REDWOOD ROW PROJECT NOISE AND VIBRATION ASSESSMENT

Cotati, California

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INTRODUCTION

A mixed-use development is proposed at the vacant lot located north of Highway 116 and west of Redwood Drive in Cotati, California. The project would include the construction of 157 residential units, approximately 10,500 square feet of commercial space, and 82 parking spaces. The project is consistent with the development density established by the general plan, for which an EIR was certified. CEQA Guideline section 15183 states that such a project "shall not require additional environmental review, except as might be necessary to examine whether there are project-specific significant effects which are peculiar to the project or its site." (14 Cal. Code Regs. § 15183(a).)

This report evaluates the project's potential to result in peculiar project-specific significant impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines section 15183. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses ambient noise conditions in the project vicinity; 2) the Plan Consistency Analysis section discusses noise and land use compatibility utilizing policies in the City's General Plan; and, 3) the Impacts and Recommended Conditions Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents recommendations to reduce , where necessary, to address project impacts to a less-than-significant level.

SETTING

Fundamentals of Environmental Noise

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

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

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

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

TABLE 2 Typical Noise Levels in the Environment

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

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

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 CNEL. Typically, the highest steady traffic noise level during the daytime is about equal to the CNEL 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.[1] Sleep and speech interference is therefore possible when exterior noise levels are about 57 to 62 dBA CNEL with open windows and 65 to 70 dBA CNEL 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 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 CNEL. At a CNEL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the 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 CNEL of 60 to 70 dBA. Between a 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 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.[2]

[1] Based on the U.S. Department of Transportation Federal Highway Administration document "Highway Traffic Noise: Analysis and Abatement Guidance" (2010) and data from Illingworth & Rodkin, Inc. noise monitoring projects.

[2] Kryter, Karl D. The Effects of Noise on Man. Menlo Park, Academic Press, Inc., 1985.

Fundamentals of Groundborne Vibration

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

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

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

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

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

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

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

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

Regulatory Background

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

Federal

Federal Transit Administration. The Federal Transit Administration (FTA) has identified construction noise thresholds in the *Transit Noise and Vibration Impact Assessment Manual*,[3] which limit daytime construction noise to 80 dBA L_{eq} at residential land uses, to 85 dBA L_{eq} at commercial land uses, and to 90 dBA L_{eq} at industrial land uses.

State of California

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

(a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

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

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

(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.

2022 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels in multi-family residential units attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn}/CNEL in any habitable room.

2022 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings, as set forth in the 2010 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). These standards were not altered in the 2022 revisions. Section 5.507 states that either the prescriptive (Section 5.507.4.1) or the performance method (Section 5.507.4.2) shall be used to determine environmental control at indoor areas. The prescriptive method is very conservative and not practical in most cases; however, the performance method can be quantitatively verified using exterior-to-interior calculations. For the purposes of this report, the performance method is utilized to determine consistency with the Cal Green Code. Both of the sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building or additional envelope or altered envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 within the 65 dBA CNEL or DNL noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the Noise Element of the General Plan.
>
> **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 or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq(1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

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

<u>City of Cotati</u>

City of Cotati General Plan (adopted 3.24.15). The Noise Element of the City of Cotati's General Plan provides the following Goal, Policies, and Implementation Measures which are relevant to the proposed project.

GOAL N-1 Create a Pleasant Sound Environment by Minimizing Exposure to Harmful and Annoying Noise.

Objective N-1A Minimize Noise Levels to Enhance the Quality of Existing and Future Land Uses.

Policy N 1.1 Ensure the noise compatibility of existing and future uses when making land use planning decisions.

Policy N 1.2 Require development and infrastructure projects to be consistent with the Land Use Compatibility for Community Noise Environments standards indicated in Table N-1 to ensure acceptable noise levels at existing and future uses.

Policy N 1.3 Require development to mitigate excessive noise through best practices, including building location and orientation, building design features, placement of noise-generating equipment away from sensitive receptors, shielding of noise-generating equipment, placement of noise-tolerant features between noise sources and sensitive receptors, and use of noise-minimizing materials such as rubberized asphalt.

Policy N 1.4 Require mixed-use projects to minimize noise exposure within the indoor areas of nearby residential areas through the use of noise attenuating building materials, engineering techniques, and site design practices. Site Design practices may include locating mechanical equipment, loading bays, parking lots, driveways, and trash enclosures away from residential uses and providing noise attenuating screening features onsite.

Policy N 1.5 Control non-transportation related noise from site specific noise sources.

Policy N 1.6 Support noise-compatible land uses along existing and future roadways, highways, and freeways.

Policy N 1.7 The following criteria shall be used to determine the significance, for projects required by the California Environmental Quality Act to analyze noise impacts, of noise impacts for development, transportation, and other projects that increase noise:

Stationary and Non-Transportation Noise Sources:

- A significant impact will occur if the project results in an exceedance of the noise level standards contained in this Noise Element, or the project will result in an increase in ambient noise levels by more than 3 dB.

Transportation Noise Sources:

- Where existing traffic noise levels are less than 60 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +5 dB Ldn increase in roadway noise levels will be considered significant; and

- Where existing traffic noise levels range between 60 and 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +3 dB Ldn increase in roadway noise levels will be considered significant; and

- Where existing traffic noise levels are greater than 65 dB Ldn at the outdoor activity areas of noise-sensitive uses, a +1.5 dB Ldn increase in roadway noise levels will be considered significant.

TABLE N-1: LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENT

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE, L_{DN}					
	55	60	65	70	75	80
Single Family Residential						
Multi-Family Residential, Hotels, and Motels						
Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds						
Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls, Churches						
Office Buildings, Business Commercial, and Professional						
Auditoriums, Concert Halls, Amphitheaters						
Industrial, Manufacturing, Utilities and Agriculture						

	NORMALLY ACCEPTABLE Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special insulation requirements.
	CONDITIONALLY ACCEPTABLE: Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.
	UNACCEPTABLE: New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

Policy N 1.8 Ensure that new development does not result in indoor noise levels for sleeping areas in excess of 45 dBA L_{dn}.

Policy N 1.11 Require acoustical studies and mitigation measures, where necessary, for new developments and transportation improvements that affect noise sensitive uses such as schools, hospitals, libraries, group care facilities, convalescent homes, and residential areas.

Policy N 1.15 Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to

minimize the potential for cosmetic damage to the building. A vibration limit of 0.30 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction:

Action N1a: Update the Land Use Code to ensure that the noise standards are consistent with this Noise Element, including Tables N---1 and N2, and to require new residential, mixed---use with a residential component, and other noise---sensitive development to be designed to minimize noise exposure to noise sensitive users through incorporation of site planning and architectural techniques such as:

- Locating dwellings as far from noise generators as possible.
- Locating noise-sensitive interior spaces, such as bedrooms, away from noise generators.
- Orienting buildings to shield noise-sensitive outdoor spaces from noise generators.
- Use of sound walls should be avoided or minimized, through alternative measures such as berms, setbacks, or other measures, to the maximum extent feasible and appropriate.

Action N1b: Review land use and development proposals, including use permits, for compliance with the noise requirements established in this element, including the standards established in Tables N---1 and N---2. Where necessary, mitigation measures to achieve the noise standards identified in Tables N-1 and N-2 and, where applicable to minimize exposure of sensitive uses to existing or potential vibration levels to the maximum feasible extent.

Action N1c: Require an acoustical study for all new discretionary projects, including development and transportation, with potential noise impacts. The study shall include mitigation measures necessary to ensure compliance with this Noise Element and relevant noise standards in the Land Use Code.

Action N1h: During the environmental review process, determine if proposed construction will constitute a significant impact on nearby residents and require mitigation measures in addition to the standard "best practice" controls. Suggested "best practices" for control of construction noise:

- Construction period shall be less than twelve months.
- Noise-generating construction activities, including truck traffic coming to and from the construction site for any purpose, shall be limited to between the hours of 7:00 am and 7:00 pm on weekdays and 9:00 am

and 5:00 pm on Saturdays (if allowed through specific project conditions of approval). No construction shall occur on Sundays or holidays.

- All equipment driven by internal combustion engines shall be equipped with mufflers, which are in good condition and appropriate for the equipment.

