2535 PULGAS AVENUE
NOISE AND VIBRATION ASSESSMENT

EAST PALO ALTO, CALIFORNIA

February 18, 2021

Prepared for:

Carolyn Neer, MUP, AICP Candidate
Associate Project Manager
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San José, CA 95126

Prepared by:

Cameron Heyvaert and
Carrie J. Janello

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

I&R Job No.: 19-138

INTRODUCTION

A four-story office building is proposed at 2535 Pulgas Avenue in East Palo Alto, California. The proposed project would provide approximately 110,000 square feet of office space and 357 parking spaces throughout a surface parking lot. The 3.86-acre site is currently developed with two single-story buildings and associated storage areas. These would be demolished as part of the proposed project.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to 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 noise and land use compatibility utilizing policies in the City of East Palo Alto'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* (*DNL* or L_{dn}) 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 to 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 to 62 dBA L_{dn} with open windows and 65 to 70 dBA L_{dn} if the windows are closed. Levels of 55 to 60 dBA are common along collector streets and secondary arterials, while 65 to 70 dBA is a typical value for a primary/major arterial. Levels of 75 to 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 to 30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60 to 70 dBA. Between a L_{dn} of 70 to 80 dBA, each decibel increase 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 to 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.

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 pm and 7:00 am.
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 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
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 2018.

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 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	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

This section describes the relevant guidelines, policies, and standards established by State Agencies, Santa Clara County, and the City of East Palo Alto. The State 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 California Environmental Quality Act (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;

(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.

2019 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2019 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). 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.

Vista 2035 East Palo Alto General Plan. The City of East Palo Alto adopted the 2035 General Plan Final Version in March 2017. The Safety and Noise Chapter of the General Plan[1] provides goals and policies to reduce noise within the community. The goals and policies that apply to the proposed project are as follows:

Goal SN-6: Minimize the effects of noise through proper land use planning.

Intent: To ensure that new noise-sensitive land uses in the City are located in a compatible noise environment or adequately mitigated in order to provide a compatible exterior and interior noise environment.

> **Policy 6.1. Noise standards.** Use the Interior and Exterior Noise Standards (Table 10-1) for transportation noise sources. Use the City's Noise Ordinance for evaluating non-transportation noise sources when making planning and development decisions. Require that applicants demonstrate that the noise standards will be met prior to project approval.
>
> **Policy 6.2. Compatibility standards.** Utilize noise/land use compatibility standards and the Noise Ordinance as guides for future development decisions.
>
> **Policy 6.3. Noise control.** Provide noise controls measures, such as berms, walls, and sound attenuating construction in areas of new construction or rehabilitation.

[1] City of East Palo Alto, *Vista 2035 East Palo Alto General Plan*, Safety and Noise Chapter, Adopted October 4, 2016. Final Version March 2017.

Policy 6.4. Vibration impacts. The City shall require new developments to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV will be used to minimize the potential for cosmetic damage to the building. A vibration limit of 0.30 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Policy 6.5. Airport-adjacent land uses. Maintain the non-residential designation for land near the airport in order to prevent new noise-sensitive residential uses from being constructed in areas with excessive aircraft noise.

Table 10-1. Interior and Exterior Noise Standards

Land Use	Noise Standards[1]	
	Interior[2, 3]	Exterior
Residential – Single family, multifamily, duplex, mobile home	CNEL 45 dB	CNEL 65 dB[4]
Residential – Transient lodging, hotels, motels, nursing home, hospitals	CNEL 45 dB	CNEL 65 dB[4]
Private offices, church sanctuaries, libraries, board rooms, conference rooms, theaters, auditoriums, concert halls, meeting halls, etc.	Leq(12) 45 dB(A)	-
Schools	Leq(12) 45 dB(A)	Leq(12) 67 dB(A)[5]
General offices, reception, clerical, etc.	Leq(12) 50 dB(A)	-
Bank lobby, retail store, restaurant, typing pool, etc.	Leq(12) 55 dB(A)	-
Manufacturing, kitchen, warehousing, etc.	Leq(12) 65 dB(A)	-
Parks, playgrounds	-	CNEL 65 dB[5]
Golf courses, outdoor spectator sports, amusement parks	-	CNEL 70 dB[5]

Notes:

1. CNEL: Community Noise Equivalent Level; Leq (12): The A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation).
2. Noise standard with windows closed. Mechanical ventilation shall be provided per UBC requirements to provide a habitable environment.
3. Indoor environment excluding bathrooms, toilets, closets, and corridors.
4. Outdoor environment limited to rear yard of single family homes, multifamily patios, and balconies (with a depth of 6' or more) and common recreation areas.
5. Outdoor environment limited to playground areas, picnic areas and other areas of frequent human use.

Source: Title 24, California Code of Regulations

Goal SN-7: Minimize transportation- and non-transportation-related noise impacts, especially on noise-sensitive land uses.

Intent: To maintain and improve the noise environment at noise-sensitive land uses throughout the City.

Policy 7.1. Noise ordinance. Continually enforce and periodically review the City's Noise Ordinance for adequacy (including requiring construction activity to comply with

established work schedule limits). Amend as needed to address community needs and development patterns.

Policy 7.2. CEQA acoustical analysis. Require an acoustical analysis to evaluate mitigation measures for noise-generating projects that are likely to cause the following criteria to be exceeded or to cause a significant adverse community response:

- Cause the L_{dn}/CNEL at noise-sensitive uses to increase by 3 dBA or more and exceed the "normally acceptable" level.

- Cause the L_{dn}/CNEL at noise-sensitive uses to increase by 5 dBA or more and remain "normally acceptable."

Policy 7.7. Site design review. Utilize site design review to identify potential noise impacts on new development, especially from nearby transportation sources. Encourage the use of noise barriers (walls, berms, or landscaping), setbacks and/or other buffers.

Policy 7.11. Construction noise. The City shall require that contractors use available noise suppression devices and techniques and limit construction hours near residential uses. Reasonable noise reduction measures shall be incorporated into the construction plan and implemented during all phases of construction activity to minimize the exposure of neighboring properties. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses. A typical construction noise logistics plan would include, but not be limited to, the following measures to reduce construction noise levels as low as practical:

- Limit construction activity to weekdays between 7:00 a.m. and 7:00 p.m. and Saturdays and holidays between 9:00 a.m. and 7:00 p.m., with no construction on Sundays;

- Utilize "quiet" models of air compressors and other stationary noise sources where such technology exists;

- Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment;

- Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from adjacent land uses;

- Locate staging areas and construction material areas as far away as possible from adjacent land uses;

- Prohibit all unnecessary idling of internal combustion engines;

- If impact pile driving is proposed, multiple-pile drivers shall be considered to expedite construction. Although noise levels generated by multiple pile drivers would be higher than the noise generated by a single pile driver, the total duration of pile driving activities would be reduced;

- If impact pile driving is proposed, temporary noise control blanket barriers shall shroud pile drivers or be erected in a manner to shield the adjacent land uses. Such noise control blanket barriers can be rented and quickly erected;

- If impact pile driving is proposed, foundation pile holes shall be pre-drilled to minimize the number of impacts required to seat the pile. Pre-drilling foundation pile holes is a standard construction noise control technique. Pre-drilling reduces the number of blows required to seat the pile. Notify all adjacent land uses of the construction schedule in writing;

- Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem are implemented.

- Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction.

City of East Palo Alto Municipal Code. Chapter 8.52, Noise Control, of the City's Municipal Code seeks to protect the citizens of East Palo Alto from unnecessary, excessive, and annoying noise; to maintain quiet in areas where noise levels are low; and to implement programs to reduce unacceptable noise. The regulations limit the amount of noise that may be created as measured at the exterior of any dwelling unit, school, hospital, church, or public library. Table 4 provides the Municipal Code's exterior noise standards. In addition, Chapter 8.52 limits the creation of noise that results in excessive noise levels within any dwelling unit. Table 5 provides the standards for interior noise in dwelling units. Exemptions to these standards are provided for activities such as special events and noise sources due to construction activities not taking place between 8:00 p.m. and 7:00 a.m.[2]

[2] City of East Palo Alto, 2017, *East Palo Alto Municipal Code*, Chapter 8.52, Noise Control.

TABLE 4 Receiving Land Use: Noise Level Standards for Single or Multiple Family Residence, School, Hospital, Church, or Public Library Properties

Category	Cumulative Number of Minutes in Any 1-Hour Time Period	Noise Level Standards, dBA	
		Daytime (7:00 am – 10:00 pm)	Nighttime (10:00 pm – 7:00 am)
1	30	55	50
2	15	50	55
3	5	65	60
4	1	70	60
5	0	75	70

Notes:

A. In the event the measured background noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted in 5 dBA increments so as to encompass the background noise level.

B. Each of the noise level standards specified above shall be reduced by 5 dBA for simple tone noises, consisting primarily of speech or music, or for recurring or intermittent impulsive noises.

C. If the intruding noise source is continuous and cannot reasonably be stopped for a period of time whereby the background noise level can be measured, the noise level measured while the source is in operation shall be compared directly to the noise level standards in this table.

Source: City of East Palo Alto Municipal Code, 2017.

While Table 4 summarizes the levels provided in the Municipal Code for each category, the original Municipal Code document has two typos: Category 2 should be 60 dBA during daytime hours and 55 dBA during nighttime hours, and Category 4 should be 70 dBA during daytime hours and 65 dBA during nighttime hours. For any analysis involving these categories, the corrected levels are used.

Section 15.04.125 of the City's Municipal Code limits construction activity to the hours of 7:00 a.m. to 6:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturdays. No construction activity is allowed on Sundays or national holidays.

TABLE 5 Interior Noise Level Standards – Dwelling Unit

Category	Cumulative Number of Minutes in Any 1-Hour Time Period	Noise Level Standards, dBA	
		Daytime (7:00 am – 10:00 pm)	Nighttime (10:00 pm – 7:00 am)
1	5	45	40
2	1	50	45
3	0	55	50

Notes:

A. In the event the measured background noise level exceeds the applicable noise level standard in any category above, the applicable standard shall be adjusted in 5 dBA increments so as to encompass the background noise level.

B. Each of the noise level standards specified above shall be reduced by 5 dBA for simple tone noises, consisting primarily of speech or music, or for recurring or intermittent impulsive noises.

C. If the intruding noise source is continuous and cannot reasonably be stopped for a period of time whereby the background noise level can be measured, the noise level measured while the source is in operation shall be compared directly to the noise level standards in this table.

Source: City of East Palo Alto Municipal Code, 2017.

Existing Noise Environment

The project site currently consists of a tow trucking building and associated tow lot. The project site is bound by commercial and industrial uses to the north and west, and vacant land to the south. Additional commercial and industrial uses are located to the east, opposite Pulgas Avenue. The nearest residential land uses are located approximately 390 feet to the west of the site.

Due to regional shelter-in-place restrictions implemented by the State of California at the time of this study, traffic volumes along the surrounding roadways were reduced and not representative of typical conditions. Therefore, a noise monitoring survey was not completed to document ambient noise levels at the project site. Instead, the City's General Plan and noise data collected as part of previous projects in the vicinity were reviewed to establish the existing noise environment.

According to the noise contours included in the Noise Element of the City's General Plan, existing noise levels at the project site would range from 55 to 60 dBA CNEL, as shown in Figure 1.

A noise monitoring survey for the East Palo Alto General Plan Update Draft EIR[3] was completed in 2015. Among the measurements completed, one long-term noise measurement (LT-12) was made at Jack Farrell Park from Tuesday, April 23rd, 2015 to Tuesday, April 28th, 2015. The measurement was made approximately 165 feet west of the centerline of Illinois Street and 340 feet east of the centerline of Fordham Street. The average CNEL ranged from 58 to 60 dBA. Typical daytime hourly average noise levels ranged from 50 to 61 dBA L_{eq}, and typical nighttime hourly average noise levels ranged from 44 to 60 dBA L_{eq}.

Additional noise monitoring surveys were completed for projects at 2020 Bay Road and at 1950 Bay Road in 2017. Due to the nature of the roadways in this area and the buildout of the area, the noise measurements made for these previous projects would be representative of the existing conditions in the project vicinity. Figure 2 shows the project site and the long-term measurements made in 2015 (LT-12) and in 2017 (LT-1 through LT-3).

Long-term noise measurements LT-1 and LT-2 were made from Thursday, April 20, 2017 to Monday, April 24, 2017. LT-1 was made from a pole along Bay Road at the southern boundary of 2020 Bay Road, approximately 15 feet from the centerline of the roadway. Hourly average noise levels at this location typically ranged from 50 to 70 dBA L_{eq} during the day and from 42 to 57 dBA L_{eq} at night. The average community noise equivalent level was 63 dBA CNEL on the weekdays and ranged from 60 to 61 dBA CNEL on the weekends.

