Appendix K – Noise and Vibration Technical Report

620 Airport Boulevard Redevelopment Project

Noise and Vibration Technical Report

April 2022 | 02816.00021.001

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
ANSI	American National Standards Institute
APN	Assessor's Parcel Number
CAD	Computer Aided Design
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of Burlingame
CNEL	Community Noise Equivalent Level
CY	cubic yard
dB	decibel
dBA	A-weighted decibels
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
kHz	kilohertz
L_{DN}	Day-Night level
L_{EQ}	equivalent sound level
L_{MAX}	maximum noise level
mPa	micro-Pascals
NSLU	noise-sensitive land use
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
SPL	sound pressure level
S_{WL}	sound power level
TNM	Traffic Noise Model
USDOT	U.S. Department of Transportation

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EXECUTIVE SUMMARY

This report presents an assessment of potential noise impacts associated with the proposed 620 Airport Boulevard Redevelopment Project (project). The project is located in the City of Burlingame (City), San Mateo County (County), California. The project involves the redevelopment of an existing airport parking lot with a new life science/office development on the 3.70-acre site. The project consists of two 9-story buildings (6-stories of commercial uses and 3-stories of in-building parking) over a partially subterranean parking structure.

Anticipated construction activities would generate elevated noise levels in the immediate vicinity; however, temporary construction noise impacts, including from construction traffic and from construction vibration, would be less than significant. The project's heating, ventilation, and air conditioning (HVAC) systems are not anticipated to exceed allowable City limits. The project would add traffic to nearby roadways, but transportation noise impacts to off-site land uses would be less than significant.

The project site is not located within a noise contour for San Francisco International Airport. Therefore, no effects related to airport noise would occur at the project site, and impacts would be less than significant.

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1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This report analyzes potential noise and vibration impacts associated with the proposed 620 Airport Boulevard Redevelopment Project (project). The analysis includes a description of existing conditions in the project vicinity and an assessment of potential impacts associated with project implementation. Analysis within this report addresses the relevant issues listed in Appendix G of the California Environmental Quality Act (CEQA) Guidelines.

1.2 PROJECT LOCATION

The project site is located at 620 Airport Boulevard within the city of Burlingame (City) in San Mateo County (County), California. The project site is developed as a metered asphalt parking lot to serve the nearby San Francisco Airport. The project site consists of a single parcel Assessor's Parcel Number (APN) 026-342-330 (see Figure 1, *Regional Location*, and Figure 2, *Project Vicinity*). The approximately 3.70-acre site is located on the north side of Airport Boulevard, between Anza Boulevard and Bay View Place. The project site is situated directly south of the Anza Lagoon and the shoreline Bay Trail runs adjacent to the eastern and northern border. The project site is bordered by ornamental landscaping and surrounded by commercial and industrial development. The site consists of a single parcel that is developed as a metered asphalt parking lot to serve the nearby San Francisco Airport.

1.3 PROJECT DESCRIPTION

The project would redevelop the existing airport parking surface lot with a new life science/office development on the 3.70-acre site. The approximately 484,000 square foot project concept consists of two 9-story buildings (6-stories of commercial uses and 3-stories of in-building parking) over a partially subterranean podium level of parking. The top of the podium is designed to be a new integrated plaza level where ground floor activation, building lobbies, amenities and physical connection to the shoreline will occur. The maximum height of the development is proposed at approximately 163 feet with approximately 868 on-site parking spaces. An option for additional parking spaces may be available through a shared parking agreement with the adjacent hotel. Refer to Figure 3, *Site Plan*.

Construction activities would include site preparation (including removal of asphalt and vegetation), grading and excavation for the foundations, podium construction, building construction, and architectural coating (e.g., painting). During grading/excavation, approximately 25,900 cubic yards (CY) of debris would be exported.

1.4 NOISE AND SOUND LEVEL DESCRIPTORS AND TERMINOLOGY

1.4.1 Descriptors

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration. The Community Noise Equivalent Level (CNEL) is a 24-hour average, where noise levels during the evening hours of 7:00 p.m. to 10:00 p.m. have an added 5 dBA weighting, and noise levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. have an added 10 dBA weighting. This is similar to the Day Night sound level (L_{DN}), which is a 24-hour average with an added 10 dBA weighting on the same nighttime hours but no added weighting on the evening hours. Sound levels expressed in CNEL are always based on dBA. These metrics are used to express noise levels for both measurement and municipal regulations, as well as for land use guidelines and enforcement of noise ordinances.

1.4.2 Terminology

1.4.2.1 Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

1.4.2.2 Frequency

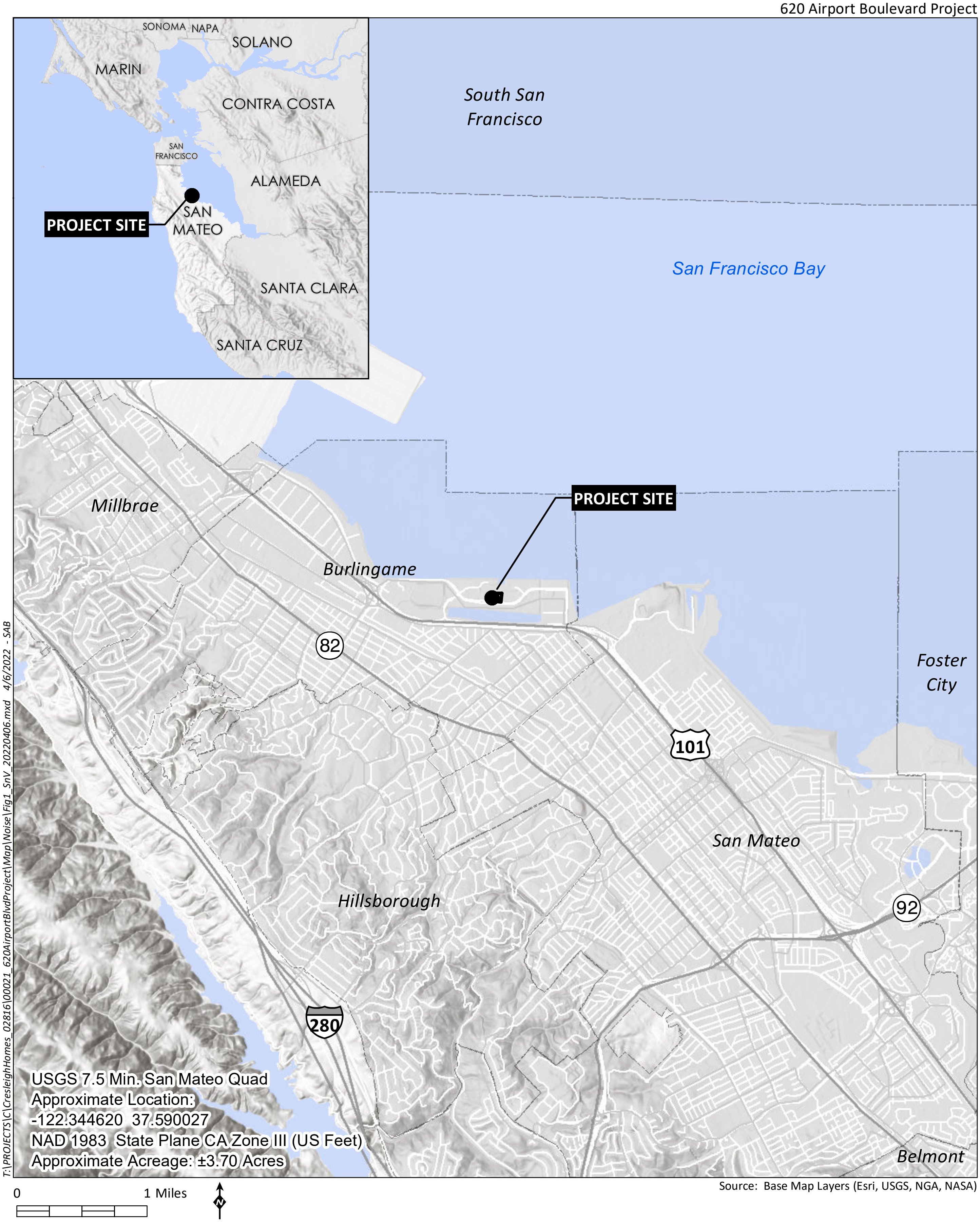
Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this wide range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA. The threshold of hearing for the human ear is about 0 dBA, which corresponds to 20 mPa.