- The construction contractor shall utilize "quiet" models of air compressors and other stationary noise sources where technology exists.

- At all times during project grading and construction, stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from residences.

- Unnecessary idling of internal combustion engines shall be prohibited.

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

- The required construction-related noise mitigation plan shall also specify that haul truck deliveries are subject to the same hours specified for construction equipment.

- Neighbors located adjacent to the construction site shall be notified of the construction schedule in writing.

- The construction contractor shall designate a "noise disturbance coordinator" who will be responsible for responding to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and institute reasonable measures as warranted to correct the problem. A telephone number for the disturbance coordinator shall be conspicuously posted at the construction site.

Existing Noise Environment

The project site is located on a vacant lot north of Highway 116 and west of Redwood Drive in Cotati, California. Existing commercial uses adjoin the project site to the east and northeast. Additional commercial uses are located south of the site, opposite Highway 116, and east of Redwood Drive. A future mixed-use development is planned for development at the vacant lot to the west; existing residences adjoins the site to the northwest; and a vacant lot and existing commercial buildings adjoin the site to the north.

The noise environment at the site and in the surrounding area results primarily from vehicular traffic along nearby U.S. Highway 101 and Highway 116. Mechanical equipment noise from the neighboring commercial properties and the occasional aircraft associated with Charles M. Schulz Sonoma County Airport also contributes to the existing noise environment.

A noise monitoring survey consisting of three long-term (LT-1 through LT-3) and two short-term (ST-1 and ST-2) noise measurements was conducted between Wednesday, October 16, 2024, and Friday, October 18, 2024. All measurement locations are shown in Figure 1.

Long-term noise measurement LT-1 was made along the southeastern boundary of the project site, approximately 210 feet north of the centerline of Highway 116 and approximately 155 feet west of the centerline of Redwood Drive. Hourly average noise levels at LT-1 typically ranged from 51 to 62 dBA L_{eq} during the day (between 7:00 a.m. and 10:00 p.m.) and from 45 to 61 dBA L_{eq} at night (between 10:00 p.m. and 7:00 a.m.). The day-night average noise level Thursday, October 17, 2024, was 61 dBA L_{dn}. The daily trend in noise levels at LT-1 is shown in Figure A1 through A3 of Appendix A.

LT-2 measured noise levels along the southern boundary of the project site, approximately 30 feet north of the centerline of Highway 116. Hourly average noise levels at this location typically ranged from 67 to 75 dBA L_{eq} during the day and from 59 to 71 dBA L_{eq} at night. The day-night average noise level Thursday, October 17, 2024, was 74 dBA L_{dn}. The daily trend in noise levels at LT-2 is shown in Figure A4 through A6 of Appendix A.

LT-3 was made near the northeastern boundary, approximately 30 feet from the property line shared with Lowes. Hourly average noise levels at this location typically ranged from 46 to 59 dBA L_{eq} during the day and from 43 to 59 dBA L_{eq} at night. The day-night average noise level Thursday, October 17, 2024, was 58 dBA L_{dn}. The daily trend in noise levels at LT-3 is shown in Figure A7 through A9 of Appendix A.

Short-term noise measurements were made over 10-minute measurement periods, concurrent with the long-term noise data, on Wednesday, October 16, 2024, between 10:40 a.m. and 11:10 a.m. All short-term measurements are summarized in Table 4.

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

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: made near the center of the site	10/16/2024, 10:40-10:50	67	64	60	54	49	56
ST-2: made along the eastern boundary of site	10/16/2024, 11:00-11:10	57	53	51	49	48	50

FIGURE 1 Aerial Image of the Project Site and Surrounding Area with the Noise Measurement Locations Identified

Source: Google Earth 2024.

ST-1 was made near the center of the project site where the proposed community outdoor use area is proposed. ST-1 was positioned approximately 275 feet north of the centerline of Highway 116. Traffic noise along Highway 116 was the dominant noise source. Traffic noise along Highway 116 generated noise levels of 52 to 63 dBA, and traffic noise along Redwood Drive generated noise levels of 48 to 67 dBA. In the absence of these noise sources, the background ambient noise levels, which are produced by nearby U.S. Highway 101, ranged from 48 to 50 dBA. The 10-minute average noise level measured at ST-1 was 56 dBA L_{eq}.

ST-2 was made in the northwestern corner of the project site near a proposed park area. Traffic noise along Highway 116 was the dominant noise source, with heavy trucks generating noise levels of 49 to 55 dBA and passenger cars generating noise levels of 48 to 51 dBA. Other contributing noise sources included a jet (51 dBA) and brief loading dock noise (57 dBA). In the absence of these noise sources, the background ambient noise levels, which are produced by nearby U.S. Highway 101, ranged from 46 to 48 dBA. The 10-minute average noise level measured at ST-2 was 50 dBA L_{eq}.

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

Noise levels at outdoor use areas that are affected by transportation noise are required to be maintained at or below 65 dBA L_{dn} to be considered normally acceptable for multi-family residential land uses, according to the City's General Plan. The City's normally acceptable threshold for outdoor recreational and neighborhood park areas is 65 dBA L_{dn}. Higher noise levels are conditionally acceptable for multifamily uses and outdoor recreational/park areas as well. Additionally, residential interior noise levels are required to meet the performance standard of 45 dBA L_{dn}.

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

The future noise environment at the project site would continue to result primarily from vehicular traffic along nearby U.S. Highway 101 and Highway 116. Additionally, mechanical equipment noise from the surrounding commercial uses would continue to affect the noise environment at the project site.

While mechanical equipment noise would be consistent in the future, potential noise level increases due to traffic noise along Highway 116 are considered in this analysis to assume worst-case conditions. While the proposed project did not require a full traffic study, peak hour project trips generated by the project would include a total of 86 during the peak AM hour and 116 during the peak PM hour. When added to the existing volumes along Highway 116, this would not result in a measurable noise level increase. To estimate the future permanent noise level increase, a 1% to 2% traffic increase per year through 2045 was estimated. The noise level increase by the year 2045 was calculated to be 2 dBA L_{dn}. This increase was applied throughout the project site to represent worst-case conditions.

Future Exterior Noise Environment

The site plan shows a community pool and deck near the center of the site; a children's play area and community park with a social seating area east of the pool area; and a public park at the rear of the site along the western boundary. Each of these areas would be common use areas subject to the City's exterior noise thresholds. The site plan also shows private yards; however, due to the orientation of the townhome units, the private yards would be considered front yards with access walkways to each unit. Garage access is located on the rear of the units. Exterior noise thresholds are not applied to front yards, given the need for access to the units.

The centers of each of the outdoor use areas would range from 190 to 435 feet from the centerline of Highway 116 and would receive some shielding from the intervening project buildings. The intervening buildings would offer shielding from the noise and with such shielding future exterior noise levels would be below 65 dBA L_{dn} at each of the outdoor use areas.

All outdoor use areas associated with the proposed project would be compatible with the future exterior noise environment at the project site. No noise control measures would be required.

Future Interior Noise Environment[4]

Proposed Residential Uses

The California Building Code requires that interior residential noise standards not exceed 45 dBA, and the project would be required to show how it meets Building Code requirements to obtain building permits for construction. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn}, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn}, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Buildings A and B (see Figure 2), which front Highway 116, have ground-level commercial uses that face the roadway and residential units on the upper levels. With setbacks of 60 feet from the centerline of Highway 116, these units would be exposed to future exterior noise levels of 73 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in the residential units would be up to 58 dBA L_{dn}.

Building S and the low-income housing building would also have direct line-of-sight to Highway 116, with setbacks ranging from 80 to 210 feet from the centerline of Highway 116. Residential

[4] Impacts of the environment on project workers and future residents are not covered by CEQA. CEQA requires an agency to review the potential significant impacts of a project on the environment. Nonetheless, this analysis is included for informational purposes.

units in these buildings would be exposed to future exterior noise levels ranging from 66 to 72 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in these units would range from 51 to 57 dBA L_{dn}.

The second row of townhomes (i.e., Buildings C, CC, V, T, and U) are set back approximately 145 to 310 feet from the centerline of Highway 116. Additionally, these buildings would be partially shielded from the first-row buildings that front Highway 116. Residential units in these buildings would be exposed to future exterior noise levels at or below 60 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in these units would be at or below 45 dBA L_{dn}.

