APPENDIX B:
NOISE BASELINE STUDY
RWDI

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Canadian Environmental Assessment Agency

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DRAFT REPORT

AMI PROJECT ENVIRONMENTAL - BASELINES SERVICES

NORTHWEST, ONTARIO

NOISE BASELINE STUDY

RWDI #1701998

November 23, 2017

SUBMITTED TO

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1 INTRODUCTION AND FACILITY DESCRIPTION

Palmer Environmental Consulting Group Inc. has retained RWDI to conduct a baseline study of environmental noise for the proposed AMI Mine located in the Kenora Mining Division and the Dryden District, approximately 40 km southwest of Ignace, Ontario. The proposed AMI mine is expected to produce an estimated 1.9 million tonnes per year of DR-grade pellets from 8 million tonnes of crude ore. Operations at the project will include a mine, a coarse crusher, a fine crusher, a dry cobber, concentrator circuit, pelleting plant and support facilities.

2 ENVIRONMENTAL NOISE

Environmental sound levels vary continuously over time. To account for both daily and short-term variations in sound levels, several single numerical descriptors have been developed based on large-scale psycho-acoustic studies of annoyance with environmental noise. These allow sound monitoring to be conducted for a constantly varying sound environment over an extended period, with the results described as a single number that accurately describes the sound environment.

The single number descriptor commonly used in most international standards for environmental sound measurements is the energy equivalent sound level (L_{EQ}). The L_{EQ} is the steady, continuous sound level that has the same acoustic energy as the actual varying sound levels over a given period of time. The L_{EQ} is expressed in terms of A-weighted decibels (dBA). The A-weighting accounts for the frequency response of the human ear, which does not perceive all frequencies of sound equally.

The descriptors specific to this study are $L_{EQ\ 1\text{-}hr}$, L_{MAX} and L_{MIN}. The $L_{EQ\ 1\text{-}hr}$ is the 1-hour A-weighted energy equivalent sound level, referred to hereafter as the hourly sound level. The L_{MAX} is the maximum instantaneous sound level experienced during the hour. The L_{MIN} is the minimum instantaneous sound level experienced during the hour

Ranges of typical everyday sounds are presented in Table 1.

Table 1: Typical Ranges of Commonly Encountered Sound Levels

Sound Level	dBA	Common Everyday Sources
Deafening	120	Threshold of pain
	115	Maximum noise level at a hard rock concert
	110	Accelerating motorcycle at 1 m
	105	Loud auto horn at 3 m
Very Loud	100	Dance club; Maximum human vocal output at 1 m
	95	Jackhammer at 15 m
	90	Inside a noisy factory
	85	Heavy truck pass-by at 15 m
Loud	80	School cafeteria; Noisy bar
	75	Near edge of major highway; Inside automobile travelling at 60 km/h
	70	Vacuum cleaner at 1.5 m
	65	Normal human speech, i.e., an un-raised voice, at 1 m
Moderate	60	Typical background noise levels in a large department store; Hair dryer
	55	Running tap water
	50	Clothes dryer; Air conditioner
	45	Typical background noise level in an office caused by HVAC; Flowing stream
Faint	40	Typical background noise level in a library; EUB guideline for noise at 1.5 km
	35	Average whisper; Typical quiet outdoors
	30	Broadcast studio
	25	
Very Faint	20	Deep woods on a calm day
	15	
	10	
	5	Human breathing
	0	Threshold of hearing, i.e., quietest sound that can be heard

3 ASSESSMENT CRITERIA

The baseline noise assessment helps to establish noise limits for the proposed future mining operation. The approach is based on the MOECC's Environmental Noise Guide, NPC-300. The area surrounding the proposed AMI mine is representative of a what is known as a Class 3 area, i.e., typical of an acoustic environment dominated by the sounds of nature and infrequent human activity. The NPC-300 sound level limits for receptors in Class 3 areas are outlined as follows:

- The higher of 45 dBA or background noise, during the daytime hours (0700-1900h);
- The higher of 40 dBA or background noise, during the evening hours (1900-2300h); and
- The higher of 40 dBA or background noise, during the night-time hours (2300-0700h).

Long-term ambient monitoring was used to determine if background sound levels in the area are higher than the NPC-300 default limits. The results of the background ambient monitoring are summarized in Section 4.

4 BASELINE SOUND LEVEL ASSESSMENT

The basic procedures for the baseline assessment consists of long-term background sound level measurements near the Project, validation of measured hourly data based on weather information, and comparing the validated lowest hourly sound level data to the default guideline limits.

Long-term measurements of background ambient sound levels were conducted from August 15, 2017 to August 24, 2017, at two separate locations near the project site. These locations, defined as Site 1 and Site 2 within this report, are illustrated in Figure 1. All measurements were conducted in accordance with the applicable requirements of MOE Publication NPC-103 (MOE, 1977b).