1.4.2.3 Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through standard arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than from one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dBA—rather, they would combine to produce 73 dBA. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dBA louder than one source.



Source: Base Map Layers (Esri, USGS, NGA, NASA)

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Vicinity Map

Figure 1

Source: Aerial Imagery (NAIP, 2020)

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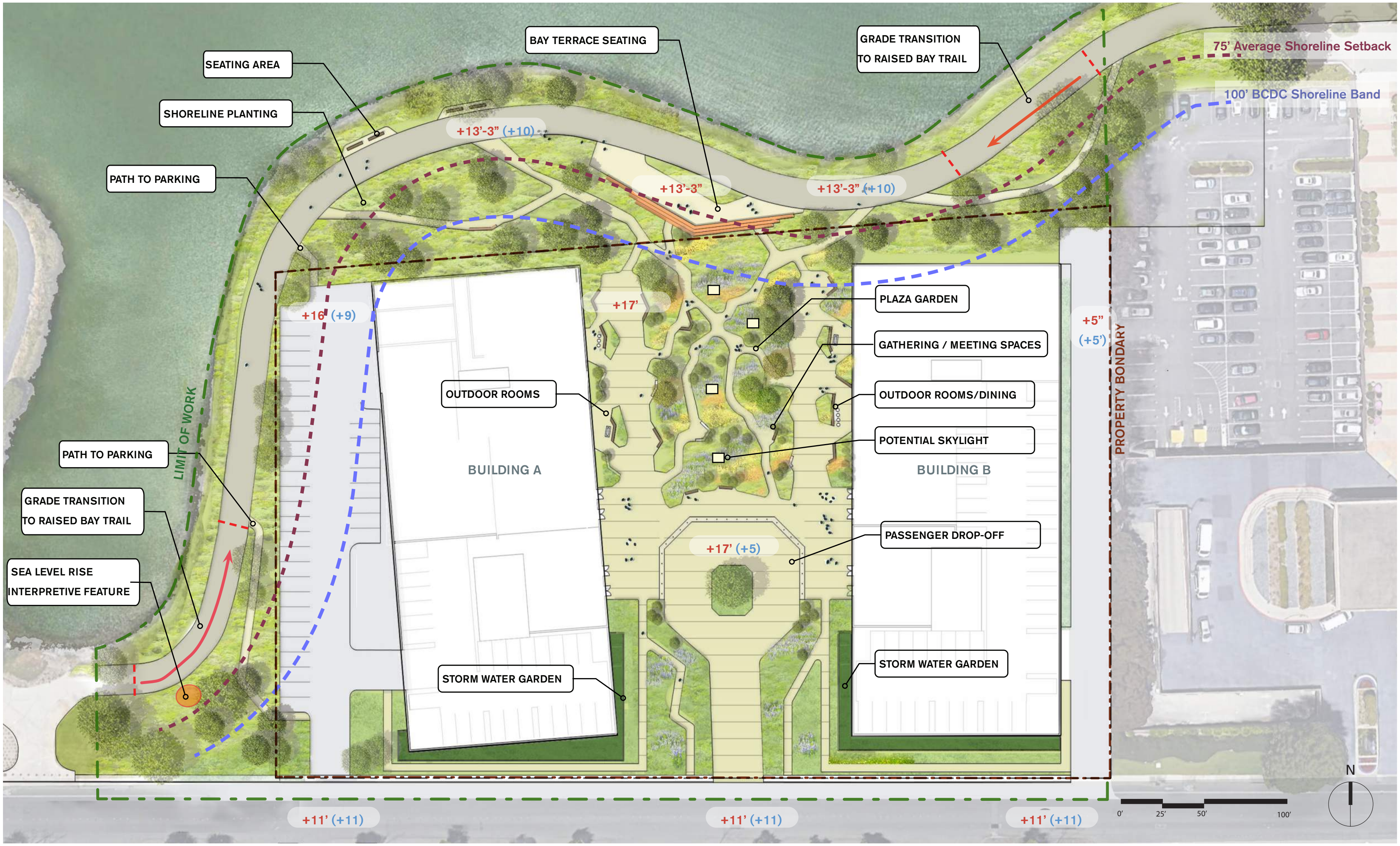
Project Vicinity

Figure 2



Source: CMG, 2022

Site Plan

Figure 3

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1 dBA changes in sound levels, when exposed to steady, single-frequency ("pure-tone") signals in the mid-frequency (1,000 Hz to 8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dBA are generally not perceptible. It is widely accepted, however, that people begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5 dBA increase is generally perceived as a distinctly noticeable increase, and a 10 dBA increase is generally perceived as a doubling of loudness.

No known studies have directly correlated the ability of a healthy human ear to discern specific levels of change in traffic noise over a 24-hour period. Many ordinances, however, specify a change of 3 CNEL as the significant impact threshold. This is based on the concept of a doubling in noise energy resulting in a 3 dBA change in noise, which is the amount of change in noise necessary for the increase to be perceptible to the average healthy human ear.

1.4.2.4 Vibration Terminology and Descriptors

Vibration is measured in feet (ft) or inches (in). Acceleration is measured by comparing acceleration to that of the Earth's gravity, and this unit is "G." These units of acceleration or velocity are relative to time in seconds and are noted as in/sec^2 for acceleration and in/sec for velocity. Displacement is not relative to time and is only shown as inches.

Vibration effects can be described by its peak and root mean square (RMS) amplitudes. Building damage is often discussed in terms of peak velocity, or peak particle velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is related to the stresses that are experienced by buildings; it is often used in monitoring of blasting vibration and to discuss construction vibration.

The RMS amplitude is useful for assessing human annoyance. Because the net average of a vibration signal is zero, the RMS amplitude is used to describe the "smoothed" vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal. The RMS amplitude is always less than the PPV and is always positive. The RMS average is typically calculated over a one-second period.

