CERES COMMUNITY PROJECT ENVIRONMENTAL NOISE AND VIBRATION ASSESSMENT

Santa Rosa, California

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INTRODUCTION

The Ceres Community Project is proposed on an approximate 1.5-acre property in the Northpoint Commercial Center business park, in Santa Rosa, California. The proposed project would construct a new food production facility totaling approximately 18,000 square feet, consisting of 13,000 square feet of culinary operations and 5,000 square feet of administrative offices. The majority of administrative offices will be located on the building's second floor, with other offices provided on the ground floor for accessibility. This project would also construct approximately 45 on-site parking spaces.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and ground-borne 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's General Plan; and, 3) the Impacts and Recommendations Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents recommended measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

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

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

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

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

Effects of Noise

Sleep and Speech Interference

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

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn}/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 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn}/CNEL of 60-70 dBA. Between a L_{dn}/CNEL of 70-80 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 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

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

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

Fundamentals of Groundborne Vibration

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

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

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

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

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

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

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

The State of California and the City of Santa Rosa have established regulatory criteria that are applicable in this assessment. 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 Government

Federal Transit Administration. The Federal Transit Administration (FTA) has identified construction noise thresholds in the *Transit Noise and Vibration Impact Assessment Manual*,[1] 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

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

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

(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.

Checklist items (a) and (b) are applicable to the proposed project. In this case, the project is at least 6 miles from the nearest airport (Sonoma County Airport). As a result, the project would not expose people residing or working in the project area to excessive aircraft noise levels; therefore, item (c) is not carried further in this analysis.

2022 California Building Cal Green Code. The State of California established 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 or addition envelope or altered envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} 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.
>
> > **5.507.4.1.1 Noise exposure where noise contours are not readily available.** Buildings exposed to a noise level of 65 dB Leq-1hr during any hour of operation shall have building, addition or alteration exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30).
>
> **5.507.4.2 Performance method.** For buildings located, as defined by Section 5.507.4.1, or 5.507.4.1.1, wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

City of Santa Rosa

City of Santa Rosa General Plan 2035. The Noise and Safety Element of the City of Santa Rosa's General Plan identifies policies that are intended to "maintain an acceptable community noise level to protect the health and comfort of people living, working and/or visiting in Santa Rosa, while maintaining a visually appealing community." Office buildings, Business Commercial and Professional/Commercial land uses are normally acceptable in areas with a noise environment of 70 dBA L_{dn} or less, conditionally acceptable in areas exposed to an L_{dn} of 68 to 78 dBA, and normally unacceptable in areas exposed to an L_{dn} of 75 dBA or more (see Figure 12-1).

The following policies are applicable to the proposed project:

NS-B-1 Do not locate noise-sensitive uses in proximity to major noise sources, except residential is allowed near rail to promote future ridership.

NS-B-3 Prevent new stationary and transportation noise sources from creating a nuisance in existing developed areas. Use a comprehensive program of noise prevention through planning and mitigation, and consider noise impacts as a crucial factor in project approval.

The Land Use Compatibility Standards specify normally acceptable levels for community noise in various land use areas

NS-B-4 Require new projects in the following categories to submit an acoustical study, prepared by a qualified acoustical consultant:

- All new projects proposed for areas outside of the Downtown Station Area with existing noise above 60dBA DNL. Mitigation shall be sufficient to reduce noise levels below 45 dBA DNL in habitable rooms and 60 dBA DNL in private and shared recreational facilities. Additions to existing housing units are exempt
- All new projects in the Downtown Station Area where ambient noise conditions exceed 65dBA DNL. Mitigation shall be sufficient to reduce noise levels below 45dBA DNL.
- All new projects that could generate noise whose impacts on other existing uses would be greater than those normally acceptable (as specified in the Land Use Compatibility Standards).

NS-B-5 Pursue measures to reduce noise impacts primarily through site planning. Engineering solutions for noise mitigation, such as sound walls, are the least desirable alternatives.

NS-B-8 Adopt mitigations, including reduced speed limits, improved paving texture, and traffic controls, to reduce noise to normally acceptable levels in areas where noise standards may be exceeded (e.g., where homes front regional/arterial streets and in areas of mixed use development.)

NS-B-9 Encourage developers to incorporate acoustical site planning into their projects. Recommended measures include:

- Incorporating buffers and/or landscaped earth berms;

- Orienting windows and outdoor living areas away from unacceptable noise exposure;

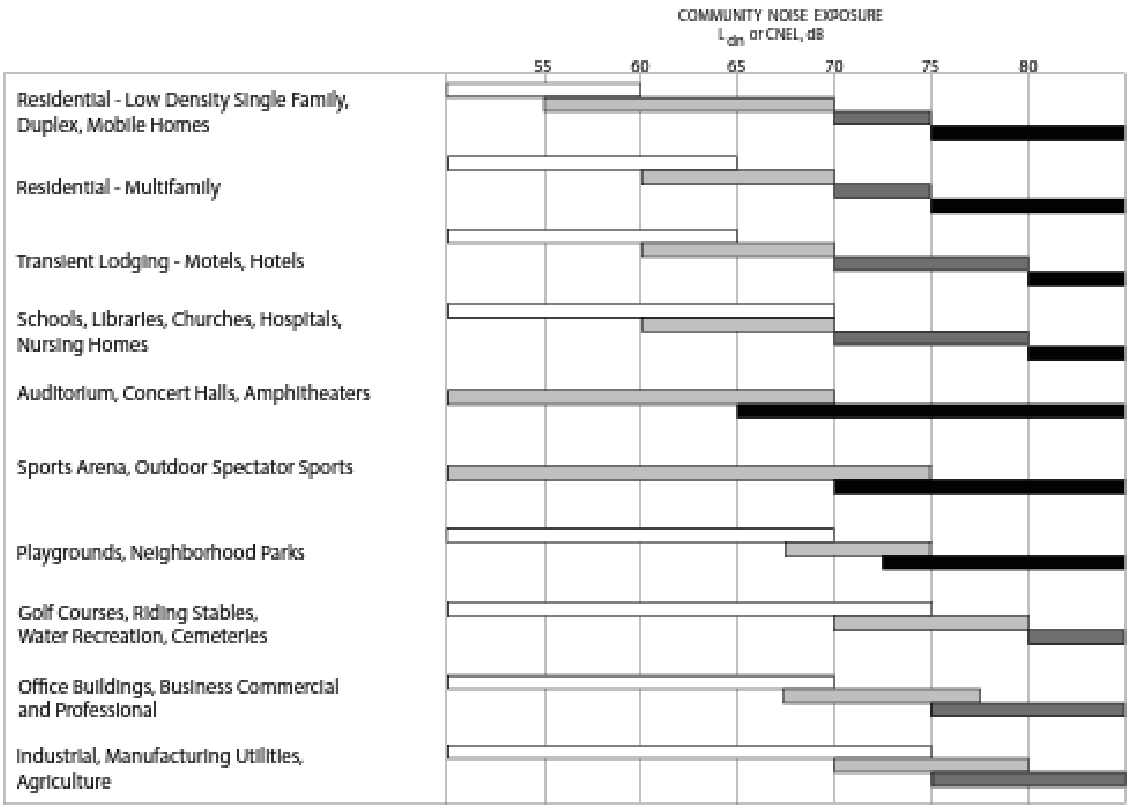
- Using reduced-noise pavement (rubberized-asphalt);
- Incorporating traffic calming measures, alternative intersection designs, and lower speed limits; and
- Incorporating state-of-the-art structural sound attenuation and setbacks.

NS-B-10 Work with private enterprises to reduce or eliminate nuisance noise from industrial and commercial sources that impact nearby residential areas. If progress is not made within a reasonable time, the City shall issue abatement orders or take other legal measures.

NS-B-14 Discourage new projects that have potential to create ambient noise levels more than 5 dBA L_{dn} above existing background, within 250 feet of sensitive receptors.

Figure 12-1

Land Use Compatibility Standards



LEGEND:

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements.

