Appendix E
Noise and Vibration Assessment

SHOE PALACE EXPANSION PROJECT NOISE AND VIBRATION ASSESSMENT

Morgan Hill, California

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INTRODUCTION

The Shoe Palace Corporation currently occupies a 250,000 square foot warehouse, office, and distribution facility at 755 Jarvis Drive in Morgan Hill, California. This building is located on a 30.16-acre parcel, and the corporation also owns an adjacent 7.9-acre parcel, which is currently undeveloped. Shoe Palace Corporation proposed to construct a 468,400 square foot warehouse, office, and distribution facility on this vacant parcel owned by the corporation. The existing operation currently has approximately 200 personnel during a typical workday Monday through Friday between the hours of 6:00 a.m. and 11:00 p.m. With the new facility, the personnel working at the facility are estimated to increase to 300.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses the results of the ambient noise and vibration monitoring surveys completed to document existing conditions; 2) the General Plan Consistency Section discusses land use compatibility utilizing policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the impacts of the project on sensitive receptors in the vicinity.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which

the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (L_{dn} or *DNL*) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn}. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn}. At a L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60-70 dBA. Between a L_{dn} of 70-80 dBA, each decibel increase increases the percentage of the population highly annoyed by about 3 percent. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous or frequent intermittent vibration levels produce. The guidelines in Table 3 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to cause damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and some old buildings” to “Modern industrial/commercial buildings”. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m.to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background - Noise

The State of California and the City of Morgan Hill have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

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

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Pursuant to recent court decisions, the impacts of site constraints, such as exposure of the proposed project to excessive levels of noise and vibration, are not included in the Impacts and Mitigation Section of this report. These items are discussed in a separate section addressing the project's consistency with the policies set forth in the City's General Plan.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn} or greater would be considered significant where exterior noise levels would exceed the normally acceptable noise level standard (60 dBA L_{dn} for residential land uses). Where noise levels would remain at or below the normally acceptable noise level standard with the project, noise level increases of 5 dBA L_{dn} or greater would be considered significant.

2016 California Green Building Standards Code (Cal Green Code). The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). Section 5.507 states that either the prescriptive (Section 5.507.4.1) or the performance method (Section 5.507.4.2) shall be used to determine environmental control at indoor areas. The prescriptive method is very conservative and not practical in most cases; however, the performance method can be quantitatively verified using exterior-to-interior calculations. For the purposes of this report, the performance method is utilized to determine consistency with the Cal Green Code. The sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

City of Morgan Hill General Plan. The Safety, Services and Infrastructure Chapter in the Morgan Hill 2035 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of Morgan Hill. The following policies are applicable to the proposed project:

Policy SSI-8.1- *Exterior Noise Level Standards:* Require new development projects to be designed and constructed to meet acceptable exterior noise level standards (as shown in Table SSI-1) as follows:

- Apply a maximum exterior noise level of 60 dBA L_{dn} in residential areas where outdoor use is a major consideration (e.g., backyards in single-family housing developments and recreation areas in multi-family housing projects). Where the City determines that providing an L_{dn} of 60 dBA or lower cannot be achieved after the application of reasonable and feasible mitigation, an L_{dn} of 65 dBA may be permitted.

- Indoor noise levels should not exceed an L_{dn} of 45 dBA in new residential housing units.

- Noise levels in new residential development exposed to an exterior L_{dn} 60 dBA or greater should be limited to a maximum instantaneous noise level (e.g., trucks on busy streets, train warning whistles) in bedrooms of 50 dBA. Maximum instantaneous noise levels in all other habitable rooms should not exceed 55 dBA. The maximum outdoor noise level for new residences near the railroad shall be 70 dBA L_{dn}, recognizing that train noise is characterized by relatively few loud events.

Policy SSI-8.2- *Impact Evaluation:* The impact of proposed development project on existing land uses should be evaluated in terms of the potential for adverse community response based on significant increase in existing noise levels, regardless of compatibility guidelines.

Policy SSI-8.3- *Commercial and Industrial Noise Level Standards:* Evaluate interior noise levels in commercial and industrial structures on a case-by-case basis based on the use of the space.

Policy SSI-8.4- *Office Noise Level Standards:* Interior noise levels in office buildings should be maintained at 45 dBA L_{eq} (hourly average) or less, rather than 45 dBA L_{dn} (daily average).

Policy SSI-8.5- *Traffic Noise Level Standards:* Consider noise level increases resulting from traffic associated with new projects significant if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn}, or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater.

Policy SSI-8.6- *Stationary Noise Level Standards:* Consider noise levels produced by stationary noise sources associated with new projects significant if they substantially exceed existing ambient noise levels.

Policy SSI-8.7- *Other Noise Sources:* Consider noise levels produced by other noise sources (such as ballfields) significant if an acoustical study demonstrates they would substantially exceed ambient noise levels.

Policy SSI-8.9- *Site Planning and Design:* Require attention to site planning and design techniques other than sound walls to reduce noise impacts, including: a) installing earth berms, b) increasing the distance between the noise source and the receiver; c) using non-sensitive structures such as parking lots, utility areas, and garages to shield noise-sensitive areas; d) orienting buildings to shield outdoor spaces from the noise source; and e) minimizing the noise at its source.

Policy SSI-9.1- *Techniques to Reduce Traffic Noise:* Use roadway design, traffic signalization, and other traffic planning techniques (such as limiting truck traffic in residential areas) to reduce noise caused by speed or acceleration of vehicles.

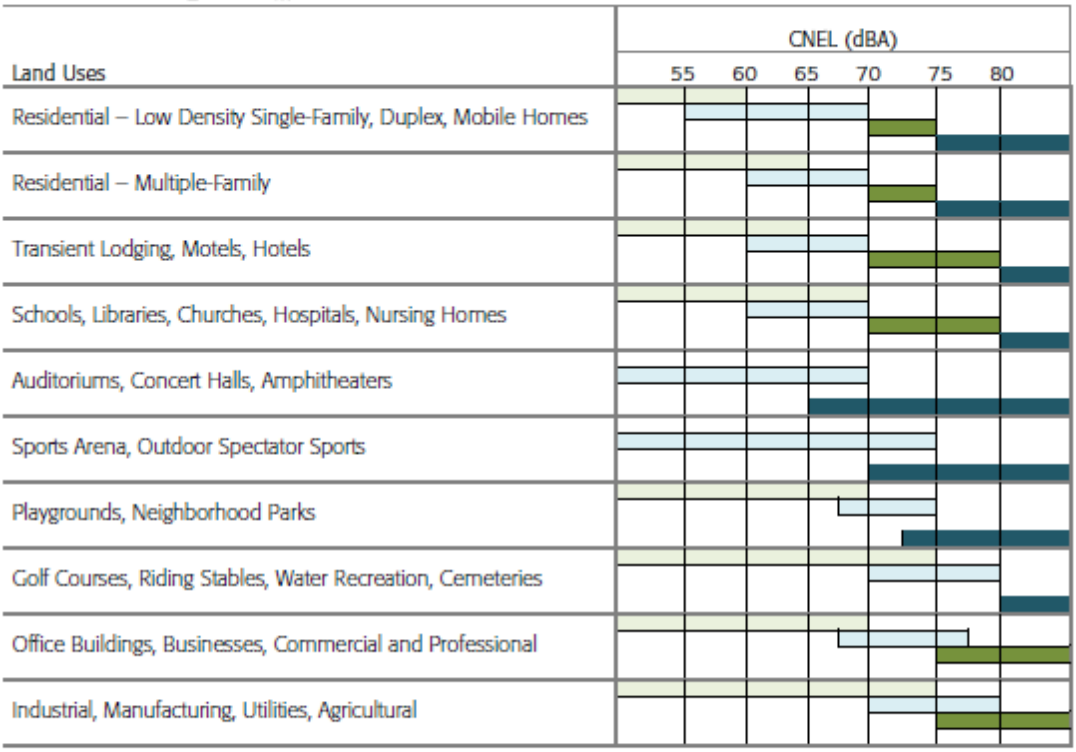
Policy SSI-9.3- *Sound Wall Design:* The maximum height of sound walls shall be eight feet. Residential projects adjacent to the freeway shall be designed to minimize sound wall height through location of a frontage road, use of two sound walls or other applicable measures. Sound wall design and location shall be coordinated for an entire project area and shall meet Caltrans noise attenuation criteria for a projected eight-lane freeway condition. If two sound walls are used, the first shall be located immediately adjacent to the freeway right-of-way and the second shall be located as necessary to meet Caltrans noise requirements for primary outdoor areas. The minimum rear yard setback to the second wall shall be 20 feet.

