Northeast Capital
Industrial Association

NCIA Regional Noise Management Plan (RNMP) Report

(covering the 2020 Calendar Year)

Prepared for the

Albert Energy Regulator (AER)

And

The Alberta Utilities Commission (AUC)

October 27, 2021

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NCIA Regional Noise Management Plan (RNMP)

Annual Report to the Alberta Energy Regulator (AER) and

The Alberta Utilities Commission (AUC)

2021 (covering the calendar year 2020)

1 Executive Summary

Field validation measurements for the Regional Noise Model were completed in 2020 (conducted by ACI Acoustical Consultants Inc.). The 2020 field validation measurements are compared to the range of sound levels that can be expected (from the 2018 RNM version 2) due to varying weather conditions at each location. In general, the predictions are either in line with measurements, or over-predicting which can be expected due to the model assuming that all facilities are running with all noise sources. The exceptions to this are location 4, 6 and 13.

Location 4 is predicting a little low, possibly due to some equipment at Inter Pipeline's HPC facility that was operating, as they began some commissioning activity during this field sampling program. The IPL HPC facility noise model is not yet included in the Regional Noise Model.

Location 6 is predicting low. This location has traditionally always had predictions on the low end, but this year ACI's report also mentions an unusual and unknown high frequency noise that elevated the measured noise level during both nights at this location.

Location 13 is under predicting likely due to the absence of the Sturgeon Refinery in the regional model.

Measured versus modeled results for the 2020 field data are shown in Table 2 and Figure 2 and 3. A discussion of the results is presented in Section 3 of this report.

Figure 4 shows trend analysis that was completed for any location that had at least 4 years or more of data. Additional locations were added to the charts this year as they now have enough data to provide a trend. The results provide similar information to what has been seen previously. Some locations are trending upward, others downward and some are very consistent. When assessing the results as a whole, there is no conclusive upward or downward trend in the region – just local variances throughout the years.

2 AER Audits of NCIA Member Facilities

No Audits of NCIA member companies' Regional Noise Management Plans were conducted by AER in 2020.

3 2020 Monitoring results for Regional Noise Model (Appendix 1)

ACI Acoustical Consultants Inc., of Edmonton AB, was retained by the Northeast Capital Industrial Association (NCIA) to conduct an environmental noise survey within Alberta's Industrial Heartland (AIH). The purpose of the study was to conduct a single 48-hour noise monitoring at eleven (11) pre-specified locations within the AIH. An additional noise monitoring, spanning two (2) 48-hour periods, was conducted at a 12th monitoring location (referred to as Location 12) as an independent control/reference point. The noise monitoring was conducted in support of the NCIA's Regional Noise Management Plan. In addition, the results from these noise monitoring's will be used to validate the Regional Noise Level Assessment Model (the Regional Noise Model). All noise monitoring procedures and equipment used was in accordance with the requirements of the Alberta Energy Regulator (AER) Directive 038 on Noise Control. Site work was conducted for aci in June and, July 2020 by P. Froment, B.Sc., P.L.(Eng.).

As part of the study, a total of thirteen (13) 48-hour noise monitoring's were conducted throughout the Alberta's Industrial Heartland. In many cases, the weather conditions during the 48-hour time monitoring periods resulted in noise levels representing the low and high ranges of the typical noise climate of each noise monitoring location. As such, the isolated noise levels and 1/3 octave band Leq sound levels has greater variations when compared to previous years.

The noise levels at most locations consisted of low frequency components with occasional mid/high frequency components that could be attributed to the nearest facility relative to each individual noise monitoring location. Despite the noise being relatively low in frequency, none of the sites indicated any low frequency tonal components. The noise from train passages was again prevalent at all locations and tended to dominate the noise climate as they passed through, particularly during favorable weather conditions. This was particularly true for locations within proximity to a rail line and for locations further away from any of the large industrial sites.

The noise monitoring locations were the same for 2020 as in previous years and are shown in Table 1 and Figure 1 below. Complete details can be found in Appendix 1 of this report.

Measured versus modeled results are shown in Table 2 and Figures 2 and 3 below. Figure 4 below presents a multi-year trend analysis.

The results in Table 2 indicate some fairly large differences between measured and predicted sound levels at several locations. In previous assessments, it was noted that the field measured results often varied quite significantly between the two nighttime periods which made it difficult to draw conclusions on the data. Therefore, it was suggested that instead of comparing measured sound levels to predicted sound levels for a specific meteorological condition, it would be more meaningful to compare the measured levels to predicted levels based on a range of possible meteorological conditions.

The meteorological conditions used to define the extents of the predicted range are representative of temperature lapse conditions (calm wind with Pasquill Stability Class “b”), and temperature inversion conditions (calm wind with Pasquill Stability Class “F”). These represent the reasonable extremes of meteorological conditions that may exist at any given time in the region. The Case 3 model was run with these parameters to define the lower and upper limits of predicted sound levels at each monitoring location, and the measured sound levels are compared to these ranges, as shown in Figures 2.

Table 1
Monitoring Location Details

Monitoring Location	UTM Coordinates (Approximate)		Start Time	End Time
	Easting (m)	Northing (M)		
1D	355210	5954184	7/27/20 9:00	7/29/20 9:00
2	358256	5957216	7/27/20 9:00	7/29/20 9:00
3B	358361	5959283	7/27/20 9:00	7/29/20 9:00
4C	361665	5960870	6/24/20 12:00	6/26/20 12:00
5	361777	5964711	6/24/20 12:00	6/26/20 12:00
6	364322	5967894	6/24/20 12:00	6/26/20 12:00
8A	358897	5965430	6/24/20 12:00	6/26/20 12:00
9	355872	5957574	7/27/20 9:00	7/29/20 9:00
10	355925	5955818	7/27/20 9:00	7/29/20 9:00
11	358430	5963804	6/24/20 12:00	6/26/20 12:00
12B (1st 48-hour)	368223	5963070	6/24/20 12:00	6/26/20 12:00
12B (2nd 48-hour)			7/27/20 9:00	7/29/20 9:00
13	358667	5970180	6/24/20 13:00	6/26/20 13:00

The complete report is included as Appendix 1 of this report.

Figure 1: NCIA Regional Noise Monitoring Locations (as per Table 1)

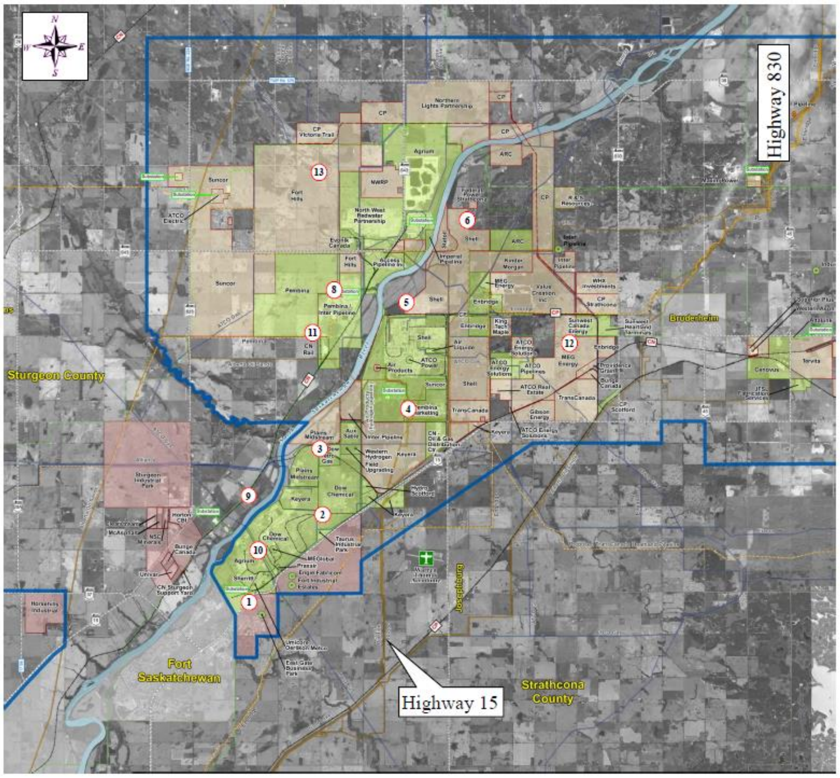
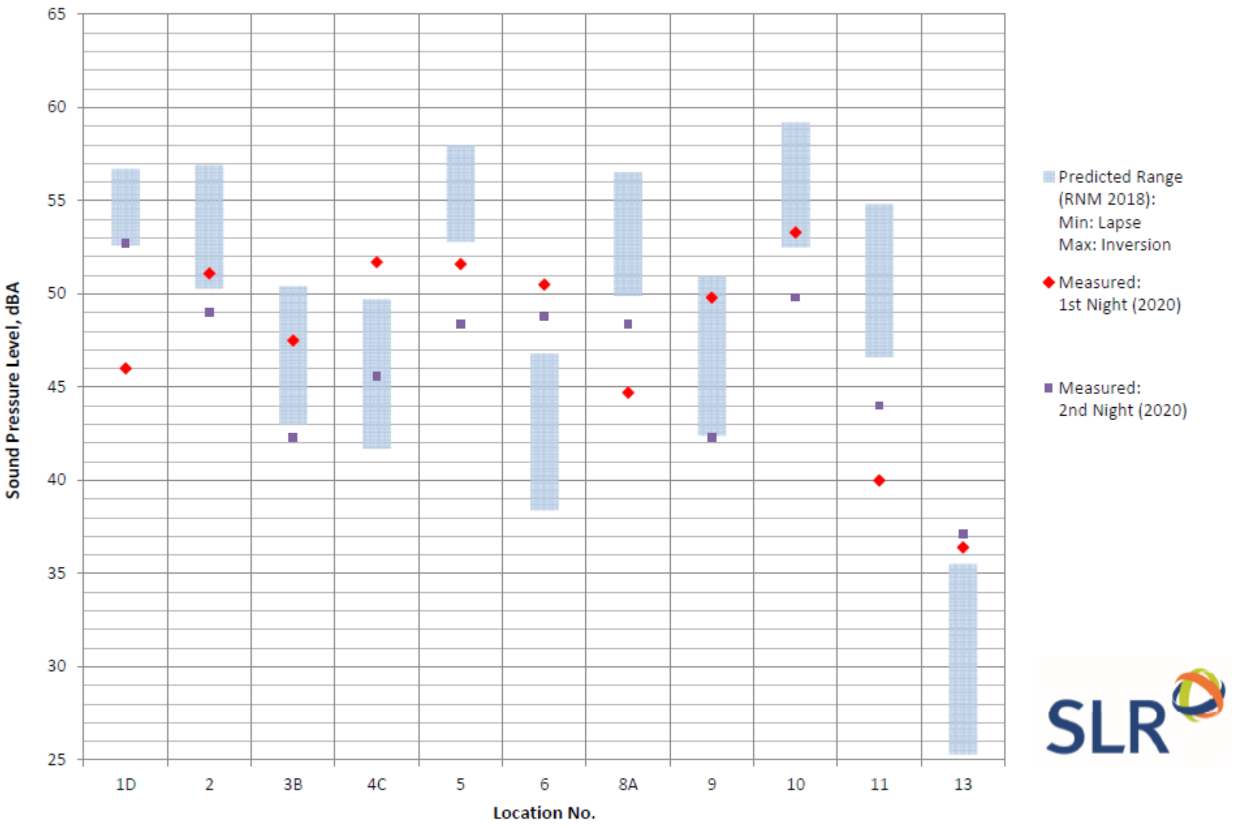


Table 2
Comparison of Measured versus Modelled (predicted) results for 2020

Location	1st Nighttime Period			2nd Nighttime Period			Average Difference (dBA)
	Measured	Predicted	delta (Predicted - Measured)	Measured	Predicted	delta (Predicted - Measured)	
1D	46.0	53.5	7.5	52.7	56.4	3.7	5.6
2	51.1	53.4	2.3	49.0	54.4	5.4	3.9
3B	47.5	47.7	0.2	42.3	43.4	1.1	0.7
4C	51.7	41.7	-10.0	45.6	48.4	2.8	-3.6
5	51.6	58.1	6.5	48.4	52.9	4.5	5.5
6	50.5	45.1	-5.4	48.8	37.1	-11.7	-8.6
8A	44.7	54.6	9.9	48.4	54.5	6.1	8.0
9	49.8	49.1	-0.7	42.3	42.5	0.2	-0.2
10	53.3	56.7	3.4	49.8	55.0	5.2	4.3
11	40.0	46.2	6.2	44.0	54.7	10.7	8.5
12B (1st 48 hour)	41.4	31.0	-10.4	34.4	22.2	-12.2	-11.3
12B (2nd 48 hour)	37.8	22.6	-15.2	43.7	28.3	-15.4	-15.3
13	36.4	33.2	-3.2	37.1	30.4	-6.7	-5.0

Figure 2: Predicted Range versus Measured Sound Levels (2020)



For the 2020 comparison, the model over-predicts the noise level at receptors 1D, 5, 8A, and 11 by about 7 dBA on average. It under-predicts the noise levels at receptors 6 and 13 by a similar amount. The model also under predicts Location 12 as well. Locations 2, 3B, 4C, 9 and 10 were reasonably well predicted by the model. Location 13 is affected by the Sturgeon Refinery, which is not included in the Existing Case regional model yet. Additionally, IPL's HPC facility is not included in the regional model yet either. Based on the predicted range (Figure 2 above) the agreement between measured and modeled results is reasonable given this type of model and the many variables that affect measurements in the field.

There were a significant number of facility turnarounds this year as well, and while every effort is made to ensure that facilities are operating near normal during the field measurements, that may not always be the case.

Figure 3: Comparison of 2020 Field Measurements to Model Predictions

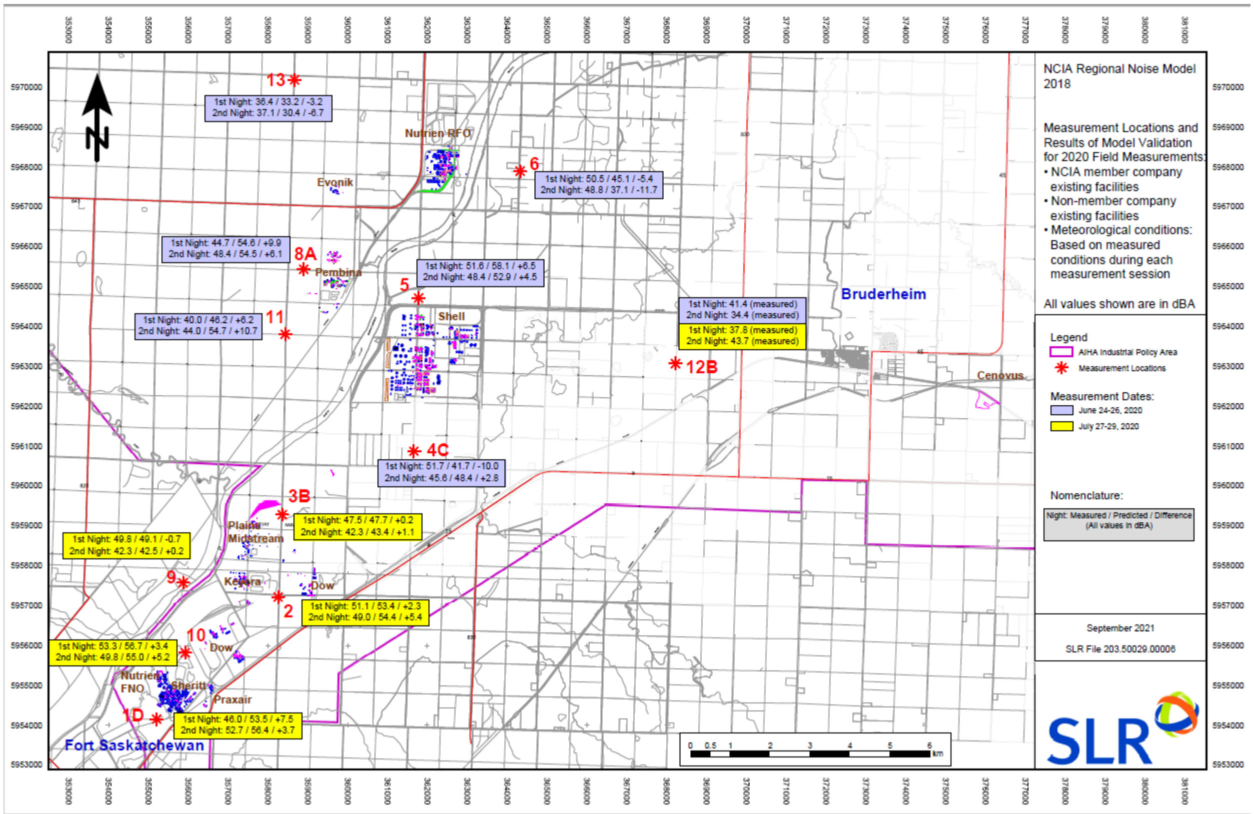
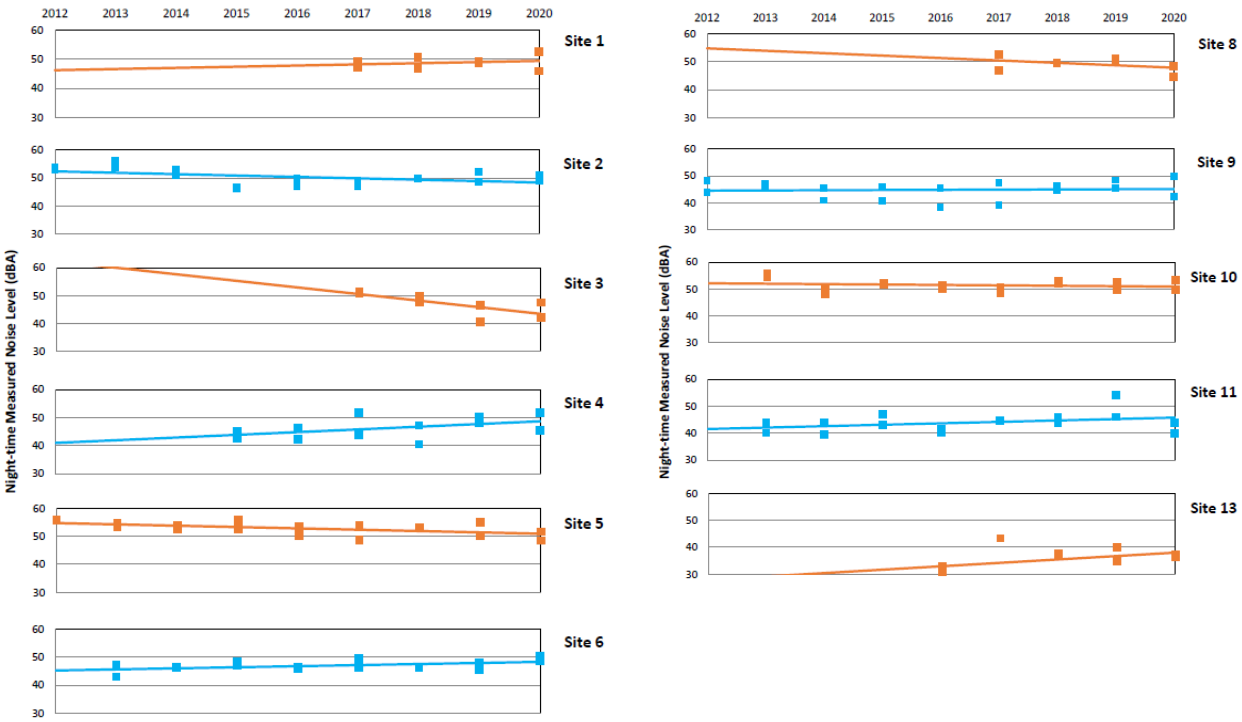


Figure 4: Trend Analysis of Measured Data (2012 to 2020)



As we saw for the previous trend report the data is trending up in some locations and down in other. There is no clear trend in noise levels across the region.

4 NCIA Member Compliance

Table 3 summarizes the compliance requirements for NCIA member and non-member companies' vis-a-vis the NCIA RNMP.

Table 3
Compliance Requirements for NCIA Member Companies

NCIA Member	AER Regulated	RNMP Participant	Compliance Vehicle
Yes	Yes	Yes	NCIA - RNMP
No	Yes	No	AER to Determine
Yes	No	No	Municipality/AEP
Yes	No	Yes	NCIA - RNMP
No	No	Yes	Potential NCIA-RNMP
No	No	No	Other Regulatory Jurisdictions

As of this date, Table 4 summarizes the NCIA member companies and their status with respect to Table 3 above. Complete details can be found in Appendix 2.

Table 4

Summary of NCIA Member Company Information for RNMP

NCIA Member[1]	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2020 (Appendix 2)	Developed a Site Noise Management Plan
Air Liquide Canada	Not regulated	Yes	Yes
Aux Sable Canada	Regulated under Section 11 of the OSCA and therefore D-038.	No	Yes
Conifer Energy (formerly ACCEL Energy)	AER regulated under Noise Control Directive 038.	Yes	Not Yet
Cenovus Energy	Not regulated	Yes	Yes
Chemtrade West	Not regulated	Yes	Yes
Dow Chemical Canada	Regulated under D-038 Operator No. 0F05	Yes	Yes
Enbridge Pipelines	Is regulated	Yes	Yes
Evonik	Not regulated	Yes	Yes
Inter Pipeline HPC	Not Regulated	Yes	Not Yet
Keyera Corp.	Regulated under D-038 Operator No. A5W1 LSD - 02-14-055-22W4 Facility No. F-12695	Yes	Yes
MEG Energy	Has no noise generating assets in the region now	Covered by Wolf Midstream	Covered by Wolf Midstream
MEGlobal	Not regulated	Included with Dow's submission	Yes
North West Redwater Partnership	Is regulated. LSD - E1/2-18-56-21-W4M	No	Yes
Nutrien Fort Saskatchewan	Not regulated	Yes	Yes
Nutrien Redwater	Not regulated	Yes	Yes
Oerlikon Metco (Canada)	Not regulated	Yes	Yes
Pembina NGL Corporation	Regulated under D-038	Yes	Yes

NCIA Member[1]	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2020 (Appendix 2)	Developed a Site Noise Management Plan
Plains Midstream Canada	Regulated under D-038 Operator No. 60 LSD - 14-55-22 W4M Facility No. 12699	Yes	Yes
Linde Canada (formerly Praxair Canada)	Not regulated	No	Partly
Shell Chemicals	Not regulated	Yes	Yes
Shell Refinery	Regulated under Section 11 of the OSCA and therefore Noise Control Directive 038. AER Approval No. 11640.	Yes	Yes
Shell Upgrader	AER Approval No. 8522 regulated under D-038.	Yes	Yes
Sherritt International	Not regulated	Yes	Yes
Umicore Canada	Not regulated	Yes	Yes
Value Chain Solutions[2]	Not operational. Will be regulated.	No	No
Wolf Midstream	AER regulated under Noise Control Directive 038.	Yes	Yes

[1] **Bold** type in the above table signifies that these members have operational assets on the ground within Alberta's Industrial Heartland.

[2] Not a member of NCIA currently.

5 Regional Noise Model General

5.1 ***Improvements/Corrective Actions implemented in 2020/21*** *(Appendix 2)*

1. Conifer Energy – Installation of new standalone incinerator for sales oil truck loading operation. A noise model was completed for this by Motive Acoustics and is included in Appendix 2. No significant offsite noise impact results from this new incinerator.
2. Keyera – Following the installation and commissioning of a new hot oil heater, new glycol boiler and new MCC building, an update to the NIA was completed in 2020. The results of the assessment indicated that the facility is expected to meet the no-net noise increase from baseline. The updated site model will be incorporated into the Regional Noise Model update in 2023.
3. Nutrien Redwater – Sound barriers were installed in the 30# steam vents in the spring of 2021. This may reduce the noise level from the site. Silencers were also installed in the Nitric Acid Process Unit during the summer of 2021 on the compressor kickback line, as well as the centrifugal air compressor discharge vent line (CVM exit vent line). This should reduce the noise level. The compressor/gas turbine (CGT-902) replacement project will be completed in 2021 and should result in decreased environmental noise.
4. Pembina – Final measurements required for RFS II/III to finalize model from theoretical to actual. Work was postponed due to Covid-19 site restrictions. Expect to complete this work in 2021 to finalize the site noise model for inclusion in the Regional Noise Model update in 2023.
5. Plains Midstream – Construction activities commenced on the installation of new pumps to support cavern storage. The new pumps did not commence operations in 2020. The new pumps may result in changes that require the facility to update its site noise model. If that is required, it will be done in conjunction with the next Regional Noise Model update, currently planned for 2023.

5.2 ***Noise Complaints in 2020*** *(Appendix 2)*

1. Nutrien Redwater – There was one noise complaint for the Redwater facility in 2020. A neighbour north of the plant site phoned in a noise complaint. Nutrien personnel confirmed that the source of the noise was the bird cannon used on the Phosphogypsum stack. The neighbour was contacted and informed of the noise source and the requirement for the bird cannon. No further follow-up was required.
2. Dow – Received two calls on August 31, 2020 related to thumping/noise of new LHC flare tip during startup after the flare tip replacement. There were no other noise complaints related to the Dow or MEGlobal operations at the site in 2020.

5.3 Other Items for Follow-up Based on 2020 Field Measurements

1. The NWR Sturgeon Refinery not yet included in the Existing Case RNM (that will change for the next RNM update in 2023, delayed by one year owing to Covid-19 restrictions).
2. The IPL Heartland Petrochemical Complex that is not yet included in the RNM but will be for the next update in 2023.
3. We will continue to conduct annual field monitoring and compare it to the RNM predicted ranges.
4. As noted with the trend analysis, Figure 4 of this report, there is no clear trend (up or down) of measured noise levels in the region.

5.4 Next Steps for 2021/2022

1. Mostly captured in Section 5.1 above.
2. Inter Pipeline HPC Facility – Engaged SLR Consulting to complete a Noise Management Plan for their site (completed). SLR will also conduct noise validation measurements post startup in 2022 (likely spring of 2023) to update the site noise model. The updated site noise model will then be incorporated into the NCIA Regional Noise model update in 2023.
3. As noted, owing to Covid-19 issues, the next Regional Noise Model update has been delayed to 2023. At that time updated or new site models from the following will be included:
    a. Cenovus
    b. Conifer Energy
    c. Dow
    d. Inter Pipeline HPC
    e. Keyera
    f. North West Redwater Partnership
    g. Nutrien Redwater
    h. Plains Midstream
    i. Shell

APPENDIX 1

2020 Regional Noise Model Annual Field Validation Monitoring Report

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www.aciacoustical.com

2020 Environmental Noise Survey

For The

Regional Noise Model Annual Field Validation Monitoring

Prepared for:
Northeast Capital Industrial Association

Prepared by:
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aci Acoustical Consultants Inc.
Edmonton, Alberta
APEGA Permit to Practice #P7735

01/25/2021

aci Project #: 20-030
January 25, 2021

Disclaimer

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Executive Summary

aci Acoustical Consultants Inc., of Edmonton AB, was retained by the Northeast Capital Industrial Association (NCIA) to conduct an environmental noise survey within Alberta's Industrial Heartland (AIH). The purpose of the study was to conduct a single 48-hour noise monitoring at eleven (11) pre-specified locations within the AIH. An additional noise monitoring, spanning two (2) 48-hour periods, was conducted at a 12th monitoring location (referred to as Location 12) as an independent control/reference point. The noise monitoring was conducted in support of the NCIA's Regional Noise Management Plan. In addition, the results from these noise monitoring's will be used to validate the Regional Noise Level Assessment Model (the Regional Noise Model). All noise monitoring procedures and equipment used was in accordance with the requirements of the Alberta Energy Regulator (AER) Directive 038 on Noise Control. Site work was conducted for aci in June and, July 2020 by P. Froment, B.Sc., P.L.(Eng.).

As part of the study, a total of thirteen (13) 48-hour noise monitoring's were conducted throughout the Alberta's Industrial Heartland. In many cases, the weather conditions during the 48-hour time monitoring periods resulted in noise levels representing the low and high ranges of the typical noise climate of each noise monitoring location. As such, the isolated noise levels and 1/3 octave band L_{eq} sound levels has greater variations when compared to previous years.

The noise levels at most locations consisted of low frequency components with occasional mid/high frequency components that could be attributed to the nearest facility relative to each individual noise monitoring location. Despite the noise being relatively low in frequency, none of the sites indicated any low frequency tonal components. The noise from train passages was again prevalent at all locations and tended to dominate the noise climate as they passed through, particularly during favorable weather conditions. This was particularly true for locations within proximity to a rail line and for locations further away from any of the large industrial sites.

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1.0 Introduction

aci Acoustical Consultants Inc., of Edmonton AB, was retained by the Northeast Capital Industrial Association (NCIA) to conduct an environmental noise survey within Alberta's Industrial Heartland (AIH). The purpose of the study was to conduct a single 48-hour noise monitoring at eleven (11) pre-specified locations within the AIH. An additional noise monitoring, spanning two (2) 48-hour periods, was conducted at a 12th monitoring location (referred to as Location 12) as an independent control/reference point. The noise monitoring was conducted in support of the NCIA's Regional Noise Management Plan. In addition, the results from these noise monitoring's will be used to validate the Regional Noise Level Assessment Model (the Regional Noise Model). All noise monitoring procedures and equipment used was in accordance with the requirements of the Alberta Energy Regulator (AER) Directive 038 on Noise Control. Site work was conducted for aci in June and, July 2020 by P. Froment, B.Sc., P.L.(Eng.).

2.0 Location Description

Alberta's Industrial Heartland (AIH) is located northeast of Edmonton, AB and extends into five different municipalities as indicated in Figure 1. This includes 533 km^2 within the City of Fort Saskatchewan and the Counties of Lamont, Strathcona and Sturgeon, in addition to 49 km^2 in the City of Edmonton's "Edmonton Energy and Technology Park". The area has 40+ companies in various sectors that include producing and processing oil, gas and petrochemicals in addition to advanced manufacturing.

Topographically, the AIH does have some varying elevation changes however in general it can be considered relatively flat with no substantial hills. Areas with more significant changes in elevation are found adjacent to the North Saskatchewan River (the River) which divides the AIH from the southwest to the northeast (excluding the AIH area within the City of Edmonton's limits). The vegetation varies from open grain fields to thick dense vegetation. Due to the relative distance from the noise monitoring locations to the nearby facilities (apart from Noise Monitor Location 12) and the relatively low frequency nature of the industrial noise, the level of vegetative sound absorption is considered negligible to low.

