BUTTERFIELD PARK
NOISE AND VIBRATION ASSESSMENT

Morgan Hill, California

July 11, 2019

Prepared for:

Alejandra Sanchez
Assistant Project Manager
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San José, CA 95126

Prepared by:

Cameron Heyvaert and
Michael S. Thill

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
429 East Cotati Avenue
Cotati, CA 94931
(707) 794-0400

Project: 19-111

INTRODUCTION

The project proposes a neighborhood park located south of Butterfield Boulevard, between Monterey Road on the west and the Union Pacific Railroad (UPRR) tracks on the east in Morgan Hill, California. The site is currently undeveloped and is adjacent to open space to the south. Existing residences are located within several hundred feet of the project site to the west, south, and east. The proposed development would include two bicycle pump tracks, adult exercise equipment, a baseball field, two grass turf fields, and a surface parking lot. Supporting amenities would include picnic tables, a building with a public meeting room, concessions and restrooms, a separate storage building, grass lawns, and a walking path around the perimeter of the site. The parking lot would be constructed on the western portion of the project site, with access via Butterfield Boulevard.

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 monitoring survey completed to document existing noise 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 increases by about 3 percent the percentage of the population highly annoyed. 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 Reactions 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	Virtually no risk of damage to normal 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 dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

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

Regulatory Background

The State of California and the City of Morgan Hill have established regulatory criteria that are applicable in this assessment. The 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) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

(b) Generation of excessive groundborne vibration or groundborne noise levels; or

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

Pursuant to 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.

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).

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-8.5- *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.

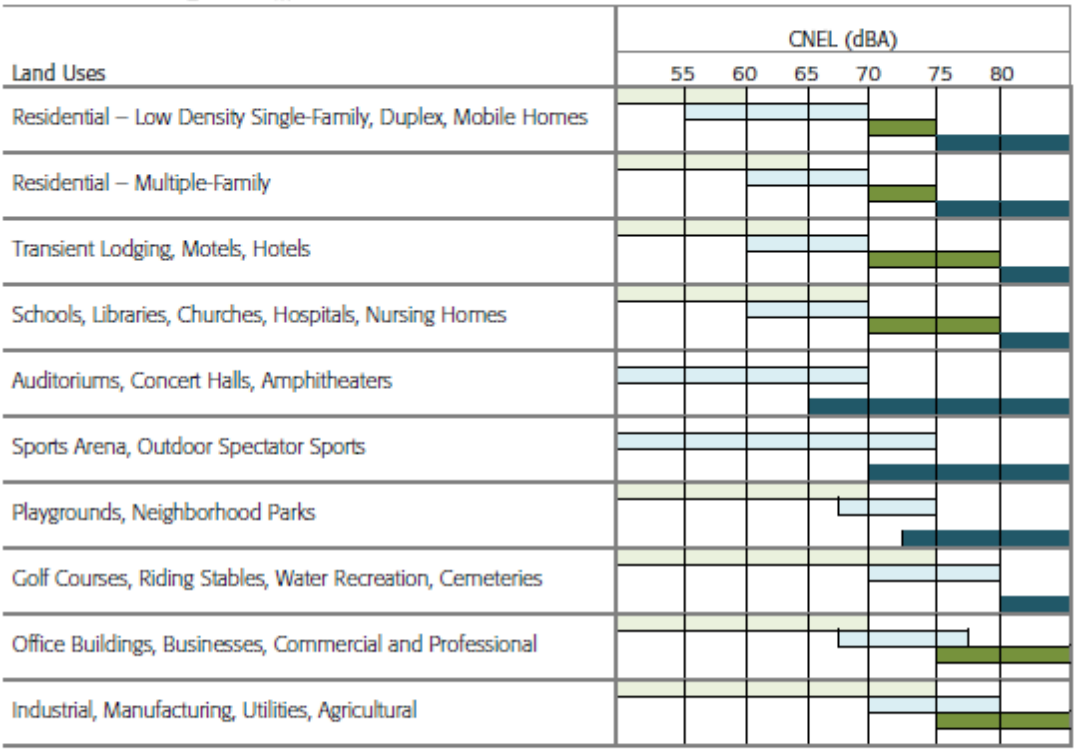
Policy SSI-8.7- *Other Noise Sources:* Consider noise levels produced by other noise sources (such as ballfields) significant if an acoustical study demonstrates they would substantially exceed ambient noise levels.

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-9.6- *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



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.

Normally Unacceptable:
New construction or development should generally be discouraged. If new construction does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Conditionally Acceptable:
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and the needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

Clearly Unacceptable:
New construction or development generally should not be undertaken.

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 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 site is undeveloped and is surrounded by open space directly to the south and across Butterfield Boulevard to the north. Sensitive land uses in the vicinity include residences approximately 130 feet to the west across Butterfield Boulevard, 260 feet to the west across the intersection of Butterfield Boulevard and Monterey Road, 430 feet to the south across Monterey Road, 450 feet to the east across the UPRR tracks and Railroad Avenue, and 540 feet to the southeast across open space. The noise environment at the site results primarily from vehicle traffic along Butterfield Boulevard and Monterey Road and intermittent train activity along the UPRR tracks.

A noise monitoring survey was performed at the site beginning on Tuesday, June 11, 2019 and concluding on Friday, June 14, 2019. The monitoring survey at the site included one long-term measurement and three short-term noise measurements, as shown in Figure 1. Data from an additional long-term measurement (labeled LT-2 in this study), taken from a prior study with the City, was also included in this analysis. An additional short-term measurement was taken at a BMX pump track in Novato, California to characterize and quantify noise levels associated with the use of pump track facilities.

