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Appendix E
Noise

Attachment 1: Acoustical Terminology
Attachment 2: Examples of Sound Levels

ACOUSTICAL ANALYSIS

FORM ENERGY, EAST ROAD STORAGE PROJECT
MENDOCINO COUNTY, CALIFORNIA

WJVA Report No. 23-27

PREPARED FOR

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1. INTRODUCTION

Project Description:

Form Energy, Inc. (Form Energy) proposes to install a demonstration energy storage project known as the East Road Storage Project (Project), on a Pacific Gas and Electric (PG&E) property in the Redwood Valley area of Mendocino County, California. The Project would provide 5 megawatts (MW)/500 megawatt hours (MWh) of 100-hour, iron-air, multi-day energy storage (MDS). The site consists of two adjacent parcels. The northern parcel (APN 166-050-02-00) is 12.18 acres in size and contains an equipment and materials storage area. It is located at 7475 East Road. The southern parcel (APN 166-050-03-00) is 17.0 acres and contains the Mendocino substation. It is located at 7399 East Road. Access to both parcels is by an unnamed dirt road off East Road that is located between the two parcels. Both parcels include vacant land where the Project components would be located. The project Site Plan is provided as Figure 1.

The Project would include two power blocks. Power Block 1, would be located on the north parcel and would contain 64 MDS battery enclosures, generating 2.5 MW. Each battery enclosure contains about 10 battery modules. Access to Power Block 1 would be from the center access road. Power Block 2 would be located in the southwest corner of the southern parcel. Access to Power Block 2 would also be from the center access road. It would also contain 64 MDS battery enclosures. The battery enclosures are modified shipping containers that are painted white and are about 8.5 feet wide, 37 feet long, and 8.5 feet high. Additionally, there would be one auxiliary enclosure to support air and water management for every four battery enclosures. The auxiliary enclosures would be white and measure 8 feet wide, 18 feet long, and 8.5 feet high. Each power block would also contain a bi-directional inverter and a 10,000-gallon water storage tank.

During operation of the battery system, heat generated will be removed via a forced air thermal management system (i.e., fans). Like most aqueous batteries, iron-air batteries create a small amount of hydrogen while charging. In Form's iron-air battery, a fan dilutes the battery charging exhaust air with fresh air and exhausts it to the outside, where the non-toxic hydrogen gas promptly disperses. Due to the anticipated noise from the fans in the battery enclosures, a noise barrier/sound wall, using acoustical treatments with concrete masonry unit (CMU) blocks or similar enclosures may be installed between the power blocks and the nearest residences (see Figure 1, Site Plan.)

The power blocks would be connected to the pad-mounted switchgear via 880 feet of electrical cable installed in a trench. From the pad-mounted switchgear, a 300-foot overhead primary transmission line would be extended to the Mendocino Substation 12 kV tap and from the substation to the 12-kV distribution line running along the east side of East Road. Both power blocks and the pad-mounted switchgear would be surrounded by a six-foot-tall chain-link security fence to restrict public access during construction and operation.

Because this multi-day storage project has a large, 500 MWh storage capacity, it is also able to charge and discharge energy over extended periods. For example, the MDS battery can charge during months when net loads are low and dispatch power during months when net loads are

high, allowing it to take advantage of more seasonal trends and relieve more prolonged grid stress events. Form Energy will use system forecasts and dispatch software to estimate optimal dispatch cycles.

The proposed Project is expected to operate for at least five years, during which time it would receive quarterly maintenance. No support staff would be required onsite, and no night-lighting (other than minimal safety and security lighting) would be required for the facility. The system will provide 5 MW of electrical power to participate in CAISO markets that may include: wholesale energy, frequency regulation, spinning reserves, and flexible ramping.

Environmental Noise Assessment:

This environmental noise assessment has been prepared to document existing ambient noise levels in the overall project vicinity, and to determine if significant noise impacts will be produced by the project and to describe mitigation measures for noise if significant impacts are determined. The environmental noise assessment, prepared by WJV Acoustics, Inc. (WJVA), is based upon the project site plan provided by the applicant, noise level data provided by the project applicant, and findings of noise level measurements conducted in the project vicinity on August 15 & 16, 2023 as well as October 9 & 10, 2023. Revisions to the site plan or other project-related information available to WJVA at the time the analysis was prepared may require a reevaluation of the findings and/or recommendations of the report.

Attachment 1 provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise. Attachment 2 provides examples of sound levels for reference.

In terms of human perception, a 5 dB increase or decrease is considered to be a noticeable change in noise levels. Additionally, a 10 dB increase or decrease is perceived by the human ear as twice as loud or half as loud respectively. In terms of perception, generally speaking the human ear cannot perceive an increase (or decrease) in noise levels less than 3 dB.

2. THRESHOLDS OF SIGNIFICANCE

The CEQA Guidelines apply the following questions for the assessment of significant noise impacts for a project:

a. Would the project result in 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. Would the project result in 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, would the project expose people residing or working in the project area to excessive noise levels?

a. Noise Level Standards

Mendocino County

The County of Mendocino General Plan was adopted in 2009. The General Plan Development Element includes the noise section, but does not explicitly provide noise standards. However, the General Plan Draft Environmental Impact Report (EIR)[1] does provide the noise standards that would typically be provided in the General Plan itself. The land use compatibility noise standards referenced in the General Plan EIR are those which were provided in the previous Mendocino County General Plan (1991), and are still considered to be generally applicable.

The General Plan Update Draft EIR references the 1991 General Plan, which establishes land use compatibility criteria in terms of the Day/Night Level (L_{dn}) or the Community Noise Equivalent Level (CNEL) to describe noise exposure for noise compatibility planning purposes. Both the L_{dn} and CNEL represent the time-weighted energy average noise level for a 24-hour day, with a 10 dB penalty added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL includes an additional penalty of 5 dB (technically 4.77 dB) that is added to noise levels occurring during the evening hours between 7:00 p.m. and 10:00 p.m. The CNEL is utilized to describe aircraft noise exposure as required by the State of California. Both the L_{dn} and CNEL represent cumulative exposure to noise over an extended period of time and are therefore calculated based upon *annual average* conditions. The L_{dn} and CNEL are considered to be equivalent descriptors of the community noise environment for the purposes of this study.

The Noise Section of the General Plan Update Draft EIR provides ranges of noise exposure levels which are considered acceptable, conditionally acceptable, or unacceptable for

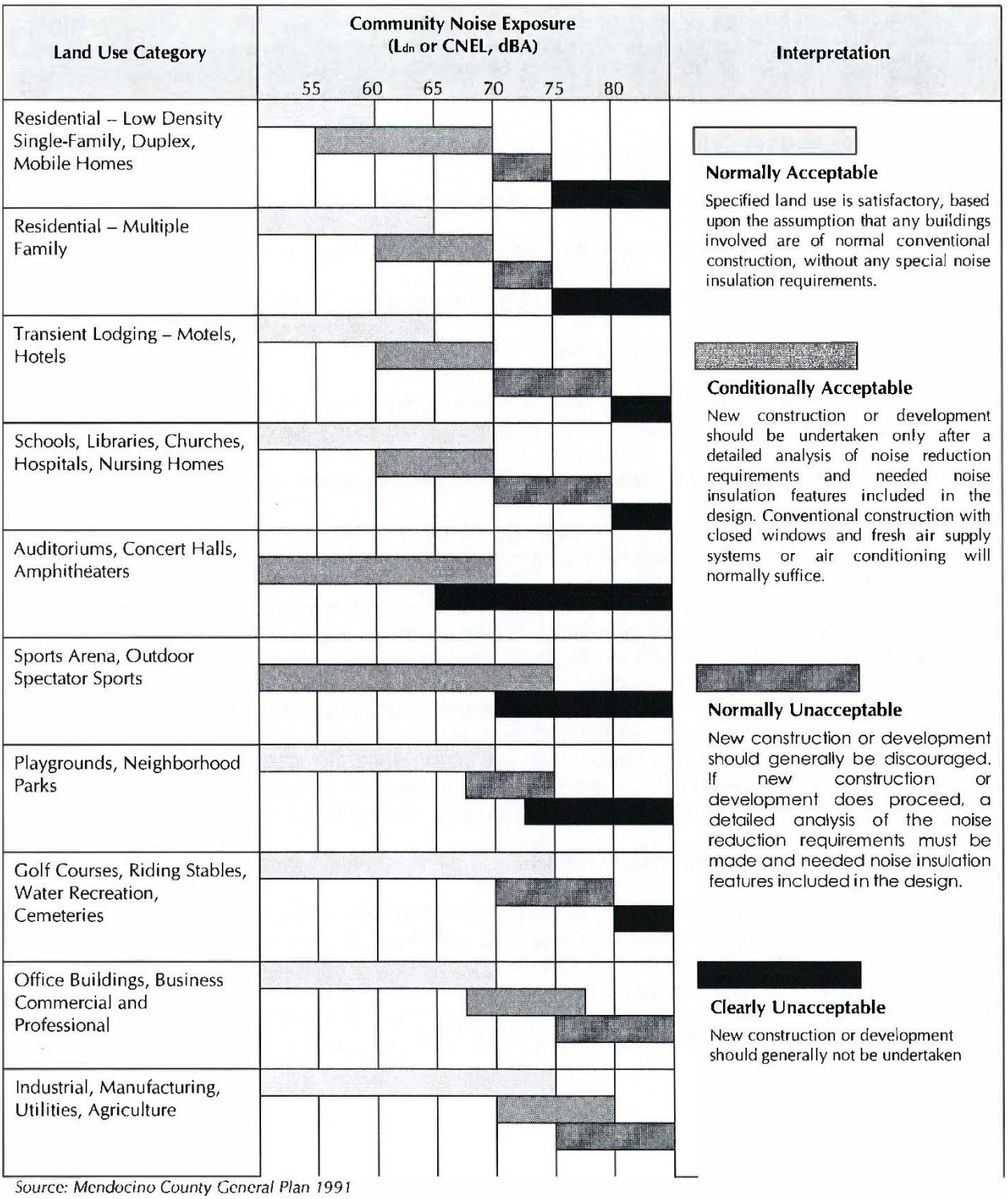
[1] The County of Mendocino General Plan Update Draft Environmental Impact Report, Section 4.10 Noise, September 2008

