



Hub City Energy Park

Aberdeen, South Dakota

Application for an Energy Conversion Facility Permit

Docket EL26-XXX

Appendix M – Noise Study

October 2026

Report

Date: Thursday, October 01, 2026

Project: Northwestern Energy – Hub City Energy Park

To: Carrie Schuler

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Subject: DRAFT – Preliminary Conceptual Hub City Energy Park Site Noise Modeling

Introduction

Northwestern Energy is considering developing a gas turbine electrical generation facility at the Hub City Energy Park site (the Project). The Project is anticipated to operate in conjunction with the existing Aberdeen Generating Station (AGS) Unit 2, as well as an expansion to the AGS, which is currently under construction (Units 3 and 4).

The Project is located in unincorporated Brown County, South Dakota, and the nearest municipality is the City of Aberdeen, South Dakota. The Hub City Energy Park site is a greenfield area that is presently an open field; it is adjacent to agricultural areas with isolated residences, a residential neighborhood to the north, and the AGS to the south.

The purpose of this report is to establish noise criteria for the Hub City Energy Park facility and estimate noise levels associated with operation of the facility, including cumulative noise levels with the existing and future AGS units that are currently under construction. The existing baseline noise environment with and without AGS-2 operating was established via noise measurements, while contributions from the future AGS units and Hub City Energy Park were established via modeling.

Vibration effects are not included in this noise assessment.

Acoustics Glossary

This memo incorporates the following acoustics concepts and terminology:

- dB – A unit of level representing the ratio between two quantities that are proportional to power. The decibel level is 10 times the logarithm to the base 10, with a reference level serving as the denominator of the ratio.
- A-Weighted Sound Level – The human ear does not hear all frequencies equally, deemphasizing low and very high frequencies as they relate to loudness perception. The most common weighting scale used to represent this selective sensitivity of human hearing is the A-weighted sound level (dBA).
- C-Weighted Sound Level – The C-weighted sound level (dBC) is often used to evaluate the presence of low-frequency sound, as it retains low frequency content not

represented in A-weighted levels, and is typically more representative of loudness perception for high noise levels (on the order of 100+ dB).

- Frequency – The rate at which a sound wave oscillates, measured in Hertz (Hz) or cycles/s.
- RMS – The square root of the mean-square of an oscillating waveform, known as the root-mean-square.
- L_{eq} – The equivalent continuous sound pressure level (L_{eq}) is used to describe noise over a specified period of time in terms of a single numerical value that represents a constant sound that, over the specified time period, has the same acoustic energy as the time-varying signal; the L_{eq} of a time-varying signal and that of a steady signal are the same if they comprise the same acoustic energy over a given time.
- L_p – Sound pressure level. In air, 20 times the logarithm to the base 10 of a given sound pressure to the reference sound pressure. Sound pressure levels presented in this technical report are relative to 20 micro-pascals (10^{-6} Pa, or μ Pa), the accepted threshold of hearing for healthy young adults. Sound pressure levels reaching a receiver of interest from a source are influenced by distance, ground absorption, atmospheric absorption, intervening sound absorptive or reflecting surfaces, shielding by structures, and other potential factors.
- L_w – Sound power level. Ten times the logarithm to the base 10 of the ratio of a given sound power to the reference sound power (1 pW). Because they represent the amount of sound energy per unit time (power) emitted from a sound source, sound power levels are independent of environmental factors that influence sound pressure levels.
- L_x – Centile Levels. The L_{10} , L_{50} , and L_{90} represent the sound levels exceeded for 10, 50, and 90 percent of a time period, respectively. For example, the L_{10} for a one-hour measurement is the level that is exceeded during 6 minutes of that time. The L_{10} , representing the higher range of sound levels over the time duration, is heavily influenced by transient noise events (for example, vehicle passbys and airplane flyovers), while the L_{90} is dominated by constant sources of noise (for example, a power plant). The L_{50} is the median noise level in a given time period.
- L_{max} : The highest root-mean-square sound pressure level experienced during a given period of time.

Project Noise Criteria

Pertinent acoustic related municipal requirements are presented below. Code review is limited to readily available, public online materials.

The South Dakota Administrative Rules, Chapter 20:10:22, Energy Facility Siting Rules (the Rules), do not contain noise limits for energy facilities. However, the Rules do require a map showing noise-sensitive land uses in the study area (section 20:10:22:18).

There are no quantitative noise ordinances available for the City of Aberdeen.

The Brown County, South Dakota Code of Ordinances, Title 4, Zoning, provides zoning requirements for the County. Chapter 4.31, Performance Standards for H-I District, provides noise requirements for Heavy Industrial land uses. It states that:

“All noises and noise-causing activities shall be muffled so that they will not create a disturbance greater than normal peak hour traffic noise on a major street when observed from any area residential district. Major street noise for comparison purposes shall be measured at the property line.”

The language in the ordinance does not specify an acoustical metric or weighting.

Measurements

Noise measurements were conducted to establish the existing baseline noise environment at nearby noise-sensitive receivers with and without AGS-2 operating. A summary of relevant methodology and results from the noise measurements is given in this section. For a detailed description of the noise measurements and results, see the noise measurement memo dated April 20, 2026 and included as Attachment A.

Methodology

HDR measured noise levels on March 19-20, 2026 to establish the existing baseline noise environment at nearby noise-sensitive receivers with and without AGS-2 operating. HDR performed long-term (overnight) noise measurements concurrently at three locations, and short-term (10-minute) noise measurements consecutively at two locations in the vicinity of the Project area. All locations were conducted outside of the Project area (off-site).

Figure 1 shows the noise measurement locations. The noise measurement locations (labeled as “ML”) were in the vicinity of the facility and were located at varying distances and directions from existing facility equipment. These off-site locations were chosen to be representative of nearby noise-sensitive receptors.

Figure 1 presents the following information:

- Location of Aberdeen Generating Station (AGS). Includes currently operating AGS-2 Unit and two additional units under construction of the site expansion at time of measurements;
- Location of future Hub City Energy Park site;
- Surrounding parcels in vicinity of site, including noise-sensitive land uses with residential structures;
- Location of ML's.

Figure 1. Measurement Location Map (March 19, 2026 – March 20, 2026)

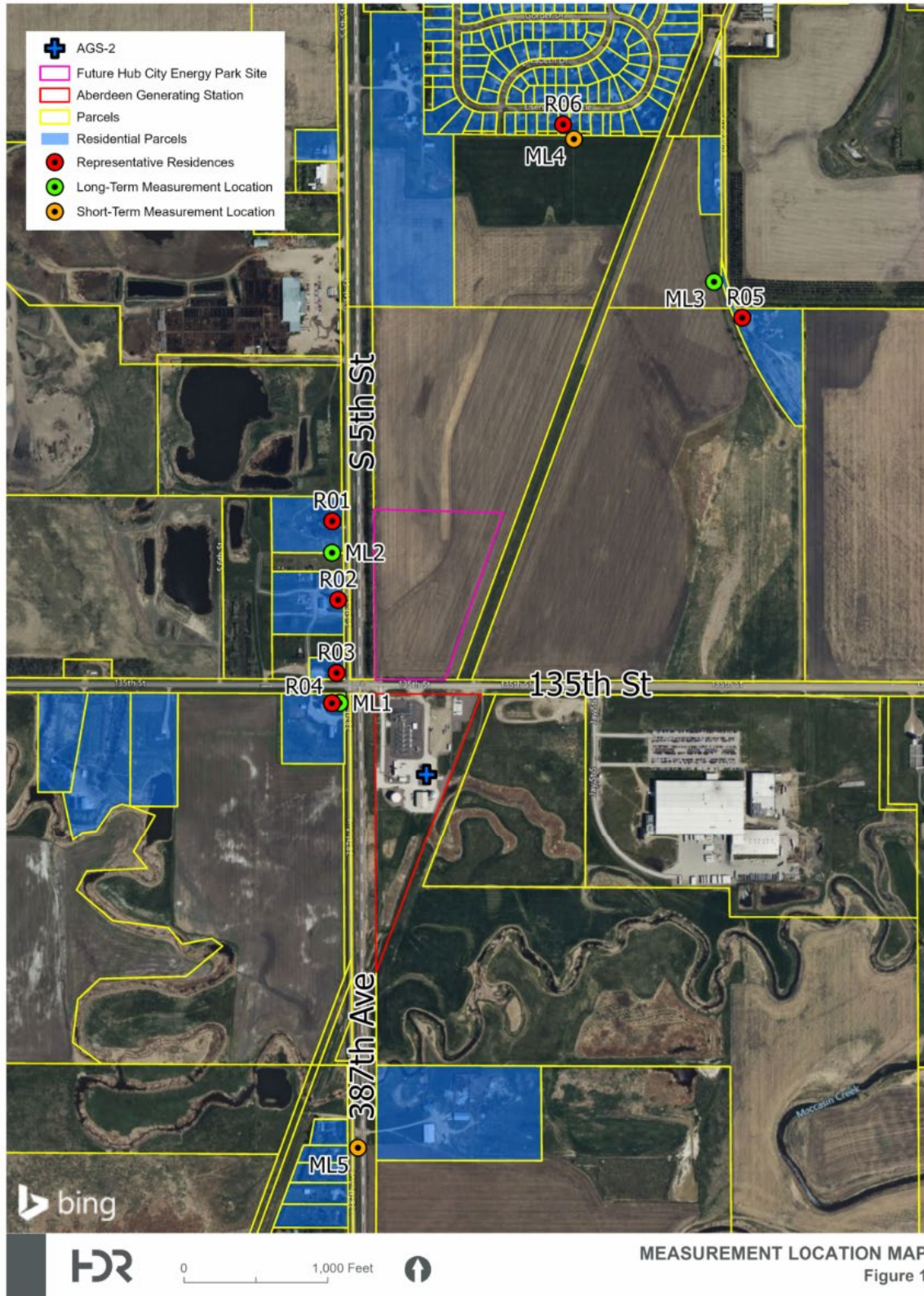


Table 1 provides a description of each noise measurement location.

Table 1. Measurement Location Descriptions (March 19, 2026 – March 20, 2026)

Measurement Location	Measurement Type	Location Description	Approximate Distance and Direction from AGS-2 Unit	Approximate Distance and Direction from Hub City Energy Park Engine Hall
ML1	Long-term	Lawn of residence at 3306 387 th Avenue.	740 ft NW	920 ft SW
ML2	Long-term	Between 2820 and 2904 S 5 th Street.	1,600 ft NNW	520 ft W
ML3	Long-term	Edge of residential parcel at 2400 Bunker Drive.	3,900 ft NE	2,680 ft NE
ML4	Short-term	Field just south of residences at Eisenhower Circle.	4,500 ft NNE	3,130 ft NNE
ML5	Short-term	Across street from 3524 387 th Avenue.	2,600 ft S	3,930 ft S

Source: HDR Engineering, Inc. 2026

Aside from existing facility-generated noise associated with AGS-2 when operating, wind rustling vegetation, birdsong, traffic noise, train passbys, and airplane flyovers were considered typical sounds in the existing noise environment. Therefore, these noise events were retained in the datasets. HDR measured noise levels from the afternoon of March 19 to the afternoon of March 20, 2026. Four meters were used in the measurements, one at each of the three long-term measurement locations, and one meter for all short-term measurement locations.

During daytime (7AM-10PM) and nighttime hours (10PM-7AM), the long-term measurements captured periods when AGS-2 was operating and not operating. The short-term measurements captured a daytime non-operational period on March 19 and a daytime operational period on March 20. Note that due to ambient temperatures at the time of measurement, some noise contributing equipment associated with AGS-2, such as the inlet fogging skid and other cooling equipment, may not have been operating. Environmental and facility operating parameters are taken to be representative of seasonal conditions at the time of measurement.

Results

Recorded metrics include the hourly A-weighted and C-weighted L_{eq} , L_{10} , L_{50} , and L_{90} sound pressure levels (SPL), average wind speed at microphone height, average wind direction, and precipitation. No precipitation was recorded during the measurements, and all hours had average wind speeds below the maximum allowable threshold of 11 mph; therefore, no periods were excluded from the measurement analysis.

Table 2 below summarizes the overall A-weighted and C-weighted L_{50} level for the nighttime period at each long-term measurement location, for both operational and non-operational

periods of the AGS-2. Other recorded metrics may be found in the measurement report in Attachment A.

Table 2. Long-Term Noise Measurement Summary

Operating condition	Period	ML1		ML2		ML3	
		Average L ₅₀ (dBA)	Average L ₅₀ (dBC)	Average L ₅₀ (dBA)	Average L ₅₀ (dBC)	Average L ₅₀ (dBA)	Average L ₅₀ (dBC)
Operational	Day	50	69	44	64	42	61
	Night	44	67	39	61	40	59
Non-Operational	Day	51	61	48	62	43	59
	Night	42	60	40	59	38	56

A-weighted average hourly L₅₀ levels were generally similar (no more than +/- 4 dB difference) between operational and non-operational levels at any given location. At ML2, the operational A-weighted L₅₀ level was lower than non-operational levels, indicating that other sources may contribute to overall background noise levels in the general area.

For the C-weighted average hourly L₅₀ levels, all locations showed an increase in dBC levels during facility operation. At ML1, the C-weighted L₅₀ level was measured as 7 dB higher during nighttime operational periods and 8 dB higher during daytime operational periods. Based on this data, this indicates that the operation of AGS-2 contributes to low-frequency noise levels in the area.

The measured L_{max} was strongly influenced by transient events such as traffic and train passbys, so the L₅₀ level was used to focus on the more consistent facility noise.

The short-term daytime measurements did not show differences between operational and non-operational levels that were attributable to operation of AGS-2, so only the long-term measurement results are used for comparison against modeled results at nearby residences.

Noise Modeling

ENVIRONMENTAL NOISE MODELING

HDR modeled potential future noise levels from the proposed generation facilities, including Hub City Energy Park and AGS-3 and AGS-4. Note that noise sources associated with existing AGS-2 were not modeled, as noise emissions associated with this unit are presumed to be captured by the noise measurements described in the previous section according to operating conditions at the time.

Noise modeling was performed using the three-dimensional environmental noise analysis program CadnaA. CadnaA is based on ISO 9613-2, “Attenuation of Sound during Propagation Outdoors.” Parameters for the noise model are given in Table 3, below.

Table 3. Noise Model Parameters

Parameter	Model Approach
Equipment Noise Emissions	Sound level inputs for modeled noise sources were determined from data provided by Solar Turbines, or estimated using industry references. All modeled equipment is assumed to be running at 100% load at steady state.
Terrain	The Project site and surrounding terrain was modeled as completely flat, as there are no topographical features in the surroundings that would significantly influence receiver sound pressure levels.
Buildings	Shielding from on-site structures such as storage tanks and enclosures were included in the model. Up to two reflections from buildings and barriers are accounted for in the model calculations. Buildings and barriers were assumed to be completely reflective.
Ground Factor	All ground was modeled as 50% sound-absorptive to account for unpaved areas, except for the developed portions of the Project site and AGS facility, which were modeled as 0% sound-absorptive to account for acoustically reflective (hard) ground such as pavement and packed earth.
Meteorology	CadnaA conservatively models meteorological conditions that are favorable for outdoor noise propagation by default, including a moderate temperature inversion and downwind conditions from every source to every receptor.
Temperature and Relative Humidity	The modeled temperature of 50° Fahrenheit (10° Celsius) and relative humidity of 70% generally matched annual average values for the area (Time&Date, 2026).

CadnaA calculates frequency-dependent sound propagation from proposed facility sources to surrounding receivers in the study area, with the modeled receiver height being 5 ft (1.52 m) above grade per average hearing height, consistent with typical industry-accepted practice. Model calculations include the factors important to sound propagation over distance, such as geometrical spreading, downwind conditions in all directions, acoustic absorption characteristics of the ground surface in the propagation path, grading / topography, temperature (50°F (10°C)), and relative humidity (70%), among others. In addition to ground absorption and atmospheric effects, CadnaA can also account for reflections and shielding from structures, including buildings and noise barriers. For the purposes of this study, the shielding and reflection effects of proposed on-site buildings, large equipment, and tanks are included.

Using this information, CadnaA calculates hourly equivalent sound pressure levels ($L_{eq(h)}$) at receiver locations of interest. The program utilizes a Cartesian coordinate grid that extends beyond the project property lines in all four cardinal directions in order to create noise contours

that HDR overlaid upon site plans and a digital aerial photograph of the study area. Sound level results for $L_{eq(h)}$ may be considered representative of typical site operations at full load capacity.

Modeled noise sources for the AGS expansion included turbine air intakes, exhaust ducts and outlets, and casing radiation, as well as oil coolers, transformers, and other auxiliary equipment. Noise from the switchyards, transmission lines, and emergency equipment were excluded from the model. Conceptual site plans dated August 15th, 2025 were utilized as the basis of the noise model for the AGS expansion.

Modeled noise sources for the Hub City Energy Park facility included turbine air intakes, exhaust ducts and outlets, casing radiation, indoor-to-outdoor sound transmission from the turbine hall walls, roof, doors, and ventilation, as well as transformers and other auxiliary equipment. Noise from the switchyards, transmission lines, and emergency equipment is excluded from the model. Conceptual site plans were utilized as the basis of the noise model for the Hub City Energy Park site.

As the design of the AGS expansion is complete and construction is currently underway, potential noise mitigation measures will only be modeled for the proposed Hub City Energy Park site.

Note that noise modeling efforts herein are intended to provide a representative understanding of facility-related noise emissions, as well as a general overview and order of magnitude estimation of noise control measures and strategies. To the extent available, project specific equipment noise data has been incorporated into the modeling (specifically for the Solar Titan 350 turbines), and noise emissions for balance of plant equipment was modeled using representative data that is typical for this application as further defined in the Scenario Inputs sections of this memo below. A future comprehensive noise study will be performed to update the modeling results and to define recommended mitigation measures based on the finalized Project design and project-specific equipment procured for the installation to facilitate far-field noise guarantees and development of other project specifications.

Figure 2 and Figure 3 show the noise model layout and features in plan, including the location of noise sources, for the AGS expansion and Hub City Energy Park Site, respectively. Figure 4 and Figure 5 show an isometric view of the noise model to better illustrate the vertical orientation of noise sources, as represented within the modeling software, for the AGS expansion and Hub City Energy Park Site, respectively. Additionally, Table 4 provides heights used for noise sources and buildings in modeling. Assumptions specific to individual noise sources are described in the next section.