Long-term noise measurement LT-1 was made from a light post on the north side of Butterfield Boulevard, approximately 215 feet from the center of the intersection of Butterfield Boulevard and Monterey Road, and 45 feet from the centerline of Butterfield Boulevard. This site was chosen to quantify noise levels along Butterfield Boulevard and to characterize ambient noise levels at the nearest residential receptor to the west. Hourly average noise levels at LT-1 ranged from 65 to 72

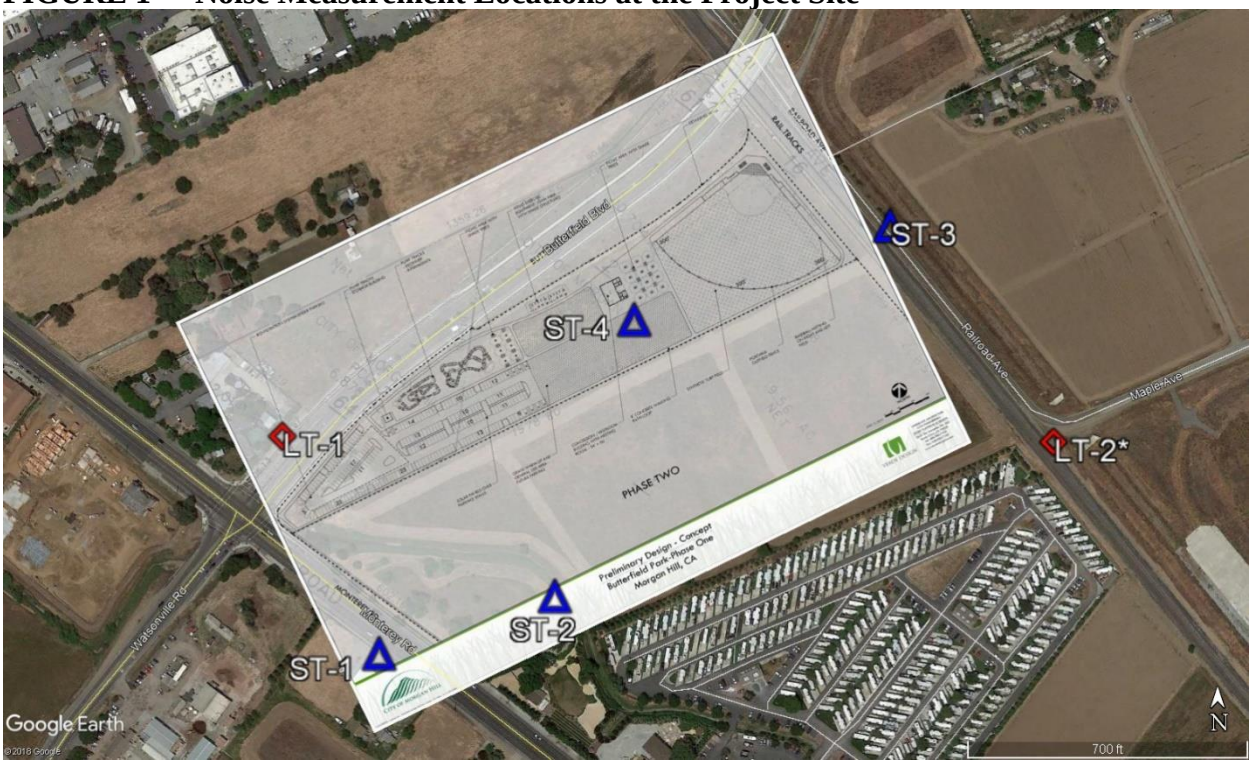
dBA L_{eq} during the day and from 55 to 75 dBA L_{eq} at night. The day-night average noise level measured from Tuesday through Friday was 72 dBA L_{dn}. The daily trend in noise levels at LT-1 is shown in Figures 2-5.

Long-term noise measurement LT-2 was made from a utility pole near the junction of Railroad Avenue and Maple Avenue, approximately 30 feet from the center of UPRR tracks. This measurement was made from Tuesday, April 9, 2019 to Thursday, April 11, 2019, and was included in this analysis to quantify noise levels from freight trains along UPRR tracks and to characterize ambient noise levels at residential receptors to the east and southeast of the project site. Hourly average noise levels at LT-2 ranged from 57 to 74 dBA L_{eq} during the day and from 45 to 71 dBA L_{eq} at night. The day-night average noise level measured was 70 dBA L_{dn}. Noise levels at this site were heavily influenced by passenger and freight trains, and the hourly L_{eq} was considerably higher during hours of the day when trains passed. Therefore, ambient noise levels for the majority of the day near these residences are likely considerably lower than the given L_{eq} and L_{dn} and are better represented by the L_{90} noise levels. The daily trend in noise levels at LT-2 is shown in Figures 6-8.

Short-term noise measurements ST-1 and ST-2 were made on Tuesday, June 11, 2019 and ST-3 and ST-4 were made on Friday, June 14, 2019. The intent of these short-term measurements was to quantify ambient noise levels at the project site and at land uses in the vicinity. ST-1 was made from the south side of Monterey Road, approximately 45 feet from the centerline of Monterey Road and 5 feet from the residential property line. This site was chosen to capture ambient noise levels at the residential receptors to the southwest and to quantify noise levels along Monterey Road. ST-2 was made approximately 420 feet south of the project site, about 90 feet from the property line of the single-family residences. Mechanical equipment was operating in the yard of one of the residences, so this setback was chosen to quantify ambient noise levels near the backyards of the residences without the influence of the mechanical equipment. ST-3 was made to the east of the project site, approximately 16 feet from the centerline of Railroad Avenue and 55 feet from the center of the UPRR track. This site was chosen to quantify ambient noise levels at land uses to the east of the project site when trains are not passing by. ST-4 was made near the center of the project, approximately 280 feet from the centerline of Butterfield Boulevard. This site was chosen to quantify ambient noise levels near the track and field area at the project site. Table 4 summarizes the results of short-term measurements ST-1 through ST-4.

