Glenview Terrace Environmental Noise Assessment

City of San Bruno, California

March 17, 2021

jcb Project # 2019-125

Prepared for:

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Table of Contents

List of Figures

List of Tables

List of Appendices

INTRODUCTION

This report has been prepared to address the noise impacts due to and upon the Glenview Terrace residential development, located in the City of San Bruno, California. The proposed project includes the construction of 29 single-family homes on the northeast corner of San Bruno Avenue and Glenview Drive. Currently, the site includes a church, parking lot, and one single family home. The church and house are not in use and are vacant.

Figure 1 shows the project site plan and Figure 2 shows the project location.

The primary noise sources which may affect the project site include roadway traffic and potential aircraft operations associated with the San Francisco Airport.

The project may also contribute to increased traffic noise on the local street system. In addition, the project may result in construction noise and vibration impacts at nearby residences.

GENERAL NOTES:

1. BUILDING ROOF DRAINS FOR THE PORTIONS OF THE BUILDING THAT OVERHANG OVER THE DOWNHILL SLOPE WILL BE PIPED BACK TO THE DRAINAGE AREAS WITH A TREATMENT MEASURE.
2. ALL DEAD, DYING OR DISEASED TREES SHALL BE REMOVED.
3. ALL TREES ANDLANDSCAPING SHALL BE MAINTAINED TO MITIGATE FIRE HAZARD.
4. PHOTOVOLTAIC SYSTEM TO BE APPLIED UNDER SEPARATE PERMITS.
5. PRIVATE DRIVE TO BE DESIGNATED AS A "NO PARKING" AREA AND TO BE MARKED WITH RED CURBING AND SIGNAGE.
6. ALL RESIDENCES SHALL BE BACKLIT ADDRESS LIGHTING WITH A MINIMUM OF 4" NUMBERS.
7. STOP SIGNS SHALL BE PLACED AT ALL EXITS OF THE COMPLEX.
8. PROPER SIGNAGE SHALL BE POSTED AT ALL THE ENTRANCES TO REFLECT PRIVATE PROPERTY PARKING.
9. DESIGNATED FIRE LANES SHALL BE CLEARLY MARKED AND PAINTED PROPERLY FOR ENFORCEMENT PURPOSES.
10. SEE LANDSCAPE PLAN L-1 & L-2 FOR FENCE LOCATIONS & TYPES AND SEE A-11.2 FOR FENCE DETAILS.

APN: 019-042-150
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APN: 019-042-170

Location of 6-foot tall barrier

Figure 1
Glenview Terrace Site Plan

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Continuous 24-hour Noise Measurement Site

Short-term Noise Measurement Sites

Figure 2
Glenview Terrace Project Location

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ENVIRONMENTAL SETTING

Background Information on Noise and Vibration

<u>*Fundamentals of Acoustics*</u>

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels, but are expressed as dB, unless otherwise noted.

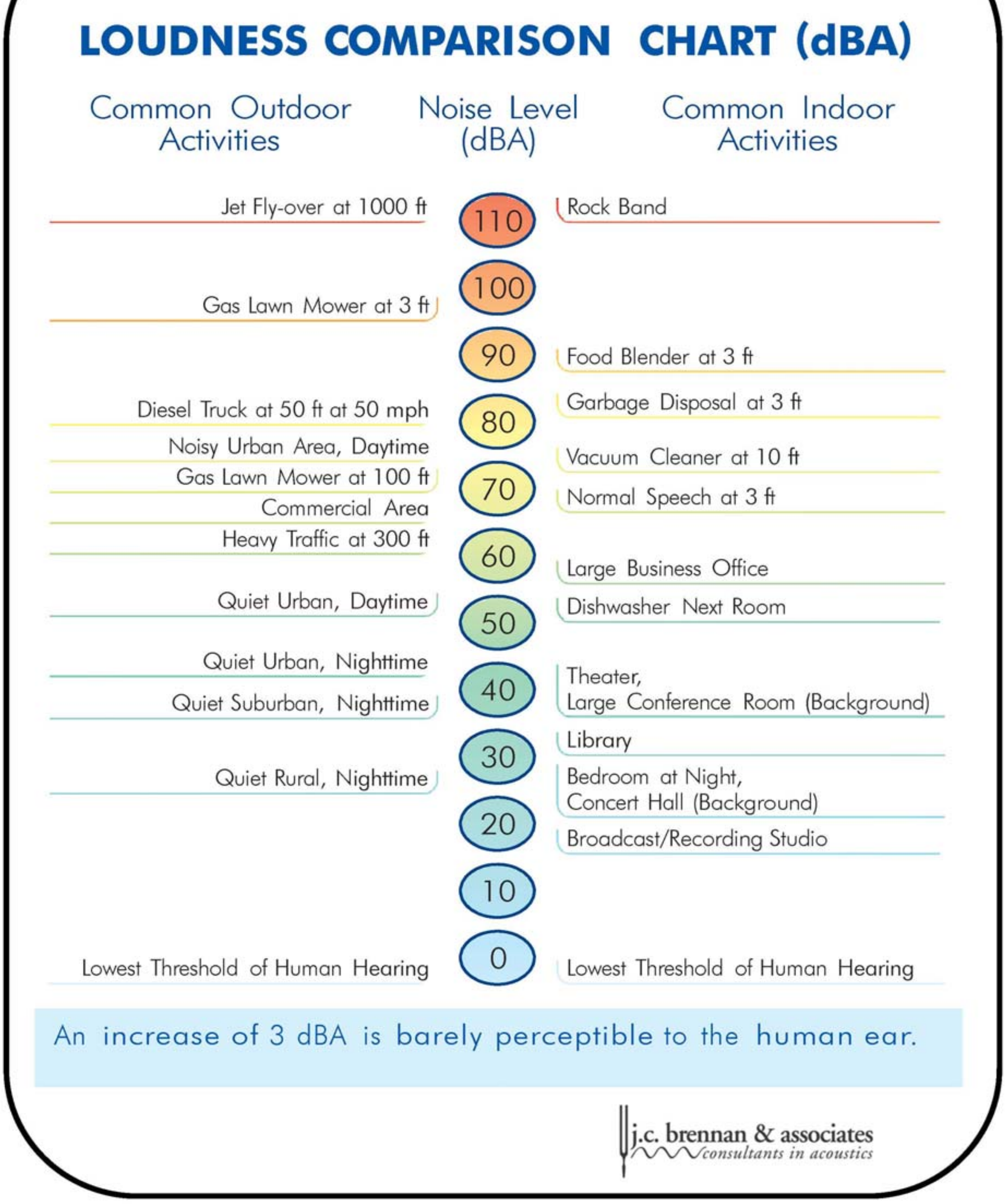
The decibel scale is logarithmic, not linear. In other words, two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. Appendix A provides a summary of acoustical terms used in this report.

Table 1


LOUDNESS COMPARISON CHART (dBA)
Common Outdoor Activities
Noise Level (dBA)
Common Indoor Activities
Jet Fly-over at 1000 ft
110
Rock Band
100
Gas Lawn Mower at 3 ft
90
Food Blender at 3 ft
Garbage Disposal at 3 ft
Diesel Truck at 50 ft at 50 mph
80
Noisy Urban Area, Daytime
Vacuum Cleaner at 10 ft
Gas Lawn Mower at 100 ft
70
Normal Speech at 3 ft
Commercial Area
Heavy Traffic at 300 ft
60
Large Business Office
Quiet Urban, Daytime
Dishwasher Next Room
50
Quiet Urban, Nighttime
Theater,
Large Conference Room (Background)
40
Quiet Suburban, Nighttime
Library
30
Quiet Rural, Nighttime
Bedroom at Night,
Concert Hall (Background)
20
Broadcast/Recording Studio
10
Lowest Threshold of Human Hearing
0
Lowest Threshold of Human Hearing
An increase of 3 dBA is barely perceptible to the human ear.
j.c. brennan & associates
consultants in acoustics

Effects of Noise on People

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

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

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, 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 an adverse response.