various noise-sensitive land uses in the city. Table 4.10-4 (provided below as Table I) of the General Plan EIR provides these land use noise compatibility criteria.

For transportation noise sources, the General Plan EIR establishes an exterior noise exposure level of up to 60 dB L_{dn} as "normally acceptable" for residential land uses. An exterior noise exposure level of up to 70 dB L_{dn} for residential land uses is considered to be "conditionally acceptable".

Table I: Mendocino County Land Use Compatibility Noise Criteria

TABLE 4.10-4
LAND USE COMPATIBILITY NOISE CRITERIA
MENDOCINO COUNTY GENERAL PLAN



Source: Mendocino County General Plan 1991

The General Plan Update Draft EIR also provides reference to noise level standards for non-transportation (stationary) noise sources provided in the Mendocino County Zoning Code. Appendix B (Exterior Noise Limit Standards) of the Mendocino County Zoning Code[2] provides non-transportation (stationary) noise standards applicable to the project. The non-transportation standards are provided in terms of the L_{50} statistical noise metric. The L_{50} represents the noise level that is not to be exceeded for more than 50% (30 minutes) of any given one hour of time. These noise standards become more restrictive (either 5 dB or 10 dB) during the nighttime hours of 10:00 p.m. to 7:00 a.m. The exterior noise standards are provided as Table II below.

Table II: Mendocino County Exterior Noise Level Standards

TABLE 4.10-5
EXTERIOR NOISE LIMIT STANDARDS
MENDOCINO COUNTY ZONING CODE

Receiving Land Use Category (3,4)	Time Period	Noise Level Standard (dBA) Not to be Exceeded More than 30 Minutes in Any Hour (1,2)	
		Rural/Suburban	Urban/Highways (5)
One- and Two-Family Residential	10:00 p.m. – 7:00 a.m. 7:00 a.m. – 10:00 p.m.	40 50	50 60
Multifamily Public Spaces	10:00 p.m. – 7:00 a.m. 7:00 a.m. – 10:00 p.m.	45 50	55 60
Limited Commercial Some Multifamily	10:00 p.m. – 7:00 a.m. 7:00 a.m. – 10:00 p.m.	55 60	
Commercial	10:00 p.m. – 7:00 a.m. 7:00 a.m. – 10:00 p.m.	60 65	
Light Industrial Heavy Industrial	Any Time Any Time	70 75	

Adjustments to Noise Level Standard		
Duration		Adjustment Factor
L50:	30 minutes per hour	Standard
L25:	15 minutes per hour	Standard + 5 dB
L0:	Maximum permissible level	Standard + 20 dB
Character:	Tone, whine, screech, hum, or impulsive, hammering, riveting, or music or speech	Standard + 5 dB
Ambient Noise Level (1):	Existing ambient L50, L25	Standard + 5 dB
	Existing ambient L0	Existing maximum

Interpretive Footnotes:

(1) When an acoustical study demonstrates that ambient levels exceed the noise standard, then the ambient levels become the standard.

(2) Higher noise levels may be permitted for temporary, short-term or intermittent activities when no sensitive or residential uses will be affected.

(3) County staff shall recommend which receiving land use category applies to a particular project, based on the mix of uses and community noise levels. Industrial noise limits intended to be applied at the boundary of industrial zones, rather than within industrial areas.

(4) The "rural/suburban" standard should be applied adjacent to noise sensitive uses such as hospitals or convalescence homes.

(5) "Highways" apply to roads and highways where average daily traffic (ADT) exceeds 10,000. (Ord. No. 4017 (part), adopted 1998)

Source: Mendocino County Inland & Coastal Zoning Codes

[2] Mendocino County Zoning Code, Appendix B, Exterior Noise Limit Standards, 2005

State of California

There are no state noise standards that are applicable to the project.

Federal Noise Standards

There are no federal noise standards that are applicable to the project.

b. Construction Noise and Vibration

Mendocino County does not provide specific construction noise level standards applicable to the project. Some guidance can be found from various sources. The Federal Transit Administration[3]. (FTA) has identified a daytime noise level of 90 dB L_{eq} as a reasonable criterion for construction noise impact assessment. The FTA guidance states that adverse community reactions may result if such noise levels are exceeded during construction activities. Furthermore, The World Health Organization[4] (WHO) recommends that noise exposure levels should not exceed 70 dB over a 24-hour period, and 85 dB over a 1-hour period to avoid hearing impairment. The more conservative of these two noise levels, 85 dB L_{eq}, is applied within this analysis to assess potential construction-related noise levels that may result in noise impacts to off-site sensitive receptors in the project vicinity.

Mendocino County does not provide noise standards or guidance related to construction activities. However, it is common to limit hours of construction to reasonable daytime hours and establish additional best management practices to minimize construction noise impacts at nearby sensitive receiver locations.

During all phases of construction activity, reasonable noise reduction measures should be utilized to minimize the exposure of neighboring properties to excessive noise levels. Noise reduction measures could include, but would not be limited to:

- Construction activities shall normally be limited to the hours of 7 a.m. to 7 p.m. Monday through Friday, and 8 a.m. to 5 p.m. Saturday.

- Use available noise suppression devices and properly maintain and muffle loud construction equipment.

- Avoid staging of construction equipment and unnecessary idling of equipment within 200 feet of noise-sensitive land uses.

[3] Federal Transit Administration, *Transportation Noise and Vibration Impact Assessment,* May 2006.

[4] World Health Organization, *Compendium of WHO and UN Guidance on Health and Environment,* 2022.

Mendocino County does not provide any specific vibration guidelines. Some guidance is provided by the Caltrans Transportation and Construction Vibration Guidance Manual[5]. The Manual provides guidance for determining annoyance potential criteria and damage potential threshold criteria. These criteria are provided below in Table III and Table IV, and are presented in terms of peak particle velocity (PPV) in inches per second (in/sec). For the purpose of this analysis, a threshold of significance for which a construction vibration impact is considered to occur is 0.1 PPV (in/sec).

TABLE III

GUIDELINE VIBRATION ANNOYANCE POTENTIAL CRITERIA

Barely Perceptible	0.04	0.01
Strongly Perceptible	0.9	0.1

Source: Caltrans

TABLE IV

GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile, historic buildings, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans

[5] California Department of Transportation, *Transportation and Construction Vibration Guidance Manual,* April 2020.

3. SETTING

The proposed Project would be located on property owned by PG&E at the existing Mendocino Substation located in Redwood Valley, an unincorporated census-designated place in Mendocino County, California. Mendocino County is in northwestern California. The county is bordered by Humboldt and Trinity counties to the north, Tehama, Glenn, and Lake counties to the east, Sonoma County to the south, and the Pacific Ocean to the west.

The Project location is approximately 0.8 mile east of U.S. Route 101 and north of the community of Calpella, California. Project facilities would be situated on two adjacent PG&E parcels on the east side of East Road. An existing access road from East Road provides access to both parcels and the PG&E facilities located on them.