An additional short-term measurement (ST-5) was made at the Stafford Lake Bike Park in Novato, California to quantify typical noise levels associated with a pump track. This measurement was made on Thursday, June 13, 2019 from 4:00 p.m. to 4:35 p.m. Typical noise levels of bicycles passing by on a dirt track at a distance of 50 feet were 43 to 50 dBA L_{max}. Other sounds commonly associated with recreational land uses, such as people talking and shouting, constituted the primary noise source at the bike park, with noise levels ranging from 48 to 69 dBA L_{max} at a distance of 50 feet. Table 5 summarizes the results of short-term measurement ST-5.

FIGURE 1 Noise Measurement Locations at the Project Site



*LT-2 was included from a prior study with the City of Morgan Hill.
Source: Google Earth 2019.

TABLE 4 Summary of Short-Term Noise Measurements at the Project Site (dBA)

Noise Measurement Location (Date, Time)	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10\text{-}min)}$
ST-1: 45 feet from Monterey Rd centerline (6/11/2019, 11:30 a.m. - 11:40 a.m.)	89	80	75	65	53	71
ST-2: 420 feet south of project site (6/11/2019, 11:00 a.m. - 11:10 a.m.)	65	54	?	46	43	48
ST-3: 16 feet from Railroad Ave centerline (6/14/2019, 9:30 a.m. - 9:40 a.m.)	81	77	59	52	51	63
ST-4: Near center of project site (6/14/2019, 9:50 a.m. – 10:00 a.m.)	60	57	54	51	49	52

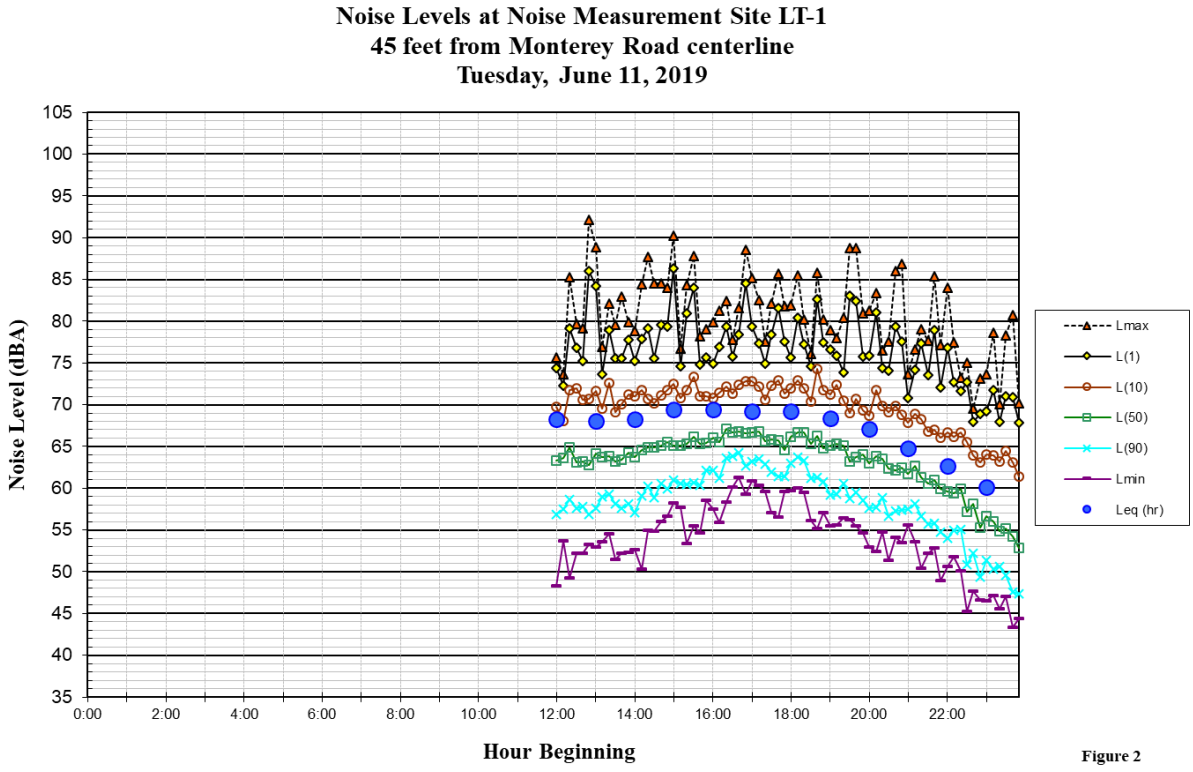
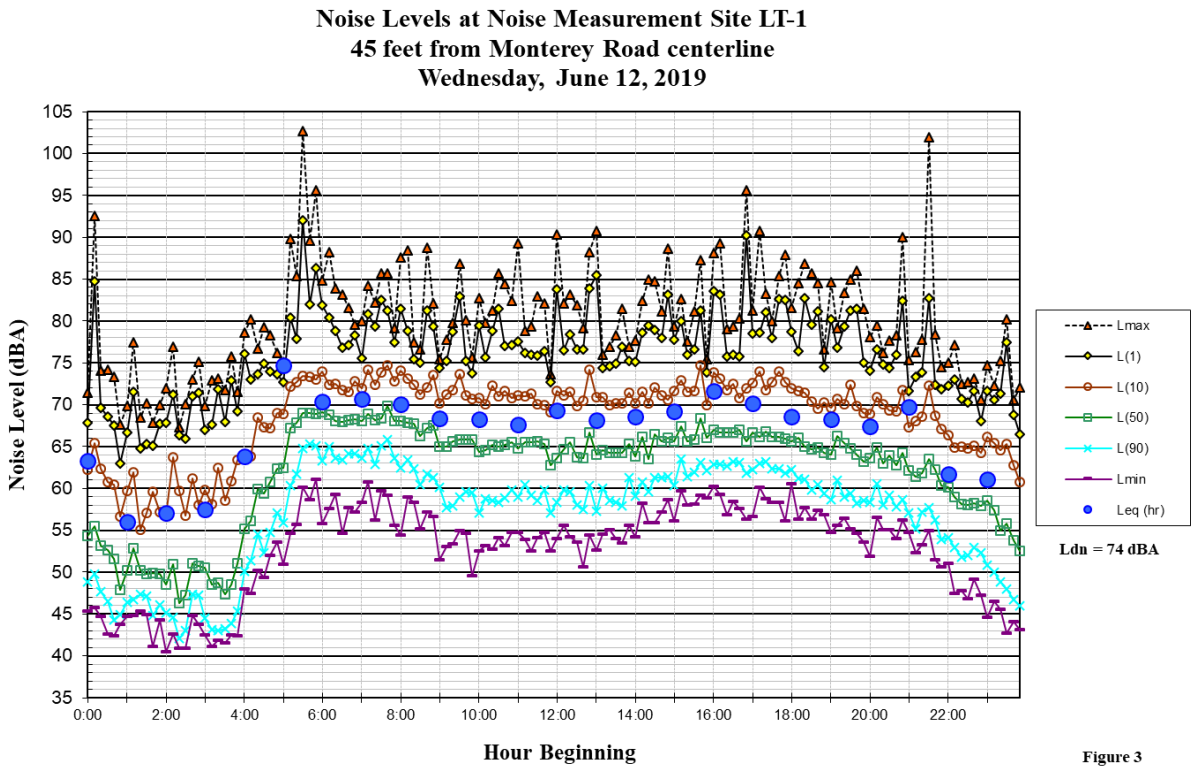