Policy SSI-9.5- *Noise Studies for Private Development:* In order to prevent significant noise impacts on neighborhood residents which are related to roadway extensions or construction of new roadways, require completion of a detailed noise study during project-level design to quantify noise levels generated by projects such as the Murphy Avenue extension to Mission View Drive and the Walnut Grove Extension to Diana Avenue. The study limits should include noise sensitive land uses adjacent to the project alignment as well as those along existing segments that would be connected to new segments. A significant impact would be identified where traffic noise levels would exceed the "normally acceptable" noise level standard for residential land uses and/or where ambient noise levels would be substantially increased with the project. Project specific mitigation measures could include, but not be limited to, considering the location of the planned roadway alignment relative to existing receivers in the vicinity, evaluating the use of noise barriers to attenuate project-generated traffic noise, and/or evaluating the use of "quiet pavement" to minimize traffic noise levels at the source. Mitigation should be designed to reduce noise levels into compliance with "normally acceptable" levels for residential noise and land use compatibility.

Policy SSI-9.6- *Earth Berms:* Allow and encourage earth berms in new development projects as an alternative to sound walls if adequate space is available.

Policy SSI-9.7- *Sound Barrier Design:* Require non-earthen sound barriers to be landscaped, vegetated, or otherwise designed and/or obscured to improve aesthetics and discourage graffiti and other vandalism.

TABLE SSI-1 STATE OF CALIFORNIA LAND USE COMPATIBILITY GUIDELINES FOR COMMUNITY NOISE ENVIRONMENTS



Source: Governor's Office of Planning and Research, General Plan Guidelines 2003.

City of Morgan Hill Municipal Code. The City of Morgan Hill's Municipal Code Chapter 8.28 states that "It is unlawful and a misdemeanor for any person to make or continue, or cause to be made or continued, any loud, disturbing, unnecessary or unusual noise or any noise which annoys, disturbs, injures or endangers the comfort, health, repose, peace or safety of other persons within the city." The following sections of the code would be applicable to the project:

C. Blowers, Fans, and Combustion Engines. The operation of any noise-creating blower, power fan or internal combustion engine, the operation of which causes noise due to the

explosion of operating gases or fluids, unless the noise from such blower or fan is muffled and such engine is equipped with a muffler device to deaden such noise;

D. 1. Construction activities as limited below. "Construction activities" are defined as including but not limited to excavation, grading, paving, demolition, construction, alteration or repair of any building, site, street or highway, delivery or removal of construction material to a site, or movement of construction materials on a site. Construction activities are prohibited other than between the hours of seven a.m. and eight p.m., Monday through Friday and between the hours of nine a.m. to six p.m. on Saturday. Construction activities may not occur on Sundays or federal holidays. No third person, including but not limited to landowners, construction company owners, contractors, subcontractors, or employers, shall permit or allow any person working on construction activities which are under their ownership, control or direction to violate this provision. Construction activities may occur in the following cases without violation of this provision:

a. In the event of urgent necessity in the interests of the public health and safety, and then only with a permit from the chief building official, which permit may be granted for a period of not to exceed three days or less while the emergency continues and which permit may be renewed for periods of three days or less while the emergency continues.

b. If the chief building official determines that the public health and safety will not be impaired by the construction activities between the hours of eight p.m. and seven a.m., and that loss or inconvenience would result to any party in interest, the chief building official may grant permission for such work to be done between the hours of eight p.m. and seven a.m. upon an application being made at the time the permit for the work is issued or during the progress of the work.

c. The city council finds that construction by the resident of a single residence does not have the same magnitude or frequency of noise impacts as a larger construction project. Therefore, the resident of a single residence may perform construction activities on that home during the hours in this subsection, as well as on Sundays and federal holidays from nine a.m. to six p.m., provided that such activities are limited to the improvement or maintenance undertaken by the resident on a personal basis.

d. Public work projects are exempt from this section and the public works director shall determine the hours of construction for public works projects.

e. Until November 30, 1998, construction activities shall be permitted between the hours of ten a.m. to six p.m. on Sundays, subject to the following conditions. No power-driven vehicles, equipment or tools may be used during construction activities, except on the interior of a building or other structure which is enclosed by exterior siding (including windows and doors) and roofing, and which windows and doors are closed during construction activities. Construction

activities must be situated at least one hundred fifty feet from the nearest occupied dwelling. No delivery or removal of construction material to a site, or movement of construction materials on a site, is permitted. No activity, including but not limited to the playing of radios, tape players, compact disc players or other devices, which creates a loud or unusual noise which offends, disturbs or harasses the peace and quiet of the persons of ordinary sensibilities beyond the confines of the property from which the sound emanates is allowed.

2. If it is determined necessary in order to ensure compliance with this section, the chief building official may require fences, gates or other barriers prohibiting access to a construction site by construction crews during hours in which construction is prohibited by this subsection. The project manager of each project shall be responsible for ensuring the fences, gates or barriers are locked and/or in place during hours in which no construction is allowed. This subsection shall apply to construction sites other than public works projects or single dwelling units which are not a part of larger projects.

G. Loading or Unloading Vehicles and Opening Boxes. The creation of loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates and containers;

J. Pile Drivers, Hammers and Similar Equipment. The operation, between the hours of eight p.m. and seven a.m. of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist or other appliance, the use of which is attended by loud or unusual noise;

Existing Noise Environment

The project site is located in the northeast corner of the Jarvis Drive/Serene Drive intersection in the City of Morgan Hill. The site is currently developed with the Shoe Palace Corporation building, which includes a 250,000 square foot warehouse, office, and distribution facility at 755 Jarvis Drive. The facility is located in an industrial park, with other commercial and light industrial uses located to the west and to the southwest. U.S. Highway 101 bounds the site to the northeast. To the south and to the east of the project site, there are some single-family residences. However, the roadways accessing the project site do not connect to the residential roadways.

The noise environment at the site and in the surrounding area results primarily from vehicular traffic along U.S. Highway 101. Secondary noise sources include traffic along Jarvis Drive and Serene Drive and industrial noise from the adjacent land uses. Occasional overhead aircraft associated with the San Martin Airport are also audible at times at the project site.

A noise monitoring survey was performed at the site beginning on Tuesday, August 21, 2018 and concluding on Thursday, August 23, 2018. The monitoring survey included two long-term noise measurements and two short-term noise measurements, which are shown in Figure 1.

Long-term noise measurement LT-1 was made near the existing docking area along the southeastern boundary of the site. LT-1 was approximately 135 feet from the docking area and

approximately 190 feet from the edge of the existing building. Additionally, heavy trucks accessing the docks on the northeast side of the building would pass by this meter, which was approximately 55 feet from the centerline of the driveway. The daily trend in noise levels at LT-1 is shown in Figures 2 through 4. The instantaneous peaks in the figures represent truck pass-by events, which would occur over short durations. Hourly average noise levels at LT-1 ranged from 53 to 65 dBA L_{eq} during daytime hours (7:00 a.m. and 10:00 p.m.) and from 51 to 58 dBA L_{eq} during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level measured on Wednesday, August 22, 2018 was 63 dBA L_{dn}.

