

APPENDIX K: TECHNICAL NOISE STUDY

Technical Noise Study prepared by Coffman Engineers, Inc.



**Technical Noise Study for:
Guadalupe Quarry Redevelopment Project
Brisbane, CA**

Date:

23 August 2024

FOR:

**ORCHARD PARTNERS, LLC
3697 MT. DIABLO BOULEVARD, SUITE 200
LAFAYETTE, CA 94549**

PREPARED BY:

**COFFMAN ENGINEERS, INC.
1939 Harrison Street, Suite 320
Oakland, CA 94612**

CONTACT:

**Harold Goldberg, P.E.
Anthony Wong
Alan Rosen**

510.251.9578

1 Introduction

This report analyzes the potential noise and vibration associated with the construction and operation of an approximately 1.3 million-square-foot warehouse facility at the existing Guadalupe Quarry site. This study includes a description of the ambient noise environment and an assessment of the project generated noise and vibration from activities including:

- On-site construction activities
- Off-site construction of PG&E facilities between the project site and the Martin Substation
- Increased truck traffic on the roadway network
- On-site operations, including circulation of trucks on project site, parking lot activities, loading dock activities, and rooftop mechanical equipment

2 Fundamental Concepts of Environmental Noise

Noise can be defined as unwanted sound. It is commonly measured with an instrument called a sound level meter. The sound level meter captures the sound with a microphone and converts it into a number called a sound level. Sound levels are expressed in units of decibels.

To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local General Plans as well as federal and state noise regulations (e.g. Caltrans, EPA, OSHA and HUD). The abbreviation dBA is sometimes used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. The maximum instantaneous noise level (L_{max}) is often used to identify the loudness of a single event such as a car pass-by or airplane flyover.

To express the average noise level the L_{eq} (equivalent noise level) is used. The L_{eq} can be measured over any length of time but is typically reported for periods of 15 minutes to 1 hour. The background noise level (or residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the L_{90} which is the sound level exceeded 90 percent of the time.

There are other statistical descriptors that are used, often times as part of a local noise ordinance. These descriptors are used since local ordinances will have limits based on the number of minutes per hour that an intrusive sound may exceed a specified limit. For example, if a specified noise level cannot be exceeded more than 30 minutes in an hour that is referred to as the L_{50} . The L_{50} is also referred to as the median noise level.

To quantify the noise level over a 24-hour period, the Day/Night Average Sound Level (DNL or

L_{dn}) or Community Noise Equivalent Level (CNEL) is used. These descriptors are averages like the L_{eq} except they include a 10 dB penalty during nighttime hours (and a 5 dB penalty during evening hours in the CNEL) to account for peoples increased sensitivity during these hours. The CNEL and DNL are typically within one decibel of each other.

In environmental noise, a change in noise level of 3 dB is considered a barely noticeable difference. A 5 dB change is clearly noticeable, but not dramatic. A 10 dB change is perceived as a halving or doubling in loudness. Because of the logarithmic scale of the decibel unit, sound levels cannot be added or subtracted arithmetically. A simple rule of thumb is useful in dealing with sound levels: if a sound's physical intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example, 60 dB plus 60 dB equals 63 dB, 80 dB plus 80 dB equals 83 dB. When 70 dB and 60 dB sources are added, the resulting noise level equals 70.4 dB. Consequently, when the project's noise levels are substantially greater than ambient noise levels, noise levels will be controlled by the louder noise level.

Examples of common noise sources and their corresponding noise levels are provided in the following table.

Sound Source	Sound Pressure Level (dBA)
Air raid siren at 50 ft (threshold of pain) ⁽¹⁾	120
Maximum levels in audience at rock concerts ⁽¹⁾	110
Train horn at 100 ft ⁽³⁾	103
On platform by passing subway train ⁽¹⁾	100
On sidewalk by passing heavy truck or bus ⁽¹⁾	90
Commuter train traveling at 79 mph at 100 ft ⁽³⁾	88
On sidewalk by passing automobiles ⁽¹⁾	70
Typical gas and electric powered leaf blower at 50 ft ⁽²⁾	68 - 71
Conversational speech ⁽⁴⁾	60
Typical urban area background/busy office ⁽¹⁾	60
Typical suburban area background ⁽¹⁾	50
Quiet suburban area at night ⁽¹⁾	40
Typical rural area at night ⁽¹⁾	30
Isolated broadcast studio ⁽¹⁾	20
Audiometric (hearing testing) booth ⁽¹⁾	10
Threshold of hearing ⁽¹⁾	0

¹Cowan, James P. *Handbook of Environmental Acoustics*. Van Nostrand Reinhold, 1994.

²California Environmental Protection Agency, Air Resources Board. Mobile Source Control Division (2000). A report to the California legislature on the potential health and environmental impacts of leaf blowers. Retrieved from <https://www3.arb.ca.gov/msprog/leafblow/leafblow.htm>

³California High-Speed Rail Authority. (2018). *How do High-Speed Train Noise Levels Compare to Traditional Trains*. Retrieved from https://www.hsr.ca.gov/communication/info_center/factsheets.aspx

⁴Everest, Fredrick Alton, and Ken C. Pohlmann. *Master Handbook of Acoustics*, 5th Ed. McGraw-Hill, 2009.

When noise propagates over a distance, it changes in level and frequency. The manner in which noise reduces with distance depends on factors such as the type of noise source and the propagation path. Noise from a localized source (i.e., point source) generally propagates uniformly outward in a spherical pattern; therefore, this type of propagation is referred to as “spherical spreading.” Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate of 6 dBA for each doubling of distance from the reference measurement as their energy is continuously spread out over a spherical surface.

Roadways and highways consist of several localized noise sources on a defined path, and hence are treated as “line” sources, which approximate the effect of several point sources. Noise from a line source propagates over a cylindrical surface, which is often referred to as “cylindrical spreading.” Line sources (e.g., traffic noise from vehicles) attenuate at a rate of 3 dBA for each doubling of distance from the reference measurement. Therefore, noise due to a line source attenuates less with distance than that of a point source with increased distance.

In addition to attenuation from geometric spreading, other factors that are considered in noise propagation models include atmospheric absorption, ground effect, reflection from surfaces and screening by barriers/obstacles. A barrier will typically provide at least a 5 dB noise reduction when it just breaks the line of sight between a noise source and a receiver, and additional noise reduction is achieved with increased height of the barrier.

As discussed in greater detail below in Section 5, this analysis uses SoundPLAN to calculate noise levels. This program uses a 3D model of the noise sources, buildings, terrain, barriers and noise receptors to calculate the noise levels taking into account the source noise levels, distance, acoustical shielding and acoustical reflections.

Effects of Noise on People

The effects of noise on people can be placed into three categories:

- Subjective effects of annoyance, nuisance, dissatisfaction;
- Interference with activities such as speech, sleep, and learning; and
- Physiological effects such as hearing loss or sudden startling.

These potential effects can be caused by both short and long-term exposure to very loud noises and long-term exposure to lower levels of sound. However, there is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation exists in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual’s past experiences with noise. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise would be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled conditions, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause adverse response.

2.1 Vibration

Vibration is an oscillatory motion which can be described in terms of the displacement, velocity, or acceleration. Because the motion is oscillatory, there is no net movement. Displacement is the easiest descriptor to understand. For a vibrating floor, the displacement is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement.

The peak particle velocity (PPV) is the descriptor used in monitoring of construction vibration since it is related to the stresses that are experienced by buildings. The tables below show the guideline criteria for building damage and annoyance potential by Caltrans. The criteria are in terms of the peak particle velocity (PPV) expressed in inches per second.

Guideline Vibration Damage Potential Criteria (Caltrans Table 19¹)

Structure and Condition	Maximum PPV (in/sec)	
	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.

¹ Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013.

The Federal Transit Administration (FTA) has adopted criteria² for human annoyance due to ground vibration affecting certain residential and institutional land uses, and buildings with special features or sensitive equipment. The criteria are in terms of RMS vibration velocity expressed in VdB re 1-micro-inch per second. The criteria were developed to address vibration from transit systems but they are used in this report to assess the potential impact of construction vibration on people living or working near the project site.

Land Use Category	GBV Impact Levels (VdB re 1 micro-inch /sec)		
	Frequent Events	Occasional Events	Infrequent Events
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB*	65 VdB*	65 VdB*
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

3 Regulatory Framework

3.1 City of Brisbane General Plan

The Noise Element of the Brisbane General Plan has policies and programs for noise and land use compatibility. These policies and programs guidelines are shown below.

Policy 176 Minimize the intrusion of unwarranted and intrusive noise on community life.

Program 176a: Discourage new sources that generate excessive noise.

Transportation Noise

Policy 177 Maintain ongoing communication with County, State and Federal agencies in an effort to reduce noise impacts from regional uses.

Policy 178 Establish the reduction of overflights as the highest priority for noise control.

Program 178a: Investigate obtaining from San Francisco Airport and/or Federal Aviation Administration better monitoring information on overflight noise impacts on the community, including single-event noise.

² Transit Noise and Vibration Impact Assessment Manual, FTA Report No 0123, U.S. Department of Transportation - Federal Transit Administration/John A. Volpe National Transportation Systems Center, September 2018.

Program 178b: Provide information to citizens on overflight impacts, airport operations and how to contact officials and agencies responsible for decisions that could result in overflights.

Program 178c: Cooperate with other jurisdictions affected by aviation noise to insist that noise impacts are considered when decisions are made regarding airport operations.

Program 178d: Communicate to local, State and Federal officials the City's position regarding the unwarranted impacts of overflights on the community.

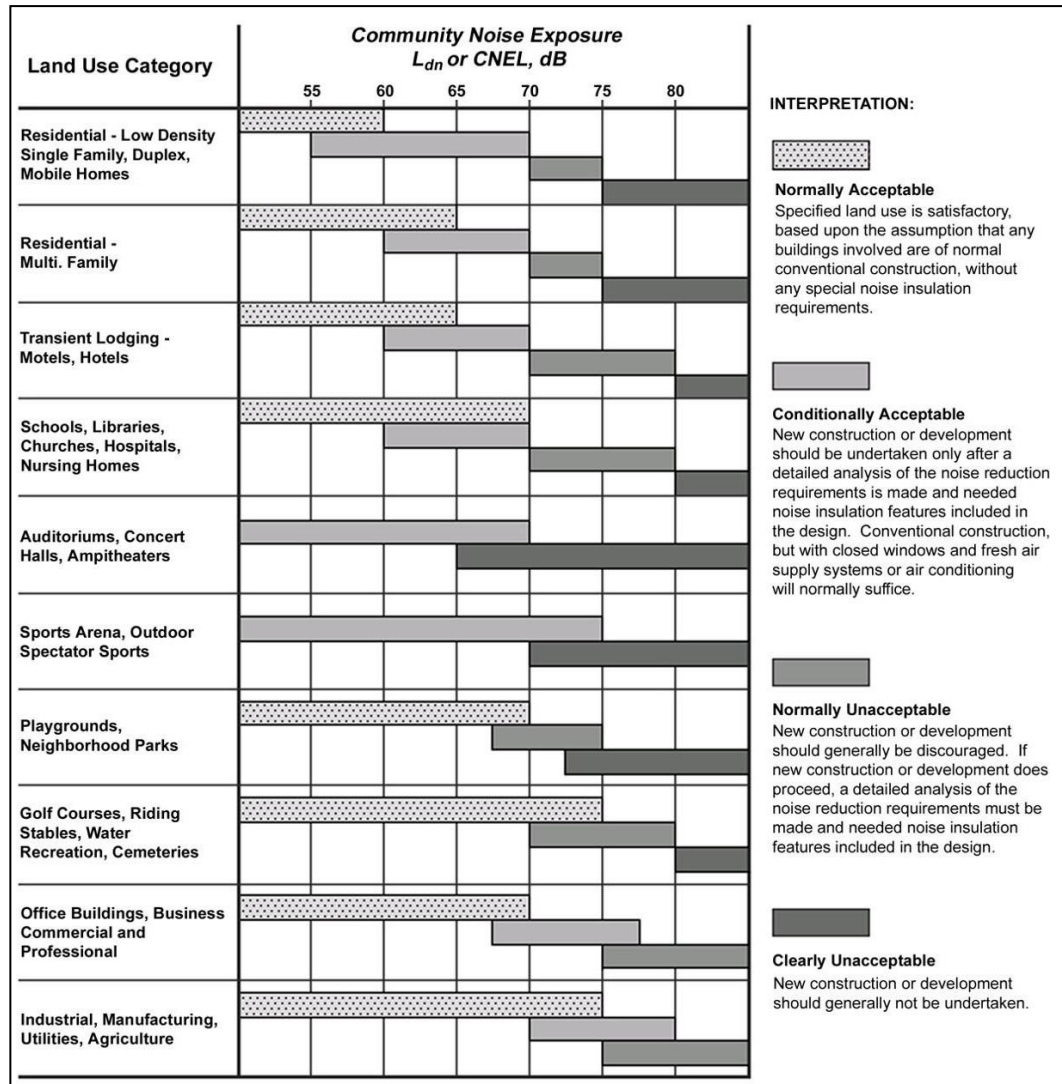
- Policy 179** **Require the incorporation, when feasible, of new road or landscaping features that buffer traffic noise impacts on adjacent areas.**
- Policy 180** **Establish and enforce truck routes and times of operation for haul routes to minimize impacts on residential areas.**
- Policy 181** **Support efforts to establish stricter noise emission standards for vehicle design.**
- Policy 182** **Support efforts to reduce vehicle trips and keep smooth traffic flow to the extent that the number of trips and stop-and-start traffic contribute to traffic noise.**
- Policy 183** **Coordinate land uses and construction conditions to minimize noise impacts of the Caltrain corridor and major highway arterials on adjacent land uses.**

Land Use

- Policy 184** **In conjunction with development applications and other land use decisions, consider the potential for noise generation from, as well as noise impacts on, the project or area.**

Program 184a: Use the State Guidelines for land use compatibility [Figure 1] to determine noise impacted uses.

Figure 1: State of California General Plan Guidelines Land Use Compatibility



Program 184b: Require acoustical studies for development applications in areas identified as noise impacted and potential noise generators.

Program 184c: For such projects, require a noise attenuation or a mitigation program to be submitted as part of the project design.

Policy 185 Provide citizens with general information on noise insulation construction techniques and encourage them to include such features as part of new construction and remodeling projects.

Enforcement

Policy 186 For noises that most directly affect neighbors, such as barking dogs and electronic equipment, communicate the need for citizens to be sensitive to the needs of others and utilize the Peninsula Conflict Resolution Center's Mediation Program as an integral part of the local enforcement procedure.

Program 186a: Maintain an alternative dispute resolution program to allow neighbors to resolve issues in the first instance, if possible.

Policy 187 Enforce noise standards.

Local Standards

Policy 188 Periodically review Municipal Code noise standards for commercial and industrial operations.

Policy 189 In the Municipal Code, continue to restrict noise-producing construction activities to daytime hours of operation.

Program 189a: Continue to incorporate regulations in the Municipal Code to provide a framework to enforce noise standards and impose penalties for violations.

Program 189b: Periodically review the Municipal Code to update regulations based on new information and new technologies.

Program 189c: Periodically hold training sessions for City personnel to provide noise information and review enforcement procedures.

Program 189d: Provide information to citizens on how noise can be controlled and about City regulations and enforcement procedures.

