Appendix E

Noise and Vibration Assessment

Ravenswood/Four Corners Specific Plan Update SEIR

RAVENSWOOD/4 CORNERS TOD SPECIFIC PLAN UPDATE SEIR NOISE AND VIBRATION ASSESSMENT

EAST PALO ALTO, CALIFORNIA

May 17, 2023

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INTRODUCTION

The approximately 207-acre Ravenswood Business District/4 Corners Transit-Oriented Development Specific Plan Update (Specific Plan Update) area is located in the northeastern portion of East Palo Alto. The project area is generally bounded by the City limits/Union Pacific Railroad (UPRR) tracks to the north, the western edge of the Union Pacific Railroad easement along the back of Illinois Street to the west, Weeks Street or Runnymede Street to the south, and the Ravenswood Open Space Preserve and Palo Alto Baylands Nature Preserve to the east. Existing development within the Specific Plan area includes single-family and multi-family residential, retail, medical office, light and general industrial, and civic/institutional land uses. University Village, a single-family neighborhood located immediately east of University Avenue, was formerly located within the Specific Plan area but has been removed in the updated Specific Plan (the Specific Plan Update area is therefore a smaller subset of the original 2013 Ravenswood Specific Plan area which was 350 acres in size). No land use changes are proposed for the University Village neighborhood.

The proposed Specific Plan Update would increase the total amount of development allowed within the Specific Plan area by increasing the maximum square footages for office, R&D/life science, light industrial, civic/community, and tenant amenity, and the total number of residential units allowed under the Specific Plan.

The Supplemental Environmental Impact Report (SEIR) evaluates two development scenarios: Scenario #1 consists of 2.82 million square feet (sf) of office and R&D and 1,350 residential units; Scenario #2 consists of 3.35 million sf of office and R&D and 1,600 residential units. Compared to the 2013 Specific Plan, the proposed update could result in increasing the allowable intensity and height for some land use designations, and a decreasing the allowable intensity and height for others. Under both Buildout Scenarios, all proposed increases in non-residential development square footage would occur on parcels within the Specific Plan Area that currently allow such non-residential land uses. In contrast, the proposed Specific Plan Update would allow for residential uses in more zones/parcels than what is allowed under the 2013 Specific Plan.

The proposed Specific Plan Update also includes amendments to the East Palo Alto General Plan and Zoning Ordinance, which would amend certain existing land use designations in the Specific Plan Area and update existing or establish new development standards to replace current zoning provisions applicable to the Specific Plan area. The future exact allocation of that development will be determined by project-specific applications and approvals but will not exceed the total under cleared this SEIR.

This report evaluates the potential to result in significant noise and vibration impacts with respect to California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses noise and land use compatibility utilizing policies in the City of East Palo Alto's General Plan; and 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate impacts that would result from

implementation of the Specific Plan upon sensitive receptors at a programmatic level, provides a discussion of each impact, and presents measures, where necessary, to mitigate the impacts.

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 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 ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

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

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

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added

to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

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

Annoyance

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

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro-Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro-Pascals (or 20 micro-Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro-Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels 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 addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

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

TABLE 2 Typical Noise Levels in the Environment

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

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2018.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One is the Peak Particle Velocity (PPV) and another is the Root Mean Square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration. 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.

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. In high noise environments, that are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

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 induce structural 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. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. 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.
Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. 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.

Table 3 displays continuous vibration impacts on human annoyance and on buildings. As discussed previously, annoyance is a subjective measure and vibrations may be found to be annoying at much 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.

TABLE 3 Reactions of People and Damage to Buildings From Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect.
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure.
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected.
0.1	Strongly perceptible	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.

Regulatory Background

This section describes the relevant guidelines, policies, and standards established by Federal and State Agencies, Santa Clara County, and the City of East Palo Alto. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

Federal

U.S. Department of Housing and Urban Development (HUD)

HUD environmental criteria and standards are presented in 24 CFR Part 51. New residential construction qualifying for HUD financing proposed in high noise areas (exceeding 65 dBA L_{dn}) must incorporate noise attenuation features to maintain acceptable interior noise levels. A goal of 45 dBA L_{dn} is set forth for interior noise levels and attenuation requirements are geared toward achieving that goal. It is assumed that with standard construction any building will provide sufficient attenuation to achieve an interior level of 45 dBA L_{dn} or less if the exterior level is 65 dBA L_{dn} or less. Approvals in a "normally unacceptable noise zone" (exceeding 65 dBA but not exceeding 75 dBA) require a minimum of 5 dBA additional noise attenuation for buildings if the day-night average is greater than 65 dBA but does not exceed 70 dBA, or minimum of 10 dBA of

additional noise attenuation if the day-night average is greater than 70 dBA but does not exceed 75 dBA.

Federal Highway Administration (FHWA)

Proposed federal or federal-aid highway construction projects at a new location, or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes requires an assessment of noise and consideration of noise abatement per Title 23 of the Code of Federal Regulations, Part 772 (23 CFR Part 772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise." FHWA has adopted noise abatement criteria (NAC) for sensitive receivers such as picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals when "worst-hour" noise levels approach or exceed 67 dBA L_{eq}. The California Department of Transportation (Caltrans) has further defined approaching the NAC to be 1 dBA below the NAC for noise-sensitive receivers identified as Category B activity areas (e.g., 66 dBA L_{eq} is considered approaching the NAC).[1]

Federal Transit Administration (FTA)

The FTA has identified construction noise thresholds in the *Transit Noise and Vibration Impact Assessment Manual*,[2] which limit daytime construction noise to 80 dBA L_{eq} at residential land uses and to 90 dBA L_{eq} at commercial and industrial land uses.

State of California

California Building Code

California Noise Insulation Standards

In 1974 the State of California established minimum noise insulation performance standards for hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings in Title 25 of the California Administrative Code. These standards were ultimately implemented through Title 24 and the various versions of the California Building Code (most recently Chapter 12, Appendix Section 1207.11 of the 2010 Code). The noise limit was a maximum interior noise level of 45 dBA L_{dn}/CNEL. Where exterior noise levels exceed 60 dBA L_{dn}/CNEL, a report must be submitted with the building plans describing the noise control measures that have been incorporated into the design of the project to meet the noise limit. The State Office of Planning and Research (OPR) Guidelines require the General Plan to facilitate the implementation of the Building Code noise insulation standards. However, the 2013 update (that became effective January 1, 2014) did not include this section of the State Building Code. Most jurisdictions have adopted policies that implement the limits in the Code and extend them to all residential development.

1 Traffic Noise Analysis Protocol, Caltrans Division of Environmental Analysis, May, 2011.

2 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, FTA Report No. 0123, September 2018.

Cal Green Code

The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2022 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). The sections that pertain to this project are as follows:

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

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

Division of Aeronautic Noise Standards

Title 21 of the California Code of Regulations[3] sets forth the State's airport noise standards. In the findings described in Section 5006, the standard states the following: "A level of noise acceptable to a reasonable person residing in the vicinity of an airport is established as a CNEL value of 65 dB for purposes of these regulations. This criterion level has been chosen for reasonable persons residing in urban residential areas where houses are of typical California construction and may have windows partially open. It has been selected with reference to speech, sleep, and community reaction." Based on this finding, the airport noise standard as defined in Section 5012 is set at a CNEL of 65 dBA.

California Department of Transportation (Caltrans) – Construction Vibration

Caltrans recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards. A conservative vibration limit of 0.25 to 0.30 in/sec PPV has been used for older buildings that are found to be structurally sound but cosmetic damage to plaster ceilings or walls is a major concern. For historic buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. All of these limits have been used successfully and compliance with these limits has not been known to result in appreciable structural damage. All

3 California Code of Regulations Airport Noise Standards, Title 21, Public Works Division 2.5, Division of Aeronautics (Department of Transportation), Chapter 6 Noise Standards, Article 1.General.

vibration limits referred to herein apply on the ground level and consider the response of structural elements (i.e. walls and floors) to groundborne excitation.

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.

County of Santa Clara

Santa Clara County Comprehensive Land Use Plan

The Comprehensive Land Use Plan (CLUP) adopted by the Santa Clara County Airport Land Use Commission contains standards for projects within the vicinity of Norman Y. Mineta San José International Airport that are relevant to this project:
4.3.2.1 Noise Compatibility Policies

N-1 The Community Noise Equivalent Level (CNEL) method of representing noise levels shall be used to determine if a specific land use is consistent with the CLUP.

N-2 In addition to the other policies herein, the Noise Compatibility Policies presented in Table 4-1 shall be used to determine if a specific land use is consistent with this CLUP.

N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5 (not shown in this report).

N-6 Noise level compatibility standards for other types of land uses shall be applied in the same manner as the above residential noise level criteria. Table 4-1 presents acceptable noise levels for other land uses in the vicinity of the Airport.

Table 4 - 1

NOISE COMPATIBILITY POLICIES

LAND USE CATEGORY	CNEL					
	55-60	60-65	65-70	70-75	75-80	80-85
Residential – low density Single-family, duplex, mobile homes	*	**	***	****	****	****
Residential – multi-family, condominiums, townhouses	*	**	***	****	****	****
Transient lodging - motels, hotels	*	*	**	****	****	****
Schools, libraries, indoor religious assemblies, hospitals, nursing homes	*	***	****	****	****	****
Auditoriums, concert halls, amphitheaters	*	***	***	****	****	****
Sports arena, outdoor spectator sports, parking	*	*	*	**	***	****
Playgrounds, neighborhood parks	*	*	***	****	****	****
Golf courses, riding stables, water recreation, cemeteries	*	*	*	**	***	****
Office buildings, business commercial and professional, retail	*	*	**	***	****	****
Industrial, manufacturing, utilities, agriculture	*	*	*	***	***	****
* Generally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements. Mobile homes may not be acceptable in these areas. Some outdoor activities might be adversely affected.					
** Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Outdoor activities may be adversely affected. Residential: Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.					
*** Generally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor activities are likely to be adversely affected.					
**** Unacceptable	New construction or development shall not be undertaken.					

Source: Based on General Plan Guidelines, Appendix C (2003), Figure 2 and Santa Clara County ALUC 1992 Land Use Plan, Table 1

Source:Comprehensive Land Use Plan Santa Clara County, Norman Y Mineta San José International Airport, May 25, 2011, Amended May 23, 2019.

City of East Palo Alto

Vista 2035 East Palo Alto General Plan

The City of East Palo Alto adopted the 2035 General Plan Final Version in March 2017. The Safety and Noise Chapter of the General Plan[4] provides goals and policies to reduce noise within the community. The goals and policies that apply to the proposed project are as follows:

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

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

> **Policy 6.1. Noise standards.** Use the Interior and Exterior Noise Standards (Table 10-1) for transportation noise sources. Use the City's Noise Ordinance for evaluating non-transportation noise sources when making planning and development decisions. Require that applicants demonstrate that the noise standards will be met prior to project approval.
>
> **Policy 6.2. Compatibility standards.** Utilize noise/land use compatibility standards and the Noise Ordinance as guides for future development decisions.
>
> **Policy 6.3. Noise control.** Provide noise controls measures, such as berms, walls, and sound attenuating construction in areas of new construction or rehabilitation.
>
> **Policy 6.4. Vibration impacts.** The City shall require new developments to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV will be used to minimize the potential for cosmetic damage to the building. A vibration limit of 0.30 in/sec PPV will be used to minimize the potential for cosmetic damage to buildings of normal conventional construction.
>
> **Policy 6.5. Airport-adjacent land uses.** Maintain the non-residential designation for land near the airport in order to prevent new noise-sensitive residential uses from being constructed in areas with excessive aircraft noise.

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

Table 10-1. Interior and Exterior Noise Standards		
Land Use	Noise Standards[1]	
	Interior[2, 3]	Exterior
Residential – Single family, multifamily, duplex, mobile home	CNEL 45 dB	CNEL 65 dB[4]
Residential – Transient lodging, hotels, motels, nursing home, hospitals	CNEL 45 dB	CNEL 65 dB[4]
Private offices, church sanctuaries, libraries, board rooms, conference rooms, theaters, auditoriums, concert halls, meeting halls, etc.	Leq(12) 45 dB(A)	-
Schools	Leq(12) 45 dB(A)	Leq(12) 67 dB(A)[5]
General offices, reception, clerical, etc.	Leq(12) 50 dB(A)	-
Bank lobby, retail store, restaurant, typing pool, etc.	Leq(12) 55 dB(A)	-
Manufacturing, kitchen, warehousing, etc.	Leq(12) 65 dB(A)	-
Parks, playgrounds	-	CNEL 65 dB[5]
Golf courses, outdoor spectator sports, amusement parks	-	CNEL 70 dB[5]

Notes:

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

Source: Title 24, California Code of Regulations

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

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

Policy 7.1. Noise ordinance. Continually enforce and periodically review the City's Noise Ordinance for adequacy (including requiring construction activity to comply with established work schedule limits). Amend as needed to address community needs and development patterns.

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

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

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

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

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

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

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

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

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

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

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

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

- Prohibit all unnecessary idling of internal combustion engines;

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

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

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

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

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

City of East Palo Alto Municipal Code

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

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

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

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

Notes:

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

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

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

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

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

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

TABLE 5 Interior Noise Level Standards – Dwelling Unit

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

Notes:

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

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

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

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

Existing Noise Environment

A noise measurement survey was completed to establish existing noise sources and noise levels in the Specific Plan area. There were several purposes for the noise measurements. Long-term (LT) measurements made hour-by-hour over a period of 24 hours or more provide information on how noise levels vary throughout the day and night and how noise levels may vary from day-to-day. A series of attended short-term (ST) measurement were also made that are useful for several purposes. The person attending the measurements can identify the noise sources that occur during the measurement and note the level of noise associated with identifiable events. This assists in quantitatively and qualitatively characterizing the noise environments along the major roadways and also in the quieter areas. CNEL is the metric used in East Palo Alto to characterize the 24-hour average noise exposure level. It is also important to know how noise levels vary within each hour of the day and night. For this purpose, standard acoustical descriptors $L_{eq,}$ L_{max}, L_1, L_{10}, L_{50}, L_{90}, and L_{min} were also measured and reported.