Figure 2



Ldn = 74 dBA

Figure 3

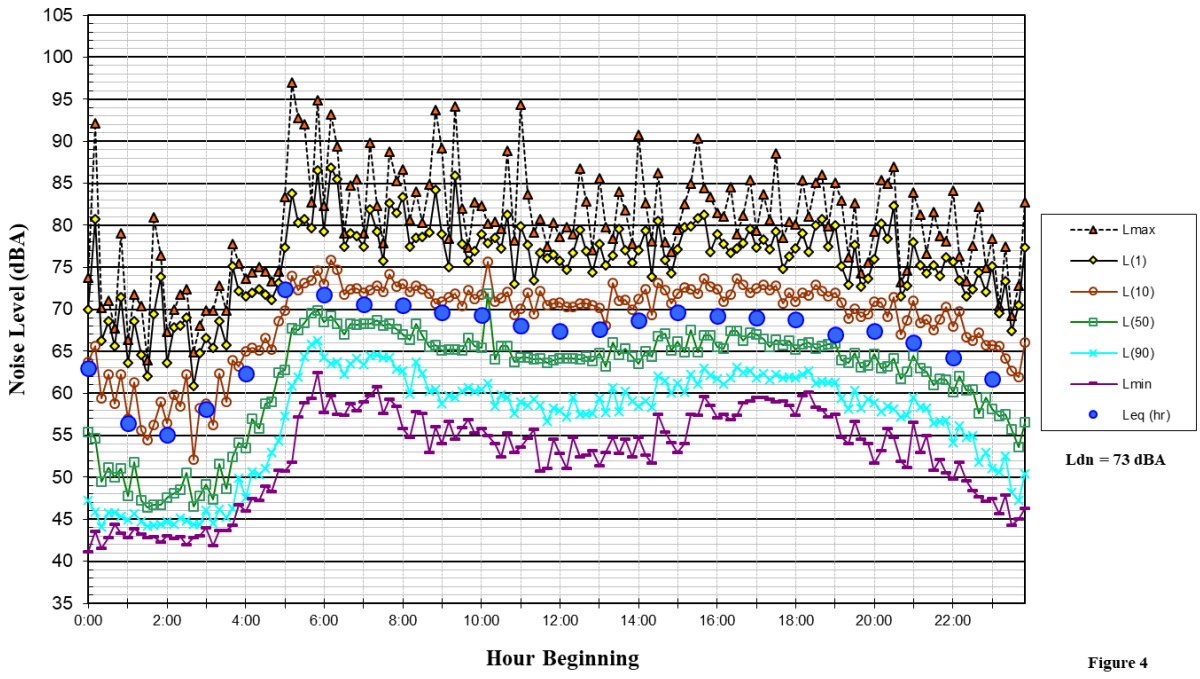


Figure 4

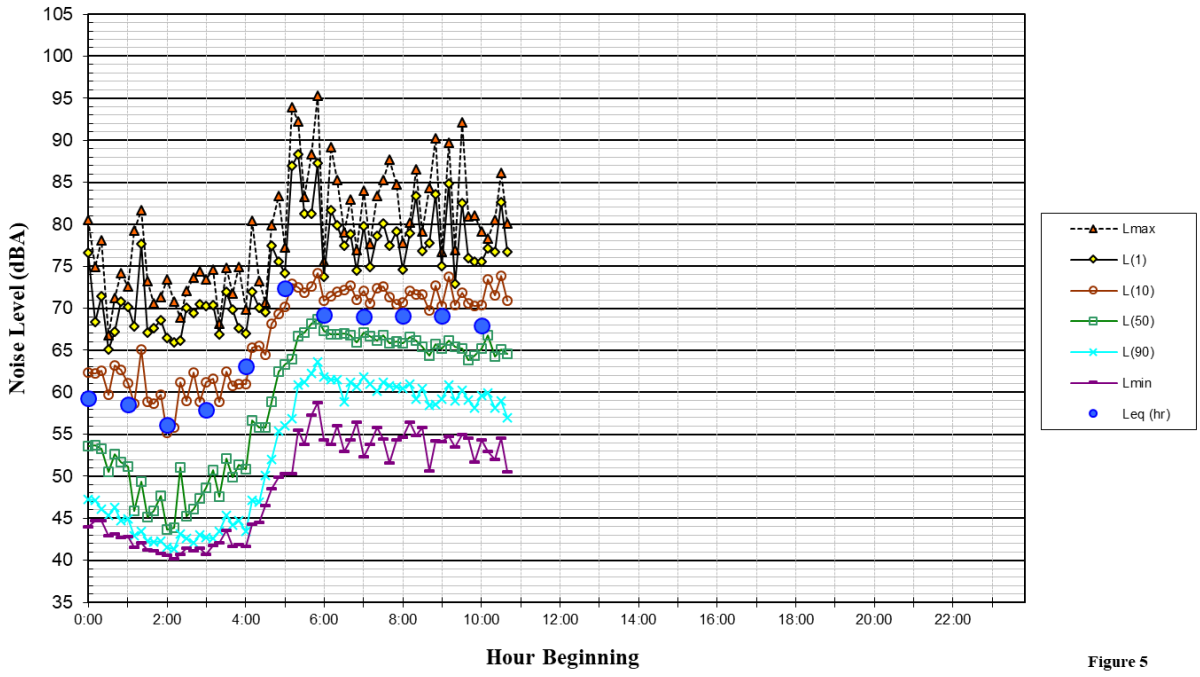