4.1 Equipment

Sound level readings were obtained using a Larson-Davis Model 820 precision integrating sound level meters, configured to log L_{EQ} (15 minute) levels during the monitoring. Measured 15-minute L_{EQ}, L_{MIN}, and L_{MAX} were converted to their respective 1-hour metrics prior to analysis. These units meet IEC 61672 (IEC, 2002) Class I sound level meter requirements, and Ontario Ministry of the Environment Publication NPC-102 requirements (MOE, 1977a). The sound level meters were field-calibrated at the beginning and end of measurements to ensure accuracy for all monitoring events.

Each microphone was mounted on a tripod, with the microphone located approximately 1.5 m above grade. Environmental microphone kits were used to provide protection from wind and rain. Each kit includes a wind screen with bird spikes to reduce wind noise and interference from birds. Desiccant was used to sustain dryness of the environmental kit to prevent damage from rain.

Weather data were recorded on site for parts of the monitoring program, and used to validate data from the nearest Environment Canada meteorological station located in Dryden, Ontario. This station recorded wind speed, wind direction, temperature and relative humidity on an hourly basis.

4.1.1 Data Validation

Data collected from the sound level meters were analyzed to determine the baseline conditions. Only data with meteorological conditions complying with the MOECC's NPC-103 criteria during the measurement period have been used in the analysis of background sound levels. Acceptable meteorological conditions are shown in Table 2.

Table 2: Acceptable Meteorological Conditions

Parameter	Lower Limit	Upper Limit
Temperature	-20°C	40°C
Wind Speed	-	20 km/h
Relative	-	95 %
Precipitation	-	0 mm/hr

Periods of short duration high-level events resulting from the deployment and retrieval of the meters were excluded from the analysis.

5 BASELINE MONITORING RESULTS AND DISCUSSION

The study area is in a rural location outside a small northern community with low levels of human activity. Background ambient sound levels in remote areas are typically low, ranging from about 25 to 40 dBA. The sound at these levels from human activity would be described as being faint to very faint (see Table 1). These values are similar to those measured for the Project.

Table 3 details the lowest $L_{EQ\ (1hr)}$ background sound levels measured during the daytime, evening, and nighttime periods in relation to the NPC-300 guideline limits. In all instances, other than the evening period at site 2, the measured ambient sound levels are lower than the NPC-300 guideline minima; therefore, the NPC-300 guideline minima will be used as the sound level criteria for the detailed impact assessment of the proposed mining project.

Table 3: Baseline Monitoring Results

Monitoring Site	UTM Coordinates	Time of Day	Lowest L_{EQ} (1hr) (dBA)	NPC-300 Guideline Minima (dBA)	Resultant Limit (dBA)
Site 1	(563805, 5458250)	Day	22	45	45
		Evening	22	40	40
		Night	19	40	40
Site 2	(556514, 5463012)	Day	44	45	45
		Evening	42	40	40
		Night	19	40	40

Notes: *Daytime period – 0700-1900 hours*
Evening period – 1900-2300 hours
Nighttime period – 2300-0700 hours

Noise observed at Site 1 consisted predominantly of sounds of nature including wind, small animals, birds and crickets/insects. Sound levels at site 1 ranged from around 20 dBA to 49 dBA. There is little influence from human activity at this location, and most of this range is anticipated to be the result of wind on trees, and increased wildlife activity during the daytime. During the monitoring period the measured L_{MAX} varied from 22 - 57 dBA and the L_{MIN} from 18 - 35 dBA.

At Site 2, the daytime noise consisted primarily of adjacent vehicle passbys on the adjacent roadway. During passbys, vehicles are the dominant sound here. In lulls in traffic, the dominant sounds are those of nature, similar to those at Site 1. At this location, the difference between sound levels during the daytime, evening and nighttime were more noticeable having a diurnal pattern due to the variation in human/traffic activity throughout the day. During car passbys the L_{MAX} reached a level of around 75 dBA, and without any traffic the L_{MIN} was around 19 dBA.

Figures 2 through 3 graphically display the measured L_{EQ}, L_{MIN} and L_{MAX} for the duration of the study for both measurement locations. All data in this graph is based on a 1-hour interval.

6 CONCLUSIONS

This report has presented a summary of the current noise levels in the vicinity of the Project site. The noise measurement results indicate that the existing baseline sound levels did not exceed the Class 3 sound level limits as outlined in the MOE Publication NPC-300. Based on our review of the data, it appears that the existing baseline conditions are typical of Northwestern Ontario conditions.