Although it is not universally accepted, decibel notation is in common use for vibration. Decibel notation serves to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as: L_V=20 × LOG10(V/V_{ref}), where "Lv" is the velocity level in decibels, "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude. The reference must be specified whenever a quantity is expressed in terms of decibels. All railroad vibration levels in this report are referenced to 1 × 10^{-6} in/sec with the notation VdB.

1.5 NOISE-SENSITIVE LAND USES

Noise-sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise, including residences, hospitals, schools, hotels, resorts, libraries, sensitive wildlife habitat, or similar facilities where quiet is an important attribute of the environment. Noise receptors are individual locations that may be affected by noise. The nearest NSLU is the Hilton hotel located approximately 200 feet east of the project site. There are no residences or other NSLUs in the immediate vicinity.

1.6 REGULATORY FRAMEWORK

1.6.1 California Noise Control Act

The California Noise Control Act is a section within the California Health and Safety Code that describes excessive noise as a serious hazard to the public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also finds that there is a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The California Noise Control Act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the State to provide an environment for all Californians free from noise that jeopardizes their health or welfare.

1.6.2 City of Burlingame General Plan, Noise Element

The goal of the Noise Element of the Burlingame General Plan (City of Burlingame 2019) is to minimize the impact of noise on the community by identifying existing and potential noise sources and providing the policies and standards needed to keep noise from reducing the quality of life in the city. The Noise Element establishes guidelines to evaluate the compatibility of land uses and noise exposure levels. Table 1, *Exterior Land Use Noise Compatibility Guidelines*, summarizes the City's exterior land use-noise compatibility guidelines. Shading in this table represents the normally acceptable, conditionally acceptable, and unacceptable noise exposure levels for each land use category. The acceptable noise levels for project land uses are 65 CNEL for office buildings, commercial and professional uses.

Table 1
CITY OF BURLINGAME EXTERIOR LAND USE NOISE COMPATIBILITY GUIDELINES

Land Use Category	Exterior Noise Exposure (dBA CNEL)				
	<60	60-65	65-70	70-75	75+
Residential					
Single-family, Duplex, and Mobile Homes					
Multiple Family					
Transient Lodging					
Hotels and Motels					
Institutional					
Schools, Libraries, Churches, Hospitals, and Nursing Homes					
Gathering Spaces					
Auditoriums, Concert Halls, Amphitheaters					
Sports Arena, Outdoor Spectator Sports					
Parks and Recreation					
Playgrounds and Neighborhood Parks					
Golf Courses, Riding Stables, Water Recreation, and Cemeteries					
Commercial and Office Uses					
Office Buildings, Businesses, Commercial and Professional Uses					

Land Use Category	Exterior Noise Exposure (dBA CNEL)				
	<60	60-65	65-70	70-75	75+
Industrial					
Industrial, Manufacturing, and Utilities					
Agricultural					
Agricultural and Nurseries					

	Normally Acceptable	Specified land use is satisfactory based upon the assumption that most buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.
	Unacceptable	New construction or development should generally not be undertaken. 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.

Source: City 2019; CNEL=Community Noise Equivalent Level; dBA=A-weighted decibel

1.6.3 City of Burlingame Municipal Code

The City's Municipal Code limits construction to weekdays between 7:00 a.m. and 7:00 p.m., Saturdays between 9:00 a.m. and 6:00 p.m., and Sundays and holidays between 10:00 a.m. and 6:00 p.m. An exception must be approved in writing by the building official.

According to Section 25.31.080, mechanical equipment, including HVAC units, shall not exceed a maximum outdoor noise level of 60 dBA between the daytime hours of 7:00 a.m. and 10:00 p.m. or 50 dBA between the nighttime hours of 10:00 p.m. and 7:00 a.m., as measured at the property line.

2.0 ENVIRONMENTAL SETTING

2.1 SURROUNDING LAND USES

The project site is situated in an urban area of the city. Surrounding land uses include a commercial building to the west, Anza Lagoon and shoreline Bay Trail to the north, the Hilton hotel to the east, and a metered parking lot south of Airport Boulevard. The project area is characterized by commercial and industrial uses to support the San Francisco International Airport. The nearest residential uses are located approximately 0.25 mile south of Highway 101.

2.2 EXISTING NOISE ENVIRONMENT

The existing noise environment is dominated by traffic noise from Airport Boulevard and Highway 101. In addition, heating, ventilation, and air conditioning (HVAC) equipment from the nearby Hilton hotel is audible at the site. The project is subject to distant aircraft noise since the site is located near the San Francisco International Airport, located approximately 2 miles to the northwest.

2.2.1 On-site Survey

Three measurements were taken at the project site for the ambient noise survey. The first ambient noise measurement was recorded on the sidewalk along Airport Boulevard adjacent to the southern boundary of the project site. The second measurement was taken at the center of the site and the third measurement was taken north of the site near the shoreline Bay Trail. The measured noise levels are shown in Table 2, *Noise Measurement Results.* The site survey sheets are found in Appendix A.

Table 2
NOISE MEASUREMENT RESULTS

Measurement 1	
Date:	October 27, 2021
Time:	11:11 a.m. – 11:26 a.m.
Location:	South of the project site on the sidewalk along Airport Boulevard.
Measured Noise Level:	62.3 dBA L_{EQ}
Notes:	Noise primarily from vehicular traffic on Airport Boulevard. A total of 44 cars and 2 medium trucks passed during the measurement.
Measurement 2	
Date:	October 27, 2021
Time:	11:31 a.m. – 11:41 a.m.
Location:	Center of project site. The parking lot was empty with no parked cars.
Measured Noise Level:	50.4 dBA L_{EQ}
Notes:	Noise primarily from vehicular traffic on Airport Boulevard. HVAC from Hilton hotel audible on-site.
Measurement 3	
Date:	October 27, 2021
Time:	11:46 a.m. – 12:01 p.m.
Location:	North of project site near shoreline Bay Trail.
Measured Noise Level:	50.5 dBA L_{EQ}
Notes:	Noise primarily from distant vehicular traffic on Airport Boulevard.

3.0 ANALYSIS, METHODOLOGY, AND ASSUMPTIONS

3.1 METHODOLOGY

3.1.1 Ambient Noise Survey

The following equipment was used to measure existing noise levels at the project site:

- Larson Davis 831 Noise Meter
- Larson Davis Model CA250 Calibrator
- Windscreen and tripod for the sound level meter

The sound level meter was field-calibrated immediately prior to the noise measurements to ensure accuracy. All sound level measurements conducted and presented in this report were made with a sound level meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters (ANSI SI.4-1983 R2006). All instruments were maintained with National Institute of Standards and Technology traceable calibration per the manufacturers' standards.

3.1.2 Noise Modeling Software

Modeling of the exterior noise environment for this report was accomplished using Traffic Noise Model (TNM) version 2.5. TNM was released in February 2004 by the U.S. Department of Transportation (USDOT) and calculates the daytime average hourly L_{EQ} from three dimensional model inputs and traffic data (California Department of Transportation [Caltrans] 2004). Project operation noise was analyzed using a computer noise model: Computer Aided Noise Abatement (CadnaA) version 2021.