The study area is bounded by the Dumbarton Rail Line to the north, the Ravenswood Open Space Preserve and Palo Alto Baylands Nature Preserve to the east, Weeks and Runnymede Streets to the south, and University Avenue and Gloria Way to the west. Noise from transportation activity is the primary component of the noise environment in the Ravenswood area of East Palo Alto. Transportation corridors that traverse the area, such as State Route 109 (SR 109); major arterial roadways, such as University Avenue and Bay Road; and collector roadways, such as Clarke and Pulgas Avenues, are the predominant sources of environmental noise. Aircraft noise from the local Palo Alto Airport and San Francisco International Airport also contribute to the noise environment. Portions of the study area include industrial land uses, that further contribute to the noise environment.

The noise monitoring survey was completed between Wednesday, October 12, 2022 and Friday, October 14, 2022. Four long-term noise measurements (LT-1 through LT-4) and nine short-term (ten-minute duration) noise measurements (ST-1 through ST-9) were made within the study area. The measurement locations are shown in Figure 1.

Long-term noise measurement LT-1 was approximately 35 feet north of the centerline of Bay Road. Hourly average noise levels at this location typically ranged from 61 to 76 dBA L_{eq} during the day and from 51 to 66 dBA L_{eq} at night. The average community noise equivalent level was 70 dBA CNEL on Thursday, October 13, 2022. Long-term noise measurement LT-2 was approximately 35 feet east of the centerline of University Avenue. Hourly average noise levels at this location typically ranged from 71 to 77 dBA L_{eq} during the day and from 62 to 72 dBA L_{eq} at night. The average community noise equivalent level was 77 dBA CNEL on Thursday, October 13, 2022. Long-term noise measurement LT-3 was approximately 95 feet east of the centerline of Illinois Street. Hourly average noise levels at this location typically ranged from 50 to 63 dBA L_{eq} during the day and from 38 to 52 dBA L_{eq} at night. The average community noise equivalent level was 58 dBA CNEL on Thursday, October 13, 2022. Long-term noise measurement LT-4 was conducted approximately 55 feet east of the centerline of University Avenue. Hourly average noise levels at this location typically ranged from 64 to 72 dBA L_{eq} during the day and from 55 to 66 dBA L_{eq} at night. The average community noise equivalent level was 71 dBA CNEL on Thursday,

October 13, 2022. The daily trends in noise levels measured at LT-1 through LT-4 are shown in Figures A1 through A12 in the Appendix.

FIGURE 1 Project Site and Surrounding Area

Source: Google Earth, Modified by Illingworth & Rodkin, Inc. December 2022

Short-term noise measurement ST-1 was made at the end of Rutgers Street by the bicycle path on Wednesday, October 12, 2022, starting at 11:20 a.m. This location was selected to quantify background ambient noise levels at the northern edge of the study area. The 10-minute average noise level measured at this location was 49 dBA L_{eq}. Aircraft were the main sources of noise in the area and produced maximum noise levels ranging from 51 to 61 dBA L_{max}. A single vehicle pass-by on Tulane Avenue produced maximum noise levels up to 48 dBA L_{max}, and nearby landscaping activities produced maximum noise levels ranging from 40 to 60 dBA L_{max}. Short-term noise data are summarized in Table 6.

Short-term noise measurement ST-2 was made at the end of Forham Street, near the Ravenswood Open Space Preserve on Wednesday, October 12, 2022, starting at 11:40 a.m. This location was selected to quantify ambient noise levels around the northeast corner of the study area. The 10-minute average noise level measured at this location was 48 dBA L_{eq}. Aircraft were the main source of noise in the area and produced maximum noise levels ranging from 48 to 58 dBA L_{max}. There were no vehicle pass-bys during the measurement. Nearby power tools produced maximum noise levels up to 54 dBA L_{max}.

Short-term noise measurement ST-3 was made at the end of Stevens Avenue near the Ravenswood Open Space Preserve on Wednesday, October 12, 2022, starting at 12:00 p.m. This location was selected to quantify ambient noise levels at the east side of the study area. The 10-minute average noise level measured at this location was 48 dBA L_{eq}. Vehicle pass-bys and aircraft were the main

sources of noise in the area and produced maximum noise levels ranging from 48 to 67 dBA L_{max}, and from 49 to 55 dBA L_{max}, respectively.

Short-term noise measurement ST-4 was made across from 2524 Pulgas Avenue on Wednesday, October 12, 2022, over two ten-minute periods starting at 12:20 p.m. and concluding at 12:40 p.m. This location was selected to quantify ambient noise levels around the industrial zones of the study area. The first 10-minute average noise level measured at this location was 71 dBA L_{eq}. A flatbed truck was loading a dumpster during the measurement. At approximately 150 feet, the truck generated noise levels up to 95 dBA L_{max}. Eighteen vehicle pass-bys produced maximum noise levels ranging from 65 to 73 dBA, and a truck pass-by produced maximum noise levels up to 75 dBA L_{max}. Aircraft also contributed to the noise environment, producing maximum noise levels ranging from 61 to 68 dBA L_{max}. An industrial saw approximately 500 feet to the west produced maximum noise levels ranging from 55 to 62 dBA L_{max}. The second 10-minute average noise level measured at this location was 62 dBA L_{eq}. 20 vehicles passed by during the measurement, and aircraft, and industrial sawing also contributed to the noise environment.

Short-term noise measurement ST-5 was made at 1950 Bay Road approximately 50 feet from the roadway centerline on Wednesday, October 12, 2022, starting at 12:50 p.m. This location was selected to quantify ambient noise levels along Bay Road. The 10-minute average noise level measured at this location was 60 dBA L_{eq}. Industrial machinery noise approximately 200 feet to the north was the main source of noise in the area and produced maximum noise levels ranging from 46 to 53 dBA L_{max}. Eleven vehicle pass-bys produced maximum noise levels ranging from 55 to 66 dBA, and a truck pass-by produced maximum noise levels up to 74 dBA L_{max}. Aircraft also contributed to the noise environment, producing maximum noise levels ranging from 65 to 74 dBA L_{max}.

Short-term noise measurement ST-6 was made at the playground next to 621 Montage Circle on Wednesday, October 12, 2022, starting at 1:10 p.m. This location was selected to quantify ambient noise levels in the neighborhood south of Bay Road, located about 330 feet to the north. The 10-minute average noise level measured at this location was 51 dBA L_{eq}. Background traffic noise produced maximum noise levels up to 44 dBA L_{max}. Aircraft also contributed to the noise environment, producing maximum noise levels ranging from 44 to 67 dBA L_{max}.

Short-term noise measurement ST-7 was made near the end of Weeks Street, approximately 25 feet south of the roadway centerline, on Friday, October 14, 2022, starting at 10:00 a.m. This location was selected to quantify ambient noise levels in the neighborhood in the southeast corner of the study area. The 10-minute average noise level measured at this location was 46 dBA L_{eq}. Background traffic noise along Pulgas Avenue produced maximum noise levels ranging from 38 to 45 dBA L_{max}, while a single vehicle pass-by on Weeks Street produced maximum noise levels up to 62 dBA L_{max}. Aircraft also contributed to the noise environment, producing maximum noise levels ranging from 44 to 66 dBA L_{max}.

Short-term noise measurement ST-8 was made near 2370 Cooley Avenue, approximately 32 feet east of the roadway centerline and 145 feet east of the University Avenue centerline on Friday, October 14, 2022 starting at 10:20 a.m. This location was selected to quantify ambient noise levels in the neighborhood in the southwest corner of the study area. The 10-minute average noise level

measured at this location was 60 dBA L_{eq}. One hundred fifty-seven vehicles along University Avenue and 13 vehicles along Cooley Avenue produced maximum noise levels ranging from 55 to 67 dBA L_{max}, Two jets also contributed to the noise environment, producing maximum noise levels ranging from 61 to 62 dBA L_{max}.

Short-term noise measurement ST-9 was made near 1586 Bay Road, approximately 45 feet south of the roadway centerline on Friday, October 14, 2022, starting at 10:40 a.m. This location was selected to quantify ambient noise levels in the neighborhood in the southwest corner of the study area, near Bay Road. The 10-minute average noise level measured at this location was 61 dBA L_{eq}. Sixty-four vehicles along Bay Road produced maximum noise levels ranging from 57 to 73 dBA L_{max}, A truck and a bus produced maximum noise levels up to 67 and 69 dBA L_{max}, respectively.

TABLE 6 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: End of Rutgers Street (10/12/2022, 11:20 a.m. - 11:30 a.m.)	61	58	53	46	41	49
ST-2: End of Fordham Street (10/12/2022, 11:40 a.m. - 11:50 a.m.)	59	58	52	43	39	48
ST-3: End of Stevens Avenue (10/12/2022, 12:00 p.m. - 12:10 p.m.)	67	56	51	43	40	48
ST-4a: Across from 2524 Pulgas Avenue (10/12/2022, 12:20 p.m. - 12:30 p.m.)	95	80	70	60	55	71
ST-4b: Across from 2524 Pulgas Avenue (10/12/2022, 12:30 p.m. - 12:40 p.m.)	79	71	65	57	49	62
ST-5: 1950 Bay Road (10/12/2022, 12:50 p.m. - 1:00 p.m.)	75	72	64	52	48	60
ST-6: Playground near 621 Montage Circle (10/12/2022, 1:10 p.m. - 1:20 p.m.)	67	64	54	43	41	51
ST-7: End of Weeks Street (10/14/2022, 10:00 a.m. - 10:10 a.m.)	66	60	45	37	34	46
ST-8: 2370 Cooley Avenue (10/14/2022, 10:20 a.m. - 10:30 a.m.)	67	66	64	60	52	60
ST-9: 1586 Bay Road (10/14/2022, 10:40 a.m. - 10:50 a.m.)	73	69	64	59	55	61

Future Noise Environment

SoundPLAN Version 8.2, a three-dimensional ray-tracing computer program, was used to develop the traffic noise contours calculated for the existing (2020) and future (2040) traffic conditions along major roadways in the plan area. Calculations accounted for the source of noise (traffic), the frequency spectra of the noise source, traffic speeds, vehicle mix information and the topography of the area. In order to provide a credible worst-case assessment of existing and future traffic noise conditions throughout the plan area, the modeling did not incorporate existing buildings or barriers, including centerline K-rails on the expressway medians, into the calculations. The modeling also

assumed a hard ground surface for the plan area since it consists of mostly paved roads and buildings and other features commonly found in built environments. The geometric data used to create the model were based on GIS information provided by the City of East Palo Alto. Existing (2020) and future (2040) peak hour traffic data provided by the traffic consultants and observed travel speeds were input into the model for local roadways. Since the plan area consists of residential and light industrial uses, a truck mix of 1% to 2% was used along the local roadways. The predicted noise levels were then compared to measured noise levels for calibration purposes and adjustments were made as necessary. Contours presented in this report represent the primary traffic noise sources in the plan area. Localized sources of noise, such as industrial plants and other stationary equipment or operations, were not included in the model because these sources only affect limited areas. Figure 2 provides the existing (2020) traffic noise contour for the plan area, Figures 3 and 4 provide the traffic contours for the worst-case scenario i.e., the 2040 buildout scenario #2 (3.35 million square feet) with and without the loop road, respectively.

Table 7 summarizes the existing and future CNEL noise levels, as measured at a distance of 75 feet from the centerline of the roadway. The existing and future CNEL noise levels are adjusted based on existing measurements, modeled traffic noise levels and airport noise contours presented in Figure 5.

Palo Alto Airport is located approximately 0.6 miles southeast of the plan area, and noise exposure information is developed and reported in the Comprehensive Land Use Plan (CLUP).[6] Existing conditions are best represented by the 2022 noise exposure map that was adopted in 2018 and is shown in Figure 5. The western portion of the plan area would fall outside the 65 dBA CNEL contour line but within the 55 and 60 dBA CNEL noise contours.

[6] Santa Clara County Airport Land Use Commission, "Comprehensive Land Use Plan Santa Clara County: Palo Alto Airport," November 19, 2018 and amended November 18, 2020.

FIGURE 2 Ravenswood/4 Corners Specific Plan Area – Existing (2020) Traffic Noise Contours

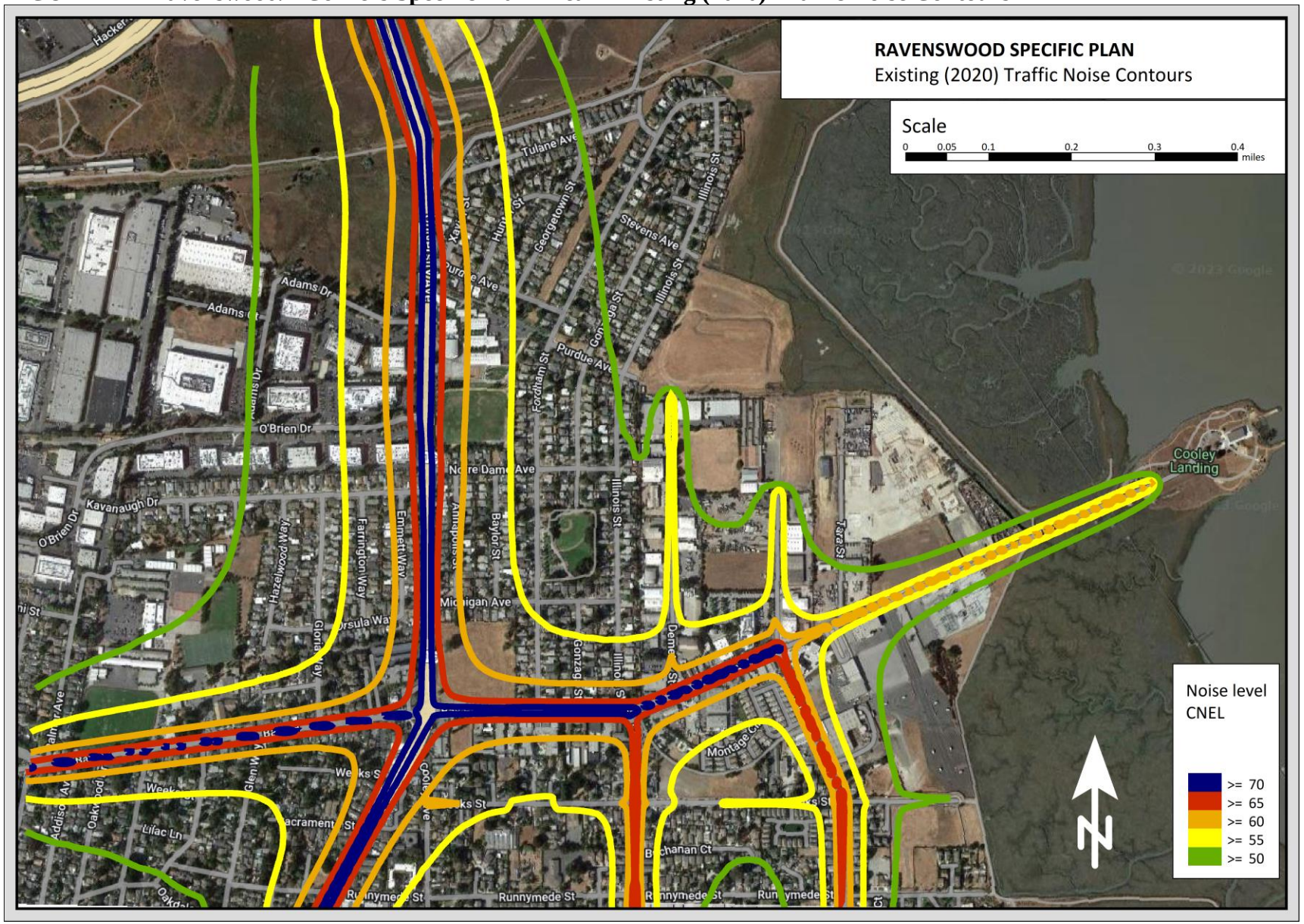


FIGURE 3 Ravenswood/4 Corners Specific Plan Area – Scenario #2 (2040) No Loop Road Traffic Noise Contours