3.0 Measurement Methods

As part of the study, a total of thirteen (13) 48-hour noise monitoring's were conducted at 12 locations[1] throughout the AIH, as indicated in Figure 2. The monitoring's were conducted under summer conditions and tried to avoid times of precipitation and high wind-speeds based on weather forecasts.

Apart from Noise Monitor Location 1, all noise monitoring locations were identical to those conducted during the 2019 Noise Survey. The noise monitoring was conducted collecting broadband A-weighted and C-weighted as well as 1/3 octave band sound levels and were conducted during "typical" operations at all facilities[2]. In particular, the chosen noise monitoring periods avoided any major shut-downs or outages[3] of nearby facilities that could adversely affect the "typical" noise levels (either louder or quieter) for a given region. Each noise monitoring was accompanied by a 48-hour digital audio recording for more detailed post process analysis.

Two (2) (July 27 – 29, 2020) and Three (3) (June 24 – 26, 2020) local weather monitoring stations were used for the two (2) 48-hour time monitoring periods. The weather monitors obtained the wind speed, wind direction, temperature, relative humidity, barometric pressure, and rain fall data in 15-second sampling periods. Lastly, it should be noted that all measurements were performed in accordance with the methods described in the AER Directive 038 on Noise Control.

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[1] Once again, it should be noted that two (2) 48-hour monitoring were conducted at Monitoring Location 12.
[2] This was verified by all the various company representatives.
[3] This was based on information provided by the various NCIA members.

4.0 Noise Monitoring Location Description

In addition to Table 1, which provides the UTM coordinates and the start and end times for each noise monitoring, a brief discussion of each noise monitoring location can be found below. All noise measurement instrumentation was calibrated at the start of the measurements and then checked afterwards to ensure that there had been no significant calibration drift over the duration of the measurements. Refer to Appendix I for a detailed description of the measurement equipment used and for all calibration records.

Table 1. Noise Monitoring Locations with Start and End Times[1]

Monitoring Location	UTM Coordinates (Approximate)		Start Time	End Time
	Easting (m)	Northing (M)		
1D	355210	5954184	7/27/20 9:00	7/29/20 9:00
2	358256	5957216	7/27/20 9:00	7/29/20 9:00
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12B (2nd 48-hour)			7/27/20 9:00	7/29/20 9:00
13	358667	5970180	6/24/20 13:00	6/26/20 13:00

4.1. Noise Monitor Location 1

The noise monitor at Location 1 was located approximately 10 m north of 100 Avenue[2], 160 m west of 114 Street and approximately 395 m northwest of Highway 15 as indicated in Figure 2 and Figure 3. This put the noise monitor approximately 380 m southwest of the Sherritt International Corporation facility. This is the southernmost noise monitoring location found within the AIH. At this location, there was direct line-of-sight to 100 Avenue, Mel Martin's Transfer Facility, and the Sherritt International Corporation facility. There was no significant vegetation between the noise monitor and the facilities to the north. It should be noted that the microphone for this measurement was placed on top of a mobile monitoring station

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[1] The letters accompanying the noise monitoring location refers to their location.

[2] Due to accessibility the noise monitor was placed north of 100 Avenue as opposed to previous years.

at a height of 2.5 m from the ground. In addition, a weather monitor was placed at this location adjacent to the noise monitor for the duration of the July 27 – 29, 2020 noise monitoring period.

4.2. Noise Monitor Location 2

The noise monitor at Location 2 was located approximately 90 m southeast of 125 Street and approximately 1.0 km north of Highway 15 as indicated in Figure 2 and Figure 4. This put the noise monitor approximately 120 m west of the Dow yard, 170 m north of the Dow rail yard and approximately 850 m east-southeast of the Keyera Facility. At this location, there was direct line-of-sight to Dow's main site to the east and to the rail yard to the south. There was no significant vegetation between the noise monitor and the facilities.

4.3. Noise Monitor Location 3

The noise monitor at Location 3 was located approximately 10 m east of 125 Street, 275 m south of the CN Rail line 55 m east of the north entrance to the Plains Midstream Facility and approximately 125 m north of the entrance to the Petrogas northern entrance as indicated in Figure 2 and Figure 5. This put the noise monitor approximately 230 m northwest of the Petrogas facility and approximately 380 m east of major equipment at the Plains Midstream Facility. At this location, there was direct line-of-sight to the Plains Midstream Facility but not to the Petrogas site. There was no significant vegetation between the noise monitor and the facilities.

4.4. Noise Monitor Location 4

The noise monitor at Location 4 was located approximately 1.2 km south of the south fence line of the Shell Scotford site and approximately 1.6 km east of Range Road 220 (130 Street) as indicated in Figure 2 and Figure 6. This put the noise monitor at 490 m south of the entrance to the electrical substation to the northwest. At this location, there was direct line-of-sight to the Shell Scotford site but not to the electrical substation to the northwest. There was no significant vegetation between the noise monitor and the Shell Scotford facility.

4.5. Noise Monitor Location 5

The noise monitor at Location 5 was located approximately 200 m north of Township Road 560A and 5 m east of Range Road 215 as indicated in Figure 1 and Figure 7. This put the noise monitor approximately 300 m north of the north fence line for the Shell Scotford facility and approximately 135 m west of an industrial yard to the east. At this location, there was direct line-of-sight to the Shell Scotford site but not the industrial yard (due to the topography of the area). There was no significant vegetation between the noise monitor and the Shell Scotford facility.

4.6. Noise Monitor Location 6

The noise monitor at Location 6 was located approximately 1.0 km north of Township Road 562 and 3 m east of Range Road 213A as indicated in Figure 1 and Figure 8. This put the noise monitor approximately 1.6 km east of the Nutrien Redwater facility. Due to favorable topography between the noise monitor and Nutrien there was direct line-of-sight to the Nutrien site through a small row of deciduous trees across the road. There was no significant vegetation between the noise monitor and the Nutrien facility. A weather monitor was placed at this location, adjacent to the noise monitor for the duration of the June 24 – 26, 2020 noise monitoring period.

4.7. Noise Monitor Location 8

The noise monitor at Location 8 was located approximately 1.6 km south of Highway 643 (eastbound) and 365 m east of Range Road 221 as indicated in Figure 2 and Figure 9. This put the noise monitor approximately 30 m north of the northern fence line for the Pembina/Williams facility. At this location, there was direct line-of-sight to the Pembina/Williams site through a thin row of deciduous trees. There was no significant vegetation between the noise monitor and the aforementioned facilities.

4.8. Noise Monitor Location 9

The noise monitor at Location 9 was located approximately 5 m southwest of the intersection of Lamoureux Drive and Godbout Avenue as indicated in Figure 2 and Figure 10. This put the noise monitor approximately 1.2 km northwest of the major structures at the Dow facility and approximately 1.3 km west of the Keyera facility. Due to favorable topography, there was direct line-of-sight to the facilities across the River through a thin row of deciduous trees[1]. Despite the thin row of trees there was no significant vegetation between the noise monitor and the aforementioned facilities.

4.9. Noise Monitor Location 10

The noise monitor at Location 10 was located approximately 30 m west of 119 Street and 12 m north of the access road to the Nutrien Fort Saskatchewan facility as indicated in Figure 2 and Figure 11. This put the noise monitor approximately 750 m northeast of the major structures at the Nutrien facility and approximately 180 m west of the west fence-line of the Dow facility. There was direct line-of-sight to the

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[1] This was observable during the night-time period.

Dow facility but not to the Nutrien facility (due to the topography of the area). There was no significant vegetation between the noise monitor and the aforementioned facilities.

4.10. Noise Monitor Location 11

The noise monitor at Location 11 was located approximately 3 m northwest of the intersection of Range Road 221 and Township Road 560 as indicated in Figure 2 and Figure 12. This put the noise monitor approximately 1.7 km southwest of the major structures at the Pembina/Williams facility and approximately 330 m west of the Pembina/Williams rail yard. At this location, there was direct line-of-sight to the Pembina/Williams facility but not to the rail yard (due to the topography of the area). There was no significant vegetation between the noise monitor and the facilities. A weather monitor was placed at this location, adjacent to the noise monitor for the duration of the June 24 – 26, 2020 noise monitoring period.

4.11. Noise Monitor Location 12

The noise monitor at Location 12 was the independent control/reference point. It was located approximately 15 m east of Range Road 211 and 450 m south of Township Road 560 as indicated in Figure 2 and Figure 13. This placed the noise monitor approximately 1.6 km west of Highway 830 and approximately 2.7 km north of Highway 15. At this location, there was direct line-of-sight to the west of the AIH region. The noise monitor was bordered on all sides by a combination of open grassy fields. Due to the distance from the noise monitor to the existing major facilities within the AIH, the vegetative absorption between the noise monitor and these facilities would be considered significant. Note also that a weather monitor was placed at this location for the duration of all noise monitoring periods.

4.12. Noise Monitor Location 13

The noise monitor at Location 13 was located approximately 3 m east of Range Road 221 and 100 m south of Township Road 564 as indicated in Figure 2 and Figure 14. This put the noise monitor approximately 1.1 km northwest of the lay down yard for the NWR facility and is the north easternmost noise monitoring location found within the AIH. At this location, there was no direct line-of-sight to any facilities. There was moderate vegetation between the noise monitor and the aforementioned facilities.

5.0 Equivalent Sound Level & Statistical Descriptors

Environmental noise levels from industry are commonly described in terms of equivalent sound levels or L_{eq}. This is the level of a steady sound having the same acoustic energy, over a given time period, as the fluctuating sound. The concept is that the same amount of annoyance occurs from a sound having a high level for a short period of time as from a sound at a lower level for a longer period of time. In addition, this energy averaged sound level is often A-weighted to account for the reduced sensitivity of average human hearing to low frequency sounds and/or C-weighted to allow for more low frequency noise to be considered. These L_{eq} in dBA/dBC, which are the most common environmental noise measure, are often given for day-time (07:00 to 22:00) L_{eq}Day and night-time (22:00 to 07:00) L_{eq}Night while other criteria use the entire 24-hour period as L_{eq}24.

Another method of conveying long term noise levels utilizes statistical descriptors. These are calculated from a cumulative distribution of the sound levels over the entire measurement duration and then determining the sound level at xx % of the time. These descriptors can be used to provide a more detailed analysis of the varying noise climate.

For purposes of this study, the following equivalent sound levels and statistical descriptors will be presented and discussed:

L_{eq}Day	- Measured over the daytime (07:00 – 22:00)
L_{eq}Night	- Measured over the night-time (22:00 – 07:00)
L_{10}	- Sound level that was exceeded only 10% of the time. - Good measure of intermittent or intrusive noise
L_{50}	- Sound level that was exceeded 50% of the time (arithmetic average) - Good to compare to L_{eq} to determine steadiness of noise
L_{90}	- sound level that was exceeded 90% of the time - Good indicator of typical "ambient" noise levels

For further information, refer to Appendix II for a description of the acoustical terminology and Appendix III for a list of common noise sources and their associated noise levels.

6.0 Results and Discussion

6.1. Environmental Noise Monitoring

The results of the thirteen (13) 48-hour noise monitoring's have been provided in Table 2[1] and are presented in Figures 15 – 105. The figures include the 15-second broadband dBA and dBC L_{eq} sound levels[2], 1-hour dBA and dBC, L_{90}, L_{50}, L_{10} sound levels[3] and the 1/3 octave band L_{eq} sound levels[3] for each noise monitoring location. Table 2 provides results of each of the three daytime periods in addition to the isolated and non-isolated values for the two night-time periods. The isolation analysis for the night-time periods was performed in accordance with Section 4.3.2 of the AER Directive 038. A list of all non-typical noise events removed from each of the thirteen (13) noise monitoring's are provided in Appendix IV. Each event removed has been dated with its corresponding time period as well as the rationale for its removal. A detailed discussion of the results for each monitoring location can be found below.

Table 2. 2020 - L_{eq} 24-Hour Results[4]

Monitoring Location	1st Daytime Period	1st Night-time Period (Non-isolated)	1st Night-time Period (Isolated)	2nd Daytime Period	2nd Night-time Period (Non-isolated)	2nd Night-time Period (Isolated)	3rd Daytime Period
1C	57.8	55.9	46.0	57.5	56.8	52.7	60.2
2	59.0	52.9	51.1	56.8	52.0	49.0	55.8
3B	52.7	52.7	47.5	54.4	54.1	42.3	64.8
4C	43.0	51.9	51.7	53.4	46.1	45.6	45.0
5	50.4	54.6	51.6	50.5	51.7	48.4	52.4
6	50.6	51.7	50.5	53.1	49.3	48.8	62.6
8a	50.0	45.3	44.7	47.3	48.8	48.4	48.6
9	48.3	50.2	49.8	46.9	45.8	42.3	47.3
10	54.5	54.4	53.3	54.5	52.0	49.8	55.5
11	53.7	44.2	40.0	47.9	45.0	44.0	46.8
12b (1st 48-hour)	47.8	45.8	41.4	48.4	45.6	34.4	50.5
12b (2nd 48-hour)	45.8	43.1	37.8	47.7	46.6	43.7	48.2
13	46.2	44.8	36.4	53.0	43.5	37.1	44.2

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[1] The results of each location will be discussed individually.

[2] The data provided in the 15-second L_{eq} traces shows the 24-hour time period with the isolated night-time results, after removal of non-typical noise levels. This was done to indicate the relative steadiness of the noise levels and to make it easier to view the night-time data.

[3] Isolated and non-isolated values are presented.

[4] The letters accompanying the noise monitoring location refers to their location.

6.1.1. Noise Monitoring Location 1D

The results of the noise monitoring conducted at Location 1 are provided in Table 2 and in Figures 15 - 21 The isolated L_{eq}Night values from Table 2 and the traces found in Figures 15 – 18 indicate relatively consistent noise levels for the July 28 – 29 night-time period until approximately 04:00. After this time, there was a significant increase in vehicle traffic along 100 Avenue, which is consistent with previous years. The L_{eq}Night noise levels for the first night are comparable to previous years.

As indicated in Table 2 and in Figures 15 – 18 the L_{eq}Night levels were higher for the second night-time period and tend to be higher than in previous years. The elevated noise levels can be attributed to the wind conditions during this period as the wind was higher (between 5 – 15 km/hr) and primarily from the north. Thus, the noise monitor was downwind from the major noise sources to the north for the majority of the night-time period. As such, the measured levels during the second night are likely reflective of the highest noise levels at this location. Despite the relative difference in noise levels between both nights the 1/3 octave band L_{eq} sound levels have similar traces (apart from the overall level). They both have relatively higher noise levels in the lower frequency bands that decrease as the frequency increases.

When comparing the results and subjective observations from this year to previous years, the isolated values of the first night are representative of the typical noise climate of the area while the isolated values of the second night are representative of its loudest noise climate.

6.1.2. Noise Monitoring Location 2

The results of the noise monitoring conducted at Location 2 are provided in Table 2 and in Figures 22 - 28. The isolated L_{eq}Night values from Table 2 and the traces found in Figures 22 – 23 indicate consistent noise levels. The isolated 1/3 octave figures show relatively broadband noise levels, particularly in the mid-frequency bands, with elevated noise levels in the lower (below 125 Hz) frequency bands which is consistent with previous noise surveys. The variance in noise levels between the two night-time periods can be attributed to the wind conditions. The noise levels from the first night can be most attributed to the facilities from the south while the noise levels from the second night can be attributed to the facilities to the north. Based on the isolated L_{eq}Night results and the 1/3 octave band spectral data, it would be anticipated that the results from the 2020 noise monitoring are reflective (in comparison to previous years) of the typical range of noise levels for this area.

Lastly, as indicated in Appendix IV, the "non-typical" incidents included a relatively significant amount of rail activity. The removal of data due to the rail yard is consistent with previous years.

6.1.3. Noise Monitoring Location 3B

The results of the noise monitoring conducted at Location 3 are provided in Table 2 and in Figures 29 - 35. The isolated L_{eq}Night values vary significantly between the two night-time periods. The trace for the first night-time period is relatively consistent and the overall L_{eq}Night noise level is comparable to previous years. This can be attributed to the wind conditions being calm and from the south, thus resulting in downwind conditions for the noise monitor relative to the facilities to the south. The noise levels during the second night-time period are significantly lower than the first night due once again to the wind conditions. Currently, there are no facilities within proximity and to the north of this monitoring location, therefore, the second night L_{eq}Night noise levels are indicative of the noise climate of this area when the wind is primarily from the north.

When comparing the noise levels of each night-time period to previous years, the results of the first night are more indicative of the typical noise climate of the area.

6.1.4. Noise Monitoring Location 4C

The results of the noise monitoring conducted at Location 4 are provided in Table 2 and in Figures 36 - 42. The trace of the isolated L_{eq}Night values from the first night-time period (Figure 36) indicates a slow, gradual increase in noise level from the start of the night (22:00) to the end of the night (07:00). The rise in noise level for this time period can be attributed to the weather conditions enhancing the contributions from the new facility to the west of this noise monitoring location. The trace of the isolated L_{eq}Night noise levels for the second night-time period, (Figure 37) are very consistent throughout the entire night-time period. In addition, the broadband L_{eq}Night noise levels are consistent with previous years.

Despite the relatively significant difference in noise levels between nights, the 1/3 octave band spectral data shows a similar trace between the two overnight periods. Based on the results, it is anticipated that though high when compared to previous years, the isolated values of the June 24 – 25, 2020 night-time period could potentially be representative of the new noise climate of the area. However, this will have to be verified in future noise monitorings. The isolated values of the June 25 – 26, 2020 night-time period are more reflective of the historical noise climate of the area with the primary contributions arriving from the large facility to the north.

6.1.5. Noise Monitoring Location 5

The results of the noise monitoring conducted at Location 5 are provided in Table 2 and in Figures 43 - 49. Figures 43 – 46 indicate very consistent isolated 15-second L_{eq} traces for the first night-time period while the second night has significantly more fluctuations. This variance can be attributed to the less favorable weather conditions during the June 25 – 26, 2020 night-time period, which resulted in the noise monitor being up-wind from the facility to the south. As noted in Appendix IV, there was again a significant number of "non-typical" incidents removed this year for rail activity when compared to 3-4 years ago.

Based on the results and from subjective observations the isolated values of the June 24 – 25, 2020 night-time period would be more representative of the typical noise climate of this area due to the more favorable weather conditions.

6.1.6. Noise Monitoring Location 6

The results of the noise monitoring conducted at Location 6 are provided in Table 2 and in Figures 50 - 56. The isolated L_{eq}Night values from Table 2 and the traces found in Figures 50 – 53 indicates that there were considerable fluctuations in the noise climate of the surrounding area for both night-time periods. In addition, the isolated L_{eq}Night values and the 1/3 octave band spectral data are similar between both noise monitoring periods but vary greatly from previous years. Unfortunately, the site visits did not occur during the significant increases in noise levels (specifically at 00:22 on June 26, 2020), therefore the source of the increase is unknown. Based on the 1/3 octave band spectral data the increases in noise levels can be primarily be attributed to a noise source(s) with elevated noise levels in the higher frequency bands (between 6.3 kHz -8 kHz). This will need to be investigated further in future noise monitorings if this occurs again.

When compared to previous years in which the noise levels are relatively flat throughout the entire time period, the broadband and 1/3 octave band spectral data from the 2020 noise monitoring are not representative of the typical noise climate at this location.

6.1.7. Noise Monitoring Location 8A

The results of the noise monitoring conducted at Location 8 are provided in Table 2 and in Figures 57 - 63. The isolated L_{eq}Night values indicate relatively consistent noise levels for both night-time periods. The relative difference between the L_{eq}Night noise levels can be attributed to the weather conditions between the two nights. As described in Section 6.3, the wind from primarily form the south for the first night-time period thus resulting in upwind conditions from the nearest facility, while the wind during the second night resulted in the noise monitoring being in a downwind position relative to the nearest facility. The similarities are also reflected in the 1/3 octave band L_{eq} sound levels for both nights. They both show higher noise levels in the lower frequency bands that decrease as the frequency increases.

The isolated values of both 2020 night-time periods are representative of the typical noise climate of this area when comparing to previous years.

6.1.8. Noise Monitoring Location 9

The results of the noise monitoring conducted at Location 9 are provided in Table 2 and in Figures 64 - 70. The isolated L_{eq}Night values for the July 27 – 28, 2020 illustrates consistent noise levels throughout the entire night-time period. This can be attributed to the wind conditions being calm and from the south/east, thus resulting in downwind conditions for the noise monitor relative to the facilities to the southeast. The noise levels during the second night-time period are significantly lower than the first night and have significant fluctuations, which again can be attributed to the wind conditions. Currently, there are no facilities to the north that are within proximity to this monitoring location, therefore, the second night L_{eq}Night noise levels are indicative of the noise climate of this area when the wind is primarily from the north.

When comparing the values of each night-time period to previous years the results of the first night are more indicative of the typical noise climate of the area and are more reflective of its loudest noise climate.

6.1.9. Noise Monitoring Location 10

The results of the noise monitoring conducted at Location 10 are provided in Table 2 and in Figures 71 - 77. The isolated L_{eq}Night values from Table 2 and the traces found in Figure 71 – 72, indicate relatively consistent noise levels for both night-time periods. The isolated 1/3 octave figures indicate relatively broadband noise levels, particularly in the mid-frequency bands, with elevated noise levels in the lower (below 125 Hz) frequency bands which is consistent with previous noise surveys.

Similarly to other noise monitoring locations, the variance in noise levels between the two night-time periods can be attributed to the wind conditions. The noise levels from the first night can be most attributed to the facilities from the south while the noise levels from the second night can be attributed to the facilities to the north. Based on the isolated L_{eq}Night results and the 1/3 octave band spectral data, it would be anticipated that the results from the 2020 noise monitoring are reflective (in comparison to previous years) of the typical range of noise levels for this area.

6.1.10. Noise Monitoring Location 11

The results of the noise monitoring conducted at Location 11 are provided in Table 2 and in Figures 78 - 84. The isolated L_{eq}Night values for the June 25 – 26, 2020 illustrates consistent noise levels throughout the entire night-time period. This can be attributed to the wind conditions being calm and from the northeast, thus resulting in downwind conditions for the noise monitor relative to the facilities to the northeast. The noise levels during the first night-time period are significantly lower than the second night and have significant fluctuations, which again can be attributed to the wind conditions. Currently, there are no facilities to the south that are within proximity to this monitoring location, therefore, the first night L_{eq}Night noise levels are indicative of the noise climate of this area when the wind is primarily from the south.

As noted in Appendix IV, the “non-typical” incidents included a relatively significant amount activity directly associated with the nearby rail yard which is consistent with previous years.

When comparing the results and subjective observations to previous years, the isolated values of both 2020 night-time periods are representative of the low and high ranges of the typical noise climate of this area.

6.1.11. Noise Monitoring Location 12

The results of the noise monitoring conducted at Location 12 are provided in Table 2 and in Figures 85 - 98. As previously mentioned, this location was the independent control/reference point. Therefore, the results from this location span two (2) 48-hour monitoring periods.

Similarly to previous years, all night-time periods show a significant difference between the non-isolated L_{eq}Night noise levels in comparison to the isolated L_{eq}Night noise levels. This can be attributed to this location being relatively far any major facility[1], therefore most instances of vehicular traffic on Range Road 211 or rail activity along the nearby CP rail line dominate the noise climate. In addition, during all night-time periods there were significant noise contributions from the rail line, the morning rush (on Highway 211) and the morning chorus (birds chirping). These noise sources totally dominated the noise climate and thus large portions of this time period were removed.

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[1] This location is approximately 2.3 km northeast of the ATCO Natural Gas Salt Cavern Storage Site.

In the absence of the vehicular or rail activity the 1/3 octave band L_{eq} sound levels indicate a similar trace to the other monitoring locations with elevated noise levels in the lower frequency bands (50 Hz – 80 Hz) that gradually decrease as the frequency increases. However, the presence of the contributions from the crickets and birds (3.15 – 5.0 kHz) is very pronounced.

6.1.12. Noise Monitoring Location 13

The results of the noise monitoring conducted at Location 13 are provided in Table 2 and in Figures 99 - 105. The isolated L_{eq}Night values from Table 2 and the traces found in Figures 99 – 100 indicate relatively consistent traces between the two night-time periods. This can be further verified in reviewing the isolated 1/3 octave figures which show almost identical traces.

In comparison to previous years, the isolated L_{eq}Night values are more consistent and are within the range of highest and lowest values, respectively. As a result, it is possible the noise climate of the area has stabilized due to the completion of facilities to the southeast of this monitoring location. However, this will have to be verified in future monitorings.

6.2. 2020 General Subjective Observations and Notes from Site Visits and Data Analysis

- For several locations, the weather conditions during the 48-hour time monitoring periods resulted in noise levels representing the low and high ranges of the typical noise climate of the given area.
- As such, the isolated noise levels and 1/3 octave band L_{eq} sound levels has greater variations when compared to previous years.
- The noise arriving at most monitor locations consisted primarily of low frequency components that gradually decreased in noise level as the frequency increased.
- None of the sites indicated any specific low frequency tonal components.
- The noise from train passages was prevalent at all locations and tended to dominate the noise climate as they passed through, particularly when there were train whistles. This was particularly more prevalent when the wind caused the noise monitoring location to be in an up-wind condition.
- The number of train whistles and train passages subjectively appeared to be similar to the previous two years (2018 – 2019).
- In comparison to previous years, the train passages were more subjectively observed during the site visits.

6.3. Night-time Weather Conditions

As previously mentioned, local weather monitoring stations were used throughout all noise monitoring periods to obtain the wind speed, wind direction, temperature, relative humidity, barometric pressure and rain fall data in 1-minute sampling periods. All weather data are presented in Appendix V. A brief discussion of each night-time period can be found below. There were times in which the wind speeds during certain night-time periods were above the limits of AER Directive 038. However, for these instances, the data was removed from the L_{eq}Night calculations, therefore, the results found within Table 2 are considered in compliance with AER Directive 038.

6.3.1. June 24 – 25, 2020

Weather Monitor near Noise Monitor Location 6

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr). The wind was generally from the south-west for the duration of the night-time period. The temperature ranged from 12°C to 15°C and the relative humidity ranged from approximately 79% - 87%. The barometric pressure was consistent and flat at approximately 94 kPa. Lastly, there was no precipitation during the night.

Weather Monitor near Noise Monitor Location 11

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr). The wind was generally from the south-west for the duration of the night-time period. The temperature ranged from 11°C to 14°C and the relative humidity ranged from approximately 77% - 90%. The barometric pressure was consistent and flat at approximately 94 kPa. Lastly, there was no precipitation during the night.

Weather Monitor near Noise Monitor Location 12

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr). The wind was generally from the south-west for the duration of the night-time period. The temperature ranged from 11°C to 16°C and the relative humidity ranged from approximately 79% - 87%. The barometric pressure was consistent and flat at approximately 94 kPa. Lastly, there was no precipitation during the night.

6.3.2. June 25 – 26, 2020

Weather Monitor near Noise Monitor Location 6

The wind conditions during the night-time period were considered moderate to high (between 5 - 15km/hr). The wind direction was generally from the northeast-east for the entire night-time period. The temperature ranged from 15°C to 19°C and the relative humidity ranged from approximately 42% - 70%. The barometric pressure was consistent and flat at approximately 94 kPa. There was no precipitation during the night.

Weather Monitor near Noise Monitor Location 11

The wind conditions during the night-time period were considered moderate to high (between 5 - 10 km/hr and above 15 km/hr, respectively) apart from 02:50 – 03:50 in which the wind increased above 20 km/hr. The wind direction was generally from the northeast-east for the entire night-time period. The temperature ranged from 15°C to 20°C and the relative humidity ranged from approximately 35% - 66%. The barometric pressure was consistent and flat at approximately 94 kPa. There was no precipitation during the night.

Weather Monitor near Noise Monitor Location 12

The wind conditions during the night-time period were considered moderate to high (between 5 - 10 km/hr and above 15 km/hr, respectively). The wind direction was generally from the northeast-east for the entire night-time period. The temperature ranged from 15°C to 20°C and the relative humidity ranged from approximately 42% - 68%. The barometric pressure was consistent and flat at approximately 94 kPa. There was no precipitation during the night.

6.3.3. July 27 - 28, 2020

Weather Monitor near Noise Monitor Location 1

The wind conditions throughout the night-time period were considered calm to moderate (below 10 km/hr). The wind direction was generally from the east - southeast. The temperature ranged from 16°C to 22°C and the relative humidity ranged from approximately 65% - 76%. The barometric pressure was consistent and relatively flat at approximately 93 - 94 kPa. Lastly, there was no precipitation.

Weather Monitor near Noise Monitor Location 12

The wind conditions throughout the night-time period were considered calm to moderate (primarily below 10 km/hr). The wind direction varied more than in other monitoring locations and periods. As such the wind started from the east and then shifted to the south. The temperature ranged from 18°C to 22°C and the relative humidity ranged from approximately 50% - 75%. The barometric pressure was consistent and relatively flat at approximately 94 kPa. Lastly, there was no precipitation.

6.3.4. July 28 - 29, 2020

Weather Monitor near Noise Monitor Location 1

The wind conditions throughout the night-time period were considered moderate (primarily between 5 - 10 km/hr). The wind direction was generally from the north-northwest. The temperature ranged from 19°C to 24°C and the relative humidity ranged from approximately 65% - 77%. The barometric pressure was consistent and relatively flat at approximately 94 kPa. Lastly, there was no precipitation.

Weather Monitor near Noise Monitor Location 12[1]

The wind conditions throughout the night-time period were considered moderate to high (primarily above 10 km/hr). The wind direction was generally from the north-northwest. The temperature ranged from 18°C to 24°C and the relative humidity ranged from approximately 67% - 83%. The barometric pressure was consistent and relatively flat at approximately 94 kPa. Lastly, there was no precipitation.

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[1] Due to issues with cellular connectivity, there is no data from 05:11 – 09:00 on July 29, 2020.

7.0 Conclusion

As part of the study, a total of thirteen (13) 48-hour noise monitoring's were conducted throughout the Alberta's Industrial Heartland. In many cases, the weather conditions during the 48-hour time monitoring periods resulted in noise levels representing the low and high ranges of the typical noise climate of each noise monitoring location. As such, the isolated noise levels and 1/3 octave band L_{eq} sound levels has greater variations when compared to previous years.