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

NORMALLY UNACCEPTABLE
New construction or development should generally 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.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

Source: Environmental Science Associates, 2001

City of Santa Rosa noise ordinance

The City of Santa Rosa has adopted a quantitative noise ordinance in Chapter 17-16 of the Municipal Code. Section 17-16.120 regulates noise from machinery and equipment:

> *"It is unlawful for any person to operate any machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than 5 decibels."*

The Ambient base noise levels for residential areas are established in Section 17-16.030. The applicable ambient noise level criteria are shown in Table 4, following.

TABLE 4: City of Santa Rosa Municipal Code Ambient Base Noise Levels

Zone	Time	Sound Level A (decibels) Community Environment Classification
R1 and R2	10 p.m. to 7 a.m.	45
R1 and R2	7 p.m. to 10 p.m.	50
R1 and R2	7 a.m. to 7 p.m.	55
Multi-family	10 p.m. to 7 a.m.	50
Multi-family	7 a.m. to 10 p.m.	55
Office & Commercial	10 p.m. to 7 a.m.	55
Office & Commercial	7 a.m. to 10 p.m.	60
Intensive Commercial*	10 p.m. to 7 a.m.	55
Intensive Commercial	7 a.m. to 10 p.m.	65
Industrial	Anytime	70

Source: City of Santa Rosa, City of Santa Rosa Municipal Code 17-16.030

As shown in Table 4, the ambient base noise level for Office and Commercial areas is 60 dBA during the daytime (7 a.m. to 10 p.m.), and 55 dBA at night (10 p.m. to 7 a.m.).

17-16.120 Machinery and equipment. It is unlawful for any person to operate any machinery, equipment, pump, fan, air-conditioning apparatus or similar mechanical device in any manner so as to create any noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels.

Existing Noise Environment

The project site is located in southwest Santa Rosa, generally bounded by Mercury Way to the north, Apollo Way to the south and east, and Corporate Center Parkway to the west. Existing land uses surrounding the project site include commercial uses to the north, east and south. Kaiser Mercury Way Medical Office Building adjoins the project site to the west. The closest residences are located to the east on Lombardi Lane.

The existing noise environment at the site primarily consists of light traffic along Mercury Way and Apollo Way. A noise monitoring survey was conducted at the site, beginning on Monday, April 10, 2023, and concluding on Wednesday, April 12, 2023. The monitoring survey included two long-term noise measurements and three short-term measurements, as shown in Figure 1.

Long-term noise measurement LT-1 was conducted along Lombardi Lane to the east of the project site, approximately 25 feet east of the centerline. LT-1 would represent the existing ambient noise environment at the closest residences located east of the project site. Hourly average noise levels ranged from 48 to 62 dBA L_{eq} during daytime hours (7:00 a.m. and 10:00 p.m.) and from 40 to 55 dBA L_{eq} during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level on Tuesday, April 11, 2023, was 56 dBA L_{dn}. The daily trend in noise levels at LT-1 is shown in Figures A1 through A3 of Appendix A.

Long-term noise measurement LT-2 was conducted approximately 140 feet east of the centerline of Apollo Way near Pippin Circle. LT-2 would represent the existing ambient noise environment at the closest residences located northeast of the project site. Hourly average noise levels ranged from 45 to 59 dBA L_{eq} during daytime hours and from 42 to 53 dBA L_{eq} during nighttime hours. The day-night average noise level on Tuesday, April 11, 2023, was 53 dBA L_{dn}. The daily trend in noise levels at LT-2 is shown in Figures A4 through A6 of Appendix A.

Three short term noise measurements were made to complete the noise survey. Table 5 summarizes the results of the short-term noise measurements.

TABLE 5 Summary of Short-Term Noise Measurement Data, April 10, 2023

ID	Location (Date, Time)	Measured Noise Levels, dBA					Primary Noise Source
		L_1	L_{10}	L_{50}	L_{90}	L_{eq}	
ST-1	West of site, near Kaiser parking lot (4/10/23, 3:20 p.m. to 3:30 p.m.)	52	49	47	46	47	Parking lot activities
ST-2	North of site, ~ 25 feet from Mercury Way centerline (4/10/23, 3:40 p.m. to 3:50 p.m.)	66	56	49	47	54	Traffic on Mercury Way
ST-3	South of site, ~40 feet from Apollo Way Centerline (4/10/23, 3:20 p.m. to 3:30 p.m.)	64	50	45	44	51	Mechanical/HVAC noise, Traffic on Apollo Way and Corporate Center Parkway

FIGURE 1 Aerial Image of Project Site and Surrounding Area with Long- and Short-Term Measurement Locations Identified

GENERAL PLAN CONSISTENCY ANALYSIS

The impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not considered under CEQA. This section addresses the compatibility of the project with respect to the applicable policies and standards set forth in the City's General Plan.

Noise and Land Use Compatibility

The Noise and Safety Element of City of Santa Rosa'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 Santa Rosa. 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 70 dBA L_{dn} or less for proposed office buildings, business, commercial and professional uses.

- The 2022 Cal Green Code standards specify an interior noise environment attributable to exterior sources not to exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas of nonresidential uses during any hour of operation.

The primary source of noise affecting the project site under future conditions will continue to be vehicular traffic on Apollo Way, Mercury Way and Corporate Center Parkway. A traffic impact study was prepared for the proposed project by *W-Trans* in September 2022[2]. Based on the traffic study, the proposed project is expected to increase the existing traffic volumes by approximately 222 trips per day (including 30 a.m. peak hour trips and 15 p.m. peak hour trips). The day night noise level resulting from adding 30 a.m. peak hour trips and 15 p.m. peak hour trips[3] at a distance of 75 feet is about 43 dBA L_{dn}. Based on the long-term measurement LT-2 made near the project site, the ambient day night noise level at 75 feet is calculated to be 57 dBA L_{dn}. Hence for the future noise environment at the project site, noise from project trips would not measurably contribute to ambient noise levels in the area (0 dBA L_{dn} increase).

Figure 2 shows an aerial view of the project site along with an overlay of the proposed project plans.

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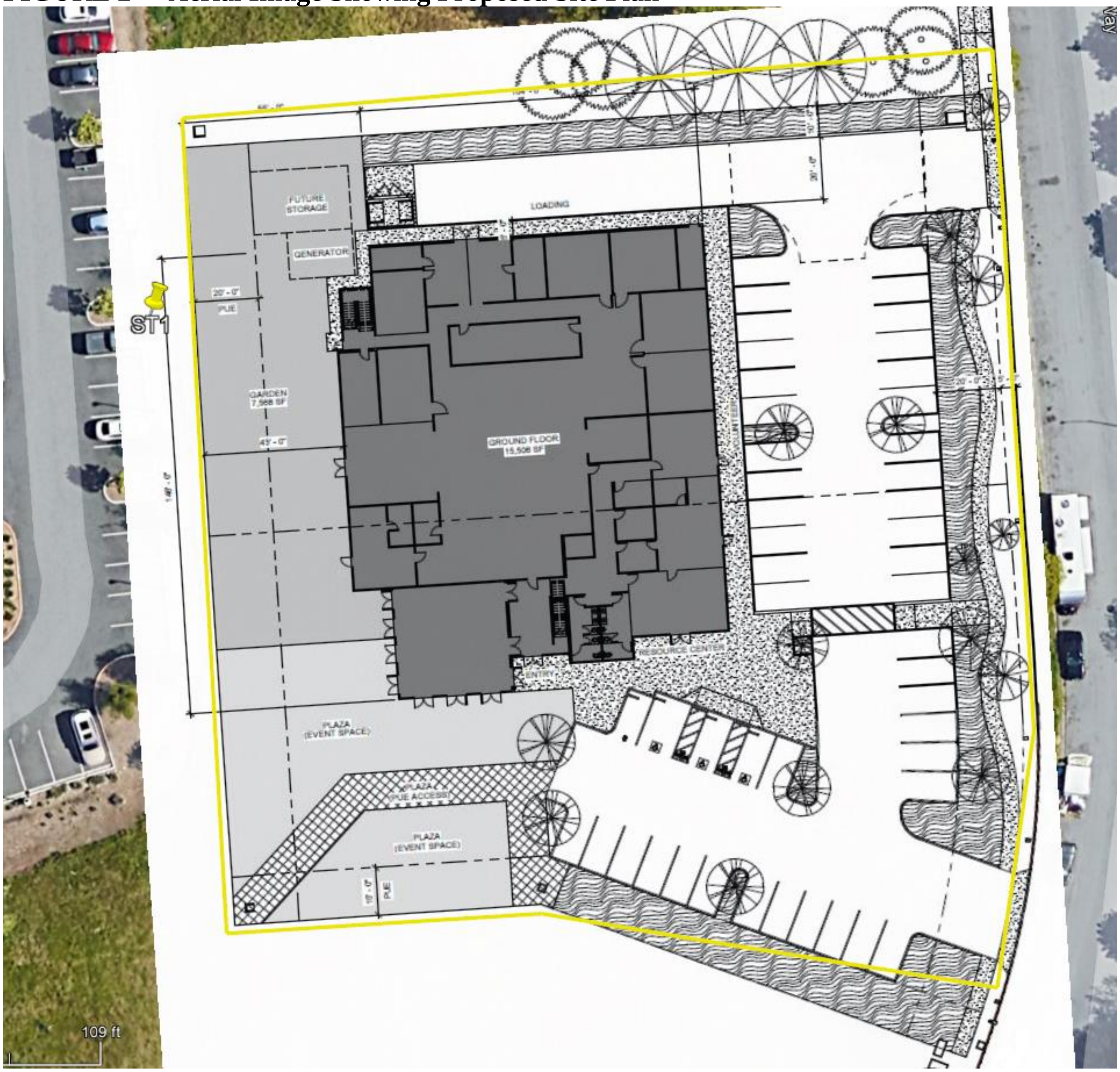
[2] W-Trans, "Preliminary Transportation Impact Study for the Ceres Community Project", September 1, 2022