Other Standards

Program 189e: Cooperate with other agencies with authority to monitor and regulate noise, such as the Department of Transportation and OSHA, in order to reduce noise impacts on individuals, neighborhoods and businesses.

3.2 City of Brisbane Municipal Code

Title 8 Chapter 8.28 establishes performance standards for noise control. The specific noise control language for commercial and industrial zoning districts, as well as construction activities are shown below.

8.28.020 - Definitions.

For the purposes of this chapter, the following words and phrases shall have the meanings respectively ascribed to them in this section, unless the context or the provision clearly requires otherwise:

- A. "Ambient noise" means the all-encompassing noise associated with a given environment, usually being a composite of sounds from many sources, near and far. Local ambient is the noise level obtained when the noise level is averaged over a period of ten (10) minutes without inclusion of noise from exceptional isolated identifiable sources at the location and time of day near that at which a comparison is to be made, and when the noise source at issue is silent. However, for purposes of this chapter, in no case shall the local ambient be considered or determined to be less than:

1. Thirty-five (35) dBA for interior noise in Section 8.28.030;
2. Forty-five (45) dBA in all other sections of this chapter.

If the local ambient is largely composed of noise produced by other individual identifiable sources which would otherwise be operating continuously during the ten minute measurement period and contributing significantly to the ambient sound level, determination of the local ambient shall be accomplished with these separate identifiable noise sources silent but only to the extent that such separate identifiable noises do not typically occur at the particular location and time of day.

- B. "Commercial purpose" means and includes the use, operation or maintenance of any sound-amplifying equipment for the purpose of advertising any business, any goods or any services or for the purpose of attracting the attention of the public to, or advertising for, or soliciting patronage or customers to or for any performance, show, entertainment, exhibition or event or for the purpose of demonstrating such sound equipment.
- C. "dBA" means the decibel measurement that is a logarithmic indication of the ratio between the acoustic energy present at a given location and the lowest amount of acoustic energy audible to sensitive human ears and weighted by frequency to account for characteristics of human hearing, as set forth in the American National Standards Institute Standard S1.1, "Acoustic Technology," paragraph 2.9, or successor reference.
- D. "Decibel" means a unit which is one-tenth of a dimensionless unit for expressing the ratio of two values of a power, the number of those dimensionless units being the logarithm to the base ten of the power ratio.
- E. "Emergencies" means essential activities necessary to restore, preserve, protect or save lives or property from imminent danger, loss or harm.
- F. "Noise level" means the maximum continuous noise level, sound level or repetitive peak level produced by a source or group of sources as measured with a precision sound level meter using the "A" weighting scale, and the meter response function set to "slow."
- G. "Noncommercial purpose" means the use, operation or maintenance of any sound equipment for other than a commercial purpose. The term "noncommercial purpose" means and includes, but shall not be limited to, philanthropic, political, patriotic and charitable purposes.

-
- H. "Type 2 general purpose sound level meter" means a device for measuring sound levels in decibel units within the performance specifications in the American National Standards Institute Standard S1.4, "Specification for Sound Level Meters" or successor reference.
 - I. "Property plane" means a vertical plane, including the property line, which determines the property boundaries in space of the parcel of property over or from which the sound in question is audibly transmitted.
 - J. "Receiver" means a person or persons who question the level of sound transmitted from an identifiable source.
 - K. "Sound-amplifying equipment" means any machine or device for the amplification of the human voice, music or any other sound. This does not include standard automobile radios, stereos, or other sound-amplifying equipment installed in the vehicle when used or heard only by the occupants of the vehicle in which the vehicular sound-amplifying equipment is installed. The term "sound-amplifying equipment," as used in this chapter, shall not include warning devices on authorized emergency vehicles or horns or other warning devices of any vehicle used only for traffic safety purposes.
 - L. "Vehicle" means any device by which any person or property may be propelled, moved, driven or drawn upon a public street or highway or on any private property.

8.28.030 - Noise levels for residential zoning districts.

- A. No person shall cause, produce, suffer or allow to be produced by any machine, animal or device or any combination of same, in a single-family residential zoning district, a noise level more than ten (10) dBA above the local ambient to any receiver for a cumulative period of more than ten (10) minutes in any hour, a noise level more than twenty (20) dBA above the local ambient to any receiver for a cumulative period of more than three (3) minutes in any hour, or a noise level more than thirty (30) dBA above the local ambient to any receiver.
- B. No person shall cause, produce, suffer or allow to be produced by any machine, animal or device or any combination of same, in a multi-family residential zoning district, a noise level more than ten (10) dBA above the local ambient three (3) feet from any wall, floor or ceiling inside any dwelling unit on the same property, except within the dwelling unit in which the noise source or sources may be located to any receiver for a cumulative period of more than ten (10) minutes in any hour, a noise level more than twenty (20) dBA above the local ambient to any receiver for a cumulative period of more than three (3) minutes in any hour, or a noise level more than thirty (30) dBA above the local ambient to any receiver.

8.28.040 – Noise level for commercial and industrial zoning districts.

No person shall cause, produce, suffer or allow to be produced by any machine, animal or device or any combination of same, in any commercial or industrial zoning district, a noise level more than ten (10) dBA above the local ambient to any receiver

for a cumulative period of more than ten (10) minutes in any hour, a noise level more than twenty (20) dBA above the local ambient to any receiver for a cumulative period of more than three (3) minutes in any hour, or a noise level more than thirty (30) dBA above the local ambient to any receiver.

8.28.050 - Exemptions.

The following are exempted from the noise level restrictions set out in Sections 8.28.030 and 8.28.040:

- A. Emergencies;
- B. School bands, school athletic and school entertainment events;
- C. Activities conducted on parks, public playgrounds and school grounds provided such parks, playgrounds and school grounds are owned and operated by a public entity;
- D. Any activity to the extent regulation thereof has been preempted by state or federal law.

[Subsection D typically includes noise from aviation, vehicles on roadways, and trains.]

8.28.060 - Construction activities.

Except as set forth in Section 8.28.050A, notwithstanding any other provision of this chapter, construction shall be allowed only between the hours of seven (7:00) a.m. and seven (7:00) p.m. on weekdays and nine (9:00) a.m. to seven (7:00) p.m. on weekends and holidays. Construction, alteration or repair activities which are authorized by a valid city permit shall be allowed if they meet at least one of the following noise limitations:

- A. No individual piece of equipment shall produce a noise level exceeding eighty-three (83) dBA at a distance of twenty-five (25) feet from the source thereof. If the device or other source is housed within a structure on the property, the measurement shall be made outside the structure, but at a distance as close to the equipment or source as possible.
- B. The noise level at any point outside of the property plane of the project shall not exceed eighty-six (86) dBA.

8.28.080 - Exception permits.

If the applicant demonstrates to the satisfaction of the planning director that immediate compliance with the requirements of this chapter would be impractical or unreasonable, the planning director may issue a permit to allow exception from any or all of the provisions contained in this chapter, with appropriate conditions to minimize the public detriment caused by such exceptions. Any such permit shall be of as short duration as possible and shall be conditioned by a schedule for compliance and details of methods thereof in appropriate cases.

8.28.090 - Excessive noise—Standards to determine violation.

- A. Notwithstanding any other provision of this chapter, and in addition thereto, it shall be unlawful for any person to willfully make or continue or cause to be made or continued, any loud, unnecessary or unusual noise which disturbs the peace or quiet

of any neighborhood or which causes discomfort or annoyance to any reasonable person of normal sensitivities residing in the area.

- B. The standards which shall be considered in determining whether a violation of this section exists shall include, but not be limited to, the following:
1. The level of the noise;
 2. Whether the nature of the noise is unusual;
 3. Whether the origin of the noise is natural or unnatural;
 4. The level of the background noise, if any;
 5. The proximity of the noise to residential sleeping facilities;
 6. The nature and zoning of the area within which the noise emanates or to which it is transmitted;
 7. The density of the inhabitation of the area within which the noise emanates or to which it is transmitted;
 8. The time of the day or night the noise occurs;
 9. The duration of the noise;
 10. Whether the noise is recurrent, intermittent or constant; and
 11. Whether the noise is produced by a commercial or noncommercial activity.

3.3 Airport Land Use Compatibility Plan

The 2012 Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport has guidelines for noise and land use compatibility. These guidelines are summarized in Table IV-1.

Table IV-1 Noise/Land Use Compatibility Criteria

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

Notes:

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

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

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

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

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

4 Existing Noise Environment

The project site encompasses the existing Guadalupe Quarry and undeveloped hillside land located on the east face of San Bruno Mountain. At the neighboring land uses, the major existing noise sources include local traffic, commercial/industrial traffic in the Crocker Park area, and distant traffic from Bayshore Boulevard and US-101. There are also occasional aircraft passbys that contribute to the ambient noise levels. At the time of this noise study, major quarry production activities at the Guadalupe Quarry are not occurring and, therefore, the ambient noise conditions quantified by noise measurements do not include on-site quarry machinery or significant haul truck activity.

Noise measurements were conducted from Friday 1 April 2022 to Tuesday 5 April 2022 to quantify the existing noise environment. The measurements consisted of four long-term, 4-day, measurements (LT-1 through LT-4) and six short-term, 15-minute, measurements (ST-1 through ST-6). The noise measurement locations are shown in Figure 2.

The noise measurements quantify the ambient noise levels at the residential and commercial land uses in the vicinity of the project. Therefore, these noise measurements are also considered representative of ambient noise levels in proximity to these locations. To the north of the project site, across the valley, are residential land uses on the hillsides off of Silverspot Drive and Mission Blue Drive which are represented by LT-1 and ST-1. Residences to the northeast on the hillsides off of Mission Blue Drive are represented by LT-2 and ST-2. The commercial areas in the valley are represented by LT-3, ST-3 and ST-5. Residences and the Lipman Middle School to the east are represented by LT-4 and ST-4. Recreation trails to the west, south and east are represented by ST-6.

The long-term noise measurement at Location LT-1 was made on a light pole at the outdoor area between Huckleberry Court and Golden Aster Court at a height of 12 feet above ground. The long-term noise measurement at Location LT-2 was made on a tree at the end of Tanager Court at 12 feet above ground. The long-term noise measurement at Location LT-3 was made on a utility pole along Valley Drive at 12 feet above ground. The long-term noise monitor at Location LT-4 was made on a utility pole at the end of Trinity Road at 12 feet above ground.

During the long-term noise measurement high wind noise in the trees increased ambient noise levels at several of the locations on Sunday. The increased ambient noise levels between the Sunday hours of 2 p.m. to midnight and were not included in the calculation of the ambient CNEL for the purposes of this analysis.

Figure 2: Noise Measurement Locations



Source: Map data © 2023 Google

The noise measurements were made with a Larson Davis Model 820 or 824 Sound Level Meter meeting Type 1 specifications (ANSI S1.4). Calibrations were checked with a Larson Davis Cal200 calibrator.

Graphs showing the hourly noise levels at each monitoring location are shown in Figures 3 to 6. Table 1 shows the short-term noise measurement results.