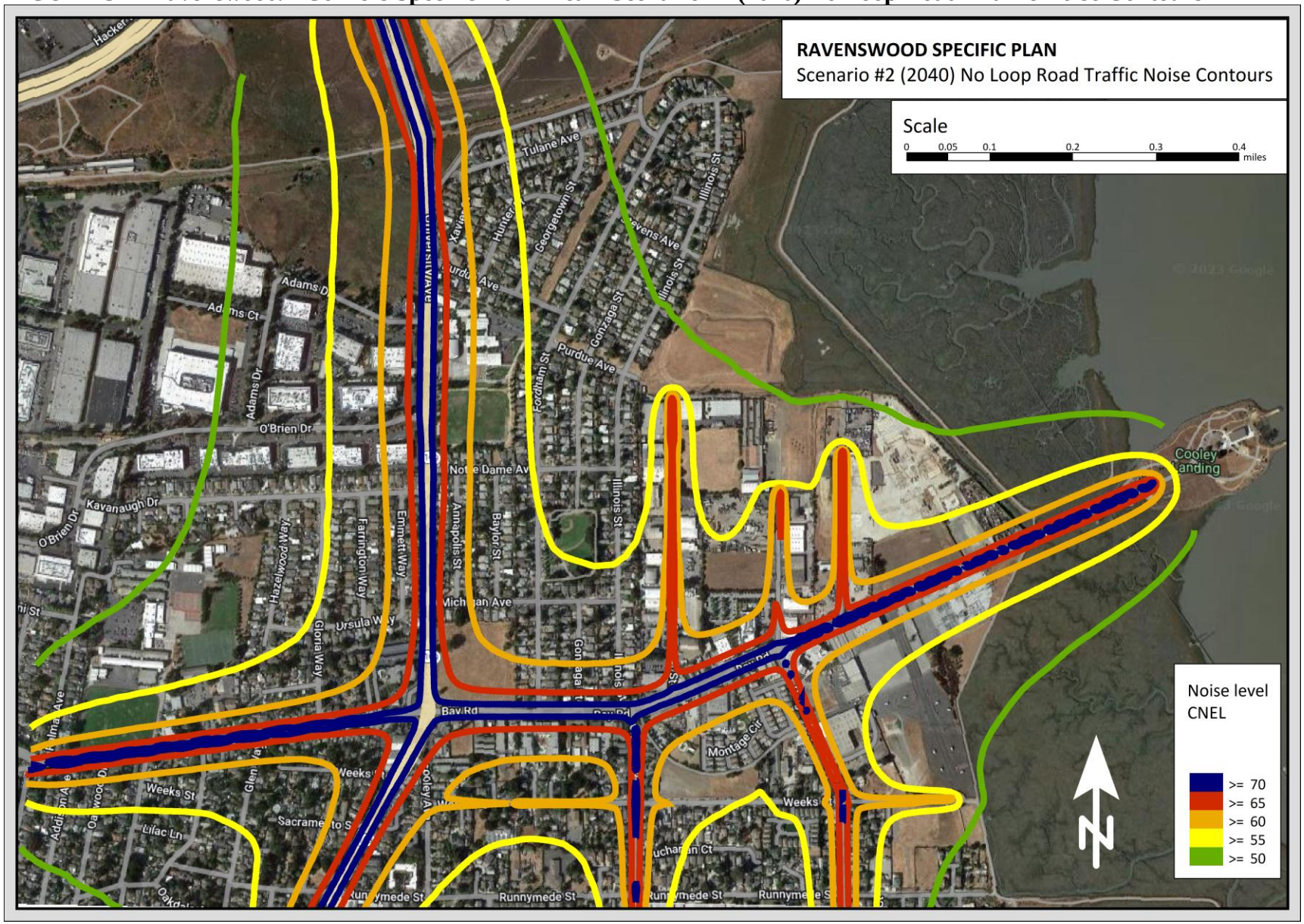


FIGURE 4 Ravenswood/4 Corners Specific Plan Area – Scenario #2 (2040) With Loop Road Traffic Noise Contours

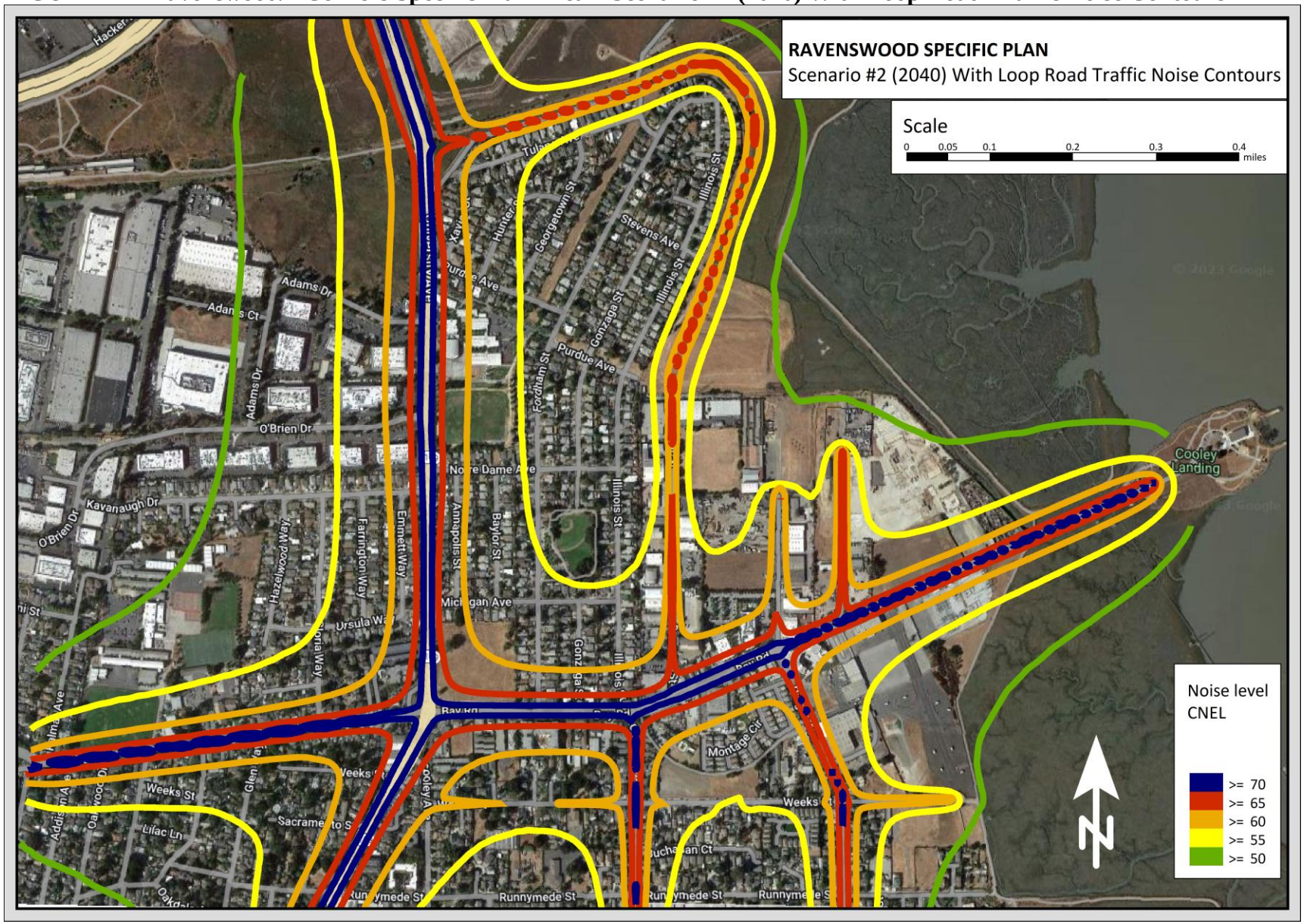
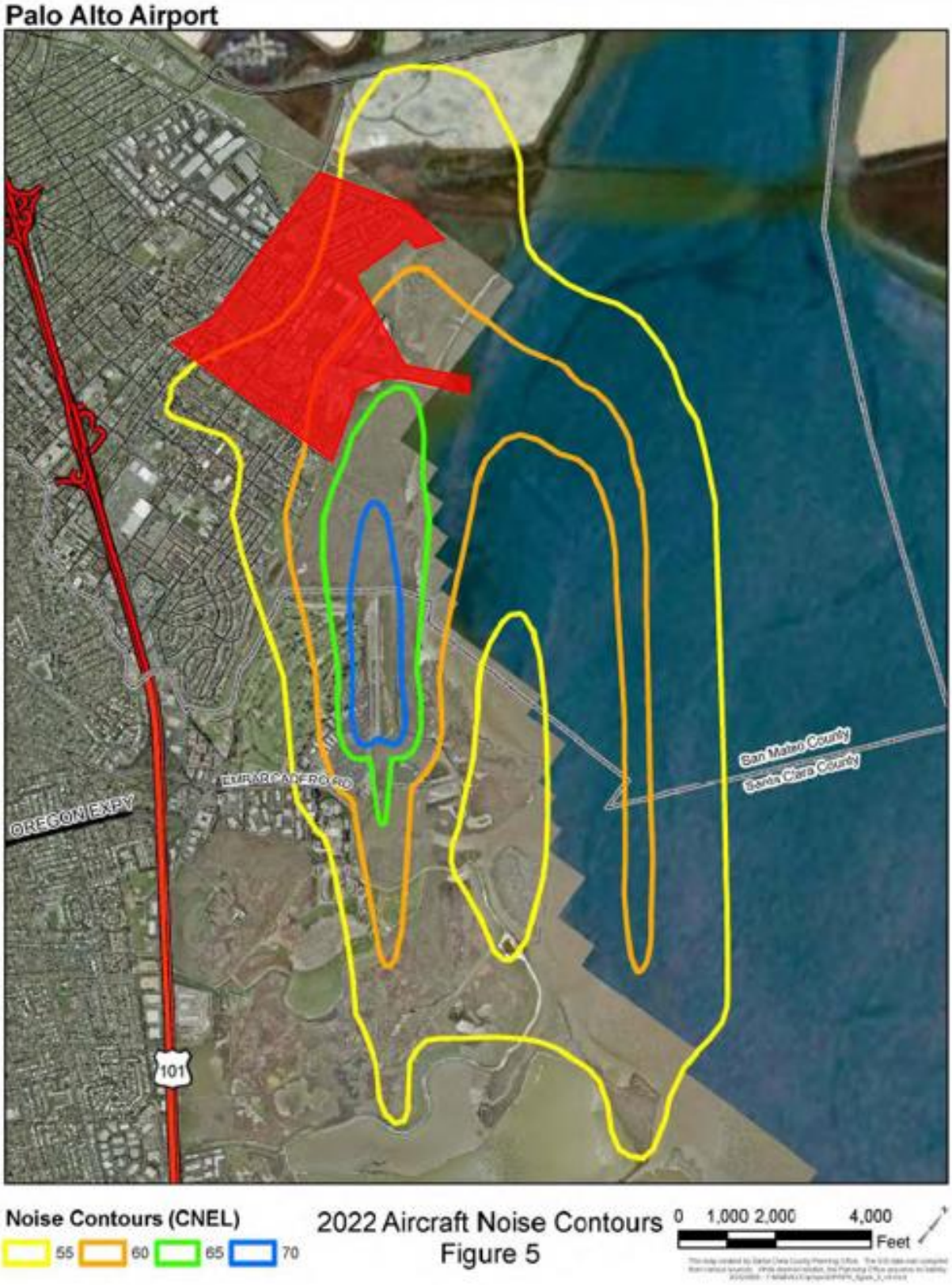


TABLE 7 Existing and Future Modeled Noise Levels Along Surrounding Roadways

Roadway	Segment	CNEL at 75 feet from the Roadway Centerline, dBA					
		Existing	2040 "No project" Scenario with Loop Road	2040 Scenario #1 No Loop Road	2040 Scenario #1 With Loop Road	2040 Scenario #2 No Loop Road	2040 Scenario #2 With Loop Road
University Avenue	Bayfront Expressway to Loop Road (future)	66	66	67	67	67	67
	Loop Road to Purdue Ave.	66	66	66	66	66	66
	Purdue Ave to O Brian Dr	66	67	67	67	67	67
	O Brian Dr to Notre Dame Ave	66	66	67	66	67	66
	Notre Dame Ave to Bay Road	64	65	65	65	65	65
	Bay Road to Runnymede St	64	65	65	65	66	66
	South of Runnymede St	64	65	66	66	66	66
Bay Road	East of Newbridge St	62	63	63	63	64	64
	University Ave to Clarke Ave	64	66	**67**	66	**67**	**67**
	Clarke Ave to Pulgas Ave	64	65	**68**	**67**	**68**	**67**
	East of Pulgas Ave	62	63	65	65	65	65
Pulgas Ave	North of Bay Road	61	61	62	62	62	62
	Bay Road to Weeks St	62	62	63	63	63	63
	Weeks St to Runnymede St	61	61	62	62	62	62
	South of Runnymede St	61	61	62	62	62	62
Clarke Ave	Bay Road to Weeks St	61	62	63	63	64	63
	Weeks St to Runnymede St	60	61	62	61	62	61
	South of Runnymede St	60	60	61	61	61	61
Demeter St	North of Bay Road	57	58	60	59	60	59
Tara St	North of Bay Road	61	62	62	62	63	62

Roadway	Segment	CNEL at 75 feet from the Roadway Centerline, dBA					
		Existing	**2040 "No project" Scenario with Loop Road**	**2040 Scenario #1 No Loop Road**	**2040 Scenario #1 With Loop Road**	**2040 Scenario #2 No Loop Road**	**2040 Scenario #2 With Loop Road**
Weeks St	West of Clarke Ave	59	60	60	60	60	60
	Clarke Ave to Pulgas Ave	59	59	60	60	60	60
	East of Pulgas Ave	62	62	63	63	63	63
Loop Road	East of University Ave	58	60	58	60	58	60
	North of Demeter St	58	60	58	60	58	60

FIGURE 5 2022 Noise Contours for Palo Alto Airport



PLAN CONSISTENCY ANALYSIS

This section summarizes the analysis of the land use compatibility of the proposed development within the Plan Area with respect to the future noise environment. Recommendations are made to ensure that future developments within the Plan Area are not exposed to excessive noise levels.