Surrounding Land Uses

Surrounding land uses include single-family residential units to the north and northwest, a park and open space to the west across Glenview Drive, commercial to the south across San Bruno Avenue, and open space to the east.

Existing Ambient Noise Levels

On September 10th - 11th, 2019, j.c. brennan & associates, Inc. staff conducted continuous 24-hour noise level measurements and short-term noise level measurements on the project site to quantify the existing ambient noise environment in the project vicinity. The noise measurement locations are shown on Figure 2. The noise level measurement survey results are provided in Table 2. Appendix B provides the complete results of the continuous noise level measurement survey.

Larson Davis Laboratories (LDL) Model 820 and Model 824 precision integrating sound level meters were used for the ambient noise level measurement survey. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

TABLE 2: EXISTING AMBIENT NOISE MONITORING RESULTS

Continuous 24-hour Noise Measurement Site **September 10 - 11, 2019**								
		Average Measured Hourly Noise Levels, dBA						
			Daytime (7:00 am – 10:00 pm)			**Nighttime (10:00 pm -7:00 am)**		
Site	**Location**	**L_{dn}**	**L_{eq}**	**L_{50}**	**L_{max}**	**L_{eq}**	**L_{50}**	**L_{max}**
A	Northcentral Portion of the Site	60.3	57.8	54.3	53.4	52.7	51.2	63.5

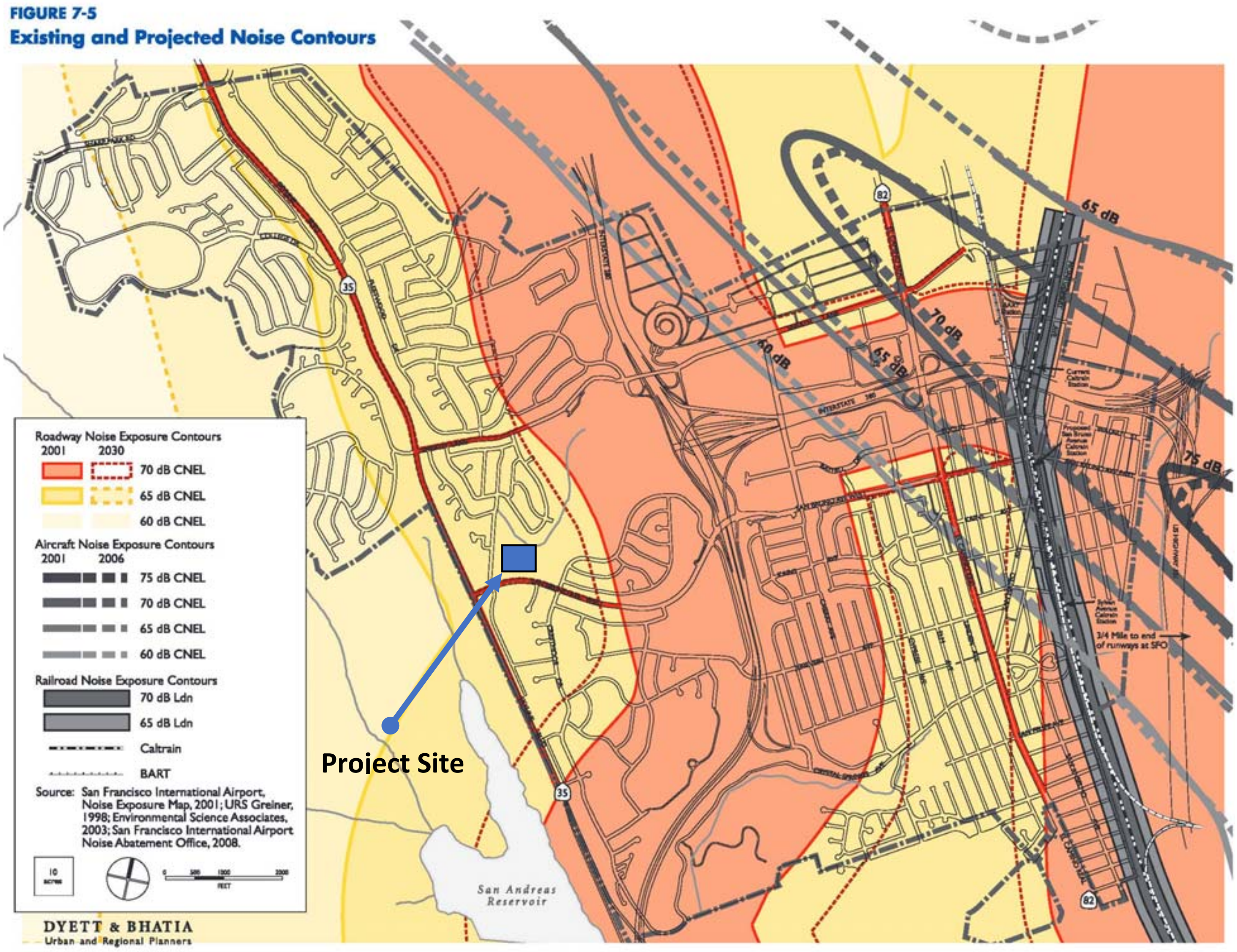
Short-Term Noise Measurement Sites **September 10, 2019**						
Site	**Location**	**Time**	**L_{eq}**	**L_{50}**	**L_{max}**	**Notes**
1	Adjacent to Glenview	11:20	56.8	55.8	64.7	Glenview Drive is Primary Source
2	Adjacent to San Bruno	11.55	60.1	57.7	75.7	San Bruno Avenue is Primary Source
Source: j.c. brennan & associates, Inc., 2019						

Based upon field observations and the data located in Table 2, the existing ambient noise levels at the project site are primarily defined by traffic along local roadways.

Chapter 7 of the City of San Bruno General Plan contains the Health and Safety Element. Figure 3 of this report (Figure 7-5 of the Health and Safety Element) shows the existing and future traffic noise and San Francisco Airport noise contours, as they relate to the proposed project site. Although these may be somewhat outdated, they give a general idea of potential noise impacts from roadway traffic and aircraft operations at the project site.

Figure 3

San Bruno General Plan Health and Safety Element Noise Contours



Source: San Bruno General Plan Health and Safety Element

Existing Roadway Noise Levels

As a means of updating the existing and future roadway noise levels analyses, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. The model is based upon the Calveno reference noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions.

Traffic volumes for existing conditions were obtained from the traffic study prepared by DKS Traffic Consultants. Truck percentages and vehicle speeds on the local area roadways were estimated from field observations.

Traffic noise levels are predicted at 75-feet from the centerline along each project-area roadway segment. Sensitive receptors may be located at distances which vary from the assumed calculation distance and may experience shielding from intervening barriers or sound walls. However, the traffic noise analysis is believed to be representative of the majority of sensitive receptors located closest to the project-area roadway segments analyzed in this report.