Figure 2. Noise Model Layout - AGS Expansion

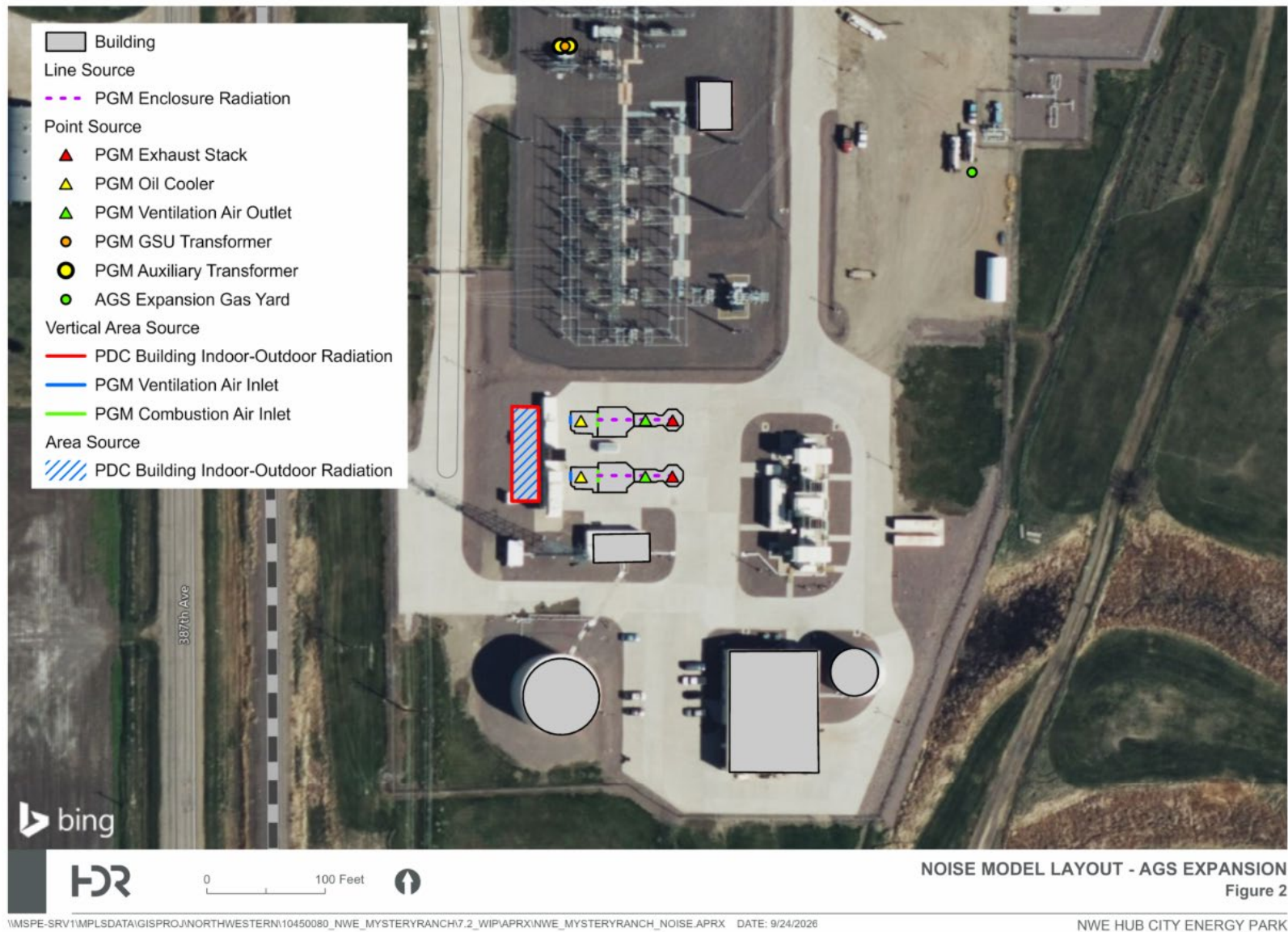
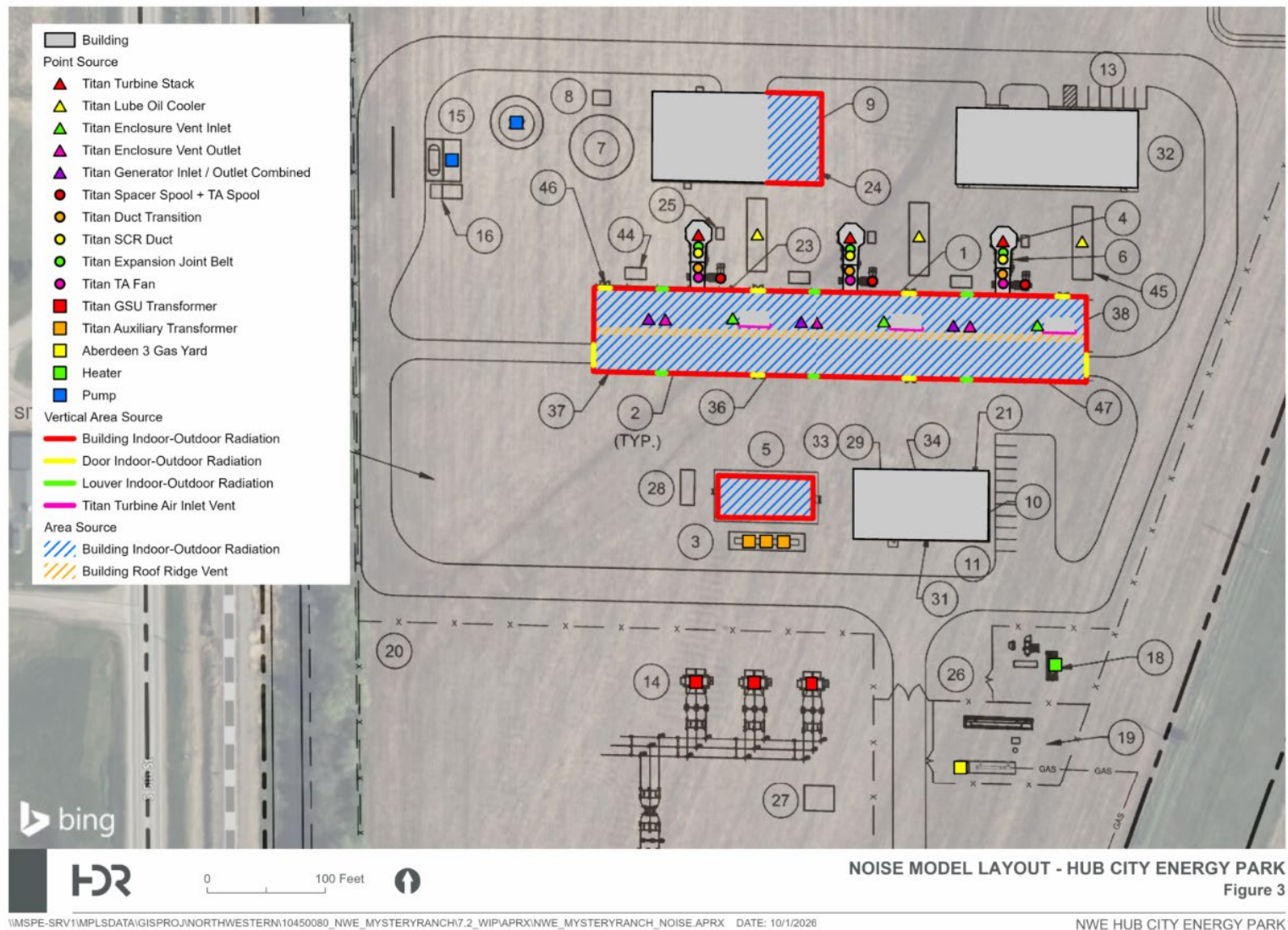


Figure 3. Noise Model Layout – Hub City Energy Park*



*Titan Turbine Stack source also includes Titan Stack Base Radiated, Titan Stack Silencer, and Titan Upper Stack Tailpipe sources.

Figure 4. Isometric Noise Model Layout - AGS Expansion

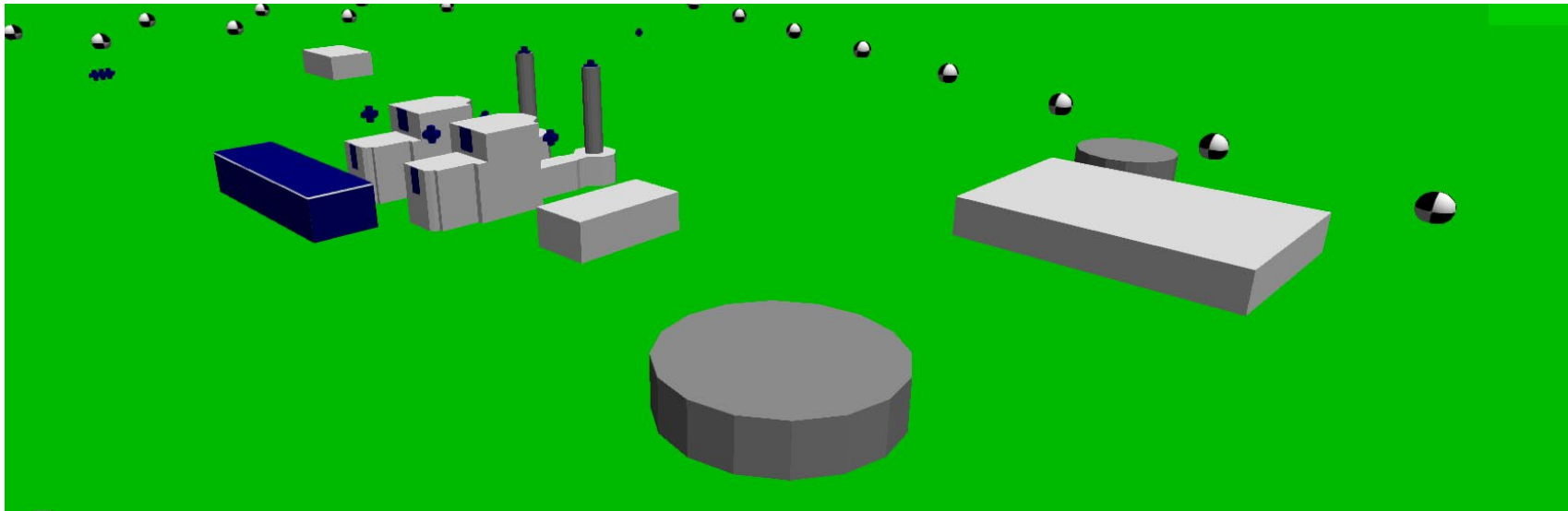


Figure 5. Isometric Noise Model Layout – Hub City Energy Park Site

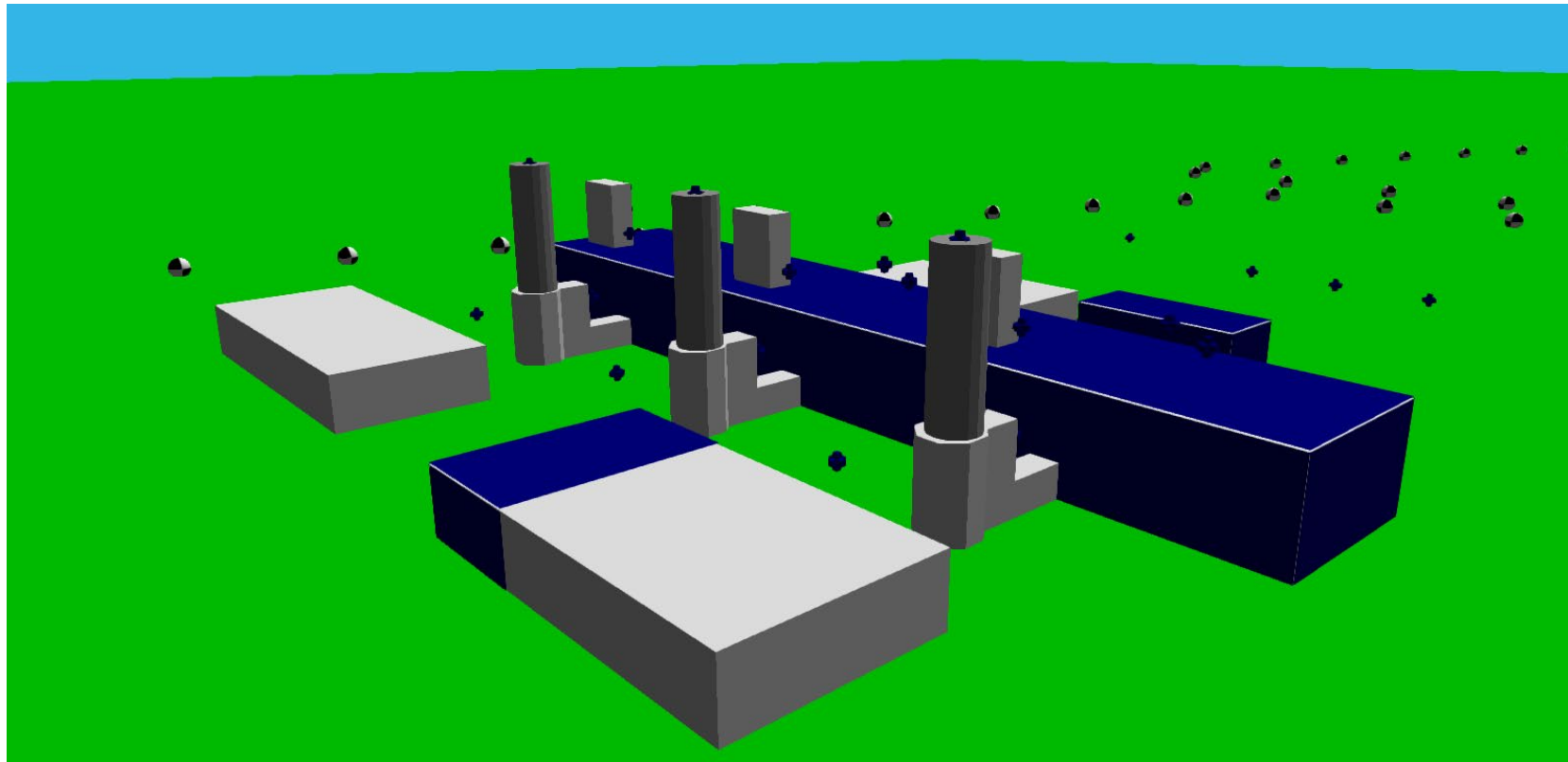




Table 4. Modeled Heights

Location	Element	Modeled Height (ft)
Existing AGS	Existing Buildings and Tanks	15.0
AGS Expansion	PGM Exhaust Stack	49.2
	PGM Ventilation Air Outlet	23.3
	PGM Ventilation Air Inlet	13.1 - 23.4 extents
	PGM Combustion Air Inlet	25.0 - 34.4 extents
	PGM Enclosure Radiation	6.0
	PGM Oil Cooler	34.4
	PGM GSU Transformer	9.8
	PGM Auxiliary Transformer	9.8
	AGS Expansion Gas Yard	9.8
	PGM Enclosure Radiation	34.4
	AGS Expansion PDC Building	12.0 - 27.0 extents
Hub City Energy Park	Titan Turbine Stack	91.9
	Titan Generator Inlet / Outlet Combined	55.5
	Titan Enclosure Vent Inlet	48.4
	Titan Enclosure Vent Outlet	60.0
	Titan Turbine Air Inlet	40.0 - 73.5 extents
	Titan Spacer Spool + TA Spool	7.6
	Titan SCR Duct	25.7
	Titan Duct Transition	25.7
	Titan TA Fan	7.6
	Titan Expansion Joint Belt	25.7
	Titan Stack Base Radiated	0.0 - 34.0 extents
	Titan Stack Silencer	34.0 – 56.0 extents
	Titan Tailpipe	56.0 – 91.8 extents
	Titan Lube Oil Cooler	9.8
	Titan GSU Transformer	14.8
	Titan Auxiliary Transformer	9.8
	Hub City Energy Park Gas Yard	9.8
	Ammonia Pump	9.8
	Demineralization Pump	9.8
	Fuel Gas Heater	9.8
	Control Building	16.0
	Maintenance Building	24.0
	BOP Building	24.0
	PDC Building	24.0
	Engine Hall	40.0

ROOM ACOUSTICS

Sound from equipment operating inside buildings or enclosures is contained within those buildings or enclosures, and therefore acoustic reflections from building or enclosure surfaces lead to noise build-up in that space. The reverberant noise build-up inside equipment building spaces has been incorporated into noise modeling estimates in this analysis. For enclosures with an abundance of “hard”, acoustically reflective surfaces, increases in interior equipment sound levels can be considerable – adding to the sound levels otherwise emitted from the equipment, itself. The amount of sound build-up is reflected in room acoustics calculations, which account for the sound-absorption properties of interior surfaces (floor, walls, roof deck).

Use of sound-absorptive treatments can control the amount of reverberant sound build-up in the space. This helps reduce the amount of noise reduction that the building shell must provide as it radiates the remaining noise into the environment. The sound absorption performance of materials is largely available from manufacturers and published references.

This analysis accounts for noise build-up from equipment housed inside buildings traveling through the building shell (e.g. exterior walls, louvers, exterior doors, roof), and radiating from the building shell into the outdoor noise environment. These calculations also account for the level of sound isolation that the building envelope provides. In effect, the indoor equipment is an indirect noise source, and the building exterior surfaces that radiate the remaining noise (not attenuated by the building shell) are the direct noise sources that emit noise into the outdoor environment.

Manufacturers of building panels or doors are often able to provide octave band sound transmission loss data for these building elements, while published references contain data for more generic materials such as concrete, metal, wood, and the like. In some circumstances, INSUL, an industry-accepted acoustics software package, can provide sound transmission loss (TL) data for many materials, including custom building shell assemblies. This data represents the level of sound isolation that can be provided by each building element according to its surface area coverage within an overall exterior wall or roof assembly. Attenuation from the building elements is then applied to interior noise levels to determine the amount of noise that is radiated into the environment. Lightweight structures, such as some roof decks, overhead doors, and non-acoustic louvers, can unfortunately be very efficient radiators of sound.

At the Hub City Energy Park site, interior sound buildup, absorption and radiation from the turbine hall was calculated and modeled. Radiated noise from the BOP equipment and PDC buildings at Hub City Energy Park and the AGS expansion was also calculated and modeled; however, since detailed information about equipment within each building was unknown, these calculations were used primarily to estimate relative octave-band levels, which were then normalized to a sound pressure level of 85 dBA at three feet from the building walls for initial modeling purposes. See the following section for more details on modeled noise levels for these sources.

Base (Unmitigated) Scenario Inputs

Table 5 and Table 6 below list sound power levels (L_w) for proposed equipment noise sources modeled in the base (unmitigated) scenario for the AGS expansion and the Hub City Energy Park site, respectively. These sources consider limited, typical overall noise control measures, both to engine components (intake and exhaust silencers) and architectural building systems (moderate engine hall exterior wall and roof sound-isolating constructions). Engine sound data was provided by Solar Turbines for the Titan 350 and PGM 130 engines (including engine radiated noise, charge air intakes, exhaust ducting, and exhaust exits) and radiators, while sound power levels for remaining equipment were estimated by HDR using published industry references.

For the Hub City Energy Park engine hall, ventilation is presumed to be achieved through one 269 sq ft (5 m^2) intake opening per engine on each long side of the hall, along with a roof ridge vent for discharge running the length of the hall with a 6.5-ft (2-meter) width. Note that while Table 6 provides unmitigated sound power levels for the Hub City Energy Park site equipment. Additional details on building and ventilation assumptions are provided in the next subsection.

