Appendix G – Noise and Vibration Assessment

BLOCK 20 MIXED-USE PROJECT NOISE AND VIBRATION ASSESSMENT

San Mateo, California

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INTRODUCTION

A new seven-story mixed-use building is proposed on the northwestern portion of the block between South Delaware Street and South Claremont Street, facing East 4th Avenue, in San Mateo, California. The project proposes demolishing all existing structures on the site. The proposed seven-story building would include approximately 98,717 square feet of office space and 72 residential units. Six of the residential units (about 15%) are designated as very low-income units, and six are designated as moderate-income units. Additionally, two levels of below-grade parking are included in the proposed project.

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

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 the 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 that are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement that 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 tenfold 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

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 sounds 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 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 the addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after the 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 2013.

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 on 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 between 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 and 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.

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 of 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.

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

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

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, April 2020.

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, which 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 of 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 in 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.

Regulatory Background – Noise

This section describes the relevant guidelines, policies, and standards established by State Agencies and the City of San Mateo. 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 of California

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.

2025 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels in multi-family residential units attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn}/CNEL in any habitable room.

2025 California Building Cal Green Code.
The State of California established exterior sound transmission control standards for new nonresidential buildings as set forth in the 2025 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 or addition envelope or altered 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}/CNEL noise contour of an airport or within the 65 dBA L_{dn}/CNEL noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway source, as determined by the Noise Element of the General Plan.

5.507.4.1.1 Noise exposure where noise contours are not readily available. Buildings exposed to a noise level of 65 dBA $L_{eq(1\text{-}hr)}$ during any hour of operation shall have building, addition or alteration exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (or OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30).

5.507.4.2 Performance method. For buildings located, as defined by Section 5.507.4.1 or 5.507.4.1.1, wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

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

City of San Mateo

City of San Mateo General Plan: The Strive San Mateo General Plan 2040 includes the City's Noise Element, which sets forth goals and policies to control environmental noise and protect citizens from excessive noise exposure. The goals and policies relevant to this project are summarized below:

GOAL N-1: Protect noise-sensitive land uses from excessive noise levels.

POLICIES:

N 1.1: Noise and Land Use Planning. Integrate noise considerations into land use planning decisions to minimize noise impacts to or from new development.

N 1.2: Interior Noise Level Standard. Require submittal of an acoustical analysis and interior noise insulation for all noise-sensitive land uses listed in Table N-1 that have an exterior noise level of 60 dBA (L_{dn}) or above, as shown on Figure N-2. The maximum interior noise level shall not exceed 45 dBA (L_{dn}) in any habitable rooms, as established by the California Building Code.

N 1.3: Exterior Noise Level Standard for Residential Uses. Require an acoustical analysis for new multifamily common open space for residents that have an exterior noise level of 60 dBA (L_{dn}) or above, as shown on Figure N-2. Incorporate necessary mitigation measures into residential project design to minimize common open space noise levels. Maximum exterior noise should not exceed 65 dBA (L_{dn}) for residential uses.

N 1.4: Exterior Noise Level Standard for Parks and Playgrounds. Require a feasibility analysis of noise-reduction measures for public parks and play areas that have an exterior noise level of 70 dBA (L_{dn}) or above.

Table N-1 Land Use Compatibility Guidelines

Land Use Category of Proposed New Use		Day-Night Average Exterior Noise Level, L_{dn} (dBA)				
		0 - 59	60 - 65	66 - 70	71 - 80	over 81
Noise-Sensitive Land Uses	Residential (all densities) *					
	Multifamily Common Open Space for Residents					
	Hotels, Motels, and Other Lodging					
	Schools, Libraries, Hospitals, Churches, Long-Term Care Facilities					
	Parks, Playgrounds, Privately Owned Publicly Accessible Open Space					
Office and Commercial						
Research and Development, Industrial						

	Normally Acceptable. Specified land use is satisfactory based on the assumption that any buildings involved are of normal, conventional construction, without any special noise mitigation requirements.
	Conditionally Acceptable. New construction or development should be undertaken only after a detailed analysis of the noise-reduction requirements is made and needed noise mitigation features have been included in the design.
	Normally Unacceptable. New construction or development should not be undertaken.

* See residential land use designations in the Land Use Element of this General Plan.

GOAL 2: Minimize unnecessary, annoying and unhealthful noise.

POLICIES:

N 2.1: Noise Regulation. Regulate noise in San Mateo to prohibit noise that is annoying or injurious to community members.

N 2.2: Minimize Noise Impacts. Incorporate necessary mitigation measures into new development design to minimize short-term noise impacts. Determine whether new development has the potential to result in a significant noise impact on existing development based on the following standards. Impacts will be analyzed based on long-term operational noise increases at the sensitive receptor property line, or new uses that generate noise levels at the sensitive receptor property line, as follows:

Ldn Category of Existing Development Per Figures N-1, N-2, and/or N-3	Noise Increase Considered "Significant" over Existing Noise Levels
Normally Acceptable	An increase of more than 5 dBA and the total Ldn exceeds the "normally acceptable" category
Conditionally Acceptable	An increase of more than 5 dBA
Unacceptable	An increase of more than 5 dBA

N 2.3: Minimize Commercial Noise. Protect land uses other than those listed as "noise sensitive" in Table N-1 from adverse impacts caused by the on-site noise generated by new developments. Incorporate necessary mitigation measures into development design to minimize short-term and long-term noise impacts. Prohibit new uses that generate noise levels of 65 dB (L_{dn}) or above at the property line, excluding existing ambient noise levels.

N 2.4: Traffic Noise. Recognize projected increases in ambient noise levels resulting from future traffic increases, as shown on Figure N-2. Promote reduced traffic speeds and the installation of noise barriers or other methods to reduce traffic noise along highways and high-volume roadways where noise-sensitive land uses (listed in Table N-1) are adversely impacted by excessive noise levels (60 dBA [L_{dn}] or above).

N 2.7: Construction Noise and Vibration Monitoring. Require construction noise limits and vibration monitoring around sensitive receptors, including through limiting construction hours and individual and cumulative noise from construction equipment. For larger development projects that demand intensive construction periods and/or use equipment that could create vibration impacts, require a vibration impact analysis, as well as monitoring and reporting of noise/vibration levels throughout construction, consistent with industry standards.

City of San Mateo Municipal Code: The Noise Regulations of the San Mateo Municipal Code, Chapter 7.30 are set forth to protect the inhabitants of the City against all forms of nuisances.

Section 7.30.040 Maximum Permissible Sound Levels. It is unlawful for any person to operate or cause to be operated any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any other property to exceed:

(1) The noise level standard for that property as specified in Table 7.30.040 for a cumulative period of more than thirty minutes in any hour;

(2) The noise level standard plus five dB for a cumulative period of more than fifteen minutes in any hour;

(3) The noise level standard plus ten dB for a cumulative period of more than five minutes in any hour;

(4) The noise level standard plus fifteen dB for a cumulative period of more than one minute in any hour; or

(5) The noise level standard or the maximum measured ambient level, plus twenty dB for any period of time.

If the measured ambient level for any area is higher than the standard set in Table 7.30.040, then the ambient shall be the base noise level standard for purposes of this section. In such cases, the noise levels for purposes of subsections (2) through (5) of this section shall be increased in five dB increments above the ambient.

Table 7.30.040: Noise Level Standards

Noise Zone	Time Period	Noise Level, dBA
Noise Zone 1 (single-family residential zone)	10 p.m.--7 a.m.	50
	7 a.m.--10 p.m.	60
Noise Zone 2 (commercial/mixed residential, multi-family residential)	10 p.m.--7 a.m.	55
	7 a.m.--10 p.m.	60
Noise Zone 3 (commercial or central business district)	10 p.m.--7 a.m.	60
	7 a.m.--10 p.m.	65
Noise Zone 4 (any manufacturing or industrial zone)	Anytime	70

Section 7.30.060 Special Provisions. Construction, alteration, repair, or land development activities authorized by a valid city permit shall be allowed at the following times:

- Weekdays: between 7:00 a.m. and 7:00 p.m.

- Saturdays: between 9:00 a.m. and 5:00 p.m.

- Sundays and Holidays: between 12:00 p.m. and 4:00 p.m.

- Or at other such hours as authorized or restricted by the permit, so long as they meet the following conditions:

    1. No individual piece of equipment shall produce a noise level exceeding 90 dBA at a distance of 25 feet. If the device is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close to 25 feet as possible.

    2. The noise level outside of any point outside the property plane of the project shall not exceed 90 dBA.

Existing Noise Environment

The project site is located on the block bounded by East 4th Avenue, South Delaware Street, East 5th Avenue, and South Claremont Street in San Mateo, California. Existing residential land uses are located east of the project site, opposite the South Delaware Street/East 5th Avenue intersection. Commercial uses and a multi-family residential building are located northeast of the site, opposite South Delaware Street. North of the site, opposite the South Delaware Street/East 4th Avenue intersection, are existing commercial uses. An existing office building is located west of the project site, opposite the South Claremont Street/East 4th Avenue intersection. The San Mateo Lumber Co. Inc. and existing single-family residences are located southeast of the site, opposite East 5th Avenue. Other sites undergoing redevelopment near the Block 20 project site include a future residential building southwest of the site, opposite South Claremont Street, and a future parking garage to the south, opposite the South Claremont Street/East 5th Avenue intersection. A mixed-use building has been approved northwest of the project site, opposite East 4th Avenue. Figure 1 shows the project site and the surrounding existing and future land uses.

The existing noise environment at the site results primarily from vehicular traffic along East 4th Avenue and South Delaware Street. Traffic along nearby U.S. Highway 101 (Highway 101) and railroad activity along the nearby UPRR/Caltrain tracks would also affect the noise environment, as well as other local vehicular traffic and aircraft associated with the San Francisco International Airport.

A noise monitoring survey, which included two long-term (LT-1 and LT-2) and three short-term (ST-1 through ST-3) noise measurements, was performed at the site between Tuesday, August 1, 2023, and Thursday, August 3, 2023. All measurement locations are shown in Figure 2.