The noise levels at most locations consisted of low frequency components with occasional mid/high frequency components that could be attributed to the nearest facility relative to each individual noise monitoring location. Despite the noise being relatively low in frequency, none of the sites indicated any low frequency tonal components. The noise from train passages was again prevalent at all locations and tended to dominate the noise climate as they passed through, particularly during favorable weather conditions. This was particularly true for locations within proximity to a rail line and for locations further away from any of the large industrial sites.

8.0 References

- *Environmental Noise Survey for the Regional Noise Model Annual Field Validation Monitoring*, prepared for the NCIA by aci Acoustical Consultants Inc., (2015 – 2018)
- Alberta Energy Regulator (AER), *Directive 038 on Noise Control*, *2007*, Calgary, Alberta
- International Organization for Standardization (ISO), *Standard 1996-1*, *Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*, *2003*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-1*, *Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of absorption of sound by the atmosphere*, *1993*, Geneva Switzerland.
- International Organization for Standardization (ISO), *Standard 9613-2, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, 1996*, Geneva Switzerland.

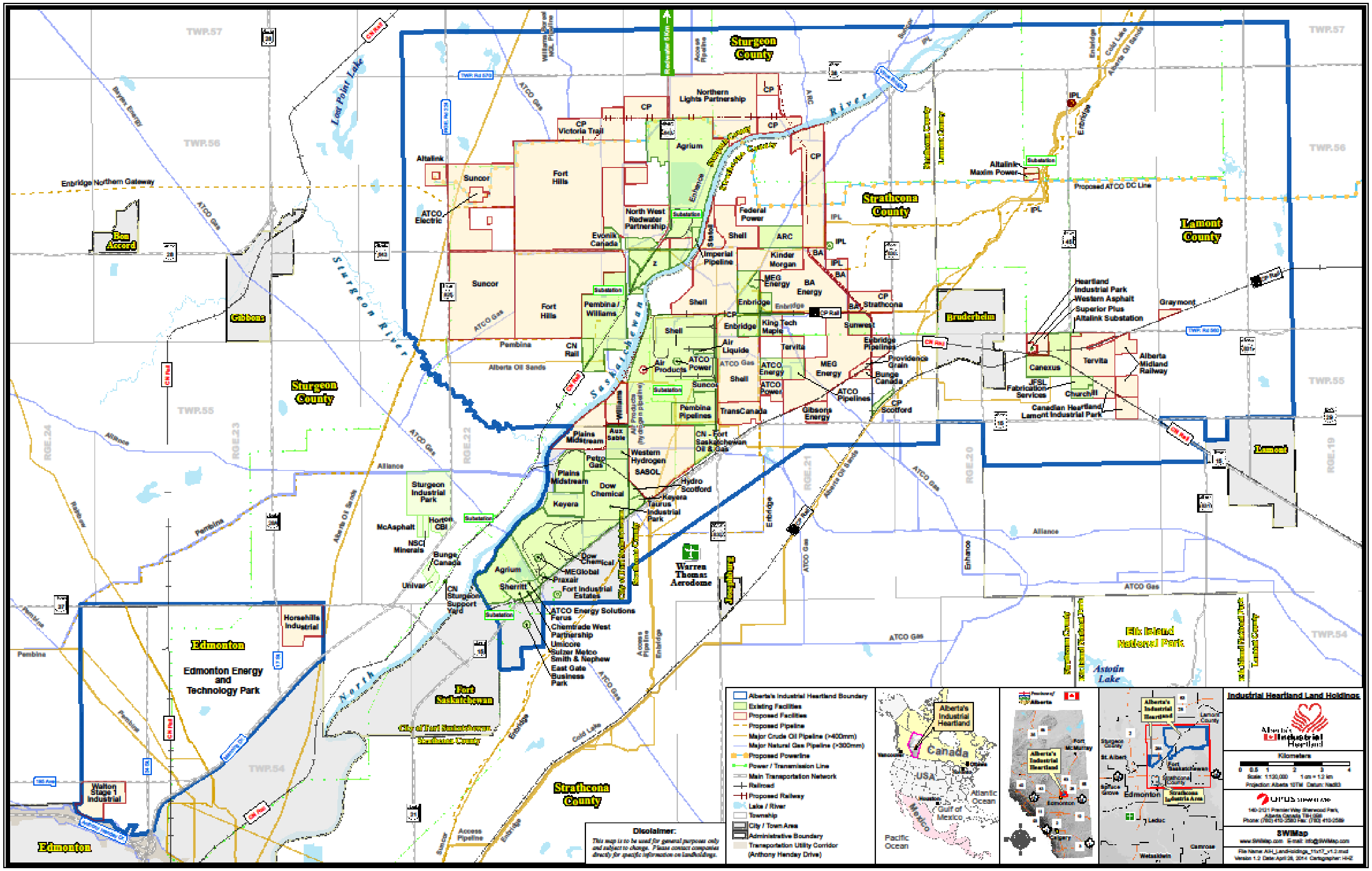

Figure 1. Study Area

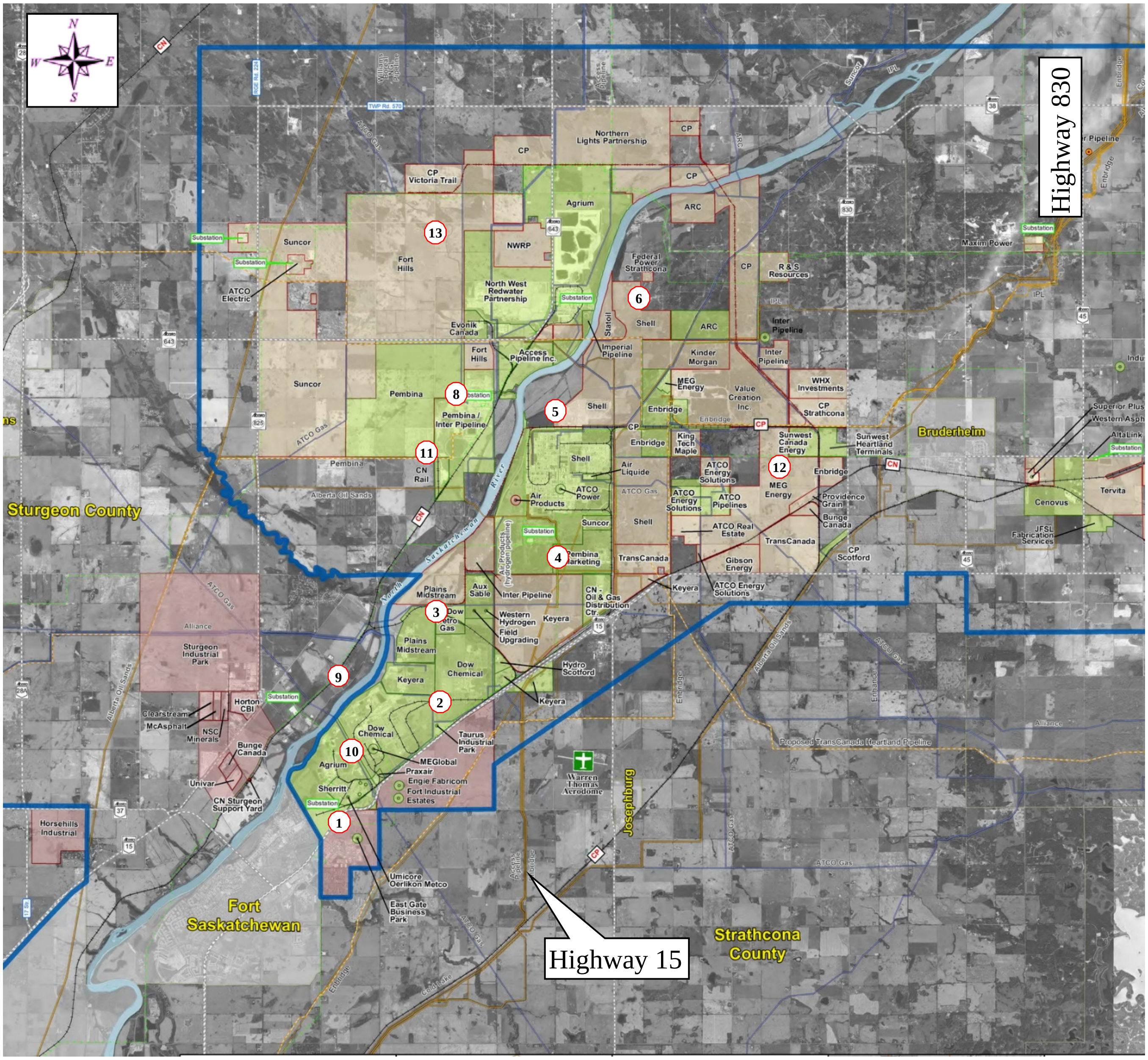

Figure 2. 2020 Study Area (With Noise Monitoring Locations)

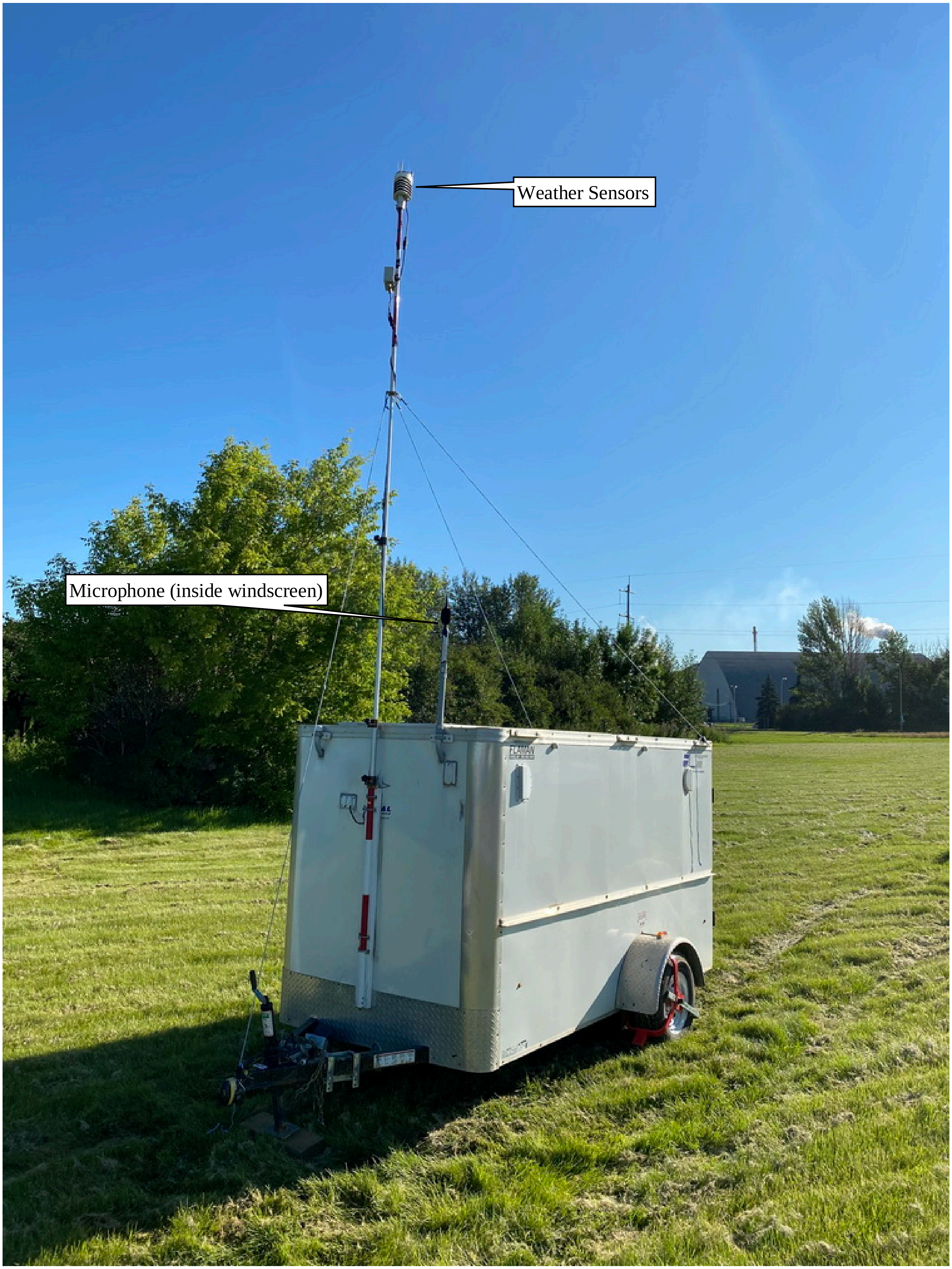

Figure 3. Noise Monitor #1 (With Weather Monitor)