Table 3 shows the existing traffic noise levels in terms of L_{dn} at 75-feet from the centerline along each roadway segment. This table also shows the distances to existing traffic noise contours. A complete listing of the FHWA Model input data is contained in Appendix C.

The actual distances to noise level contours may vary from the distances predicted by the FHWA model due to roadway curvature, grade, shielding from local topography or structures, elevated roadways, or elevated receivers. The distances reported in Table 3 are generally considered to be conservative estimates of noise exposure along the project-area roadways.

TABLE 3: EXISTING NOISE LEVELS AND DISTANCES TO CONTOURS

Roadway	Segment	Exterior Noise Level, L_{dn} (dB) @ 75-feet	Distance to Contours (feet)		
			65 dB	60 dB	55 dB
San Bruno Avenue	East of Glenview Drive	62 dBA	49	106	229
Glenview Drive	San Bruno to Claremont Drive	57 dBA	23	50	107
Glenview Drive	Claremont to Plymouth Way	49 dBA	7	14	31
Earl Avenue	West of Glenview Drive	49 dBA	6	14	30
Claremont Drive	West of Glenview Drive	50 dBA	7	16	34
Claremont Drive	East of Glenview Drive	48 dBA	6	12	26
Skyline Boulevard	San Bruno to Sheath Lane	70 dBA	162	349	753
Skyline Boulevard	South of San Bruno Avenue	69 dBA	135	290	625
Notes: Distances to traffic noise contours are measured in feet from the centerlines of the roadways. Source: FHWA-RD-77-108 with inputs from DKS and j.c. brennan & associates, Inc. 2019.					

Existing San Francisco Airport Noise Levels

The 2019 San Francisco Airport (SFO) noise contours are shown on Figure 4 of this report. Based upon the Figure 4, the project site is located approximately 1.1 miles outside of the SFO 65 dBA CNEL noise contour.

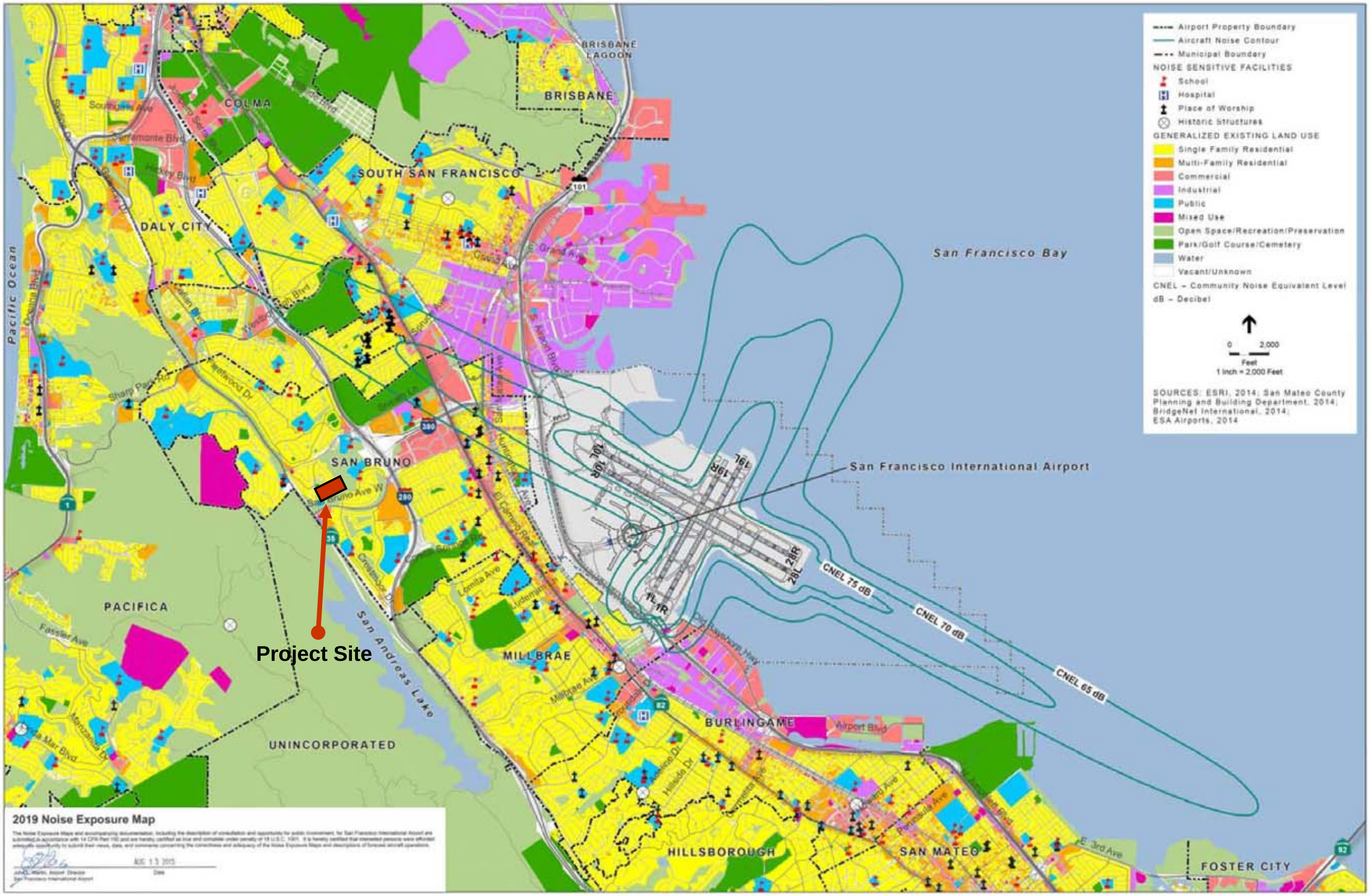


Figure 4

SFO – 2019 Noise Contours

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REGULATORY CONTEXT

Federal

There are no federal regulations related to noise that apply to the Proposed Project.

State

California Environmental Quality Act

The California Environmental Quality Act (CEQA) Guidelines, Appendix G, indicate that a significant noise impact may occur if a project exposes persons to noise levels in excess of local general plans or noise ordinance standards, or cause a substantial permanent or temporary increase in ambient noise levels.

California State Building Codes

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room.

Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

San Mateo County Comprehensive Airport Land Use Plan

The San Mateo County Airport Land Use Commission (ALUC) develops and implements the *San Mateo County Comprehensive Airport Land Use Plan (CLUP).* It is incorporated by reference in the San Bruno General Plan Health and Safety Element. It is discussed under the City General Plan standards.

City of San Bruno General Plan Noise Standards

The Goals and Policies of the San Bruno General Plan Health and Safety Element which are relative to this project are listed below. The General Plan noise standards are shown in Table 7-2 of the General Plan (Table 4 of this report). These apply to areas outside of the airport noise impacted areas. County airport land use compatibility noise standards as per Table 7-1 (Table 5 of this report) apply to those areas impacted by the SFO operations.