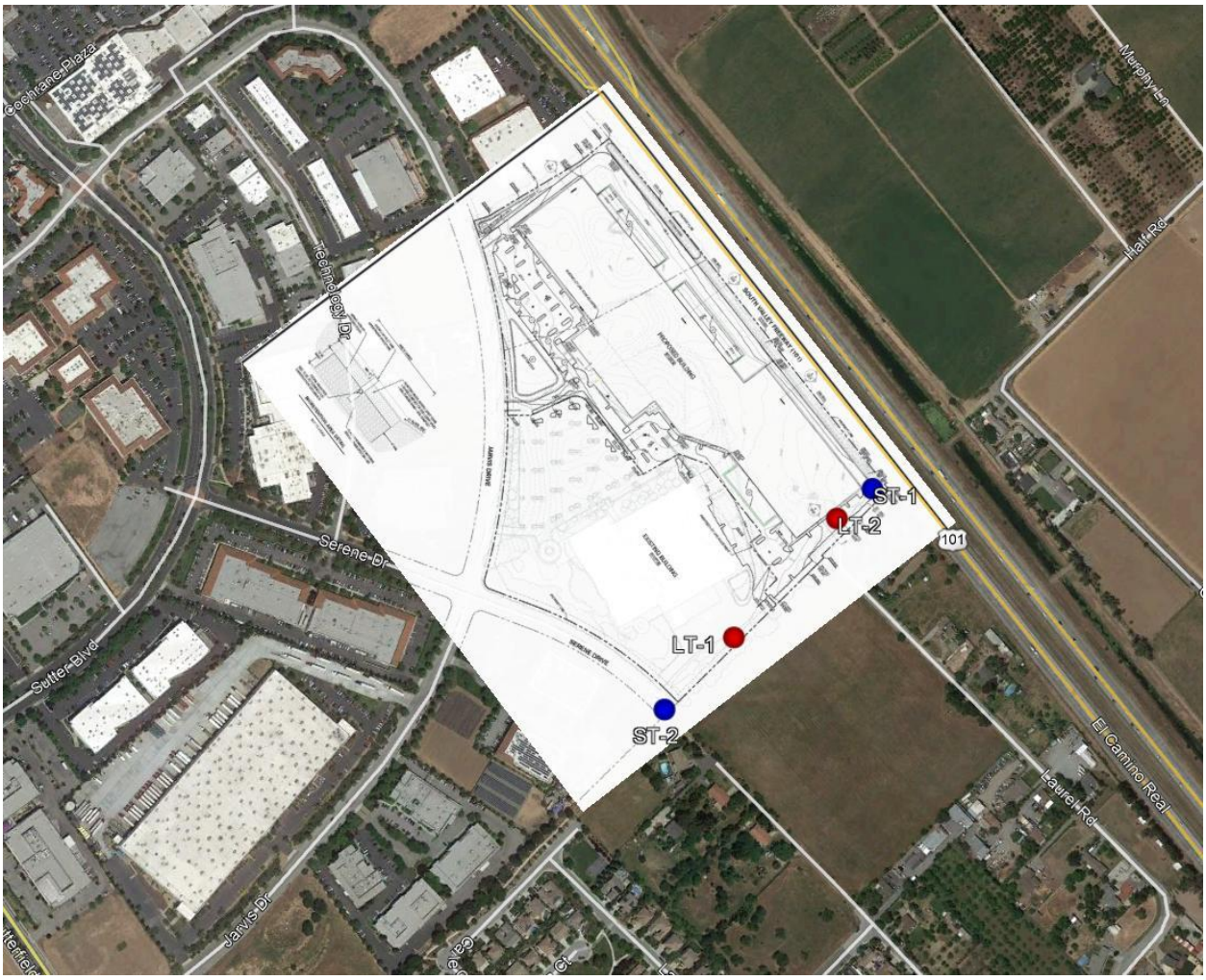
LT-2 was made near the eastern corner of the site, in the vicinity of the existing residence along U.S. Highway 101. LT-2 was approximately 255 feet from the centerline of nearest through lane along southbound U.S. Highway 101. Hourly average noise levels at this location typically ranged from 62 to 67 dBA L_{eq} during the day and from 59 to 66 dBA L_{eq} at night. The day-night average noise level measured on Wednesday, August 22, 2018 was 70 dBA L_{dn}. The daily trend in noise levels at LT-2 is shown in Figures 5 through 7.

Short-term noise measurements were made on Tuesday, August 21, 2018 between 11:30 a.m., and 11:40 a.m. and on Thursday, August 23, 2018 between 11:40 a.m., and 12:00 p.m. The results of these short-term measurements are summarized in Table 4.

ST-1 was made near LT-2 at a setback of approximately 95 feet from the centerline of the nearest through lane along southbound U.S. Highway 101. This measurement was made over a 10-minute period. Typical noise levels during heavy truck pass-bys along U.S. Highway 101 ranged from 74 to 75 dBA, and typical vehicle pass-bys generated noise levels ranging from 70 to 73 dBA. On the nearby local roadway, a garbage truck passed by during the measurement, generating noise levels of 80 to 81 dBA when the truck's air brake released. The 10-minute average noise level measured at ST-1 was 73 dBA $L_{eq(10\text{-}min)}$.

ST-2 was made over two consecutive 10-minute periods at the end of Serene Drive, near the existing residence to the south of the site. The steady background noise of U.S. Highway 101 resulted in noise levels of about 46 to 47 dBA. Some mechanical equipment noise was audible from the Sakata Seed property, located to the west, but the noise levels generated from this site were below the background noise from U.S. Highway 101. Jet flyovers were observed during the measurement period, and these events produced noise levels ranging from 52 to 53 dBA. A FedEx truck departed the Shoe Palace driveway during the measurement, and this medium truck generated noise levels of 61 to 62 dBA. A second medium truck turned into the Shoe Palace driveway, generating noise levels up to 66 to 67 dBA at a distance of 95 feet. Both 10-minute average noise levels at ST-2 were 50 dBA $L_{eq(10\text{-}min)}$. After the measurements, a heavy truck departed the Shoe Palace, generating noise levels of 62 to 67 dBA at 95 feet.

FIGURE 1 Noise and Vibration Measurement Locations



Source: Google Earth 2018.