7 REFERENCES

1. Ontario Ministry of the Environment (MOE), 1977a, Publication NPC-102 “Instrumentation”.
2. Ontario Ministry of the Environment and Climate Change (MOECC), 1978, Model Municipal Noise Control Bylaw, which includes Publication NPC-103 – Procedures, and Publication NPC-104 – Sound Level Adjustments.
3. International Electrotechnical Commission (IEC), 2002, IEC Standard 61672-1 “Electroacoustics – Sound level meters – Part 1: Specifications”
4. Ontario Ministry of the Environment and Climate Change (MOECC), August 2013, Publication NPC-300, *Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning*

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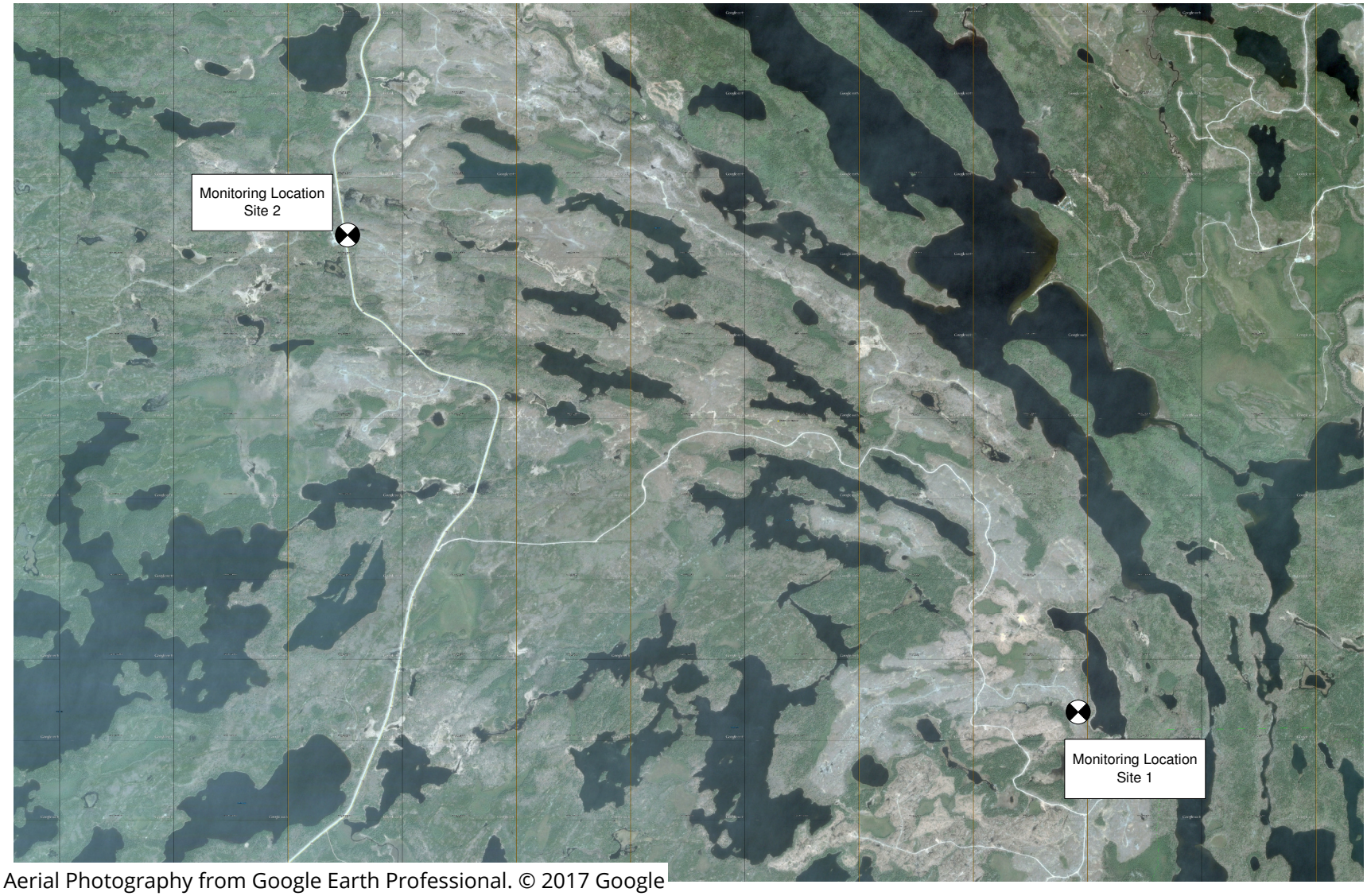
FIGURES