TABLE 4: CITY OF SAN BRUNO LAND USE COMPATIBILITY NOISE LEVEL STANDARDS

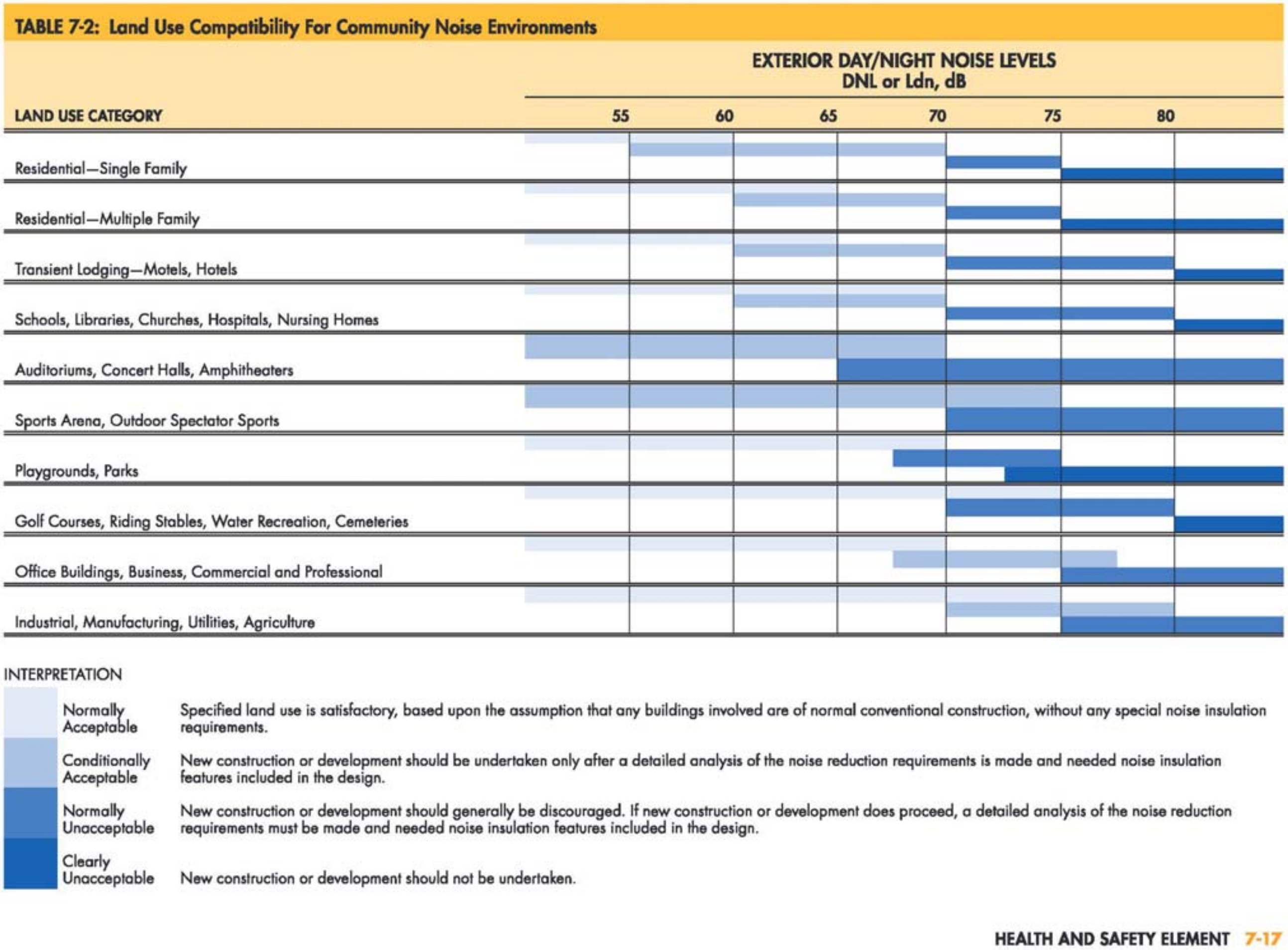

TABLE 5: SAN MATEO COUNTY AIRPORT LAND USE COMPATIBILITY NOISE LEVEL STANDARDS

TABLE 7-1: San Mateo County Comprehensive Airport Land Use Plan Noise/Land Use Compatibility Standards

LAND USE	GENERAL LAND USE CRITERIA, CNELA		
	COMPATIBLE *No special noise insulation requirements for new construction*	**CONDITIONALLY COMPATIBLE** *New development should be undertaken only after analysis and including needed noise insulation features in design*	**INCOMPATIBLE** *New construction should not be undertaken unless related to airport activities or services. Special noise insulation features should be included in construction*
RESIDENTIAL: single- and multi-family, mobile homes, schools, libraries, churches, hospitals, nursing homes, and auditoriums	Less than 65	65 to 70	More than 70
COMMERCIAL: retail, restaurants, office buildings, hotels, motels, movie theaters, sports arenas, playgrounds, cemeteries, and golf courses	Less than 70	70 to 80	More than 80
INDUSTRIAL: manufacturing, transportation, communications, and utilities	Less than 75	75 to 85	More than 85
OPEN SPACE: agriculture, mining, fishing	Less than 75	NA	More than 75

Source: San Mateo County Airport Land Use Commission, San Mateo County Comprehensive Airport Land Use Plan, December 1996.

Policies:

<u>HS-32</u>

Encourage developers to mitigate ambient noise levels adjacent to major noise sources by incorporating acoustical site planning into their project. Utilize the City's Building Code to implement mitigation measures such as:

- Incorporating buffers and/or landscaped berms along high-noise roadways or railways;
- Incorporating traffic calming measures and alternative intersection design within and/or adjacent to the project;
- Using reduced-noise pavement (rubberized asphalt); and
- Incorporating state-of-the-art structural sound attenuation measures.

<u>HS-33</u>

Prevent the placement of new noise-sensitive uses unless adequate mitigation is provided. Establish insulation requirements as mitigation measures for all development per the standards in Table 7-1.

<u>HS-35</u>

Require developers to comply with relevant noise insulation standards contained in Title 24 of the California Code of Regulations (Part 2, Appendix Chapter 12A).

<u>HS-36</u>

Encourage developers of new residential projects to provide noise buffers othen than sound walls, such as vegetation, storage areas, or parking, as well as site planning and locating bedrooms away from noise sources.

<u>HS-37</u>

Require that all sponsors of new housing (residential and senior housing units) record a notice of Fair Disclosure regarding the proximity of the proposed development to San Francisco Airport and of the potential impacts of aircraft operations, including noise impacts, per Ordinance 1646 and AB2776.

<u>HS-38</u>

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

<u>HS-40</u>

Prohibit new residential development within the 70+ Airport CNEL areas, as dictated by Airport Land Use Commission infill criteria.

<u>HS-42</u>

Require new residential development within the 65 dBA CNEL SFO noise contour to submit an avigation easement to the airport. Specific avigation easement requirements shall be consistent with the County of San Mateo Comprehensive Airport Land Use Compatibility Plan for SFO.

<u>HS-43</u>

Allow reasonable latitude for noise generated by uses that are essential to community health.

Substantial Increase Criteria

Generally, a project may have a significant effect on the environment if it will substantially increase the ambient noise levels for adjoining areas or expose people to measurably severe noise levels. In practice, a noise impact may be considered significant if it would generate noise that would conflict with local project criteria or ordinances, or substantially increase noise levels at noise sensitive land uses. The potential increase in traffic noise from the project is a factor in determining significance. Research into the human perception of changes in sound level indicates the following[1]:

- A 3-dB change is barely perceptible,
- A 5-dB change is clearly perceptible, and
- A 10-dB change is perceived as being twice or half as loud.

A common practice in many jurisdictions is to use a 3-5 dB increase as a threshold of significance. However, a limitation of using a single noise level increase value to evaluate noise impacts is that it fails to account for pre-project noise conditions.