Figure 4. Noise Monitor #2

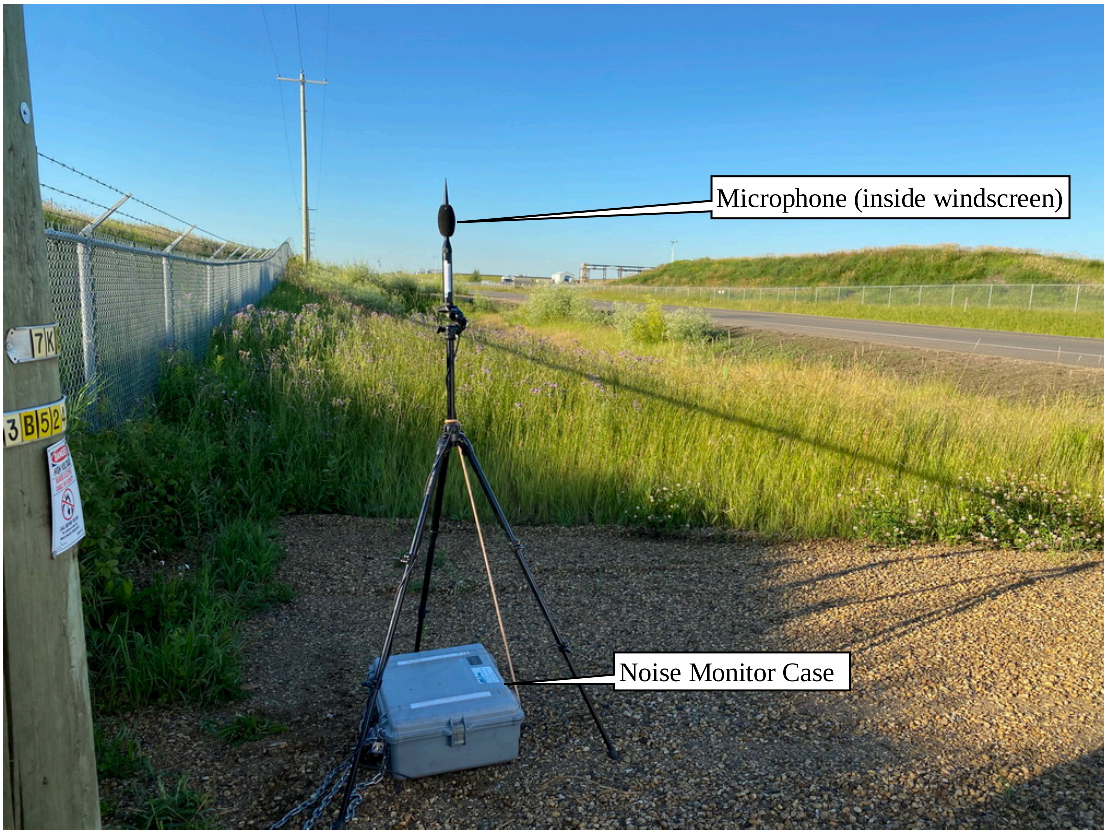

Figure 5. Noise Monitor #3

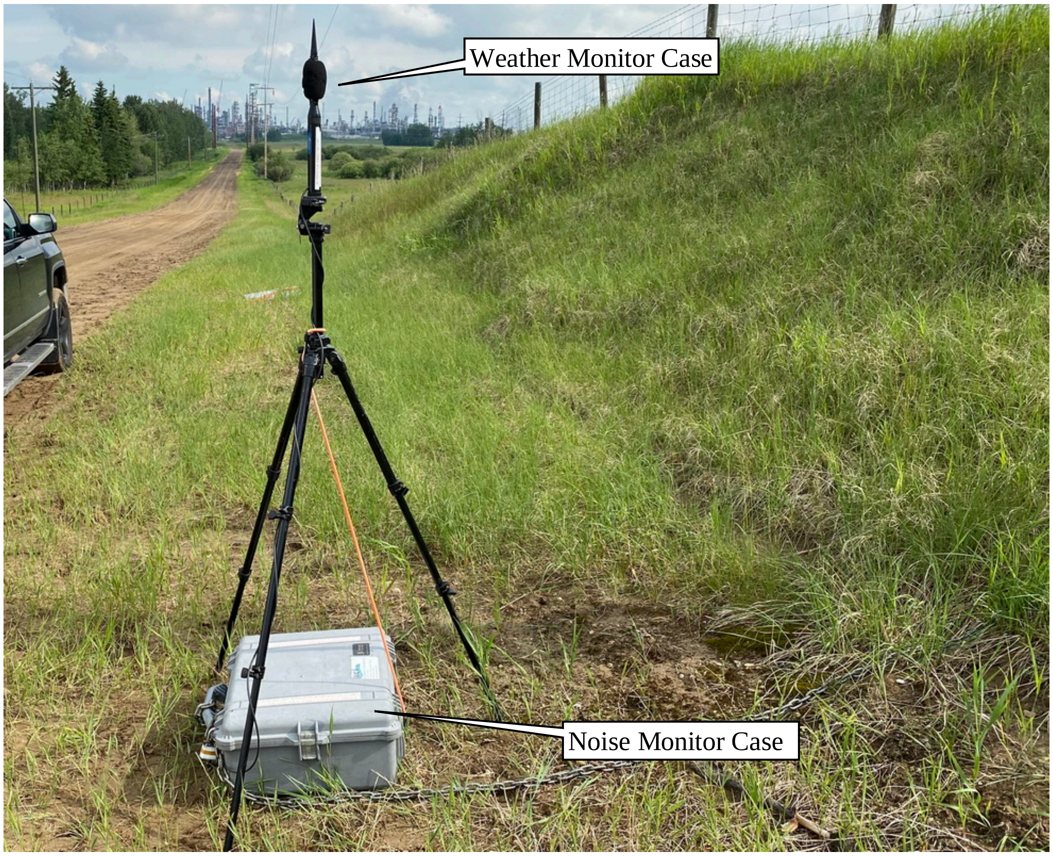

Figure 6. Noise Monitor #4

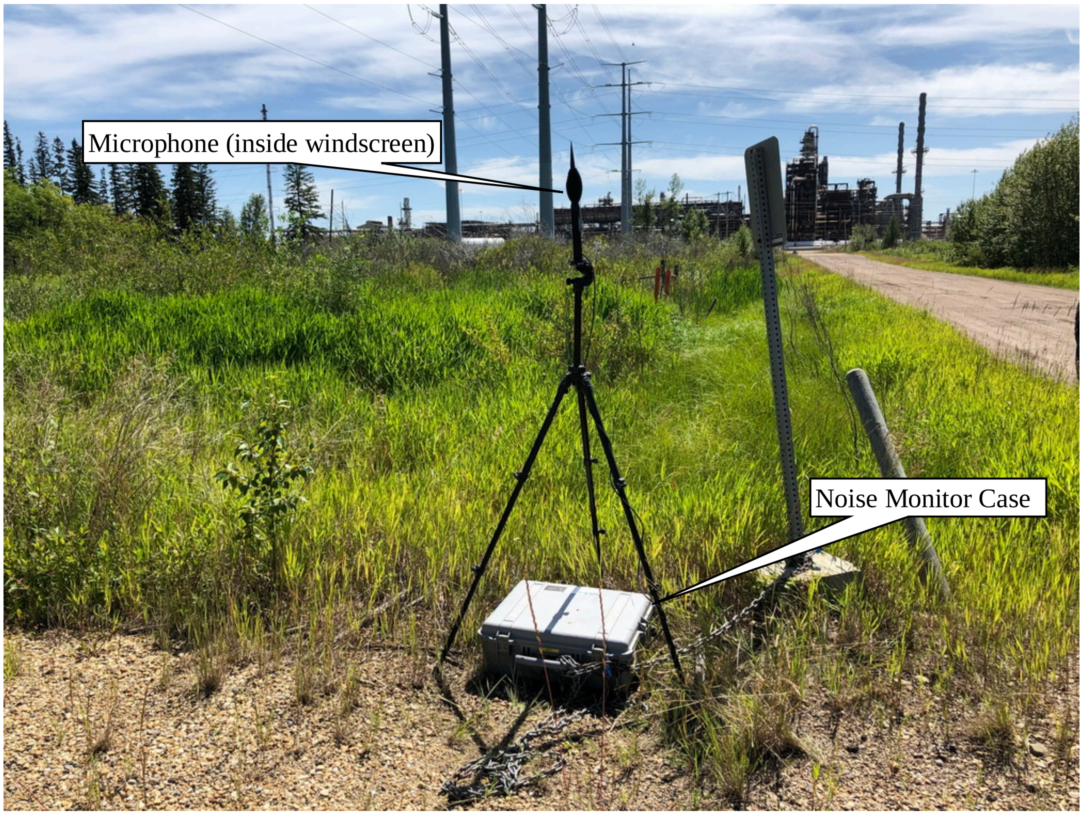

Figure 7. Noise Monitor #5

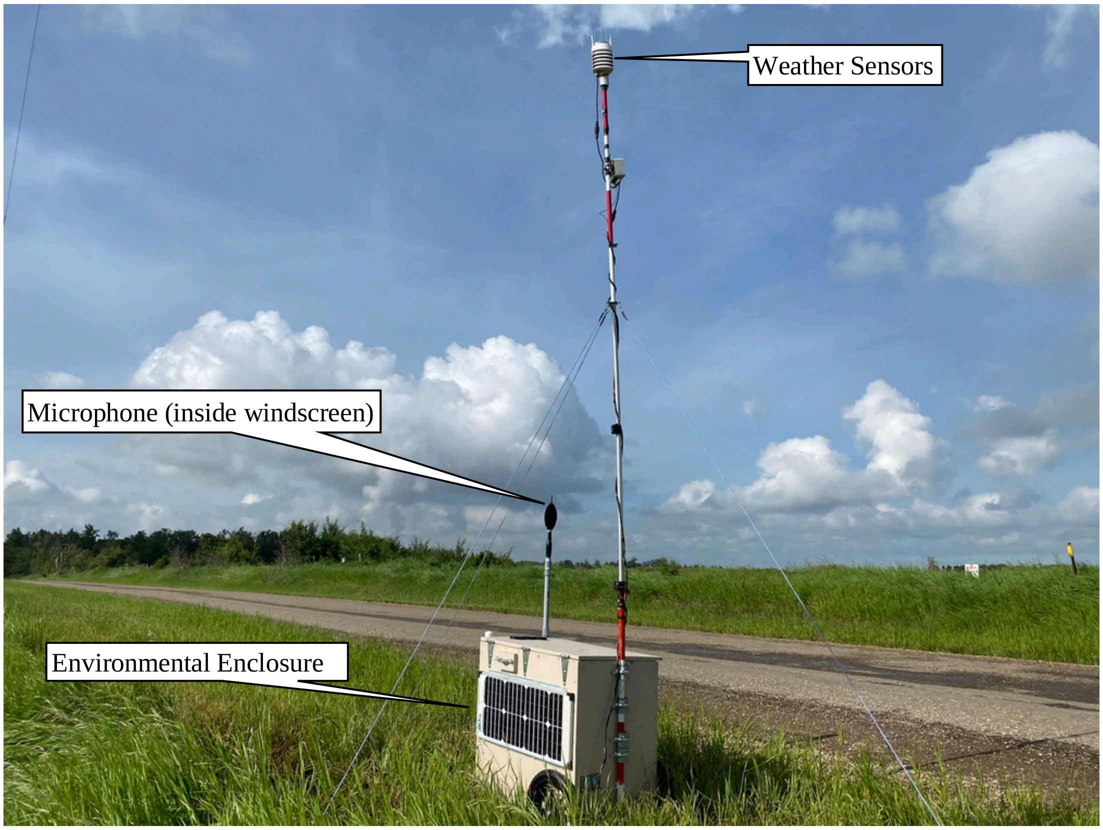

Figure 8. Noise Monitor #6

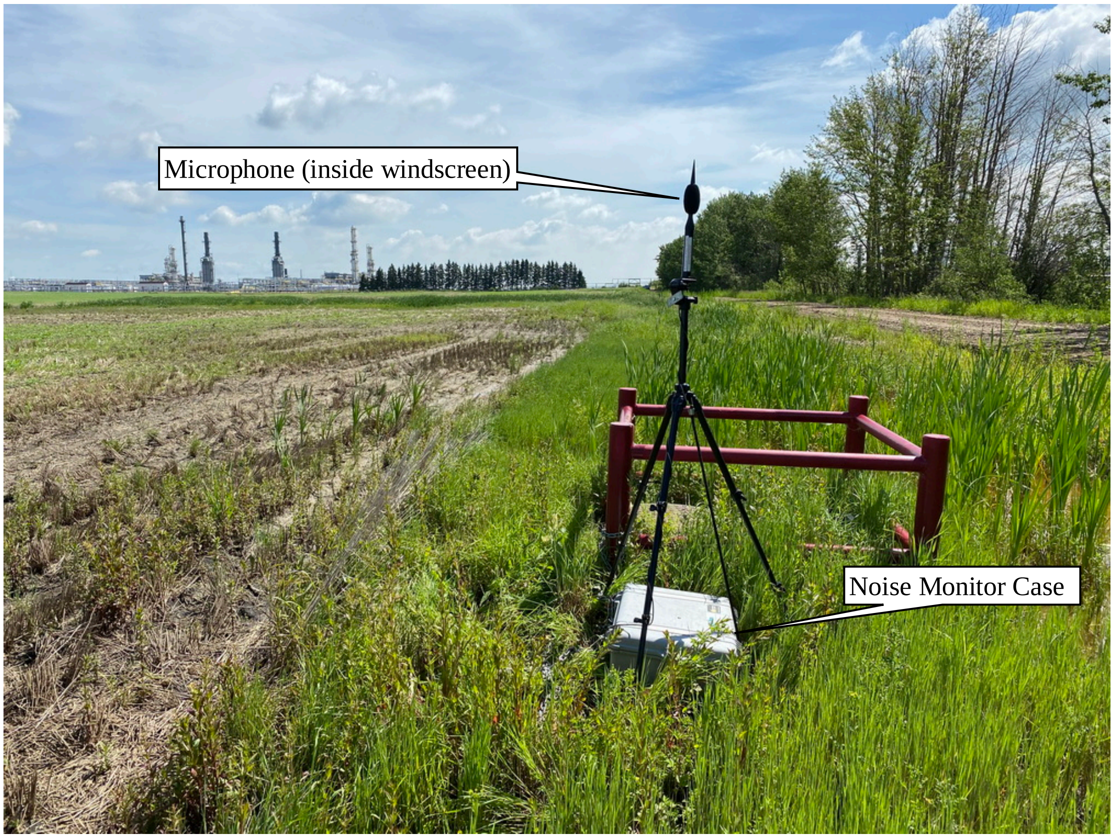

Figure 9. Noise Monitor #8

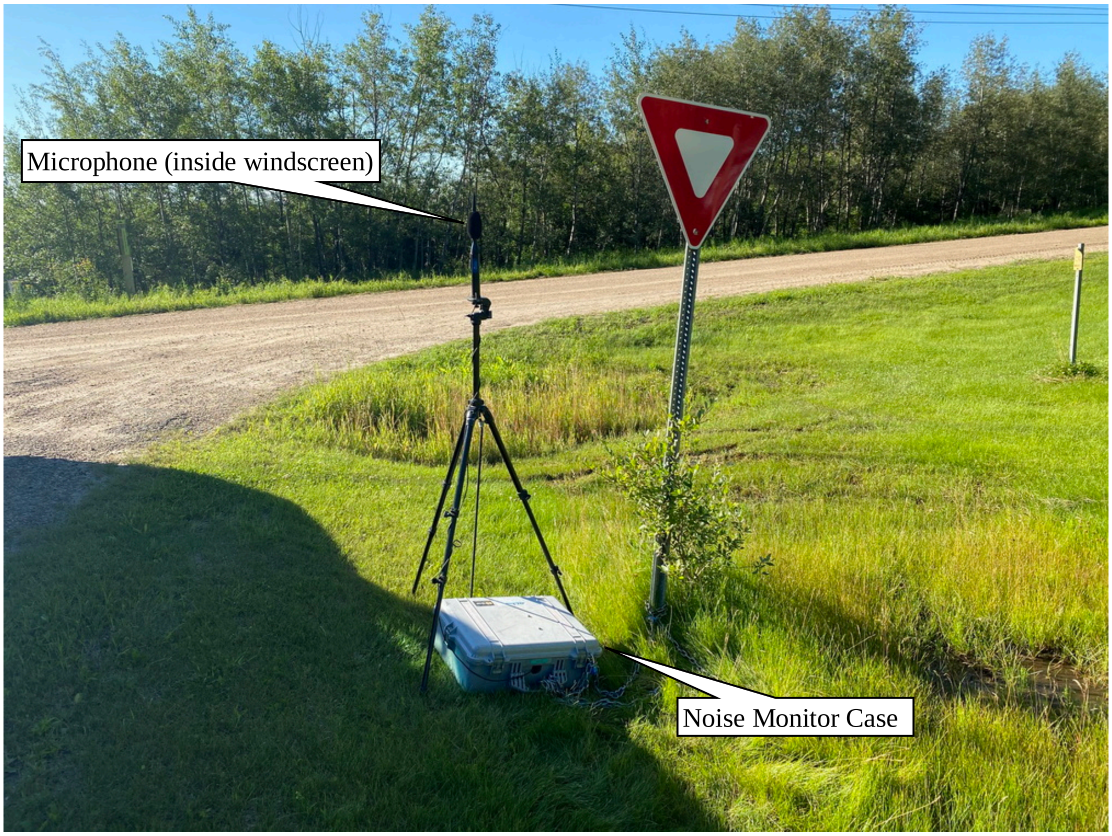

Figure 10. Noise Monitor #9

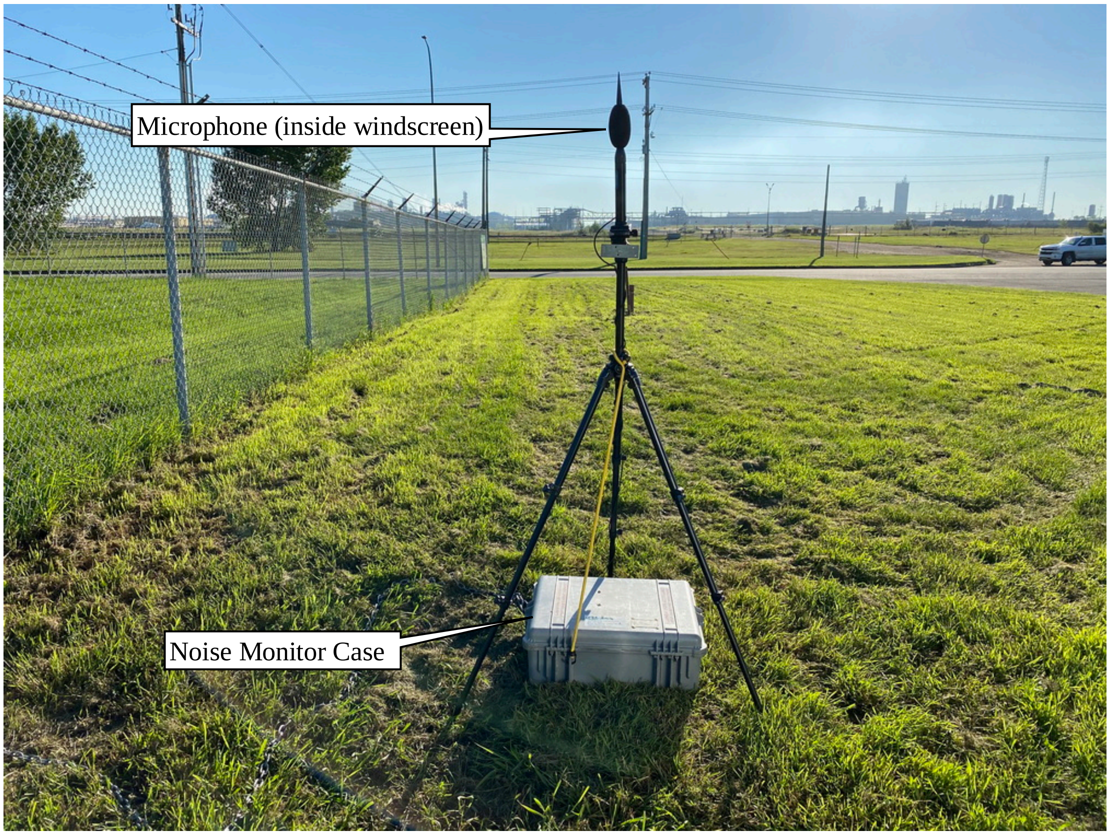

Figure 11. Noise Monitor #10

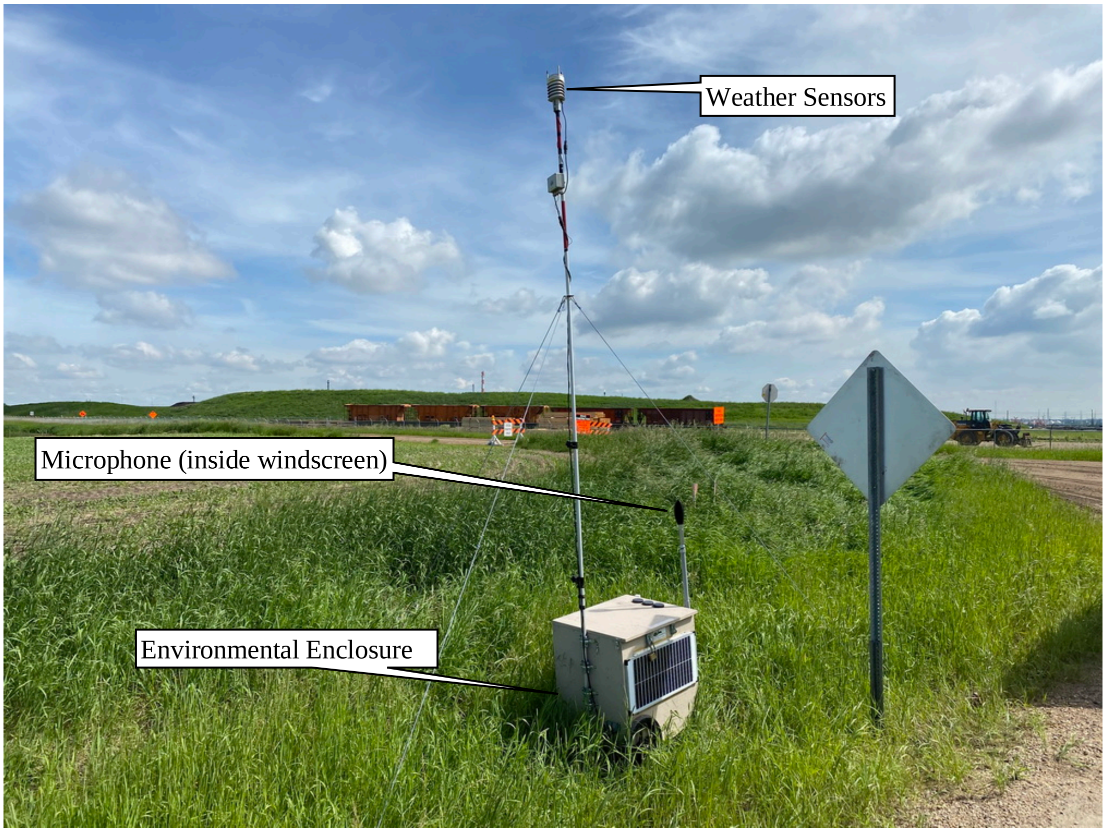

Figure 12. Noise Monitor #11

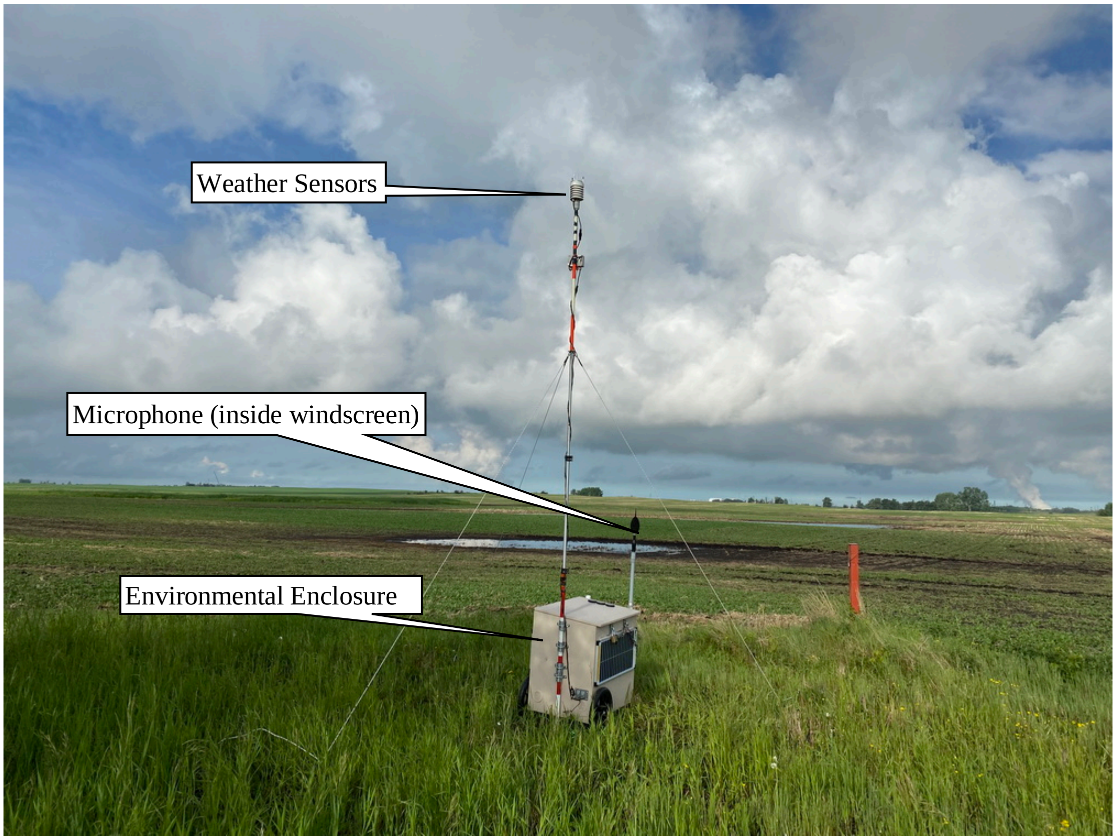

Figure 13. Noise Monitor #12 (Control Site w/ Weather Monitor)

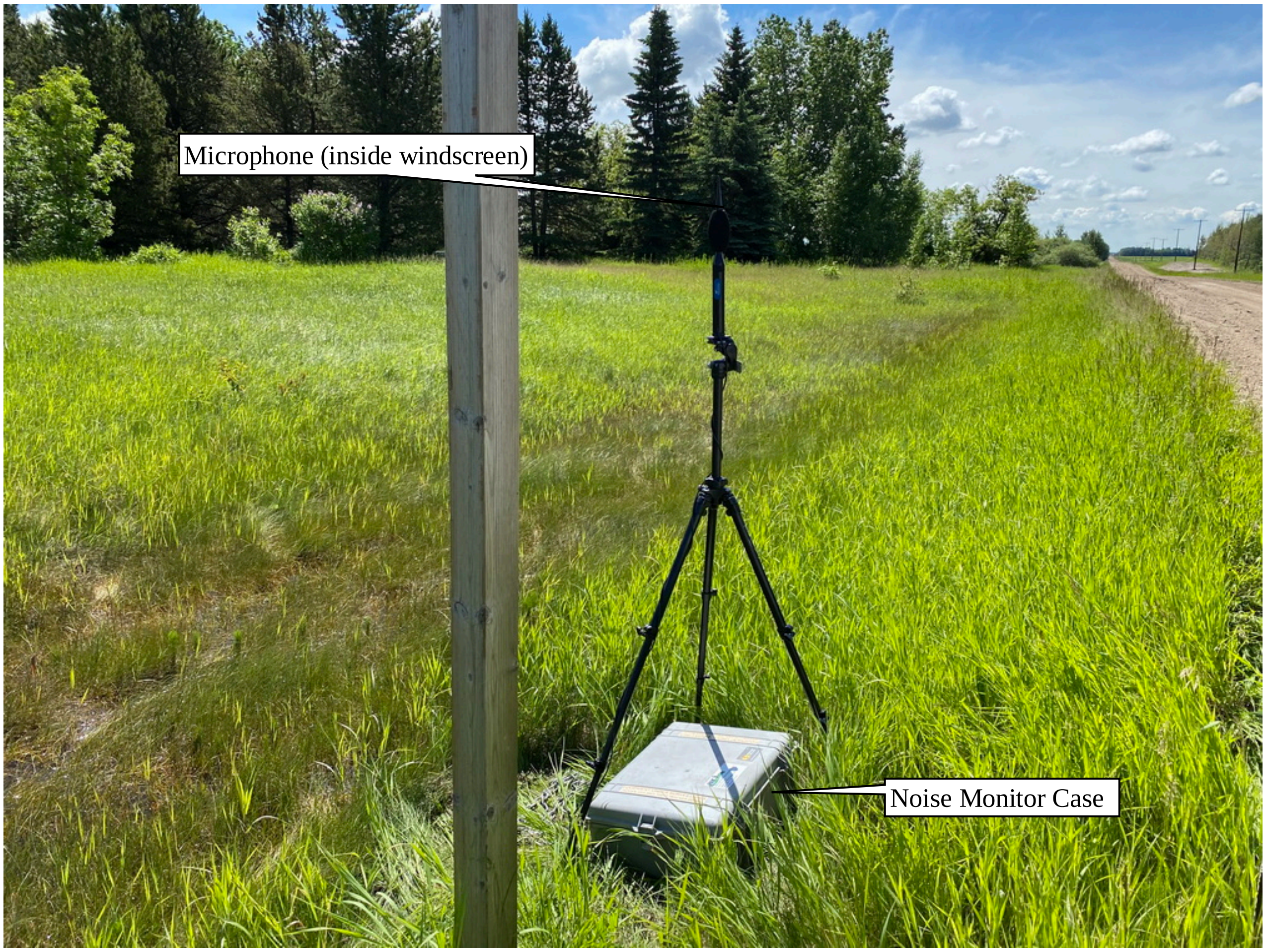

Figure 14. Noise Monitor #13

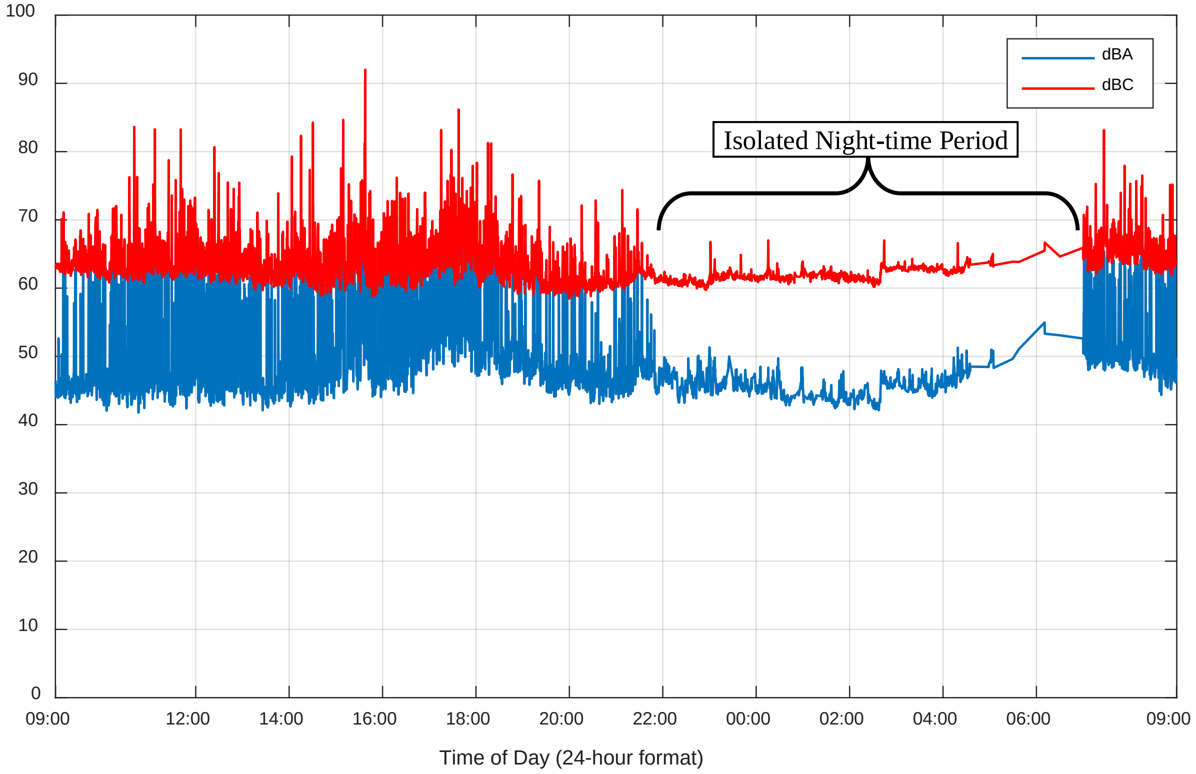

Figure 15. Noise Monitor #1, 15-Second L_{eq} Sound Levels (July 27 - 28, 2020)

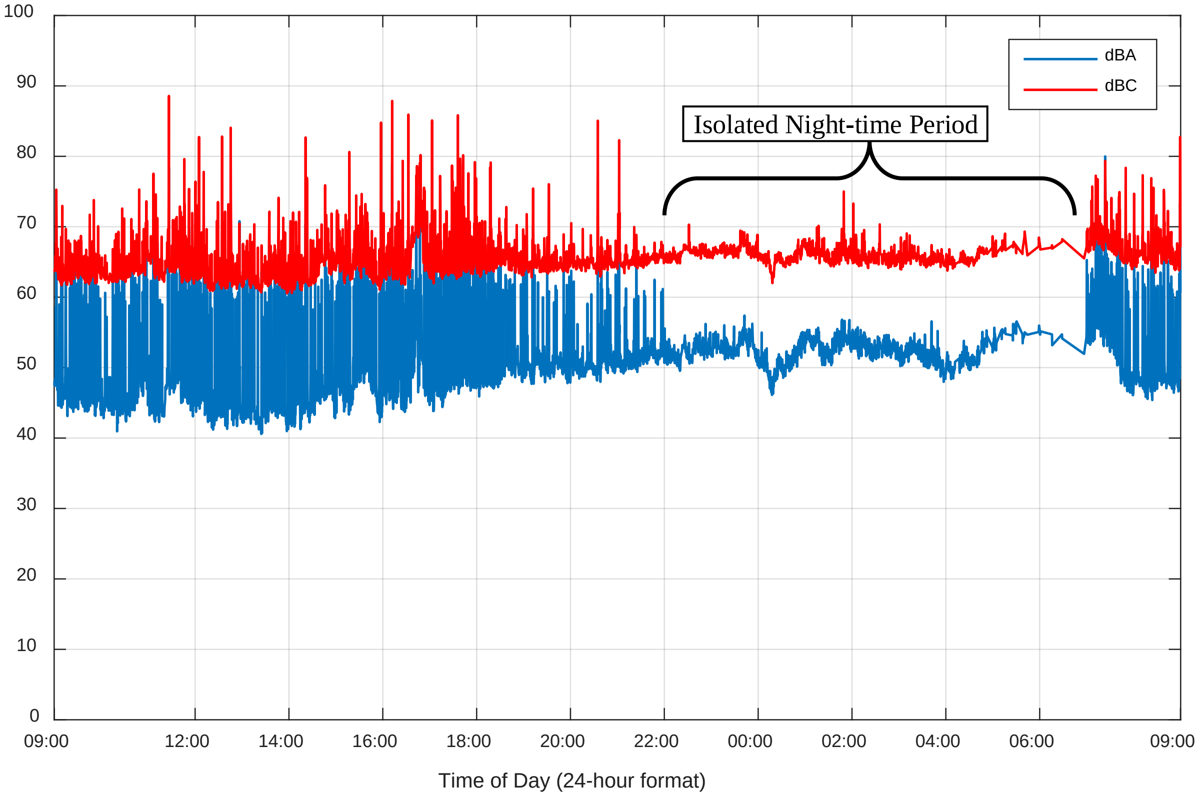

Figure 16. Noise Monitor #1, 15-Second L_{eq} Sound Levels (July 28 - 29, 2020)

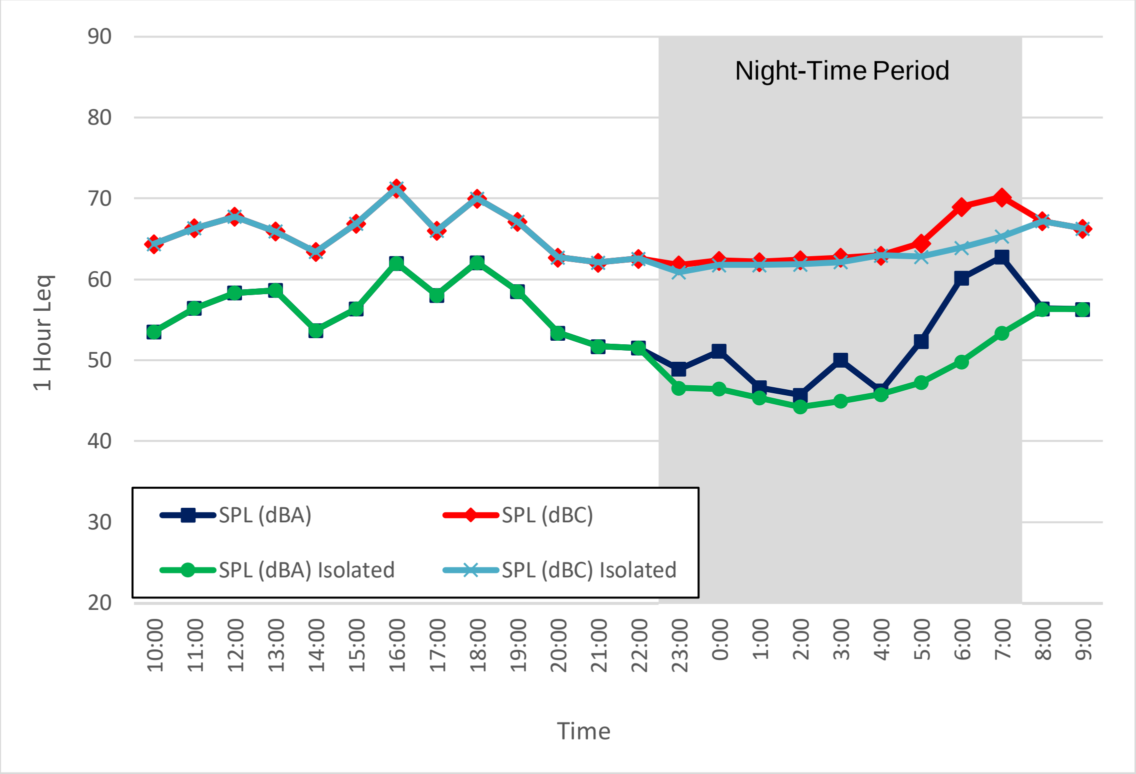

Figure 17. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (July 27 - 28, 2020)

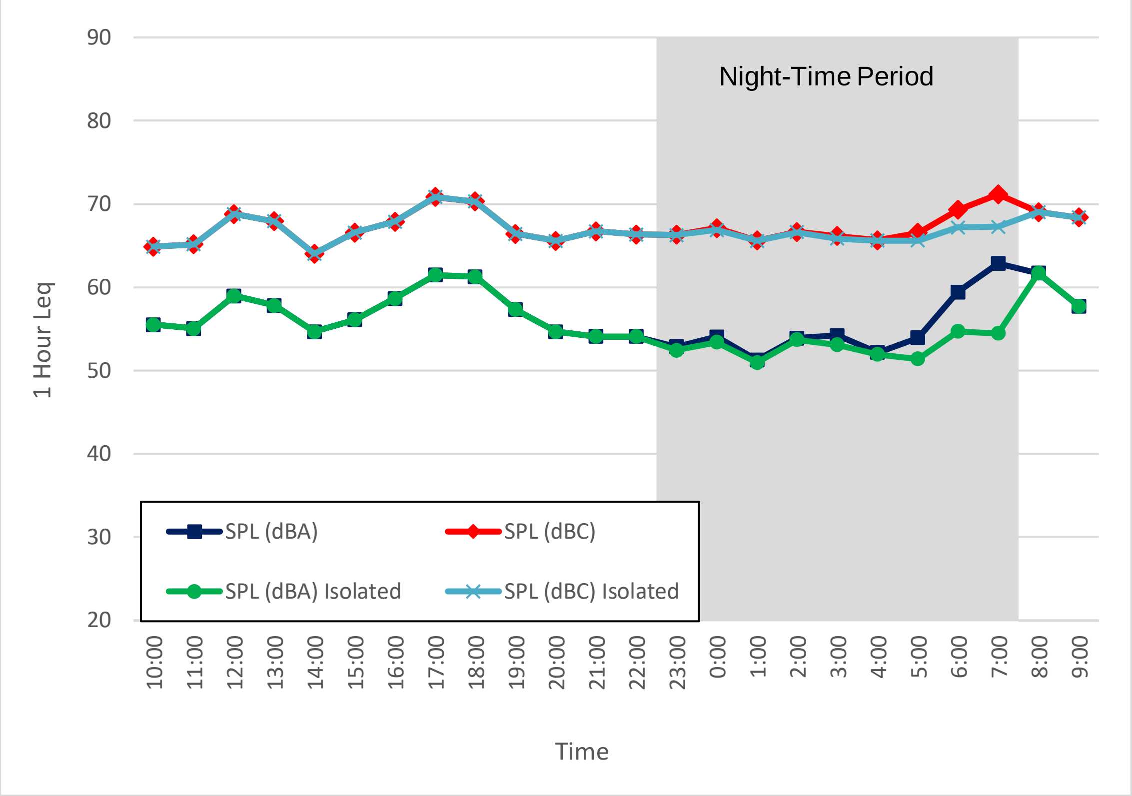

Figure 18. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (July 28 - 29, 2020)

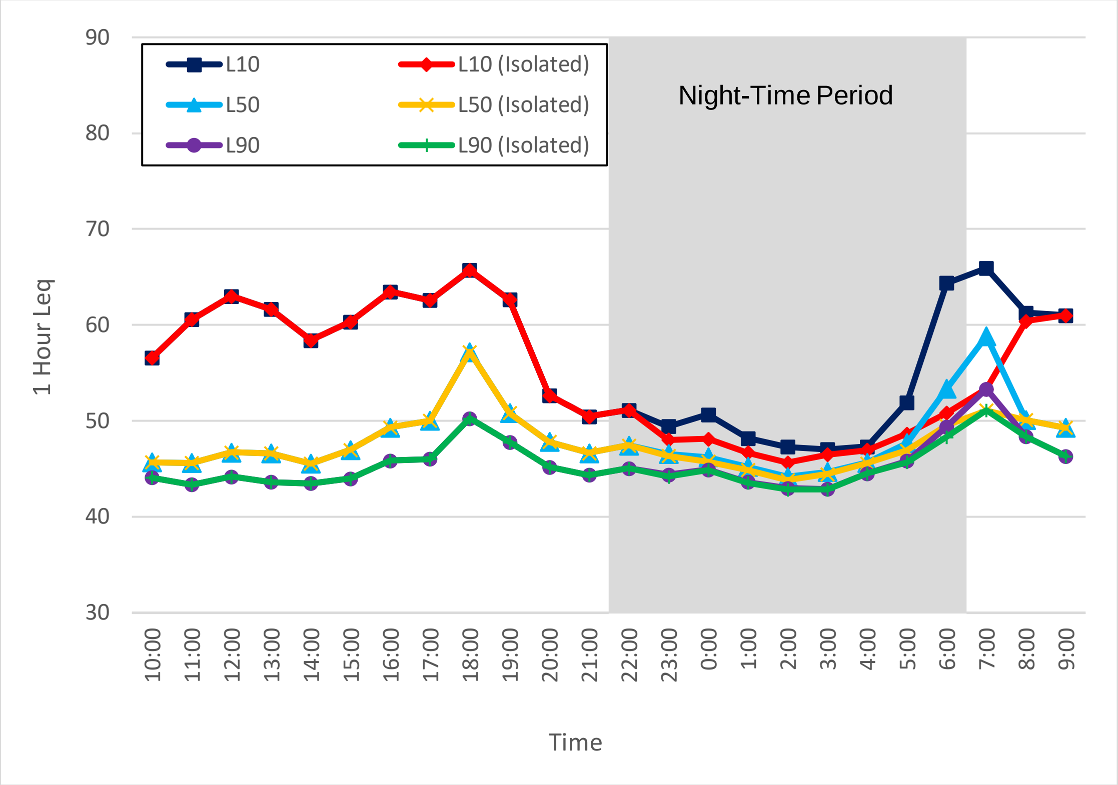

Figure 19. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 27 - 28, 2020)

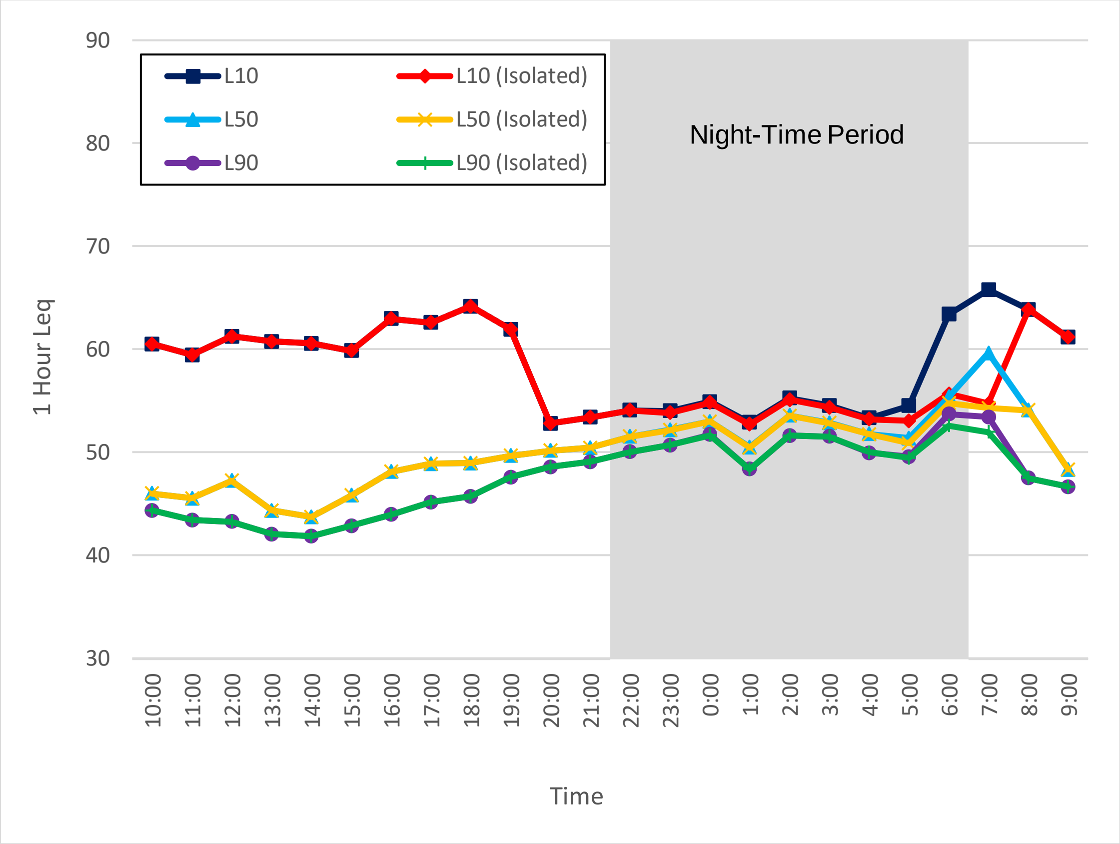

Figure 20. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 28 - 29, 2020)