Peak-hour traffic volumes are estimated based on the assumption that approximately 10 percent of the average daily traffic would occur during a peak hour. The one-hour L_{EQ} noise level is calculated utilizing peak-hour traffic. Peak hour L_{EQ} can be converted to CNEL using the following equation, where $L_{EQ}(h)pk$ is the peak hour L_{EQ}, *P* is the peak hour volume percentage of the average daily trips (ADT), *d* and *e* are divisions of the daytime fraction of ADT to account for daytime and evening hours, and *N* is the nighttime fraction of ADT:

$$CNEL = L_{EQ}(h)pk + 10log10\ 4.17/P + 10log10(d + 4.77e + 10N)$$

The model-calculated one-hour L_{EQ} noise output is therefore approximately equal to the CNEL (Caltrans 2013).

Project construction noise was analyzed using the Roadway Construction Noise Model (RCNM; USDOT 2008), which utilizes estimates of sound levels from standard construction equipment.

3.2 ASSUMPTIONS

3.2.1 Construction

Construction would require the use of equipment throughout the site for the full term of construction. General project construction activities would include site clearing, grading, underground utility installation, physical building construction, paving, and application of architectural coatings. The most prominent noise-generating standard construction equipment anticipated to be used on the site includes excavators, front-end loaders, backhoes, dozers, rollers, and pavers.

Debris and soil hauling would be required during initial construction of the project. Debris hauling would be required for approximately 25,900 CY. Assuming export over a 30-day grading period, 863 CY of soil would be required for export each day, requiring 108 daily one-way haul trips. Assuming an 8-hour work day, 7 round trips (or 14 one-way trips) would be required for grading and excavation. Haul trips are assumed to be directed west along Airport Boulevard toward Highway 101.

3.2.2 Operations

The proposed project's operational noise sources are anticipated to include HVAC systems and vehicular traffic. During operations, the project would also be exposed to vehicular traffic noise from Airport Boulevard.

3.2.2.1 Heating, Ventilation, and Air Conditioning Units

For modeling purposes, a typical rooftop commercial HVAC unit was analyzed for the project building. The unit used in this analysis is a 10-ton Carrier Centurion Model 50 PG03-12 with a sound rating of 80 dBA sound power. This unit produces noise levels of 45 dBA L_{EQ} at 50 feet. Standard HVAC planning assumes one ton of HVAC for every 350 SF of habitable space (ASHRAE Handbook 2012). Using this calculation, approximately 70 units would be required for each of the project's building.

3.2.2.2 Vehicular Traffic

The project's trip generation estimate was provided by the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 11th Edition (ITE 2021). The project is estimated to generate 2,488 ADT. For the purposes of this analysis, 100 percent of project traffic is assumed to be directed along Airport Boulevard toward Anza Boulevard, which connects the peninsula to the mainland via the Anza Boulevard bridge. Table 3, *Existing Plus Project Traffic Volumes*, summarizes the ADT data for the segments of Airport Boulevard and Anza Boulevard relevant to this analysis.

Table 3
EXISTING PLUS PROJECT TRAFFIC VOLUMES

Roadway Segment	Existing ADT	Project ADT	Existing + Project ADT
Airport Boulevard			
Old Bayshore Highway to Anza Boulevard	7,000	2,488	9,488
Anza Boulevard to Project Driveway	6,600	2,488	9,088
Project Driveway to Bay View Place	6,000	2,488	8,488
Anza Boulevard			
Highway 101 northbound (NB) ramp to Airport Boulevard	3,200	2,488	5,688

Source: ITE 2021

3.3 GUIDELINES FOR THE DETERMINATION OF SIGNIFICANCE

Based on Appendix G of the CEQA Guidelines, implementation of the project would result in a significant adverse impact if it would:

Threshold 1: *Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the City's Municipal Code.*

Per the City's Municipal Code, impacts would be significant if the project's HVAC equipment would generate noise levels at the property line of any property exceeding 60 dBA during daytime hours or 50 dBA during nighttime hours.

As stated in the City's Municipal Code, construction activity is limited to weekdays between 7:00 a.m. and 7:00 p.m., Saturdays between 9:00 a.m. and 6:00 p.m., and Sundays and holidays between 10:00 a.m. and 6:00 p.m. Construction occurring outside these hours would be considered a significant impact.

For traffic-related noise, impacts are considered significant if noise levels at nearby NSLUs would increase by 3 CNEL or more.

Threshold 2: *Generate excessive ground-borne vibration or ground-borne noise levels.*

Excessive ground-borne vibration would occur if construction-related ground-borne vibration exceeds the “strongly perceptible” vibration annoyance potential criteria for human receptors of 0.1 inch per second PPV or the damage potential criteria to relatively old residential structures 0.5 inch per second PPV for continuous/frequent intermittent construction sources (such as impact pile drivers, vibratory pile drivers, and vibratory compaction equipment), as specific by Caltrans (2020).

Threshold 3: *For a project located within the vicinity of a private airstrip or an airport land use plan, or where such a plan has not been adopted, within two miles of a public use airport or private airstrip, expose people residing or working in the project area to excessive noise.*

Excessive noise exposure is defined as noise levels that exceed standards for the associated land use.

4.0 IMPACTS

4.1 ISSUE 1: EXCESSIVE NOISE LEVELS

Would the project generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the City’s municipal code.

4.1.1 Operational On-site Noise Generation

The project would likely include HVAC systems on the rooftops of the proposed structure. CadnaA modeling software was used assuming 70 HVAC units located on the rooftop above ground level. At this height, noise generated by HVAC units would generate noise levels of 35.3 dBA at the nearest property lines. This noise level would be below the 50 dBA nighttime limit for mechanical equipment and impacts would be less than significant.

4.1.2 Operational Off-site Transportation Noise Generation

The project would generate vehicular traffic that would utilize Airport Boulevard and Anza Boulevard. An increase in traffic has the potential to result in increased noise levels along those roadways. The project is expected to generate an additional 2,488 ADT with the trips directed along Airport Boulevard and Anza Boulevard. As a general rule of thumb, the doubling of a noise source, in this case traffic, would lead to a 3 CNEL increase in noise levels. A 3 CNEL increase would be a noticeable increase and would therefore be considered significant for a permanent noise source. As shown on Table 3, Airport Boulevard currently carries approximately 7,000 ADT on the segment between Old Bayshore Highway to Anza Boulevard. An additional 2,488 trips would not double the traffic, and noise levels would therefore not increase significantly. Anza Boulevard carries approximately 3,2000 ADT on the segment between Highway 101 NB ramp to Airport Boulevard. Similarly, an addition of 2,488 ADT would not double traffic.

TNM software was used to model the increase in noise on each roadway. As shown in Table 4, *Project-Generated Traffic Noise Level*s, the traffic generated by the project would lead to an increase of 2.7 CNEL at the nearest NSLUs along Anza Boulevard. Although project-related traffic would increase noise levels on local roadways, it would not exceed 3 CNEL, and impacts would be less than significant.