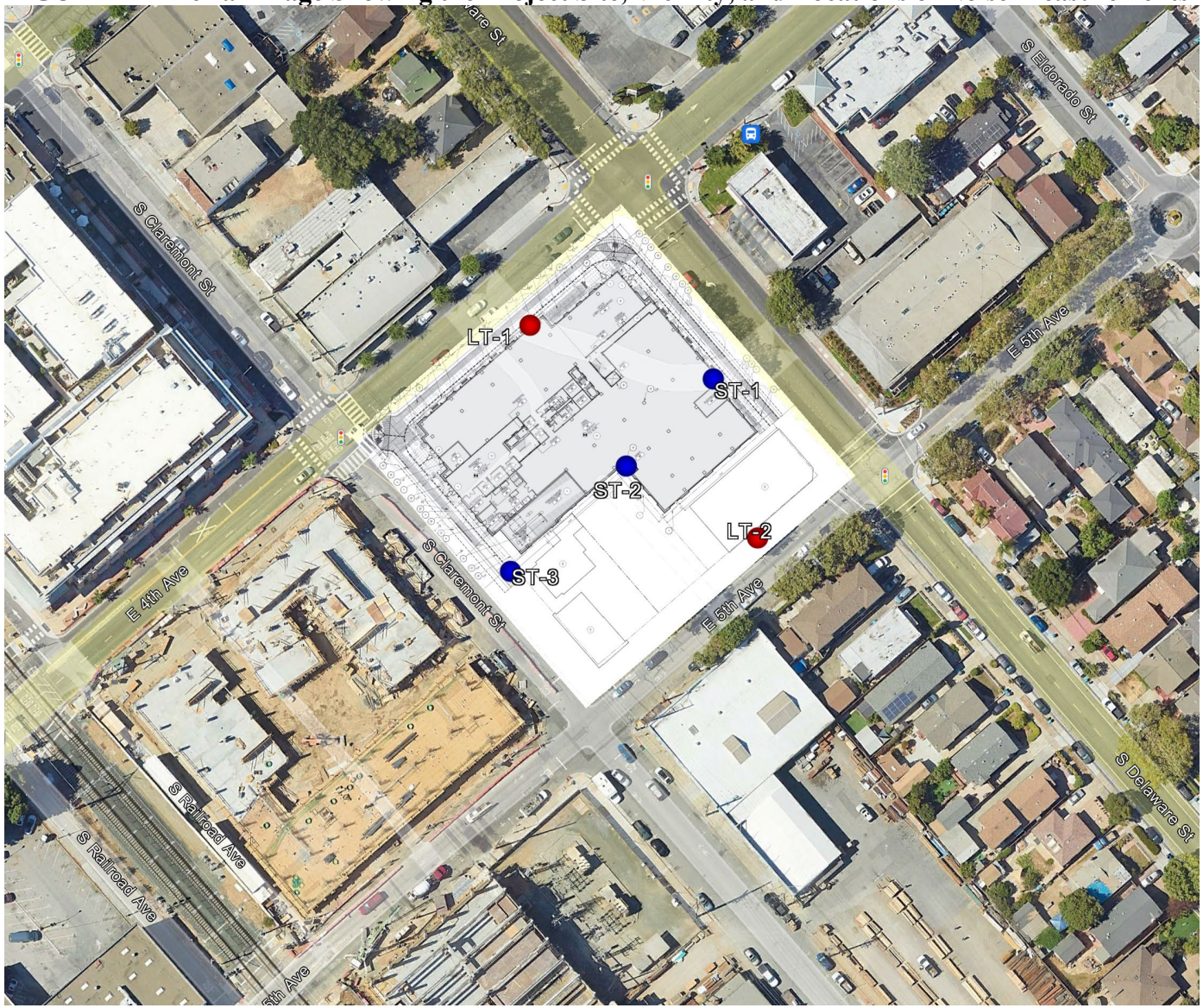
Long-term noise measurement LT-1 was installed on a light pole near the former gas station along East 4th Avenue. LT-1 was positioned approximately 12 feet above the ground and set back approximately 30 feet southeast of the centerline of East 4th Avenue. Nearby construction occurring opposite South Claremont Street was primarily indoors, and minimal construction noise was measurable at LT-1. Hourly average noise levels at LT-1 typically ranged from 63 to 69 dBA

FIGURE 1 Aerial Image Showing the Project Site and Identified Existing and Future Receptors Surrounding the Site



Source: Google Earth, 2024.
Notes: *Existing Adj. Community Center is a documented historical building.

FIGURE 2 Aerial Image Showing the Project Site, Vicinity, and Locations of Noise Measurements



Source: Google Earth, 2024.

L_{eq} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and from 51 to 64 dBA L_{eq} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The day-night average noise level (L_{dn}) for the 24-hour period occurring on Wednesday, August 2, 2023, was 68 dBA L_{dn}. The daily trends in noise levels at LT-1 are shown in Figures A1 through A3 in the Appendix of this report.

Noise measurement LT-2 was installed in a tree just outside the Safari Kids preschool building, currently located on the project site. LT-2 was positioned about 10 to 12 feet above the ground and set back approximately 25 feet northwest of the centerline of East 5th Avenue. Similar to LT-1, construction noise occurring in the vicinity was audible but did not measurably affect the noise levels at LT-2. Hourly average noise levels at LT-2 typically ranged from 61 to 67 dBA L_{eq} during the day and from 45 to 61 dBA L_{eq} at night. The L_{dn} for the 24-hour period occurring on Wednesday, August 2, 2023, was 66 dBA L_{dn}. The daily trends in noise levels at LT-2 are shown in Appendix Figures A4 through A6.

Three short-term noise measurements (ST-1 through ST-3) were made on Tuesday, August 1, 2023, in 10-minute intervals between 11:40 a.m. and 12:20 p.m. Table 4 summarizes the results of the 10-minute noise measurements made at each short-term measurement.

TABLE 4 Summary of Short-Term Noise Measurement Data

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: ~45 feet southwest of the South Delaware Street centerline	8/1/2023, 11:40-11:50	91	82	67	61	55	69
	8/1/2023, 11:50-12:00	81	75	69	61	56	65
ST-2: ~135 feet southwest of the South Delaware Street centerline	8/1/2023, 12:10-12:20	78	71	63	57	53	61
ST-3: ~25 feet northeast of the South Claremont Street centerline	8/1/2023, 11:40-11:50	81	77	73	67	63	69
	8/1/2023, 11:50-12:00	78	75	71	67	64	68

ST-1 was made approximately 45 feet from the centerline of South Delaware Street, halfway between East 4th Avenue and East 5th Avenue. Two consecutive 10-minute noise measurements were made at ST-1. Local traffic from South Delaware Street dominated the noise environment at ST-1, which included passenger cars (56 to 71 dBA) and a bus (65 dBA). Heavy trucks produced noise levels ranging from 71 to 91 dBA; however, the maximum instantaneous noise level of 91 dBA was produced during loud braking, which was atypical. To capture a more typical 10-minute period, a second measurement period was completed at ST-1. Traffic noise from East 4th Avenue generated noise levels ranging from 54 to 71 dBA at ST-1. A train horn was also measured at ST-1 (71 dBA). Nearby construction noise was not audible over traffic noise at ST-1. The 10-minute average noise levels at ST-1 ranged from 65 dBA L_{eq} during the typical 10-minute measurement to 69 dBA L_{eq} during the measurement period with the loud truck braking.

ST-2 was made behind ST-1 near the center of the site. ST-2 was made in front of an existing six-foot fence and was set back approximately 135 feet from the centerline of South Delaware Street. Local traffic from South Delaware Street and nearby East 4th Avenue dominated the noise environment at ST-2, which ranged from 50 to 78 dBA. A train horn was also measured at ST-2 (70 dBA). Nearby construction noise was not audible over traffic noise at ST-2. The 10-minute average noise level at ST-2 was 61 dBA L_{eq}.

ST-3 was made approximately 25 feet from the centerline of South Claremont Street, halfway between East 4th Avenue and East 5th Avenue. Traffic noise along South Claremont Street and construction noise from the site opposite the roadway dominated the noise environment at ST-3. Traffic noise from South Claremont Street typically generated noise levels of 62 to 72 dBA at ST-3. Construction noise mostly consisted of a generator running fairly constantly at 60 to 61 dBA. The 10-minute L_{eq} measured at ST-3 ranged from 68 to 69 dBA.

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The City of San Mateo's 2040 General Plan includes exterior and interior noise thresholds for residential uses. Note, the City's exterior noise thresholds apply only to common use areas and not private balconies, porches, or patios. Additionally, the State of California establishes acceptable interior noise limits within residential and non-residential land uses. The thresholds that apply to the proposed project are summarized below:

- Policy N 1.3 and Table N-1 of the City's General Plan identify exterior noise thresholds of 65 dBA L_{dn} or below as "normally acceptable" for multi-family residential uses.

- Table N-1 identifies exterior noise thresholds of 70 dBA L_{dn} or below as "normally acceptable" for office uses.

- The City and State's acceptable interior noise level standard is 45 dBA L_{dn} or less for the proposed residential land uses.

- The Cal Green Code standards specify an interior noise environment attributable to exterior sources not to exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas of nonresidential uses during any hour of operation.

The future noise environment at the site would continue to result primarily from vehicular traffic along South Delaware Street and East 4th Avenue, as well as nearby Highway 101 and nearby UPRR/Caltrain activity. The project's original traffic study was completed for a six-story mixed-use building with a footprint consisting of the entire block between East 4th Avenue and East 5th Avenue. While an update to the traffic study was not required for the revised project with a smaller footprint, the peak hour trips for the revised project would be less than those for the original project. Therefore, traffic volumes included in the original traffic report would represent the worst-case scenario for the noise level increase calculated under future cumulative plus project conditions, which was 1 dBA L_{dn} along South Delaware Street and East 4th Avenue when

compared to existing volumes. Conservatively, a 1 dBA L_{dn} traffic noise increase is assumed at the project site under future cumulative conditions.

Future Exterior Noise Environment

The site plan shows two third-floor office open spaces, two common use residential open spaces on the fourth floor, and a shared office balcony on the seventh floor.

Residential Land Uses

The fourth-floor residential balconies are located in the northernmost corner of the building, facing East 4th Avenue and South Delaware Street, and along the southeastern building façade, on the interior of the block. The center of the north balcony would be set back approximately 50 feet from the centerline of East 4th Avenue and approximately 50 feet from the centerline of South Delaware Street. Assuming a minimum attenuation of 10 dBA due to the elevation above the ground and the setback from the edge of the building, future exterior noise levels would be below 60 dBA L_{dn} at the fourth-floor residential balcony. The other fourth-floor balcony would be located on the interior of the block, facing the adjoining land uses. This balcony would be 75 to 150 feet from the centerline of South Claremont Street and would be partially shielded from the elevation of the building and the building façade nearest to the roadway. With a minimum attenuation of 12 dBA due to elevation above the ground and the building façade, future exterior noise levels would be below 60 dBA L_{dn} at the fourth-floor interior balcony. This would meet the City's exterior noise limit of 67 dBA L_{dn} for residential uses.

Office and Commercial Land Uses

The third-floor shared office balconies are located along the northwest and southwest façades, facing East 4th Avenue and South Claremont Street, respectively. The centers of each balcony are approximately 30 feet from the centerline of East 4th Avenue and approximately 30 feet from the centerline of South Claremont Street. The height of the third floor (27.5 feet above the ground) would provide some shielding for these shared balconies (a minimum of 5 dBA attenuation). Future exterior noise levels would be at or below 64 dBA L_{dn} at each of these balconies.

The seventh-floor balcony is located in the northernmost corner of the building, facing East 4th Avenue and South Delaware Street. The center of the north balcony would be approximately 80 feet from the centerline of East 4th Avenue and approximately 75 feet from the centerline of South Delaware Street. Assuming a minimum attenuation of 15 dBA due to elevation above the ground and setback from the edge of the building, future exterior noise levels would be below 60 dBA L_{dn} at the seventh-floor balcony.

The outdoor use area associated with the residential component of the proposed project would meet the City's exterior noise limit of 67 dBA L_{dn} for residential uses. Each of the outdoor use areas associated with the office and commercial uses of the proposed building would be below 70 dBA L_{dn} at the center of the spaces where most of the extended use would occur. The proposed project would be compatible with the future exterior noise environment at the project site.

Future Interior Noise Environment

Residential Land Uses

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn}, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn}, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Residential units would be located on floors four through six of the proposed building. Units located along the northwestern façade would have direct line-of-sight to East 4th Avenue, with setbacks of approximately 35 feet. At this distance, units would be exposed to future exterior noise levels up to 68 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels would reach 53 dBA L_{dn}.

Units located along the southwestern façade would have direct line-of-sight to South Claremont Street, with setbacks of approximately 40 feet. Units located along the northeastern façade would have direct line-of-sight to South Delaware Street, with setbacks of approximately 45 feet. At these distances, units would be exposed to future exterior noise levels ranging from 64 to 67 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in these units would range from 49 to 52 dBA L_{dn}.