All remaining residential buildings would be adequately shielded and exposed to future exterior noise levels at or below 60 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in these units would be at or below 45 dBA L_{dn}.

To meet the interior noise requirements set forth by the California Building Code and as adopted by the City of Cotati of 45 dBA L_{dn}, implementation of noise insulation features would be required. The amount of attenuation required can be accomplished through common construction techniques.

Proposed Commercial Uses

The ground floor commercial retail uses would be located in Buildings A and B and would front Highway 116. The setback of the commercial uses from the centerline of Highway 116 would be 60 feet from the centerline. At this distance, the ground floor commercial retail uses would be exposed to exterior daytime hourly average noise levels ranging from 66 to 74 dBA L_{eq}, with community noise equivalent level up to 73 dBA L_{dn}.

Standard construction materials for commercial uses would provide about 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so that windows may be kept closed at the occupant's discretion and would provide an additional 5 dBA reduction. The standard construction materials in combination with forced-air mechanical ventilation would satisfy the State's daytime threshold of 50 dBA L_{eq}.

FIGURE 2 Project Site Plan

Recommended Noise Insulation Features to Reduce Future Residential Interior Noise Levels

The following noise insulation features would reduce interior noise levels to 45 dBA L_{dn} or less at residential interiors. These features or other features shown to accomplish the required noise reduction shall be incorporated into the proposed project:

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

- Preliminary calculations indicate that residential units located Buildings A, B, S would require windows and doors with a minimum rating of 35 STC with adequate forced-air mechanical ventilation to meet the interior noise threshold of 45 dBA L_{dn}.

- Units located in the low-income housing building would require windows and doors with a minimum rating of 28 STC with adequate forced-air mechanical ventilation.

- All remaining units would require windows and doors with standard construction materials and adequate forced-air mechanical ventilation to meet the 45 dBA L_{dn} interior threshold.

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

Standard Condition of Approval

The project applicant shall prepare final design plans that incorporate building design and acoustical treatments to ensure compliance with State Building Codes and City noise standards. A project-specific acoustical analysis shall be prepared to ensure that the design incorporates controls to reduce interior noise levels to 45 dBA L_{dn} or lower within the residential units. The applicant shall conform with any special building construction techniques required to meet the interior noise standard, which may include sound-rated windows and doors, sound-rated wall constructions, and acoustical caulking.

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.** With the incorporation of recommended construction best management practices, the temporary construction noise impact would be reduced to a **less-than-significant** level.

Project construction is expected to be completed over approximately 18 months, with construction work occurring Monday through Friday between 8:00 a.m. and 5:00 p.m. Construction phases would include site preparation, excavation/grading, trenching/foundation, building exterior, architectural coating, and paving. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating.

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

The City's General Plan suggests construction activities be limited (including the loading and unloading of materials and truck movements) to the hours of 7:00 a.m. to 7:00 p.m. on weekdays and between the hours of 9:00 a.m. and 5:00 p.m. on Saturdays (if allowed through specific project conditions of approval). No construction is permitted on Sundays or holidays.

While noise thresholds for temporary construction are not provided in the City's General Plan, 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*.[1] During daytime hours, an exterior threshold of 80 dBA L_{eq} shall be applied at residential land uses, 85 dBA L_{eq} shall be applied at commercial land uses, and 90 dBA L_{eq} shall be applied at industrial land uses.

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

Table 6 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction are about 72 to 88 dBA L_{eq} for residential mixed-use buildings, measured at a distance of 50 feet from the center of a busy construction site. Construction-generated noise levels drop off at a rate of about 6 dBA per

doubling of the distance between the source and receptor. Shielding by buildings or terrain often results in lower construction noise levels at distant receptors.

TABLE 5 Construction Equipment 50-foot Noise Emission Limits

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

Notes:

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

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

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

TABLE 6 Typical Ranges of Construction Noise Levels at 50 feet, L_{eq} (dBA)

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

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

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

Equipment expected to be used in each construction phase is summarized in Table 7, along with the quantity of each type of equipment and the reference noise level at 50 feet, assuming the operation of the two loudest pieces of construction equipment for each construction phase.

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

To assess construction noise impacts at the receiving property lines of noise-sensitive receptors surrounding the site, the worst-case hourly average noise level, which is calculated by combining all pieces of equipment per phase, was propagated from the geometrical center of the project site to the nearest property lines of the surrounding land uses. These noise level estimates are shown in Table 8. Noise levels in Table 8 do not assume reductions due to intervening buildings or existing barriers.

TABLE 7 Estimated Construction Noise Levels for the Proposed Project at a Distance of 50 feet

Phase of Construction	Total Number of Workdays	Construction Equipment (Quantity)	Estimated Construction Noise Level at 50 feet, dBA L_{eq}
Site Preparation	10	Rubber-Tired Dozer (3)[a] Tractor/Loader/Backhoe (4)[a]	82
Grading/Excavation	30	Excavator (2) Grader (1)[a] Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2) [a] Scraper (2)	84
Trenching/Foundation	30	Tractor/Loader/Backhoe (1)[a] Excavator (1)[a]	82
Building – Exterior	300	Crane (1) Forklift (3) Generator Set (1) [a] Tractor/Loader/Backhoe (3)[a] Welder (1)	82
Building – Interior	20	Air Compressor (1)[a]	74
Paving	20	Paver (2)[a] Paving Equipment (2)[a] Roller (2)	83

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

TABLE 8 Estimated Construction Noise Levels for the Proposed Project at the Property Lines of Receptors Surrounding the Project Site

Phase	Calculated Hourly Average L_{eq}, dBA					
	Northeast Comm. (270ft)	East Comm. (385ft)	South Comm. (415ft)	West Future Res. (410ft)	Northwest Res. (485ft)	North Comm. (370ft)
Site Preparation	73	70	69	69	68	70
Grading/Excavation	74	71	70	70	69	71
Trenching	67	64	63	63	62	64
Building-Exterior	71	68	68	69	66	69
Building-Interior/ Architectural Coating	59	56	55	55	54	56
Paving	72	69	68	68	67	69

As shown in Tables 7 and 8, construction noise levels would intermittently range from 74 to 84 dBA L_{eq} when activities occur 50 feet from nearby receptors. When focused near the center of the project site, construction noise levels would typically range from 54 to 70 dBA L_{eq} at the surrounding future and existing residential land uses and from 55 to 74 dBA L_{eq} at the commercial uses.

While construction noise levels would not exceed the FTA's 85 dBA L_{eq} threshold at the surrounding commercial uses, construction noise levels would potentially exceed the exterior threshold of 80 dBA L_{eq} at the residential uses adjoining the site by up to 4 dBA when activities would occur within 50 feet of the receptors.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. In accordance with *Action N1h* of the City's General Plan, the construction crew shall adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity. These practices shall be incorporated into the project as a project condition of approval and would reduce temporary construction noise levels as much as possible.

Construction Best Management Practices

According to the City's *Action N1h* of the General Plan, the following Construction Best Management Practices shall be incorporated into the proposed project:

- Noise-generating construction activities, including truck traffic coming to and from the construction site for any purpose, shall be limited to between the hours of 7:00 am and 7:00 pm on weekdays and 9:00 am and 5:00 pm on Saturdays (if allowed through specific project conditions of approval). No construction shall occur on Sundays or holidays.

- All equipment driven by internal combustion engines shall be equipped with mufflers, which are in good condition and appropriate for the equipment.

- The construction contractor shall utilize "quiet" models of air compressors and other stationary noise sources where technology exists.

- At all times during project grading and construction, stationary noise-generating equipment shall be located as far as practicable from sensitive receptors and placed so that emitted noise is directed away from residences.

- Unnecessary idling of internal combustion engines shall be prohibited.

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

- The required construction-related noise mitigation plan shall also specify that haul truck deliveries are subject to the same hours specified for construction equipment.

- Neighbors located adjacent to the construction site shall be notified of the construction schedule in writing.

- The construction contractor shall designate a "noise disturbance coordinator" who will be responsible for responding to any local complaints about construction noise. The disturbance coordinator would determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and institute reasonable measures as warranted to correct the problem. A telephone number for the disturbance coordinator shall be conspicuously posted at the construction site.

