APPENDIX C: NOISE TECHNICAL MEMORANDUM

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Final
Noise Technical Memorandum

Pier 70 Mixed-Use District Project
San Francisco, California

Case No. 2014-001272ENV

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Noise Technical Memorandum (Final)

Date December 17, 2016

To Melinda Hue, Environmental Planning, San Francisco Planning Department

From Valerie Chew Geier, Senior Associate

Subject Pier 70 Mixed-Use District Project

INTRODUCTION AND PURPOSE

This memorandum presents the results of noise measurements to characterize the existing noise environment in the Pier 70 Mixed-Use District Project site and discussion of the project's noise compatibility with the existing and future noise environment. This document is prepared in support of the Pier 70 Mixed-Use District Project EIR.

The proposed Pier 70 Mixed-Use District project site is an approximately 35-acre area bounded by Illinois Street to the west, 20th Street to the north, San Francisco Bay to the east, and 22nd Street to the south. The majority of the project site is located within the Pier 70 area (Pier 70), which is owned by the City and County of San Francisco through the Port of San Francisco (Port). Two development areas constitute the project site. The "28-Acre Site" is an approximately 28-acre site located between 20th Street, Michigan Street, 22nd Street, and San Francisco Bay. The "Illinois Parcels" form an approximately 7-acre site that consists of an approximately 3.4-acre Port-owned parcel, called the 20th/Illinois Parcel, along Illinois Street at 20th Street and an approximately 3.6-acre parcel, called the Hoedown Yard, at Illinois and 22nd streets, which is owned by PG&E; the Hoedown Yard includes a 0.2-acre portion of street right-of-way that bisects the site, and is owned by the City.

PROJECT DESCRIPTION

The Proposed Project would include amendments to the General Plan and Planning Code, adding a Pier 70 Special Use District, which would establish land use controls for the project site and incorporate the design standards and guidelines in the proposed *Pier 70 SUD Design for Development* document. As envisioned, the proposed Pier 70 Mixed-Use District Project (Proposed Project) would include market-rate and affordable residential uses, commercial use, retail, arts, light-industrial (RALI) uses,[1] parking, shoreline improvements, infrastructure development and street improvements, and public open space.

[1] The project sponsors describe the RALI use as including neighborhood-serving retail, arts, eating and drinking places, production distribution and repair, light manufacturing, and entertainment establishments.

Under the provisions of the proposed Pier 70 Special Use District, the Proposed Project would provide a mixed use land use program. To cover a full range of potential land uses that could be developed under the Proposed Project, the EIR analyzes a maximum residential-use scenario (Maximum Residential Scenario) and a maximum commercial-use scenario (Maximum Commercial Scenario) for the project site, which will bracket specific maximum ranges of uses that could be developed.

For the 28-Acre Site, up to a maximum of approximately 3,442,265 gross square feet (gsf) of construction in new buildings and improvements to existing structures[2] could be constructed. Development of the Illinois Parcels would include up to a maximum of approximately 801,400 gsf in new buildings. Under both scenarios, two parcels (C1 and C2) on the project site that would be designated for district-structured parking could be developed with residential/commercial uses or residential use, depending on future market demand. Specifically, Parcel C1 could be developed with residential, commercial, or parking uses, and Parcel C2 could be developed with residential or parking uses. Active or passive public rooftop open space (sports courts, play fields, urban agriculture plots, seating, and observational terrace areas) could be developed on the roof of both of these parcels under both scenarios as well if the parcels are built as district parking structures. Accessory, surface and below grade parking would be allowed on all parcels on the 28-Acre Site except Buildings 2, 12, and 21 and Parcel E4. These buildings would be renovated and converted into commercial, RALI, or residential uses. RALI uses would be allowed on the ground-floor levels of all future buildings on Parcels A, B, C1, C2, D, E1, E2, E3, F, G, H1, H2, PKN, PKS, HDY1, and HDY2. Building 2 would allow either commercial or residential uses, with RALI allowed on the ground floor. Buildings 12 and 21 as well as Parcel E4 would allow RALI only with commercial allowed on the upper floor. On the Illinois Parcels, retail/restaurant uses would be allowed on the ground floor, while accessory parking would be allowed on all four parcels. No residential uses would be allowed on the ground floor of PKN.

Open spaces programmed as part of the Proposed Project are anticipated to accommodate public outdoor events, including art exhibitions, theater performances, cultural events, outdoor fairs, festivals and markets, outdoor film screenings, evening/night markets, food events, street fairs, and lecture services. Fewer than 100 events per year are anticipated, including approximately 25 mid-size events attracting attendance between 500 to 750 people, and four larger-size events attracting up to 5,000 people.

The Maximum Residential Scenario and the Maximum Commercial Scenario for both the 28-Acre Site and the Illinois Parcels are mutually exclusive: the maximum commercial and maximum residential programs could not both be built. If the Proposed Project were to be built with the maximum amount of commercial space, less space would be developed with residential uses, and conversely, if the maximum number of residential units were constructed, less space would be developed with commercial uses as described below. Depending on the uses developed, the Proposed Project's total gsf would range between a maximum of 4,212,230 gsf, under the Maximum Residential Scenario, to 4,179,300 gsf, under the Maximum Commercial Scenario, excluding square footage associated with accessory and district parking.

[2] Excluding basement-level square footage allocated to accessory and district parking.

Total construction on the 28-Acre Site would not exceed a maximum of 3,422,265 gsf, and a maximum of 801,400 gsf on the Illinois Parcels.

Maximum Residential Scenario

Figure 1: Illustrative Phased Site Plan – Maximum Residential Scenario, presents the proposed land uses and possible phasing for each parcel in the Pier 70 Mixed-Use District Project site. **Table 1, Project Summary Table by Parcel**, lists proposed uses, height limits, and whether new construction or building rehabilitation (by parcel) is proposed under the Maximum Residential Scenario.

28-Acre Site

Development under the Maximum Residential Scenario on the 28-Acre Site would include a maximum of up to 3,410,830 gsf in new and renovated buildings. Under this scenario, there would be up to 2,150 residential units (up to approximately 710 studio/one-bedroom units and 1,440 two- or more bedroom units), totaling about 1,870,000 gsf, as well as approximately 1,095,650 gsf of commercial space and 445,180 gsf of RALI space (241,655 gsf of retail space, 60,415 gsf of restaurant space, and 143,110 gsf of arts/light-industrial space). The overall development envelope includes rehabilitation, in compliance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, of 237,800 gsf in Buildings 2, 12, and 21. For this analysis, the flexible-use parcels (Parcels F, G, H1, and H2) are assumed to be devoted to residential use, and Parcels C1 and C2 would be built as residential use in order to study the maximum gsf of development area on the project site under the Maximum Residential Scenario.

Illinois Parcels

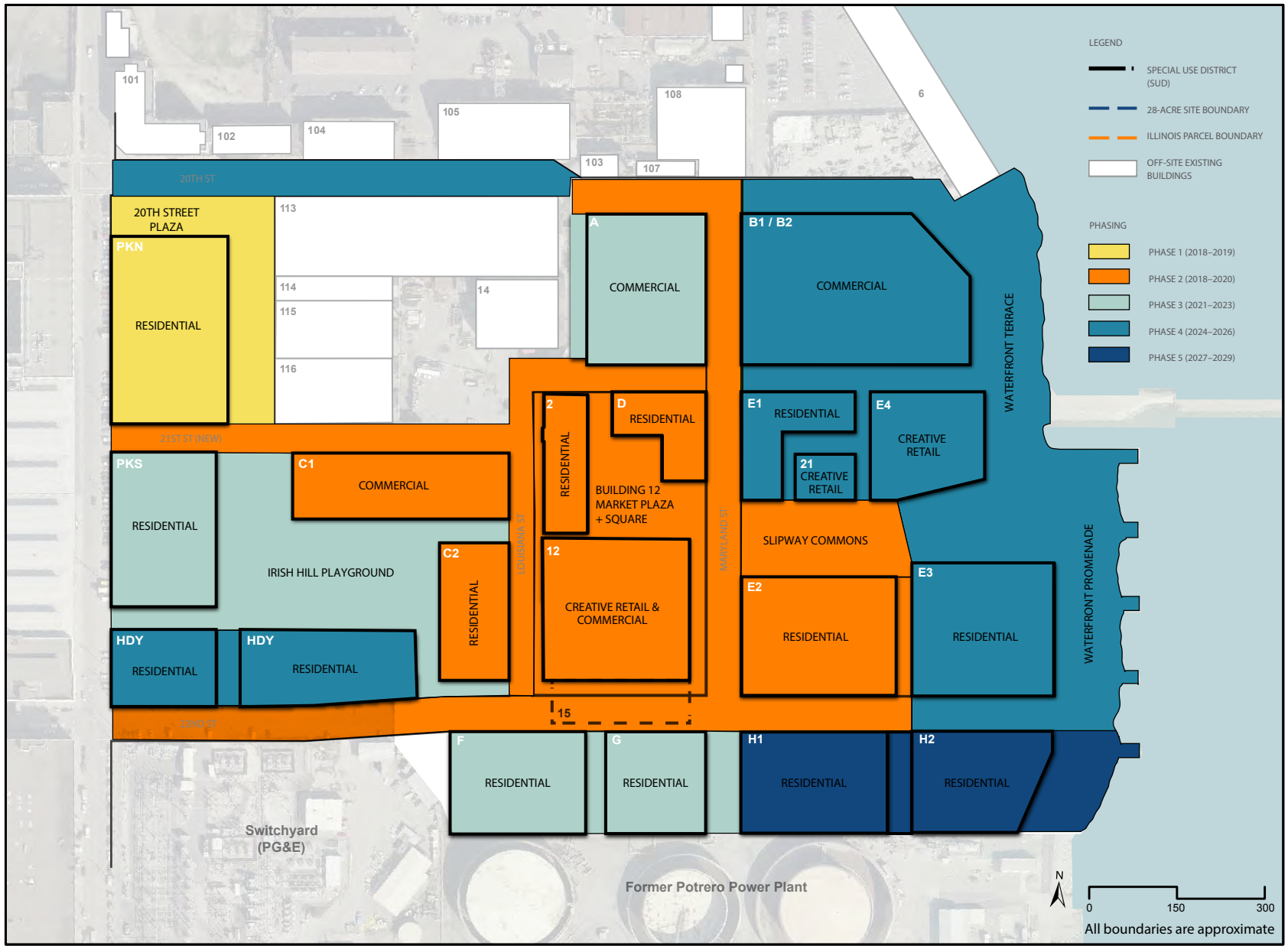
Development under the Maximum Residential Scenario on the Illinois Parcels would include a maximum of up to 801,400 gsf in newly constructed buildings. Under this scenario, there would be up to 875 residential units (up to approximately 290 studio/one-bedroom units and 585 two- or more bedroom units) totaling about 760,000 gsf, as well as approximately 6,600 gsf of commercial area and approximately 34,800 gsf of retail/restaurant space (27,840 gsf of retail space and 6,960 gsf of restaurant space) in new buildings.

Maximum Commercial Scenario

Figure 2, Illustrative Phased Site Plan – Maximum Commercial Scenario, presents the proposed land uses and possible phasing for each parcel in the Pier 70 Mixed-Use District Project site. Table 1, Project Summary Table by Parcel, lists proposed uses, height limits, and whether new construction or building rehabilitation (by parcel) is proposed under the Maximum Commercial Scenario.

28-Acre Site

Development on the 28-Acre Site under the Maximum Commercial Scenario would include a maximum of up to about 3,422,265 gsf in new and renovated buildings. Under this scenario, there would be up to 1,100 residential units (up to approximately 365 studio/one-bedroom units and 735 two- or more bedroom units) totaling about 957,000 gsf, as well as approximately 2,024,050 gsf of commercial area, and



SOURCE: FOREST CITY

FIGURE 1: ILLUSTRATIVE PHASED SITE PLAN - MAXIMUM RESIDENTIAL SCENARIO

Table 1: Project Summary Table by Parcel

Project Parcel/ Building	Max Res Scenario Proposed Use	Max Com Scenario Proposed Use	Maximum Height (feet)	Building Rehabilitation	New Construction
28-Acre Site[1]					
Parcel A	Commercial	Commercial	90		X
Parcel B	Commercial	Commercial	90		X
	Commercial	Commercial	90		X
Parcel C1[2]	Residential / Parking (rooftop open space)	Commercial / Parking (rooftop open space)	90		X
Parcel C2[2]	Residential / Parking (rooftop open space)	Residential / Parking (rooftop open space)	90		X
Parcel D	Residential	Residential	90		X
Parcel E1	Residential	Residential	90/65[3]		X
Parcel E2	Residential	Residential	70		X
Parcel E3	Residential	Residential	70		X
Parcel F	Residential	Commercial	90		X
Parcel G	Residential	Commercial	90		X
Parcel H1	Residential	Commercial	90		X
Parcel H2	Residential	Commercial	90		X
Building 2	Residential	Commercial	No Change	X	
Parcel E4	RALI	RALI	50		X
Building 12	RALI	RALI	No Change	X	
Building 21	RALI	RALI	No Change	X	
Illinois Parcel[4]					
20th/Illinois Parcels (PKN & PKS)	Residential	Residential	65		X
Hoedown Yard (HDY1 & HDY2)	Residential	Commercial	65		X

Notes:

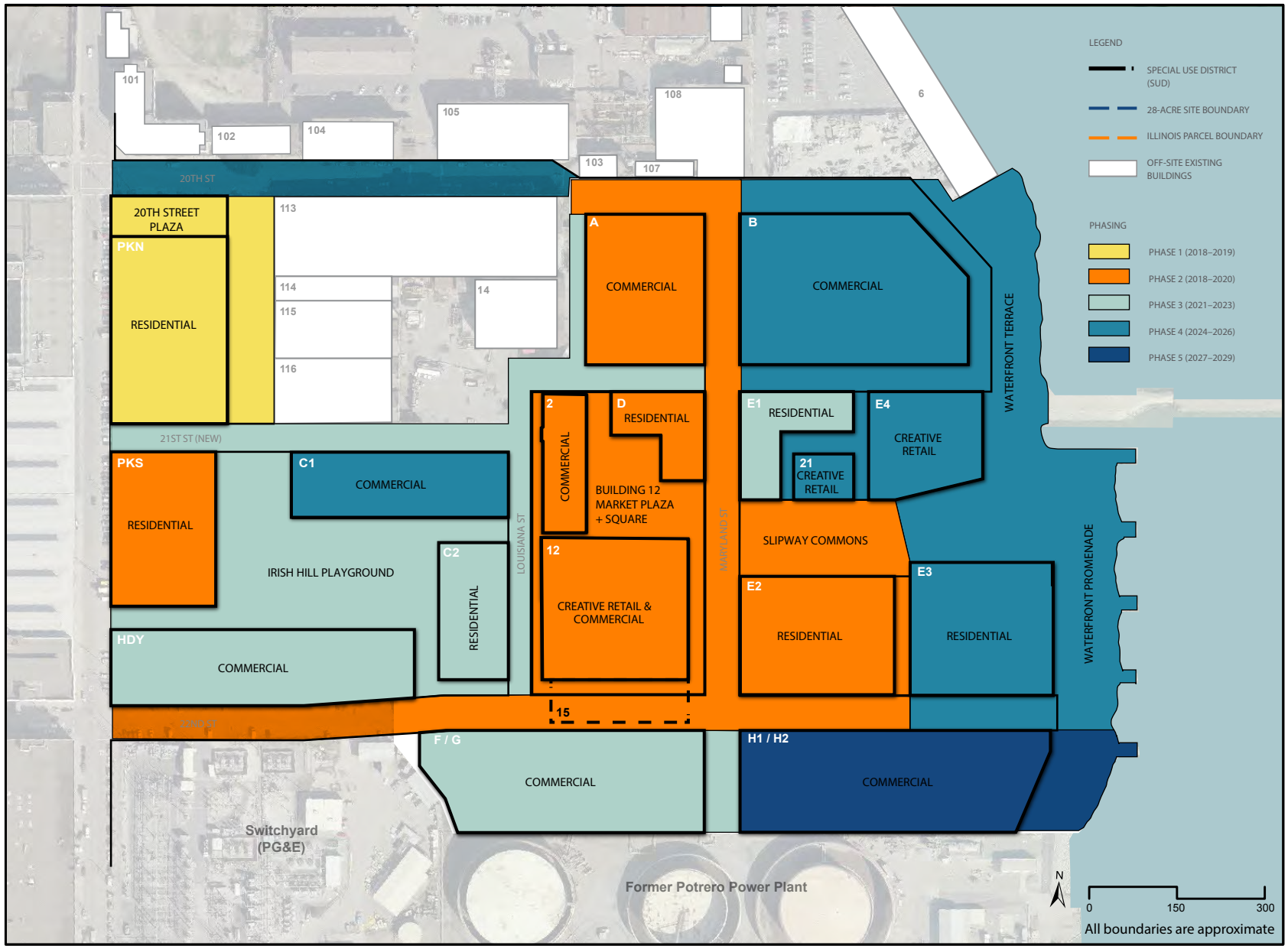
1 All 28-Acre Site parcels except existing Buildings 2, 12, and 21 would be permitted to include parking as an accessory use (both within building floors or under buildings). Buildings 2, 12, and 21 on the 28-Acre Site would be renovated and converted into commercial, RALI, or residential uses. Also RALI uses would be on the ground-floor levels of all future buildings on Parcels A, B, C1, C2, D, E1, E2, E3, F, G, H1, H2, PKN, PKS, HDY1, HDY2 and Buildings 2 and 12. Parcel E4 and Building 21 would contain only RALI uses.

2 Under both scenarios, Parcel C1 could be developed with residential, commercial, or parking uses and Parcel C2 could be developed with residential or parking uses. Active public rooftop open space (sports courts, play fields, urban agriculture plots, seating, and observational terrace areas) could be developed on the roof of both of these parcels under both scenarios as well, if the parcels are built as district parking structures.

3 The maximum height is 65 feet under the Maximum Commercial scenario.

4 Retail/Restaurant uses would be allowed on the ground floor and accessory parking would be allowed on all four parcels.

Source: Forest City; Turnstone / SWCA



SOURCE: FOREST CITY

FIGURE 2: ILLUSTRATIVE PHASED SITE PLAN - MAXIMUM COMMERCIAL SCENARIO

441,215 gsf of RALI space (238,485 gsf of retail space, 59,620 gsf of restaurant space, and 143,110 gsf of arts/light-industrial space). The overall development envelope includes the rehabilitation, in compliance with the Secretary of the Interior's Standards for Treatment of Historic Properties, of 227,800 gsf in Buildings 2, 12, and 21. As noted above, the flexible land use program contemplates two parcels, Parcels C1 and C2, which may be developed for parking, residential or commercial-office use depending on future market demand and future transportation network changes. Under this scenario, flexible-use parcels (Parcels F, G, H1, H2, and C1 and Building 2) would be developed as commercial use and that Parcel C2 would be developed as residential use in order to study the maximum gsf of development area on the project site under this Maximum Commercial Scenario.

Illinois Parcels

Development on the Illinois Parcels under the Maximum Commercial Scenario would include a maximum of about 757,035 gsf in new buildings. Under this scenario, there would be up to 545 residential units (up to approximately 180 studio/one-bedroom units and 365 two-or-more bedroom units) totaling about 473,000 gsf, as well as approximately 238,300 gsf of commercial area and approximately 45,735 gsf of retail/restaurant space (36,590 gsf of retail space and 9,145 gsf of restaurant space) in new buildings.

Proposed Construction Phasing

For both development scenarios, the Maximum Residential Scenario and the Maximum Commercial Scenario, Proposed Project construction is conceptual; however it is expected to begin in 2018 and would be phased over an approximately 11-year period, concluding in 2029. Proposed development is expected to involve up to five phases, designated as Phases 1, 2, 3, 4, and 5; phasing estimates are shown in **Table 2: Project Construction and Rehabilitation Phasing for the Maximum Residential Scenario, Figure 3: Proposed Phasing Plan - Maximum Residential Scenario, Table 3: Project Construction and Rehabilitation Phasing for the Maximum Commercial Scenario, and Figure 4: Proposed Phasing Plan - Maximum Commercial Scenario**. These phases are subject to change, but would occur within an approximately 11-year period and within the maximum development ranges presented in the two scenarios.

Infrastructure improvements (utilities, streets and open space) and grading and excavation activities would be constructed by Forest City, as master developer, and would occur in tandem, as respective and adjacent parcels are developed. Vertical development on the various parcels could be constructed by Forest City, or by third party developers.

SOUND FUNDAMENTALS

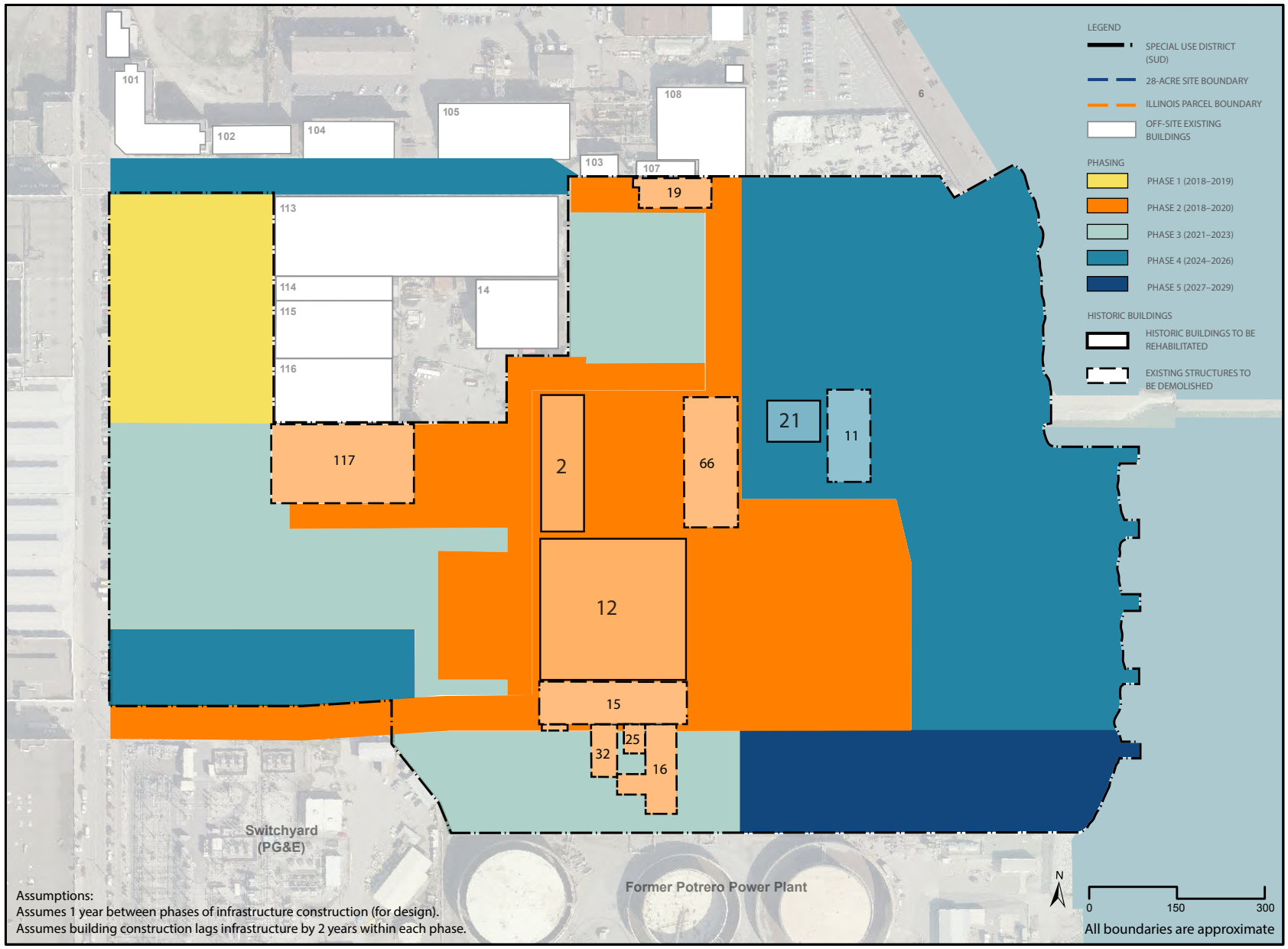
Sound is characterized by various parameters that describe the rate of oscillation (frequency) of sound waves, the distance between successive troughs or crests in the wave, the speed that it travels, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over one million times within

Table 2: Project Construction and Rehabilitation Phasing for the Maximum Residential Scenario

Phase	Project Site	Parcel or Building	Proposed Construction and Rehabilitation			Open Space	Roadways and Other Improvements
			Residential (gsf /No. of Residential Units)	Commercial (gsf)	RALI (gsf)		
Phase 1 (2018-2019)	28-Acre Site						
	Illinois Parcels	PKN	261,700 / 300 units	6,600	6,600	20th Street Plaza	Michigan Street (new), 20th Street Pump Station (new)
Phase 2 (2018-2020)	28-Acre Site	Building 2*, Parcel C1, Parcel C2, Parcel D, Parcel E2	578,250 / 662 units	221,100	52,035	Building 12 Market Plaza Market Square Slipway Commons (western portion)	20th Street (new/central portion) 21st Street (new/eastern portion) 22nd Street (existing and new) Louisiana Street (new/southern portion) Maryland Street (new/northern portion)
		Building 12*		60,000	105,500		
	Illinois Parcels						
Phase 3 (2021-2023)	28-Acre Site	Parcel A, Parcel F, Parcel G	436,100 / 505 units	288,200	57,270	Irish Hill Playground	Maryland Street (new/southern portion [continued from Phase 2])
	Illinois Parcels	PKS	213,100 / 240 units		11,000		
Phase 4 (2024-2026)	28-Acre Site	Parcel E1, Parcel E3, Parcel E4, Parcel B	378,600 / 436 units	526,350	189,675	Slipway Commons (eastern portion [continued from Phase 3]) Waterfront Terrace Waterfront Promenade (northern portion)	20th Street (western and eastern portions [continued from Phase 2]) 21st Street (eastern portion [continued from Phase 2]) 22nd Street (eastern portion [continued from Phase 2])
		Building 21*			10,200		
	Illinois Parcels	Parcel HDY1, Parcel HDY2	285,200 / 335 units		17,200		
Phase 5 (2027-2029)	28-Acre Site	Parcel H1, Parcel H2	477,050 / 547 units		40,700	Waterfront Promenade (southern portion [continued from Phase 4])	
	Illinois Parcels						
Total			2,630,000 / 3,025 units	1,102,250	479,980		

Notes:
* = denotes an existing building that would be rehabilitated under the Proposed Project.

Source: Forest City; Turnstone / SWCA



SOURCE: FOREST CITY

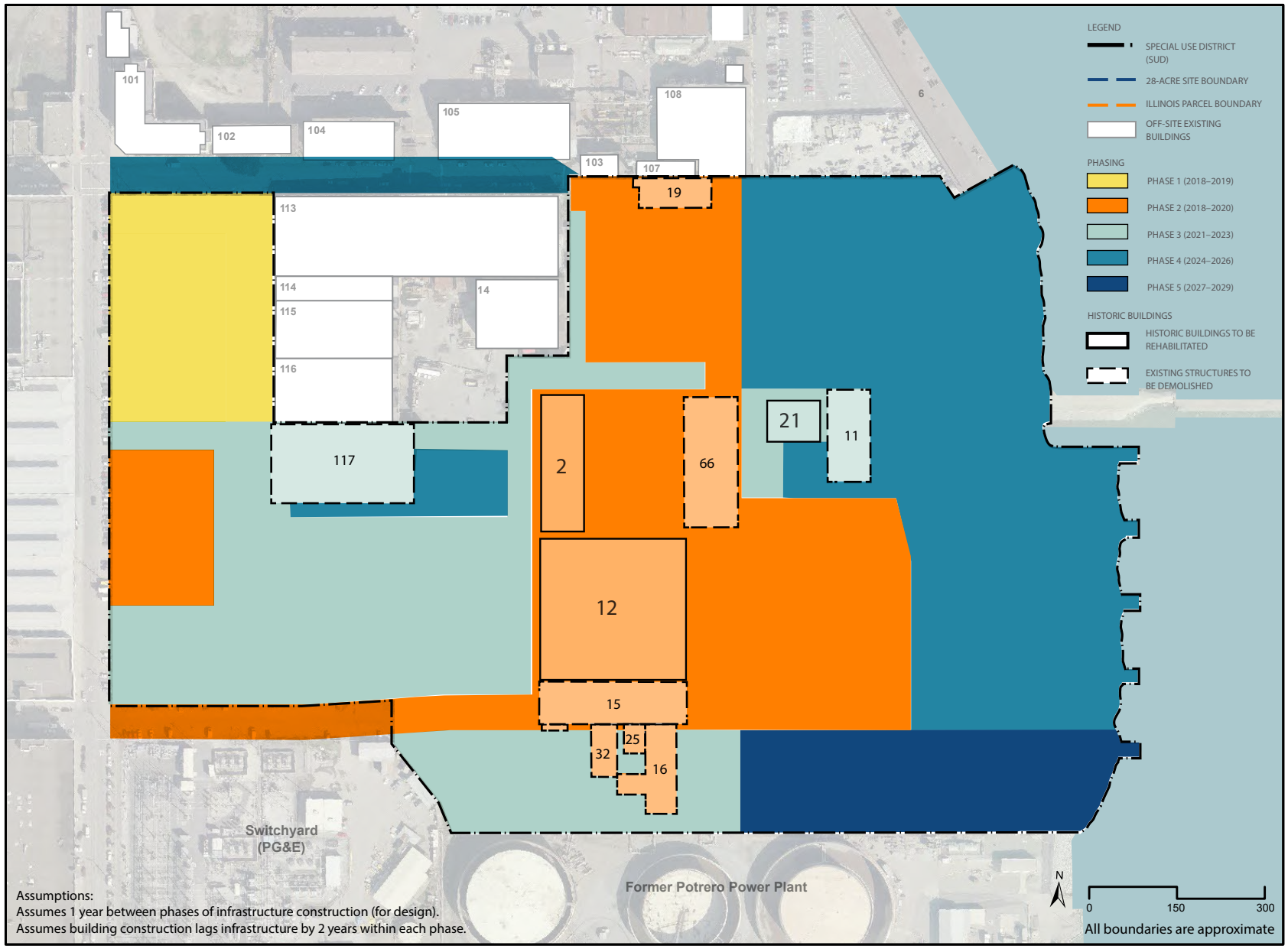
FIGURE 3: PROPOSED PHASING PLAN - MAXIMUM RESIDENTIAL SCENARIO

Table 3: Project Construction and Rehabilitation Phasing for the Maximum Commercial Scenario

Phase	Project Site	Parcel or Building	Proposed Construction and Rehabilitation			Open Space	Roadways and Other Improvements
			Residential (gsf/No. of Residential Units)	Commercial (gsf)	RALI (gsf)		
Phase 1 (2018-2019)	*28-Acre Site*						
	Illinois Parcels	PKN	260,500 / 300 units	6,600	6,600	20th Street Plaza	Michigan Street (new), 20th Street Pump Station (new)
Phase 2 (2018-2020)	*28-Acre Site*	Parcel A, Parcel D, Parcel E2, Building 2*	389,400 / 445 units	348,200	97,400	Building 12 Market Plaza Market Square Slipway Commons (western portion)	20th Street (new/central portion) 22nd Street (existing and new) Maryland Street (new/northern portions)
		Building 12*			52,720		
	Illinois Parcels	PKS	215,500 / 245 units		11,000		
Phase 3 (2021-2023)	*28-Acre Site*	Parcel C2, Parcel E1, Parcel F, Parcel G	325,350 / 375 units	442,200	57,620	Irish Hill Playground	21st Street (new/eastern portion) Louisiana Street (new) Maryland Street (new/southern portion [continued from Phase 2])
	Illinois Parcels	Parcel HDY1, Parcel HDY2		231,700	28,135		
Phase 4 (2024-2026)	*28-Acre Site*	Parcel B, Parcel C1, Parcel E3,	242,250 / 280 units	747,450	85,505	Slipway Commons (eastern portion [continued from Phase 2]) Waterfront Terrace Waterfront Promenade (northern portion)	20th Street (western and eastern portions [continued from Phase 2]) 21st Street (western portion [continued from Phase 3]) 22nd Street (eastern portion [continued from Phase 2])
		Building 21*, Parcel E4			110,400		
	Illinois Parcels						
Phase 5 (2027-2029)	*28-Acre Site*	Parcel H1, Parcel H2		486,200	37,570	Waterfront Promenade (southern portion [continued from Phase 4])	
	Illinois Parcels						
Total			**1,433,000 / 1,645 units**	**2,262,350**	**486,950**		

Notes:
* = denotes an existing building that would be rehabilitated under the Proposed Project.

Source: Forest City; Turnstone / SWCA



SOURCE: FOREST CITY

FIGURE 4: PROPOSED PHASING PLAN - MAXIMUM COMMERCIAL SCENARIO

the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. Except in carefully controlled laboratory experiments, a change of only 1 dBA in sound level cannot be perceived. Outside of the laboratory, a 3-dBA change is considered a perceptible difference. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness.[3]

Noise Descriptors

Noise is generally defined as sound that is loud, disagreeable, unexpected or unwanted. Sound is mechanical energy transmitted in the form of a wave by a disturbance or vibration that causes pressure variation in air is detectable by the human ear\. Variations in noise exposure over time are typically expressed in terms of a steady-state energy level (called L_{eq}) that represents the acoustical energy of a given measurement, or alternatively as a statistical description of what sound level is exceeded over some fraction (10, 50 or 90 percent) of a given observation period (i.e., L_{10}, L_{50}, L_{90}). L_{eq} (24) is the steady-state acoustical energy level measured over a 24-hour period. L_{max} is the maximum, instantaneous noise level registered during a measurement period. Because residential receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires for planning purposes that an artificial dBA increment be added to evening and nighttime noise levels to form a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dBA penalty during the evening (7 p.m. to 10 p.m.) and a 10-dBA penalty at night (10 p.m. to 7 a.m.). Another 24-hour noise descriptor, called the day-night noise level (L_{dn}), is similar to CNEL. Both CNEL and L_{dn} add a 10-dBA penalty to all nighttime noise levels between 10 p.m. and 7 a.m., but L_{dn} does not add the evening 5-dBA penalty between 7 p.m. and 10 p.m. In practice, L_{dn} and CNEL usually differ by less than 1 dBA at any given location from transportation noise sources.[4] **Table 4, Representative Environmental Noise Levels,** presents representative noise sources and their corresponding noise levels in dBA at varying distances from the noise sources.