LT-2 was made from a pole along Bay Road near the intersection of Bay Road and Pulgas Avenue. LT-2 was approximately 40 feet north of the centerline of Bay Road and approximately 125 feet west of the centerline of Pulgas Avenue. Vehicular traffic volumes were substantially higher at this measurement location along this section of Bay Road. Hourly average noise levels at this location typically ranged from 59 to 73 dBA L_{eq} during the day and from 51 to 68 dBA L_{eq} at night. The average community noise equivalent level was 71 dBA CNEL on the weekdays and ranged from 67 to 69 dBA CNEL on the weekends.

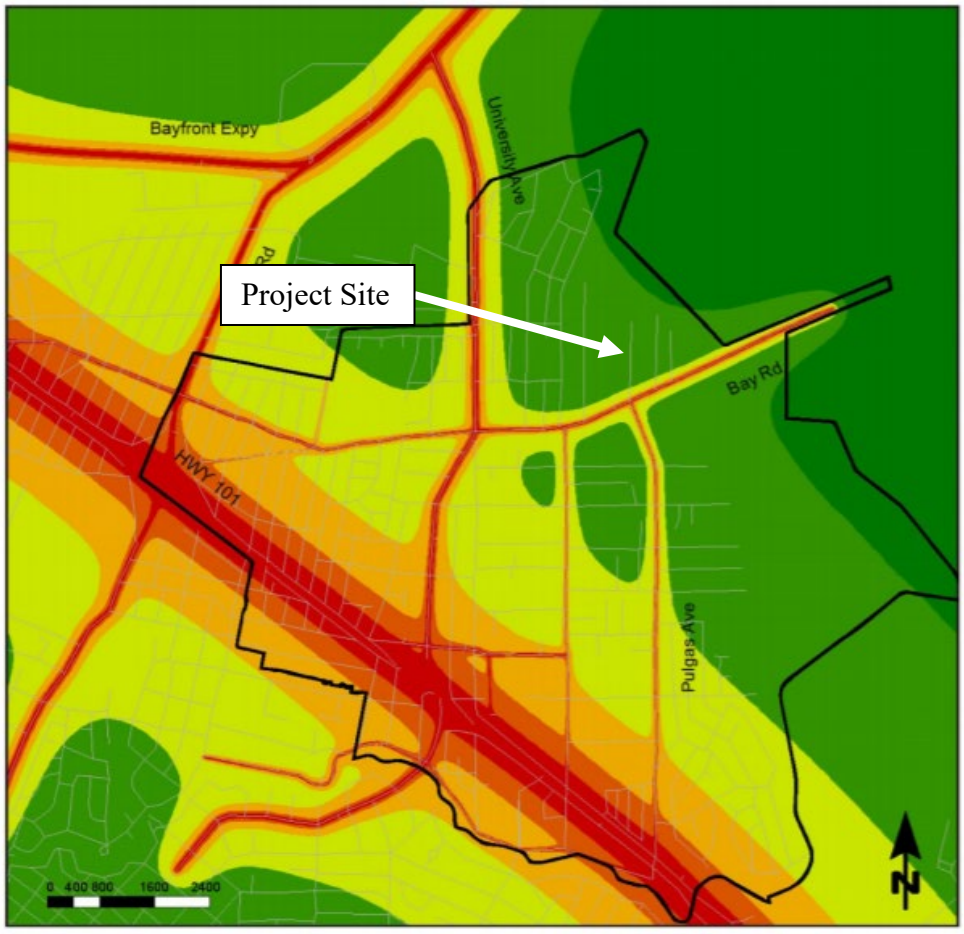
[3] Illingworth & Rodkin, Inc., "City of East Palo Alto General Plan Update EIR Draft Noise and Vibration Assessment," November 2015.

Long-term noise measurement LT-3 was made from a tree located in front of 530 Pulgas Avenue, approximately 30 feet from the roadway centerline, from Wednesday, April 5, 2017 to Thursday, April 6, 2017. Hourly average noise levels at this location typically ranged from 61 to 68 dBA L_{eq} during the day and from 49 to 60 dBA L_{eq} at night. The average community noise equivalent level measured from Wednesday, April 5, 2017 to Thursday, April 6, 2017 was 66 dBA CNEL.

The daily trend in noise levels measured at LT-1 is shown in Figure 3 through 7. The daily trend in noise levels measured at LT-2 is shown in Figure 8 through 12. The daily trend in noise levels for LT-3 is shown in Figure 13. LT-12 daily trends are shown in Figure 14.

FIGURE 1 Project Site in Relation to East Palo Alto General Plan Traffic Noise Contours

Figure 10-6 - Existing (2015) Traffic Noise



Existing Noise Levels from Vehicle Traffic along Major Roadways in decibels (dB)

