4.J Noise and Vibration

4.J.1 Introduction

This section evaluates the noise impacts that would result from Project Site development. It discusses the existing noise environment at and around the Project Site, as well as the regulatory framework for regulation of noise. It also analyzes Project Site development's effect on the existing ambient noise environment during construction, demolition, and operational activities, and evaluates Project development's noise effects for consistency with relevant local agency noise policies and regulations. The analysis in this section is based on a comprehensive review of existing documentation for the Project Site, a noise monitoring survey conducted by ESA, and applicable City policies, standards, and regulations. This section addresses noise and vibration impacts on humans, as well as vibration impacts on structures. Noise effects on marine and terrestrial wildlife are addressed in Section 4.C, *Biological Resources*.

Techniques for Measuring Noise

Sound is defined as mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters, including the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude).

Sound always has a source. Sound sources within the Project Site could be construction activities, automobile and rail traffic, jets flying overhead, people talking, onsite commercial and industrial operations, or wind turbines. How loud the sound source actually is depends on how rapidly the object converts energy into sound energy. In contrast, an individual's perception of the loudness of a sound depends on its distance from the sound's source.

Based on these concepts - actual sound energy (loudness) at the source and loudness of a sound at the receiver's distance from the source - there are two measures of sound magnitude. The first is *sound power level*, which measures the sound energy created at the source. The second is *sound pressure level*, which is the common measurement of the loudness of sound at a given observer location. "Sound power" belongs strictly to the sound source, while "sound pressure" is a measurement at a receiver's distance from the source. Unless otherwise specified, all discussion of sound levels in this EIR refers to sound pressure levels.

Sound power levels and sound pressure levels are often confused, since they are both often referred to as "sound levels" and both are measure on a decibel (dB) scale, which is the most common term used to characterize the loudness of noise. A decibel is a unit of measurement that indicates the relative amplitude and pressure level of a sound. A 0 dB corresponds roughly to the lowest sound level detectable by the human ear, while 120 to 140 dB corresponds to the threshold of pain. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The human ear is not equally sensitive to all frequencies, but rather has a decreased sensitivity to frequencies below 1,000 Hz and above 5,000 Hz. Therefore, when assessing potential noise impacts on the surrounding community, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz, as those frequencies that are largely undetectable by the human ear. This method of frequency weighting is referred to as "A-weighting." It is expressed in units of A-weighted decibels (dBA)[1] and follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of the noise experienced by the individual over a period of time. A noise level is a measure of noise at a given instant in time. However, noise levels rarely persist consistently over a long period of time. Rather, community noise varies continuously with time with respect to the contributing sound sources. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The level of background noise typically changes throughout the day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. Additionally, short-duration single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), many of which are readily identifiable to the individual also contribute to the variability of community noise, beyond the fluctuations attributable to varying background noise levels.

These successive additions of sound to the community noise environment vary the community noise level from instant to instant, requiring that noise exposure be measured over a period of time to characterize a community noise environment and evaluate noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized as follows:

L_{eq}: The equivalent sound level, which is used to describe noise over a specified period of time, typically 1 hour, in terms of a single numerical value. The L_{eq} is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level measured during the measurement period of interest.

[1] All noise levels reported herein reflect A-weighted decibels unless otherwise stated.

L_{min}: The instantaneous minimum noise level measured during the measurement period of interest.

L_x: The sound level that is equaled or exceeded x percent of a specified time period. The L_{50} represents the median sound level (i.e., the noise level exceeded 50 percent of the time).

DNL: The day-night noise level, or the energy average of the A-weighted sound levels occurring during a 24-hour period, accounting for the greater sensitivity of most people to nighttime noise by weighting noise levels at night (penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted by adding 10 dBA to take into account the greater annoyance of nighttime noises.

CNEL: The Community Noise Equivalent Level, which, similar to the DNL, adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

Effects of Noise on People

The effects of noise on people can be placed into three categories: (1) subjective effects of annoyance, nuisance, and dissatisfaction; (2) interference with activities such as speech, sleep, and learning; and (3) physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants generally experience noise in the third 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 exists in the individual thresholds of annoyance, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Because there is such wide variation in individual noise thresholds, an important way of predicting human reaction to a new or changed noise environment is the way the noise levels compare to the existing environment to which one has adapted, or the "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 to the individual. 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 adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion; hence, the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in

a simple additive fashion, but rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including mobile sources such as idling vehicles, attenuate (lessens) at a rate of 6 to 7.5 dBA per doubling of distance from the source, depending on the topography of the area and environmental conditions (e.g., atmospheric conditions, noise barriers [either vegetative or manufactured]). Thus, a noise measured at 90 dBA 50 feet from the source would attenuate to about 84 dBA at 100 feet, 78 dBA at 200 feet, 72 dBA at 400 feet, and so forth. Widely distributed noise, such as a large industrial facility spread over many acres or a street with moving vehicles, would typically attenuate at a lower rate, approximately 4 to 6 dBA per doubling of distance from the source.

Fundamentals of Vibration

As described in the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* (FTA, 2006), groundborne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility causing buildings to shake and generating audible rumbling sounds. In contrast to airborne noise, groundborne vibration is not a common environmental problem. It is unusual for vibrations from sources such as buses and trucks on a normal roadway to be perceptible by individuals, even in locations close to major roads. However, there are some common sources of groundborne vibration, including trains, buses on rough roads, and construction activities such as blasting, pile driving, and operating heavy earth-moving equipment.

There are several different methods used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts on buildings. Although peak particle velocity is appropriate for evaluating the potential of building damage, it is not suitable for evaluating human response since it takes time for humans to perceive and react to vibration. Alternatively, the root mean square (RMS) amplitude, which is defined as the average of the squared amplitude of the signal, is most frequently used to describe the effect of vibration on the human body. RMS is commonly measured with the Decibel notation (Vdb). Vdb acts to compress the range of numbers required to describe vibration. Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly and sick), and vibration-sensitive equipment.

The effects of groundborne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of blasting and pile driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by

only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings.

The California Department of Transportation (Caltrans) measure of the threshold of architectural damage for conventional sensitive structures is 0.5 inch per second (in/sec) PPV for new residential structures and modern commercial buildings and 0.25 in/sec PPV for historic and older buildings. Caltrans vibration annoyance potential criteria characterize 0.1 in/sec PPV as "strongly perceptible" and 0.4 in/sec PPV as "severe" (Caltrans, 2004).

4.J.2 Environmental Setting

Existing Noise Environment in Project Site Vicinity

Within the boundaries of the Project Site, the ambient noise environment is dominated by vehicular traffic on US Highway 101 and Tunnel Road, and the intermittent rail activity of the Caltrain commuter train. Aircraft flights from San Francisco International Airport (SFO) also contribute to the ambient noise environment. A 1992 survey conducted by the City for its General Plan Noise Element revealed that citizens consider Brisbane to be impacted by flyover activity from SFO, especially in the early morning and evening hours (City of Brisbane, 1994). The City participates in the SFO Community Roundtable, which provides a forum for the public to address local elected officials, Airport management, FAA staff, and airline representatives, regarding aircraft noise issues. The committee monitors a performance-based aircraft noise mitigation program, as implemented by airport staff, interprets community concerns, and attempts to achieve additional noise mitigation through a cooperative sharing of authority brought forth by the airline industry, the FAA, airport management, and local government officials. A review of the most recent complaint summary in the Directors Report for SFO indicates that more than half of the 1,331 complaints received in September and October 2012 were from residents in the City of Brisbane.

As evidenced by the high proportion of noise complaints received by SFO from Brisbane residents, single event noise levels from aircraft are a community concern. However, the Noise Exposure Map for SFO (SFO, 2012) indicates that all portions of the City of Brisbane are outside the 65-DNL noise contour relative to aircraft noise from the airport (i.e., aircraft operations from the airport contribute less than 65 dBA to ambient noise levels within Brisbane).

A noise monitoring survey was conducted to document existing noise levels at various locations in and around the Project Site. Long-term (48-hour) measurements were taken using a Metrosonics dB-308 noise meter. Measurements were taken in 2007 and, based on a review of changes in area traffic volumes, remain representative of conditions for the project site and its vicinity at the time of the Notice of Preparation in 2010. A review of traffic volumes for the section of US Highway 101 adjacent to the project site indicates that a 0.7 percent increase in peak hour traffic has occurred between 2007 and 2010. Noise models indicate that such a modest increase in traffic volumes would not have an appreciable effect on roadside noise levels (less than 0.1 dBA). The results of the long-term measurements are presented in **Table 4.J-1**. The noise monitoring locations are shown in **Figure 4.J-1**.

TABLE 4.J-1
MEASURED LONG-TERM NOISE LEVELS ON OR WITHIN THE VICINITY OF THE PROJECT SITE

Site No.[b]	Measurement Location	Noise Level in dBA[a]			
		DNL/CNEL	L_{max}	Daytime L_{eq}	L_{90}
Based on 48-Hour Noise Measurement Data					
1	Northeastern Portion of Project Site	75/75	85	69	66
2	Southeastern Portion of Project Site	69/70	84	60	58
3	South-Central Portion of Project Site	62/63	86	58	51
4	North-Central Portion of Project Site	60/60	81	57	48
5	Northwestern Portion of Project Site	65/65	86	61	52
6	Southwestern Portion of Project Site	66/67	90	65	50
7	Residence at Terminus of San Francisco Street, Brisbane	70/70	97	67	60
8	Residential Area at Mission Blue Drive	64/65	82	61	54

NOTES:

[a] dBA = A-weighted decibels. DNL = day-night noise level. L_{eq} = equivalent steady-state noise level over a 1-hour period produced by the same noise energy as the variable noise levels during that period; L_{max} = instantaneous maximum noise level;; L_{90} = noise level exceeded 90 percent of the time.

[b] Measurement locations correspond to those shown in Figure 4.J-1.

SOURCE:ESA, 2007.

Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. Residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, and parks and other outdoor recreation areas generally are more sensitive to noise than are commercial and industrial land uses. Existing and proposed sensitive receptor locations are shown in **Figure 4.J-2**.