Table 5. Base Scenario Sound Power Level Inputs, AGS Expansion (dB re: 1 pW)

Equipment Noise Source	Qty	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	dBA	Notes
PGM Exhaust Stack	2	122	126	122	119	116	111	110	102	93	118	Manufacturer-provided sound power level for PGM-130 turbine. Includes performance and use of silencer provided by manufacturer.
PGM Ventilation Air Outlet	2	108	105	97	91	83	81	79	78	72	89	Manufacturer-provided sound power level for PGM-130 turbine.
PGM Ventilation Air Inlet	2	103	101	96	92	81	78	75	87	73	91	Manufacturer-provided sound power level for PGM-130 turbine.
PGM Combustion Air Inlet	2	113	111	107	95	90	83	79	81	72	95	Manufacturer-provided sound power level for PGM-130 turbine.
PGM Enclosure Radiation	2	119	108	108	106	106	104	101	103	99	110	Manufacturer-provided sound power level for PGM-130 turbine.
PGM Oil Cooler	2	120	111	100	99	99	101	98	95	90	105	Manufacturer-provided sound power level for PGM-130 turbine.
PGM GSU Transformer	1	97	106	111	110	110	104	99	94	87	110	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 48 MVA rating.
PGM Auxiliary Transformer	2	87	96	101	100	100	94	89	84	77	100	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 33 MVA rating.
AGS Expansion Gas Yard ⁽¹⁾	1	100	100	103	97	94	95	97	99	96	104	Estimated based on published gas reducing station noise levels (Seebold, 1985) and typical yard equipment noise emissions. Assumes use of water bath heater and 4 regulators.

Equipment Noise Source	Qty	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	dBA	Notes
AGS Expansion PDC	1	-										Refer to Table 9 for details of building radiation elements.

(1) Accounts for both powerblock gas yard and pipeline gas yard.

Table 6. Base Scenario Sound Power Level Inputs, Hub City Energy Park Site (dB re: 1pW)

Equipment Noise Source	Qty	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	dBA	Notes
Titan Turbine Stack ⁽¹⁾	3	118	112	110	106	102	97	94	104	116	115	Manufacturer-provided sound power levels from “ <i>Change Order Quotation 2026-07-28T090213_4R071 R1</i> ” dated 8/28/2026. Additional adjustment used to correct directivity of data to form without directivity (attenuation). Includes performance and use of silencer provided by manufacturer.
Titan Generator Inlet / Outlet Combined with silencers	3	121	118	113	99	91	84	84	95	99	103	Manufacturer provided sound power levels from “ <i>Acoustics 4R071 Rev H</i> ” dated 9/21/2026. Inlet and Outlet sources combined in noise model due to proximity on plans.
Titan Enclosure Vent Inlet with silencer	3	110	110	109	91	87	82	98	90	88	101	Manufacturer provided sound power levels from “ <i>Acoustics 4R071 Rev H</i> ” dated 9/21/2026.
Titan Enclosure Vent Outlet with silencer	3	108	107	104	81	75	67	87	79	79	92	Manufacturer provided sound power levels from “ <i>Acoustics 4R071 Rev H</i> ” dated 9/21/2026.

Equipment Noise Source	Qty	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	dBA	Notes
Titan Turbine Air Inlet	3	118	107	88	64	58	55	79	71	64	85	Manufacturer provided sound power levels from "Acoustics 4R071 Rev H" dated 9/21/2026.
Titan Spacer Spool + TA Spool	3	88	113	106	101	97	93	84	77	71	99	Manufacturer provided sound power levels from "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan Distribution Grid + SCR Duct	3	108	107	103	97	93	89	84	77	70	96	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan Duct Transition	3	108	109	102	97	93	89	80	73	67	95	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan TA Fan (Casing and Inlet)	3	102	102	99	96	88	79	76	73	71	91	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan Expansion Joint Belt 2	3	89	87	83	78	77	79	80	81	93	93	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan Stack Base Radiated	3	78	81	96	90	86	87	78	70	63	90	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan Stack Silencer	3	89	89	96	87	79	69	64	68	68	84	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.

Equipment Noise Source	Qty	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	dBA	Notes
Titan Stack Tailpipe	3	87	83	86	76	66	57	50	55	61	73	Manufacturer provided sound power levels "Change Order Quotation 2026-07-28T090213_4R071 R1" dated 8/28/2026.
Titan Lube Oil Cooler	3	90	87	91	88	86	84	82	80	77	90	Manufacturer provided sound power levels from "Acoustics 4R071 Rev H" dated 9/21/2026.
Titan GSU Transformer	3	97	106	111	110	110	104	99	94	87	110	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 45 MVA rating.
Titan Auxiliary Transformer	3	87	96	101	100	100	94	89	84	77	100	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 3 MVA rating.
Hub City Energy Park Gas Yard ⁽²⁾	1	100	100	103	97	94	95	97	99	96	104	Estimated based on published gas reducing station noise levels (Seebold, 1985) and typical yard equipment noise emissions. Assumes use of water bath heater and 4 regulators.
Ammonia Pump ⁽³⁾	1	76	77	78	80	80	83	80	76	70	87	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 2 hp pump.
Demineralization Pump ⁽⁴⁾	1	85	86	87	89	89	92	89	85	79	95	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 15 hp pump.
Fuel Gas Heater	1	109	111	114	110	106	102	98	94	91	108	Estimated using Bies and Hansen's <i>Engineering Noise Control</i> Methodology, based on 50-300 BHP boiler.
Hub City Energy Park Engine Hall	1	-										Refer to Table 7 for details of engine hall building radiation elements including doors and ventilation.

Equipment Noise Source	Qty	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	dBA	Notes
Hub City Energy Park BOP	1	-										Refer to Table 9 for details of building radiation elements.
Hub City Energy Park PDC	1	-										Refer to Table 9 for details of building radiation elements.

- (1) Additional adjustment used to correct for inherent directivity of data.
- (2) Accounts for both powerblock gas yard and pipeline gas yard.
- (3) Pump sound pressure level of approximately 77 dBA at 3 feet.
- (4) Pump sound pressure level of approximately 86 dBA at 3 feet.

ENGINE HALL INDOOR-TO-OUTDOOR SOUND TRANSMISSION AND VENTILATION

Data for airborne noise from the turbine enclosures were provided by Solar Turbines, in the form of octave band sound power levels. The resulting direct and reverberant sound pressure level at the interior surfaces of the engine hall walls and roof was calculated by HDR, assuming all three engines in the engine hall are operating concurrently at 100% load. The transmission loss of the walls and roof were calculated based on Sound Transmission Class (STC) 35, 20 gauge metal panels. Sound-absorptive treatment with a Noise Reduction Coefficient (NRC) 0.95 rating was assumed to be applied to the majority of interior wall and roof surfaces (80% of the non-louver interior wall area and 90% of non-ridge vent interior roof area).¹ Noise transmitted from inside the engine hall wings through the building walls and roof were modeled as area sources.

Noise emissions were also calculated through ventilation intakes and discharges, as well as through man doors and roll-up doors. For the base scenario, ventilation intakes were assumed to be one 54-square-foot (5 square meter) opening per turbine on the south side of the building and one 54-square-foot opening per turbine on the north side of the building. Ventilation discharge was assumed to be a roof ridge vent with an open area of approximately 2,500 square ft (420 ft by 6 ft) for the engine hall. Ventilation openings are assumed to be fitted with open louvers (non-acoustic louvers possessing no noise attenuation capability) in the base scenario. Two STC 12 roll-up doors, representative of a standard roll-up door with acoustic leaks were assumed in the base scenario; one on the east side of the engine hall, and one on the west. A total of six double man doors per wing were also assumed, with four along the north side of the engine hall, and two along the south. Each double man door was modeled as an STC 17 door element, representing a standard (unsealed) hollow metal door with acoustical leaks. Both roll-up and man door locations were based upon the most recent site plan, dated April 13, 2026. Table 7 summarizes the sound power levels of the engine hall noise radiated through the walls, roof, ventilation, and doors.

¹ Typically, manufacturers of industrial metal buildings such as this will incorporate sound absorption directly into panel systems by using a perforated interior face and solid exterior face, with sound absorptive material (e.g. fiberglass, mineral wool) placed between these two surfaces. The perforated interior panel permits sound inside the building space to be absorbed by the sound absorptive material. While this is commonly the approach, appropriate sound-absorptive treatment (e.g. acoustic panels, spray-applied insulation) that is typically directly-attached to wall and deck surfaces can also be considered.

Table 7. Engine Hall Radiated Sound Power Levels - Base Scenario (dB re: 1 pW)

Building Component	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dBA
North Exterior Wall (STC 35 Metal Panel)	136	127	116	99	85	77	76	64	60	104
South Exterior Wall (STC 35 Metal Panel)	135	126	115	97	83	73	73	61	57	104
East Exterior Wall (STC 35 Metal Panel)	127	118	107	88	73	63	63	51	47	95
West Exterior Wall (STC 35 Metal Panel)	127	118	107	88	73	63	63	51	47	95
Roof (STC 35 Metal Panel)	138	129	118	102	89	80	80	68	63	107
Roll-Up Doors	129	123	110	96	87	85	90	79	81	100
Man Doors	119	109	96	84	77	75	84	78	83	90
Ventilation Intakes (North Façade)	121	118	108	98	93	93	101	92	92	104
Ventilation Intakes (South Façade)	121	118	107	96	90	89	97	88	89	101
Ventilation Discharge at Roof (Roof ridge vent)	138	135	125	116	111	111	119	110	110	122

AUXILIARY BUILDING INDOOR-TO-OUTDOOR SOUND TRANSMISSION AND VENTILATION

Indoor-to-outdoor noise transmission can also potentially occur through the various auxiliary buildings located on the AGS expansion and Hub City Energy Park sites. A Power Distribution Center (PDC) building will be used on the AGS expansion site. Additionally, a Balance Of Plant (BOP) and PDC building will be present on the Hub City Energy Park site.

For the purposes of this analysis, some noise-producing buildings have been isolated as only having certain sides of the building façade anticipated to radiate noise to the outdoors. Although multiple room plans will likely serve to reduce the extent of transmitted noise to the outdoors, specific details are unknown. Table 8 below provides the dimensions of each building, and the extents anticipated to generate noise.

Table 8. Building Radiation Summary

Building	Dimensions (ft)			Noise Producing Extents
	Length	Width	Height	
AGS Expansion PDC ⁽¹⁾	23	80	27	All sides and roof.
Hub City Energy Park BOP	145	75	24	Eastern façade, and northern and southern facades extending 45 feet to the east.
Hub City Energy Park PDC	80	35	24	All sides and roof.

(1) The AGS expansion PDC is built on elevated concrete piles. The building sits on these piles, extending from them beginning at 12 feet.

Table 9, below, lists the sound power levels estimated to be radiated through the roof and exterior walls of each auxiliary building, which account for composite transmission loss through assumed elements such as doors and ventilation systems, normalized to an 85-dBA sound pressure level at 3 feet from the envelope of each building. For the base scenario, exterior walls have been presumed to follow a steel panel design, noting that details of door, window, and overall building fenestration can influence overall building noise reduction performance.

Table 9. Auxiliary Building Radiated Sound Power Levels⁽¹⁾

Building	Building Component	31.5	63	125	250	500	1000	2000	4000	8000	dBA
		Hz	Hz	Hz	Hz	Hz	Hz	Hz	Hz	Hz	
AGS Expansion PDC	North / South Façade	100	103	107	106	102	100	98	96	91	106
	East/West Façade	103	106	110	109	105	103	101	99	94	109
	Roof	105	107	111	111	107	105	102	100	95	110
Hub City Energy Park BOP	North / South Façade Portion	108	103	103	99	99	101	101	99	96	107
	East Façade	109	105	105	101	101	103	103	111	98	109
	Roof	112	107	107	103	104	106	105	103	100	111
Hub City Energy Park PDC	North / South Façade	103	106	110	109	105	103	101	99	94	109
	East/West Façade	100	103	107	106	102	100	98	96	91	106
	Roof	105	107	111	111	107	105	102	100	95	110

(1) Sound power levels are normalized to an 85-dBA sound pressure level at 3 feet from the envelope of each building.

Base Scenario Model Results

HDR modeled Project-related noise levels throughout a Cartesian coordinate grid and at specific receiver points for the base scenario. Only future noise sources associated with AGS-3 and AGS-4 and Hub City Energy Park were modeled. Figure 6 and Figure 7 below delineate calculated dBA L_{eq} and dBC L_{eq} sound pressure levels, respectively, for solely the AGS Expansion based on presumed base scenario design parameters. Figure 8 and Figure 9, as well as Figure 10 and Figure 11, provide these levels for solely the Hub City Energy Park Facility, and both sites operating simultaneously, respectively.

The noise contours represent estimated Project noise levels over areas of equal sound pressure level; areas with the same color contour are predicted to experience similar noise levels (within a 5 dB range). Receptor locations (R01-R06) representative of the nearest noise-sensitive residences to the facility are also shown.