To meet the City and State's interior noise requirement of 45 dBA L_{dn}, implementation of noise insulation features would be required.

Office Land Uses

Office uses would be located on floors one, two, three, and seven of the proposed building. The nearest building façades would be set back from the centerline of South Delaware Street by approximately 45 feet, from the centerline of East 4th Avenue by approximately 35 feet, and from the centerline of South Claremont Street by approximately 30 feet. At these distances, daytime hourly average noise levels would range from 60 to 67 dBA L_{eq}, with day-night average noise levels up to 68 dBA L_{dn}.

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. The standard construction materials in combination with forced-air mechanical ventilation would satisfy the daytime threshold of 50 dBA $L_{eq(1\text{-}hr)}$

Spaces where lower noise levels would be desired, such as private offices and conference rooms, may benefit from additional noise control in order to meet a lower, more desirable interior noise level. Additional noise control could be accomplished by selecting higher sound-rated windows (STC 34 or greater along exterior façades).

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insulation features shall be incorporated into the proposed project to reduce interior noise levels to 45 dBA L_{dn} or less at residential interiors:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all residential units on the project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

- Preliminary calculations indicate that all residential units facing East 4th Avenue, South Delaware Street, and South Claremont Street would require windows and doors with a minimum rating up to 30 STC with adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA L_{dn}.

The implementation of these noise insulation features would reduce interior noise levels to 45 dBA L_{dn} or less at residential uses.

Conditions of Approval

Interior Noise Standard for Residential Development. The project applicant shall prepare final design plans that incorporate building design and acoustical treatments to ensure compliance with State Building Codes and City noise standards. A project-specific acoustical analysis shall be prepared to ensure that the design incorporates controls to reduce interior noise levels to 45 dBA L_{dn} or lower within the residential unit and to 50 dBA $L_{eq(1\text{-}hr)}$ or lower within nonresidential interiors. The project applicant shall conform to any special building construction techniques requested by the City's Building Department, which may include sound-rated windows and doors, sound-rated wall constructions, and acoustical caulking.

NOISE IMPACTS AND MITIGATION MEASURES

This section describes the significance criteria used to evaluate project impacts under CEQA, provides a discussion of each project impact, and presents mitigation measures, where necessary, to reduce project impacts to less-than-significant levels.

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

(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.

Impact 1a: **Temporary Construction Noise.** Existing and future noise-sensitive land uses would potentially be exposed to a temporary increase in noise levels in excess of the City's construction noise limits. With the incorporation of construction best management practices as project conditions of approval, the impact would be reduced to a **less-than-significant** level.

The construction schedule assumed that the earliest possible start date would be early June 2024, with an estimated completion date of end of February 2026. Construction phases would include demolition, site preparation, grading, building construction, architectural coating, and paving. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating.

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.

Policy N 2.7 of the City's General Plan requires construction noise monitoring, which includes defined construction noise thresholds and limited construction hours. Section 7.30.060 of the City of San Mateo's Municipal Code limits construction to weekdays between 7:00 a.m. and 7:00 p.m., Saturdays between 9:00 a.m. and 5:00 p.m., and Sundays and holidays between 12:00 p.m. and 4:00 p.m. Additionally, the City specifies that no individual piece of equipment shall produce a noise level exceeding 90 dBA at a distance of 25 feet and that the noise level outside any point outside the property plane of the project shall not exceed 90 dBA.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The hauling of excavated materials and construction materials would generate truck trips on local roadways, as well. For the proposed project, pile driving, which generates excessive noise levels, is not expected. The typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 5) from the equipment. At 25 feet, maximum instantaneous noise levels for equipment for the proposed project would range from 76 to 96 dBA L_{max}.

Table 6 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction are about 72 to 88 dBA L_{eq} for mixed-use buildings, measured at a distance of 50 feet from the center of a busy construction site. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often results in lower construction noise levels at distant receptors.

Equipment expected to be used in each construction phase are summarized in Table 7, along with the quantity of each type of equipment and the reference noise level at 25 feet, assuming the operation of the two loudest pieces of construction equipment for each construction phase.

Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) was used to calculate the hourly average noise levels for each phase of construction, assuming the two loudest pieces of equipment would operate simultaneously, as recommended by the FTA for construction noise evaluations. This construction noise model includes representative sound levels for the most common types of construction equipment and the approximate usage factors of such equipment that were developed based on an extensive database of information gathered during the construction of the Central Artery/Tunnel Project in Boston, Massachusetts (CA/T Project or "Big Dig"). The usage factors represent the percentage of time that the equipment would be operating at full power.

Table 8 summarizes the worst-case construction noise levels propagated from the geometrical center of the proposed building to the property lines of the surrounding land uses, assuming all pieces of equipment per phase operating simultaneously. Noise levels in Table 8 do not assume reductions due to intervening buildings or existing barriers.

As shown in Tables 7 and 8, construction noise levels would intermittently range from 80 to 91 dBA L_{eq} when activities occur approximately 25 feet from the construction site and would typically range from 59 to 84 dBA L_{eq} when focused near the center of the site. Individual pieces of equipment could potentially exceed the City's 90 dBA noise limit at a distance of 25 feet. Further, when equipment is used within 25 feet of the project's boundaries, the 90 dBA noise limit could be exceeded outside the property plane, which would impact the existing sensitive receptors adjoining the project site.

TABLE 5 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.

Source: U.S. Department of Transportation, Federal Highway Administration. 2017 (updated). FHWA Highway Construction Noise Handbook. Available: https://www.fhwa.dot.gov/ENVIRONMENT/noise/construction_noise/handbook/handbook00.cfm

TABLE 6 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 7 Estimated Construction Noise Levels at a Distance of 25 feet

Phase of Construction	Total Workdays	Construction Equipment (Quantity)	Estimated Construction Noise Level at 25 feet, dBA L_{eq}
Demolition	20	Concrete/Industrial Saw (1)[a] Rubber-Tired Dozer (2) Tractor/Loader/Backhoe (2)[a]	91
Site Preparation	20	Rubber-Tired Dozer (3)[a] Tractor/Loader/Backhoe (4)[a]	88
Grading	80	Grader (1)[a] Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)[a]	90
Building Construction	310	Crane (1) Forklift (3) Generator Set (1)[a] Tractor/Loader/Backhoe (3)[a] Welder (3)	88
Paving	15	Paver (1)[a] Paving Equipment (2)[a] Roller (2)	89
Architectural Coating	15	Air Compressor (1)[a]	80

[a] Denotes two loudest pieces of construction equipment per phase.

TABLE 8 Estimated Construction Noise Levels at Receiving Property Lines

Phase of Construction	Calculated Hourly Average Noise Levels, L_{eq} (dBA)								
	East Res. (275ft)	NE Res. & Comm. (150ft)	North Comm. (210ft)	West Off. (250ft)	SE Res. & Comm. (225ft)	Future NW Res. & Off. (125ft)	Future SW Res. (215ft)	Adj. Community Center (85ft)	Adj. Preschool (80ft)
Demolition	72	77	75	73	74	79	74	82	83
Site Preparation	73	78	75	74	75	80	75	83	84
Grading	72	77	74	73	74	79	74	82	83
Building – Exterior	72	77	74	72	73	78	74	82	82
Paving	71	77	74	72	73	78	74	82	82
Building – Interior/ Architectural Coating	59	64	61	60	61	66	61	69	70

The Safari Kids' Preschool has indicated that their lease ends in July 2028 and that the lease will not be renewed. Two other construction alternatives have been suggested for the proposed project, assuming that the preschool will no longer operate in the site vicinity:

- Option 1 – construction would start after the preschool moves out. This option would eliminate a sensitive receptor adjoining the project site but would require a condition of approval on the construction starting date.

- Option 2 – demolition and grading activities would start immediately, but all construction upwards would be postponed until the preschool's lease ends. This option would require mitigation for below-grade and at-grade construction but would eliminate the need for mitigation during construction on the second floor and above. This option would also require a condition of approval on the construction starting date.

Modification, placement, and operation of construction equipment are possible means for minimizing the impact of construction noise on existing sensitive receptors. Construction equipment should be well-maintained and used judiciously to be as quiet as possible. Additionally, construction activities for the proposed project should incorporate the following best management practices as project conditions of approval to reduce noise from construction activities near sensitive land uses:

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

- Quieter saws, cement mixers, cranes, dozers, excavators, graders, and pavers shall be selected. No individual device or piece of equipment shall produce a noise level exceeding 90 dBA at a distance of twenty-five (25) feet from the source.

- All internal combustion engine-driven equipment shall be equipped with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited. If necessary, the idling of internal combustion engines shall be limited to 5 minutes.

- Construct a solid plywood fence along the southeastern boundary of the construction site. A temporary eight-foot noise barrier would provide a minimum 6 dBA attenuation for adjacent sensitive land uses when construction activities occur at the ground level when the loudest equipment would be used (i.e., during demolition and grading phases). This would reduce L_{eq} and L_{max} noise levels for equipment to below 90 dBA at a distance of 25 feet outside the project plane when equipment operates along the project boundaries.

    - If construction Option 1 is selected, the fence would only be required to shield the community center since the preschool would no longer be a sensitive receptor.

- Erect a temporary noise control blanket barrier with a minimum height of 12 feet at the southeastern property line or on scaffolding just outside the proposed building facing the

preschool and community center during construction of the upper floors. This would control construction noise when activities do not occur at the ground level.

  - If construction Option 1 or 2 is selected, the temporary noise control blanket barrier would only be required to shield the community center since the preschool would no longer be a sensitive receptor for construction on the upper floors.

- Stationary noise-generating equipment shall be located as far as possible from sensitive receptors and property lines. If they must be located within 30 feet of receptors and property lines, adequate muffling (with barriers or enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent receptors to 90 dBA. All temporary barriers used shall be eight feet in height at a minimum, continuous from grade to top, with no cracks or gaps, and have a minimum surface density of three pounds per square foot (e.g., one-inch-thick plywood).

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

- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The contractor shall submit the construction plan to the City's Planning Division subject to the satisfaction of the Community Development Director, or his/her designee prior to the issuance of any demolition, building, and site development permit relating to the construction of the superstructure and prior to the pre-construction meeting.

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

- If construction Option 1 or 2 is selected, a condition of approval shall be required for the construction starting date.

Implementation of the above measures as project conditions of approval would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures and recognizing that noise generated by construction activities would occur over a temporary period and would not exceed the 90 dBA limit at the property line of the nearest uses, the impact would be less-than-significant.

Mitigation Measure 1a: No further mitigation required.

Impact 1b: **Permanent Noise Level Increase/Exceed Applicable Standards.** The proposed project would not result in a substantial permanent increase in noise levels or exceed applicable standards at the noise-sensitive receptors in the project vicinity. **This is a less-than-significant impact.**

Policy N 2.2 of the City's General Plan defines significant permanent noise increases depending on the existing noise environment. If the existing noise environment falls within the "normally acceptable" range for the receptors, a significant increase would occur if the project resulted in an increase of more than 5 dBA L_{dn} and the total L_{dn} exceeded the "normally acceptable" category. If the existing noise environment falls within the "conditionally acceptable" or the "unacceptable" range for the receptors, a significant increase would occur if the project resulted in an increase of more than 5 dBA L_{dn}.

Policy N 2.3 prohibits new uses from generating noise levels of 65 dBA L_{dn} or more at the property line, excluding ambient noise levels.