Noise from Multiple Sources

Since 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, both producing noise at the same level, will not double the noise level. **Table 5, Rules for Combining Sound Levels by "Decibel Addition,"** demonstrates the result of adding noise from multiple sources.

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[3] California Department of Transportation (Caltrans), *Technical Noise Supplement (TeNS) to the Traffic Noise Analysis Protocol,* pp. 2-44 to 2-45, September 2013. Available online at http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf. Accessed April 14, 2015.

[4] Ibid. pp. 2-48.

Table 4: Representative Environmental Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Fly-over at 100 feet		
	100	
Gas Lawnmower at 3 feet		
	90	
Diesel Truck going 50 mph at 50 feet		Food Blender at 3 feet
	80	Garbage Disposal at 3 feet
Noise Urban Area during Daytime		
Gas Lawnmower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Area during Daytime	50	Dishwasher in Next Room
Quiet Urban Area during Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Area during Nighttime		
	30	Library
Quiet Rural Area during Nighttime		Bedroom at Night, Concert Hall (background)
	20	
		Broadcast/Recording Studio
	10	
	0	

Source: California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol,* p. 2-20, September 2013.

Table 5: Rules for Combining Sound Levels by "Decibel Addition"[1]

When two decibel values differ by	Add the following amount to the higher decibel value	Example
0 to 1 dB	3 dB	60 dB + 61 dB = 64 dB
2 to 3 dB	2 dB	60 dB + 63 dB = 65 dB
4 to 9 dB	1 dB	60 dB +69 dB = 70 dB
10 dB or more	0 dB	60 dB + 75 dB = 75 dB

Note:
[1] This methodology provides an estimate of the resulting sound level and is accurate to ±1 decibel.

Source: Orion Environmental Associates, 2016.

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 they 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.

Attenuation of Noise

A receptor's distance from a noise source affects how noise levels attenuate (decrease). Transportation noise sources tend to be arranged linearly such that roadway traffic attenuates at a rate of 3.0 dBA to 4.5 dBA per doubling of distance from the source, depending on the intervening surface (paved or vegetated, respectively). Point sources of noise, such as stationary equipment or construction equipment, typically attenuate at a rate of 6.0 dBA to 7.5 dBA per doubling of distance from the source.[5] For example, a sound level of 80 dBA at 50 feet from the noise source will be reduced to 74 dBA at 100 feet, 68 dBA at 200 feet, and so on. Noise levels can also be attenuated by "shielding" or providing a barrier between the source and the receptor. With respect to interior noise levels, noise attenuation effectiveness depends on whether windows are closed or open. Based on the U.S. Environmental Protection Agency's national average, closed windows reduce noise levels by approximately 25 dBA, while open windows reduce noise levels by about 15 dBA.[6]

Health Effects of Environmental Noise

The World Health Organization (WHO) is perhaps the best source of current knowledge regarding health impacts of noise. According to WHO, sleep disturbance can occur when continuous indoor noise levels exceed 30 dBA (L_{eq}) or when intermittent interior noise levels reach or exceed 45 dBA (L_{max}), particularly if background 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 (L_{eq}) or below, and short-term events should not generate noise in excess of 60 dBA (L_{max}). 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.[7]

Other potential health effects of noise identified by WHO include decreased performance on complex cognitive tasks, such as reading, attention, problem solving, and memorization; physiological effects such as hypertension and heart disease (after many years of constant exposure, often by workers, to high noise levels); and hearing impairment (again, generally after long-term occupational exposure, or shorter term exposure to very high noise levels, for example, exposure several times a year to concert noise at 100 dBA). Noise can also disrupt speech intelligibility at relatively low levels; for example, in a classroom setting, a noise level as low as 35 dBA can disrupt clear understanding. Finally, noise can cause annoyance, and can trigger emotional reactions like anger, depression, and anxiety. WHO reports that,

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[5] The 1.5 dBA variation in attenuation rate (6 dBA vs. 7.5 dBA) can result from ground-absorption effects, which occur as sound travels over soft surfaces such as soft earth or vegetation (7.5 dBA attenuation rate) versus hard ground such as pavement or very hard-packed earth (6 dBA rate). (U.S. Housing and Urban Development, *The Noise Guidebook*, 1985, p. 24. Available online at https://www.hudexchange.info/onecpd/assets/File/Noise-Guidebook-Chapter-4.pdf. Accessed April 14, 2015.)

[6] U.S. EPA, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. Appendix B, Table B-4, p. B-6. March 1974.

[7] 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 on November 18, 2015.

during daytime hours, few people are seriously annoyed by activities with noise levels below 55 dBA, or moderately annoyed with noise levels below 50 dBA.

Vehicle traffic and continuous sources of machinery and mechanical noise contribute to ambient noise levels. Short-term noise sources, such as large vehicle audible warnings, the crashing of material being loaded or unloaded, car doors slamming, and engines revving, contribute very little to 24-hour noise levels but are capable of causing sleep disturbance and severe annoyance. The importance of noise to receptors depends on both time and context. For example, long-term high noise levels from large traffic volumes can make conversation at a normal voice level difficult or impossible, while short-term peak noise levels, if they occur at night, can disturb sleep.

Vibration and Groundborne Noise

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity or acceleration. Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Vibration is typically measured by peak particle velocity (PPV) in inches per second (in/sec). With the exception of long-term occupational exposure, vibration levels rarely affect human health. Instead, most people consider vibration to be an annoyance that can affect concentration or disturb sleep. People may tolerate infrequent, short duration vibration levels, but human annoyance to vibration becomes more pronounced if the vibration is continuous or occurs frequently. High levels of vibration can damage fragile buildings or interfere with sensitive equipment. Depending on the age of the structure and type of vibration (transient, continuous or frequent intermittent sources), vibration levels can range between 0.1 to 2.0 in/sec PPV for damage to a structure.[8]

Typical sources of groundborne vibration in San Francisco are large-scale construction projects that involve pile driving or underground tunneling, Vibration is also caused by operation of transit vehicles in the subway system under Market Street (including Muni and Metro light rail vehicles and heavy rail Bay Area Rapid Transit (BART) trains. In general, such vibration is only an issue when sensitive receptors are located in close proximity. Since rubber tires provide vibration isolation, rubber tire vehicles, such as Muni buses, trucks, and automobiles, rarely create substantial groundborne vibration effects unless there is a discontinuity or bump in the road that causes the vibration.[9]

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[8] California Department of Transportation (Caltrans), *Transportation and Construction Vibration Guidance Manual*, September 2013, Table 9, p. 23. Available online at http://www.dot.ca.gov/hq/env/noise/publications.htm. Accessed on December 16, 2016.

[9] FTA, 2006. *Transit Noise and Vibration Impact Assessment,* DTA-VA-90-1003-06, p. 10-6. May 2006. U.S. Department of Transportation. Available online at http://www.fta.dot.gov/12347_2233.html. Accessed April 14, 2015.

EXISTING CONDITIONS

Noise

The Pier 70 Mixed-Use District project site is bounded by Illinois Street to the west, 20th Street to the north, the San Francisco Bay to the east, and 22nd Street to the south. The project site is located in an urban area where noise from nearby industrial uses (including BAE Shipyard repair facilities to the north and the American Industrial Center (AIC) to the west) and vehicular traffic (autos, trucks and buses on the I-280 freeway and other streets in the vicinity) dominate the existing ambient noise environment. In addition, intermittent sources of noise that contribute to ambient noise levels include distant commuter train traffic (Caltrain) approximately ¼ mile to the west and nearby light rail trains (Third Street line) approximately 365 feet west of the Project's western boundary. More distant intermittent noise sources include activities such as concerts at AT&T Ballpark, which is located 1¼ mile north of the site. Principal noise sources in the immediate project vicinity are described as follows:

- **BAE Systems Ship Repair Facility.** The BAE Systems Ship Repair facility is located to the north of the project site. The short-term measurements at the ship repair docks reveal that the general noise character of the ship repair work is discontinuous and episodic, but also generally broadband and without substantial tonality. The lack of strong tonality results in the noise being perceived as less annoying than a similar noise level from a tonal source, such as a transformer or chiller. The fire pump at the western end of the dock runs continuously and has substantial tonality; however, the pump was not audible over the ambient conditions at any of the long-term measurement locations and in fact, is barely detectable in the short-term measurement made nearby at the western end of the ship repair docks.

  In the waterfront vicinity of the 28-Acre Site (near Location LT-1) where there are no other buildings to block the line-of-sight from Dry Dock 2, more high-frequency energy from activities, such as water blasting or painting, is present and audible. Another mildly tonal source is the Aggreko generators located between Dry Dock 2 and Dock 4 East. These generators contribute substantial noise at the northern, central, and eastern portions of the 28-Acre Site (Locations LT-1, LT-2 and LT-3). However, BAE has upgraded the electrical infrastructure at the shipyard, and these generators now only operate if a ship cannot connect to line power or during a power outage.

- **American Industrial Center (AIC).** The AIC is located west of the Illinois Parcels on the west side of Illinois Street. AIC is located on Third Street between 20th and 23rd Streets, and extends to Illinois Street. The facility comprises about 900,000 square feet of commercial, industrial and related supporting uses. AIC currently leases to approximately 300 tenants engaged in various commercial and industrial activities. The facility houses breweries, commercial kitchens and bakeries, garment manufacturing businesses, warehouses and distribution centers. On average, there are typically 2,500 to 3,000 people on the site at a given time.[10] AIC loading docks are located on Illinois Street, and

[10] Charles J. Higley, Farella Braun + Martel, LLP, *Pier 70 Mixed-Use District – EIR Scoping Comments,* June 5, 2015.

noise from loading activities could cause noise disturbance along the western Illinois Parcels boundary, across Illinois Street.

- **PG&E Potrero Substation**. There is a PG&E substation located south of the Illinois Parcels (south of the project site), and it contains large transformers and related electrical equipment that are not enclosed. Transformer noise can be disturbing, because transformers generate tonal noise (i.e., noise with simple or pure tones or "hum" components). Field observations indicate that transformer noise is audible, but heavy equipment and traffic noise on local streets dominate the ambient noise environment in this area. This type of noise source could be annoying during the nighttime hours, if audible at future residences.

- **Nearby Sporting or Special Events.** Project residents living along Illinois Street could possibly be subject to short-term, intermittent increases in traffic noise before and after events held at the existing AT&T Park and proposed Warrior's arena. Since these increases only occur for a short time before and after a game, they do substantially increase 24-hour (L_{dn} or CNEL) noise levels. Even so, these short-term, intermittent increases would likely be noticeable to these Project residents living adjacent to Illinois Street.

Groundborne Noise and Vibration

Groundborne noise is that which is experienced inside a building or structure from vibrations produced outside of the building and transmitted as ground vibration between the source and receiver. Groundborne noise can be a problem in situations where the primary airborne noise path is blocked, such as in the case of a subway tunnel passing near homes or other noise-sensitive structures. There are no known sources of existing groundborne noise or vibration in the vicinity of the project site. Distant Caltrain traffic (approximately ¼ mile west of the project site) and nearby light rail train operations (Third Street line, approximately 365 feet west of the Project's western boundary) both operate at the surface and generate airborne noise and surface vibration. Given their distance and surface location, these two sources are not considered to be substantial sources of groundborne noise or vibration for the 28-Acre Site or Illinois Parcels. There is no machinery or activities in the adjacent BAE Shipyard that would generate vibration on the 28-Acre Site or Illinois Parcels.[11]

Ambient Noise Measurements

To characterize the background noise environment in the project vicinity, a total of 14 noise measurements were collected. Four long-term (96 hours) and five short-term (15 to 30 minutes) measurements were collected north of and in the northern portion of the project site over a five-day

[11] Email communication dated February 2, 2016 from Dennis Deisinger, BAE Systems Ship Repair, to David Beaupre, Port of San Francisco, regarding vibration sources at the BAE Shipyard that could cause vibration in areas outside of BAE's leasehold area.

period[12] in May 2012 in order to determine noise characteristics of the BAE Shipyard repair activities and their effect on the project site's noise environment. In addition, one long-term and two short-term measurements were collected in the southeastern, southern, and western margins of the project site for a 48-hour period in April and August 2015.[13] Measurement locations are indicated on **Figure 5, Noise Measurement Locations.**

Noise measurement data is included in **Attachment 1, Vibro-Acoustic Consultants Report and Supplemental Noise Measurement Data.** A summary of noise measurement data is presented in **Table 6, Summary of Long-Term (LT) and Short-Term (ST) Noise Monitoring on the Project Site and Vicinity (dBA)**. Since it is one of the primary sources of noise on the Mixed-Use District project site, the frequency and tonal characteristics of the shipyard noise were measured as part of short-term measurements (see Attachment 1).

When noise measurements were taken in 2012, BAE was repairing a cruise ship. When this occurs, ship repair activities occur 24 hours per day, seven days a week. Since maximum BAE operations occurred during this measurement period, these measurements are considered the worst-case, maximum background ambient noise level since they include nighttime shipyard activities and operation of generators). Subsequent to the 2012 measurements, BAE completed an electrical upgrade, which allows docking ships to connect to line power instead of Aggreko electric power generators. These generators are located between Dry Dock 2 and Dock 4 East and can also be located on docking ships near the exhaust stack. While this upgrade reduced 2012 noise levels in the northern margin of the project site most of the time, these generators still operate on a short-term basis during power outages and if a ship cannot connect to line power.[14] Therefore, the 2012 measurements conservatively represent maximum noise levels generated at the BAE site

Sims Metals Management (SMM) was also operating in 2012 but has since closed. In 2012, it operated in the northeastern portion of the project site every day of the 2012 measurement period except Sunday. Since SMM no longer operates on-site, the noise levels measured on Sunday, May 13, 2012 (when SMM was not operating) are considered to reflect the existing ambient noise environment in the project vicinity.

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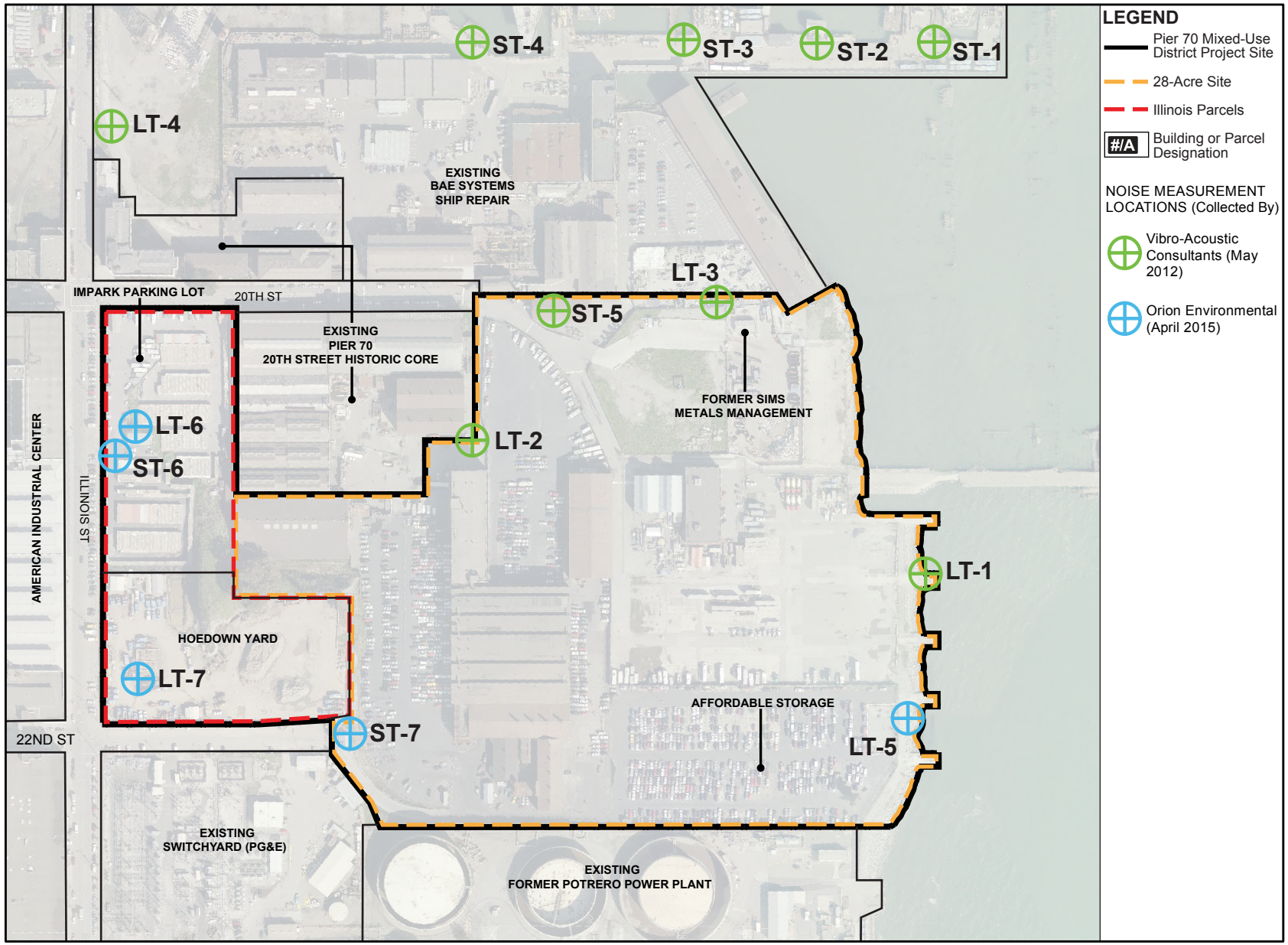
[12] Two long-term measurements (LT-1 and LT-2) were collected by Vibro-Acoustic Consultants (VACC) in the central and eastern portions of the 28-Acre Site, one long-term measurement (LT-3) was taken near the northeastern boundary of the 28-Acre Site, and one long-term measurement (LT-4) was collected by VACC along Illinois Street (north of the Mixed-Use District project site) from May 11 to May 16, 2012 (96 hours). Five short-term measurements (ST-1 through ST-5, 15 to 30 minutes) were also conducted by VACC during this same period in the vicinity of the BAE ship repair facilities, which are located north of the Mixed-Use District project site. The VACC report and noise measurement details are included in Attachment 1 (Noise Measurement Report and Data).

[13] Three long-term measurements (LT-5, LT-6, and LT-7) were collected at the waterfront on the 28-Acre Site and along Illinois Street on the Illinois Parcels by Orion Environmental Associates in the southern portion of the Mixed-Use District project site, while short-term measurements (ST-6 and ST-7, 15 minutes) were taken along the southern and western boundaries of the Mixed-Use District project site in April and August, 2015. Short-term measurements were taken with a Metrosonics Model dB 308 sound level meter, while the long-term measurement was taken with a 3M SoundPro SE/DL Type 2 sound meter.

[14] Email communication with David Beaupre, Port of San Francisco, on September 8, 2015 regarding the status of the electrical upgrade project and operation of Aggreko generators at the BAE Shipyard.



SOURCE: SITELAB URBAN STUDIO, ORION ENVIRONMENTAL

0 100 200 400 FT

FIGURE 5: NOISE MEASUREMENT LOCATIONS

Table 6: Summary of Long-Term (LT) and Short-Term (ST) Noise Monitoring on the Project Site and Vicinity (dBA)

Measurement Location		Time Period	L_{dn} or Leq	Primary Noise Sources
LT-1:	Eastern boundary of 28-Acre Site on the waterfront, south of Pier 64, between Slips 5 and 6 (minimum of 1,100 feet south of BAE Shipyard)	Saturday, 5/12/12: Sunday, 5/13/12: Monday, 5/14/12: Tuesday, 5/15/12: **Average:**	69 dBA (L_{dn}) 66 dBA (L_{dn})[a] 64 dBA (L_{dn}) 64 dBA (L_{dn}) **66 dBA (L_{dn})**	BAE ship repair activities occurred days, nights, and weekends (24/7) during measurement period and were audible above background ambient noise levels during site visit. Large trucks and buses were observed during site visit and may have operated in parking lot near the meter.
LT-2:	Center of 28-Acre Site at north façade of Building 2	Saturday, 5/12/12: Sunday, 5/13/12: Monday, 5/14/12: Tuesday, 5/15/12: **Average:**	67 dBA (L_{dn}) 65 dBA (L_{dn})[a] 65 dBA (L_{dn}) 67 dBA (L_{dn} **66 dBA (L_{dn})**	Ambient noise dominated by traffic in the distance and local industrial activity; BAE Shipyard repair activities audible; and some lighting ballasts at the roof of Building 2 were very noisy, but did not affect noise measurement results.
LT-3:	Northeast boundary of 28-Acre Site southeast of Building 6 (minimum of 500 feet south of BAE Shipyard)	Saturday, 5/12/12: Sunday, 5/13/12: Monday, 5/14/12: Tuesday, 5/15/12: **Average:**	62 dBA (L_{dn}) 60 dBA (L_{dn}) 61 dBA (L_{dn}) 63 dBA (L_{dn}) **62 dBA (L_{dn})**	Adjacent to Sims Metal Management (SMM), which was operating in 2012 but is no longer operating. Since SMM was closed on Sunday, 5/13/12, this level is more representative of the existing noise environment when cruise ship repair activities occur. Historic Building 6 helps block ship repair noise from this location and would continue to do so with the project.
LT-4:	East of Illinois Street, north of project site, in tow yard just north of Building 103.	Saturday, 5/12/12: Sunday, 5/13/12: Monday, 5/14/12: Tuesday, 5/15/12: **Average:**	61 dBA (L_{dn}) 61 dBA (L_{dn}) 63 dBA (L_{dn}) 63 dBA (L_{dn}) **62 dBA (L_{dn})**	Construction of the residential development at 820 Illinois occurred directly across Illinois Street and these activities occurred everyday except Sunday. Ship repair activities were not audible at this location during site visit.
LT-5:	Southeastern boundary of 28-Acre Site on the waterfront, south of Pier 64 at Slip 8	Thursday, 4/2/15: Friday, 4/3/15: **Average:**	57 dBA (L_{dn}) 59 dBA (L_{dn}) **58 dBA (L_{dn})**	Traffic and construction activities at Affordable Storage occurred near meter. Military ship (in for repair at BAE Shipyard) was moved from Drydock 2 to Berth 4-East around midnight.[b]
LT-6:	North-central portion of Illinois Parcels, east of Illinois Street, about 110 feet east of the centerline at Impark parking lot	Tuesday, 8/18/15 Thursday, 8/19/15 **Average:**	64 dBA (L_{dn}) 64 dBA (L_{dn}) **64 dBA (L_{dn})**	Traffic on Illinois Street (including construction haul trucks), cars parking in ImPark lot, and traffic/activities at AIC to the west across Illinois.
LT-7:	Southwest portion of Illinois Parcels in Hoedown Yard, 110 feet from Illinois Street	Tuesday, 8/18/15 Daytime, 8/18/15 Wednesday, 8/19/15 Daytime, 8/19/15 **Average:**	67 dBA (L_{dn}) 63 dBA (Leq) 68 dBA (L_{dn}) 66 dBA (Leq) **68 dBA (L_{dn})**	Heavy equipment at Hoedown Yard, Potrero Substation hum, traffic on Illinois and 22nd Streets, and AIC activities to the west across Illinois.

Table 6 (Cont'd): Summary of Long-Term (LT) and Short-Term (ST) Noise Monitoring on the Project Site and Vicinity (dBA)

Measurement Location		Time Period	L_{dn} or Leq	Primary Noise Sources
ST-1:	North of project site at BAE Shipyard, at Dry Dock 2	Thursday, 5/17/12, 11:00 a.m. to noon, (15–30 minutes)	77 dBA (Leq)	Cruise ship repair activities, including nights and weekends.
ST-2:	North of project site at BAE Shipyard, West of Dry Dock 2	Thursday, 5/17/12 11:00 a.m. to noon, (15–30 minutes)	81 dBA (Leq)	Aggreko electric power generators operating 30 feet away.
ST-3:	North of project site at BAE Shipyard at Dock 4 East	Thursday, 5/17/12 11:00 a.m. to noon, (15–30 minutes)	76 dBA (Leq)	Military ship repair activities.
ST-4:	North of project site at BAE Shipyard at the western end of repair facilities	Thursday, 5/17/12 11:00 a.m. to noon, (15–30 minutes)	66 dBA (Leq); 77 dBA (Leq)	Ship repair activities at west end of ship repair docks; fire pump (runs continuously).
ST-5:	Northern boundary of 28-Acre Site adjacent to 20th Street at southern façade of BAE boiler building	Thursday, 5/17/12, 11:00 a.m. to noon (15–30 minutes)	76 dBA (Leq)[a]	BAE Site boiler facilities
ST-6:	West side of Illinois Parcels, about 50 feet east of the Illinois Street centerline	Wednesday, 4/1/15 at 11:30 a.m. to 11:45 a.m. (15 minutes)	64 dBA (Leq)	Traffic on Illinois Street, including construction haul trucks; heavy equipment operating to the south (in Hoedown Yard) was audible during measurement.
ST-7:	Southern boundary of project site, adjacent to 22nd Street at gate, 550 feet from Illinois Street	Wednesday, 4/1/15 noon to 12:15 p.m. (15 minutes)	58 dBA (Leq)	Heavy equipment at Hoedown Yard, Potrero Substation hum, and traffic on 22nd Street were audible.

Notes: Maximum BAE Shipyard operations (24/7) occurred during measurement of LT-1 through LT-4 and therefore, these measurements are considered the worst-case, maximum background ambient noise levels. No nighttime ship repair activities occurred during the LT-5 measurement period, but an undocking operation occurred around midnight on Friday, 4/3/15.

[a] During the 2012 measurement period, Sims Metals Management (SMM) operated in the northern portion of the project site every day except Sunday. Since SMM no longer operates on-site, the noise levels measured on Sunday, May 13, 2012 (when SMM was not operating) are considered to reflect the existing ambient noise environment in the project vicinity.

[b] Email Communication from Gerry Roybal, Maritime Marketing Manager, Port of San Francisco, on April 15, 2015.

Sources: VACC, 2012 (LT-1 through LT-4; ST-1 through ST-5); Orion Environmental Associates, 2015 (LT-5, LT-6, LT-7, ST-6, ST-7).

The 0 to 2 dBA difference in L_{dn} between Sunday and average noise levels at the three long-term measurement locations in the vicinity of SMM is not considered a substantial difference. When noise measurements were taken in 2015, there were intermittent noise sources observed during measurements. BAE Shipyard repair facilities typically operate during the daytime hours only, but an undocking operation occurred, which appeared to raise nighttime noise levels for a short time by 5 to 10 decibels, resulting in a minor increase in the 24-hour L_{dn} of 2 dBA.

A comparison of 2015 nighttime noise measurements collected along the western boundary of the Illinois Parcels (Location LT-6, which is 700 feet north of the Potrero Substation and 110 feet from the centerline of Illinois Street, and Location LT-7, which is 200 feet from the Potrero Substation and 110 feet from the

centerline of Illinois Street) indicate that as much as 10 to 13 dBA (L_{eq}) of the nighttime ambient noise levels could be attributable to noise generated by the Potrero Substation.

Both short-term and long-term noise measurements taken along Illinois Street in 2012 and 2015 were both affected by construction-related truck traffic traveling on Illinois Street, current activities at the PG&E Hoedown Yard (southwest corner of the Illinois Parcel), and construction of a multi-family development (820 Illinois Street) northwest of the site.

In the project vicinity, the primary sources of noise are BAE Systems Ship Repair facilities, various industrial activities (AIC Industrial Center, PG&E Hoedown Yard and Potrero Substation facilities), new development-related construction activities along Illinois Street, traffic on local streets in the project vicinity (Illinois Street, 20th Street, and 22nd Street), and the distant I-280 freeway. Noise measurements indicate that noise levels in the project site area averaged 66 dBA (L_{dn}, ranging between 60 and 70 dBA [L_{dn}]) when nighttime ship repair activities occur, and averaged 60 dBA (L_{dn}) or 6 dBA less when nighttime repair activities do not occur.[15]

Sensitive Receptors

Some land uses (and associated users) are considered more sensitive to ambient noise levels than others due to the types of activities typically involved with the land use and the amount of noise exposure (in terms of both exposure duration and insulation from noise). In general, occupants of residences, schools, daycare centers, hospitals, places of worship, and nursing homes are considered to be sensitive receptors (i.e., persons who are sensitive to noise based on their specific activities, age, health, etc.). There are industrial, commercial, and residential uses in the project site vicinity. Existing noise-sensitive receptors in the project vicinity (within 900 feet of the Project site) include residences and schools as listed below in **Table 7, Noise-Sensitive Receptors in the Project Vicinity** and their locations are indicated in **Figure 6, Noise-Sensitive Receptors in the Project Vicinity**. The UCSF Mission Bay Hospital (1825 4th Street) is located approximately 0.3 mile to the north. Also, there are additional planned residential developments in the project vicinity and they are also listed in Table 7**.** There are no skilled nursing facilities, churches, or public libraries in the immediate project vicinity.

REGULATORY AND PLANNING SETTING

Federal Regulations

In 1972, the Noise Control Act (42 U.S.C. §4901 et seq.) was passed by Congress to promote noise environments in support of public health and welfare. It also established the U.S. Environmental Protection Agency (USEPA) Office of Noise Abatement and Control to coordinate federal noise control activities. The USEPA established guidelines for noise levels that would be considered safe for

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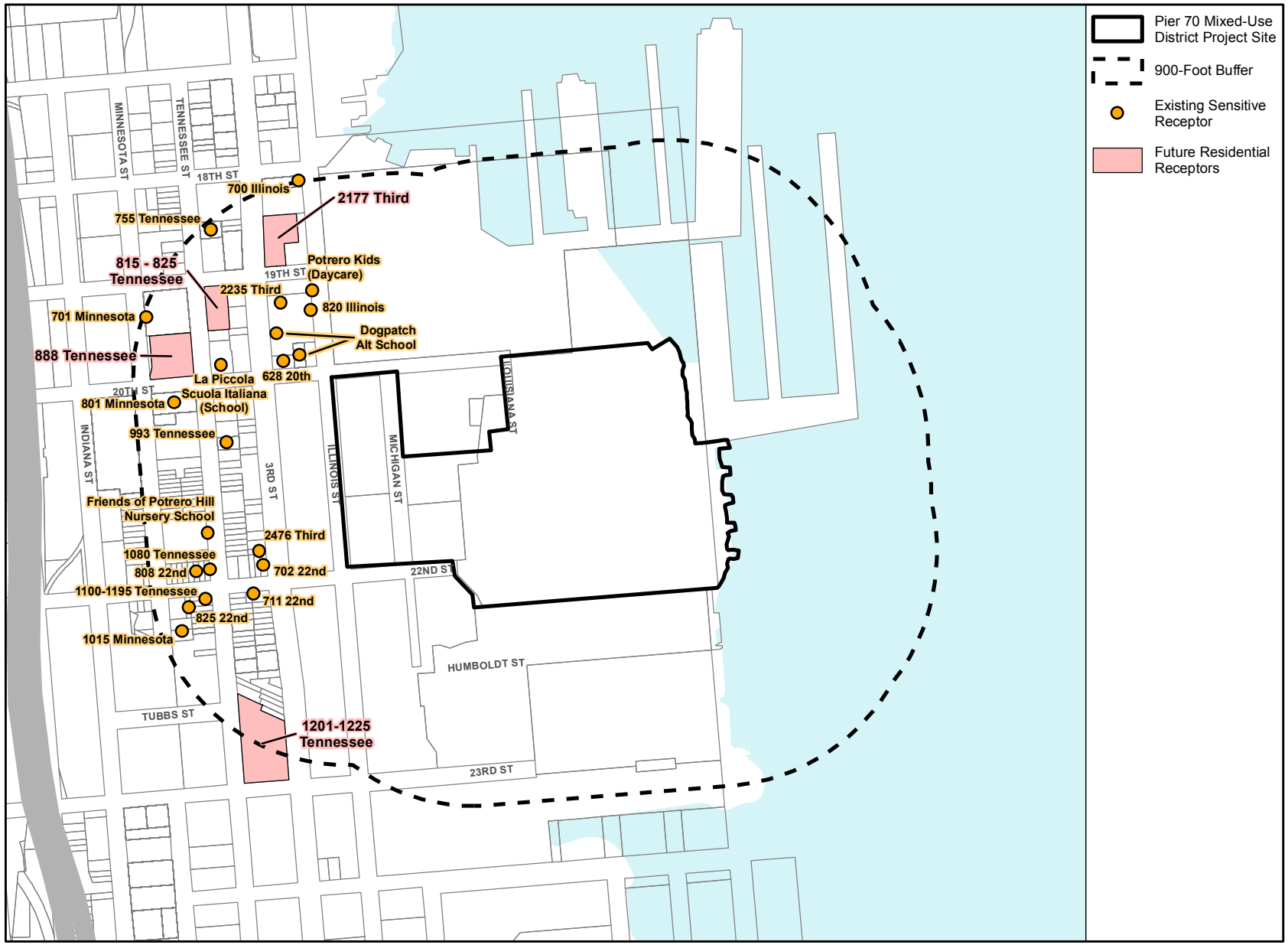
[15] LT-1 is located approximately 1,100 feet from the BAE Shipyard repair facilities, while LT-5 is located approximately 1,400 feet from these repair facilities. When adjusted for this difference in distance (difference of 2 dB), nighttime noise levels at approximately 1,100 feet from the dry docks (LT-1) ranged from 57 to 61 dBA (L_{eq}) or 66 dBA (L_{dn}) with nighttime ship repair activities and 50 to 55 dBA (L_{eq}) or 60 dBA (L_{dn}) without nighttime ship repair activities.