Noise Monitor #1

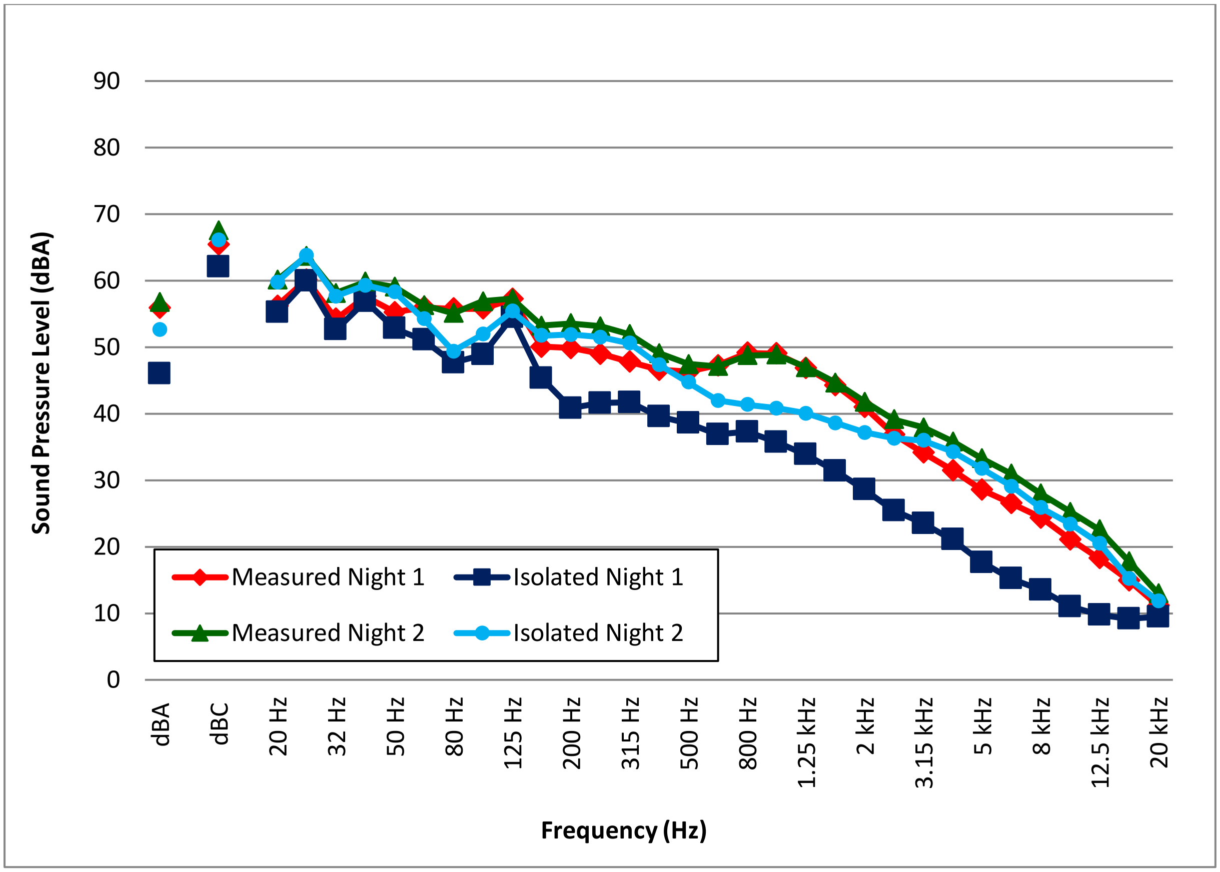

Figure 21. Noise Monitor #1, 1/3 Octave L_{eq} Sound Levels (July 27 - 29, 2020)

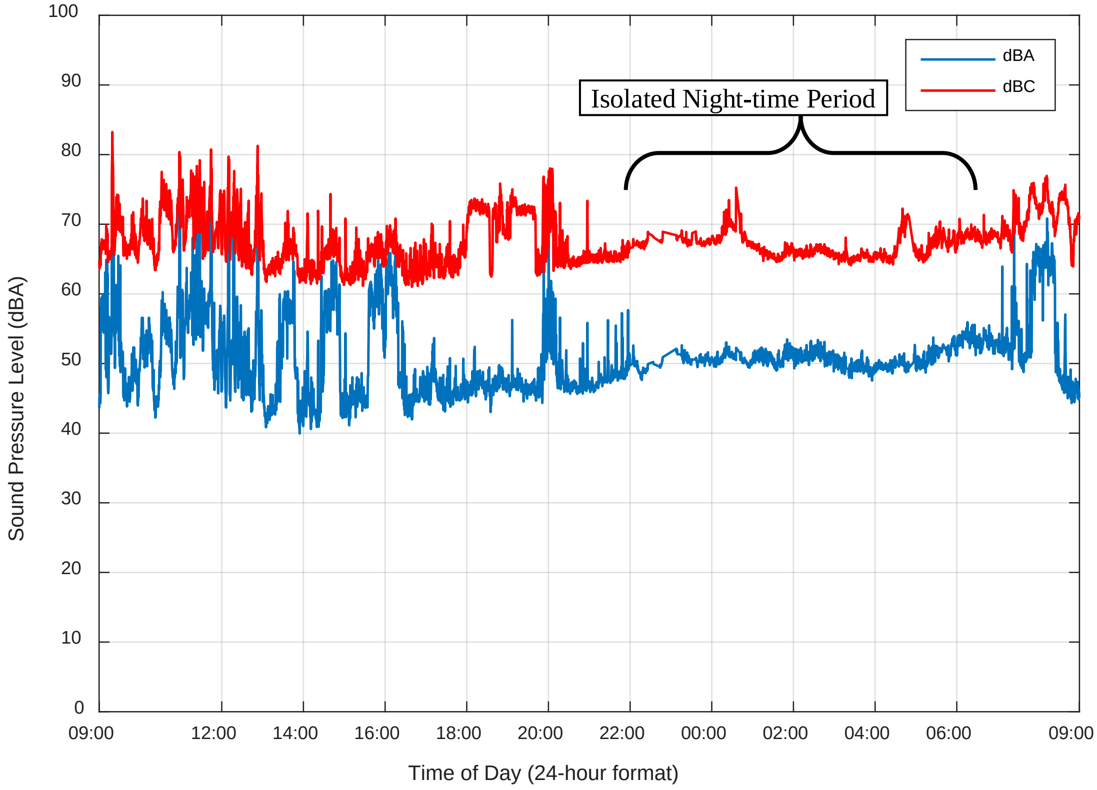

Figure 22. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 27 - 28, 2020)

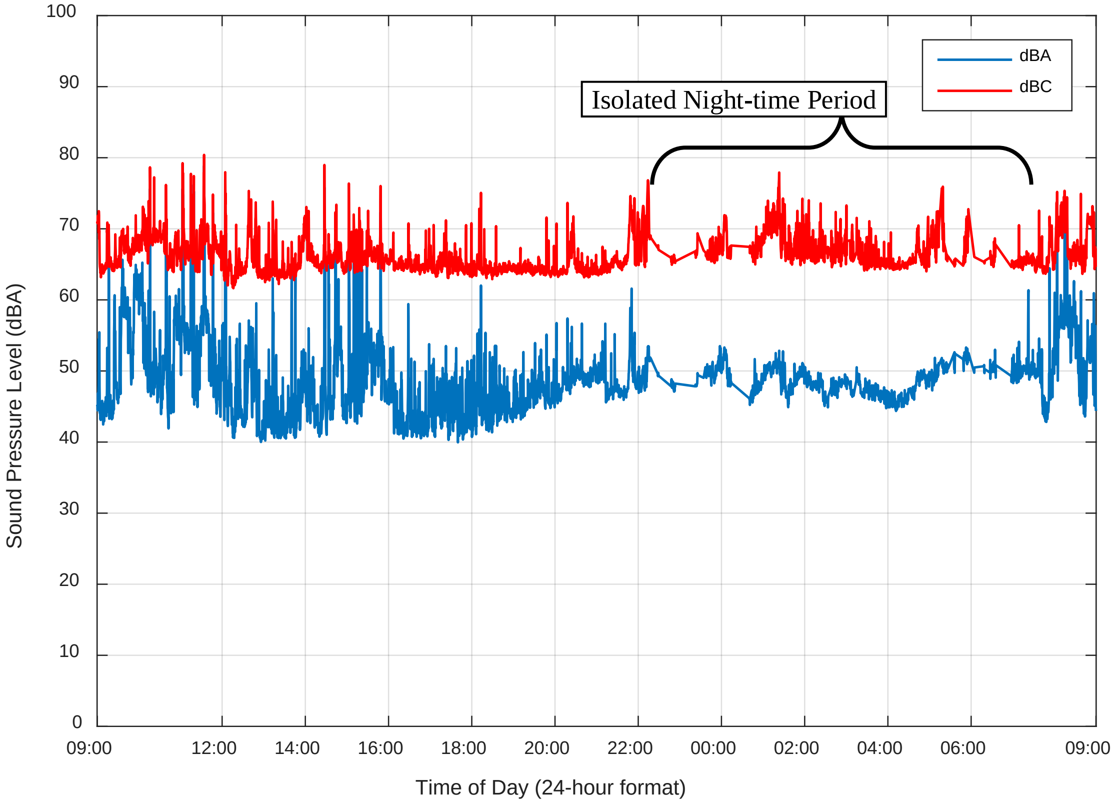

Figure 23. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 28 - 29, 2020)

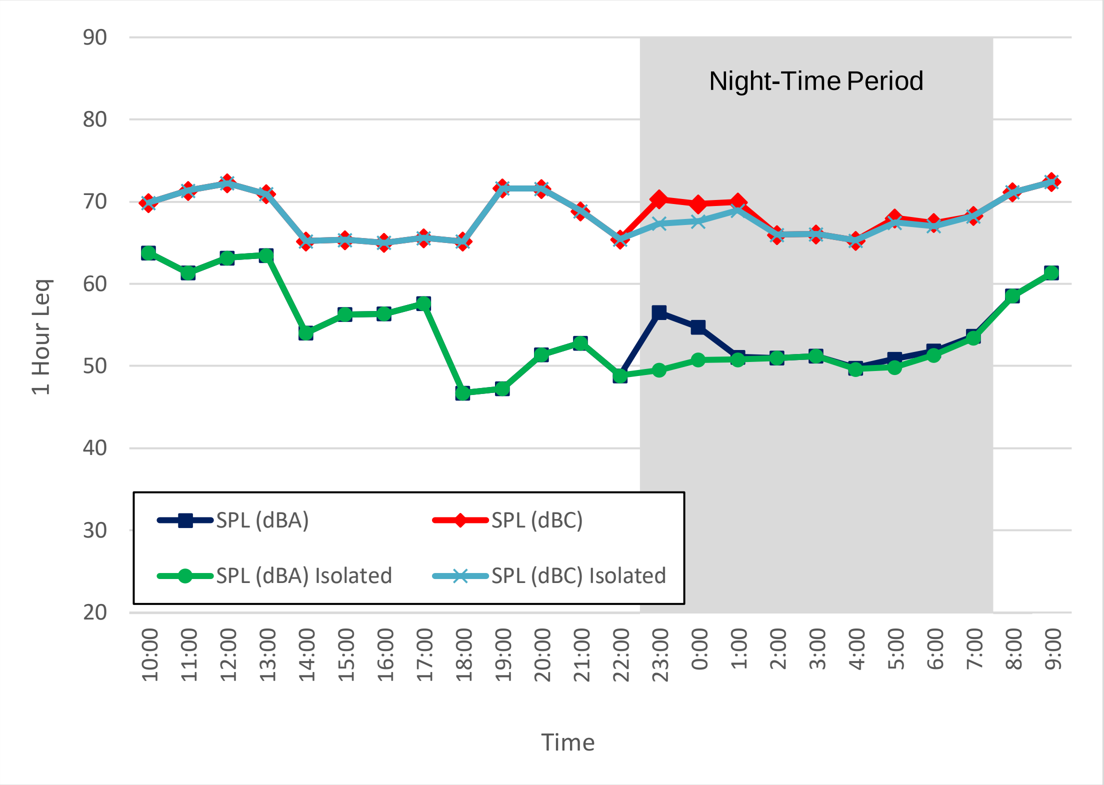

Figure 24. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 27 - 28, 2020)

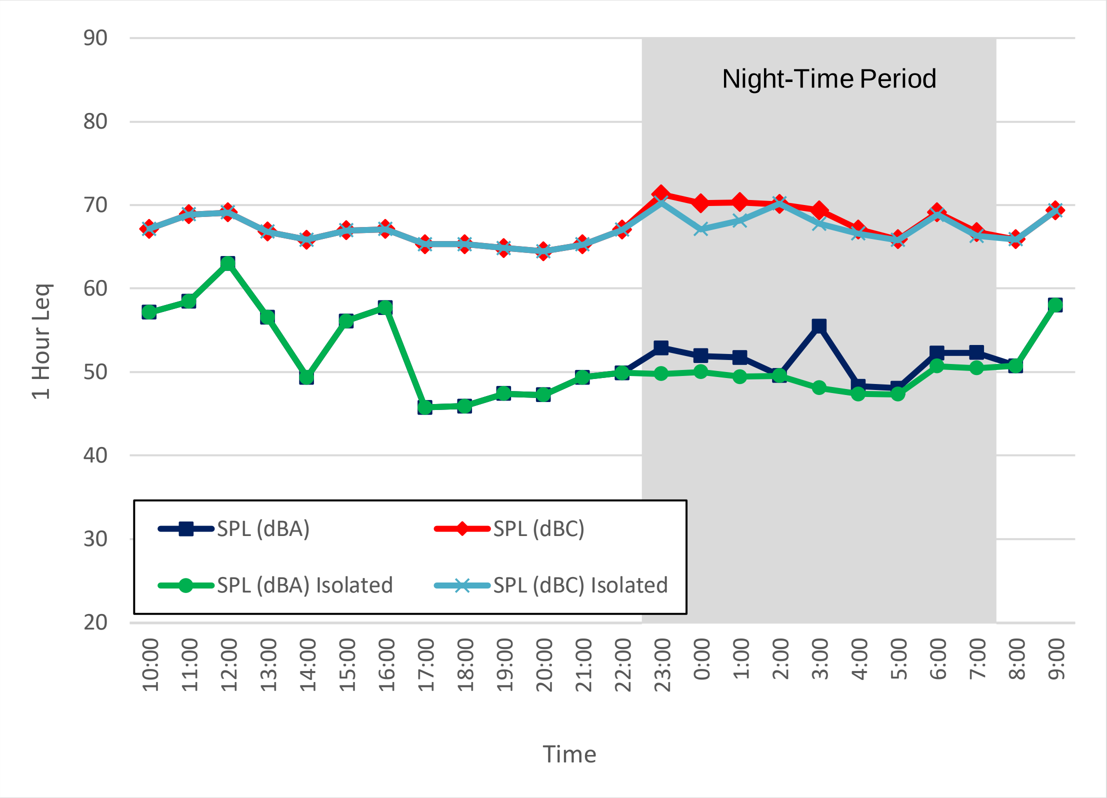

Figure 25. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 28 - 29, 2020)

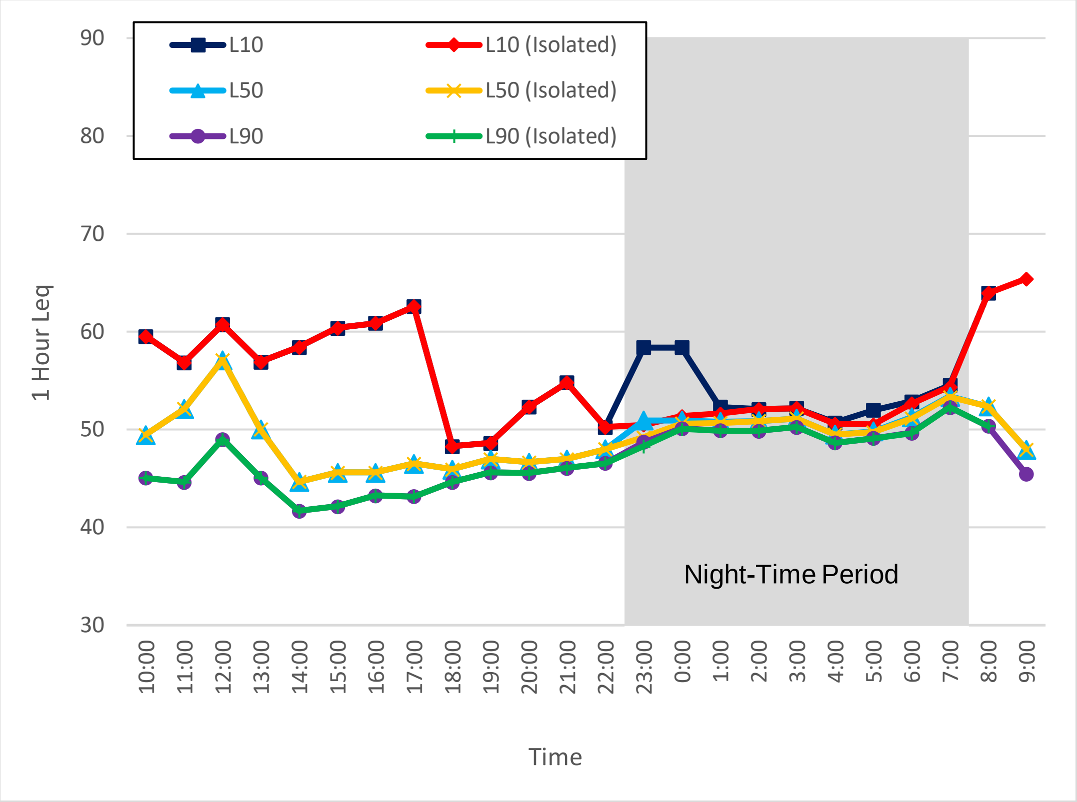

Figure 26. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 27 - 28, 2020)

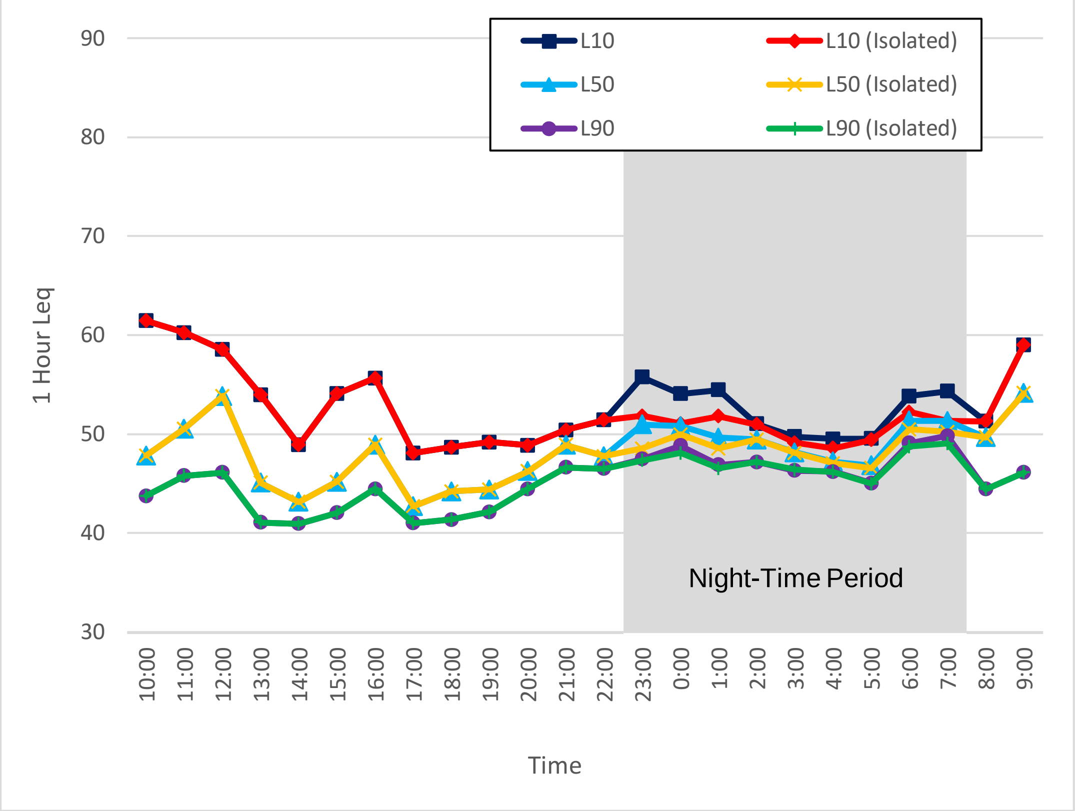

Figure 27. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 28 - 29, 2020)

Noise Monitor #2

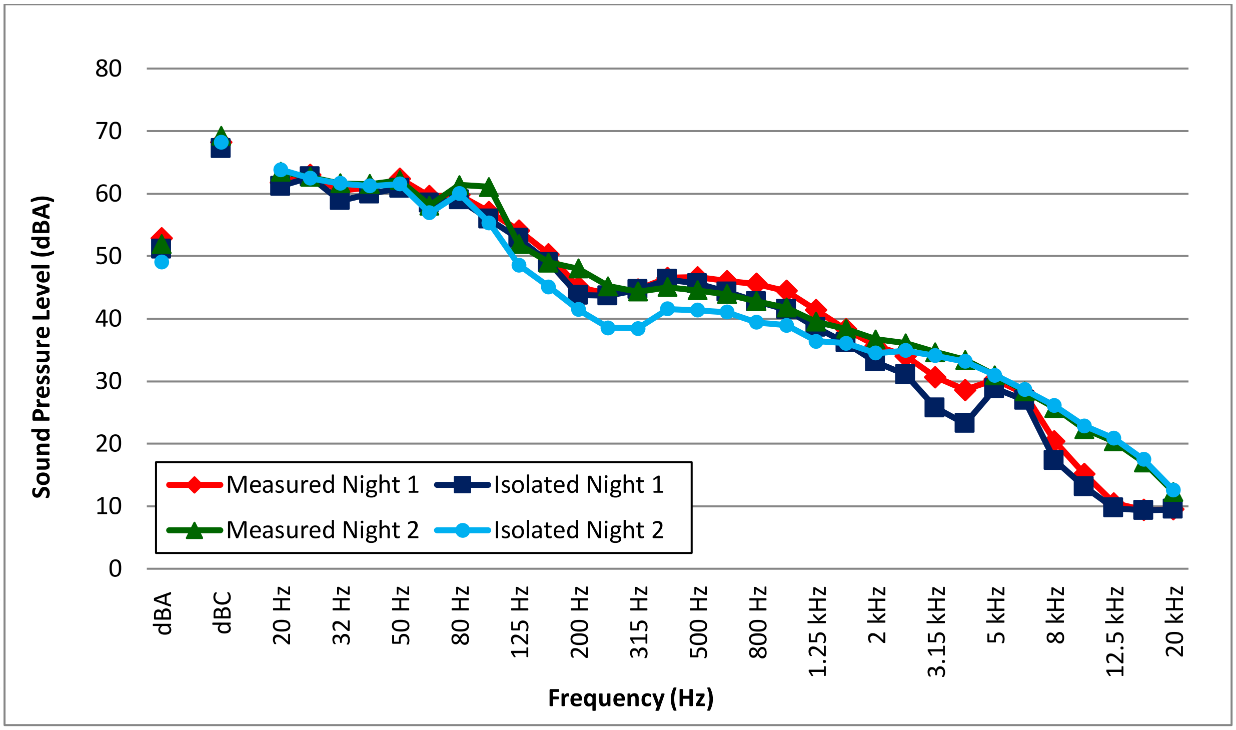

Figure 28. Noise Monitor #2, 1/3 Octave L_{eq} Sound Levels (July 27 - 29, 2020)

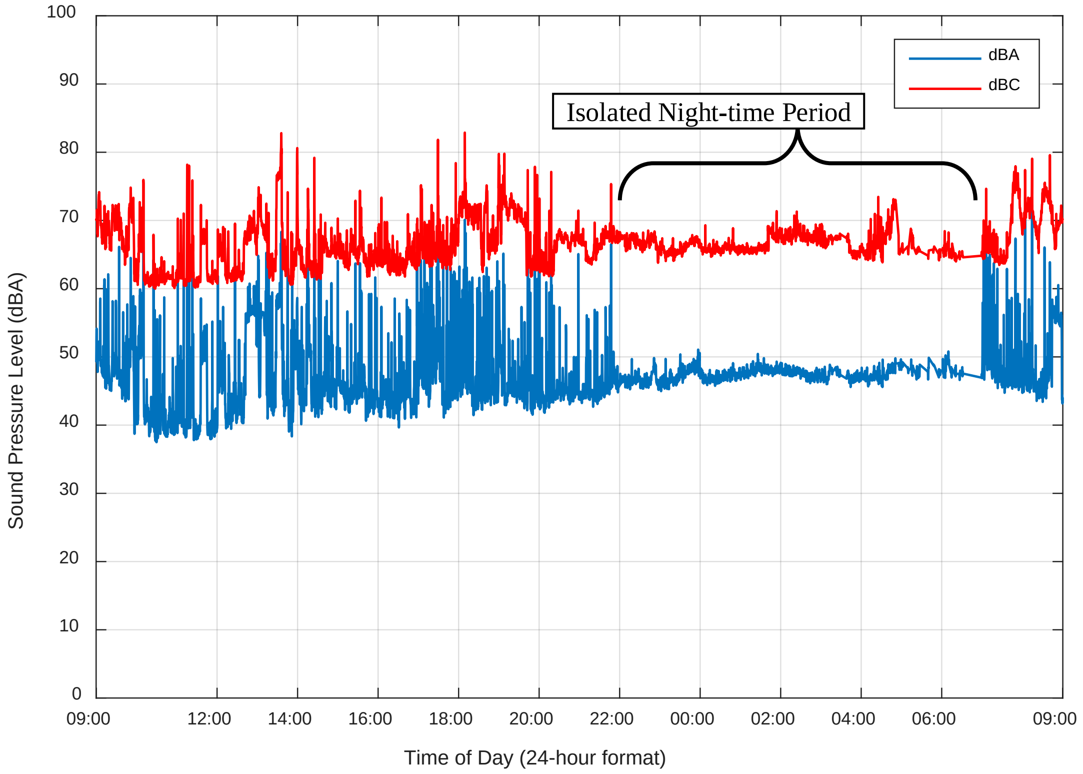

Figure 29. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 27 - 28, 2020)

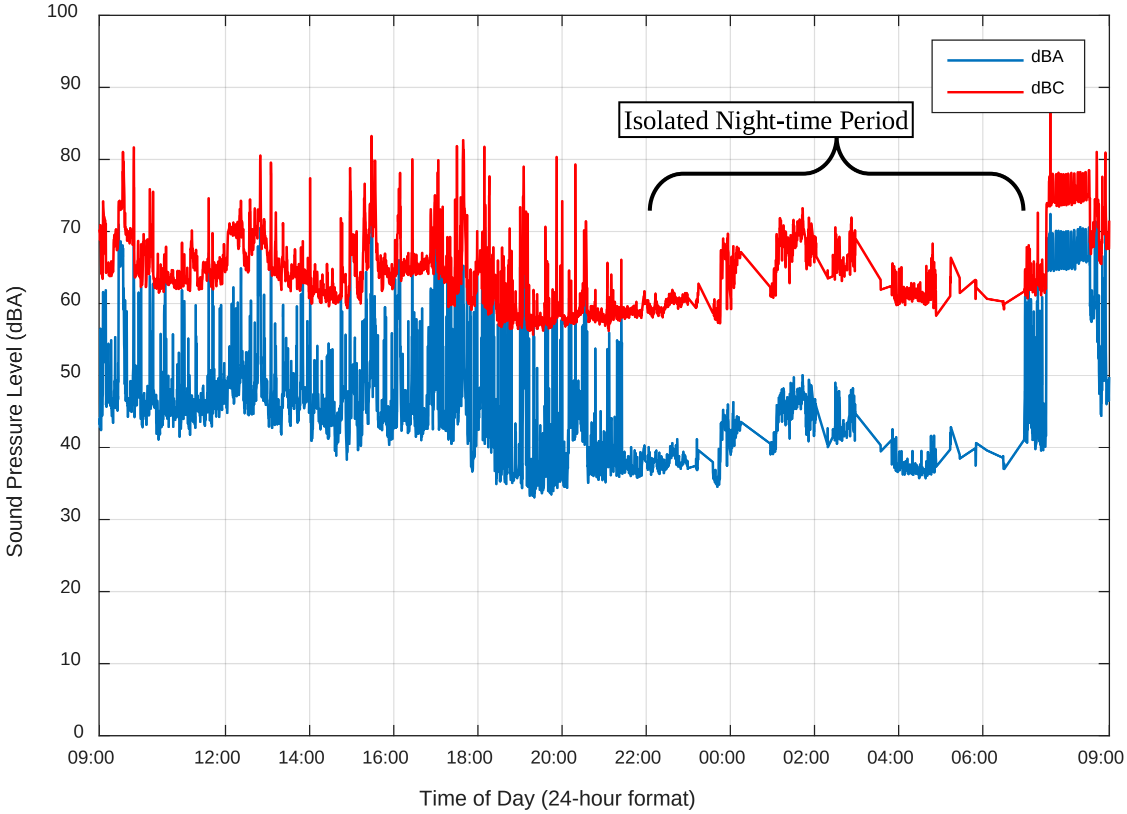

Figure 30. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 28 - 29, 2020)