Operational noise is limited to the noise levels specified in Table 7.30.040, adjusted for ambient conditions. If existing conditions exceed the limits, ambient noise levels would be used as thresholds. For noise sources operating more than 30 minutes in a given hour (i.e., L_{50}), thresholds would be 50 dBA at night and 60 dBA during the day at single-family residential uses (i.e., east and southeast residences); 55 dBA at night and 60 dBA during the day at multi-family residential uses (i.e., northeast, future northwest, and future southwest residences); 60 dBA at night and 65 dBA during the day at commercial uses (i.e., north and southeast commercial uses, west and future northwest offices, and the adjoining community center and preschool); and 70 dBA anytime at industrial uses (i.e., future south parking garage).

For noise sources operating more than five minutes in a given hour (i.e., L_{08}), thresholds would be 60 dBA at night and 70 dBA during the day at single-family residential uses (i.e., east and southeast residences); 65 dBA at night and 70 dBA during the day at multi-family residential uses (i.e., northeast, future northwest, and future southwest residences); 70 dBA at night and 75 dBA during the day at commercial uses (i.e., north and southeast commercial uses, west and future northwest offices, and the adjoining community center and preschool); and 80 dBA anytime at industrial uses (i.e., future south parking garage).

Ambient noise levels measured at LT-1 range from 57 to 66 dBA L_{50} (average of 61 dBA L_{50}) during daytime hours and from 41 to 61 dBA L_{50} (average of 52 dBA L_{50}) during nighttime hours. Ambient noise levels measured at LT-2 range from 51 to 64 dBA L_{50} (average of 60 dBA L_{50}) during daytime hours and from 39 to 58 dBA L_{50} (average of 46 dBA L_{50}) during nighttime hours. Using these ambient noise levels, Table 9 summarizes the thresholds applied in this impact discussion to each of the surrounding receptors.

TABLE 9 Thresholds Applied to Each of the Surrounding Receptors

Receptor	Ambient Meter	Daytime Threshold		Nighttime Threshold	
		More than 30 minutes, dBA L_{50}	More than 5 minutes, dBA L_{08}	More than 30 minutes, dBA L_{50}	More than 5 minutes, dBA L_{08}
East Residences	LT-2	60	70	50	60
Northeast Residences	LT-2	60	70	55	65
Northeast Commercial	LT-1	61	71	60	70
North Commercial	LT-1	61	71	60	70
West Office	LT-1	61	71	60	70
Southeast Residences	LT-2	60	70	50	60
Southeast Commercial	LT-2	61	71	60	70
Future Northwest Residences	LT-1	61	71	55	65
Future Northwest Office	LT-1	61	71	60	70
Future Southwest Residences	LT-1	61	71	55	65
Future South Parking Garage	LT-2	70	80	70	80
Adjoining Community Center	LT-2	65	75	60	70
Adjoining Preschool	LT-2	65	75	60	70

Project Traffic Increase

The traffic study completed for the original project in 2023 included peak hour turning movements for six intersections in the project vicinity for the existing traffic volumes. When project trips were added to the existing traffic volumes, the existing plus project scenario was estimated. By comparing the existing plus project traffic volumes to the existing volumes, the project's contribution to the overall noise level increase was determined to be less than 1 dBA L_{dn} along each roadway segment in the project vicinity. An update to the traffic study was not required for the updated 2024 project with a smaller footprint on the block since the updated project would generate fewer project trips. Therefore, the updated project would result in a permanent noise level increase of less than 1 dBA L_{dn} and would not result in a permanent noise increase of 5 dBA L_{dn} or more at noise-sensitive receptors in the project vicinity. This would be a less-than-significant impact.

Mechanical Equipment

The site plan shows the following ground-level equipment: two office transformers and one residential transformer located inside the building in the eastern corner, and an emergency generator located in the fire room along the southwestern building façade. Other electrical rooms are shown on the ground floor, but equipment located within these rooms would not generate noise levels audible at the property line. Additionally, the roof plan shows solar panels and heating, ventilation, and air conditioning (HVAC) units.

Ground-Level Mechanical Equipment

Transformers up to 1,000 kVA typically generate noise levels up to 64 dB, as measured at 1 meter (3.28 feet). Assuming both transformers run continuously during daytime and nighttime hours, the hourly average noise level would be 67 dBA L_{eq} at 1 meter, and the day-night average noise level would be 73 dBA L_{dn} at a distance of 1 meter. The building façade would provide about 20 dBA attenuation for surrounding receptors.

Due to the location of the transformer rooms, the only receptors potentially exposed to transformer noise would include the east residences, northeast residences and commercial uses, north commercial uses, southeast residences and commercial uses, the adjoining community center, and the adjoining preschool. Table 10 summarizes the expected operational noise levels due to the transformers.

The applicant has indicated that a Generac 400 kW industrial spark-ignited generator set would be used for the project. According to the manufacturer's specification sheet, source levels for this generator would be 92 dBA at 23 feet with a standard enclosure, 84 dBA at 23 feet with a Level 1 Acoustic Enclosure, and 75 dBA at 23 feet with a Level 2 Acoustic Enclosure. Emergency generators do not typically run continuously, as they operate during emergency situations when the noise level restrictions would not typically apply. However, emergency equipment is tested monthly for a period of one hour between 7:00 a.m. and 10:00 p.m. to ensure the equipment is operating efficiently in case an emergency occurs. During the monthly testing periods, the noise level thresholds would apply. The building wall assembly would provide an additional 20 dBA attenuation, which is assumed for this analysis.

Due to the location of the fire room, the only receptors potentially exposed to noise from the generator would include the west offices, the future northwest mixed-use building, the future southwest residences, the future south parking garage, and the adjoining community center. Table 11 summarizes the expected operational noise levels due to the emergency generator.

Based on the estimated noise levels in Tables 10 and 11, the ground-level mechanical equipment would not exceed the City's daytime or nighttime thresholds at the receptors with direct exposure to the equipment. Note, the emergency generator noise levels are only subject to the daytime noise limits during the monthly testing periods and would not be subject to the nighttime thresholds. For all existing receptors, the noise level increase due to ground-level equipment would not be measurable or detectable (0 dBA L_{dn} increase), resulting in a less-than-significant impact.

TABLE 10 Operational Noise Levels from Ground-Level Transformers

Receptor	Distance from Center of Transformers, feet	L_{eq}, dBA	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
East Residences	160	< 20[a]	< 20[a]	0
Northeast Residences & Commercial	105	< 20[a]	23[a]	0
North Commercial	260	< 20[a]	< 20[a]	0
Southeast Residences & Commercial	125	< 20[a]	22[a]	0
Adjoining Community Center	130	< 20[a]	22[a]	0
Adjoining Preschool	20	31[a]	38[a]	0

[a] Conservative 20 dBA noise level attenuation is assumed due to the wall assembly of the building.

TABLE 11 Operational Noise Levels from Ground-Level Emergency Generator

Receptor	Distance from Center of Fire Room, feet	L_{eq}, dBA	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
West Offices	150	56[a,b] 48[a,c] 39[a,d]	42[a,b] 34[a,c] 25[a,d]	0
Future Northwest Residences & Offices	105	59[a,b] 51[a,c] 42[a,d]	45[a,b] 37[a,c] 28[a,d]	N/A[e]
Future Southwest Residences	90	60[a,b] 52[a,c] 43[a,d]	46[a,b] 38[a,c] 29[a,d]	N/A[e]
Future South Parking Garage	265	51[a,b] 43[a,c] 34[a,d]	37[a,b] 29[a,c] 20[a,d]	N/A[e]
Adjoining Community Center	90	60[a,b] 52[a,c] 43[a,d]	46[a,b] 38[a,c] 29[a,d]	0

[a] Conservative 20 dBA noise level attenuation is assumed due to the wall assembly of the building.
[b] Levels estimated assuming the standard enclosure.
[c] Levels estimated assuming the Level 1 Acoustic Enclosure.
[d] Levels estimated assuming the Level 2 Acoustic Enclosure.
[e] A noise level increase would not occur at future residences since occupants of this building would not be subject to existing conditions.

Rooftop Equipment

Rooftop equipment shows two mechanical yards. The main mechanical yard would include 35 residential HVAC equipment, solar panels, two energy recovery ventilators (ERV), make-up air handlers, and 16 variable refrigerant flow (VRF) condenser units. The southern mechanical yard would include 16 residential HVAC units.

Noise levels produced by residential HVAC units typically range from 53 to 63 dBA at 3 feet during operation. Solar panels do not generate measurable or detectable noise levels at the project boundaries. Noise source levels for ERVs would range from 68 dBA at the return to 78 dBA at the discharge and fan, as measured at 1 meter (about 3 feet). Noise source levels for each VRF would range from 64 to 67 dBA at 1 meter (about 3 feet). The total noise generated at the main mechanical yard would be 85 dBA L_{eq} at 3 feet, assuming all equipment runs continuously throughout a given hour, and the total noise generated at the southeast yard would be 75 dBA L_{eq} at 3 feet.

Each of these unit types would cycle on and off continuously during both daytime and nighttime hours. Considering worst-case conditions, this analysis assumes all rooftop equipment operates continuously each hour in a 24-hour period. Under this assumption, the main mechanical yard would generate a day-night average noise level of 91 dBA L_{dn} at 3 feet, and the southeast yard would generate a day-night average noise level of 82 dBA L_{dn} at 3 feet.

The roof would be surrounded by a 7.5-foot ridge, which would provide a minimum attenuation of 15 dBA for all surrounding receptors below five stories when combined with the elevation of the equipment. The roof ridge would provide a minimum 10 dBA attenuation for elevated receptors, including the future northwest and southwest buildings.

Table 12 summarizes the hourly average noise levels and day-night average noise levels expected at the property lines of the nearest surrounding receptors, assuming the minimum attenuation for the rooftop equipment.

Based on the estimated noise levels in Table 12, the rooftop equipment would not exceed the City's daytime or nighttime thresholds at the surrounding receptors. For all existing receptors, the noise level increase due to rooftop equipment would not be measurable or detectable (i.e., 0 dBA L_{dn} increase), resulting in a less-than-significant impact.

TABLE 12 Operational Noise Levels from the Rooftop Equipment

Receptor	Main Yard		Southeast Yard		Combined		Noise Level Increase, dBA L_{dn}
	Distance from Center of Equipment, feet	L_{eq}, dBA	Distance from Center of Equipment, feet	L_{eq}, dBA	L_{eq}, dBA	L_{dn}, dBA	
East Residences	300	30[a]	195	24[a]	31	37	0
NE Residences & Commercial	200	33[a]	115	28[a]	34	41	0
North Commercial	260	31[a]	255	22[a]	31	38	0
West Offices	225	32[a]	330	< 20[a]	32	39	0
SE Residences & Commercial	215	33[a]	145	26[a]	33	40	0
Future NW Residences & Offices	140	41[b]	210	28[b]	41	48	N/A[c]
Future SW Residences	160	40[b]	235	27[b]	40	47	N/A[c]
Future South Parking Garage	270	31[a]	280	21[a]	31	37	N/A[c]
Adjoining Community Center	60	44[a]	105	29[a]	44	50	0
Adjoining Preschool	120	38[a]	40	38[a]	41	47	0

[a] Conservative 15 dBA noise level attenuation is assumed due to the building façade and the 7.5-foot ridge along the perimeter of the roof.
[b] Conservative 10 dBA noise level attenuation is assumed for elevated receptors due to the rooftop ridges.
[c] A noise level increase would not occur at future residences since occupants of this building would not be subject to existing conditions.