**Figure 3: Long-term Noise Measurement Results at
Location LT-1 – Huckleberry Court
Weekly CNEL 55 dBA**

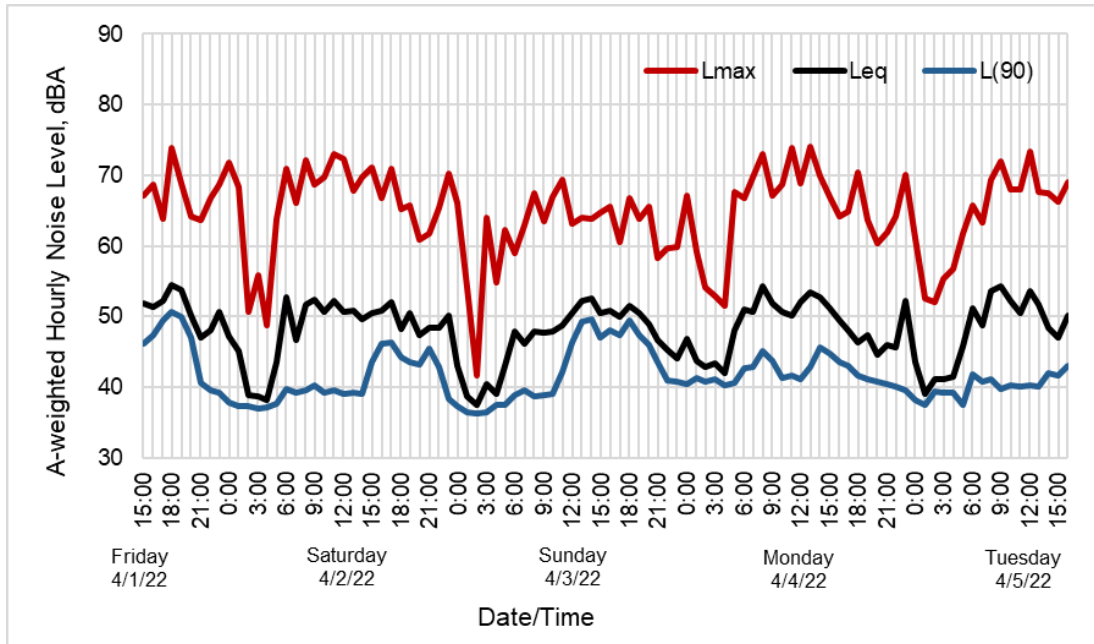


**Figure 4: Long-term Noise Measurement Results at
Location LT-2 – Tanager Court
Weekly CNEL 58 dBA**

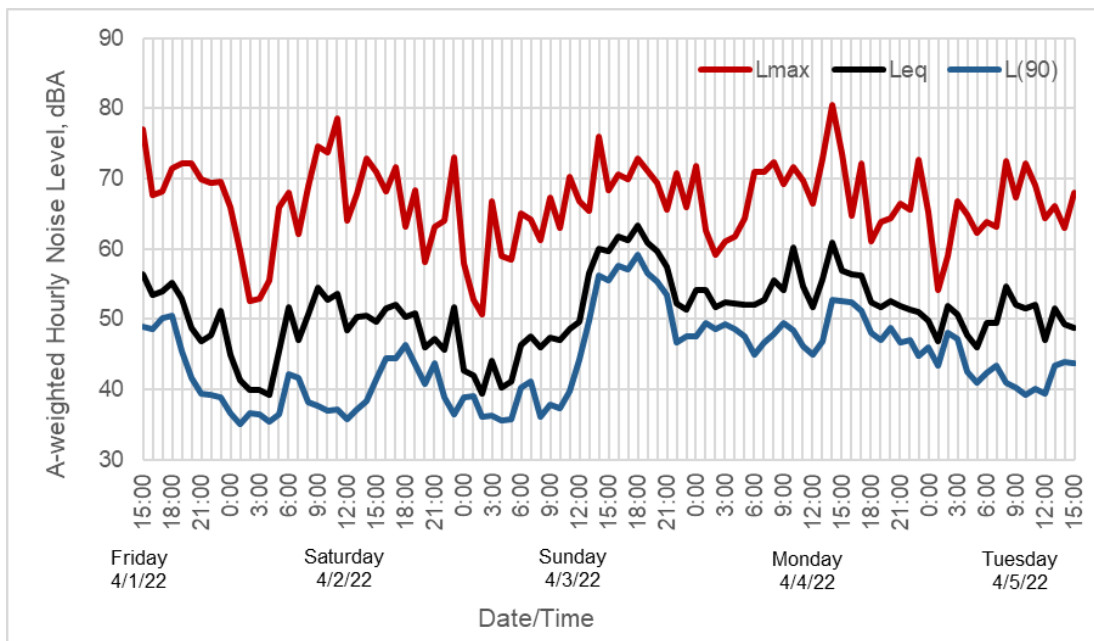


**Figure 5: Long-term Noise Measurement Results at
Location LT-3 – Valley Drive
Weekly CNEL 72 dBA**

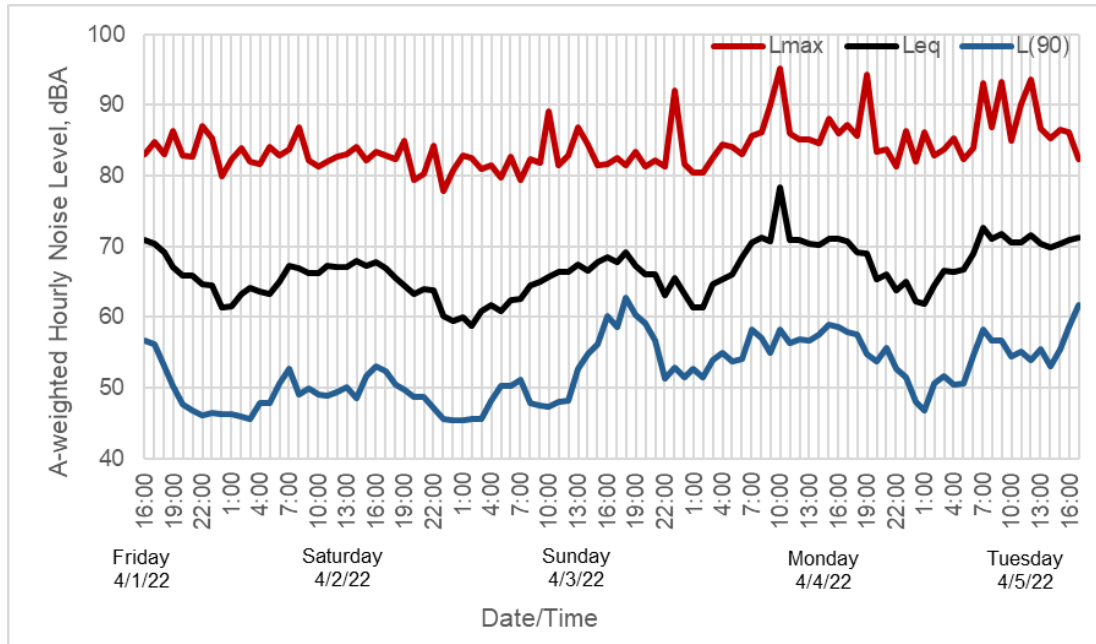


**Figure 6: Long-term Noise Measurement Results at
Location LT-4 – Trinity Road
Weekly CNEL 65 dBA**

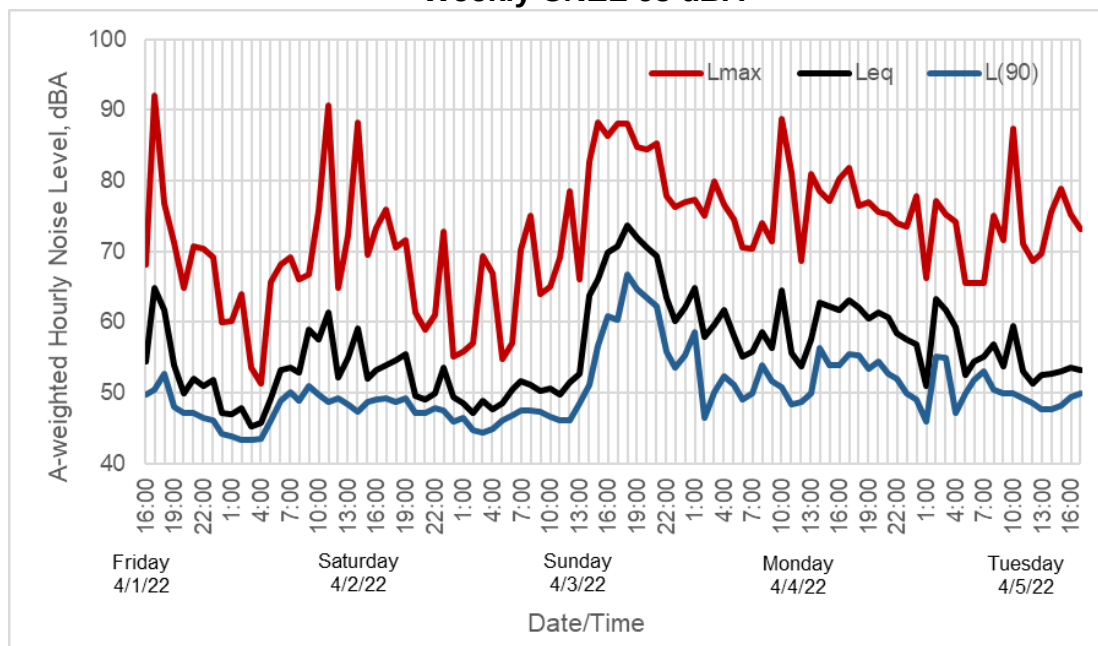


Table 1: Short-Term Noise Measurement Results – 5 April 2022

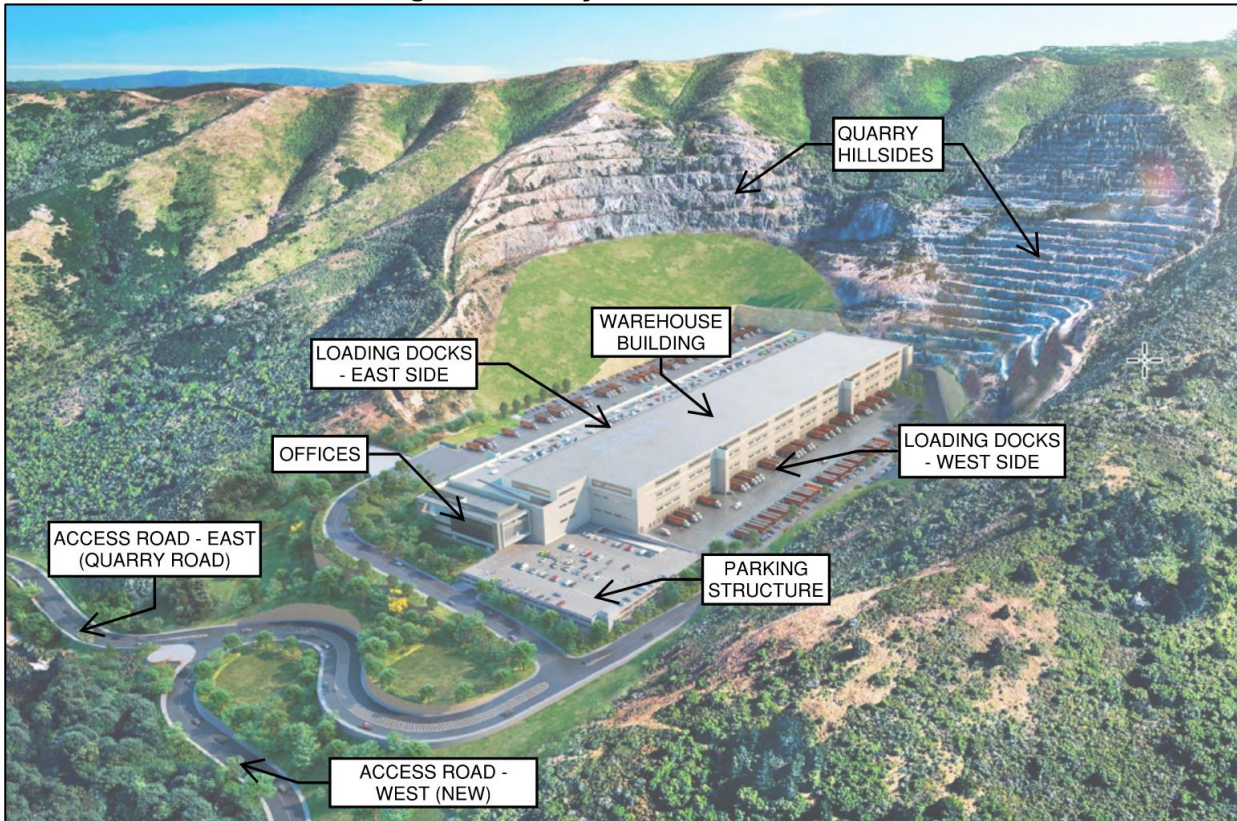
Site	Location	Date/Time	L _{eq}	L ₅	L ₁₇	L ₉₀	CNEL*	Notes
ST-1	Butterweed Lane	3:31 PM – 3:48 PM	50	53	51	47	54	Distant traffic: 54 – 57 Distant Backup Beeper: < 47 Jets: 55, 59 Ruffling leaves: 48
ST-2	Mission Blue Drive	3:55 PM – 4:10 PM	55	61	54	49	64	Cars: 57, 59, 63 – 66 Jets: 52, 53 Backup Beeper: < 48 Traffic on South Hill: 49 -50
ST-3	Valley Drive	4:47 PM – 5:02 PM	64	71	64	51	65	Cars: 67 – 72 Medium Trucks: 67 – 73 Heavy Trucks on Valley Drive: 73, 81 Heavy Truck Venting Brakes at Nearby Loading Dock: 54, 57, 58 Backup Beeper at Nearby Loading Dock: 52, 53 General Aviation Aircraft: < 52 Jets: 54, 64 (w/ car passby)
ST-4	Trinity Road	5:32 PM – 5:47 PM	53	58	53	50	66	Distant Traffic: 49 – 50 Jets: 53, 57, 60, 63
ST-5	Back of 175 South Hill Drive	3:09 PM – 3:24 PM	50	56	49	43	65	Heavy Truck on South Hill Drive: 53 Jets: 45, 50, 64 Rooftop Mech: < 45 Nearby Roll up door: 56 Distant Backup Beeper: < 44, 47
ST-6	Back of Guadalupe Quarry	2:18 PM – 2:33 PM	45	48	46	43	54	Distant Traffic: 42 – 46 Distant Backup Beeper: < 42 General Aviation Aircraft: < 44 Jets: < 46, 51

*CNEL calculated based on correlation between simultaneous long-term and short-term measurements.

5 Noise Prediction Methodology

The proposed warehouse building is located on the quarry site. The features of the site and project are shown in Figure 7.

Figure 7: Project Site Features



Since there are hillsides around the project site and they are steep and rocky, there is a potential for the hillsides to reflect sound from the project noise sources toward land uses in the vicinity. To address this potential effect, the noise generated at the building site (construction and operation) is calculated using the SoundPLAN computer program. SoundPLAN uses a 3D model of the noise sources, buildings, terrain, barriers and noise receptors to calculate the noise levels taking into account the source noise levels, distance, acoustical shielding and acoustical reflections. The acoustical reflections from the hillsides are accounted for in the SoundPLAN models by including acoustically reflective surfaces to represent the hillsides and proposed retaining walls. The exterior walls of the warehouse building are also considered to be acoustically reflective in the noise model. The SoundPLAN model uses standard noise propagation methodologies³ that calculates the attenuation for distance and barriers.

Atmospheric conditions can affect sound propagation. These effects are observed when the sound level from a particular steady source varies from day-to-day or even hour-to-hour and are most noticeable for sources that are distant (greater than 1000 feet). The greatest effects are often caused by wind or temperature gradients. Gradients are the variation in temperature or wind speed with the height above the ground which cause sound to bend or “diffract” as it travels through the air. This diffraction can enhance or diminish the attenuation effect of intervening ground and barriers. The noise propagation methodology of the SoundPLAN model uses favorable noise propagation conditions that result in a conservative analysis. The intent of this methodology is to predict sound levels that represent the reasonable maximum noise exposure that would occur over a range of atmospheric conditions.

Noise levels from construction activities that occur offsite and along the access roads were calculated with basic outdoor noise propagation methodology (see Appendix B) and conservatively do not take into account sound attenuation from terrain or intervening buildings. Offsite traffic noise levels were calculated using a spreadsheet model based on the TNM traffic noise methodology. Onsite traffic circulation was calculated within the SoundPLAN model using the TNM methodology option. The SoundPLAN modeling figures and tables of the basic noise modeling and offsite traffic noise modeling calculations are summarized in the Appendices of this report.

³ ISO 9613-2: 1996 and FHWA TNM 3.0.

6 Noise and Vibration Analysis

6.1 Construction Noise

6.1.1 Thresholds for Evaluation

Given the particular characteristics of the project site and the surrounding land uses, the City's construction noise ordinance (Municipal Code Section 8.280.060) is not well tailored for determining the project's effects on sensitive receptors. Therefore, for this noise analysis, the threshold for evaluation is whether noise levels would exceed 86 dBA at the nearest noise-sensitive land use, instead of at the project property plane as typically required by the City's Municipal Code Section 8.280.060b.

6.1.2 Construction Noise Assessment

Construction would occur in two general phases: (1) horizontal site development, which includes rough grading/site walls which include site preparation and earthwork related to creation of the building pad), site work for parking lot, and site utilities that is anticipated to take 12 months, and (2) vertical building development, which includes foundations, walls, enclosures, and the parking garage that is anticipated to take 18 months. Slab-on-grade construction is also included in this time frame. Construction is expected to commence in quarter 3, 2024 and be completed in quarter 1, 2027. Construction would occur between 7 a.m. and 7 p.m. Monday through Friday, consistent with City code. Weekend/holiday work, while not anticipated, if necessary would occur between 9 a.m. and 7 p.m. on Saturday, Sunday and holidays, consistent with City code. Any night work, while not anticipated, would be coordinated with the City per its exception permit provisions for construction occurring outside of codified limits.

Construction activities also will include improvements to the existing 40-foot-wide 2-lane access road (Quarry Road) and the construction of a new secondary 30-foot-wide 2-lane access road extending from South Hill Drive approximately 0.5 miles west of the eastern entrance. The locations of the two access roads are indicated in Figure 2.

The site improvements construction planning includes both deep dynamic compaction on the building pad and the drill displacement columns for the site retaining walls on the north end of the building.

In addition to the on-site construction activities, the project construction will also include off-site PG&E electrical routing along roadways between the project site and the Martin Substation. The electrical routing will involve undergrounding the electrical utility underneath Geneva Avenue, Bayshore Boulevard, Guadalupe Canyon Parkway, North Hill Drive and South Hill Drive. See Appendix A for electrical routing.

Table 2 shows typical noise levels for the construction equipment that is expected to be used for the project and the noise level generated by that equipment at a distance of 25 feet.

Table 2: Construction Equipment Noise Levels

Construction Equipment	A-weighted Noise Level, dBA		
	Reference Sound Level at 50 feet*	Sound Level Adjustment for 25 feet	Sound Level at 25 feet
Scraper	84	6	90
Compactor	83	6	89
Excavator	81	6	87
Loader	79	6	85
Dozer	82	6	88
Gradall Forklift	83	6	89
Bobcat	78	6	84
Auger Drill Rig	84	6	90
Roller	80	6	86
Deep Dynamic Compaction**	76	6	82
Paver	77	6	83
Dump Truck	76	6	82
Backhoe	78	6	84
Truck Crew	76	6	82
Crane	81	6	87
Forklift	78	6	84
Gradall	83	6	89
Flat Bed Truck	83	6	89
Concrete Mixer	79	6	85
Concrete Pumper	81	6	87
Concrete Saw	90	6	96
Impact Hammer (Hoe Ram)	90	6	96

*Source: FHWA, *Roadway Construction Noise Model*, 2006.