East Palo Alto City Limits

> 75 dB
70-75 dB
65-70 dB
60-65 dB
55-60 dB
<55 dB

FIGURE 2 Project Site and Surrounding Area

FIGURE 3 Daily Noise Trends at LT-1, Thursday, April 20, 2017

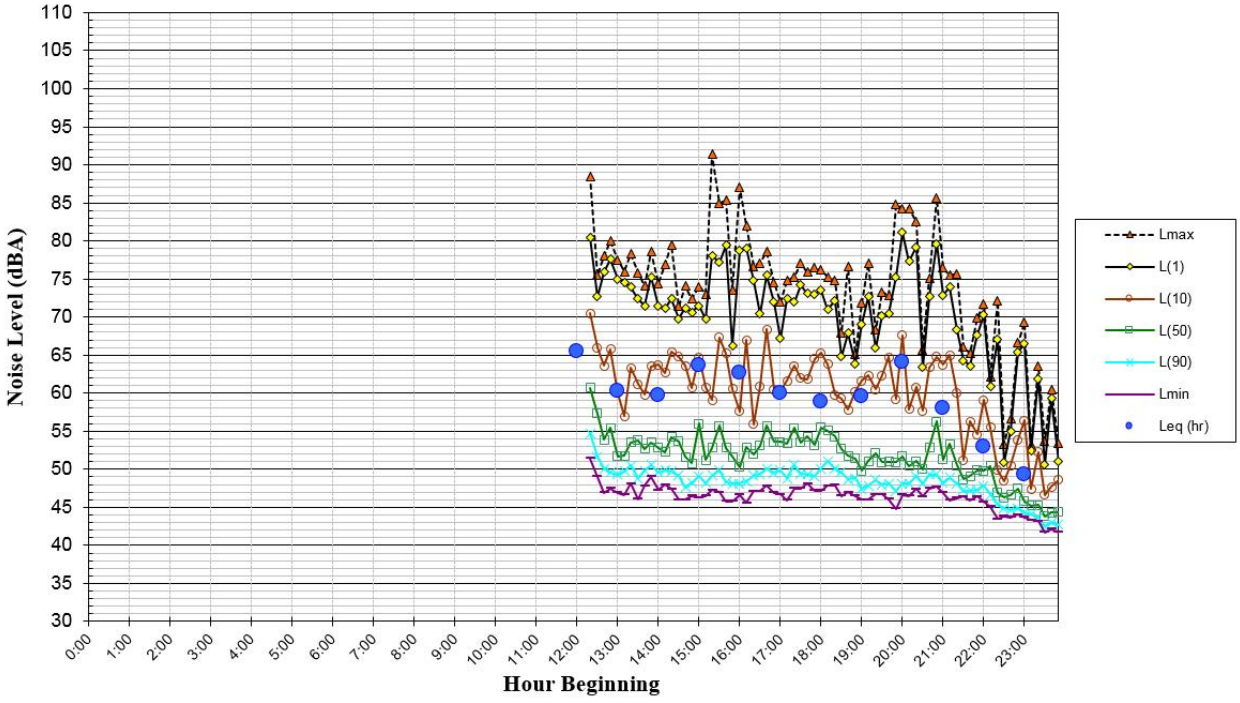


FIGURE 4 Daily Noise Trends at LT-1, Friday, April 21, 2017

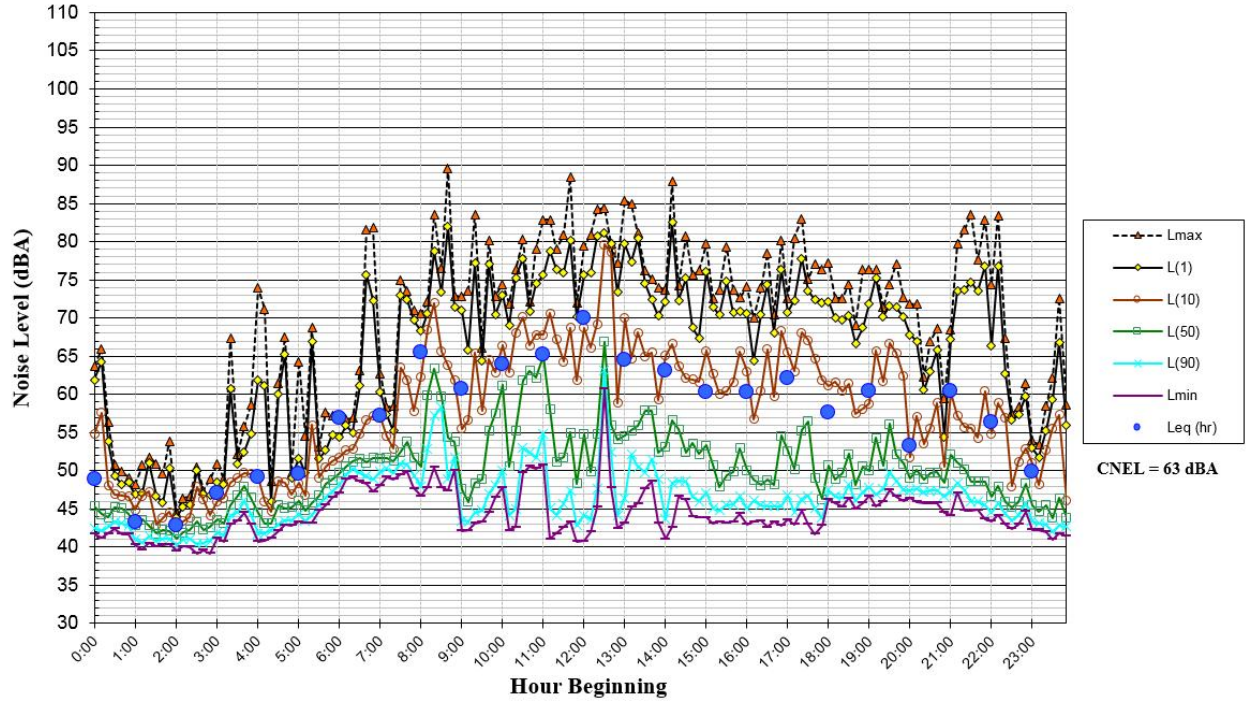


FIGURE 5 Daily Trend in Noise Levels at LT-1, Saturday, April 22, 2017

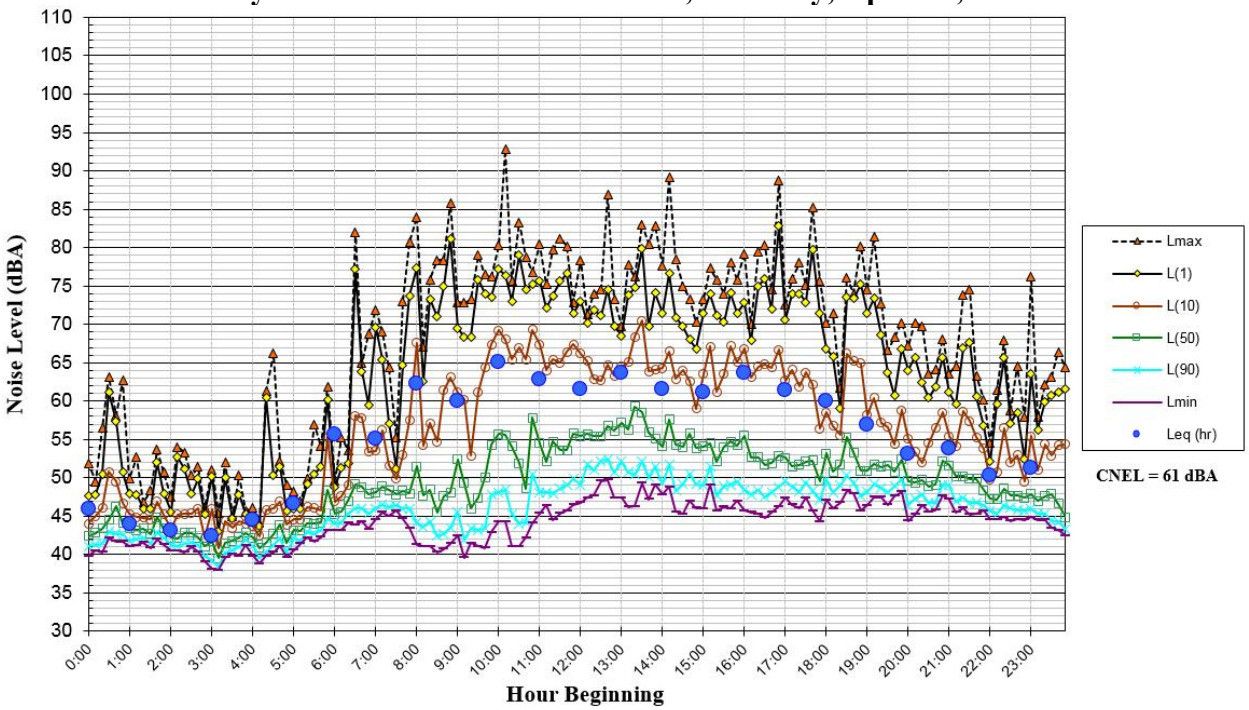


FIGURE 6 Daily Trend in Noise Levels at LT-1, Sunday, April 23, 2017

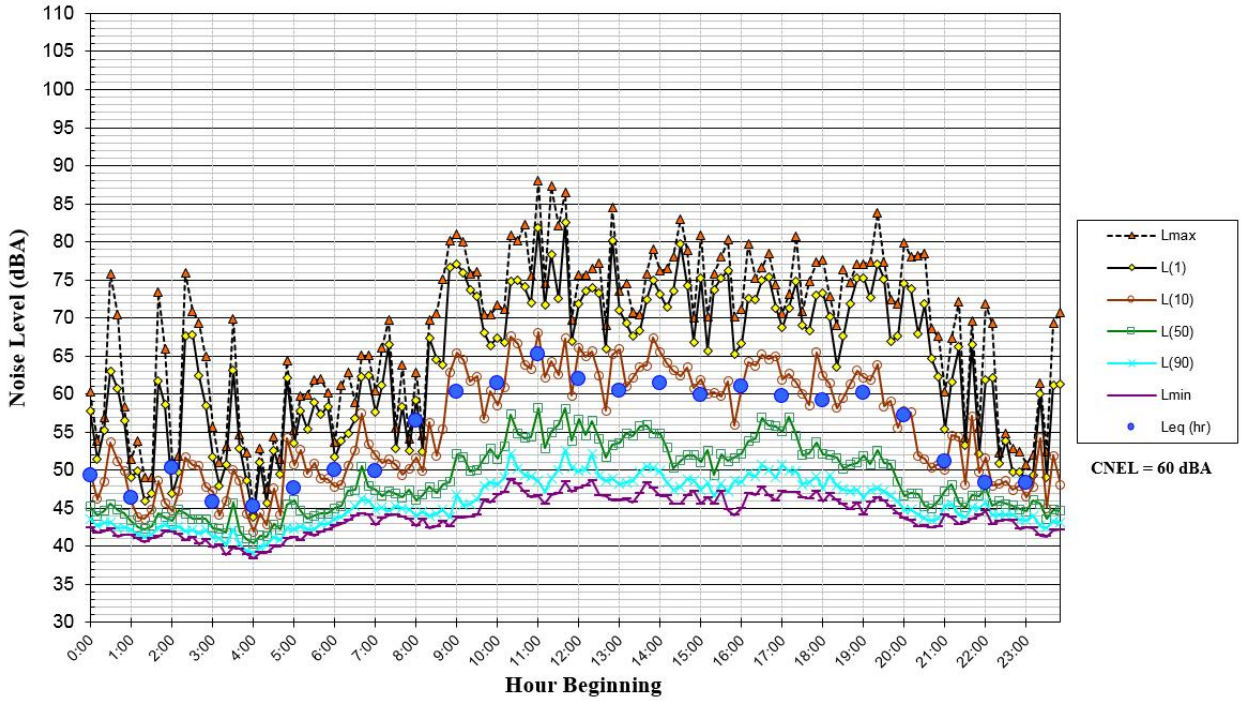


FIGURE 7 Daily Trend in Noise Levels at LT-1, Monday, April 24, 2017

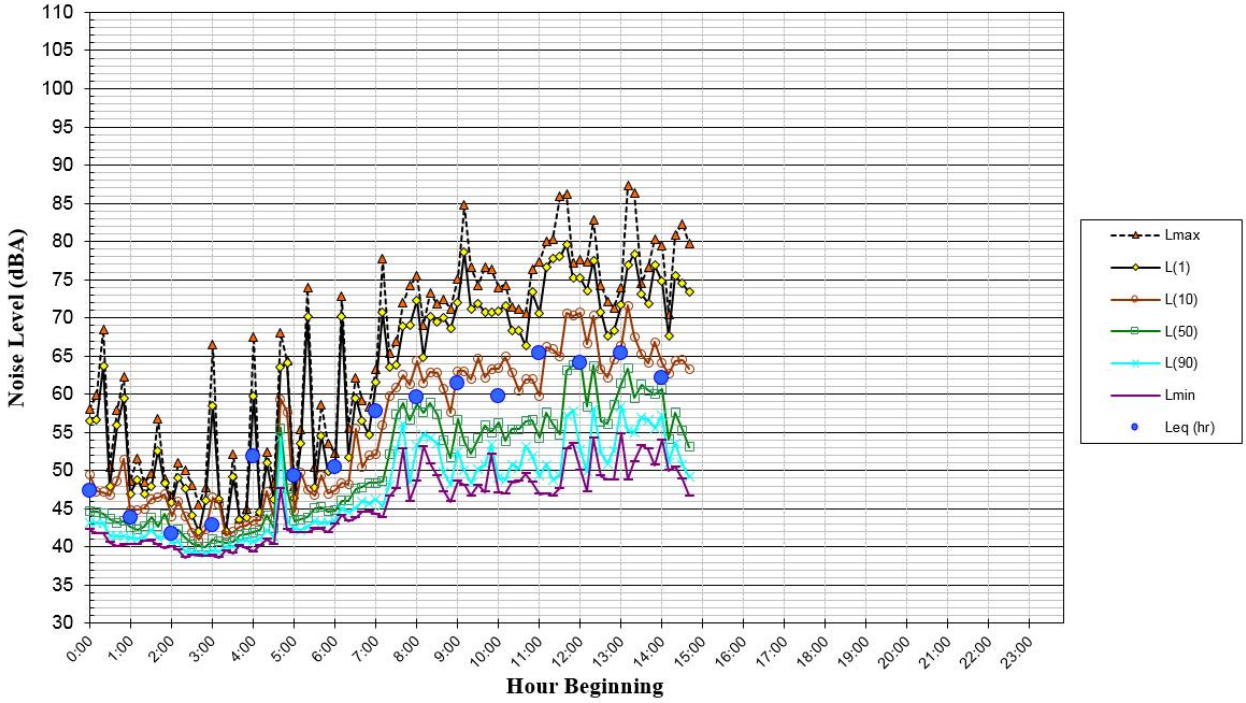