Table 6 is based upon recommendations made by the Federal Interagency Committee on Noise (FICON) to provide guidance in the assessment of changes in ambient noise levels resulting from aircraft operations. The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been widely accepted that they are applicable to all sources of noise described in terms of cumulative noise exposure metrics such as the L_{dn}.

TABLE 6: SIGNIFICANCE OF CHANGES IN NOISE EXPOSURE

Ambient Noise Level Without Project, L_{dn}	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more
Source: Federal Interagency Committee on Noise (FICON)	

Vibration Standards

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

The City of San Bruno does not have specific policies pertaining to vibration levels. However, vibration levels associated with construction activities and project operations are addressed as

[1] California Department of Transportation. *Technical Noise Supplement to the Traffic Analysis Protocol.* September 2013.

potential noise impacts associated with project implementation.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Table 7 indicates that the threshold for damage to structures ranges from 0.2 to 0.6 peak particle velocity in inches per second (in/sec p.p.v). The general threshold at which human annoyance could occur is noted as 0.1 in/sec p.p.v.

TABLE 7: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

Peak Particle Velocity		Human Reaction	Effect on Buildings
mm/sec.	**in./sec.**		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of “architectural” damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of “architectural” damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize “architectural” damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause “architectural” damage and possibly minor structural damage.
Source: Caltrans. Transportation Related Earthborne Vibrations. TAV-02-01-R9601 February 20, 2002.			

IMPACTS AND MITIGATION MEASURES

Method of Analysis

Traffic Noise Impact Assessment Methodology

To describe future noise levels due to traffic, the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA RD-77-108) was used. Direct inputs to the model included peak hour traffic volumes provided by DKS Traffic Consultants. A 10% peak hour factor was used to determine the average daily traffic volumes. The FHWA model is based upon the Calveno reference noise factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model was developed to predict hourly L_{eq} values for free-flowing traffic conditions. To predict L_{dn}/CNEL values, it is necessary to determine the day/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

SFO Aircraft Operations Noise Assessment Methodology

The most recent noise contours developed for the San Francisco Airport are used for determining the potential aircraft noise impacts.

Construction Noise and Vibration Impact Methodology

Construction noise and vibration was analyzed using data compiled for various pieces of construction equipment at a representative distance of 50 feet. Potential impacts and mitigation measures are discussed.

Thresholds of Significance

Consistent with Appendix G of the CEQA Guideline, and the County's General Plan and Noise Ordinance, the project will have a significant impact related to noise if it will result in:

A. Exposure of persons to, or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. Specifically, an exterior noise level of 60 dBA L_{dn} and an interior noise level of 45 dB L_{dn} for residential uses exposed to transportation noise sources. For impacts associated with SFO, the 60 dBA and the 65 dBA CNEL contours developed for the airport are used.

B. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels. Specifically, a limit of 0.1 in/sec p.p.v., as discussed above;

C. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

D. A substantial temporary or periodic increase in ambient noise levels in the project vicinity;

E. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels within two miles of a public airport or public use airport; or

F. For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

The proposed project is not located within two miles of a public or private airport or airstrip. However, the potential impacts from SFO airport are described.

Project-Specific Impacts and Mitigation Measures

Impact 1 Construction Noise at Sensitive Receptors

Construction of the Proposed Project would temporarily increase noise levels during construction. This would be a ***potentially significant*** *impact.*

During the construction of the project, and associated off-site improvements, including roads, water and sewer lines and related infrastructure, noise from construction activities would add to the noise environment in the project vicinity. Activities involved in construction would generate maximum noise levels, as indicated in Table 8, ranging from 76 to 90 dB at a distance of 50-feet, and from 70 to 84 dB at 100-feet. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. A substantial project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from construction sites. This noise increase would be of short duration, and would likely occur primarily during daytime hours.

TABLE 8 : CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Maximum Level, dB	
	at 50 feet	At 100-feet
Backhoe	78	72
Compactor	83	77
Compressor (air)	78	72
Concrete Saw	90	84
Dozer	82	76
Dump Truck	76	70
Excavator	81	75
Generator	81	75
Jackhammer	89	83
Pneumatic Tools	85	79
Source: *Roadway Construction Noise Model User's Guide*. Federal Highway Administration. FHWA-HEP-05-054. January 2006.		

Section 6.16.070 Construction of buildings and projects as contained in the City of San Bruno Municipal Code states the following with respect to construction noise levels:

hammer, derrick, power hoist, or any other construction-type device which shall exceed, between the hours of seven a.m. and ten p.m., a noise level of eighty-five decibels as measured at one hundred feet, or exceed between the hours of ten p.m. and seven a.m., a noise level of sixty decibels as measured at one hundred feet, unless such person shall have first obtained a permit therefore from the director of public works. No permit shall be required to perform emergency work.

Based upon Table 8, the construction activities would not exceed 85 dB at a distance of 100-feet. These levels are considerably less than the City standards. The following mitigation measures are to be included:

<u>Mitigation Measures</u>

The following mitigation measures are required for the Proposed Project to minimize construction noise impacts.

MM1a: Construction activities shall be restricted to hours of 7:00 a.m. to 10:00 p.m..

MM1b: Locate fixed construction equipment such as compressors and generators as far as possible from sensitive receptors. Shroud or shield all impact tools, and muffle or shield all intake and exhaust ports on power construction equipment.

MM1c: Obtain permit from the director of public works.

<u>Significance after Mitigation</u>

Less than significant

Impact 2 Construction Vibration at Sensitive Receptors

The proposed project has the potential to expose sensitive receptors to substantial vibration associated with construction activities. This would be a ***less-than-significant*** *impact.*

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading and utility placement occur.

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural. Table 9 shows the typical vibration levels produced by construction equipment.

Sensitive receptors could be impacted by construction related vibrations, especially vibratory compactors/rollers. The nearest receptors are located approximately 130-feet to the south, and 230-feet to the north of the project site. At these distances construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours.

TABLE 9: VIBRATION LEVELS FOR VARYING CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity @ 25 feet (inches/second)	Peak Particle Velocity @ 50 feet (inches/second)	Peak Particle Velocity @ 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210	0.074	0.026

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Guidelines, May 2006

The Table 9 data indicate that construction vibration levels anticipated for the project are less than the 0.1 in/sec criteria at distances of 50-feet. Therefore, construction vibrations are not predicted to cause damage to existing buildings or cause annoyance to sensitive receptors. Implementation of the proposed project would have a **less than significant** impact.

Mitigation for Impact 2: **None required**

Impact 3 Transportation Noise at Existing Sensitive Receptors

*Traffic generated by the Proposed Project could generate traffic noise increases exceeding the substantial increase criteria, as outlined in the Thresholds of Significance criteria above. This would be a **less-than-significant** impact.*

Table 10 shows the predicted traffic noise level increases on the local roadway network for existing and existing plus project conditions. Table 11 shows the predicted traffic noise level increases on the local roadway network for cumulative and cumulative plus project conditions.

Appendix C provides the complete inputs and results of the FHWA traffic noise modeling.