**Source for Deep Dynamic Compaction noise levels: *Keller Vibration Guide* excerpt provided in email from Raymond Franz, Keller North America to Troy Snyder, DeSilva-Gates, March 2023.

The construction noise is also evaluated at the property plane by adding together the noise contributions from the proposed construction equipment for each of the construction phases and location of the construction activity. Table 3 and Table 4 show the major construction equipment and expected quantity of noise levels for the equipment by construction phase.

Table 3: Construction Equipment By Phase On-Site

Phase	Equipment	Number
Rough Grading and Site Walls	Scraper	9
	Compactor	3
	Excavator	2
	Loader	1
	Dozer	4
	Gradall Forklift	1
	Bobcat	1
	Auger Drill Rig	1
	Backhoe	1
	Dump Truck	1
	Impact Hammer (Hoe Ram)	1
Site Work	Dozer	1
	Scraper	1
	Roller	5
	Loader	2
	Paver	1
	Dump Truck	1
	Deep Dynamic Compaction	1
Site Utilities	Excavator	4
	Backhoe	1
	Loader	2
	Dump Truck	1
	Truck Crew	1
Slab on Grade	Concrete Mixer	5
	Concrete Pumper	5
	Auger Drill Rig	2
Vertical Construction	Crane	1
	Forklift	1
	Gradall	2
	Flat Bed Truck	1

Source: Information on Project equipment list and quantity were provided by the Project Applicant

Table 4: Access Road and Off-Site PG&E Routing Construction Equipment

Phase	Equipment	Number
Access Road Construction	Dozer	1
	Scraper	1
	Roller	1
	Loader	2
	Paver	1
	Dump Truck	1
PGE Electrical Routing Construction	Excavator	2
	Loader	2
	Roller	1
	Water Truck	1
	Sweeper Truck	1
	Dump Truck	2
	Crew Truck	1
	Concrete Saw	2

Source: Information on Project equipment list and quantity were provided by the Project Applicant

The calculated construction noise levels at the property lines and the nearby land uses are based on the combination of noise from all the equipment in that phase and the distance between the equipment and the property line or land use. An “acoustical usage factor” is also included which accounts for the fact that the equipment does not operate at its maximum capacity 100 percent of the time and is based on assumptions developed by the FHWA⁴. For the property line noise assessment, the on-site construction equipment is assumed to be located near the property line of the project site. The off-site construction activities will occur in the roadways, and the construction equipment is considered to be located at the centerline of the roadways or where the PG&E routing will occur as defined in Appendix A. The calculations of the construction noise, including the distance and usage factor assumptions, are presented in Appendix B. For this analysis the property *line* noise levels are considered to be equal to the property *plane* of the receiver.

Construction noise levels presented in this report do not include contribution from the ambient noise levels. Even so, the property lines of the project site are close enough to the construction noise that ambient noise will not affect the overall noise level measured at the property line.

⁴ Federal Highway Administration, Roadway Construction Noise Model User’s Guide, FHWA-HEP-05- 054, January 2006

Table 5 summarizes noise levels calculated at the property lines for activities in the various construction locations/phases. For the access road construction phase, the equipment is assumed to be located at the centerline of the roadway. For the PGE routing, the equipment is assumed to be located at the proposed routing as shown in Appendix A. For offsite construction work, the property line is assumed to be the edge of the roadway right-of-way.

Table 5: Construction Noise Levels at Property Lines

Construction Phase		Distance from Construction Equipment to Property Line	Noise Level at Property Line	Assessed Property Line Location
Project Building Site	Rough Grading and Site Walls	37 feet	95	Northwestern and northeastern property lines
	Site Work (Parking Lot)	37 feet	88	
	Site Utilities	37 feet	88	
	Vertical Construction	90 feet	79	
	Slab on Grade	90 feet	81	
Access Roads		38 feet	87	Closest property line of commercial to north
		92 feet	79	Typical property line of commercial to north
PGE Routing		71 feet	85	Geneva Avenue
		50 feet	88	Bayshore Blvd
		50 feet	88	Guadalupe Canyon Parkway
		32 feet	92	North Hill Drive
		32 feet	92	South Hill Drive

Quantitative Analysis of Construction Noise Levels at Nearby Land Uses

To assess the construction noise levels with respect to the threshold of evaluation, Table 6 shows the calculated average noise levels (L_{eq}) from project-related construction equipment at the location of the noise sensitive land uses in the project vicinity.

**Table 6: Project Building Construction
Equipment Noise Levels at Land Uses in the Vicinity**

Receivers	Distance to Project Site*	Construction Phase Noise Level at Receiver, L_{eq} dBA				
		Rough Grading and Site Walls	Site Work	Site Utilities	Slab on Grade	Vertical Construction
Residences to the North (Silverspot Drive and Swallowtail Court area near LT-1, ST-1)	2661 feet	56	50	49	49	48
Residence to the Northeast (Mission Blue Drive area LT-2, ST-2)	3093 feet	51	45	44	45	43
Residence to the East (Trinity Road LT-4, ST-4)	3922 feet	44	38	37	38	37
Lipman Middle School	3479 feet	46	40	39	40	38
San Bruno Mountain Ridge Trail	2225 feet	50	44	43	43	42
Ridge Path Owl/Buckeye Canyon	2134 feet	47	41	40	40	39

*Distance to center of building site. The noise levels in Table 6 were calculated with SoundPLAN to help account for acoustical reflections from the terrain. The modeling uses an 'area' source to represent the locations of where the various construction activities would occur. Although the distances shown in the table are to the center of the site for reference, the modeling uses an 'area' source (rather than a 'point' source) and includes locations that are closer to the noise sensitive receivers.

The calculated noise at the residences in the Silverspot Drive and Swallowtail Court area range from 48 dBA to 56 dBA, with the noisiest phase being the rough grading and site walls. Based on the ambient measurement at ST-1, the daytime average noise level (L_{eq}) is 50 dBA and the background noise level (L_{90}) is 47 dBA. Based on this comparison, the construction noise would be detectable but tend to blend in with the ambient noise. However, during the most intensive construction phase, noise from construction activities at the project site would, at times, be the prevailing steady state noise source contributing to the noise environment for residences in the area of Silverspot Drive and Swallowtail Court.

The calculated noise at the residences in the area to the northeast along Mission Blue Drive range from 51 dBA to 43 dBA with the noisiest construction phase being the rough grading and site walls. Based on the ambient measurement at ST-2, the average noise level (L_{eq}) is 55 dBA and the background noise level (L_{90}) is 49 dBA. Based on this comparison, the construction noise would be detectible but would generally tend to blend in with the ambient noise.

Tables 7 through 8 show the construction equipment and calculated noise level during off-site construction activities (e.g. the access roads and the PG&E routing). For the purpose of determining construction noise levels from activities that occur off of the project site, the distance from the centerline of the roadways or where the PG&E routing will occur as shown in Appendix A to the nearest building or outdoor use area of the receiver is used.

**Table 7: Access Road Construction
Equipment Noise Levels at Nearby Land Uses**

Receivers	Distance to Access Road	Construction Phase Noise Level at Receiver, L_{eq} dBA
Nearest Commercial/Industrial Building on South Hill Drive	45 feet	86
Lipman Middle School	370 feet	67

Source: Coffman Engineers, Inc.

Table 8: Construction Equipment Noise Levels from Off-Site PG&E Electrical Routing at Nearby Land Uses

Roadway with Construction	Nearest Land Uses	Distance between Receiver Buildings and Construction in Roadway	Construction Noise Level L_{eq} at Receiver, dBA
Geneva Avenue	Residential, Hotel, Commercial	81 feet	84
Bayshore Blvd	Commercial, Industrial	100 feet	82
Guadalupe Canyon Parkway	Commercial	88 feet	83
North Hill Drive	Residential (Cliff Swallow Ct)	245 feet	74
	Residential (Kestrel Ct)	230 feet	75
	Commercial	50 feet	88
South Hill Drive	Commercial	63 feet	86
	School	430 feet	70

Source: Coffman Engineers, Inc.

Based on the noise levels in Table 6, 7 and 8, the most noise-sensitive receivers (i.e., residences, trails and school) are exposed to construction noise levels below 86 dBA. The noise-sensitive receivers in Table 6 are in excess of 2,600 feet from the project building site and the associated construction noise levels are generally comparable to the ambient noise levels. The construction noise quantified in Tables 7 and 8 addresses the construction activities occurring in existing roadways and access roads. The receiving land uses in these Tables are exposed to noise from traffic on these roads. The average construction noise levels presented in the tables would be about 8 dBA noisier than the maximum noise level from a truck on these roadways (using the TNM data that a single truck passby generates 81 dBA at a distance of 50 feet). The construction noise would tend to be loud enough to interfere with speech communication in a normal voice outdoors. The construction noise level calculated for Lipman Middle School is for the far western edge of the school which is an access road and one building. The playground and most school buildings would be exposed to much lower construction noise levels due to shielding from the terrain and intervening buildings which would generally not interfere with speech communication outdoors. The construction noise levels calculated for the residential land uses near North Hill Drive are for when construction on North Hill Drive occurs in view of the nearest residences. These residential homes are located on top of a hill and parts of North Hill Drive construction work will not be in view of these residences due to the terrain. Construction noise levels at these residences would be much lower than the those presented in Table 8 when construction work is not in view of the residences.

6.2 Construction Vibration

6.2.1 Thresholds for Evaluation

Neither CEQA nor the City of Brisbane specifies acceptable vibration levels from construction activities. Therefore, for the purposes of this assessment, the guideline criteria for building damage recommended by Caltrans⁵ is used. The construction vibration damage criteria is a Peak Particle Velocity (PPV) of 0.5 inches/sec for modern industrial/commercial buildings and new residential structures exposed to continuous/frequent intermittent sources. The threshold for annoyance is based on the FTA criteria. The FTA does not specify thresholds for annoyance from construction vibration; therefore, this assessment uses the vibration threshold for infrequent transit train events since vibration associated with construction equipment is both intermittent and temporary. Construction vibration annoyance is assessed for sensitive receptors which include residences, schools, places of worship, hospitals, convalescent homes, hotels, libraries. For residential receptors the criterion for annoyance due to construction vibration is 80 VdB. For non-residential sensitive receptors such as schools, the institutional criterion for annoyance is 83 VdB.

6.2.2 Construction Vibration Evaluation

The nearest off-site buildings are the commercial/industrial land uses along South Hill Drive. During construction at the project building, construction equipment would be located 700 feet or more from the nearest off-site building at 155 South Hill Drive, which is occupied by commercial/light industrial uses. Table 9 shows the vibration generating construction equipment and the calculated construction vibration levels when construction occurs at the project building.

Table 9: Calculated Vibration Levels from Construction Occurring at Project Building

Construction Equipment	Vibration Levels	
	Reference Vibration Level	Calculated Vibration Levels at 155 South Hill Drive (600 feet from Equipment) PPV (in/s)
Deep Dynamic Compaction	0.157 at 230 feet ¹	0.021
Vibratory Roller	0.210 at 25 feet ²	0.002
Hoe Ram	0.089 at 25 feet ²	0.001
Large Bulldozer	0.089 at 25 feet ²	0.001
Caisson Drilling	0.089 at 25 feet ²	0.001
Loaded Trucks	0.076 at 25 feet ²	0.001
Jackhammer	0.035 at 25 feet ²	< 0.001
Small Bulldozer	0.003 at 25 feet ²	< 0.001

Source: Coffman Engineers, Inc.

¹Moseley & Kirsch, *Ground Improvement 2nd edition*, 2004. (Fig 3.7, $PPV_{equip} = PPV_{ref} \times (25/D)^{1.8}$)

²Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, 2018 (Eq 7-2, $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$, Eq 7-3, $L_{v,distance} = L_{v,ref} - 30\log(D/25)$, and crest factor of 4 for RMS vibration velocity levels from PPV levels)

⁵ Caltrans, *Transportation and Construction Vibration Guidance Manual*, September 2013.

During construction of the Project's access roads, construction equipment distances to the neighboring buildings range from 45 feet to 155 feet. Table 10 shows the calculated construction vibration levels at the neighboring buildings when construction occurs at the access roads.

Table 10: Calculated Vibration Levels at Commercial /Industrial Uses from Construction of Access Roads

Construction Equipment	Vibration Level, PPV (in/s)			
	99 South Hill Drive (45 feet from Equipment)	123 South Hill Drive (155 feet from Equipment)	155 South Hill (150 feet from Equipment)	175 South Hill Drive (110 feet from Equipment)
Vibratory Roller	0.087	0.014	0.014	0.023
Hoe Ram	0.037	0.006	0.006	0.010
Large bulldozer	0.037	0.006	0.006	0.010
Caisson drilling	0.037	0.006	0.006	0.010
Loaded trucks	0.031	0.005	0.005	0.008
Small Bulldozer	0.001	< 0.001	< 0.001	< 0.001

Source: Coffman Engineers, Inc.

Table 9 and Table 10 show that construction equipment vibration levels are calculated to be less than the potential building damage threshold of a PPV of 0.5 in/sec.

During PG&E electrical routing construction, the anticipated construction equipment that is expected to generate the most vibration is a vibratory roller which has a reference vibration level of 0.21 in/sec at 25 feet. Table 11 shows the calculated vibration levels from a vibratory roller at neighboring land uses based on the typical distances between the construction equipment and the nearest land uses.

**Table 11: Calculated Vibration Levels from Vibratory Roller along
PG&E Electrical Routing**

Roadway	Land Uses	Distance (feet)	Vibration Level	
			PPV (in/sec)	RMS Vibration Velocity (VdB)
Geneva Avenue	Residential, Hotel, Commercial	81 feet	0.036	79
Bayshore Blvd	Commercial	100 feet	0.026	N/A*
Guadalupe Canyon Parkway	Commercial	88 feet	0.032	N/A
North Hill Drive	Residential (Cliff Swallow Ct)	245 feet	0.007	65
	Residential (Kestrel Ct)	230 feet	0.008	65
	Commercial	50 feet	0.074	N/A
South Hill Drive	Commercial	63 feet	0.052	N/A
	School	430 feet	0.003	57

*N/A- not applicable

Table 11 shows that vibratory roller vibration levels at the surrounding land uses are calculated to be less than the threshold of 0.5 in/sec for potential building damage. We calculated that a vibratory roller would need to be within 14 feet of a structure for vibration levels to exceed a PPV of 0.5 in/sec. The calculated vibration levels in Table 11 for the vibratory roller are less than the annoyance threshold of 80 VdB near residences and hotels. All other construction equipment would generate vibration levels below the annoyance threshold.

At the school the vibration is predicted to be imperceptible. At the homes along Geneva Avenue, vibration from the vibratory roller is predicted to be distinctly perceptible. At the residences along North Hill Drive the vibratory roller would be barely perceptible. The construction activities would move sequentially along the length of the PG&E route. Therefore, the potential for annoyance from noticeable ground vibration will be limited to the time when the construction activity is occurring near a particular home.