Table 7: Noise-Sensitive Receptors in the Project Vicinity

Type of Sensitive Receptor	Address	Minimum Distance from Site
Existing Sensitive Receptors within 900 Feet of Project Site		
North of 20th Street (Northwest of Project Site)		
Dogpatch Alternative School (Site 2)	616 20th Street	140 feet
Residential	628 20th Street	190 feet
Potrero Kids (Daycare)	810 Illinois Street	350 feet
Residential	820 Illinois Street	200 feet
Residential	2235 Third Street	375 feet
Residential	993 Tennessee Street	460 feet (approx.)
La Piccola Scuola Italiana (School)	728 20th Street	470 feet (approx.)
Residential	700 Illinois Street	770 feet
Residential	755 Tennessee Street	800 feet
Residential	701 Minnesota Street	700 feet
Between 20th and 22nd Streets (West of Project Site)		
Dogpatch Alt School	2265 Third Street	250 feet
Residential	2476-2478 Third Street	370 feet
Residential	702-718 22nd Street	375-430 feet
Residential	1080 Tennessee Street	630 feet
Friends of Potrero Hill Nursery School	1060A Tennessee Street	630 feet
Residential	808-840 22nd Street	690-780 feet
Residential	801-976 Minnesota Street	650-915 feet
South of 22nd Street (Southwest of Project Site)		
Residential	711 22nd Street	380 feet
Residential	1100-1195 Tennessee Street	500 feet
Residential	825-829 22nd Street	700 feet
Residential	1015 Minnesota Street	750 feet
Future/Planned Residential Receptors within 900 Feet of Project Site		
North of 20th Street (North or Northwest of Project Site)		
Residential (Mixed)	815 Tennessee Street	525 feet
Residential (Mixed)	2177 Third Street	700 feet
Residential (Mixed)	888 Tennessee Street	650 feet
South of 22nd Street (Southwest of Project Site)		
Residential (Mixed)	1201-1225 Tennessee Street	780 feet

Source: Google Earth (Imagery Date 4/5/2016) for parcel data (land use, address, and distance to the site). *Baseline and Cumulative Projects List,* Chapter 4.a of the Pier 70 Mixed-Use District Project Draft EIR.



SOURCE: ORION ENVIRONMENTAL

PIER 70 MIXED-USE DISTRICT

FIGURE 6: NOISE-SENSITIVE RECEPTORS IN THE PROJECT VICINITY

community exposure without the risk of adverse health or welfare effects. The USEPA found that to prevent hearing loss over the lifetime of a receptor, the yearly average L_{eq} should not exceed 70 dBA, and the L_{dn} should not exceed 55 dBA in outdoor activity areas or 45 dBA indoors to prevent interference and annoyance. In 1982, the USEPA phased out the office's funding as part of a shift in federal noise control policy to transfer the primary responsibility of regulating noise to state and local governments.

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under Title 40 of the Code of Federal Regulations, Part 205, Subpart B. The federal truck passby noise standard is 80 dBA at 50 feet from the vehicle pathway centerline, under specified test procedures. These controls are implemented through regulatory controls on truck manufacturers. There are no comparable standards for vibration, which tend to be specific to the roadway surface, the vehicle load, and other factors.

State Regulations

Noise

With respect to noise insulation standards, the 2013 *California Building Code* (Title 24, Part 2 of the *California Code of Regulations* [CCR]) requires that walls and floor/ceiling assemblies separating dwelling units from each other or from public or service areas have a Sound Transmission Class (STC) of at least 50, meaning they can reduce noise by a minimum of 50 dB.[16] The Green Building Code standards (Section 1207.4, Allowable Interior Noise Levels) also specify a maximum interior noise limit of 45 dBA (L_{dn} or CNEL) in habitable rooms, and require that common interior walls and floor/ceiling assemblies meet a minimum STC rating of 50 for airborne noise.

The 2013 *Green Building Standards Code* (also part of the State building code; CCR Title 24, Part 11, and referenced below as the more commonly known "Title 24") specifies the following insulation standards for Environmental Comfort (Section 5.507) to minimize exterior noise transmission into interior spaces for non-residential buildings:

- Section 5.507.4.1, Exterior Noise Transmission, requires wall and roof-ceiling assemblies to have an STC of at least 50 and exterior windows to have a minimum STC of 30 for any of the following building locations: (1) within the 65-dBA, L_{dn}, noise contour of a freeway, expressway, railroad, or industrial source; and (2) within the 65-dBA noise contour of an airport. Exceptions include buildings with few or no occupants and where occupants are not likely to be affected by exterior noise, such as factories, stadiums, parking structures and storage or utility buildings. Section 5.507.4.1.1 requires non-residential buildings to be designed with exterior walls and roof-ceiling assemblies with an STC rating of 45 to provide an acceptable interior noise level of 50 dBA, L_{eq}, in occupied areas during any hour of operation.[17]

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[16] State *Building Code* Section 1207.2.

[17] California Building Standards Commission and International Code Council, *Guide to the 2013 California Green Building Standards Code (Nonresidential), Cal Green, Section 5.507, Environmental Comfort,* pp. 95-97, February 2014.

- 5.507.4.3, Interior Sound Transmission, requires wall and floor-ceiling assemblies separating tenant spaces and also separating tenant spaces and public places to have an STC of at least 40.
- 5.507.4.2, Interior Sound, requires wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public places to have an STC of at least 40.

San Francisco has adopted the Green Building Code; it is enforced by DBI.

Vibration

To assess the damage potential to structures from ground vibration induced by construction equipment, various vibration criteria were reviewed and synthesized by Caltrans, and they are presented in **Table 8, Vibration Criteria for Potential Damage to Structures.** As indicated in this table, the threshold for continuous vibration sources is about half of the threshold for transient sources.

Table 8: Vibration Guidelines for Potential Damage to Structures

	Maximum Peak Particle Velocity (PPV) (in/sec)	
Structure Type 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, such as 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: Caltrans, *Transportation and Construction Vibration Guidance Manual,* September 2013, Table 19, p. 38. Available online at http://www.dot.ca.gov/hq/env/noise/publications.htm. Accessed on December 16, 2016.

People are more sensitive to vibration during the nighttime hours when sleeping than during daytime waking hours. Numerous studies have been conducted to characterize the human response to vibration. As shown in **Table 9, Vibration Guidelines for Annoyance,** for steady-state (continuous) vibration, human response is typically "strongly perceptible" at 0.1 in/sec PPV, "distinctly perceptible" at 0.035 in/sec PPV, and "barely perceptible" at 0.01 in/sec PPV.

Table 9: Vibration Guidelines for Annoyance

Human Response	Maximum Peak Particle Velocity (in/sec, PPV)	
	Transient Sources[a]	Continuous/Frequent Intermittent Sources[b]
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.10

Notes:

in/sec = inches per second; PPV = peak particle velocity

[a] Transient sources create a single isolated vibration event, such as blasting or drop balls.

[b] Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Source: Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013, Table 20, p. 38. Available online at http://www.dot.ca.gov/hq/env/noise/publications.htm. Accessed on December 16, 2016.

Local Regulations and Guidelines

San Francisco Police Code

In the City, regulation of noise is addressed in Article 29 of the Police Code (the Noise Ordinance), which states the City's policy is to prohibit unnecessary, excessive and offensive noises from all sources subject to police power. Section 2900 makes the following declaration with regard to community noise levels: "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."

Sections 2907 and 2908 of Article 29 regulate construction equipment and construction work at night, while Section 2909 provides for limits on stationary-source noise from machinery and equipment. Sections 2907 and 2908 are enforced by the Department of Building Inspection, and Section 2909 is enforced by the Department of Public Health. Summaries of these and other relevant sections are presented below.

Section 2907(a) of the Police Code limits noise from construction equipment to 80 dBA when measured at a distance of 100 feet from such equipment, or an equivalent sound level at some other convenient distance. Exemptions to this requirement include impact tools with approved mufflers, pavement breakers, and jackhammers with approved acoustic shields, and construction equipment used in connection with emergency work. Section 2908 prohibits nighttime construction (between 8:00 p.m. and 7:00 a.m.) that generates noise exceeding the ambient noise level by 5 dBA at the nearest property line unless a special permit has been issued by the City.

Section 2909 generally prohibits fixed mechanical equipment noise and music in excess of 5 dBA more than ambient noise from residential sources, 8 dBA more than ambient noise from commercial sources, and 10 dBA more than ambient on public property at a distance of 25 feet or more. Section 2909(d) establishes maximum noise levels for fixed noise sources (e.g., mechanical equipment) of 55 dBA (7:00 a.m. to 10:00 p.m.) and 45 dBA (10:00 p.m. to 7:00 a.m.) inside any sleeping or living room in any dwelling unit located on residential property to prevent sleep disturbance, with windows open, except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

The City's Guidelines for Noise Control Ordinance Monitoring and Enforcement, revised in December 2014, clarifies the definition of "ambient" as the L_{90} (the level of noise exceeded 90 percent of the time), and this noise descriptor is considered to be a conservative representation of the ambient under most conditions.[18] Ordinance compliance is determined by measuring the L_{90} for 10 minutes, with and without the noise source at issue. Use of the L_{90} descriptor is appropriate when determining code compliance of a fixed noise source (such as mechanical equipment), but is not appropriate for other aspects of an environmental impact analysis, which determines noise compatibility based on L_{dn} or CNEL, a different noise descriptor (as described above under Sound Fundamentals).

Use of Sound Amplifying Equipment

As discussed above under Project Features, the Proposed Project includes open space that would be programmed for various special events, some of which may include amplified sound and, therefore, may require a permit from the Entertainment Commission. Article 1, Section 47.2 of the Police Code regulates the use of any sound amplifying equipment, whether truck-mounted or otherwise, within the City and County of San Francisco and consists of the following regulations:

1. The only sounds permitted are music or human speech.

2. Hours of operation permitted shall be between 9:00 a.m. and 10:00 p.m.; operation after 10:00 p.m. is permitted only at the location of a public event or affair of general public interest or as otherwise permitted by the Entertainment Commission.

3. Except as permitted by the Entertainment Commission, sound shall not be issued within 450 feet of hospitals, schools, churches, courthouses, public libraries, or mortuaries.

4. No sound truck with its amplifying device in operation shall traverse any one block in the City and County more than four times in any one calendar day.

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[18] City and County of San Francisco, *San Francisco Police Code, Article 29: Regulation of Noise Guidelines for Noise Control Ordinance Monitoring and Enforcement, December 2014 Guidance (Supersedes All Previous Guidance),* December 2014. Available online at https://www.sfdph.org/dph/files/EHSdocs/ehsNoise/GuidelinesNoiseEnforcement.pdf. Accessed on April 22, 2015.

5. Amplified human speech and music shall not be unreasonably loud, raucous, jarring, or disturbing to persons of normal sensitiveness within the area of audibility, nor louder than permitted in Subsections (6) and (7) hereof.

6. When the sound truck is in motion, the volume of sound shall be controlled so that it will not be audible for a distance in excess of 450 feet from its source; provided, however, that when the sound truck is stopped by traffic, the said sound amplifying equipment shall not be operated for longer than one minute at such a stop.

7. Except as permitted by the Entertainment Commission for public gatherings, in all cases where sound amplifying equipment remains at one location or when the sound truck is not in motion, the volume of sound shall be controlled so that it will not be audible for a distance in excess of 250 feet from the periphery of the attendant audience.

8. No sound amplifying equipment shall be operated unless the axis of the center of any sound reproducing equipment used shall be parallel to the direction of travel of the sound truck; provided, however, that any sound reproducing equipment may be so placed upon said sound truck as to not vary more than 15 degrees on either side of the axis of the center of the direction of travel and, provided further, that radial, nondirectional type of loudspeakers may be used on said sound trucks either alone or in conjunction with sound reproducing equipment placed within 15 degrees of the center line of the direction of travel.

San Francisco Entertainment Commission Permits

Section 90.1 of the San Francisco Administrative Code establishes the role of the San Francisco Entertainment Commission to regulate, promote and enhance the field of entertainment in San Francisco. The seven-member commission has powers to accept, review, and gather information to conduct hearings for entertainment-related permit applications and rule upon and issue, deny, condition, suspend, revoke or transfer entertainment-related permits in accordance with applicable laws and regulations. Additionally, the Entertainment Commission plans and coordinates the provision of City services for major events for which there is no recognized organizer, promoter, or sponsor.

Pursuant to Section 1060.1 of the Police Code, the Entertainment Commission has permit authority over a variety of different permit types including Place of Entertainment permits, Outdoor Amplified Sound/Loudspeaker permits, and Limited Live Performance permits. Permit hearings require the applicant to provide proof of neighborhood outreach to the Commission. Such outreach must consist of at least two of four types of outreach: (1) presentation to a neighborhood, community or residential group; (2) presentation to the leadership of a local not-for-profit that deals with community support such as housing, at risk youth, health, or mental services; (3) a petition including an appropriate number of neighbor signatures according to the applicants business address; and/or (4) presentation to a business association if no community organization or not-for-profit exists near the venue.

San Francisco General Plan

The Environmental Protection Element of the San Francisco General Plan contains Land Use Compatibility Guidelines for Community Noise for determining the compatibility of various land uses with different noise levels (see **Figure 7, San Francisco Land Use Compatibility Chart for Community Noise**). These guidelines, which are similar to state guidelines set forth by the Governor's Office of Planning and Research, indicate maximum acceptable noise levels for various land uses. Although this figure presents a range of noise levels that are considered compatible or incompatible with various land uses, the maximum "satisfactory" noise level is 60 dBA (L_{dn}) for residential and hotel uses, 65 dBA (L_{dn}) for school classrooms, libraries, churches and hospitals, 70 dBA (L_{dn}) for playgrounds, parks, office uses, retail commercial uses and noise-sensitive manufacturing/ communications uses, and 77 dBA (L_{dn}) for other commercial uses such as wholesale, some retail, industrial/manufacturing, transportation, communications and utilities. If these uses are proposed to be located in areas with noise levels that exceed these guidelines, a detailed analysis of noise reduction requirements is normally necessary for each building or group of buildings prior to final review and approval.

Objectives and policies in the Environmental Protection Element that pertain to the Proposed Project include the following:

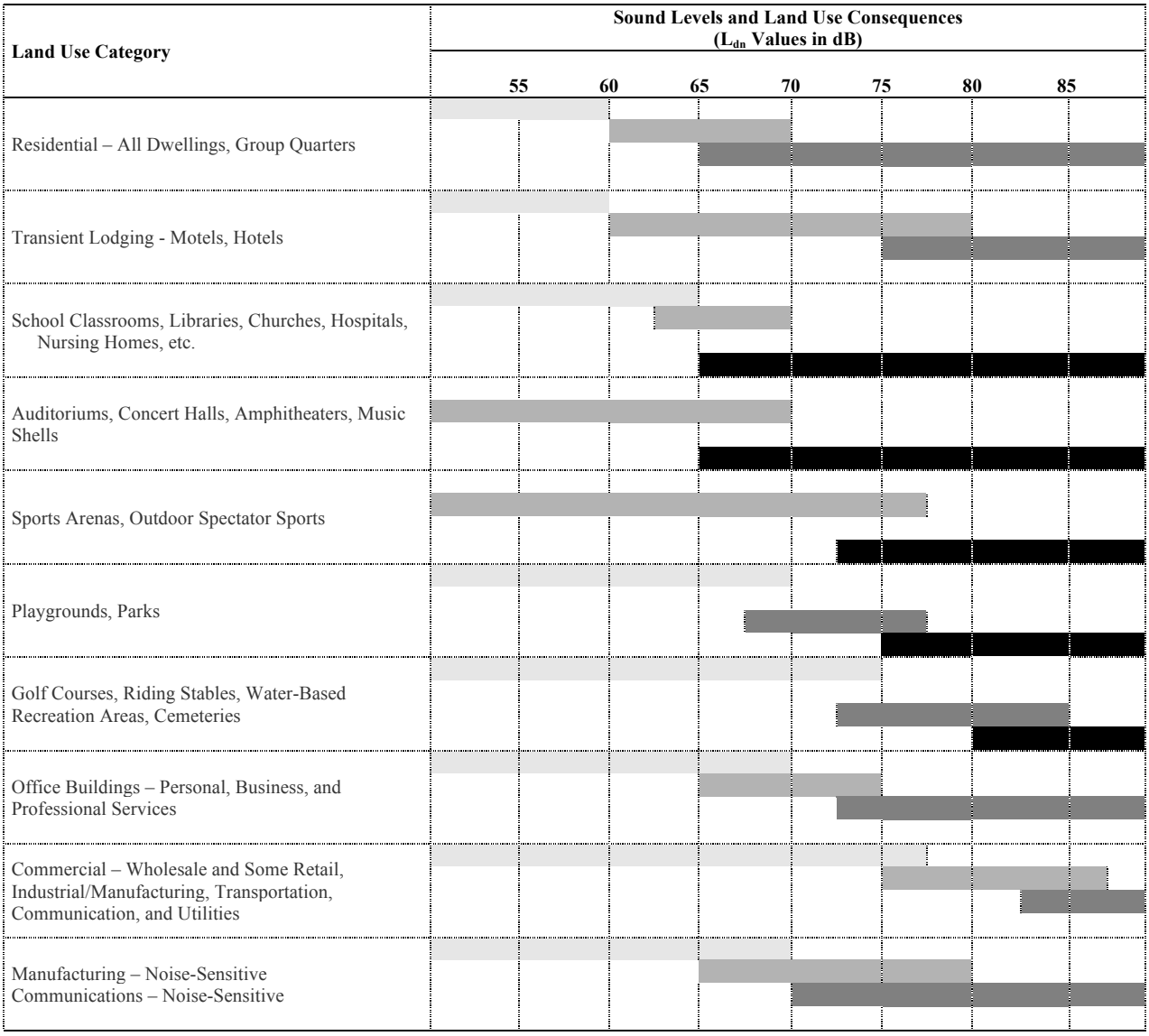
POLICY 9.2: *Impose traffic restrictions to reduce transportation noise. Transportation noise levels vary according to the predominance of vehicle type, traffic volume, and traffic speed. Curtailing any of these variables ordinarily produces a drop in noise level. In addition to setting the speed limit, 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.*

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,*

Figure 7: San Francisco Land Use Compatibility Chart for Community Noise



Satisfactory, with no special noise insulation requirements. Noise levels in this range are considered "Acceptable."

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Noise levels in this range are considered "Conditionally Acceptable."

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. Noise levels in this range are considered "Conditionally Unacceptable."

New construction or development should generally not be undertaken. Noise levels in this range are considered "Unacceptable."

Source: San Francisco Planning Department, 1996. *San Francisco General Plan*, adopted on June 27, 1996. Available online at: http://www.sf-planning.org/ftp/General_Plan/I6_Environmental_Protection.htm#ENV_TRA_11. Accessed March 12, 2015.

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.

Central Waterfront Plan

OBJECTIVE 1.5: MINIMIZE THE IMPACT OF NOISE ON AFFECTED AREAS AND ENSURE GENERAL PLAN NOISE REQUIREMENTS ARE MET. Noise, or unwanted sound, is an inherent component of urban living. While environmental noise can pose a threat to mental and physical health, potential health impacts can be avoided or reduced through sound land use planning. The careful analysis and siting of new land uses can help to ensure land use compatibility, particularly in zones which allow a diverse range of land uses. Traffic is the most important source of environmental noise in San Francisco. Commercial land uses also generate noise from mechanical ventilation and cooling systems, and though freight movement. Sound control technologies are available to both insulate sensitive uses and contain unwanted sound. The use of good urban design can help to ensure that noise does not impede access and enjoyment of public space.

Policies that address Objective 1.5 above are as follows:

POLICY 1.5.1: Reduce potential land use conflicts by providing accurate background noise-level data for planning.

POLICY 1.5.2: Reduce potential land use conflicts by carefully considering the location and design of both noise generating uses and sensitive uses in the Central Waterfront.

METHODOLOGY

Noise

Methodology for Analysis of Construction Impacts

Project implementation would result in operation of heavy equipment on the project site for demolition of existing structures, construction of new structures, and rehabilitation of on-site structures to be retained. Construction activities would occur intermittently on the project site over the 11-year construction duration and could expose nearby sensitive receptors to temporary increases in noise levels substantially in excess of ambient levels. Project construction would also result in temporary increases in truck traffic noise along haul routes for off-hauling excavated materials and materials deliveries. To assess potential short-term construction noise impacts, sensitive receptors and their relative exposure were identified and described. When determining exposure to noise, consideration was given to factors such as structural barriers and distance because of their ability to attenuate noise.

Operation of on-site equipment expected to be used in project construction were estimated based on equipment noise data published by the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), as shown in Table 8: Typical Construction Noise Levels. The sources assessed were identified by the project sponsor as likely equipment to be used during project construction. The roadway noise construction model of the FHWA was then used to predict noise levels at the nearest receptors during both pile-driving activity and non-impact construction activity.

Construction-related noise impacts were assessed in part using the U.S. Federal Transit Administration (FTA) methodology for general quantitative noise assessment.[19] This methodology calls for estimating a combined noise level from simultaneous operation of the two noisiest pieces of equipment expected to be used in each construction phase. This method applies usage factors to each piece of equipment analyzed to account for the time that the equipment is in use over the specified time period. Given the size of the project site, the minimum distance between source and receptor was based on the distance between the closest boundary to the specified receptors.

Proposed construction activities would be required to comply with the San Francisco Noise Ordinance. The San Francisco Noise Ordinance prohibits construction activities between 8:00 p.m. and 7:00 a.m., and limits noise from any individual piece of construction equipment, except impact tools approved by the San Francisco Public Works, to 80 dBA at 100 feet, which is equivalent to 86 dBA at 50 feet. Noise increases from operation of construction equipment are also compared to this ordinance noise limit as

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[19] U.S. Department of Transportation, Federal Transit Administration (FTA), *Transit Noise and Vibration Impact Assessment, Section 12.1.1 Quantitative Noise Assessment Methods,* May 2006, pp. 12-4 to 12-8. Available online at http://www.fta.dot.gov/12347_2233.html. Accessed on March 13, 2016.

well as FTA guidelines (at residential uses, 90 dBA (L_{eq}) during the day and 80 dBA during the night because they are noise-sensitive) to determine if noise increases could adversely affect existing off-site noise-sensitive receptors or future on-site receptors. Additionally, the Planning Department considers an increase of 10 dBA over existing noise levels ("Ambient+10 dBA" threshold) due to persistent construction, which generally represents a perceived doubling of loudness, to be a substantial temporary increase in noise levels.

Methodology for Analysis of Operational Impacts

Operation of the Proposed Project would result in permanent increases in ambient noise levels, primarily through project-related increases in traffic, addition of stationary equipment, and introduction of new uses, events, and activities on the project site. Operational noise issues evaluated in this analysis include: (1) noise increases resulting from the Proposed Project's stationary and mobile noise sources; (2) compatibility of the Proposed Project's noise-sensitive sensitive uses and existing uses in the project site vicinity with future noise levels at the project site, as defined by San Francisco Land Use Compatibility Guidelines for Community Noise; and (3) any operations or activities with the potential to cause sleep disturbance. Traffic noise modeling was performed using the FHWA Traffic Noise (RD-77-108) Model. Noise increases from operation of stationary equipment on the project site are compared to ordinance noise increase limits to determine if noise increases could adversely affect existing off-site noise-sensitive receptors or future on-site receptors.

Traffic increases associated with the Proposed Project would result in traffic noise increases along local streets. In general, traffic noise increases of less than 3 dBA are barely perceptible to people, while a 5-dBA increase is readily noticeable.[20] Therefore, permanent increases in ambient noise levels of more than 5 dBA are considered to be unacceptable. However, in places where the existing or resulting noise environment is not "Conditionally Acceptable," "Conditionally Unacceptable," or "Unacceptable" based the San Francisco Land Use Compatibility Chart for Community Noise (Figure 7), any noise increase greater than 3 dBA is considered to be unacceptable.

Traffic noise levels on 79 road segments in the project vicinity were modeled using traffic volumes presented in the *Pier 70 Traffic Impact Study*.[21] These modeled traffic noise levels were used to determine the change in traffic noise levels resulting from changes in traffic volumes. The above thresholds (more than a 5-dBA increase, or 3-dBA increase where ambient noise levels are Conditionally Acceptable, Conditionally Unacceptable or Unacceptable) were applied to determine whether these incremental noise increases would be acceptable or unacceptable.

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[20] California Department of Transportation, Division of Environmental Analysis, "Technical Noise Supplement," November 2009; pp. 2-48 – 2-49. Available online at http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf.

[21] Fehr & Peers, Pier 70 Mixed-Use District Project Transportation Impact Study, 2016. A copy of this report is available for review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, as part of Case File No. 2014.001272ENV.

Vibration

Vibration is considered substantial if it is at levels high enough to cause damage to nearby structures or buildings or cause annoyance at sensitive receptors. Groundborne noise occurs when vibrations transmitted through the ground result in secondary radiation of noise. Construction-related groundborne noise is generally associated with underground construction activities where the airborne noise path is blocked, which is not proposed as part of this project. Therefore this analysis is focused on groundborne vibration from construction-related activities such as the use of certain types of pile-driving and heavy equipment.

This evaluation compares estimated vibration levels to vibration levels identified by Caltrans as potentially causing architectural damage to buildings. For adverse human reaction, this analysis compares estimated vibration levels to those which are typically "strongly perceptible" (0.1 inches per second [in/sec] PPV).[22]

RESULTS AND DISCUSSION

Construction-Related Noise and Vibration

On-Site Equipment Operation

Construction activity noise levels at and near any construction site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. Construction-related material haul trips would increase ambient noise levels along haul routes, with the magnitude of the increase depending on the number of haul trips made and types of vehicles used. In addition, certain types of construction equipment generate impulsive noises (such as pile driving), which can be particularly annoying to most people. Given the project's proximity to the Bay, it is assumed that at least some development in the project site area, such as the secant walls proposed in the northeastern and southeastern portions (near Parcels B and H2) would entail pile-driving activities.

Table 10, Typical Construction Noise Levels, shows typical noise levels associated with a range of construction equipment associated with new construction. As indicated in this table, operation of jackhammers and concrete saws have the potential to exceed the 86-dBA at 50 feet or 80-dBA at 100 feet noise limit for construction equipment (as specified in the *Police Code)* by 2 to 4 dBA. While jackhammers with approved acoustic shields are exempt from this ordinance limit (Section 2907(b)), concrete saws would not be exempt. All construction equipment will be required to employ necessary noise control measures (Construction Noise Approach 1, below) in order to comply with the noise limit specified in the *Police Code*, which would minimize the potential for noise disturbance of future on-site residents.

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[22] Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013. Available online at http://www.dot.ca.gov/hq/env/noise/publications.htm. Accessed December 16, 2016.

Table 10: Typical Construction Noise Levels

Construction Equipment	Noise Level (dBA, Leq at 50 feet)	Noise Level (dBA, Leq at 100 feet)
Jackhammer (Pavement Breaker)[1]	**88**	**82**
Concrete Saw or Mounted Impact Hammer (Hoe Ram)	**90**	**84**
Loader	79	73
Dozer	82	76
Excavator	81	75
Grader	85	79
Compactor	83	77
Dump Truck	76	70
Flatbed Truck	74	68
Concrete Truck	81	75
Forklift (gas-powered)	83	77
Street Sweeper (vacuum)	82	76
Generator	81	75
Compressor	78	72
Roller	80	74
Crane	81	75
Paver	77	71
Pile Driver[1]	**101**	**95**
San Francisco Noise Ordinance Limit	86	80

Notes: Noise levels in bold exceed the above ordinance limit, but as indicated, two of the three exceedances are exempt from this limit.

[1] Exempt from the ordinance requirement of 80 dBA at 100 feet.

Sources: U.S. Department of Transportation, Federal Highway Administration, *9.0 Construction Equipment Noise Levels and Ranges, Table 9.1, RCNM Default Noise Emission Reference Levels and Usage Factors, Construction Noise Handbook,* Updated July 2011. Available online at http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm, Accessed January 4, 2016; U.S. Department of Transportation, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment,* May 2006. Available online at http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf, Accessed January 4, 2016.

Implementation of noise control measures recommended in Construction Noise Approach 1 would ensure that all construction equipment noise subject to the noise ordinance be maintained at or below the 86-dBA limit, reducing potential construction-related noise impacts on future on-site residents.

On-Site Construction Activities

Project implementation would result in operation of heavy equipment on the project site for demolition of existing structures, construction of new structures, and rehabilitation of on-site structures to be retained. Construction activities would occur intermittently on the project site over the 11-year construction duration and could expose nearby sensitive receptors to temporary increases in noise levels substantially in excess of ambient levels.

Proposed redevelopment of the Pier 70 Mixed-Use District project site would result in demolition of seven existing structures, removal of a portion of Irish Hill, demolition of portions of the existing Slipways 5-8, construction of new buildings and rehabilitation of three existing buildings. Figure 3, Phased Demolition Plan - Maximum Residential Scenario, and Figure 4, Phased Demolition Plan - Maximum Commercial Scenario, show the proposed buildings to be demolished under each scenario. Construction activities associated with new building construction would include site preparation, pile driving, placement of

infrastructure, placement of foundations for structures, and fabrication of structures. Demolition and construction activities would require the use of heavy trucks, material loaders, cranes, concrete saws, and other mobile and stationary construction equipment listed in Table 10 (Typical Construction Noise Levels) above. Piles would be driven with the use of impact or vibratory pile drivers. General building construction would be less noise intrusive, involving cranes, forklifts, saws, and nail guns. Project construction would also result in temporary increases in truck traffic noise along haul routes for off-hauling excavated materials and materials deliveries.

Because the Proposed Project would be constructed in phases over an 11-year period, multiple construction activities could be occurring on different parcels within the project site at any given time (i.e., demolition could occur on one parcel while pile driving occurs on another) so that some of the noisier construction activities, such as pile driving, on one project parcel could overlap with other noisier construction phases, such as demolition, on other parcels. If pile drivers operated on one parcel while a mounted impact hammer or concrete saw (for demolition) occurred on another parcel at the same time (worst-case condition), the combined noise level from these two noisiest pieces of equipment would be 89 dBA (Leq) at 50 feet.[23] When compared to the FTA daytime thresholds of 90 dBA (L_{eq}) at residential uses and 100 dBA (L_{eq}) at commercial/ industrial uses, the maximum combined L_{eq} noise level would not exceed these thresholds. It is noted that while pile driving and demolition activities could occur at any given time over the 11-year construction duration, they would not occur continuously over this time period and it is unlikely that pile drivers and either impact hammers or concrete saws would not operate simultaneously at closer than 50 feet from any existing residential or commercial uses for any sustained period of time.

Noise Impacts on Off-Site Receptors

As listed in Table 7 (Noise-Sensitive Receptors in the Project Vicinity), the closest existing off-site sensitive receptors are located 140 to 200 feet from the closest site boundary (northwest corner of Parcel PKN). When construction occurs near the northwest corner of Parcel PKN, the maximum combined L_{eq} noise level of 89 dBA (L_{eq}) at 50 feet would attenuate to 80 dBA and 77 dBA (L_{eq}) at these respective receptors. Measurement Location LT-4 (across the street from the 820 Illinois Street residential development) is the closest noise measurement location to these receptors. Ambient noise levels averaged 62 dBA (L_{dn}) or an average of 57 dBA (daytime L_{eq}) at this location and when these ambient noise levels are applied to the Planning Department's Ambient+10 dBA guideline, the applicable guideline would be 72 dBA (L_{dn}) or 67 dBA (daytime L_{eq}) at these receptors and the maximum combined noise levels at the three closest off-site receptors would exceed these thresholds by up to 13 dBA, indicating the potential that these three receptors could be adversely affected by construction noise.

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[23] A 20 percent usage factor was applied to both pieces of equipment. Pile drivers generate 101 dBA (L_{max}) or 88 dBA (L_{eq}) with a 20 percent usage factor. Mounted impact hammers generate 90 dBA (L_{max}) or 83 dBA (L_{eq}) with a 20 percent usage factor. If these two pieces of equipment were to operate at the same time in the same vicinity (not likely since one would be used for demolition and the other as part of foundation work), the combined noise level would be 89 dBA (L_{eq}).

For all but these three receptors (residences at 820 Illinois Street and 628 20th Street [second floor], and Alt School at 616 20th Street), there are intervening buildings that would block and reduce Proposed Project-related construction noise at nearby existing and planned receptors.[24] For example, the AIC building to the west of the site would interrupt the line-of-sight (at ground level and lower floors) between the project site and existing residential receptors located west of the AIC building. If phasing occurs as proposed, it would result in the construction of residential buildings on the western portion of the project site (Illinois Parcels) first. These buildings would also help block and reduce Project-related construction noise (including noise from pile driving activities to the east on the 28-Acre Site) at all existing off-site receptors (including the closest existing receptors).

With implementation of noise controls during all construction phases (Construction Noise Approach 1, below) as well as implementation of noise controls during pile driving (Construction Noise Approach 2, below), the potential for noise disturbance of existing off-site residents (assumed to be occupied during the 11-year construction period) located approximately 140 feet to 200 feet to the northwest would be reduced. However, these measures would not necessarily reduce these noise increases to below the Planning Department's Ambient+10 dBA guideline because feasibility of quieter, alternative methods in all areas cannot be determined at this time.

Noise Impacts on On-Site Receptors

While early construction of Proposed Project residential uses on the Illinois Parcels would help reduce construction-related noise levels at existing receptors, it would also expose future residents living in these new residential buildings to construction noise generated during subsequent phases of Project construction. Construction activities in this area would occur in phases over an 11-year period. Phasing may not occur exactly as laid out in the conceptual phasing plan, but this plan provides a representative approximation of Project phasing.

If Proposed Project phasing occurs as proposed for the Maximum Residential Scenario, residential uses would be developed during all five phases (2018 to 2029), while commercial and RALI uses would be developed during all phases except Phase 1. If Proposed Project phasing occurs as proposed for the Maximum Commercial Scenario, more residential areas would be developed in the early phases (Phases 1, 2, and 3; 2018 to 2023) while more commercial uses would be developed in the later phases (Phases 3, 4, and 5; (2021-2029). As a result of this possible phasing under either scenario, future residents in the project site area that face an adjacent or nearby construction project could be subject to demolition and construction noise for as long as 6 to 9 years. Construction-related noise generated on any given parcel would primarily affect receptors located within about 900 feet and with a direct line-of-sight (a piece of equipment generating 85 dBA would attenuate to 60 dBA over a distance of 900 feet). Depending on the

[24] The three exceptions are the east-facing existing residential units on the upper floors of the residential building at 2235 Third Street (located approximately 200 feet northwest of the project site boundary), the east-facing residential units at 616-620 20th Street (located about 120 feet from the project site boundary), and the top floor (one residential unit) of Building 101 in the 20th Street Historic Core (located about 75 feet from the project site boundary).

order of construction within each phase and overall phasing, some Proposed Project buildings that have already been constructed could interrupt the direct line-of-sight between construction sources and noise-sensitive receptors, and reduce the number of receptors directly exposed to construction noise with no intervening buffering structure.