Figure 6. Base Scenario dBA L_{eq} Noise Contours, AGS Expansion

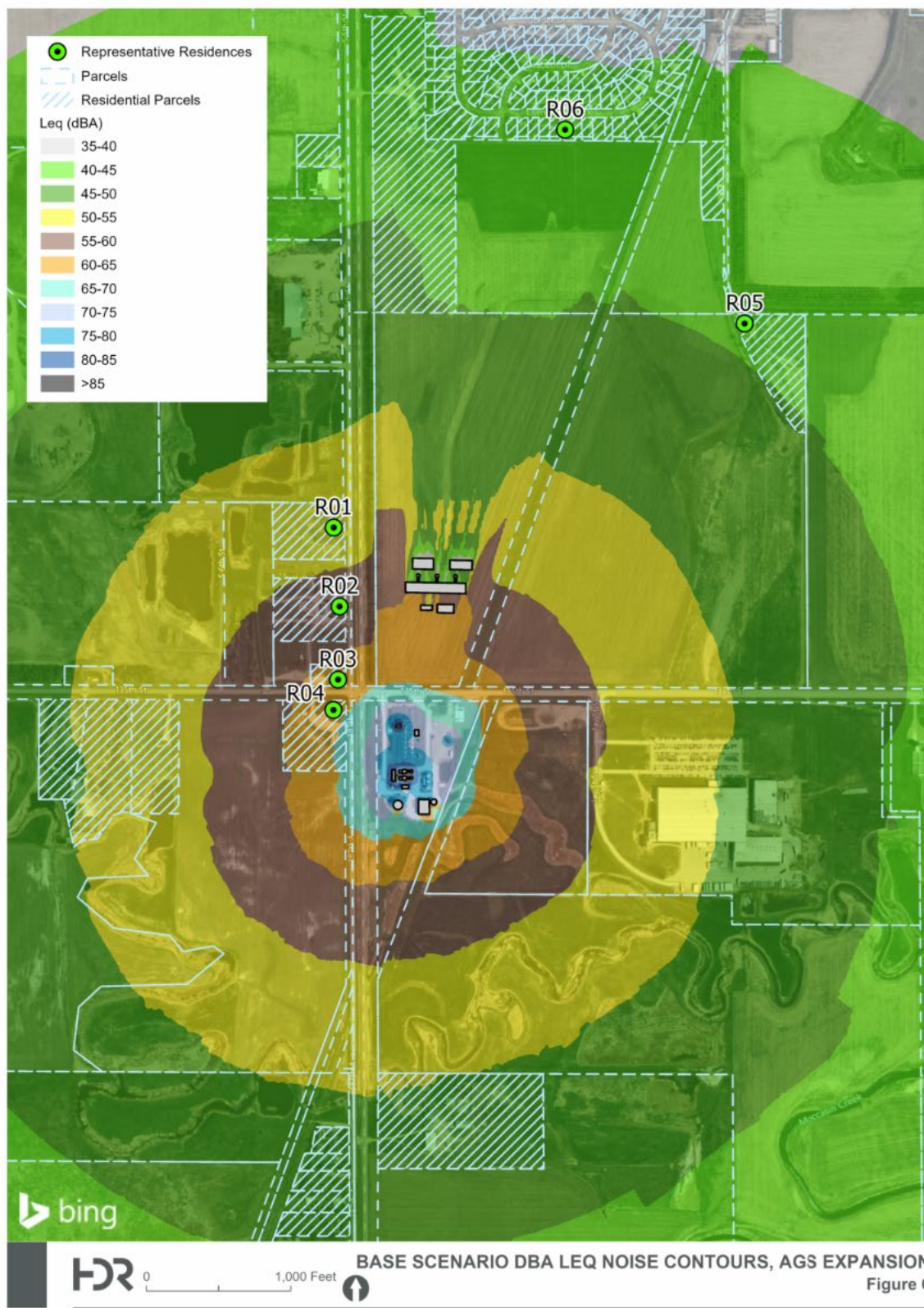


Figure 7. Base Scenario dBC L_{eq} Noise Contours, AGS Expansion

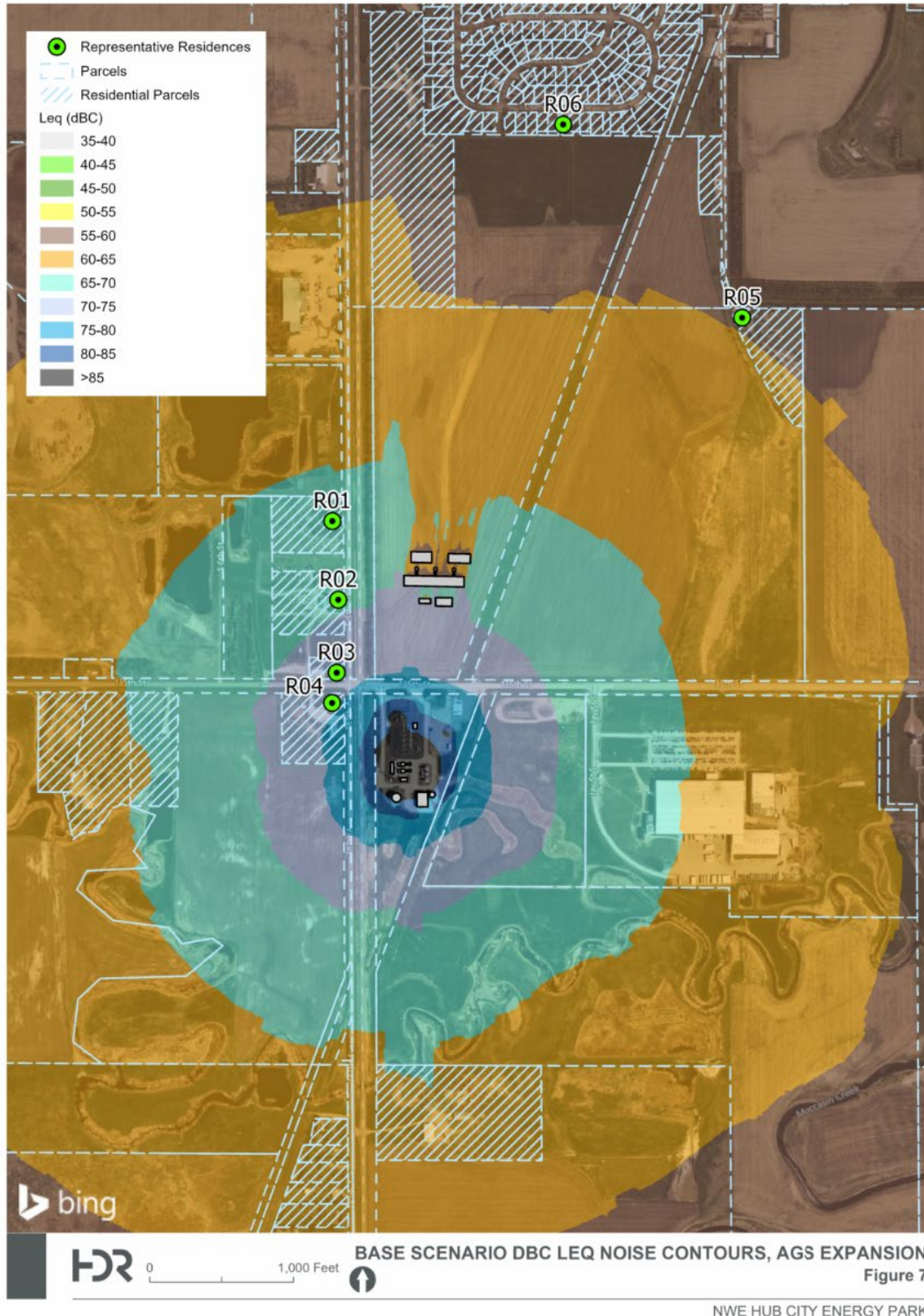


Figure 8. Base Scenario dBA L_{eq} Noise Contours, Hub City Energy Park

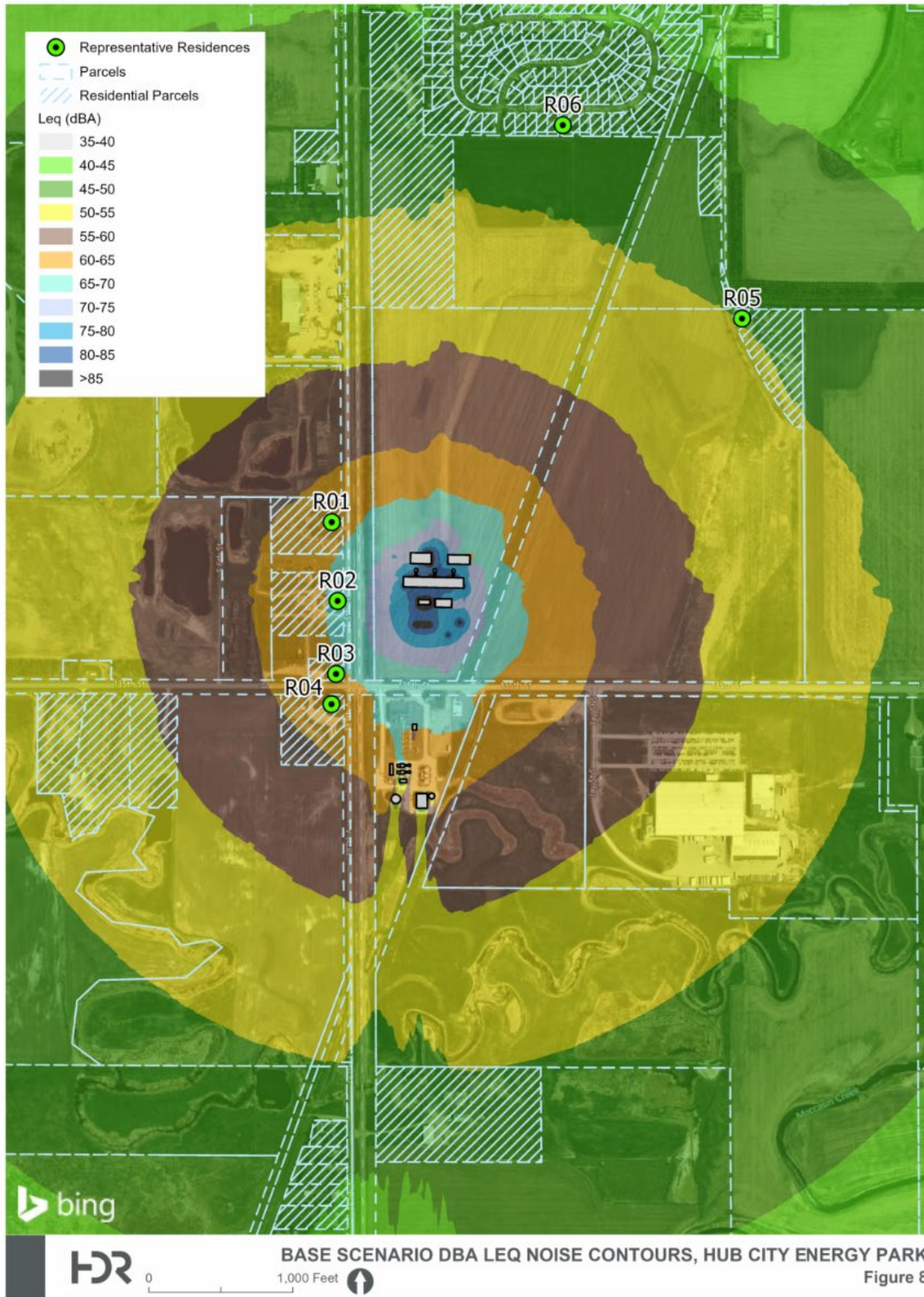


Figure 9. Base Scenario dBC L_{eq} Noise Contours, Hub City Energy Park

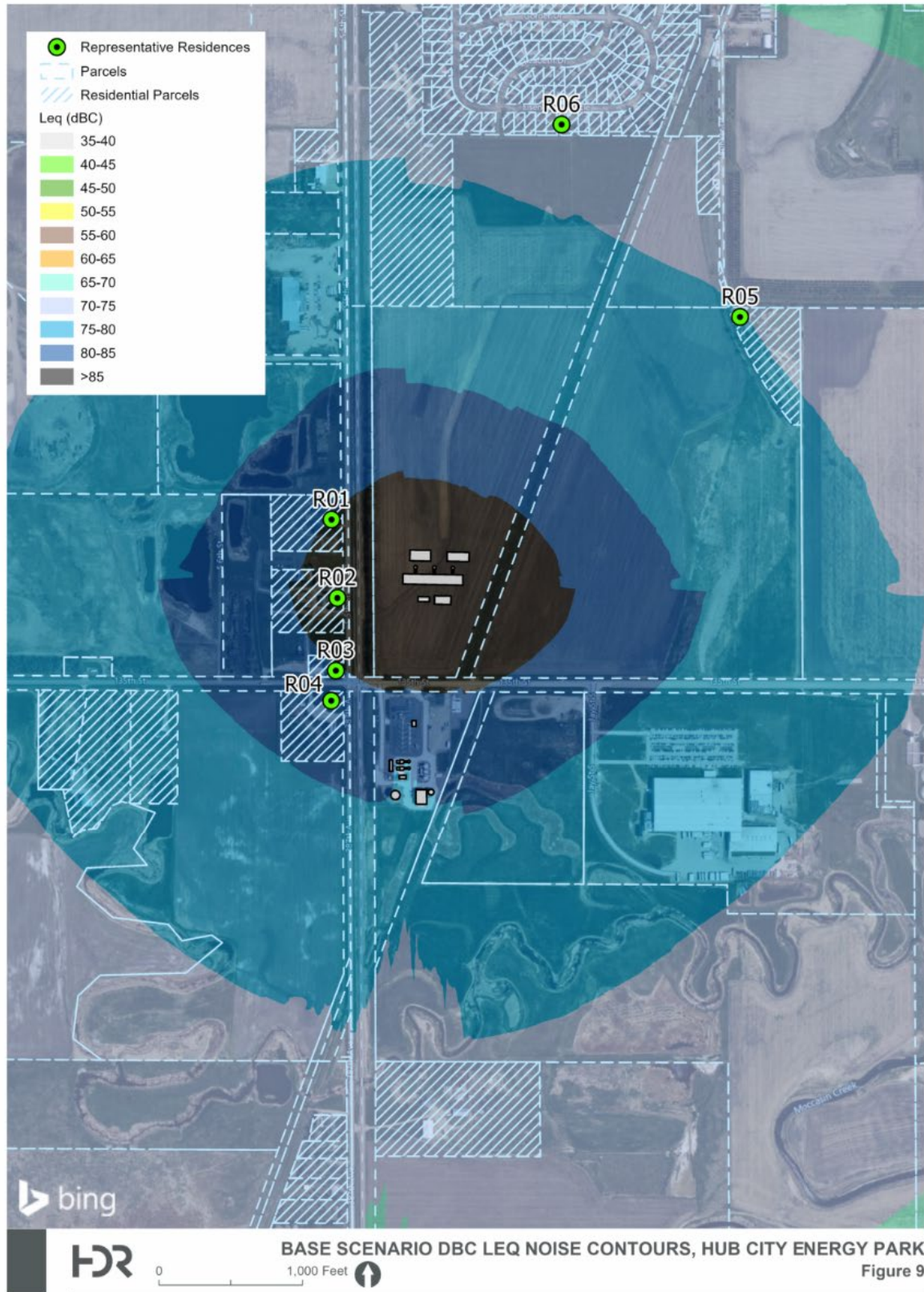
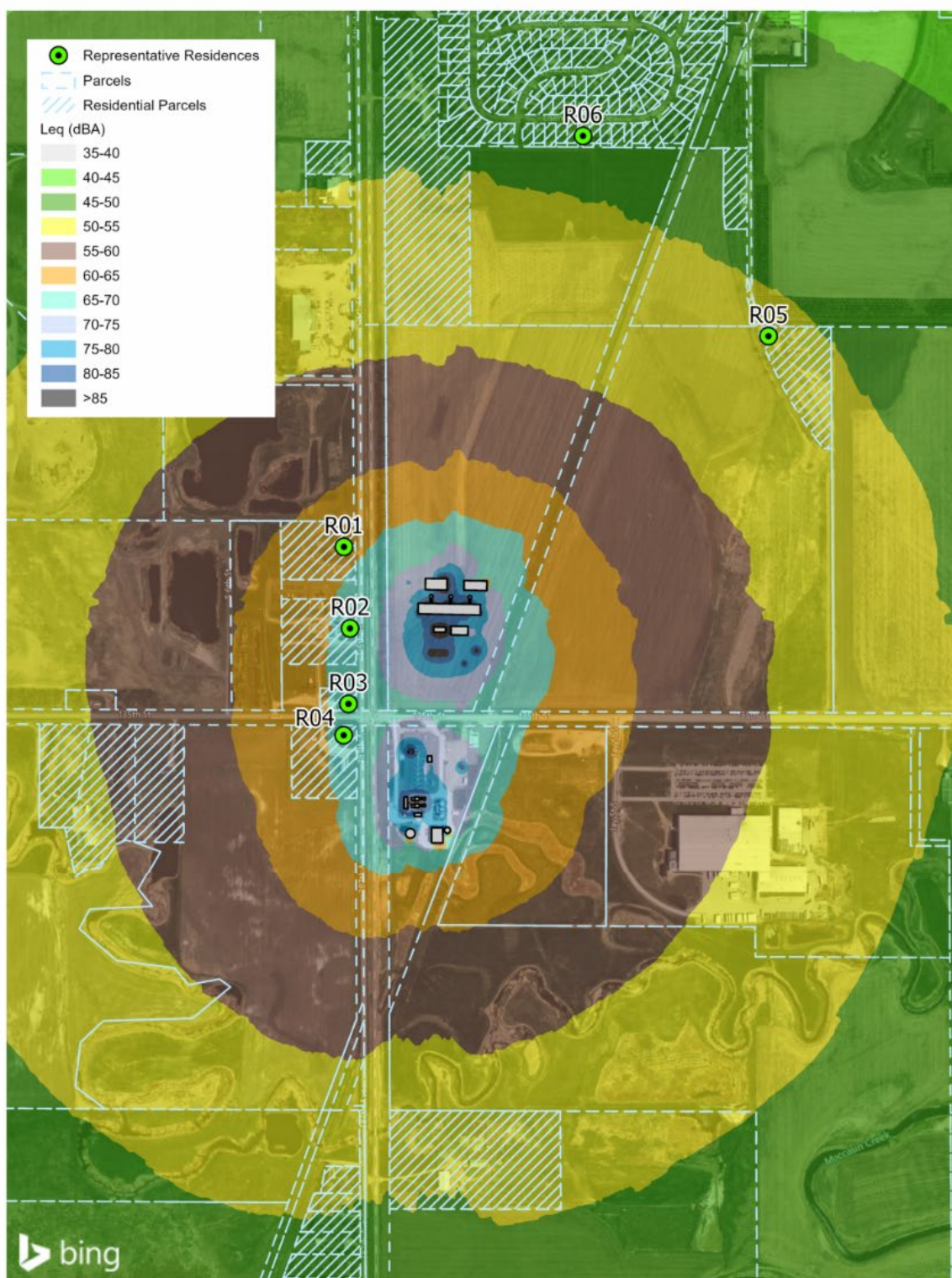


Figure 10. Base Scenario dBA Leq Noise Contours, Both Sites

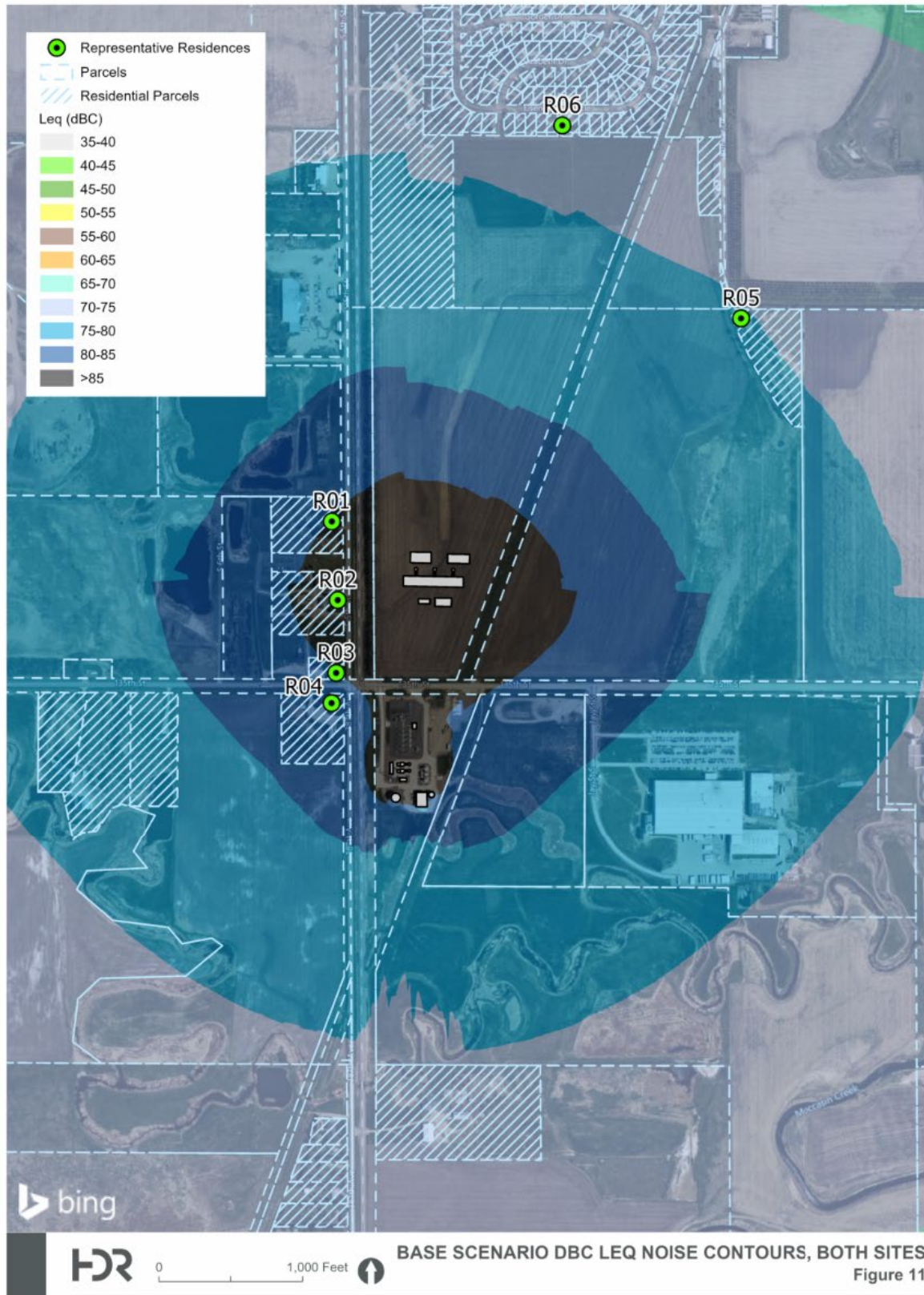


BASE SCENARIO DBA LEQ NOISE CONTOURS, BOTH SITES

Figure 10

NWE HUB CITY ENERGY PARK

Figure 11. Base Scenario dBC Leq Noise Contours, Both Sites



As shown in Figure 6, A-weighted Project-related noise emissions from the Aberdeen Expansion (AGS Units 3 and 4) alone in the base unmitigated scenario are estimated to reach approximately 64 dBA L_{eq} at the nearest residence, R04. For the Hub City Energy Park facility alone in the base scenario, facility-generated noise levels are anticipated to reach approximately 65 dBA L_{eq} at the nearest residence, R02.

C-weighted noise levels from AGS-3 and AGS-4 are anticipated to reach a maximum of approximately 74 dBC L_{eq} at the nearest residence, R04. C-weighted noise levels from Hub City Energy Park alone are anticipated to reach a maximum of approximately 88 dBC L_{eq} at the nearest residence, R02.

Table 10 summarizes the results of the base scenario noise model, showing noise levels due to the modeled facilities only. The table shows A-weighted and C-weighted results in terms of L_{eq} levels.