6.3 Operational Noise

6.3.1 Off-site Noise

6.3.1.1 Traffic Noise Increase

6.3.1.2 Thresholds for Evaluation

Neither the CEQA checklist nor the City of Brisbane's General Plan specify a quantitative method for assessing the increase in traffic noise. In general, an increase of 3 dBA is just noticeable, a change of 5 dBA is clearly noticeable and a change of 10 dBA is perceived as a doubling (or halving).

Project Operational Traffic Noise Evaluation

For the purposes of this assessment, the thresholds for evaluation at residential land use are based on a FAA⁶ discussion of screening and impact thresholds for increases in aircraft noise. The thresholds for non-residential land use are based on the “normally acceptable” noise exposure of CNEL 70 dBA for commercial and school land uses. The thresholds are shown in Table 12.

Table 12: Thresholds for Increase in Noise

Land Use	Noise Level with Project ¹ CNEL	Threshold of Evaluation for Increases Ambient Noise Levels by
Residential	less than 60 dBA	5.0 dBA or more
	60 dBA or greater and less than 65 dBA	3.0 dBA or more
	65 dBA or greater	1.5 dBA or more
Commercial and School	less than 70 dBA	5.0 dBA or more
	70 dBA or greater	3.0 dBA or more

Notes:

¹ Noise level criteria can also be applied to cumulative conditions for evaluating of the project's contribution to the cumulative increase in noise.

6.3.1.3 Traffic Noise Assessment

The project's traffic data⁷ shows project-generated daily trips of 317 heavy trucks, 50 medium trucks, and 1,117 passenger vehicles. The traffic data also provides existing and project-generated traffic volumes for various roadways in the project vicinity. Table 13 shows the existing PM peak hour traffic volumes. PM peak hour volumes are used since they are typically greater than the AM peak hour volumes. Tables 14 and 15 show the project's daily project traffic and peak-hour traffic volumes on the nearby roadways.

⁶ FAA, *Environmental Impacts: Policies and Procedures, Order 1050.1F*, July 2015

⁷ Beggs, Kelly, City of Brisbane. “Quarry Traffic Data Request”. Email to Don Little, Orchard Partners. November 16, 2022

Table 13: Existing PM Peak Hour Traffic Volumes

Roadway	Existing Volumes by Vehicle Type (Vehicles / PM Peak Hour)	
	Trucks	Passenger Vehicles
<i>South Hill Drive</i>		
Quarry Road Valley Drive	3	222
Quarry Road Project West Access Road	3	222
<i>North Hill Drive</i>		
Valley Drive Guadalupe Canyon Parkway	4	372
<i>Guadalupe Canyon Parkway</i>		
North Hill Drive Carter Street	4	568
North Hill Drive Bayshore Boulevard	11	748
<i>Valley Drive</i>		
South Hill Drive Bayshore Boulevard	5	464
<i>Bayshore Boulevard</i>		
Tunnel Avenue Geneva Avenue	29	1,931
Geneva Avenue Guadalupe Canyon Parkway	26	2,000
Guadalupe Canyon Parkway Valley Drive	26	2,025
Valley Drive Old County Road / Tunnel Ave	28	2,082
Old County Road / Tunnel Ave Airport Boulevard / US-101S Ramps	34	2,325
<i>Tunnel Avenue</i>		
Bayshore Boulevard Lagoon Road	15	496
<i>Lagoon Road</i>		
Tunnel Avenue Sierra Point Parkway / US-101S Ramps	5	202

Source: Fehr and Peers, Project Bay Data Request for Traffic_FP_20221118.xlsx, Received 29 November 2022.

Table 14: Project-Generated Traffic - Daily Volumes

Roadway	Traffic Volumes by Fleet (Vehicles/day)		
	Heavy Duty Trucks	Medium Trucks	Passenger Vehicles
<i>South Hill Drive</i>			
<i>Quarry Road Valley Drive</i>	320	50	1,130
<i>Quarry Road Project West Access Road</i>	160	25	565
<i>North Hill Drive</i>			
<i>Valley Drive Guadalupe Canyon Parkway</i>	0	0	290
<i>Guadalupe Canyon Parkway</i>			
<i>North Hill Drive Carter Street</i>	40	10	290
<i>North Hill Drive Bayshore Boulevard</i>	40	10	0
<i>Valley Drive</i>			
<i>South Hill Drive Bayshore Boulevard</i>	320	50	850
<i>Bayshore Boulevard</i>			
<i>Tunnel Avenue Geneva Avenue</i>	160	30	460
<i>Geneva Avenue Guadalupe Canyon Parkway</i>	170	30	490
<i>Guadalupe Canyon Parkway Valley Drive</i>	210	30	490
<i>Valley Drive Old County Road / Tunnel Ave</i>	110	20	370
<i>Old County Road / Tunnel Ave Airport Boulevard / US-101S Ramps</i>	110	20	340
<i>Tunnel Avenue</i>			
<i>Bayshore Boulevard Lagoon Road</i>	0	0	0
<i>Lagoon Road</i>			
<i>Tunnel Avenue Sierra Point Parkway / US-101S Ramps</i>	0	0	0

Source: Fehr and Peers, *Project Bay Data Request for Traffic_FP_20221118.xlsx*, Received 29 November 2022.

Table 15: Project Peak-Hour Trip Generation by Vehicle Type

Vehicle Type	AM			PM		
	In	Out	Total	In	Out	Total
Passenger Vehicle	120	12	133	69	109	179
Vans & Trucks	9	9	18	15	10	25
Total	129	21	150	85	119	204

Source: Fehr and Peers, *Project Bay AM and PM Peak Hour Trip Generation by Vehicle Type*, Received by email 16 February 2023.

Table 16 shows the total AM and PM peak hour traffic volumes used in the noise modeling. The truck volumes in Table 16 are determined by using the ratio of project truck types (317 heavy trucks and 50 medium trucks daily).

Table 16: Project Peak-Hour Trip Generation by Vehicle Type for Noise Modeling

Vehicle Type	Peak Hour Volume (both directions)	
	AM	PM
Passenger Vehicles	133	179
Medium Duty Trucks	2.5	3.4
Heavy Duty Trucks	15.5	21.6

In order to calculate the increase in traffic noise due to the project, it is necessary to determine the expected hourly variation in project trip generation over the course of the day. This was accomplished by using the provided peak hour and daily traffic volumes as well as the project description's anticipated operation hours (5 a.m. to 10 p.m.). According to the project trip generation information for passenger vehicles, there would be elevated activity during the daytime, with peaks in the early morning (4-7AM)⁸, mid-afternoon (2-3PM), and evening (5-7PM). The resulting assumed traffic distribution is shown in Table 17.

⁸ Although trip generation evaluate early morning period as 4 a.m. to 7 a.m., project operations would occur between 5 a.m. to 10 p.m.

Table 17: Assumed Hourly Distribution of Project Generated Traffic

Time of Day		Hourly Volume		
		Heavy Trucks	Medium Trucks	Passenger Cars
12:00 AM	Outside Anticipated Operation Hours	0	0	0
1:00 AM		0	0	0
2:00 AM		0	0	0
3:00 AM		0	0	0
4:00 AM		0	0	133
5:00 AM	Anticipated Warehouse Operation Hours	16	2	133
6:00 AM		16	2	133
7:00 AM		16	2	0
8:00 AM		16	2	0
9:00 AM		16	2	0
10:00 AM		16	2	0
11:00 AM		16	2	0
12:00 PM		16	2	0
1:00 PM		22	3	0
2:00 PM		22	3	179
3:00 PM		22	3	0
4:00 PM		22	3	0
5:00 PM		22	3	179
6:00 PM		22	3	179
7:00 PM		22	3	179
8:00 PM		22	3	0
9:00 PM		22	3	0
10:00 PM	Outside Anticipated Operation Hours	0	0	0
11:00 PM		0	0	0

Table 18 shows traffic noise increase along the roadways in the study area. The noise levels are calculated at a reference distance of 50 feet from the roadway centerline. The calculations are based on the Federal Highway Administration's Traffic Noise Model (TNM) using the existing and project-generated traffic data from Tables 13 to 14. To calculate the existing CNEL from the existing peak-hour volumes, an offset of 1.4 dBA was added to the calculated peak hour L_{eq} based on the difference between the measured peak-hour L_{eq} and measured CNEL at measurement location LT-3, Valley Drive.

Table 18: Traffic Noise Increase along Roadways in the Study Area

Roadway/Segment	Land Use***	Traffic CNEL at 50ft, dBA				Exceeds Threshold? (Increase Threshold*)
		Existing	Project	Existing + Project	Increase	
<i>South Hill Drive</i>						
<i>Quarry Road to Valley Drive</i>	Comm	65.0**	65.7**	68.3**	3.4	No (5.0 dBA)
<i>Quarry Road to Project West Access Road</i>	Comm	56.2	58.5	60.5	4.3	No (5.0 dBA)
<i>North Hill Drive</i>						
<i>Valley Drive to Guadalupe Canyon Parkway</i>	Res and Comm	61.8	51.3	62.2	0.4	No (3.0 dBA)
<i>Guadalupe Canyon Parkway</i>						
<i>North Hill Drive to Carter Street</i>	Res	68.1	58.7	68.6	0.5	No (1.5 dBA)
<i>North Hill Drive to Bayshore Boulevard</i>	Comm	69.6	55.1	69.7	0.2	No (5.0 dBA)
<i>Valley Drive</i>						
<i>South Hill Drive to Bayshore Boulevard</i>	Comm	64.4	63.6	67.0	2.6	No (5.0 dBA)
<i>Bayshore Boulevard</i>						
<i>Tunnel Avenue to Geneva Avenue</i>	Res	72.3	61.7	72.7	0.4	No (1.5 dBA)
<i>Geneva Avenue to Guadalupe Canyon Parkway</i>	Comm	72.4	62.0	72.7	0.4	No (3.0 dBA)
<i>Guadalupe Canyon Pkwy to Valley Drive</i>	Comm	72.4	62.6	72.8	0.4	No (3.0 dBA)
<i>Valley Drive to Old County Road/Tunnel Ave</i>	Comm	72.6	60.3	72.8	0.3	No (3.0 dBA)
<i>Old County Rd/Tunnel Ave to Airport Boulevard/US-101</i>	Res	73.1	60.2	73.3	0.2	No (1.5 dBA)

*Increase threshold is based on the most noise sensitive land use along the roadway segment.

**Traffic noise includes contribution from Valley Drive traffic since this roadway segment only has land uses that border both South Hill Drive and Valley Drive.

***Res: residential
Comm: commercial

Table 18 (cont.): Traffic Noise Increase along Roadways in the Study Area

Roadway/Segment	Land Use	Traffic CNEL at 50ft, dBA				Exceeds Threshold? (Increase Threshold*)
		Existing	Project	Existing + Project	Increase	
<i>Tunnel Avenue</i> <i>Bayshore Blvd to Lagoon Road</i>	Comm	64.2	0.0	64.2	0.0	No (5.0 dBA)
<i>Lagoon Road</i> <i>Tunnel Avenue to Sierra Point Pkwy/US-101</i>	Comm	60.0	0.0	60.0	0.0	No (5.0 dBA)

*Increase threshold is based on the most noise sensitive land use along the roadway segment.

**Traffic noise includes contribution from Valley Drive traffic since this roadway segment only has land uses that border both South Hill Drive and Valley Drive.

***Res: residential
Comm: commercial

Table 18 shows that increase in traffic CNEL is less than 1 dB at all of the roadway segments except those that are located very near to the project site, between the Project's access roads and Valley Drive where the project generated traffic will be a greater percentage of overall traffic. At South Hill Drive and Valley Drive, the increase in traffic noise is up to 4.3 dBA and is less than the 5 dBA threshold for a significant increase.

All of the land uses along the roadway network would be exposed to traffic noise increases that are below the evaluation thresholds.

It should be noted that the existing uses in the immediate vicinity of the project's access roads and Valley Drive, where the project-related traffic noise level increases are predicted to be greatest, are not particularly sensitive to noise and are primarily interior uses. This analysis is considered conservative as it does not account for historic trips associated with quarry activities.

Cumulative Traffic Noise Increase

In the future, traffic will increase due to general growth in the area that is not directly related to the project. Table 19 shows the cumulative without project traffic volumes. Table 20 shows the calculated traffic noise levels under the "existing", "cumulative" and "cumulative plus project" conditions. Table 20 also shows the comparison between the project's contribution to cumulative noise levels and the threshold for increase in noise as shown in Table 12.

Table 19: Cumulative without Project Traffic Volumes

Roadway	Cumulative w/o Project Volumes by Vehicle Type (Vehicles / PM Peak Hour)	
	Trucks	Passenger Vehicles
<i>South Hill Drive</i>		
<i>Quarry Road to Valley Drive</i>	3	382
<i>Quarry Road to Project West Access Road</i>	3	382
<i>North Hill Drive</i>		
<i>Valley Drive to Guadalupe Canyon Parkway</i>	7	628
<i>Guadalupe Canyon Parkway</i>		
<i>North Hill Drive to Carter Street</i>	14	2183
<i>North Hill Drive to Bayshore Boulevard</i>	29	2114
<i>Valley Drive</i>		
<i>South Hill Drive to Bayshore Boulevard</i>	5	954
<i>Bayshore Boulevard</i>		
<i>Tunnel Avenue to Geneva Avenue</i>	29	2477
<i>Geneva Avenue to Guadalupe Canyon Parkway</i>	27	3324
<i>Guadalupe Canyon Parkway to Valley Drive</i>	26	3332
<i>Valley Drive to Old County Road / Tunnel Ave</i>	34	3339
<i>Old County Road / Tunnel Ave to Airport Boulevard / US-101S Ramps</i>	39	3377

Source: Fehr and Peers, *Project Bay Data Request for Traffic_FP_20230310.xlsx*, Received 13 March 2023. Calculated based on difference between cumulative with project traffic volumes and proposed project traffic volumes.

Table 20: Cumulative Traffic Noise Levels

Roadway/Segment (Types of Land Uses)	Traffic CNEL at 50ft, dBA					Exceed Threshold for increase due to project contribution to cumulative increase in noise
	Existing	Cumulative w/o Project	Cumulative w/ Project	Increase (Existing to Cumulative w/ Project)	Project Contribution to Cumulative Increase (Cumulative w/ vs w/o Project)	
<i>South Hill Drive</i>						
<i>Quarry Road to Valley Drive (commercial)</i>	65.0*	67.7 *	69.8*	4.8	2.1	No (5.0 dBA)
<i>Quarry Road to Project West Access Road (commercial)</i>	56.2	58.0	61.2	5.0	3.2	No (5.0 dBA)
<i>North Hill Drive</i>						
<i>Valley Drive to Guadalupe Canyon Parkway (residential and commercial)</i>	61.8	64.1	64.3	2.5	0.2	No (3.0 dBA)
<i>Guadalupe Canyon Parkway</i>						
<i>North Hill Drive to Carter Street (residential)</i>	68.1	73.9	74.0	5.9	0.1	No (1.5 dBA)
<i>North Hill Drive to Bayshore Boulevard (commercial)</i>	69.6	74.0	74.1	4.5	0.1	No (3.0 dBA)
<i>Valley Drive (commercial)</i>						
<i>South Hill Drive to Bayshore Boulevard</i>	64.4	67.2	68.8	4.4	1.6	No (5.0 dBA)
<i>Bayshore Boulevard</i>						
<i>Tunnel Avenue to Geneva Avenue (residential)</i>	72.3	73.2	73.5	1.2	0.3	No (1.5 dBA)
<i>Geneva Avenue to Guadalupe Canyon Parkway (commercial)</i>	72.4	74.4	74.6	2.2	0.2	No (3.0 dBA)
<i>Guadalupe Canyon Pkwy to Valley Drive (commercial)</i>	72.4	74.4	74.6	2.2	0.3	No (3.0 dBA)
<i>Valley Drive to Old County Road/Tunnel Ave (commercial)</i>	72.6	74.5	74.6	2.1	0.2	No (3.0 dBA)
<i>Old County Rd/Tunnel Ave to Airport Boulevard/US-101 (residential)</i>	73.1	74.6	74.7	1.6	0.2	No (1.5 dBA)

Source: Coffman Engineers, Inc.