Area of Study and Monitoring Locations

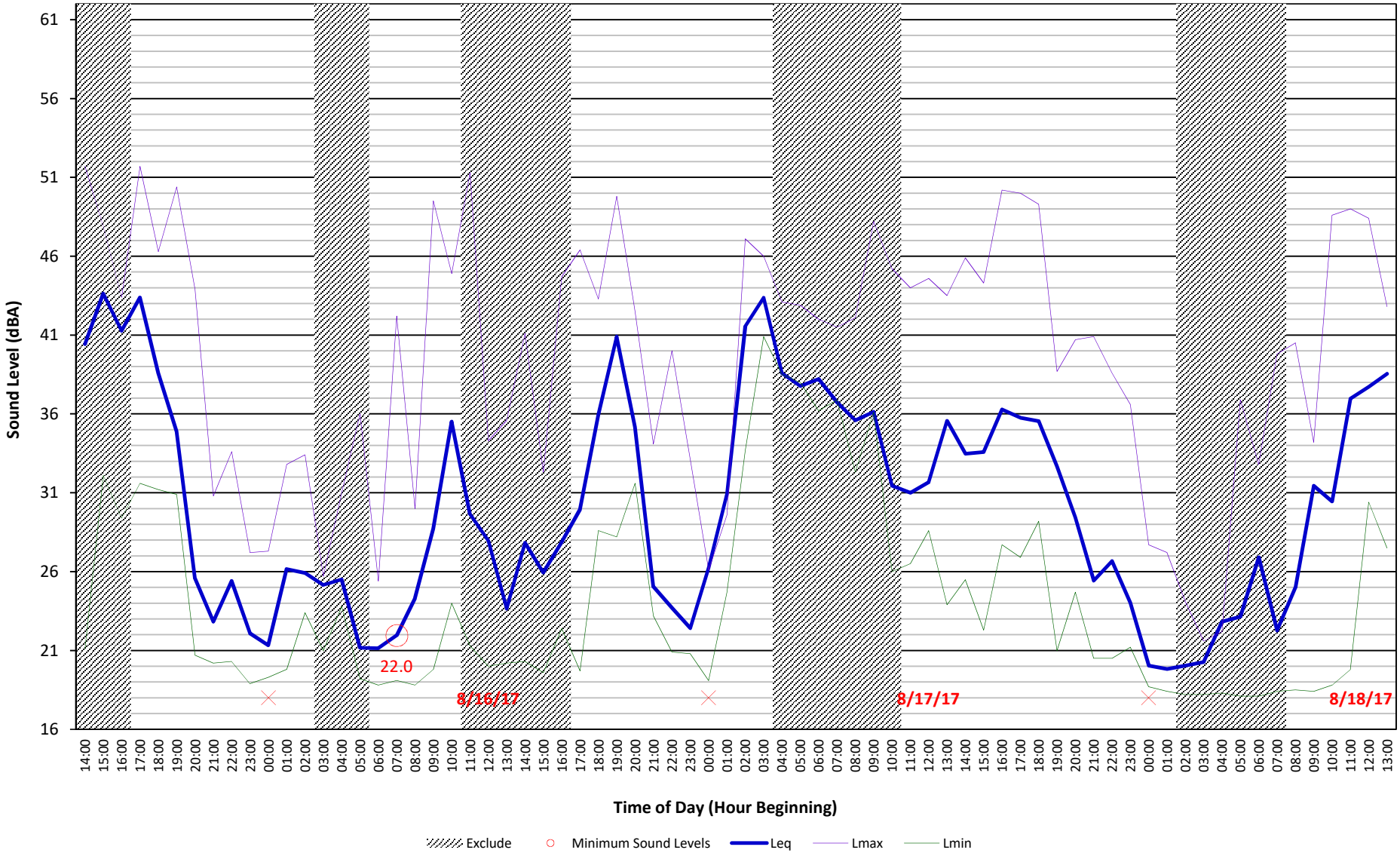
True North

Project #1700613

Drawn by: MMB	Figure: 1
Scale:	1:60000
Date:	Sept. 26, 2017

AMI Project - Northwestern Ontario

Long-Term Measurement Results
Site 1



Measured Ambient Sound Levels