Figure 5

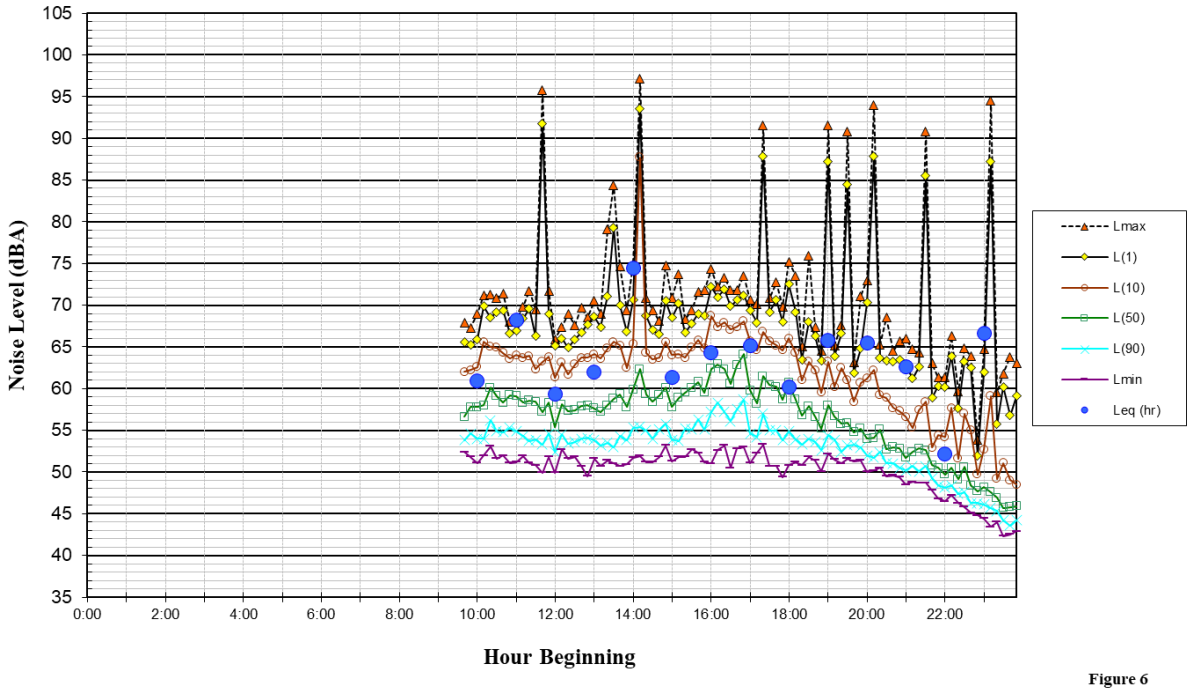
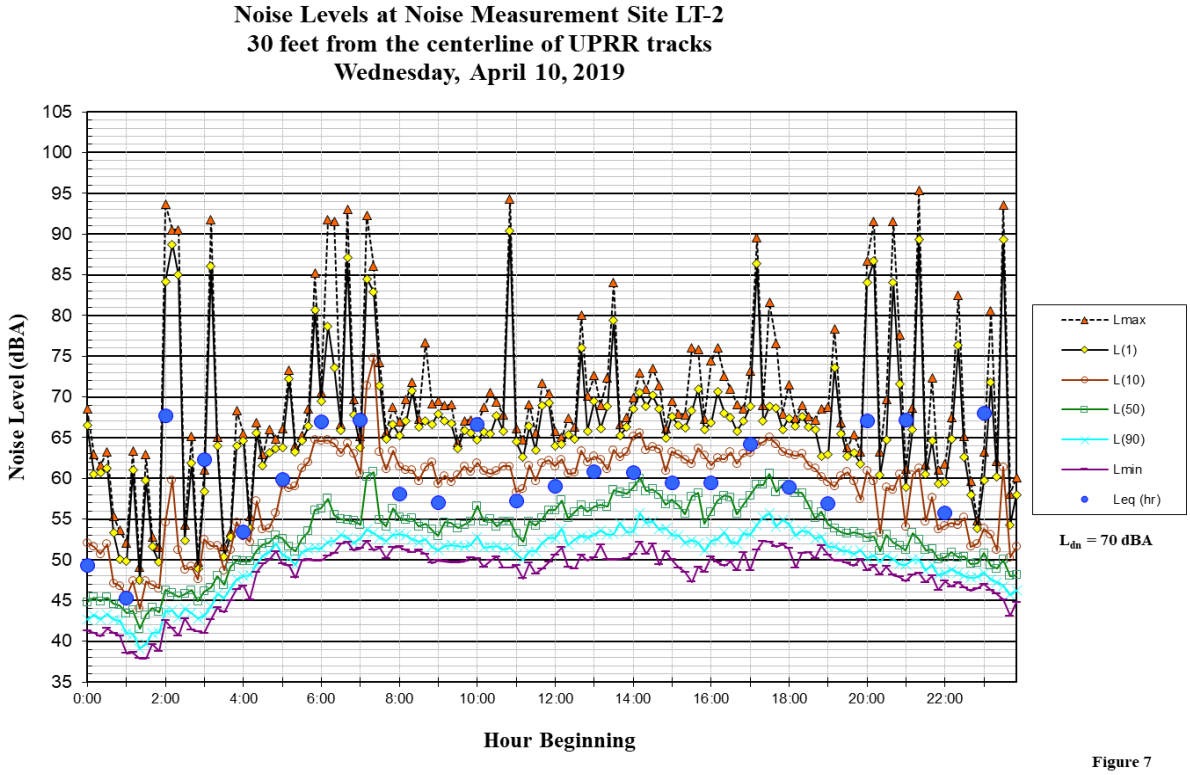