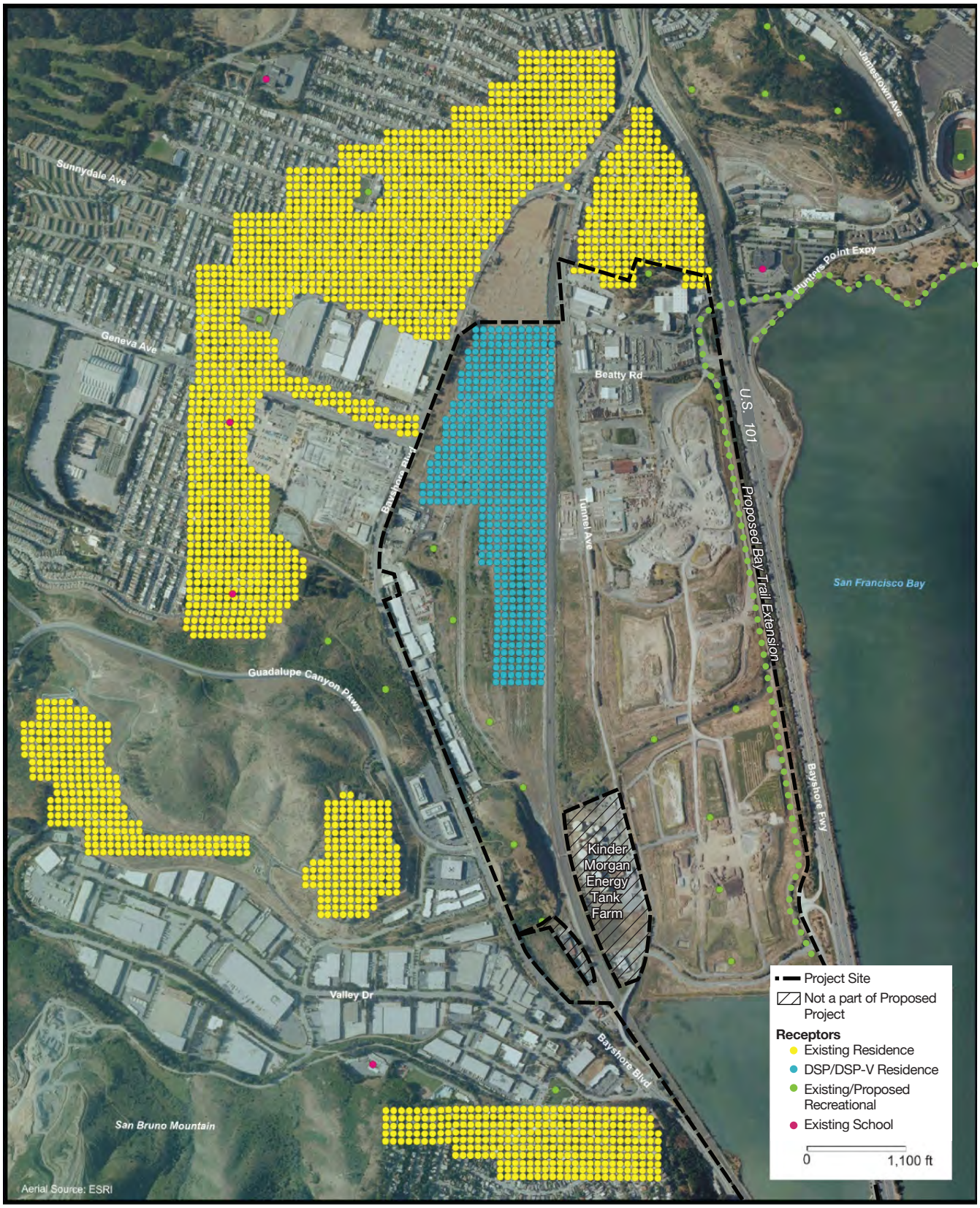
Sensitive land uses (or sensitive receptors) in the vicinity of the Project Site include residences, a day care center and open space areas. The Project Site does not immediately border residential areas. Single-family houses of the Northeast Ridge development (Monitoring Location 8 on Figure 4.J-1) are located 0.5 mile west of the former railyard area on the Project Site and 0.25 mile west of the western Project Site boundary. Noise levels in this area are dominated by vehicle traffic on Bayshore Boulevard and Guadalupe Canyon Parkway. Secondary noise sources include aircraft and rail activity and distant crushing and earthmoving operations on the eastern side of the Project Site.

Single-family residences on San Francisco Street and Santa Clara Street (Monitoring Location 7 on Figure 4.J-1) are located 2,000 feet southwest of the southern Project Site boundary and less than 0.25 mile from the western edge of Brisbane Lagoon. Noise levels in this area are dominated by vehicle traffic on Bayshore Boulevard and Old County Road. Single-family houses on Linda Vista Drive and Bayshore Child Care Service in the City of Daly City are located approximately 1,500 feet west of the northwestern Project Site boundary. Single-family houses

SOURCE: ESA

Brisbane Baylands . 206069

Figure 4.J-1
Noise Monitoring Locations



SOURCE: KB Environmental Sciences, Inc., 2012

Brisbane Baylands . 206069

Figure 4.J-2
Existing and Proposed
Sensitive Receptor Locations

on Tocoloma Avenue in San Francisco's Little Hollywood neighborhood are located approximately 1,300 feet north of the northern Project Site boundary. Single-family houses on MacDonald Avenue in Daly City and Desmond Street and in San Francisco would be located approximately 350 feet from the western Project Site boundary.

Recreational areas, Brisbane Lagoon and the Bay Trail within the Project Site would be considered sensitive receptors, as would future parks and trails that would be developed within the Project Site. Noise impacts in these areas would be shorter in duration for visitors than for residents. Because water access is not currently permitted at the lagoon, visitors are restricted to the perimeter of the lagoon. The Bay Trail in the southern portion of the site is the shoulder of Sierra Point Parkway with direct line-of-sight with US Highway 101, 30 feet to the east. Consequently visitors to these recreational receptor areas experience substantial vehicle traffic noise from Sierra Point Parkway and US Highway 101. Both the lagoon and the Bay Trail are considered recreational sensitive receptors to be considered with an emphasis on daytime noise.[2]

4.J.3 Regulatory Setting

Development within the Project Site must comply with federal, state, and local regulations. The requirements listed below will affect the way Project development occurs.

Noise is addressed by the Federal Aviation Administration (FAA), in Title 24 of the California Code of Regulations (for new multi-family residential developments), local general plan policies, and local noise ordinance standards and municipal codes related to noise. Federal, state, and local agencies regulate different aspects of environmental noise.

Federal Regulations

FAA Order 1050.1E, FAA Order 5050.4B and Title 14 - Aeronautics and Space Chapter I - Federal Aviation Administration, Department Of Transportation Subchapter I - Airports Part 150 - Airport Noise Compatibility Planning (FAR Part 150) provide the regulatory framework for noise related to aircraft operation. Appendix A of FAR Part 150 states "for the purpose of compliance with this part, all land uses are considered to be compatible with noise levels less than DNL (or CNEL in California) 65 dB. Local needs or values may dictate further delineation based on local requirements or determinations."

State Regulations

State regulations related to noise include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in California Code of Regulations, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as

[2] This section addresses noise and vibration impacts on humans. Noise effects on wildlife as a sensitive receptor are dependent on species and a number of biological factors, and those effects are addressed in Section 4.C, *Biological Resources*.

the California Building Code), Appendix Chapters 12 and 12A. For limiting noise transmitted between adjacent dwelling units, the noise insulation standards specify the extent to which walls, doors, and floor ceiling assemblies must block or absorb sound. For limiting noise from exterior sources, the noise insulation standards set forth an interior standard of DNL 45 dBA in any habitable room and, where such units are proposed in areas subject to noise levels greater than DNL 60 dBA require an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard. If the interior noise level depends upon windows being closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment. Title 24 standards are enforced through the building permit application process in the City of Brisbane.

Local Regulations

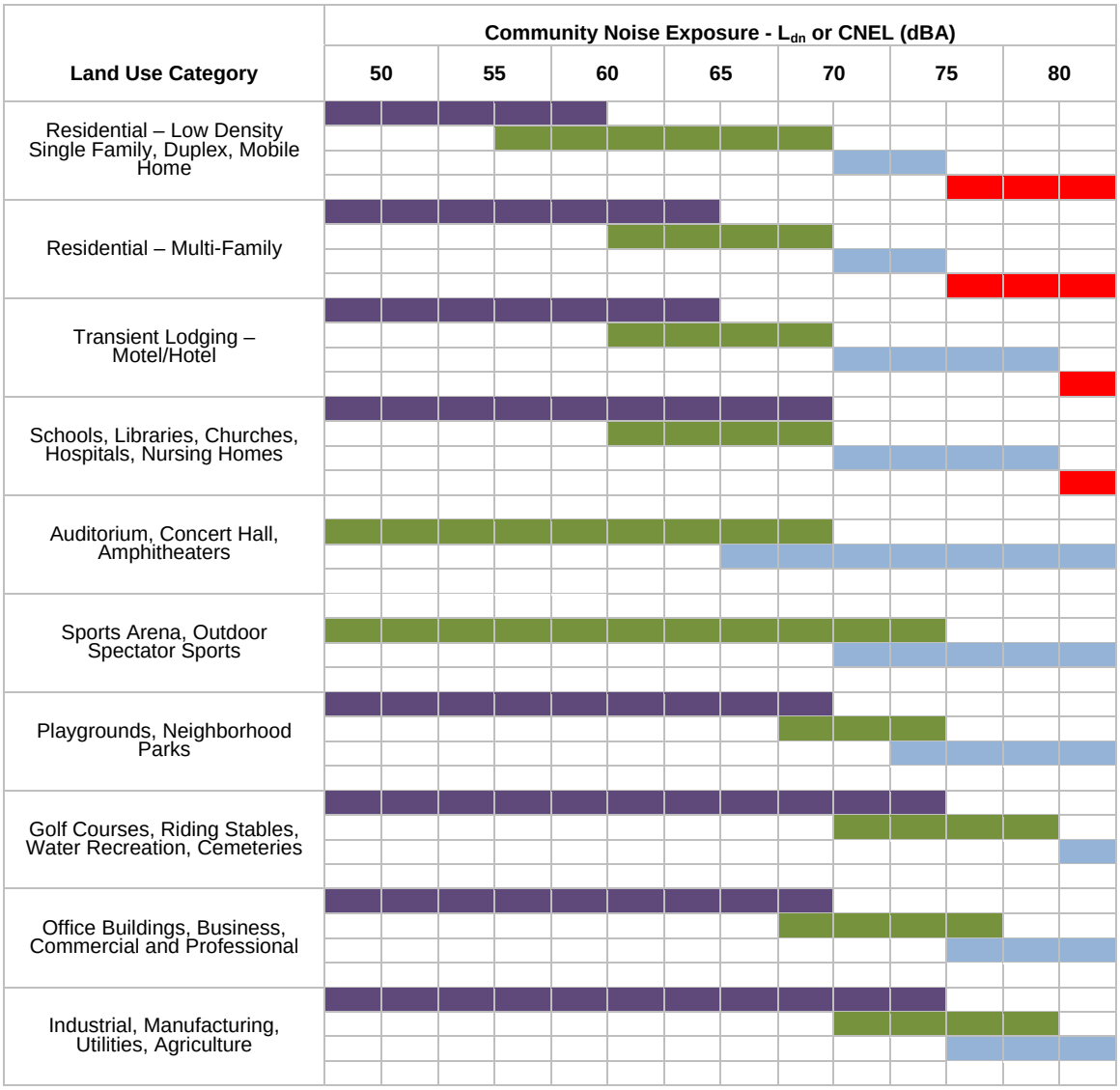
City of Brisbane General Plan

The Community Health and Safety Element of the City of Brisbane General Plan (City of Brisbane, 1994) contains 10 policies regarding noise within the city. The following Community Health and Safety Element policies and programs regarding noise are relevant to the Project Site and Project Site development:

> ***Policy 176:*** Minimize the intrusion of unwarranted and intrusive noise on community life.
>
> > *Program 176a:* Discourage new sources that generate excessive noise.
>
> ***Policy 179:*** Require the incorporation, when feasible, of new road or landscaping features that buffer 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 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.
>
> ***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 to determine noise impacted uses.
> >
> > *Program 184b:* Require acoustical studies for development applications in areas identified as noise impacted and potential noise generators.
> >
> > *Program 184c:* For such projects, require noise attenuation or a mitigation program to be submitted as part of the project design.

Program 184a requires the use of the State's Land Use Compatibility Guidelines to determine noise-affected uses. The acceptable noise exposures for land use compatibility published by the State of California are presented in **Figure 4.J-3**.

Figure 4.J-3
Land Use Compatibility for Community Noise Environment



	Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

SOURCE: State of California, Governor's Office of Planning and Research, 2003. *General Plan Guidelines*.

The State Guidelines are used for determining the compatibility of various land uses with different noise environments. Noise levels in Figure 4.J-3 are expressed in terms of DNL, which applies a correction or "penalty" to noise generated during the more sensitive nighttime hours. CNEL measurements are a weighted average of sound levels gathered throughout a 24-hour period, providing a measure of ambient noise. Different weighting factors apply to day, evening, and nighttime periods. This recognizes that community members are most sensitive to noise in late night hours and are more sensitive during evening hours than in daytime hours.

Under State General Plan Guidelines, the acceptable noise level for residential, hotel and motel uses is generally 60 to 65 dBA or less, while conditionally acceptable noise levels range from 60 dBA to 70 dBA (may require insulation, etc.). Noise levels over 70 dBA are, in general, unacceptable for these sensitive land uses.

Noise environments of up to 70 dBA are generally considered acceptable for office, professional and business commercial land uses, while conditionally acceptable noise levels range from 67.5 dBA to 77.5 dBA (may require insulation, etc.). Noise levels over 75 dBA are, in general, normally unacceptable for these land uses.

City of Brisbane Noise Ordinance

The City of Brisbane also regulates community noise levels through enforcement of Chapter 8.28 of the Brisbane Municipal Code. Noise standards are established by land use and are presented in **Table 4.J-2**.

TABLE 4.J-2
NOISE STANDARDS OF THE BRISBANE MUNICIPAL CODE

Land Use Type	Duration of Noise in Minutes within an Hour	Noise Standard as dBA increase Above Ambient
Single Family Residential	3 minutes	20
	15 minutes	10
Multi Family Residential	3 minutes	20
	15 minutes	10
Commercial / Industrial	3 minutes	20
	15 minutes	10

SOURCE: City of Brisbane, 2012.

For single-family residential zoning districts, Section 8.28.030 establishes that noise levels may not be more than 10 dBA above the existing ambient noise level for a cumulative period of more than 15 minutes in a given hour, or a noise level of more than 20 dBA above the ambient level for more than three minutes per hour. For multi-family residential zoning districts, Section 8.28.030 prohibits noise increases of more than of 10 dBA above local ambient noise levels three feet from any wall, floor, or ceiling in any dwelling unit on the same property, for a cumulative period of more than 15 minutes in a given hour, or a noise level of more than 20 dBA above the ambient level for more than three minutes per hour.

For commercial and industrial zoning districts, Section 8.28.040 establishes that noise levels may not be more than 10 dBA above the existing ambient level for a cumulative period of more than 15 minutes in a given hour, and may not be more than 20 dBA above the ambient level for more than three minutes per hour.

Noise from construction activities is restricted by Section 8.28.060 of the Brisbane Municipal Code. This section limits construction hours to between 7:00 a.m. and 7:00 p.m. on weekdays and 9:00 a.m. and 7:00 p.m. on weekends and holidays. Further, this section prohibits individual pieces of construction equipment from operating at a noise level in excess of 83 dBA at a distance of 25 feet from the equipment or operating such that the noise level at any point beyond the property line of the Project Site exceeds 86 dBA.

4.J.4 Impacts and Mitigation Measures

Significance Criteria

Appendix G of the CEQA Guidelines indicates that a project would have a significant effect on the environment if it were to:

- Expose persons to or generate noise levels in excess of standards established in the local (City of Brisbane) general plan or noise ordinance, or applicable standards of other affected agencies;
- Expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- Result in a substantial permanent increase in ambient noise levels in the project vicinity or above levels existing without the project;
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- 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; or
- For a project located within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

Impact Assessment Methodology

Following is a description of the methodology used to evaluate the impacts of Project Site development in relation to each of the significance thresholds cited above.

Exposure of Persons to or Generation of Noise in Excess of Established Standards

The first threshold of significance examines (1) the extent to Project Site development would place people within locations that exceed established noise standards or (2) whether Project Site development would generate noise in excess of established noise standards. Because later thresholds related to permanent and temporary increases in permanent increases in ambient noise

levels and temporary or periodic increases in noise levels in the vicinity of the project site, the evaluation of this threshold under Impact 4.J-1 focuses on exposure of people within the Project Site to noise in excess of established standards.

Impact 4.J-3 addresses the contribution of noise related to Project Site development creating or contributing to permanent increases in ambient noise levels in excess of established standards, while Impact 4.J-4 addresses the contribution of noise related to Project Site development creating or contributing to temporary or periodic increases in ambient noise levels in excess of established standards.

To assess the extent to which Project Site development would expose receptors to noise in excess of established standards, future, with-Project Site development noise conditions were evaluated against the policies and programs of the Brisbane General Plan Noise Element. Program 184a requires the use of the State's Land Use Compatibility Guidelines to determine noise-affected uses. The acceptable noise exposures for land use compatibility published by the State of California are presented in Figure 4.J-3.

To determine whether Project Site development would expose people to noise in excess of established standards, under Impact 4.J-1, future "with Project Site development" noise conditions were modeled based on future cumulative "with Project Site development" traffic conditions along roadways and rail lines. If development would expose people within the Project Site to noise levels in excess of those presented in Figure 4.J-3, a significant impact was determined to exist. In addition, if Project Site development would cause offsite noise levels to exceed the standards presented in Figure 4.J-3, a significant impact was determined to exist. Finally, within offsite areas where the standards presented in Figure 4.J-3 would be exceeded without any development of the Project Site, a significant impact was determined to exist if Project Site development would cause an increase of 1.5 dBA or more in ambient conditions[3].An assessment of whether Project Site development would expose people residing or working within the Project Site area to excessive noise levels related to airport operations was accomplished using the Noise Exposure Map for San Francisco International Airport (SFO, 2012). The map contains noise contour relative to aircraft noise from the airport (i.e., aircraft operations from the airport contribute less than 65 dBA to ambient noise levels within Brisbane). The contours were used to determine whether the area in the vicinity of the project site would be below the federal noise abatement criterion of 65 DNL, the level above which the FAA requires that noise abatement measures be implemented for residences.

Exposure of Persons to or Generation of Groundborne Vibration

Impacts from groundborne vibration during Project Site construction are assessed in Impact 4.J-2 using vibration damage threshold criteria expressed in PPV for architectural damage. The Caltrans measure of the threshold of architectural damage for conventional sensitive structures is

[3] See discussion of permanent increases in noise levels and Table 4.J-3 for the rationale of the 1.5 dBA increase in relation to impact significance.

0.5 in/sec PPV for new residential structures and modern commercial buildings and 0.25 in/sec PPV for historic and older buildings.

Impacts from groundborne vibration during Project construction are also assessed for their potential to cause annoyance to residents and other Project Site occupants. Caltrans vibration annoyance potential criteria characterize vibrations of 0.01 in/sec PPV as "barely perceptible," 0.04 in/sec PPV as "distinctly perceptible," 0.1 in/sec PPV as "strongly perceptible," and 0.4 in/sec PPV as "severe" (Caltrans, 2004).

Operational vibration levels can result in interference or annoyance impacts to residences or other land uses where people sleep, such as hotels and hospitals. Impacts of groundborne vibration from existing sources (Caltrain) on proposed receptors were assessed using the federal standards established by the U.S. Department of Transportation, Federal Transit Administration (FTA, 2006). For frequent events, a criterion of 72 VdB (vibration decibels) has been established, while for infrequent events, a criterion of 80 VdB has been established. As frequent events are defined as more than 70 vibration events per day and recent Caltrain schedules indicate a maximum daily train activity of 86 trains per day, Caltrain pass-by events driving would be considered as a frequent event and, therefore, the 72 Vdb criterion would apply.