Truck Loading and Unloading

The site plan shows a residential loading zone and an office loading zone along the southwestern façade, facing the future residential building. This future residential building, as well as the existing west office building and south future parking garage, would potentially be exposed to truck loading and unloading activities. Due to the location of the loading zones, all other receptors surrounding the site would be shielded from the truck loading and unloading activities. For all loading and unloading activities, including trash pickup, truck maneuvering would take more than five minutes but less than 15 minutes per delivery.

Truck maneuvering noise would include a combination of engine, exhaust, and tire noise, as well as the intermittent sounds of back-up alarms and releases of compressed air associated with truck/trailer air brakes. For offices, small commercial retail, and multi-family residences, medium-sized delivery trucks would be expected at the proposed building. Medium-sized delivery trucks typically generate maximum noise levels of 60 to 65 dBA at 50 feet. The noise level of backup alarms can vary depending on the type and directivity of the sound, but maximum noise levels are typically in the range of 65 to 75 dBA at a distance of 50 feet.

It is assumed that up to two deliveries associated with the office and commercial retail uses would occur weekly, and up to two deliveries associated with the residential use would occur weekly. The site plan shows that both loading areas are set into the building, so the proposed building would provide some shielding. Conservatively, 5 dBA attenuation is assumed for the proposed project.

Table 13 summarizes expected noise levels generated by typical truck deliveries at the receptors with exposure to the loading areas.

Based on the estimated noise levels in Table 13, truck loading/unloading activities would not exceed the City's L_{08} daytime thresholds, which are summarized in Table 9, at the receptors with direct line-of-sight to the loading areas. For all existing receptors, the noise level increase due to truck loading/unloading activities would not be measurable or detectable (i.e., 0 dBA L_{dn} increase), resulting in a less-than-significant impact.

TABLE 13 Operational Noise Levels due to Truck Loading and Unloading Activities

Receptor	Office Loading Area		Residential Loading Area		Combined		Noise Level Increase, dBA L_{dn}
	Distance from Center of Loading Area, feet	Noise Levels from Truck Deliveries, dBA L_{08}	Distance from Center of Loading Area, feet	Noise Levels from Truck Deliveries, dBA L_{08}	L_{08}, dBA	L_{dn}, dBA	
West Offices	175	44 to 49[a]	195	43 to 48[a]	52	30	0
Future Southwest Residences	75	52 to 57[a]	75	52 to 57[a]	60	38	N/A[b]
Future South Parking Garage	225	42 to 47[a]	210	43 to 48[a]	50	29	N/A[b]

[a] Conservative 5 dBA noise level attenuation is assumed due to a building façade.
[b] A noise level increase would not occur at future residences since occupants of this building would not be subject to existing conditions.

Total Combined Project-Generated Noise

The operational noise levels produced by the proposed project combined (i.e., traffic, mechanical equipment, and truck loading/unloading activities) would result in an increase of less than 1 dBA L_{dn} at all existing noise-sensitive receptors surrounding the project site. Therefore, the proposed project would not result in a substantial increase over ambient noise levels in the project vicinity. Further, operational noise levels would not exceed the City's daytime or nighttime thresholds at the property lines of the surrounding existing and future receptors or exceed ambient levels at the surrounding land uses. This is a less-than-significant impact.

Mitigation Measure 1b: None required.

Impact 2: Exposure to Excessive Groundborne Vibration. Construction-related vibration levels would not exceed applicable vibration thresholds at nearby sensitive land uses. **This is a less-than-significant impact.**

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

The California Department of Transportation (Caltrans) recommends a vibration limit of 0.5 in/sec PPV for new residential and modern commercial/industrial structures, which typically consist of buildings constructed since the 1990s. A vibration limit of 0.3 in/sec PPV is used for older residential structures, which would apply to most structures built since the 1940s. For historical buildings or some older buildings, a vibration limit of 0.25 in/sec PPV would apply. These vibration limits are conservative and designed to provide protection for existing buildings in California. Vibration levels exceeding these thresholds would be capable of cosmetically damaging adjacent buildings. Cosmetic damage (also known as threshold damage) is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint, or the dislodging of loose objects. Minor damage is defined as hairline cracking in masonry or the loosening of plaster. Major structural damage is defined as wide cracking or the shifting of foundation or bearing walls.

The future buildings to the northwest, to the southwest, and to the south, as well as the newer office building to the west, would be new construction buildings subject to the 0.5 in/sec PPV threshold. All structures to the east, to the northeast, to the north, to the southeast, and the existing adjoining preschool would be conventional buildings of unknown age. Conservatively, these buildings would be subject to the 0.3 in/sec PPV threshold. The adjoining community center located at 415 Claremont Street is a historical building subject to the 0.25 in/sec PPV threshold. The next nearest historical building is located at 273 Railroad Avenue, which is approximately 490 feet from the project site boundary. At this distance, vibration levels due to construction activity would be at or below 0.008 in/sec PPV, which would be well below the 0.25 in/sec PPV threshold.

Table 14 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock

drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet.

Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 14 also summarizes the distances to the 0.25 in/sec PPV threshold for historical buildings, to the 0.3 in/sec PPV threshold for all conventional buildings, and to the 0.5 in/sec PPV threshold for buildings of new construction materials.

TABLE 14 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft., in/sec	Minimum Distance to Mett Threshold, feet		
			0.25 in/sec PPV	0.3 in/sec PPV	0.5 in/sec PPV
Clam shovel drop		0.202	21	18	11
Hydromill (slurry wall)	in soil	0.008	2	1	<1
	in rock	0.017	3	2	2
Vibratory Roller		0.210	22	19	12
Hoe Ram		0.089	10	9	6
Large bulldozer		0.089	10	9	6
Caisson drilling		0.089	10	9	6
Loaded trucks		0.076	9	8	5
Jackhammer		0.035	5	4	4
Small bulldozer		0.003	1	<1	<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., September 2024.

Vibration levels are highest close to the source and then attenuate with increasing distance at the rate $\left({}^{D_{ref}}/_{D}\right)^{1.1}$, where D is the distance from the source in feet, and D_{ref} is the reference distance of 25 feet. While construction noise levels increase based on the cumulative equipment in use simultaneously, construction vibration levels would be dependent on the location of individual pieces of equipment. That is, equipment scattered throughout the site would not generate a collective vibration level, but a vibratory roller, for instance, operating near the project site boundary would generate the worst-case vibration levels for the receptor sharing that property line. Further, construction vibration impacts are assessed based on the potential for damage to buildings on receiving land uses, not at receptors at the nearest property lines.

All buildings located opposite East 4th Avenue, South Claremont Street, South Delaware Street, and East 5th Avenue would be 50 feet or more from the nearest project site boundary. At this distance, vibration levels would be at or below 0.1 in/sec PPV, which would be below the 0.3 and 0.5 in/sec PPV thresholds. The adjoining historical and conventional buildings, however, would both be about 5 feet from the southeastern project boundary. Table 15 summarizes the vibration levels expected at these distances.

TABLE 15 Vibration Levels Estimated at the Adjoining Historical and Conventional Buildings

Phase	Equipment	PPV at 25 ft., in/sec	Adjoining Buildings, 5 feet	
			415 South Claremont Street Historical Building	Safari Kids' Preschool Conventional Building
Demolition	Concrete/Industrial Saw	0.003	0.018	0.018
	Rubber-Tired Dozer	0.089	**0.523**	**0.523**
	Tractor/Loader/Backhoe	0.003	0.018	0.018
Site Preparation	Rubber-Tired Dozer	0.089	**0.523**	**0.523**
	Tractor/Loader/Backhoe	0.003	0.018	0.018
Grading/ Excavation	Grader	0.089	**0.523**	**0.523**
	Rubber-Tired Dozer	0.089	**0.523**	**0.523**
	Tractor/Loader/Backhoe	0.003	0.018	0.018
Building – Exterior	Crane	0.003	0.018	0.018
	Forklift	0.003	0.018	0.018
	Generator Set	0.003	0.018	0.018
	Tractor/Loader/Backhoe	0.003	0.018	0.018
	Welder	0.003	0.018	0.018
Paving	Paver	0.003	0.018	0.018
	Paving Equipment	0.003	0.018	0.018
	Roller	0.21	**1.233**	**1.233**
Building – Interior/ Architectural Coating	Air Compressor	0.003	0.018	0.018

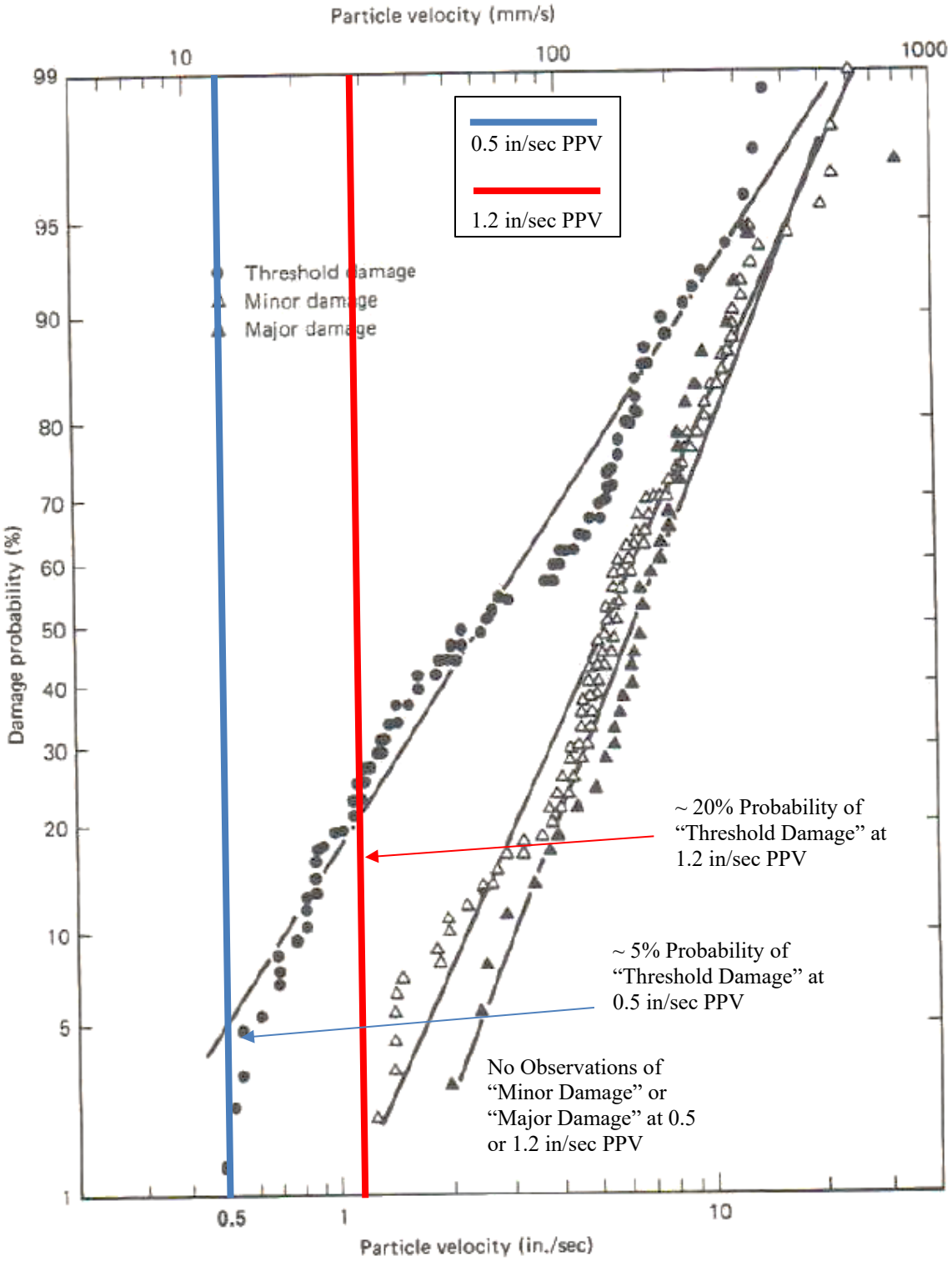
Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., September 2024.