[3] Calculated using Federal Highway Administration's Traffic Noise Model (FHWA TNM) Version 2.5

FIGURE 2 Aerial Image Showing Proposed Site Plan



Future Exterior Noise Environment

The site plan for the project site shows a garden and plaza spaces to the west and a parking lot towards the east of the proposed building. These spaces would be subject to the City's exterior noise threshold of 70 dBA L_{dn}. Based on the measurements conducted at locations LT-2 and the short-term measurements, the unattenuated exterior noise levels at the vicinity of the outdoor spaces and the proposed building are expected to be about 57 dBA L_{dn}. These levels are below the 70 dBA L_{dn} exterior noise threshold.

Future Interior Noise Environment

For the proposed project the north façade which faces Mercury Way would be set back about 275 feet from the centerline of the roadway. The east façade would be set back about 120 feet from the centerline of Apollo Way. The south façade would be set back about 275 feet away from Apollo way and the west façade would be facing the parking lot of the adjacent Kaiser Medical Office Building. At these distances these facades would be exposed to future exterior noise levels ranging from 49 to 55 dBA L_{eq}.

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

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

NOISE IMPACTS AND RECOMMENDATIONS

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. (Not applicable since the project site is located 6 miles from the nearest airport).

Impact 1a: **Temporary Construction Noise.** Existing noise-sensitive land uses (both residential and commercial) would be exposed to a temporary increase in ambient noise levels due to project construction activities. This temporary increase in levels falls below the established FTA thresholds for construction noise and is a **less-than-significant** impact.

The construction schedule assumes a start date of March 25, 2024, and the development would be built out over a period of ten months or 229 construction workdays. The earliest year of full operation was assumed to be 2025. Construction phases would include site preparation, grading, building construction, architectural coating, and paving. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating.

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

While the City of Santa Rosa does not establish noise level thresholds or timings 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*. 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.

The typical range of maximum instantaneous construction noise levels range from 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 6) from the equipment. Table 7 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction range from about 75 to 89 dBA L_{eq} for office 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.

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.

Equipment expected to be used in each construction phase are summarized in Table 8, along with the quantity of each type of equipment to be used. Table 8 also summarizes the construction noise levels calculated at 50 feet for the two loudest pieces of equipment identified in each phase.

Standard methods for acoustical analysis of construction sites are based on the distance from the "acoustical center" or construction activity center on the site to the nearest receiving property lines of existing noise-sensitive receptors, as was the case for this analysis. The proposed pieces of construction equipment are modeled at the approximate center of the area in which most construction activity is likely to occur. The worst-case hourly average noise level, calculated from combining all equipment per phase, was propagated from the geometrical center of the project building to the property lines of the receptors. These noise level estimates are shown in Table 9. Noise levels in Table 9 do not assume reductions due to intervening buildings or existing barriers.

TABLE 6 Construction Equipment, 50-foot Noise Emission Limits

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

Notes: [1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.
[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
[3]Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

TABLE 7 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

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

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

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

TABLE 8 Estimated Construction Noise Levels per phase for two loudest equipment at 50 feet

Phase of Construction	Total Workdays	Construction Equipment (Quantity)	Estimated Construction Noise Level at 50 feet, dBA L_{eq}
Site Preparation	2	Graders (1)[a] Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)[a]	84
Grading/Excavation	4	Graders (1)[a] Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2)[a]	84
Trenching	4	Graders (1)[a] Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)[a]	84
Building Exterior	200	Cranes (1) Forklifts (1) Generator Sets (1)[a] Tractors (1)[a] Welders (3)	82
Building – Interior/ Architectural Coating	10	Air Compressors (1)	74
Paving	10	Cement & Mortar Mixers (1)[a] Paver (1) Paving Equipment (1) Roller (1) Tractor/Loader/Backhoe (1)[a]	81

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

TABLE 9 Estimated Construction Noise Levels at the Property Lines of Nearby Land Uses

Phase of Construction	Calculated Worst-Case [a] Hourly Average Noise Levels, dBA L_{eq}				
	North Commercial (165ft[b])	East Commercial (200ft[b])	South Commercial (380ft[b])	West Kaiser Medical Offices (115ft[b])	Nearest Residences (515ft[b])
Site Preparation	74	73	67	77	64
Grading/ Excavation	75	74	68	79	66
Trenching	74	73	67	77	64
Building – Exterior	73	71	66	76	63
Building – Interior/ Architectural Coating	63	62	56	66	53
Paving	73	71	65	76	63

[a] These noise levels represent all equipment per phase operating simultaneously and propagated to the surrounding property lines.
[b] The distances shown in the table were conservatively measured from the center of the project building to the receiving property lines.

At 50 feet, construction noise levels from the two loudest pieces of equipment range from 74 to 84 dBA L_{eq} (as shown in Table 8). Construction noise levels would intermittently range from 53 to 66 dBA L_{eq} at existing residential uses and from 56 to 79 dBA L_{eq} at existing office and commercial uses when activities are focused near the center of the project building (as shown in Table 9). These construction noise levels would not exceed the exterior threshold of 80 dBA L_{eq} at the nearest existing residential land uses in the project site vicinity or the 90 dBA L_{eq} threshold at the office and commercial land uses surrounding the project site when activities occur near the center of the proposed project.

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.

Temporary noise from construction of the proposed project would result in a less-than-significant impact

Mitigation Measure 1a: None Required

Impact 1b: Permanent Noise Level Increase/Exceed Applicable Standards. The proposed project would not result in a substantial permanent noise level increase for day-to-day operations. With implementation of the recommended mitigation measures for the emergency generator, operational noise would be reduced to a **less-than-significant** level.

According to the City of Santa Rosa General Plan Policy NS-B-14, new projects that have the potential to create ambient noise levels more than 5 dBA L_{dn} above existing background within 250 feet of sensitive receptors are discouraged. The City of Santa Rosa's Noise Ordinance states that it is unlawful to operate any machinery, equipment, pump, fan, air-conditioning apparatus or similar mechanical device in any manner so as to create noise which would cause the noise level at the property line of any property to exceed the ambient base noise level by more than five decibels. Based on the Zoning Code[4] assigned to the properties in the vicinity of the project site, the baseline ambient noise level for Office and Commercial areas is 60 dBA during the day (7 a.m. to 10 p.m.) and 55 dBA at night (10 p.m. to 7 a.m.).

Therefore, a significant impact would occur at the receptors surrounding the site if ambient noise levels exceeded 65 dBA L_{eq} during the day and 60 dBA L_{eq} during the night and/or exceeded the 57 dBA L_{dn} ambient noise level at the vicinity of the project site by 5 dBA L_{dn} or more.