*Traffic noise includes contribution from Valley Drive traffic since this roadway segment only has land uses that border both South Hill Drive and Valley Drive.

Table 20 shows that the project's contribution to the cumulative noise levels do not exceed the threshold for increase in noise.

It should be noted that the types of buildings located along S. Hill Drive between the west access road and Quarry Road are commercial with primarily interior uses. The Crocker Park Recreational Trail is located along the north side of South Hill Drive between the roadway and the commercial properties. Even with the increase in noise, the buildings and recreational trail would be exposed to normally acceptable noise levels.

6.3.2 On-Site Noise Sources

6.3.2.1 Thresholds of Evaluation

Noise Ordinance: This analysis determines whether on-site noise sources generate noise levels that exceed the commercial and industrial zoning district limits in Section 8.28.040 of the City's municipal Code.

Zoning District	Duration of Noise within an Hour	Noise Standard
Commercial/Industrial	< 3 minutes	30 dBA above ambient*
	3 minutes	20 dBA above ambient*
	10 minutes	10 dBA above ambient*

*Noise Ordinance defines the minimum ambient level to be 45 dBA for the purpose of applying the noise standards.

Increase in Noise: This analysis determines whether on-site noise sources generate a increase in noise levels (CNEL) that exceed the thresholds in Table 12 from Section 6.3.1.2.

6.3.2.2 On-Site Noise Sources Assessment

On-site noise sources include:

- Mechanical ventilation equipment
- Truck circulation around the warehouse and access roads
- Parking lot noise
- Loading Dock activities (truck maneuvering, back-up beepers, truck brake air venting)

Noise levels from on-site noise sources were calculated using the SoundPLAN computer program. SoundPLAN uses a 3D model of the noise sources, buildings, terrain, barriers and noise receptors to calculate the noise levels taking into account the source noise levels, distance, acoustical shielding and acoustical reflections. SoundPLAN was used to calculate noise levels at representative receiver locations for the comparison of noise levels with appropriate thresholds.

The proposed warehouse building is located on the quarry site and the adjacent hillsides are steep and rocky. The acoustical reflections from these hillsides are specifically included in the SoundPLAN models through the inclusion of acoustically reflective surfaces to represent the hillsides and proposed retaining walls. The exterior walls of the warehouse building are also considered to be acoustically reflective in the noise model.

Figure 8 below shows the modeled receivers along with the project site and proposed warehouse building.

Figure 8: Noise Assessment Locations Map



Noise Ordinance Assessment

To assess compliance with Municipal Code Section 8.28.020, it is necessary to identify the ambient noise level because the noise limits are dependent on the ambient. Table 19 summarizes the ambient noise levels during the project's operational hours based on the noise measurements. The minimum measured hourly L_{eq} is used to identify the most restrictive noise ordinance limit. Table 21 also shows the ambient noise levels for the purpose of assessing compliance with Municipal Code Section 8.28.020. Per Municipal Code 8.28.020.A, for the purposes of assessing compliance with the municipal code noise limits, the ambient noise level shall be no less than 45 dBA even if the measured

ambient noise level is lower.

Table 21: Ambient and Noise Level Criteria Summary

Receiver		A-weighted Hourly Noise Level, dBA				
		Minimum Measured Hourly L_{eq} 5 a.m. – 10 p.m.*	Minimum Ambient for Municipal Code Noise Assessment	Criteria		
				L_{17} (10 min/ hour)	L_5 (3 min/ hour)	L_{max}
				10 dBA above ambient	20 dBA above ambient	30 dBA above ambient
R-1	Huckleberry Ct. (Residential)	43	45	55	65	75
R-2	83 Lily Ct. (Residential)	43	45	55	65	75
R-3	1 Butterweed Ln. (Residential)	43	45	55	65	75
R-4	37 Lupine Valley Ct. (Residential)	43	45	55	65	75
R-5	821 Swallowtail Ct. (Residential)	43	45	55	65	75
R-6	Swallowtail Ct. (Residential)	43	45	55	65	75
R-7	Mission Blue Center (Commercial)	43	45	55	65	75
R-8	Mission Blue Baseball field (Commercial)	43	45	55	65	75
R-9	1 Tanager Ct. (Residential)	41	45	55	65	75
R-10	211 Mission Blue Dr. (Residential)	47	47	57	67	77
R-11	143 Kestrel Ct. (Residential)	47	47	57	67	77
R-12	Valley Dr. w/o North Hill Dr. (Commercial)	53	53	63	73	83
R-13	Valley Drive e/o North Hill Dr. (Comm.)	61	61	71	81	91
R-14	Lipman Middle School (School)	49	49	59	69	79
R-15	Trinity Rd. – Ground level (Residential)	49	49	59	69	79
R-16	Trinity Rd. – 2 nd level (Residential)	49	49	59	69	79
R-17	99A S Hill Dr. (Commercial)	48	48	58	68	78
R-18	111 S Hill Dr. (Commercial)	48	48	58	68	78
R-19	155 S Hill Dr. (Commercial)	48	48	58	68	78
R-20	San Bruno Mountain Ridge Trail (Trail)	45	45	55	65	75
R-21	Ridge Path Owl/Buckeye Cyn (Trail)	45	45	55	65	75
R-22	Ridge Trail east of Buckeye Cyn (Trail)	45	45	55	65	75

Source: Coffman Engineers, Inc.

*Based on noise measurements at representative noise measurements shown in Figure 1.

The following sections discuss our methodology for calculating noise levels from different noise sources.

Mechanical Ventilation Equipment

The proposed project building will have mechanical equipment generally associated with building ventilation. These will consist of rooftop air-conditioning units at the office areas of the project, and ventilation fans. At the time of this report, the design of the mechanical ventilation system is not known. For the purpose of this report, the analysis of the project's mechanical equipment noise assumes roof mounted exhaust ventilators and packaged rooftop heat pump units. The reference sound powers are 88 dBA for the roof exhaust ventilator⁹ and 79 dBA for the packaged rooftop heat pump¹⁰ based on data for representative equipment. The SoundPLAN noise model includes 6 packaged heat pump units at each of the four rooftop corners of the office area ("front" of building) and 58 rooftop exhaust ventilators on the main warehouse/distribution area. Although powered rooftop equipment is not expected at the warehouse portion of the project building, the noise modeling includes the rooftop exhaust ventilators on the warehouse portion of the roof to provide a conservative assessment. Since noise from mechanical ventilation equipment is relatively steady, and would occur more than 10 minutes in an hour, the L_{17} and L_{eq} are assumed to be equal.

Truck Circulation, Loading Dock and Traffic on Project Site Access Roads

The Project will be served by two access roads off South Hill Drive. The east access road follows the existing Quarry Road alignment, and the west access road is a new alignment. The SoundPLAN noise model includes vehicles traveling on the access roads using the Federal Highway Administration's Traffic Noise Model source data which includes increased noise adjustments for trucks traveling uphill. The traffic volumes are based on the peak hour data shown in Table 17 and it is assumed that the vehicles would be split equally between the project's west and east access roads. To convert the L_{eq} from the Traffic Noise Model to the L_{17} metric used for comparison with the City's municipal code, a factor of 0.9 dBA was added to the L_{eq} noise level based on the difference between L_{17} and L_{eq} measured at location ST-3.

According to the Project Description, the circulation strategy at the warehouse development is to separate passenger vehicle traffic from tractor trailer traffic. At the project warehouse development, the passenger vehicles will turn into a parking garage while trucks will continue straight and circulate the warehouse.

To model the noise from parking events, the SoundPLAN model included Parking Lot noise elements at all the parking areas. This includes a total of 1,401 parking stalls as shown in the Conceptual Massing Study (dated 01/12/2023) at the parking garage, the two surface level parking lots, and a rooftop parking area at the roof of the Project warehouse's level 2. For the purpose of this analysis, we assumed that there would be a constant amount of parking lot activity and it would take more than 10 minutes for all the

⁹ COOK ACRUD-HP Upblast Centrifugal Roof Mounted Exhaust Ventilator, Catalog Number 195RH17D

¹⁰ Carrier 6-ton Weathermaker packaged rooftop unit, 50FCQM07A2A6-0A0A0

parking lots to be filled or emptied. Therefore, we assumed that the L_{eq} and L_{17} noise level from parking lot are equal.

To model the medium and heavy trucks circulating and maneuvering around the project building, the SoundPLAN model included roadway noise source elements around the building. The Project's peak-hour trips of 21.6 for heavy trucks and 3.4 for medium trucks representing the noisiest loading dock hour were used as inputs to the roadway noise source element. Roadways simulating heavy trucks maneuvering in and out of the loading docks were also specifically added. Based on the truck travel distance around the project building and assuming that the peak-hour truck trips are evenly distributed during the peak-hour, noise from trucks would occur more than 10 minutes in an hour and be relatively constant. Therefore, the L_{17} and L_{eq} from truck noise were assumed to be equal.

Other noise sources associated with medium and heavy trucks are backup beepers and venting truck brakes. Since backup beepers would likely be used while trucks are maneuvering, a beeper noise source at the east and west sides of the warehouse is included in the noise model. For the purposes of this analysis, the assumption was that there would always be one backup beeper at each side of the building during the hours of operation. Each of the modeled backup beeper has a noise level of 97 dBA at 4 feet based on a commercial backup beeper (Mallory Back-up Alarm Model STA20502). Since the assumption was that there would always be one backup beeper at each side of the building, the sound of the backup beeper was assumed to be relatively constant so the L_{17} and L_{eq} from backup beeper noise are also assumed to be equal. Noise from venting truck brakes generate a "hiss" sound that is short in duration but is expected to be the loudest noise source. The noise model included a truck venting brake on each side of the warehouse. The modeled venting brake noise has a sound power level of 120 dBA based on SoundPLAN's system library.

Table 22 and Table 24 show the calculated noise levels at the receivers for assessing compliance with the Municipal Code's L_{17} criteria (cumulative duration of 10 minutes in an hour) and L_{max} criteria, respectively. In general, the L_{17} criteria is more restrictive than the L_{max} criteria since the L_{17} standard is 10 dBA above the ambient while the L_{max} standard is 30 dBA above the ambient. Truck venting brakes is not included in the L_{17} assessment since the cumulative duration of trucks venting brakes would not exceed 10 minutes per hour. Noise from venting brakes is assessed with respect to the L_{max} standard (Table 23).

Table 22: On-Site Project Noise Summary

Receiver		Project Generated Noise Level L ₁₇ , dBA							Exceed Criteria?
		Vehicles on Access Roads	Truck at Loading Docks	Backup Beepers at Loading Docks	Parking Lots	Rooftop HVAC equip	Total	Criteria	
R-1	Huckleberry Ct.	27	33	19	29	31	37	55	No
R-2	83 Lily Ct.	30	34	29	27	29	38	55	No
R-3	1 Butterweed Ln.	30	34	31	28	28	38	55	No
R-4	37 Lupine Valley Ct.	36	38	33	30	32	42	55	No
R-5	821 Swallowtail Ct.	37	38	25	32	36	42	55	No
R-6	Swallowtail Ct.	39	39	37	33	36	44	55	No
R-7	Mission Blue Center	40	40	38	31	33	45	55	No
R-8	Mission Blue Baseball field	37	37	35	29	31	42	55	No
R-9	1 Tanager Ct	35	37	33	28	32	41	55	No
R-10	Mission Blue Dr	37	39	35	29	31	43	57	No
R-11	143 Kestrel Ct	37	37	35	29	33	42	57	No
R-12	Valley Dr. w/o North Hill Dr.	38	39	32	34	37	43	63	No
R-13	Valley Drive e/o North Hill Dr.	33	31	27	27	29	37	71	No
R-14	Lipman Middle School	37	35	36	27	31	41	59	No
R-15	Trinity Rd. – Ground level	35	33	32	24	26	39	59	No
R-16	Trinity Rd. – 2 nd level	34	33	32	24	28	39	59	No
R-17	99A S Hill Dr.	53	35	28	28	33	53	58	No
R-18	111 S Hill Dr.	49	34	27	27	35	50	58	No
R-19	155 S Hill Dr.	50	42	29	29	39	51	58	No
R-20	San Bruno Mountain Ridge Trail	25	38	36	29	32	42	55	No
R-21	Ridge Path Owl/Buckeye Cyn	38	37	38	27	31	43	55	No
R-22	Ridge Trail east of Buckeye Cyn	37	35	34	24	27	40	55	No

Source: Coffman Engineers, Inc.

Appendix D also shows the L₁₇ noise contours from on-site operational noise sources.

Table 23: Maximum Instantaneous Noise Levels from Short-Term Events

Receiver		L _{max} , dBA		Exceed Criteria?
		Truck Venting Brakes	Criteria	
R-1	Huckleberry Ct.	35	75	No
R-2	83 Lily Ct.	39	75	No
R-3	1 Butterweed Ln.	40	75	No
R-4	37 Lupine Valley Ct.	42	75	No
R-5	821 Swallowtail Ct.	41	75	No
R-6	Swallowtail Ct.	46	75	No
R-7	Mission Blue Center	47	75	No
R-8	Mission Blue Baseball field	44	75	No
R-9	1 Tanager Ct	44	75	No
R-10	Mission Blue Dr	45	77	No
R-11	143 Kestrel Ct	46	77	No
R-12	Valley Dr. w/o North Hill Dr.	48	83	No
R-13	Valley Drive e/o North Hill Dr.	43	91	No
R-14	Lipman Middle School	44	79	No
R-15	Trinity Rd. – Ground level	40	79	No
R-16	Trinity Rd. – 2 nd level	41	79	No
R-17	99A S Hill Dr.	40	78	No
R-18	111 S Hill Dr.	40	78	No
R-19	155 S Hill Dr.	42	78	No
R-20	San Bruno Mountain Ridge Trail	48	75	No
R-21	Ridge Path Owl/Buckeye Cyn	48	75	No
R-22	Ridge Trail east of Buckeye Cyn	42	75	No

Source: Coffman Engineers, Inc.

The calculated noise levels associated with the operation of the project are generally comparable to the minimum ambient noise levels at the residential areas in the project vicinity. Although the project noise may be audible and identifiable at times at the residential areas, it would generally tend to blend in with the ambient noise environment. Table 22 and Table 23 show that project-generated on-site noise does not exceed the L₁₇ and L_{max} criteria at the neighboring receivers.

Trucks traveling on the access roads will generate short-duration noise events at the existing commercial land uses adjacent to the access roads. Based on the FHWA Model TNM's reference sound level of 80 dBA at 50 feet for a "full-throttle" heavy truck, the calculated maximum instantaneous noise level from a heavy truck passby ranges from 69 to 78 dBA at the nearest commercial/industrial buildings along South Hill Drive, which is below the L_{max} standard.