A study completed by the US Bureau of Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507.[1] The findings of this study have been applied to buildings affected by construction-generated vibrations.[2] As reported in USBM RI 8507[1] and reproduced by Dowding,[2] Figure 3 presents the damage probability, in terms of "threshold damage" (described above as cosmetic damage), "minor damage," and "major damage," at varying vibration levels, which are described above. As shown in Figure 3, maximum vibration levels of 0.5 in/sec PPV would result in about 5% chance of cosmetic damage, while maximum vibration levels of 1.2 in/sec PPV would result in about 20% chance of cosmetic damage. No minor or major damage would be expected at the buildings immediately adjoining the project site.

[1] 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.

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

FIGURE 3 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

Neither cosmetic, minor, nor major damage would occur at historical or conventional buildings located 60 feet or more from the project site. At these locations, and in other surrounding areas where vibration would not be expected to cause cosmetic damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during daytime hours, the effects of perceptible vibration can be kept to a minimum.

In summary, the use of rubber-tired dozers or graders within 10 feet of the adjoining historical structure (i.e., the community center) or within 9 feet of the adjoining conventional building (i.e., the preschool) would result in vibration levels exceeding the applicable thresholds of 0.25 and 0.3 in/sec PPV, respectively. Additionally, the use of vibratory rollers with 21 feet of the adjoining historical structure (i.e., the community center) or within 19 feet of the adjoining conventional building (i.e., the preschool) would result in vibration levels exceeding the applicable thresholds. This would be a potentially significant impact.

Mitigation Measure 2:

The applicant and contractor shall implement the following measures to reduce construction vibration levels:

- A list of all heavy construction equipment to be used for this project known to produce high vibration levels (e.g., tracked vehicles, vibratory compaction, jackhammers, hoe rams, clam shovel drop, and vibratory roller, etc.) shall be submitted to the City by the contractor as well as a list of smaller equipment (less than 18,000 pounds) to be used near the southeastern property line.

- Smaller equipment (less than 18,000 pounds) shall be used near the property lines adjacent to the historical building to minimize vibration levels at the adjacent southeastern building (i.e., the community center) and the conventional building to the southeast (i.e., the preschool). For example, a smaller vibratory roller similar to a Caterpillar model CP433E vibratory compactor could be used when compacting materials within 25 feet of the adjacent historical and conventional buildings to the southeast. The smaller equipment intended to implement this requirement shall be individually identified among the list of equipment required under the above condition as the subset of equipment allowed for use at the property lines.

- Avoid dropping heavy equipment and using vibratory rollers within 25 feet of sensitive structures to the southeast. Use alternative methods for breaking up existing pavement, such as a pavement grinder, instead of dropping heavy objects, within 25 feet of the adjacent southeastern buildings. Select demolition methods that do not involve large impact tools such as hoe-rams within 25 feet of the shared property line with historical and conventional buildings to the southeast. Portable jackhammers, saws, or grinders shall be used to minimize impacts to the ground.

- Where heavy, vibration-generating equipment is required within 25 feet of the adjoining buildings and smaller equipment or alternative construction methods cannot be substituted, a Construction Vibration Monitoring Plan shall be required to document conditions prior to, during, and after vibration generating demolition and construction activities. All monitoring plan tasks shall be undertaken under the direction of a licensed Professional Engineer in the State of California. Initial placement of sensors, data, and corrective actions shall be reviewed by a licensed Professional Structural Engineer in the State of California and shall demonstrate how vibration levels during demolition and construction will not exceed 0.25 in/sec Peak Particle Velocity (PPV) at the adjacent historical building (i.e., the community center) and at the adjacent conventional building (i.e., the preschool) directly southeast of the project site, subject to all standards and best management practices, in accordance with industry-accepted standard methods. The Construction Vibration Monitoring Plan shall include, but not be limited to, the following measures to address any potential cosmetic damage:

    - The Construction Vibration Monitoring Plan shall be submitted to the Building and Planning Division subject to satisfaction of the Community Development Director, or his/her designee, prior to issuance of any demolition, grading, or building permits, whichever occurs first.

    - A description of measurement methods, equipment used, calibration certificates, and graphics as required to clearly identify vibration-monitoring locations.

    - A list of all construction equipment to be used and the anticipated time of duration shall be submitted by the contractor.

    - Document conditions at all structures located within 25 feet of construction site, where access is granted, prior to, during, and after vibration-generating construction activities. Perform a photo survey, elevation survey, and crack monitoring survey prior to any construction activity, at the end of each phase of construction, and after project completion, and shall include internal and external crack monitoring in structures, settlement, and distress, and shall document the condition of foundations, walls and other structural elements in the interior and exterior of said structures. Where the crack survey identifies damage to adjacent buildings, the applicant shall be responsible for any repairs.

    - A plan to identify structures where and when monitoring would be conducted. If vibration levels exceed the limits, suspend construction and implement contingency measures to either lower vibration levels or secure the affected structures.

    - The applicant or their designated contractor shall identify a “disturbance coordinator” responsible for registering and investigating claims of excessive vibration. The disturbance coordinator shall determine the cause of the complaint and shall require that measures be implemented to reduce the vibration impact. The applicant or their designated contractor shall 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 schedule.

- A completed monitoring report and findings of the crack surveys and any repairs done shall be made available to the Building and Planning Division prior to final building inspection for the demolition and final occupancy.

Implementation of these measures would reduce the vibration activities during construction by limiting the use of heavy vibration-generating equipment and requiring alternative approaches to ground disturbing activities. Where vibration below 0.25 in/sec PPV nonetheless results in cosmetic damage to buildings, additional measures are incorporated to restore receiving buildings to preconstruction conditions, if required. Accordingly, the project would have a less-than-significant impact from generation of groundborne vibration.

Impact 3: **Excessive Aircraft Noise.** The project site is located about 3.7 miles from the San Francisco International Airport. The noise environment attributable to aircraft is considered normally acceptable. This is a **less-than-significant** impact.

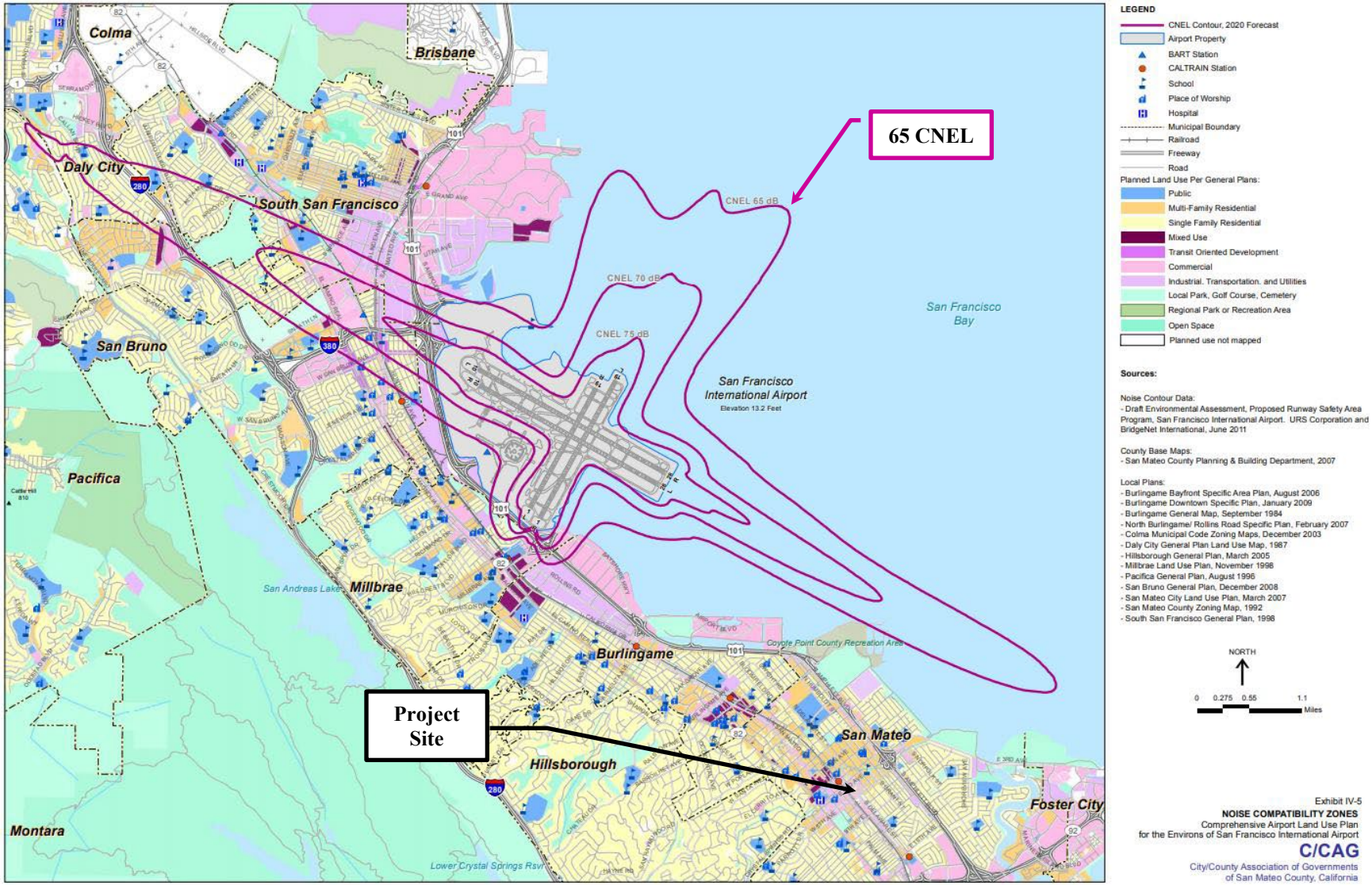
The San Francisco International Airport is a public-use airport located about 3.7 miles northwest of the project site. According to the *Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport*,[3] the project site lies well outside the 65 dBA CNEL/L_{dn} noise contour (see Figure 3), and the required safe and compatible threshold for exterior noise levels would be at or below 65 dBA CNEL/L_{dn} for aircraft. Therefore, the proposed project would be compatible with the exterior noise standards for aircraft noise.

Assuming standard construction materials for aircraft noise below 60 dBA L_{dn}, the future interior noise levels resulting from aircraft would be below 45 dBA L_{dn}. Therefore, future interior noise at the proposed building would be compatible with aircraft noise. This would be a less-than-significant impact.

Mitigation Measure 3: **None required.**

[3] Ricondo & Associates, Inc. with Jacobs Consultancy and Clarion Associates, *Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport*, November 2012.