Project Traffic Increase

The traffic study[5] provided for the project states that the proposed project is expected to generate an average of 222 trips per day, including 30 a.m. peak hour trips and 15 trips during the p.m. peak hour. The existing ambient noise levels measured in the vicinity of the job site range from 47 to

[4] https://maps.srcity.org/Html5Viewer/Index.html?viewer=parcel&Center=6375999,1920000

[5] W-Trans, "Preliminary Transportation Impact Study for the Ceres Community Project", September 1, 2022

54 dBA hourly average L_{eq}. An addition of 30 a.m. peak hour trips and 15 p.m. peak hour trips to the project area would result in noise levels ranging from 49 to 55 dBA hourly average L_{eq}. These levels fall within the baseline ambient noise levels of 60 dBA during the day and 55 dBA during nighttime hours for Office and Commercial areas. The day night noise level calculated by the addition of 30 a.m. peak hour trips and 15 p.m. peak hour trips to the existing ambient noise levels in the area would not measurably contribute to ambient noise levels in the area (0 dBA L_{dn} increase).

This would be a less-than-significant impact.

Mechanical Equipment

The ground floor of the site plan shows a generator located at the northwest corner of the site. The back-up propane generator would operate only during emergencies and during testing periods of about one hour every month. HVAC units consisting of heat pumps and air handling units were assumed to be located on the roof of the project building. For a worst-case scenario a total of 3 heat pumps and 3 air handling units were assumed to operate simultaneously at about 10 feet from the edge of the roof of the proposed building since details pertaining to the mechanical equipment planned at the proposed building, such as specific type of units, quantities of units, locations of units, and noise levels generated by the units are unknown at this time.

Emergency generators typically generate hourly average noise levels ranging from of 65 to 89 dBA L_{eq}[6] at 50 feet. A single heat pump typically generates hourly average noise levels ranging from 56 to 66 dBA Leq at 3 feet and a single air handling unit typically generates hourly average noise levels of about 62 dBA L_{eq} at 20 feet. As mentioned above, noise levels for a reasonable worst-case scenario of 3 heat pumps and 3 air handling units operating at about 10 feet from the nearest building edge, would generate a combined hourly average noise level of about 53 to 63 dBA at 20 feet.

The estimated mechanical equipment noise levels at the proposed building were propagated to the nearest property lines of the surrounding land uses. These estimated noise levels are summarized in Table 10. For the ground-level commercial receptors in all directions, a minimum equipment setback of 10 feet from the edge of the rooftop would result in at least 10 dB attenuation. Attenuation is not assumed for the nearest residences to the east on Lombardi Lane since they are over 450 feet away from the nearest building façade.

[6] Emergency generators generate noise levels of about 65 dBA Leq at 50 feet with a Level 1 or 2 sound enclosure, and about 89 dBA Leq at 50 feet for a standard enclosure.

TABLE 10 Estimated Mechanical Equipment Noise Levels at Receiving Land Uses

Receptor	Distance from Rooftop HVAC Equipment, feet	Hourly L_{eq}, dBA	Distance from Emergency Generator, feet	L_{eq} from Emergency Generators, dBA	Combined L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
North Commercial	120	31 to 41[b]	145	52 to 76	41 to 62	0 to 6
East Commercial	170	29 to 39 [b]	280	42 to 66	36 to 53	0 to 1
South Commercial	340	18 to 28 [b]	460	38 to 62	27 to 49	0 to 1
West Kaiser Medical Office	70	37 to 47 [b]	400 [c]	39 to 63	44 to 55	0 to 2
East Residences (Lombardi Ln)	480	25 to 35	580	36 to 60	32 to 48	0 to 1

[a] Combined L_{dn} assumes 1 hour of emergency generator operation in the day and 24-hour operation of rooftop mechanical equipment as a worst-case scenario.
[b] Minimum attenuation of 10 dB is assumed due to elevation of noise sources located 10 feet from the edge of the roof.
[c] Distance to the Kaiser Medical Office building is assumed here instead of the property line since the closest edge of the property line to the generator is a parking lot which is not a noise-sensitive receptor location.

As seen from Table 10 above, noise levels from the emergency backup generator would be expected to exceed the 65 dBA hourly average L_{eq} threshold for the daytime hours and would also exceed the 5 dB L_{dn} increase in ambient levels threshold for the north commercial receptor.

Noise levels from operation of the rooftop HVAC mechanical equipment are not expected to exceed thresholds established by the City's noise ordinance (65 dBA during daytime hours and 60 dBA during nighttime hours) or the City's General Plan thresholds (increase of 5 dBA L_{dn}) for any receiving land uses.

Noise from the emergency backup generator would be considered to be potentially significant impact.

Truck Loading/Unloading and Pass-Bys

The site plan shows a loading zone located at the north edge of the property. This area is expected to have about 2 deliveries per day. Truck delivery noise would include a combination of engine, exhaust, and tire noise, as well as the intermittent sounds of back-up alarms and releases of compressed air associated with truck/trailer air brakes. Heavy trucks typically generate maximum instantaneous noise levels of 70 to 75 dBA at a distance of 50 feet. Smaller medium-sized delivery trucks typically generate maximum noise levels of 60 to 65 dBA at 50 feet. The noise level of backup alarms can vary depending on the type and directivity of the sound, but maximum noise levels are typically in the range of 65 to 75 dBA at a distance of 50 feet. Assuming a single truck would take up to 10 minutes to load/unload and two loading/unloading activities would occur in a single hour, hourly average noise levels would range from 61 to 71 dBA L_{eq} for medium and heavy trucks, respectively. As per the supplied traffic study[7], all deliveries would occur between 9 a.m. and 10 a.m. Assuming up to two deliveries in a single day during these daytime hours, the day-night average noise level at 50 feet would be 47 to 57 dBA L_{dn} for medium and heavy trucks, respectively.

Table 11 summarizes the truck loading/unloading noise levels propagated to the nearest property lines of commercial and residential receptors.

[7] W-Trans, "Preliminary Transportation Impact Study for the Ceres Community Project", September 1, 2022

TABLE 11 Estimated Noise Levels for Truck Loading and Unloading at Receiving Land Uses

Receptor	Distance from Center of the Loading Zone, feet	L_{eq} from Heavy Truck Noise, dBA	L_{eq} from Medium Truck Noise, dBA	Combined L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
North Commercial	100	65	55	42 to 52	0 to 1
East Commercial	200	59	49	35 to 45	0
South Commercial	450	52	42	28 to 38	0
West Kaiser Medical Office	120	64	54	40 to 50	0 to 1
East Residences (Lombardi Ln)	500	51	41	27 to 37	0

Noise levels from truck loading and unloading operations are not expected to exceed thresholds established by the City's noise ordinance (65 dBA during daytime hours and 60 dBA during nighttime hours) or the City's General Plan thresholds (increase of 5 dBA L_{dn}).

To estimate the pass-by noise levels for medium and heavy trucks traveling at speeds of 15 mph, Federal Highway Administration's Traffic Noise Model (FHWA TNM), version 2.5, was used to model the hourly scenarios for truck traffic, based on the assumption of two truck trips an hour in one day as per the traffic study. Table 12 summarizes the estimated truck pass-by noise levels at the surrounding receptors calculated at the distance from the center of the nearest on-site truck access driveway to the receiving property lines.

TABLE 12 Estimated Truck Pass-by Noise Levels at Receiving Land Uses

Receptor	Distance from Center of Nearest Driveway, feet	Hourly L_{eq}, dBA	Combined L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
North Commercial	100	38 to 44	24 to 30	0
East Commercial	100	38 to 44	24 to 30	0
South Commercial	400	25 to 31	12 to 18	0
West Kaiser Medical Office	240	30 to 36	16 to 22	0
East Residences (Lombardi Ln)	380	26 to 32	12 to 18	0

Noise levels from truck pass bys are not expected to exceed the thresholds established by the City's noise ordinance (65 dBA during daytime hours and 60 dBA during nighttime hours) or the City's General Plan thresholds (increase of 5 dBA L_{dn}).