FIGURE 8 Daily Trend in Noise Levels at LT-2, Thursday, April 20, 2017

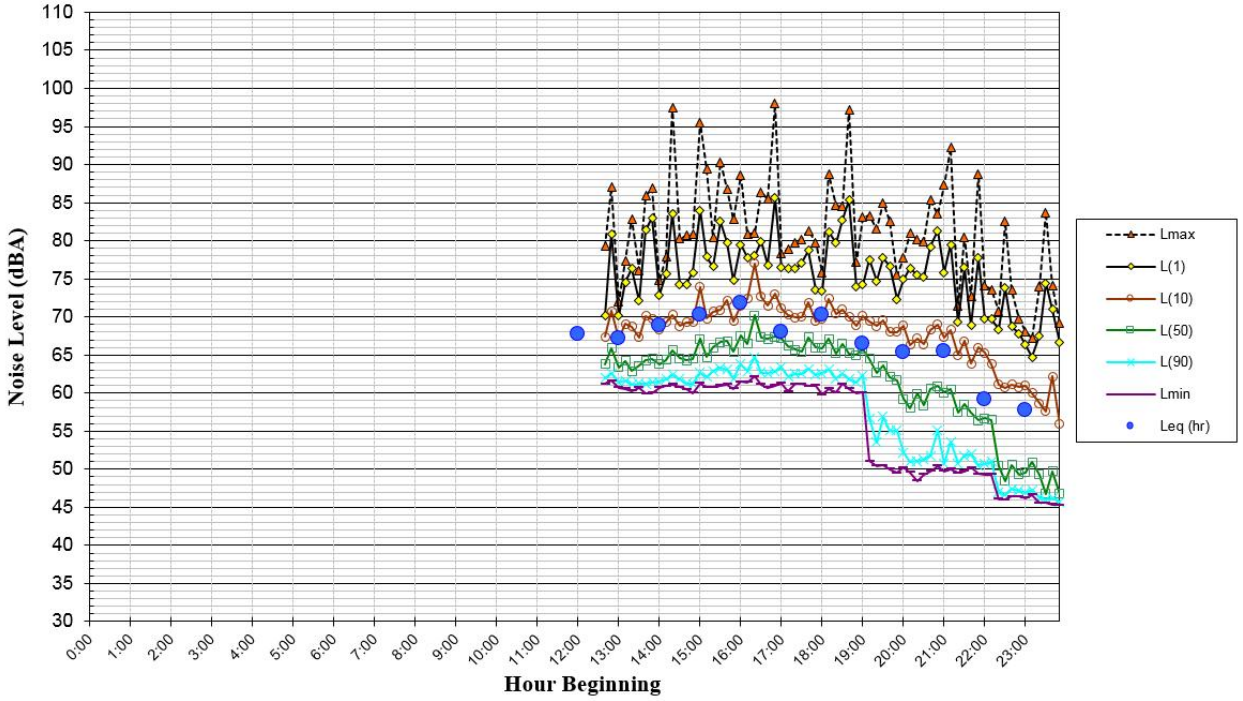


FIGURE 9 Daily Trend in Noise Levels at LT-2, Friday, April 21, 2017

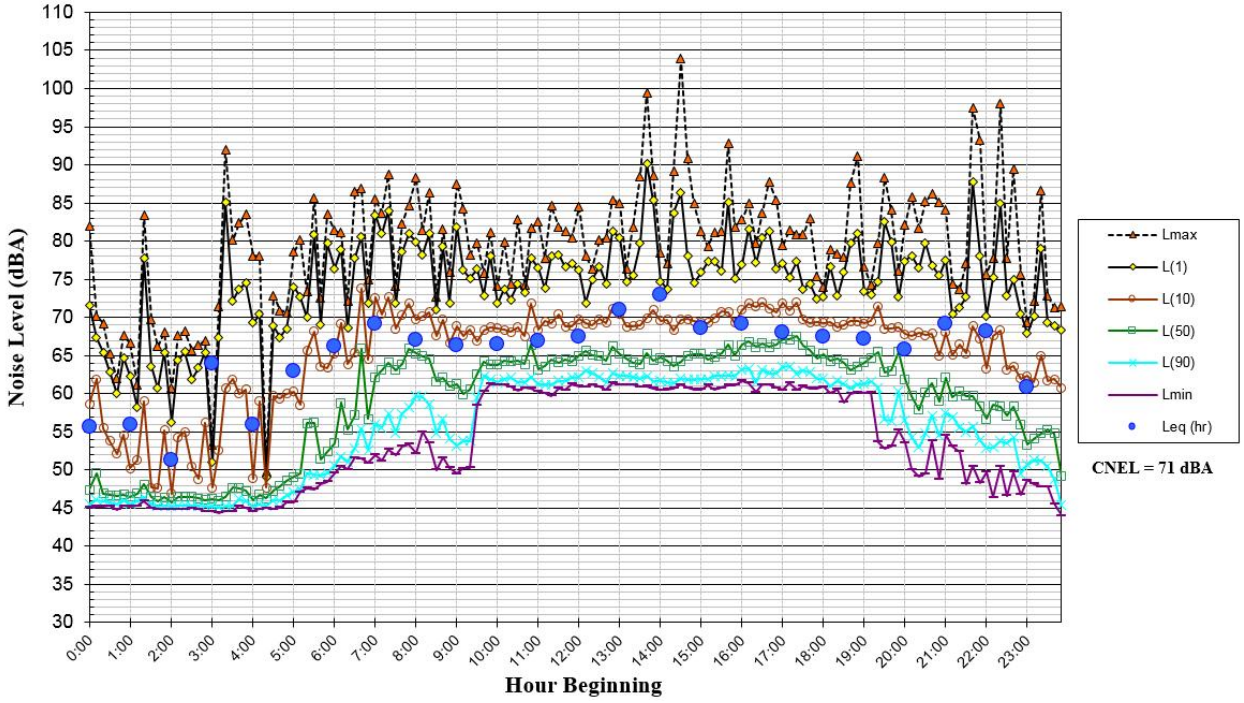


FIGURE 10 Daily Trend in Noise Levels at LT-2, Saturday, April 22, 2017

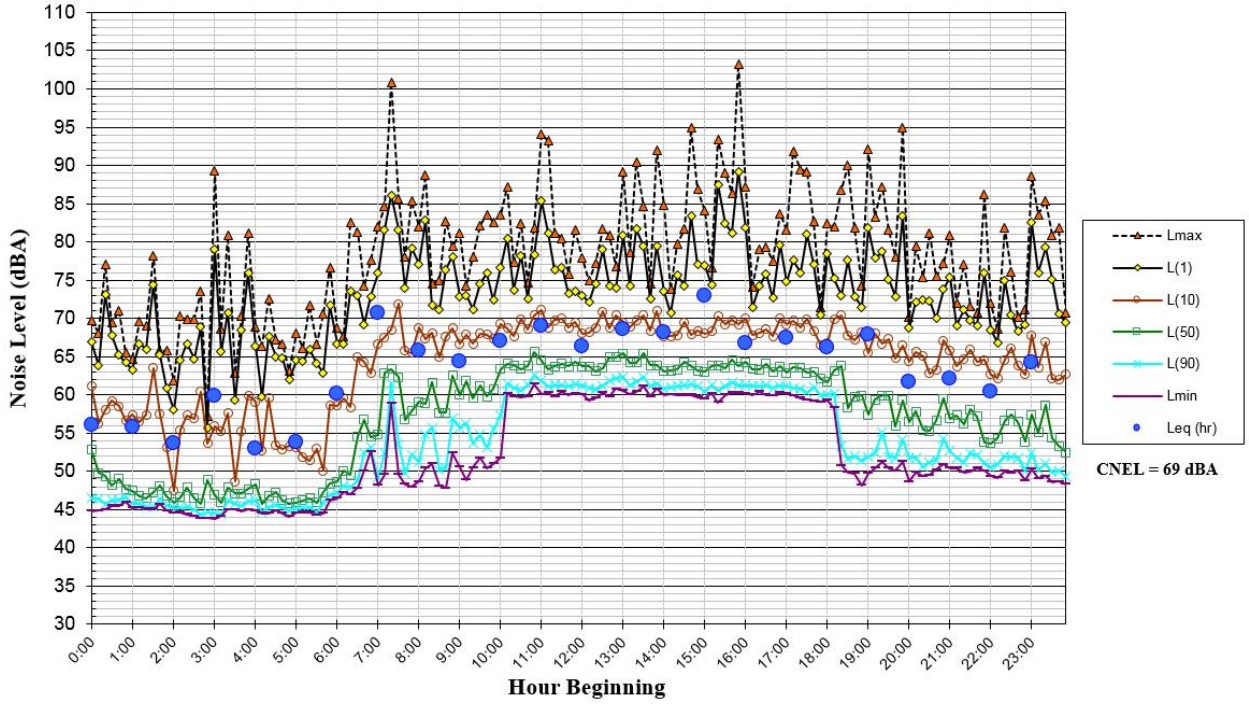


FIGURE 11 Daily Trend in Noise Levels at LT-2, Sunday, April 23, 2017

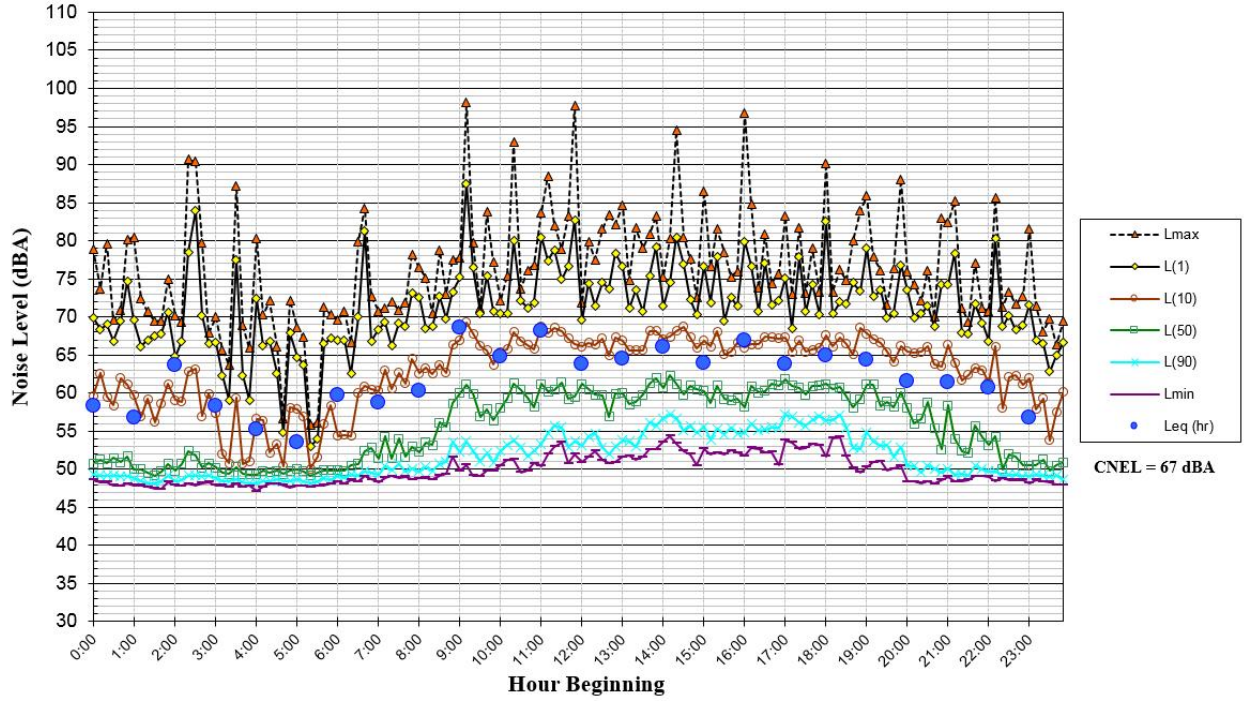


FIGURE 12 Daily Trend in Noise Levels at LT-2, Monday, April 24, 2017

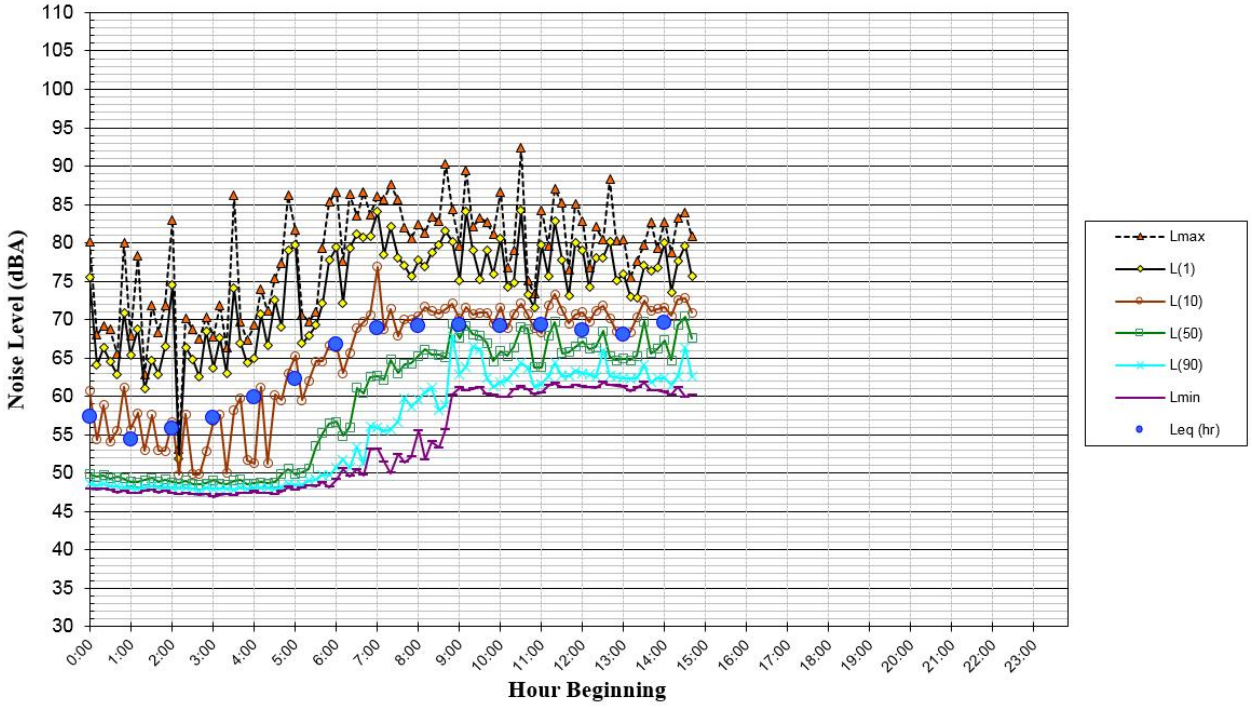


FIGURE 13 Daily Trend in Noise Levels at LT-3, Wednesday, April 5, 2017 through Thursday, April 6, 2017