- Additionally, the contractor shall construct a solid plywood fence along the western and northwestern property lines to shield the adjoining future (if applicable) and existing residential receptors from construction work. A temporary 8-foot-tall noise barrier would be tall enough to block direct line-of-sight with ground-level receptors and reduce noise levels generated by large earthwork equipment by a minimum of 4 dBA.

Implementation of the above measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures and recognizing that noise generated by construction activities would occur over a temporary period, the temporary increase in ambient noise levels would reduce 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 not result in a substantial permanent noise level increase at receptors in the project vicinity. Operational noise levels generated by the proposed project would not exceed the City's Municipal Code thresholds. This is a **less-than-significant** impact.

According to Policy N 1.7 of the City's General Plan, a significant impact would occur if the stationary or non-transportation noise sources generated by the project results in an exceedance of the noise level standards contained in this Noise Element, or the project will result in an increase in ambient noise levels by more than 3 dBA.

For transportation sources, a significant impact would occur if the permanent noise level increase due to project-generated traffic was 5 dBA L_{dn} or greater where existing traffic noise levels are less than 60 dBA L_{dn} at the outdoor activity areas of noise-sensitive uses; was 3 dBA L_{dn} or greater where existing traffic noise levels range between 60 and 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses; or was 1.5 dBA L_{dn} where existing traffic noise levels are greater than 65 dB L_{dn} at the outdoor activity areas of noise-sensitive uses.

Project Traffic Increase

A traffic study was not required for the proposed project; however, peak hour trips would be 86 during the peak AM hour and 116 during the peak PM hour. Compared to the existing volumes[5] along Highway 116 of about 1250 during the peak hour, these peak hour trips would not result in a measurable or detectable noise level increase (0 dBA L_{dn} increase). The project's trips are also not anticipated to result in a significant increase in noise along other roadways, as the project's trips are minimal and would disperse beyond Highway 116, the primary point of project access.

Mechanical Equipment

The site plan shows a transformer located on the ground level in the northeast corner of Building B. Transformers up to 1,000 kVA typically generate noise levels up to 64 dB, as measured at 1 meter (about 3 feet). Assuming the transformer runs continuously during daytime and nighttime hours, the day-night average noise level would be 70 dBA L_{dn} at a distance of about 3 feet. Due to the location of the transformer, all surrounding receptors to the north and east would be well shielded from transformer noise. The future residences to the west and commercial uses to the south would be mostly shielded, as well. These receptors would be 250 feet or more from the transformer, and the unattenuated hourly average noise levels would be at or below 26 dBA L_{eq}, which would be below existing ambient noise levels. Over a 24-hour period, the day-night average noise level would be at or below 32 dBA L_{dn}. When added to the existing ambient noise environment, transformer noise would not result in a measurable or detectable noise level increase (i.e., 0 dBA L_{dn} increase).

The site plan also shows heating, ventilation, and air conditioning (HVAC) units and likely solar panels on the rooftops of the proposed buildings. Solar panel operations would not be audible at the property lines. Each townhome and low-income housing unit would have an HVAC unit. On the rooftops of the townhomes, the HVAC units are either spread out or clumped with up to four units located in the same general area. The site plan also shows parapet walls about 3.5 feet high surrounding the rooftop units. For all surrounding receptors, located at the ground level or elevated above the ground by up to three stories, a minimum attenuation of 11 dBA would be provided by the elevation of the units above the ground and the parapet wall. This attenuation would apply to all receptors, future and existing.

Typical noise levels produced by residential HVAC units would range from 53 to 63 dBA at 3 feet during operation. These types of units typically cycle on and off continuously during daytime and nighttime hours. Assuming up to four units operate simultaneously at any given time in the same general area of the roof, the estimated hourly average noise level at 3 feet would be 69 dBA L_{eq}, and the day-night average noise level would be 75 dBA L_{dn}, assuming this worst hour level operates over a 24-hour period.

Table 9 shows the estimated mechanical equipment noise propagated to the surrounding land uses.

[5] https://dot.ca.gov/programs/traffic-operations/census

Based on the estimated noise levels in Table 9, mechanical equipment noise levels would not exceed the existing ambient average hourly average noise levels during daytime or nighttime hours and would not result in a measurable or detectable noise level increase (0 dBA L_{dn} increase).

TABLE 9 Estimated Operational Noise Levels for Rooftop Equipment

Receptor	Distance from Equipment, feet	Hourly L_{eq}, dBA	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
North Commercial Uses	70	31[a]	37[a]	0
East Commercial Uses	45	35[a]	41[a]	0
South Commercial Uses	145	24[a]	31[a]	0
West Future Residences	70	31[a]	37[a]	N/A[b]
Northwest Residences	205	21[a]	28[a]	0
North Commercial Uses	50	34[a]	40[a]	0

[a] Conservative 11 dBA attenuation applied to noise levels due to elevation of equipment and parapet wall surrounding the rooftop.
[b] Noise level increase would not be applicable for future land uses that are not exposed to existing ambient conditions.

Total Combined Project-Generated Noise

The operational noise levels produced by the proposed project combined (i.e., traffic, mechanical equipment) would not result in a measurable or detectable noise level increase at existing noise-sensitive receptors in the project vicinity. Therefore, the proposed project would not result in a substantial increase over ambient noise levels in the project vicinity.

Operational noise levels due to mechanical equipment at the surrounding land uses would not exceed the City's ambient noise levels or applicable thresholds. This is a less-than-significant impact.

Mitigation Measure 1b: None required.

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

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

Policy N 1.15 of the City's General Plan limits construction vibration levels to 0.08 in/sec PPV for sensitive historical structures and to 0.3 in/sec PPV for normal conventional buildings to limit cosmetic damage. Cosmetic damage (also known as threshold damage) is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint, or the dislodging of loose objects. Minor damage is defined as hairline cracking in masonry or the loosening of plaster. Major structural damage is defined as wide cracking or the shifting of foundation or bearing walls.

No known historical buildings are located within 200 feet of the project site. Therefore, all buildings surrounding the site are subject to the 0.3 in/sec PPV threshold.

Table 10 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet.

Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 10 also summarizes the distances to the 0.3 in/sec PPV threshold for conventional buildings.

TABLE 10 Vibration Source Levels for Construction Equipment

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

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

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

All existing buildings would be 40 feet or more from the nearest project site boundary. Most large, vibration-inducing equipment would be 10 feet or more from the property lines; therefore, vibration levels would be less than 0.1 in/sec PPV at all surrounding off-site buildings. Construction vibration levels at the project site would not exceed the 0.3 in/sec PPV threshold.

Neither cosmetic, minor, or major damage would occur at buildings located 30 feet or more from the project site. At these locations, and in other surrounding areas where vibration would not be

expected to cause cosmetic damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby businesses, perceptible vibration can be kept to a minimum.

In summary, the construction of the project would not generate vibration levels exceeding the applicable City thresholds at the nearest off-site building façades. This would be less-than-significant impact.

Mitigation Measure 2: **None required.**

Impact 3: **Excessive Aircraft Noise.** The project site is located about 12.9 miles from Charles M. Schulz Sonoma County Airport and would be well outside the area of influence for the airport. This would be a **less-than-significant** impact.

Charles M. Schulz Airport is a domestic airport located about 12.9 miles north of the project site. The project site would be well outside the area of influence of the airport. The airport noise from the Charles M. Schulz Airport would have no impact on the noise environment at the project site. This is a less-than-significant impact.

Mitigation Measure 3: **None required.**

Cumulative Impacts

Cumulative noise impacts would include either cumulative traffic noise increases under future conditions or temporary construction noise from cumulative construction projects.

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

The traffic study did not include volumes for the cumulative (no project) and cumulative plus project scenarios. Considering the peak AM trips would be 86 and the peak PM trips would 116 for the proposed project, these trips are insignificant compared to existing volumes along Highway 116. It is assumed that these peak hour trips would be insignificant under future cumulative conditions, as well. Therefore, the project is not expected to result in a significant cumulative traffic noise increase. This is a less-than-significant impact.