The PG&E parcels are located between Valley View Drive and Electra Way. Immediately to the north of the properties is an open field and a rural residence, to the northeast is a residence, to the east are woodlands and a wooded hill, and to the south are vineyards. West of the PG&E parcels, on the west side of East Road, are several residences and some vineyards.

a. Background Noise Level Measurements

Existing noise levels in the project vicinity are dominated by traffic noise along East Road. Other sources of noise observed during the project site visit include noise associated with the existing substation, noise associated with PG&E construction staging activities and noise associated with occasional aircraft overflights.

Measurements of existing ambient noise levels in the project vicinity were conducted between August 15-16, 2023 as well as October 10-11, 2023. Long-term (24-hour) ambient noise level measurements were conducted at six (6) locations (sites LT-1 through LT-6). Site LT-1 and LT-3 were located near the closest residential land uses to the project site, along East Road. Both sites were exposed predominantly to traffic noise associated with vehicles traveling along East Road, as well as noise sources associated with nearby residential land uses. Site LT-2 was located near existing residential land uses on Valley View Drive. Site LT-2 was exposed to noise associated with vehicles traveling along Valley View Drive and East Road, as well as noise associated with residential land uses. Site LT-4 was located off Electra Way, southeast of the Project site, in the vicinity of residential land uses. Site LT-4 was exposed to noise associated with vehicles traveling on Electra Way and East Road, as well as noise associated with substation operations as well as PG&E construction staging activities (several PG&E trucks and employees were observed in the vicinity). Sites LT-5 and LT-6 were located in the vicinity of residential property lines between residences off Valley View Drive and the project site. The locations of the six ambient noise monitoring sites are shown on Figure 2.

Noise monitoring equipment consisted of Larson-Davis Laboratories Model LDL-820 sound level analyzers equipped with B&K Type 4176 1/2” microphones. The equipment complies with the specifications of the American National Standards Institute (ANSI) for Type I (Precision) sound level meters. The meters were calibrated with a B&K Type 4230 acoustic calibrator to ensure the accuracy of the measurements.

Measured ambient noise levels are summarized below in terms of the L_{50} statistical noise descriptor applicable to the Mendocino County Noise standards, provided above as Table II, as well as the L_{eq} (energy average noise level), the L_{max} (maximum) and the L_{90} statistical descriptor. The L_{90} is a statistical descriptor that defines the noise level exceeded 90% of the time during each hour of the sample period. The L_{90} is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft, and other local noise sources. Table V provides the 24-hour hourly L_{50} noise level at each of the six ambient noise measurement sites, and provides the average daytime (7:00 a.m. to 10:00 p.m.) L_{50} noise levels and the average nighttime (10:00 p.m. to 7:00 a.m.) L_{50} noise levels. As described above, the Mendocino County noise level standards applicable to the project are 50 dB L_{50} during daytime hours and 40 dB L_{50} during nighttime hours.

Measured hourly energy average noise levels (L_{eq}) at site LT-1 ranged from a low of 51.4 dB between 1:00 a.m. and 2:00 a.m. to a high of 68.0 dBA between 6:00 p.m. and 7:00 p.m. Measured hourly L_{50} noise levels at site LT-1 ranged from a low of 40.9 dB between 1:00 a.m. and 2:00 a.m. to a high of 58.1 dBA between 5:00 p.m. and 6:00 p.m. Hourly maximum (L_{max}) noise levels at site LT-1 ranged from 75.1 to 90.1 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 36.5 to 48.1 dBA. The measured L_{dn} value at site LT-1 over the 24-hour monitoring period was 68.5 dB L_{dn}. Figure 3 graphically depicts hourly variations in ambient noise levels at site LT-1 over the 24-hour monitoring period. Figure 4 provides a photograph of site LT-1.

Measured hourly energy average noise levels (L_{eq}) at site LT-2 ranged from a low of 43.0 dB between 6:00 p.m. and 7:00 p.m. to a high of 57.4 dBA between 10:00 p.m. and 11:00 p.m. Measured hourly L_{50} noise levels at site LT-2 ranged from a low of 37.0 dB between 10:00 a.m. and 11:00 a.m. to a high of 57.2 dBA between 10:00 p.m. and 11:00 p.m. and between 11:00 p.m. and midnight. Hourly maximum (L_{max}) noise levels at site LT-2 ranged from 53.8 to 83.1 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 34.5 to 56.1 dBA. The measured L_{dn} value at site LT-2 over the 24-hour monitoring period was 60.6 dB L_{dn}. Figure 5 graphically depicts hourly variations in ambient noise levels at site LT-2 over the 24-hour monitoring period. Figure 6 provides a photograph of site LT-2.

Measured hourly energy average noise levels (L_{eq}) at site LT-3 ranged from a low of 50.8 dB between 1:00 a.m. and 2:00 a.m. to a high of 66.4 dBA between 4:00 p.m. and 5:00 p.m. Measured hourly L_{50} noise levels at site LT-3 ranged from a low of 42.3 dB between 1:00 a.m. and 2:00 a.m. to a high of 57.2 dBA between 3:00 p.m. and 4:00 p.m. Hourly maximum (L_{max}) noise levels at site LT-3 ranged from 73.4 to 85.5 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 38.7 to 48.4 dBA. The measured L_{dn} value at site LT-3 over the 24-hour monitoring period was 67.2 dB L_{dn}. Figure 7 graphically depicts hourly variations in ambient noise levels at site LT-3 over the 24-hour monitoring period. Figure 8 provides a photograph of site LT-3.

Measured hourly energy average noise levels (L_{eq}) at site LT-4 ranged from a low of 43.5 dB between 9:00 a.m. and 10:00 a.m. to a high of 54.9 dBA between 10:00 p.m. and 11:00 p.m. Measured hourly L_{50} noise levels at site LT-4 ranged from a low of 35.9 dB between 10:00 a.m.

and 11:00 a.m. to a high of 54.8 dBA between 10:00 p.m. and 11:00 p.m. Hourly maximum (L_{max}) noise levels at site LT-4 ranged from 50.6 to 79.1 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 35.1 to 54.1 dBA. The measured L_{dn} value at site LT-4 over the 24-hour monitoring period was 57.6 dB L_{dn}. Figure 9 graphically depicts hourly variations in ambient noise levels at site LT-4 over the 24-hour monitoring period. Figure 10 provides a photograph of site LT-4.

Measured hourly energy average noise levels (L_{eq}) at site LT-5 ranged from a low of 37.2 dB between 1:00 a.m. and 2:00 a.m. to a high of 52.3 dBA between 7:00 a.m. and 8:00 a.m. Measured hourly L_{50} noise levels at site LT-5 ranged from a low of 35.9 dB between 1:00 a.m. and 2:00 a.m. to a high of 51.5 dBA between 7:00 a.m. and 8:00 a.m. Hourly maximum (L_{max}) noise levels at site LT-5 ranged from 47.2 to 73.1 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 33.6 to 47.4 dBA. The measured L_{dn} value at site LT-5 over the 24-hour monitoring period was 52.1 dB L_{dn}. Figure 11 graphically depicts hourly variations in ambient noise levels at site LT-5 over the 24-hour monitoring period. Figure 12 provides a photograph of site LT-5.

Measured hourly energy average noise levels (L_{eq}) at site LT-6 ranged from a low of 41.7 dB between 1:00 a.m. and 2:00 a.m. to a high of 52.4 dBA between 6:00 p.m. and 7:00 p.m. Measured hourly L_{50} noise levels at site LT-6 ranged from a low of 41.5 dB between 1:00 a.m. and 2:00 a.m. to a high of 49.2 dBA between 7:00 a.m. and 8:00 a.m. Hourly maximum (L_{max}) noise levels at site LT-6 ranged from 47.1 to 70.2 dBA. Residual noise levels at the monitoring site, as defined by the L_{90}, ranged from 38.1 to 46.2 dBA. The measured L_{dn} value at site LT-6 over the 24-hour monitoring period was 51.5 dB L_{dn}. Figure 13 graphically depicts hourly variations in ambient noise levels at site LT-6 over the 24-hour monitoring period. Figure 14 provides a photograph of site LT-6.