It is likely that pile driving will be required for construction of some buildings or structures on the 28-Acre Site and possibly on the northern portion of the Illinois Parcels. Construction of secant walls in the northeastern and southeastern portions of the 28-Acre Site could also require pile driving on upland portions of the site. In addition, other impact tools such as jackhammers, concrete saws, or mounted impact hammers (hoe rams) could be used during demolition activities. As indicated above, simultaneous operation of such equipment would generate a maximum combined L_{eq} noise level of 89 dBA (L_{eq}) at 50 feet. Future on-site residents with a direct line-of-sight and 50 feet from demolition or construction activities could be subject to such maximum combined noise levels. As listed in Table 6 (Summary of Long-Term (LT) and Short-Term (ST) Noise Monitoring on the Project Site and Vicinity), ambient noise levels on the project site ranged between 58 dBA and 68 dBA (L_{dn}) and averaged 64 dBA (L_{dn}). Daytime noise levels ranged from 53 dBA (L_{eq}) to 73 dBA (L_{eq}) and average 61 dBA (L_{eq}). When these ambient noise levels are applied to the Planning Department's Ambient+10 dBA guideline, the average thresholds are 74 dBA (L_{dn}) and 71 dBA (daytime L_{eq}) at on-site receptors, and the maximum combined noise level of 89 dBA (L_{eq}) at 50 feet would, at times, exceed this guideline at the closest future on-site residential receptors (those occupying residential units built in earlier phases) by up to 18 dBA. The degree of disturbance would vary with proximity of the demolition and construction activities to sensitive receptors.

Construction of proposed changes to the street network, new infrastructure (including those associated with all three sewer options), and open space improvements in the project site area would include use of similar construction equipment as would development projects, although typically for a lesser duration and generally with fewer pieces of equipment than for a major development. Accordingly, construction noise impacts associated with the street network, new infrastructure, and open space would be similar to, but somewhat less substantial than, those for development projects in the project site area, except that pile driving would not be necessary for the street network changes, utility lines (including those associated with all three sewer options), or open space improvements. Building demolition, road construction and building construction would all occur concurrently within each phase. It is expected that infrastructure improvements (including utility lines proposed in roadways) would be done at the same time as road construction. Construction of open space would occur during all five phases of construction. Simultaneous operation of the noisiest pieces of equipment associated with demolition (mounted impact hammer or concrete saw) and other construction activities (excavator) would result in a combined noise level of 85 dBA (L_{eq}) at 50 feet. Such maximum combined noise levels would still exceed the average "Ambient+10 dBA" guideline of 74 dBA (L_{dn}) or 71 dBA (daytime L_{eq}) at on-site receptors located at this proximity. Therefore, construction-related noise increases generated during other phases of construction, such as construction for road and infrastructure improvements, could adversely affect future on-site residents.

Feasible noise avoidance and minimization approaches and practices for construction (Construction Noise Approach 1, below) and pile driving activities (Construction Noise Approach 2, below) could be

employed to minimize the noise disturbance of the existing school approximately 140 feet to the northwest, existing residential units approximately 190 to 200 feet to the northwest, and future on-site residents. However, even with implementation of these noise minimization approaches, the potential would still exist that combined noise levels from simultaneous operation of the noisiest types of construction equipment could still exceed the Ambient+10 dBA guideline.

Off-site Haul Truck Traffic

The net export total of about 340,000 cubic yards of soil and an import of about 20,000 cubic yards of clean fill would generate a total of about 45,000 truck trips, which would be phased over the duration of the planned construction activities (averaging 17 truck trips per day). This average daily increase would be minor on the principal major access streets in the project vicinity, comprising less than 0.1 percent of daily traffic on Illinois Street in the project vicinity and an even smaller percentage of daily traffic on Third Street. Construction-related truck trips generated during the estimated 11-year Project construction duration would be required by the Construction Traffic Control Plan to travel on designated truck routes (i.e., Third Street and Cesar Chavez Street for regional access to the I-280 and SR 101 freeways[25]), minimizing truck traffic in residential areas. There are residential uses on Third Street between 22nd Street and 23rd Street, but no residential uses on this street to the south (between 23rd Street and Cesar Chavez Street). There are no existing residential uses on Cesar Chavez Street between Third Street and the SR 101 freeway. There are also no residential uses on Illinois Street between 22nd Street and Cesar Chavez Street, although this street is not a designated truck route. Given the minimal increase in traffic on local roadways that would be attributable to Project-related haul trucks, temporary increases in traffic noise resulting from haul trucks would not have a substantial effect. Use of truck routes that avoid residential uses as required by the Construction Traffic Control Plan would further reduce potential construction-related noise impacts.

Groundborne Noise and Vibration

Groundborne noise refers to a condition where noise is experienced inside a building or structure as a result of vibrations produced outside of the building and transmitted as ground vibration between the source and receiver. Groundborne noise can be problematic even in situations where the primary airborne noise path is blocked, such as in the case of a subway tunnel passing in close proximity to homes or other noise-sensitive structures. While the Proposed Project would involve excavation to a maximum depth of 27 feet, noise and vibration-generating construction activities associated with construction of proposed basements level would not involve tunneling or underground construction where the airborne noise path is blocked, but instead would use techniques that generate airborne noise and surface vibration. Therefore, impacts related to groundborne noise from construction activities are not expected to be substantial.

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[25] San Francisco Municipal Transportation Agency, 2009. *San Francisco Truck Traffic Routes.* Trucks are expected to use truck routes, arterials or freeways except for local deliveries.

The Proposed Project would include the types of construction activities that could produce excessive groundborne vibration (i.e., pile driving for foundations or secant walls). In addition, construction equipment used for demolition, site preparation, and shoring activities, such as jackhammers, pavement breakers, and drills, could generate varying degrees of temporary groundborne vibration, with the highest levels expected during demolition, excavation, and below-grade construction stages of each construction phase. Excavation for basements on the Illinois Parcels would require excavation into bedrock where use of hoe-rams or jackhammers would be required. Project construction would also entail the use of heavy trucks for material deliveries and for off-site hauling of excavated materials and demolition debris during the daytime hours and throughout the 11-year construction period. All construction activities would be conducted primarily between 7:00 a.m. and 8:00 p.m. in compliance with Section 2908 of the City's Noise Ordinance and subject to noise controls outlined in Construction Noise Approaches 1 and 2 below.

If groundborne vibration generated by Project-related demolition and construction activities were to exceed 0.5 in/sec Peak Particle Velocity (PPV), it could cause cosmetic damage to a nearby structure. Older structures (i.e., potentially historic), such as the unreinforced monumental masonry Buildings 113 and 114 may be more fragile and cosmetic damage could occur at lower vibration levels, possibly as low as 0.2 in/sec PPV. Typical vibration levels associated with the operation of various types of construction equipment at 25, 60, and 160 feet, some of which are similar to those proposed to be used for this Project, are listed in **Table 11, Vibration Levels for Construction Equipment**. While vibration attenuation with distance can vary depending on subsoils, normal attenuation rates indicate that vibration generated by impact pile drivers could result in cosmetic damage to adjacent historic buildings if it occurs within 160 feet of these buildings. Parcel PKN is located approximately 80 feet from the older Buildings 113 and 114, and Parcel A is located approximately 50 feet from Building 113. Cosmetic damage to existing and future buildings on the project site could occur if impact pile drivers are operated within 70 feet of Project structures and 160 feet of Buildings 113 or 114, assuming maximum reference vibration levels. Use of sonic or vibratory pile drivers, if feasible, would typically generate lower levels with commensurate minimum setback distances of approximately 35 feet from Project structures and 70 feet from historic buildings required to avoid cosmetic damage.

Pile driving and building locations on Project parcels have not been specified for the entire site, but pile driving is proposed adjacent to and east of the 20th Street Historic Core, which adjoins the northwestern boundary of the 28-Acre Site and eastern boundary of the 20th/Illinois Parcels. While it may be possible to maintain a setback of 70 feet or more between pile drivers and adjacent structures at many locations to avoid cosmetic damage to adjacent structures, the minimum separation between some parcels such as between Parcel E1, Parcel E4 and Building 21 or between Parcels E2 and E3 would also be less than 70 feet. At distances of less than 70 feet, vibration from impact or vibratory pile driving activities could result in cosmetic damage to Project structures and historic Buildings 113 and 114. When the more stringent threshold of 0.2 in/sec PPV is applied to historic buildings, cosmetic damage could occur at distances of up to 160 feet from historic buildings (as indicated in Table 8, Vibration Guidelines for Potential Damage to Structures). However, implementation of vibration minimization approaches and practices for pile driving and other construction activities (Construction Noise Approach 3, below) could be employed to minimize the potential for cosmetic damage to adjacent Project and historic structures.

Table 11: Vibration Levels for Construction Equipment

	Peak Particle Velocity (PPV) (in/sec)		
Equipment	**At 25 Feet**	**At 60 Feet**[1]	**At 160 Feet**[1]
Impact or Vibratory Pile Driver			
Range	0.170–1.518	0.065–0.579	0.022-0.197
Typical	0.65	0.248	0.084
Other Construction Equipment			
Vibratory Roller/Compactor	0.210	0.080	0.027
Large Bulldozer	0.089	0.034	0.012
Caisson Drilling	0.089	0.034	0.012
Loaded Trucks	0.076	0.029	0.010
Jackhammer	0.035	0.013	0.005
Small Bulldozer	0.003	0.001	0.000

Note:

[1] Vibration amplitudes for construction equipment assume normal propagation conditions and calculated using the following formula: PPV equip = PPVref x $(25/D)^{1.1}$ where:

- PPV (equip) = the peak particle velocity in in/sec of the equipment adjusted for the distance
- PPV (ref) = the reference vibration level in in/sec from pages 31-33 and Table 18 of the Caltrans Vibration Guidance Manual as well as Table 12-2 of the FTA Noise and Vibration Guidance Manual
- D = the distance from the equipment to the receiver

Source: Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013, pp. 29-34. Available online at http://www.dot.ca.gov/hq/env/noise/publications.htm. Accessed on December 16, 2016; Federal Transit Administration, *Transit Noise and Vibration Impact Assessment,* May 2006. Available online at https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/noise-and-vibration. Accessed on December 16, 2016.

Depending on the timing of development at Parcels E2, E3 and E4, as well as the timing of the proposed relocation of historic Building 21 to within 25 feet of new development, construction-related vibration impacts on this building from adjacent pile driving activities could be avoided entirely if development precedes relocation. If, however, relocation of Building 21 precedes development at adjacent Parcels E2, E3, and E4, impact or vibratory pile driving activities could result in cosmetic damage to this historic building and implementation of vibration minimization approaches (Construction Noise Approach 3, below) would be necessary.

While vibratory pile driving (or similar continuous vibration sources) can reduce the potential impacts to fragile structures that can occur with impact pile driving, (where higher intermittent vibration levels can occur when the hammer strikes the pile), continuous vibration also can cause liquefaction (or differential settlement in sandy soils), due to the continuous nature of the vibration. AASHTO[26] states "Saturated, loose, uniformly or poorly graded sands and silts are sensitive to cyclic vibration such as might be

[26] American Association of State Highway Transportation Officials (AASHTO). *Evaluation of Transportation-Related Earthborne Vibrations,* R 8-96, 2004.

produced by vibratory pile driving. These activities can produce noticeable settlement even at low vibration levels (0.1 to 0.7 in/sec), which are known not to produce threshold cracking." Evaluation of this potential, enforcement of an appropriate vibration limit, and using smaller equipment or pre-drilling pile holes, as specified in Construction Noise Approach 3 below, would minimize the potential for structural damage from vibration-induced liquefaction. [27]

Operational Noise and Vibration

Operation of the Proposed Project would increase ambient noise levels in the project vicinity, primarily through the on-site use of stationary equipment, such as emergency generators, heating/ ventilation/ air conditioning systems, a below-grade wastewater pump station (new 20th Street pump station), outdoor activities in open space areas, and Project-related traffic increases in traffic.

Stationary Equipment

Project implementation would add new mechanical equipment, such as heating/ventilation/air conditioning (HVAC) systems, which could produce operational noise. Operation of HVAC equipment would be subject to the City's Noise Ordinance (Article 29 of the San Francisco Police Code). Under Section 2909, stationary sources are not permitted to result in noise levels that exceed the existing ambient (L_{90}) noise level by more than 5 dBA on residential property, 8 dBA on commercial and industrial property and 10 dBA on public property. Section 2909(d) states that no fixed noise source may cause the noise level measured inside any sleeping or living room in a dwelling unit on residential property to exceed 45 dBA between 10:00 p.m. and 7:00 a.m. or 55 dBA between 7 a.m. and 10 p.m. with windows open, except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

Based on noise measurements collected on the project site and its vicinity (see noise measurement data in Attachment 1), the existing daytime ambient (L_{90}) noise levels range between 44 and 58 dBA near the western boundary of the Illinois Parcels (LT-4 and LT-6) and between 57 and 62 dBA (LT-2) on the 28-Acre Site range. Section 2909 of the *Police Code* would allow mechanical equipment to generate up to 8 dB higher than the lowest ambient (or up to 52 dBA, L_{90}) near the western boundary of the Illinois Parcels and up to 8 dB higher (or up to 65 dBA, L_{90}) near the 28-Acre Site northern boundary. Depending on size, noise from HVAC equipment can generate noise levels of up to 75 dBA (L_{90}) at 30 feet.[28] Assuming HVAC equipment operates 24 hours per day (worst-case), such noise levels would exceed ordinance noise limits if this equipment is placed near parcel boundaries. However, with incorporation of noise attenuation measures (e.g., provision of sound enclosures/barriers, addition of roof parapets to block noise, and increasing setback distances from sensitive receptors), as recommended in Noise Compatibility Approach 1, Stationary Equipment Noise Controls, HVAC-related noise would be reduced to ordinance

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[27] The Proposed Project would likely include the installation of below-grade secant pile walls along the northeastern and southeastern portions of the project site on either side of the craneways to prevent lateral spread from occurring.

[28] Based on specifications for HVAC units provided by vendors and adjusted by Orion Environmental Associates.

noise limits (52 dBA) at the western boundary of the Illinois Parcels, and this reduced noise level would attenuate to below 30 dBA at the closest existing sensitive receptors (140 to 200 feet away). With windows open, interior noise levels would be even lower and well below the 45-dBA nighttime interior noise limit (with windows open) specified in Section 2909. Other nearby sensitive receptors to the west, northwest, and southwest are located farther away and noise levels from Project mechanical equipment would be less. Intervening buildings would also interrupt any direct lines-of-sight between these more distant receptors and rooftop noise sources.

With respect to on-site Project residences, an interior noise level of 45 dBA (L_{dn} or CNEL) would be required by the Title 24 of the California Building Code, and design of Proposed Project residences (under either the Maximum Residential or Maximum Commercial scenarios) would need to account for not only existing noise sources, as required by Title 24, but also future noise sources known at the time of development (including HVAC systems). Therefore, incorporation of noise attenuation measures outlined in Noise Compatibility Approach 1, Stationary Equipment Noise Controls, would ensure compliance with Section 2909 of the *Police Code* in the interiors of Project residential units under both existing and future noise conditions, and also ensure that Project-related noise increases associated with stationary equipment would be reduced to acceptable levels at nearby sensitive receptors.

Emergency generators would be required on at least 11 of the proposed buildings or parcels where building heights would exceed 70 feet under both the Maximum Residential and Maximum Commercial scenarios as well as at the proposed pump station. The only exception would be Parcel E1, which would not require an emergency generator under the Maximum Commercial scenario because the building on this parcel would be 65 feet high under this scenario. These parcels are located along the northern (A, B, D, and E1) and southern (F, G, H1, and H2) Project boundaries, as well as in the center of the site and just east of Irish Hill (C1 and C2). The closest existing off-site sensitive receptors would be located 700 feet or more from the closest of these buildings (C1). The emergency generators would create temporary noise from use during a power failure, could periodically result in temporary noise during testing to ensure their continued reliability, and could operate continuously following a catastrophic emergency until electric power service is restored to the area. Emergency generators typically operate for approximately 1 hour per week (50 hours per year) and such a short noise event would not substantially alter ambient noise levels. Depending on the size, emergency generators can generate noise levels of 75 to 80 dBA (L_{eq}) at 50 feet[29] and the L_{90} noise level would be similar to the L_{eq} level due to the continuous nature of generator noise (i.e., during testing generators could operate continuously for an entire hour so the L_{eq} and L_{90} would be approximately the same during that hour). Although there are no existing off-site sensitive receptors within 700 feet of parcels that could contain buildings requiring generators, some of the Proposed Project buildings where emergency generators would be located would be developed with residential uses. Therefore, the Proposed Project's residential receptors could be located as close as 50 feet from these

[29] U.S. Federal Highway Administration (FHWA), *Construction Noise Handbook, Table 9-1, RCNM Default Noise Emission Reference Levels and Usage Factors.* Available online at http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm. Accessed on December 16, 2016.

buildings/parcels. At this distance, noise levels generated by operation of emergency generators would exceed noise limits specified in Section 2909(d) of the Police Code (55 dBA from 7:00 a.m. to 10:00 p.m. and 45 dBA from 10:00 p.m. to 7:00 a.m. inside any sleeping or living room in any dwelling unit located on residential property). Incorporation of noise attenuation measures outlined in Noise Compatibility Approach 1, Stationary Equipment Noise Controls, would also ensure these ordinance limits would be met.

A wastewater pump station (the 20th Street Pump Station) and at-grade electrical transformers are proposed to be located to the north of the 28-Acre Site between Buildings 108 and Building 6. Pumps associated with the pump station would be located below grade, while other pump station facilities and transformers would be above grade. Noise increases resulting from these new facilities would ultimately depend on the number and size of pumps, the size and type of transformers, extent of noise attenuation features incorporated into the facility design, ambient noise levels in the vicinity, and proximity to sensitive receptors. Although pump noise can be highly variable, below-grade pumps are estimated to generate approximately 52 dBA (L_{eq} or L_{90}, due to the continuous nature of pump noise when operating) at 25 feet from any vent openings to the below-grade pump station structure.[30] In the same vicinity, transformers (up to 1,000 kilovolt amps) could generate noise levels of up to 38 to 44 dBA (L_{eq} or L_{90}, due to the continuous nature of transformer noise) at 25 feet, depending on the type of type of transformer (liquid immersed vs. dry-type).[31] As indicated in Table 6 (Summary of Long-Term (LT) and Short-Term (ST) Noise Monitoring in the Project Mixed-Use District Vicinity), daytime L_{90} noise levels in this vicinity (LT-3) were measured to range from 52 to 58 dBA (L_{90}), and therefore, combined noise generated by these facilities (53 dBA, L_{90}) would have a slight potential to exceed ambient noise levels at times in this vicinity. Existing industrial uses (BAE Systems Ship Repair) and proposed commercial uses (under both the Maximum Residential and Maximum Commercial scenarios) would be located adjacent to this facility, and Section 2909(b) would limit noise increases adjacent to such uses to 8 dBA above ambient (L_{90}). Whether or not future noise levels exceed ordinance noise limits will ultimately depend the size and design of the proposed wastewater pump station facilities as well as ambient noise levels at the closest property plane for the pump station. Given the range of existing ambient noise levels in the pump station vicinity, addition of the proposed pump station is conservatively considered to have the potential to slightly exceed ordinance noise limits. Incorporation of supplemental noise attenuation measures (e.g., installing louvered vent openings, locating vent opening away from adjacent commercial uses, and providing a noise barrier around the transformers, as necessary) outlined in Noise Compatibility Approach 1, Stationary Equipment Noise Controls, would ensure compliance with Section 2909 of the *Police Code.* Compliance with this ordinance limit would ensure that Project-related noise increases from

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[30] This level assumes that the interior level will not exceed 85 dBA (to avoid the need for OSHA worker hearing protection) and the building/enclosure reduces interior noise levels by 20 dBA at vent openings (conservative since most enclosures can provide at least 25 dB reductions), so that the exterior noise level at 6 feet from the vent opening is 65 dBA.

[31] Transformer noise levels were estimated based on National Electrical Manufacturers Association standards (NEMA, *NEMA TR 1-2013, Transformers, Step Voltage Regulators and Reactors,* p. 4, 2014; NEMA *Transformers, Regulators and Reactors, No. TR 1,* p. 4, 1994. Since distance is not specified in NEMA standards, for the purpose of this analysis, levels were assumed to be a near-field noise level at 5 feet and then converted to a far-field noise level at 50 feet by applying a 20-dB reduction.

this pump station would be maintained at acceptable levels at existing industrial uses, proposed commercial uses, and more distant proposed residential uses.

Noise Compatibility of Future Uses

Development of commercial-office uses in proximity to existing residential uses would increase the potential for noise disturbance or conflicts. Sources of noise typically associated with such non-residential uses that can cause sleep disturbance include mechanical equipment, delivery trucks and associated loading areas, parking cars and use of refuse bins. Mechanical equipment (stationary noise sources) can include emergency generators as well as refrigeration and HVAC units, and associated noise impacts from these sources are discussed above.

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. Noise typically associated with delivery trucks include trucks maneuvering in and out of designated loading areas, audible warnings when trucks reverse into loading areas, idling during deliveries, opening and closing of truck doors and rollup doors, use of rolling hand carts and dollies, and engines starting. There would be a potential for sleep disturbance from these types of noise under both scenarios, because all future commercial-office or RALI buildings would be located adjacent to one or more residential buildings (as close as 23 to 38 feet in some instances). 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. 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. However, 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.) would reduce the potential for sleep disturbance of future residents from this noise source (see Noise Compatibility Approach 2, Design of Future Noise-Generating Uses, below).

Noise associated with parking cars include engines starting and car doors slamming. Such noise can cause annoyance at adjacent residential uses if they are concentrated in one area (i.e., a surface parking lot is located adjacent to residences), and if it occurs during the evening or nighttime hours, it could cause sleep disturbance. Parking for each Project building is proposed to be located under the building (below grade parking) or in a parking garage. These types of parking facilities could be designed to avoid or minimize the potential for such noise disturbance or annoyance at future residences assuming appropriate noise shielding measures are incorporated into any future parking garages to comply with ordinance limits (see Noise Compatibility Approach 2, Design of Future Noise-Generating Uses, below).

Noise associated with trash or refuse facilities for both future residential and commercial-office uses could disturb or annoy any future nearby residents. 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).

As indicated above (see Operational Noise and Vibration, Stationary Equipment), *Police Code* Section 2909 limits noise increases from fixed (stationary) mechanical equipment associated with each Project building (residential or commercial-office) to 5 dBA from residential sources and 8 dBA for commercial-office sources, and this requirement would limit the potential for noise compatibility problems. However, there are no similar code restrictions or noise limits that restrict activities such as these (i.e., parking structures, loading docks, and trash bins) that are related to commercial-office uses. Implementation of noise avoidance or minimization practices through the design of both future commercial-office and residential buildings (Noise Compatibility Approaches 2, Design of Future Noise-Generating Uses, and 3, Design of Future Noise-Sensitive Uses, below) to the maximum extent feasible would help reduce potential conflicts between future noise-generating uses and residential receptors and the potential for sleep disturbance. Noise Compatibility Approach 3, Design of Future Noise-Sensitive Uses, would require a site-specific noise evaluation for each residential parcel or building to be developed to ensure that applicable interior noise standards are met, and the evaluation is required to account for planned commercial-office and open space uses in adjacent areas, future variations in Project buildout (building heights, location, and phasing), any changes in activities adjacent to or near the Illinois Parcels or 28-Acre Site (given the Proposed Project's long buildout period), and any shielding provided by surrounding buildings that exist at the time of development. In addition, implementation of noise minimization approaches in the design of noise-generating uses such as loading docks, trash enclosures, surface parking lots, and mechanical equipment evaluation (see Noise Compatibility Approach 2, Design of Future Noise-Generating Uses, below) would ensure that new sources of noise associated with development of new non-residential uses are properly evaluated and potential sleep disturbance effects ameliorated, so that potential conflicts between new noise-generating uses and existing noise-sensitive uses can be minimized or avoided.

Traffic Noise

Operation of the Proposed Project would result in permanent increases in ambient noise levels, primarily through Project-related increases in traffic. Traffic increases associated with the Proposed Project would result in traffic noise increases along local streets. In general, traffic noise increases of less than 3 dBA are barely perceptible to people, while a 5-dBA increase is readily noticeable.[32] Therefore, permanent

[32] California Department of Transportation, Division of Environmental Analysis, "Technical Noise Supplement," November 2009; pp. 2-48 – 2-49. Available online at http://www.dot.ca.gov/hq/env/noise/pub/tens_complete.pdf.

increases in ambient noise levels of less than 5 dBA are typically considered to be acceptable, except in circumstances in which the resulting noise environment is relatively loud. Some guidance thresholds for determining when changes in ambient noise levels are considered substantial is provided by the San Francisco Land Use Compatibility Chart for Community Noise. The City considers a traffic noise increase to be substantial if it exceeds the following threshold levels: (1) any increase that exceeds 5 dBA regardless of the affected land use; and (2) any increase that exceeds 3 dBA in places where the existing or resulting noise environment at the affected land use is "Conditionally Acceptable," "Conditionally Unacceptable," or "Unacceptable" for noise-sensitive uses based the San Francisco Land Use Compatibility Chart for Community Noise (Figure 7).

Noise modeling was completed to estimate existing (baseline) and future traffic noise levels along 79 road segments in the project vicinity and they were modeled using traffic volumes presented in the *Pier 70 Traffic Impact Study* (TIS).[33] Noise modeling results are presented in **Table 12, Summary of Existing and Existing Plus Project Traffic Noise Levels**. Traffic noise levels presented in this table have been modeled for the purpose of identifying the future incremental noise level increases attributable to Project and cumulative development.

Table 12 (Summary of Existing Traffic Noise Levels) indicates that Proposed Project implementation (under both the Maximum Residential and Maximum Commercial scenarios) would result in traffic noise increases ranging from 0 to 14 dBA on local roadways providing access to the site. Of the 79 road segments examined, traffic noise increases on all analyzed street segments would not exceed the above guidance thresholds except for the following:

- 20th Street (east of Third Street to east of Illinois Street)
- 22nd Street (east of Tennessee Street to east of Illinois Street)
- Illinois Street (20th Street to south of 22nd Street)

These street segments either directly adjoin the project site or are within two blocks of the project site and provide direct access to the site. As shown in Table 12, existing land uses located adjacent to all but one of the above-listed street segments are currently industrial, and such uses are not considered sensitive to traffic noise increases (i.e., not noise-sensitive receptors). There is one street segment, 22nd Street between Tennessee Street and Third Street where there are residential uses and the resulting noise level is estimated to slightly exceed 60 dBA (L_{dn} or CNEL) and the incremental increase attributable to the Proposed Project would be 3.2 dBA, 0.2 dBA above the guidance threshold.

[33] Fehr & Peers, Pier 70 Mixed-Use District Project Transportation Impact Study, 2016. A copy of this report is available for review at the San Francisco Planning Department, 1650 Mission Street, Suite 400, as part of Case File No. 2014.001272ENV.

Table 12: Summary of Existing and Existing Plus Project Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline					Existing Use
		Baseline (2020)	With Project (Max Res)	Project Change (Max Res)	With Project (Max Com)	Project Change (Max Com)	
Third Street	North of Harrison	67.1	67.4	0.4	67.5	0.4	Res/Com/Off
	Harrison to Bryant	67.8	68.1	0.3	68.1	0.4	Res/Com/Ind
	South of Bryant	67.5	68.0	0.5	68.1	0.6	Res/Com/Ind
	North of King	67.3	67.9	0.5	67.9	0.6	Res/Com
	King to Terry Francois	66.3	67.3	1.0	67.4	1.1	Ballpark/Res
	Terry Francois to Channel	65.6	66.8	1.1	66.9	1.2	Vacant/Parking
	Channel to Mission Rock	65.5	66.7	1.2	66.8	1.3	Res/Parking
	South of Mission Rock	65.3	66.6	1.3	66.7	1.4	UCSF/Inst/Res
	North of 16th	66.2	67.5	1.2	67.6	1.3	UCSF/Inst
	16th to Mariposa	66.4	67.9	1.5	67.9	1.5	Hospital/Ind
	Mariposa-20th	65.5	66.9	1.4	66.9	1.4	Res/Com/Ind
	20th to 22nd	66.0	67.3	1.3	67.5	1.4	Res/Com/Ind
	22nd to 23rd	66.4	67.9	1.5	58.8	1.5	Com/Res
	23rd to 25th	66.2	68.5	2.3	68.5	2.3	Ind
	25th to Cesar Chavez	66.3	68.1	1.8	68.0	1.8	Com/Ind
	South of Cesar Chavez	65.6	66.1	0.5	66.1	0.5	Ind
16th Street	West of Mississippi	64.5	65.3	0.8	65.3	0.8	Com/Ind
	East of Mississippi	65.7	66.6	0.9	66.5	0.8	Com/Ind
	West of Owens	65.7	66.5	0.9	66.5	0.8	UCSF/Inst.
	East of Owens	65.9	66.8	0.9	66.8	0.9	UCSF/Inst.
	West of Third	65.4	66.9	1.5	66.8	1.4	UCSF/Hospital
	East of Third	60.0	62.2	2.3	62.3	2.3	UCSF/Inst.

Table 12: Summary of Existing and Existing Plus Project Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline					Existing Use
		Baseline (2020)	With Project (Max Res)	Project Change (Max Res)	With Project (Max Com)	Project Change (Max Com)	
18th Street	West of Arkansas	54.7	55.6	0.9	55.6	0.9	Res/Ind
	East of Arkansas	55.4	56.2	0.8	56.2	0.8	Res/Com
	West of Texas	58.3	58.8	0.4	58.8	0.4	Res/Com
	Texas to Pennsylvania	58.5	58.8	0.3	58.8	0.3	Res/Com
	East of Pennsylvania	59.0	60.4	1.3	60.2	1.1	Off/Com
	West of Indiana	59.0	60.4	1.3	60.2	1.1	Ind
	East of Indiana	59.2	61.2	2.0	61.2	2.0	Ind
20th Street	West of Third	58.9	60.0	1.1	60.0	1.1	Res/Ind
	East of Third	59.7	65.1	**5.5**	65.2	**5.5**	Ind
	West of Illinois	59.6	65.0	**5.5**	65.1	**5.5**	Ind
	East of Illinois	62.4	67.1	4.6	67.0	4.6	Ind
22nd Street	West of Indiana	59.4	62.1	2.7	62.1	2.7	Ind
	Indiana to Tennessee	58.8	61.8	3.0	61.8	3.0	Res
	Tennessee to Third	58.4	61.6	**3.2**	61.6	**3.2**	Com/**Res**
	East of Third	58.5	66.9	**8.4**	66.7	**8.2**	Ind
	West of Illinois	58.1	66.9	**8.7**	66.7	**8.6**	Ind
	East of Illinois	51.1	65.4	**14.3**	65.4	**14.3**	Ind
23rd Street	West of Third	56.5	60.0	3.5	60.0	3.4	Ind
	East of Third	54.9	58.7	3.8	58.8	3.8	Ind
	West of Illinois	53.6	58.2	4.6	58.2	4.7	Ind
	East of Illinois	50.9	50.9	0.0	50.9	0.0	Ind

Table 12: Summary of Existing and Existing Plus Project Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline					Existing Use
		Baseline (2020)	With Project (Max Res)	Project Change (Max Res)	With Project (Max Com)	Project Change (Max Com)	
25th Street	West of Pennsylvania	56.5	56.5	0.0	56.5	0.0	Res
	East of Pennsylvania	59.4	61.7	2.3	61.8	2.3	Ind
	West of Indiana	59.3	61.6	2.3	61.7	2.4	Ind
	East of Indiana	59.4	61.7	2.3	61.8	2.3	Ind
	West of Third	57.4	61.7	4.4	62.0	4.6	Ind
	East of Third	53.0	57.9	4.8	58.4	5.4	Ind
	West of Illinois	54.0	58.2	4.2	58.7	4.7	Ind
	East of Illinois	49.5	49.5	0.0	49.5	0.0	Ind
Cesar Chavez	West of Pennsylvania	65.1	66.4	1.3	66.4	1.3	Ind
	East of Pennsylvania	64.6	67.2	2.6	67.2	2.6	Ind
	West of Third	63.4	66.6	3.2	66.6	3.2	Ind
	East of Third	58.2	62.5	4.3	62.5	4.3	Ind
Arkansas Street	North of 18th	54.9	54.9	0.0	54.9	0.0	Res/Ind
	South of 18th	54.2	54.2	0.0	54.2	0.0	Res
Future Driveway	East of Illinois	NA	65.2	NA	65.2	NA	Ind
Illinois Street	North of Mariposa	56.8	59.9	3.1	59.9	3.1	Vacant/UCSF
	Mariposa-19th	59.9	62.9	3.0	62.9	3.0	Res/Com/Ind
	19th to 20th	60.4	63.4	3.0	63.4	3.0	Res/Com/Ind
	20th to Driveway	58.9	64.7	**5.7**	64.4	**5.5**	Ind
	Driveway to 22nd	58.9	65.9	**7.0**	65.8	**6.9**	Ind
	South of 22nd	57.6	63.2	**5.7**	63.4	**5.8**	Ind
Indiana Street	North of 22nd	54.1	54.1	0.0	54.1	0.0	Com/Ind
	South of 22nd	54.6	54.6	0.0	54.6	0.0	Ind
	North of 25th	58.6	60.3	1.7	60.6	1.9	Ind/Res
	South of 25th	57.5	57.5	0.0	57.5	0.0	Ind/Res

Table 12: Summary of Existing and Existing Plus Project Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline					Existing Use
		Baseline (2020)	With Project (Max Res)	Project Change (Max Res)	With Project (Max Com)	Project Change (Max Com)	
Mariposa Street	West of I-280 Ramp	63.8	63.9	0.1	63.9	0.1	Ind/Res
	East of I-280 Ramp	65.6	65.9	0.4	66.0	0.4	Ind
	East of Indiana	63.4	64.1	0.7	64.1	0.7	Ind
	West of Third	62.5	63.3	0.8	63.3	0.8	Ind/Res
	East of Third	60.3	61.5	1.2	61.5	1.2	Ind
	West of Illinois	60.2	61.4	1.2	61.4	1.2	Ind
	East of Illinois	59.6	59.6	0.0	59.6	0.0	Ind
Tennessee Street	North of 22nd	53.4	53.4	0.0	53.4	0.0	Com/Res
	South of 22nd	49.7	49.7	0.0	49.7	0.0	Res/Com
Texas Street	North of 18th	52.6	52.6	0.0	52.6	0.0	Res
	South of 18th	51.5	51.5	0.0	51.5	0.0	Res

Notes: Noise levels may vary by up to one-tenth of a decibel due to rounding. Noise levels in **bold** exceed either of the following threshold increases when compared to baseline noise levels: (1) an increase of 5 dBA or more, or (2) an increase of 3 dBA or more in areas where the existing or resulting noise increase exceeds acceptable (or satisfactory) levels for the affected use (see Figure 7, San Francisco Land Use Compatibility Chart for Community Noise).