From the City's website,[6] two planned or approved projects would be located within 1,000 feet of the project site: Cotati Village Community I and II, which are located in the northeast and northwest corners of the Highway 116/Alder Lane intersection, respectively. The Cotati Village Community I is expected to start construction in January 2025 and would likely be complete before the proposed project starts. This future project adjoins the Highway 116/Redwood Drive project site and were considered the west future residences in this report. Since construction activities would not overlap or run concurrently, this would not result in a cumulative construction impact.

The Cotati Village Community II project was approved in August 2024 and is also expected to start construction in 2025. Depending on the start date for the Cotati Village Community II project, construction activities may overlap with the proposed Highway 116/Redwood Drive project. However, most construction occurring at the Cotati Village Community II project would likely have moved indoors and would be mostly shielded from the surrounding receptors. Therefore, construction noise levels would not be cumulative. This would result in a less-than-significant cumulative construction impact.

No other projects are located within 1,000 feet of the proposed project site. There would be no cumulative impacts.

[6] https://www.cotaticity.org/228/Projects-in-Progress

APPENDIX A

FIGURE A1 Daily Trend in Noise Levels for LT-1, Wednesday, October 16, 2024

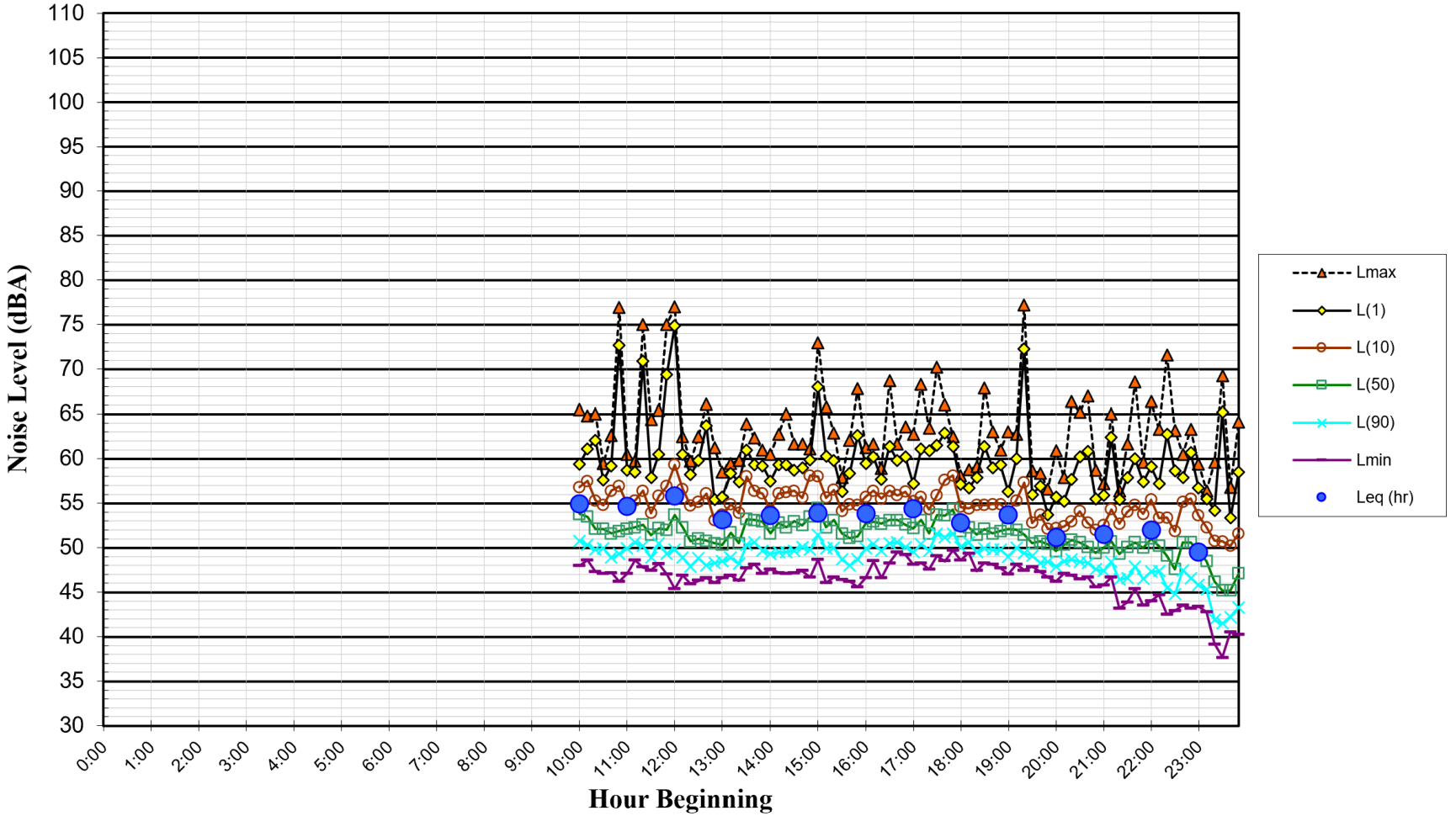
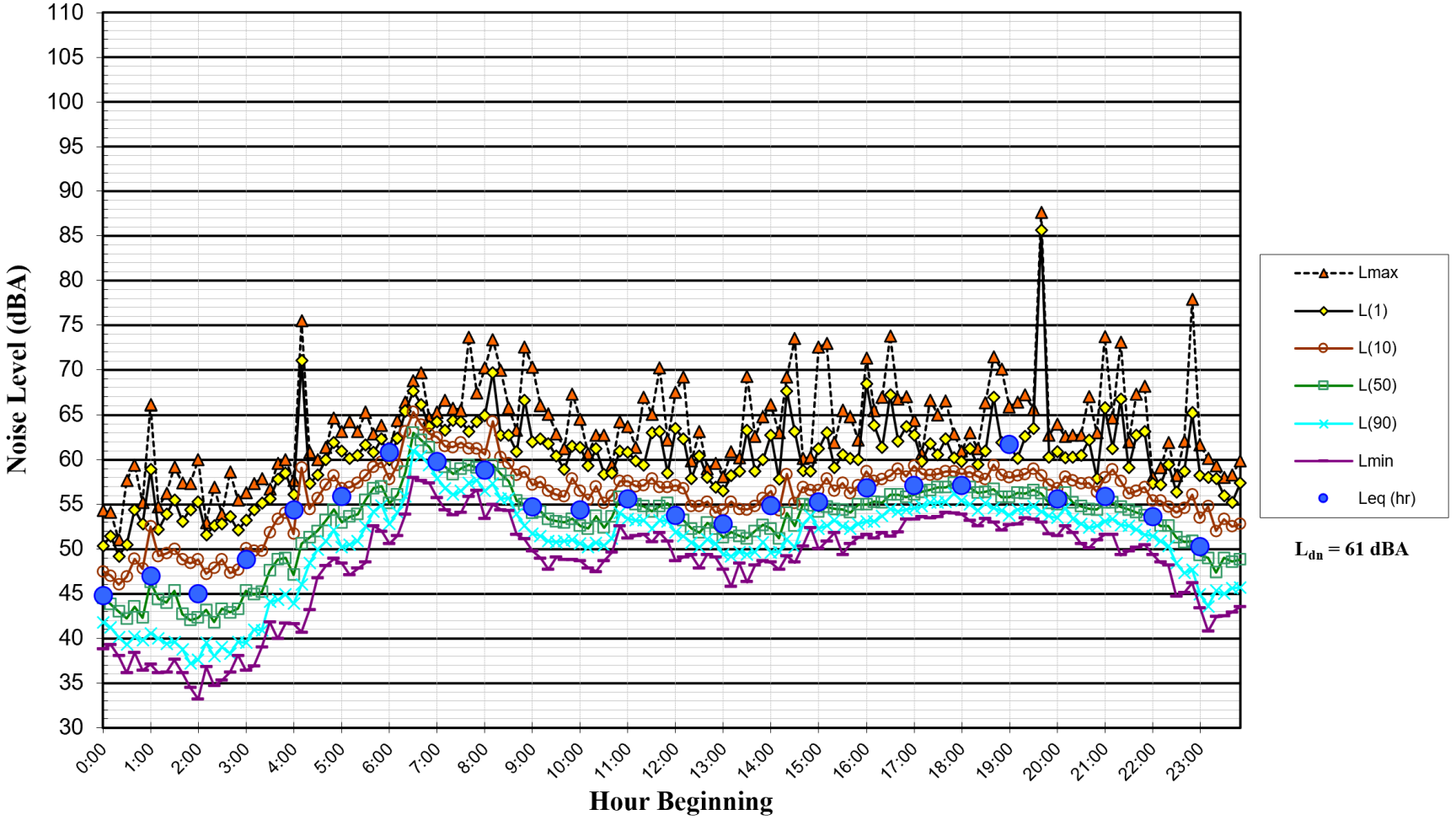