Table 4
PROJECT-GENERATED TRAFFIC NOISE LEVELS

Roadway Segment	Distance to Nearest NSLU (feet)	Existing CNEL	Existing + Project CNEL	Change in CNEL
Airport Boulevard				
Old Bayshore Highway to Anza Boulevard	190	49.8	51.1	+1.3
Anza Boulevard to Project Driveway	200	49.0	50.5	+1.5
Project Driveway to Bay View Place	145	51.6	53.0	+1.4
Anza Boulevard				
Highway 101 northbound (NB) ramp to Airport Boulevard	125	50.3	53.0	+2.7

Source: Linscott Law & Greenspan 2022

4.1.3 Construction Noise

Construction of the project is not anticipated to occur outside the hours of 7:00 a.m. and 7:00 p.m. on weekdays, Saturdays between 9:00 a.m. and 6:00 p.m., or Sundays and holidays between 10:00 a.m. and 6:00 p.m. Because construction would occur within the hours required by the City Municipal Code, noise impacts from construction would be less than significant.

Construction of the project would require grading, installation of underground utilities/infrastructure, construction of new buildings, paving, and architectural coating. The magnitude of the noise would depend on the type of construction activity, equipment, duration of each construction phase, distance between the noise source and receiver, and any intervening structures. Construction would generate elevated noise levels at nearby land uses. The nearest residences are those across Highway 101, approximately 0.25 mile to the south. At this distance, and with multiple intervening structures, construction noise at the project site would not be expected to rise above ambient noise levels.

The nearest NSLU is the Hilton hotel located approximately 200 feet east of the project site. Construction equipment would move throughout the site over the duration of the construction period. Therefore, equipment noise levels are measured from the center of the site, which is approximately 400 feet from the Hilton hotel. As noted by the ambient noise measurements taken at the project site, noise levels in the area range from 50.3 to 62.3 dBA L_{EQ}. For informational purposes, Table 5, *Construction Equipment Noise Levels*, provides noise levels of standard construction equipment at 400 feet. At these distances, construction noise would be within the range of the existing ambient noise environment.

Table 5
CONSTRUCTION EQUIPMENT NOISE LEVELS

Unit	Percent Operating Time	dBA L_{EQ} at 400 feet
Backhoe	40	55.6
Compactor	20	38.5
Concrete Mixer Truck	40	56.8
Crane	16	54.6
Dozer	40	59.7
Dump Truck	50	54.5
Excavator	40	58.7
Front End Loader	40	57.1
Generator	50	59.5
Paver	50	56.1
Roller	20	51.0

Source: RCNM; Appendix B
dBA = A-weighted decibel; L_{EQ} = equivalent sound level

4.1.4 Construction Traffic Noise

As discussed above, over the course of an eight-hour construction day, it is assumed 14 haul truck trips would occur per hour during grading and excavation. This daily traffic level associated with soil export is anticipated to be the highest daily traffic level associated with project construction.

Using TNM for Anza Boulevard, an additional 14 hourly trips from heavy trucks would increase noise levels at the nearest hotels to 53.1 CNEL, or an increase of 2.8 CNEL over existing conditions. This would not be a noticeable increase, and the localized increase in noise from haul trucks would be temporary (estimated at 30 days for grading and excavation) and would cease upon the completion of construction. Therefore, impacts from construction traffic noise would be less than significant.

4.2 ISSUE 2: EXCESSIVE VIBRATION

Would the project expose persons to or generate excessive ground-borne vibration or noise levels?

4.2.1 Construction Vibration

Construction activities known to generate excessive ground-borne vibration, such as pile driving, would not be conducted by the project. A possible source of vibration during general project construction activities would be a vibratory roller used for compaction of soil beneath building foundations. A vibratory roller would create approximately 0.210 inch per second PPV at 25 feet (Caltrans 2013). A 0.210 inch per second PPV vibration level would equal 0.046 inch per second PPV at a distance of 100 feet.[1] This would be lower than what is considered a “strongly perceptible” level for humans of 0.1 inches per second PPV, and lower than the structural damage threshold of 0.5 inches per second PPV for continuous/frequent intermittent construction sources. A vibratory roller could be used within 200 feet of the closest off-site structure (Hilton hotel to the east). This would be twice the distance of

[1] Equipment PPV = Reference PPV * $(25/D)^n$ (in/sec), where Reference PPV is PPV at 25 feet, D is distance from equipment to the receiver in feet, and n = 1.1 (the value related to the attenuation rate through the ground); formula from Caltrans 2013.

the standard vibration level and would be well below the "strongly perceptible" level for humans. Therefore, although a vibratory roller may be perceptible to nearby human receptors, temporary impacts associated with the roller (and other potential equipment) would be less than significant.

4.3 ISSUE 3: AIRPORT NOISE EXPOSURE

Would the project expose people residing or working in the project area to excessive noise from a nearby public use airport or private airstrip?

4.3.1 Aircraft Noise

The project area is subject to distant aircraft noise because San Francisco International Airport is located approximately 2 miles northwest of the project site. The San Mateo County Association of Governments develops and adopts Airport Land Use Compatibility Plans (ALUCPS) for each airport within its jurisdiction. The San Francisco International Airport's ALUCP, as amended in July 2012, provides policies to ensure compatibility with airport and surrounding uses. These policies span various topics including noise, overflight zones, and safety. The ALUCP is based on the Federal Aviation Administration (FAA) approved Airport Layout Plan. The project site is not located within a noise contour for San Francisco International Airport. The nearest noise contour is the 60 to 65 CNEL contour, which is located approximately 0.25 mile north of the project site. The proposed project uses would be compatible with the ALUCP. Therefore, no effects related to airport noise would occur at the project site, and impacts would be less than significant.

5.0 LIST OF PREPARERS

Brendan Sullivan, Noise Specialist
Jason Runyan, Noise Specialist, QA/QC

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

6.0 REFERENCES

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2013. Technical Noise Supplement to the Traffic Noise Protocol. September.

2004. California Department of Transportation, Traffic Noise Model (TNM).

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Institute of Transportation Engineers Trip Generation Manual, 11th Edition. 2021. Available at: https://www.ite.org/technical-resources/topics/trip-and-parking-generation/resources/.

U.S. Department of Transportation (USDOT). 2008. Roadway Construction Noise Model.

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Appendix A

Site Survey Sheets

M1

Site Survey

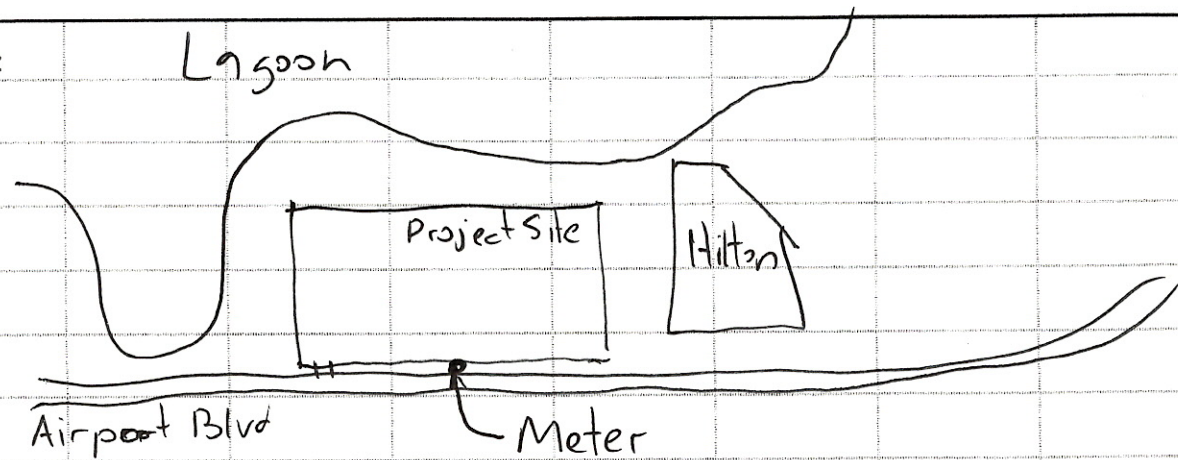
Job #	Project Name: 620 Airport Blvd.	
Date: 10/27/21	Site #:	Engineer: M. Rolph