Table 10. Base Scenario Noise Modeling Results, L_{eq}

Receiver ¹	A-Weighted L_{eq}			C-Weighted L_{eq}		
	Unmitigated AGS Expansion Level	Unmitigated Hub City Energy Park Level	Unmitigated AGS Exp+ Hub City Energy Park Level	Unmitigated AGS Expansion Level	Unmitigated Hub City Energy Park Level	Unmitigated AGS Exp+ Hub City Energy Park Level
R01	53 dBA	63 dBA	63 dBA	67 dBC	85 dBC	85 dBC
R02	57 dBA	65 dBA	66 dBA	69 dBC	88 dBC	88 dBC
R03	62 dBA	64 dBA	66 dBA	73 dBC	85 dBC	85 dBC
R04	64 dBA	62 dBA	66 dBA	74 dBC	83 dBC	84 dBC
R05	44 dBA	50 dBA	51 dBA	60 dBC	75 dBC	75 dBC
R06	41 dBA	47 dBA	49 dBA	57 dBC	73 dBC	73 dBC

1- Noted sound pressure levels for noise-sensitive receiver locations are calculated at residential home or structure location. Noise levels at property line locations may be significantly higher; refer to noise contour figures for approximate noise levels.

Conclusion

Noting that all noise modeling is conceptual, HDR modeled noise from the proposed Hub City Energy Park generating facility, as well as the expansion to the existing Aberdeen Generating Station (AGS), which is currently under construction. The results of this noise modeling indicate that feasible noise control measures exist for the Hub City Energy Park facility to reduce noise. Noise mitigation measures may include enhanced building envelope sound isolation, equipment silencers or sound packages, building interior sound-absorptive treatments, noise barriers, and performance specifications to limit noise emissions via proactive selection of quieter equipment and components. Northwestern Energy plans to work with the local authority having jurisdiction to meet applicable noise requirements.

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Seebold, James G. Control valve noise. *Noise Control Engineering Journal*. Volume 24. Number 1. January 1985.

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Attachment A: Noise Measurement Memo

Memo

Date: Monday, April 20, 2026

Project: NWE Mystery Ranch

To: Ben Custer

From: Nolan Ames, Ben Copenhaver

Subject: Baseline Noise Measurement Memo

Introduction

On behalf of Northwestern Energy, HDR Engineering, Inc. (HDR) measured baseline noise levels in the area of the Mystery Ranch facility (the Project), which is located within unincorporated Brown County, South Dakota. The nearest municipality is the city of Aberdeen, South Dakota. The purpose of the measurements was to acquire noise levels with and without the existing AGS-2 unit operating in order to establish a baseline comparison for noise modeling of the proposed Mystery Ranch generating units, while also informing study of noise emissions associated with currently operational portions of the overall facility based on the load and environmental conditions at the time of the measurement that will be utilized in subsequent noise modeling efforts of the proposed Mystery Ranch power-generating units

Acoustics Glossary

This memo incorporates the following acoustics concepts and terminology:

- **dB** – A unit of level representing the ratio between two quantities that are proportional to power. The decibel level is 10 times the logarithm to the base 10, with a reference level serving as the denominator of the ratio.
- **A-Weighted Sound Level** – The human ear does not hear all frequencies equally, deemphasizing low and very high frequencies as they relate to loudness perception. The most common weighting scale used to represent this selective sensitivity of human hearing is the A-weighted sound level (dBA).
- **C-Weighted Sound Level** – The C-weighted sound level (dBC) is often used to evaluate the presence of low-frequency sound, as it retains low frequency content not represented in A-weighted levels, and is typically more representative of loudness perception for high noise levels (on the order of 100+ dB).
- **Frequency** – The rate at which a sound wave oscillates, measured in Hertz (Hz) or cycles/s.
- **L_{eq}** – The equivalent continuous sound pressure level (L_{eq}) is used to describe noise over a specified period of time in terms of a single numerical value that represents a constant sound that, over the specified time period, has the same acoustic energy as the time-varying signal; the L_{eq} of a time-varying signal and that of a steady signal are the same if they comprise the same acoustic energy over a given time.

- L_p – Sound pressure level. In air, 20 times the logarithm to the base 10 of a given sound pressure to the reference sound pressure. Sound pressure levels presented in this technical report are relative to 20 micro-pascals (10^{-6} Pa, or μPa), the accepted threshold of hearing for healthy young adults. Sound pressure levels reaching a receiver of interest from a source are influenced by distance, ground absorption, atmospheric absorption, intervening sound absorptive or reflecting surfaces, shielding by structures, and other potential factors.
- L_x – Centile Levels. The L_{10} , L_{50} , and L_{90} represent the sound levels exceeded for 10, 50, and 90 percent of a time period, respectively. For example, the L_{10} for a one-hour measurement is the level that is exceeded during 6 minutes of that time. The L_{10} , representing the higher range of sound levels over the time duration, is heavily influenced by transient noise events (for example, vehicle passbys and airplane flyovers), while the L_{90} is dominated by constant sources of noise (for example, a power plant). The L_{50} is the median noise level in a given time period.

Measurements

Measurement Locations

HDR measured baseline noise levels on March 19-20, 2026. HDR performed long-term (overnight) noise measurements concurrently at three locations, and short-term (10-minute) noise measurements consecutively at two locations in the vicinity of the Project area. All locations were outside the Project area (offsite). These offsite measurements were conducted on public property, and private property where Northwestern Energy had requested appropriate written permissions from the property owners.

Figure 1 shows the noise measurement locations. The noise measurement locations (labeled as “ML”) were in the vicinity of the facility and were located at varying distances and directions from existing facility equipment. These off-site locations were chosen to be representative of nearby noise-sensitive receptors.

Figure 1 presents the following information:

- Location of Aberdeen Generating Station (AGS). Includes currently operating AGS-2 Unit and two additional units under construction at time of measurements;
- Location of future Mystery Ranch site;
- Surrounding parcels in vicinity of site, including noise-sensitive land uses with residential structures;
- Location of ML’s.

Figure 1. Measurement Location Map (March 19, 2026 – March 20, 2026)

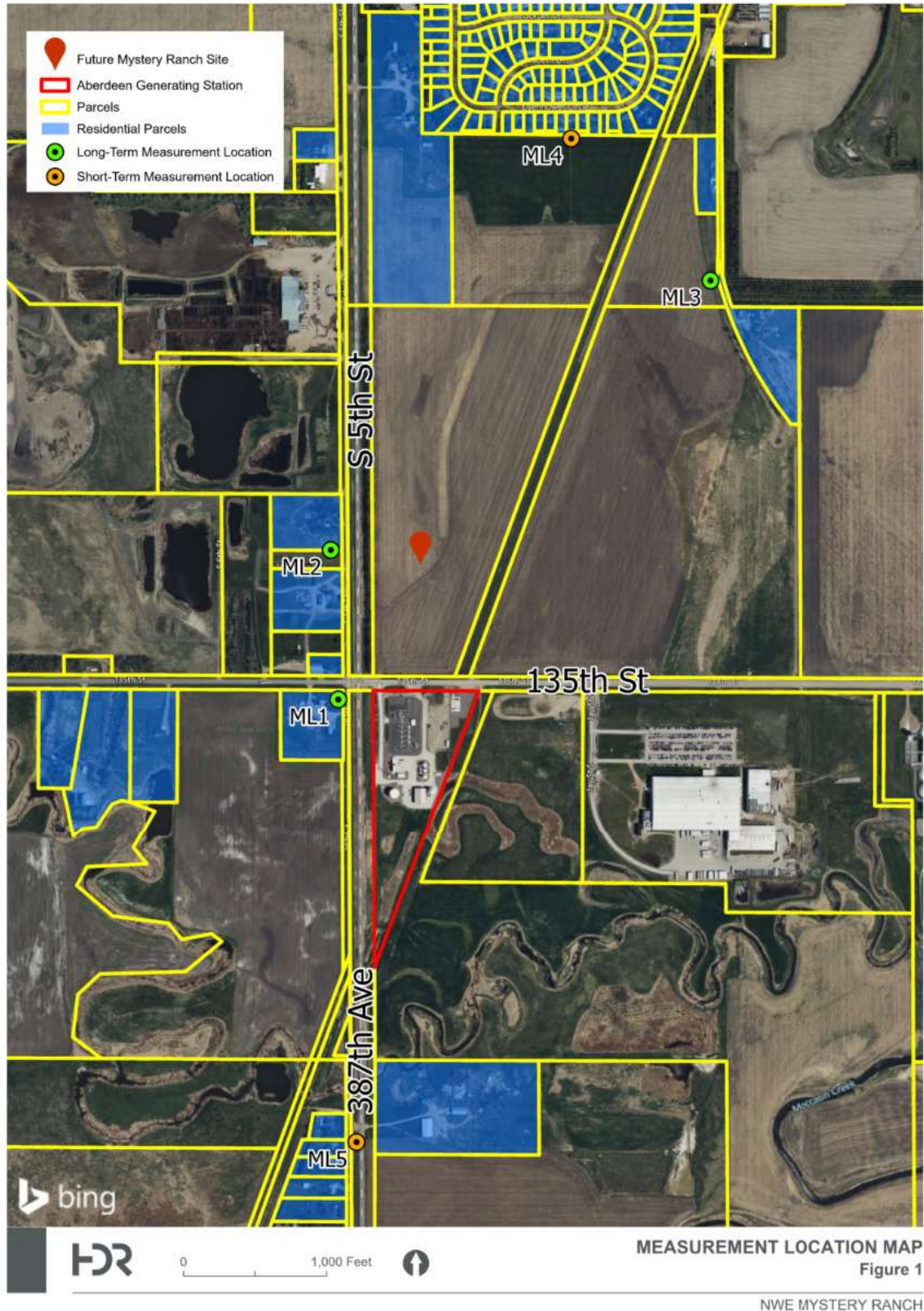


Table 1 provides a description of each noise measurement location.

Table 1. Measurement Location Descriptions (March 19, 2026 – March 20, 2026).

Measurement Location	Measurement Type	Location Description	Approximate Distance and Direction from AGS-2 Unit
ML1	Long-term	Lawn of residence at 3306 387 th Avenue.	740 ft NW
ML2	Long-term	Between 2820 and 2904 S 5 th Street.	1600 ft NNW
ML3	Long-term	Edge of residential parcel at 2400 Bunker Drive.	3900 ft NE
ML4	Short-term	Field just south of residences at Eisenhower Circle.	4500 ft NNE
ML5	Short-term	Across street from 3524 387 th Avenue.	2600 ft S

Source: HDR Engineering, Inc. 2026

At each noise measurement location, the microphone was placed approximately five feet above the ground and was more than 25 feet from large reflecting surfaces (buildings, walls, etc.) in accordance with typical industry practice. Photos of the measurement equipment setup at each location may be found in Appendix A.

Instrumentation

HDR used digital sound level meters with 1/3 octave band filters to perform the noise measurements. The sound level meters and handheld calibrator used by HDR meet Class 1/Type 1 precision requirements of American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC) standards. All instrumentation used by HDR to measure noise levels on this Project is calibrated on a regular basis by an independent accredited calibration laboratory using standards traceable to the National Institute of Standards and Technology (NIST). The instrumentation was calibrated to a reference level traceable to the NIST prior to transportation to the measurement site. Calibration checks were performed in the field prior to and upon completion of each series of measurements.

The measurement system at ML-1 used a Vaisala WXT520 weather station to measure microphone-height wind speed and direction, as well as precipitation. All microphones used for long-term measurements were covered by a large wind screen with bird spikes, and all microphones used for short-term measurements were covered by a large wind screen, in accordance with industry practice.

Methodology

HDR measured outdoor baseline noise levels as follows:

- The sound level meters continuously integrated sound pressure level measurements.
- The sound level meters at all long-term locations stored one-second and one-hour interval sound pressure levels. The sound level meter at all short-term locations stored one-second

interval sound pressure levels. Additionally, the sound level meter at ML-1 collected meteorological data including wind speeds, wind direction, and precipitation.

- The sound level meters stored the A-weighted L_{eq} , L_{10} , L_{50} , L_{90} , the unweighted 1/3 octave band L_{eq} levels from 12.5 to 20,000 Hz, and the unweighted 1/1 octave band L_{eq} levels from 16 to 16,000 Hz.
- The sound level meters stored continuous audio recordings. Where necessary and relevant, HDR selectively listened to the audio recordings to identify acoustical anomalies causing random “spikes” in the noise measurement data, which are not representative of the typical background noise environment.

Data recorded is considered acoustically invalid if the one-second-averaged microphone height wind speed is greater than 11 miles per hour, or during precipitation, per the ANSI / ASA S12.9 Part 3 standard. This did not occur during the measurement periods.

Aside from existing facility-generated noise when operating, wind rustling vegetation, birdsong, automobile passbys, train passbys, and airplane flyovers were considered typical sounds in the existing noise environment. Therefore, these noise events were retained in the datasets. HDR measured noise levels from the afternoon of March 19 to the afternoon of March 20, 2026. Four meters were used in the measurements, one at each long-term measurement location, and one meter for all short-term measurement locations.

Results

This section summarizes noise measurement results. Table 2, below, summarizes the measurement periods recorded, the measurement periods considered in analysis, and the audible noise sources at each measurement location.

Table 2. Measurement Location Summaries

Measurement Location	Measurement Period Recorded	Measurement Period Considered in Analysis	Audible Noise Sources
ML1	March 19, 2026 3:18 PM – March 20, 2026 1:26 PM	March 19, 2026 5:00 PM – March 20, 2026 1:00 PM	Traffic from nearby roadways 135 th St and S 5 th St, infrequent train passbys (3 during measurement period). Construction activities at Aberdeen Generating Station were visible from the measurement location, but were not clearly audible over background noise.
ML2	March 19, 2026 3:41 PM – March 20, 2026 1:17 PM	March 19, 2026 5:00 PM – March 20, 2026 1:00 PM	Traffic from nearby and distant roadways, infrequent train passbys (3 during measurement period).
ML3	March 19, 2026 4:07 PM – March 20, 2026 1:05 PM	March 19, 2026 5:00 PM – March 20, 2026 1:00 PM	Traffic from distant roadways, infrequent train passbys (3 during measurement period). Constant hum / whine and occasionally audible beating from nearby plant or slaughterhouse. Occasional dog barking in nearby yard.
ML4	March 19, 2026 4:46 PM – March 19, 2026 4:56 PM, March 20, 2026 12:44 PM – March 20, 2026 12:54 PM	March 19, 2026 4:46 PM – March 19, 2026 4:56 PM, March 20, 2026 12:44 PM – March 20, 2026 12:54 PM	Traffic from roadway, wind, children and dogs in nearby yard.
ML5	March 19, 2026 5:12 PM – March 19, 2026 5:22 PM, March 20, 2026 12:24 PM – March 20, 2026 12:34 PM	March 19, 2026 5:12 PM – March 19, 2026 5:22 PM, March 20, 2026 12:24 PM – March 20, 2026 12:34 PM	Traffic from roadway, birdsong.

Note: Refer to Table 3 for existing facility operational times for comparison with measurement periods.

Note that the measurements for the short-term measurement locations, ML4 and ML5, were taken during separate occasions on two different days according to varying facility operating conditions. The short-term measurements on March 19 captured a period when the facility was not operating, and the measurements on March 20 captured a period when the facility was operating.

Table 3, below, provides operation periods of facility equipment, and their gross power generation.

Table 3. Operation Periods

Period	Time	Power Range (MWH)
Operation, Day 1 (Nighttime)	March 19, 2026 10:00 PM – March 20, 2026 12:00 AM	58 - 60
Operation, Day 2 (Daytime)	March 20, 2026 10:00 AM – March 20, 2026 1:00 PM	59 - 60

Note: Measurement analysis period concluded at 1:00 PM on March 20, but power generation continued.

Long-Term Measurement Results

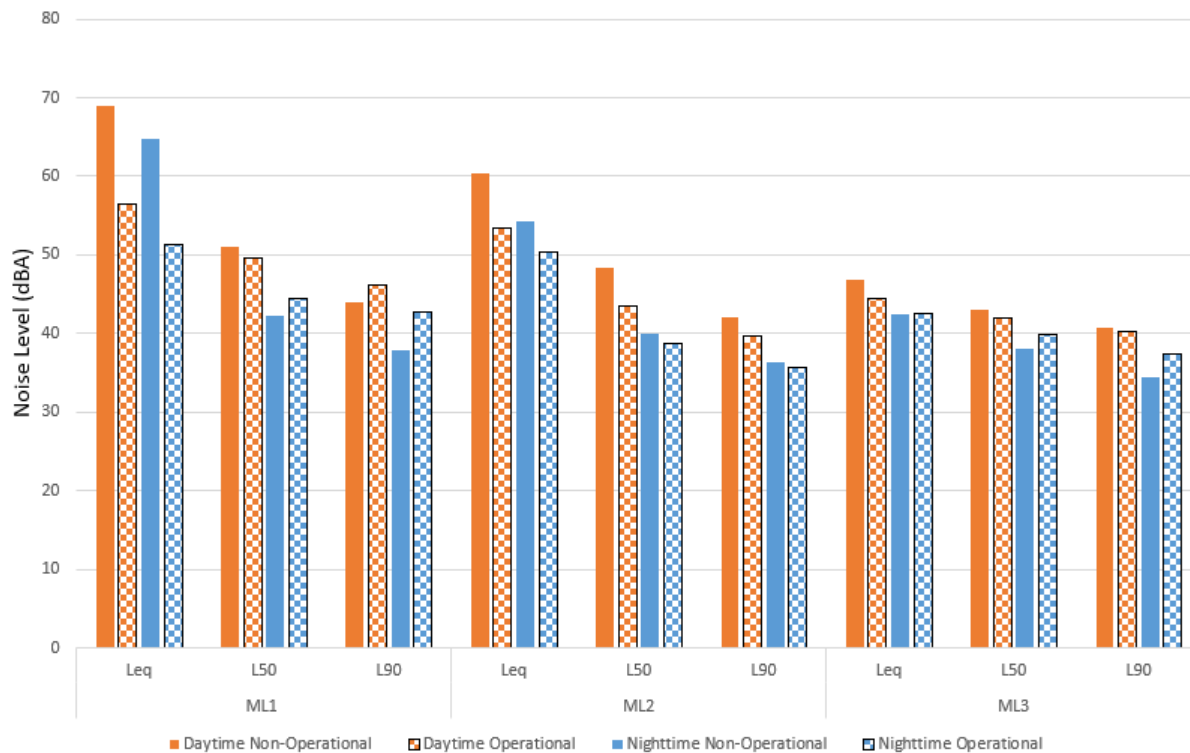
For each long-term analysis period, Appendix B shows recorded metrics for ML1, ML2, and ML3. Recorded metrics include the hourly A-weighted and C-weighted L_{eq} , L_{10} , L_{50} , and L_{90} , average wind speed at microphone height, average wind direction, and precipitation. No precipitation was recorded during the measurements, and all hours had average wind speeds below 11 mph, such that no periods were excluded from the measurement analysis. As an inherent part of the acoustic environment, events such as train pass-bys were also not excluded. See Appendix C for graphs of the 1-second L_{eq} at each long-term measurement location.

Table 4 below summarizes the overall A-weighted L_{eq} , and average hourly L_{50} , and L_{90} during the daytime period (7AM-10PM) and nighttime period (10PM-7AM) at each long-term measurement location, for both operational and non-operational periods. Figure 2 below shows this information graphically.