FIGURE 2 Daily Trends in Noise Levels at LT-1, Tuesday, August 21, 2018

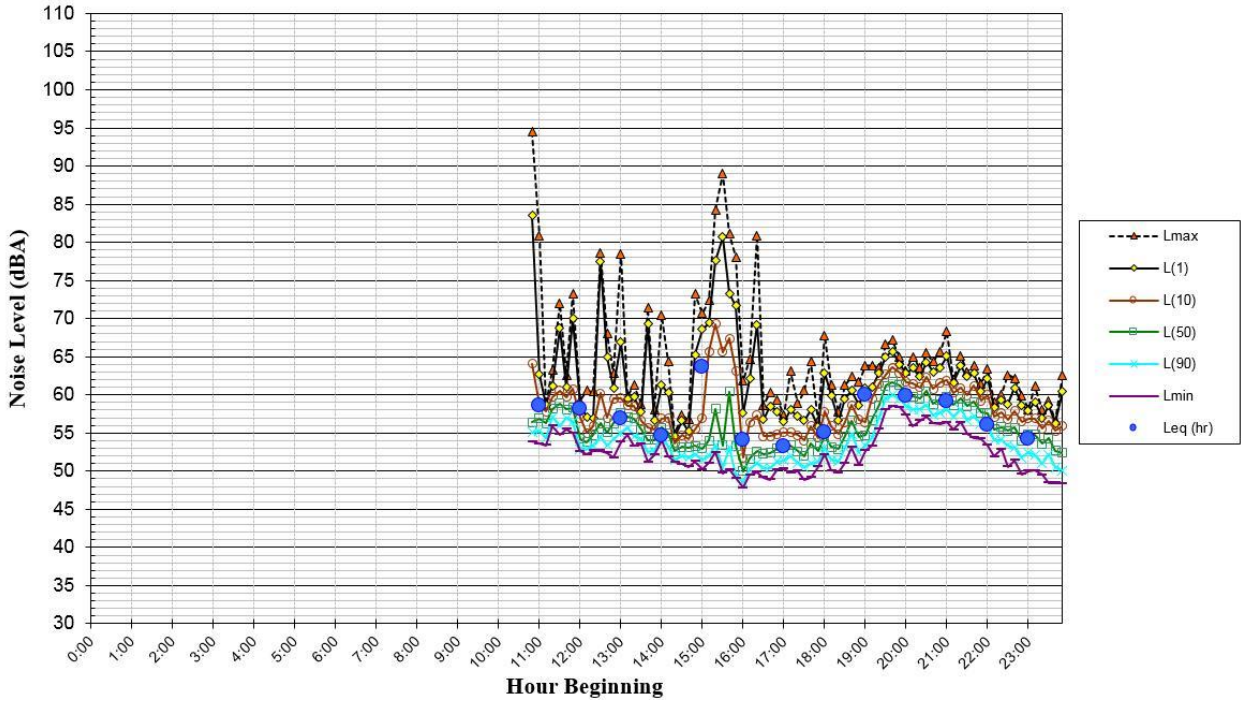


FIGURE 3 Daily Trends in Noise Levels at LT-1, Wednesday, August 22, 2018

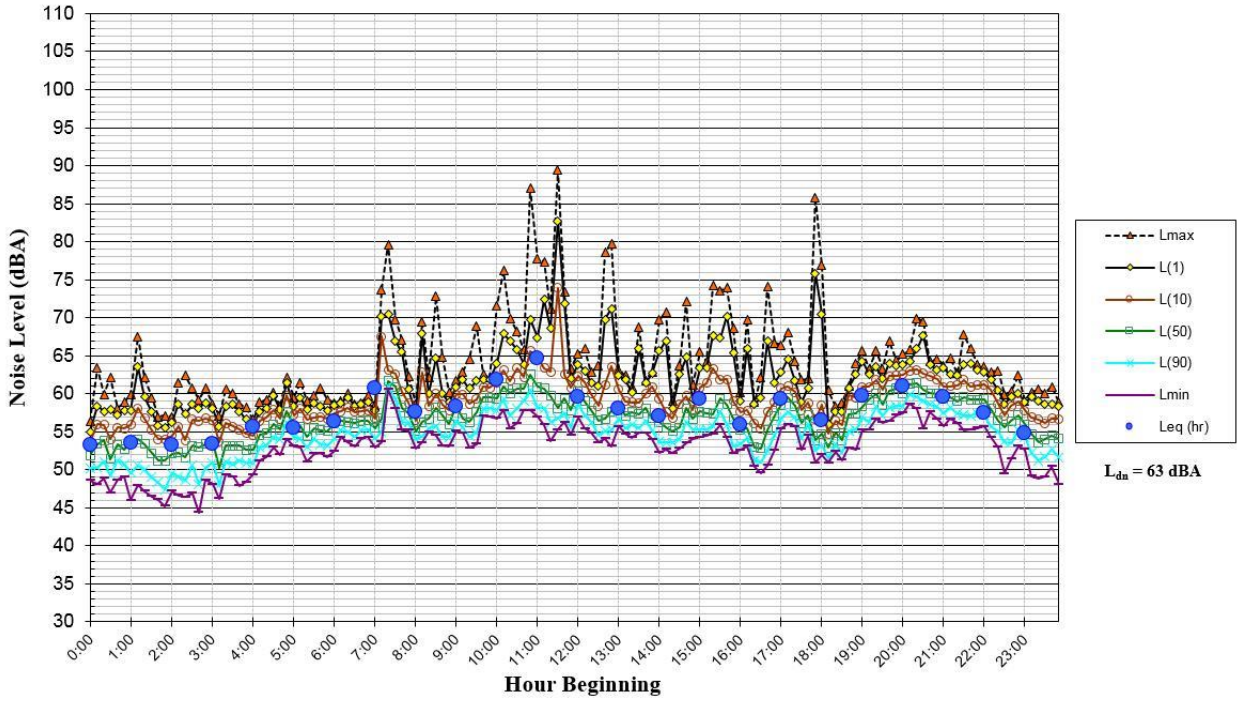


FIGURE 4 Daily Trends in Noise Levels at LT-1, Thursday, August 23, 2018

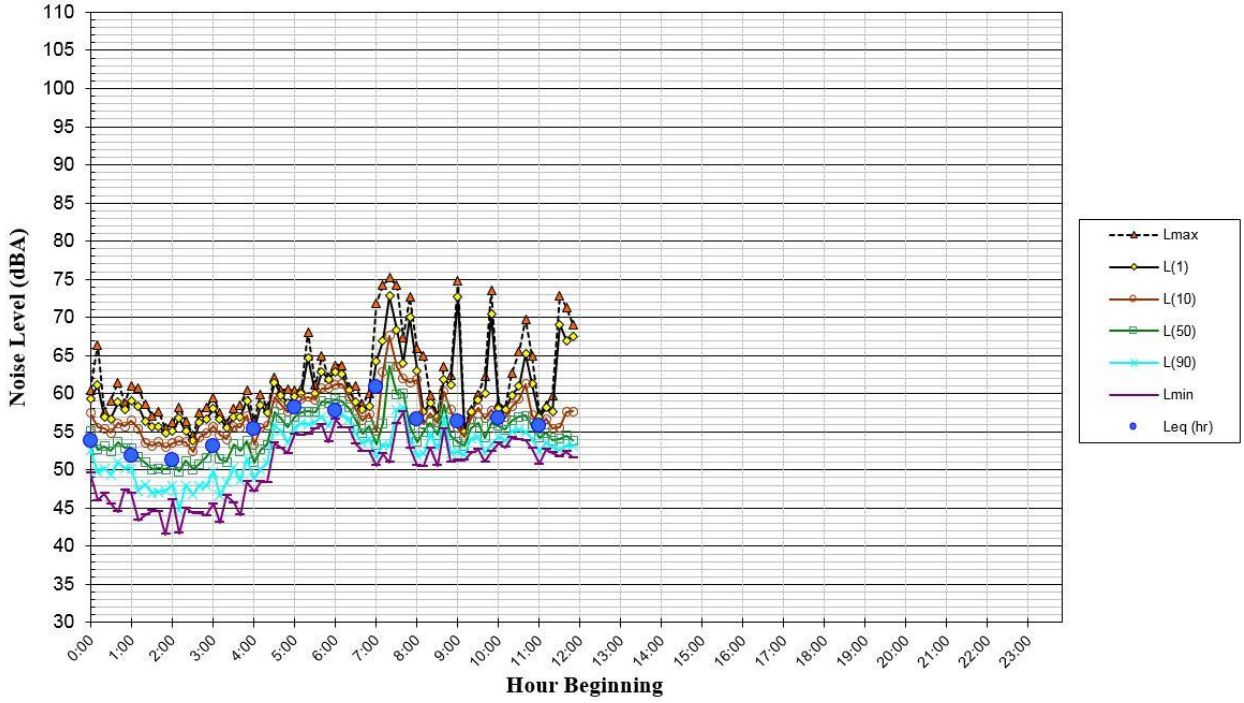


FIGURE 5 Daily Trends in Noise Levels at LT-2, Tuesday, August 21, 2018

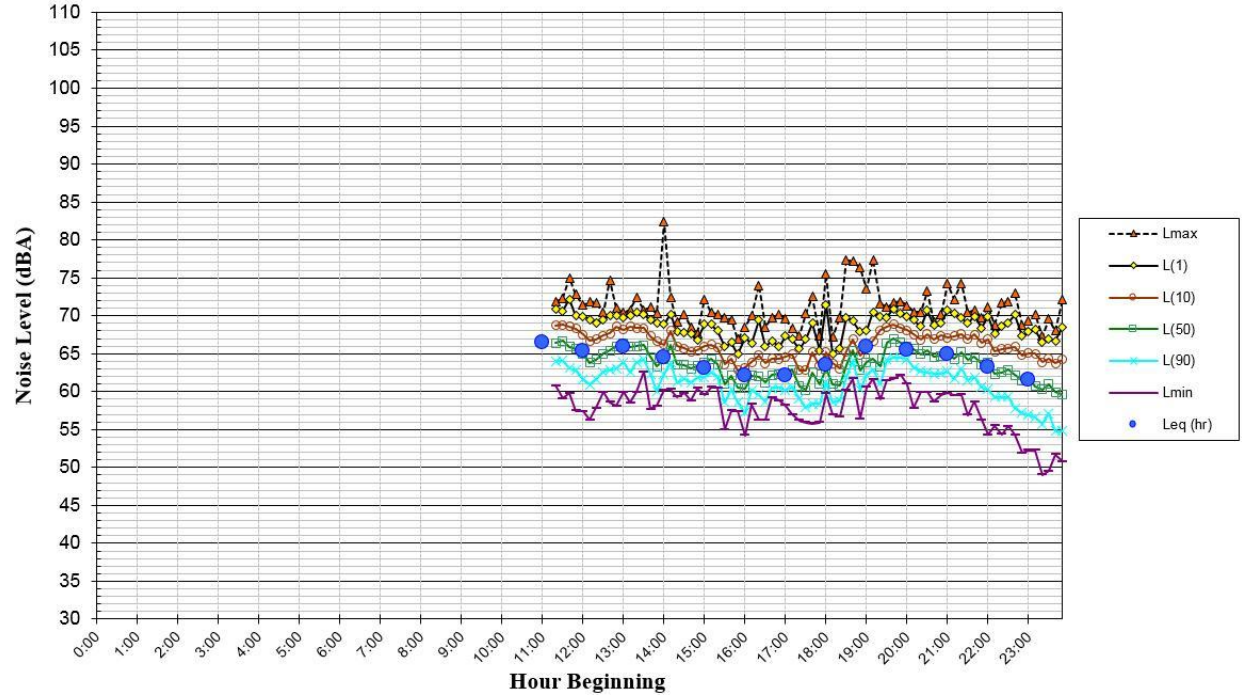


FIGURE 6 Daily Trends in Noise Levels at LT-2, Wednesday, August 22, 2018

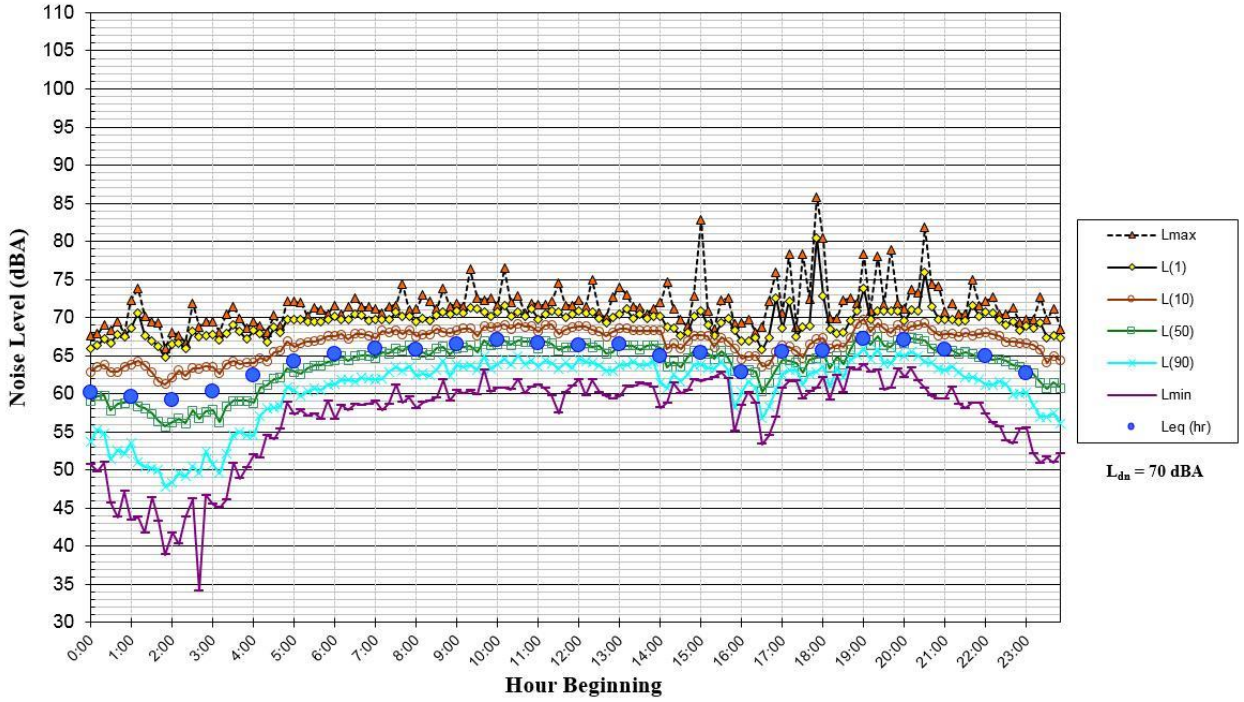


FIGURE 7 Daily Trends in Noise Levels at LT-2, Thursday, August 23, 2018

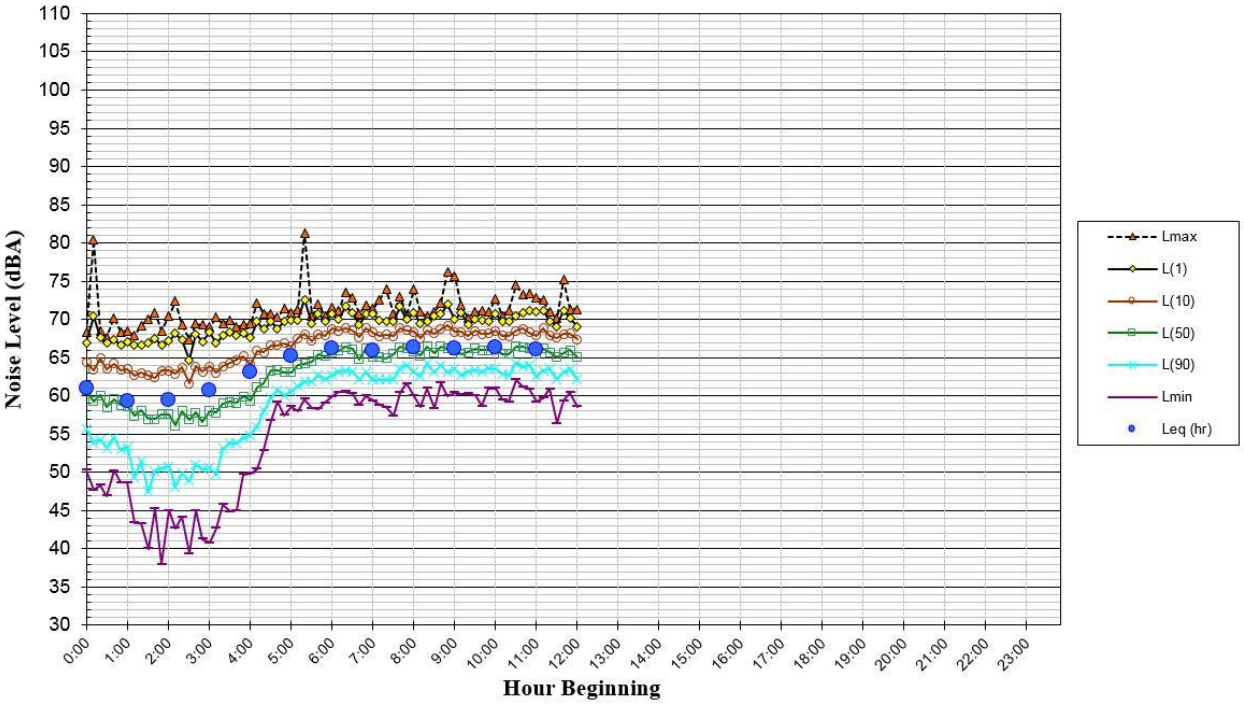


TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10\text{-}min)}$
ST-1: ~95 feet from centerline of the nearest through lane along southbound U.S. Highway 101	8/21/2018, 11:30-11:40	81	76	74	72	70	73
ST-2: End of Serene Drive	8/23/2018, 11:40-11:50	62	61	52	48	46	50
	8/23/2018, 11:50-12:00	67	62	49	47	46	50

GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

According to Table SSI-1 of the City's General Plan, the exterior noise level standard for which new office and commercial uses shall maintain is 70 dBA L_{dn}. This noise standard would apply to common outdoor use areas. For interior noise, the 2016 Cal Green Code would apply. The performance method enforced in the Cal Green Code requires that interior noise levels be maintained at 50 dBA $L_{eq(1\text{-}hr)}$ or less during hours of operation, which are defined to be between 6:00 a.m. and 11:00 p.m. for the proposed project.