From 15/08/17 to 18/08/17

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Figure No. **2a**

Date: Sep. 26, 2017

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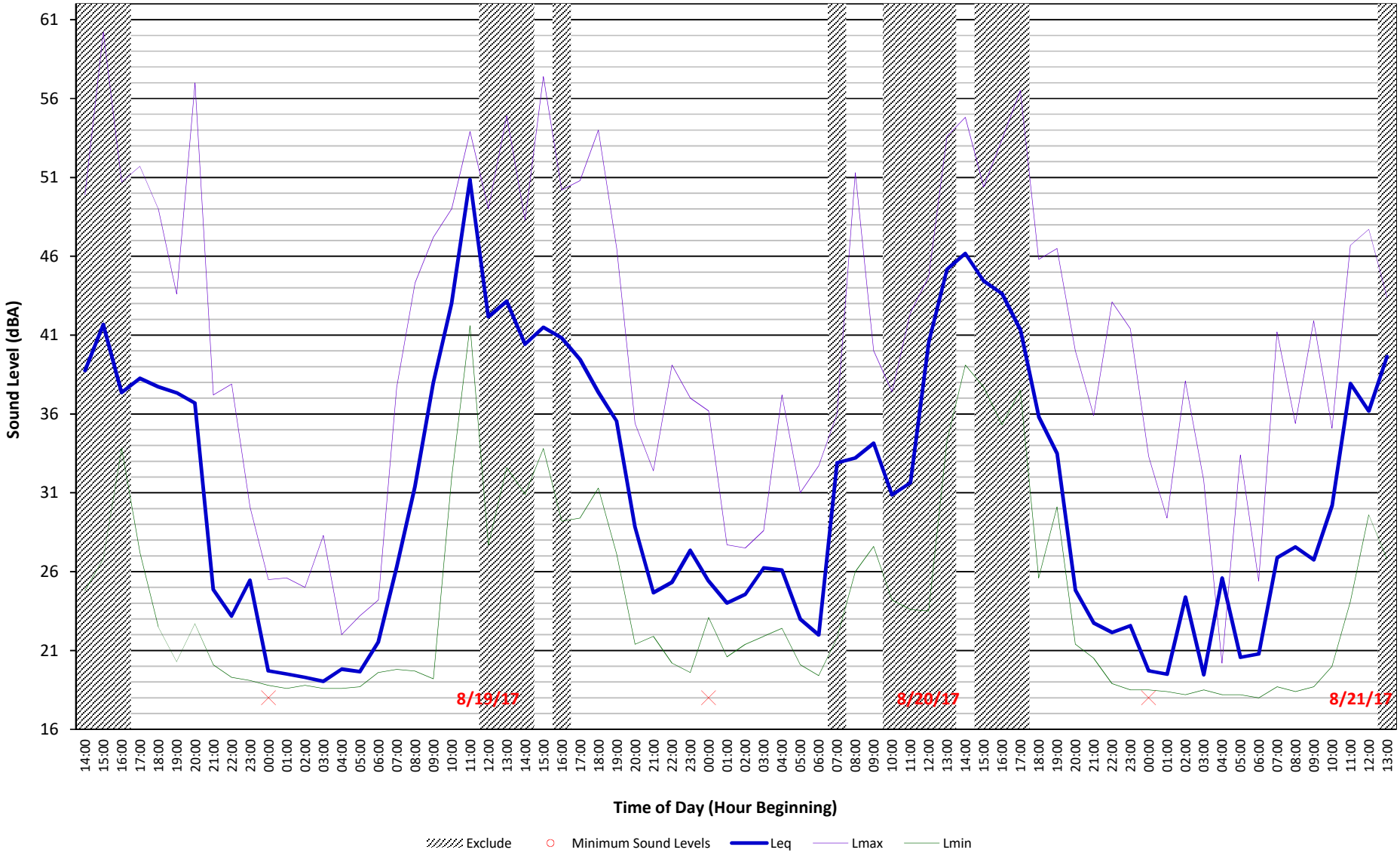
Long-Term Measurement Results
Site 1