FIGURE A2 Daily Trend in Noise Levels for LT-1, Thursday, October 17, 2024



L_{dn} = 61 dBA

FIGURE A3 Daily Trend in Noise Levels for LT-1, Friday, October 18, 2024

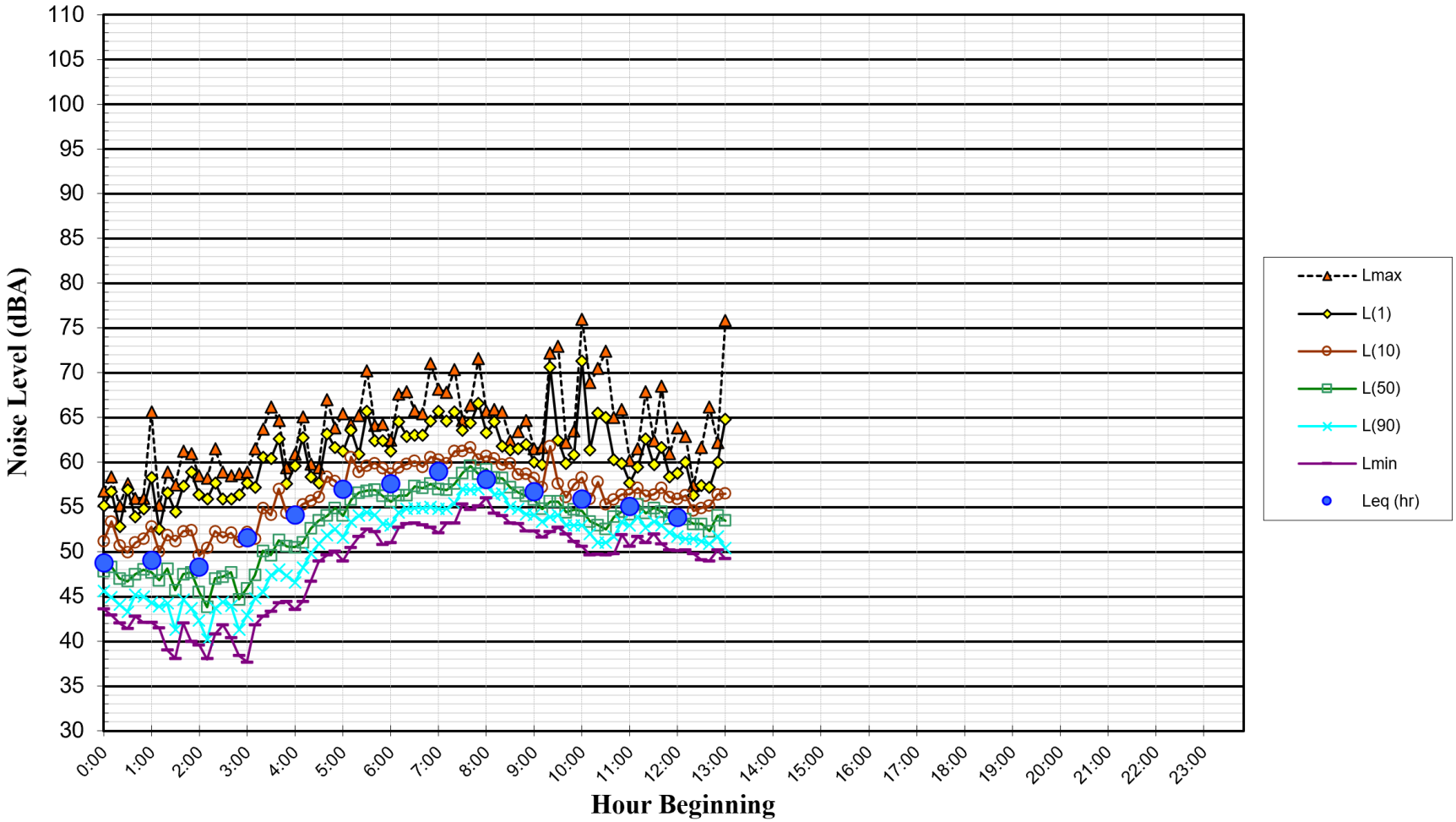


FIGURE A4 Daily Trend in Noise Levels for LT-2, Wednesday, October 16, 2024