Noise and Land Use Compatibility

The Specific Plan proposes to develop noise-sensitive mixed-use residential uses along major and local roadways and adjacent to proposed industrial uses. The Specific Plan also proposes to develop Light Industrial, R&D/Industrial and Civic Community Service uses adjacent to existing and proposed residential areas with and adjacent to the Plan Area. Much of the mixed-use residential development proposed in the Specific Plan is expected to include retail or commercial uses on the ground floor with residences located on the upper stories.

The City of East Palo Alto's General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques and through appropriate land use policies in the City of East Palo Alto. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The City's acceptable exterior noise level standard is 65 dBA CNEL or less for the proposed residential uses.

- The City's acceptable interior noise level standard is 45 dBA CNEL or less for the proposed residential land uses.

- The City's acceptable interior noise level standard is 45 dBA $L_{eq(12)}$ or less for the proposed private offices and conference rooms over a 12-hour period during operational hours.

- The City's acceptable interior noise level standard is 50 dBA $L_{eq(12)}$ or less for the proposed general offices, reception, and clerical areas over a 12-hour period during operational hours.

- The City's acceptable interior noise level standard is 55 dBA $L_{eq(12)}$ or less for the proposed banks, retail, and restaurant uses over a 12-hour period during operational hours.

- The City's acceptable interior noise level standard is 65 dBA $L_{eq(12)}$ or less for the proposed manufacturing and warehouse uses over a 12-hour period during operational hours.

- 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.

Noise levels in the Plan Area were measured and calculated using SoundPLAN Version V8.2. The estimated noise level increases along each roadway segment are summarized in Table 7, and the cumulative plus project noise contours are shown in Figure 4.

Future Exterior Noise Environment

Specific locations for future development projects are unknown at this time. However, distances to the 65 dBA CNEL threshold for residential uses were estimated along each roadway segment based on the future exterior noise levels that are summarized in Table 8 and 9.

Table 8 presents the distances to the 70, 65 and 60 dBA CNEL contours for the worst-case scenario (Scenario #2) without the Loop Road while Table 9 shows the same with the Loop Road.

Future exterior noise levels at a distance of 75 feet from the centerline of the primary roadways within the Ravenswood Plan Area would typically range from 58 dBA CNEL to 67 dBA CNEL for the no Loop Road worst-case scenario (Scenario #2) and from 59 dBA CNEL to 67 dBA CNEL for the worst-case scenario (Scenario #2) with the Loop Road.

TABLE 8 2040 General Plan Buildout Plus Proposed Project (Scenario #2) Without Loop Road Traffic Noise Contour Distances within the Plan Area

Roadway	Segment	Distance from Centerline to Traffic Noise Contour, feet		
		70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
University Avenue	Bayfront Expressway to Loop Road (future)	<50 feet	120 feet	380 feet
	Loop Road to Purdue Ave.	<50 feet	100 feet	200 feet
	Purdue Ave to O Brian Dr	<50 feet	120 feet	380 feet
	O Brian Dr to Notre Dame Ave	<50 feet	120 feet	380 feet
	Notre Dame Ave to Bay Road	<50 feet	80 feet	150 feet
	Bay Road to Runnymede St	<50 feet	100 feet	200 feet
	South of Runnymede St	<50 feet	100 feet	200 feet
Bay Road	East of Newbridge St	<50 feet	60 feet	130 feet
	University Ave to Clarke Ave	<50 feet	120 feet	380 feet
	Clarke Ave to Pulgas Ave	<50 feet	120 feet	380 feet
	East of Pulgas Ave	<50 feet	80 feet	150 feet
Pulgas Ave	North of Bay Road	<50 feet	<50 feet	120 feet
	Bay Road to Weeks St	<50 feet	50 feet	150 feet

Roadway	Segment	Distance from Centerline to Traffic Noise Contour, feet		
		70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
	Weeks St to Runnymede St	<50 feet	<50 feet	120 feet
	South of Runnymede St	<50 feet	<50 feet	120 feet
Clarke Ave	Bay Road to Weeks St	<50 feet	60 feet	130 feet
	Weeks St to Runnymede St	<50 feet	<50 feet	120 feet
	South of Runnymede St	<50 feet	<50 feet	100 feet
Demeter St	North of Bay Road	<50 feet	<50 feet	80 feet
Tara St	North of Bay Road	<50 feet	50 feet	150 feet
Weeks St	West of Clarke Ave	<50 feet	<50 feet	80 feet
	Clarke Ave to Pulgas Ave	<50 feet	<50 feet	80 feet
	East of Pulgas Ave	<50 feet	50 feet	150 feet
Loop Road	East of University Ave	<50 feet	<50 feet	50 feet
	North of Demeter St	<50 feet	<50 feet	50 feet

TABLE 9 2040 Buildout Plus Proposed Project (Scenario #2) With Loop Road Traffic Noise Contour Distances within the Plan Area

Roadway	Segment	Distance from Centerline to Traffic Noise Contour, feet		
		70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
University Avenue	Bayfront Expressway to Loop Road (future)	<50 feet	120 feet	380 feet
	Loop Road to Purdue Ave.	<50 feet	100 feet	200 feet
	Purdue Ave to O Brian Dr	<50 feet	120 feet	380 feet
	O Brian Dr to Notre Dame Ave	<50 feet	100 feet	200 feet
	Notre Dame Ave to Bay Road	<50 feet	80 feet	150 feet
	Bay Road to Runnymede St	<50 feet	100 feet	200 feet
	South of Runnymede St	<50 feet	100 feet	200 feet
Bay Road	East of Newbridge St	<50 feet	60 feet	130 feet
	University Ave to Clarke Ave	<50 feet	120 feet	380 feet
	Clarke Ave to Pulgas Ave	<50 feet	120 feet	380 feet
	East of Pulgas Ave	<50 feet	80 feet	150 feet
Pulgas Ave	North of Bay Road	<50 feet	<50 feet	120 feet
	Bay Road to Weeks St	<50 feet	50 feet	150 feet
	Weeks St to Runnymede St	<50 feet	<50 feet	120 feet
	South of Runnymede St	<50 feet	<50 feet	120 feet
Clarke Ave	Bay Road to Weeks St	<50 feet	50 feet	150 feet
	Weeks St to Runnymede St	<50 feet	<50 feet	100 feet
	South of Runnymede St	<50 feet	<50 feet	100 feet
Demeter St	North of Bay Road	<50 feet	<50 feet	60 feet
Tara St	North of Bay Road	<50 feet	<50 feet	120 feet

Roadway	Segment	Distance from Centerline to Traffic Noise Contour, feet		
		70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
Weeks St	West of Clarke Ave	<50 feet	<50 feet	80 feet
	Clarke Ave to Pulgas Ave	<50 feet	<50 feet	80 feet
	East of Pulgas Ave	<50 feet	50 feet	150 feet
Loop Road	East of University Ave	<50 feet	<50 feet	80 feet
	North of Demeter St	<50 feet	<50 feet	80 feet

Future Interior Noise Environment

Residential Uses

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Where exterior noise levels range from 60 to 65 dBA CNEL, 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 CNEL, 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.

The setback distances in Tables 8 and 9, to meet the exterior noise limit of 65 dBA CNEL would also meet the interior noise limit of 45 dBA CNEL, assuming standard residential construction materials. Buildings within the setback distances to the 65 dBA CNEL contour would require adequate forced-air mechanical ventilation with standard construction materials to meet 45 dBA CNEL within residential units. At or within the 70 dBA CNEL contour distance, sound-rated construction materials would be required to meet the 45 dBA CNEL limit.

Commercial, Office, and Industrial Uses

Standard construction materials for commercial, office, and industrial 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 $L_{eq(1\text{-}hr)}$ and the City's thresholds of 45 to 65 dBA $L_{eq(12)}$ at most commercial, office, and industrial uses.

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).

Recommendations to Reduce Future Exterior and Interior Noise Levels

When project-level development information, such as site plans, building elevations, floor plans, and the position of buildings and outdoor use areas within the Plan Area are known, site-specific project-level noise studies should be conducted to confirm the recommendations for exterior and interior noise reduction methods for both residential and nonresidential uses. An acoustical study shall be conducted when an application is received for a development project that could be exposed to noise greater than that deemed acceptable by the maximum noise levels specified in Table 10-1 of the City of East Palo Alto's General Plan for any given land use proposed on the site. The study shall determine compliance with the noise and land use compatibility standards, identify potential noise impacts, and propose site-specific measures to reduce exposure to exterior and interior noise levels that exceed maximum permissible levels.

The Specific Plan may also implement development of new residential uses adjacent to or within the same building as noise-generating commercial or retail uses. Noise levels resulting from heating, ventilating, and air conditioning equipment, entertainment, etc., from such could exceed the City's noise ordinance limits. The Specific Plan also proposes to develop Light Industrial, R&D/Industrial and Civic Community Service uses adjacent to existing and proposed residential areas. Noise levels resulting from the operation of these new uses could result in noise levels exceeding the City's noise element and/or ordinance limits at these existing residential uses. Noise mitigation, such as proper facility or site design, operational limits, and/or sound barriers, may be required to achieve the comply with City noise standards where these adjacencies occur.

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

A project-specific acoustical analysis shall be prepared, in compliance with State Building Codes and City noise standards, to ensure that the design incorporates controls to reduce interior noise levels to 45 dBA CNEL or lower within the residential units and to 45 to 65 dBA $L_{eq(12)}$ or lower, depending on the specific land use, within nonresidential interiors. The project applicant shall conform with 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.

The following general recommendations shall be considered to reduce exterior noise levels to meet the normally acceptable thresholds of 65 dBA CNEL at residential uses:

- When developing project site plans, locate noise-sensitive outdoor use areas away from major roadways or other significant sources of noise. Shield noise-sensitive spaces with

buildings or noise barriers to reduce exterior noise levels. The final detailed design of the heights and limits of proposed noise barriers shall be completed at the time that the final site and grading plans are submitted.

If the 45 dBA CNEL or 45 to 65 dBA $L_{eq(12)}$ threshold, depending on the proposed use, would not be met, other site-specific measures, such as increasing setbacks of the buildings from the adjacent roadways, using shielding by other buildings or noise barriers to reduce noise levels, implementing additional sound treatments to the building design, etc. shall be considered to reduce interior noise levels to meet the State and City thresholds.

NOISE IMPACTS AND MITIGATION MEASURES

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

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

Section 15.04.125 of the City's Municipal Code limits construction activities to between 7:00 a.m. and 6:00 p.m. on weekdays and to between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction activities are prohibited on Sundays and national holidays. During these allowable hours, construction noise would be exempt from the City's exterior and interior noise level standards at single- or multi-family residences, schools, hospitals, churches, and public libraries. Additionally,

Policy 7.11 of the City's General Plan states that a significant construction noise impact would occur if substantial noise-generating construction activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) occurred within 500 feet of residential uses or 200 feet of commercial or office uses for more than 12 months. Further, large complex projects would require a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints to be in place prior to the start of construction and to be implemented during construction to reduce noise impacts on neighboring residents and other uses.

While the City of East Palo Alto does not establish noise level thresholds for construction activities, this analysis uses the noise limits established by the Federal Transit Administration (FTA) to identify the potential for impacts due to substantial temporary construction noise. The FTA identifies construction noise limits in the *Transit Noise and Vibration Impact Assessment Manual*.[7] During daytime hours, an exterior threshold of 80 dBA L_{eq} shall be enforced at residential land uses and 90 dBA L_{eq} shall be enforced at commercial and industrial land uses.

Major noise-generating construction activities associated with Area Plan would typically include removal of existing structures, site grading and excavation, installation of utilities, the construction of building foundations, cores, and shells, paving, and landscaping. Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. While specific project information is unknown at this time, the construction of building foundations for high-rise building may require impact or vibratory pile driving activities to support the structure, which would generate high noise levels. Site grading, excavation activities, the operation of heavy construction equipment, and the arrival/departure of heavy-duty trucks would also generate high noise levels, as these phases often require the simultaneous use of multiple pieces of heavy equipment such as dozers, excavators, scrapers, and loaders.

Typical hourly average construction generated noise levels are about 81 to 88 dBA L_{eq}, measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors. Lower noise levels result from building construction activities when these activities move indoors, and less heavy equipment is required to complete the tasks. Typical construction noise levels at a distance of 50 feet are shown in Tables 10 and 11. Table 10 shows the average noise level ranges, by construction phase, and Table 11 shows the maximum noise level ranges for different construction equipment.

7 Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, FTA Report No. 0123, September 2018.

TABLE 10 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 11 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.

Temporary construction noises are disturbances that are necessary for the construction or repair of buildings and structures in urban and rural areas. Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction materials, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Limiting the hours when construction can occur to daytime hours is often a simple method to reduce the potential for noise impacts. In areas immediately adjacent to construction, controls such as constructing temporary noise barriers and utilizing "quiet" construction equipment can also reduce the potential for noise impacts.