FIGURE 3 2020 CNEL Noise Contours for San Francisco International Airport Relative to Project Site



Cumulative Impacts

Cumulative noise impacts would include temporary construction noise from 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 L_{dn} or greater for future levels exceeding the normally acceptable threshold; and 2) if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA L_{dn} or more attributable solely to the proposed project.

Cumulative (no project) and cumulative plus project peak hour traffic volumes were included in the traffic study. When cumulative (no project) and cumulative plus project traffic volumes were compared to the existing peak hour volumes, an increase of 3 dBA L_{dn} or more was calculated along one roadway segment: East 5th Avenue, east of South Delaware Street. However, the same noise level increase was estimated under both cumulative (no project) and cumulative plus project traffic conditions, which means the project would not result in a cumulatively considerable contribution to the overall traffic noise increase. All other segments in the project vicinity would result in a 2 dBA L_{dn} or less increase under cumulative (no project) and cumulative plus project scenarios. Therefore, the project would not cause a significant cumulative noise increase at noise-sensitive uses in the project vicinity.

The City of San Mateo has identified one development project located within 500 feet of the proposed Block 20 project site:

- **Block 21** – this project is located northwest of the project site, opposite East 4th Avenue, and was treated as a future receptor in this report. This mixed-use project has been approved but has not yet been constructed. It is expected that construction will start soon and be completed before the proposed Block 20 construction starts. Therefore, a significant cumulative construction impact would not occur.

- **Kiku Crossing and 5th Avenue Garage** – this project is a residential building and parking garage currently being constructed southwest of the project site, opposite South Claremont Street. This project would be completed before the proposed Block 20 construction starts. Therefore, a significant cumulative construction impact would not occur.

- **435 East 3rd Avenue** – this five-story mixed-use building project is located approximately 430 feet northwest of the project site. This project has been approved and is expected to be constructed before Block 20 construction begins. There would be no shared receptors with direct line-of-sight of Block 20; therefore, a significant cumulative construction impact would not occur.

- **Post + Beam** – this seven-story mixed-use building project is located at 668 East 3rd Avenue, which is approximately 240 feet north of the project site. This project is in the planning review process and could be constructed simultaneously or consecutively as Block 20. The shared receptors with direct line-of-sight to both project sites would include

the commercial buildings to the north of the project site. The nearest property line of the north commercial receptor would be 120 feet from the northernmost property line of Block 20. At this distance, maximum construction noise levels, assuming all equipment per phase is operating simultaneously. would range from 66 to 80 dBA L_{eq}. This would represent the loudest possible construction noise levels that could occur due to the proposed project. When activities are scattered throughout the site, noise levels due to construction activity would be lower. Since the Post + Beam site would adjoin the north commercial properties, construction of that project would dominate the noise environment. Therefore, with the incorporation of construction mitigation measures recommended from both projects, the cumulative construction impact would be reduced to a less-than-significant level.

- **445 South B Street** – this new mixed-use project is located approximately 500 feet southwest of the project site. This project is in the planning review phase and would not share receptors with Block 20. Since there would be no shared receptors with direct line-of-sight of Block 20, a significant cumulative construction impact would not occur.

No other planned or approved projects would be located within 500 feet of the proposed project site. The potential cumulative construction impact would be less-than-significant.