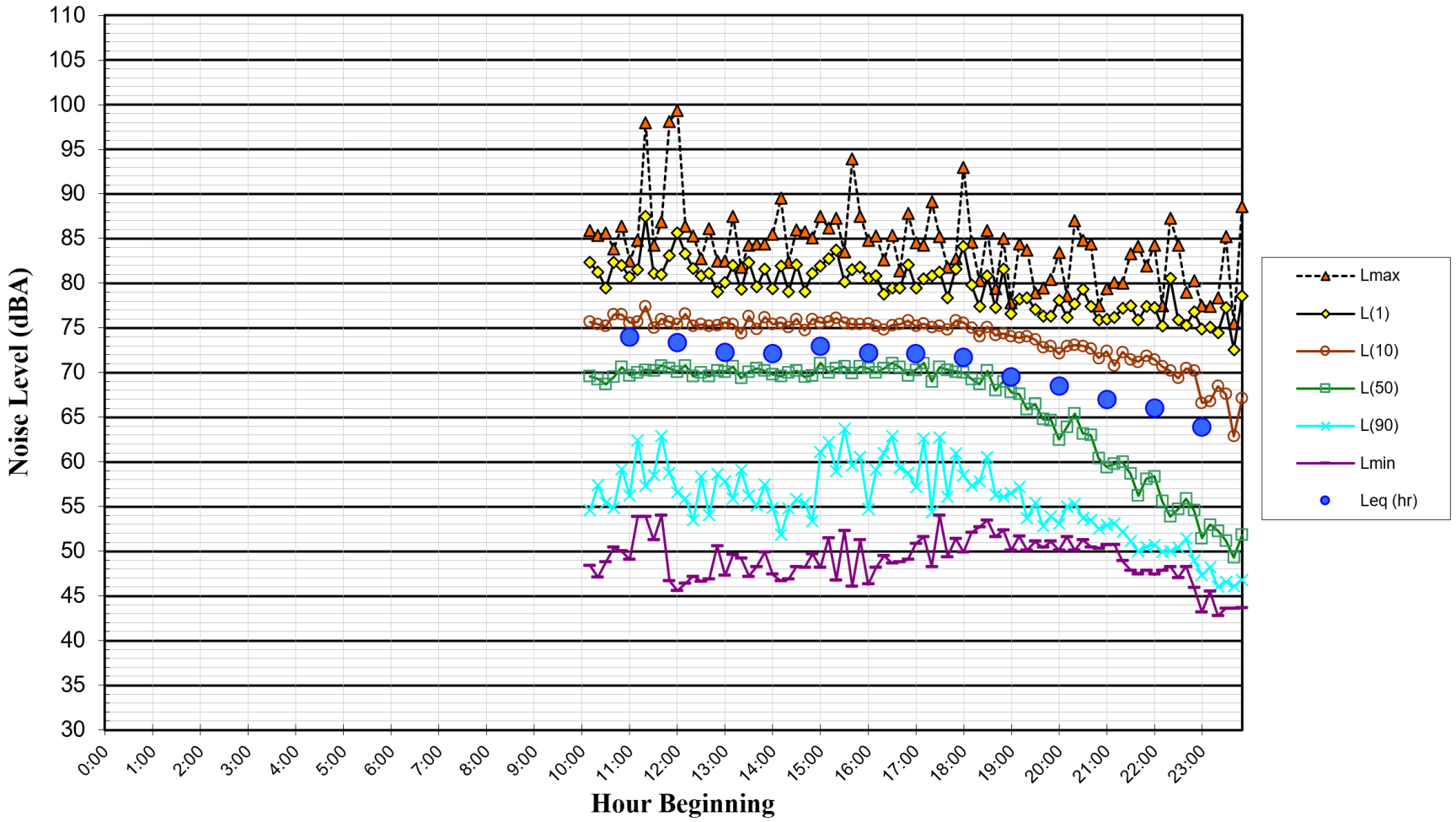


FIGURE A5 Daily Trend in Noise Levels for LT-2, Thursday, October 17, 2024

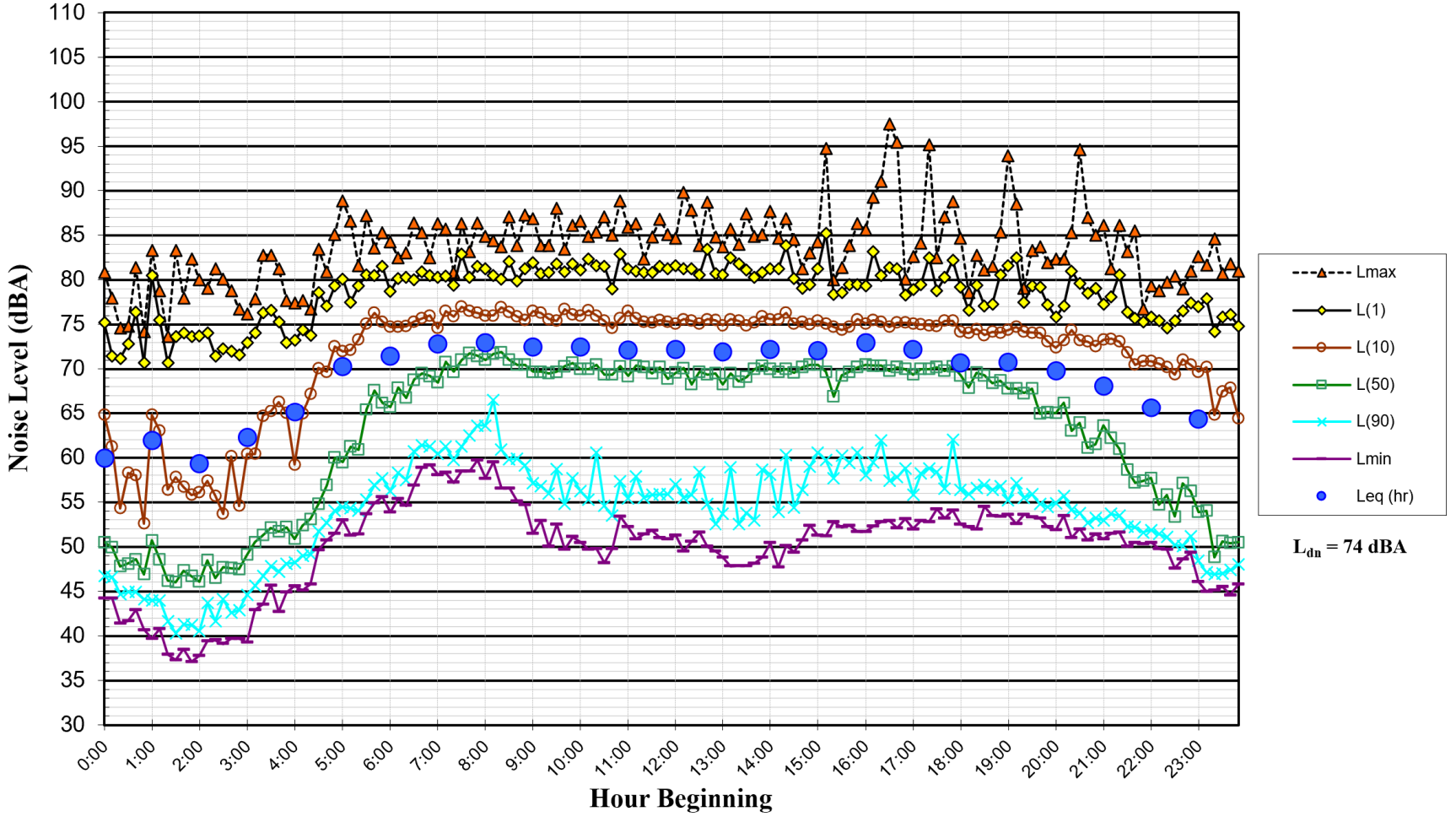


FIGURE A6 Daily Trend in Noise Levels for LT-2, Friday, October 18, 2024

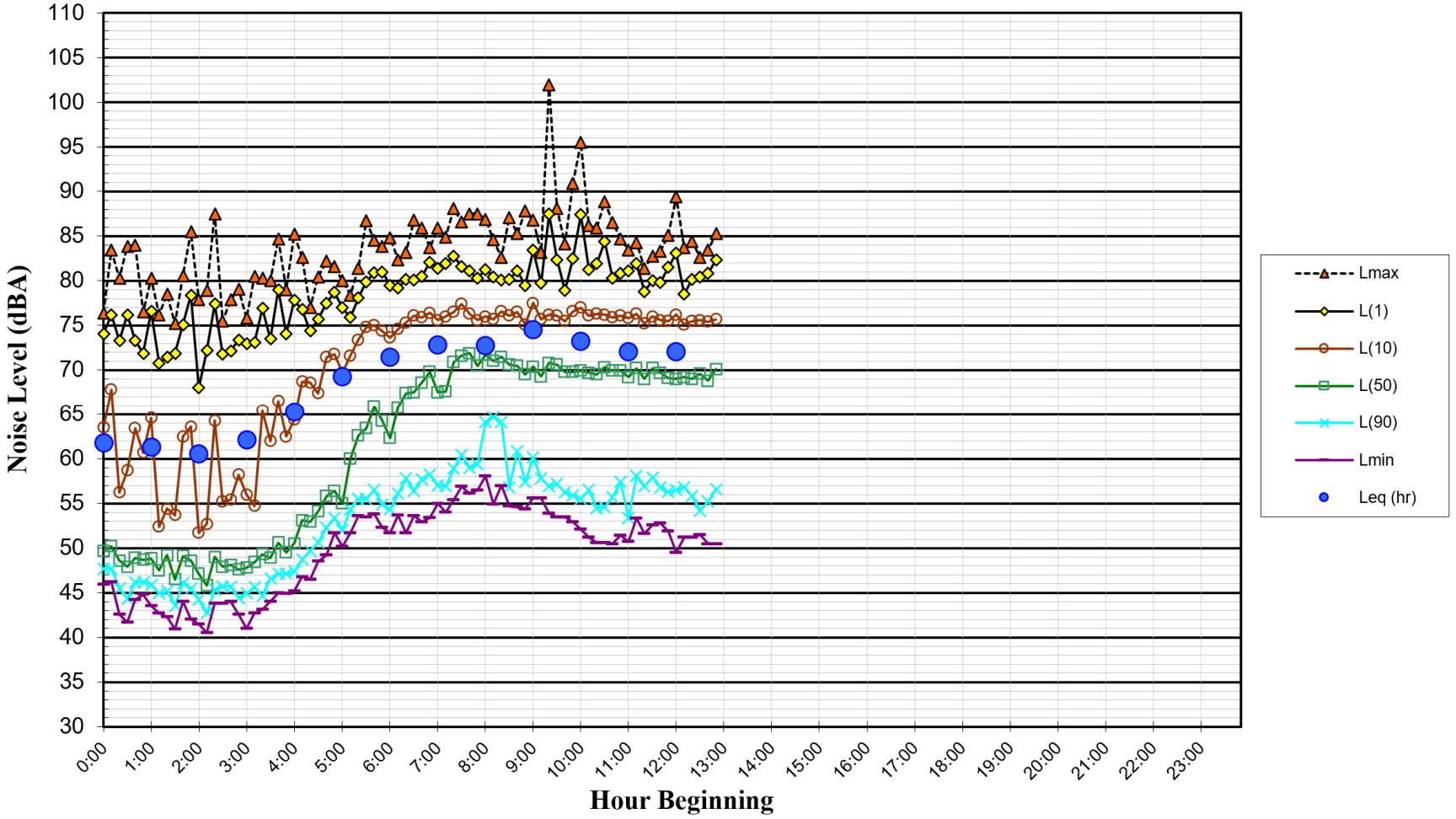


