Old Buildings" (refer to Table 4.F-3, page 4.F-7), a damage potential threshold of 0.25 in/sec PPV has been used in this analysis, based on the Caltrans criteria shown in Table 4.F-3 (page 4.F-7). Vibration in excess of this 0.25 in/sec PPV threshold could occur if pile driving were to occur within about 85 feet of Pier 48. Because pile driving would need to occur close to the existing building structure at distance less than 85 feet, this impact could be significant. However, the in-water pile driving would be conducted in accordance with the Port of San Francisco *Port-wide Maintenance Manual*[41] and employ a vibratory hammer to the greatest

[41] Port of San Francisco. 2016. *Port-wide Maintenance Manual*. April.

extent possible to minimize hydroacoustic impacts. When use of an impact hammer is necessary to finish pile driving and achieve the required final depth, the impact hammer would be equipped with a 12-inch-thick wooden block for cushioning and employ a "soft start" technique.[42]

It is the Port of San Francisco's experience that in-water pile driving, as proposed at the Pier 48 aprons, consistent with the Port's maintenance procedures, has not resulted in irreparable structural damage to piers or structures from vibration. The Port has confirmed that the proposed pile replacement associated with Pier 48 would be consistent with the protocols and plans associated with other in-water pier replacement projects that the Port has performed along its piers where the buildings had similar structural characteristics.[43]

With regard to potential vibration-related annoyance, new commercial uses and residences constructed as part of the proposed project could be occupied while construction is still occurring at the project site. These new commercial uses and residences would be located closer to construction activities than existing commercial uses and residences. Because of the length of the construction schedule, it is possible that there could be occupied businesses and residences on the project site while pile-driving or other equipment could be operating in the vicinity. Pile driving would most likely occur within 175 feet of new commercial uses and residences on the project site, and vibration would be strongly perceptible. Thus, pile driving could result in ground vibration that could disturb new commercial uses and residences, and this impact could be significant.

MITIGATION MEASURE. Implementation of Mitigation Measure M-NOI-3.1, Pile-Driving Control Measures – Annoyance, described previously, proposed for the vibration impacts on offsite receptors, would partially mitigate vibration impacts on new onsite residential and commercial uses. However, because the project site is a single confined area, pile driving could be necessary within 175 feet of new occupied commercial uses and residences. Further, because pile driving may need to occur within 100 feet of Pier 48, including not just the in-water pile-driving that as explained above would be subject to the Port's standard procedures for such in-water work, but also pile-driving associated with Seawall 337 and surrounding street areas, the potential exists for vibration-related damage to occur at this historic building. Implementation of Mitigation Measure M-NOI-3.2, Pile-Driving Vibration Control Measures – Damage, described below, would reduce potential damage-related vibration impacts. Given the measure's requirement for monitoring to ensure that vibration at potentially affected onsite buildings (Pier 48) would be limited to levels that have been recommended by an expert building evaluation team, building

[42] Port of San Francisco. 2017. Memo to Erin Efner from Joe Roger, senior structural engineer. Subject: Pier 48 Vibration Resulting from Pile Replacement Authority. March 24.

[43] Port of San Francisco. 2017. Memo to Erin Efner from Joe Roger, senior structural engineer. Subject: Pier 48 Vibration Resulting from Pile Replacement Authority. March 24.

damage would not be expected to occur. The impact related to potential vibration-related damage would be reduced to ***less-than-significant*** levels with mitigation. However, even with implementation of Mitigation Measures M-NOI-3.1, Pile Driving Control Measures – Annoyance, and M-NOI-3.2, Pile Driving Vibration Control Measures, vibration impacts related to annoyance at onsite uses would be ***significant and unavoidable***.

M-NOI-3.2: *Pile-Driving Vibration Control Measures – Damage.* To reduce the potential for damage to Pier 48, the following measures shall be implemented:

- The Port of San Francisco shall be notified in writing prior to construction activity that construction may occur within 100 feet of the Pier 48 buildings.
- The project sponsor shall retain a structural engineer, an architectural historian, and a licensed historical architect (hereafter referred to as the building evaluation team) to evaluate potentially affected buildings and determine their susceptibility to damage. The structural engineer shall evaluate the building structure. The architectural historian and licensed historical architect shall evaluate architectural elements. This building evaluation team shall then establish building-specific vibration thresholds that will (a) identify the level of vibration the affected historic buildings will tolerate so as to preclude structural damage to the building of a nature that would result in material damage to any historic features of the buildings, and (b) identify the level of vibration at which cosmetic damage may begin to occur to buildings.
- The building evaluation team shall inventory and document existing cracks in paint, plaster, concrete, and other building elements.
- The building evaluation team shall develop a ground-borne vibration monitoring plan that will include monitoring vibration at the buildings of concern to determine if the established thresholds are exceeded.
- The project sponsor shall retain a qualified acoustical consultant or engineering firm to implement the vibration monitoring plan at Pier 48. As part of the monitoring plan, the consultant shall conduct regular periodic inspections for cosmetic damage to each building within 160 feet of planned ground-disturbing activity on the project site.
- Should vibration levels be observed in excess of the cosmetic damage threshold or cosmetic damage be observed below that level, the driving of piles within 100 feet of the Pier 48 structure (or within the impact distance determined by the study of building-specific vibration thresholds, per second bullet above, whichever distance is shorter) shall be halted until measures are implemented to prevent cosmetic damage to the extent feasible. These measures include use

of alternative construction techniques, including, but not limited to, use of pre-drilled piles if soil conditions allow, use of smaller, lighter equipment, using vibratory hammers in place of impact hammers, and using pile cushioning or equipping the impact hammer with wooden cushion blocks to increase the period of time over which the energy from the driver is imparted to the pile. Should cosmetic damage to a building occur as a result of ground-disturbing activity on the site, notwithstanding the use of alternative construction techniques, the building(s) shall be remediated to its pre-construction condition at the conclusion of ground-disturbing activity on the site.

- Should vibration levels be observed that reach the threshold designed to protect historic buildings from material damage to historic features, pile-driving within impact distances of the Pier 48 building, as determined by the building evaluation team, shall be halted and a structural bracing program or other appropriate protective measures for the potentially affected buildings shall be designed by the building evaluation team and implemented by the project sponsor. The structural bracing program or other protective measures shall be designed to prevent damage to the potentially affected buildings that could materially impair their historic resource status consistent with CEQA Guidelines Section 15064.5(b)(2). In addition, the structural bracing program shall be consistent with the proposed rehabilitation of the Pier 48 buildings and meet the Secretary of the Interior's Standards for Rehabilitation.
- Following completion of construction, the project sponsor shall conduct a second inspection to inventory changes in existing cracks and new cracks or damage, if any, that occurred as a result of pile driving. If new damage is found, then the project sponsor shall promptly arrange to have the damage repaired in accordance with recommendations made by the building evaluation team.

CUMULATIVE IMPACTS

The geographic scope of analysis for cumulative noise and vibration construction impacts and stationary noise sources encompasses reasonably foreseeable projects within approximately 900 feet of the project site. Beyond 900 feet, the contributions of noise from other projects would be greatly attenuated through both distance and intervening structures, and their contribution would be expected to be minimal. For cumulative vehicular noise impacts, cumulative noise increases would result primarily from increased traffic on the local roadway network. Cumulative plus-project traffic data, which include existing and future developments as well as other current projects, probable future projects, and projected future growth within the city through 2040, were used to estimate the cumulative operational noise increases.

Impact C-NOI-1. Construction activities for the proposed project, in combination with other past, present, and reasonable future projects in the city, would result in a substantial temporary increase in noise or noise levels in excess of the applicable local standards. (Significant and Unavoidable with Mitigation)

With regard to cumulative construction noise impacts, the closest reasonably foreseeable projects in the vicinity of the project site are Mission Bay Blocks 3E, 4E, 7E, 7W, 9, and 9A (see Figure 4-1 in Chapter 4, *Environmental Setting and Impacts*).

As discussed for Impact NOI-1, the Noise Ordinance for construction limits noise from individual pieces of powered construction equipment to 80 dBA L_{max} at a distance of 100 feet, except for impact equipment (note that average or L_{eq} noise levels would be even lower). Noise from impact equipment is not limited by the Noise Ordinance as long as it is equipped with appropriate noise control features, as recommended by the manufacturers and approved by the Director of Public Works or the Director of Building Inspection. The construction equipment for other projects in the vicinity of the project site would be similar to the equipment proposed for construction of the project. Therefore, it is likely that no individual piece of nonimpact equipment associated with construction of the foreseeable projects would violate the Noise Ordinance. If nearby projects utilize impact equipment, it would need to be equipped with noise control features to be in compliance with the City's Noise Ordinance. Further, according to the City Noise Ordinance, construction activities are generally prohibited between the hours of 8:00 p.m. and 7:00 a.m.