Table 4. Long-Term Noise Measurement Summary, dBA

Period	Time	ML1			ML2			ML3		
		L_{eq} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{eq} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{eq} (dBA)	L_{50} (dBA)	L_{90} (dBA)
Daytime Non-Operational	3/19/2026 5:00 PM – 9:00 PM, 3/20/2026 7:00 AM – 9:00 AM	69	51	44	60	48	42	47	43	41
Daytime Operational	3/20/2026 10:00 AM – 1:00 PM	56	50	46	53	44	40	44	42	40
Nighttime Non-Operational	3/20/2026 1:00 AM – 7:00 AM	65	42	38	54	40	36	42	38	35
Nighttime Operational	3/19/2026 10:00 PM – 3/20/2026 12:00 AM	51	44	43	50	39	36	42	40	37

Figure 2. Long-Term Noise Measurement Summary, dBA



In most cases, the L_{eq} during operational periods is notably quieter than the L_{eq} during corresponding non-operational periods. This is largely due to train pass-bys during the non-operational periods, which have very high levels that can skew the overall L_{eq} upward due to these transient events. This is most pronounced at ML1, which was near a crossing where train horns sounded.

The statistical noise levels such as the L_{50} and L_{90} , which respectively describe the sound levels exceeded for 50% and 90% of a given time period, naturally filter out shorter term events. Comparing results within these metrics shows generally similar levels (no more than +/- 2 dB difference) between operational and non-operational levels for a given location and time of day. The most pronounced increase is in the L_{90} at ML1, where the operational L_{90} was 2 dB higher during daytime and 5 dB higher during nighttime. At ML2, the operational L_{50} and L_{90} for both daytime and nighttime were lower than non-operational, indicating that other sources may contribute to overall background noise levels in the general area.

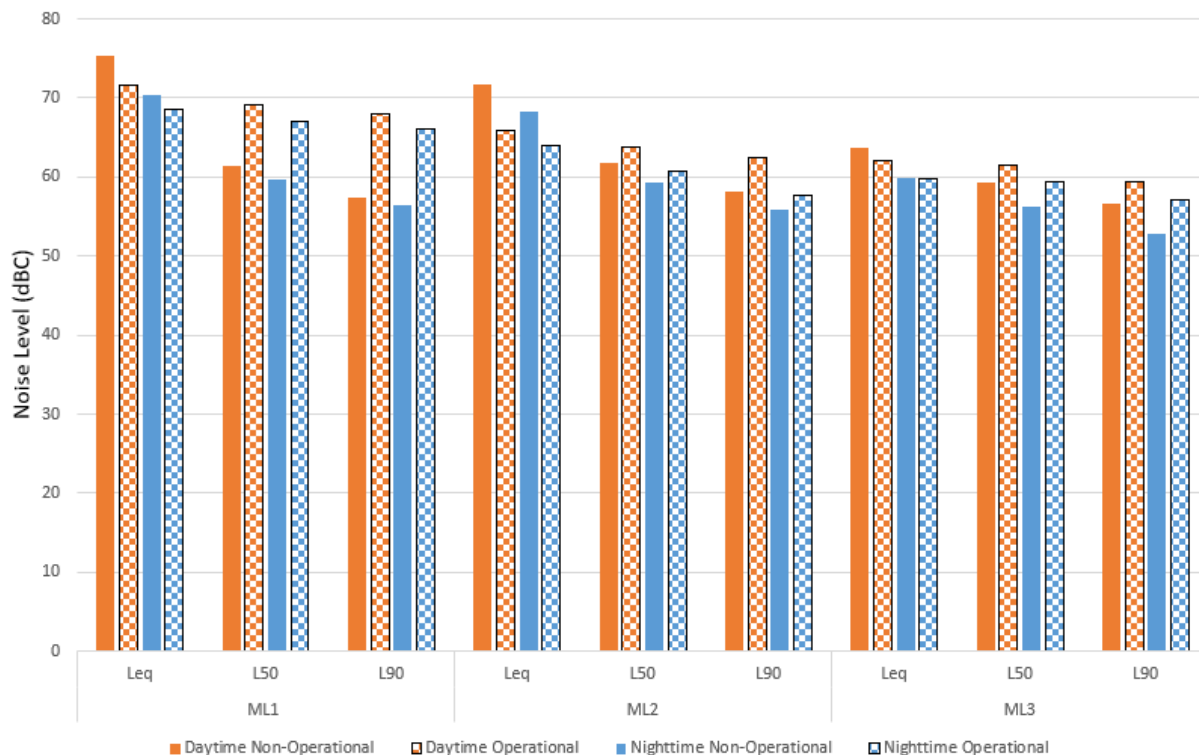
The relatively small differences between operational and non-operational L_{50} and L_{90} levels indicate that facility operations are expected not have a large effect on A-weighted noise levels at most measurement locations, other than potentially in the vicinity of ML1, which is the closest noise-sensitive area to the site, as well as during nighttime hours when general activity subsides.

Table 5 below summarizes the overall C-weighted L_{eq} , and average hourly L_{50} , and L_{90} for the daytime period (7AM-10PM) and nighttime period (10PM-7AM) at each long-term measurement location, for both operational and non-operational periods. Figure 3 below shows this information graphically.

Table 5. Long-Term Noise Measurement Summary, dBC

Period	Time	ML1			ML2			ML3		
		L _{eq} (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)	L _{eq} (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)	L _{eq} (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)
Daytime Non-Operational	3/19/2026 5:00 PM –9:00 PM, 3/20/2026 7:00 AM –9:00 AM	75	61	57	72	62	58	64	59	57
Daytime Operational	3/20/2026 10:00 AM –1:00 PM	72	69	68	66	64	62	62	61	59
Nighttime Non-Operational	3/20/2026 1:00 AM–7:00 AM	70	60	57	68	59	56	60	56	53
Nighttime Operational	3/19/2026 10:00 PM – 3/20/2026 12:00 AM	69	67	66	64	61	58	60	59	57

Figure 3. Long-Term Noise Measurement Summary, dBC



Similar to the A-weighted noise level results, C-weighted Leq results at all locations during non-operational periods are equal or higher than during corresponding operational periods, though the difference is less pronounced. However, for the L₅₀ and L₉₀ results, all sites showed an increase in dBC levels during facility operation. This increase is quite pronounced at ML1, where the C-weighted L₉₀ is 10-11 dB higher during operational periods. This indicates that the operation of the facility contributes to low-frequency noise levels in the area.

Refer to Appendix C for the time-varying sound level throughout each measurement. Events such as train passbys are annotated in those graphs, to show the difference between steady-state noise levels and noise levels associated with transient events.

Short-Term Measurement Results

Table 6 shows recorded A-weighted metrics during each short-term measurement for ML4 and ML5. Recorded metrics include the overall A-weighted L_{eq} , L_{50} , and L_{90} .

Table 7 shows the same information for C-weighted metrics.

Table 6. Short-Term Measurement Results, dBA

Period		ML4				ML5		
	Measurement Time	L _{eq} (dBA)	L ₅₀ (dBA)	L ₉₀ (dBA)	Measurement Time	L _{eq} (dBA)	L ₅₀ (dBA)	L ₉₀ (dBA)
3/19, Day 1 Measurement (Non-Operational)	3/19/2026, 4:46 PM – 4:56 PM	44	43	40	3/19/2026, 5:12 PM – 5:22 PM	58	48	37
3/20, Day 2 Measurement (Operational)	3/20/2026 12:44 PM – 12:54 PM	41	39	38	3/20/2026, 12:24 PM– 12:34 PM	56	38	35

Table 7. Short-Term Measurement Results, dBC

Period		ML4				ML5		
	Measurement Time	L _{eq} (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)	Measurement Time	L _{eq} (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)
3/19, Day 1 Measurement (Non-Operational)	3/19/2026, 4:46 PM – 4:56 PM	70	67	61	3/19/2026, 5:12 PM – 5:22 PM	65	61	55
3/20, Day 2 Measurement (Operational)	3/20/2026 12:44 PM – 12:54 PM	61	61	59	3/20/2026, 12:24 PM– 12:34 PM	64	60	58

All metrics, including both A-weighted and C-weighted levels, showed lower levels during the operational period. Given the shorter measurement periods for these locations, they are likely more influenced by fluctuations in other noise sources such as local traffic. Given that the non-operational measurement occurred closer to typical peak traffic hours, traffic noise was likely a primary contributor to the difference in levels between periods, rather than operational facility noise. These results may be used to inform baseline noise estimates in the vicinity of each location, and show no direct influence of facility operations.

Conclusions

HDR performed baseline long-term noise measurements concurrently at three locations, and short-term noise measurements consecutively at two locations in the vicinity of the Project area, from March 19-20, 2026. All locations were outside the Project area (offsite). These off-site locations were chosen to be representative of nearby noise-sensitive receptors.

The L_{eq} , L_{50} , and L_{90} for each location were compiled and reported. L_{10} results were omitted from the main body for brevity, and are included in Appendix B.

Results indicated some contribution of existing facility operation to A-weighted noise levels at the nearest long-term measurement location to the facility (ML1), and minimal at the more distant locations. C-weighted results indicated stronger contribution from existing facility operation at all long-term measurement locations. Both A-weighted and C-weighted L_{eq} results typically found noise levels during operation to be less than or equal to those when the facility was not operating. Additionally, both A-weighted and C-Weighted L_{eq} results during the daytime were typically greater than those during the nighttime, between both operational and non-operational periods. Results at the short-term measurement locations, which were more distant from the site, showed no discernable effect of facility operation on dBA or dBC levels during the periods measured.

Appendix A. Measurement Site Photos

ML-1



ML-2



ML-3



ML-4



ML-5



Appendix B. Long-Term Noise Measurement Results

Table B-1. Long-Term Noise Measurement Results, dBA

Date	Operating Status	Hour	Average Wind Speed (mph)	Average Wind Direction	ML1				ML2				ML3			
					L _{eq} (dBA)	L ₁₀ (dBA)	L ₅₀ (dBA)	L ₉₀ (dBA)	L _{eq} (dBA)	L ₁₀ (dBA)	L ₅₀ (dBA)	L ₉₀ (dBA)	L _{eq} (dBA)	L ₁₀ (dBA)	L ₅₀ (dBA)	L ₉₀ (dBA)
3/19	Rest	17:00	4.6	SW	57	59	50	43	55	59	50	41	43	44	42	40
		18:00	2.4	WSW	77	66	52	45	67	63	50	41	51	51	42	40
		19:00	2.2	SW	59	59	51	44	58	60	48	42	46	48	43	41
		20:00	1.7	SW	53	57	47	40	53	58	45	40	44	46	43	40
	Ramp-up	21:00	1.1	SW	52	55	45	40	51	53	42	38	46	48	44	42
	Operation	22:00	1.4	W	51	51	45	43	50	48	39	37	44	46	41	38
		23:00	1.7	WNW	52	51	44	43	51	47	38	35	41	43	39	36
3/20	Ramp-down	0:00	1.0	WNW	46	43	37	33	42	41	35	32	38	40	36	34
	Rest	1:00	1.4	WNW	45	46	37	34	46	42	35	32	37	40	35	32
		2:00	1.7	WNW	45	44	42	39	41	42	39	37	39	41	38	32
		3:00	1.2	W	43	46	40	36	46	44	40	37	41	42	40	37
		4:00	1.2	NW	49	47	40	37	49	45	38	36	41	42	38	34
		5:00	1.6	NW	73	61	47	40	61	62	44	38	47	49	37	34
		6:00	1.0	SSE	56	57	49	41	53	56	45	39	42	43	41	38
		7:00	1.0	W	58	60	53	45	56	61	50	45	45	46	44	42
		8:00	0.8	WNW	57	59	52	47	56	59	49	45	46	47	45	43
	Ramp-up	9:00	1.8	ESE	70	62	50	46	58	61	47	44	48	48	45	43
	Operation	10:00	2.4	SE	56	59	50	47	54	58	44	41	45	46	44	42
		11:00	2.1	SSE	57	60	50	47	53	58	43	39	46	45	42	40
		12:00	3.2	SE	55	58	48	45	54	58	43	39	42	43	40	39

Table B-2. Long-Term Noise Measurement Results, dBC

Date	Operating Status	Hour	Average Wind Speed (mph)	Average Wind Direction	ML1				ML2				ML3			
					L _{eq} (dBC)	L ₁₀ (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)	L _{eq} (dBC)	L ₁₀ (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)	L _{eq} (dBC)	L ₁₀ (dBC)	L ₅₀ (dBC)	L ₉₀ (dBC)
3/19	Rest	17:00	4.6	SW	69	70	63	56	68	71	65	58	68	71	64	59
		18:00	2.4	WSW	82	78	61	55	77	78	61	56	66	68	57	55
		19:00	2.2	SW	72	68	60	56	74	67	60	58	63	64	59	57
		20:00	1.7	SW	62	64	59	56	61	64	60	57	58	59	57	56
	Ramp-up	21:00	1.1	SW	66	68	62	58	62	64	61	58	61	63	60	58
	Operation	22:00	1.4	W	69	68	67	66	64	64	62	59	60	62	60	58
		23:00	1.7	WNW	69	68	67	66	64	63	60	57	59	61	59	56
3/20	Ramp-down	0:00	1.0	WNW	63	63	57	54	56	58	55	52	54	56	54	52
	Rest	1:00	1.4	WNW	58	59	57	54	58	57	55	53	54	56	53	52
		2:00	1.7	WNW	61	63	59	56	59	62	58	55	58	62	56	52
		3:00	1.2	W	61	64	61	57	61	63	61	57	61	63	61	55
		4:00	1.2	NW	62	63	59	56	63	63	60	55	58	62	55	52
		5:00	1.6	NW	78	73	62	59	75	72	61	58	64	68	56	53
		6:00	1.0	SSE	66	66	60	58	63	65	61	58	57	60	56	54
		7:00	1.0	W	72	69	63	60	66	68	63	60	60	64	59	57
		8:00	0.8	WNW	68	69	63	61	66	67	63	61	61	62	60	58
	Ramp-up	9:00	1.8	ESE	75	76	66	63	71	70	64	62	63	65	63	61
	Operation	10:00	2.4	SE	72	73	69	68	67	68	64	63	63	64	62	60
		11:00	2.1	SSE	72	74	70	68	65	67	64	62	62	63	61	59
		12:00	3.2	SE	71	72	69	68	66	67	64	62	62	64	61	59