TABLE 10: PREDICTED TRAFFIC NOISE LEVELS AND PROJECT-RELATED TRAFFIC NOISE LEVEL INCREASES (EXISTING TRAFFIC CONDITIONS)

Roadway	Segment	Predicted L_{dn} @ 75-feet from the Roadway Centerlines				
		Existing	Existing + Project	Change	Criteria	Significant?
San Bruno Avenue	East of Glenview Drive	62 dBA	62 dBA	0 dBA	+3.0 dBA	No
Glenview Drive	San Bruno to Claremont Drive	57 dBA	58 dBA	+1 dBA	+5.0 dBA	No
Glenview Drive	Claremont to Plymouth Way	49 dBA	49 dBA	0 dBA	+5.0 dBA	No
Earl Avenue	West of Glenview Drive	49 dBA	49 dBA	0 dBA	+5.0 dBA	No
Claremont Drive	West of Glenview Drive	50 dBA	50 dBA	0 dBA	+5.0 dBA	No
Claremont Drive	East of Glenview Drive	48 dBA	48 dBA	0 dBA	+5.0 dBA	No
Skyline Boulevard	San Bruno to Sheath Lane	70 dBA	70 dBA	0 dBA	+1.5 dBA	No
Skyline Boulevard	South of San Bruno Avenue	69 dBA	69 dBA	0 dBA	+1.5 dBA	No

Source: j.c. brennan & associates, Inc., Inc., FHWA RD-77-108 Traffic Noise Prediction Model, and DKS Traffic Consultants, 2019

TABLE 11: PREDICTED TRAFFIC NOISE LEVELS AND PROJECT-RELATED TRAFFIC NOISE LEVEL INCREASES (CUMULATIVE TRAFFIC CONDITIONS)

Roadway	Segment	Predicted L_{dn} @ 75-feet from the Roadway Centerlines				
		Cumulative	Cumulative + Project	Change	Criteria	Significant?
San Bruno Avenue	East of Glenview Drive	62 dBA	62 dBA	0 dBA	+3.0 dBA	No
Glenview Drive	San Bruno to Claremont Drive	57 dBA	57 dBA	0 dBA	+5.0 dBA	No
Glenview Drive	Claremont to Plymouth Way	49 dBA	49 dBA	0 dBA	+5.0 dBA	No
Earl Avenue	West of Glenview Drive	50 dBA	50 dBA	0 dBA	+5.0 dBA	No
Claremont Drive	West of Glenview Drive	51 dBA	51 dBA	0 dBA	+5.0 dBA	No
Claremont Drive	East of Glenview Drive	49 dBA	49 dBA	0 dBA	+5.0 dBA	No
Skyline Boulevard	San Bruno to Sheath Lane	72 dBA	72 dBA	0 dBA	+1.5 dBA	No
Skyline Boulevard	South of San Bruno Avenue	72 dBA	72 dBA	0 dBA	+1.5 dBA	No

Source: j.c. brennan & associates, Inc., Inc., FHWA RD-77-108 Traffic Noise Prediction Model, and DKS Traffic Consultants, 2019.

Some noise sensitive receptors located along the project-area roadways may currently be exposed to exterior traffic noise levels exceeding the City of San Bruno 60 dBA L_{dn} exterior noise level standard for residential uses, based upon the data in Table 10 and Table 11. As shown by Table 10 and Table 11, these receptors will not be exposed to an increase in traffic noise levels due to the project. The proposed project's contribution to traffic noise increases is predicted to be no more than 1 dBA L_{dn}, which in imperceptible to the human ear. This is less than the FICON criteria for pre-project noise levels. Therefore, the increase of 1 dB L_{dn} is considered less than significant relative to the FICON substantial increase threshold.

The proposed project would not cause increased noise levels exceeding the City of San Bruno 60 dBA L_{dn} exterior noise level standard at existing noise-sensitive residential receptors. Therefore, this would be a less-than-significant impact relative to the CEQA checklist threshold.

This impact is considered **less-than-significant** relative to the project's significance criteria.

Mitigation for Impact 3: **None required**

Impact 4 Transportation Noise at New Sensitive Receptors

The proposed project could expose new noise-sensitive uses to transportation noise levels that exceed the City of San Bruno exterior and interior noise level standards. This is considered to be a ***potentially significant*** *impact.*

Exterior Traffic Noise Level Impacts:

The FHWA traffic noise prediction model was used to predict Cumulative + Project traffic noise levels at the proposed residential land uses associated with the project. Table 12 shows the predicted traffic noise levels at the proposed residential uses adjacent to the major project-area roadways.

TABLE 12: TRANSPORTATION NOISE LEVELS AT PROPOSED RESIDENTIAL USES

Noise Source	Approximate Distance to Outdoor Activity Area, feet[1]	Predicted Noise Levels, dB L_{dn}	
Traffic Noise		**No Wall**	**6' Wall**
Glenview Drive	50-feet	60 dBA	54 dBA
San Bruno Avenue	65-feet	63 dBA	56 dBA
Skyline Boulevard	440-feet	60 dBA	54 dBA

[1] Setback distances are measured in feet from the centerlines of the roadways to the center of residential patios .
Source: FHWA-RD-77-108 with inputs from DKS Traffic Consultants, and j.c. brennan & associates, Inc. 2019.

The Table 13 data indicate that predicted exterior noise levels would not comply with the City of San Bruno 60 dB L_{dn} exterior noise level standard at residences adjacent to San Bruno Avenue without additional noise control measures. A sound wall of 6-feet in height would reduce exterior traffic noise levels to the 60 dB L_{dn} standard for lots adjacent to San Bruno Avenue.

Interior Noise Impacts:

Modern construction typically provides a 25 dB exterior-to-interior noise level reduction with windows closed. Therefore, sensitive receptors exposed to exterior noise of 70 dB L_{dn}, or less, will typically comply with the City of San Bruno 45 dBA L_{dn} interior noise level standard. However, air conditioning will be required to allow residents to close doors and windows for the appropriate acoustical isolation.

<u>Mitigation Measures</u>

The following mitigation measures are required for the Proposed Project to minimize transportation noise impacts on the proposed project.

MM 4a: For lots adjacent to San Bruno Avenue, the project applicant should construct a sound wall 6-feet in height at the property line adjacent to San Bruno Avenue. Figure 2 shows the location of the recommended sound wall.

MM 4b: Mechanical ventilation shall be installed in all residential uses to allow residents to keep doors and windows closed, as desired for acoustical isolation.

Significance after Mitigation: **Less-than-significant**.

Impact 5: SFO Aircraft Operations at New Sensitive Receptors

*The proposed project would be exposed to aircraft operations from SFO of less than 60 dBA CNEL. This is considered to be a **less than significant** impact.*

Based upon Figure 3 (Figure 7-5 of the General Plan), the project site is located outside of the 60 dBA CNEL contour. This figure is somewhat outdated, but it provides a good indication of where the 60 dBA CNEL contour is in relation to the 65 dBA Contour. Figure 4 shows the updated SFO CNEL contours, and the project site is located well outside of the 65 dBA CNEL contour. In comparison of the location of the 60 dBA and the 65 dBA contour in Figure 3 to the location of the 65 dBA contour shown in Figure 4, the project site is located outside of the SFO 60 dBA CNEL contour.

This impact is considered to be a **less-than-significant** impact.