Substantial Permanent Increases in Ambient Noise Levels in the Vicinity of the Project Site or Above Levels Existing without Project Site Development

The assessment of substantial permanent increases in noise levels resulting from Project Site development is addressed in Impact 4.J-3 based on a combination of existing ambient noise conditions at a given receptor and the incremental increase in noise. Project Site development-related noise generally would be associated with Project Site development-generated traffic, given the types of uses proposed and the fact that the Brisbane General Plan Noise Element acknowledges that the noisiest areas of the City are immediately adjacent to traffic corridors, including the US Highway 101 and Bayshore Boulevard. Guidance on the significance of changes in ambient noise levels is provided by the 1992 findings of the Federal Interagency Committee on Noise (FICON), which assessed the annoyance effects of changes in ambient noise levels resulting from aircraft operations (FICON, 1992). The recommendations are based upon studies that relate aircraft noise levels to the percentage of persons highly annoyed by the noise. The term "annoyance" is a summary measure of the general adverse reaction of people to noise that generates speech interference, sleep disturbance, or interference with the desire for a tranquil environment. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, it has been asserted that they are applicable to all sources of transportation noise described in terms of cumulative noise exposure metrics such as the DNL, as shown in **Table 4.J-3**. The rationale for the Table 4.J-3 criteria is that, as ambient noise levels increase, a small increase in decibel levels is sufficient to cause significant annoyance. The quieter the ambient noise level is, the more the noise can increase (in decibels) before it causes significant annoyance. Thus, the significance of permanent increases in noise levels is evaluated in Impact 4.J-3 based on the information provided in Table 4.J-3.

TABLE 4.J-3
MEASURES OF SUBSTANTIAL INCREASE IN TRANSPORTATION NOISE EXPOSURE

Ambient Noise Level Without Project (DNL)	Significant Impact Assumed to Occur if Project Site Development Increases Ambient Noise Levels By:
<60 dB	+ 5.0 dB or more
60-65 dB	+ 3.0 dB or more
>65 dB	+ 1.5 dB or more

NOTES:
DNL = day-night noise level. dB = decibels.

SOURCE: FICON, 1992.

Substantial Temporary or Periodic Increases in Noise Levels in the Vicinity of the Project Site above Levels Existing without Project Site Development

Temporary increases in noise levels in the vicinity of the Project Site are typically the result of site development and construction activities. Assessment of noise from construction activities resulting from Project Site development in Impact 4.J-4 employs the restrictions established by Section 8.26.060 of the Brisbane Municipal Code (consequently, it also indirectly applies to exposure of people or generation of noise in excess of established standards). This section of the Municipal Code limits construction hours to between 7:00 a.m. and 7:00 p.m. on weekdays and 9:00 a.m. and 7:00 p.m. on weekends and holidays. Further, the Municipal Code prohibits individual pieces of construction equipment from operating at a noise level in excess of 83 dBA at a distance of 25 feet from the equipment or operating such that the noise level at any point beyond the property line of the Project Site exceeds 86 dBA. These requirements were used as the basis of analyzing temporary or periodic noise impacts of the proposed Project Site development. Construction related impacts associated with implementation of the proposed Project infrastructure improvements described in Chapter 3, *Project Description*, are included in the analysis below. In addition, the potential for proposed uses within the Project Site to generate periodic noise levels exceeding Municipal code standards following completion of construction was evaluated.

Exposure of People to Excessive Airport Noise

Both the State of California and the FAA define the CNEL 65 dB contour as the threshold of noise compatibility with noise sensitive uses (e.g., residences, schools, and churches) in relation to exposure of people to airport-generated noise. Both have established a noise abatement criterion of 65 DNL that is used to identify potentially significant contributions from aircraft operations based on noise exposure maps typically contained in an airport land use compatibility plan. To determine whether Project Site development would expose people living or working within the Project Site to excessive noise levels, Impact 4.J-5 involved reviewing the Noise Exposure Map for SFO to determine whether any portion of the Project Site would be within the airport's 65 CNEL noise contour.

Exposure of People to Excessive Noise from Private Airstrip Operations

Based on a review of aerial photography, it was determined that there are no private air strips within a 10-mile radius of the Project Site. Thus, development of the Project Site would have no impacts related to operations of a private airstrip. No further evaluation related to this significance threshold was therefore undertaken.

Project Impacts and Mitigation Measures

Impact 4.J-1: Would the Project result in exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan, specific plan, or other land use plan?

Impact Significance by Scenario (before Mitigation)			
DSP	**DSP-V**	**CPP**	**CPP-V**
SM	SM	SM	SM

SU = Significant Unavoidable
SM = Significant but Mitigable
LTS = Less than Significant
- = no impact

The policies and standards of the Brisbane General Plan are intended to guide future development within the City. As such, the following is an assessment of noise impacts on the noise sensitive land uses proposed by Project Site development. Noise impacts to receptors outside of the Project Site are addressed in Impacts 4.J-3 and 4.J-4 for permanent noise increases, and Impact 4.J-5 for temporary (construction-related) noise increases.

DSP and DSP-V

The DSP and DSP-V scenarios propose development of multi-family residential units, which are considered noise-sensitive. Preliminary development plans indicate that these residential units would be as close as 50 feet from the Caltrain tracks. The DSP and DSP-V scenarios also both propose hotels and schools, which are considered sensitive to noise. The proposed hotels would be located just west of US Highway 101 in the DSP and DSP-V scenarios. A school is proposed southwestern portion of the Project Site south of Icehouse Hill.

Exposure of Multi-Family Housing to Noise

Program 184a of the Brisbane General Plan requires the use of the State's Land Use Compatibility Guidelines to determine noise-affected uses (see Table 4.J-2). For multi-family residential uses, noise environments of 65 DNL or less represent the normally acceptable noise exposure by the Governor's Office of Planning and Research. Long-term noise monitoring conducted in the northwestern part of the Project Site where residences would be located documented a DNL of 65 dBA at a distance of approximately 150 feet from the tracks. Noise monitoring conducted as part of the EIR for the Visitation Valley Redevelopment Program north of the Project Site indicated a long-term noise level DNL of 72 dBA at a distance of approximately 50 feet from the tracks (City of San Francisco Planning Department, 2008). Therefore, multi-family residential land uses closer than 150 feet to the Caltrain tracks would be exposed to noise levels considered conditionally acceptable, while residences located within approximately 75 feet of the Caltrain tracks would be exposed to noise levels considered normally unacceptable for such uses. "Conditionally acceptable" means that new construction or development should be undertaken only after a detailed analysis of the noise reduction

requirements is made and needed noise insulation features are included in the design. Therefore, a significant noise exposure impact would occur if residential uses receptors would occur within 150 feet of the Caltrain tracks as the result of exposing persons to noise levels in excess of those established in the City of Brisbane General Plan. Mitigation measures would therefore be required for any multi-family residential units located closer than 150 feet to the Caltrain tracks.

Development of multi-family residential uses would be subject to the standards of Title 24 of the California Code of Regulations, which provides an interior noise standard of DNL 45 dBA in any habitable room and requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard. Notwithstanding the requirements of Title 24, existing noise levels close to the Caltrain tracks would also affect exterior common areas, such as patios and balconies, and mitigation for exterior noise levels would be necessary (**Mitigation Measure 4.J-1a**).

Exposure of Hotels to Noise

Under the DSP and DSP-V scenarios, land uses proposed for the eastern portion of the Project Site would include hotels, which, while not as noise-sensitive as residential uses, represent a noise exposure category (transient lodging) within the California Land Use Compatibility Guidelines for Community Noise Environments, as shown in Table 4.J-2 and are considered to be noise sensitive. Noise monitoring conducted in the northeastern area of the Project Site indicates that the DNL of 75 dBA noise contour in this area is located approximately 100 feet from US Highway 101. These noise levels would be considered normally unacceptable for such uses. “Normally unacceptable” means that new construction or development should generally be discouraged and that, if new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Similar to multi-family housing, hotels would also be subject to the standards of Title 24 of the California Code of Regulations, which provides an interior standard of DNL 45 dBA in any habitable room and requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard.

Implementation of Title 24 standards would minimize the impact of noise from Caltrain operations and vehicle traffic on US Highway 101 in relation to interior spaces to a less-than-significant level, but would have no effect on exterior noise levels.

However, General Plan Policy 179 requires the incorporation, when feasible, of new road or landscaping features that buffer noise impacts on adjacent areas while Policy 183 encourages coordination of land uses and construction conditions to minimize noise impacts of the Caltrain corridor and major highway arterials on adjacent land uses. Implementation of these policies would serve to reduce exterior noise impacts to some extent, but without an established design guideline or performance standard (as set forth in **Mitigation Measure 4.J-1b**), the degree of reduction cannot be quantified therefore simply being consistent with the policy would not necessarily reduce exterior noise impacts to a less than significant level. Therefore, this impact would be significant.

Exposure of Schools to Noise

As noted above, under the DSP and DSP-V scenarios, land uses proposed for the southwestern portion of the Project Site south of Icehouse Hill would include school facilities, which are considered to be noise sensitive within the California Land Use Compatibility Guidelines for Community Noise Environments, as shown in Table 4.J-2. Noise monitoring conducted in the northeastern area of the Project Site indicates a DNL of 66 dBA in this area, located approximately 250 feet from Caltrain tracks. These noise levels would be considered to be normally to conditionally acceptable for school uses.

Exposure of Users of Trails and Parks to Noise

The DSP and DSP-V development scenarios reserve approximately 170 acres for open space and public use areas. Open space areas are proposed to include both passive and active areas. Passive recreational areas are proposed along the Visitacion Creek corridor, around Icehouse Hill, and along the edges of Brisbane Lagoon. The primary open space element proposed in the DSP and DSP-V scenarios is the Visitacion Creek Park.

The Specific Plan for the DSP and DSP-V scenarios states that the lagoon may offer water-related recreational activities such canoeing and kayaking. The more active proposed use areas include parks and cultural features spread across the Project Site, as well as extension of the San Francisco Bay Trail along the US Highway 101 frontage road. In the eastern portion of the Project Site, the north-south spine of the trail network is proposed to accommodate a new section of the San Francisco Bay Trail. In the western portion of the Project Site, a new north-south greenway is proposed to connect the northern boundary of the area to the Roundhouse building.

Noise monitoring conducted at the southeastern and northeastern portions of the Project Site, near the alignment of the proposed Bay Trail extension and the eastern portion of the lagoon, indicate noise levels ranging from 70 to 75 CNEL. This noise environment is within the upper end of the normally acceptable noise exposure category for active recreational uses (i.e., golf course, riding stables, water recreation), overlapping into the lower end of noise considered to be conditionally acceptable for active recreational use.