Parking Lot Noise

Surface parking lots for passenger cars would be located in the east and southeast portions of the site. Noise sources associated with the use of the parking lots would include vehicular circulation, loud vehicle engines, door slams, and human voices. The maximum noise level of a passing car at 15 mph typically ranges from 45 to 55 dBA L_{max} at a distance of 100 feet. The noise generated during an engine start is similar. Door slams cause slightly lower noise levels. The hourly average noise levels resulting from all these noise-generating activities in a busy parking lot typically range from 40 to 50 dBA L_{eq} at a distance of 100 feet from the parking area. Busy parking lot operations are only expected to last for four hours between 7:00 a.m. and 10:00 p.m. Typical hourly operations would include a few cars at any time, which would result in lower levels.

Noise levels decrease at a rate of 6 dB per doubling of distance. Table 13 summarizes the estimated parking lot noise at the surrounding receptors when the noise source is positioned at the center of the parking lot on the project site. Conservatively, no attenuation is assumed for any receptors surrounding the project site.

TABLE 13 Estimated Parking Lot Noise Levels at Receiving Land Uses

Receptor	Distance from Center of the Parking Area, feet	Hourly L_{eq}, dBA	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
North Commercial	180	35 to 45	30 to 40	0
East Commercial	130	37 to 47	33 to 43	0
South Commercial	320	30 to 40	25 to 35	0
West Kaiser Medical Office	200	34 to 44	29 to 39	0
East Residences (Lombardi Ln)	420	28 to 38	23 to 33	0

Noise levels from parking lot activities are not expected to exceed the thresholds established by the City's noise ordinance (65 dBA during daytime hours and 60 dBA during nighttime hours) or the City's General Plan thresholds (increase of 5 dBA L_{dn}).

Community Plaza – Event Space

The site plan has a space referred to as "Community Plaza" towards the southwest corner of the site. This space will be used regularly by staff and volunteers for lunch, breaks and potentially for small one on one or small group meetings. None of these involve the use of amplified sounds.

According to the Chief Executive Officer of the project, this "Community Plaza" could be used for about 12 events in a year such as Volunteer Appreciation events and Donor Dinners. These large events would be held from 5 p.m. to 7:30 p.m. either on weekdays or weekends. It is expected that these events would involve amplified speech and music. The number of people attending these events would be about 20 to 50 people.

Typical hourly average noise levels for raised conversations, amplified speech and music for events involving about 50 people would range from 60 to 65 dBA L_{eq} at 50 feet.

Noise levels decrease at a rate of 6 dB per doubling of distance. Table 14 summarizes the estimated noise levels expected during large events at the Community Plaza, at the surrounding receptors when the noise source is positioned at the center of the plaza spaces on the project site. Conservatively, no attenuation is assumed for any receptors surrounding the project site.

TABLE 14 Estimated Community Plaza Noise Levels at Receiving Land Uses

Receptor	Distance from Center of the Community Plaza[a], feet	Combined Hourly L_{eq}, dBA	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
North Commercial	265	52	42	0
East Commercial	250	52	43	0
South Commercial	320	50	41	0
West Kaiser Medical Office	75	63	53	2
East Residences (Lombardi Ln)	570	45	36	0

[a] Distances measured to the receiving property lines of commercial uses. For the nearest receptor (Kaiser medical office), this distance is measured from the east most edge of the parking lot for a worst-case scenario.

Noise levels from the "Community Plaza" events would not be expected to exceed the thresholds established by the City's noise ordinance (65 dBA during daytime hours and 60 dBA during nighttime hours) or the City's General Plan thresholds (increase of 5 dBA L_{dn}).

Total Combined Project Generated Noise

Operational noise levels produced by the proposed project combined (i.e., traffic, rooftop HVAC units, truck loading/unloading, truck pass bys, parking lot, community plaza events) would result in combined noise levels of 65 dBA L_{eq} or less at receiving land uses. This falls within the City's noise ordinance threshold during daytime business hours. During nighttime hours, only the HVAC equipment is expected to operate which would fall well within the City's noise ordinance threshold during nighttime.

These operational noise sources combined (i.e., traffic, rooftop HVAC units, truck loading/unloading, truck pass bys, parking lot, community plaza events) would also result in a less than 5 dBA L_{dn} increase in ambient levels at the surrounding land uses, in compliance with the City's General Plan noise threshold.

Noise levels from emergency generator operations (1 hour every month during daytime business hours), have the potential to exceed both the City's noise ordinance thresholds (65 dBA L_{eq} for daytime hours) and the City's General Plan thresholds (increase of 5 dBA L_{dn}).

Mitigation Measure 1b:
The following measure shall be implemented into the proposed project to reduce operational noise from the emergency backup generator to a less-than-significant level:

- The emergency backup generator shall be selected and designed to reduce noise levels to meet City requirements (65 dBA L_{eq} for daytime hours) at the nearby land uses. A qualified acoustical consultant shall be retained to review noise from the generator as these systems are selected, to 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 installation of noise barriers, such as enclosures and parapet walls, to block the line-of-sight between the noise source and the nearest receptors. Other alternate measures may be optimal, such as locating equipment in less noise-sensitive areas, such as along the building façades farthest from the affected receptors, where feasible.

Impact 2: Generation of Excessive Groundborne Vibration due to Construction. Construction-related vibration levels would not exceed the 0.3 in/sec PPV at existing off-site residences or commercial buildings. **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, grading/excavation, trenching, building exterior and interior work and paving. According to the equipment list provided at the time of this study, impact or vibratory pile driving activities, which can cause excessive vibration, are not expected for the proposed project.

The City of Santa Rosa does not define vibration thresholds. For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. No historical buildings or buildings that are documented to be structurally weakened adjoin the project site. Therefore, conservatively, ground-borne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact.

Table 15 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 15 also presents the minimum distance needed to meet the 0.3 in/sec PPV threshold for the respective construction equipment.

TABLE 15 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	17
Hydromill (slurry wall)	in soil	0.008	1
	in rock	0.017	2
Vibratory Roller		0.210	18
Hoe Ram		0.089	8
Large bulldozer		0.089	8
Caisson drilling		0.089	8
Loaded trucks		0.076	7
Jackhammer		0.035	4
Small bulldozer		0.003	<1

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

Table 16 summarizes the vibration levels at each of the surrounding buildings in the project vicinity. 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 damage to buildings on receiving land uses, not receptors at the nearest property lines. Therefore, the distances used to propagate construction vibration levels (as shown in Table 16), which are different than the distances used to propagate construction noise levels (as shown in Table 9), were estimated under the assumption that each piece of equipment from Table 16 was operating along the nearest boundary of the busy construction site, which would represent the worst-case scenario.

Project construction activities would potentially generate vibration levels up to 0.068 in/sec PPV at the existing buildings adjoining the project site. A study completed by the US Bureau of Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507[8]. The findings of this study have been applied to buildings affected by construction-generated vibrations.[9] As reported in USBM RI 8507[3] and reproduced by Dowding,[4] Figure 3 presents the damage probability, in terms of “threshold damage” (described above as cosmetic damage), “minor damage,” and “major damage,” at varying vibration levels. Threshold damage, or cosmetic damage, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline cracking in masonry or

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

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

the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls.

As shown in Figure 3, maximum vibration levels of 0.3 in/sec PPV or lower would result in virtually no measurable damage. No minor or major damage would be expected to the buildings immediately adjoining the project site.

Neither cosmetic, minor, or major damage would occur at historical or conventional buildings located 20 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 generate vibration levels lower than the 0.3 in/sec PPV threshold at conventional properties adjoining the project site. **This is a less-than-significant impact**.