The future noise environment at the project site would continue to be dominated by vehicular traffic along U.S. Highway 101, with the secondary noise source continuing to be local traffic and other industrial sources. A traffic report was completed for the proposed project, which included peak hour turning movements at local intersections in the project vicinity for existing and existing plus project scenarios. However, peak hour traffic volumes along U.S. Highway 101 were not included in the traffic study. To estimate the future noise increase at the project site, U.S. Highway 101 peak hour volumes from the Caltrans website[1] were used to estimate the noise level increase expected by the year 2035, assuming a typical 1% to 2% increase in traffic volumes each year. The future noise increase calculated along U.S. Highway 101 would be up to 2 dBA L_{dn} at the project site by the year 2035. From the traffic report, traffic volumes along the local roadways accessing the site indicated that the proposed project would result in a 3 dBA L_{dn} increase over existing volumes along Jarvis Drive. Since the commercial and industrial area surrounding the site is built out, an additional increase in traffic volume increases by the year 2035 is not expected along Jarvis Drive. Therefore, the future noise environment at the project site would be 72 dBA L_{dn} at a distance of 255 feet from the centerline of the nearest through lane along U.S. Highway 101 (LT-2).

[1] http://www.dot.ca.gov/trafficops/census/docs/2016_aadt_volumes.pdf

Future Exterior Noise Environment

The site plan does not indicate any proposed outdoor use areas at the project site. Therefore, the exterior noise levels thresholds established in the General Plan would not apply to the proposed project.

Future Interior Noise Environment

Hourly average noise levels during business hours would be required to meet the 50 dBA $L_{eq(1\text{-}hr)}$ threshold established by the 2016 Cal Green Code within proposed commercial land uses. Standard construction materials for commercial uses would provide at least 20 to 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so windows may be kept closed at the occupants' discretion.

The nearest building façade facing U.S. Highway 101 would be set back approximately 125 to 215 feet from the centerline of the nearest southbound lane. At these distances, hourly average exterior noise levels during hours of operation would range from 64 to 72 $L_{eq(1\text{-}hr)}$.

Assuming a minimum of 20 dBA of exterior-to-interior noise reduction, the future interior noise levels would up to 52 dBA $L_{eq(1\text{-}hr)}$ at the building façades facing U.S. Highway 101. With standard construction materials, the proposed building interior may exceed daytime operational noise levels established in the Cal Green standard and would require noise insulation features to be compatible with the noise environment at the site.

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insultation features shall be incorporated into the proposed project to reduce interior noise levels to acceptable levels:

- To meet the 50 dBA $L_{eq(1\text{-}hr)}$ threshold, incorporate an adequate forced-air mechanical ventilation system in order for windows to be kept shut at the occupants' discretion.

Aircraft Noise

San Martin Airport is a public non-towered airport located about 4.85 miles south of the project site. According to the Santa Clara County Airport Land Use Commission (ALUC)'s Comprehensive Land Use Plan for this airport, [2] the project site lies outside the 2022 55 dBA CNEL noise contour. While aircraft flyovers would at times be audible at project site, noise levels due to aircraft would not result in future exterior noise levels of 65 dBA L_{dn}/CNEL or more, and therefore, both the exterior and interior noise levels resulting from aircraft would be compatible with the proposed project.

[2] Santa Clara County Airport Land Use Commission, "Comprehensive Land Use Plan Santa Clara County: South County Airport," September 10, 2008 and amended November 16, 2016.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive ground-borne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.

- A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant impact would be identified if traffic generated by the project would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn}, or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater.

- A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA $L_{eq,}$ and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: **Noise Levels in Excess of Standards.** The proposed project could generate noise in excess of standards established in the City's General Plan and Municipal Code at the nearby sensitive receptors. **This is a potentially significant impact.**

Construction

Chapter 8.28 of the City of Morgan Hill's Municipal Code establishes allowable hours of construction between 7:00 a.m. and 8:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. to 6:00 p.m. on Saturday. Construction activities may not occur on Sundays or federal holidays. Construction is anticipated to take place during these allowable hours. Under this assumption, the proposed project would comply with the City's Municipal Code, resulting in a less-than-significant impact.

Mechanical Equipment

Under the City of Morgan Hill's Noise Element and Municipal Code, noise levels produced by the operation of the mechanical equipment would be considered significant if noise levels substantially exceed existing ambient noise levels.

The proposed project would include mechanical equipment, such as heating, ventilation, air conditioning systems, exhaust fans, chillers, etc. The existing building includes chillers in the loading dock area on the southeastern building façade. This existing equipment generated noise levels ranging from 61 to 62 dBA at a distance of 20 feet. The proposed building would include the new ventilation system on the roof of the two-story office building located at the main entrance along the southwestern building façade. Additionally, five exhaust fans will be located on the rooftop of the proposed building, distributed throughout the roof. For purposes of this study, it is assumed that the new ventilation equipment would generate similar noise levels as the existing equipment. While parapet walls are planned to surround the new rooftop equipment, details regarding the parapet wall design is unknown. This study assumes the worst-case scenario, which would not include parapet walls.

The two nearest residences to the site are located near U.S. Highway 101 in the easternmost corner of the site and along Serene Drive near the southernmost corner of the site. Due to the height of the proposed building (approximately 42 feet) and the existing building (approximately 35 feet), the rooftop equipment would be partially shielded from these residences. These residences would be approximately 825 and 1,050 feet, respectively, from the nearest rooftop equipment. Assuming the same noise levels as the existing equipment and no shielding effects from the building façades, mechanical equipment noise generated by the proposed building would be 30 dBA or less at both nearby residences. Compared to hourly average noise levels at each residence during daytime and nighttime hours, the mechanical equipment noise from the proposed project would be below ambient conditions. This would be a less-than-significant impact.

Parking/Circulation

Intermittent noise from vehicles accessing the parking lots must not exceed the existing ambient noise levels at the nearby residences, according to the City of Morgan Hill's General Plan. While the existing parking lot would be slightly reduced in size, new parking areas would be added near the northwestern corner of the site, which would be more than 1,000 feet from both nearby residences. Parking in this area would not impact the residences. Additional parking spots are proposed along the southeastern building façade, approximately 100 to 165 feet from the nearest residence located near the easternmost corner of the project site. This additional parking area would be more than 740 feet from the nearest residence south of the site.

Noise sources associated with the use of the parking lots and vehicular circulation around the site would include slow moving vehicles, engine noise, car alarms, squealing tires, door slams, and human voices. The sound of slow moving vehicles, engines starting, doors closing, and people talking in the parking lot would be expected to reach maximum levels of 50 to 60 dBA at a distance of 50 feet.

At the eastern residence, which is located along U.S. Highway 101, existing ambient noise levels were measured to be 62 to 67 dBA L_{eq} during operational hours (see LT-2). At a distance of 100 feet, noise levels generated by parking and vehicle circulation would range from 44 to 54 dBA L_{eq}, which is below the range in daytime ambient noise levels. Assuming the worst-case scenario, noise levels of 54 dBA L_{eq} occurring each hour from 7:00 a.m. through 7:00 p.m. would result in a day-night average noise level of 51 dBA L_{dn}, which is below the ambient day-night average noise level at this residence.

At the residence to the south of the site, ambient noise levels typically range from 53 to 65 dBA L_{eq} during daytime operational hours (see LT-1). At a distance of 740 feet, noise levels generated by parking and vehicle circulation would be below 40 dBA L_{eq}, which is below the range in daytime ambient noise levels. Assuming these noise levels each hour from 7:00 a.m. through 7:00 p.m., the day-night average noise level would be 37 dBA L_{dn}.

Parking lot noise is different from typical traffic noise and may at times be audible at the nearest residences; however, noise levels generated in the parking lot would be below existing ambient noise levels. This is a less-than-significant impact.