Construction activities within the Plan Area will be conducted in accordance with the provisions of the City's Municipal Code, which limits temporary construction work to between 7:00 a.m. and 6:00 p.m. on weekdays and between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction activity is not permitted on Sundays or national holidays. Further, construction activities will be conducted in accordance with the City of East Palo Alto's General Plan, which states that if substantial noise-generating construction activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) occur within 500 feet of residential uses or 200 feet of commercial or office uses for more than 12 months, construction noise would be considered significant. Large complex projects within the Plan Area would require a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints to be in place prior to the start of construction and to be implemented during construction to reduce noise impacts on neighboring residents and other uses. A typical construction noise logistics plan would include, but not be limited to, the following measures to reduce construction noise levels as low as practical:

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

- Limit combined construction noise levels (levels from all construction equipment used per phase) to an hourly average of 80 dBA Leq for residential receptors and to an hourly average of 90 dBA Leq for commercial receptors;

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

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

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

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

- Prohibit all unnecessary idling of internal combustion engines;

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

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

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

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

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

With the implementation of these measures to control noise during construction activities, in accordance with Policy 7.11 and the Municipal Code allowable construction hours, the temporary construction noise impact would be reduced to a less-than-significant level.

Mitigation Measure 1a: No further mitigation required.

Impact 1b: Permanent Noise Level Increase/Exceed Applicable Standards. The proposed project would result in a substantial permanent traffic noise level increase at receptors in the project vicinity. Operational noise levels generated by the proposed project would potentially exceed Municipal Code thresholds. This is a **potentially significant** impact.

For a substantial permanent cumulative noise increase to occur, two qualifications must be met: 1) if the 2040 Scenario #2 (worst-case scenario) traffic volumes result in a noise level increase at sensitive receptors of 3 dBA CNEL and exceeds the "normally acceptable" level of 65 dBA CNEL or is 5 dBA CNEL or greater and remains "normally acceptable;" (at or under 65 dBA CNEL) and 2) if the 2040 cumulative plus project traffic volumes result in a 1 dBA CNEL or more noise level increase compared to 2040 cumulative (no project) conditions, which would be considered a cumulatively considerable contribution to the overall traffic noise increase. The City's General Plan defines 65 dBA CNEL exterior noise standard in Table 10-1 to be considered as "normally acceptable."

Tables 4 and 5 summarize the Municipal Code's thresholds for exterior and interior noise levels, respectively, as measured on the receiving land uses. For receiving land uses that include single- or multi-family residences, schools, hospitals, churches, or public libraries, exterior noise level thresholds are as follows:

- For noise sources that operate for 30 minutes or more in any given hour, 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.).

- For noise sources that operate for 15 minutes in any given hour, 60 dBA during daytime hours and 55 dBA during nighttime hours.

- For noise sources that operate for 5 minutes in any given hour, 65 dBA during daytime hours and 60 dBA during nighttime hours.

- For noise sources that operate for 1 minute in any given hour, 70 dBA during daytime hours and 65 dBA during nighttime hours.

- For noise sources that operate for 0 minutes in any given hour, 75 dBA during daytime hours and 70 dBA during nighttime hours.

Additionally, interior noise levels within dwelling units are as follows:

- For noise sources that operate for 5 minutes in any given hour, 45 dBA during daytime hours and 40 dBA during nighttime hours.

- For noise sources that operate for 1 minute in any given hour, 50 dBA during daytime hours and 45 dBA during nighttime hours.

- For noise sources that operate for 0 minutes in any given hour, 55 dBA during daytime hours and 50 dBA during nighttime hours.

Project Traffic Increase

SoundPLAN Version v8.2 was used to calculate the traffic noise increase expected for Scenario #2 (worst-case scenario) using data supplied by the traffic consultant. All of the predicted noise levels are summarized in Table 7. Noise level increases of 3 dBA CNEL or more for noise levels greater than 65 dBA CNEL or noise level increases of 5 dBA CNEL or more for noise levels equal to or less than 65 dBA CNEL are bolded in Table 7. Additionally for these bolded noise levels, if the permanent noise level increase is calculated to be greater than 1 dBA CNEL when compared to the 2040 cumulative no project scenario, these levels are highlighted in **green**. For these bolded levels highlighted in green, the corresponding road segments would be predicted to have a cumulatively significant increase in permanent noise levels due to increased traffic.

The road segments resulting in a significant cumulative noise increase due to increased traffic from Table 7 were:

a) Bay Road – University Avenue to Clarke Ave
b) Bay Road – Clarke Ave to Pulgas Ave

Both road segments have noise sensitive residential receptors in the vicinity. This is a significant impact.

Operational Noise

Various mechanical equipment for heating, ventilation, and cooling purposes, exhaust fans, emergency generators, and other similar equipment could produce noise levels exceeding the maximum noise limits when located near existing or proposed residential land uses. Additionally, potential noise-generating sources, such as truck deliveries or other project-specific noise sources, may also be proposed at the project-level. The number of variables inherent in the mechanical equipment needs of an individual project (number and types of units, locations, size, housing, specs, etc.), as well as details pertaining to project-specific noise sources, are unavailable at this time. The impacts of operational noise sources on nearby noise-sensitive uses should be assessed during the final design stage of individual projects. Conservatively, this is considered a potentially significant impact.

Summary of Project-Generated Noise

The City of East Palo Alto General Plan and Municipal Code provides policies and thresholds to reduce operational and transportation noise at sensitive receptors. Chapter 8.52 of the Municipal Code regulates all operational noise, single-event noises, and hours of operation to control noise-producing operations. Conservatively, this is considered a potentially significant impact.

Policy 7.2 establishes thresholds for permanent noise level increases that would help maintain or reduce transportation noise along major roadways. In accordance with the City's General Plan policies, project-specific mitigation may be required along roadway segments in the Plan Area that would result in a 3 dBA CNEL increase over the "normally acceptable" 65 dBA CNEL level and may result in a cumulatively considerable contribution to the overall noise environment. This is a significant impact.

Mitigation Measure 1b:

Operational Noise Mitigation

New developments within the Plan Area would be required to comply with City noise standards set forth in the General Plan and Municipal Code. To ensure compliance with the operational noise level thresholds required in the Municipal Code (Chapter 8.52), a qualified acoustical consultant will be retained to review mechanical equipment systems during final design of the proposed project consistent with standards City practice. The consultant shall review selected equipment and determine specific noise reduction measures necessary to reduce noise to comply with the City's noise level requirements.

Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers, such as enclosures and parapet walls, to block the line-of-sight between the noise source and the nearest receptors. Additionally, enclosures and interior wall treatments shall be considered to reduce noise exposure within the on-site units. Alternate measures may include locating equipment in less noise-sensitive areas, where feasible. The measures recommended by the acoustical consultant to ensure compliance with the City's requirements would be implemented as project conditions of approval, and therefore, this would be a less-than-significant impact.

Cumulative Traffic Noise Mitigation

Noise reduction strategies to implement include paving the impacted road segments with "quieter" pavement types such as Open-Grade Rubberized Asphaltic Concrete which could reduce noise levels by 2 to 3 dBA depending on the existing pavement type, traffic speed, traffic volumes, and other factors. Installing traffic calming measures to slow traffic along Bay Road (between University Avenue and Pulgas Avenue) could provide qualitative improvement by smoothing out the rise and fall in noise levels caused by speeding vehicles. Sound insulation treatments to buildings (such as sound rated windows and doors) could reduce noise levels in interior spaces. New noise barriers could reduce noise levels by 5 dBA CNEL. Final design of such barriers , including an assessment of their feasibility and reasonableness, should be completed during project level review.

Significance After Mitigation:

Mitigation measures recommended for operational noise increases would reduce the potential impacts to a less-than-significant level. For cumulative traffic noise increases, the mitigation measures recommended involve non-acoustical considerations. Engineering issues may dictate the re-paving of affected road segments. Noise barriers and sound insulation treatments must be done on private property necessitating agreements with each property owner. Therefore, it may not be reasonable or feasible to reduce cumulative traffic noise increases at all affected noise-sensitive receptors. The impact would be considered significant and unavoidable.

Impact 2: **Exposure to Excessive Groundborne Vibration due to Construction.** Construction-related vibration levels resulting from activities at the project site would potentially exceed the City's thresholds at surrounding buildings. This is a **potentially significant** impact.

The construction of the project may generate vibration when heavy equipment or impact tools (e.g., jackhammers, hoe rams) are used. Construction activities would include grading, foundation work, paving, and new building framing and finishing. Detailed information regarding construction equipment and phasing are not available at this time. Therefore, impact or vibratory pile driving activities, which can cause excessive vibration, may be required for the projects within the Plan Area.

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

Table 12 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet, as well as distances to the 0.08 in/sec PPV threshold for historical buildings and to the 0.25 in/sec PPV threshold for nonhistorical buildings. 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.

Pile driving has the potential of generating the highest ground vibration levels and is of primary concern to architectural damage, particularly when it occurs within 100 to 200 feet of structures. Vibration levels generated by pile driving activities would vary depending on project conditions, such as soil conditions, construction methods, and equipment used, but could exceed the recommended PPV thresholds to avoid architectural damage. Other project construction activities, such as caisson drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may also potentially generate substantial vibration in the immediate vicinity.

Depending on the proximity of existing structures to each construction site, the structural soundness of the existing buildings, and the methods of construction used, vibration levels may be high enough to damage existing structures. Given the scope of the proposed project and the location of Area Plan with respect to existing structures in the immediate vicinity (i.e., within 200 feet), groundborne vibration impacts would be potentially significant.

As with any type of construction, vibration levels may at times be perceptible. However, construction phases that have the highest potential of producing vibration (pile driving and use of jackhammers and other high-power tools) would be intermittent and would only occur for short periods of time for any individual project site. 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 to hours with least potential to affect nearby businesses, perceptible vibration can be kept to a minimum and as such would not result in a significant impact with respect to perception.

TABLE 12 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Minimum Distance to Meet 0.08 in/sec PPV (feet)	Minimum Distance to Meet 0.3 in/sec PPV (feet)
Pile Driver (Impact)	upper range	1.158	271	86
	typical	0.644	160	51
Pile Driver (Sonic)	upper range	0.734	180	57
	typical	0.170	48	15
Clam shovel drop		0.202	56	18
Hydromill (slurry wall)	in soil	0.008	3	1
	in rock	0.017	6	2
Vibratory Roller		0.210	58	19
Hoe Ram		0.089	27	9
Large bulldozer		0.089	27	9
Caisson drilling		0.089	27	9
Loaded trucks		0.076	23	8
Jackhammer		0.035	12	4
Small bulldozer		0.003	2	<1

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, modified by Illingworth & Rodkin, Inc. January 2023.

Mitigation Measure 2:

To address potential impacts related to vibration, the project will implement the following vibration controls in addition to the measures included in Policy 7.11 of the City's General Plan:

- Comply with the construction noise ordinance to limit hours of exposure. The City's Municipal Code allows construction activities between the hours 7:00 a.m. and 6:00 p.m. on weekdays and between 9:00 a.m. and 5:00 p.m. on Saturdays. Construction activity is not permitted on Sundays or national holidays.

- Prohibit the use of heavy vibration-generating construction equipment within 25 feet of residences. Use a smaller vibratory roller, such as the Caterpillar model CP433E vibratory compactor, when compacting materials within 25 feet of residences adjoining the site.

- Avoid dropping heavy equipment within 25 feet of residences. Use alternative methods for breaking up existing pavement, such as a pavement grinder, instead of dropping heavy objects within 25 feet of residences adjoining the site.

- The contractor shall alert heavy equipment operators to the close proximity of the adjacent structures so they can exercise extra care.

- For projects requiring impact or vibratory pile driving, a Construction Vibration Monitoring, Treatment, and Reporting Plan shall be implemented to document conditions prior to, during,

and after vibration-generating construction activities. All plan tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry-accepted standard methods. The construction vibration monitoring plan shall include, but not be limited to, the following measures:

- Document conditions at all structures located within 90 feet of pile driving activities and at historic structures located within 275 feet of pile driving activities prior to, during, and after vibration-generating construction activities. All plan tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry-accepted standard methods. Specifically:

    - Vibration limits shall be applied to vibration-sensitive structures located within 90 feet of any high impact construction activities, such as pile driving, and 275 feet of historic buildings.

    - Performance of a photo survey, elevation survey, and crack monitoring survey for each structure of normal construction within 90 feet of any high impact construction activities and each historic structure within 275 feet of pile driving activities. Surveys shall be performed prior to any construction activity, in regular intervals during 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.

- Develop a vibration monitoring and construction contingency plan to identify structures where monitoring would be conducted, set up a vibration monitoring schedule, define structure-specific vibration limits, and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies shall be identified for when vibration levels approached the limits.

- At a minimum, vibration monitoring shall be conducted during all pile driving activities.

- If vibration levels approach limits, suspend construction and implement contingency measures to either lower vibration levels or secure the affected structures.

- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

- Conduct a post-construction survey on structures where either monitoring has indicated high vibration levels or complaints of damage has been made. Make appropriate repairs or compensation where damage has occurred as a result of construction activities.

The construction noise logistics plan, including the above-listed measures will be implemented as a project condition of approval, consistent with the City's standard practice. The implementation of the construction noise logistics plan with these construction vibration controls would reduce the impact to a less-than-significant level.

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

The Palo Alto Airport is a general aviation airport located approximately 0.6 mile southeast of the Plan Area. The Plan Area lies outside the 65 dBA CNEL noise contour, as shown in Figure 5. For residential uses, the exterior noise threshold of 65 dBA CNEL would not be exceeded. Additionally, the exterior noise thresholds for all other uses is not expected to be exceeded due to aircraft activity.

Standard residential construction materials provide exterior-to-interior noise level reduction of 15 dBA with windows partially open and 20 dBA with windows shut. Standard office, commercial, and industrial construction materials would achieve a 25 to 30 dBA exterior-to-interior noise reduction with the windows closed.

Interior noise levels at office, commercial, and industrial buildings during daytime operational hours would be below the City's 45 dBA $L_{eq(12)}$ threshold, and residential interiors would meet the threshold with windows shut.
Other airports in the vicinity of the project site include the Moffett Federal Airfield (4.8 miles southeast), Norman Y. Mineta San José International Airport (12 miles southeast), San Carlos Airport (6 miles northwest), and San Francisco International Airport (15 miles northwest). The project site lies outside the areas of influence for each of the airports, and the noise environment at the site would not substantially increase due to aircraft noise from these airports.

Mitigation Measure 3: No mitigation required.