Emergency Engine Generator

An emergency engine generator would be located on the project site in a weatherproof enclosure. Its noise level and location are not known at this time. The generator is expected to operate during emergencies and for periodic testing. The City's municipal code exempts noise resulting from emergencies; however, it does not state whether emergency generators are subject to the noise limits during testing. If the generator is subject to the noise ordinance, it will need to be located and/or enclosed to meet the noise limits at the nearest receiver (i.e. commercial land uses to the north). Based on data for generators at similar facilities, the generator with a weatherproof enclosure would generate a noise level up to 84 dBA at 23 feet. For the Project, this corresponds to a noise level of 45 dBA at the nearest residential units. This noise level would meet the noise ordinance limits at the residential area. This noise level also would tend to blend in with the existing background noise during daytime testing. Because the generator would operate only during emergencies and for periodic daytime testing, its noise is not included in the project noise assessment tables in this report.

Increase in Noise Assessment

The project-generated increase in noise from the combination of all the on-site noise sources is also assessed with respect to the thresholds of Table 12. Table 24 shows the increase in CNEL with the project. In this analysis, the *Existing* noise levels are based on the measured ambient noise levels and the *Existing + Project* noise levels are the combined noise level from the ambient and project generated noise. The daily variation in traffic circulation and loading dock activity is based on an hours of operations between 5 a.m. to 10 p.m. per the traffic hourly distribution shown in Table 17. The rooftop mechanical equipment is assumed to operate on a continuous basis during the hours of operation.

Table 24: Increase in CNEL with Project from all On-Site Noise Sources

Receiver		CNEL, dBA			Increase
		Existing	Project	Existing + Project	
R-1	Huckleberry Ct.	54.6	38.2	54.7	0.1
R-2	83 Lily Ct.	54.6	39.1	54.7	0.1
R-3	1 Butterweed Ln.	54.3	39.2	54.4	0.1
R-4	37 Lupine Valley Ct.	54.3	43.2	54.6	0.3
R-5	821 Swallowtail Ct.	54.3	43.6	54.7	0.4
R-6	Swallowtail Ct.	54.3	45.8	54.9	0.6
R-7	Mission Blue Center	54.3	46.0	54.9	0.6
R-8	Mission Blue Baseball field	54.3	43.2	54.6	0.3
R-9	1 Tanager Ct	57.6	42.1	57.7	0.1
R-10	Mission Blue Dr	63.6	43.9	63.6	< 0.1
R-11	143 Kestrel Ct	63.6	43.2	63.6	< 0.1
R-12	Valley Dr. w/o North Hill Dr.	64.9	44.9	64.9	< 0.1
R-13	Valley Drive e/o North Hill Dr.	72.4	38.0	72.4	< 0.1
R-14	Lipman Middle School	64.8	42.6	64.8	< 0.1
R-15	Trinity Rd. – Ground level	64.8	39.7	64.8	< 0.1
R-16	Trinity Rd. – 2 nd level	64.8	40.0	64.8	< 0.1
R-17	99A S Hill Dr.	64.6	53.8	65.0	0.3
R-18	111 S Hill Dr.	64.6	50.3	64.8	0.2
R-19	155 S Hill Dr.	64.6	52.1	64.9	0.2
R-20	San Bruno Mountain Ridge Trail	54.4	43.1	54.7	0.3
R-21	Ridge Path Owl/Buckeye Cyn	54.4	44.1	54.8	0.4
R-22	Ridge Trail east of Buckeye Cyn	54.4	41.6	54.6	0.2

Based on Table 24, the increase in CNEL due to the project is less than 1 dBA at the nearby residences, school, and industrial/commercial land uses.

6.4 Airport Noise

6.4.1.1 *Thresholds of Evaluation*

This analysis determines whether the project would expose people working in the project area to excessive aircraft noise levels.

6.4.1.2 *Airport Noise Assessment*

According to the 2012 Comprehensive Airport Land Use Compatibility Plan (ALUCP) for the Environs of San Francisco International Airport Exhibit IV-5, the project site is located outside the CNEL 65 dBA aircraft noise contour and within “Airport Influence Area A”. Per Policy IP-1, the project has real estate disclosure requirements regarding the potential for annoyances associated with proximity to airport operations (e.g. noise).

According to the ALUCP’s Table IV-1, commercial, industrial and production land uses are compatible with aircraft noise at any level and may be permitted without any special requirements related to the attenuation of aircraft noise.

*

*

*

Appendix A PG&E Power Routing

Figure A1: PG&E Power Routing – Overview



PRIMARY POWER ROUTING
SF MARTIN SUBSTATION TO QUARRY ROAD PROJECT
(OVERHEAD VIEW START TO FINISH - PRIMARY POWER)
Overall ~ 2.33 Miles: See Routing Coordination Pages

Figure A2: PG&E Power Routing



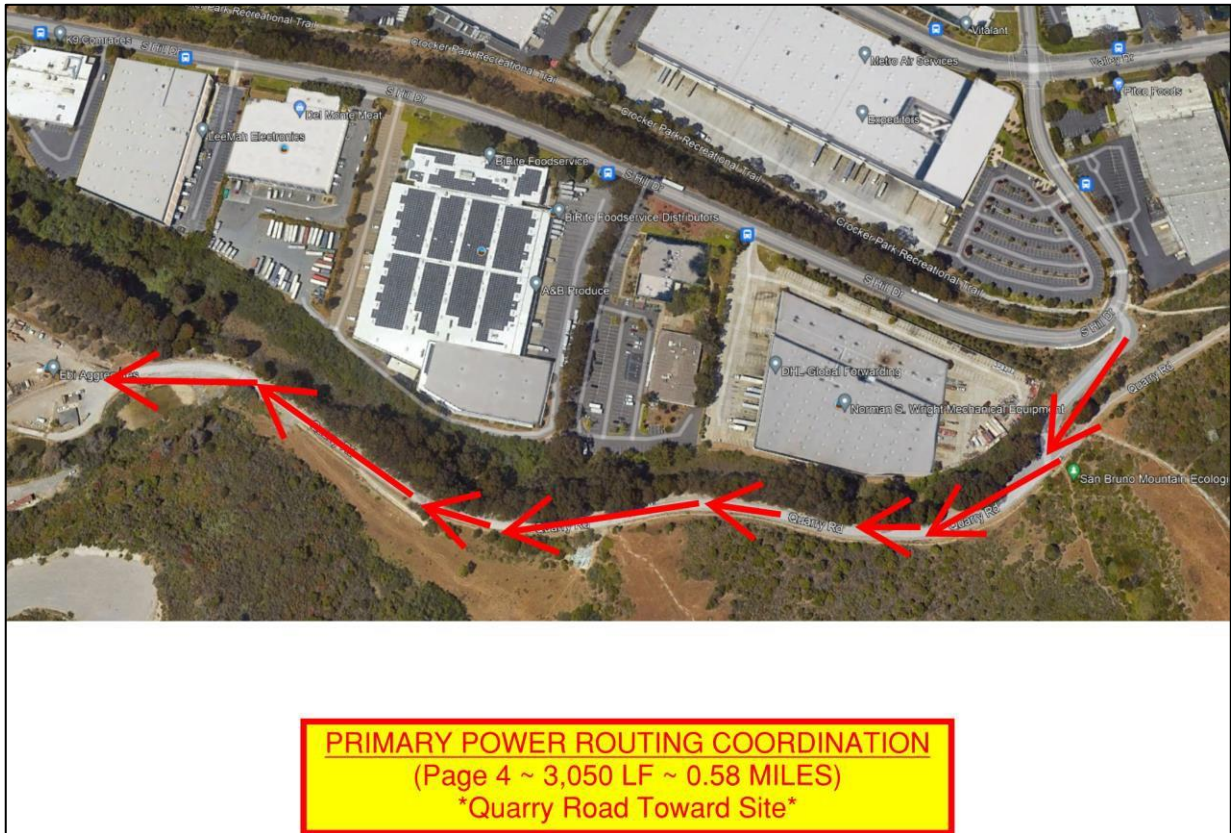
Figure A3: PG&E Power Routing



Figure A4: PG&E Power Routing



Figure A5: PG&E Power Routing



Appendix B Construction Noise Calculations

Equations to for Construction Noise:

$$SPL_D = SPL_{ref} + 20 \cdot \log(D_{ref}/D)$$

$$L_{eq} = SPL_d + 10 \cdot \log(N) + 10 \cdot \log(\text{Usage Factor})$$

$$\text{Phase } L_{eq} = 10 \cdot \log(10^{(0.1 \cdot L_{eq,1})} + 10^{(0.1 \cdot L_{eq,2})} + \dots + 10^{(0.1 \cdot L_{eq,n})})$$

Table B1: Project Building Site Construction Noise at Property Line

Phase	Equipment	N	Usage Factor	Ref SPL, dBA	Ref Dist, feet	Distance, feet	10logN, dBA	10log Usage Factor dBA	20log (D _{ref} /D) dBA	L _{eq} , dBA	Phase L _{eq} , dBA
Rough Grading and Site Walls	Scraper	9	40%	84	50	37	10	-4.0	2.6	92	95
	Compactor	3	20%	83	50	37	5	-7.0	2.6	83	
	Excavator	2	40%	81	50	37	3	-4.0	2.6	83	
	Loader	1	40%	79	50	37	0	-4.0	2.6	78	
	Dozer	4	40%	82	50	37	6	-4.0	2.6	87	
	Gradall Forklift	1	40%	83	50	37	0	-4.0	2.6	82	
	Bobcat	1	40%	78	50	37	0	-4.0	2.6	77	
	Auger Drill Rig	1	20%	84	50	37	0	-7.0	2.6	80	
	Dump Truck	1	40%	76	50	37	0	-4.0	2.6	75	
	Backhoe	1	40%	78	50	37	0	-4.0	2.6	77	
	Impact Hammer (Hoe Ram)	1	20%	90	50	115	0	-7.0	-7.2	76	
Site Work	Dozer	1	40%	82	50	37	0	-4.0	2.6	81	88
	Scraper	1	40%	84	50	37	0	-4.0	2.6	83	
	Roller	5	20%	80	50	37	7	-7.0	2.6	83	
	Loader	2	40%	79	50	37	3	-4.0	2.6	81	
	Paver	1	50%	77	50	37	0	-3.0	2.6	77	
	DDC	1	100%	76	50	90	0	0.0	-5.1	71	
	Dump Truck	1	40%	76	50	37	0	-4.0	2.6	75	
Site Utilities	Excavator	4	40%	81	50	37	6	-4.0	2.6	86	88
	Backhoe	1	40%	78	50	37	0	-4.0	2.6	77	
	Loader	2	40%	79	50	37	3	-4.0	2.6	81	
	Dump Truck	1	40%	76	50	37	0	-4.0	2.6	75	
	Truck Crew	1	40%	76	50	37	0	-4.0	2.6	75	
Vertical Construction	Crane	1	16%	81	50	90	0	-8.0	-5.1	68	79
	Forklift	1	40%	78	50	90	0	-4.0	-5.1	69	
	Gradall	2	40%	83	50	90	3	-4.0	-5.1	77	
	Flat Bed Truck	1	40%	83	50	90	0	-4.0	-5.1	74	
Slab on Grade	Concrete Mixer	5	40%	79	50	90	7	-4.0	-5.1	77	81
	Concrete Pumper	5	20%	81	50	90	7	-7.0	-5.1	76	
	Auger Drill Rig	2	20%	84	50	90	3	-7.0	-5.1	75	

Table B2: Access Road Construction Noise at Property Line – Closest Distance

Phase	Equipment	N	Usage Factor	Ref SPL, dBA	Ref Dist, feet	Distance, feet	10logN, dBA	10log Usage Factor dBA	20log (D _{ref} /D) dBA	L _{eq} , dBA	Phase L _{eq} , dBA
Quarry Road Construction	Dozer	1	40%	82	50	38	0	-4.0	2.5	80	87
	Scraper	1	40%	84	50	38	0	-4.0	2.5	82	
	Roller	1	20%	80	50	38	0	-7.0	2.5	75	
	Loader	2	40%	79	50	38	3	-4.0	2.5	80	
	Paver	1	50%	77	50	38	0	-3.0	2.5	76	
	Dump Truck	1	40%	76	50	38	0	-4.0	2.5	74	

Table B3: Access Road Construction Noise at Property Line – Typical Distance

Phase	Equipment	N	Usage Factor	Ref SPL, dBA	Ref Dist, feet	Distance, feet	10logN, dBA	10log Usage Factor dBA	20log (D _{ref} /D) dBA	L _{eq} , dBA	Phase L _{eq} , dBA
Quarry Road Construction	Dozer	1	40%	82	50	92	0	-4.0	-5.3	73	79
	Scraper	1	40%	84	50	92	0	-4.0	-5.3	75	
	Roller	1	20%	80	50	92	0	-7.0	-5.3	68	
	Loader	2	40%	79	50	92	3	-4.0	-5.3	73	
	Paver	1	50%	77	50	92	0	-3.0	-5.3	69	
	Dump Truck	1	40%	76	50	92	0	-4.0	-5.3	67	

Table B4: Access Road Construction Noise at Property Line – Nearest Commercial/Industrial Building on South Hill Drive

Phase	Equipment	N	Usage Factor	Ref SPL, dBA	Ref Dist, feet	Distance, feet	10logN, dBA	10log Usage Factor dBA	20log (D _{ref} /D) dBA	L _{eq} , dBA	Phase L _{eq} , dBA
Quarry Road Construction	Dozer	1	40%	82	50	45	0	-4.0	0.9	79	86
	Scraper	1	40%	84	50	45	0	-4.0	0.9	81	
	Roller	1	20%	80	50	45	0	-7.0	0.9	74	
	Loader	2	40%	79	50	45	3	-4.0	0.9	79	
	Paver	1	50%	77	50	45	0	-3.0	0.9	75	
	Dump Truck	1	40%	76	50	45	0	-4.0	0.9	73	

Table B5: Access Road Construction Noise at Property Line – Lipman Middle School

Phase	Equipment	N	Usage Factor	Ref SPL, dBA	Ref Dist, feet	Distance, feet	10logN, dBA	10log Usage Factor dBA	20log (D _{ref} /D) dBA	L _{eq} , dBA	Phase L _{eq} , dBA
Quarry Road Construction	Dozer	1	40%	82	50	370	0	-4.0	-17.4	61	67
	Scraper	1	40%	84	50	370	0	-4.0	-17.4	63	
	Roller	1	20%	80	50	370	0	-7.0	-17.4	56	
	Loader	2	40%	79	50	370	3	-4.0	-17.4	61	
	Paver	1	50%	77	50	370	0	-3.0	-17.4	57	
	Dump Truck	1	40%	76	50	370	0	-4.0	-17.4	55	

Table B6: PG&E Routing Noise at Property Line – Reference Distance at 50 feet

Phase	Equipment	N	Usage Factor	Ref SPL, dBA	Ref Dist, feet	Distance, feet	10logN, dBA	10log Usage Factor dBA	20log (D _{ref} /D) dBA	L _{eq} , dBA	Phase L _{eq} , dBA
PGE Electrical Routing Construction	Excavator	2	40%	81	50	50	3	-4.0	0.0	80	88
	Loader	2	40%	79	50	50	3	-4.0	0.0	78	
	Roller	1	20%	80	50	50	0	-7.0	0.0	73	
	Water Truck	1	20%	81	50	50	0	-7.0	0.0	74	
	Sweeper Truck	1	10%	82	50	50	0	-10.0	0.0	72	
	Dump Truck	2	40%	76	50	50	3	-4.0	0.0	75	
	Crew Truck	1	40%	76	50	50	0	-4.0	0.0	72	
	Concrete Saw	2	20%	90	50	50	3	-7.0	0.0	86	