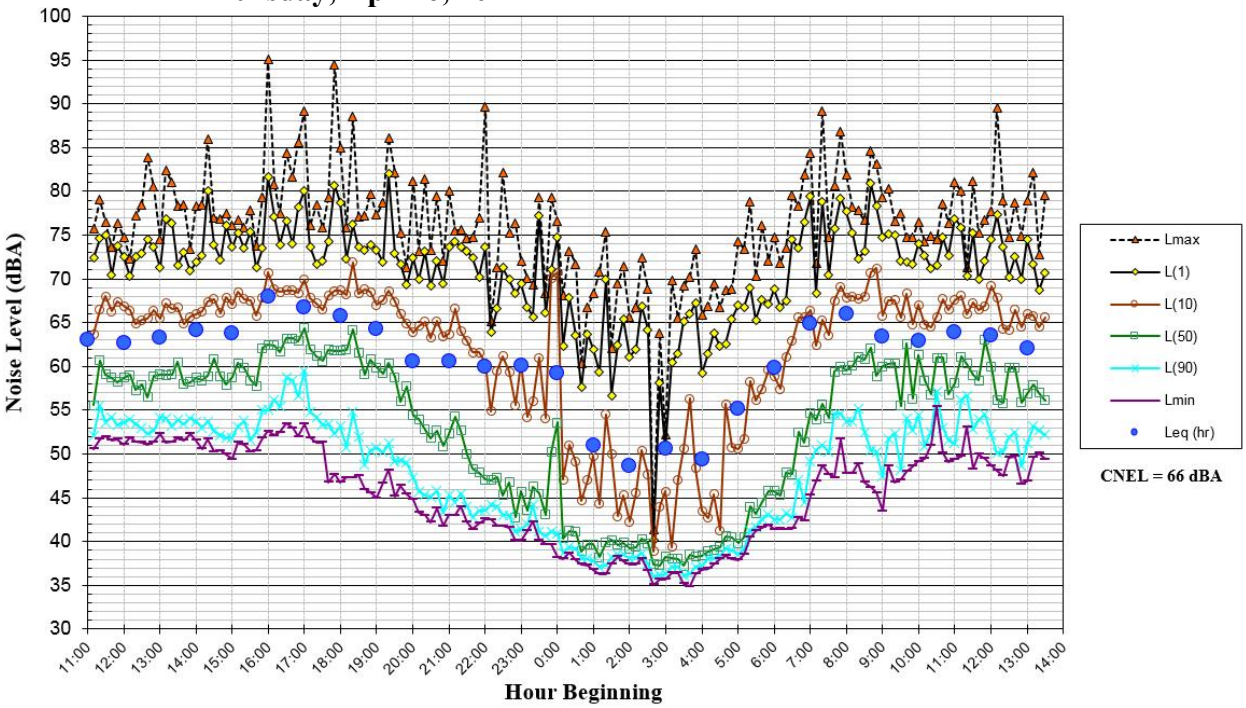
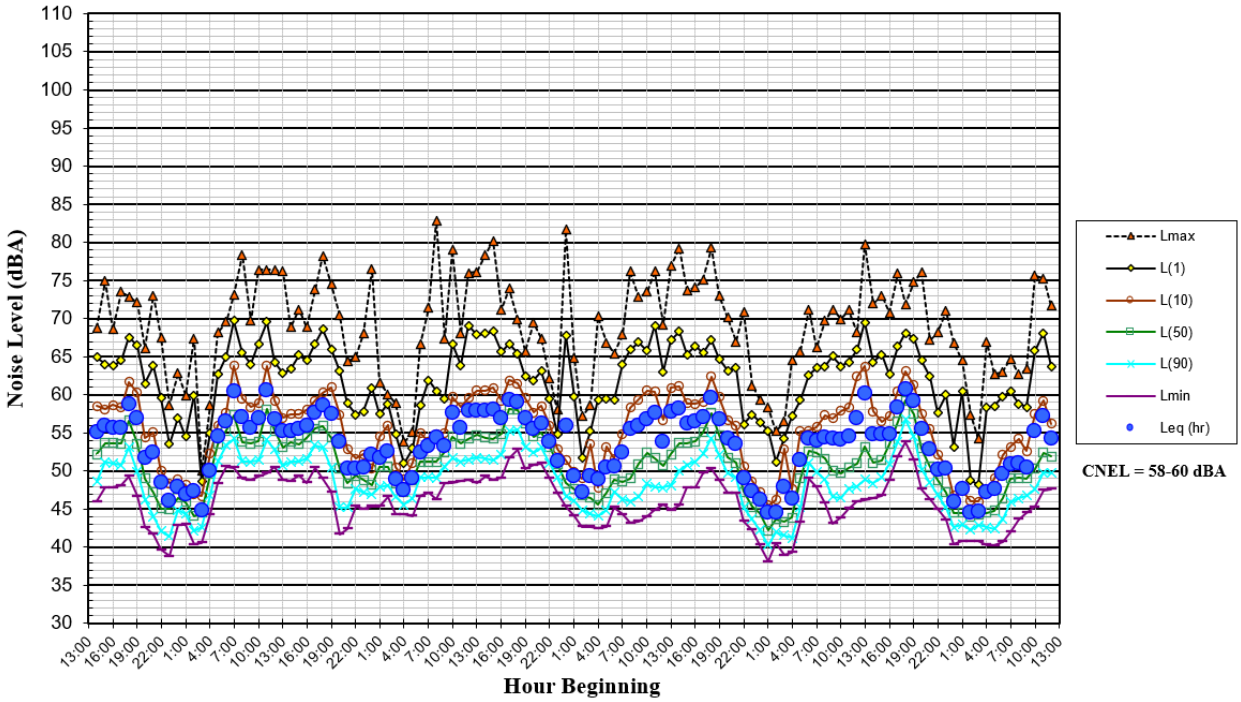


FIGURE 14 Daily Noise Trends at L-12, Thursday, April 23, 2015 through Tuesday, April 28, 2015



GENERAL PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

Table 10-1 of the City of East Palo Alto General Plan does not specify exterior noise level thresholds for common outdoor use areas of office buildings. The proposed project does include an outdoor playground area, and exterior noise levels are limited to 65 dBA CNEL, according to Table 10-1.

The 2019 Cal Green Code requires interior noise levels for nonresidential uses to be maintained at or below 50 dBA $L_{eq(1\text{-}hr)}$. Additionally, interior noise levels for private offices should be maintained at or below 45 dBA $L_{eq(12)}$, according to Table 10-1 of the City's General Plan. $L_{eq(12)}$ is the A-weighted equivalent sound level averaged over a 12-hour period (usually the daytime hours of operation).

The future noise environment at the project site would continue to result primarily from vehicular traffic along nearby roadways, such as Bay Road and Pulgas Avenue, and industrial uses generated at the surrounding sites. Aircraft associated with nearby airports would also continue to affect the noise environment at the site. Using the traffic data provided for the proposed project and the traffic study completed for the Ravenswood/4 Corners TOD Specific Plan EIR, [4] within which the

[4] *The Planning Center DC&E*, "Ravenswood/4 Corners TOD Specific Plan Final EIR," July 30, 2012.

proposed project falls, the future exterior noise level increase was calculated for the cumulative plus project scenario.

For purposes of estimating the worst-case scenario, the cumulative plus project traffic scenario was modeled in SoundPLAN Version 8.2, a three-dimensional ray-tracing computer program, to estimate future peak hour noise levels. Based on these results, future traffic conditions in the project site vicinity are anticipated to be approximately 62 dBA CNEL at the building's eastern façade.

Future Exterior Noise Environment

The proposed project site plan shows a play area surrounded by a 7-foot-tall fence along the southwest façade of the four-story office building. The play area would be mostly shielded by the existing and future buildings at the project site and surrounding properties. Depending on construction materials, the fence may provide additional acoustic shielding. A receptor positioned at the center of the play area would have future exterior noise levels below 60 dBA CNEL under future project conditions, assuming no attenuation from the privacy fence. This would meet the City's exterior noise thresholds for playgrounds.

The City does not have an exterior noise level threshold for office buildings because these spaces are not normally areas of frequent human use that would benefit from a lower noise level; therefore, the outdoor activity areas proposed by the project would be compatible with the future noise environment.

Future Interior Noise Environment

The eastern building façade located adjacent to Pulgas Avenue would be approximately 30 feet from the centerline of the roadway. Based on the long-term noise measurement LT-2 taken near the intersection of Pulgas Avenue and Bay Road, the peak hour L_{eq} would be 2 dBA higher than the 24-hour community noise equivalent level. Therefore, the highest hourly average noise level at the eastern building façade would be 64 dBA $L_{eq(1\text{-}hr)}$ during daytime hours. Conservatively, this peak hour noise level was assumed for each hour during the daytime hours of operation. Under this assumption, the eastern façade would be exposed to future exterior noise levels up to 64 dBA $L_{eq(12)}$.

Standard construction materials for commercial uses would provide about 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so that windows may be kept closed at the occupant's discretion and would provide an additional 5 dBA reduction. Standard construction materials in combination with forced-air mechanical ventilation would satisfy the threshold of 50 dBA $L_{eq(1\text{-}hr)}$ for general offices and 45 dBA $L_{eq(12)}$ for private offices.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of noise and vibration 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.

    - A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. The City of East Palo Alto considers large or complex projects involving substantial noise-generating activities and lasting more than 12 months significant when within 500 feet of residential land uses or within 200 feet of commercial land uses or offices.

    - According to Policy 7.2 of the City's General Plan, a significant impact would occur if the permanent noise level increase due to project-generated traffic was 3 dBA CNEL and exceed the "normally acceptable" level or was 5 dBA CNEL or greater and remained "normally acceptable." Based on Table 10-1, it is assumed that the 65 dBA CNEL exterior noise standard would be considered "normally acceptable" for residential land uses.

    - 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. Policy 6.4 of the City's General Plan limits vibration levels to 0.08 in/sec PPV for sensitive historic structures and to 0.30 in/sec PPV for buildings of normal conventional construction to minimize the potential for cosmetic damage.

- 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 residential land uses located within 500 feet of the project site and commercial uses located within 200 feet of the project site would be exposed to a temporary increase in ambient noise levels due to project construction activities for a period exceeding one year. **This is a significant 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.

Section 15.04.125 of the City's Municipal Code limits construction activities to between 7:00 a.m. and 6:00 p.m. on weekdays and to between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction activities are prohibited on Sundays and national holidays. During these allowable hours, construction noise would be exempt from the City's exterior and interior noise level standards at single- or multi-family residences, schools, hospitals, churches, and public libraries. Additionally, Policy 7.11 of the City's General Plan states that a significant construction noise impact would occur if substantial noise-generating construction activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) occurred within 500 feet of residential uses or 200 feet of commercial or office uses for more than 12 months. Further, large complex projects would require a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints to be in place prior to the start of construction and to be implemented during construction to reduce noise impacts on neighboring residents and other uses.

The Ravenwood Family Health Center to the south and single-family residences to the west were identified as the nearest noise-sensitive receptors to the project site. Ambient noise levels at the health center would typically range from 59 to 73 dBA L_{eq} during daytime hours (LT-2). Noise levels at the single-family residences would typically range from 50 to 61 dBA L_{eq} during daytime hours (LT-12).

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 80 to 90 dBA L_{max} at a distance of 50 feet from the noise source. A list of typical maximum instantaneous noise levels measured at 50 feet are provided in Table 6. Table 7 shows the hourly average noise level ranges, by construction phase for various types of construction projects. Typical hourly average construction-generated noise levels for commercial office buildings are about 75 to 89 dBA L_{eq}, as measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). 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 can provide an additional 5 to 10 dBA noise reduction at distant receptors.

Based on the expected construction schedule provided for the proposed project, demolition would start at the beginning of May 2021, and paving would conclude in August 2022, which would total approximately 15 months. Table 8 summarizes the number of days anticipated for each construction phase and the estimated noise levels calculated at the property lines of the nearest sensitive receptors. Equipment for each phase was used as inputs into the Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) to predict the

combined average noise level. To model worst-case conditions, it was assumed that all equipment per phase would be operating simultaneously. For construction noise, the use of multiple pieces of equipment simultaneously would add together as a collective noise source. While every piece of equipment per phase would likely be scattered throughout the site, the noise-sensitive receptors surrounding the site would be subject to the collective noise source generated by all equipment operating at once. Therefore, to assess construction noise impacts at the receiving property lines of noise-sensitive receptors, the collective worst-case hourly average noise level for each phase was positioned at the geometrical center of the site and propagated to the nearest property line of the surrounding land uses. These noise level estimates are also shown in Table 8. Note, these levels do not assume reductions due to intervening buildings, terrain, or existing barriers.

Estimated construction noise levels shown in Table 8 would exceed ambient levels by more than 5 dBA L_{eq} throughout construction, which is expected to last approximately 15 months. Since project construction is located within 500 feet of residential land uses or within 200 feet of commercial uses and is expected to exceed one year in duration, this would be considered a significant construction noise impact.

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 Nearby Land Uses

Phase	No. of Work Days	Calculated Hourly Average L_{eq} at Noise-Sensitive Receptors, dBA L_{eq}				
		Industrial North (180 ft)	Industrial West (215 ft)	Industrial East (265 ft)	Health Center South (435 ft)	Residential West (615 ft)
Demolition	10	75	71	67	73	64
Grading & Excavation	30	76	73	68	74	65
Trenching & Foundation	55	72	69	64	71	61
Building – Exterior	185	73	70	65	72	62
Building – Interior & Architectural Coating	140	66	62	58	64	55
Paving	10	74	70	66	72	63

Mitigation Measure 1a:

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. Due to the distance from the nearest noise-sensitive receptors and the size of the proposed project, this would not be considered a large complex construction project requiring a construction noise logistics plan. However, implementing the standard noise controls provided in Policy 7.11 as project conditions of approval would reduce noise levels emanating from the project site. The applicable standard noise controls shall include, but not be limited to, the following measures to reduce construction noise levels as low as practical:

- Limit construction activity to weekdays between 7:00 a.m. and 7:00 p.m. and Saturdays and holidays between 9:00 a.m. and 7:00 p.m., with no construction on Sundays;

- Utilize "quiet" models of air compressors and other stationary noise sources where such technology exists;

- Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment;

- Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from adjacent land uses;

- Locate staging areas and construction material areas as far away as possible from adjacent land uses;

- Prohibit all unnecessary idling of internal combustion engines;

- Designate a “disturbance coordinator” who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem are implemented.

- Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction.

With the implementation of standard noise controls in GP Policy 7.11 and the Municipal Code allowable construction hours, the temporary construction noise impact would be reduced to a less-than-significant level.

Impact 1b: **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.**

According to Policy 7.2, a significant impact would occur if the permanent noise level increase due to project-generated traffic is 3 dBA CNEL and exceeds the “normally acceptable” level or is 5 dBA CNEL or greater and remains “normally acceptable.” While the General Plan does not define what level would be “normally acceptable,” it is assumed that the 65 dBA CNEL exterior noise standard in Table 10-1 would be considered “normally acceptable.”