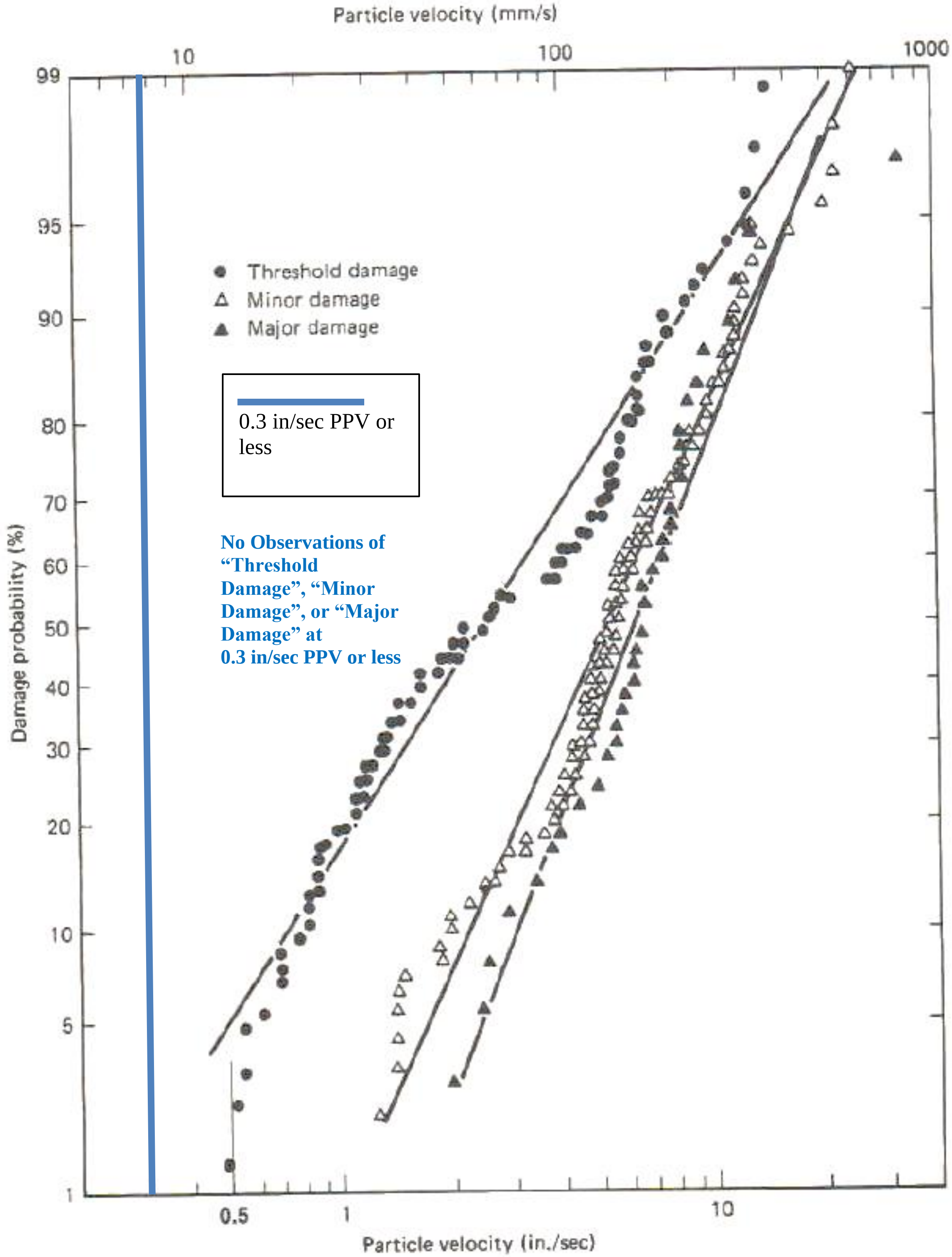
Mitigation Measure 2: None Required

TABLE 16 Construction Vibration Levels at Nearest Buildings

Equipment		PPV at 25 ft. (in/sec)	Vibration Levels at Nearest Surrounding Building Façades (in/sec PPV)				
			North Commercial (70 ft)	East Commercial (90 ft)	South Commercial (265 ft)	West Kaiser Medical Offices (375 ft)	Nearest Residences (390 ft)
Clam shovel drop		0.202	0.065	0.049	0.015	0.010	0.010
Hydromill (slurry wall)	In soil	0.008	0.003	0.002	0.001	<0.001	<0.001
	In rock	0.017	0.005	0.004	0.001	0.001	0.001
Vibratory Roller		0.21	0.068	0.051	0.016	0.011	0.010
Hoe Ram		0.089	0.029	0.022	0.007	0.005	0.004
Large bulldozer		0.089	0.029	0.022	0.007	0.005	0.004
Caisson drilling		0.089	0.029	0.022	0.007	0.005	0.004
Loaded trucks		0.076	0.024	0.019	0.006	0.004	0.004
Jackhammer		0.035	0.011	0.009	0.003	0.002	0.002
Small bulldozer		0.003	0.001	0.001	<0.001	<0.001	<0.001

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006 and modified by Illingworth & Rodkin, Inc., April 2023.

FIGURE 3 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996 as modified by Illingworth & Rodkin, Inc., April 2023.

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 for the project does not include cumulative traffic volumes hence a significant cumulative impact is not assumed.

No projects are located within 1,000 feet of the proposed project site from the City's website[10]. Therefore, potential cumulative construction impacts would be less-than-significant.