Figure 6



L_{dn} = 70 dBA

Figure 7

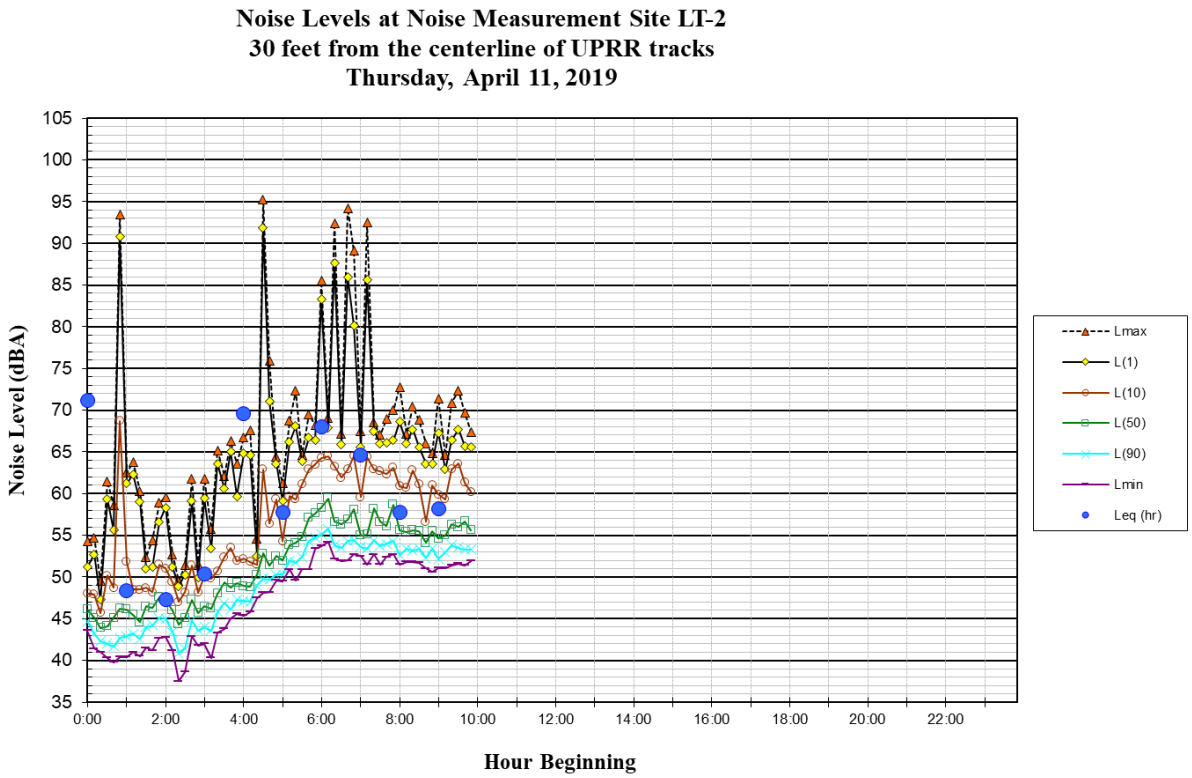


Figure 8

TABLE 5 Summary of Short-Term Noise Measurement ST-5 at Stafford Lake Bike Park in Novato, California (dBA)

Noise Source	Distance (feet)	Measured L_{max}	L_{max} at 50 feet
2 bicycles passing by on dirt track	15	58	48
Kids talking	90	54	59
1 bicycle passing by on dirt track	15	53	43
Kids shouting	120	61	69
1 bicycle passing by on dirt track	15	58	48
Kid shouting	15	71	61
1 bicycle passing by on dirt track	15	53	43
Kid shouting	120	48	56
Kid shouting	150	58	68
1 bicycle passing by on dirt track	15	59	49
Kid shouting	30	67	63
People talking	15	58	48
1 bicycle passing by on wood track	15	56	46
1 bicycle braking in dirt	15	60	50

GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility Assessment

Future Exterior Noise Environment

According to Table SSI-1 of the City's General Plan, the exterior noise level standard for new neighborhood parks is 70 dBA L_{dn}. The future noise environment at the project site would continue to result from traffic and railroad trains. A traffic study was not available at the time of this analysis. Data from the noise measurement sites and noise contours included in the City of Morgan Hill General Plan 2035[1] indicate that future noise levels at the center of the baseball diamond and BMX pump tracks could reach up to 68 dBA L_{dn} while noise levels at the center of the project site would remain below 65 dBA L_{dn}. This would be compatible with the 70 dBA L_{dn} threshold for the neighborhood parks land use designation.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

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 generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site and that would exceed applicable noise standards presented in the General Plan or Municipal Code at existing noise-sensitive receptors surrounding the project site.

    - Hourly average noise levels during construction that would exceed 60 dBA L_{eq} at residential land uses or exceed 70 dBA L_{eq} at commercial land uses and exceed the ambient noise environment by at least 5 dBA L_{eq} for a period of more than one year would constitute a significant temporary noise increase in the project vicinity.