Res: Residential; Com: Commercial; Off: Office; Ind: Industrial; Inst: Institutional; UCSF: University of California, San Francisco

Traffic noise modeling was completed using the Federal Highway Administration RD-77-108 model. Assumptions include: Travel speeds on all streets, 25 mph, except on 16th, Third, and Cesar Chavez, where the posted speed limit is 30 mph; Vehicle Mix: 98% Autos/1.5% Medium Trucks/0.5% Heavy Trucks; Day-Night Split: 76% Day (7:00 a.m. to 7:00 p.m.), 12% Evening (7:00 p.m. to 10:00 p.m.), and 12% Night (10:00 p.m. to 7:00 a.m.). Background noise levels due to traffic on other roadways (such as cross-streets or nearby freeways) and non-traffic-related activities are not reflected in these noise levels. Noise levels in this table are intended to indicate incremental noise changes due to Project implementation and future growth. Since they do not include background noise levels, they may not necessarily reflect actual noise levels along these roadway segments if there are other nearby sources of noise. Changes between scenarios analyzed may not show change due to rounding in the noise modeling results.

Source: Orion Environmental Associates, 2016

The Proposed Project would include a shuttle service, operated and maintained by the Pier 70 TMA, to connect the Pier 70 Mixed-Use District to regional transit hubs. The primary goal of the proposed shuttle service at Pier 70 is to provide a first-mile / last-mile connection for transit riders traveling to or from the project site, particularly for riders needing to use frequent local and regional transit. These riders would be expected to take regional transit services operated by BART, Caltrain, Alameda-Contra Costa Transit (AC Transit, Golden Gate Transit, San Mateo County Transit (SamTrans), or other regional transit providers, but would need an additional connection to access these services when traveling to or from Pier 70. The exact structure of any shuttle service provided for the project site has not been established and would depend on factors that are not known at this time. For planning and analysis purposes, two routes have been preliminarily identified; however, final service routes and stops would be determined based on rider feedback and demand, peak period traffic congestion on local streets, and BART and Caltrain schedules and service plans at specific stations. The two preliminary routes assumed for this analysis are:

- 22nd Street, Mississippi Street, and 16th Street to access the 22nd Street Caltrain Station and the 16th Street / Mission BART station; and
- Third Street, 16th Street, and King Street to access the Fourth and King Caltrain Station (with some trips extending to the Transbay Transit Center)

An increase in shuttle bus volumes along these routes would incrementally increase traffic noise levels along these streets. However, the degree of impact would depend on bus sizes, frequency of buses on an hourly basis, and hours of operation. Since some of the above streets have residential uses and existing noise levels on these street segments range from 50 dBA to over 70 dBA (L_{dn}), it is possible that bus traffic noise increases along some of the quieter residential streets (i.e., Mississippi Street where there are no bus lines) could be noticeable. Such potential noise increases could be reduced by using smaller or quieter shuttle buses, using streets with no residential uses, and avoiding more noise-sensitive nighttime hours.

Implementation of Transportation Demand Management measures, which are designed to achieve a performance standard that reduces Project-related one-way traffic by up to 20 percent (see Noise Compatibility Approach 4, Transportation Demand Management, below) could reduce noise levels by up to 1.0 dB. Such reductions would reduce the above noise increases to below the guidance thresholds at all of the above street segments except for three road segments:

- 22nd Street from Third Street to Illinois Street;
- 22nd Street east of Illinois Street (on the project site); and
- Illinois Street from the future 21st Street and 22nd Street (adjacent to the project site).

The one-block section of 22nd Street located off-site is developed with industrial uses and therefore, does not have noise-sensitive receptors. Project residences located adjacent to the section of 22nd Street east of Illinois Street (where the highest increase [14 dBA] is projected to occur) and the section of Illinois Street between the future 21st and 22nd Streets (where the next highest increase [7 dBA] is projected to occur) would not be adversely affected by future noise levels since Project units could be designed to

ensure that interior noise levels are maintained at acceptable levels even with future traffic noise level increases. While such TDM measures would reduce the effects of Project-related traffic noise increases on the interior environment of future uses, the Proposed Project's traffic would still result in noise levels that would cause a substantial permanent increase in ambient noise levels.

Groundborne Vibration and Noise

Operational-related ground-borne vibration is not a common environmental problem and even large vehicles (e.g., trucks and buses) do not generally result in perceptible vibration. Therefore, no long-term vibration effects are expected to be associated proposed residential, commercial and RALI uses under both the Maximum Residential and Maximum Commercial scenarios.

Operation of pumps at the below-ground or enclosed wastewater pump station would have the potential to generate groundborne vibration that could cause sleep disturbance during the more sensitive nighttime hours if residential receptors are located nearby. However, vibration generated by pump station equipment can affect other equipment within the pump station if vibration levels are not controlled adequately. Therefore, controls that are already incorporated into the design to prevent damage to pump station equipment from excessive vibration would also be sufficient to avoid operational vibration levels from causing sleep disturbance at the closest residential receptors (located a minimum of 375 feet away) and cosmetic damage of adjacent Project structures (located at least 75 feet away).

Noise Compatibility with the Future Noise Environment

As indicated above, construction and operation of the Proposed Project would result in substantial short- and long-term noise increases at the project site and its immediate vicinity. Therefore, the impact of these increases on future residents or users of the project site is evaluated below.[34] Besides residential uses, future users of the site include open space/park/playground, commercial, and RALI uses. Open space/park/playground users in urban areas, commercial uses, and RALI uses are not considered to be sensitive to noise, and therefore, noise compatibility of these uses is not considered to be an adverse impact. Noise compatibility of all proposed uses is evaluated in **Table 13, Noise Compatibility by Parcel - Maximum Residential Scenario,** and **Table 14, Noise Compatibility by Parcel - Maximum Commercial Scenario,** but where noise levels are considered Conditionally Acceptable for a proposed use, it is not considered an adverse impact unless the use is residential because residential uses are the only proposed land use that are noise-sensitive.

[34] In *California Building Industry Association v. Bay Area Air Quality Management District*, the California Supreme Court concluded that CEQA generally does not require an analysis of how existing environmental conditions will impact a project's future users or residents unless a proposed project risks exacerbating an existing environmental hazard or condition. In that case, the potential impact of such hazards on future residents or users should be evaluated.

Table 13: Noise Compatibility By Parcel - Maximum Residential Scenario

Project Parcel/ Building	Max Res Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
28-Acre Site[2]						
Parcel A	Com-Office	90	60-66 dBA	60-70 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}).	N/A
Parcel B	Com-Office	90	60-66 dBA	65-69 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}).	N/A
Parcel C1	Com-Office or Residential	90	58-66 dBA	58-71 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}) except Conditionally Acceptable on north façade (71-75 dBA, L_{dn}) or Conditionally Acceptable for residential uses (>60 dBA, Ldn).	N/A or Yes (#3)
	or Parking			58-71 dBA	Parking use is not subject to City noise guidelines, but potential noise conflicts with adjacent residential uses.	N/A
Parcel C2	Residential	90	58-66 dBA	58-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}).	Yes (#3)
	or Parking	90	58-66 dBA	58-70 dBA	Parking use is not subject to City noise guidelines, but potential for disturbance of adjacent residents from noise associated with parking activities.	N/A
Parcel D	Residential	90	66 dBA	66-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Project residences would be subject to shipyard noise with measured nighttime levels of 58-64 dBA (L_{eq}) and 60-69 dBA (L_{max}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but new construction in the northern portion of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	Yes (#3)
Parcel E1	Residential	90	66 dBA	66-69 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Project residences would be subject to shipyard noise with measured nighttime levels of 58-64 dBA (L_{eq}) and 60-69 dBA (L_{max}). Proposed building demolition could increase shipyard noise at this parcel during early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but new construction in the northern portion of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard noise, depending on phasing.	Yes (#3)
Parcel E2	Residential	70	58-66 dBA	66-69 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}).	Yes (#3)
Parcel E3	Residential	70	58-66 dBA	58-68 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}).	Yes (#3)

Table 13: Noise Compatibility By Parcel - Maximum Residential Scenario

Project Parcel/ Building	Max Res Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
Parcel F	Residential	90	58-66 dBA	58-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Proposed building demolition could increase shipyard noise at this parcel during early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard noise, depending on phasing.	Yes (#3)
Parcel G	Residential	90	58-66 dBA	58-69 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Proposed building demolition could increase shipyard noise at this parcel during early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard noise, depending on phasing.	Yes (#3)
Parcel H1	Residential	90	58-66 dBA	58-68 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Proposed building demolition could increase shipyard noise at this parcel during early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard noise, depending on phasing.	Yes (#3)
Parcel H2	Residential	90	58-66 dBA	58-68 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Proposed building demolition could increase shipyard noise at this parcel during early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard noise, depending on phasing.	Yes (#3)
Building 2	Residential	Same Ht.	66 dBA	66-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Project residences would be subject to shipyard noise with	Yes (#3)

Table 13: Noise Compatibility By Parcel - Maximum Residential Scenario

Project Parcel/ Building	Max Res Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
					measured nighttime levels of 58-64 dBA (L_{eq}) and 60-69 dBA (L_{max}). Proposed building demolition could increase shipyard noise at this parcel during early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard noise, depending on phasing.	
Parcel E4	RALI	50	66 dBA	66-69 dBA	Acceptable for RALI uses (≤70 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Building 12	RALI	Same Ht.	58-66 dBA	58-69 dBA	Acceptable for RALI uses (≤70 dBA, L_{dn}) but potential noise conflicts with adjacent residential uses.	N/A
Building 21	RALI	Same Ht.	66 dBA	66 dBA	Acceptable for RALI uses (≤70 dBA, L_{dn}) but potential noise conflicts with adjacent residential uses.	N/A
Parcel C1 Rooftop	Parks/Sport Courts	NA	58-66 dBA	58-71 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}) except Conditionally Acceptable only on C1 immediately adjacent to 21st Street (71-77.5 dBA, L_{dn}).	N/A
Parcel C2 Rooftop	Parks/Sport Courts	NA	58-66 dBA	58-70 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}).	N/A
Waterfront Promenade	Open Space/Parks	NA	58-66 dBA	58-66 dBA	Acceptable for water-related recreational uses (≤75 dBA, L_{dn}).	N/A
Waterfront Terrace	Open Space/Parks	NA	66 dBA	58-68 dBA	Acceptable for water-related recreational uses (≤75 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Slipway Commons	Open Space/Parks	NA	66 dBA	58-66 dBA	Acceptable for water-related recreational uses (≤75 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Building 12 Market Plaza/ Square	Open Space/Parks	NA	66 dBA	66-68 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Illinois Parcels[3]						
Parcel PKN	Residential	65	62-64 dBA	65-72 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}), and new residential construction generally discouraged on south façade (>70 dBA, L_{dn}), but acceptable interior levels can still be achieved with supplemental noise-reduction measures. Project residences on west side would be subject to noise generated by AIC with	Yes (#3)

Table 13: Noise Compatibility By Parcel - Maximum Residential Scenario

Project Parcel/ Building	Max Res Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
					maximum exterior noise levels up to 77 dBA (L_{max}), averaging 70 dBA (L_{max}) during the nighttime hours.	
Parcel PKS	Residential	65	62-64 dBA	65-72 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}), and new residential construction generally discouraged on north façade (>70 dBA, L_{dn}), but acceptable interior levels can still be achieved with supplemental noise-reduction measures. Project residences on west side would be subject to noise generated by AIC with maximum exterior noise levels up to 77 dBA (L_{max}), averaging 70 dBA (L_{max}) during the nighttime hours.	Yes (#3)
Hoedown Yard (HDY1/2)	Residential	65	62-64 dBA[4]	62-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Project residences on west side would be subject to noise generated by AIC (up to 77 dBA, L_{max}, averaging 70 dBA, L_{max}) to the west and Potrero Substation to the south (increased ambient of 10 to 13 dBA, L_{eq}, at 200 feet).[5]	Yes (#3)
20th Street Plaza	Open Space/Parks	NA	62-64 dBA	62-71 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}) except Conditionally Acceptable on north side (71-77.5 dBA, L_{dn}).	N/A
Irish Hill Playground	Open Space/ Parks	NA	62-64 dBA	62-72 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}), but Conditionally Acceptable on north side adjacent to 21st Street (71-77.5 dBA, L_{dn})	N/A

Notes: N/A = Not applicable and no mitigation required because it is not a noise-sensitive use. As indicated in the Setting above, closed windows reduce noise levels by approximately 25 dBA, while open windows reduce noise levels by about 15 dBA.

[1] Traffic noise levels were first estimated for each Project roadway based on future estimated traffic volumes, and then adjusted for distance to the edge of the road rights-of-way to represent the maximum noise level at closest possible location of a building façade. Noise levels by façade are listed for each parcel and building on the project site in **Attachment 2: Project On-Site Noise Exposure by Parcel.** The above table summarizes these estimates by presenting the lowest and highest combined noise levels for each parcel at the edge of the adjacent or closest road rights-of-way.

[2] All 28-Acre Site parcels except existing Buildings 2, 12, and 21 would be permitted to include accessory parking. Also RALI uses would be allowed on the ground floor of Parcels A, B, C1, C2, D, E1, E2, E3, F, G, H1, and H2.

[3] Retail/Restaurant uses would be allowed on the ground floor and accessory parking proposed on all four parcels.

[4] Ambient noise levels for Parcel HDY are estimated based on measurements collected along Illinois to the north because measurements at Parcel HDY included noise from heavy equipment operations associated with the existing PG&E corporation yard activities in the Hoedown Yard. These operations would cease on this parcel when this parcel is redeveloped as part of Project implementation, but transformer noise from the Potrero Substation would continue.

[5] When measured L90 levels between midnight and 4:00 a.m. are compared between LT-6 and LT-7 (same distance to Illinois except LT-7 is located 200 feet from the Potrero Substation to the south), the difference in nighttime ambient was 10 to 13 dBA, which could be attributable to the Potrero Substation.

Source: Orion Environmental Associates, 2016

Table 14: Noise Compatibility By Parcel - Maximum Commercial Scenario

Project Parcel/ Building	Max Com Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
28-Acre Site[2]						
Parcel A	Com-Office	90	62-66 dBA	62-70 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}).	N/A
Parcel B1	Com-Office	90	62-66 dBA	66-69 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}).	N/A
Parcel C1	Com-Office	90	58-66 dBA	58-71 dBA	Acceptable for commercial-office uses (≤70 dBA, Ldn) except Conditionally Acceptable on north façade (70-75 dBA, Ldn)..	N/A
	or Parking			58-71 dBA	Parking use not subject to City noise guidelines, but potential noise conflicts with adjacent residential uses.	N/A
Parcel C2	Residential	90	58-66 dBA	58-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}).	Yes (#3)
	or Parking	90	58-66 dBA	58-70 dBA	Parking use not subject to City noise guidelines, but potential noise conflicts with adjacent residential uses..	N/A
Parcel D	Residential	90	66 dBA	66-70 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Project residences would be subject to shipyard noise with measured nighttime levels of 58-64 dBA (L_{eq}) and 60-69 dBA (L_{max}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but new construction in the northern portion of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	Yes (#3)
Parcel E1	Residential	90	66 dBA	66-69 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}). Project residences would be subject to shipyard noise with measured nighttime levels of 58-64 dBA (L_{eq}) and 60-69 dBA (L_{max}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but new construction in the northern portion of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	Yes (#3)
Parcel E2	Residential	70	58-66 dBA	66-69 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}).	Yes (#3)
Parcel E3	Residential	70	58-66 dBA	58-68 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}).	Yes (#3)

Table 14: Noise Compatibility By Parcel - Maximum Commercial Scenario

Project Parcel/ Building	Max Com Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
Parcel F	Com-Office	90	58-66 dBA	58-70 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	N/A
Parcel G	Com-Office	90	58-66 dBA	58-69 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	N/A
Parcel H1	Com-Office	90	58-66 dBA	58-68 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	N/A
Parcel H2	Com-Office	90	58-66 dBA	58-68 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but building rehabilitation and new construction in the northern and central portions of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	N/A

Table 14: Noise Compatibility By Parcel - Maximum Commercial Scenario

Project Parcel/ Building	Max Com Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
Building 2	Com-Office	Same Ht.	66 dBA	66-70 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}). Proposed building demolition could increase shipyard-related noise at this parcel during the early phases by creating a more direct line of sight between residential uses and BAE ship repair activities, but new construction in the northern portion of the 28-Acre Site could ultimately result in offsetting decreases (by blocking direct lines of sight) from shipyard-related noise levels on this parcel, depending on phasing.	N/A
Parcel E4	RALI	50	66 dBA	66-69 dBA	Acceptable for RALI uses (≤70 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Parcel C1 Rooftop	Parks/Sport Courts	NA	58-66 dBA	58-71 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}) except Conditionally Acceptable only on C1 immediately adjacent to 21st Street (71-77.5 dBA, L_{dn}).	N/A
Parcel C2 Rooftop	Parks/Sport Courts	NA	58-66 dBA	58-70 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}).	N/A
Waterfront Promenade	Open Space/Parks	NA	58-66 dBA	58-66 dBA	Acceptable for water-related recreational uses (≤75 dBA, L_{dn}).	N/A
Waterfront Terrace	Open Space/Parks	NA	66 dBA	58-68 dBA	Acceptable for water-related recreational uses (≤75 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Slipway Commons	Open Space/Parks	NA	66 dBA	58-66 dBA	Acceptable for water-related recreational uses (≤75 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Building 12 Market Plaza/ Square	Open Space/Parks	NA	66 dBA	66-68 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}), but potential noise conflicts with adjacent residential uses.	N/A
Illinois Parcels[3]						
Parcel PKN	Residential	65	62-64 dBA	65-72 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}), and new residential construction generally discouraged on south façade (>70 dBA, L_{dn}), but acceptable interior levels can still be achieved with supplemental noise-reduction measures. Project residences on west side would be subject to noise generated by AIC with maximum exterior noise levels up to 77 dBA (L_{max}), averaging 70 dBA (L_{max}) during the nighttime hours.	Yes (#3)

Table 14: Noise Compatibility By Parcel - Maximum Commercial Scenario

Project Parcel/ Building	Max Com Scenario Proposed Use	Maximum Height (feet)	Existing Noise Level (L_{dn})	With Future Traffic Noise Increases (L_{dn})[1]	Noise Compatibility with Proposed Use (Comparison to City Noise Guidelines in Figure 7)	Noise Abatement Needed
Parcel PKS	Residential	65	62-64 dBA	65-72 dBA	Conditionally Acceptable for residential uses (>60 dBA, L_{dn}), and new construction generally discouraged on north façade (>70 dBA, L_{dn}), but acceptable interior levels can still be achieved with supplemental noise-reduction measures. Project residences on west side would be subject to noise generated by AIC with maximum exterior noise levels up to 77 dBA (L_{max}), averaging 70 dBA (L_{max}) during the nighttime hours.	Yes (#3)
Hoedown Yard (HDY1/2)	Com-Office	65	62-64 dBA[4]	62-70 dBA	Acceptable for commercial-office uses (≤70 dBA, L_{dn}). Project commercial uses on west side would be subject to noise generated by AIC (up to 77 dBA (L_{max}), averaging 70 dBA (L_{max}) during the nighttime hours) to the west and PG&E transformers to the south (increased ambient of 10 to 13 dBA (L_{eq}) at 200 feet during the night[5]), no noise compatibility problems since commercial uses are not considered noise-sensitive.	N/A
20th Street Plaza	Open Space/Parks	NA	62-64 dBA	62-71 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}) except Conditionally Acceptable adjacent to 20th Street (70-77.5 dBA, L_{dn}).	N/A
Irish Hill Playground	Open Space/ Parks	NA	62-64 dBA	62-72 dBA	Acceptable for playgrounds/parks (≤70 dBA, L_{dn}) but Conditionally Acceptable adjacent to 21st Street and Illinois Street (70-77.5 dBA, L_{dn})	N/A

Notes: N/A = Not applicable and no mitigation required because it is not a noise-sensitive use. As indicated in the Setting above, closed windows reduce noise levels by approximately 25 dBA, while open windows reduce noise levels by about 15 dBA.

[1] Traffic noise levels were first estimated for each Project roadway based on future estimated traffic volumes, and then adjusted for distance to the edge of the road rights-of-way to represent the maximum noise level at closest possible location of a building façade. Noise levels by façade are listed for each parcel and building on the project site in **Attachment 2: Project On-Site Noise Exposure by Parcel.** The above table summarizes these estimates by presenting the lowest and highest combined noise levels for each parcel at the edge of the adjacent or closest road rights-of-way.

[2] All 28-Acre Site parcels except existing Buildings 2, 12, and 21 would be permitted to include parking on the ground floor and below grade. Also RALI uses would be allowed on the ground floor of Parcels A, B, C1, C2, D, E1, E2, E3, F, G, H1, and H2.

[3] Retail/Restaurant uses would be allowed on the ground floor and accessory parking proposed on all four parcels.

[4] Ambient noise levels for Parcel HDY are estimated based on measurements collected along Illinois to the north because measurements at Parcel HDY included noise from heavy equipment operations associated with the existing PG&E corporation yard activities. These operations would cease on this parcel when this parcel is redeveloped as part of Project implementation, but transformer noise from the Potrero Substation would continue.

[5] When measured L90 levels between midnight and 4:00 a.m. are compared between LT-6 and LT-7 (same distance to Illinois except LT-7 is located 200 feet from the Potrero Substation to the south), the difference in nighttime ambient was 10 to 13 dBA, which could be attributable to the Potrero Substation.

Source: Orion Environmental Associates, 2016

Compatibility with Future Noise Levels

As indicated above, the primary sources of future noise on the project site and its vicinity are from BAE Systems Ship Repair facility activities, earthmoving activities in the southwestern corner of the Illinois Parcel (PG&E Hoedown Yard), Existing Plus Project traffic noise on Illinois Street and other local streets, tonal noise from transformers at the PG&E Potrero Substation, and loading dock activities along Illinois Street at the American Industrial Center (AIC). In addition to shipyard-related noise, there is continuous, distant background traffic noise from the I-280 freeway and other roadways. Passing Muni light rail and Caltrain rail operations also contribute to background noise. Long-term noise measurements collected in the project site and vicinity indicate that noise levels on the Illinois Parcels from these existing and future noise sources range from 64 to 68 dBA (L_{dn}), while noise levels in the southeastern portion of the 28-Acre Site range from 57 to 59 dBA (L_{dn}), which are somewhat quieter than those typical of light industrial/urban mixed-use locations. When measurement locations LT-3 and LT-4 are compared with measurement locations LT-1 and LT-2, existing intervening buildings (located both off- and on-site) appear to effectively shield some portions of the Mixed-Use District project site from noise generated by ship repair activities.

In general, the Maximum Residential Scenario would result in development of the greatest number of new residences, while the Maximum Commercial Scenario would result in development of the least number of residences. Both scenarios would result in development of the same amount of open space. Under both scenarios, multi-family residential units would be developed generally along the western and central portions of the project site (east side of Illinois Street, across from the AIC on Parcels PKN and PKS, and in the center of the site, Parcels D and E1, and in the central and eastern portions of the site (Parcels E2 and E3). Under both scenarios, Parcel C1 could be developed with residential, commercial, or parking uses and Parcel C2 could be developed with residential or parking uses. Active rooftop open space (sports courts, play fields, urban agriculture plots, seating, and observational terrace areas) could be developed on both of these parcels under both scenarios as well, if the parcels are developed with parking uses. However, under the Maximum Residential Scenario, residential uses would be developed along the southern boundary instead of commercial uses (Parcels HDY 1/HDY2, F/G, H1/H2) as well as in the center of the Mixed-Use District project site (Building 2). Noise levels are lowest in the southeast portion of the Mixed-Use District project site and the residential units in the center of the site would be shielded from BAE operational noise by commercial-office buildings to the north. Under both scenarios, residential uses on the western boundary of the Mixed-Use District project site would be subject to the highest noise levels from traffic on Illinois Street as well as activities at the AIC building and from operation of Potrero Substation.

The degree to which noise causes disturbance to people depends on noise frequencies, bandwidths, levels and time patterns. In addition, higher frequencies, pure tones and fluctuating noise levels tend to be more disturbing than lower frequencies, broadband and constant-level noise. Although there are no standards or guidelines in the State Code or City noise guidelines that pertain to noise frequency or bandwidth, it is important to consider the noise character, which includes the following existing noise sources, when considering the suitability of the project site for residential uses and potential for future noise conflicts.

Based on the data presented in Table 6 (Summary of Long-Term (LT) and Short-Term (ST) Noise Monitoring in the Pier 70 Mixed-Use District project vicinity), the existing L_{dn} over most of the project site ranged from 60 to 69 dBA (L_{dn}) on the Illinois Parcels (LT-6 and LT-7), with slightly lower noise levels (57 to 59 dBA, L_{dn}) occurring in the southeastern corner of the 28-Acre Site (LT-5). A breakdown of noise compatibility by parcel and use for the Maximum Residential Scenario is presented in Table 13, Noise Compatibility By Parcel - Maximum Residential Scenario, while the same breakdown is provided for the Maximum Commercial Scenario in Table 14, Noise Compatibility By Parcel - Maximum Commercial Scenario.

Proposed Residential Uses. The San Francisco Land Use Compatibility Chart for Community Noise (Figure 7) indicate that noise levels up to 60 dBA (L_{dn}) are considered satisfactory (Acceptable) for residential uses and no special noise insulation measure are required; between 60 dBA and 70 dBA (L_{dn}), noise levels are considered Conditionally Acceptable, where a detailed noise analysis is required and needed noise insulation features must be included in the design; above 65 dBA (L_{dn}), new residential construction is generally discouraged, but if it does proceed, a detailed noise analysis is required and needed noise insulation features must be included in the design.

As indicated in Tables 13 and 14, future noise levels at all Project parcels designated for residential use have existing noise levels that are considered Conditionally Acceptable, ranging between 60 dBA and 70 dBA (L_{dn}), with one exception: Illinois Parcels PKN and PKS, where future noise levels are estimated to be slightly higher (72 dBA, L_{dn}) at 19 feet from the centerline of the future 21st Street. Except for the residential units that would face 21st Street on these two parcels, it is expected that proposed residential uses on the project site could be designed to meet the 45-dBA (L_{dn} or CNEL) interior noise standard specified by Title 24 with incorporation of common noise attenuation measures (see Noise Compatibility Approach 3, below). Examples of common noise attenuation measures include selecting glazing with higher noise reduction, improving exterior wall construction, and adapting the layout of interior spaces and/or location of windows. Any residential units subject to noise levels above 70 dBA (L_{dn}), such as those facing the future 21st Street on Parcels PKN and PKS, supplemental noise attenuation approaches may need to be implemented to meet the 45-dBA interior standard with open windows.

Historic Building 2 is proposed to be rehabilitated in compliance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Noise levels measured just north of this building (LT-2) were 66 dBA (L_{dn}). When future traffic noise levels are added to existing ambient noise levels, future noise levels at the edges of road rights-of way are estimated to range between 66 and 70 dBA (L_{dn}). This building is proposed for residential uses under the Maximum Residential Scenario. When compared to the City's compatibility guidelines for residential uses (Figure 7: San Francisco Land Use Compatibility Chart for Community Noise), future noise levels in the vicinity of this building are considered to be Conditionally Acceptable and noise attenuation approaches would need to be incorporated as necessary into the project design in order to meet the 45-dBA interior noise standard.

The applicant will be required to demonstrate that the 45-dBA (L_{dn} or CNEL) interior noise standard specified by Title 24 would be met at all Project residences, and additional noise attenuation measures are required to be incorporated into the project design as necessary to meet this interior standard, but also

address potential sleep disturbance effects on affected parcels (as indicated in Tables 13 and 14) from adjacent or nearby industrial activities. It is noted that on-site noise levels could increase with proposed building demolition (as noted in Tables 13 and 14), but also decrease in the future with Project implementation if existing heavy equipment operations at the Hoedown Yard cease and Proposed Project buildings are up to 90 feet tall in the northern portion of the 28-Acre Site. Such building heights could help partially shield the rest of the site from noise generated by the BAE Systems Ship Repair facility (i.e., BAE boilers and generators). Such future noise reductions, however, would ultimately depend on the final locations and heights of proposed buildings but could reduce the extent of noise attenuation required at some residential units.

Proposed Open Space/Park/Playground Uses. In urban environments, playgrounds and parks (active recreation areas) as well as open space areas in urban areas are not considered noise-sensitive uses, and therefore, the following analysis of noise compatibility is provided for informational purposes only. Under the City's compatibility guidelines for playgrounds and parks (Figure 7: San Francisco Land Use Compatibility Chart for Community Noise), noise levels up to 70 dBA (L_{dn}) are considered to be Acceptable, and no noise attenuation approaches need to be implemented. As indicated in Tables 13 and 14, future noise levels at all but three Project parcels designated for open space/park/playground uses are estimated to range between 60 dBA and 70 dBA (L_{dn}). Such levels are considered Acceptable for these outdoor uses. Future noise levels under both scenarios could reach 71 or 72 dBA along the edges of the Parcel C1 Rooftop, 20th Street Plaza, and Irish Hill Playground (located adjacent to 20th and 21st Streets), and such levels are considered Conditionally Acceptable. While noise levels exceeding 70 dBA (L_{dn}) are attributable to traffic noise on these streets, they would only occur along the margins of the park/open space located adjacent to these streets, not the main park or playground areas. Park users could access quieter areas within these parks (away from adjacent streets), and noise levels would be considered generally acceptable at proposed open space/park/playground areas.

Proposed Special Events. The Proposed Project would include development of a number of public open spaces. The open space planning chapter in the *Pier 70 SUD Design for Development* provides concepts and approximate hypothetical site plans, but these concepts and site plans will be further developed. Under the conceptual ideas, the Market Square open space area is proposed to have open-air markets, market stalls, small performances, and gatherings (between Buildings 2, 12, and Parcel D). Community gatherings (i.e., festivals, performances, and nighttime cultural events) are proposed in the Slipways Common open space area (between Parcels E1, E2, E3, E4, and Building 21). A café terrace, social lawn, beer garden, food/beverage operations, and picnic area are proposed in the Waterfront Terrace open space area. Viewing pavilions proposed in the Waterfront Promenade would accommodate a variety of public program uses such as cultural events and gatherings. Typical events, occurring up to an estimated three times a month, could have attendance of approximately 500 to 750 people, while larger-scale events, occurring approximately four times per year, could have attendance up to 5,000 people. The Waterfront Promenade would also include pedestrian and bike trails, café terrace, and passive recreation. The Irish Hill Playground (between Parcels PKS, HDY, C1, and C2) would have playground facilities. If Parcels C1 and C2 are built as district parking, there would be public open space on the rooftops. While final

plans for this open space area have not been developed, potential uses for this open space include sport courts and play fields, urban agriculture plots, seating, and observational terrace areas.

Residential uses are proposed to be developed adjacent to the Irish Hill Playground (Parcel PKS under both scenarios and Parcel HDY under the Maximum Residential Scenario). Residential uses would also be developed adjacent to the Market Square open space area (Building 2 and Parcel D under the Maximum Residential Scenario, but only Parcel D under the Maximum Commercial Scenario). Residential uses would also be proposed adjacent to Slipway Commons, where events would be held during the day and evening (Parcels E1, E2, and E3 under both scenarios), as well as adjacent to the Waterfront Promenade, where cultural events would be held during the day and evening (Parcel H2 under Maximum Residential Scenario). RALI or commercial-office uses are proposed adjacent to the Waterfront Terrace open space area (Parcels B2 and E4 under both scenarios), where there would be more intensive outdoor uses (a beer garden and food/beverage operations).

The proximity of future residential uses to these types of open space uses would pose the potential for Proposed Project residents to be disturbed or annoyed by noise from outdoor active recreation/open space activities. Noise levels associated with the proposed café terrace, social lawn, beer garden, food/beverage operations, picnic areas and the playground would be typical of an urban, mixed-use residential area and considered to be compatibility with nearby sensitive receptors. The potential noise conflicts would be greatest where amplified sound systems would be used and/or events occur during the more noise-sensitive late evening/nighttime hours when sleep disturbance could occur.

As discussed above under Local Regulations and Guidelines, 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. 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.

Due to uncertainties as to the nature and extent of future outdoor events at the project site, the use of amplified sound equipment could still have the potential to adversely affect nearby sensitive receptors by exceeding standards established in the San Francisco General Plan or San Francisco Noise Ordinance. Implementation of Noise Compatibility Approach 5: Noise Control Plan for Outdoor Amplified Sound, shown below, would ensure that sound levels generated by amplified equipment would be consistent with Section 2909 of the City's Police Code, which 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 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.

Cumulative Impacts

The geographic scope of potential cumulative noise impacts encompasses the project site and its immediate vicinity, as well as areas adjacent to access and construction haul routes to the project site.

Construction-Related Noise Increases

In general, the potential for cumulative noise increases associated with Project construction would result if there are any other projects located nearby that could be constructed at the same time or extend the duration of construction noise at any nearby sensitive receptors. The closest sensitive receptor is located approximately 140 feet northwest of the site (616 20th Street). The closest cumulative projects where concurrent construction could cumulatively increase noise levels in the vicinity of the project site would be the proposed BAE Lease Renewal project, located immediately north of the 28-Acre Site, located approximately 200 feet north of the Illinois Parcels, and Crane Cove Park, located north of the 20th Street Historic Core project and BAE Lease Renewal project. BAE improvements would involve mostly routine maintenance and repair work and not expected to generate noise levels higher than normal operations. These activities are expected to occur every 18 months for 6 weeks at a time over the next 7 years. Crane Cove Park would involve primarily park improvements. Phase 1 of Crane Cove Park would be completed in January 2018, which is approximately when construction of the Proposed Project would start, minimizing the potential for overlapping construction activities. Phase 2 of Crane Cove Park has not been determined, but could occur between August 2026 and December 2028, which could overlap with Phase 5 of the Proposed Project (2027 to 2029). However, Phase 5 construction would occur in the southern margin of the 28-Acre Site, which is the most distant portion of the site from Crane Cove Park, and such separation would minimize the potential for cumulative construction noise increases. Given the limited duration and scope of potential concurrent construction activities associated with these two cumulative projects (i.e., neither would involve the extended duration of construction and pile driving activities like those associated with Project construction), cumulative noise impacts associated with any overlapping construction would not be substantial.