As also discussed under Impact NOI-1, combined noise levels from the loudest pieces of equipment operating simultaneously during construction of the project could be as high as 88 dBA L_{eq} at offsite residential uses in Mission Bay. The City uses the FTA general assessment construction noise criterion (90 dBA daytime 1-hour L_{eq}) to assess potential impacts for combined construction noise. Project construction noise could result in a noise level of 88 dBA L_{eq} at offsite uses, and the simultaneous construction of other projects in the vicinity could combine with this already high noise level to result in cumulative construction noise levels greater than 90 dBA L_{eq} (1 hour).

Because combined construction noise levels from project construction at the nearest sensitive land use (Channel Mission Bay Apartments) could be up to 88 dBA L_{eq} and the ambient noise level near the project site was conservatively estimated to be approximately 69 dBA L_{eq}, a substantial temporary increase in noise could occur. Comparing the modeled combined construction noise level of approximately 88 dBA L_{eq} at 100 feet from construction activity to the ambient noise level of 69 dBA L_{eq}, project construction could result in noise levels that would be 19 to 25 dB greater than the existing ambient noise level.

Construction activity associated with other projects located near the proposed project would result in similar noise levels and combine with project construction noise to result in even greater overall noise levels. Because construction noise from the project would exceed the

ambient noise level at onsite residences by more than 10 dB, it can be assumed that the combined noise level from all construction projects in the area would also result in noise levels of more than 10 dB above ambient conditions. Therefore, the cumulative construction noise impact related to a substantial temporary increase in noise could be significant. Because project construction would result in noise levels of more than 10 dB over ambient conditions, the project would make a cumulatively considerable contribution to this cumulative impact (substantial temporary increase in noise). Further, although construction of the development projects would generally comply with the City Noise Ordinance (e.g., abiding by hour limitations, using necessary control measures on impact equipment, ensuring no piece of equipment results in noise in excess of 80 dBA L_{eq} at a distance of 100 feet), combined noise from project construction and other adjacent projects may result in overall noise levels in excess of 90 dBA L_{eq} at sensitive receptors. As such, cumulative impacts from construction noise could be significant, and the project's contribution to this potential impact would be considered cumulatively considerable.

Although Mitigation Measure M-NOI-1, *Prepare and Implement a Construction Noise Control Plan to Reduce Construction Noise at Noise-Sensitive Land Uses*, described above under Impact NOI-1, would reduce construction noise levels as well as the severity of construction noise impacts on sensitive receptors, because of the project's proximity to offsite receptors and adjacent future construction projects, it would not be possible to guarantee that the cumulative noise level at nearby sensitive receptors would be less than 90 dBA L_{eq}. It would also not be possible to reduce the level of noise from construction activity compared with the ambient noise level. Therefore, even with incorporation of Mitigation Measure M-NOI-1, which would reduce the severity of the project construction noise impact, cumulative construction noise impacts would be ***significant and unavoidable with mitigation***.

Impact C-NOI-2. Construction activities associated with project-related development, in combination with other past, present, and reasonable future projects in the city, would expose sensitive receptors to excessive ground-borne vibration related to annoyance and could result in similar impacts related to damage to buildings. (Significant and Unavoidable with Mitigation for Annoyance)

As discussed above for Impact NOI-3, ground-borne vibration generated by traffic traveling on roadways is usually imperceptible at adjacent land uses (and far below the "distinctly perceptible" vibration level, which is often considered as the vibration annoyance threshold). Thus, there would be no cumulative vibration impacts related to vehicle traffic resulting from foreseeable projects.

Cumulative effects related to construction vibration could occur if construction activities for other projects in proximity to the project site involve impact equipment (e.g., pile drivers, impact hammers/hoe rams, jackhammers). Although vibration effects are highly localized, involving discrete single events such as pile strikes, several parcels immediately adjacent to the

project site (e.g., east of the project site [Mission Bay Block 1] and south of the project site [Blocks 9 and 9A]) could undergo construction activities that would involve pile driving. Given the project's overall construction schedule (with construction activities lasting between approximately 6 and 10 years [or more]), it is possible that the construction, including pile driving, of reasonably foreseeable adjacent projects could occur simultaneously with the proposed project. Cumulative impacts could therefore be significant.