Appendix A

FIGURE A1 Daily Trend in Noise Levels at LT-1, Wednesday, October 12, 2022

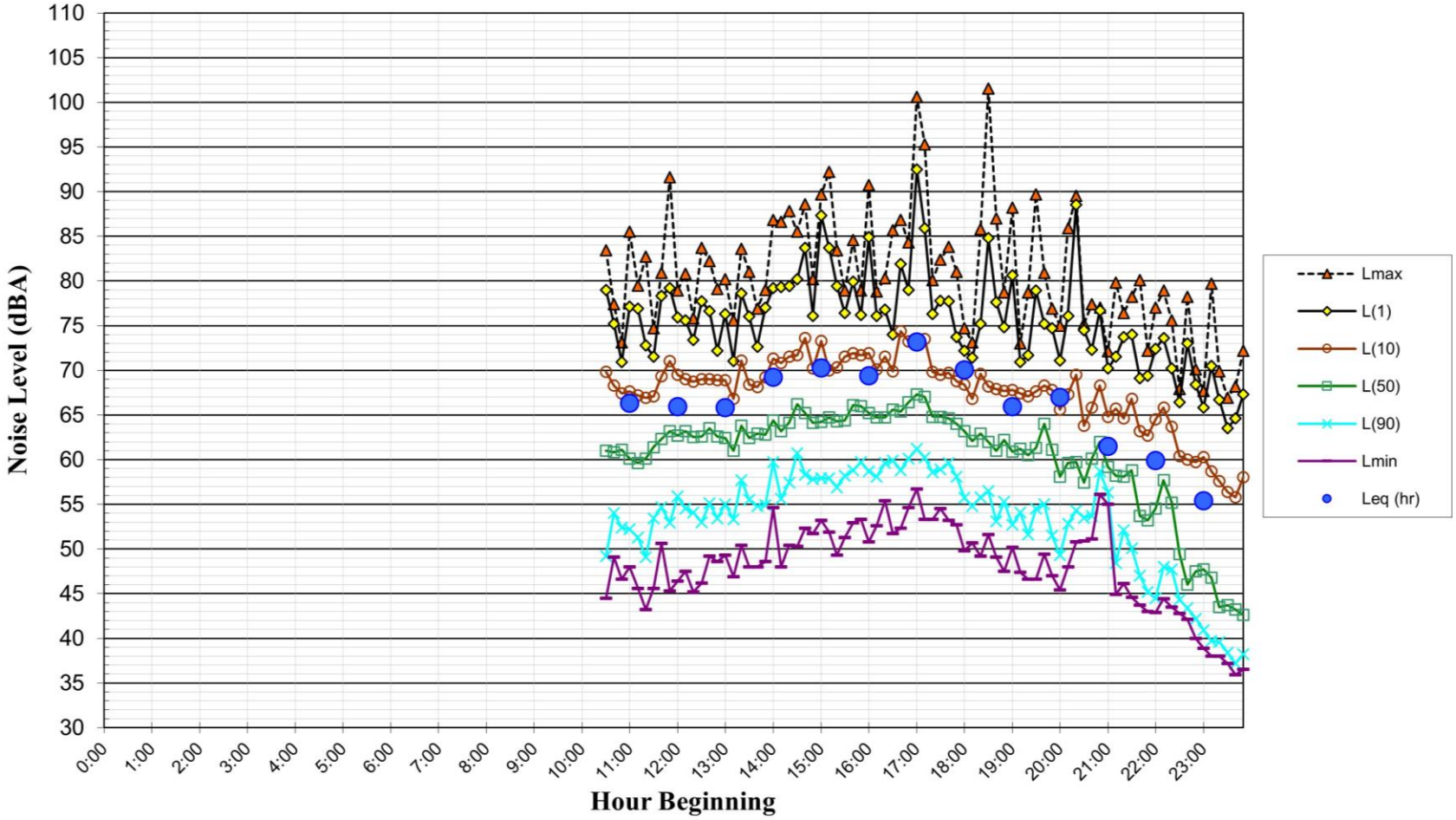


FIGURE A2 Daily Trend in Noise Levels at LT-1, Thursday, October 13, 2022

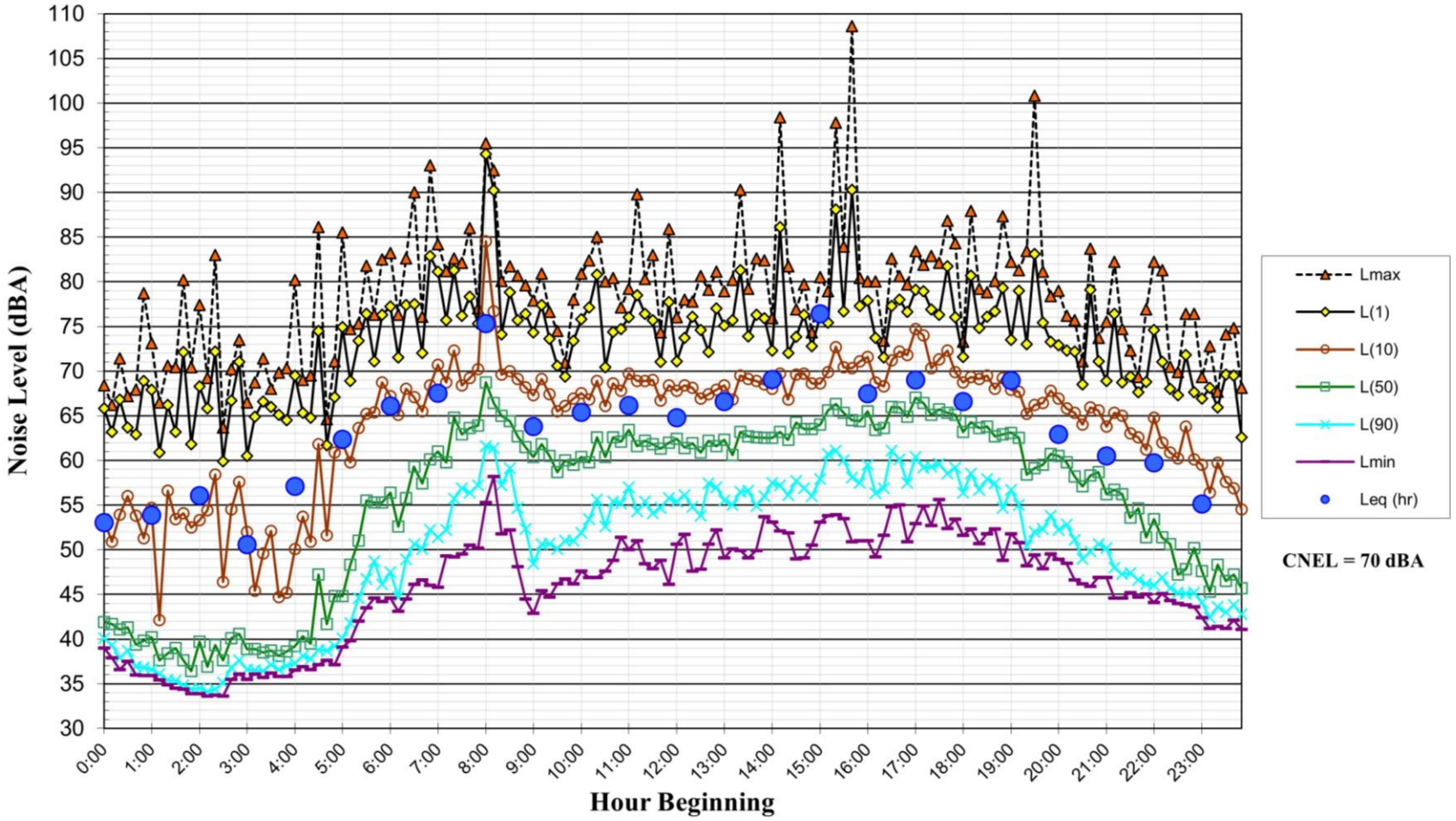


FIGURE A3 Daily Trend in Noise Levels at LT-1, Friday, October 14, 2022

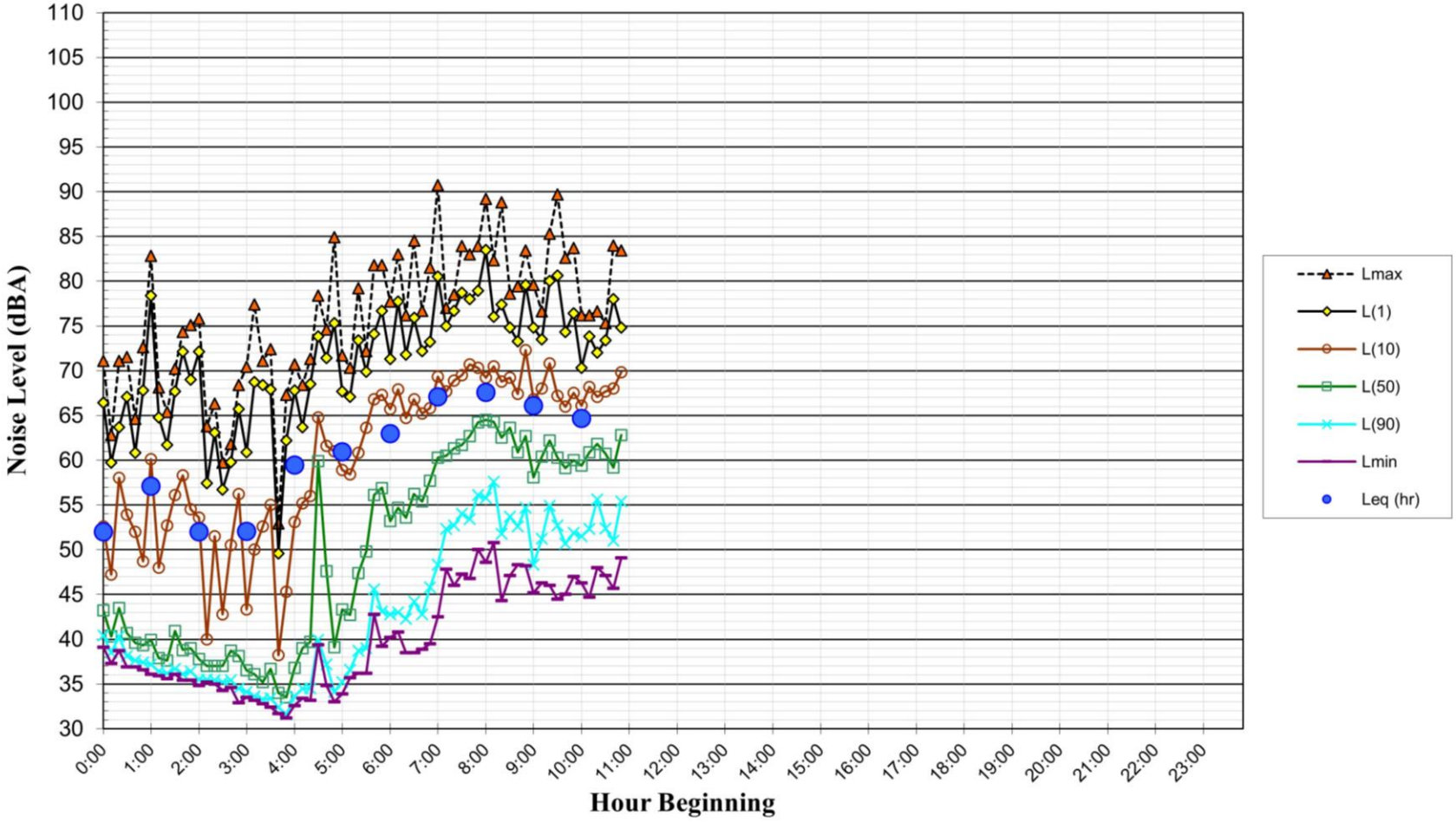


FIGURE A4 Daily Trend in Noise Levels at LT-2, Wednesday, October 12, 2022