TABLE V

SUMMARY OF 24 HOUR NOISE LEVEL MEASUREMENTS, dB L_{50}
EAST ROAD STORAGE PROJECT
AUGUST 15, 2023

Time	A Weighted Decibels, dB, L_{50}					
	LT 1	LT 2	LT 3	LT 4	LT 5	LT 6
12:00 a.m.	42.0	55.8	44.2	53.2	36.9	41.9
1:00 a.m.	40.9	56.0	42.3	51.5	35.9	41.5
2:00 a.m.	41.0	55.0	42.7	50.4	39.9	42.6
3:00 a.m.	42.4	51.9	44.8	48.3	39.3	42.1
4:00 a.m.	44.3	49.4	46.0	45.1	42.6	43.3
5:00 a.m.	49.6	46.2	49.0	43.5	46.1	45.7
6:00 a.m.	52.1	48.1	52.2	44.5	51.4	48.6
7:00 a.m.	56.5	49.1	57.2	45.4	51.5	49.2
8:00 a.m.	54.8	43.4	54.8	37.8	46.9	45.2
9:00 a.m.	52.2	39.2	49.9	36.4	45.2	43.2
10:00 a.m.	52.5	37.0	49.7	35.9	44.2	43.0
11:00 a.m.	52.6	41.2	51.6	44.0	41.7	43.5
12:00 p.m.	53.1	42.0	52.2	40.1	43.5	43.1
1:00 p.m.	53.0	42.7	55.0	45.2	43.8	44.2
2:00 p.m.	52.7	39.9	51.9	46.4	43.0	42.3
3:00 p.m.	55.6	43.7	57.2	41.2	44.1	43.0
4:00 p.m.	57.5	45.4	56.9	42.8	46.3	46.5
5:00 p.m.	58.1	44.1	56.7	41.7	45.4	46.0
6:00 p.m.	55.5	41.6	55.5	38.8	45.0	46.8
7:00 p.m.	53.0	42.2	54.1	39.9	40.8	43.9
8:00 p.m.	50.8	46.7	51.7	44.3	40.6	44.9
9:00 p.m.	47.7	56.4	48.8	54.5	39.5	44.0
10:00 p.m.	44.5	57.2	45.9	54.8	37.7	42.5
11:00 p.m.	42.7	57.2	44.5	54.5	37.5	43.1
Average Daytime	**54.4**	**47.1**	**54.4**	**45.5**	**45.2**	**45.0**
Average Nighttime	**46.3**	**54.4**	**46.9**	**51.2**	**44.2**	**44.1**

Source: WJV Acoustics, Inc.

The County's noise standards states "*When an acoustical study demonstrates that ambient levels exceed the noise standard, then the ambient levels become the standard*." (Table 4.10-5, footnote 1, presented here as Table II.) As the project would likely operate at any hour of the day, the nighttime noise level standard of 40 dB L_{50} would be considered the project compliance threshold when ambient noise levels do not already exceed this noise level.

Ambient noise measurement sites LT-1 and LT-3 were in the vicinity of residential land uses located along East Road. Noise levels measured at these two sites were dominated by traffic noise, with both sites showing higher noise levels during the daytime hours, with peaks occurring during the typical morning (6:00 a.m. to 9:00 a.m.) and afternoon (4:00 p.m. to 7:00 p.m.) commute windows. Noise levels at sites LT-1 and LT-3 dropped during the late night and early morning hours, when vehicle traffic on East Road was reduced. Reference to Table V indicates that the average nighttime L_{50} noise level at the residential land uses along East Road is approximately 46 dB L_{50}. As these levels exceed the 40 dB L_{50} nighttime noise level standard,

46 dB L_{50} would then become the maximum allowable noise level at these residential land uses.

Ambient noise measurement sites LT-2 and LT-4 were both setback approximately 1,000 feet from East Road. As such, these two sites experienced less East Road roadway noise, and were impacted by more localized noise sources. Both of these two ambient sites were located in somewhat forested areas, near rural-residential land uses. Reference to hourly variations at sites LT-2 and LT-4 indicate that noise levels at both sites rose dramatically at around 8:00 p.m. and remained elevated until the early morning hours of approximately 3:00 to 4:00 a.m. Additionally, the statistical noise level data (L_{50}, L_{90}, etc.) indicate that a somewhat constant noise source was occurring during these hours, indicative of noise associated with nocturnal insects (or possibly frogs) creating noise in the vicinity of the noise meters. This can be a common occurrence in such rural/forested environments.

In order to provide a more accurate assessment of nighttime noise levels in the vicinity of existing residential land uses near Power Block 1 (along Valley View Drive), WJVA staff conducted additional ambient noise level measurements along the actual property line between the project site and these residential land uses. Site LT-5 was located at the residential property line immediately north of the proposed Power Block 1 location, and site LT-6 was located at the residential property line northeast of the proposed Power Block 1 location. The nighttime noise measurements at both LT-5 and LT-6 were applied to determine the allowable maximum nighttime noise levels described below.

Based on the County of Mendocino noise standards (provided above as Table II) and the findings of the above-described ambient noise survey, the maximum allowable project-related noise levels (L_{50}) at the residential land uses in the vicinity of the proposed project would be as follows:

- Residences along East Road: Daytime (7 a.m. to 10 p.m.) 54 dB
  Nighttime (10 p.m. to 7 a.m.) 46 dB

- Residences off Valley View Drive: Daytime (7 a.m. to 10 p.m.) 50 dB
  Nighttime (10 p.m. to 7 a.m.) 44 dB

4. PROJECT RELATED NOISE LEVELS

a. Project Noise Impacts from Operational Sources

According to the project applicant, operational noise associated with the implementation of the Project would consist of noise associated with the individual MDS Battery Enclosures, Inverters and MV (Medium Voltage) Transformers. The project would consist of two (2) individual "power block" areas, both containing these three noise-producing components.

Power Block 1, would be located on the north parcel and would contain 64 MDS Battery Enclosures, generating 2.5 MW. Each battery enclosure contains about 10 battery modules. Power Block 2 would be located in the southwest corner of the southern parcel. It would also contain 64 MDS battery enclosures. The battery enclosures are modified shipping containers that are painted white and are about 8.5 feet wide, 37 feet long, and 8.5 feet high. Each power block would also include one (1) inverter and one (1) MV Transformer.

MDS Battery Enclosures:
As described above, each power block would include 64 individual MDS Battery Enclosures. According to the project applicant, operational noise levels each MDS Battery Enclosure would not exceed 79 dBA at any point one (1) meter away from any exterior vertical enclosure surface.

Inverter:
As described above, each power block would include one Inverter. According to the project applicant, operational noise levels each Inverter would be approximately 80 dBA at a setback distance of one meter.

MV Transformer:
As described above, each power block would include one MV Transformer. According to the project applicant, operational noise levels each MV Transformer would be approximately 63-66 dBA at a setback distance of one meter.

Combined Noise Levels at Sensitive Receptor Locations:
As described above, the project footprint would be broken into two individual areas, Power Block 1 at the northeast portion of the project site and Power Block 2 at the southwest portion of the project site. For the purpose of this analysis, it was assumed that all MDS Battery Enclosures as well as the Inverter and MV Transformer components could be in simultaneous operation over any given one hour of time. WJVA calculated what the anticipated noise levels would be at nearby residential land uses based upon the above-described noise levels provided by the project applicant and the distances between the proposed noise-producing components and existing residential land uses.

Project-related operational noise levels were calculated to be approximately 63 dB at the residential land uses in the vicinity of Power Block 2, along East Road and approximately 52-53 dB at the residential land uses in the vicinity of Power Block 1. Figure 15 graphically provides the project-related operational noise levels at nearby residential land uses.

b. Noise from Construction

Construction would be organized into the following activities:

- **Construction Preparation & Site Grading (five weeks)**
  Site grading and temporary construction facilities (e.g., fencing, construction trailers, material laydown). A grader, dozer, and front-end load would be required for this work.

- **Excavation and Undergrounding (18 weeks)**
  Excavation, installation of piping and conduit installation (including a water piping network for demineralized water distribution) followed by backfill. Excavators will be required for this work.

- **Foundation Installation (eight weeks)**
  Installation of foundations for battery and balance-of-plant equipment. Construction equipment required for this installation will be determined based on the results of the geotechnical investigation.

- **Electrical Work (six weeks)**
  Cable installation and terminations for all major equipment.

- **MDS Enclosure Installation & Electrolyte Fill (four weeks)**
  Enclosure installation and electrolyte fill. This work will require at least one 250-foot crane in addition to flatbed trucks.

- **Commissioning (10 weeks)**
  To ensure proper functioning of the battery system.

Construction is planned to start in the fourth quarter of 2024. Overall construction of the power blocks is expected to last 6 to 9 months. It is anticipated that the system would be online in the fourth quarter of 2025. All noise-producing, construction-related activities would comply with local noise ordinances.

Construction noise could occur at various locations within the project site through the build-out period and would generally occur at distances of greater than 100 feet from nearby noise-sensitive land uses (residences). Table VI provides typical construction-related noise levels at reference distances of 100 feet, 200 feet, and 300 feet.