Noise monitoring conducted at the south-central, north-central and northwestern portions of the Project Site represent the existing noise environment for passive recreation areas at the Visitacion Creek corridor, Icehouse Hill, and Roundhouse areas, respectively. Noise levels at these locations were monitored to be 63, 67 and 65 CNEL, respectively. These noise environments are within the upper end of the normally acceptable noise exposure category for passive recreational uses (e.g. playgrounds neighborhood parks). Noise exposures at locations proposed for both passive and active recreational uses would be within noise exposure limits identified by the state as normally acceptable for these uses and noise exposure for recreational uses would be a less than significant impact.

Conclusion: Residents of multi-family housing proposed by the DSP and DSP-V would be exposed to noise levels that exceed the standards established by the Brisbane General Plan, resulting in a significant impact that requires mitigation. Exterior noise exposure at hotel uses

would also be considered significant and require mitigation. **Mitigation Measures 4.J-1a** and **4.J-1b** below are therefore proposed. Impacts related to schools and recreational areas would be less than significant under these scenarios.

CPP, and CPP-V

The CPP and CPP-V scenarios do not propose housing, and therefore would not expose residents to this noise source.

Exposure of Hotels to Noise

The proposed hotels in the CPP and CPP-V scenarios would be farther away (approximately 1,200 feet as indicated in Figures 3-14 and 3-15) from US Highway 101 than proposed in the DSP and DSP-V scenarios, and would be separated from the Caltrain tracks by approximately 200 feet of open space and Tunnel Road. At this distance, noise from Caltrain would be reduced to below 65 dBA, DNL and would fall within the normally acceptable category for transient lodging land uses.

As noted above, hotels would also be subject to the standards of Title 24 of the California Code of Regulations, which provides an interior standard of DNL 45 dBA in any habitable room and requires an acoustical analysis demonstrating how dwelling units have been designed to meet this interior standard. Implementation of Title 24 standards would minimize the impact of noise from Caltrain operations and vehicle traffic on US Highway 101 on interior spaces to a less-than-significant level, but would have no effect on exterior noise levels. However, General Plan Policy 179 requires the incorporation, when feasible, of new road or landscaping features that buffer noise impacts on adjacent areas while Policy 183 encourages Coordination of land uses and construction conditions to minimize noise impacts of the Caltrain corridor and major highway arterials on adjacent land uses. Implementation of these policies could serve to reduce exterior noise impacts but without an established design guideline or performance standard (as set forth in **Mitigation Measure 4.J-1b**), the degree of reduction cannot be quantified. Therefore, this would be a significant impact.

Exposure of Schools to Noise

Under the CPP and CPP-V scenarios, land uses proposed for the southwestern portion of the Project Site south of Icehouse Hill would include a charter high school, which is within a noise exposure category in the California Land Use Compatibility Guidelines for Community Noise Environments, as shown in Table 4.J-2. Noise monitoring conducted in the northeastern area of the Project Site indicates a DNL of 66 dBA in this area, approximately 250 feet from Caltrain tracks. These noise levels would be considered normally acceptable for such uses as shown in Figure 4.J-3.

Conclusion: Noise impacts to schools under the CPP and CPP-V scenarios would be less-than-significant and no mitigation is required. Impacts associated with hotel exposure to noise would be significant. **Mitigation Measure 4.J-1b** is recommended.

Mitigation

Mitigation Measure 4.J-1a: All residential development within the Project Site shall minimize the exposure of people within the Project Site to noise from Caltrain operations through construction of noise barriers or maintenance of buffer distances, and shall adhere to the following noise performance standards:

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	-	-
✓ = measure applies - = measure does not apply			

- Exterior noise level of below 65 dBA, DNL for outdoor common areas within any approved residential use; and
- Interior noise standard of 45 dBA, DNL.

These noise levels shall be attained through use of appropriate building materials as required by state of California Title 24 standards. Compliance with these performance standards shall be verified by an acoustical professional prior to issuance of a building permit. Specific measures to achieve these performance standards shall include all or any combination of the following options:

- Site design measures, including use of building orientation to minimize window exposure toward noise sources, avoid placing balcony areas in high noise areas, and use of buildings as noise barriers;
- Use of acoustically rated building materials (insulation and windows);
- Construction of architectural noise barriers between sources and receptors; and
- Provision of landscaping or other non-noise-sensitive buffer zones between sources and receptors.

Mitigation Measure 4.J-1b: All hotel projects within the Project Site shall minimize the exposure of people within the Project Site to noise from Caltrain operations through construction of noise barriers or maintenance of buffer distances, and shall adhere to the following noise performance standards:

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	✓	✓
✓ = measure applies - = measure does not apply			

- Exterior noise level of below 65 dBA, DNL for outdoor common areas within any approved residential use or hotel; and
- Interior noise standard of 45 dBA, DNL.

These noise levels shall be attained through use of appropriate building materials as required by state of California Title 24 standards. Compliance with these performance standards shall be verified by an acoustical professional prior to issuance of a building permit. Specific measures to achieve these performance standards shall include all or any combination of the following options:

- Site design measures, including use of building orientation to minimize window exposure toward noise sources, avoid placing balcony areas in high noise areas, and use of buildings as noise barriers.

- Use of acoustically rated building materials (insulation and windows);
- Construction of architectural noise barriers between sources and receptors; and
- Provision of landscaping or other non-noise-sensitive buffer zones between sources and receptors.

Conclusion with Mitigation: With implementation of **Mitigation Measures 4.J-1** and **4.J-1b**, noise impacts on multi-family housing residents under the DSP and DSP-V and on hotel occupants under Project Site development would be less than significant.

Overall Conclusion

With the inclusion of **Mitigation Measures 4.J-1a** and **4.J-1b**, implementation of Project Site development would not result in a significant noise impact related to exposure of residents (DSP and DSP-V scenarios), hotel occupants (DSP, DSP-V, CPP and CPP-V), or recreational users (DSP, DSP-V, CPP and CPP-V) to noise levels in excess of standards of the General Plan. Exposure of schools within the Project Site to noise would be less than significant under Project Site development.

Impact 4.J-2: Would the Project expose people to or generate excessive groundborne vibration or groundborne noise levels during construction or operation?

Impact Significance by Scenario (before Mitigation)			
DSP	**DSP-V**	**CPP**	**CPP-V**
SM	SM	LTS	LTS

SU = Significant Unavoidable
SM = Significant but Mitigable
LTS = Less than Significant
- = no impact

This analysis addresses vibration impacts from construction activities as well as from Caltrain operations through the project site. Vibration impacts from project construction activities are addressed herein for both existing off-site receptors and future sensitive receptors of the proposed project that would be exposed to ongoing construction activities after initial construction activities. Exposure of people to vibration impacts from Caltrain operations are addressed only for buildings and receptors within the Project Site since exposure of persons outside of the Project Site to Caltrain operations-related vibrations would not be an impact resulting from Project Site development.

DSP, DSP-V, CPP, and CPP-V

Vibration Effects on Buildings

Groundborne vibration from construction activities that involve "impact tools," especially pile driving, can produce significant vibration. Pile driving may be necessary for the construction of high-rise office or hotel structures. Pile driving can result in peak particle velocity (PPV) of up to 1.5 in/sec at a distance of 25 feet (FTA, 2006), but typically average about 0.644 PPV at that distance. The Caltrans measure of the threshold of architectural damage for conventional sensitive structures is 0.5 in/sec PPV for new residential structures and modern commercial buildings and 0.25 in/sec PPV for historic and older buildings. Therefore, the potential exists that

Project Site development would exceed the criteria published by Caltrans of 0.25 in/sec for the protection of fragile older buildings, as well as the 5 in/sec PPV criterion for newer buildings.

Under Project Site development, the nearest existing (off-site) structures to proposed high-rise office and hotel land uses would be an industrial building approximately 360 feet northwest of the high-rise office area. At this distance, pile-driving vibration would be reduced to 0.0123 in/sec, and therefore the vibration would have a less-than-significant impact with regard to building damage.

Extremely fragile structures within the Project Site would consist of the Roundhouse, which is listed on the National Register of Historic Places. This unreinforced masonry structure has suffered fire damage which occurred primarily in the western half of the Roundhouse, with portions of its roof now missing, charred timbers, and missing or broken window frames and is therefore in a fragile condition. Development in the vicinity of the Roundhouse would consist of construction of the circular roadway around the building, with open space to the south, institutional buildings to the west, and residences to the east in the DSP and DSP-V scenarios. In the CPP and CPP-V scenarios, development in the vicinity of the Roundhouse would consist of construction of the circular roadway around the building, with open space to the south, civic buildings to the east and west and entertainment buildings to the north. Development of these surrounding uses would involve standard construction equipment and would be unlikely to require high-impact equipment such as pile driving. However, if pile driving were necessary for proposed buildings near the Roundhouse, construction-related vibration would be significant if it were to occur within 85 feet of the structure. Consequently, a mitigation measure is identified to address this potential impact.

The upper end of vibration levels generated by standard construction equipment would be 0.089 in/sec which would be generated by large bulldozers, hoe rams or caisson drilling at a distance of 25 feet and would be below the criterion published by Caltrans of 0.25 in/sec for the protection of fragile buildings.

Vibration Effects on People

Vibration levels can also result in interference or annoyance impacts for residences or other land uses where people sleep, such as hotels and hospitals. Caltrans vibration annoyance potential criteria characterize vibrations of 0.01 in/sec PPV as “barely perceptible,” 0.04 in/sec PPV as “distinctly perceptible,” 0.1 in/sec PPV as “strongly perceptible,” and 0.4 in/sec PPV as “severe” (Caltrans, 2004).

On-site Proposed Receptors

The nearest sensitive land uses to the proposed high-rise office and hotels within the Project Site would be residences (under the DSP and DSP-V scenarios) that would be approximately 400 feet away. At this distance, pile-driving vibration would be reduced to 0.01 in/sec (barely perceptible), and therefore the vibration would have a less-than-significant impact with regard to human annoyance.

Off-site Existing Receptors

The closest existing (offsite) sensitive land uses would be over 1,000 feet north of the proposed hotel and high-rise office land uses, and would exposed to substantially lower vibration levels than that predicted for residences under the DSP and DSP-V scenarios.

Conclusion: Vibration during construction would represent a less-than-significant impact under Project Site development.