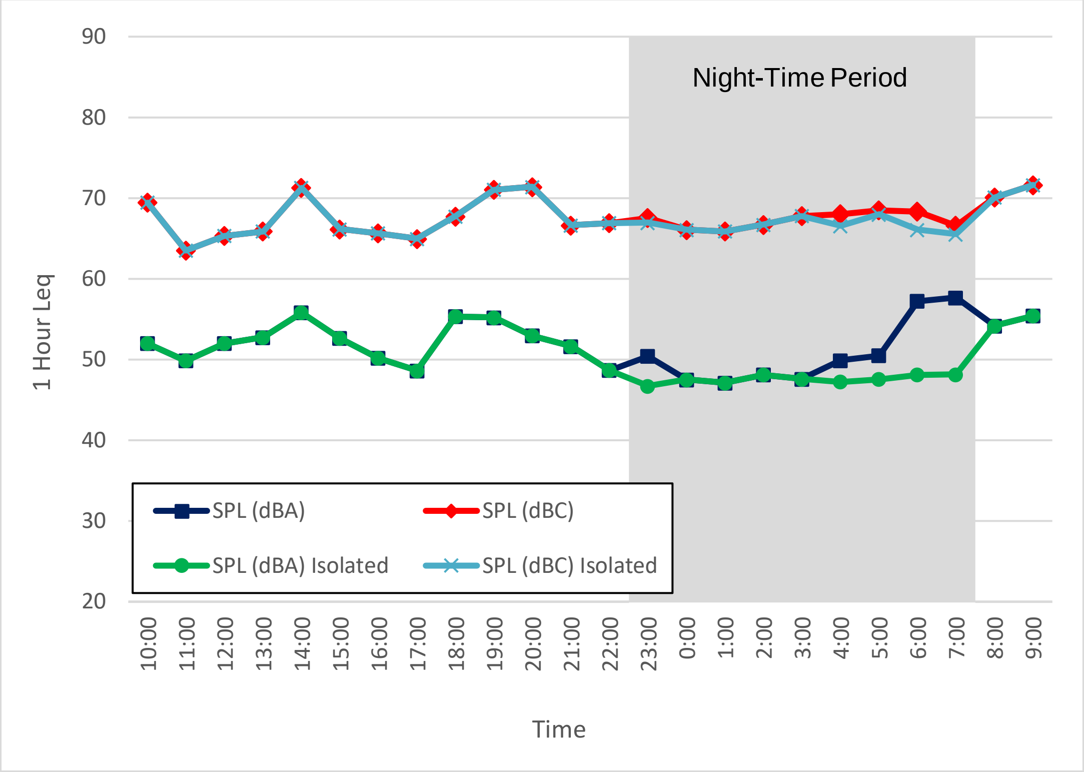

Figure 31. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 27 - 28, 2020)

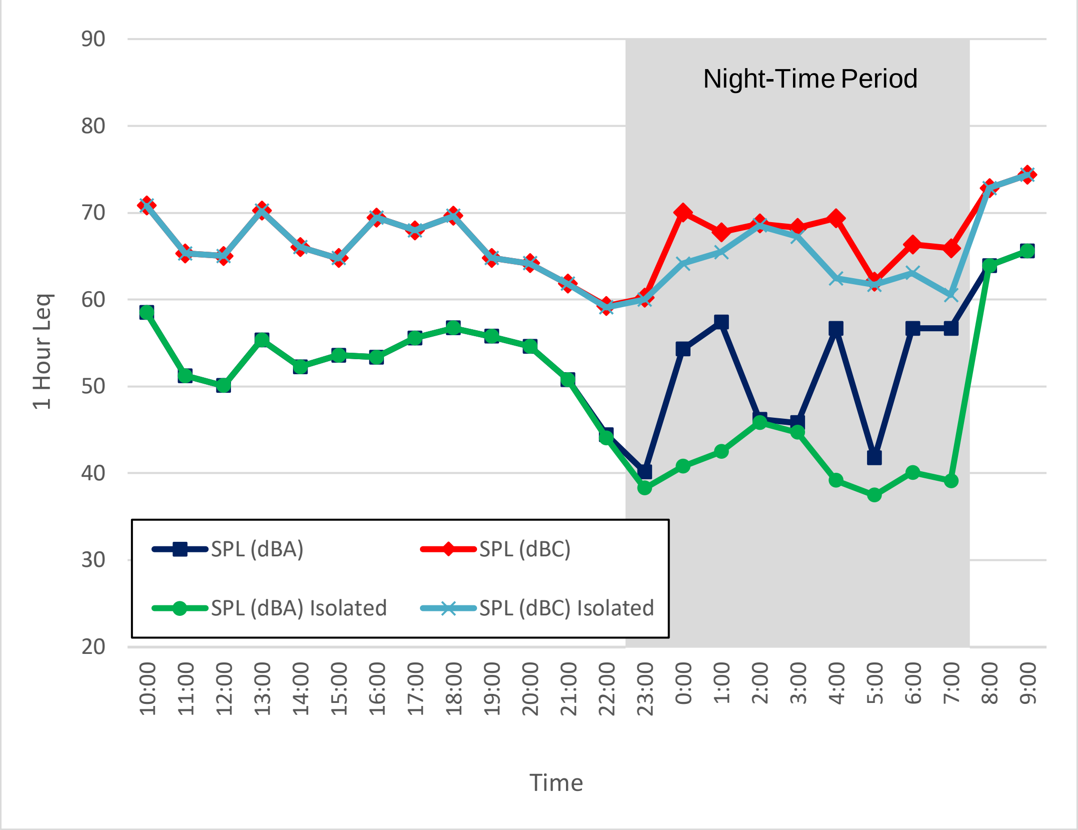

Figure 32. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 28 - 29, 2020)

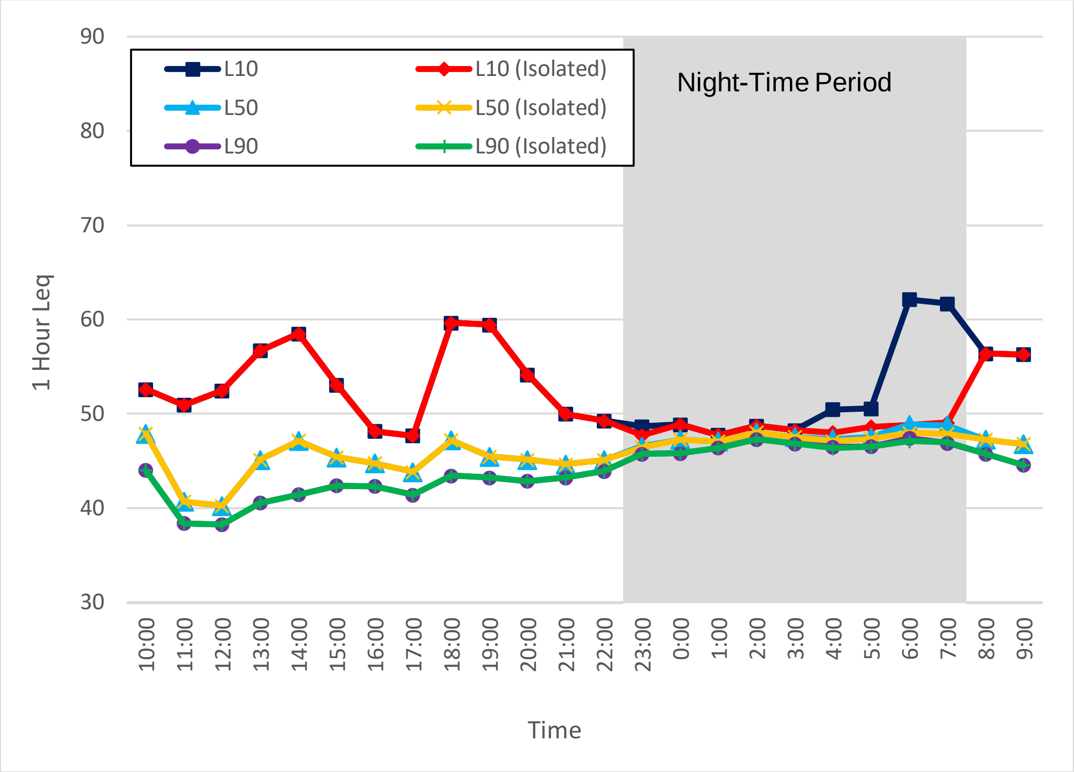

Figure 33. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 27 - 28, 2020)

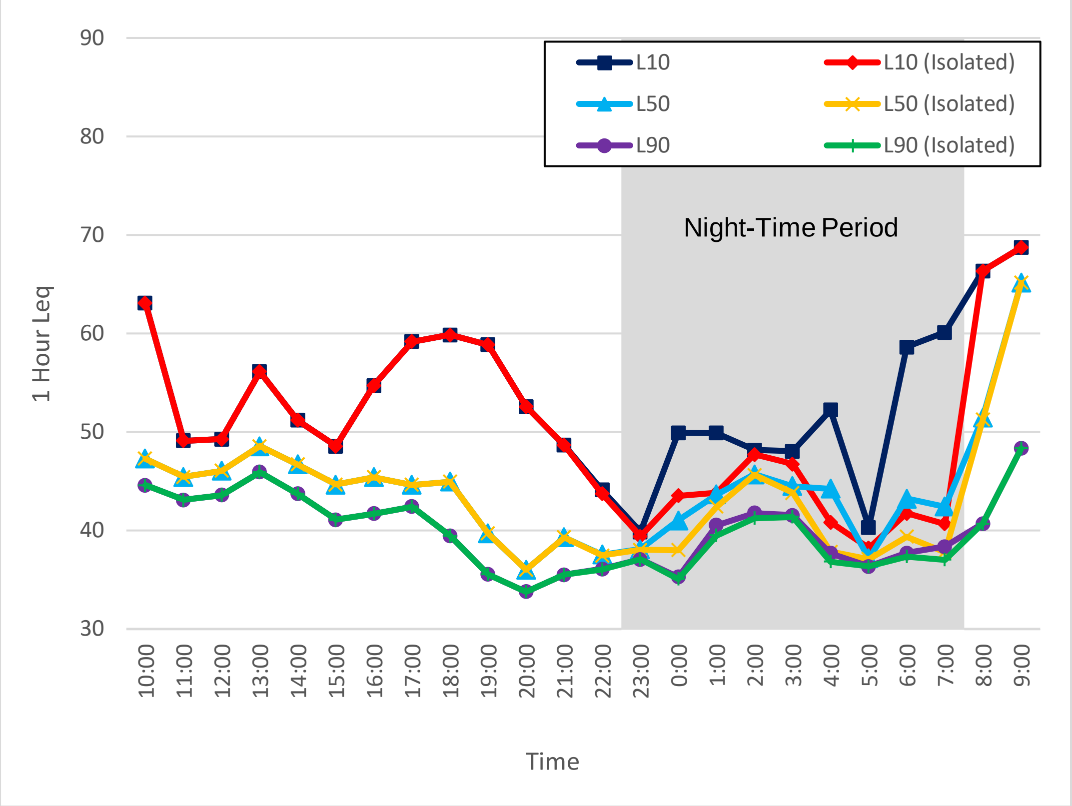

Figure 34. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 28 - 29, 2020)

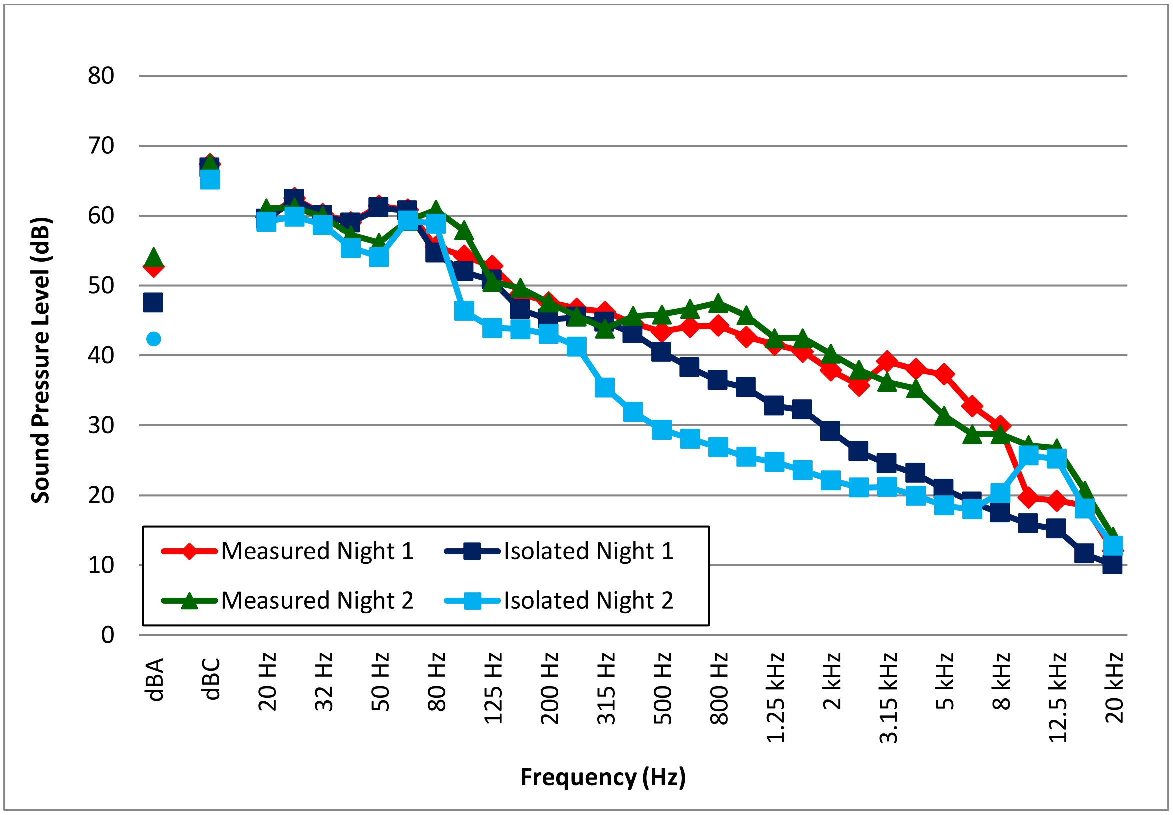

Figure 35. Noise Monitor #3, 1/3 Octave L_{eq} Sound Levels (July 27 - 29, 2020)

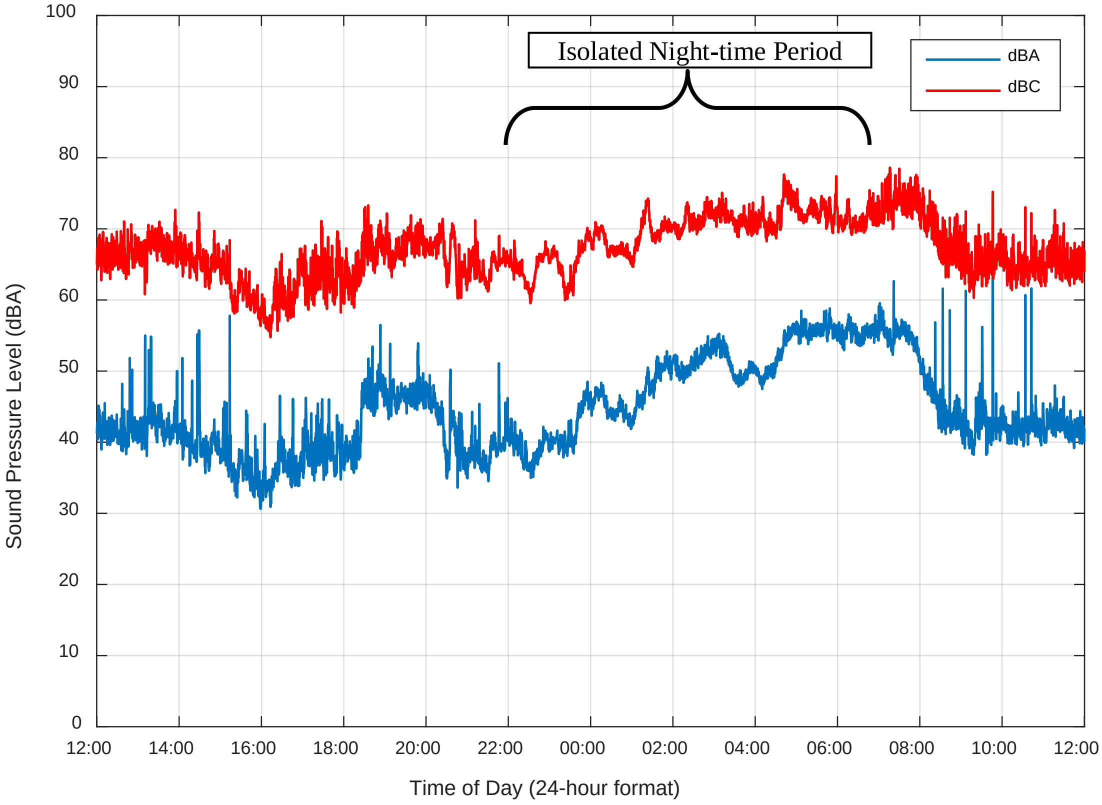

Figure 36. Noise Monitor #4, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

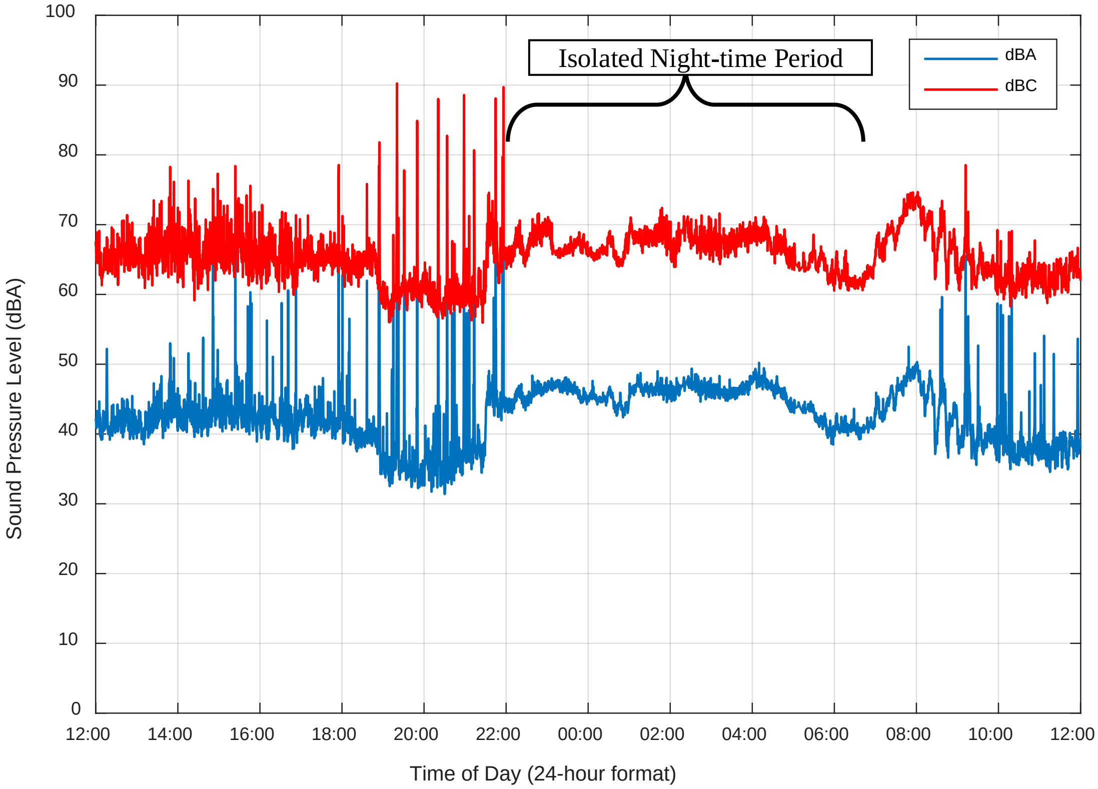

Figure 37. Noise Monitor #4, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

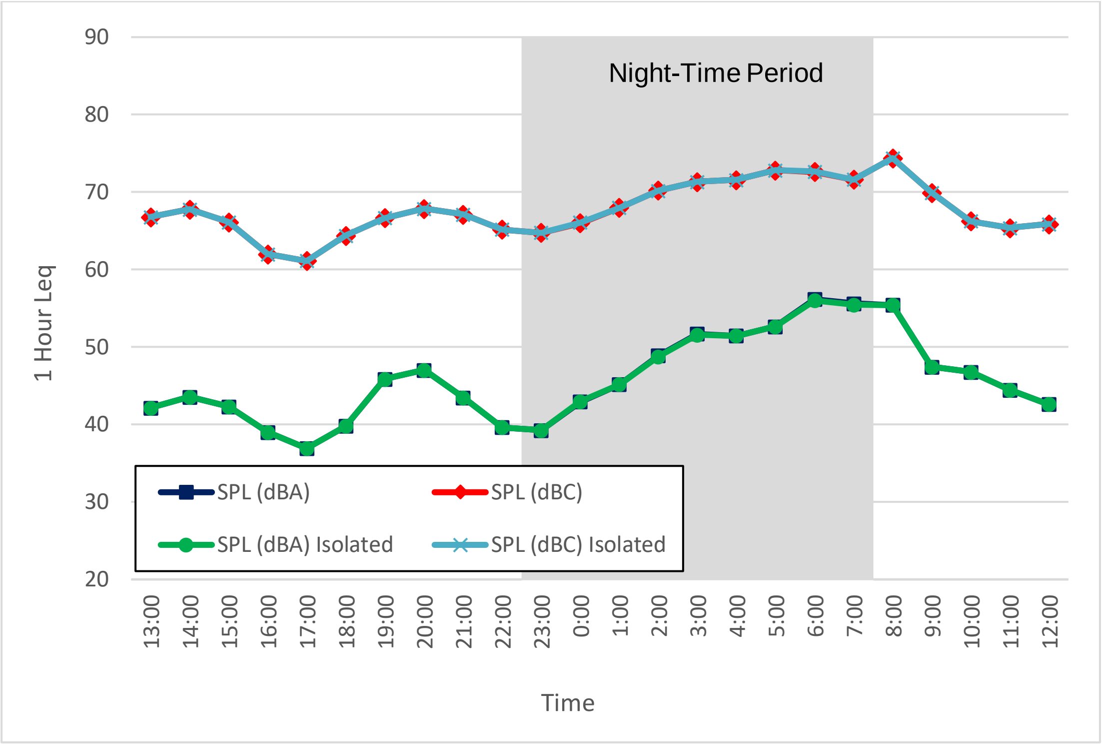

Figure 38. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

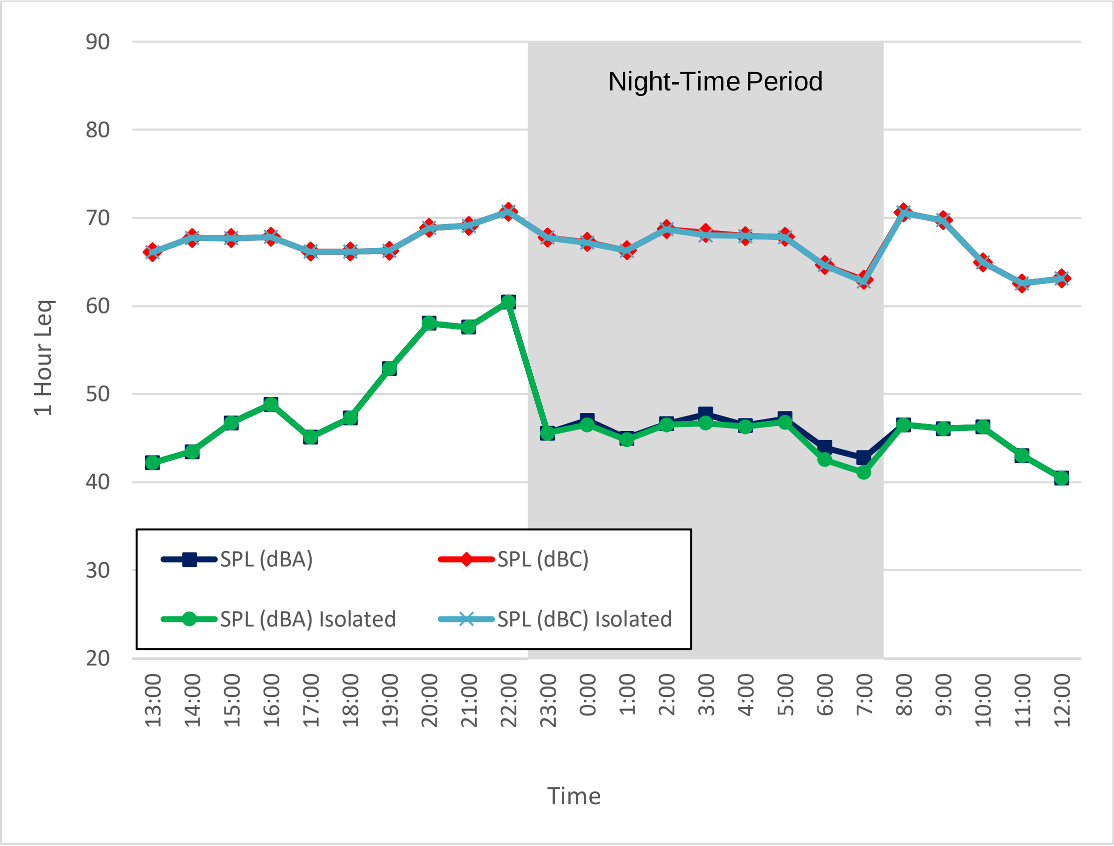

Figure 39. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

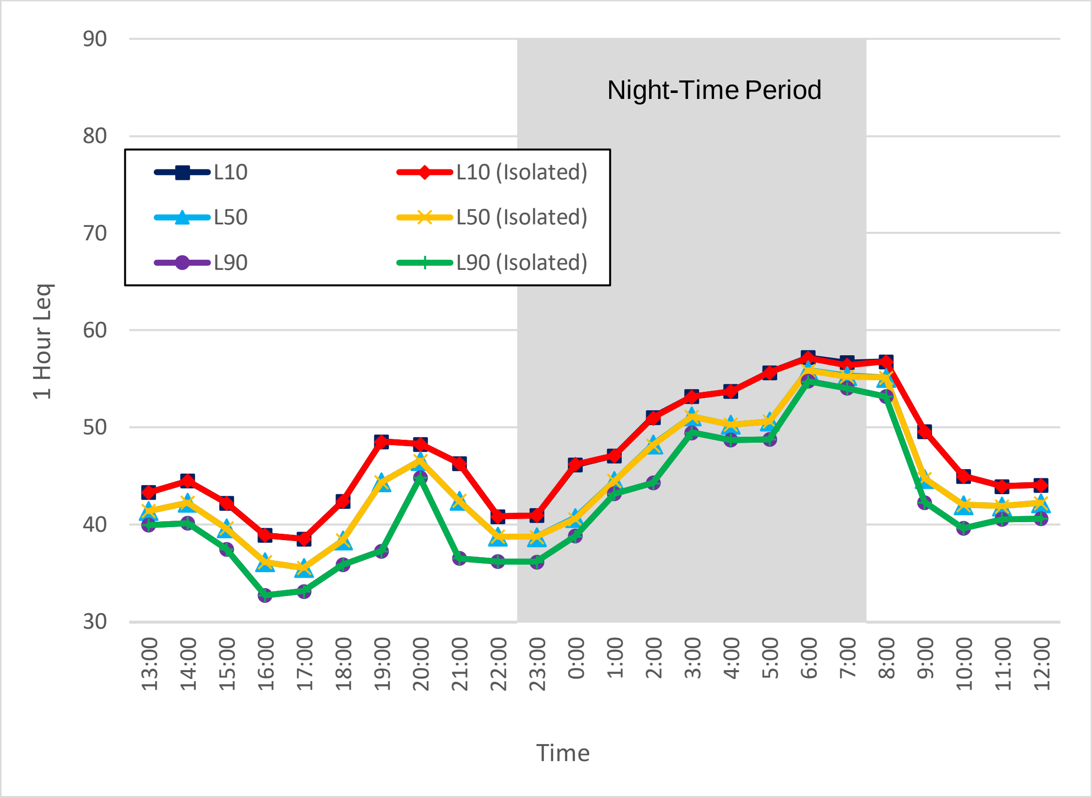

Figure 40. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

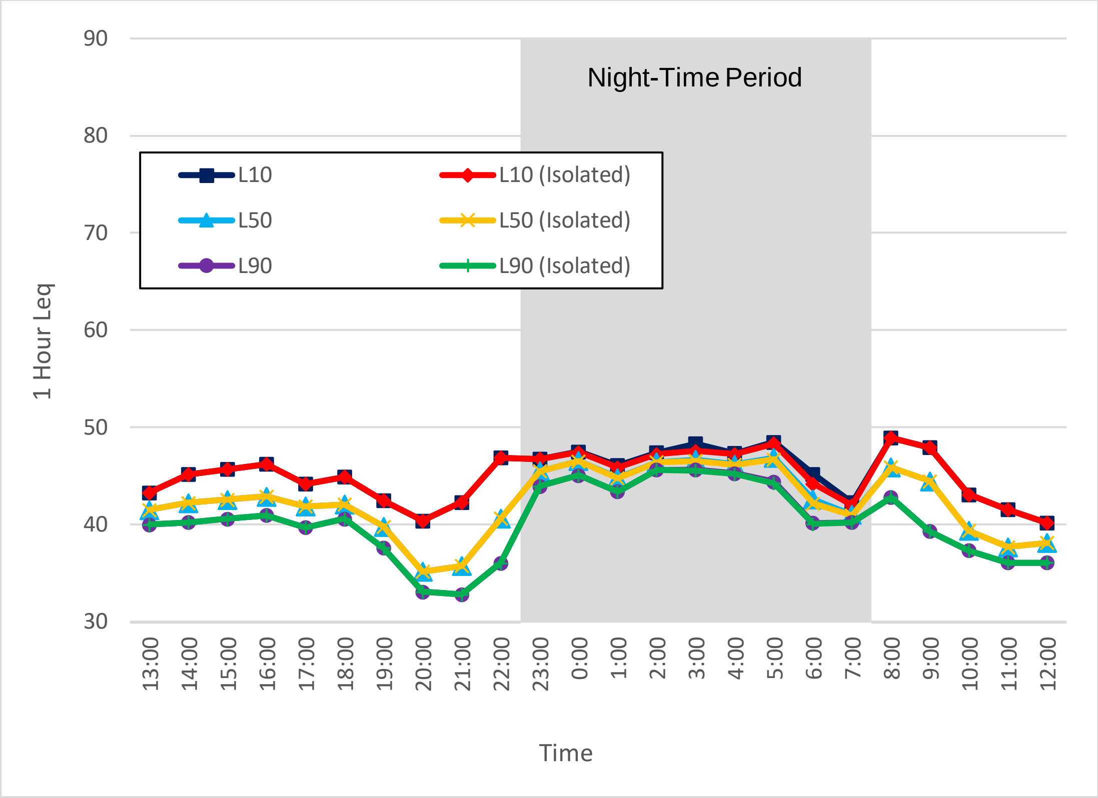

Figure 41. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

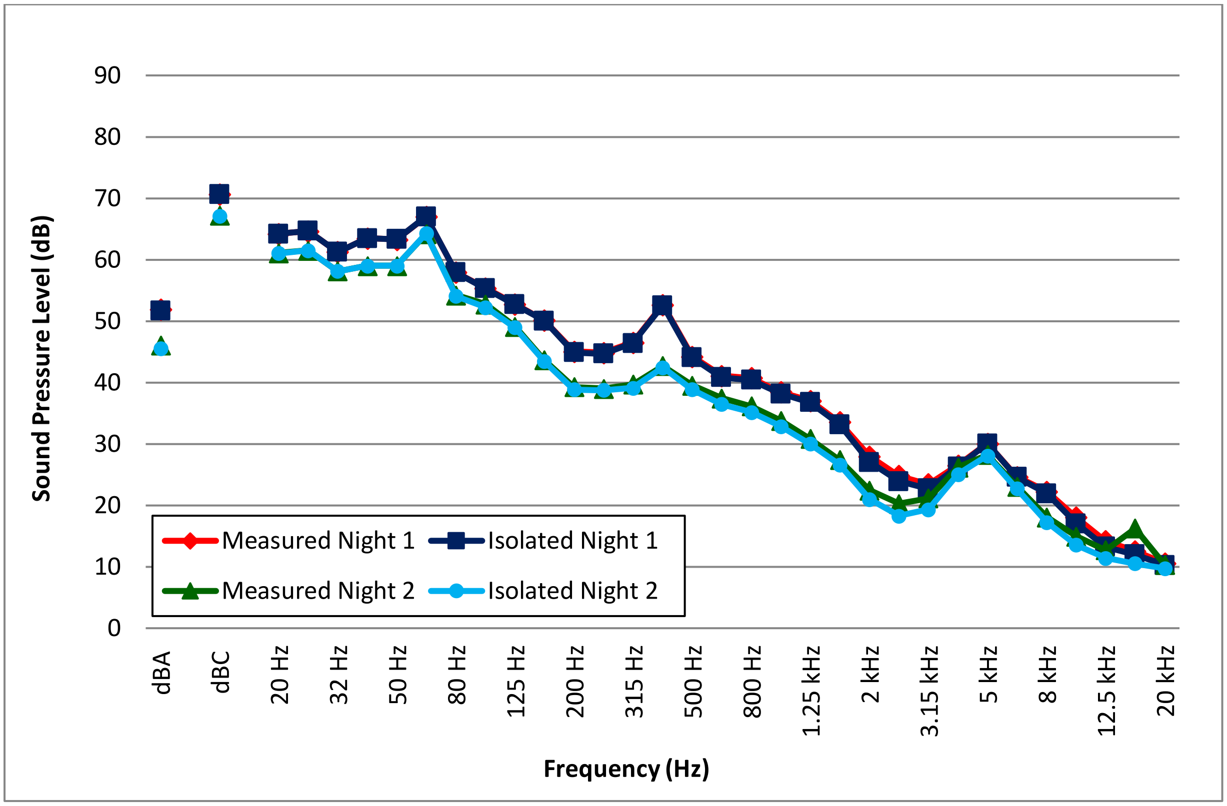

Figure 42. Noise Monitor #4, 1/3 Octave L_{eq} Sound Levels (June 24 – 26, 2020)