    - A significant permanent noise level increase would occur if project-generated traffic would result in: a) a noise level increase of more than 3 dBA L_{dn} and the total day-night average noise level exceeding the "normally acceptable" category at an existing noise environment meeting the "normally acceptable" threshold; b) a noise level increase of more than 5 dBA L_{dn} and the total day-night average noise level remains "normally acceptable" at an existing noise environment meeting the "normally acceptable" threshold; c) a noise level increase of more than 3 dBA L_{dn} at a "conditionally acceptable" existing noise environment; or d) a noise level increase of more than 3 dBA L_{dn} at an "unacceptable" existing noise environment.

[1] Placeworks, "Morgan Hill 2035 General Plan," Adopted July 27, 2016. Revised December 6, 2017.

- 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 generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant noise impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

Impact 1a: **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 short duration of project construction (one year) and the incorporation of construction best management practices as part of the project's Noise Control Plan 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), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time. The proposed project would not require pile driving, which can cause excessive noise.

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 for the proposed project is anticipated to take place during these allowable hours.

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, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential 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 and the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

For the residences located to the west and southwest of the project site, opposite Butterfield Boulevard and/or Monterey Road, daytime ambient noise levels would be represented by ST-1, which was 71 dBA $L_{eq(10\text{-}min)}$. The ambient noise environment for the existing residences to the south of the site, across the open space area, would be represented by measurements made at ST-2, which was 48 dBA $L_{eq(10\text{-}min)}$ at a distance of 320 feet from the centerline of Monterey Road.

The ambient noise environment for the existing residence to the east of the site, across UPRR tracks and Railroad Avenue, would be represented by measurements made at ST-3, which was 63 dBA $L_{eq(10\text{-}min)}$ without any trains passing by at a distance of 55 feet from the center of UPRR tracks.

The typical range of maximum instantaneous noise levels for the proposed project would be 71 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.

A detailed list of equipment expected to be used for the proposed project construction and phasing information was not available at the time of this study. Most construction activities would consist of ground clearing and grading to construct the track and field area with finishing occurring over the parking lot and areas that require concrete and asphalt. One building that would be used for storage, restrooms, and concessions will be constructed near the center of the project site. Total project construction is expected to last for approximately one year. Based on the hourly average noise levels summarized in Table 7, construction noise levels for the surrounding land uses were estimated. The typical range of average noise levels for the proposed project would be 71 to 83 dBA L_{eq} at a distance of 50 feet. Table 8 summarizes the hourly average noise levels during construction activities of the nearest sensitive land uses, as measured from the center of the project site to the property line of the receiving land use.

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

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/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 Nearby Land Uses

Reference Noise Levels at 50 feet	Estimated Noise Levels at Nearby Land Uses, dBA L_{eq}				
	West Residence (130 feet)	West Residence (260 feet)	Southwest Residence (430 feet)	East Residence (450 feet)	Southeast Residence (540 feet)
71-83	63-75	57-69	52-64	52-64	50-62

When construction activities occur near surrounding land uses, construction noise levels would exceed the 60 dBA L_{eq} threshold, and potentially exceed the ambient noise levels at residences to the south of the project by 5 dBA L_{eq} or more. However, construction of the project is not anticipated to last longer than one year, and incorporation of the controls outlined below would reduce construction noise levels at nearby land uses.

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:

- 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., jackhammers, 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; and

- Stationary noise sources shall be located as far from adjacent receptors as possible, and they shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or include other measures.

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

- 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.

- Where feasible, temporary power service from local utility companies should be used instead of portable generators.

- Locate cranes as far from adjoining noise-sensitive receptors as possible.

- During final grading, substitute graders for bulldozers, where feasible. Wheeled heavy equipment are quieter than track equipment and should be used where feasible.

- Substitute nail guns for manual hammering, where feasible.

- Avoid the use of circular saws, miter/chop saws, and radial arm saws near the adjoining noise-sensitive receptors. Where feasible, shield saws with a solid screen with material having a minimum surface density of 2 lbs/ft^2 (e.g., such as ¾" plywood).

- Maintain smooth vehicle pathways for trucks and equipment accessing the site, and avoid local residential neighborhoods as much as possible.

- The contractor shall prepare a detailed construction 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, minimizing disruption and annoyance. With the implementation of these controls, as well as the Municipal Code limits on allowable construction hours, and considering that construction is temporary, noise levels would be reduced to a **less-than-significant impact**.

Mitigation Measure 1a: No further mitigation required.

Impact 1b: **Permanent Noise Level Increase.** The proposed project would not result in a substantial permanent noise level increase due to project-generated traffic at the existing noise-sensitive 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. According to the noise contours included in the Morgan Hill 2035 General Plan, and noise measurements from the site survey, residences located within approximately 250 feet of the centerline of Butterfield Boulevard and Monterey Road 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}.

At the time of this analysis, traffic data for the proposed project were not available. Traffic data counts from a study[2] conducted in the area between May and June 2015 show over 13,000 average daily trips along the segment of Butterfield Boulevard adjacent to the project site. In order to increase ambient noise levels by 1 dBA L_{dn}, the project would need to generate an average daily traffic volume of 3,300 trips. Based on the site plans and size of the park in relation to similar projects, it is anticipated that the project would generate an average daily traffic volume well below 3,300 daily trips. 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 1b: None required.

Impact 1c: Noise Levels in Excess of Standards. The proposed project would not generate noise in excess of standards established in the City's General Plan and Municipal Code at sensitive receptors. This is a **less-than-significant impact**.