Construction activities associated with the Project in combination with construction of these and other cumulative projects in the vicinity (such as Golden State Warriors Event Center and Mixed Use Development, Seawall Lot 337/Pier 48, and various smaller projects located in the neighborhoods to the west of the site) could result in cumulative increases in construction-related traffic on construction routes such as Illinois Street, 25th Street, or Cesar Chavez Street. These are the streets that provide access to/from the I-280 and SR 101 freeways. As these streets already serve as truck routes, they have higher ambient noise levels than local residential streets. Given that these truck routes have limited residential or other sensitive receptor land uses located adjacent to these routes, cumulative traffic increases on these

routes are not expected to substantially increase ambient noise levels in the vicinity of these routes for sensitive receptors.

Prior to Proposed Project implementation, Building 117 is expected to be demolished as part of the 20th Street Historic Core project. Demolition of this building could temporarily increase baseline noise levels on the project site from traffic on Illinois Street because it currently serves as a barrier and interrupts the line-of-sight between the project site and Illinois Street.[35] However, proposed construction of structures on Parcels C1 and C2 would restore this barrier effect for parcels and buildings to the east. In addition, retention of Buildings 2 and 12 would help to further block shipyard noise from parcels to the west and south (Parcels PKS, HDY, C1, C2, F, and G). Therefore, changes in the noise environment on the project site as a result of cumulative building demolition would not adversely affect future Project residents.

Operational Noise Increases

As indicated in **Table 15, Summary of Cumulative Traffic Noise Levels,** when Project-related traffic increases (under both the Maximum Residential and Maximum Commercial scenarios) are added to future traffic increases resulting from cumulative development, the Proposed Project would add 0 to 8.0 dBA (L_{dn}) to estimated cumulative noise increases under both scenarios. Of the 79 road segments examined, the Proposed Project would contribute considerably to cumulative traffic noise increases along the following street segments:

- 22nd Street (east of Third Street to east of Illinois Street)
- Illinois Street (Mariposa Street to 22nd Street)

These street segments either directly adjoin the project site or are within two blocks of the project site and provide direct access to the site. It is noted that existing land uses located adjacent to all of the above-listed street segments are commercial or industrial, and such uses are not considered sensitive to traffic noise increases (i.e., not noise-sensitive receptors). Residential development is located adjacent to the segment of Illinois Street between Mariposa Street and 20th Street. Based on the guidance thresholds for traffic noise increases, these cumulative traffic noise increases would be a substantial contribution to cumulative noise increases along these road segments.

Additionally, when 2040 cumulative (with Proposed Project) noise levels are compared to 2020 baseline noise levels, 2020 noise levels would increase by 0 to 15 dBA under both scenarios with increases exceeding guidance thresholds for traffic noise increases on the following roadway segments:

- Third Street (Channel to south of Mission Rock and 20th to 23rd Streets)
- 20th Street (east of Third Street to east of Illinois Street)
- 22nd Street (west of Third Street to east of Illinois Street)
- 23rd Street (Third Street to Illinois Street)

[35] Increased baseline would result in lower impacts; therefore, not accounting for this increased baseline is a conservative approach.

Table 15: Summary of Cumulative Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline								Existing Use
		Baseline (2020)	Cumulative Baseline (2040)	With Cumulative + Max Res	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	With Cumulative + Max Com	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	
Third Street	North of Harrison	67.1	67.3	67.7	0.6	0.4	67.8	0.7	0.4	Res/Com/Off
	Harrison to Bryant	67.8	68.3	68.6	0.8	0.3	68.7	0.9	0.3	Res/Com/Ind
	South of Bryant	67.5	67.9	68.3	0.8	0.4	68.4	0.9	0.5	Res/Com/Ind
	North of King	67.3	68.2	68.6	1.3	0.4	68.7	1.3	0.5	Res/Com
	King to Terry Francois	66.3	67.7	68.5	2.2	0.7	68.5	2.2	0.8	Ballpark/Res
	Terry Francois to Channel	65.6	67.4	68.2	2.6	0.8	68.3	2.7	0.9	Vacant/Parking
	Channel to Mission Rock	65.5	68.0	68.8	**3.3**	0.7	68.8	**3.4**	0.8	**Res**/Parking
	South of Mission Rock	65.3	67.7	68.5	**3.2**	0.8	68.6	**3.3**	0.9	UCSF/Inst/**Res**
	North of 16th	66.2	67.9	68.8	2.5	0.9	68.8	2.6	0.9	UCSF/Inst
	16th to Mariposa	66.4	67.5	68.7	2.3	1.2	68.7	2.3	1.2	Hospital/Ind
	Mariposa-20th	65.5	67.4	68.4	2.8	1.0	68.3	2.8	0.9	Res/Com/Ind
	20th to 22nd	66.0	68.4	69.2	**3.1**	0.8	69.3	**3.2**	0.9	**Res**/Com/Ind
	22nd to 23rd	66.4	68.2	69.9	**3.5**	1.7	69.8	**3.4**	1.6	Com/**Res**
	23rd to 25th	66.2	67.4	69.2	3.0	1.9	69.2	3.0	1.8	Ind
	25th to Cesar Chavez	66.3	67.7	69.1	2.8	1.4	69.0	2.8	1.3	Com/Ind

Table 15: Summary of Cumulative Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline								Existing Use
		Baseline (2020)	Cumulative Baseline (2040)	With Cumulative + Max Res	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	With Cumulative + Max Com	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	
	South of Cesar Chavez	65.6	67.1	67.5	1.9	0.3	67.5	1.9	0.3	Ind
16th Street	West of Mississippi	64.5	65.9	66.5	2.0	0.6	66.5	2.0	0.6	Com/Ind
	East of Mississippi	65.7	66.8	67.5	1.8	0.7	67.5	1.8	0.7	Com/Ind
	West of Owens	65.7	66.9	67.6	1.9	0.7	67.5	1.9	0.6	UCSF/Inst.
	East of Owens	65.9	66.3	67.2	1.3	0.9	67.1	1.2	0.8	UCSF/Inst.
	West of Third	65.4	66.6	67.8	2.4	1.2	67.7	2.3	1.1	UCSF/Hospital
	East of Third	60.0	63.1	64.3	4.4	1.3	64.3	4.4	1.3	UCSF/Inst.
18th Street	West of Arkansas	54.7	54.9	55.8	1.1	0.9	55.8	1.1	0.9	Res/Ind
	East of Arkansas	55.4	56.6	57.2	1.9	0.6	57.2	1.9	0.6	Res/Com
	West of Texas	58.3	59.1	59.5	1.1	0.4	59.5	1.1	0.4	Res/Com
	Texas to Pennsylvania	58.5	59.1	59.4	0.9	0.3	59.4	0.9	0.3	Res/Com
	East of Pennsylvania	59.0	59.9	61.0	2.0	1.1	60.8	1.8	0.9	Off/Com
	West of Indiana	59.0	59.9	61.0	2.0	1.1	60.8	1.8	0.9	Ind
	East of Indiana	59.2	60.7	62.3	3.1	1.5	62.2	3.0	1.5	Ind
20th Street	West of Third	58.9	59.8	60.7	1.8	0.9	60.7	1.8	0.9	Res/School/Ind
	East of Third	59.7	61.8	65.9	**6.2**	4.1	65.9	**6.2**	4.1	Ind

Table 15: Summary of Cumulative Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline								Existing Use
		Baseline (2020)	Cumulative Baseline (2040)	With Cumulative + Max Res	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	With Cumulative + Max Com	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	
	West of Illinois	59.6	62.8	66.2	**6.7**	3.4	66.3	**6.7**	3.4	Ind
	East of Illinois	62.4	64.5	67.9	**5.5**	3.4	67.9	**5.5**	3.4	Ind
22nd Street	West of Indiana	59.4	61.8	63.5	4.1	1.8	63.5	4.1	1.8	Ind
	Indiana to Tennessee	58.8	61.1	63.1	4.4	2.0	63.1	4.4	2.0	Res
	Tennessee to Third	58.4	59.8	62.3	**4.0**	2.5	62.3	**4.0**	2.5	Com/**Res**
	East of Third	58.5	59.6	67.1	**8.6**	**7.5**	66.9	**8.4**	**7.3**	Ind
	West of Illinois	58.1	59.0	67.0	**8.9**	**8.0**	66.8	**8.7**	**7.8**	Ind
	East of Illinois	51.1	59.5	66.3	**15.2**	**6.7**	66.3	**15.2**	**6.7**	Ind
23rd Street	West of Third	56.5	58.4	60.9	4.4	2.6	60.9	4.4	2.5	Ind
	East of Third	54.9	58.3	60.5	**5.5**	2.1	60.5	**5.5**	2.2	Ind
	West of Illinois	53.6	58.4	60.5	**6.9**	2.1	60.5	**6.9**	2.1	Ind
	East of Illinois	50.9	53.2	53.2	2.3	0.0	53.2	2.3	0.0	Ind
25th Street	West of Pennsylvania	56.5	59.5	59.5	3.0	0.0	59.5	3.0	0.0	Res
	East of Pennsylvania	59.4	60.7	62.5	3.1	1.8	62.6	3.1	1.9	Ind
	West of Indiana	59.3	60.7	62.5	3.2	1.8	62.6	3.2	1.9	Ind
	East of Indiana	59.4	60.7	62.5	3.1	1.8	62.6	3.1	1.9	Ind
	West of Third	57.4	59.6	62.7	**5.3**	3.1	62.9	**5.5**	3.3	Ind

Table 15: Summary of Cumulative Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline								Existing Use
		Baseline (2020)	Cumulative Baseline (2040)	With Cumulative + Max Res	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	With Cumulative + Max Com	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	
	East of Third	53.0	57.7	60.0	**7.0**	2.3	60.3	**7.3**	2.6	Ind
	West of Illinois	54.0	57.7	60.0	**6.0**	2.3	60.3	**6.3**	2.6	Ind
	East of Illinois	49.5	53.7	53.7	4.1	0.0	53.7	4.1	0.0	Ind
Cesar Chavez	West of Pennsylvania	65.1	65.5	66.7	1.6	1.2	66.7	1.6	1.2	Ind
	East of Pennsylvania	64.6	65.2	67.6	3.0	2.4	67.6	3.0	2.3	Ind
	West of Third	63.4	64.4	67.1	3.7	2.7	67.1	3.7	2.7	Ind
	East of Third	58.2	60.4	63.5	**5.2**	3.1	63.5	**5.2**	3.1	Ind
Arkansas Street	North of 18th	54.9	56.1	56.1	1.2	0.0	56.1	1.2	0.0	Res/Ind
	South of 18th	54.2	55.5	55.5	1.3	0.0	55.5	1.3	0.0	Res
Future Driveway	East of Illinois	NA	NA	65.2	NA	NA	65.2	NA	NA	Ind
Illinois Street	North of Mariposa	56.8	60.4	62.0	**5.3**	1.6	62.1	**5.3**	1.6	Vacant/UCSF
	Mariposa-19th	59.9	60.4	63.7	**3.8**	**3.3**	63.7	**3.8**	**3.3**	**Res**/Com/Ind
	19th to 20th	60.4	60.6	64.6	**4.1**	**4.0**	64.5	**4.1**	**4.0**	**Res**/Com/Ind
	20th to Driveway	58.9	59.5	64.8	**5.9**	**5.3**	64.6	**5.7**	**5.1**	Ind
	Driveway to 22nd	58.9	60.9	66.4	**7.5**	**5.5**	66.3	**7.4**	**5.3**	Ind
	South of 22nd	57.6	59.6	63.9	**6.3**	4.3	64.0	**6.5**	4.4	Ind
Indiana Street	North of 22nd	54.1	55.3	55.3	1.1	0.0	55.3	1.1	0.0	Com/Ind
	South of 22nd	54.6	55.2	55.2	0.6	0.0	55.2	0.6	0.0	Ind
	North of 25th	58.6	61.5	62.5	**3.8**	0.9	62.6	**4.0**	1.1	Ind/**Res**
	South of 25th	57.5	60.0	60.0	2.6	0.0	60.0	2.6	0.0	Ind/Res

Table 15: Summary of Cumulative Traffic Noise Levels

Street	Segment or Cross-Street	Ldn/CNEL Noise Level (dBA) at 50 Feet from Roadway Centerline								Existing Use
		Baseline (2020)	Cumulative Baseline (2040)	With Cumulative + Max Res	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	With Cumulative + Max Com	Change from Baseline (Max Res)	Change from Cumulative (Max Res)	
Mariposa Street	West of I-280 Ramp	63.8	64.3	64.3	0.5	0.1	64.3	0.5	0.1	Ind/Res
	East of I-280 Ramp	65.6	67.2	67.5	1.9	0.2	67.5	2.0	0.3	Ind
	East of Indiana	63.4	65.5	66.0	2.6	0.4	66.0	2.6	0.4	Ind
	West of Third	62.5	64.8	65.3	2.8	0.5	65.3	2.8	0.5	Ind/Res
	East of Third	60.3	63.1	63.8	3.5	0.7	63.8	3.4	0.7	Ind
	West of Illinois	60.2	63.1	63.8	3.6	0.7	63.8	3.6	0.7	Ind
	East of Illinois	59.6	61.5	61.5	1.9	0.0	61.5	1.9	0.0	Ind
Tennessee Street	North of 22nd	53.4	56.0	56.0	2.7	0.0	56.0	2.7	0.0	Com/Res
	South of 22nd	49.7	49.9	49.9	0.2	0.0	49.9	0.2	0.0	Res/Com
Texas Street	North of 18th	52.6	53.1	53.1	0.5	0.0	53.1	0.5	0.0	Res
	South of 18th	51.5	52.9	52.9	1.4	0.0	52.9	1.4	0.0	Res

Notes: Noise levels may vary by up to one-tenth of a decibel due to rounding. Noise levels in **bold** exceed either of the following threshold increases when compared to baseline noise levels: (1) an increase of 5 dBA or more, or (2) an increase of 3 dBA or more in areas where the existing or resulting noise increase exceeds acceptable (or satisfactory) levels for the affected use (see Figure 7: San Francisco Land Use Compatibility Chart for Community Noise).

Res: Residential; Com: Commercial; Off: Office; Ind: Industrial; Inst: Institutional; UCSF: University of California, San Francisco Traffic noise modeling was completed using the Federal Highway Administration RD-77-108 model. Assumptions include: Travel speeds on all streets, 25 mph, except on 16th, Third, and Cesar Chavez, where the posted speed limit is 30 mph; Vehicle Mix: 98% Autos/1.5% Medium Trucks/0.5% Heavy Trucks; Day-Night Split: 76% Day (7:00 a.m. to 7:00 p.m.), 12% Evening (7:00 p.m. to 10:00 p.m.), and 12% Night (10:00 p.m. to 7:00 a.m.). Background noise levels due to traffic on other roadways (such as cross-streets or nearby freeways) and non-traffic-related activities are not reflected in these noise levels. Noise levels in this table are intended to indicate incremental noise changes due to Proposed Project implementation and future growth. Since they do not include background noise levels, they may not necessarily reflect actual noise levels along these roadway segments if there are other nearby sources of noise. Changes between scenarios analyzed may not show change due to rounding in the noise modeling.

Source: Orion Environmental Associates, 2016

- 25th Street (west of Third Street to Illinois Street)
- Cesar Chavez (East of Third Street)
- Illinois Street (Mariposa Street to south of 22nd Street)
- Indiana Street (north of 25th Street)

These street segments either directly adjoin the project site or are within approximately eight blocks of the project site and several provide direct access to the site. It is noted that existing land uses located adjacent to many of the above-listed street segments are commercial or industrial, and such uses are not considered sensitive to traffic noise increases (i.e., not noise-sensitive receptors). There is a school and residential development located adjacent to 20th Street between Third Street and Illinois Street. Residential development is also located adjacent to Third Street (Channel to 25th), Illinois Street (Mariposa Street to 20th Street), and on 22nd Street (west of Third Street). Based on guidance thresholds for traffic noise increases, these cumulative traffic noise increases would also be a substantial contribution to cumulative noise increases because traffic noise would result in a substantial permanent increase in baseline noise levels. The project's contribution to these increases would range from 22 to 95 percent of these increases and therefore, the Proposed Project contribution to these cumulative traffic noise increases would be cumulatively considerable.

Implementation of TDM measures (Noise Compatibility Approach 4, below) could result in reductions of one-way traffic by up to 20 percent, and such reductions could provide noise level reductions of up to 1.0 dBA. Such reductions would reduce the above noise increases to below the guidance thresholds along Illinois Street (between Mariposa Street and the proposed 23rd Street) and 22nd Street (west of Third Street) but would not be sufficient to reduce cumulative noise increases on any of the other above-listed street segments to below threshold levels. Cumulative traffic noise increases would still exceed threshold levels by up to 2.0 dBA when compared to future baseline noise levels (2040) and by up to 14.2 dBA when compared to existing baseline noise levels (2020).

Feasible Noise and Vibration Minimization Approaches

This section is divided into three sections. The first section outlines regulations that pertain to the Proposed Project and provide the basis for the performance standards that are specified in noise minimization approaches outlined in the second and third sections. The second section outlines noise minimization approaches for reducing the Project's construction-related noise. The third section identifies various approaches to be applied to the project design and future operations to reduce potential noise conflicts and increase future noise compatibility of proposed uses.

Regulatory Basis for Performance Standards

Noise ordinances regulate noise sources under the control of local jurisdictions, such as mechanical equipment and amplified sounds, as well as prescribe hours of heavy equipment operation. Time and noise limits prescribed in Article 29 of the Police Code are used in this analysis as a guideline to

determine where Project-related noise increases would be substantial and could adversely affect nearby sensitive receptors.[36] Relevant sections of the San Francisco Noise Ordinance that are used in this analysis to evaluate the effects of construction noise are as follows:

- Sections 2907 and 2908 of the San Francisco Noise Ordinance allows construction activities between 7:00 a.m. and 8:00 p.m. but limits noise from any individual piece of construction equipment, except impact tools approved by the San Francisco Public Works, to 80 dBA at 100 feet, which is equivalent to 86 dBA at 50 feet.

The following ordinance noise limits and General Plan policy provide the framework for establishing appropriate performance standards to the future design of Project residential buildings, which would help minimize the potential for future noise compatibility problems:

- Section 2909 of the San Francisco Police Code generally prohibits fixed mechanical equipment noise and music in excess of 5 dBA more than ambient noise from residential sources, 8 dBA more than ambient noise from commercial sources, and 10 dBA more than ambient on public property at a distance of 25 feet.
- Section 2909(c) of the San Francisco Police Code generally prohibits noise produced by any machine or device in excess of 10 dBA more than ambient on public property at a distance of 25 feet.
- Section 2909(d) of the Police Code establishes that no fixed noise sources (e.g., mechanical equipment) may cause the noise level inside any sleeping or living room in any dwelling unit located on residential property to exceed 55 dBA (7:00 a.m. to 10:00 p.m.) and 45 dBA (10:00 p.m. to 7:00 a.m.) in order to prevent sleep disturbance, protect public health and prevent the acoustical environment from progressive deterioration. This noise limit is applied to stationary sources that would be located near residential uses (as a second step or more detailed review, where initial screening review of noise limits in the above Section 2909 were exceeded).
- Title 24 of the California Building Code specifies a maximum interior noise limit of 45 dBA (L_{dn} or CNEL) for residential uses.
- City noise compatibility guidelines (Figure 7, San Francisco Land Use Compatibility Chart for Community Noise) indicate the maximum noise levels considered Acceptable are 60 dBA (L_{dn}) for residential uses. However, where noise levels exceed 70 dBA (L_{dn}), new residential development is generally discouraged. If new construction does proceed, a detailed analysis of noise reduction requirements must be made, and needed noise insulation features must be incorporated into the design. Tables 11 and 12 (Noise Compatibility By Parcel - Maximum Residential Scenario and Noise Compatibility By Parcel - Maximum Commercial Scenario,

[36] Noise limits specified in Sections 2907, 2908, and 2909 of the Police Code apply to a "person" generating noise, and Section 2901(h) of the Police Code excludes the City and County of San Francisco. Therefore, the City is exempt from these ordinance limits.

above) identify noise compatibility of proposed uses by parcel or building and recommended noise minimization approaches for each parcel.

Noise Minimization Approaches for Project Construction

The following construction-related noise minimization approaches provide feasible practices that could be applied to meet ordinance limits during Project construction:

Construction Noise Approach 1: Construction Noise Control Plan. Over the Project's approximately 11-year construction duration, Project contractors for all construction projects on the Illinois Parcels and 28-Acre Site will be subject to construction-related time-of-day and noise limits specified in Section 2907(a) of the Police Code, as outlined above. Therefore, prior to construction, a Construction Noise Control Plan shall be prepared by the project sponsors and submitted to the Department of Building Inspection. The construction noise control plan shall demonstrate compliance with these limits. Noise reduction strategies that could be incorporated into this plan to ensure compliance with ordinance limits may include, but are not be limited to, the following:

- Require the general contractor to ensure that equipment and trucks used for Project construction utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds).

- Require the general contractor to locate stationary noise sources (such as compressors) as far from adjacent or nearby sensitive receptors as possible, to muffle such noise sources, and to construct barriers around such sources and/or the construction site, which could reduce construction noise by as much as 5 dBA. To further reduce noise, the contractor shall locate stationary equipment in pit areas or excavated areas, to the maximum extent practicable.

- Require the general contractor to use impact tools (e.g., jack hammers, pavement breakers, and rock drills) that are hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used, along with external noise jackets on the tools, which would reduce noise levels by as much as 10 dBA.

- Include noise control requirements for construction equipment and tools, including concrete saws, in specifications provided to construction contractors to the maximum extent practicable. Such requirements could include, but are not limited to, erecting temporary plywood noise barriers around a construction site, particularly where a site adjoins noise-sensitive uses; utilizing noise control blankets on a building structure as the building is erected to reduce noise levels emanating from the construction site; performing all work in a manner that minimizes noise; using equipment with effective mufflers; undertaking the most noisy activities during times of least

disturbance to surrounding residents and occupants; and selecting haul routes that avoid residential buildings uses.[37]

- Prior to the issuance of each building permit, along with the submission of construction documents, submit to the Planning Department and Department of Building Inspection (DBI) or the Port, as appropriate, a plan to track and respond to complaints pertaining to construction noise. The plan should include the following measures: (1) a procedure and phone numbers for notifying DBI or the Port, the Department of Public Health, and the Police Department (during regular construction hours and off-hours); (2) a sign posted on-site describing permitted construction days and hours, noise complaint procedures, and a complaint hotline number that shall be answered at all times during construction; (3) designation of an on-site construction complaint and enforcement manager for the Project; and (4) notification of neighboring residents and non-residential building managers within 300 feet of the Project construction area at least 30 days in advance of extreme noise generating activities (such as pile driving) about the estimated duration of the activity.

Construction Noise Approach 2: Noise Control Measures During Pile Driving. The Construction Noise Control Plan (recommended in Construction Approach 1 above) shall also outline a set of site-specific noise and vibration attenuation measures for each construction phase when pile driving is proposed to occur. These attenuation measures shall be included wherever impact equipment is proposed to be used on the Illinois Parcels and 28-Acre Site. As many of the following control strategies shall be included in the Noise Control Plan, as feasible:

- Implement "quiet" pile-driving technology such as pre-drilling piles where feasible to reduce construction-related noise and vibration.

- Use pile-driving equipment with state-of-the-art noise shielding and muffling devices.

- Use pre-drilled or sonic or vibratory drivers, rather than impact drivers, wherever feasible (including slipways) and where vibration-induced liquefaction would not occur.

  Schedule pile-driving activity for times of the day that minimizes disturbance to residents as well as commercial uses located on-site and nearby.

- Erect temporary plywood or similar solid noise barriers along the boundaries of each Project parcel as necessary to shield affected sensitive receptors.

- Other equivalent technologies that emerge over time.

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[37] Based on FHA documentation, the following reductions can be achieved: 3 dBA reduction for a noise barrier or other obstruction (like a dirt mound) that interrupts the line-of-sight between the noise source and the receptor; 8 dBA reduction if the noise source is completely enclosed or completely shielded with a solid barrier located close to the source; 5 dBA reduction if the enclosure and/or barrier have some gaps in it; 10 dBA reduction if the noise source is completely enclosed and completely shielded with a solid barrier located close to the source; 15 dBA reduction if a building stands between the noise source and receptor and completely shields the noise source; and 5 dBA reduction if noise source is enclosed or shielded with heavy vinyl noise curtain material (e.g., SoundSeal BBC-13-2 or equivalent).

Construction Noise Approach 3: Vibration Control Measures During Construction. As part of the Construction Noise Control Plan recommended above, appropriate vibration controls (including pre-drilling pile holes and using smaller vibratory equipment) shall be specified to ensure that the vibration limit of 0.5 in/sec PPV can be met at adjacent or nearby existing structures and Project buildings located on the Illinois Parcels or 28-Acre Site, except as noted below:

- Where pile driving and other construction activities involving the use of heavy equipment would occur in proximity to any contributing building to the Union Iron Works Historic District, the project sponsor shall undertake a monitoring program to minimize damage to adjacent historic buildings and to ensure that any such damage is documented and repaired. The monitoring program, which shall apply within 100 feet where pile driving would be used and within 25 feet of other heavy equipment operation, shall include the following components:

  - Prior to the start of any ground disturbing activity, engage a historic architect or qualified historic preservation professional to undertake a pre-construction survey of historical resource(s) identified by the San Francisco Planning Department within 125 feet of planned construction to document and photograph the buildings' existing conditions.

  - Based on the construction and condition of the resource(s), a structural engineer or other qualified entity shall establish a maximum vibration level that shall not be exceeded at each building, based on existing conditions, character-defining features, soils conditions, and anticipated construction practices in use at the time (a common standard is 0.2 inch per second, peak particle velocity).

  - To ensure that vibration levels do not exceed the established standard, a qualified acoustical/vibration consultant shall monitor vibration levels at each structure within 125 feet of planned construction and shall prohibit vibratory construction activities that generate vibration levels in excess of the standard. Should vibration levels be observed in excess of the standard, construction shall be halted and alternative construction techniques put in practice. (For example, pre-drilled piles could be substituted for driven piles, if soil conditions allow; smaller, lighter equipment could possibly also be used in some cases.) The consultant shall conduct regular periodic inspections of each building within 125 feet of planned construction during ground-disturbing activity on the project site. Should damage to a building occur as a result of ground-disturbing activity on the site, the building(s) shall be remediated to its pre-construction condition at the conclusion of ground-disturbing activity on the site.

- In areas with a "very high" or "high" susceptibility for vibration-induced liquefaction or differential settlement risks, the Project's geotechnical engineer shall specify an appropriate vibration limit based on proposed construction activities and proximity to liquefaction susceptibility zones and modify construction practices to ensure that construction-related vibration does not cause liquefaction hazards at these homes.

Noise Minimization Approaches for Project Design and Operation

The following noise minimization approaches incorporate the above performance standards and present feasible practices that could be applied to the project design and future operations to meet these standards during Project operation:

Noise Compatibility Approach 1: Stationary Equipment Noise Controls. Noise attenuation measures shall be incorporated into all stationary equipment (including HVAC equipment and emergency generators) installed on buildings constructed on the Illinois Parcels and 28-Acre Site as well as into the below-grade or enclosed wastewater pump station as necessary to meet noise limits specified in Section 2909 of the Police Code.[38] 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 on-site 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, locating vent openings away from adjacent commercial uses, and restriction of generator testing to the daytime hours.

Noise Compatibility Approach 2: Design of Future Noise-Generating Uses. Future commercial/office and RALI uses shall be designed to minimize the potential for sleep disturbance at any future adjacent residential uses. Design approaches such as the following could 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 Commercial/Office and RALI Uses. To reduce potential conflicts between existing sensitive receptors and new noise-generating commercial or RALI uses located adjacent to these receptors, exterior facilities such as loading areas/docks, trash enclosures, surface parking lots should be located on the sides of buildings facing away from existing or planned sensitive receptors (residences or passive open space). If this is not feasible, these types of facilities should be enclosed or equipped with appropriate noise shielding.

- Design of Future Aboveground Parking Garage. If parking structures are constructed on Parcels C1 or C2, the sides of the parking structures facing adjacent or nearby existing or planned residential uses should be designed to shield residential receptors from noise associated with parking cars.

Noise Compatibility Approach 3: Design of Future Noise-Sensitive Uses. Prior to issuance of a building permit for vertical construction of a specific residential building design on each parcel, a noise study shall be conducted by a qualified acoustician, who shall determine the need to incorporate noise attenuation measures into the project design in order to meet Title 24's interior noise limit for residential

[38] Under Section 2909 of the Police Code, stationary sources are not permitted to result in noise levels that exceed the existing ambient (L90) noise level by more than 5 dBA on residential property, 8 dBA on commercial and industrial property, and 10 dBA on public property. Section 2909(d) states that no fixed noise source may cause the noise level measured inside any sleeping or living room in a dwelling unit on residential property to exceed 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, except where building ventilation is achieved through mechanical systems that allow windows to remain closed.

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 noise shielding by buildings existing at the time of the proposal, potential increases in ambient noise levels resulting from the removal of buildings that are planned to be demolished, all planned commercial or open space uses in adjacent areas, any known variations in Project buildout that have or will occur (building heights, location, and phasing), any changes in activities adjacent to or near the Illinois Parcels or 28-Acre Site (given the Project's long buildout period), 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.

To minimize the potential for sleep disturbance effects from tonal noise or nighttime noise events associated with nearby industrial uses, predicted noise levels at each Project building should account for 24/7 operation of the BAE Systems Ship Repair facility, 24/7 transformer noise at Potrero Substation (if it remains an open air facility), and industrial activities at the AIC, to the extent such use(s) are in operation at the time the analysis is conducted.

Noise reduction strategies such as the following could be incorporated into the project design as necessary to meet Title 24 interior limit and minimize the potential for sleep disturbance from adjacent industrial uses:

- Orient bedrooms away from major noise sources (i.e., major streets, open space/recreation areas where special events would occur, and existing adjacent industrial uses, including AIC, Potrero Substation, and the BAE site) and/or provide additional enhanced noise insulation features (higher STC ratings) or mechanical ventilation to minimize the effects of maximum instantaneous noise levels generated by these uses even though there is no code requirement to reduce L_{max} noise levels. Such measures could be implemented on Parcels D and E1 (both scenarios), Building 2 (Maximum Residential Scenario only), Parcels PKN (both scenarios), PKS (both scenarios), and HDY (Maximum Residential Scenario only);

- Utilize enhanced exterior wall and roof-ceiling assemblies (with higher STC ratings), including increased insulation;

- Utilize windows with higher STC/ Outdoor/Indoor Transmission Class (OITC) ratings;

- Employ architectural sound barriers as part of courtyards or building open space to maximize building shielding effects, and locate living spaces/bedrooms toward courtyards wherever possible; and

- Locate interior hallways (accessing residential units) adjacent to noisy streets or existing/planned industrial or commercial development.

Noise Compatibility Approach 4: Transportation Demand Management. The project sponsors shall prepare and implement a Transportation Demand Management (TDM) Plan with a goal of reducing estimated one-way vehicle trips by 20 percent compared to the one-way vehicle trips calculated for each building using the trip generation rates contained within the project's Transportation Impact Study. The

project sponsors shall create a Transportation Management Association that would be responsible for the administration, monitoring, and adjustment of the TDM Plan. Recommended components of the TDM Plan are outlined in the Pier 70 Air Quality Technical Report and Chapter 11, Section G, Air Quality, Mitigation Measure M-AQ-1f of the Draft EIR.

Noise Compatibility Approach 5: Noise Control Plan for Special Outdoor Amplified Sound. 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.
- Speaker systems shall be directed away from the nearest sensitive receptors to the degree feasible.
- Outdoor speaker systems shall be operated consistent with the restrictions of Section 2909 of the San Francisco Police Code, and conform to a performance standard of 8 dBA and dBC over existing ambient L_{90} noise levels at the nearest residential use.

Attachment 1

VIBRO-ACOUSTIC CONSULTANTS REPORT

AND

SUPPLEMENTAL NOISE MEASUREMENT DATA

VACC, Inc. DBA
VIBRO-ACOUSTIC CONSULTANTS

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Pier 70 Site Feasibility Study

Pier 70, San Francisco, CA

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Date: **22 June 2012**

Table of Contents

1. Background

Pier 70 is a 69-acre multi-use site with an active shipyard with dry dock capabilities (approximately 10-acres), historic repair facilities and commercial properties. As we understand it, Forest City is proposing several multi-use developments at Pier 70, including a multi-family residential component on the southeastern 25-acre parcel of the site. Review of the Port's current master plan and the nearby areas reveals that there are already residential uses in proximity to the shipyard. Forest City has requested a feasibility study to determine if a multi-family residential land use is compatible with the existing noise environment at Pier 70. We conducted long-term acoustical measurements at Pier 70 from May 11 to May 16, 2012, to characterize the existing noise environment.

2. General Methodology

We visited the site to conduct 96-hour measurements at four locations within the Pier 70 area. Short-term noise measurements were also conducted at the active ship repair facilities to assist with identifying the noise character of ship repair work. Data were collected in both overall A-weighted noise levels as well as in 1/3-octave band spectra, which allows for characterization of the different noise sources as well as to assist with the feasibility determination.

3. Data Collection

3.1 Measurement System Parameters

We measured the exterior noise levels using our standard testing suite:

Instrument	Make / Model	Identification
Noise Meter	Norsonic N-140	S/N 1403260
Microphone Preamplifier	Norsonic N-1209	S/N 13223
Microphone	Norsonic N-1225	S/N 96063
Noise Meter	Norsonic N-140	S/N 1403581
Microphone Preamplifier	Norsonic N-1209	S/N 12749
Microphone	Norsonic N-1225	S/N 103130
Noise Meter	Larson-Davis LxT1	S/N 0002773
Noise Meter	Larson-Davis LxT1	S/N 0002846
Microphone Calibrator	Bruel & Kjaer 4231	S/N 2671559

The noise monitors were calibrated to 94 dB at 1 kHz prior to and checked after the measurements. The monitors were set to collect overall A-weighted data as well as 1/3-octave band spectra in 1-minute periods.