Appendix A
Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
L_{eq}	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
$L_{(n)}$	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L_{50} is the sound level exceeded 50% of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the AMaximum@ level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is s rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy into a one-second event.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

Appendix B
2019-125 Glenview Terrace San Bruno
24hr Continuous Noise Monitoring - Site A
9/10/2019 - 9/11/2019

Hour	Leq	Lmax	L50	L90
12:00	57	70	56	53
13:00	58	76	56	54
14:00	57	72	56	54
15:00	56	65	56	54
16:00	59	84	56	54
17:00	57	74	57	54
18:00	58	83	57	55
19:00	56	70	55	52
20:00	55	76	54	52
21:00	55	70	55	52
22:00	54	65	53	49
23:00	52	63	51	47
0:00	51	67	49	46
1:00	51	63	50	46
2:00	52	62	50	47
3:00	51	61	50	46
4:00	51	60	50	47
5:00	53	62	52	49
6:00	56	69	56	53
7:00	57	71	57	54
8:00	58	75	57	55
9:00	59	75	58	55
10:00	58	75	57	54
11:00	61	81	55	50

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	60.6	55.4	57.8	56.3	50.9	52.7
Lmax (Maximum)	83.7	65.2	74.4	69.0	60.2	63.5
L50 (Median)	57.6	54.3	56.0	55.6	49.4	51.2
L90 (Background)	55.1	50.1	53.4	52.9	45.5	47.7

Computed Ldn, dB	60.3
% Daytime Energy	84%
% Nighttime Energy	16%

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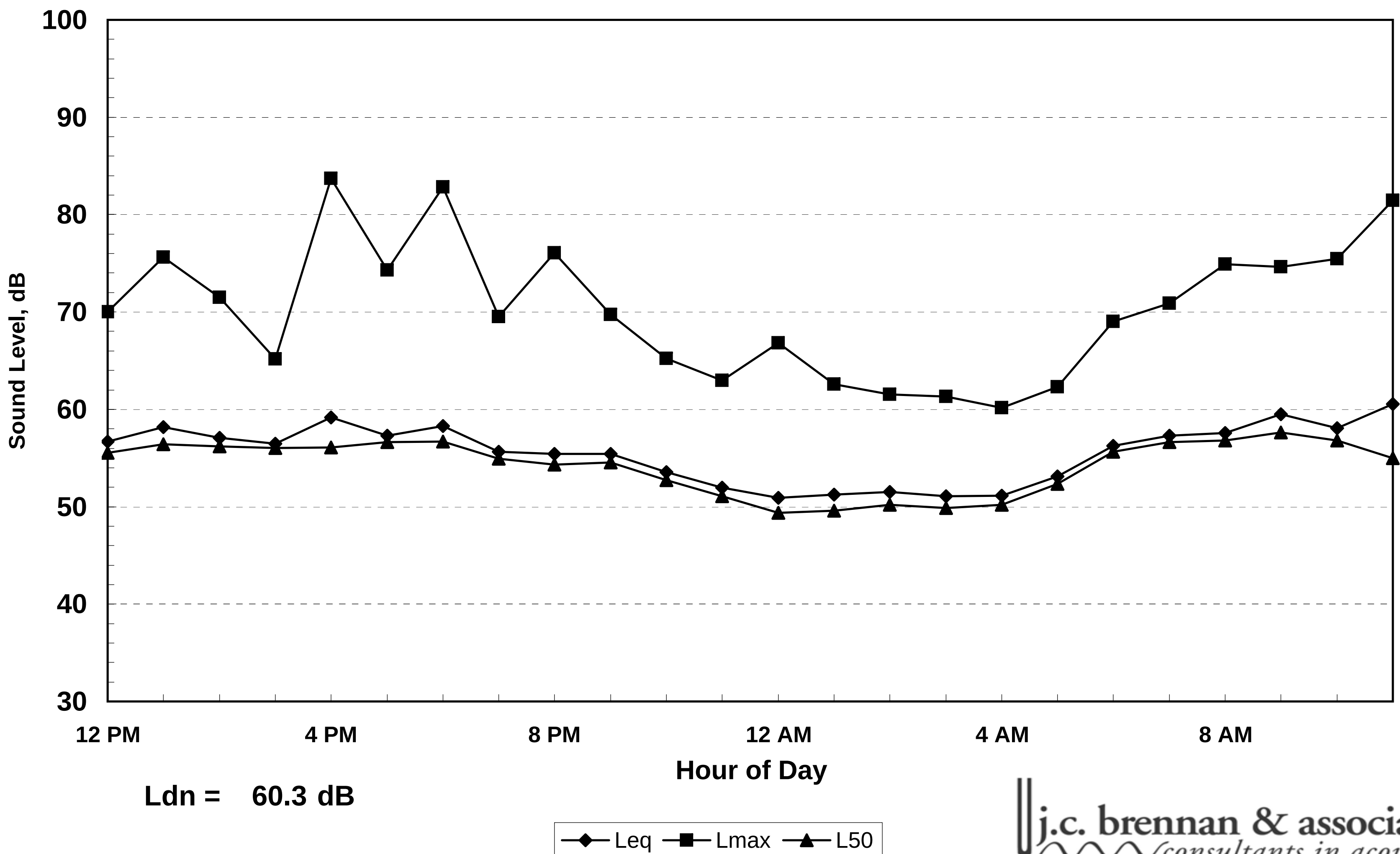
Appendix B

2019-125 Glenview Terrace San Bruno

24hr Continuous Noise Monitoring - Site A

9/10/2019 - 9/11/2019



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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2019-125 Glenview Terrace
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	San Bruno	East of Glenview	8,920	84		16	2	1	45	75	-2
2	Glenview	San Bruno to Claremont	1,930	84		16	2	0.5	45	75	
3	Glenview	Claremont to Plymouth	570	84		16	2	0.5	35	75	
4	Earl Ave	West of Glenview	580	84		16	1	0.5	35	75	
5	Claremont	West of Glenview	700	84		16	1	0.5	35	75	
6	Claremont	East of Glenview	460	84		16	1	0.5	35	75	
7	Skyline	San Bruno to Sheath	20,300	84		16	2	1	55	75	
8	Skyline	South of San Bruno	15,360	84		16	2	1	55	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2019-125 Glenview Terrace
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	San Bruno	East of Glenview	61.0	52.4	53.9	62
2	Glenview	San Bruno to Claremont	56.4	47.8	46.2	57
3	Glenview	Claremont to Plymouth	48.0	40.8	39.9	49
4	Earl Ave	West of Glenview	48.1	37.8	40.0	49
5	Claremont	West of Glenview	48.9	38.6	40.8	50
6	Claremont	East of Glenview	47.1	36.8	39.0	48
7	Skyline	San Bruno to Sheath	69.1	59.3	60.3	70
8	Skyline	South of San Bruno	67.9	58.1	59.1	69

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Noise Contour Output

Project #: 2019-125 Glenview Terrace
Description: Existing
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	-------- Distances to Traffic Noise Contours -------- 75	70	65	60	55
1	San Bruno	East of Glenview	11	23	49	106	229
2	Glenview	San Bruno to Claremont	5	11	23	50	107
3	Glenview	Claremont to Plymouth	1	3	7	14	31
4	Earl Ave	West of Glenview	1	3	6	14	30
5	Claremont	West of Glenview	2	3	7	16	34
6	Claremont	East of Glenview	1	3	6	12	26
7	Skyline	San Bruno to Sheath	35	75	162	349	753
8	Skyline	South of San Bruno	29	63	135	290	625