[10] https://www.srcity.org/2970/Developments

APPENDIX A

FIGURE A1 Daily Trend in Noise Levels for LT-1, Monday, April 10, 2023

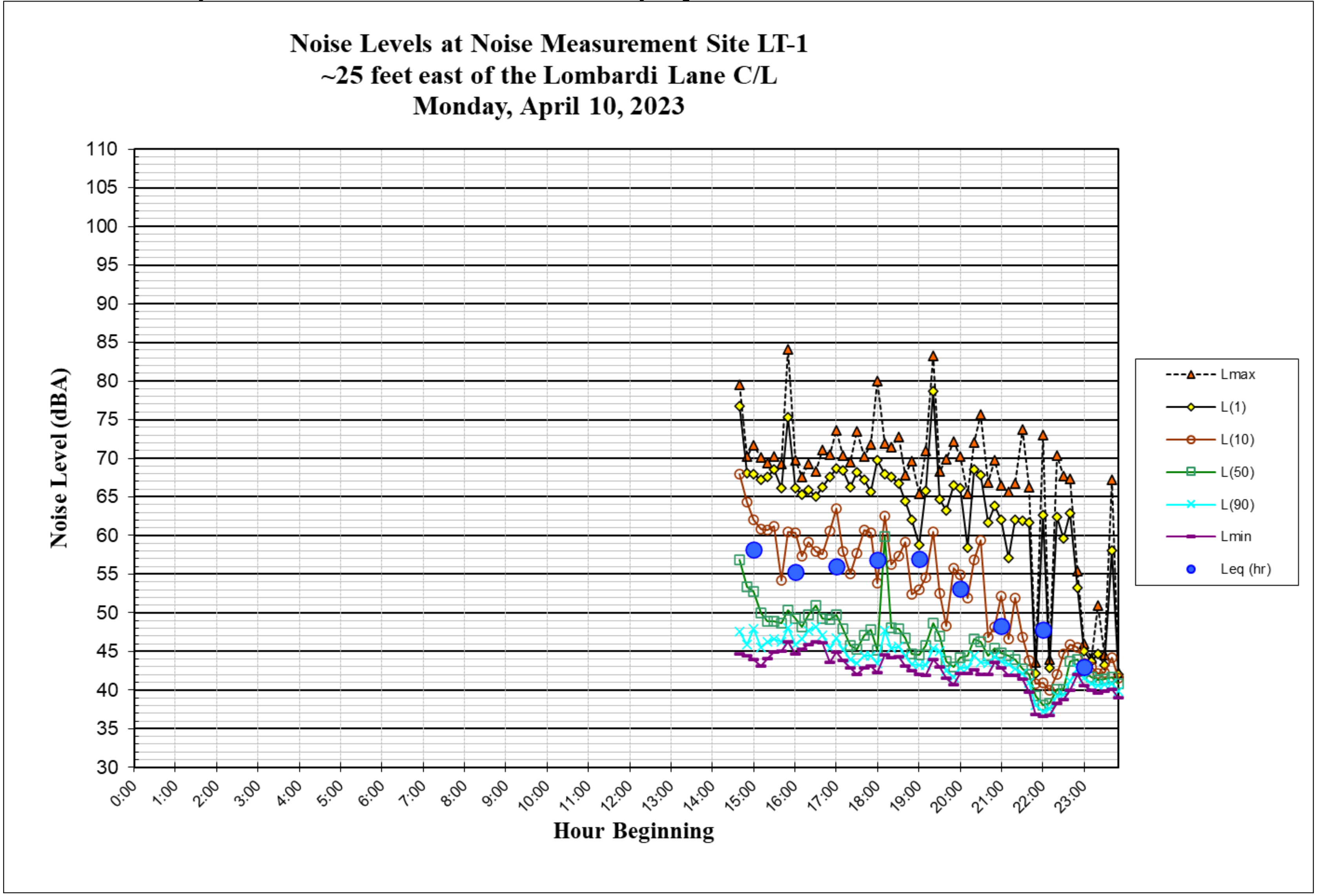


FIGURE A2 Daily Trend in Noise Levels for LT-1, Tuesday, April 11, 2023

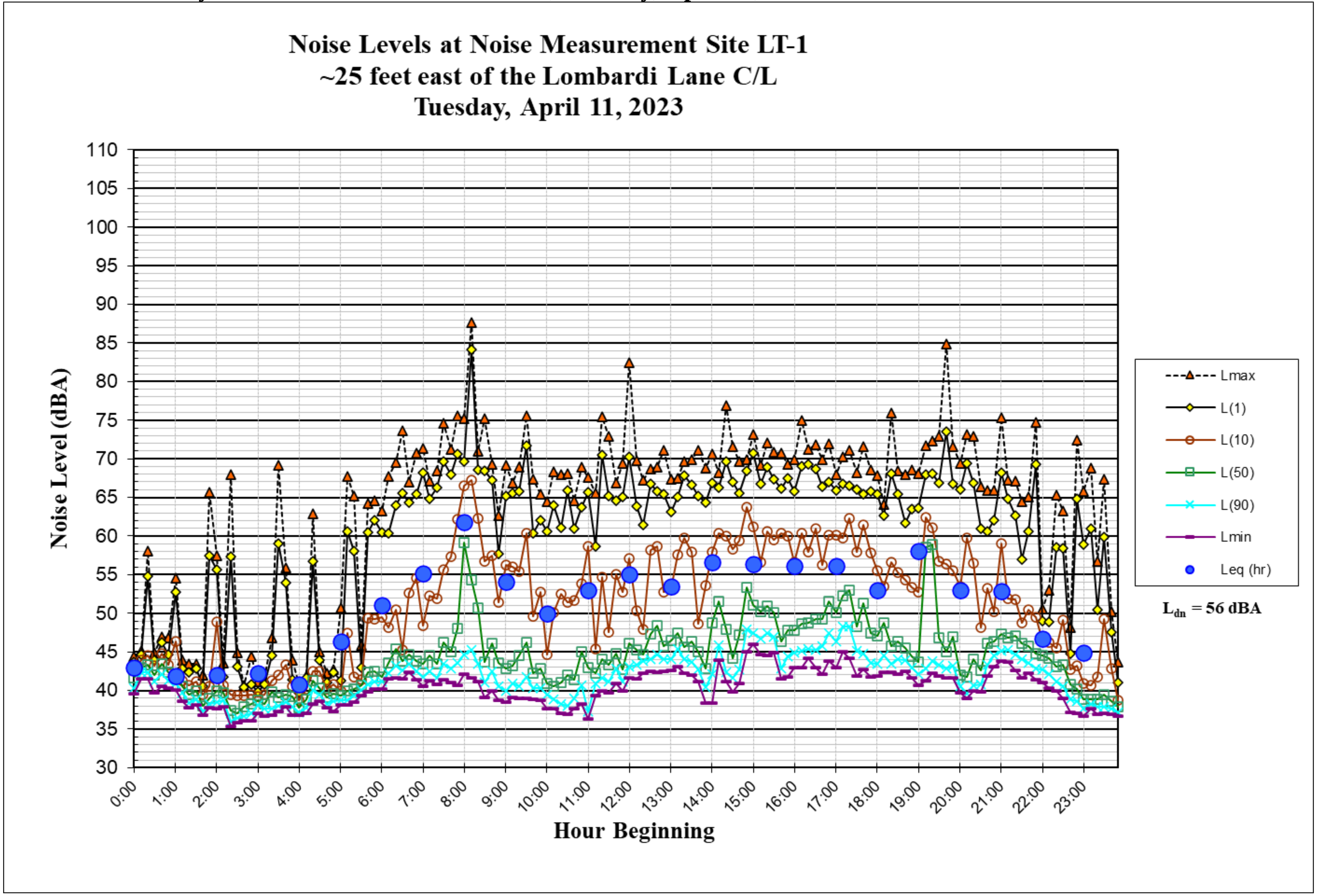


FIGURE A3 Daily Trend in Noise Levels for LT-1, Wednesday, April 12, 2023