Sports Field Area

The City of Morgan Hill limits noise from non-transportation related sources to 60 dBA at the property line of residences. The Zoning Code does not define the acoustical time descriptor such as L_{eq} (the average noise level) or L_{max} (the maximum instantaneous noise level) that is associated with the above limit. A conservative interpretation of the Zoning Code would identify the L_{max} as the noise limit at nearby residential property lines. However, this analysis will use both 60 dBA L_{max} and 60 dBA L_{eq} as significance criteria for evaluating intermittent events associated with the operation of the project.

The project description, dated July 1, 2019, indicates one baseball field, two turf fields, and two pump tracks. Other project amenities include a picnic area, a walking path around the perimeter of the site, and a multi-purpose building for restrooms, concessions, and public meetings. Field lighting would be available for use until 10:00 p.m. with shutoff at 11:00 p.m.

Illingworth and Rodkin, Inc. has made measurements of the noise generated by baseball games at several locations throughout the bay area. Little League baseball games typically generate "worst case" noise levels of about 57 dBA L_{eq} at a distance of 100 feet from the center of the infield.

[2] Hatch Mott MacDonald, "Exhibit 1 Average Daily Traffic Volumes." City of Morgan Hill Public Works Department. August 21, 2015.

Maximum noise levels of about 65 dBA L_{max} typically result from baseballs being hit and shouting from players and spectators. Noise levels generated by softball games would be anticipated to be lower than baseball games.

Measurements at an existing pump track facility in Novato, California indicate that noise levels associated with biking would be lower than those during baseball and softball games, (see Table 5). At a distance of 100 feet from the center of the pump tracks, maximum noise levels would be about 63 dBA L_{max} as a result of shouting and cheering. Noise levels associated with the bicycles on the pump track are generally lower than talking and shouting from spectators and participants. Therefore, the noise levels generated by the pump tracks are anticipated to be lower than those generated during sports activities.

Assuming a standard attenuation rate of 6 dBA per doubling of distance, the noise resulting from activities at the center of the proposed field area would generate a noise level of about 39 to 41 dBA L_{eq} at the nearest sensitive receptors to the west. Maximum noise levels at these receptors would range from approximately 47 to 49 dBA L_{max}. Receptors to the south and east could potentially be as close to noise-generating sources from the field area as the receptors to the west, depending on the location of the sports activity. Therefore, noise levels at these locations are not anticipated to be above 41 dBA L_{eq} or 49 dBA L_{max}. While occasional shouting or cheering may be heard by nearby receptors during the evening hours, average noise levels would be below ambient levels. The 24-hour average noise level (L_{dn}) at these residences would not measurably increase, and noise levels defined by the L_{eq} and L_{max} would be below 60 dBA, thus meeting the residential Zoning Code noise limits established by the City of Morgan Hill.

Parking Lot Activities

Parking areas will be located along the western portion of the project site. Noise associated with the use of the parking lots would include vehicular circulation, loud engines, door slams, and human voices. The maximum noise level of a passing car at 15 mph typically ranges from 45 dBA to 55 dBA L_{max} at a distance of 100 feet. The noise generated during an engine start is similar. Door slams cause slightly lower noise levels. The noise of car stereos is variable, potentially disturbing, and unnecessary. The hourly average noise levels resulting from all of these noise-generating activities in a busy parking lot typically ranges from 40 dBA to 50 dBA L_{eq} at a distance of 100 feet from the parking area. Noise levels decrease at a rate of 6 dB per doubling of distance. Noise levels resulting from parking activities at the nearest residences would range from 38 to 48 dBA L_{eq} and maximum noise levels would range from about 43 to 53 dBA L_{max}. Noise levels associated with normal parking lot activities would typically be below the range of ambient traffic noise levels and would be below the residential Zoning Code limits established by the City.

Mitigation Measure 1c: No further mitigation required.

Impact 2: Exposure to Excessive Groundborne Vibration. Construction-related vibration is not expected to exceed 0.3 in/sec PPV at existing buildings surrounding the project site or at future on-site receptors. **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. While equipment and phasing information

was not available at the time of this study, the proposed project is not expected to require pile driving, which can cause excessive vibration.

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. Conservative vibration limits 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 cautious 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 residential and buildings surrounding the site would have the potential to result in a significant vibration impact.

Table 9 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. 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.

Worst-case scenario vibration levels were calculated at the nearest building façades surrounding the site, as measured from project's boundaries. The potential vibration levels for each piece of equipment at the surrounding receptors is also summarized in Table 9. The nearest existing building to the project site would be the residence to the west across Butterfield Boulevard. Located approximately 150 feet from the project's boundary, the worst-case vibration levels at this structure would be 0.073 in/sec PPV. All other surrounding buildings would be subject to vibration levels at or below 0.073 in/sec PPV. This would be a less-than-significant impact.

TABLE 9 Vibration Source Levels for Construction Equipment

Equipment		Vibration Levels (in/sec PPV)	
		Reference at 25 feet	Residential Building at 150 feet
Clam shovel drop		0.202	0.071
Hydromill (slurry wall)	in soil	0.008	0.003
	in rock	0.017	0.006
Vibratory Roller		0.210	0.073
Hoe Ram		0.089	0.031
Large bulldozer		0.089	0.031
Caisson drilling		0.089	0.031
Loaded trucks		0.076	0.027
Jackhammer		0.035	0.012
Small bulldozer		0.003	0.001

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, September 2018 as modified by Illingworth & Rodkin, Inc., June 2019.

Mitigation Measure 2: None required.

Impact 3: Excessive Aircraft Noise. The project site is located more than two miles from a public airport or private-use airport and would not expose people residing or working in the project area to excessive noise levels. **This is a less-than-significant impact.**

San Martin Airport is a public non-towered airport located about 2.25 miles southeast of the project site. According to the Santa Clara County Airport Land Use Commission (ALUC)'s Comprehensive Land Use Plan for this airport, [3] the project site lies outside of 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 60 dBA L_{dn} or more and noise levels resulting from aircraft would be compatible with the proposed project.

Mitigation Measure 3: None required.

[3] 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.