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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2019-125 Glenview Terrace
Description: Existing Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	San Bruno	East of Glenview	9,050	84		16	2	1	45	75	-2
2	Glenview	San Bruno to Claremont	2,150	84		16	2	0.5	45	75	
3	Glenview	Claremont to Plymouth	600	84		16	2	0.5	35	75	
4	Earl Ave	West of Glenview	580	84		16	1	0.5	35	75	
5	Claremont	West of Glenview	800	84		16	1	0.5	35	75	
6	Claremont	East of Glenview	460	84		16	1	0.5	35	75	
7	Skyline	San Bruno to Sheath	20,300	84		16	2	1	55	75	
8	Skyline	South of San Bruno	15,420	84		16	2	1	55	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2019-125 Glenview Terrace
Description: Existing Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	San Bruno	East of Glenview	61.1	52.5	54.0	62
2	Glenview	San Bruno to Claremont	56.9	48.2	46.7	58
3	Glenview	Claremont to Plymouth	48.2	41.0	40.2	49
4	Earl Ave	West of Glenview	48.1	37.8	40.0	49
5	Claremont	West of Glenview	49.5	39.2	41.4	50
6	Claremont	East of Glenview	47.1	36.8	39.0	48
7	Skyline	San Bruno to Sheath	69.1	59.3	60.3	70
8	Skyline	South of San Bruno	67.9	58.2	59.1	69

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Noise Contour Output

Project #: 2019-125 Glenview Terrace
Description: Existing Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	-------- Distances to Traffic Noise Contours -------- 75	70	65	60	55
1	San Bruno	East of Glenview	11	23	50	107	231
2	Glenview	San Bruno to Claremont	5	11	25	53	115
3	Glenview	Claremont to Plymouth	1	3	7	15	32
4	Earl Ave	West of Glenview	1	3	6	14	30
5	Claremont	West of Glenview	2	4	8	17	37
6	Claremont	East of Glenview	1	3	6	12	26
7	Skyline	San Bruno to Sheath	35	75	162	349	753
8	Skyline	South of San Bruno	29	63	135	291	627

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2019-125 Glenview Terrace
Description: Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	San Bruno	East of Glenview	9,160	84		16	2	1	45	75	-2
2	Glenview	San Bruno to Claremont	1,110	84		16	2	0.5	45	75	
3	Glenview	Claremont to Plymouth	570	84		16	2	0.5	35	75	
4	Earl Ave	West of Glenview	660	84		16	1	0.5	35	75	
5	Claremont	West of Glenview	820	84		16	1	0.5	35	75	
6	Claremont	East of Glenview	540	84		16	1	0.5	35	75	
7	Skyline	San Bruno to Sheath	33,810	84		16	2	1	55	75	
8	Skyline	South of San Bruno	28,830	84		16	2	1	55	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Predicted Levels

Project #: 2019-125 Glenview Terrace
Description: Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	San Bruno	East of Glenview	61.1	52.5	54.0	62
2	Glenview	San Bruno to Claremont	54.0	45.4	43.8	55
3	Glenview	Claremont to Plymouth	48.0	40.8	39.9	49
4	Earl Ave	West of Glenview	48.6	38.4	40.6	50
5	Claremont	West of Glenview	49.6	39.3	41.5	51
6	Claremont	East of Glenview	47.8	37.5	39.7	49
7	Skyline	San Bruno to Sheath	71.3	61.6	62.5	72
8	Skyline	South of San Bruno	70.6	60.9	61.8	72

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2019-125 Glenview Terrace
Description: Cumulative
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	-------- Distances to Traffic Noise Contours -------- 75	70	65	60	55
1	San Bruno	East of Glenview	11	23	50	108	233
2	Glenview	San Bruno to Claremont	3	7	16	34	74
3	Glenview	Claremont to Plymouth	1	3	7	14	31
4	Earl Ave	West of Glenview	2	3	7	15	33
5	Claremont	West of Glenview	2	4	8	18	38
6	Claremont	East of Glenview	1	3	6	13	29
7	Skyline	San Bruno to Sheath	49	106	228	491	1058
8	Skyline	South of San Bruno	44	95	205	442	951

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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2019-125 Glenview Terrace
Description: Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	San Bruno	East of Glenview	9,310	84		16	2	1	45	75	-2
2	Glenview	San Bruno to Claremont	1,990	84		16	2	0.5	45	75	
3	Glenview	Claremont to Plymouth	600	84		16	2	0.5	35	75	
4	Earl Ave	West of Glenview	660	84		16	1	0.5	35	75	
5	Claremont	West of Glenview	820	84		16	1	0.5	35	75	
6	Claremont	East of Glenview	540	84		16	1	0.5	35	75	
7	Skyline	San Bruno to Sheath	33,840	84		16	2	1	55	75	
8	Skyline	South of San Bruno	28,910	84		16	2	1	55	75	
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Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Predicted Levels

Project #: 2019-125 Glenview Terrace
Description: Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	Autos	Medium Trucks	Heavy Trucks	Total
1	San Bruno	East of Glenview	61.2	52.6	54.1	62
2	Glenview	San Bruno to Claremont	56.5	47.9	46.4	57
3	Glenview	Claremont to Plymouth	48.2	41.0	40.2	49
4	Earl Ave	West of Glenview	48.6	38.4	40.6	50
5	Claremont	West of Glenview	49.6	39.3	41.5	51
6	Claremont	East of Glenview	47.8	37.5	39.7	49
7	Skyline	San Bruno to Sheath	71.3	61.6	62.5	72
8	Skyline	South of San Bruno	70.6	60.9	61.8	72

Appendix C

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Noise Contour Output

Project #: 2019-125 Glenview Terrace
Description: Cumulative Plus Project
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	-------- Distances to Traffic Noise Contours -------- 75	70	65	60	55
1	San Bruno	East of Glenview	11	24	51	109	235
2	Glenview	San Bruno to Claremont	5	11	23	51	109
3	Glenview	Claremont to Plymouth	1	3	7	15	32
4	Earl Ave	West of Glenview	2	3	7	15	33
5	Claremont	West of Glenview	2	4	8	18	38
6	Claremont	East of Glenview	1	3	6	13	29
7	Skyline	San Bruno to Sheath	49	106	228	491	1058
8	Skyline	South of San Bruno	44	95	205	442	953

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Appendix D

FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Barrier Effectiveness Prediction Worksheet

Project Information:

Job Number:	2019-125 Glenview Terrace
Description	Cumulative Plus Project
Roadway Name:	San Bruno
Location(s):	1

Noise Level Data:

Year:	2025
Auto L_{dn}, dB:	61
Medium Truck L_{dn}, dB:	53
Heavy Truck L_{dn}, dB:	54

Site Geometry:

Receiver Description:	East of Glenview
Centerline to Barrier Distance (C_1):	50
Barrier to Receiver Distance (C_2):	25
Automobile Elevation:	0
Medium Truck Elevation:	2
Heavy Truck Elevation:	8
Pad/Ground Elevation at Receiver:	0
Receiver Elevation[1]:	5
Base of Barrier Elevation:	0
Starting Barrier Height	6

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height[2] (ft)	-------------------- L_{dn}, dB -------------------- Autos	Medium Trucks	Heavy Trucks	Total	Barrier Breaks Line of Sight to… Autos?	Medium Trucks?	Heavy Trucks?
6	6	54	47	49	**56**	Yes	Yes	No
7	7	53	45	49	**55**	Yes	Yes	Yes
8	8	52	44	48	**54**	Yes	Yes	Yes
9	9	51	43	47	**53**	Yes	Yes	Yes
10	10	51	42	46	**52**	Yes	Yes	Yes
11	11	50	41	45	**51**	Yes	Yes	Yes
12	12	49	41	44	**50**	Yes	Yes	Yes
13	13	48	40	43	**50**	Yes	Yes	Yes
14	14	47	39	42	**49**	Yes	Yes	Yes

Notes: 1.Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s)

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