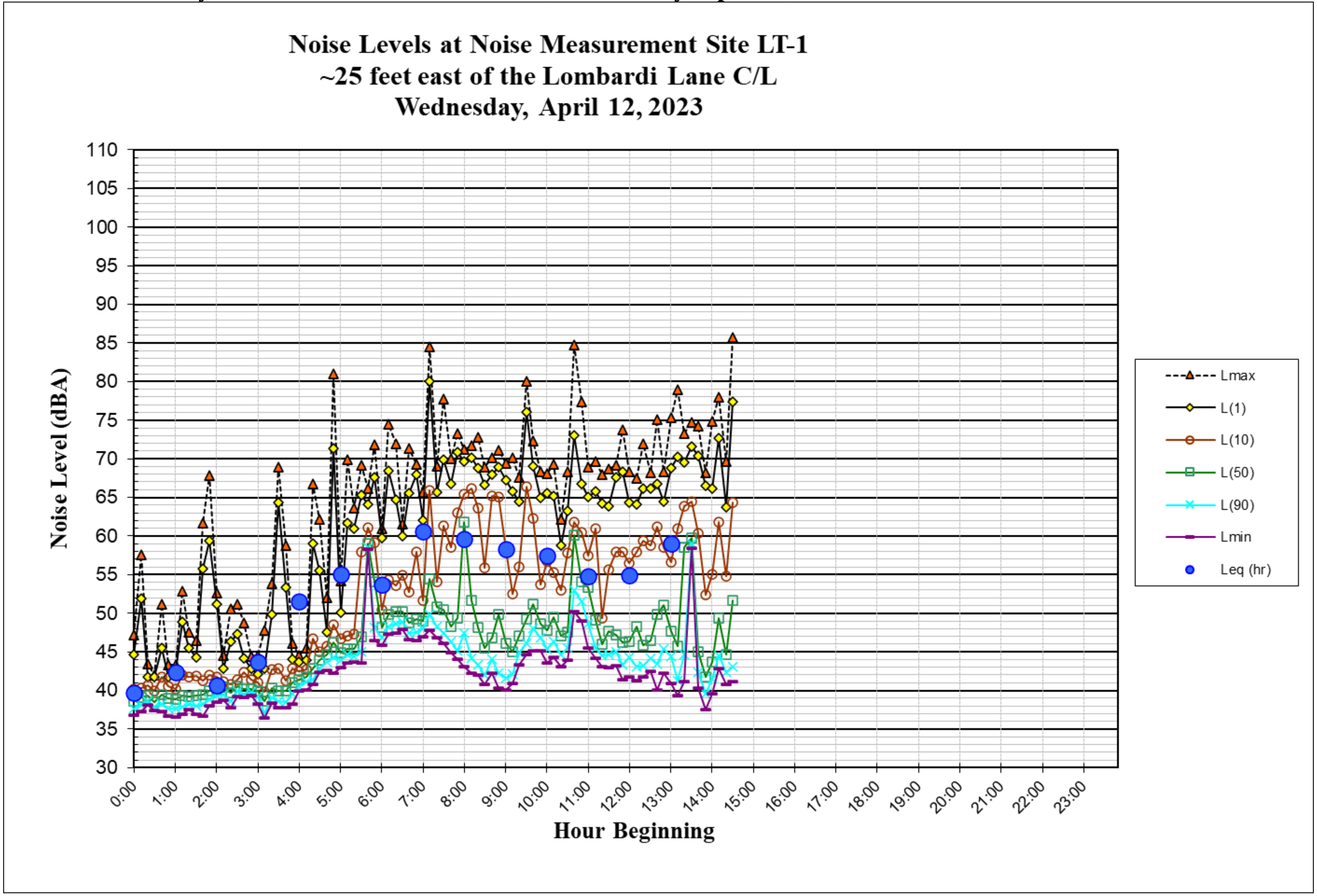


FIGURE A4 Daily Trend in Noise Levels for LT-2, Monday, April 10, 2023

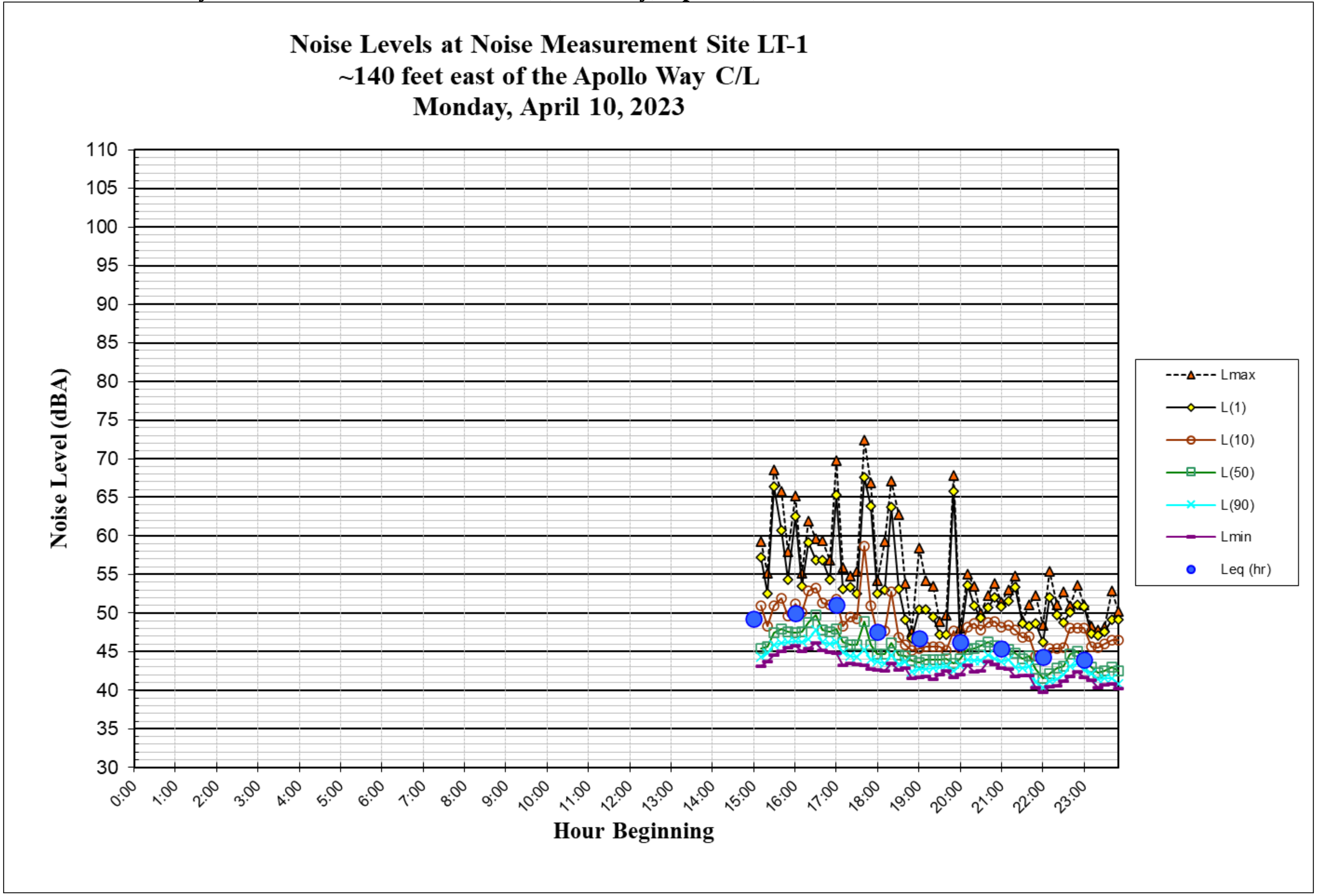


FIGURE A5 Daily Trend in Noise Levels for LT-2, Tuesday, April 11, 2023

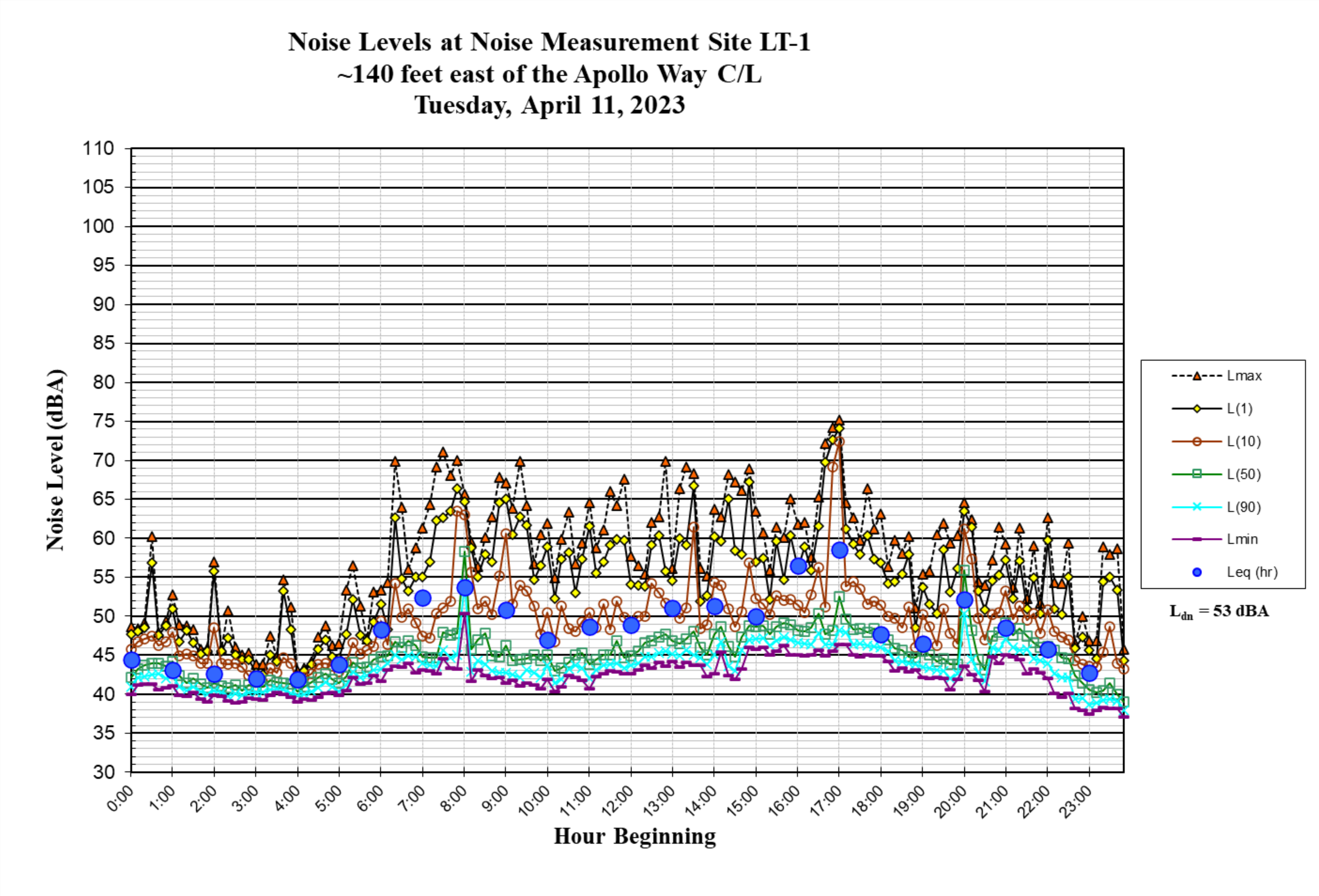


FIGURE A6 Daily Trend in Noise Levels for LT-2, Wednesday, April 12, 2023