Address: 620 Airport Blvd, Burlingame

Meter: LXT	Serial #: 1013	Calibrator: Cal 150	Serial #: 5529

Notes: Meter on sidewalk, north side of road.
Counts for both directions of travel

Sketch:



Temp:	57°F	Wind Spd:	3 mph	Humidity:	96 %

Start of Measurement: 11:11 a.m.	End of Measurement: 11:26 a.m.	62.3 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
卌 ||| +4 (44)	|| (2)	0

Noise Measurement for Information Only

No Through Roadways

No Calibration Analysis Will Be Provided

M2

Site Survey

Job #	Project Name: 620 Airport Blvd

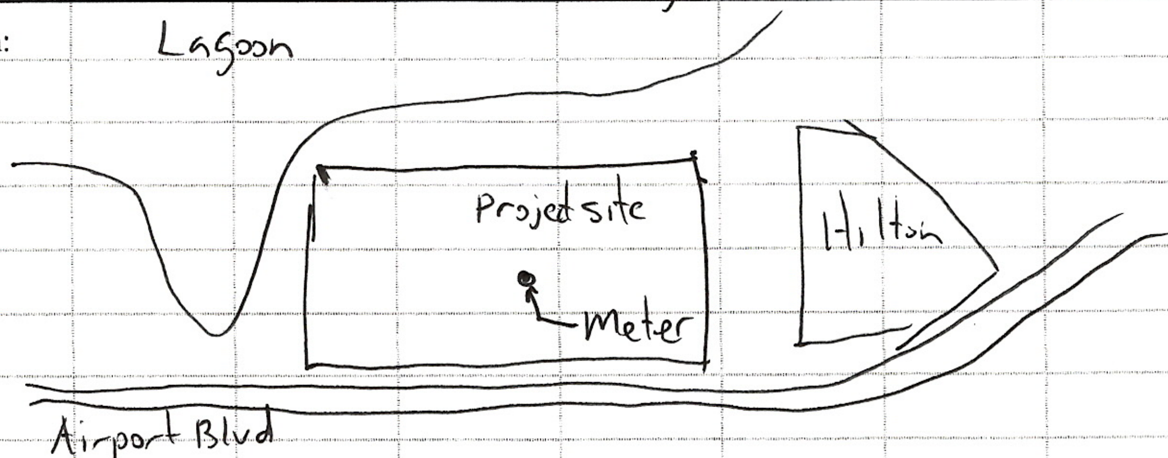
Date: 10/27/21	Site #:	Engineer: M. Rolph

Address: 620 Airport Blvd., Burlingame

Meter: LXT	Serial #: 1013	Calibrator: Cal 150	Serial #: 5529

Notes: No cars driving in parking lot, 1 shuttle bus during measurement. HVAC from Hilton audible. Parking lot 6 to 8' below roadway

Sketch:



Temp: 58°F	Wind Spd: 3	mph	Humidity: 95	%

Start of Measurement: 11:31 a.m.	End of Measurement: 11:41 a.m.	50.4 dBA L_{EQ}

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
Noise Measurement for Information Only		
No Through Roadways		
No Calibration Analysis Will Be Provided		

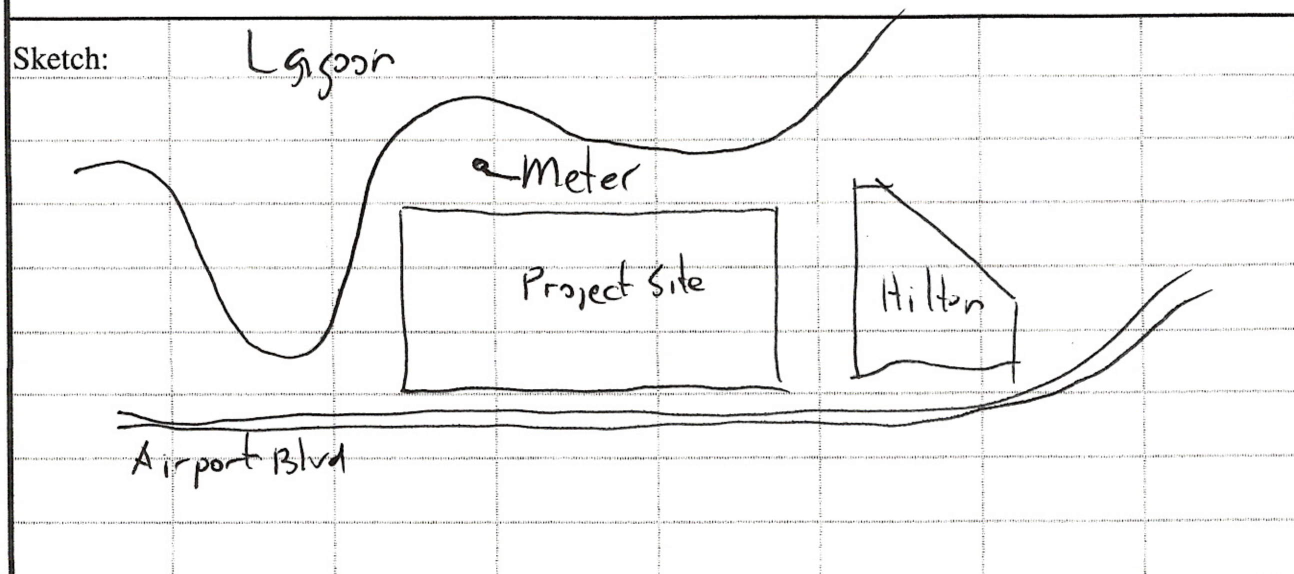
M3

Site Survey

Job #		Project Name: 620 Airport Blvd.	
Date: 10/27/21	Site #:		Engineer: M. Rolph
Address: 620 Aipont Blvd, Burlingame			
Meter: LXT	Serial #: 1013	Calibrator: Cal 150	Serial #: 5529

Notes:

Sketch:



Temp: 58°F	Wind Spd: 3 mph	Humidity: 95 %	
Start of Measurement: 11:46 a.m.	End of Measurement: 12:01 p.m.	50.4 dBA L_{EQ}	

Cars (tally per 5 cars)	Medium Trucks (MT)	Heavy Trucks (HT)
Noise Measurement for Information Only		
No Through Roadways		
No Calibration Analysis Will Be Provided		