Measured Ambient Sound Levels
From 18/08/17 to 21/08/17

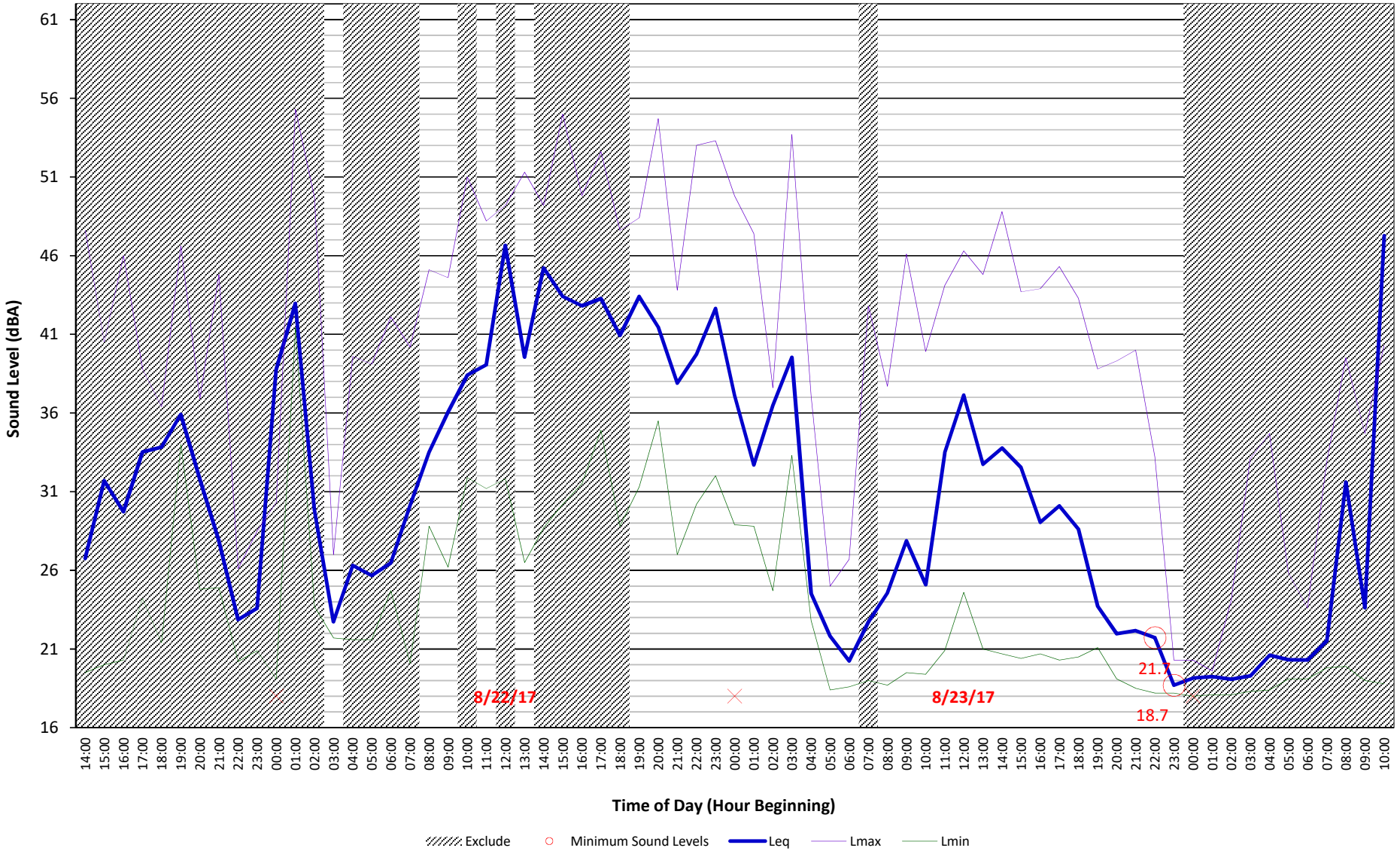
Project # 1701998

Figure No. **2b**

Date: Sep. 26, 2017

RWDI

Long-Term Measurement Results
Site 1



Measured Ambient Sound Levels
From 21/08/17 to 24/08/17

Project # 1701998

Figure No. **2c**

Date: Sep. 26, 2017

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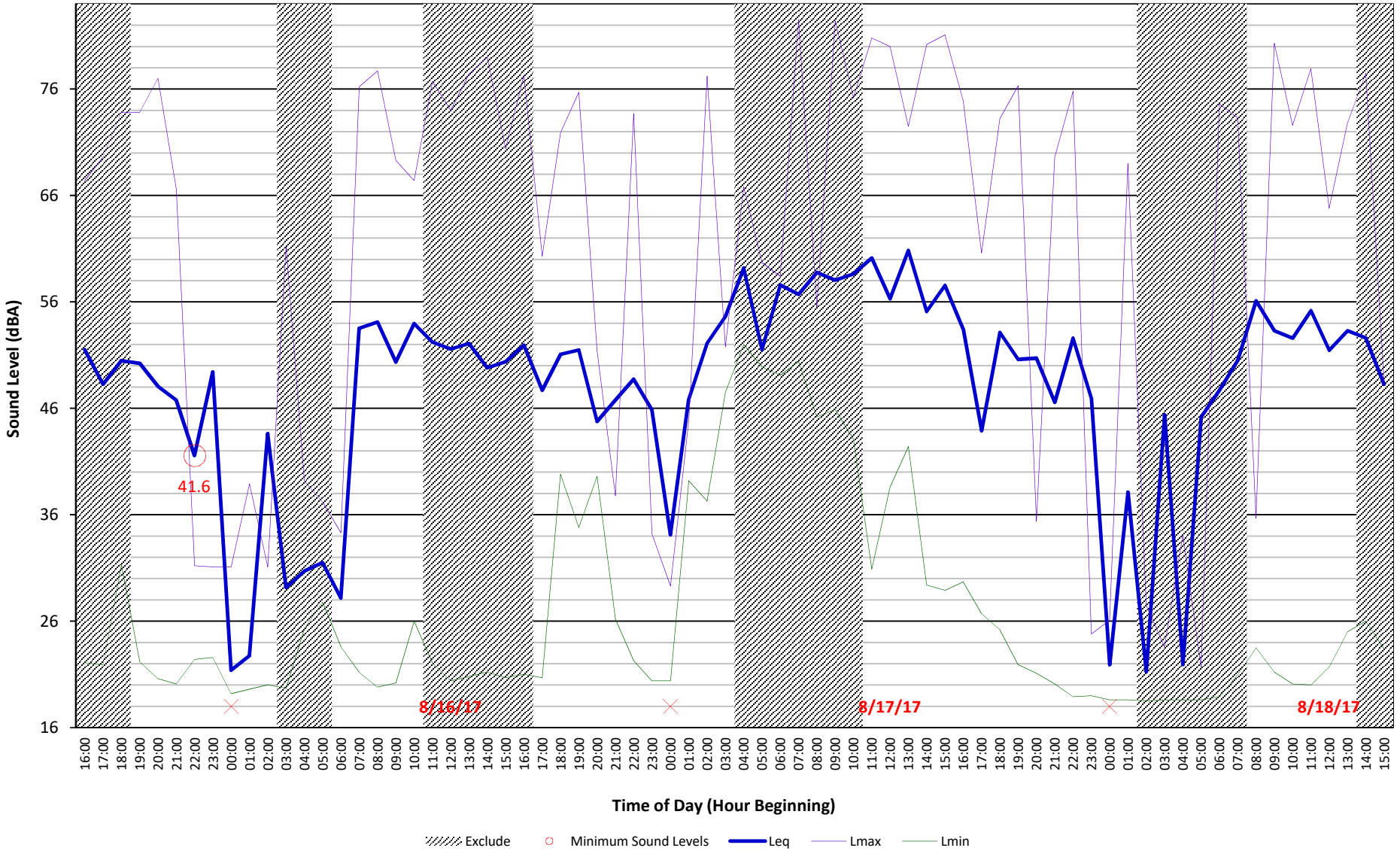
Long-Term Measurement Results
Site 2