Existing noise levels measured at the noise-sensitive receptors surrounding the site would exceed 65 dBA CNEL at the property lines nearest local roadways, as measured at LT-2 and LT-12. Under future conditions, the noise environment at these nearby noise-sensitive receptors would continue to exceed 65 dBA CNEL. Therefore, a significant impact would occur if project-generated traffic increases noise levels along local roadways by 3 dBA CNEL or more. For reference, a 3 dBA CNEL noise increase would be expected if the project would double existing traffic volumes along a roadway.

The traffic study of the proposed project included existing and existing plus project peak hour traffic volumes at 25 intersections in the vicinity of the project site. The traffic study included traffic volumes both with and without the planned loop road identified in the Ravenswood / 4 Corners TOD Specific Plan. By comparing the peak hour traffic volumes for the existing plus project traffic scenario to the existing traffic scenario, project-generated permanent noise increase was calculated. While traffic volumes along Demeter Street and Pulgas Avenue, north of Bay Road, with the planned loop road, and along Pulgas Avenue, north of Bay Road, without the planned loop road, would double under existing plus project conditions, these roadway segments have very low volumes compared to Bay Road. The Ravenswood Family Health Center, which is the only noise-sensitive receptor located along these roadway segments, traffic noise along Bay Road would be the dominant noise source, and the doubling of the traffic volumes along Demeter Street and Pulgas Avenue would result in less than 1 dBA CNEL increase at this noise-sensitive receptor. Therefore, noise-sensitive receptors in the vicinity of the project would not be impacted by project-generated traffic noise increases.

Along every other roadway segment included in the traffic study, a noise level increase of 1 dBA CNEL or less was calculated. Therefore, project-generated traffic noise increases of 3 dBA CNEL or more are not expected to occur 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 exceed the standards established in the City's General Plan or Municipal Code at the nearby sensitive receptors. **This is a less-than-significant impact.**

Tables 4 and 5 summarize the Municipal Code's thresholds for exterior and interior noise levels, respectively, as measured on the receiving land uses. Since mechanical equipment could run during daytime and nighttime hours, the exterior noise level thresholds would be 55 dBA L_{50} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and 50 dBA L_{50} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The interior noise level thresholds would be 45 dBA L_{50} during the daytime hours and 40 dBA L_{50} during nighttime hours. On-site operations, which would occur during daytime hours only, would be expected to occur for 30 minutes or more in any given hour; therefore, the exterior noise level threshold would be 55 dBA L_{50}, and the interior threshold would be 45 dBA L_{50}.

Mechanical Equipment Noise

The Ravenswood Family Health Center is located approximately 300 feet to the south of the project site and single-family residences are located approximately 400 feet to the west of the project site.

The proposed project would include mechanical equipment, such as heating, ventilation, and air conditioning systems (HVAC), an emergency generator, a transformer, and solar panels. The site plan shows the transformer located on the ground-level along the northern building façade and a mechanical penthouse and solar panel arrays on the rooftop. While the specific locations for the HVAC units and emergency generator are not identified in the site plan, it is assumed that both would be located within the mechanical penthouse. The penthouse would be constructed with a perforated screen wall to conceal the equipment.

Rooftop HVAC equipment noise levels for commercial office buildings typically range from 50 to 60 dBA L_{eq} at a distance of 50 feet where there is direct line-of-site to the mechanical equipment. In addition, the project applicant has indicated that the emergency generator would have a capacity of 100 kW. Based on file data, sound pressure levels from the generator would be approximately 76 to 78 dBA at 5 feet, assuming a Level I or Level II acoustical enclosure. The generator would be tested periodically and would provide emergency power to the building in the event of a power failure. The mechanical penthouse, which is anticipated to house the mechanical equipment units and emergency generator, would be approximately 350 feet from the property line of the nearest noise-sensitive receptor. At this distance, and assuming there is no acoustical shielding from the mechanical screens, noise from the exterior mechanical equipment and emergency generator would be less than 50 dBA L_{eq}.

A solar panel system would also be constructed on the rooftop of the proposed building. Noise levels generated by solar panels are low and would be inaudible at the nearest sensitive receptors to the south and to the west. Transformers up to 1,000 kVA typically generate noise levels up to 64 dBA at a distance of 3.28 feet (1 meter). The transformer would be approximately 500 feet from the property line of the nearest noise-sensitive receptor. At this distance, the transformer would be inaudible above ambient noise levels.

The proposed mechanical equipment would meet the City's exterior noise threshold for daytime and nighttime. Noise generated by the rooftop mechanical equipment, emergency generator, solar panel system, and external transformer would be less than 50 dBA at property lines of the nearest noise-sensitive receptors to the south and west. Assuming standard commercial construction materials for the existing health center to the south of the project site and standard residential construction materials for the existing single-family residences to the west of the project site, the expected interior noise levels due to the mechanical equipment noise would be less than 40 dBA L_{eq}. This would meet the City's interior noise threshold for daytime and nighttime. This would be a less-than-significant impact.

Operational Noise

An outdoor carpentry area and an outdoor play area will be constructed as a part of the job training center. Both areas would be located to the west of the building and would be surrounded by fences with heights of 10 feet and 7 feet, respectively.

According to the project applicant, the carpentry class would include basic carpentry tools such as saws, hammers, jigsaws, etc. The training cohorts would last approximately 11 weeks, with approximately 3 to 4 weeks spent inside a classroom and 7 to 8 weeks spent outside for hands-on training. The classes would occur between the hours of 8:30 a.m. and 3:15 p.m. Measurements from a previous study at a carpenters training center indicate that typical noise levels intermittently range from 55 to 65 dBA at a distance of approximately 75 feet. Circular saws and hammering contributed to the majority of measured noise levels. At approximately 300 feet, this would result in noise levels of 53 dBA or less. Considering that carpentry noise is anticipated to be intermittent, noise levels from the carpenters training center would be less than 55 dBA L_{50} during daytime hours (between 7:00 a.m. and 10:00 p.m.). Depending on the construction materials and methods for the fence, additional noise attenuation could be provided.

The play area would serve up to 24 kids during daytime operational hours. While the noise levels would vary based on the occupancy at any given time, noise levels from similar studies indicated that playground activity could generate hourly average noise levels up to 65 dBA L_{eq} at 50 feet. At times, children shouting may exceed this noise level, while at other times the outdoor play area would not be in use. At approximately 300 feet, this would result in noise levels that are 49 dBA or less, which would meet the City's 55 dBA L_{50} threshold during daytime hours.

Truck Delivery Noise

A loading zone is proposed at the northwest corner of the building, adjacent to the carpentry yard. Large truck deliveries would occur approximately three to four times per year in order to unload lumber and metal. Based on the infrequency of truck deliveries, and distance from the nearest sensitive receptors to the south and west, truck deliveries would not be anticipated to increase traffic noise levels near the project site. This is a less-than-significant impact.

Mitigation Measure 1c: None required.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels resulting from activities at the project site would exceed 0.3 in/sec PPV at the nearest sensitive receptor. **This is a potentially significant impact.**

The construction of the project may generate vibration when heavy equipment or impact tools (e.g. hoe rams) are used in close proximity to existing buildings. Construction activities would include grading, foundation work, paving, and new building framing and finishing. According to the list of construction equipment expected to be used for the proposed project, pile driving, which can cause excessive vibration, would not be required.

Policy 6.4 of the City's General Plan limits vibration levels to 0.08 in/sec PPV at sensitive historic structures and to 0.30 in/sec PPV at buildings of normal conventional construction to minimize the potential for cosmetic damage.

Table 9 presents typical vibration source 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. At a distance of 25 feet, jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 9 also includes vibration levels calculated at the nearest buildings surrounding the site, as measured from the property boundary where the nearest construction equipment could be used.

The industrial buildings to the north would be as close as approximately 15 feet from construction equipment. At this distance, vibration levels would be as high as 0.368 in/sec PPV. Other industrial buildings include industrial buildings located approximately 30 feet to the west and 70 feet to the east, and a health center located approximately 365 feet to the south. Vibration levels at these distances would occasionally be perceptible but would likely not cause damage to the buildings.

TABLE 9 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Estimated Vibration Levels at Surrounding Structures, in/sec PPV			
			Industrial North (15 ft)	Industrial West (30 ft)	Industrial East (70 ft)	Health Center South (365 ft)
Clam shovel drop		0.202	0.354	0.165	0.065	0.011
Hydromill (slurry wall)	in soil	0.008	0.014	0.007	0.003	0.000
	in rock	0.017	0.030	0.014	0.005	0.001
Vibratory Roller		0.210	0.368	0.172	0.068	0.011
Hoe Ram		0.089	0.156	0.073	0.029	0.005
Large bulldozer		0.089	0.156	0.073	0.029	0.005
Caisson drilling		0.089	0.156	0.073	0.029	0.005
Loaded trucks		0.076	0.133	0.062	0.024	0.004
Jackhammer		0.035	0.061	0.029	0.011	0.002
Small bulldozer		0.003	0.005	0.002	0.001	0.000

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., February 2021.

A study completed by the US Bureau of Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507.[5] The findings of this study have been applied to buildings affected by construction-generated vibrations.[6] As reported in USBM RI 8507[5] and reproduced by

[5] Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.

[6] Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

Dowding,[6] Figure 15 presents the damage probability, in terms of "threshold damage," "minor damage," and "major damage," at varying vibration levels. Threshold damage, which is described as cosmetic damage in this report, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline cracking in masonry or the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls. As shown in Figure 15, no threshold damage, minor or major damage was observed with maximum vibration levels of 0.37 in/sec PPV or below.

Typical construction equipment, as shown in Table 9, would have the potential to produce vibration levels of 0.3 in/sec PPV or more at the existing building immediately north of the project site. While no minor or major damage would be expected to occur at this building, there is the potential to result in threshold or cosmetic damage. This is a significant impact.

At this location, and in other surrounding areas within 200 feet, vibration levels would potentially be perceptible. 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 businesses, perceptible vibration can be kept to a minimum.

Mitigation Measure 2:

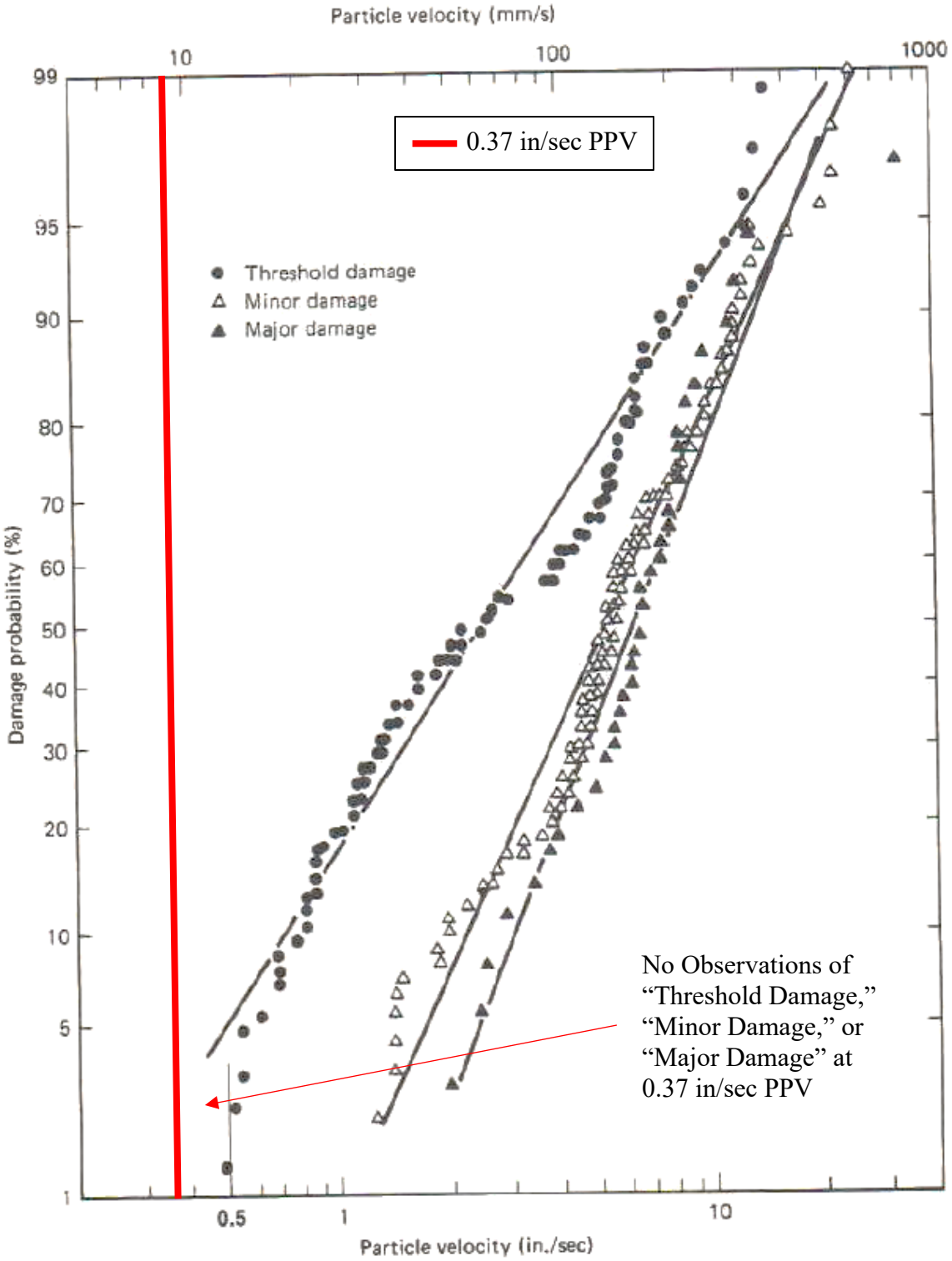
Mitigation Measure NOI-4a of the Ravenswood/4 Corners TOD Specific Plan EIR provided the following mitigation for construction vibration:

- Avoid impact pile driving, where feasible. Drilled piles cause lower vibration levels where geological conditions permit their use. *(pile driving not expected for this project)*

- Avoid using vibratory rollers and tampers near sensitive areas, where feasible.