Construction noise is not considered to be a significant impact if construction is limited to the reasonable daytime hours and construction equipment is adequately maintained and muffled.

TABLE VI

TYPICAL CONSTRUCTION EQUIPMENT MAXIMUM NOISE LEVELS, dBA

Type of Equipment	100 Ft.	200 Ft.	300 Ft.
Concrete Saw	84	78	74
Crane	75	69	65
Excavator	75	69	65
Front End Loader	73	67	63
Jackhammer	83	77	73
Paver	71	65	61
Pneumatic Tools	79	73	69
Dozer	76	70	66
Rollers	74	68	64
Trucks	80	72	70
Pumps	74	68	64
Scrapers	81	75	71
Portable Generators	74	68	64
Backhoe	80	74	70
Grader	80	74	70

Source: FHWA
Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987

c. Vibration

The dominant sources of man-made vibration are sonic booms, blasting, pile driving, pavement breaking, demolition, diesel locomotives, and rail-car coupling. Typical vibration levels at distance of 100 feet and 300 feet are summarized by Table VII.

TABLE VII

TYPICAL VIBRATION LEVELS DURING CONSTRUCTION

	PPV (in/sec)	
Equipment	@ 100´	@ 300´
Bulldozer (Large)	0.011	0.006
Bulldozer (Small)	0.0004	0.00019
Loaded Truck	0.01	0.005
Jackhammer	0.005	0.002
Vibratory Roller	.03	0.013
Caisson Drilling	.01	0.006

Source: *Caltrans*

The vibration levels provided in Table VII were derived from data provided in the Caltrans Transportation and Construction Vibration Guidance Manual. The Manual provides vibration levels for various pieces of construction equipment, normalized to a setback distance of 25 feet from the equipment source. Using these source levels provided at 25 feet, the Caltrans Manual also states that vibration from this equipment can be estimated for various setback distances by the following formula:

$$PPV_{Equipment} = PPV_{Ref} (25/D)^{n} \text{ (in/sec)}$$

Where:

PPV_{Ref} = *reference PPV at 25 ft.*
D = distance from equipment to the receiver in ft.
n = 1.1 (the value related to the attenuation rate through ground)

d. Mitigation Requirements

Based on the County of Mendocino noise standards (provided above as Table II) and the findings of the above-described ambient noise survey, the maximum allowable project-related noise levels at the residential land uses in the vicinity of the proposed project would be as follows:

- Residences along East Road: Daytime (7 a.m. to 10 p.m.) 54 dB L_{50}
- Nighttime (10 p.m. to 7 a.m.) 46 dB L_{50}

- Residences off Valley View Drive: Daytime (7 a.m. to 10 p.m.) 50 dB L_{50}
- Nighttime (10 p.m. to 7 a.m.) 44 dB L_{50}

As described above, ambient noise levels measured in the vicinity of East Road indicate that existing ambient noise levels during nighttime hours averaged approximately 46 dB L_{50}. Based upon these findings, 46 dB would be the maximum allowable noise at the residential land uses along East Road (LT-1 and LT-3). Based upon the noise levels measured off Valley View Drive (LT-2) and off Electra Way (LT-4), typical nighttime noise levels would not be expected to exceed 40 dB L_{50}, and therefore an adjustment to the noise standard is not warranted in the vicinity of these residences.

- **Power Block 1:** Calculated operational noise levels: 54 dB
  Required mitigation/attenuation: 4 dB (daytime operations) 10 dB (nighttime operations)

- **Power Block 2:** Calculated operational noise levels: 63 dB
  Required mitigation/attenuation: 9 dB (daytime operations) 17 dB (nighttime operations)

Calculations of project-related noise levels (based upon applicant provided noise levels and

setback distances) would be expected to exceed applicable noise level standards by up to 10 dB at residential land uses in the vicinity of Power Block 1 and by up to 17 dB at residential land uses in the vicinity of Power Block 2. The Project must consider mitigation measures to meet these applicable maximum noise level standards. The applicant should consider various measures to meet these noise criteria. Such measures may include a combination of the following:

- Construction of CMU (or similar) enclosures around both power blocks. The minimum height requirement of an enclosure necessary to provide adequate noise attenuation would be subject to further analysis.

- Increase setback distances between the power blocks and existing residential land uses.

- Incorporate design measures to reduce noise levels at the source(s)

5. IMPACT SUMMARY

- Based upon measured existing ambient noise levels, proposed equipment setback distances and noise levels provided by the project applicant, project-related operational noise levels resulting from the proposed project would be expected to exceed applicable noise level criteria by approximately 10 dB at residential land uses in the vicinity of Power Block 1 and by approximately 17 dB at residential land uses in the vicinity of Power Block 2.

- The applicant should consider mitigation measures necessary to attenuate noise levels to below applicable maximum noise thresholds. Such measures could include a combination of sound wall enclosures, increased setback distances between the sources and the residential land uses, or measures to reduce noise levels at the source(s). The minimum height requirement of an enclosure (sound walls) necessary to provide adequate noise attenuation would be subject to further analysis. A tentative representation of sound wall locations has been provided on Figure 1. This location is subject to change with further analysis.