Table B7: PG&E Routing Noise at Property Line

Roadway	Distance, feet	Construction Noise L _{eq} , dBA
Geneva Avenue	71	85
Bayshore Blvd	50	88
Guadalupe Canyon Parkway	50	88
North Hill Drive	32	92
South Hill Drive	32	92

Appendix C Off-Site Traffic Noise Calculations

Existing Traffic Calculations

Roadway	Segment Limits		Vehicles per Hour	Heavy Trucks	Speed, mph	Ground	Distance, feet	Peak-Hour Leq, dBA	CNEL at 50 feet, dBA
South Hill Drive	Quarry Road	Valley Drive	224	1.1%	25	Hard	50	54.8	56.2
	Quarry Road (Project south access road)	Project North Access road	224	1.1%	25	Hard	50	54.8	56.2
North Hill Drive	Valley Drive	Guadalupe Canyon Parkway	376	1.1%	35	Hard	50	60.4	61.8
Guadalupe Canyon Parkway	North Hill Drive	Carter Street	572	0.7%	50	Hard	50	66.7	68.1
	North Hill Drive	Bayshore Boulevard	759	1.4%	50	Hard	50	68.2	69.6
Valley Drive	South Hill Drive	Bayshore Boulevard	469	1.0%	40	Hard	50	63.0	64.4
Bayshore Boulevard	Tunnel Avenue	Geneva Avenue	1,960	1.5%	45	Hard	50	70.9	72.3
	Geneva Avenue	Guadalupe Canyon Parkway	2,026	1.3%	45	Hard	50	71.0	72.4
	Guadalupe Canyon Parkway	Valley Drive	2,051	1.3%	45	Hard	50	71.0	72.4
	Valley Drive	Old County Road / Tunnel Ave	2,110	1.3%	45	Hard	50	71.2	72.6
	Old County Road / Tunnel Ave	Airport Boulevard / US-101S Ramps	2,359	1.4%	45	Hard	50	71.7	73.1
Tunnel Avenue	Bayshore Boulevard	Lagoon Road	511	2.9%	35	Hard	50	62.8	64.2
Lagoon Road	Tunnel Avenue	Sierra Point Parkway / US-101S Ramps	207	2.4%	35	Hard	50	58.6	60.0

Project-Generated Traffic Noise Calculations

Roadway	Segment Limits		VPH, Passenger Cars	VPH, Medium Trucks	VPH, Heavy Trucks	Speed, mph	Ground	Distance, feet	CNEL at 50 feet, dBA
South Hill Drive	Quarry Road	Valley Drive	179	3	22	25	Hard	50	61.5
	Quarry Road (Project south access road)	Project North Access road	90	2	11	25	Hard	50	58.4
North Hill Drive	Valley Drive	Guadalupe Canyon Parkway	46	0	0	35	Hard	50	51.3
Guadalupe Canyon Parkway	North Hill Drive	Carter Street	46	1	3	50	Hard	50	58.7
	North Hill Drive	Bayshore Boulevard	0	1	3	50	Hard	50	55.1
Valley Drive	South Hill Drive	Bayshore Boulevard	135	3	22	40	Hard	50	63.6
Bayshore Boulevard	Tunnel Avenue	Geneva Avenue	73	2	11	45	Hard	50	61.7
	Geneva Avenue	Guadalupe Canyon Parkway	78	2	11	45	Hard	50	62.0
	Guadalupe Canyon Parkway	Valley Drive	78	2	14	45	Hard	50	62.6
	Valley Drive	Old County Road / Tunnel Ave	59	1	7	45	Hard	50	60.3
	Old County Road / Tunnel Ave	Airport Boulevard / US-101S Ramps	54	1	7	45	Hard	50	60.2
Tunnel Avenue	Bayshore Boulevard	Lagoon Road	0	0	0	35	Hard	50	0
Lagoon Road	Tunnel Avenue	Sierra Point Parkway / US-101S Ramps	0	0	0	35	Hard	50	0

Calculations for Land Uses at South Hill Drive and Valley Drive

Roadway	Segment Links		Existing CNEL	Project CNEL	Existing + Project	Increase
South Hill Drive	Quarry Road	Valley Drive	56.2	61.5	62.6	
Valley Drive	South Hill Drive	Bayshore Boulevard	64.4	63.6	67.0	
		total	65.0	65.7	68.3	3.4

Cumulative without Project Traffic Calculations

Roadway	Segment Limits		Vehicles per Hour	Heavy Trucks	Speed, mph	Ground	Distance, feet	Peak-Hour Leq, dBA	CNEL at 50 feet, dBA
South Hill Drive	Quarry Road	Valley Drive	385	0.6%	25	Hard	50	56.6	58.0
	Quarry Road (Project south access road)	Project North Access road	382	0.7%	25	Hard	50	56.6	58.0
North Hill Drive	Valley Drive	Guadalupe Canyon Parkway	635	1.1%	35	Hard	50	62.7	64.1
Guadalupe Canyon Parkway	North Hill Drive	Carter Street	2197	0.6%	50	Hard	50	72.5	73.9
	North Hill Drive	Bayshore Boulevard	2143	1.3%	50	Hard	50	72.6	74.0
Valley Drive	South Hill Drive	Bayshore Boulevard	958	0.5%	40	Hard	50	65.8	67.2
Bayshore Boulevard	Tunnel Avenue	Geneva Avenue	2505	1.1%	45	Hard	50	71.8	73.2
	Geneva Avenue	Guadalupe Canyon Parkway	3350	0.8%	45	Hard	50	73.0	74.4
	Guadalupe Canyon Parkway	Valley Drive	3358	0.8%	45	Hard	50	73.0	74.4
	Valley Drive	Old County Road / Tunnel Ave	3373	1.0%	45	Hard	50	73.1	74.5
	Old County Road / Tunnel Ave	Airport Boulevard / US-101S Ramps	3416	1.1%	45	Hard	50	73.2	74.6

Calculations for Land Uses at South Hill Drive and Valley Drive

<i>Roadway</i>	<i>Segment Links</i>		Existing CNEL, dBA	Cumulative without Project CNEL, dBA	Project CNEL, dBA	Cumulative with Project CNEL, dBA	Increase (Existing to Cumulative with Project)	Project Contribution, dBA
<i>South Hill Drive</i>	<i>Quarry Road</i>	<i>Valley Drive</i>	56.2	58.0	61.5	63.1		
<i>Valley Drive</i>	<i>South Hill Drive</i>	<i>Bayshore Boulevard</i>	64.4	67.2	63.6	68.8		
		Total	65.0	67.7	65.7	69.8	4.8	2.1

Appendix D SoundPLAN Model Figures

Figure of SoundPLAN Model for Project-Generated On-Site Noise Sources

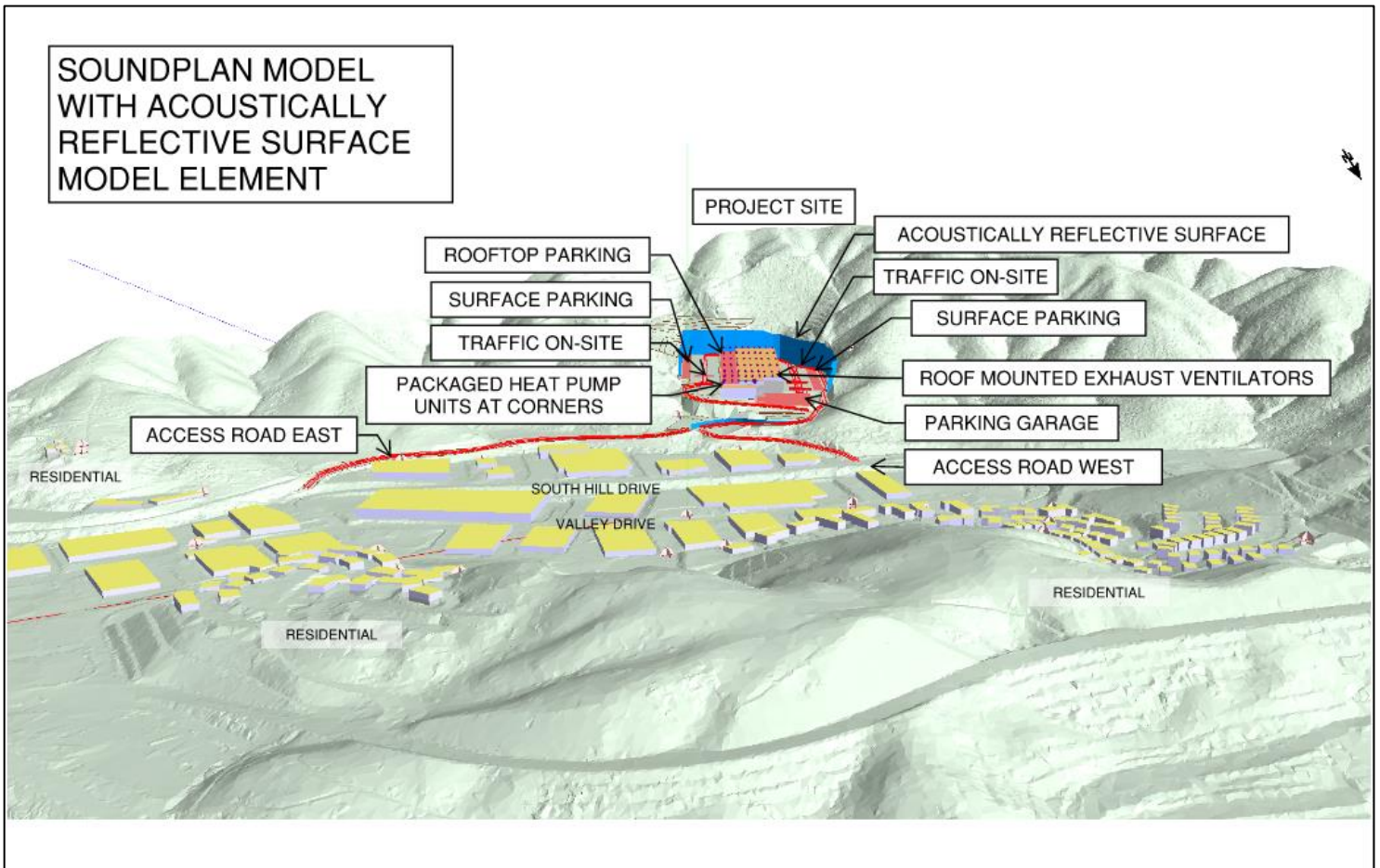
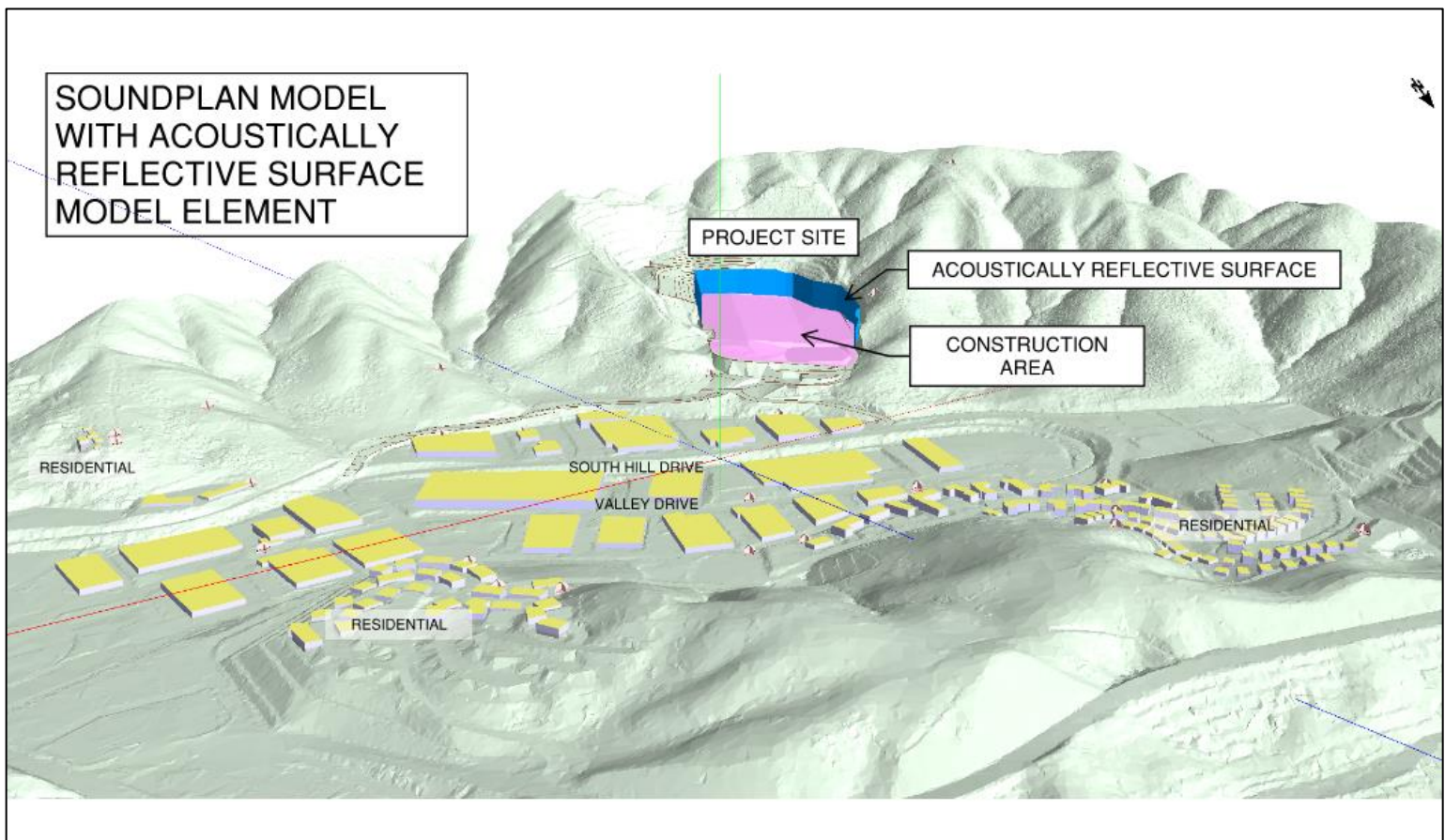


Figure of SoundPLAN Model for Project Building Construction



SoundPLAN L₁₇ Noise Contour from On-Site Operational Noise Sources

The noise contours represent the on-site operational noise sources and show how the noise propagates in the project vicinity. The contours were generated using the same SoundPLAN computer noise model that was used to calculate noise levels presented in the Noise Report. The noise sources include on-site truck circulation, loading, parking, HVAC and vehicles on the site access roads. The contours do not include ambient noise, project construction noise or off-project site traffic noise. The noise descriptor represented in the noise contours is the hourly L₁₇ during the noisiest hour of operation which is the descriptor used in the City of Brisbane's Municipal Code Noise Ordinance.