The implementation of these measures would reduce the impact to a less-than-significant level.

FIGURE 15 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996, as modified by Illingworth & Rodkin, Inc., February 2021.

Impact 3: **Excessive Aircraft Noise.** The project would not expose people working in the project area to excessive aircraft noise levels. **This is a less-than-significant impact.**

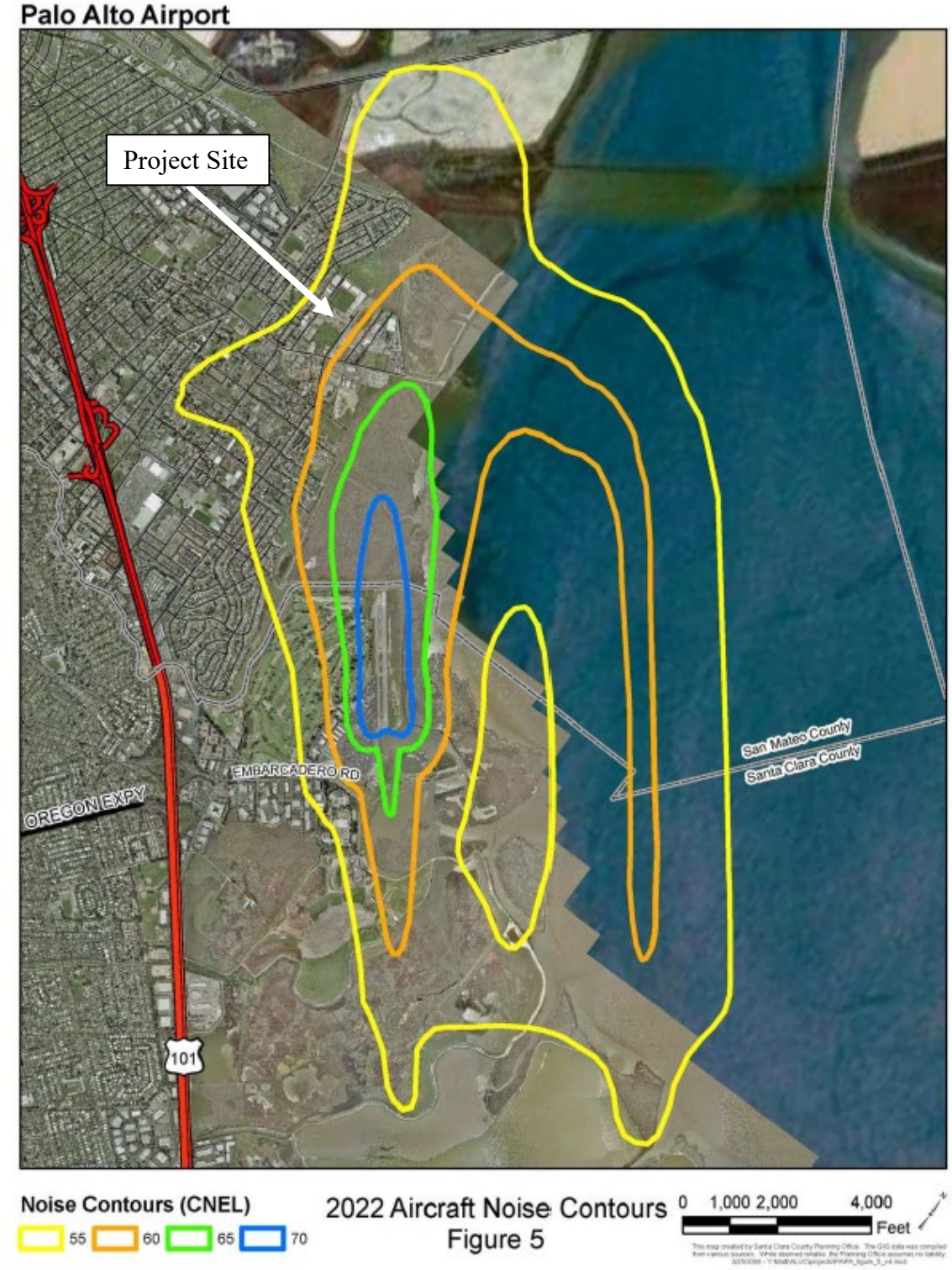
The Palo Alto Airport is a general aviation airport located approximately 1.0 mile southeast of the project site. The project site lies within the 55 dBA CNEL noise contour but outside of the 60 dBA CNEL noise contour for 2022, as shown in Figure 16. This means aircraft noise associated with this airport would result in noise levels between 55 and 60 dBA CNEL by the year 2022. According to Table 4-1 of the Palo Alto Comprehensive Plan from 1998, office buildings located within the 55 to 60 dBA CNEL noise contours would be considered generally acceptable. Further, standard construction materials would achieve a 25 to 30 dBA exterior-to-interior noise reduction with the windows closed. Therefore, interior noise levels at the proposed building during daytime hours would be below the City's 45 dBA $L_{eq(12)}$ threshold.

Other airports in the vicinity of the project site include the Moffett Federal Airfield (5 miles southeast), Norman Y. Mineta San José International Airport (12 miles southeast), San Carlos Airport (7 miles northwest), and San Francisco International Airport (15 miles northwest). The project site lies outside the areas of influence for each of the airports, and the noise environment at the site would not substantially increase due to aircraft noise from these airports.

Exterior and interior noise levels resulting from aircraft would be compatible with the proposed project.

Mitigation Measure 3: **None required.**

FIGURE 16 2022 CNEL Noise Contours for Palo Alto Airport Relative to Project Site



Cumulative Impacts

Cumulative noise impacts could result from cumulative traffic conditions and cumulative construction projects.

A significant cumulative traffic noise impact would occur if two criteria are met: 1) if the cumulative traffic noise level increase was 3 dBA CNEL or greater for future levels exceeding 65 dBA CNEL or was 5 dBA CNEL or greater for future levels at or below 65 dBA CNEL; 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 CNEL 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. Several roadway segments would result in a 3 dBA CNEL increase under both cumulative conditions (with and without the proposed project). However, since these increases would occur with and without the proposed project, this would not result in a cumulatively considerable contribution. As discussed in Impact 1b above, traffic volumes under the cumulative plus project scenario would double along Pulgas Avenue, north of Bay Road. However, this increase in traffic volumes would result in a permanent noise increase of less than 1 dBA CNEL at the nearest noise-sensitive receptor, due to Bay Road dominating the noise environment. Therefore, the project would not cause a significant cumulative noise increase at noise-sensitive uses in the project vicinity.

There are several construction projects planned near the 2535 Pulgas Avenue project site. Projects are proposed at 2519 Pulgas Avenue (shared property line to the south) and 1804 Runnymede Street (2,500 feet to the southeast). A project is currently under construction at 965 Weeks Street (1,300 feet to the southwest). Assuming worst-case-scenario, all four projects could be constructed simultaneously for a short duration of time.

Noise from the construction of the proposed project at 1804 Runnymede Street would not be audible at sensitive receptors near the 2535 Pulgas Avenue project site. Noise from the construction of the proposed project at 965 Weeks Street would occasionally be audible at residential receptors along Illinois Street to the southwest of the 2535 Pulgas Avenue project site and at the health center along Bay Road to the south but would not measurably contribute to the noise environment. In a similar manner, the construction of the proposed project at 2519 Pulgas Avenue would occasionally be audible at sensitive receptors south of Bay Road but would not measurably contribute to the noise environment. Residential receptors along Illinois Street to the west and at the health center to the south would have additional exposure to temporary noise increases if the construction of the projects overlapped. However, due to the distance between the proposed projects and the residences to the west, this exposure would be minimal. The health center would be adjacent to the 2519 Pulgas Avenue project site, which would be located between 2535 Pulgas Avenue and the sensitive receptor. Therefore, the 2519 Pulgas Avenue construction would dominate the noise exposure at the health center. With the implementation of standard noise controls in GP Policy 7.11 and the allowable hours of construction in the Municipal Code, noise and vibration impacts due to cumulative construction would be reduced. This would be a less-than-significant cumulative construction noise impact.

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality

429 East Cotati Avenue
Cotati, California 94931

Tel: 707-794-0400 *Fax: 707-794-0405*
www.illingworthrodkin.com *illro@illingworthrodkin.com*

May 6, 2021

Carolyn Neer, MUP, AICP Candidate
Associate Project Manager
David J. Powers & Associates, Inc.
1871 The Alameda, Suite 200
San José, CA 95126

Via email: **cneer@davidjpowers.com**

Subject: **2535 Pulgas Avenue (Jobtrain) Sanitary Sewer Scenarios, East Palo Alto, CA**
Addendum to the Noise and Vibration Assessment

Dear Ms. Neer:

In February 2021, *Illingworth & Rodkin, Inc*. drafted a noise and vibration assessment for the 2535 Pulgas Avenue (Jobtrain) office building project[1] in East Palo Alto, California. The applicant is considering two potential scenarios for the sanitary sewer service at the project site.

The preferred option would be to connect to the East Palo Alto Sanitary District (EPASD), which would include connecting to the existing six-inch sanitary sewer main along Pulgas Avenue. The applicant would be paying for improvements downstream along Bay Road and the Bay Trail. These improvements would qualify for a statutory exemption under CEQA and would not require further analysis. If this first option is not feasible, then the second option would be to construct an on-site sanitary sewer treatment plant to serve the office building demand.

This addendum letter discusses the potential impact generated by the second option to construct an on-site sanitary sewer treatment plant.

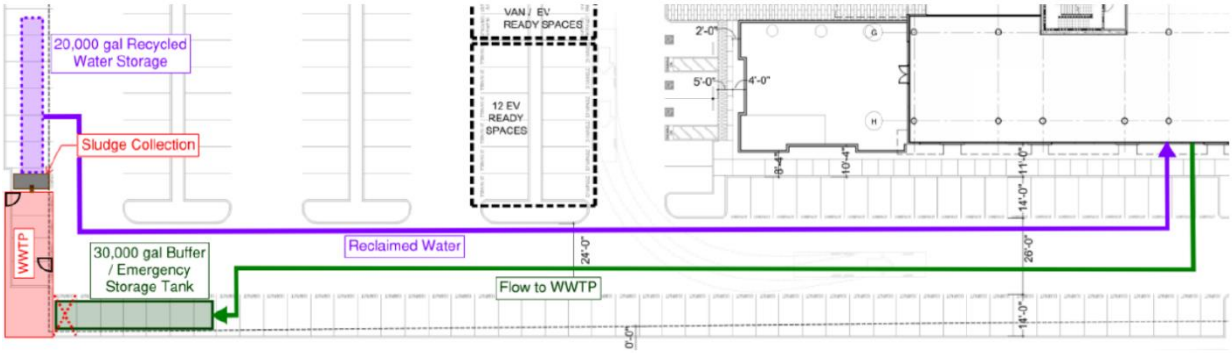
On-Site Sanitary Sewer Treatment Option

The on-site treatment facility would have a treatment capacity of 6,000 gallons per day and would be located in the southwest corner of the project site, as shown in Figure 1. The on-site sanitary sewer plant would have four main components: 1) 30,000-gallon buffer/emergency storage tank; 2) wastewater treatment plant; 3) sludge collector; and 4) 20,000-gallon recycled water storage tank. Two pipes would connect the on-site sanitary sewer treatment plant to the office building transporting sewage from the office building to the treatment plant and returning processed,

[1] Illingworth & Rodkin, Inc., "2535 Pulgas Avenue Noise and Vibration Assessment," February 18, 2021.

reclaimed water from the treatment plant back to the office building. In total, all four components of the sanitary sewer facility would occupy approximately 2,490 square feet and have a maximum height of 23 feet above grade. The maximum depth of excavation necessary to accommodate the on-site sanitary sewer system foundation would be approximately 2 feet below the existing grade. Approximately 15.37 cubic yards of soil would be exported during construction of the on-site sanitary sewer treatment plant foundation.