FIGURE 1: PROJECT SITE PLAN

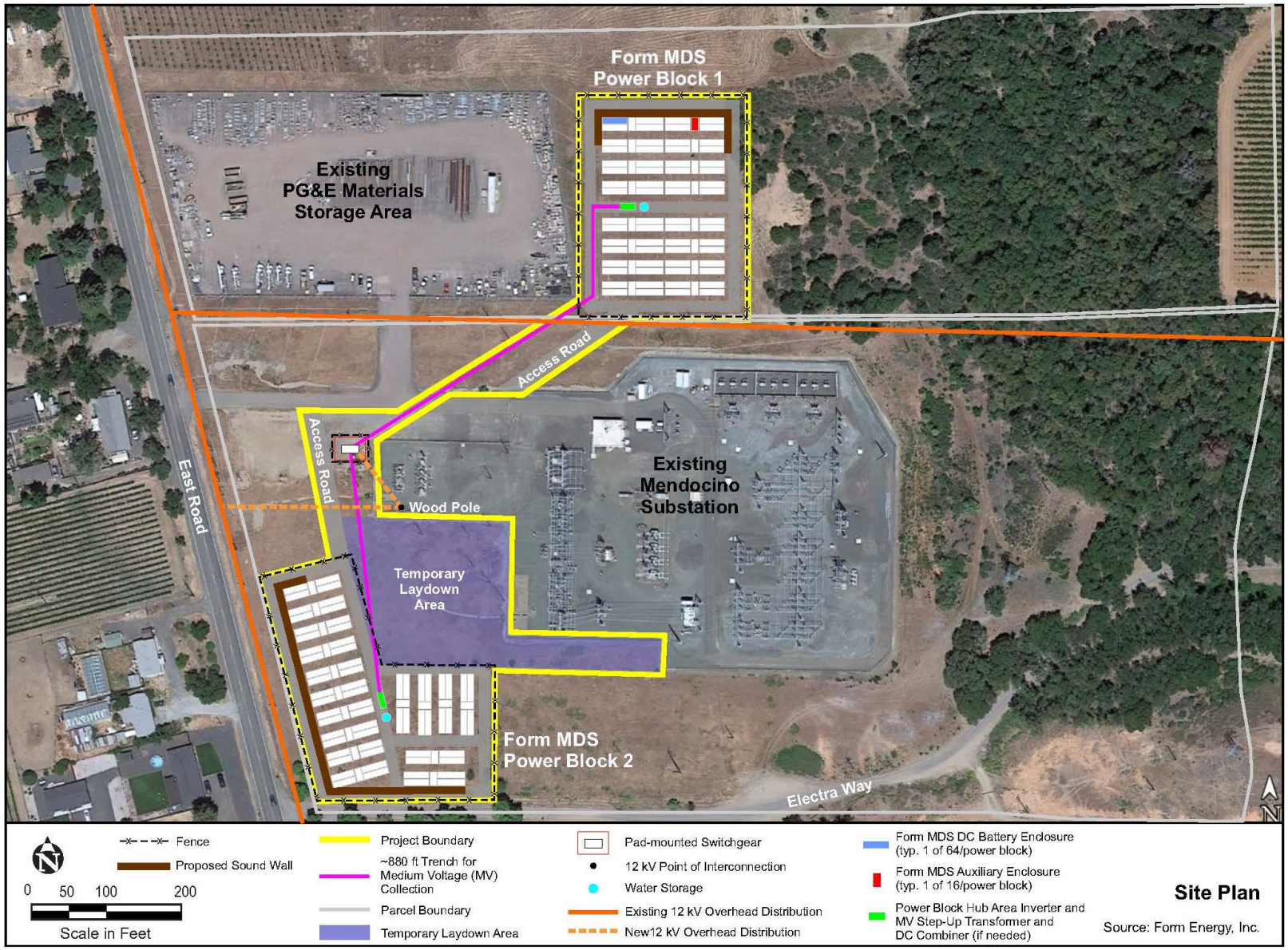


FIGURE 2: PROJECT VICINITY AND AMBIENT NOISE MONITORING SITES

FIGURE 3: HOURLY NOISE LEVELS AT SITE LT-1

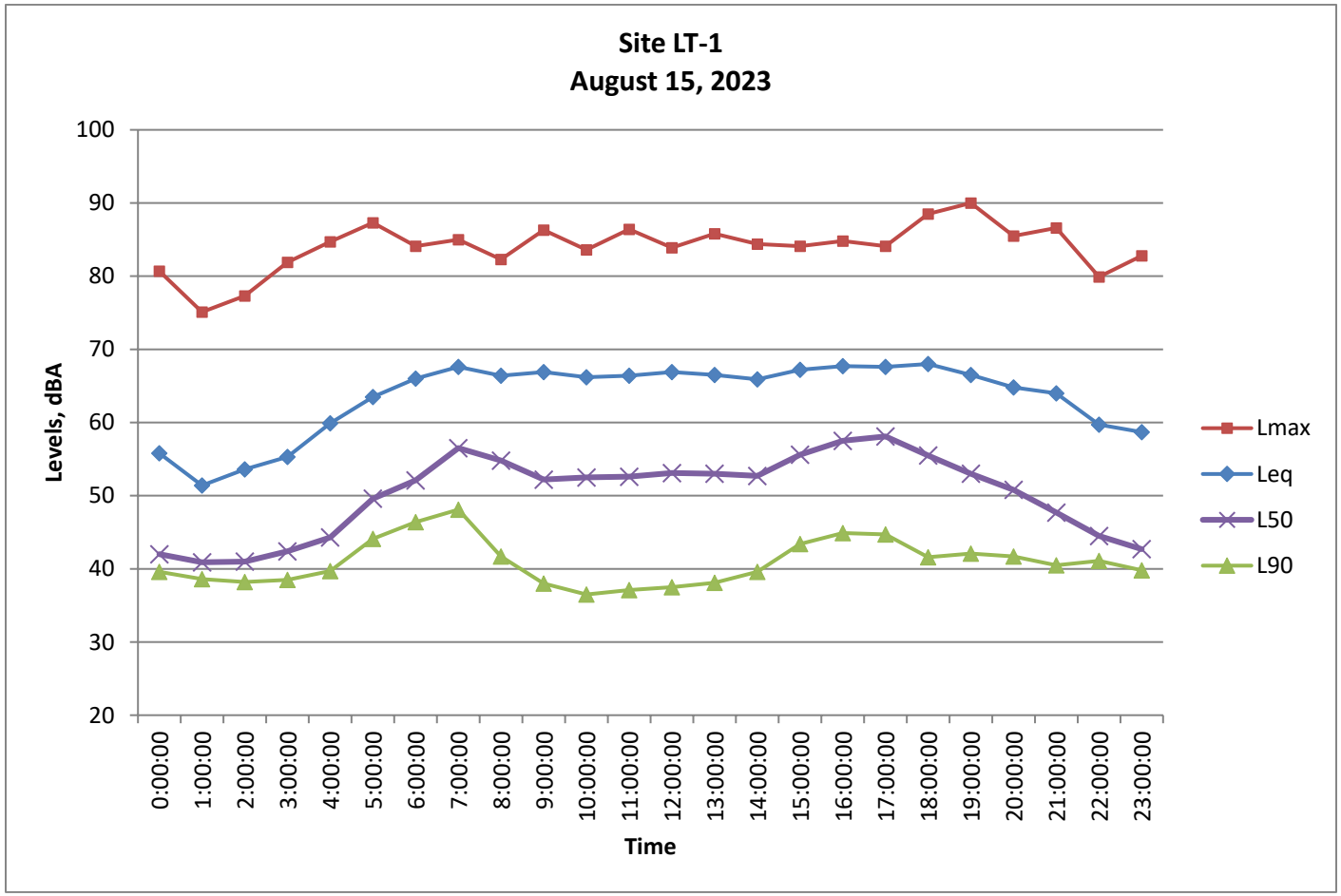


FIGURE 4: SITE LT-1

FIGURE 5: HOURLY NOISE LEVELS AT SITE LT-2

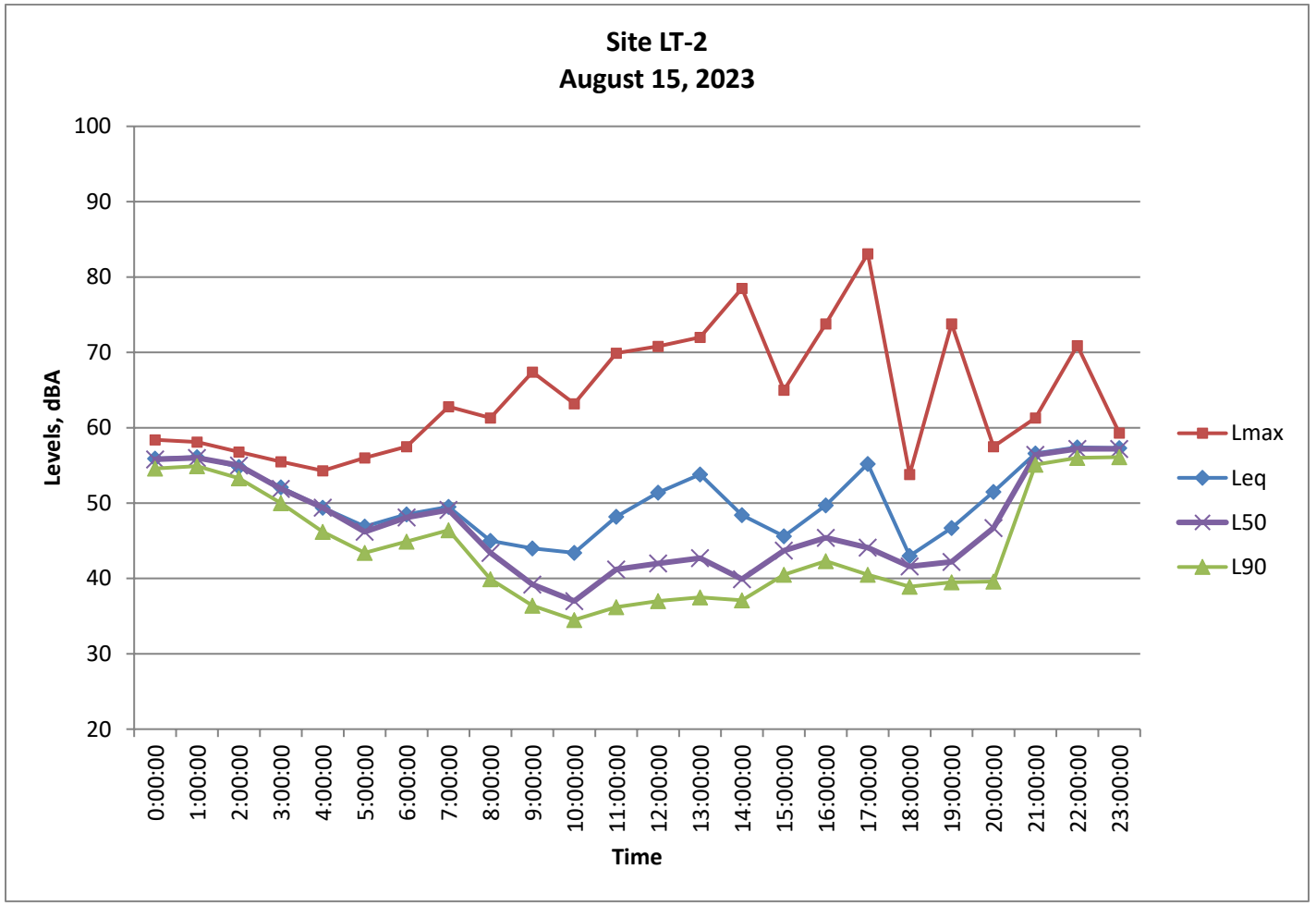


FIGURE 6: SITE LT-2

FIGURE 7: HOURLY NOISE LEVELS AT SITE LT-3

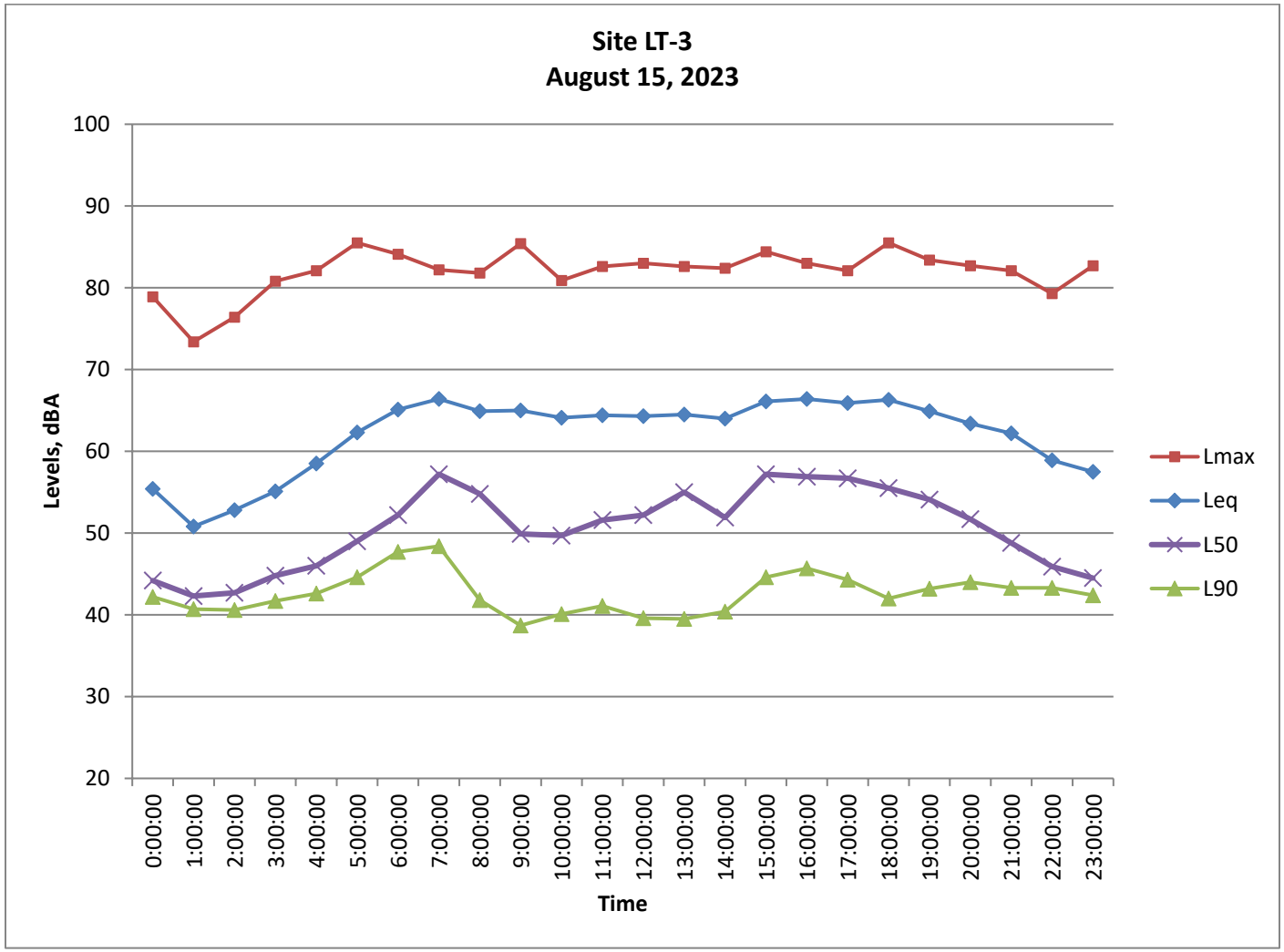


FIGURE 8: SITE LT-3

FIGURE 9: HOURLY NOISE LEVELS AT SITE LT-4

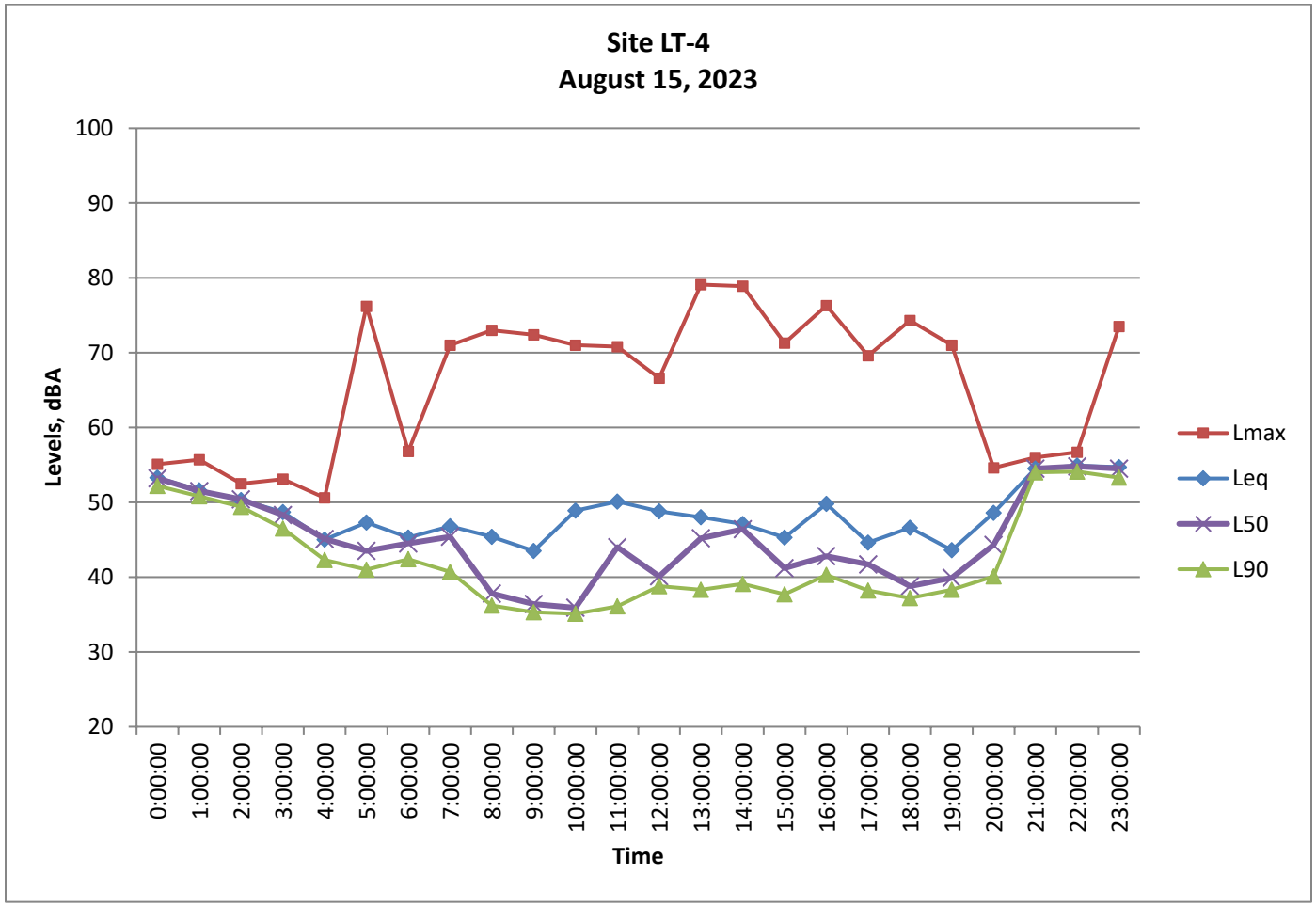


FIGURE 10: SITE LT-4

FIGURE 11: HOURLY NOISE LEVELS AT SITE LT-5

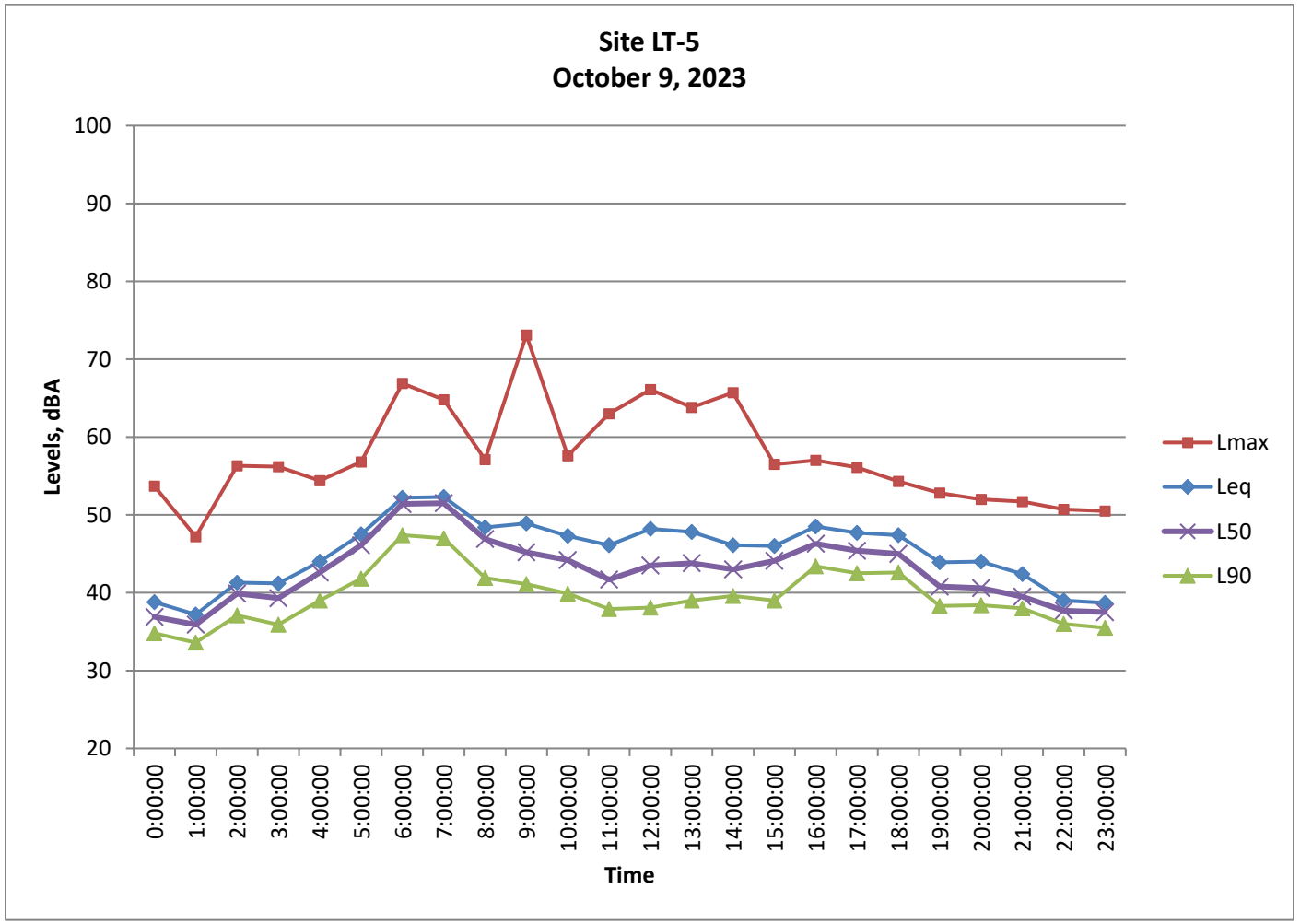


FIGURE 12: SITE LT-5

FIGURE 13: HOURLY NOISE LEVELS AT SITE LT-6