Figure B-1. Long-Term Noise Measurement Results, dBA, ML1

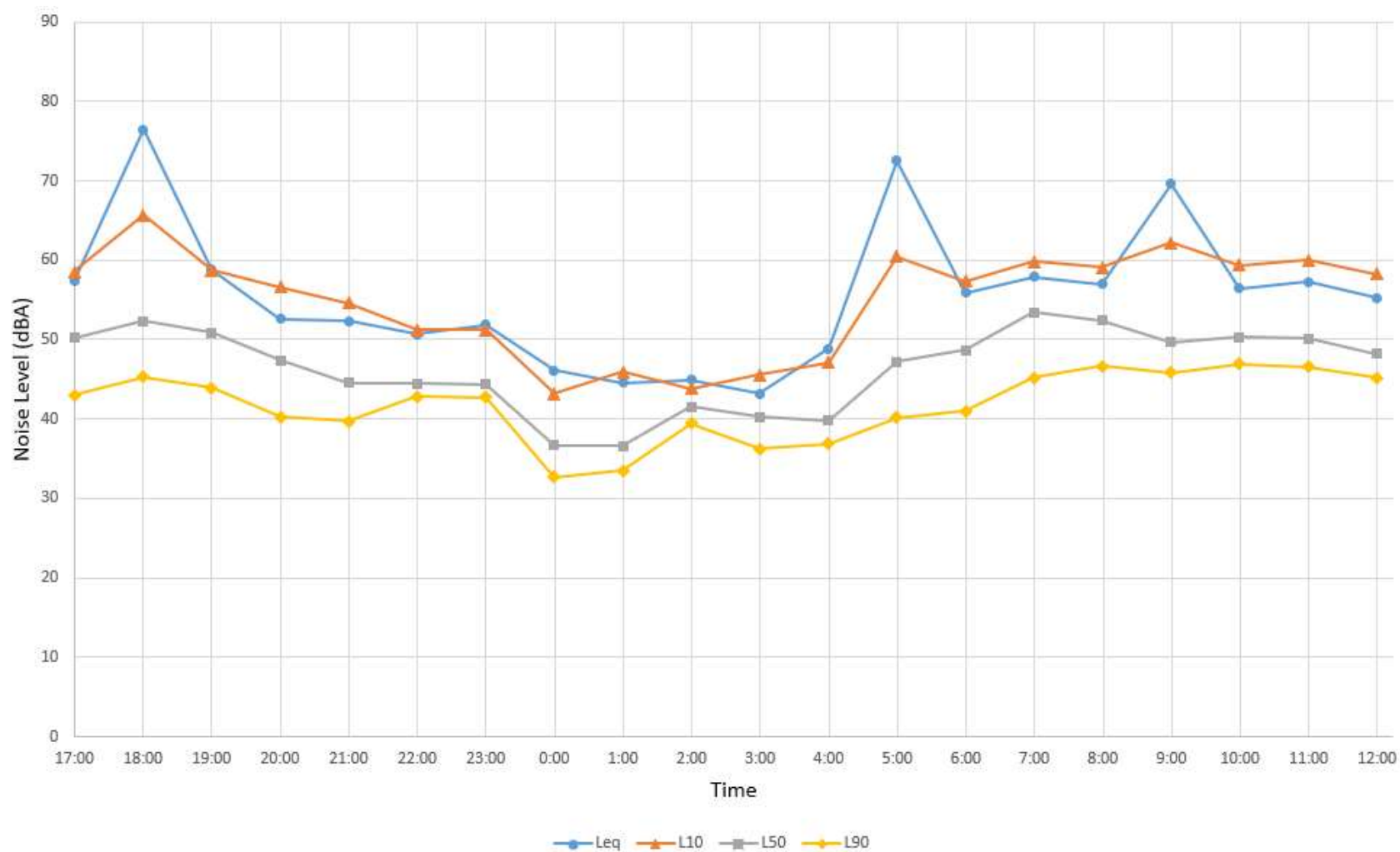


Figure B-2. Long-Term Noise Measurement Results, dBA, ML2

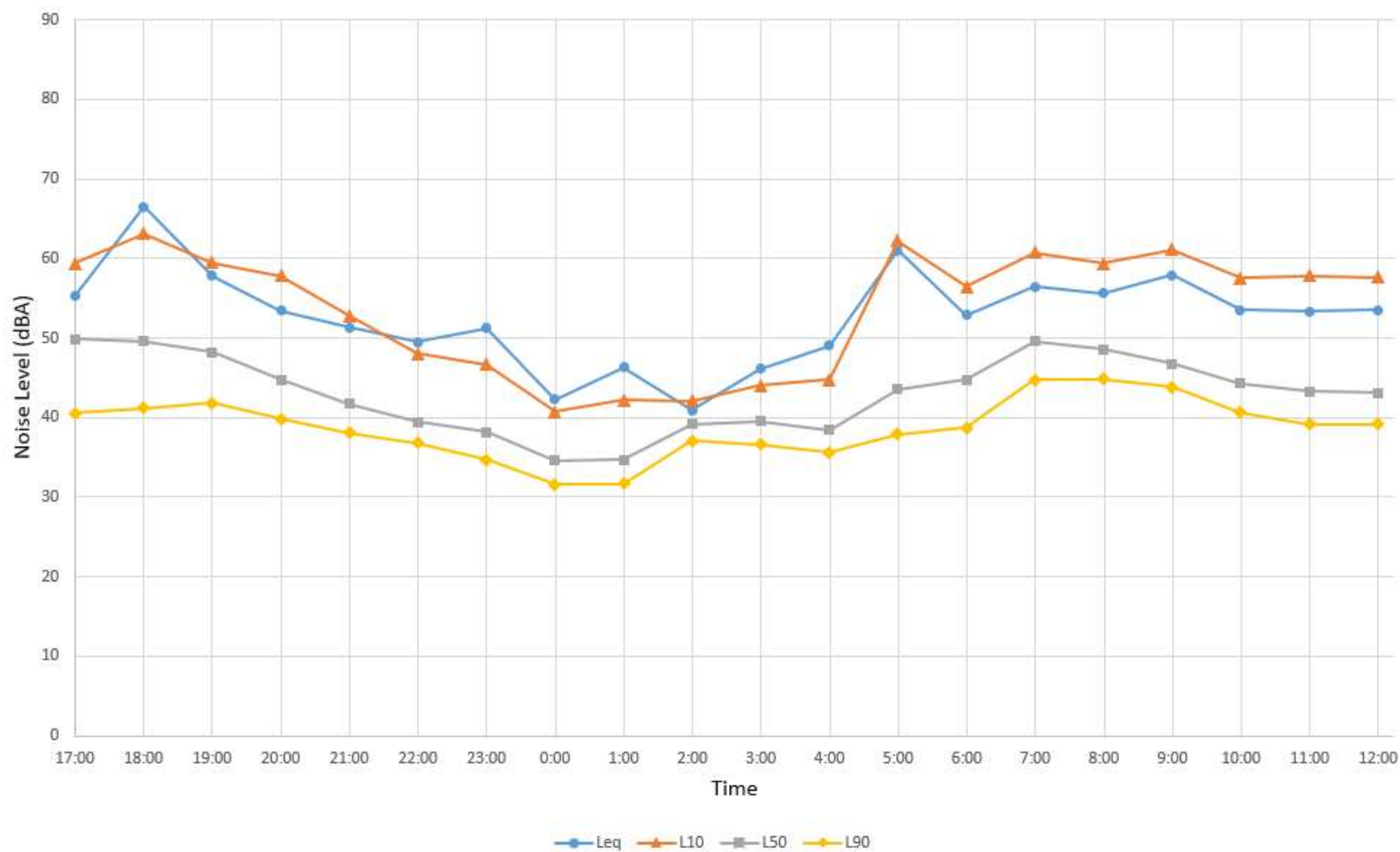


Figure B-3. Long-Term Noise Measurement Results, dBA, ML3

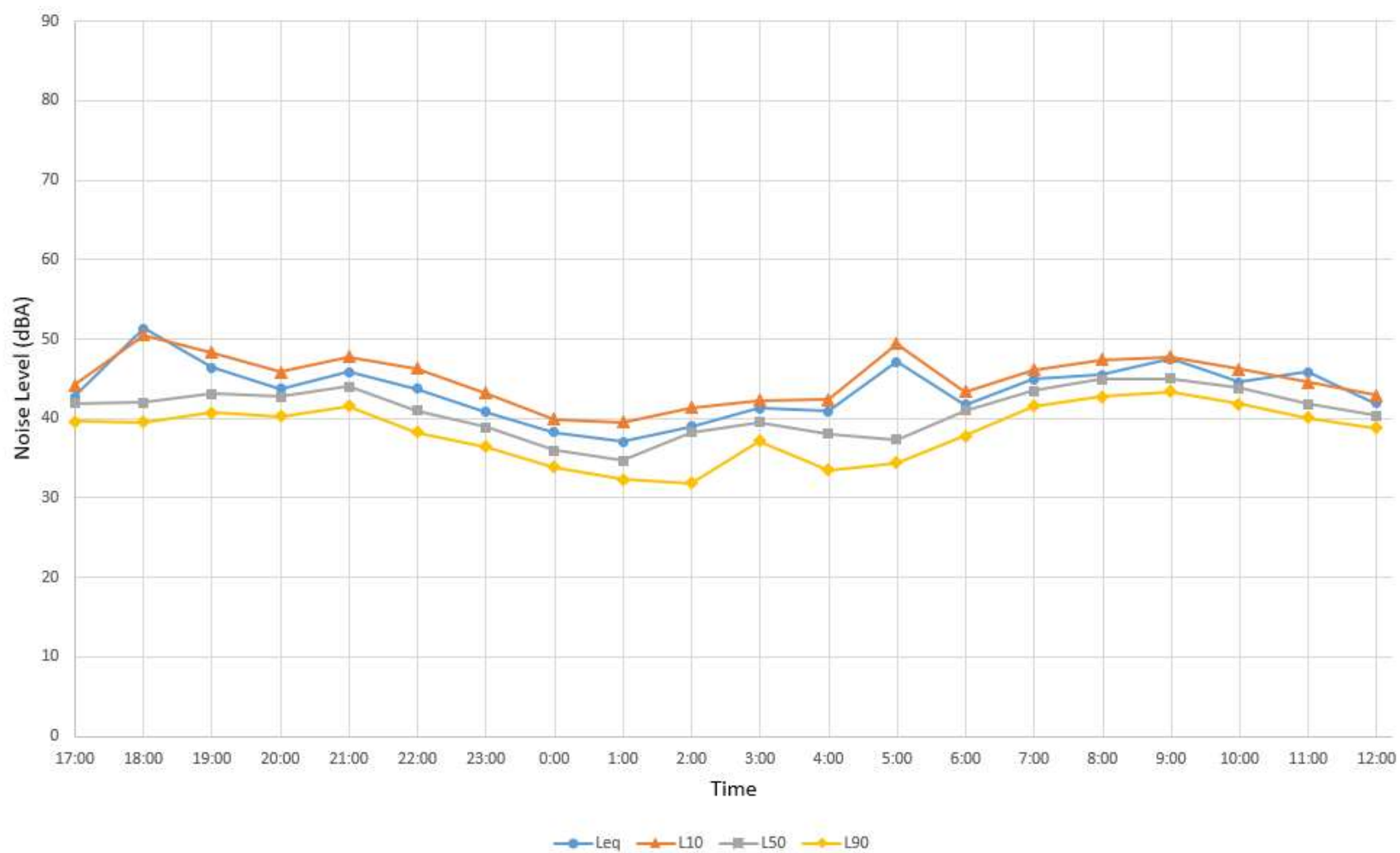


Figure B-4. Long-Term Noise Measurement Results, dBC, ML1

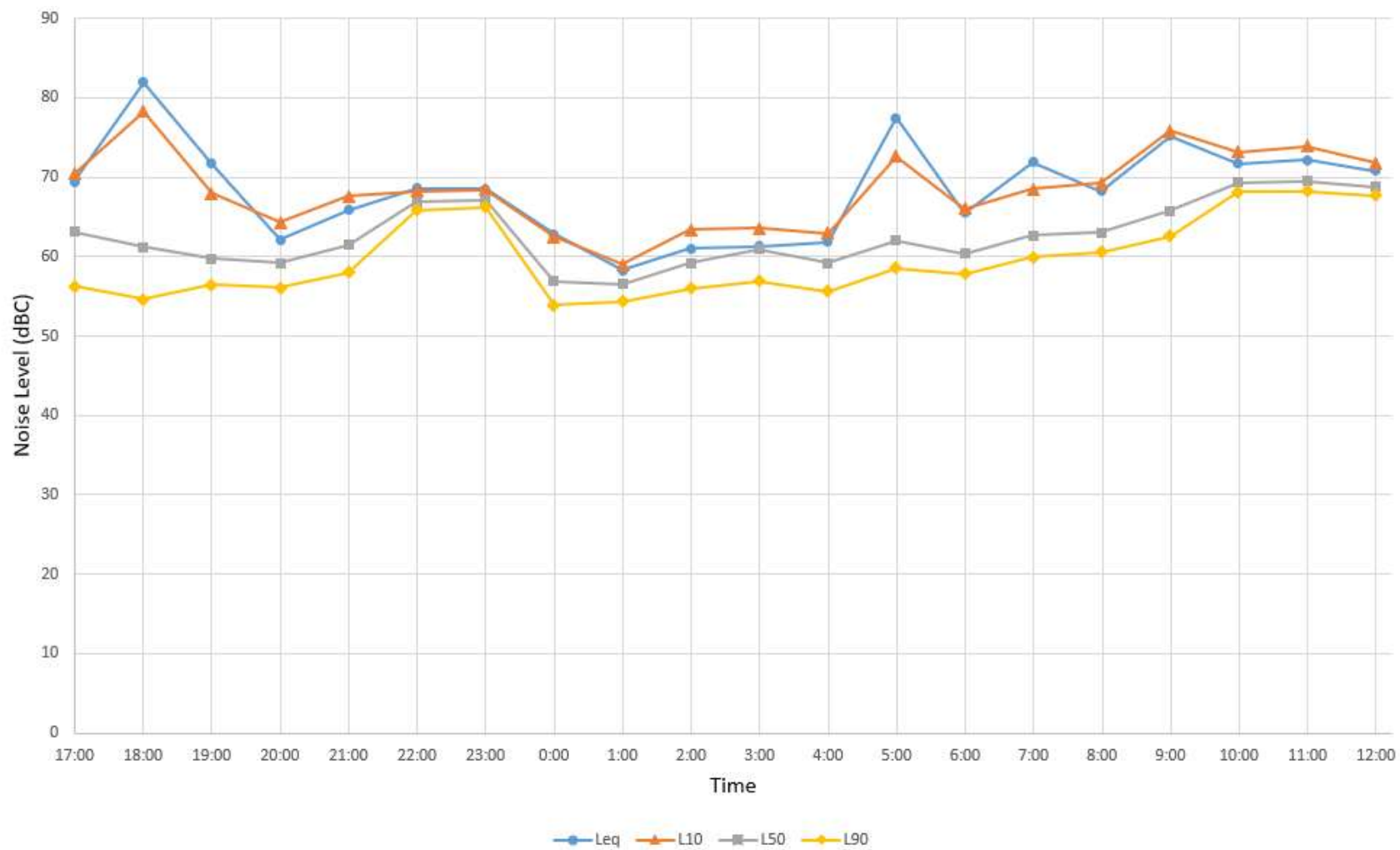


Figure B-5. Long-Term Noise Measurement Results, dBC, ML2

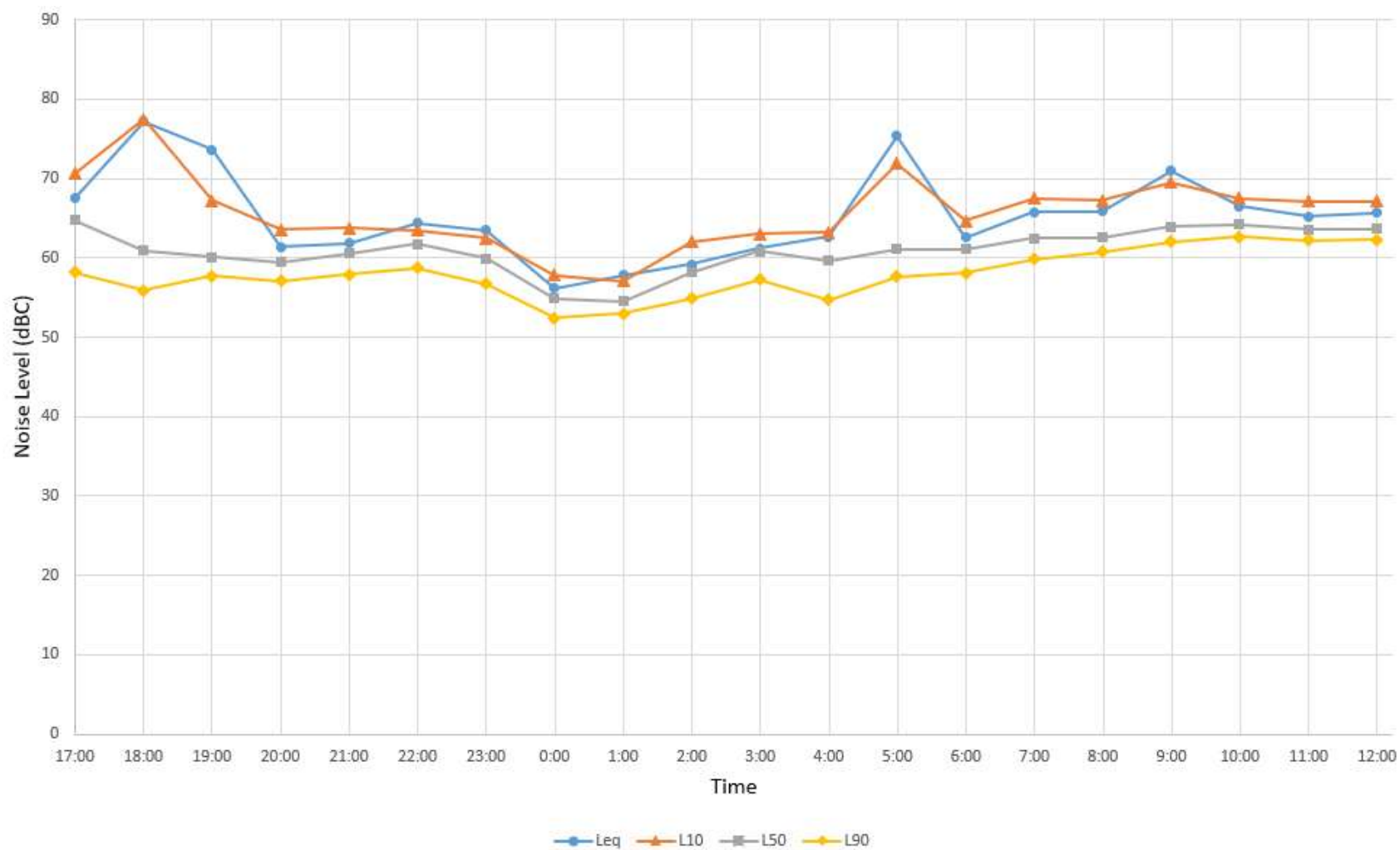
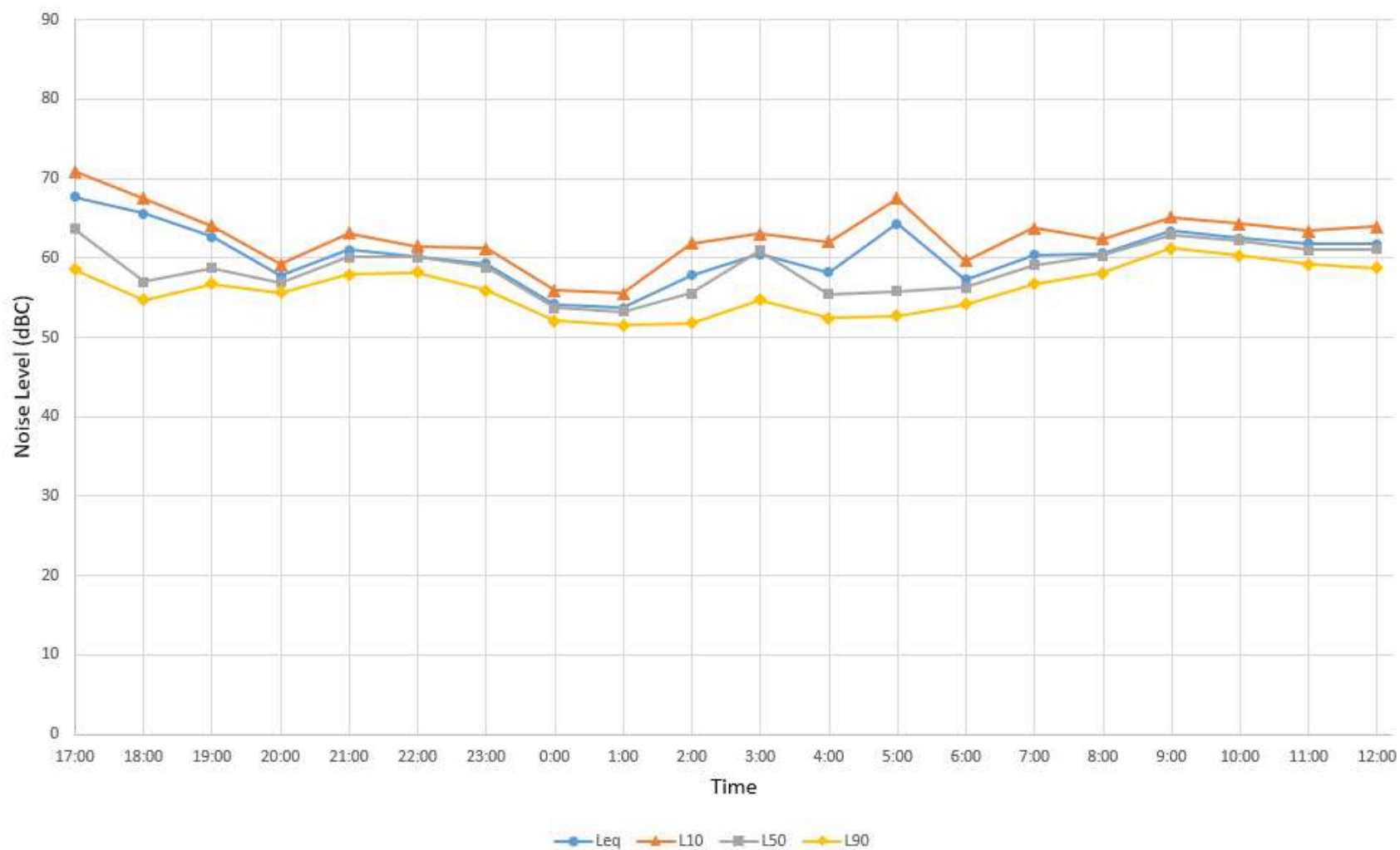


Figure B-6. Long-Term Noise Measurement Results, dBC, ML3



Appendix C. Long-Term A-Weighted L_{eq} Expanded Graphs

Figure C-1. 1-second A-weighted Leq, ML1, 3/19 (Day 1)