Exposure of People to Vibration from Rail Operations

Because the Project Site is bisected by the Caltrain commuter rail tracks, Project Site development would result in the exposure of people to vibrations from Caltrain rail operations. Approximately 86 Caltrain pass-by events currently occur on a daily basis. Nighttime freight train activity also occasionally occurs on these tracks. The FTA acknowledges that steel wheeled/steel rail vehicles can generate vibration impacts. The FTA identifies screening buffer distances in its document, *Transit Noise and Vibration Impact Assessment*. Specifically, for commuter rail lines, buffer distances of 200 feet from the right-of-way are recommended for residences or any land uses where people sleep, such as hotels and hospitals to avoid vibration impacts. For institutional land uses, such as schools and churches, the recommended buffer distance to avoid vibration impacts is 120 feet from the right-of-way.

Therefore, given that the DSP and DSP-V scenarios propose to develop residences within 200 feet of the Caltrain station and mainline track, impacts would be significant. Previous studies conducted adjacent to Caltrain tracks in San Carlos measured varied levels from 68 to 89 VdB, with the setback of the 72 VdB vibration contour located approximately 100 feet from the center of the near track (Illingworth and Rodkin, 2006). Proposed hotel land uses of the DSP and CPP scenarios would be located approximately 1,500 and 250 feet from the rail tracks, respectively, and hence not be subject to a significant vibration impact. Proposed school uses would be located more than 300 feet from the rail tracks under Project Site development.

In the event that Caltrain upgrades to electric powered trains, vibration impacts to nearby residences constructed within the Project Site would likely be reduced, as vibration curves published by the FTA indicate that vibration levels from locomotive powered passenger trains are at least 10 Vdb greater than light-rail vehicles. However, as electric power trains are not currently in use and their future use is uncertain, this impact would be significant.

Conclusion: Under the DSP and DSP-V scenarios, Project Site development would expose onsite residents to vibration from rail operations, representing a significant impact. **Mitigation Measure 4.J-2a**, which establishes a vibration performance standard for residential developments within 200 feet of the Caltrain Station and mainline track, and requires that detailed project-level vibration analyses be prepared to ensure that the that standard will be met, is recommended. In addition, **Mitigation Measure 4.J-2b** is recommended to ensure that pile driving vibrations impacts to any historic structures (Roundhouse) would be reduced.

Mitigation

Mitigation Measure 4.J-2a: All development in the Baylands shall be designed to avoid vibration from Caltrain operations in excess of 72 VdB for residences. Prior to issuance of any building permit for structures intended for human occupancy within 200 feet of the mainline track, a detailed vibration design study shall be completed by a qualified acoustical engineer to confirm the ground vibration levels and frequency content along the Caltrain tracks and to determine appropriate design to limit interior vibration levels to 72 VdB for residences. Implementation of the recommended measures of the acoustical study into project design elements shall be verified by the Brisbane Building Department as part of the plan-check process.

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	-	-
✓ = measure applies - = measure does not apply			

Specific measures to achieve the performance standards set forth above shall include all or any combination of the following methods:

- Use of vibration isolation techniques such as supporting the new building foundations on elastomer pads similar to bridge bearing pads;
- Installation of vibration wave barriers. Wave barriers would consist of control trenches or sheet piles, which are analogous to controlling noise with sound barrier. The applicability of this technique depends on the characteristics of the vibration waves.

Mitigation Measure 4.J-2b: Pre-Construction Assessment to Minimize Structural Pile-Driving Vibration Impacts on Adjacent Historic Buildings and Structures and Vibration Monitoring. Any development within 85 feet of the Roundhouse that would require pile driving or other construction techniques that could result in vibrations of 0.25 in/sec shall engage a qualified geotechnical engineer subject to City approval to conduct a pre-construction assessment of existing subsurface conditions and the structural integrity of the nearby historic structures subject to pile-driving or other vibration-inducing activity before a building permit is issued to demonstrate that the proposed construction activities would not result in vibration-induced damage to the Roundhouse building.

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	✓	✓
✓ = measure applies - = measure does not apply			

If recommended by the pre-construction assessment, groundborne vibration monitoring of nearby historic structures shall be required. Such methods and technologies shall be based on the specific conditions at the construction site such as, but not limited to, the pre-construction surveying of potentially affected historic structures and underpinning of foundations of potentially affected structures, as necessary. The pre-construction assessment shall include a monitoring program to detect ground settlement or lateral movement of structures in the vicinity of pile-driving activities. Monitoring shall be maintained while construction occurs within 85 feet of historic structures, and results shall be submitted to the City Engineer. In the event of unacceptable ground with the potential to cause structural damage movement (in excess of 0.25 in/sec PPV at historic structures), as determined by the City Engineer, all impact work shall cease until corrective measures

(e.g., installation of vibration wave barriers) are implemented to reduce ground movement to below 0.25 inches PPV.

Conclusion with Mitigation: With implementation of **Mitigation Measures 4.J-2a** and **4.J-2b,** groundborne vibration impacts on multi-family housing under the DSP and DSP-V scenarios and on the Roundhouse for Project Site development would be less than significant.

Overall Conclusion

Implementation of **Mitigation Measure 4.J-2a** would ensure that impacts resulting from the DSP and DSP-V scenarios related to groundborne vibration from rail operations would be less than significant. Implementation of **Mitigation Measure 4.J-2b** would ensure that impacts to historic structures resulting from pile driving vibrations would be less than significant. Vibration during construction would represent a less-than-significant impact under Project Site development.

Impact 4.J-3: Would the Project result in a substantial permanent increase in ambient noise levels in the vicinity or above levels existing without the Project?

Impact Significance by Scenario (before Mitigation)			
DSP	**DSP-V**	**CPP**	**CPP-V**
LTS	SM	LTS	LTS

SU = Significant Unavoidable
SM = Significant but Mitigable
LTS = Less than Significant
- = no impact

DSP, DSP-V, CPP, and CPP-V

Traffic-Generated Noise

Noise projections were made using traffic data from Fehr & Peers, included in **Appendix K** and the Federal Highway Administration Noise Prediction Model for those road segments that would experience the greatest increase in traffic volume and/or that would pass through residential or other noise-sensitive areas. The model applies 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 results of the modeling effort (in Appendix K) are shown in **Table 4.J-4** for existing conditions and existing plus Project Site development conditions. The transportation analysis estimates that Project site development would result in approximately 44,985 net new vehicle trips per day under the DSP scenario, approximately 42,446 net new vehicle trips per day under the DSP-V scenario, approximately 82,176 net new vehicle trips per day under the CPP scenario, and approximately 79,196 net new vehicle trips per day under the CPP-V scenario. This traffic would be distributed over the local street network and would affect roadside noise levels. Traffic noise dissipates with increasing distance from the source. Consequently, modeled existing noise levels shown in Table 4.J-4 correspond to a distance of 75 feet from the centerline of applicable roadway segments to account for the presence of multiple lanes, roadway shoulder, sidewalk and building setback, all of which contribute to the realized attenuated sound level at residences or other receptors. Noise levels predicted for the DSP-V scenario use traffic volumes assumed for an event as predicted in the Transportation analysis.

TABLE 4.J-4
TRAFFIC NOISE INCREASES ALONG ROADS IN THE PROJECT SITE VICINITY

Road Segment	Modeled Noise Levels, dBA, DNL								
	Existing Traffic Noise	Existing Plus DSP	Change with DSP	Existing Plus DSP-V (with Event)	Change with DSP-V (with Event)	Existing Plus CPP	Change with CPP	Existing Plus CPP-V	Change with CPP-V
1. Geneva Avenue (between Bayshore Boulevard and Schwerin Street)	67.1	68.5	+1.4	68.7	**+1.6**	68.5	+1.4	68.4	+1.3
2. Guadalupe Canyon (between Bayshore Boulevard and Carter Street)	62.5	63.9	+1.4	64.0	+1.5	64.0	+1.5	63.9	+1.4
3 Old County Road (between Bayshore Boulevard and San Bruno Avenue)	61.2	63.4	+2.2	63.6	+2.4	63.4	+2.2	63.4	+2.2
4. Bayshore Boulevard (between Old County Road and San Bruno Avenue)	67.2	68.0	+0.8	68.0	+0.8	67.7	+0.5	67.7	+0.5
5. San Bruno Avenue (between Old County Road and Bayshore Boulevard)	51.9	51.9	0.0	51.9	0.0	51.9	0.0	51.9	0.0
6. Harney Way (East of Thomas Mellon Circle)	55.7	56.2	+0.5	56.4	+0.7	56.4	+0.7	56.3	+0.6
7. Tunnel Avenue (between Beatty Road and Blanken Road)	59.1	61.6	-+2.5	62.1	+3.0	62.3	+3.2	62.1	+3.0
8. Blanken Avenue (between Bayshore Boulevard and Tunnel Avenue)	56.7	57.2	+0.5	57.5	+0.8	57.6	+0.9	57.5	+0.8
9. Sunnydale Avenue (between Desmond Street and Bayshore Boulevard)	56.9	58.0	+1.1	58.2	+1.3	58.1	+1.2	58.0	+1.1
10. Geneva Avenue (between Carter Street and Mission Street)	67.6	68.8	+1.2	68.9	+1.3	68.8	+1.2	68.8	+1.2

NOTES:
Bold indicates values that represent a significant impact, based on measures listed in Table 4.J-5.
dBA = A-weighted decibels. DNL = day-night noise level.

SOURCE: ESA, 2012.

The significance thresholds used were those identified by FICON, as set forth in **Table 4.J-5**. The results of the traffic noise study, as indicated in Table 4.J-4, demonstrate that noise increases along Geneva Avenue would be the only roadway segment where such increases would exceed the significance criteria (in this case, an increase of 1.5 or greater in an area in excess of 65 DNL, as shown in Table 4.J-5) which would only occur under the DSP-V scenario with an event. The impact at all other roadways would be less than significant, based on the measures shown in Table 4.J-5.

TABLE 4.J-5
MEASURES OF SUBSTANTIAL INCREASE IN TRANSPORTATION NOISE EXPOSURE

Ambient Noise Level Without Project (DNL)	Significant Impact Assumed to Occur if Project Site Development Increases Ambient Noise Levels By:
<60 dB	+ 5.0 dB or more
60-65 dB	+ 3.0 dB or more
>65 dB	+ 1.5 dB or more

NOTES:
DNL = day-night noise level. dB = decibels.