Appendix B

Construction Modeling Outputs

Equipment	Reference @ 50 ft dBA L_{MAX}	Percentage	Use per day (hours)	Ordinance Limits (Hours)	Reference @ 50 ft. Noise Levels (dBA Leq)	
Noise Sum	81.7	N/A	N/A	N/A	85.2	#
Truck (Dump Truck, Flatbed Truck)	76.5	40%	8	8	72.5	#
Backhoe	77.6	40%	8	8	73.6	#
Compactor	66.6	10%	8	8	56.6	#
Cement Truck	78.8	40%	8	8	74.8	#
Crane	80.6	16%	8	8	72.6	#
Bulldozer	81.7	40%	8	8	77.7	#
Truck (Dump Truck, Flatbed Truck)	76.5	40%	8	8	72.5	#
Excavator	80.7	40%	8	8	76.7	#
Loader	79.1	40%	8	8	75.1	#
Portable Generator	80.6	50%	8	8	77.6	#
Paver	77.2	50%	8	8	74.2	#
Compactor	66.6	10%	8	8	56.6	#
N/A	0.0	0%	8	8	0.0	*
N/A	0.0	0%	8	8	0.0	*
N/A	0.0	0%	8	8	0.0	*
N/A	0.0	0%	8	8	0.0	*
N/A	0.0	0%	2	8	0.0	*

Measured Distance (ft)	Noise Levels at Distance (dBA Leq)		Ordinance Limit (dBA Leq)	Distance to Ordinance Limit (ft.)
400.0	67.1	#	75	161.7
400.0	54.5	#	75	37.6
400.0	55.6	#	75	42.7
400.0	38.5	#	75	6.0
400.0	56.8	#	75	49.0
400.0	54.6	#	75	38.1
400.0	59.7	#	75	68.4
400.0	54.5	#	75	37.6
400.0	58.7	#	75	61.0
400.0	57.1	#	75	50.7
400.0	59.5	#	75	67.4
400.0	56.1	#	75	45.5
400.0	38.5	#	75	6.0
400.0	0.0	*	75	0.0
400.0	0.0	*	75	0.0
400.0	0.0	*	75	0.0
400.0	0.0	*	75	0.0
400.0	0.0	*	75	0.0

Equipment	dBA L_{MAX}	Percentage
N/A	0	0
Aerial Bucket Truck	75.0	20%
Backhoe	77.6	40%
Bulldozer	81.7	40%
Cement Truck	78.8	40%
Concrete Saw	89.6	20%
Crane	80.6	16%
Drill Rig/Truck-mounted Augur	79.1	20%
Excavator	80.7	40%
Grader	85.0	40%
Welder	74.0	40%
Jackhammer	88.9	20%
Light/Medium Helicopter at Takeoff	90.0	16%
Mower	88.0	40%
Paver	77.2	50%
Portable Generator	80.6	50%
Rock Drill/Rock Drilling Equipment	81.0	20%
Skidsteer	75.0	40%
Truck (Dump Truck, Flatbed Truck)	76.5	40%
Vacuum Truck	85.0	40%
Water Truck	80.0	20%
Grinder	76.1	10%
Compactor	66.6	10%
Loader	79.1	40%

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Description	125
<N/A>	0
1 3/4" Thick Solid Core Door	18
A/C Unit, PTC 09-AB	16
A/C Unit, Through-the-Wall	14
Door, 1 3/4" Sound Rated	28
STC 28 1/2-inch Dual Insulating Window	23
STC 28 1/2-inch Sliding Glass Door	23
STC 28 French Door with seals	23
STC 31 5/8-inch Dual Insulating Window	24
STC 33 1 3/4" Thick Solid Core Wood Door w/ seals	26
STC 33 Aluminum Door with Window	26
STC 35 1-inch Sliding Glass Door	25
STC 35 1 3/8-inch Dual Insulating Window	20
STC 37 1.5-inch Dual Insulating Window	22
STC 40 Laminated Insulating Window	29
STC 40 Laminated Sliding Glass Door	29
Window, "Arctic" Double Insulated	32
Window, ½" Monolithic	21
Window, ½" Monolithic Laminated Type 1	31
Window, ½" Monolithic Laminated Type 2	30
Window, ½" Monolithic Laminated Type 3	30
Window, 1/16" Monolithic	12
Window, 1/4" Monolithic Laminated	26
Window, 1/4" Monolithic Type 1	16
Window, 1/4" Monolithic Type 2	22
Window, 1/8" Monolithic	17
Window, 3/4" Monolithic Laminated	32
Window, Insulated Double Strength	24
Window, Insulated Dual-Glazed	14
Window, Insulated Laminated Type 1	19
Window, Insulated Laminated Type 2	31
Window, Insulated Laminated Type 3	27
Window, Insulated Laminated Type 4	24
Window, Insulated Laminated Type 5	21
Window, Insulated Laminated Type 6	21
Window, Insulated Type 1	23
Window, Insulated Type 5	25
Window, Single Pane	12
Window, Storefront	16
Sample Glass Window	24
Sample Door	20

Sample Louver	0
STC 31 1/8"-1/2"-1/8" Dual Insulating Window	17

<N/A>	0
8" CMU Exterior Wall	34
8" CMU Exterior Wall	34
STC 37	21
STC 46 Typical Exterior Wall	29
STC 46 Typical Exterior Wall	29
STC 50	29
Wall, Concrete, 6" thick	38
Wall, Standard: 5/8 Gyp, 2x4, Insul	16
Wall, Upgraded: 2x5/8 Gyp, 2x4, Insul, RC	39
Wall, Upgraded: 5/8 Gyp, 2x4, Insul, RC	29
STC 35 Wall with Wood Siding	15
STC 44 Typical Exterior Wall	29

250	500	1000	2000	4000		Source	TI method
0	0	0	0	0			
22	26	24	23	20	STC 22	Irvine	
20	25	32	36	36	STC 30		
17	23	28	32	32		Charles	
37	43	48	51	54		Irvine	
23	22	32	43	37	STC 28	Saflex	irb
23	22	32	43	37	STC 28	Saflex	irb
23	22	32	43	37	STC 28	Saflex	irb
20	26	34	46	39	STC 31	Saflex	irb
30	30	29	34	38	STC 33	Irvine	
30	30	29	34	38	STC 33	Irvine	
21	32	38	36	50	STC 35	Saflex	irb
21	35	41	41	44	STC 35	Saflex	irb
26	35	40	38	49	STC 37	Saflex	irb
33	37	37	45	54	STC 40	Saflex	irb
33	37	37	45	54	STC 40	Saflex	irb
39	46	53	56	57	STC 51	Quaker	
28	31	29	37	36	STC 32		
33	35	37	41	51	STC 38	Irvine	
35	38	37	48	56	STC 41		
34	38	36	46	55	STC 40		
19	21	19	27	26	STC 20		
29	32	35	37	42	STC 35	Irvine	
23	26	24	32	31	STC 27		
24	29	32	30	36	STC 30	Irvine	
20	27	25	33	32	STC 28	Irvine	
35	39	41	45	52	STC 42	Irvine	
16	25	30	35	33	STC 28	Quaker	
21	24	22	30	29	STC 25		
24	31	34	38	41	STC 34	Quaker	
26	28	36	43	53	STC 35	Saflex	irb
24	34	39	42	49	STC 37	Saflex	irb
26	36	41	44	52	STC 39	Saflex	irb
31	39	41	41	52	STC 40	Saflex	irb
29	39	44	46	53	STC 42		
24	27	29	24	28	STC 26		
21	32	38	36	50	STC 35	Saflex	irb
19	21	19	27	26	STC 20		
23	26	24	32	31	STC 27		
24	24	24	24	24			
20	20	20	20	20			