APPENDIX

FIGURE A1 Daily Trend in Noise Levels at LT-1, Tuesday, August 1, 2023

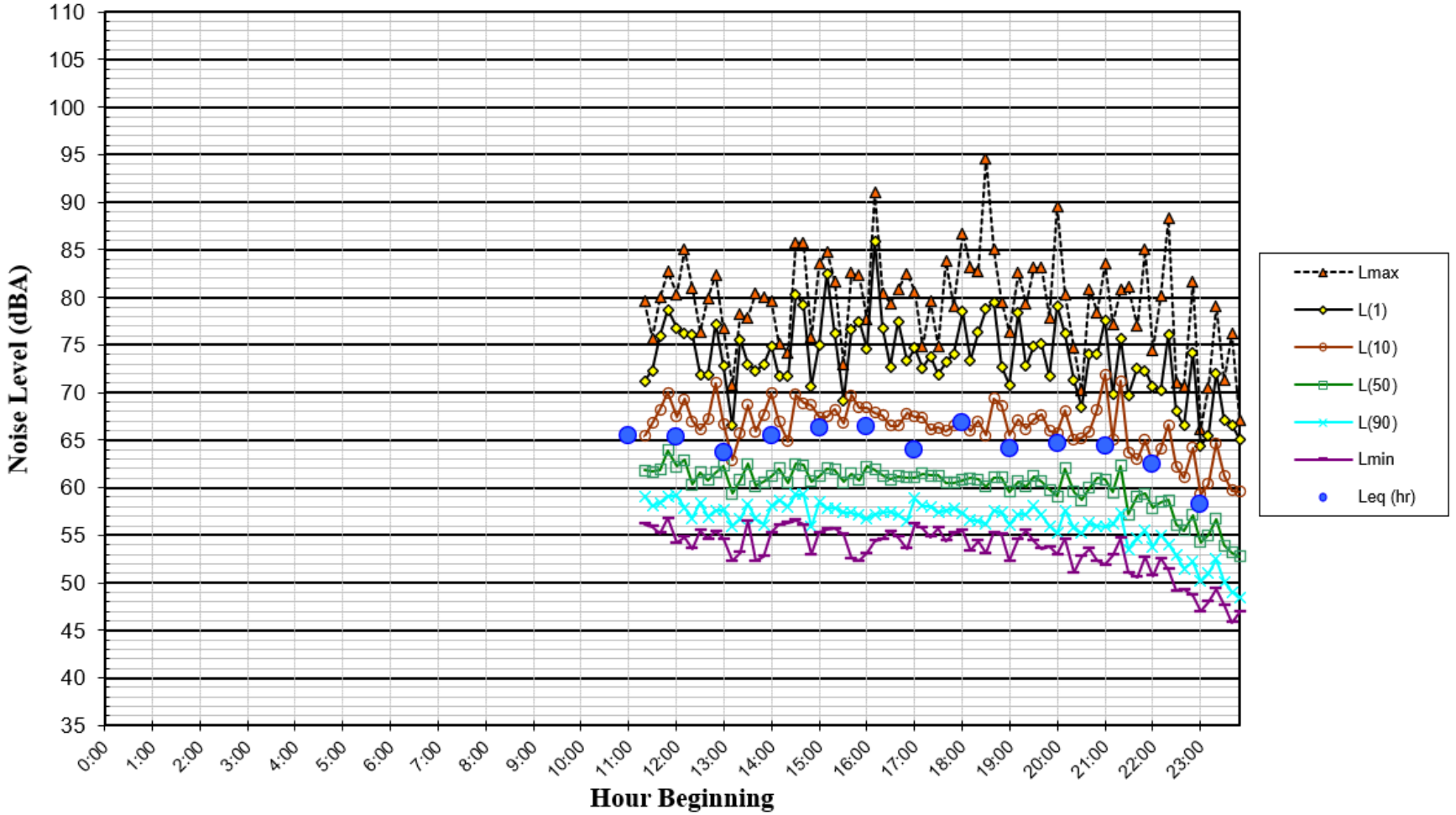


FIGURE A2 Daily Trend in Noise Levels at LT-1, Wednesday, August 2, 2023

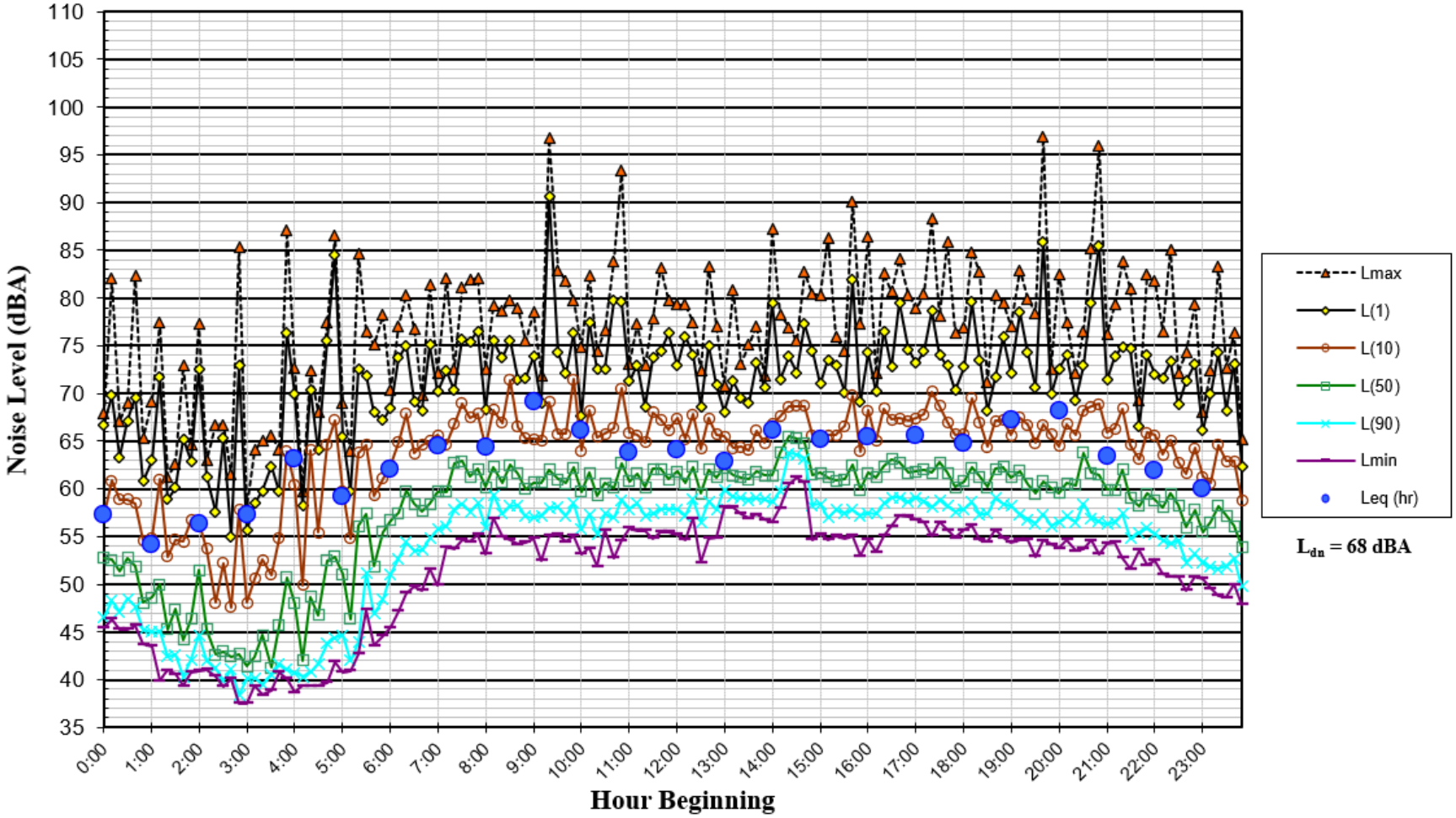


FIGURE A3 Daily Trend in Noise Levels at LT-1, Thursday, August 3, 2023

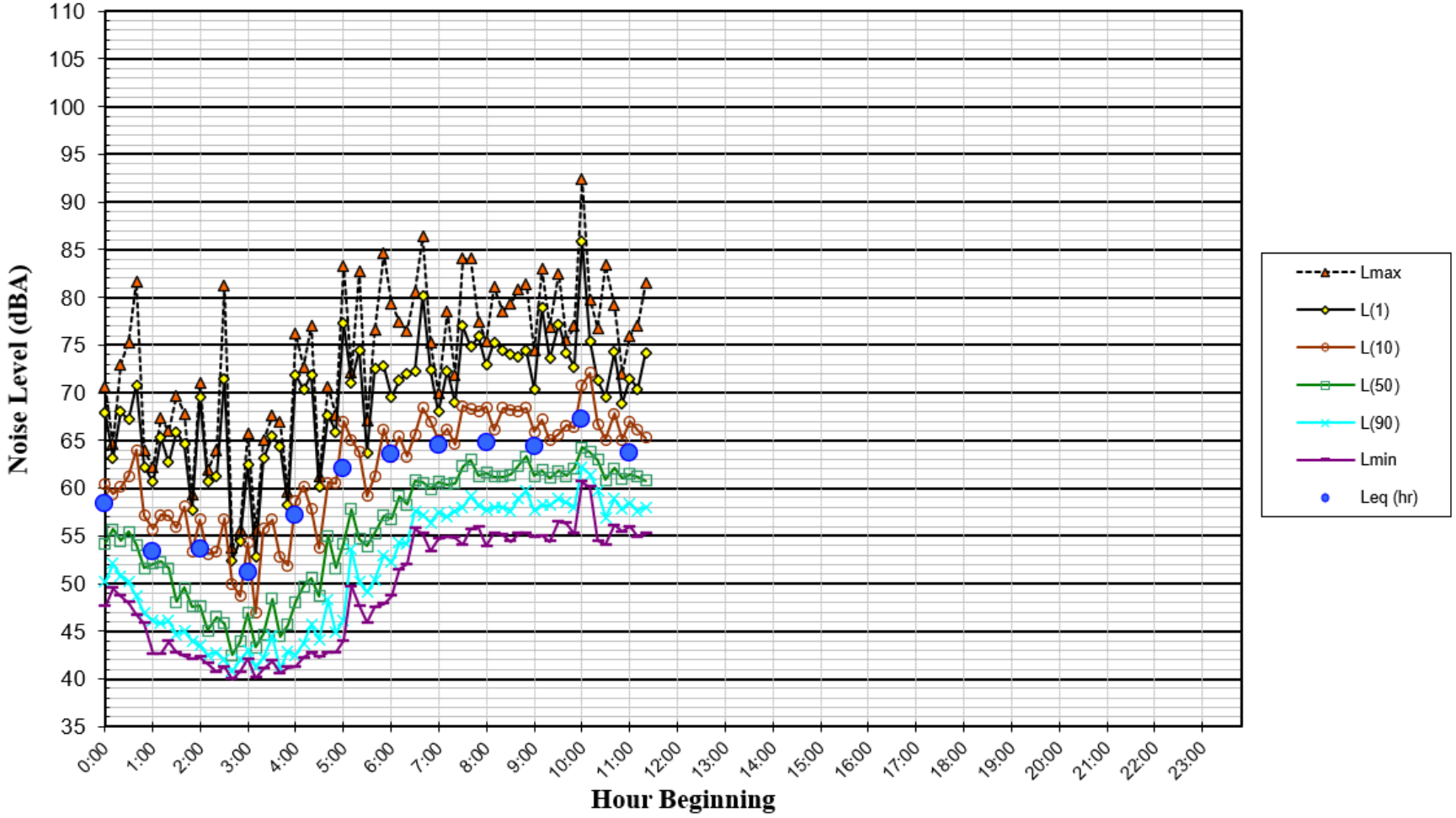


FIGURE A4 Daily Trend in Noise Levels at LT-2, Tuesday, August 1, 2023

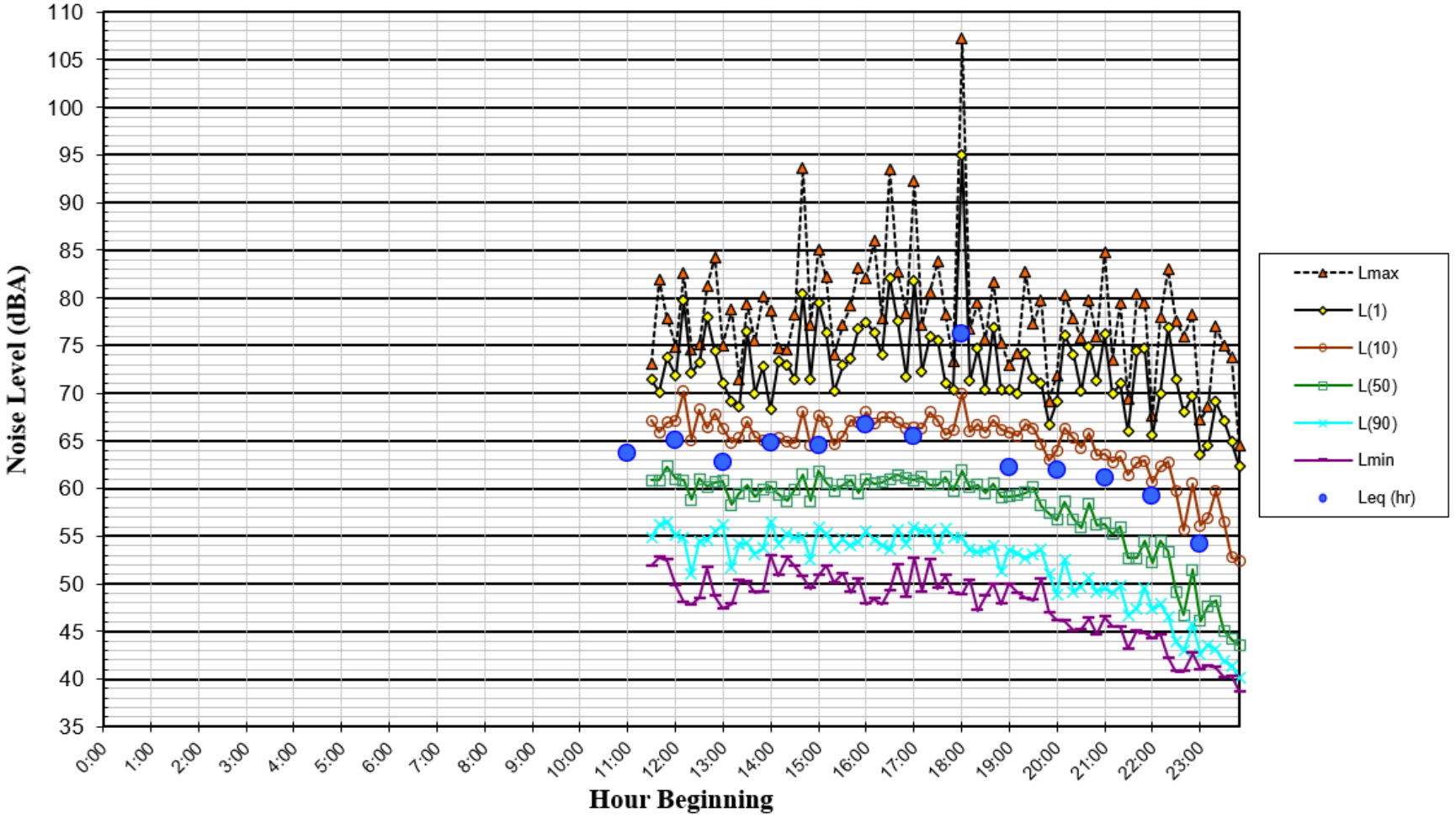


FIGURE A5 Daily Trend in Noise Levels at LT-2, Wednesday, August 2, 2023

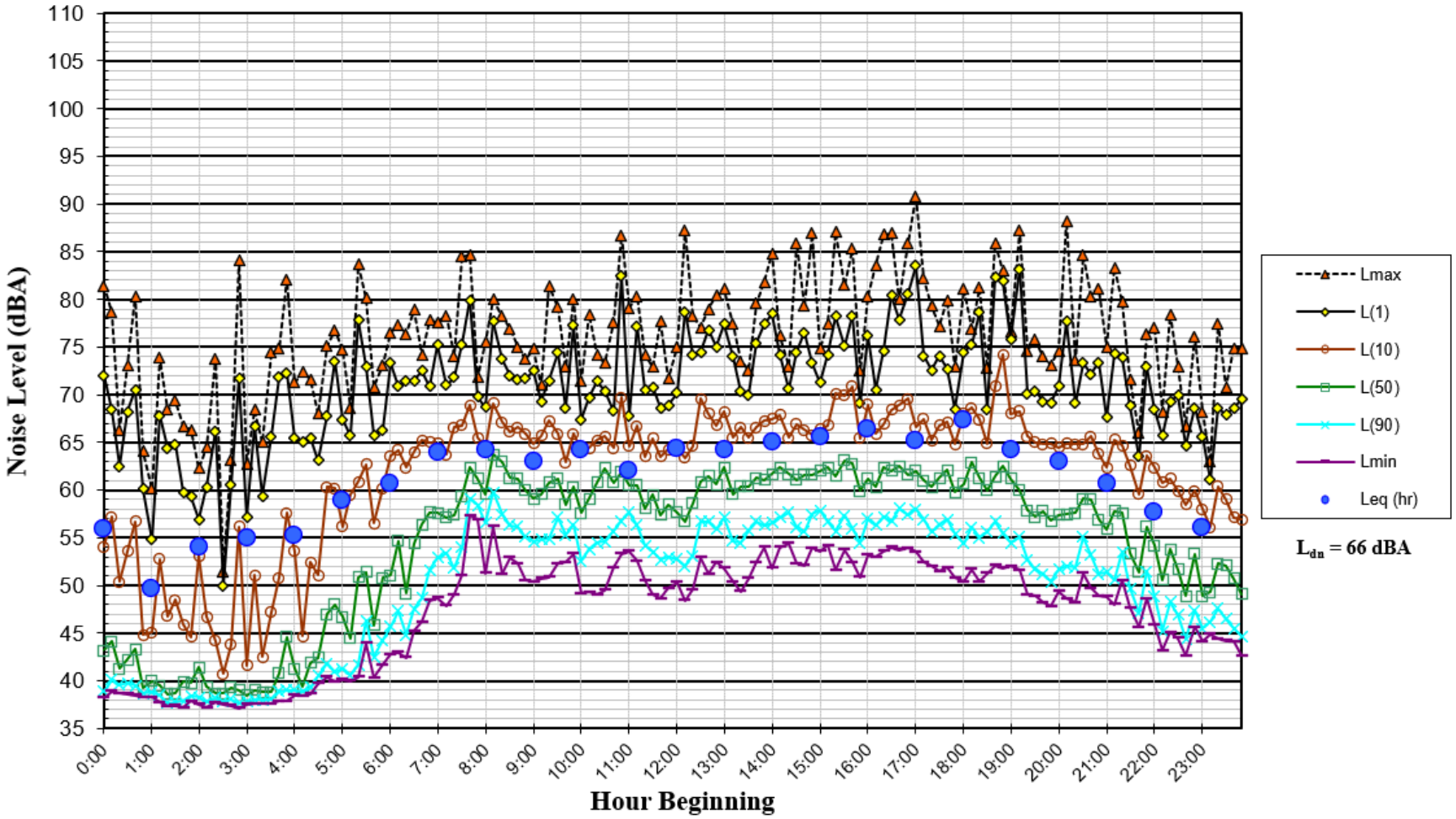


FIGURE A6 Daily Trend in Noise Levels at LT-2, Thursday, August 3, 2023