SOURCE: Federal Interagency Committee on Noise (FICON), 1992

Feasible mitigation that could be implemented to reduce this impact would be for DSP-V scenario to adopt additional transportation demand management (TDM) measures to reduce Project site development-generated traffic, as required by the County Congestion Management Program (refer to Impact 4.N-13 of Section 4.N, *Traffic and Circulation*). TDM measures would reduce vehicle trips generated by project site development and the associated increases in roadway noise on Geneva Avenue. The efficacy of TDM programs is estimated to range from at best 5 to 15 percent of overall vehicle miles travelled (CAPCOA, 2010). Therefore the needed 2.3 percent volume reduction to reduce the impact would be reasonably attainable and the impact would be less than significant with implementation of **Mitigation Measure 4.N-13**, see Section 4.N.4, *Impacts and Mitigation Measures*, of this EIR.

Conclusion: Mitigation Measure 4.N-13 would reduce peak hour traffic and its associated noise impact on Geneva Avenue to a less-than-significant level. The impact of increased traffic noise on other roadways would be less than significant.

Project Site Generated Noise (e.g., mechanical equipment, truck loading/unloading)

Once new development within the Project Site is in operation, noise would be generated by truck loading and unloading activities as well as heating, ventilation, and air conditioning systems on Project buildings. These noise sources are considered separately from traffic noise because they would be located on rooftops and in loading docks, away from streets where traffic would generate noise.

Operation of heating, ventilation, and air conditioning equipment would be subject to City Noise Ordinance standards. Provided that the equipment would be designed and used in a manner that

complies with those standards (see **Mitigation Measure 4.J-3a** below), the noise impact on Project residences (under the DSP and DSP-V) and adjacent land uses would be less than significant.

Operational noise related to the arrival, departure, and loading/unloading of goods from delivery trucks associated with Project site development's proposed warehouse and commercial land uses would generate noise. Retail land uses in all scenarios would be located as close as 350 feet from the nearest existing sensitive receptor (residences) on MacDonald Avenue.

Typical 18-wheeled semi-trailer truck delivery operations result in a maximum sound level of 71.5 dBA Leq when measured at a distance of 25 feet from the loading area (see **Appendix I**). At this distance, delivery operations would be reduced to 49 dBA, which would be below the monitored daytime noise levels on and around the Project Site (57 to 69 dBA).

Proposed residences under the DSP scenarios would be located adjacent to commercial uses. Assuming a distance of 25 feet, noise levels of 72 dBA would be generated at proposed residences. The Brisbane noise ordinance establishes an exterior noise limit of 10 dBA over existing conditions for events exceeding 15 minutes in duration. Given that existing daytime hourly noise levels as low as 57 dBA have been monitored on the Project Site, these activities would exceed noise ordinance standards. Consequently, **Mitigation Measure 4.J-3a** is identified to address this impact.

The arena proposed under the DSP-V scenario would result in noise from crowds gathering outside the area before and after events. Increased traffic volumes associated with events were assumed in the predicted traffic noise levels impacts for the DSP-V scenario are addressed above.

The CPP-V scenario includes proposed expansion of the existing Recology facility. This expansion would involve an increase in recyclable materials handled within the facility. Loading and unloading of recyclables would occur within an enclosed building under the CPP-V scenario whereas it occurs both indoors and outdoors under existing conditions. Consequently, while this variant would result in more frequent noise from loading and unloading of recyclables, it is anticipated that moving all loading and unloading operations into an enclosed structure would offset any noise increases.

Wind Energy Generated Noise

As discussed in Chapter 3, *Project Description*, wind energy production is proposed as part of Project Site development. The CPP and CPP-V scenarios are intended to generate renewable energy through a combination of solar and small-scale wind facilities installed on rooftops and within spaces dedicated to other uses. Figure 4.10.5 of the Brisbane Baylands Specific Plan, which details proposed development of the DSP and DSP-V scenarios, identifies an "iconic sustainability structure with PV panels and/or wind turbines" being constructed as part of the proposed onsite recycled water plant, while Section 3.3 of that specific plan notes that individual buildings within the Project Site may include renewable energy strategies such as solar or wind power, and energy production, including wind energy, is included as a permitted use within the Brisbane Baylands Specific Plan. Because Project Site development may include wind turbines for renewable energy generation, the noise impact of wind energy generation is evaluated below. While wind energy production under

Project Site development would involve small wind turbines, the noise characteristics of utility-grade wind turbines is provided for comparison purposes.

Wind turbines generate two types of noise: mechanical sounds from the interaction of turbine components, and aerodynamic sounds generated by the blades passing through the air. The power of aerodynamic noise is related to the ratio of the blade tip speed to wind speed. Depending on the turbine model and the wind speed, the aerodynamic noise may seem like buzzing, whooshing, pulsing, or sizzling. Turbines with their blades downwind of the tower can cause a thumping sound as each blade passes the tower. Most noise radiates perpendicular to the blades' rotation. Since turbines rotate to face the wind, they may radiate noise in different directions each day. The noise from two or more turbines may combine to create an oscillating or thumping effect.

Noise generated by small scale wind turbines varies with wind speed and the model of turbine. Because utility scale turbines must generate electricity that is compatible with grid transmission, they are typically programmed to keep the blades rotating at as constant a speed as possible. **Table 4.J-6** shows how the sound power of wind turbines varies by model and wind speed.

TABLE 4.J-6
WIND TURBINE NOISE LEVELS

Make and Model	Turbine Size	Wind Speed (meters/second)	Estimated Sound Power	Noise Level at 50 feet
Small Wind Turbines				
Southwest Windpower Whisper H400	900 W	5 m/s 10 m/s	83.8 dB(A) 91.0 dB(A)	49.1 dB(A) 56.3 dB(A)
Bergey Excel BW03	10 kW	5 m/s 10 m/s	87.2 dB(A) 105.4 dB(A)	52.5 dB(A) 70.7 dB(A)
Utility Scale Wind Turbines				
Vesta V80	1.8 MW	5 m/s	98-109 dB(A)	63.3-74.3 dB(A)
Enercon E70	2.0 MW	5 m/s	102 dB(A)	67.3 dB(A)
Enercon E112	4.5 MW	5 m/s	107 dB(A)	70.7 dB(A)

SOURCE: Alberts, 2006.

At 50 feet from sensitive noise receptors, both small wind turbines would not create significant noise levels, except under high wind conditions, where noise generated by the wind itself would mask the loudness of noise generated by the wind turbine. The noise levels that would result from onsite wind turbines are below noise levels that would occur at comparable locations from US Highway 101 and the Caltrain tracks within the Project Site. As noted in Table 4.J-1, existing ambient CNEL noise levels in the northeastern portion of the Project Site are 75 dB(A), while existing ambient CNEL noise levels in the northwestern portion of the Project Site are 70 dB(A). Significant impacts resulting from small wind turbines onsite are not, therefore, expected as long as a 50-foot separation is maintained. As shown in Table 4.J-6, larger utility scale wind turbines have the ability to create significant noise impacts on noise sensitive uses. Mitigation is therefore required.

Conclusion: Under Project Site development, Project-generated operational noise would result in substantial permanent increases in ambient noise levels, representing a significant impact. **Mitigation Measure 4.J-3a** is recommended. In addition, appropriate setbacks are needed to ensure that onsite wind turbines avoid significant noise impacts (**Mitigation Measure 4.J-3b**).

Mitigation

Mitigation Measure 4.J-3a: All development within the Project Site shall incorporate the following design features into the final site plans prior to issuance of a building permit:

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	✓	✓
✓ = measure applies - = measure does not apply			

- Building equipment (e.g., heating, ventilation, and air conditioning units) shall be located away from nearby residences, on building rooftops, or adequately shielded within an enclosure that effectively blocks the line of sight of the source from receivers in order to meet a performance standard of 5 dBA over existing ambient noise levels (generally perceptible increase to most persons) for this source which would potentially operate more than 20 minutes in a given hour.
- Formal truck delivery areas (e.g. loading bays) shall be located at least 100 feet from residences to maintain noise levels of less than 5 dBA over existing monitored levels. Truck delivery bays and waste collection areas shall be located so that they are blocked by Project buildings or designed with noise reduction barriers to reduce noise impacts on residences or other sensitive receptors.

Mitigation Measure 4.J-3b: Small wind turbines shall be sited a minimum of 50 feet from the property line of noise sensitive land uses (e.g., residential, schools, religious institutions), and utility scale wind turbines shall be cited a minimum of 100 feet from the property line of noise sensitive land uses.

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	✓	✓
✓ = measure applies - = measure does not apply			

Conclusion with Mitigation: With implementation of the **Mitigation Measures 4.J-3a** and **4.J-3b**, the noise impact from stationary operations would be reduced to a less-than-significant level under Project Site development.

Impact 4.J-4: Would the Project result in a substantial temporary or periodic increase in ambient noise levels in the vicinity of the project above levels existing without the Project?

Impact Significance by Scenario (before Mitigation)			
DSP	**DSP-V**	**CPP**	**CPP-V**
SU	SU	SM	SM
SU = Significant Unavoidable SM = Significant but Mitigable LTS = Less than Significant - = no impact			

DSP, DSP-V, CPP, and CPP-V

Project construction would occur in multiple phases and would involve demolition, transport of soils, excavation, grading,

trenching, paving, concrete work for foundations, and building erection. Noise from these activities could impact nearby existing (offsite) receptors as well as future (onsite) receptors developed in earlier increments of construction.

Construction-related activities would temporarily increase ambient noise levels in the Project Site vicinity over the duration of construction. Construction-related noise levels at and near locations on the Project Site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. The effect of construction noise would depend upon the level of construction activity on a given day and the related noise generated by that activity, the distance between construction activities and the nearest noise-sensitive uses, and the existing noise levels at those uses.

Construction Noise Impacts to Off-site Receptors

Noise from demolition and construction activities within the Project Site would affect adjacent and nearby existing commercial and residential uses. Existing offsite noise-sensitive uses nearest the proposed demolition and construction activity are the residents of the Mission Blue Drive development, residents on San Francisco and Santa Clara Streets in Brisbane and residents on Linda Vista Drive and MacDonald Street in Daly City, and residents on Desmond Street and in the Little Hollywood neighborhood in San Francisco. These uses could occasionally experience the noise levels indicated in **Table 4.J-7**, depending on the proximity of equipment at a given time.