0	0	0	0	0		
18	29	36	40	39	STC 31	INSUL

0	0	0	0	0		
40	45	45	44	52	STC 45	Insul
40	45	45	44	52	STC 45	Insul
37	41	52	56	63	STC 37	
40	46	46	44	53	STC 46	Insul
40	46	46	44	53	STC 46	Insul
42	49	55	51	60	STC 50	NRC-CNRC
43	52	59	67	72	STC 55	
31	36	42	39	43		Irvine
50	56	60	62	63		Irvine
40	49	54	49	54		Irvine
26	34	38	36	40		Insul - Citrus 17
39	44	43	42	49	STC 44	Insul - Citrus 17

Construction Equipment Noise Level	67 dBA
Percent of hour of Operation	40.00%
Ordinance Hour Base	8
Normal Operating Hours	8

Equipment Ordinance Average	63.0 dBA

Reduction	4.0 dBA

Base Distance	50 Ft
Caclulation Distance	50 Ft
Reduced Value	63.0 dBA

Table 7. Calculated Generac Noise at E					
	S_{WL} = Sound Power Level			S_{PL} = Sou	
Noise Source Height	100 Feet				
Barrier Height	10 Feet				201.06
Receiver Height	5 Feet			225.04	
Source to Barrier	3 Feet			24.97	
Receiver to Barrier	201 Feet			1.42	
Top of Road	Octave Band Center Frequency (Hz.)				
22 Feet	**63**	**125**	**250**	**500**	**1000**
Lambda	17.88	9.02	4.51	2.25	1.13
Fresnel Number	0	0	0	0	0
Insertion Loss	0	0	0	0	0
Generac	96.4	75.1	73.9	70.1	64.0
Barrier	0	0	0	0	0
A-Weight	-26.2	-16.1	-8.6	-3.2	0
Noise Without Barrie	43.2	32.0	38.3	39.9	37.0
Noise With Barrier	44.1	32.9	39.2	40.8	37.9
Noise Without Barrie	46.9 dBA				
Noise With Barrier	47.8 dBA				
	2.1E+04	1.6E+03	6.7E+03	9.7E+03	5.0E+03
	2.6E+04	2.0E+03	8.4E+03	1.2E+04	6.2E+03

astern Property Line

und Pressure Level

0.00	Source To Top Of Barrier
201.06	Receiver To Top Of Barrier
225.04	Source To Receiver
-	Effectiveness
0.00	Path Length Difference

2000	4000	8000		
0.56	0.28	0.14	ft	
0	0	0		
0	0	0	dB	
62.2	53.9	47.9	Distance	10.0
0	0	0		
1.2	1	-1.1		
36.4	27.9	19.8	Distance	225.0
37.3	28.8	20.7	Distance	201.1

4.3E+03	6.1E+02	9.5E+01
5.4E+03	7.6E+02	1.2E+02

Table 1A. Sound Power S_{PL} to So					
		S_{WL} = Sound Power Level			
	Octave Band Center Fre				
	31.5	63	125	250	500
Octave Noise S_{WL}	82.3	76.7	75.5	68.8	66.0
Distance Attenuation	-7.5	-7.5	-7.5	-7.5	-7.5
Noise at Distance S_{PL}	74.8	69.1	67.9	61.2	58.4
A-Weight	-39.4	-26.2	-16.1	-8.6	-3.2
A-Weighted Noise	35.4	42.9	51.8	52.6	55.2
	3.0E+07	8.2E+06	6.2E+06	1.3E+06	7.0E+05
	3.4E+03	2.0E+04	1.5E+05	1.8E+05	3.3E+05

Sound Power S_{WL} at a distance

Sound Pressure S_{PL} to Sound Power S_{WL}

Table 1A. Sound Pressure S_{PL} to					
		S_{WL} = Sound Power Level			
	Octave Band Center Fre				
	315	63	125	250	500
Octave Noise S_{PL}	74.8	69.1	67.9	61.2	58.4
Distance Addetion		7.5	7.5	7.5	7.5
S_{WL}		76.7	75.5	68.8	66.0
A-Weight		-26.2	-16.1	-8.6	-3.2
A-Weighted Noise		50.5	59.4	60.2	62.8
		4.7E+07	3.5E+07	7.5E+06	4.0E+06
		1.1E+05	8.7E+05	1.0E+06	1.9E+06

und Pressure S_{PL}

S_{PL} = Sound Pressure Level

quency (Hz.)					
1000	2000	4000	8000		
63.2	61.3	59.6	52.8		
-7.5	-7.5	-7.5	-7.5	Distance	3
55.6	53.7	52.0	45.2	Sum	76.7
0	1.2	1	-1.1		
55.6	54.9	53.0	44.1	dBA	62.0
3.7E+05	2.4E+05	1.6E+05	3.3E+04		
3.7E+05	3.1E+05	2.0E+05	2.6E+04		

		Distance		
S_{WL} =	50	100	12.0	= S_{PL}
S_{PL} =	12	100	50.0	= S_{WL}

Sound Power S_{PL}

S_{PL} = Sound Pressure Level

quency (Hz.)					
1000	2000	4000	8000		
55.6	53.7	52.0	45.2		
7.5	7.5	7.5	7.5	Distance	3
63.2	61.3	59.6	52.8	Sum	79.9
0	1.2	1	-1.1		
63.2	62.5	60.6	51.7	dBA	69.6
2.1E+06	1.3E+06	9.1E+05	1.9E+05		
2.1E+06	1.8E+06	1.1E+06	1.5E+05		

Noise Level A	77
Ordinance Compliance B	75
Allowable Hours	12
Base Hours	12

10 * log(y/x) + B = A	75		
10 * log(y/x) = A - B	0		
log(y/x) = (A - B)/10	0		
log(y) -log(x)=(A-B)/10	0		
-log(x)=(A-B)/10 -log(y)			
log(x)= log(y) - (A-B)/10	0.879181	1.079181	log(x)
(x) =Power(10,(log(y)-(A-B)/10)	7.57		

12

"=VLOOKUP($A$19,'STC Database'!$B$103:$H$202,2,FALSE)"

EQUIPMENT

	dBA	Usage
Aerial Bucket Truck	75	
	78	
Backhoe	78	40
Bulldozer	82	40
Cement Truck	79	40
Concrete Saw	90	20
Crane	81	16
Drill Rig/Truck-mounted Augur	78	20
Excavator	81	40
Grader	85	40
Heavy Lift Helicopter [1]	102	16
Jackhammer	8	20
Light/Medium Helicopter at Takeoff	90	16
Mower	88	40
Paver	77	50
Portable Generator	81	50
Rock Drill/Rock Drilling Equipment	81	20
Skidsteer	75	40
Truck (Dump Truck, Flatbed Truck)	76	40
Vacuum Truck	85	40
Water Truck	80	20
Wire Pulling Machine (Pulling Rig)	80	40

Euipment
Backhoe