3.2 Measurement Locations

We collected noise data at 9 locations:

- LT-1: To the south of Pier 64 at Slips 5 and 6, approximately 100-feet to the east of a potential multi-family residential building.
- LT-2: The northern façade of Building 2, at the roof level.
- LT-3: To the southeast of Building 6, near the northern boundary of Sims Metal Management, and just north of another potential residential building.
- LT-4: Along Illinois Street, just north of Building 103. This location was selected for its proximity to an approved multi-family residential development.
- ST-1: At Dry Dock 2 while the Golden Princess was being repaired.
- ST-2: To the west of Dry Dock 2, at the Aggreko generators.
- ST-3: At Dock 4 East while a US military ship was being repaired
- ST-4: At the western end of the repair facilities.
- ST-5: At the southern façade of a boiler building serving BAE.

In all cases, the microphone was placed 5 to 7-feet above the sidewalk/ground and several feet away from other boundaries. A schematic diagram of the site is given in Figure 0, with approximate measurement locations indicated.

3.3 Site Conditions

Long-term measurements were conducted from May 11 to May 16 2012; short-term measurements at the ship repair yards were conducted on May 17 2012. The general weather during this period was mild (50 to 75F) with moderately gusty wind conditions (5 to 10mph with some 15mph gusts). The wind was strong enough to contaminate the low frequency data; however, this had no effect on the overall results. No rain was reported during the measurements. Traffic on adjacent roadways appeared to be typical.

The long-term measurement window of May 11 to 16 was selected because multiple ships would be in dry dock for repairs, a theoretically worst-case condition. Work logs provided by BAE (the operator of the shipyard) indicate that most of the work involved the use of cranes, forklifts, and power tools to perform water blasting and painting.

At LT-1, the ship repair activities were clearly audible above the ambient background noise levels during our time on site. We did observe several large trucks and buses using the parking lot in the vicinity of the noise instrument and suspect that local vehicle activity significantly contributes to the ambient environment.

At LT-2, the ambient noise was dominated by traffic in the distance as well as local industrial activity. The ship repair activities were clearly audible during our time on site. It was discovered after our measurements that some lighting ballasts at the roof were very noisy. Post-processing of the data revealed this to be a non-issue with reporting accurate overall noise results.

At LT-3, next to Sims Metal Management, the noise was dominated by local shop activity on May 11 to 12 and 14 to 16; however, the shop was closed on Sunday (May 13), so the noise levels during that day are more representative of ship repair activities. Ship repair activities were audible during our time on site. Currently, historic Building 6 is rather porous (many of the windows are broken out), but this structure still serves as an effective noise barrier between the measurement location and the ship repair activities. We understand that the windows would be repaired as part of any residential development, further increasing the shielding provided by this building.

At LT-4, in the tow yard adjacent to Illinois Street, the ambient noise levels were dominated by local traffic and activities associated with the construction of a multi-family project on Illinois Street, between 19th and 20th Streets. We understand that construction did occur on Saturday (May 12) but not Sunday (May 13). Ship repair activities were not audible at this location during our time on site.

3.4 Data Presentation

The noise data are presented as an overall level time history over a 96-hour period given in units of sound pressure level re: 20μPa. The equivalent sound pressure (L_{EQ}) and L_n statistical level time histories are presented in Figures 1 through 4 (the 12-hour block of missing data on Figure 2 was due to a battery that failed sooner than expected). The L_n is a statistical descriptor, denoting the sound pressure level exceeded n% of the measurement duration. It is a useful metric for evaluating the distribution of noise events over time. For example, the L_{10} represents the noise level exceeded 10% of the time and is a useful descriptor for transient events like individual vehicle drive-bys. The L_{90} represents the noise level exceeded 90% of the time and is a useful descriptor to isolate continuous noise sources.

The statistical summary of L_{EQ} spectra recorded at Location LT-1 is presented in Figure 5 in 1/3-octave band resolution. The short-term L_{EQ} spectra recorded at Locations ST-1 through ST-5 are presented in Figure 6 in 1/3-octave band resolution

4. Noise Survey Results

The long-term noise data at each site are summarized in Table 1 below.

Table 1: Summary of Long-Term Measurement Results

	24-Hour Day/Night Level (L_{DN}) in Decibels (dBA)				
Location	**May 12**	**May 13**	**May 14**	**May 15**	**Average**
LT-1	69	66	64	64	66
LT-2	67	65	65	67	66
LT-3	62	60	61	63	62
LT-4	61	61	63	63	62

Table 2 summarizes the short-term measurement results at the BAE shipyard.

Table 2: Summary of Short-Term Measurement Results

Location	Activity/Source	L_{EQ} (dBA)	L_{MAX} (dBA)
ST-1	Dry Dock Repair	77	81
ST-2	Generators	81	82
ST-3	Dry Dock Repair	76	84
ST-4	General Dock	66	71
ST-4	Fire Pump	77	78
ST-5	Boiler Building	76	76

We make the following comments in regards to the recorded noise data:

- The site is only moderately noisy, with an average L_{DN} of 62 to 66 dBA. These levels are somewhat quieter than is typical for light industrial/urban mixed-use locations. It is apparent that existing buildings provide significant shielding of ship repair related noise at locations LT-3 and LT-4 vs. locations LT-1 and LT-2.

- The short-term measurements at the ship repair docks reveal that the general noise character of the repair work is broadband without significant tonality. The lack of strong tonality results in the noise being perceived as less annoying than a similar noise level from a tonal source, such as a transformer or chiller. The fire pump at the western end of the dock runs continuously and has significant tonality; however, the pump was not audible over the ambient conditions at any of the long-term measurement conditions and in fact, is barely detectable in the short-term measurement made nearby at the western end of the ship repair docks. Another mildly tonal source is the Aggrecko generators located between Dry Dock 2 and Dock 4 East; the generators create tones at 125 Hz and 500 Hz. We understand that these would be removed from the site if a proposed electric infrastructure upgrade is constructed.

- At locations LT-1 and LT-2, the noise environment appears to be very constant and is clearly influenced by the ship repair activities. In the L_{90} spectrum (Figure 5), the 125 and 500 Hz tones from the generators are clearly visible.

- At location LT-3, the noise environment varies significantly from day to nighttime hours, particularly when Sims is operational. While not shown, the 125 and 500 Hz tones from the generators are clearly visible in the L_{90} spectrum. However, the higher frequencies are much quieter than at LT-1 and LT-2, likely due to the shielding provided by building 6.
- At location LT-4, the noise environment also varies significantly from day to nighttime hours. Both the time history and spectra are consistent with environments controlled by vehicular traffic. No evidence of the generators or other components of the ship repair activities are visible in the spectra.

5. Site Noise Criteria

The State of California has established a requirement that the interior noise levels in residential dwellings from exterior sources be limited to 45 dBA L_{DN}. To provide for simplified enforcement of this requirement, the State developed guidelines for determining residential compatibility in differing environments. The Guidelines are formatted into categories of "Normally Acceptable", "Conditionally Acceptable", "Normally Unacceptable", and "Clearly Unacceptable" and encompass all forms of residential uses – single-family, multi-family, and apartments/rentals. To determine which category the site falls into, long-term (24+ hour) measurements are conducted at the proposed site and evaluated against the categories. For the "Conditionally Acceptable" and "Normally Unacceptable" categories, development should only be undertaken after a noise analysis has been performed and any necessary noise reduction elements incorporated into the design.

The City of San Francisco has adopted compatibility guidelines very similar to the State guidelines as part of the General Plan (Policy 11.1) The Plan states the following:

- L_{DN} values of 60 dBA or less are "Satisfactory", meaning there would be no special noise insulation measures required.
- For areas with L_{DN} values between 60 and 70 dBA, 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.
- For areas with L_{DN} values exceeding 65 dBA[1], new construction or development should generally be discouraged. If new construction does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

[1] Varying from the State guidelines, the City of San Francisco has adopted an overlapping set of guidelines.

6. Site Feasibility Determination

City of San Francisco/California Building Code Compatibility

Based on the data presented in this report, the L_{DN} at the four long-term locations varied from 60 to 69 dBA, with an average of 62 dBA at locations LT-3 and LT-4, and an average of 66 dBA at locations LT-1 and LT-2. When compared to the City of San Francisco compatibility guidelines, all four locations fall within the categories requiring a detailed analysis of noise reduction requirements and needed noise insulation features included in the design. The needed noise insulation features could include selecting glazing with higher noise reduction, improving exterior wall construction, adapting the layout of interior spaces and/or location of windows to general site planning. In addition, open windows could not be solely relied upon for ventilation.

For outdoor use areas, we would anticipate only minor to moderate shielding requirements to reduce the exterior noise levels to 60 dBA or less. The 60 dBA threshold is commonly used as the maximum noise level before speech intelligibility significantly decreases, although this is not a Code concern.

Given the moderate noise levels at the site, the mitigation measures should not require exotic or unusual construction methods or materials. It should be noted that the noise environment in large areas of the City is of a similar noise level or even higher. As noted under Measurement Locations, location LT-4 was close to an approved multi-family residential project under construction. Figure 7 presents a noise map commissioned by the City of San Francisco. As can be seen, nearby residential areas have similar or higher ambient noise levels than the potential Pier 70 residential locations.

Character of Noise at Site

While not a Code matter, understanding the subjective noise character of the site can be useful in determining the suitability for residential uses. The general character of the noise environment at the potential locations for residential development is typical light industrial/urban mixed-use with a continuous background level from traffic in the distance. The noise from ship repair activities is generally broadband and inoffensive in character. At location LT-1, there are no other buildings to block the line-of-sight from Dry Dock 2; therefore, more high frequency energy from activities, such as water blasting or painting, is present and audible. At locations LT-1, LT-2, and LT-3, noise from the generators is also significant. As we understand it, an upgrade to the electrical infrastructure at BAE has been proposed; this upgrade would remove the generators from service.

7. Conclusion

Based on the data presented in this report, the noise character at the site is generally similar to many areas of San Francisco. It is expected that the California Building Code interior noise level requirements could be met with common mitigation measures to increase the noise reduction of the exterior façade and outdoor use areas would be possible with minor to moderate shielding requirements. The noise from ship repair activities is generally broadband and inoffensive in character. Given these factors, the site should be considered acceptable for the development of multi-family residential housing.

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Please feel free to call if you have any questions; we may be reached in our San Francisco office by telephone at (+1) 415-693-0424 or via email at tyler@va-consult.com.

Sincerely,

Tyler Rynberg, PE

Vibro-Acoustic Consultants

Figure 0: Pier 70 Residential Feasibility Study – 11-17 May 2012
Noise Measurement Locations

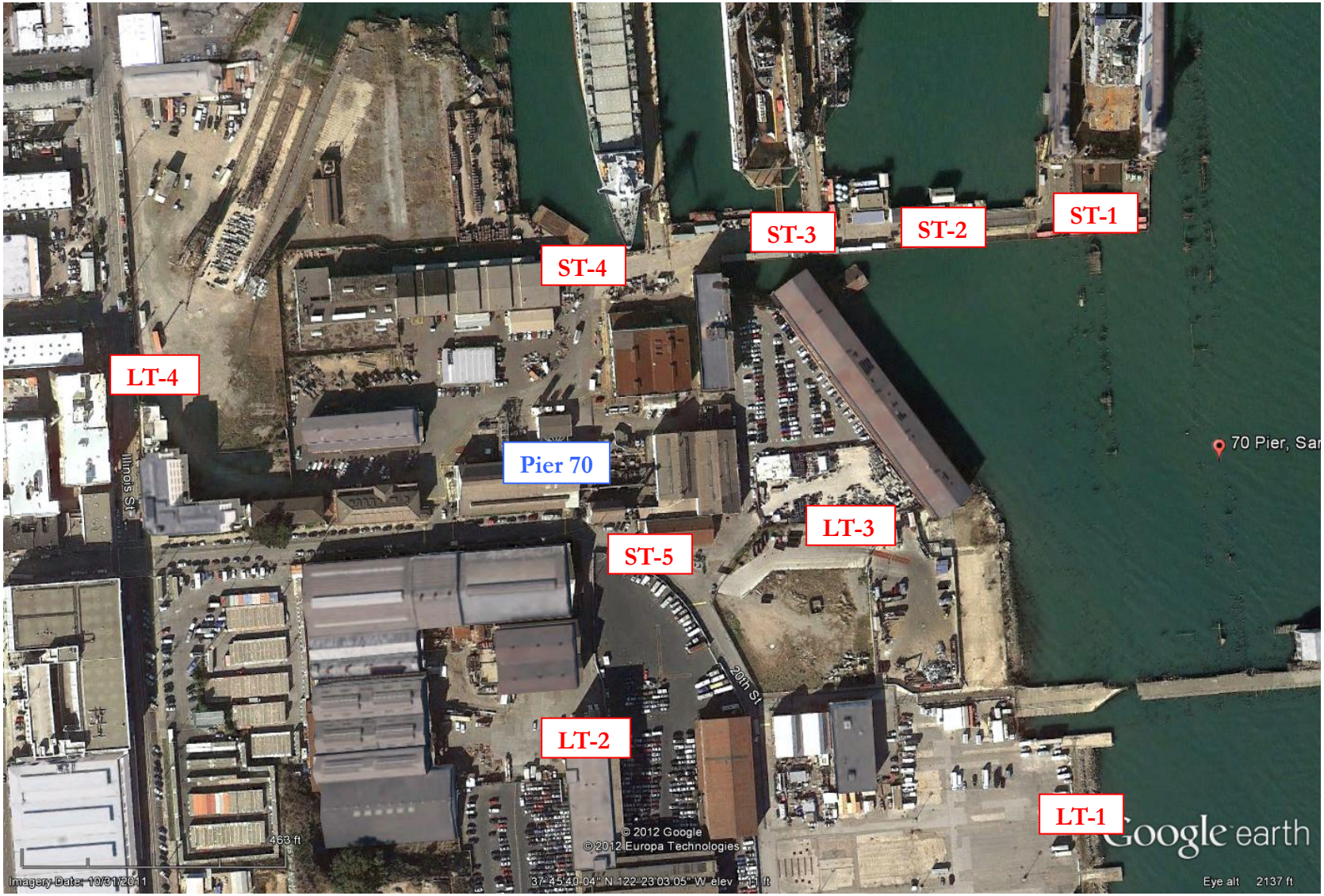


Figure 1: Pier 70 Residential Feasibility Study – 11-17 May 2012
Time History of Noise Levels over 96-hour Period at Location LT-1 (Slip 5/6)

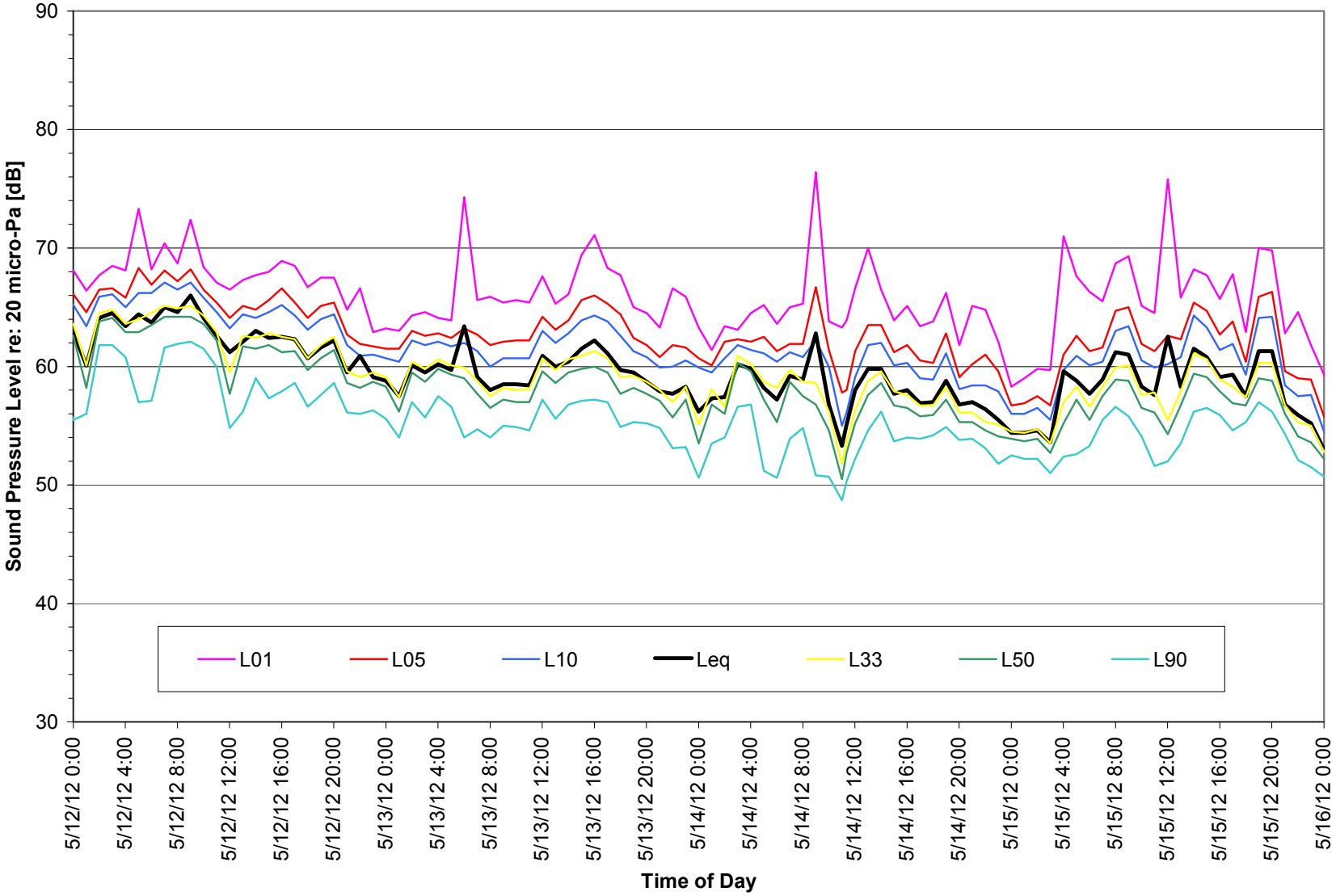


Figure 2: Pier 70 Residential Feasibility Study – 11-17 May 2012
Time History of Noise Levels over 96-hour Period at Location LT-2 (Building 2 Roof)

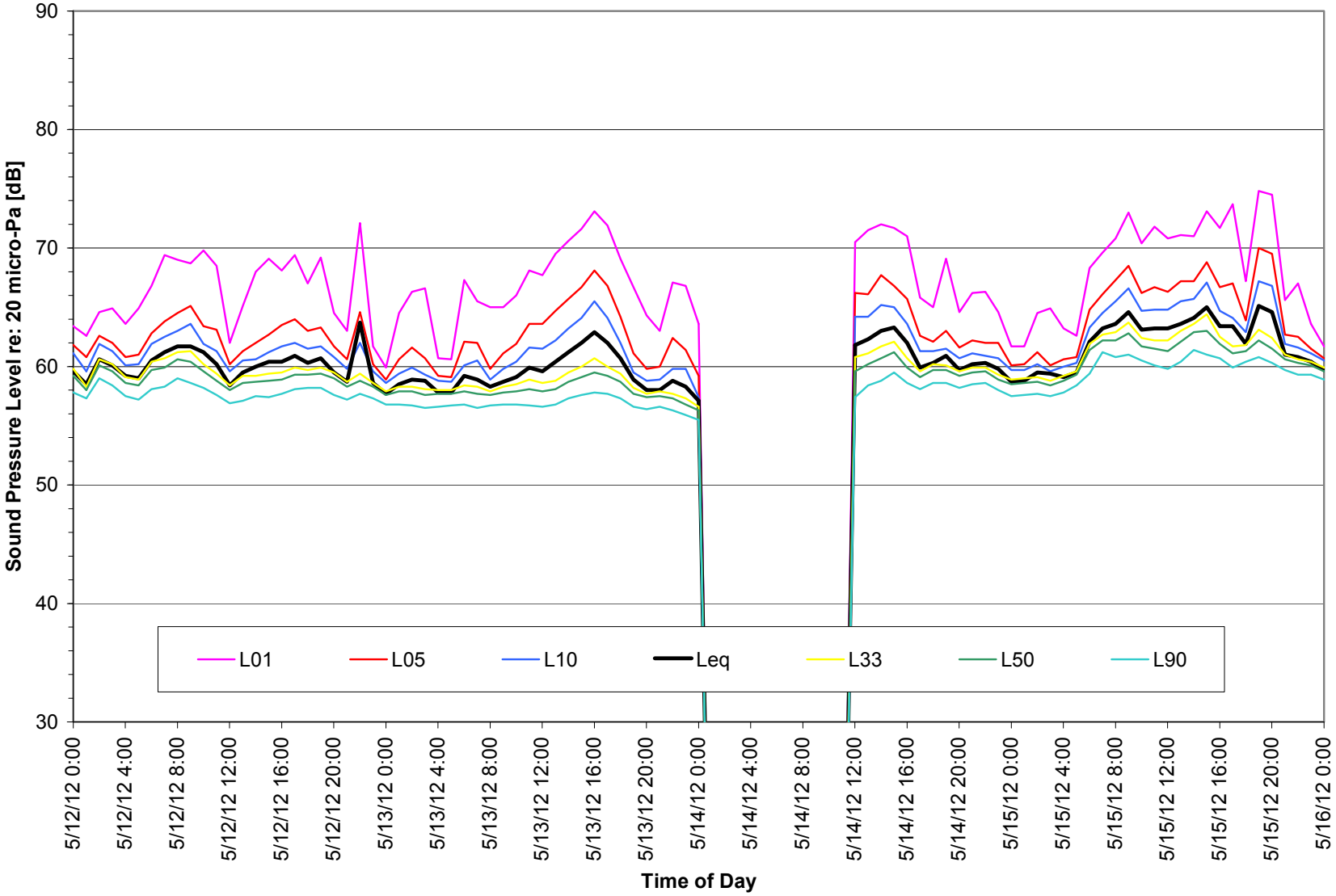


Figure 3: Pier 70 Residential Feasibility Study – 11-17 May 2012
Time History of Noise Levels over 96-hour Period at Location LT-3 (Sims Metal Management South of Building 6)

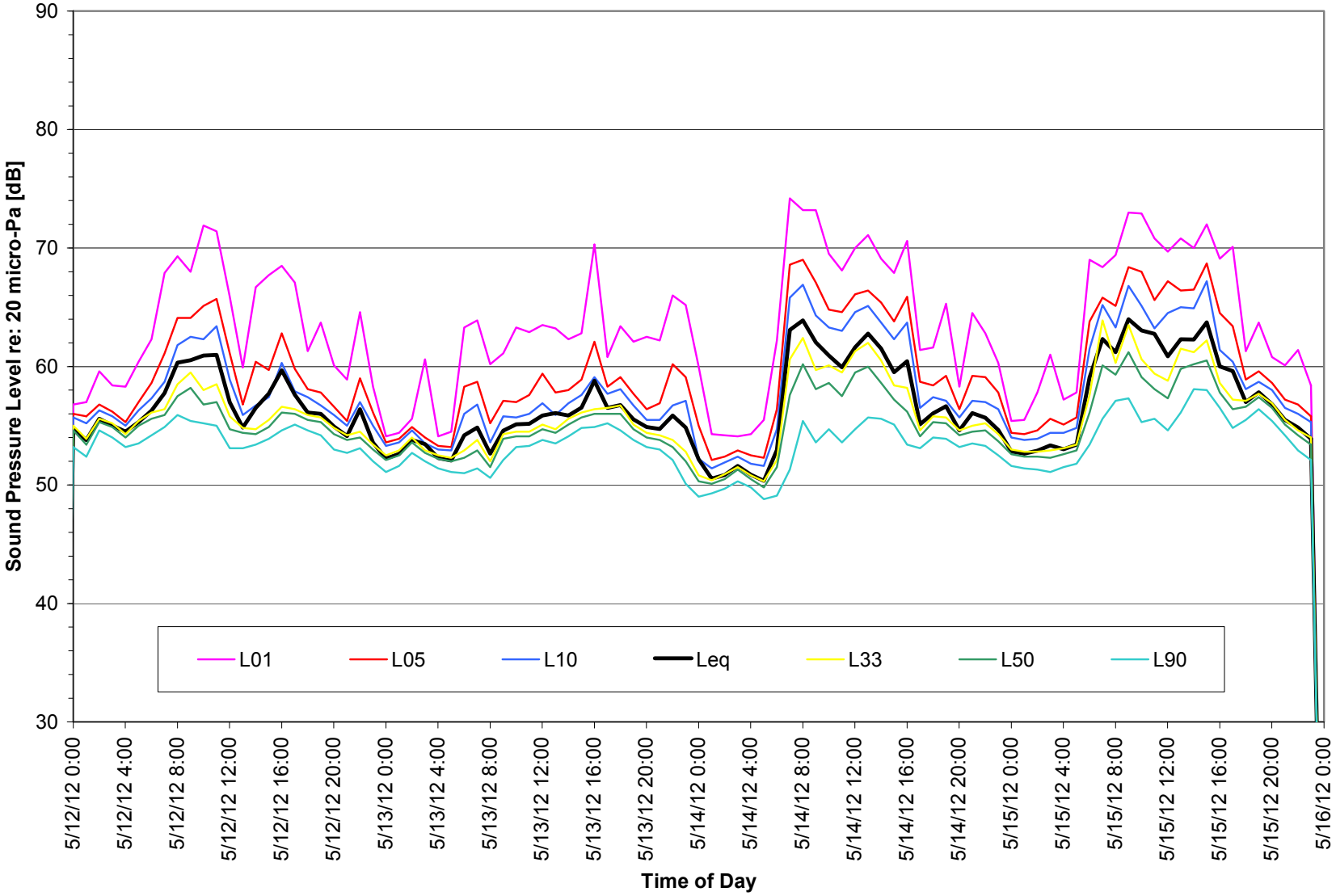


Figure 4: Pier 70 Residential Feasibility Study – 11-17 May 2012
Time History of Noise Levels over 96-hour Period at Location LT-4 (Illinois Street North of Building 131)

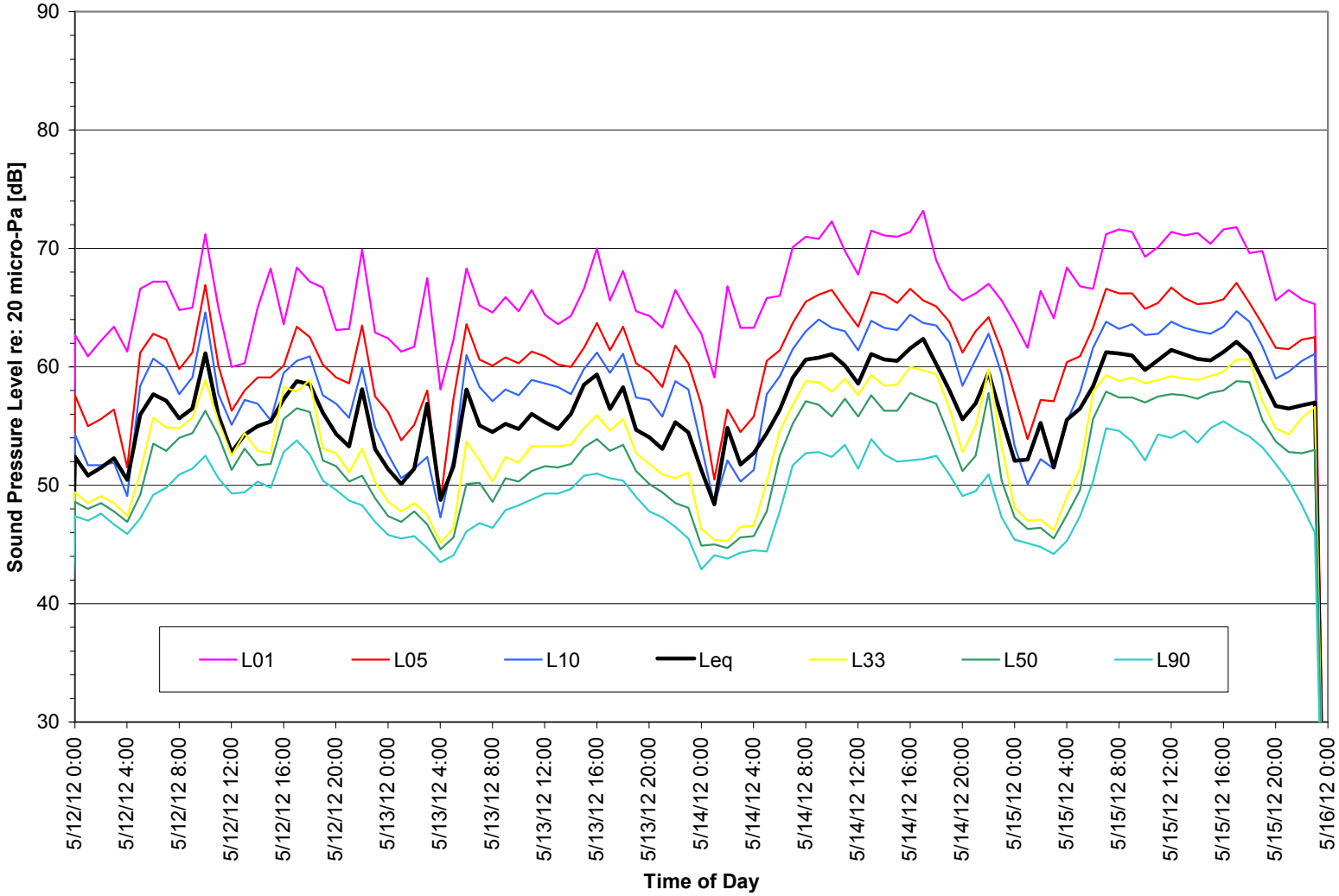


Figure 5: Pier 70 Residential Feasibility Study – 11-17 May 2012
Statistical Summary of Spectra over 96-Hour Period at Location LT-1

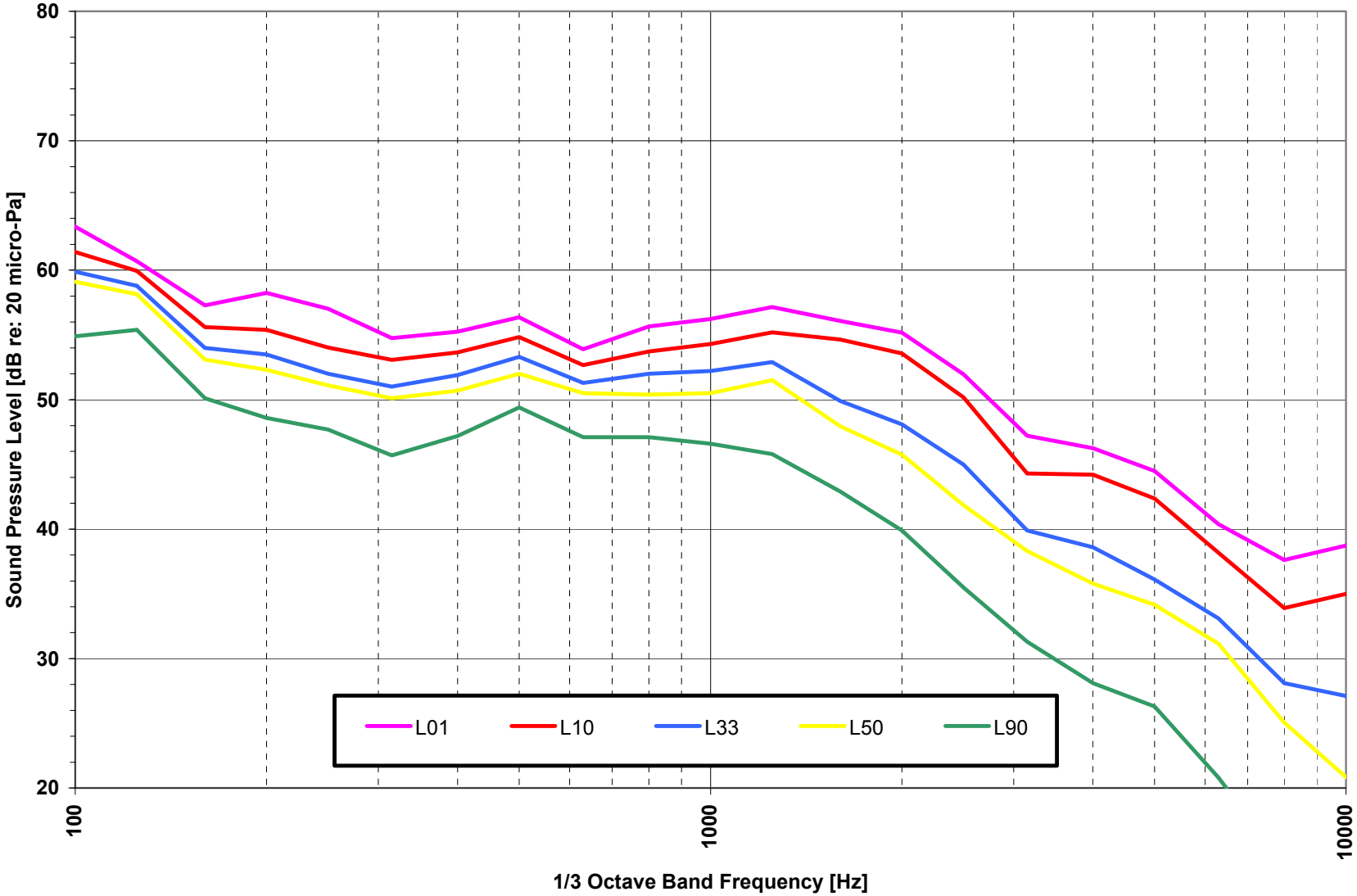


Figure 6: Pier 70 Residential Feasibility Study – 11-17 May 2012
Short-Term Ship Repair Facility Noise Levels at Locations ST-1 through ST-5