Truck Deliveries

Loading areas, which are currently located along the southeastern façade and the northeastern façade of the existing building, would be located on the southwestern façade and northeastern façade of the new building. The proposed loading dock on the southwestern façade would be approximately 220 feet from the southeastern boundary, and both loading docks on the northeastern façade would be located towards the northwestern boundary of the site and would be shielded from the nearby residences by the proposed building. However, the delivery trucks would enter the site from Jarvis Drive near the northern boundary, and the trucks would drive around the perimeter of the site, exiting along Serene Drive in the southernmost corner. Therefore, trucks would pass-by the residence to the east under project conditions.

Currently, a total of 10 delivery trucks access the site daily, with deliveries occurring between 8:00 a.m. and 6:00 p.m. Under future project conditions, the total number of truck trips would increase by no more than five trucks daily. Incoming deliveries arrive on heavy-duty semi-tractor trucks, while outgoing deliveries depart on smaller medium-duty box trucks. The incoming deliveries currently occur at the loading dock on the northeastern façade of the existing building, and in the future, will occur at the dock on the southwestern façade of the proposed building. These loading areas are in the same vicinity on the project site. The outgoing deliveries will move from the eastern façade of the existing building to the northeastern façade of the proposed building, which would be mostly shielded from the nearest residences by the proposed building, according to the site plan. For this reason, truck maneuvering at the outgoing docks would not result in an increase in ambient noise levels at the eastern or southern residence and therefore would have no impact to the existing noise-sensitive receptors.

While specific delivery times are not specified in the City's Municipal Code, restricting deliveries to the hours between 7:00 a.m. and 10:00 p.m. would limit excess noise disturbance to nearby

noise-sensitive receptors. Assuming the current delivery hours of 8:00 a.m. to 6:00 p.m. are maintained under future project conditions, this restriction would be met.

Trucks maneuvering at loading docks would generate a combination of engine, exhaust, and tire noise, as well as the intermittent sounds of back-up alarms and releases of compressed air associated with truck/trailer air-brakes. Heavy trucks used for incoming deliveries typically generate maximum instantaneous noise levels of 70 to 75 dBA L_{max} at a distance of 50 feet. The noise level of backup alarms can vary depending on the type and directivity of the sound, but maximum noise levels are typically in the range of 65 to 75 dBA L_{max} at a distance of 50 feet. The distance from the incoming delivery zone to the nearest residential property lines to the east and to the south would be 270 and 745 feet, respectively. For purposes of this study, worst-case conditions are assumed, which means no shielding from intervening buildings. At 270 feet, the eastern residence would be exposed to heavy truck maneuvering noise levels ranging from 55 to 60 dBA L_{max}, with noise levels from backup alarms ranging from 50 to 60 dBA L_{max}. With ambient noise levels ranging from 67 to 86 dBA L_{max}, heavy truck maneuvering would fall within the range of ambient noise levels at the eastern residence. At 745 feet, the southern residence would be exposed to heavy truck maneuvering noise levels ranging from 47 to 52 dBA L_{max}, with noise levels from backup alarms ranging from 42 to 52 dBA L_{max}. These noise levels would be within the range of ambient noise levels, which are 55 to 89 dBA L_{max}. This would be a less-than-significant impact.

During the noise monitoring, a heavy truck pass-by was measured while traveling at a speed of 5 to 10 mph, which would be expected for all delivery trucks at the site under existing and future conditions. At a distance of 35 feet from the centerline of the roadway, the truck pass-by generated noise levels ranging from 68 to 70 dBA. A typical pass-by would take less than 5 minutes. At the property line of the eastern residence, the centerline of the truck delivery driveway would be approximately 95 feet away. At this distance, a truck pass-by would generate noise levels ranging from 62 to 64 dBA. Assuming each truck pass-by would take up to five minutes in any hour and up to 15 deliveries occur in a day, the day-night average noise level would be less than 55 dBA L_{dn} at the eastern residence. These noise levels would be below ambient conditions.

The residence to the south would be approximately 135 feet from the exit driveway of the project site. While existing truck deliveries are included in the ambient noise levels at this residence, the number of deliveries would increase under future project conditions. At a distance of 135 feet, truck pass-bys would generate noise levels ranging from 59 to 61 dBA at the property line of the southern residence. On a daily basis, this would result in a day-night average noise level less than 50 dBA L_{dn}. This would be below ambient noise levels at this residence.

Mitigation Measure 1: None required.

Impact 2: **Exposure to Excessive Groundborne Vibration due to Construction.** Construction-related vibration levels resulting from activities at the project site would not exceed 0.3 in/sec PPV at the nearest residential land uses. **This is a less-than-significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition, preparation work, foundation work, and new building framing and finishing. The proposed project is not expected to require pile driving, which can cause excessive vibration.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. No historical buildings or buildings that are documented to be structurally weakened adjoin the project site. For the purposes of this study, groundborne vibration levels exceeding the conservative 0.3 in/sec PPV limit at the existing adjacent residences would have the potential to result in a significant vibration impact.

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

To the east of the project site, a single-family residence is located along Laurel Road. This residential property is approximately 30 feet from the project's property line, with the residential structure set back approximately 75 feet from the property line. At a distance of 75 feet from the nearest possible construction equipment, vibration levels would be at or below 0.06 in/sec PPV.

An existing commercial building is adjacent to the site to the north, and the nearest building façade would be approximately 60 feet from the shared property line. At this distance, vibration levels would be up to 0.08 in/sec PPV. The existing commercial building opposite Jarvis Drive to the west would be set back approximately 115 feet from the nearest construction activity. At this distance, vibration levels would be up to 0.04 in/sec PPV.

The existing Shoe Palace facility located on-site would also be exposed construction vibration. The existing building would be approximately 65 to 100 feet from the boundary of the construction site, and at this distance, vibration levels would be at or below 0.07 in/sec PPV.

The construction-generated vibration levels for the proposed project would not result in cosmetic damage (e.g., hairline cracks in plaster, opening of old cracks, etc.) at any existing structure surrounding the site or on-site. At these locations, and in other surrounding areas where vibration would not be expected to cause cosmetic damage, vibration levels may still be perceptible.

However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby residences and commercial uses, perceptible vibration can be kept to a minimum. This is a less-than-significant impact.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

Mitigation Measure 2: None required.

Impact 3: Permanent Noise Level Increase. The proposed project is not expected to cause a substantial permanent noise level increase at the existing residential land uses in the project vicinity. **This is a less-than-significant impact.**

A significant permanent noise increase would occur if the project would substantially increase noise levels at existing sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn} at residences; or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater at residences. The nearest residences surrounding the site would be those along Laurel Road and Condit Road, which both front U.S. Highway 101, and those along Serene Drive to the south of the site. According to the 2035 noise contours included in the Morgan Hill 2035 Draft Environmental Impact Report,[3] these nearby residences would have future noise levels exceeding 60 dBA L_{dn}. Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 3 dBA L_{dn}. For reference, a 3 dBA L_{dn} noise increase would be expected if the project would double existing traffic volumes along a roadway.

[3] Placeworks, "Morgan Hill 2035 DEIR," January 13, 2016.

The peak hour turning movements for 18 intersections in the project vicinity were provided in the traffic study prepared for the proposed project. To determine the permanent traffic noise level increase along each roadway segment included in the traffic study, the existing plus project peak hour traffic volumes were compared to the existing traffic volumes. Along Jarvis Drive north of Serene Drive, the permanent noise level increase would be 3 dBA L_{dn}; however, the receptors along this roadway would include commercial and light industrial, which would not be considered noise-sensitive receptors. Along Serene Drive west of Jarvis Drive and along Jarvis Drive south of Serene Drive, the permanent noise level increase was calculated to be 2 dBA L_{dn}. On all other roadway segments included in the traffic study, the calculated noise level increase would be less than 1 dBA L_{dn}. Therefore, the proposed project would not cause a substantial permanent noise level increase at noise-sensitive receptors in the project vicinity. This is a less-than-significant impact.

Mitigation Measure 3: **None required.**

Impact 4: **Cumulative Noise Increase.** The proposed project would not result in a "cumulatively considerable" permanent noise level increase at the existing residential land uses in the project vicinity. **This is a less-than-significant impact.**

A significant impact would occur if two criteria are met: 1) if the cumulative traffic noise level increase was 3 dBA L_{dn} or greater for future levels exceeding 60 dBA L_{dn} or was 5 dBA L_{dn} or greater for future levels at or below 60 dBA L_{dn}; and 2) if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA L_{dn} or more attributable solely to the proposed project.