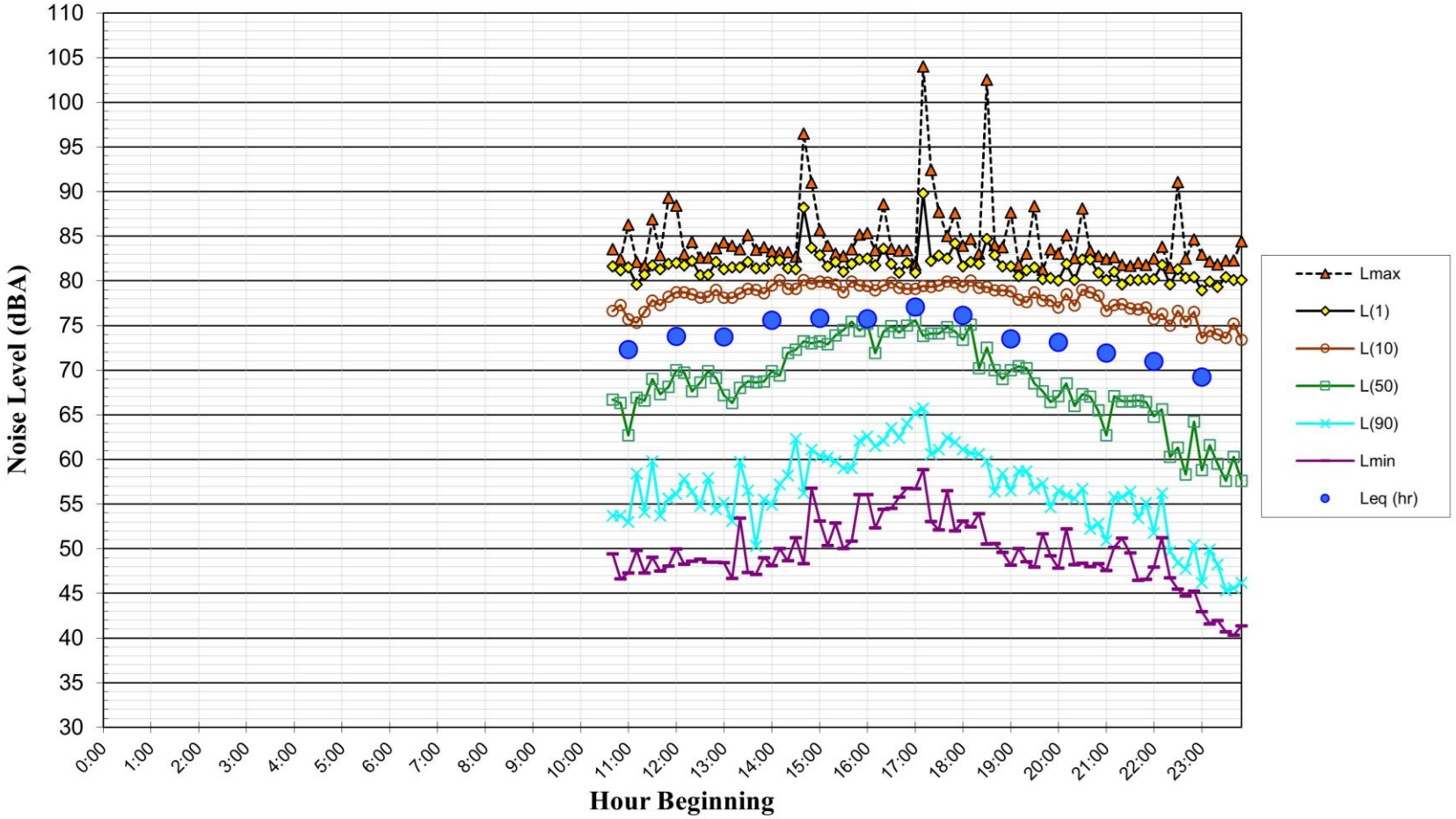


FIGURE A5 Daily Trend in Noise Levels at LT-2, Thursday, October 13, 2022

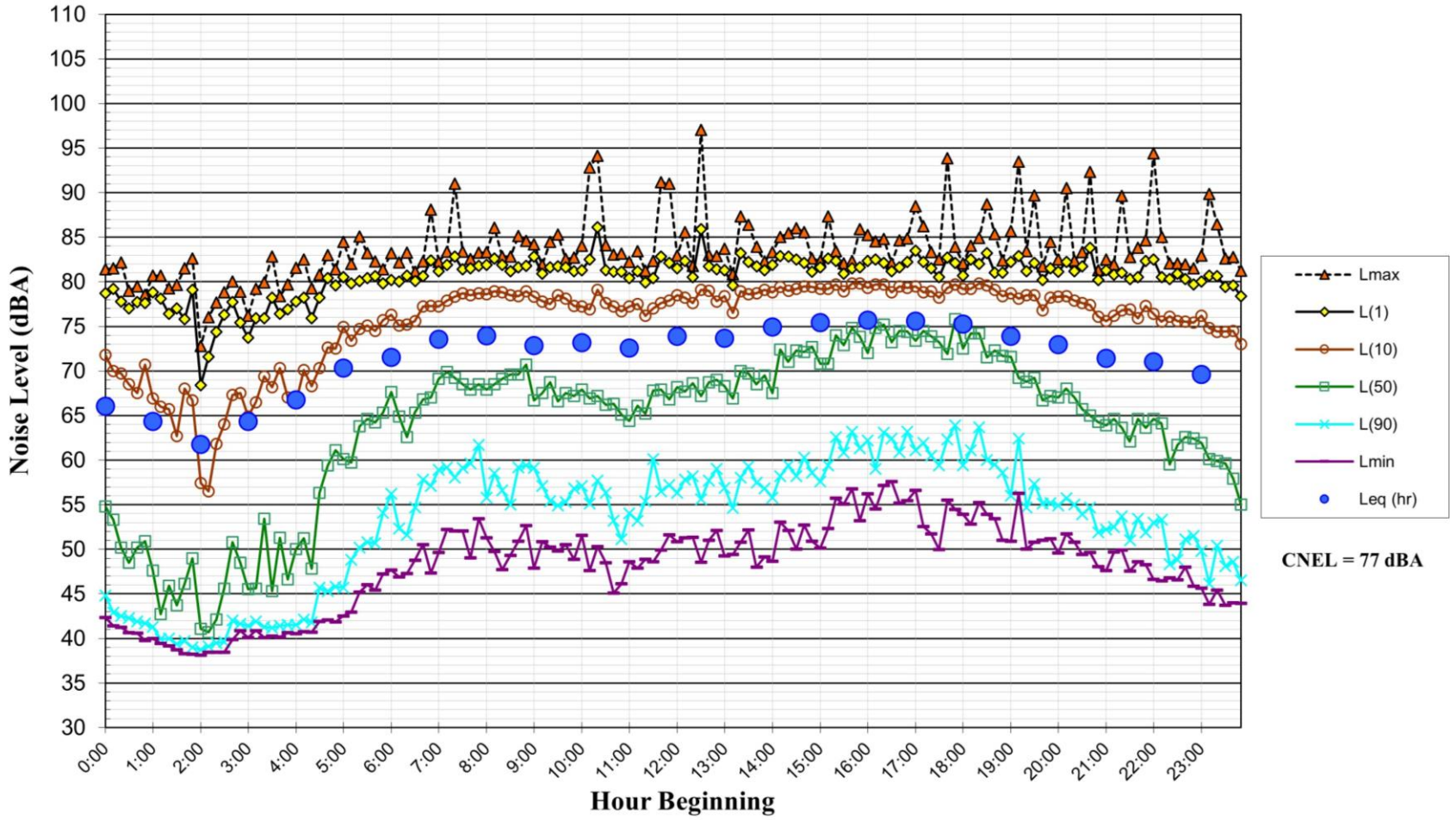


FIGURE A6 Daily Trend in Noise Levels at LT-2, Friday, October 14, 2022

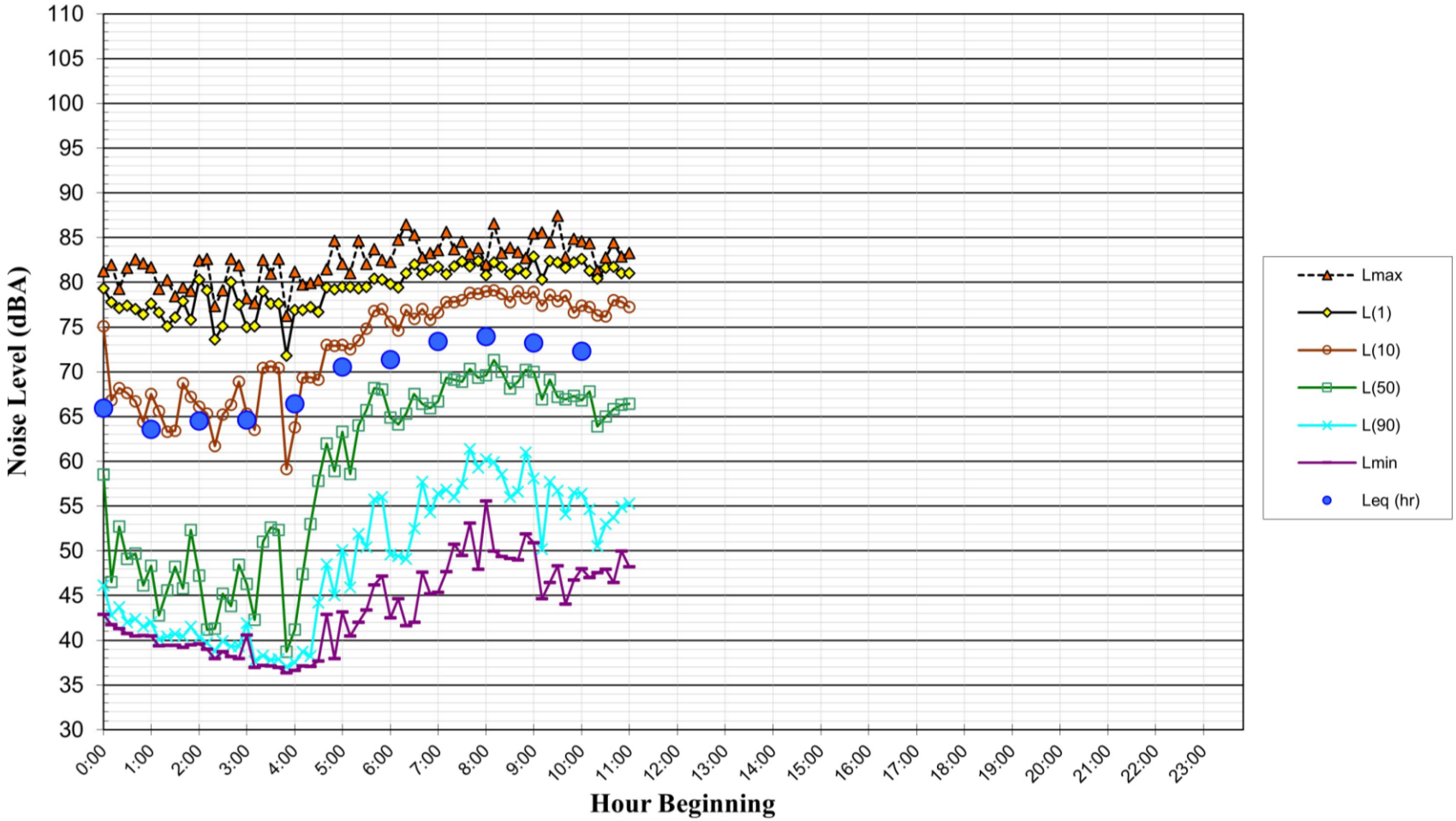


FIGURE A7 Daily Trend in Noise Levels at LT-3, Wednesday, October 12, 2022

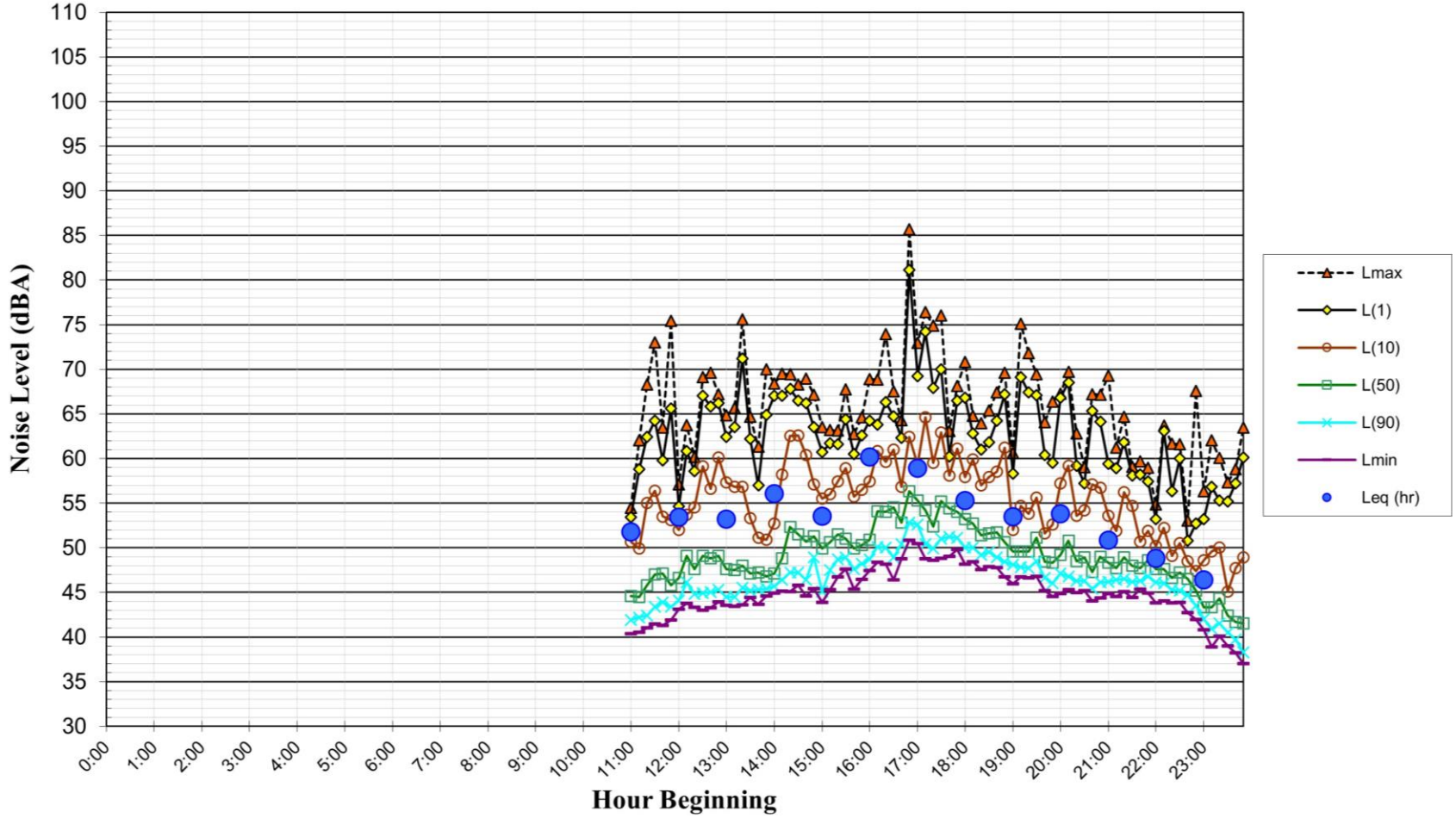


FIGURE A8 Daily Trend in Noise Levels at LT-3, Thursday, October 13, 2022