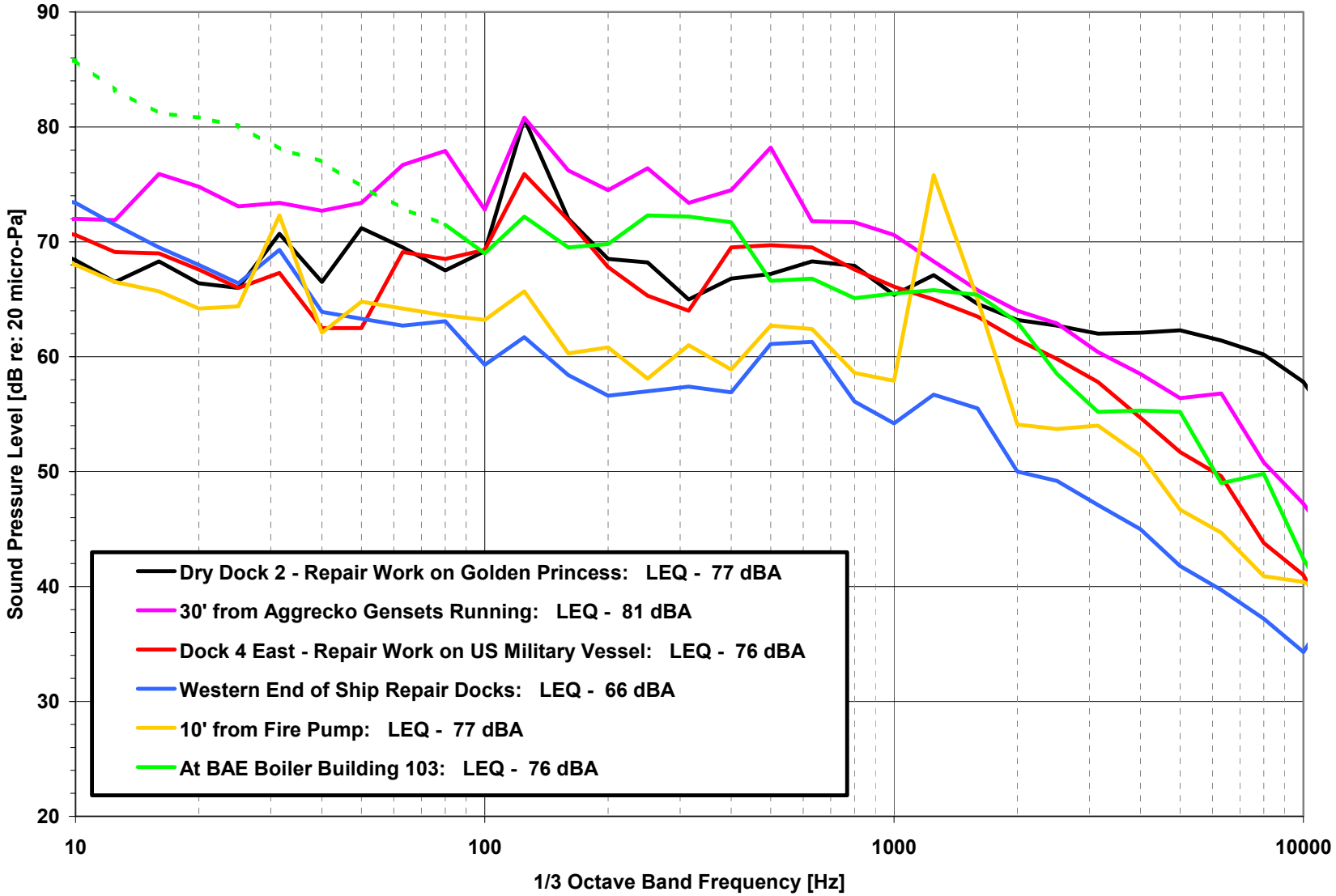
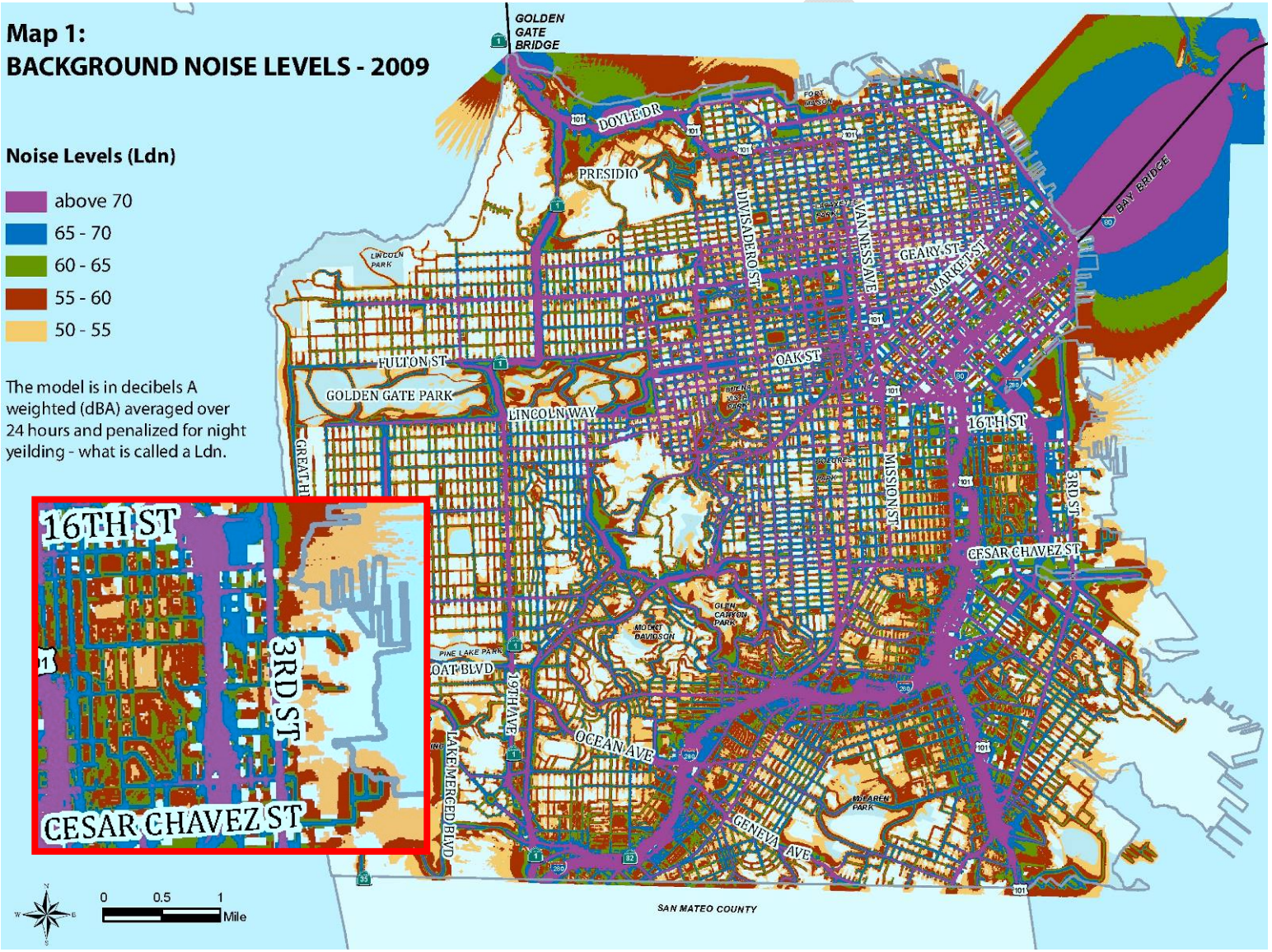


Figure 7: Pier 70 Residential Feasibility Study – 11-17 May 2012
Noise Map Commissioned by City of San Francisco



Session Report

4/6/2015

Information Panel

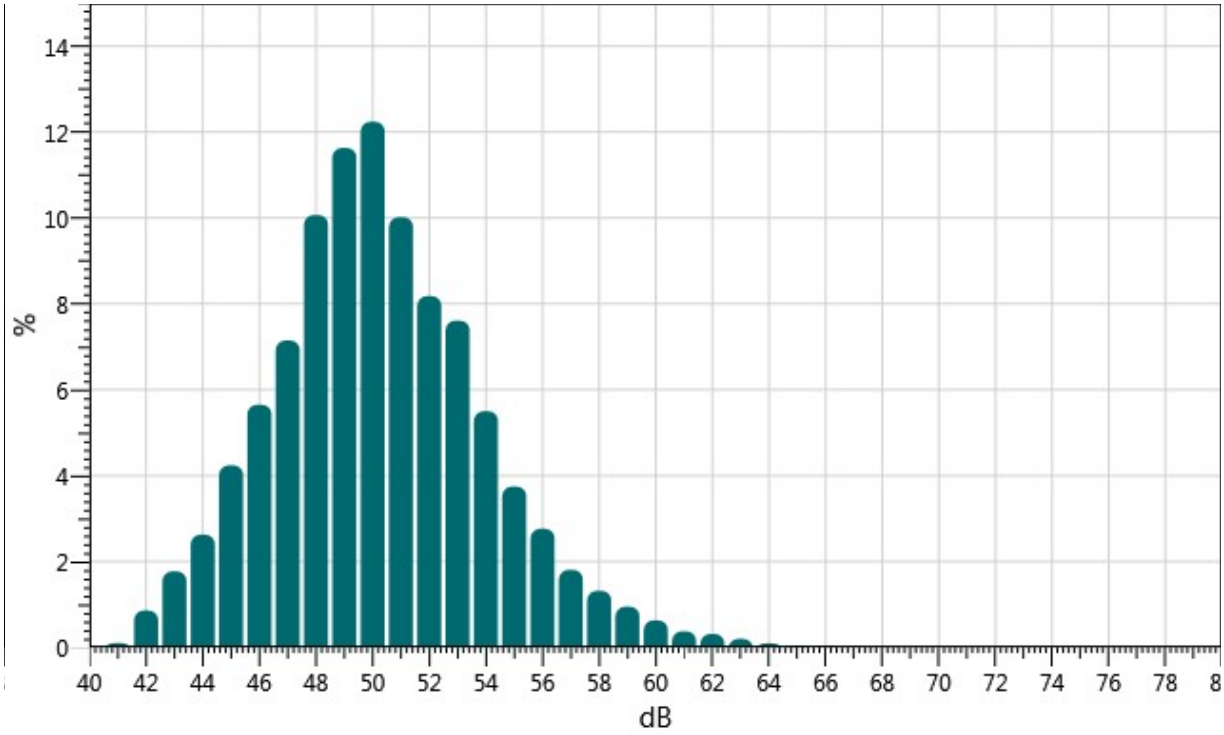
Name	S021_BGF100003_05042015_171527
Start Time	4/2/2015 12:00:00 AM
Stop Time	4/4/2015 12:10:00 AM
Device Name	BGF100003
Model Type	SoundPro DL
Device Firmware Rev	R.12L
Comments	

Summary Data Panel

Description	Meter	Value	Description	Meter	Value
Leq	1	52.6 dB	CNEL	1	58.3 dB
L10	1	55.4 dB	L50	1	50.3 dB
L90	1	45.9 dB	LDN	1	57.9 dB
Lmax	1	74.7 dB	Lmin	1	41.1 dB
Exchange Rate	1	3 dB	Weighting	1	A
Response	1	SLOW	Bandwidth	1	OFF

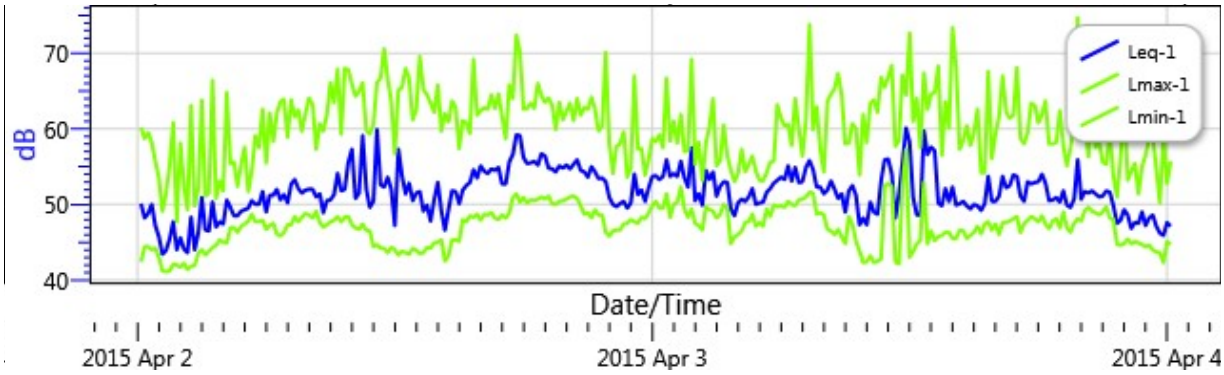
Statistics Chart

S021_BGF100003_05042015_171527: Statistics Chart



Logged Data Chart

S021_BGF100003_05042015_171527: Logged Data Chart



Session Report

8/21/2015

Information Panel

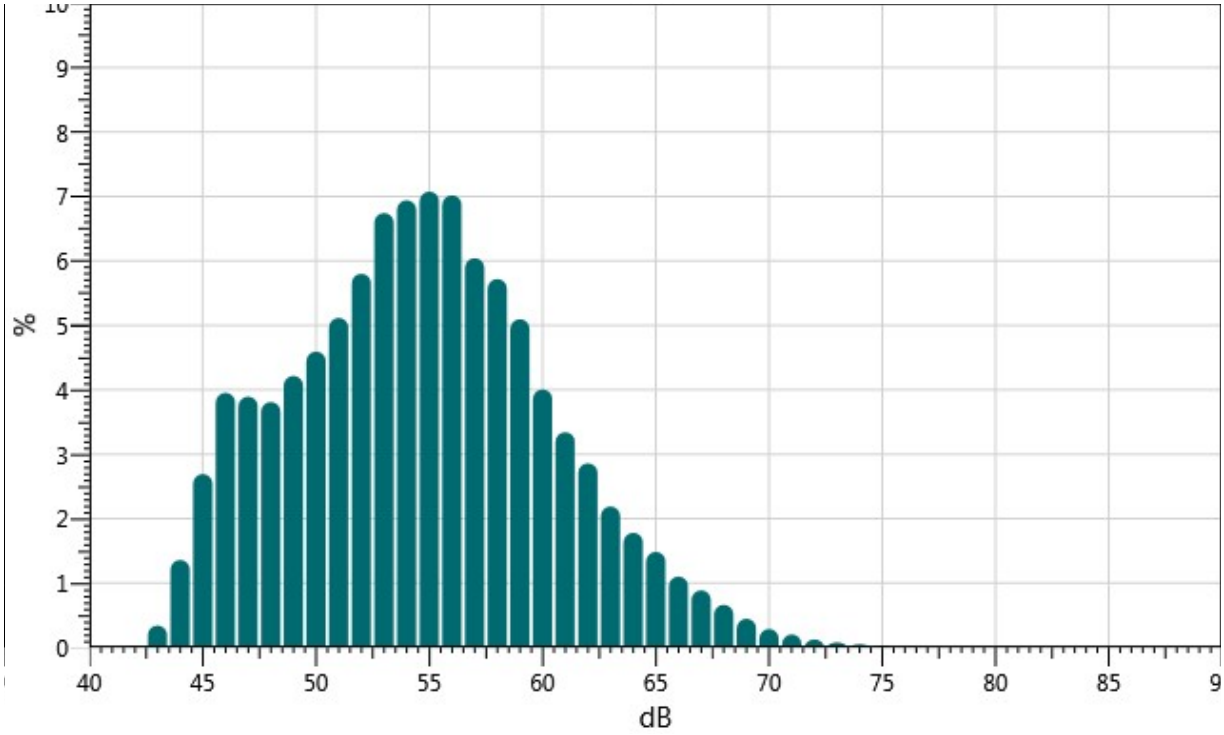
Name	ImPark parking lot
Start Time	8/18/2015 12:00:00 AM
Stop Time	8/20/2015 12:10:00 AM
Device Name	BGF100004
Model Type	SoundPro DL
Device Firmware Rev	R.12L
Comments	

Summary Data Panel

Description	Meter	Value	Description	Meter	Value
Leq	1	59.3 dB	CNEL	1	63.9 dB
L50	1	54.9 dB	L90	1	47.3 dB
LDN	1	63.7 dB	Lmax	1	81.9 dB
Lmin	1	42.2 dB			
Exchange Rate	1	3 dB	Weighting	1	A
Response	1	SLOW			

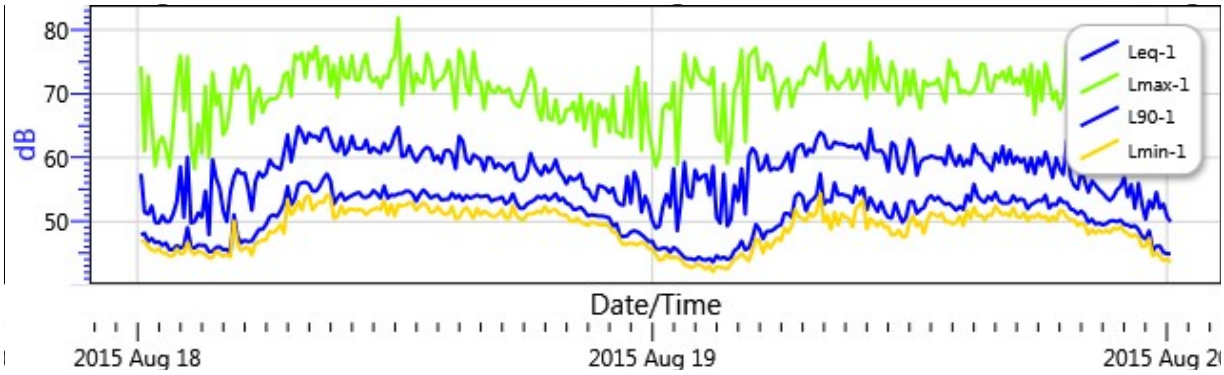
Statistics Chart

S048_BGF100004_21082015_152408: Statistics Chart



Logged Data Chart

S048_BGF100004_21082015_152408: Logged Data Chart



Session Report

8/21/2015

Information Panel

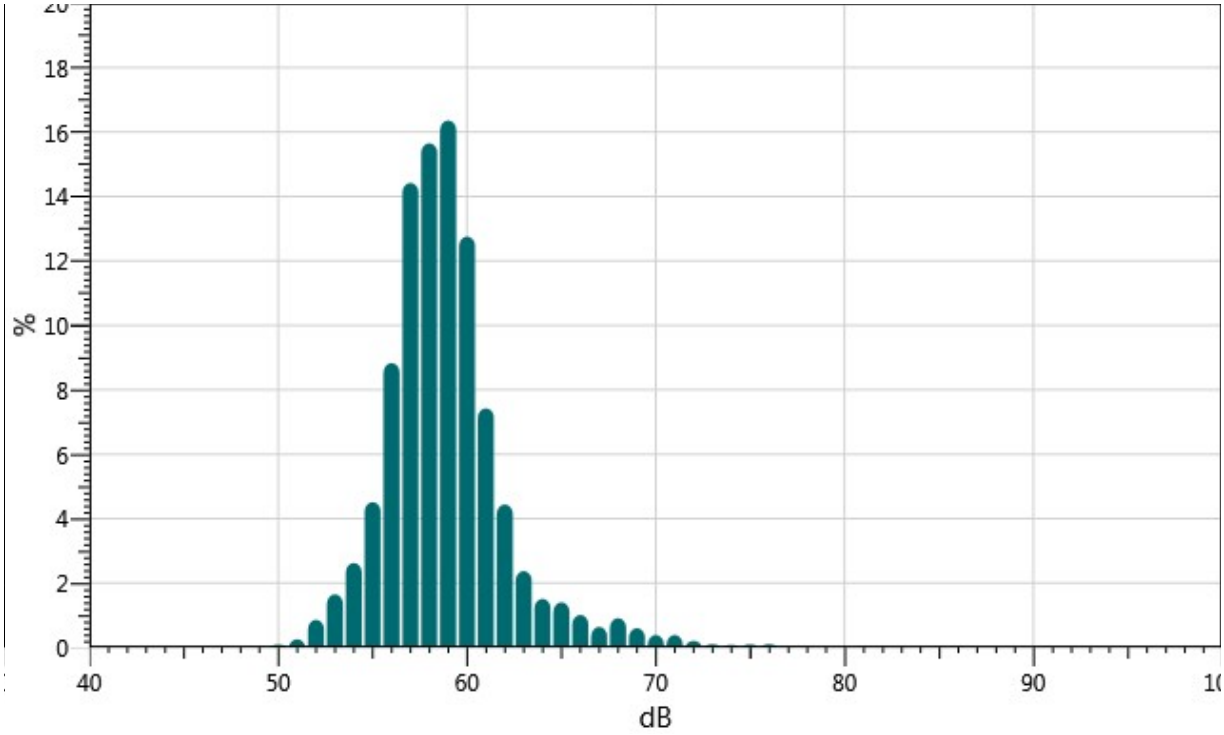
Name	PG&E Hoedown Yard
Start Time	8/18/2015 12:00:00 AM
Stop Time	8/20/2015 12:10:00 AM
Device Name	BGF100003
Model Type	SoundPro DL
Device Firmware Rev	R.12L
Comments	

Summary Data Panel

Description	Meter	Value	Description	Meter	Value
Leq	1	62.6 dB	L50	1	58.9 dB
CNEL	1	67.4 dB	L90	1	55.8 dB
LDN	1	67.3 dB	Lmax	1	93.1 dB
Lmin	1	49.1 dB			
Exchange Rate	1	3 dB	Weighting	1	A
Response	1	SLOW			

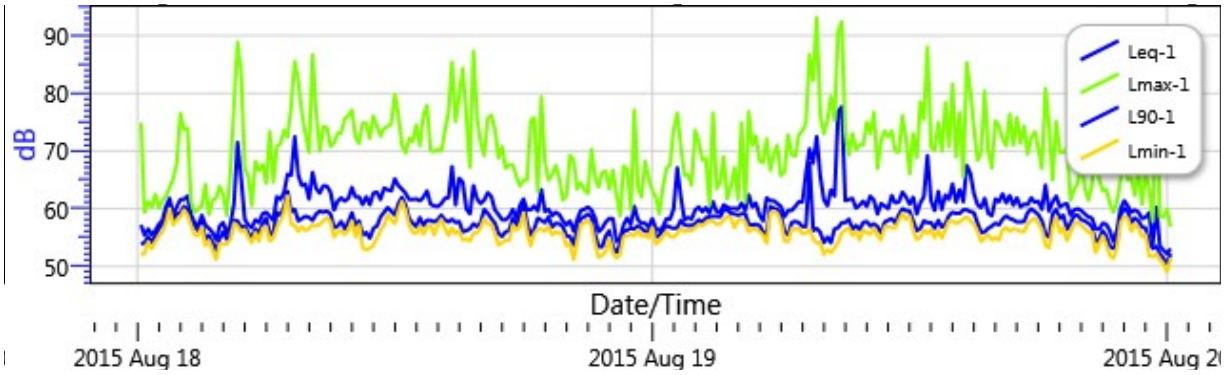
Statistics Chart

S026_BGF100003_21082015_142503: Statistics Chart



Logged Data Chart

S026_BGF100003_21082015_142503: Logged Data Chart



Attachment 2

PROJECT ON-SITE NOISE EXPOSURE BY PARCEL

Attachment 2: Estimated Project On-Site Noise Exposure by Parcel

Future On-Site Noise Exposure by Project Parcel													
Proposed Building/Parcel	**Façade**	**Minimum Building Setback from CL (feet)**	**Min. Measured or Estimated Ambient Noise Level**	**Max. Measured or Estimated Ambient Noise Level**	**Traffic Noise Level at 50' fr. CL**	**Adj. Traffic Noise Level at Minimium Setback**	**Minimum Combined Noise Level at Receptor**	**Maximum Combined Noise Level at Receptor**	**Max Res Maximum Acceptable Noise Level**	**Max Res Max Conditionally Acceptable Noise Level**	**Max Com Maximum Acceptable Noise Level**	**Max Com Max Conditionally Acceptable Noise Level**	**Designated Use Max Res/Max Com**
28-Acre Site													
Parcel A	N	30	60	66	65	67	68	70	70	75	70	75	Commercial Office/Com Office
	E	30	60	66	61	64	65	68	70	75	70	75	Com Office/Com Office
	S	23	60	66	65	68	69	70	70	75	70	75	Com Office/Com Office
	W	-	60	66	0	0	60	66	70	75	70	75	Com Office/Com Office
Parcel B	N	30	60	66	63	65	66	69	70	75	70	75	Com Office/Com Office
	E	19	60	66	60	64	66	68	70	75	70	75	Com Office/Com Office
	S	23	60	66	63	66	67	69	70	75	70	75	Com Office/Com Office
	W	30	60	66	61	64	65	68	70	75	70	75	Com Office/Com Office
Parcel C1	N	23	58	66	66	69	70	**71**	70	75	70	75	Com Office or Resid/Com Office
	E	19	58	66	62	66	67	69	70	75	70	75	Com Office/Com Office
	S	-	58	66	0	0	58	66	70	75	70	75	Com Office/Com Office
	W	350	58	66	66	58	61	67	70	75	70	75	Com Office/Com Office
Parcel C2	N	-	58	66	0	0	58	**66**	60	70	60	70	Residential/Residential
	E	19	58	66	62	66	**67**	**69**	60	70	60	70	Residential/Residential
	S	30	58	66	66	68	**69**	**70**	60	70	60	70	Residential/Residential
	W	550	58	66	64	54	59	**66**	60	70	60	70	Residential/Residential
Parcel D	N	23	66	66	65	68	**70**	**70**	60	70	60	70	Residential/Residential
	E	30	66	66	60	62	**68**	**68**	60	70	60	70	Residential/Residential
	S	-	66	66	0	0	**66**	**66**	60	70	60	70	Residential/Residential
	W	-	66	66	0	0	**66**	**66**	60	70	60	70	Residential/Residential
Parcel E1	N	23	66	66	63	66	**69**	**69**	60	70	60	70	Residential/Residential
	E	-	66	66	0	0	**66**	**66**	60	70	60	70	Residential/Residential
	S	-	66	66	0	0	**66**	**66**	60	70	60	70	Residential/Residential
	W	30	66	66	60	62	**68**	**68**	60	70	60	70	Residential/Residential
Parcel E2	N	-	58	66	0	0	58	**66**	60	70	60	70	Residential/Residential
	E	-	58	66	0	0	58	**66**	60	70	60	70	Residential/Residential
	S	30	58	66	60	62	**64**	**68**	60	70	60	70	Residential/Residential
	W	30	58	66	60	62	**64**	**68**	60	70	60	70	Residential/Residential
Parcel E3	N	-	58	66	0	0	58	**66**	60	70	60	70	Residential/Residential
	E	-	58	66	0	0	58	**66**	60	70	60	70	Residential/Residential
	S	30	58	66	60	62	**64**	**68**	60	70	60	70	Residential/Residential
	W	-	58	66	0	0	58	**66**	60	70	60	70	Residential/Residential
Parcel F	N	30	58	66	66	68	**69**	**70**	60	70	70	75	Residential/Com Office
	E	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	S	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	W	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
Parcel G	N	30	58	66	64	67	**67**	**69**	60	70	70	75	Residential/Com Office
	E	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	S	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	W	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
Parcel H1	N	30	58	66	60	62	**64**	**68**	60	70	70	75	Residential/Com Office
	E	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	S	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	W	30	58	66	55	58	**61**	**67**	60	70	70	75	Residential/Com Office
Parcel H2	N	30	58	66	60	62	**64**	**68**	60	70	70	75	Residential/Com Office
	E	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	S	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office
	W	-	58	66	0	0	58	**66**	60	70	70	75	Residential/Com Office

Attachment 2: Estimated Project On-Site Noise Exposure by Parcel (Continued)

Future On-Site Noise Exposure by Project Parcel													
Proposed Building/Parcel	**Façade**	**Minimum Building Setback from CL (feet)**	**Min. Measured or Estimated Ambient Noise Level**	**Max. Measured or Estimated Ambient Noise Level**	**Traffic Noise Level at 50' fr. CL**	**Adj. Traffic Noise Level at Minimium Setback**	**Minimum Combined Noise Level at Receptor**	**Maximum Combined Noise Level at Receptor**	**Max Res Maximum Acceptable Noise Level**	**Max Res Max Conditionally Acceptable Noise Level**	**Max Com Maximum Acceptable Noise Level**	**Max Com Max Conditionally Acceptable Noise Level**	**Designated Use Max Res/Max Com**
28-Acre Site													
Building 2	N	23	66	66	65	68	70	**70**	60	70	70	75	Residential/Com Office
	E	-	66	66	0	0	**66**	**66**	60	70	70	75	Residential/Com Office
	S	-	66	66	0	0	**66**	**66**	60	70	70	75	Residential/Com Office
	W	19	66	66	62	66	**69**	**69**	60	70	70	75	Residential/Com Office
Parcel E4	N	23	66	66	63	66	69	69	77.5	87.5	77.5	87.5	Creative Retail (RALI)/RALI
	E	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
	S	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
	W	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
Building 12	N	-	58	66	0	0	58	66	77.5	87.5	77.5	87.5	RALI/RALI
	E	30	58	66	60	62	64	68	77.5	87.5	77.5	87.5	RALI/RALI
	S	30	58	66	64	67	67	69	77.5	87.5	77.5	87.5	RALI/RALI
	W	19	58	66	62	66	67	69	77.5	87.5	77.5	87.5	RALI/RALI
Building 21	N	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
	E	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
	S	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
	W	-	66	66	0	0	66	66	77.5	87.5	77.5	87.5	RALI/RALI
Parcel C1 Roof	N	23	58	66	66	69	70	**71**	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	E	19	58	66	62	66	67	69	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	S	-	58	66	0	0	58	66	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	W	350	58	66	66	58	61	67	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
Parcel C2 Roof	N	-	58	66	0	0	58	66	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	E	19	58	66	62	66	67	69	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	S	30	58	66	66	68	69	70	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	W	550	58	66	66	56	60	66	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
Waterfront Promenade	N	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	E	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	S	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	W	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
Waterfront Terrace	N	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	E	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	S	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	W	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
Slipway Commons	N	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	E	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	S	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
	W	-	58	66	0	0	58	66	75	85	75	85	Water-based Rec/Water-based Rec
Building 12 Market Plaza / Square	N	-	66	66	0	0	66	66	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	E	30	66	66	60	62	68	68	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	S	-	66	66	0	0	66	66	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	W	-	66	66	0	0	66	66	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
Illinois Parcels													
Parcel PKN	N	98	62	64	65	62	**65**	**66**	60	70	60	70	Residential/Residential
	E	38	62	64	61	63	**65**	**66**	60	70	60	70	Residential/Residential
	S	19	62	64	67	71	**71**	**72**	60	70	60	70	Residential/Residential
	W	35	62	64	65	66	**68**	**68**	60	70	60	70	Residential/Residential
Parcel PKS	N	19	62	64	67	71	**71**	**72**	60	70	60	70	Residential/Residential
	E	-	62	64	0	0	**62**	**64**	60	70	60	70	Residential/Residential
	S	-	62	64	0	0	**62**	**64**	60	70	60	70	Residential/Residential
	W	35	62	64	66	68	**69**	**69**	60	70	60	70	Residential/Residential

Attachment 2: Estimated Project On-Site Noise Exposure by Parcel (Continued)

Future On-Site Noise Exposure by Project Parcel

Proposed Building/Parcel	Façade	Minimum Building Setback from CL (feet)	Min. Measured or Estimated Ambient Noise Level	Max. Measured or Estimated Ambient Noise Level	Traffic Noise Level at 50' fr. CL	Adj. Traffic Noise Level at Minimum Setback	Minimum Combined Noise Level at Receptor	Maximum Combined Noise Level at Receptor	Max Res Maximum Acceptable Noise Level	Max Res Max Conditionally Acceptable Noise Level	Max Com Maximum Acceptable Noise Level	Max Com Max Conditionally Acceptable Noise Level	Designated Use Max Res/Max Com
Illinois Parcels													
Parcel HDY*	N	-	*62*	*64*	0	0	**62**	**64**	60	70	70	75	Residential/Com Office
	E	-	*62*	*64*	0	0	**62**	**64**	60	70	70	75	Residential/Com Office
	S	30	*62*	*64*	66	68	**69**	**70**	60	70	70	75	Residential/Com Office
	W	35	*62*	*64*	66	68	**69**	**69**	60	70	70	75	Residential/Com Office
20th Street Plaza	N	30	62	64	65	67	**68**	**69**	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	E	-	62	64	0	0	62	64	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	S	-	62	64	0	0	62	64	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	W	35	62	64	65	66	68	68	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
Irish Hill Playground	N	19	62	64	67	71	71	72	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	E	-	62	64	0	0	62	64	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	S	-	62	64	0	0	62	64	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds
	W	35	62	64	66	68	69	69	70	77.5	70	77.5	Parks-Playgrds/Parks-Playgrnds

Notes: Noise levels in **Bold** exceed Maximum Acceptable Noise Levels, but do not exceed Maximum Conditionally Acceptable Noise Levels for the proposed uses, indicating that incorporation of supplemental noise attenuation measures would be adequate to reduce interior noise levels to acceptable levels. Noise levels in **Red Bold** exceed both Maximum Acceptable Noise Level and Maximum Conditionally Acceptable Noise Levels for the proposed uses, indicating that additional noise attenuation measures may be needed to meet the 45-dBA interior standard with open windows.

*Ambient noise levels for Parcel HDY are estimated based on measurements collected along Illinois to the north because measurements at Parcel HDY included noise from heavy equipment operations associated with the existing PG&E corporation yard activities. These operations would cease on this parcel when this parcel is redeveloped as part of project implementation, but transformer noise from the PG&E substation would continue.

Estimated On-Site Traffic Noise Levels

Street	Segment or Cross-Street	ADT	With Maximum Future With Project Noise Level Ldn/CNEL at 50' from CL	With +3 dBA Echo Adjustmt.
20th Street	E of Illinois	14,000	65	65
	W of Louisiana Ext.	12,000	63	66
	W of Maryland	9,000	62	65
	E of Maryland	6,000	60	63
21st Street (new)	E of Illinois	14,000	64	67
	W of Louisiana	12,000	63	66
	W of Maryland	9,000	62	65
	E of Maryland	6,000	60	63
22nd Street	E of Illinois	12,000	63	66
	W of Maryland	8,000	61	64
	E of Maryland	3,000	57	60
Unnamed St/E of PKN	20th-21st	4,000	58	61
Louisiana Street	21st-22nd	5,000	59	62
Maryland Street	20th-21st	4,000	58	61
	21st-22nd	3,000	57	60
	S of 22nd	1,000	52	55
Unnamed St/E of B2	20th-21st	3,000	57	60

NOTES:
"CL": Roadway Centerline
"With +3 dBA Echo Adjustment": 3 dBA was added where roadway widths were 45 feet or less and adjacent buildings were taller than two stories to account for noise reflection or "echo" effect.