FIGURE A7 Daily Trend in Noise Levels for LT-3, Wednesday, October 16, 2024

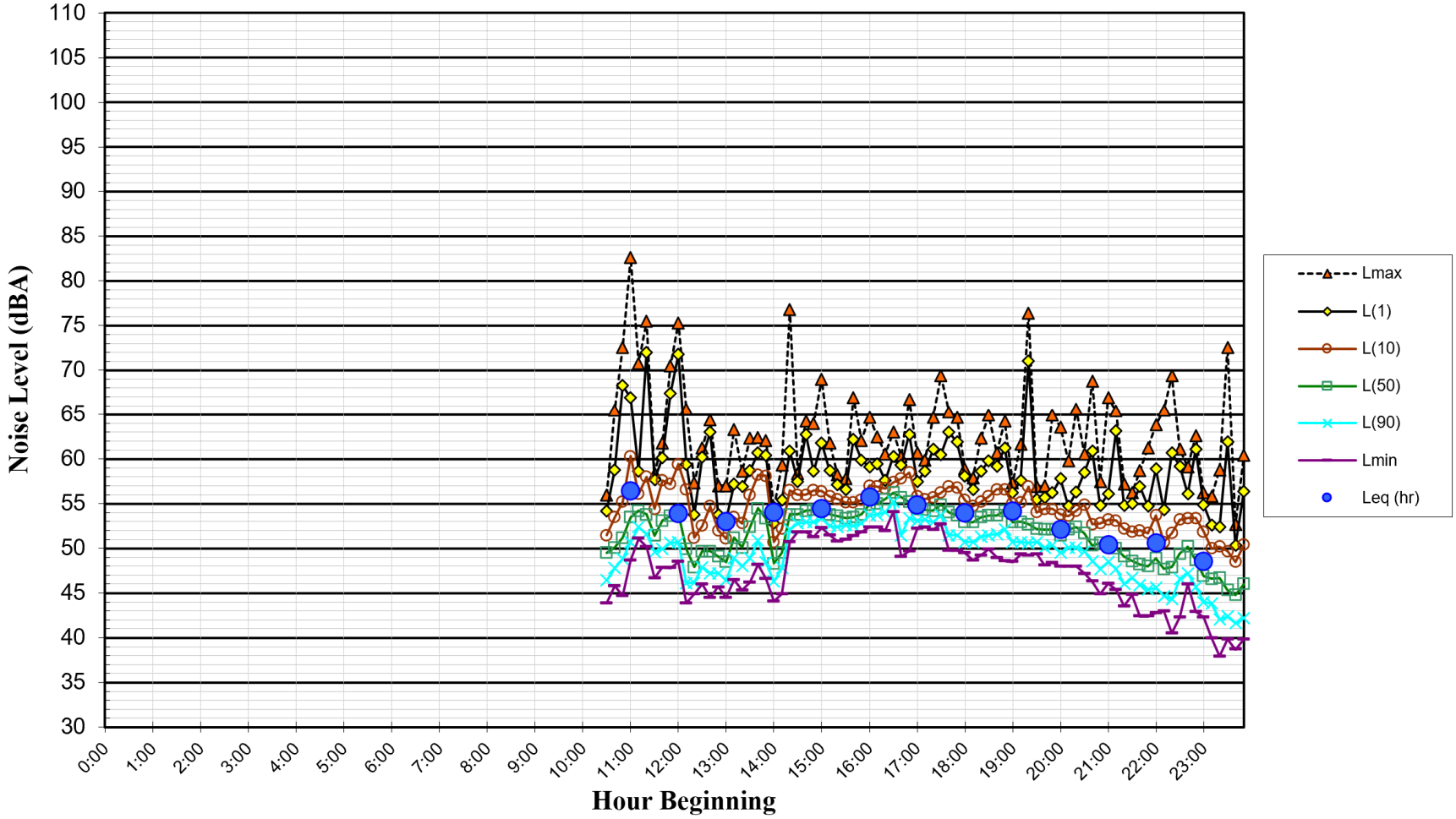
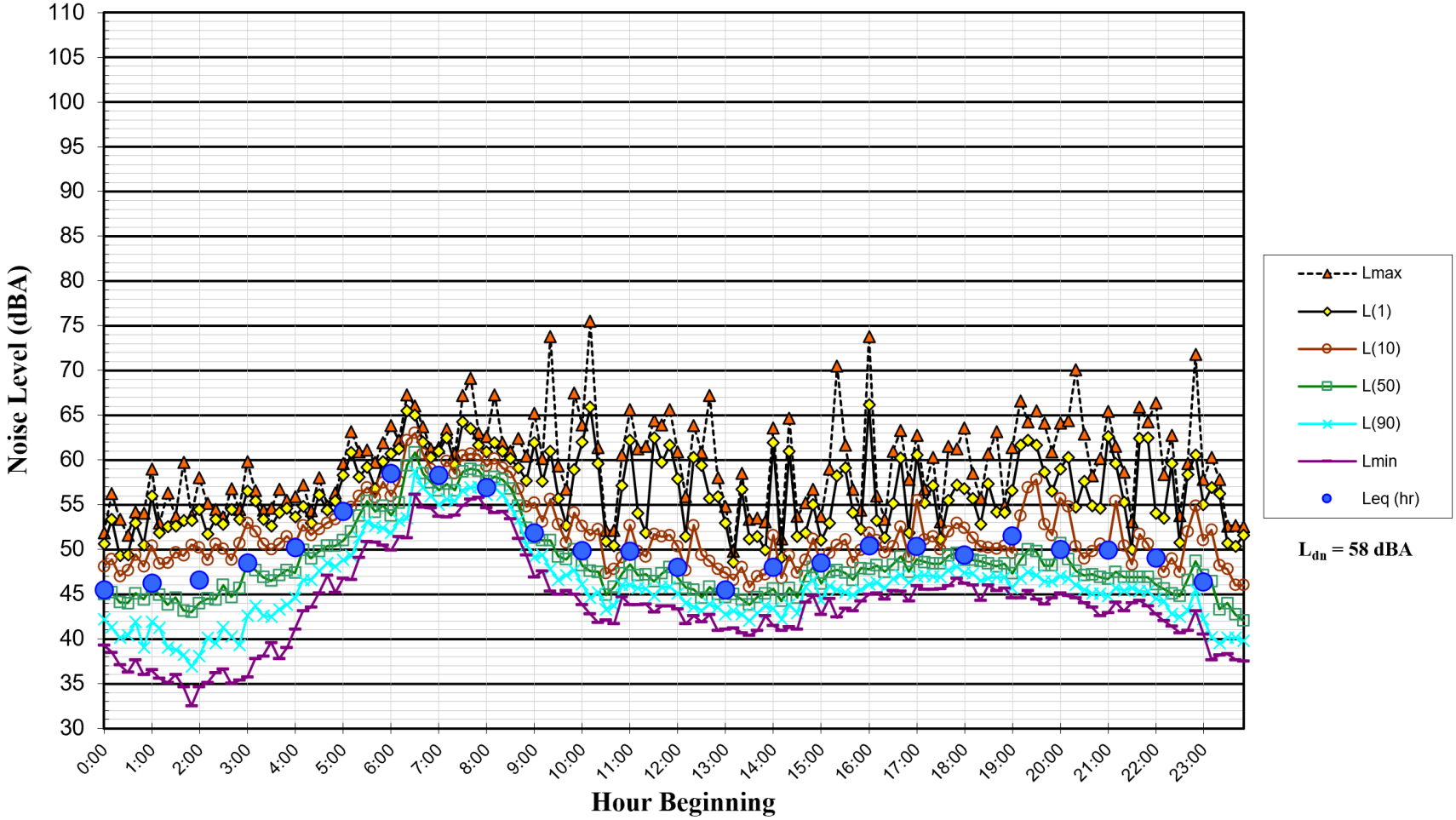


FIGURE A8 Daily Trend in Noise Levels for LT-3, Thursday, October 17, 2024



L_{dn} = 58 dBA

FIGURE A9 Daily Trend in Noise Levels for LT-3, Friday, October 18, 2024