Cumulative traffic noise level increases were calculated by comparing the cumulative no project traffic volumes and the cumulative plus project volumes to existing traffic volumes. A traffic noise increase of 3 dBA L_{dn} or more was calculated under both scenarios along Serene Drive, east and west of Jarvis Drive and along Jarvis Drive, east of Butterfield Boulevard. Since the same increase was calculated for the cumulative no project and the cumulative plus project scenarios, the project's contribution would be less than 1 dBA L_{dn}, which would not be considered a "cumulatively considerable" contribution. Additionally, the cumulative plus project scenario would result in a 4 dBA L_{dn} increase along Jarvis Drive, north of Serene Drive, while the cumulative no project scenario would result in a 2 dBA L_{dn} increase along this segment. Therefore, the project's contribution would be greater than 1 dBA L_{dn}. However, the land uses along this roadway segment consist of commercial and light industrial uses. With no residential land uses located along this roadway segment, the project would not cause a significant cumulative traffic noise impact at noise-sensitive uses in the project vicinity. This is a less-than-significant impact.

Mitigation Measure 4: **None required.**

Impact 5: **Temporary Construction Noise.** Existing noise-sensitive land uses would be exposed to a temporary increase in ambient noise levels due to project construction activities. The incorporation of construction best management practices as project

conditions of approval would result in a **less-than-significant** temporary noise impact.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), when the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

While noise thresholds for temporary construction are not provided in the City's General Plan or Municipal Code, the Fundamentals section of this report provides a threshold of 45 dBA for speech interference indoors. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction and 25 dBA exterior-to-interior reduction for standard commercial, this would correlate to an exterior thresholds of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant if project construction activities produced noise levels exceeding 60 dBA L_{eq} at residential land uses or 70 dBA L_{eq} at commercial land uses and the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year at surrounding receptors.

For the residences located to the east of the project site adjacent to the U.S. Highway 101, including the residences located opposite U.S. Highway 101 from the site and the commercial uses to the north of the site, daytime ambient noise levels would be represented by measurements made at LT-2, which range from 62 to 67 dBA L_{eq}. The ambient noise environment for the existing residences to the south of the site and the commercial uses located opposite Serene Drive would be represented by measurements made at LT-1, which range from 53 to 65 dBA L_{eq} during daytime hours.

The typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 6). Table 7 shows the hourly average noise level ranges, by construction phase, as measured from the center of a busy construction site. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

Construction of the proposed project is expected to take 46 weeks to complete. Based on the equipment list provided for the proposed project for each phase of construction and the quantity of each piece of equipment expected to be used in each phase, construction noise levels were estimated at the nearby existing residential and commercial land uses. Table 8 summarizes the equipment and quantity expected to be used during each phase of construction, as well as the estimated noise levels at the receiving land uses surrounding the site when each piece of equipment is used simultaneously. For the purposes of these estimations, the distances were measured from the center of the active construction site to the nearest property line of the receiving land use. For the purposes of estimating the worst-case scenario, calculated construction noise levels for the

nearest receptors to the construction site, which are not obstructed by the existing on-site building are summarized in Table 8 assuming no noise reduction. For the residences to the south of the project site, which would be shielded by the existing building during most of the construction work, a conservative 10 dBA noise reduction was assumed.

TABLE 6 CONSTRUCTION EQUIPMENT 50-FOOT NOISE EMISSION LIMITS

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

[1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

[3] Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

TABLE 7 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 8 Estimated Construction Noise Levels at the Noise-Sensitive Receptors

Phase of Construction	Time Duration (Number of Days)	Construction Equipment (Quantity)	Calculated Hourly Average Noise Levels, L_{eq} (dBA)				
			East Res-Adjacent (900ft)	East Res-Opp. U.S. 101 (1,040ft)	North Comm (760ft)	South Res (1,270ft)[a]	West Comm (675ft)
			Ambient = 62-67 dBA			Ambient = 53-65 dBA	
Demolition	Week 1 to 2 (10 days)	Concrete/Industrial Saw (2) Excavator (2) Tractor/Loader/Backhoe (1) Crushing/Processing Equip. (1)	63 dBA	62 dBA	65 dBA	50 dBA	66 dBA
Site Preparation	Week 2 to 6 (20 days)	Grader (1) Tractor/Loader/Backhoe (2)	60 dBA	59 dBA	62 dBA	47 dBA	63 dBA
Grading/Excavation	Week 4 to 16 (60 days)	Excavator (1) Grader (1) Off-Highway Tractors (1) Tractor/Loader/Backhoe (2) Scraper (2)	63-65 dBA[b]	62-64 dBA[b]	65-66 dBA[b]	50-52 dBA[b]	66-67 dBA[b]
Trenching	Week 16 to 24 (40 days)	Tractor/Loader/Backhoe (2) Excavator (2)	60 dBA	58 dBA	61 dBA	47 dBA	62 dBA
Building Exterior	Week 20 to 40 (100 days)	Crane (1) Rough Terrain Forklift (2) Forklift (1) Generator Set (1) Tractor/Loader/Backhoe (1) Welder (2) Aerial Lift (8)	59-62 dBA[c]	58-61 dBA[c]	61-64 dBA[c]	46-49 dBA[c]	62-65 dBA[c]
Building Interior/Architectural Coating	Week 36 to 46 (50 days)	Air Compressor (2) Aerial Lift (4)	53-60 dBA[d]	52-59 dBA[d]	55-62 dBA[d]	40-47 dBA[d]	56-63 dBA[d]
Paving	Week 36 to 38 (10 days)	Paver (1) Paving Equipment (1) Roller (2) Tractor/Loader/Backhoe (1)	60-63 dBA[e]	59-62 dBA[e]	62-64 dBA[e]	47-50 dBA[e]	63-65 dBA[e]

[a] 10 dBA noise reduction applied to the estimated construction noise levels due to shielding from the existing Shoe Palace building.
[b] Ranges of levels represent noise levels generated by Grading/Excavation alone and during the overlapping period with the Site Preparation phase.
[c] Ranges of levels represent noise levels generated by Building Exterior alone and during the overlapping period with the Trenching phase.
[d] Ranges of levels represent noise levels generated by Building Interior/Architectural Coating alone and during the overlapping period with the Building Exterior phase.
[e] Ranges of levels represent noise levels generated by Paving alone and during the overlapping period with the Building Exterior and Building Interior/Architectural Coating phases.

As shown in Table 8, construction noise levels would at times exceed 60 dBA L_{eq} at the existing residential land uses. However, ambient levels at the surrounding residences are not expected to be exceeded by 5 dBA L_{eq} or more for most of project construction. When construction activities occur near the project boundaries that are within 100 feet of the surrounding noise-sensitive land uses, construction noise may at times exceed 60 dBA L_{eq} and may at times exceed ambient noise levels by 5 dBA L_{eq} or more, but due to the size of the project site and the high ambient noise levels, disruption to the neighbors is expected to be minimal, considering project construction is expected to last for a total of 46 weeks, which is less than one year.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Construction activities will be conducted in accordance with the provisions of the City's General Plan and the Municipal Code, which limits temporary construction work to between the hours of 7:00 a.m. and 8:00 p.m. Monday through Friday and between 9:00 a.m. to 6:00 p.m. on Saturday. Construction is prohibited on Sundays and federal holidays. Further, the City shall require the construction crew to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following construction best management controls:

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment when located within 200 feet of adjoining sensitive land uses. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used. Any enclosure openings or venting shall face away from sensitive receptors.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

The implementation of the reasonable and feasible controls outlined above would reduce construction noise levels emanating from the site in order to minimize disruption and annoyance. With the implementation of these measures, the lack of high-intensity construction equipment required for the proposed project, and the fact that noise generated by construction activities would occur over a temporary period, the temporary increase in ambient noise levels at each of the proposed development sites would be a less-than-significant impact.

Mitigation Measure 5: No further mitigation required.