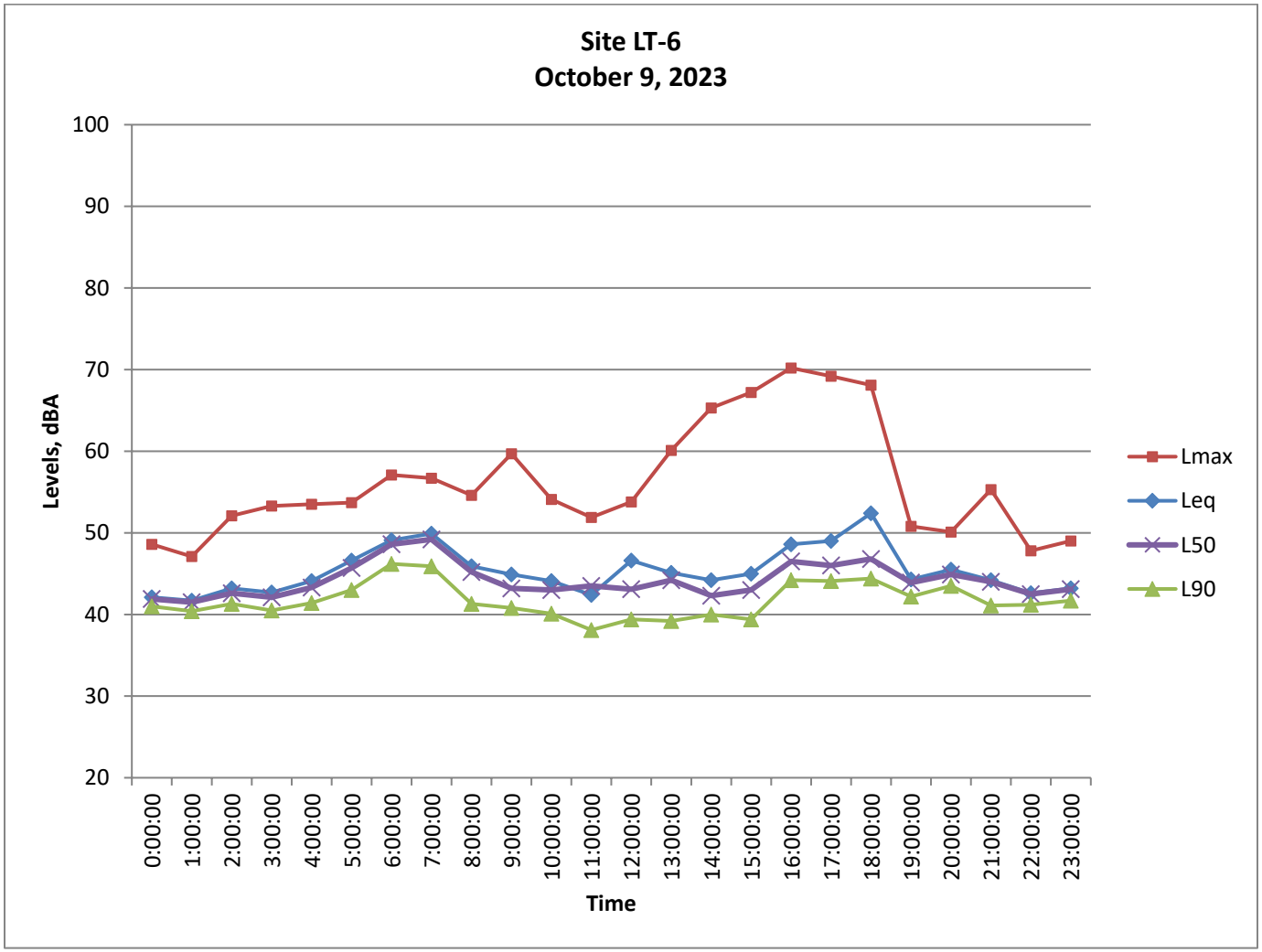


FIGURE 14: SITE LT-6

FIGURE 15: PROJECT-RELATED OPERATIONAL NOISE LEVELS

ATTACHMENT 1

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL: The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

CNEL: Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

DECIBEL, dB: A unit for 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, which is 20 micropascals (20 micronewtons per square meter).

DNL/L_{dn}: Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

L_{eq}: Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.

NOTE: The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.

L_{max}: The maximum noise level recorded during a noise event.

L_n: The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR): The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of Anoise level reduction" combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL: 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 response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC): The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

ATTACHMENT 2

EXAMPLES OF SOUND LEVELS

NOISE SOURCE	SOUND LEVEL	SUBJECTIVE DESCRIPTION
AMPLIFIED ROCK 'N ROLL ▸	120 dB	
JET TAKEOFF @ 200 FT ▸		DEAFENING
	100 dB	
BUSY URBAN STREET ▸		VERY LOUD
	80 dB	
FREEWAY TRAFFIC @ 50 FT ▸		LOUD
CONVERSATION @ 6 FT ▸	60 dB	
TYPICAL OFFICE INTERIOR ▸		MODERATE
SOFT RADIO MUSIC ▸	40 dB	
RESIDENTIAL INTERIOR ▸		FAINT
WHISPER @ 6 FT ▸	20 dB	
HUMAN BREATHING ▸		VERY FAINT
	0 dB