Measured Ambient Sound Levels
From 15/08/17 to 18/08/17

Project # 1701998

Figure No. 3a

Date: Sep. 20, 2017

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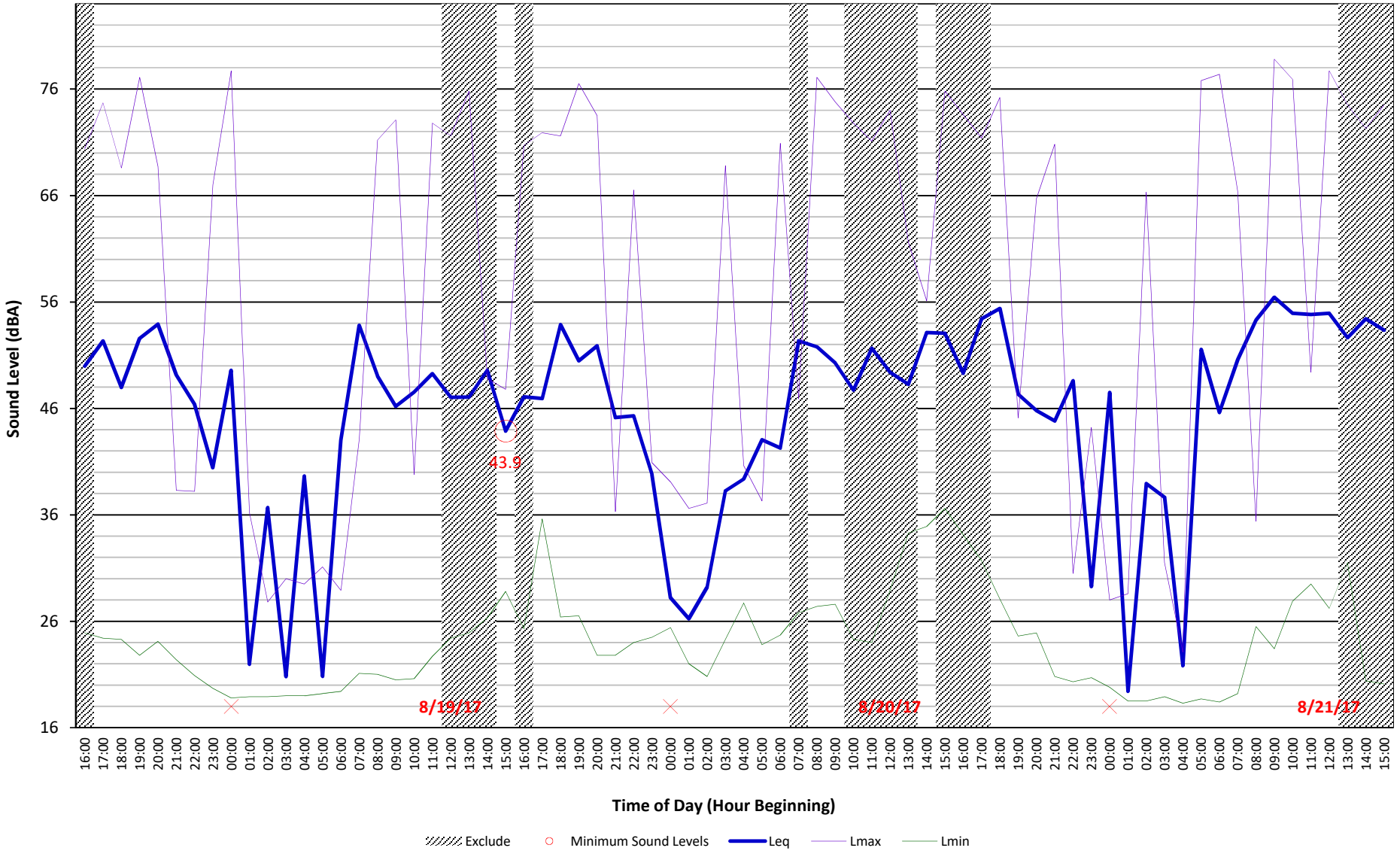
Long-Term Measurement Results
Site 2