Noise Monitor #5

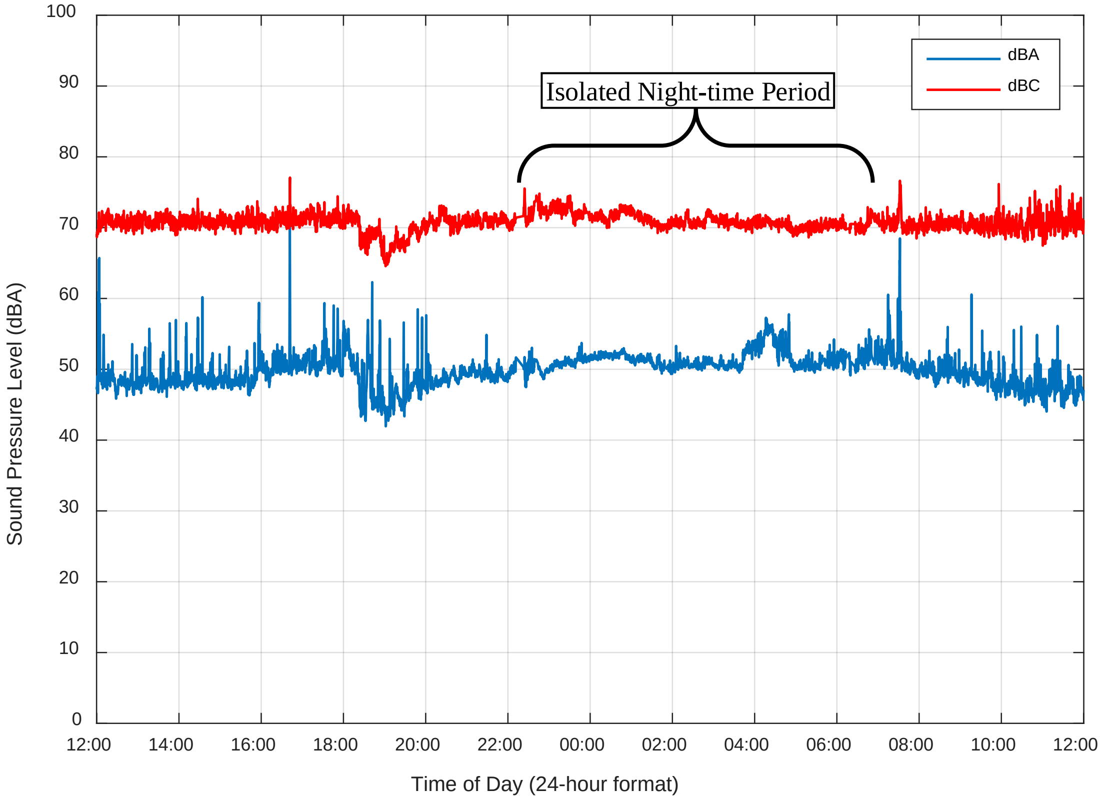

Figure 43. Noise Monitor #5, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

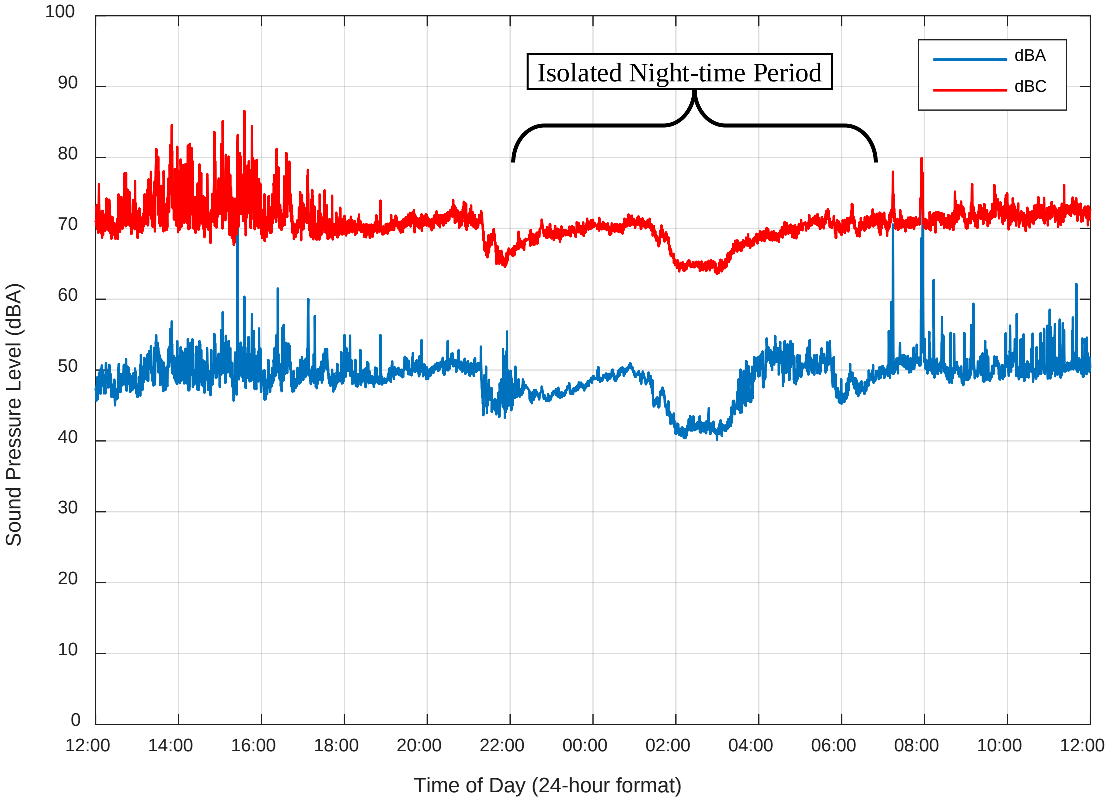

Figure 44. Noise Monitor #5, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

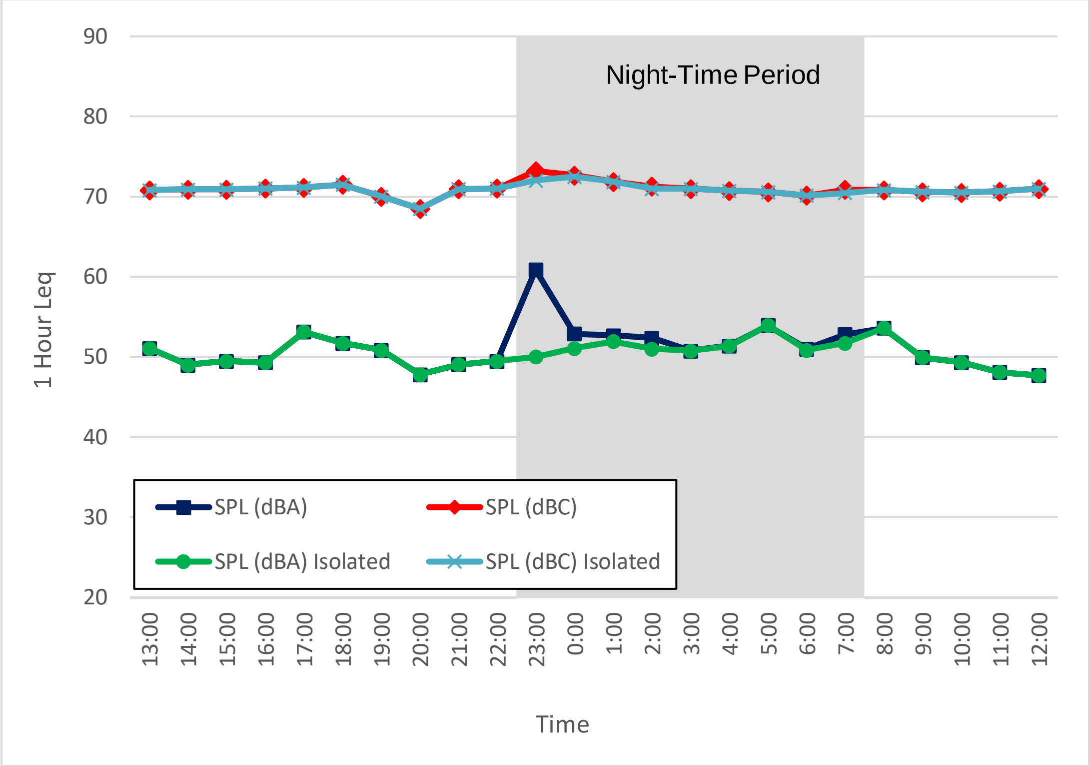

Figure 45. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

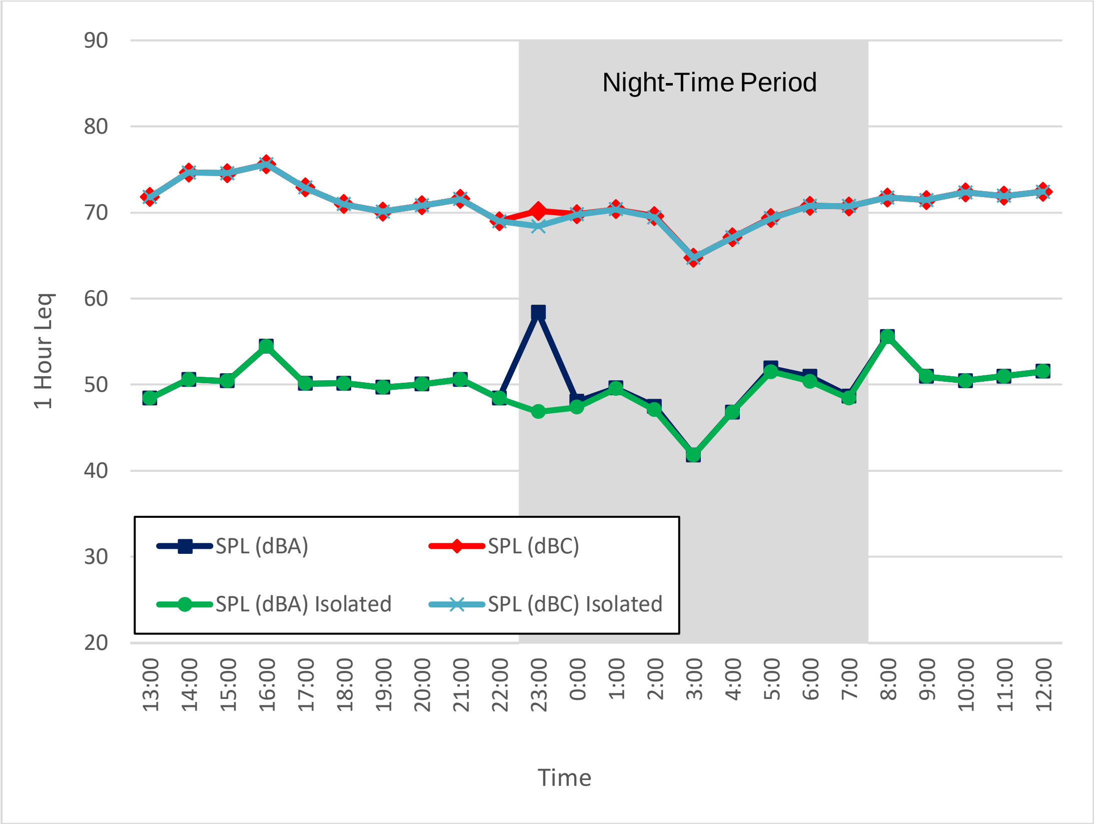

Figure 46. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

Noise Monitor #5

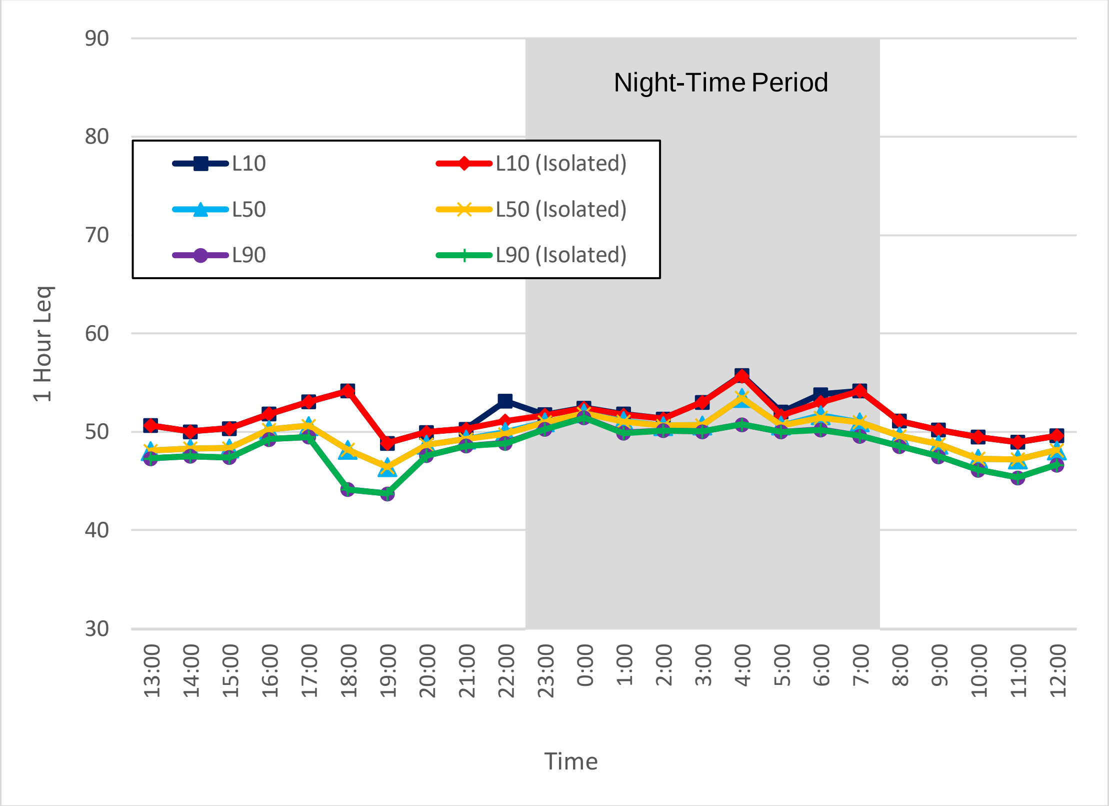

Figure 47. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

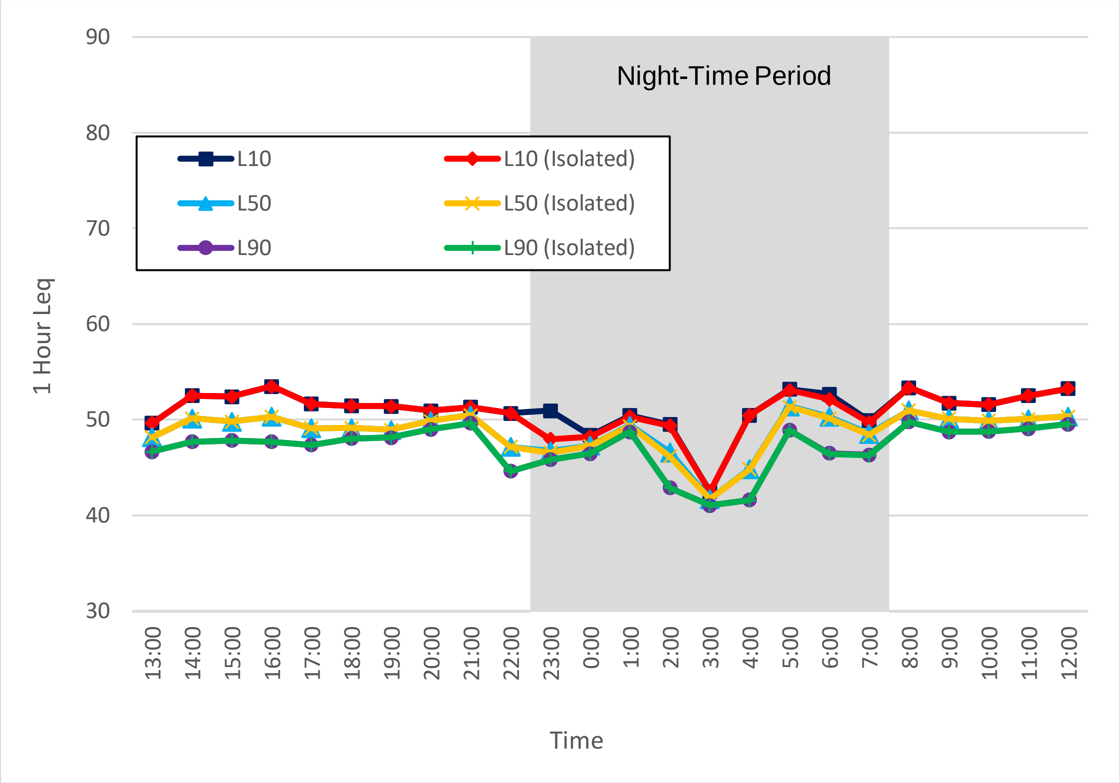

Figure 48. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

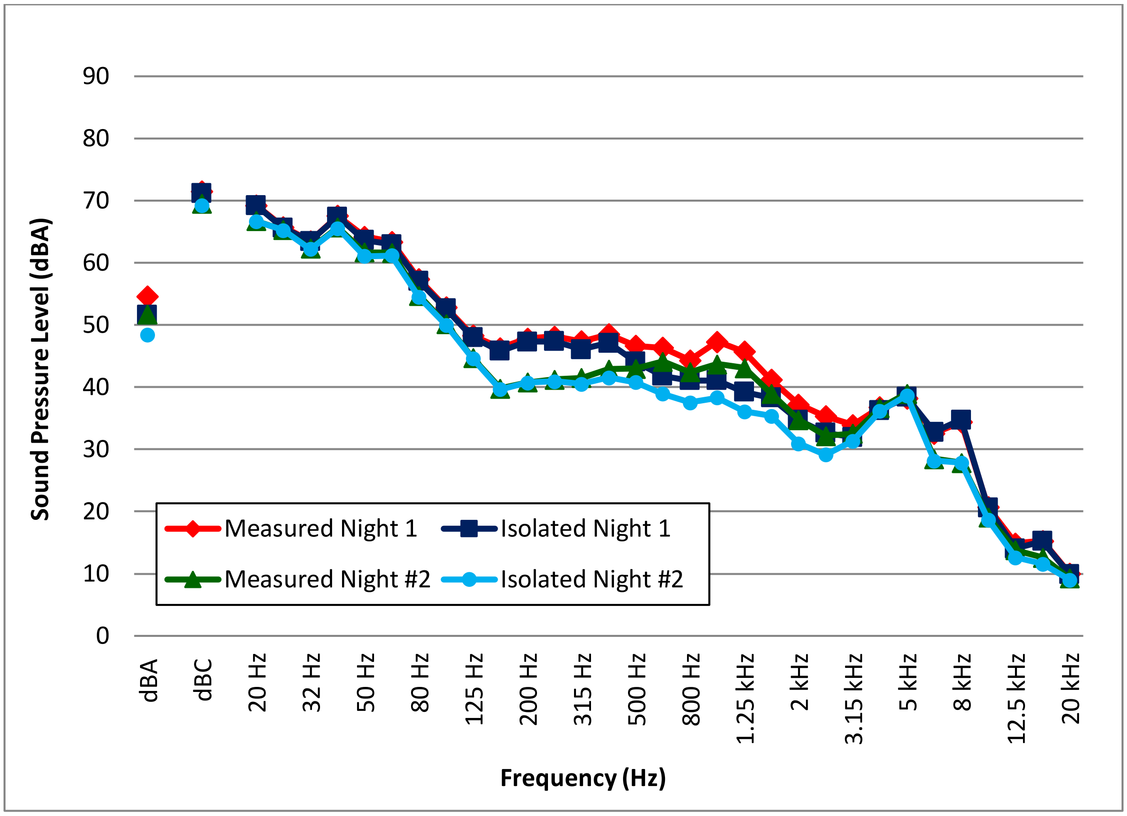

Figure 49. Noise Monitor #5, 1/3 Octave L_{eq} Sound Levels (June 24 – 25, 2020)

Noise Monitor #6

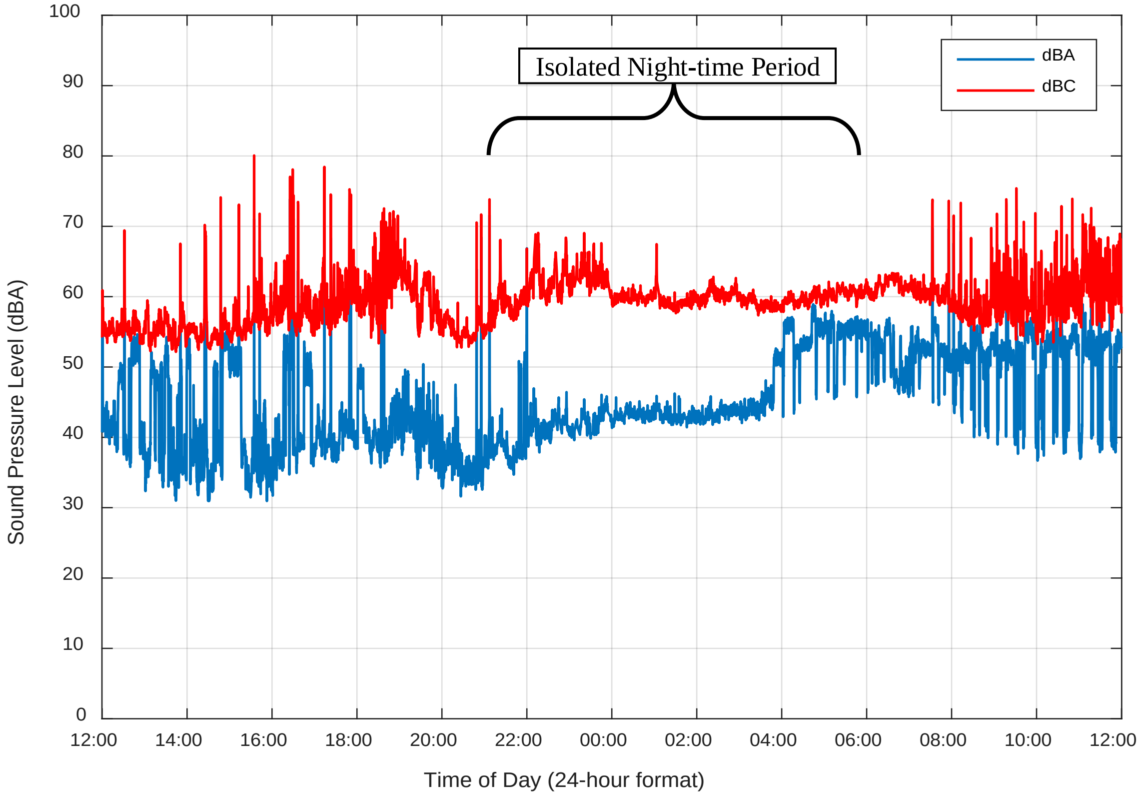

Figure 50. Noise Monitor #6, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

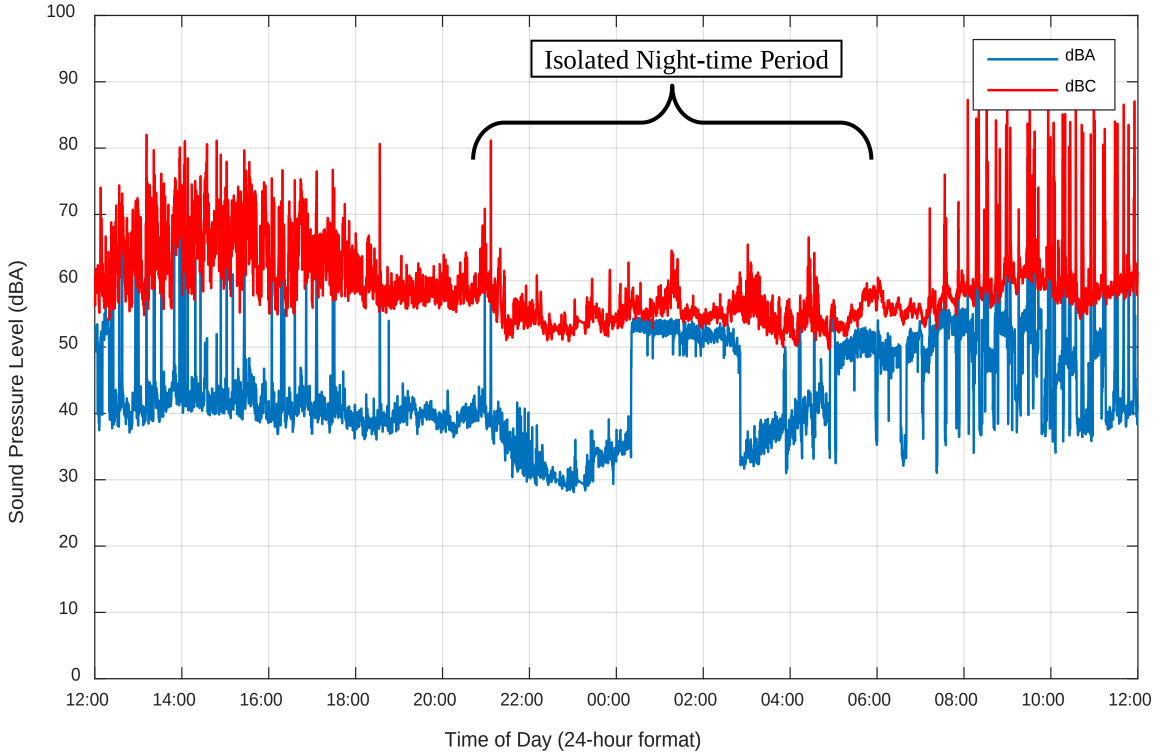

Figure 51. Noise Monitor #6, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