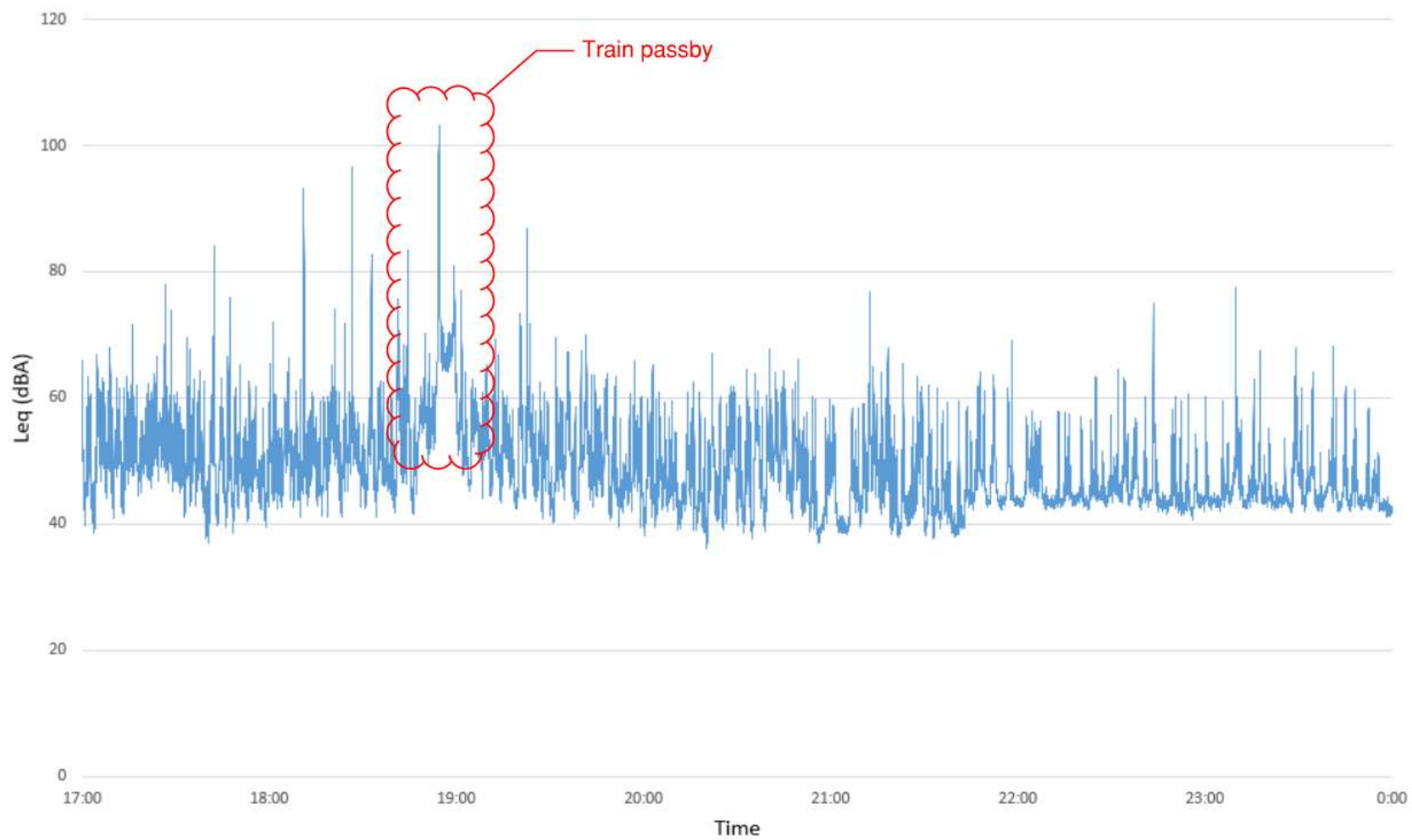


Figure C-2. 1-second A-Weighted Leq, ML1, 3/20 (Day 2)

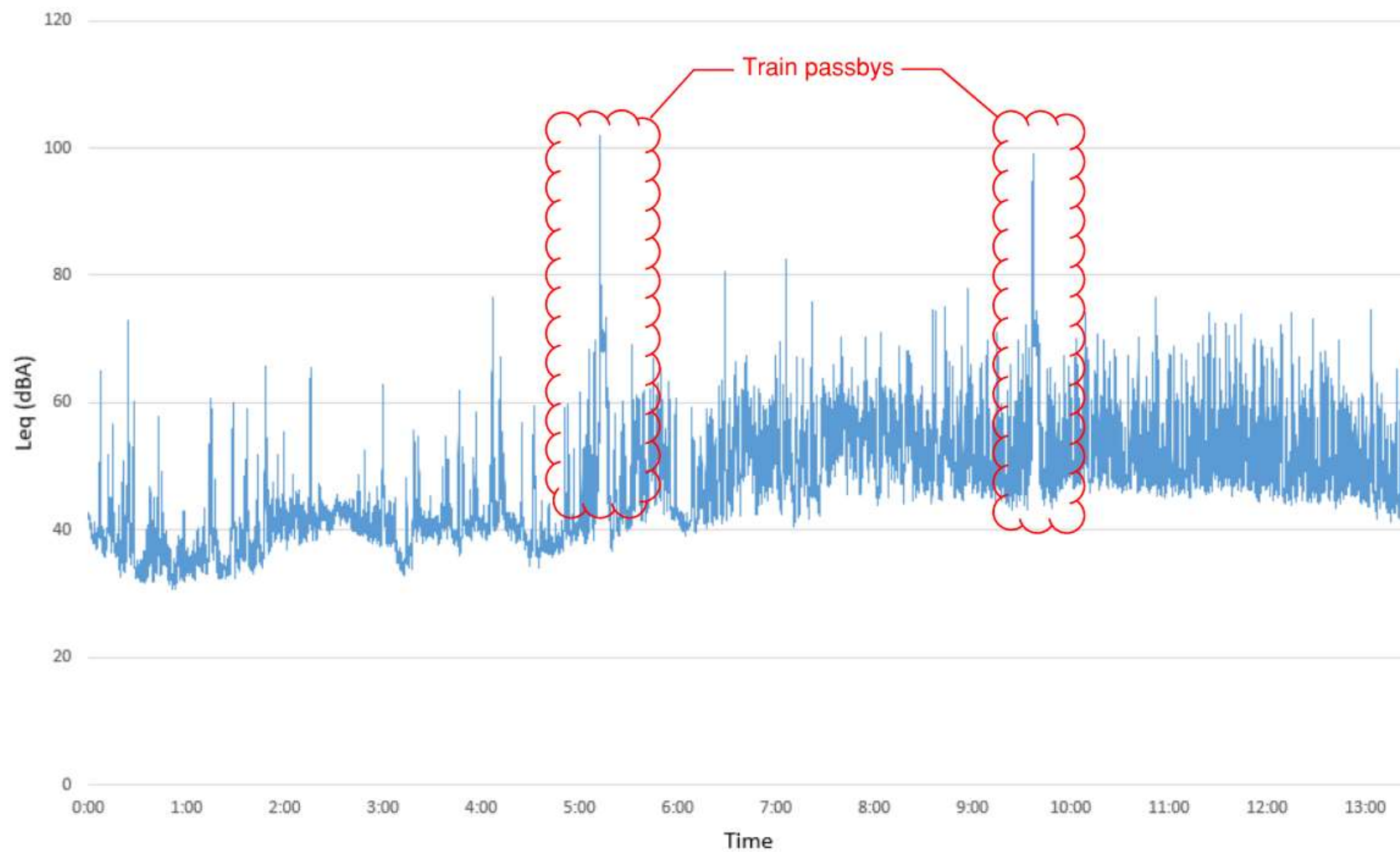


Figure C-3. 1-second A-Weighted Leq, ML2, 3/19 (Day 1)

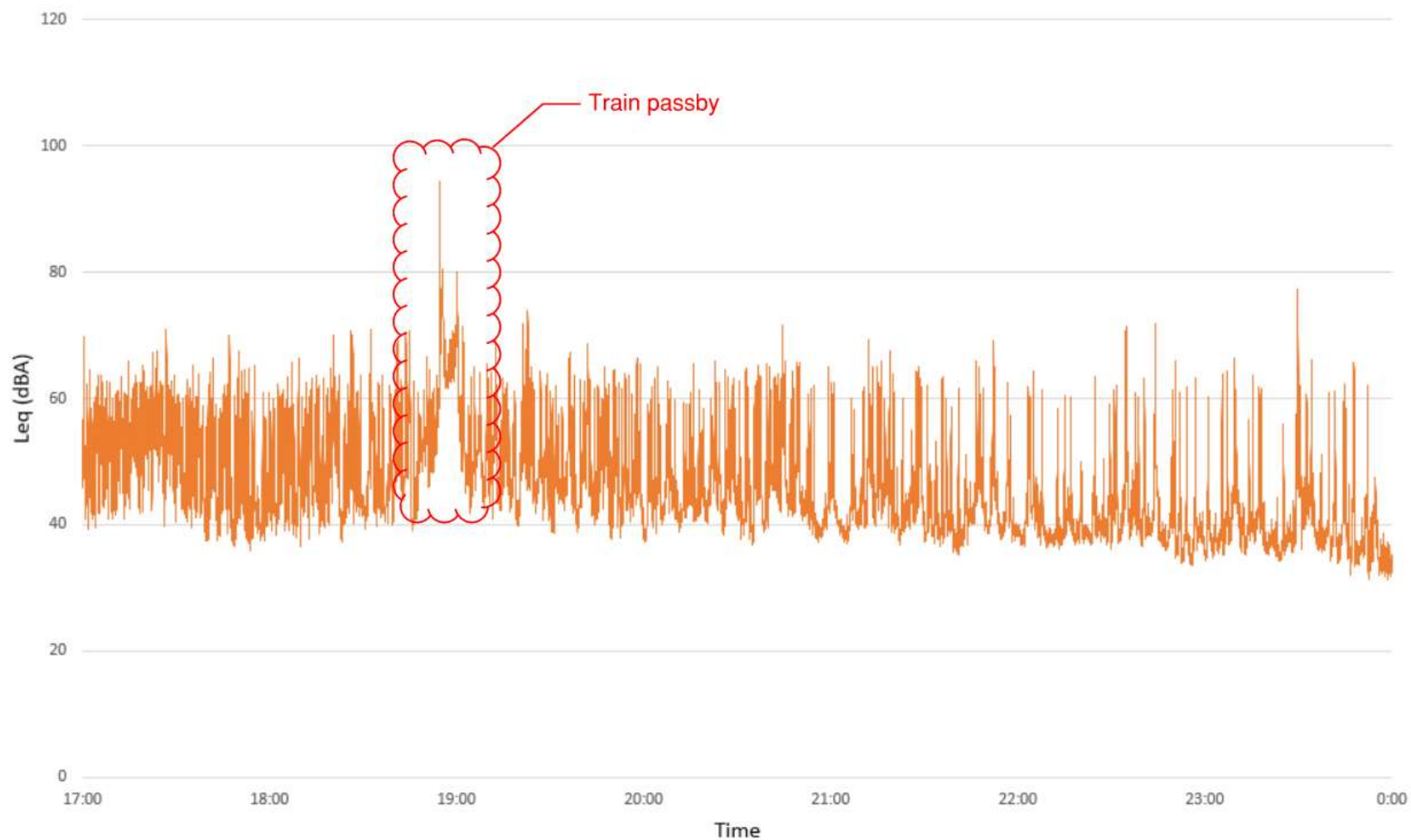


Figure C-4. 1-second A-Weighted Leq, ML2, 3/20 (Day 2)

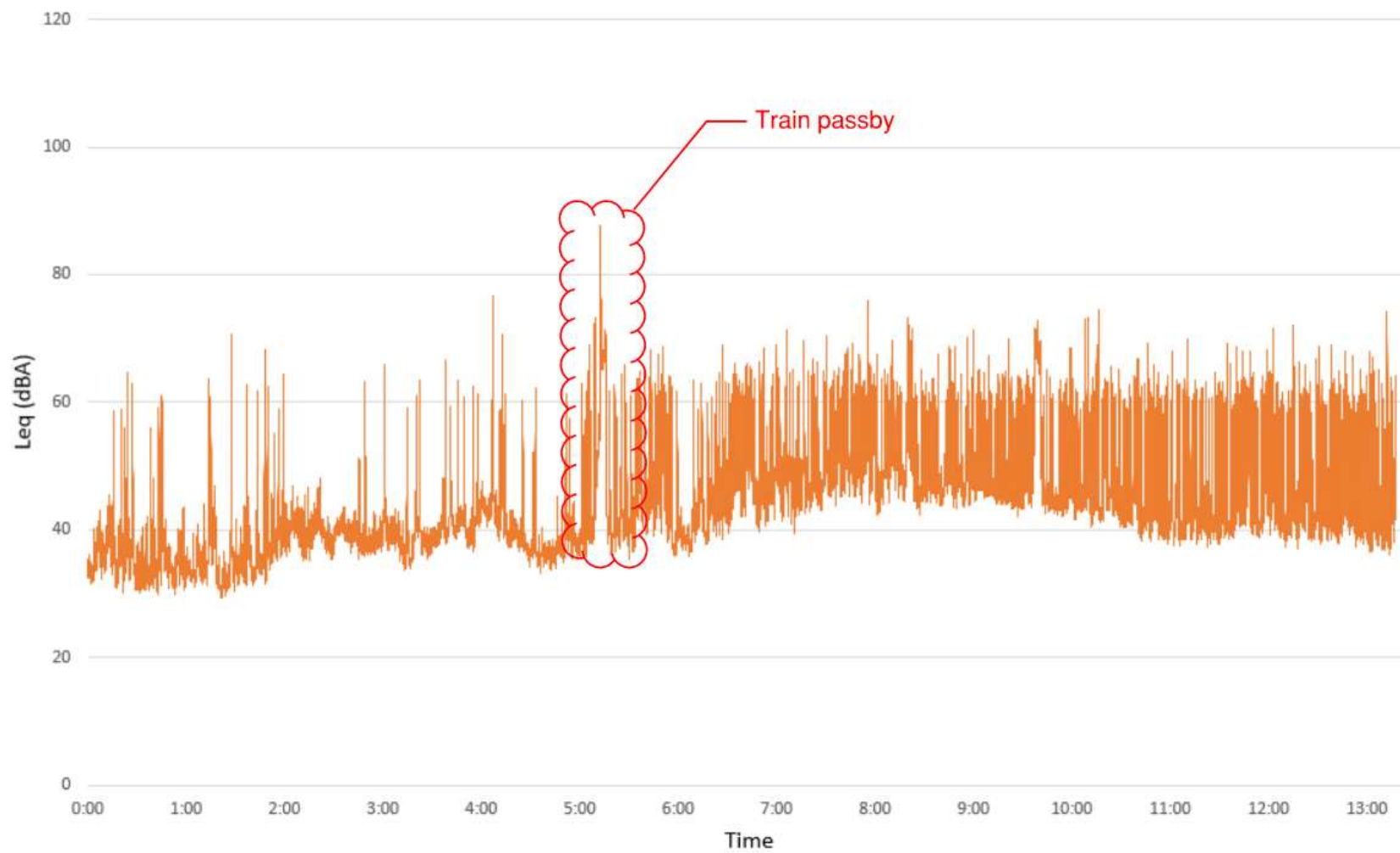


Figure C-5. 1-second A-Weighted Leq, ML3, 3/19 (Day 1)

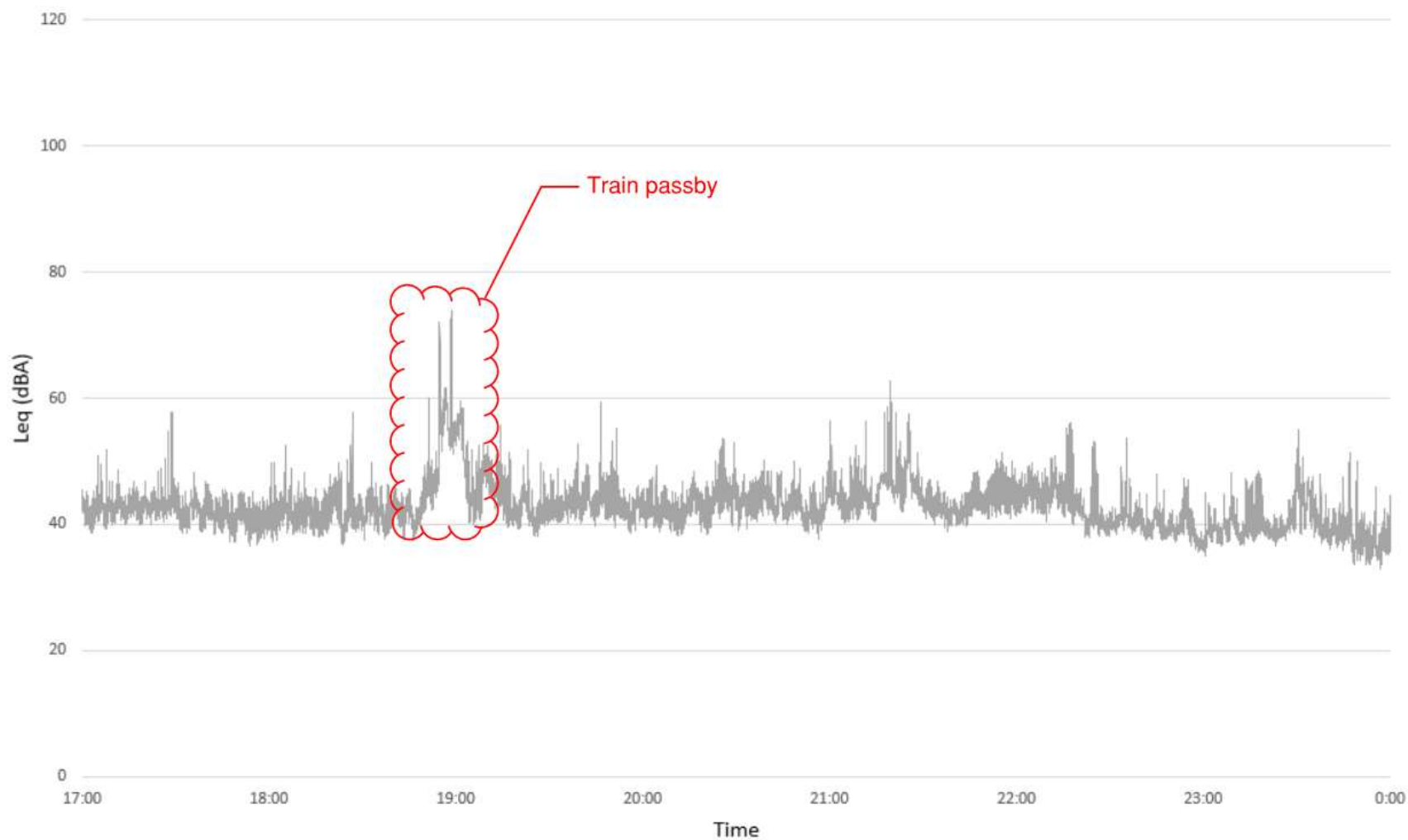


Figure C-6. 1-second A-Weighted Leq, ML3, 3/20 (Day 2)