As discussed above, the proposed project would result in significant and unavoidable impacts related to vibration annoyance because pile driving would result in vibration levels that would be in excess of the "strongly perceptible" threshold at nearby sensitive receptors. Implementation of Mitigation Measure M-NOI-3.1, Pile-Driving Control Measure – Annoyance, would help to reduce the severity of this significant impact; however, it may not reduce vibration to less than strongly perceptible (0.10 in/sec PPV) and, thus, less than significant levels. Because it is possible that the construction of reasonably foreseeable adjacent projects could occur simultaneously with the proposed project, cumulative vibration impacts related to annoyance would be significant. Because no other feasible mitigation actions are available to further reduce vibration annoyance from pile driving at nearby sensitive receptors, cumulative vibration impacts related to annoyance would be significant, and the proposed project's contribution to that impact would be cumulatively considerable.

As discussed previously, vibration-related damage impacts from project construction would be less than significant for offsite buildings and less than significant for onsite buildings (Pier 48) with implementation of Mitigation Measure M-NOI-3.2, Pile-Driving Vibration Control Measures – Damage. Although construction activities in the area could combine (especially if pile driving were to occur close by) and result in cumulative vibration effects (and possibly associated vibration-related building damage), the proposed project's contribution to this cumulative impact would be less than significant with implementation of Mitigation Measure M-NOI-3.2, described previously. As such, the project's contribution to this potential cumulative impact related to building damage is considered to be less than significant with mitigation. However, as described above, implementation of Mitigation Measure M-NOI-3.1, Pile-Driving Control Measure – Annoyance, would not reduce vibration to less than strongly perceptible levels. Because no other feasible mitigation actions are available to further reduce vibration annoyance from pile driving at nearby sensitive receptors, cumulative vibration impacts related to annoyance would be significant, and the proposed project's contribution to that impact would be cumulatively considerable. The cumulative vibration impact related to annoyance as well as the project's contribution to this impact is considered to be ***significant and unavoidable with mitigation.***

Impact C-NOI-3. Operation of the proposed project, in combination with other past, present, and reasonable future projects in the city, would result in the exposure of persons to noise in excess of the applicable local standards or a substantial permanent ambient noise level increase in the project vicinity. (Significant and Unavoidable)

STATIONARY NOISE

Implementation of other development projects would have the potential to increase ambient noise by creating new operational noise sources (such as HVAC equipment, emergency generators, etc.). Operational noise impacts from stationary sources associated with other development could combine with project noise sources to generate noise in excess of ambient levels at nearby noise-sensitive land uses. However, as described in Chapter 2, *Project Description*, the project would comply with the City Noise Ordinance (specifically Sections 2909[a], [b], and [d]) and Title 24 to ensure that stationary noise sources would not generate noise in excess of allowable levels at adjacent noise-sensitive land uses and onsite noise-sensitive land uses. This would be done by incorporating noise attenuation features, such as enclosures or barriers around HVAC equipment and emergency generators (and other noise-generating mechanical equipment), to reduce noise to allowable levels. Considering the proximity of Blocks 3E, 4E, 7E, 7W, 9, and 9A to the project site, noise in the area would be expected to increase overall from project development as well as cumulative development in the area. Operation of the project, along with other development projects, could result in a significant cumulative impact. However, through implementation of Mitigation Measure M-NOI-2.2, as well as compliance with the Noise Ordinance and Title 24, the project's contribution would not be cumulatively considerable. This impact is considered ***less than significant.***

TRAFFIC NOISE

Cumulative growth in the city could lead to increased noise levels from vehicular traffic. A cumulative substantial permanent increase in noise would occur if a greater than 3 dB increase from existing to future cumulative (2040 plus-project) noise levels were to occur in areas with resultant noise levels in excess of the applicable land use compatibility standard or if a greater than 5 dB increase were to occur anywhere (i.e., where the standard is not exceeded). If a cumulative traffic noise impact is anticipated along a given roadway segment, then the proposed project's contribution to that impact must be assessed. The proposed project would result in a cumulatively considerable contribution to a cumulative traffic noise impact if project-added traffic would result in an increase of more than 3 dB in areas where noise is in excess of the applicable land use compatibility standard or 5 dB in any area.

The 15 segments shown in Table 4.F-16, page 4.F-68, were modeled to have an increase of 3 dB from existing conditions to cumulative plus-project conditions in areas where the resultant (2040 plus-project) noise level exceeds the applicable compatibility criteria or an increase of 5 dB where the land use compatibility criteria are not exceeded (refer to Appendix 5 for more details).

Cumulative impacts related to a substantial permanent increase in noise along these 15 segments would be significant.