TABLE 4.J-7
TYPICAL CONSTRUCTION ACTIVITY NOISE LEVELS

Phase	Noise Level at 50 Feet (L_{eq})[a]	Noise Level (L_{eq}) at 200 Feet	Noise Level (L_{eq}) at 400 Feet	Noise Level (L_{eq}) at 1,600 Feet
Ground Clearing	84	75	66	54
Excavation	89	80	71	59
Foundations	78	69	60	48
Erection	85	76	67	56
Exterior Finishing	89	80	71	59
Pile Driving	90-105	81-96	72-87	60-75

NOTES:

[a] 50 foot estimates correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase and 200 feet from the other equipment associated with that phase.

L_{eq} = equivalent sound level.

SOURCE: Bolt, Baranek, and Newman, 1971.

Table 4.J-7 shows typical noise levels generated by building construction. As shown in the table, the noisiest phase of construction would be during pile driving, which would generate noise levels of approximately 90 to 105 L_{eq} at 50 feet. Excavation and exterior finishing would also generate a substantial amount of noise. To further define the level of pile-driving noise, monitoring was conducted during pile-driving activities at Sierra Point in Brisbane, approximately one mile southeast of the Project Site where soil conditions could be similar to conditions at the Project Site. Maximum noise levels monitored were 91 dBA at a distance of 200 feet.

Construction Noise Impacts to On-site Receptors

Pile driving may be necessary for mid- and high-rise office or hotel structures in later phases of site development. Under the CPP and CPP-V scenarios, the closest sensitive land use to pile driving would be offsite receptors approximately 1,600 feet away. At this distance, pile-driving noise would be attenuated to 73 dBA which, while noticeable, would be of similar intensity as high-volume roadway traffic and would not be considered significant in an urban environment, as it would be below the 86-dBA construction noise standard of the City of Brisbane Noise Ordinance. Pile-driving noise from construction of the CPP or CPCP-V scenario would therefore be considered a less-than-significant impact.

Receptors constructed in early increments of site development of the DSP and DSP-V Scenarios would likely be occupied and exposed to construction noise during Phase 2 development. These receptors would be as close as 200 feet from Phase 2 construction areas. At this distance, typical construction noise levels would range from 69 to 80 dBA.

Pile driving may be necessary for mid- and high-rise office, entertainment uses or hotel structures in Phase 2. Under the DSP and DSP-V scenarios, the nearest sensitive land uses to proposed mid- and high-rise office and hotel land uses would be residences that could be developed prior to mid- and high-rise offices, approximately 200 feet to the west, where intermittent pile-driving noise of up to 91 dBA would be expected to occur for several weeks, depending on the size of the buildings constructed. This noise increase would be more than 10 dBA in excess of existing ambient levels and would exceed the 86-dBA construction noise standard of the City of Brisbane Noise Ordinance. Pile-driving noise from construction of the DSP or DSP-V scenario would therefore be considered a significant impact. Offsite receptors located nearest construction areas requiring pile-driving under the DSP scenarios would be 1,500 feet to the north and exposed to lesser resultant noise levels of 74 dBA.

Standard construction equipment (i.e., equipment other than pile drivers) would generate the noise levels shown in **Table 4.J-8**. Based on the analysis below, several types of the construction equipment specified would exceed the 83 dBA at 25 feet standard of Section 8.28.060. Therefore, the second criterion, which restricts construction noise at the property line from exceeding 86 dBA, would represent the applicable significance criterion and could be exceeded when construction is within 75 feet of a sensitive receptor. Also, during nighttime, temporary construction-related noise could be more disturbing given the more sensitive nature of the nighttime period.

To reduce construction noise impacts to levels required by Section 8.28.060 of the Brisbane Municipal Code, an available menu of mitigation options to achieve the 84 dBA performance standard is included in **Mitigation Measure 4.J-4a**.

Additionally, the Municipal Code requires construction contractors to limit standard construction activities to between 7:00 a.m. and 7:00 p.m. Monday through Friday and between 9:00 a.m. and 7:00 p.m. on weekends and holidays. Pile driving and/or other extreme noise-generating activities (greater than 90 dBA) would be limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday, with no extreme noise-generating activity permitted between 12:30 p.m. and 1:30 p.m. No extreme noise-generating activities would be allowed on weekends and holidays.

TABLE 4.J-8
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, Leq at 50 Feet)
Dump truck	88
Portable air compressor	81
Concrete mixer (truck)	85
Scraper	88
Jackhammer	88
Dozer	87
Paver	89
Generator	76
Backhoe	85

NOTES:
dBA = A-weighted decibels. L_{eq} = equivalent sound level.

SOURCE: FTA, 2006.

To ensure that construction noise is minimized under construction of Project Site development, **Mitigation Measure 4.J-5b** below is recommended.

Conclusion: Under Project Site development, construction would create substantial temporary or intermittent noise. Under the DSP and DSP-V, pile-driving activities would result in a significant impact, and **Mitigation Measure 4.J-4a** is recommended. **Mitigation Measure 4J-4b** is recommended to reduce significant impacts related to other construction activities to a less-than-significant level under Project Site development.

Mitigation

Mitigation Measure 4.J-4a: All applicants for site-specific development within the Project Site shall implement site-specific noise attenuation measures during all construction-related activities under the supervision of a qualified acoustical consultant as a pre-requisite to issuance of site grading(s). These measures shall be included in a Noise Control Plan that shall be submitted for review and approval by the City of Brisbane Building Department to ensure that construction noise does not exceed the standards set forth in the City's Noise Ordinance. These attenuation measures shall include all or any combination of the following control strategies:

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	-	-

✓ = measure applies
- = measure does not apply

- Limit standard construction activities to between 7:00 a.m. and 7:00 p.m. Monday through Friday and between 9:00 a.m. and 7:00 p.m. on weekends and holidays. Pile driving and/or other extreme noise-generating activities (greater than 90 dBA) would be limited to between 8:00 a.m. and 4:00 p.m. Monday through Friday, with no extreme noise-generating activity permitted between 12:30 p.m. and 1:30 p.m. No extreme noise-generating activities would be allowed on weekends and holidays;

- Equipment and trucks used for construction shall use the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds;
- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible; this could achieve a reduction of 5 dBA. Quieter procedures, such as use of drills rather than impact tools, shall be used;
- Stationary noise sources shall be located as far as possible from adjacent receptors, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or include other measures;
- Erect temporary plywood noise barriers around the construction site when adjacent occupied sensitive land uses are present within 75 feet;
- Implement "quiet" pile-driving technology (such as pre-drilling of piles and the use of more than one pile driver to shorten the total pile driving duration), where feasible, in consideration of geotechnical and structural requirements and conditions;
- Use noise control blankets on building structures as buildings are erected to reduce noise emission from the site; and
- Use cushion blocks to dampen impact noise.

Mitigation Measure 4.J-4b: Prior to City issuance of grading permits, applicants for site-specific development projects within the Project Site shall submit to the Brisbane Building Department, a list of measures that will be undertaken to respond to and track complaints pertaining to construction noise, including:

Mitigation Measure Applicability by Scenario			
DSP	**DSP-V**	**CPP**	**CPP-V**
✓	✓	✓	✓
✓ = measure applies - = measure does not apply			

- A procedure for notifying the Building Department staff of complaints;
- A plan for posting onsite signs pertaining to permitted construction days and hours, complaint procedures, and the contact person who should be notified in the event of a problem;
- A listing of telephone numbers (during regular construction hours and off-hours);
- Designation of an onsite construction complaint manager for Project site development;
- Notification of neighbors within 300 feet of the Project site development construction area about the estimated duration of the pile-driving activity at least 30 days in advance of the activity; and
- A preconstruction meeting with the job inspectors and the general contractor/onsite project manager to confirm that noise mitigation and practices (including construction hours, neighborhood notification, posted signs, etc.) are completed.

Conclusion with Mitigation: Inclusion of **Mitigation Measures 4.J-4a** and **4.J-4b** would result in a reduction of Project construction noise. However, due to the substantial noise levels associated with potential pile driving and the proximity to residential receptors developed under the DSP and DSP-V scenarios, temporary construction-related noise is identified as a significant unavoidable impact for these scenarios. Under the CPP and CPP-V scenarios, temporary construction-related noise would represent a less-than-significant impact with implementation of **Mitigation Measure 4.J-4b**.

Impact 4.J-5: Would the Project expose people residing or working in the area to excessive noise levels related to operations of a public airport?

Impact Significance by Scenario (before Mitigation)			
DSP	**DSP-V**	**CPP**	**CPP-V**
LTS	LTS	LTS	LTS

SU = Significant Unavoidable
SM = Significant but Mitigable
LTS = Less than Significant
- = no impact

DSP, DSP-V, CPP, and CPP-V

The Noise Exposure Map for SFO indicates that all portions of the City of Brisbane are outside the 65-CNEL noise contour relative to aircraft noise from the airport (i.e., aircraft operations from the airport contribute less than 65 dBA to ambient noise levels within Brisbane) (SFO, 2012) which is the state and federal threshold for noise abatement pursuant to Caltrans and FAA guidelines. As noted in Section 4.I, *Land Use and Planning*, the Project Site is, however, within Airport Influence Area A, which is defined as an area that is flown by an aircraft at an altitude of 10,000 feet or less above mean sea level a minimum of once weekly.

While aircraft noise contributions on the Project Site would be below the federal noise abatement criterion of 65 CNEL, data from the December 2012 Directors Report for SFO indicates that Brisbane residents are impacted by single event aircraft noise that may not be reflected in the 24-hour based CNEL noise descriptor used by Caltrans and FAA. More than half of the 1,331 noise complaints of SFO operations received in September and October 2012 were from residents in the City of Brisbane (SFO, 2012). Therefore, while Project site development would have a less-than-significant impact with regard to exposing people to long-term excessive noise levels related to operations of the nearest airport, data exist to indicate that nuisance noise impacts from airport operations regularly occur within the City and may be experienced by future receptors of the project site. While there is a potential for aircraft noise to be a nuisance to future Project Site residents in the DSP and DSP-V scenarios, impacts would not be significant noise since the Project Site is located outside of the airport's 65 CNEL noise contour, which is the significance threshold for airport-related noise impacts.

Conclusion: The impact would be less than significant under Project Site development, and no mitigation is required.

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