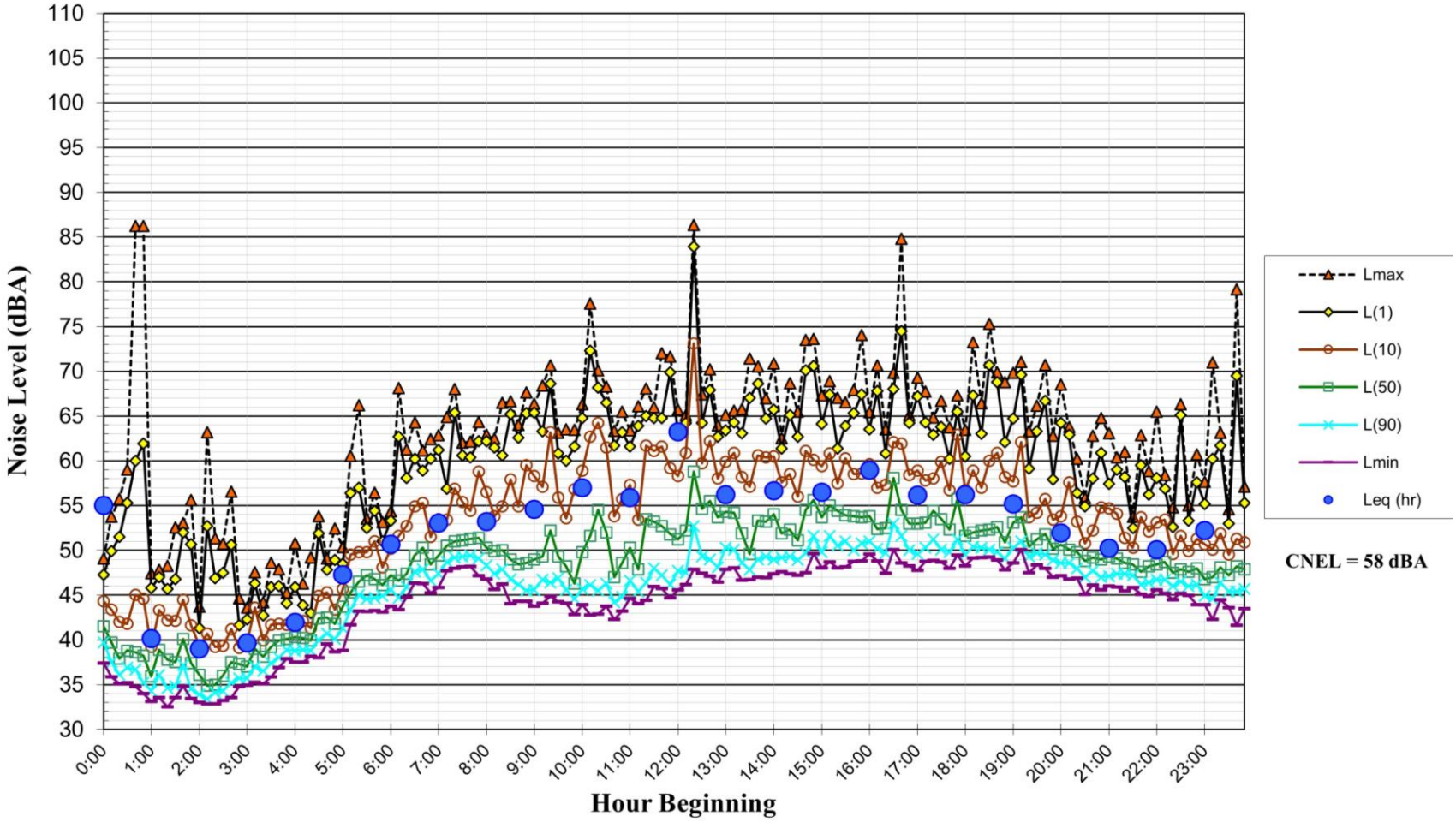


FIGURE A9 Daily Trend in Noise Levels at LT-3, Friday, October 14, 2022

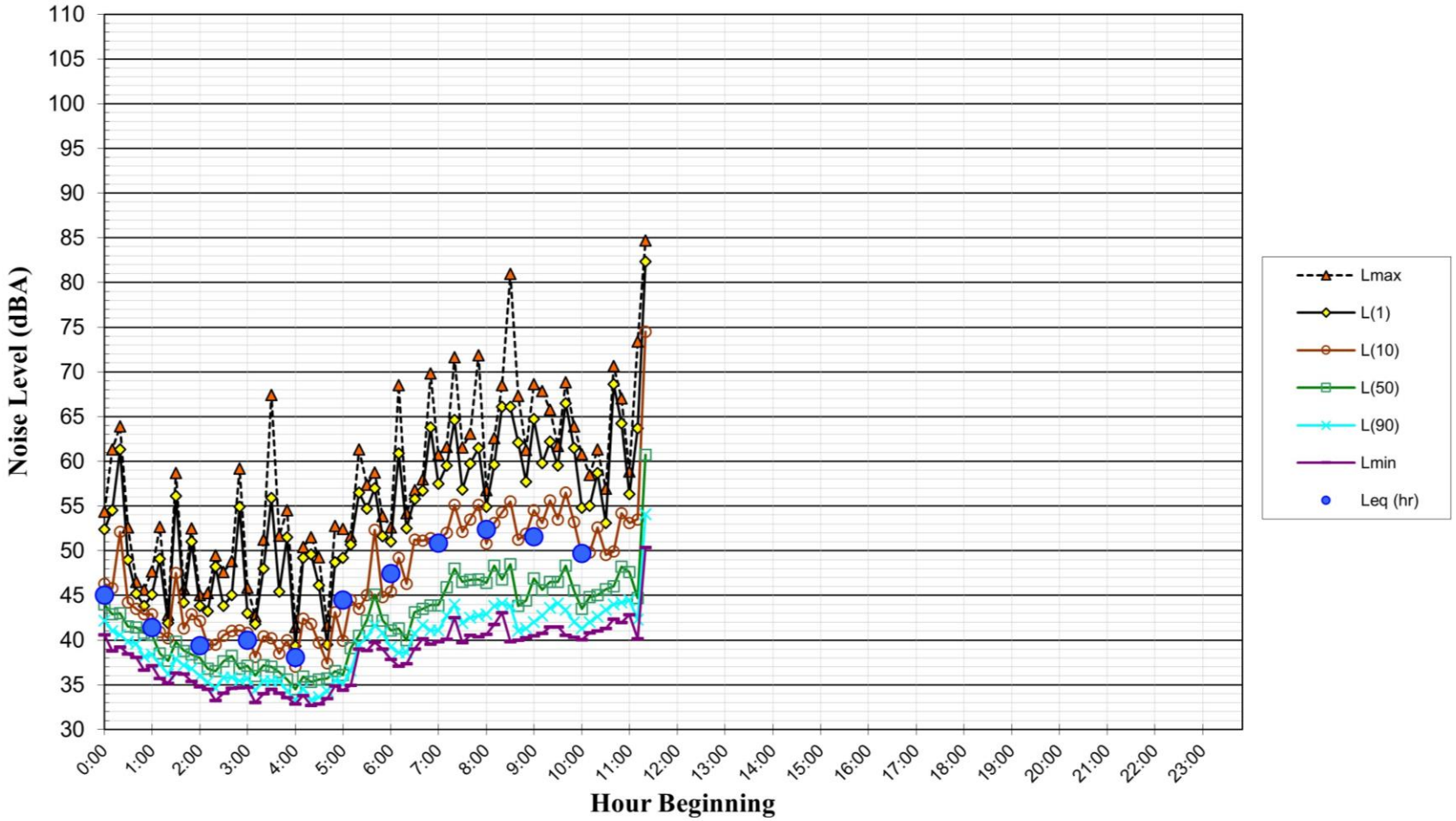


FIGURE A10 Daily Trend in Noise Levels at LT-4, Wednesday, October 12, 2022

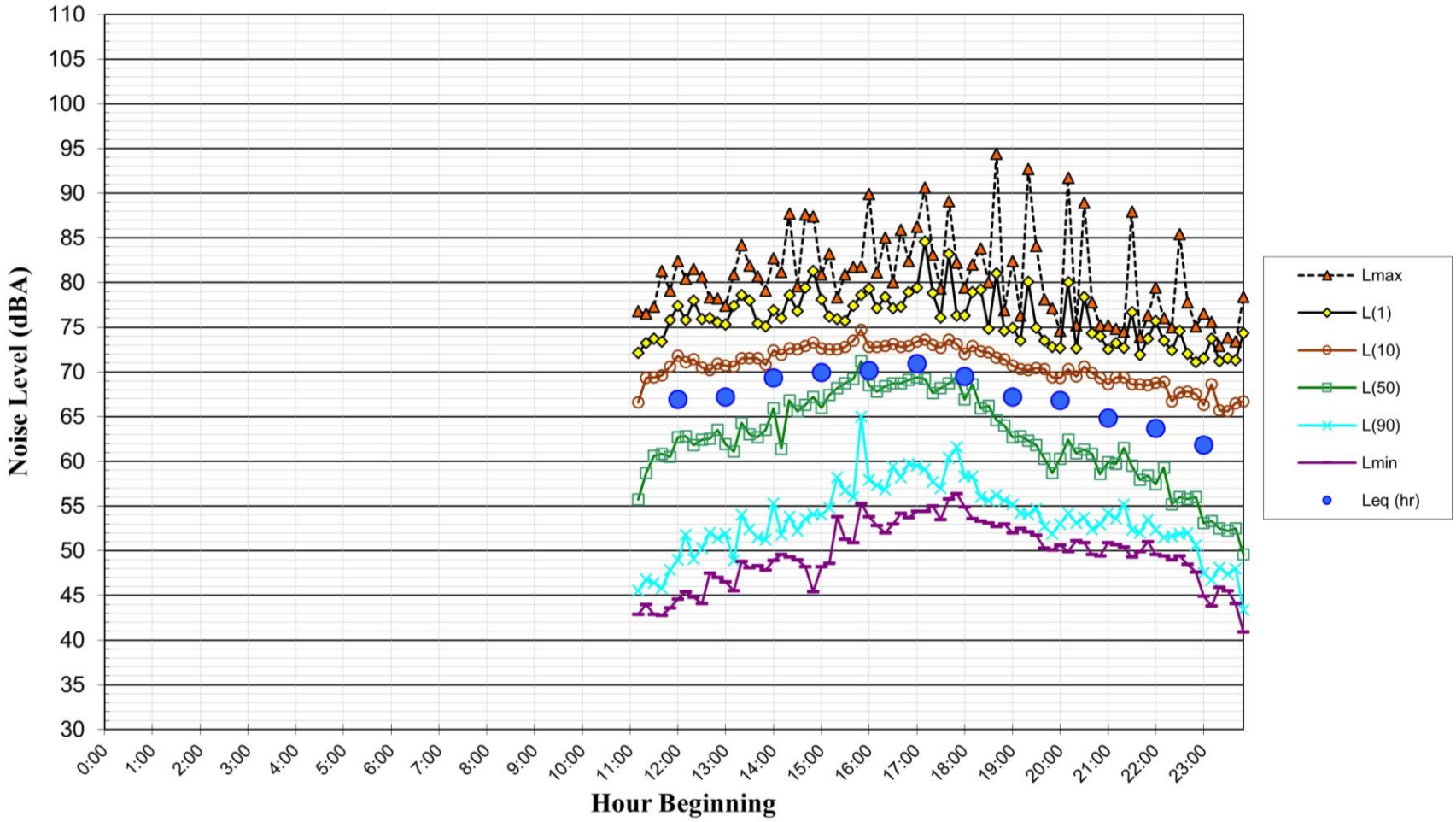


FIGURE A11 Daily Trend in Noise Levels at LT-4, Thursday, October 13, 2022

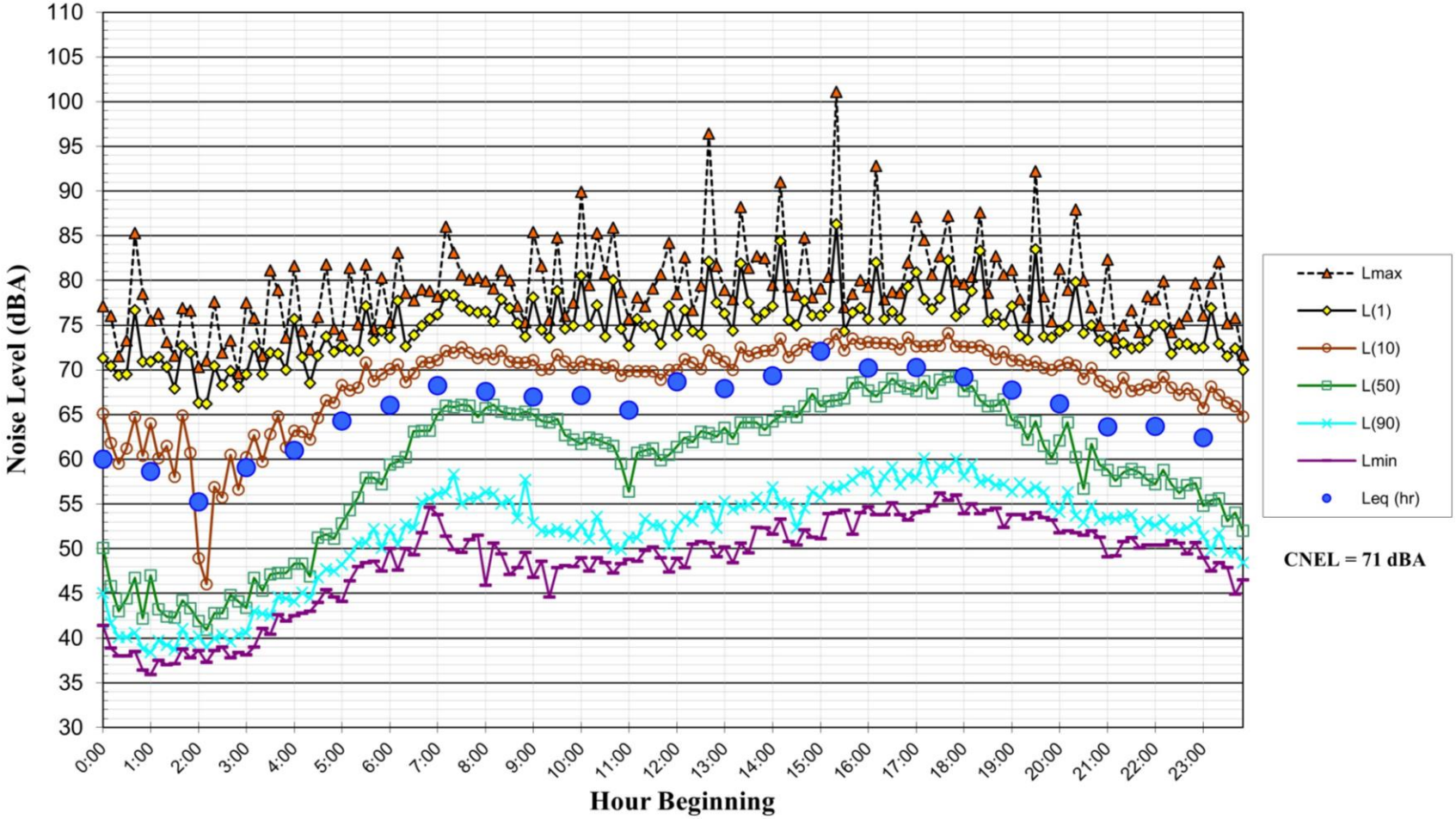


FIGURE A12 Daily Trend in Noise Levels at LT-4, Friday, October 14, 2022