Measured Ambient Sound Levels
From 18/08/17 to 21/08/17

Project # 1701998

Figure No. **3b**

Date: Sep. 20, 2017

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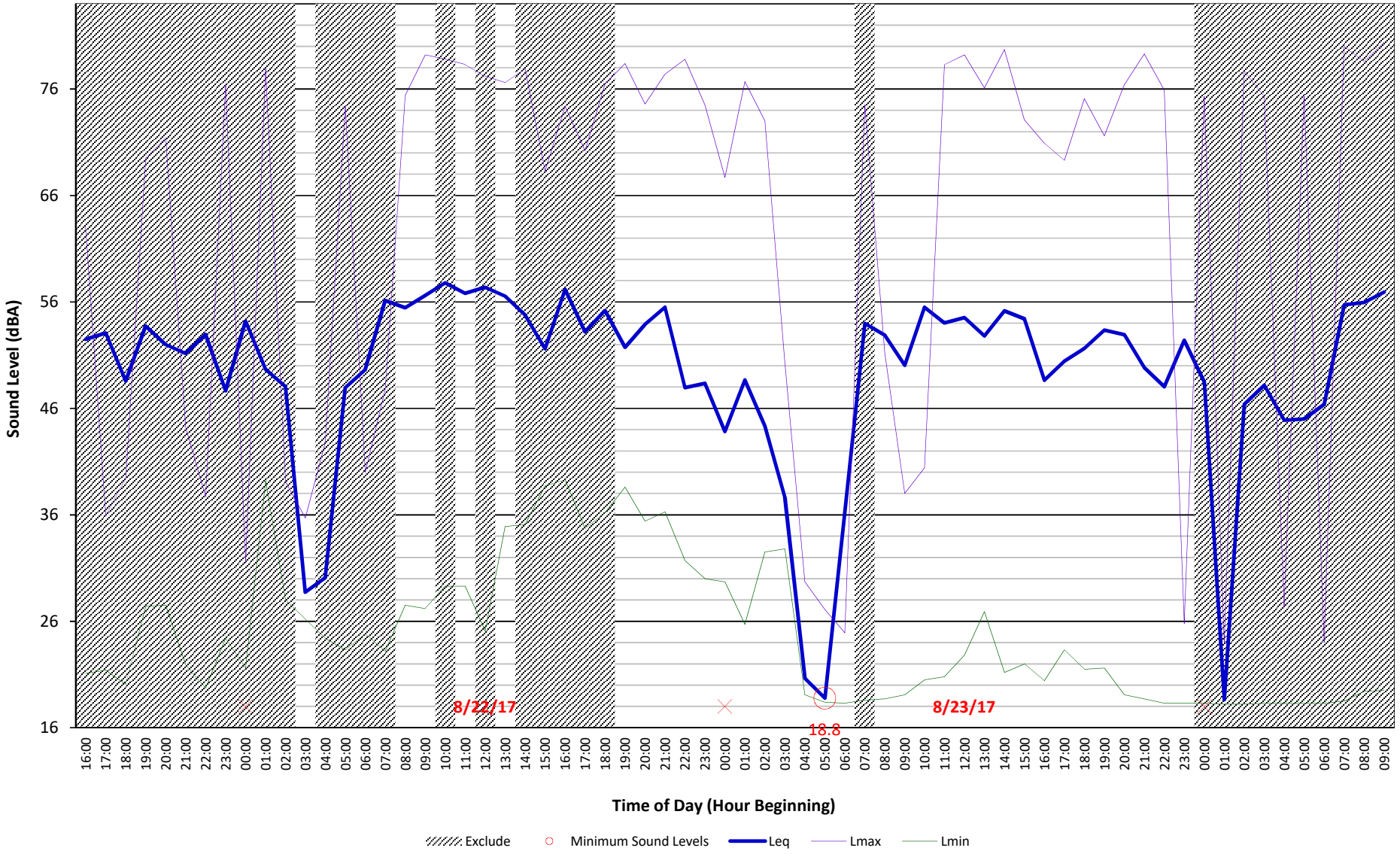
Long-Term Measurement Results
Site 2



Measured Ambient Sound Levels
From 21/08/17 to 24/08/17

Project # 1701998

Figure No. 3c

Date: Sep. 20, 2017

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