FIGURE 1 On-Site Sanitary Sewer Treatment Option



Operational Noise

The City's Municipal Code includes thresholds for exterior and interior noise levels at receiving land uses. A wastewater treatment plant (WWTP) would operate continuously during daytime and nighttime hours. Therefore, the exterior noise level thresholds would be 55 dBA L_{50} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and 50 dBA L_{50} during nighttime hours (between 10:00 p.m. and 7:00 a.m.) at the nearest noise-sensitive receptors, and the interior noise level thresholds would be 45 dBA L_{50} during the daytime hours and 40 dBA L_{50} during nighttime hours at the nearest noise-sensitive receptors.

The storage tanks and underground piping shown in Figure 1 is not expected to generate noise; however, the WWTP building would include pumps, compressors, fans, electrical equipment, and likely odor control equipment. Specific equipment planned at the site, location for the equipment, and noise levels generated by the equipment are unknown at this time. Major WWTP facilities generate a collective noise level of 85 dBA L_{eq} at 5 feet. While this noise level is expected to be conservative for this relatively small facility, this source level is used here for a credible worst-case assessment. With equipment at the WWTP building being located indoors, the building façade would provide about 20 dBA reduction outdoors.

The nearest property lines of noise-sensitive receptors would be 240 feet to the south (Ravenswood Family Health Center) and 415 feet to the west (nearest residences). At these property lines, operational noise levels would be 31 and 27 dBA L_{eq}, respectively, assuming the equipment would be housed indoors. Therefore, exterior noise levels at the nearby noise-sensitive receptors would be below 50 dBA L_{eq}, and interior noise levels at the nearest noise-sensitive receptors would be below 40 dBA L_{eq}. This option would not result in a significant operational impact at the nearest noise-sensitive receptors.

Construction Noise

For the WWTP option, components would be delivered to the site premanufactured and would be assembled on-site. The maximum depth of excavation necessary to accommodate the on-site sanitary sewer system foundation would be approximately 2 feet below the existing grade. Approximately 15.37 cubic yards of soil would be exported during construction of the on-site sanitary sewer treatment plant foundation. Total construction is expected to last for a period of about 2.5 to 3 months.

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.

Section 15.04.125 of the City's Municipal Code limits construction allowable hours to 7:00 a.m. to 6:00 p.m. on weekdays and 9:00 a.m. to 5:00 p.m. on Saturdays. No construction is allowed on Sundays. For large, complex projects, Policy 7.11 of the City's General Plan recommends construction hours to be limited to 7:00 a.m. to 7:00 p.m. on weekdays and to 9:00 a.m. to 7:00 p.m. on Saturdays and holidays, with no work allowed on Sundays. Additionally, Section 8.52 of the City's Municipal Code exempts construction noise occurring between 7:00 a.m. and 8:00 p.m. from the exterior and interior thresholds established in the Municipal Code for receiving land uses such as residences, schools, hospitals, churches, or public libraries. It is assumed that all construction activities would occur between these allowable hours.

The Ravenwood Family Health Center to the south and single-family residences to the west were identified as the nearest noise-sensitive receptors to the project site. Ambient noise levels at the health center would typically range from 59 to 73 dBA L_{eq} during daytime hours. Noise levels at the single-family residences would typically range from 50 to 61 dBA L_{eq} during daytime hours.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 80 to 90 dBA L_{max} at a distance of 50 feet from the noise source, and typical hourly average noise levels would range from 78 to 88 dBA L_{eq} for sewer systems, as measured at a distance of 50 feet from the center of the work site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). A list of typical maximum instantaneous noise levels and hourly average noise level ranges were provided in the February 2021 noise assessment.

Table 1 summarizes the phasing information and the equipment expected to be used during each phase. The equipment was used as inputs into the FHWA's Roadway Construction Noise Model (RCNM) to predict the combined average noise level for each phase. To model worst-case conditions, it was assumed that all equipment per phase would be operating simultaneously. For construction noise, the use of multiple pieces of equipment simultaneously would add together as a collective noise source. While every piece of equipment per phase would likely be scattered

throughout the site, the noise-sensitive receptors surrounding the site would be subject to the collective noise source generated by all equipment operating at once. Therefore, to assess construction noise impacts at the receiving property lines of noise-sensitive receptors, the collective worst-case hourly average noise level for each phase was positioned at the geometrical center of each building and propagated to the nearest property line of the surrounding land uses.

The results of the RCNM model for each phase of construction of the sewer system, as estimated at a distance of 50 feet, are summarized in Table 1. The construction of the sewer system would overlap with the Jobtrain Project. The range in noise levels in Table 1 reflect the maximum noise levels during the overlapping periods. The noise levels in Table 1 were propagated from the center of the project site to the property lines of the surrounding land uses. These are summarized in Table 2.

TABLE 1 Summary of Construction Equipment Estimated for Each Construction Phase, Calculated at a Distance of 50 feet

Phase of Construction	Equipment (Quantity)	Combined L_{eq}, dBA
Demolition (5/3/2021-5/28/2021)	Concrete/Industrial Saw (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)	87 to 90[a]
Site Preparation (5/29/2021-6/1/2021)	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	85 to 89[b]
Grading/ Excavation (6/2/2021-6/7/2021)	Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	85
Trenching/ Foundation (6/8/2021-6/11/2021)	Tractor/Loader/Backhoe (1) Excavator (1)	82 to 88[c]
Paving (6/12/2021-6/25/2021)	Cement and Mortar Mixer (1) Paver (1) Paving Equipment (1) Roller (1) Tractor/Loader/Backhoe (1)	86 to 89[d]

[a] Range reflects the demolition phase for the sewer system only and when completed simultaneously with the demolition phase of the Jobtrain Project and the grading/excavation phase of the Jobtrain Project.
[b] Range reflects the site preparation phase for the sewer system only and when completed simultaneously with the grading/excavation phase of the Jobtrain Project.
[c] Range reflects the trenching/foundation phase for the sewer system only and when completed simultaneously with the grading/excavation phase of the Jobtrain Project.
[d] Range reflects the paving phase for the sewer system only and when completed simultaneously with the grading/excavation phase of the Jobtrain Project.

TABLE 2 Construction Noise Levels Estimated at Nearby Sensitive Land Uses

Phase of Construction	Calculated Hourly Average L_{eq} at Noise-Sensitive Receptors, dBA				
	North Industrial (180ft)	West Industrial (215ft)	East Industrial (265ft)	South Health Center (435ft)	West Residential (615ft)
Demolition	76 to 79	73 to 76	69 to 72	75 to 78	66 to 69
Site Preparation	73 to 78	70 to 75	66 to 70	72 to 76	63 to 67
Grading/ Excavation	73	70	66	72	63
Trenching/ Foundation	71 to 77	67 to 74	63 to 69	69 to 76	60 to 66
Paving	74 to 78	71 to 75	67 to 71	73 to 77	64 to 68

[a] Range reflects the demolition phase for the sewer system only and when completed simultaneously with the demolition phase of the Jobtrain Project and the grading/excavation phase of the Jobtrain Project.
[b] Range reflects the site preparation phase for the sewer system only and when completed simultaneously with the grading/excavation phase of the Jobtrain Project.
[c] Range reflects the trenching/foundation phase for the sewer system only and when completed simultaneously with the grading/excavation phase of the Jobtrain Project.
[d] Range reflects the paving phase for the sewer system only and when completed simultaneously with the grading/excavation phase of the Jobtrain Project.

Estimated construction noise levels shown in Table 2 would exceed ambient levels at the health center and residences by more than 5 dBA L_{eq} at times during the construction of the sewer system. While construction of the sewer system is not expected to last for more than one year, project construction of the Jobtrain Project would last longer than one year. The project would require the inclusion of construction best management practices as project conditions of approval.

Policy 7.11 of the City's General Plan requires the implementation of a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints to reduce noise impacts on neighboring residents and other uses. A typical construction noise logistics plan would include, but not be limited to, the following measures to reduce construction noise levels as low as practical:

Standard Construction Noise Controls

- Limit construction activity to weekdays between 7:00 a.m. and 7:00 p.m. and Saturdays and holidays between 9:00 a.m. and 7:00 p.m., with no construction on Sundays;

- Utilize "quiet" models of air compressors and other stationary noise sources where such technology exists;

- Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment;

- Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from adjacent land uses;

- Locate staging areas and construction material areas as far away as possible from adjacent land uses;

- Prohibit all unnecessary idling of internal combustion engines;

- Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem are implemented.

- Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction.

With the implementation of standard noise controls in GP Policy 7.11 and the Municipal Code allowable construction hours, the temporary construction noise impact would be reduced to a less-than-significant level.

Construction Vibration Assessment

The construction of the WWTP option may generate perceptible vibration when heavy equipment or impact tools (e.g., jackhammers, hoe rams) are used. The proposed WWTP option 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, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened. No known ancient buildings or buildings that are documented to be structurally weakened adjoin the project area. Conservatively, groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact.

Table 3 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Construction activities for the WWTP option, 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. While specific equipment listed in Table 1 for the proposed project may not be included in Table 3, all vibration levels for each piece of equipment expected to be used in the proposed project would be represented by the vibration levels summarized in Table 3, falling within the range of 0.003 and 0.210 in/sec PPV at a distance of 25 feet. Vibration levels perceived at receptors would vary depending on soil conditions, construction methods, and equipment used. Table 3 also summarizes the distances to the 0.3 in/sec PPV threshold for all nonhistorical buildings.

TABLE 3 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Minimum Distance to Meet 0.3 in/sec PPV (feet)
Clam shovel drop		0.202	18
Hydromill (slurry wall)	in soil	0.008	1
	in rock	0.017	2
Vibratory roller		0.210	19
Hoe ram		0.089	9
Large bulldozer		0.089	9
Caisson drilling		0.089	9
Loaded trucks		0.076	8
Jackhammer		0.035	4
Small bulldozer		0.003	<1

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., May 2021.

During each phase of construction, all off-site buildings would be 30 feet or more from the nearest construction site. At these distances, vibration levels would be at or below 0.172 in/sec PPV, which would be below the 0.3 in/sec PPV threshold. Table 4 summarizes construction vibration levels at all nearby off-site structures. While these levels may be perceptible to off-site occupants, damage to the structures would not be expected.

For existing health center to the south and the residences to the west, which are both more than 300 feet from the sewer alignment, vibration levels would at or below 0.01 in/sec PPV. The 0.3 in/sec PPV threshold is not expected to be exceeded by construction activities of the on-site sewer system at any off-site buildings. This would be a less-than-significant impact.

TABLE 4 Vibration Source Levels for Construction Equipment Propagated to the Nearest Off-Site Buildings Surrounding the Jobtrain Site

Equipment		Estimated Vibration Levels at Surrounding Structures, in/sec PPV			
		North Industrial (330ft)	East Industrial (85ft)	West Industrial (30ft)	South Health Center (390ft)
Clam shovel drop		0.012	0.053	0.165	0.010
Hydromill (slurry wall)	in soil	0.0005	0.002	0.007	0.0004
	in rock	0.001	0.004	0.014	0.001
Vibratory Roller		0.012	0.055	0.172	0.010
Hoe Ram		0.005	0.023	0.073	0.004
Large bulldozer		0.005	0.023	0.073	0.004
Caisson drilling		0.005	0.023	0.073	0.004
Loaded trucks		0.004	0.020	0.062	0.004
Jackhammer		0.002	0.009	0.029	0.002
Small bulldozer		0.0002	0.001	0.002	0.0001

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., May 2021.

♦ ♦ ♦

Please feel free to contact us with any questions on the analysis or if we can be of further assistance.

Sincerely,

Carrie J. Janello
Senior Consultant
Illingworth & Rodkin, Inc.

(19-138)