As shown in Table 4.F-16, page 4.F-68, the project would make a cumulatively considerable contribution to the cumulative substantial permanent increase in noise along one roadway segment (i.e., where the project would increase noise levels by 3 dB, with resultant noise in excess of the applicable criteria, or by 5 dB or more in any area compared to cumulative without-project conditions). The project would not make a cumulatively considerable contribution to the other 14 segments with potential cumulative impacts related to a substantial permanent increase in noise. However, along the aforementioned roadway segment, the project contribution to the cumulative impact could be significant. Refer to Appendix 5 for the full results of the cumulative impact assessment.

Although potential mitigation measures, such as the use of sound walls, were considered to reduce the project's cumulatively considerable contribution to the cumulative substantial permanent increase in noise along one roadway segment, it was determined that they would not be feasible in this dense urban area, with residential buildings located close to roadways. In addition, Mitigation Measure M-AQ-2.3 requires preparation of a transportation demand management plan, with a goal of reducing the number of one-way vehicle trips by 20 percent. This mitigation measure could reduce the amount of traffic on roadway segments that would experience a significant traffic noise increase, but it would be speculative to quantify the precise number of vehicle trips (and hence vehicle-related noise) eliminated along any given segment. Therefore, the cumulative traffic noise impact and the project's contribution to this impact would be ***significant and unavoidable***.

TABLE 4.F-16. ROADWAY SEGMENTS WITH POTENTIAL FOR A CUMULATIVE SUBSTANTIAL PERMANENT INCREASE (RELATED TO TRAFFIC) NOISE IMPACT

Roadway	Segment	Existing Noise Level (dBA L_{dn})	2040 without-Project L_{dn} at 50-foot Distance (dBA L_{dn})	2040 Plus-Project L_{dn} at 50-foot Distance (dBA L_{dn})	Difference between Existing and 2040 Plus Project (dB)	Cumulative Impact? (increase greater than allowable)[1]	Difference between 2040 without Project and 2040 Plus Project (dB)	Cumulatively Considerable Project Contribution to Cumulative Impact?[2]
16th Street	Third Street to Owens Street	61.5	64.5	65	3.4	Yes	0.4	No
Channel Street	East of Third Street	52.5	54.9	58.7	6.2	Yes	3.8	No
Channel Street	Third Street to Fourth Street	51.7	54.8	56.8	5.1	Yes	2.0	No
Fourth Street	King Street to Fourth Street Bridge	57	60	62.3	5.3	Yes	2.2	No
Fourth Street	Channel Street to Mission Rock Street	53.8	58.3	60.7	6.9	Yes	2.4	No
Fourth Street	Fourth Street Bridge to Channel Street	55.5	59.4	61.9	6.4	Yes	2.5	No
Fourth Street	Townsend Street to King Street	59.8	62	62.8	3.1	Yes	0.8	No
I-280 NB Off-Ramp	South of Mariposa Street	62.1	65.3	65.6	3.5	Yes	0.4	No
Mariposa Street	I-280 NB Off-Ramp to Minnesota Street	60.2	63.2	63.7	3.5	Yes	0.5	No
Mariposa Street	Third Street to Illinois Street	56.2	60.2	60.7	4.4	Yes	0.5	No
Mariposa Street	I-280 SB On-Ramp to I-280 NB Off-Ramp	50.8	60.7	61.4	10.6	Yes	0.7	No
Mariposa Street	Minnesota Street to Third Street	59.2	62.1	62.7	3.5	Yes	0.6	No
Mission Rock Street	Terry A. Francois Boulevard to Third Street	49.6	54.6	62	12.4	Yes	**7.4**	**Yes**
Mission Rock Street	Third Street to Fourth Street	47.8	54.4	58.9	11.1	Yes	4.5	No
Third Street	Terry A. Francois Boulevard to Channel Street	60.7	62.5	63.9	3.2	Yes	1.5	No

Notes:

[1] Cumulative impact occurs when there is a 3 dBA increase where resultant cumulative plus-project noise levels are greater than 60 dBA L_{dn} or a 5 dBA increase where resultant cumulative plus-project noise levels are less than 60 dBA L_{dn}.

[2] Cumulatively considerable contribution to a cumulative impact occurs if the project contributes a 3 dBA increase to a cumulative impact where resultant cumulative plus-project noise levels are greater than 60 dBA L_{dn} or a 5 dBA increase where resultant cumulative plus-project noise levels are less than 60 dBA L_{dn}.

NB = northbound; SB = southbound