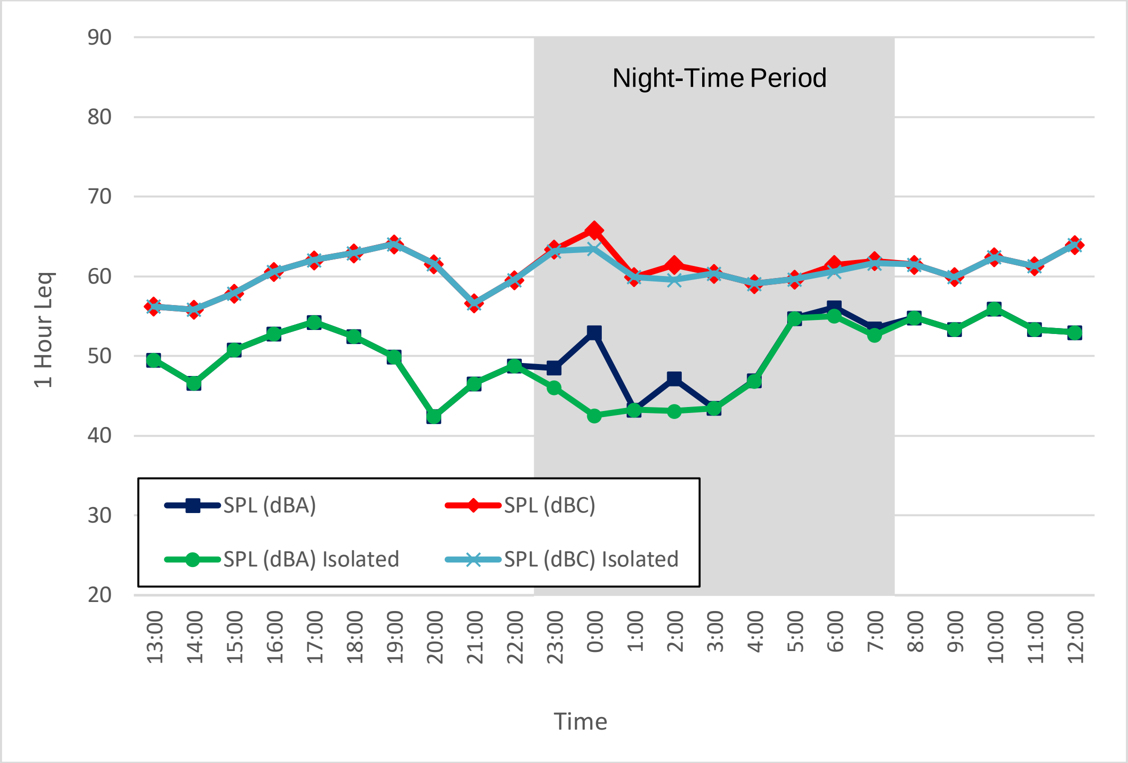

Figure 52. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

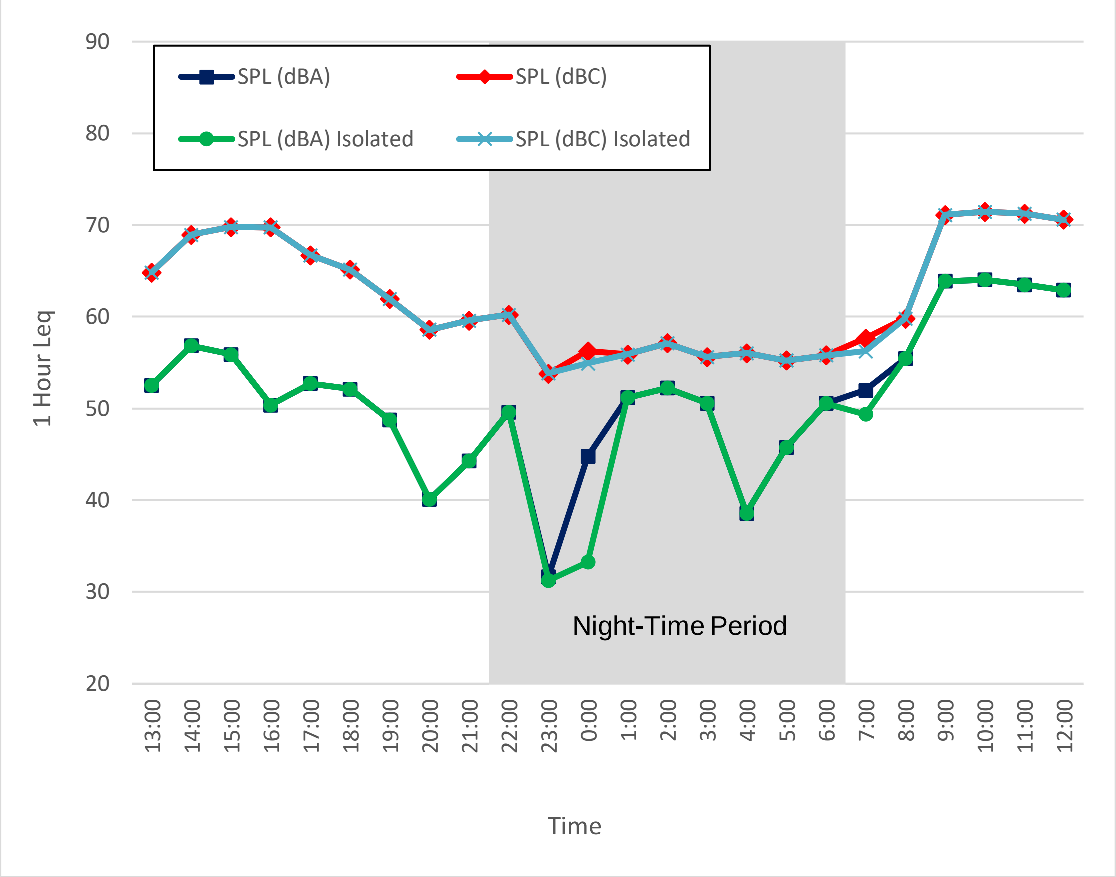

Figure 53. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

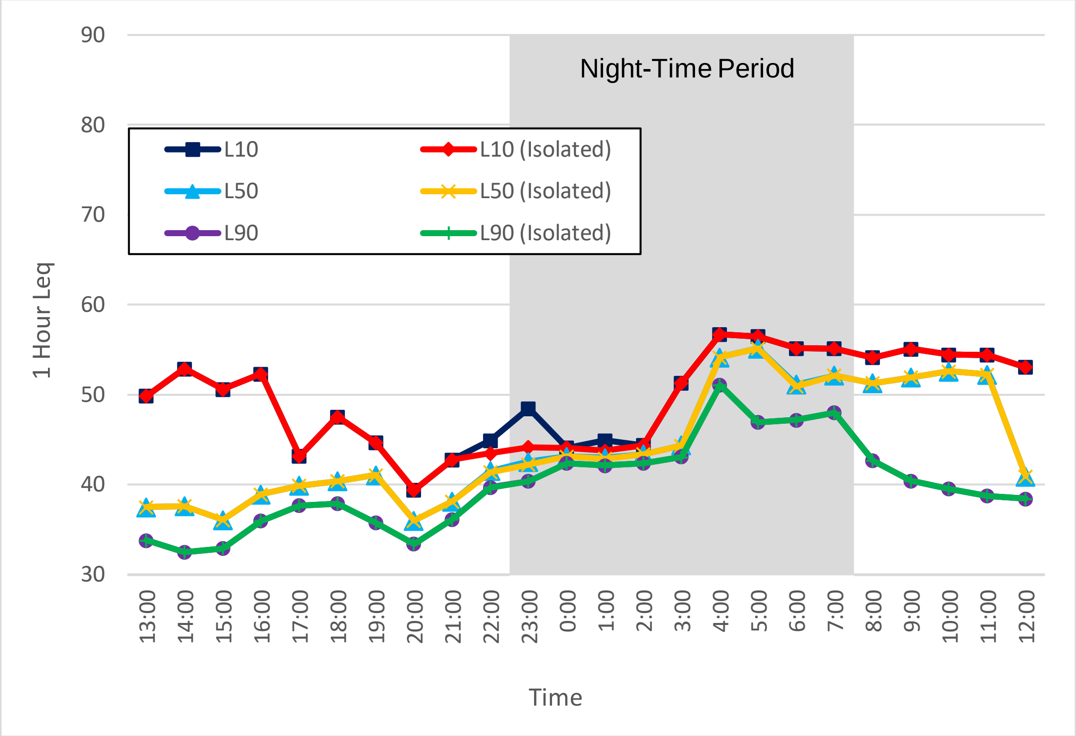

Figure 54. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

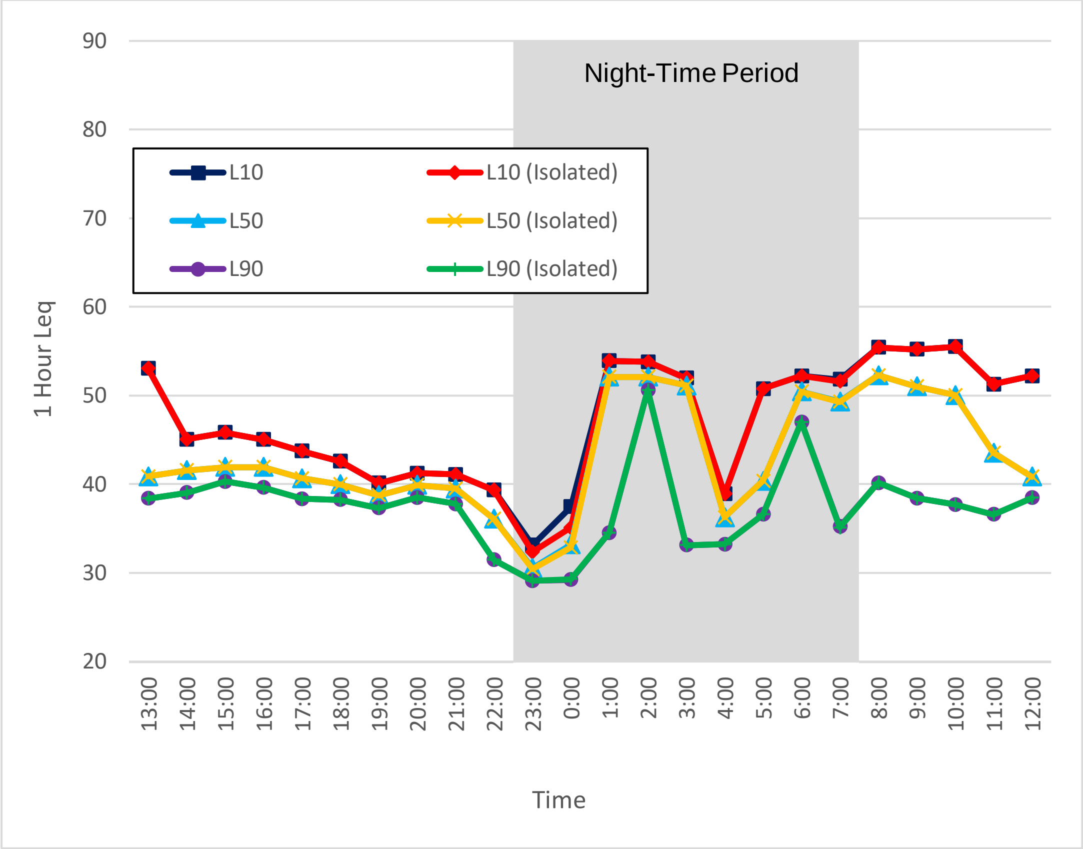

Figure 55. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

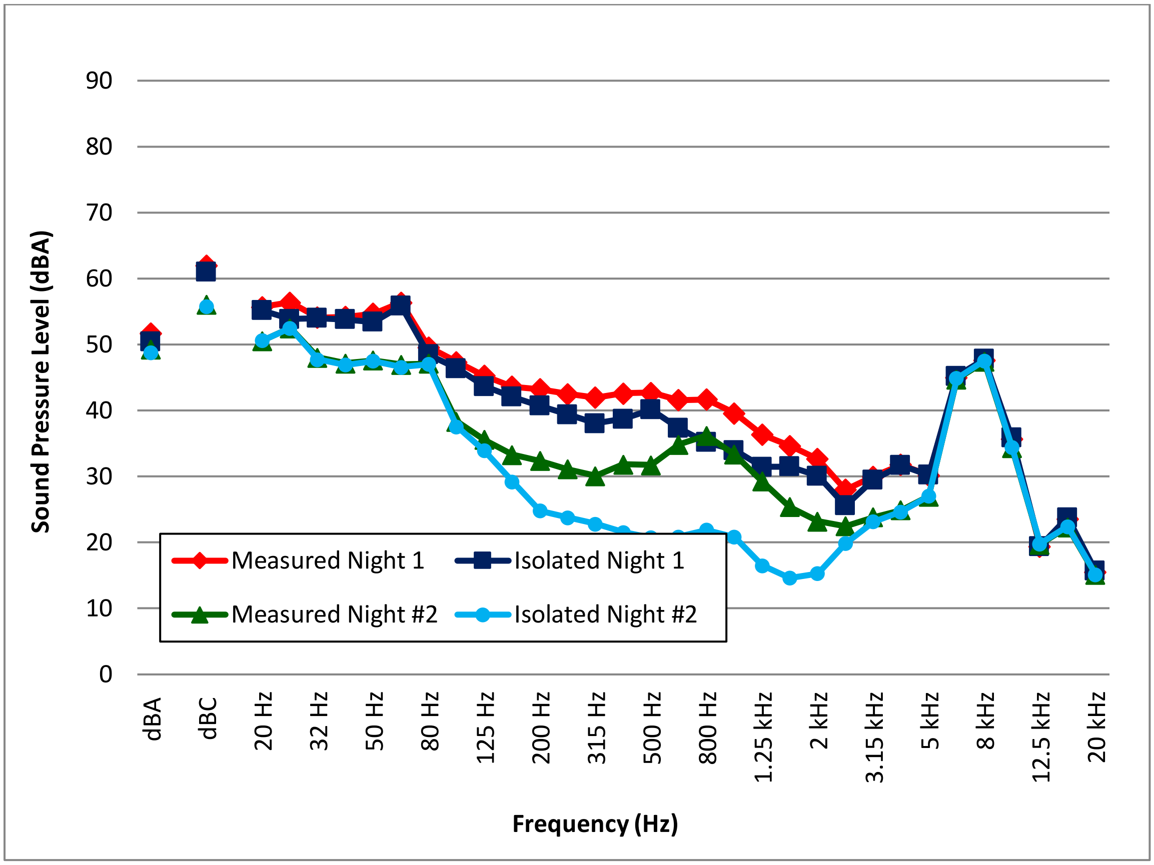

Figure 56. Noise Monitor #6, 1/3 Octave L_{eq} Sound Levels (June 24 – 26, 2020)

Noise Monitor #8

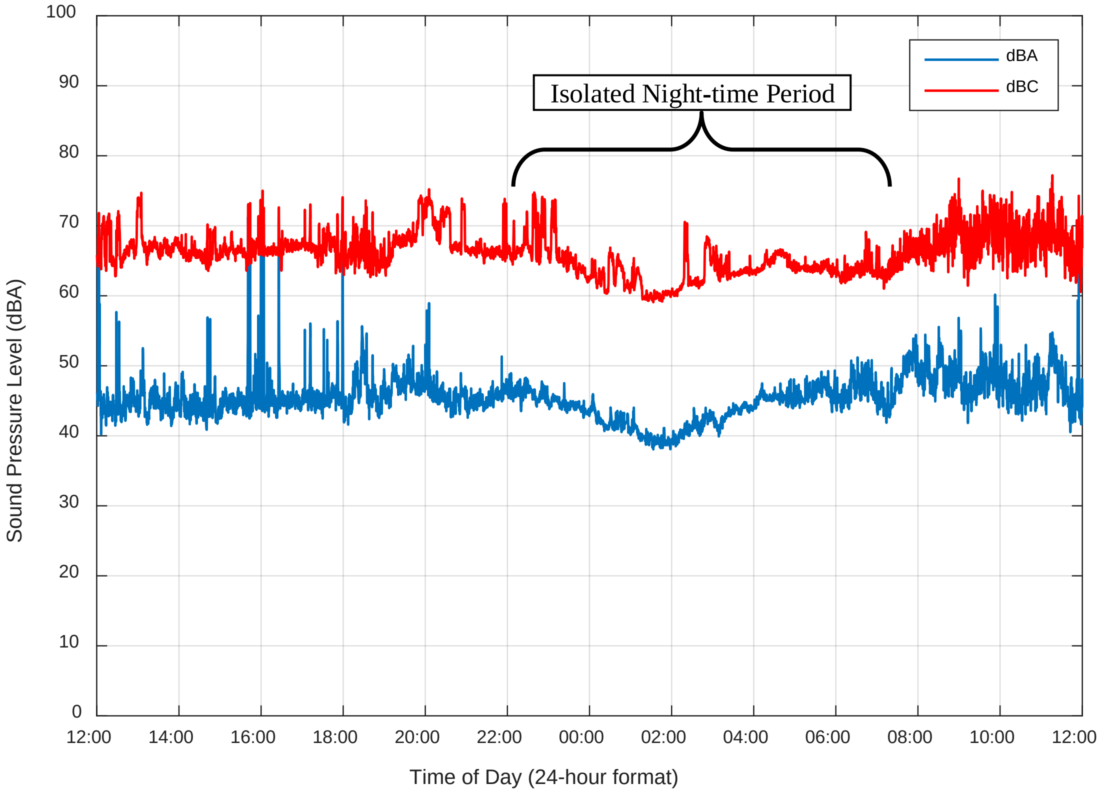

Figure 57. Noise Monitor #8, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

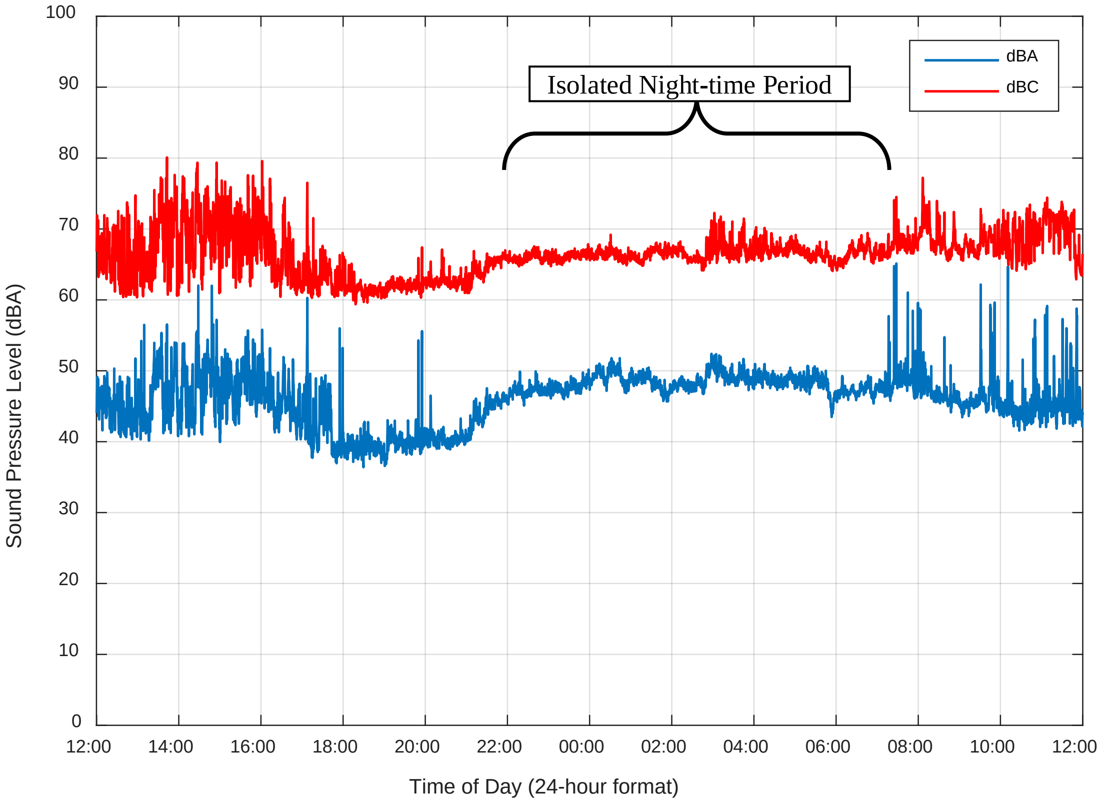

Figure 58. Noise Monitor #8, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

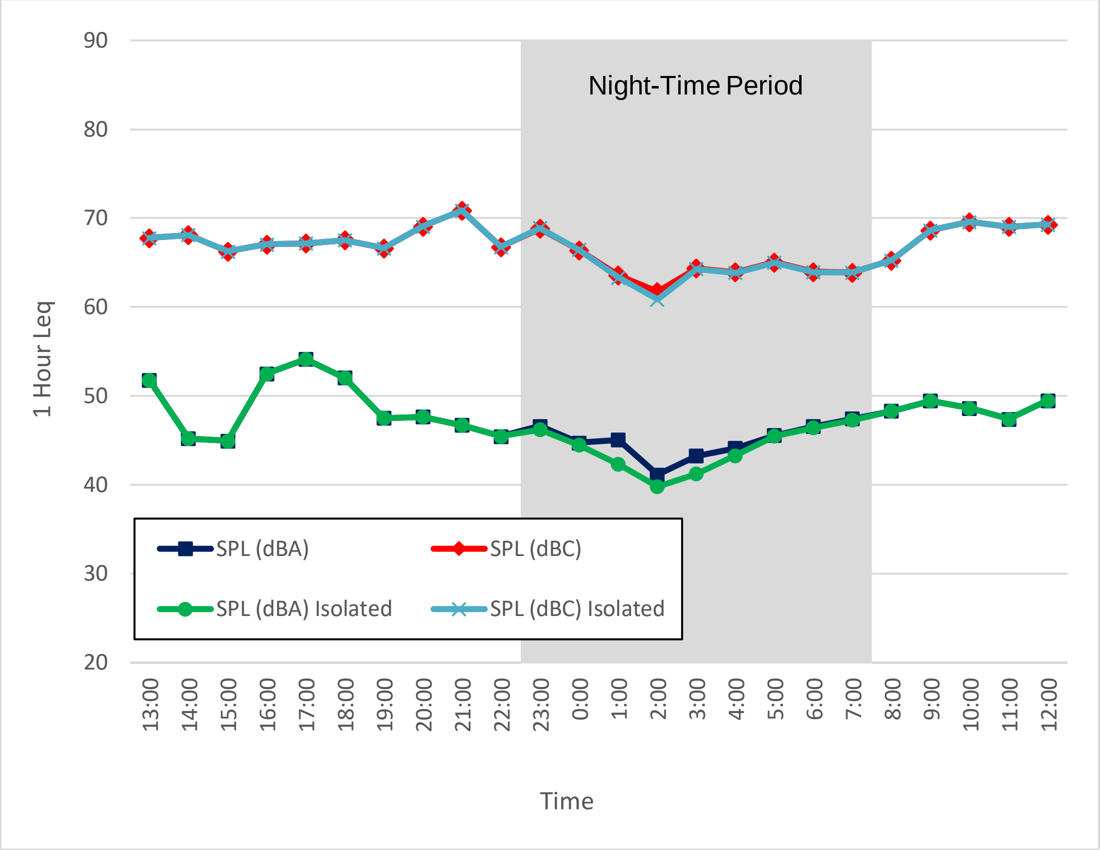

Figure 59. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

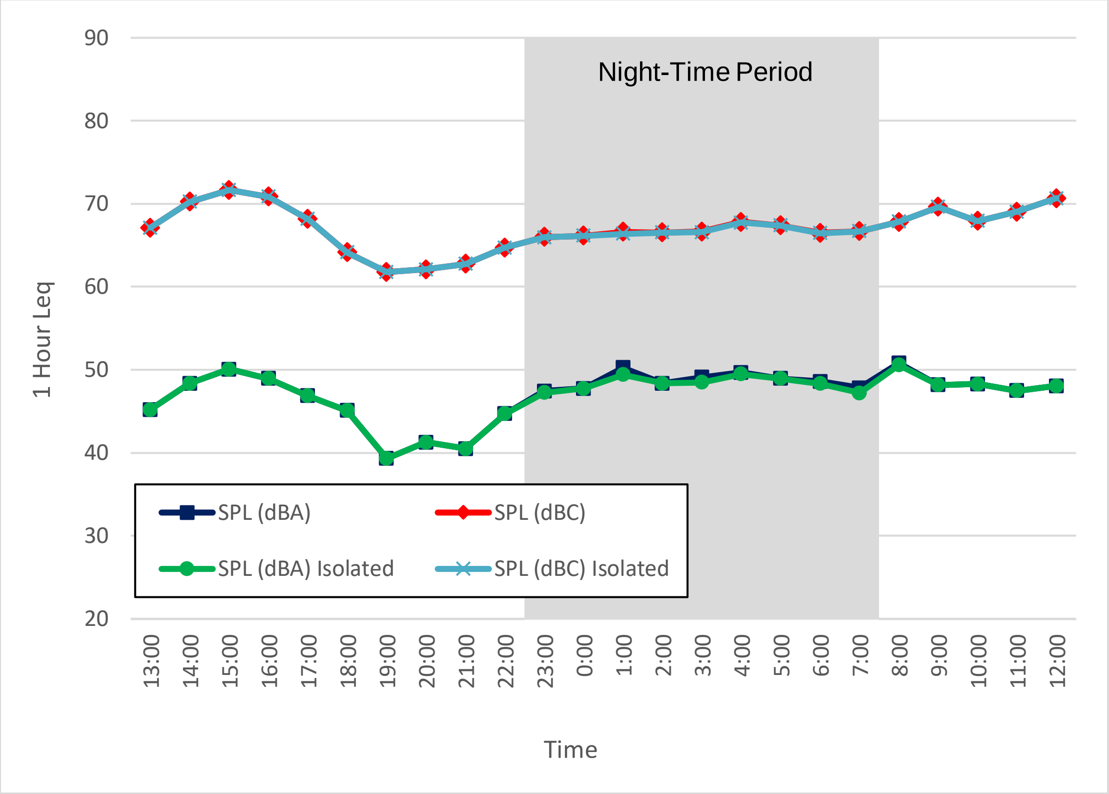

Figure 60. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

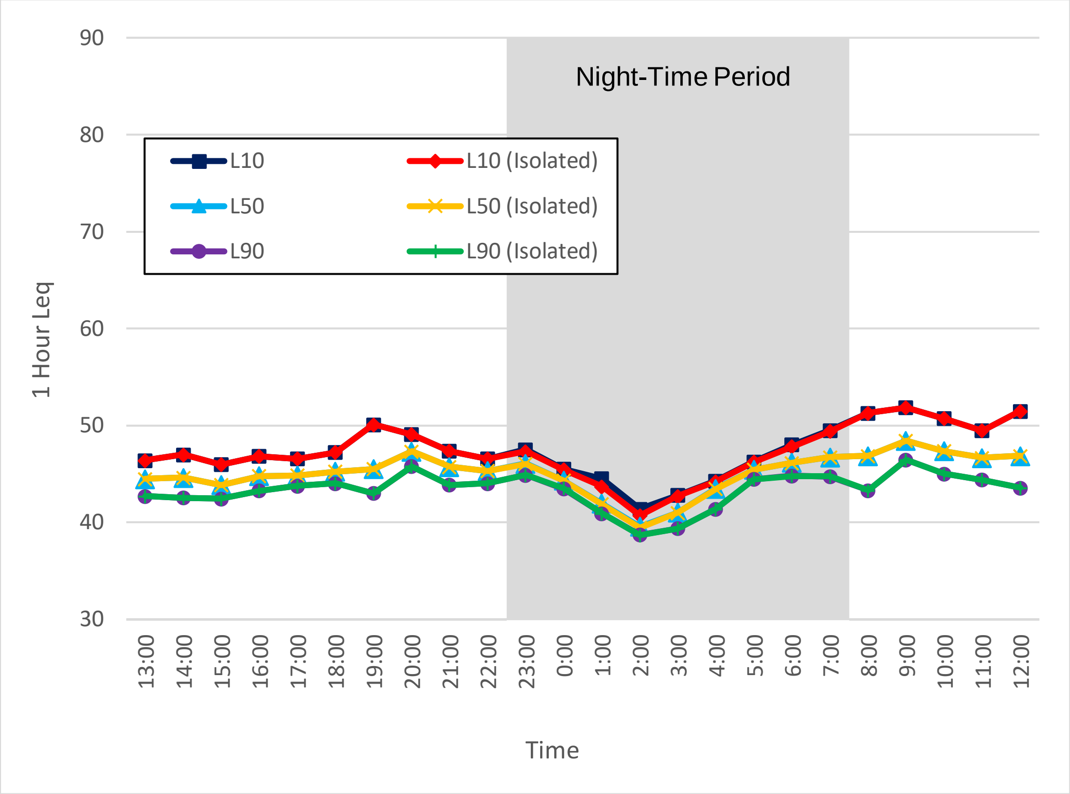

Figure 61. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

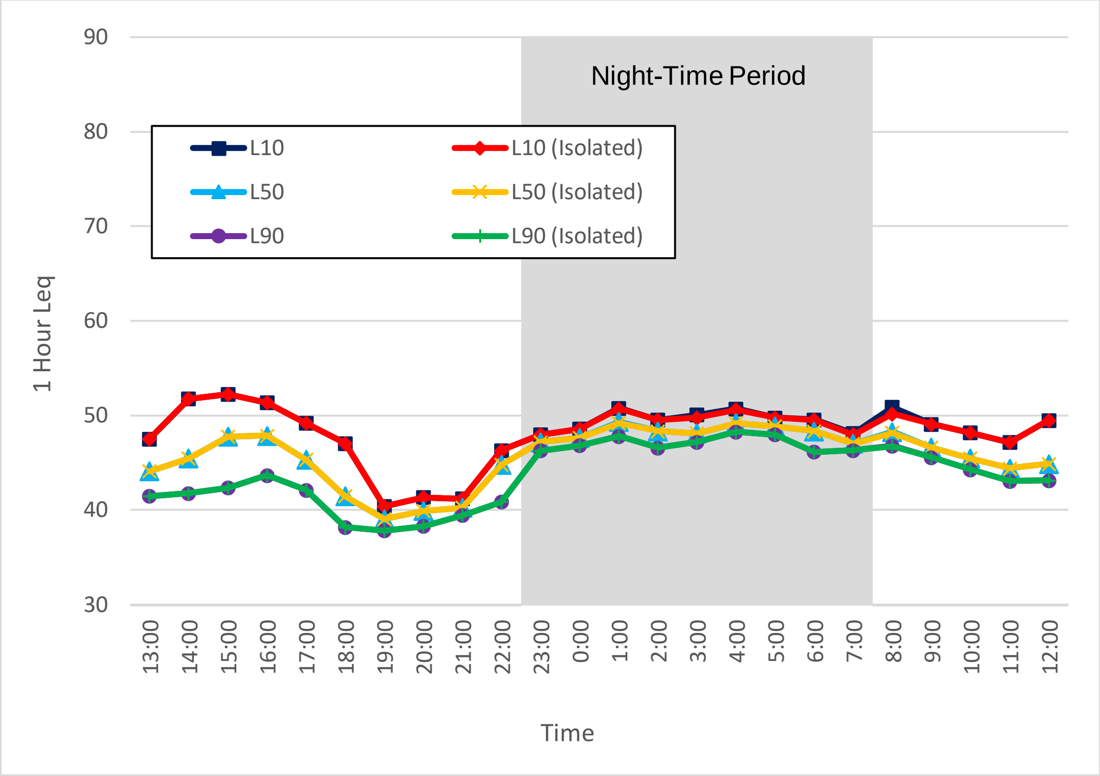

Figure 62. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

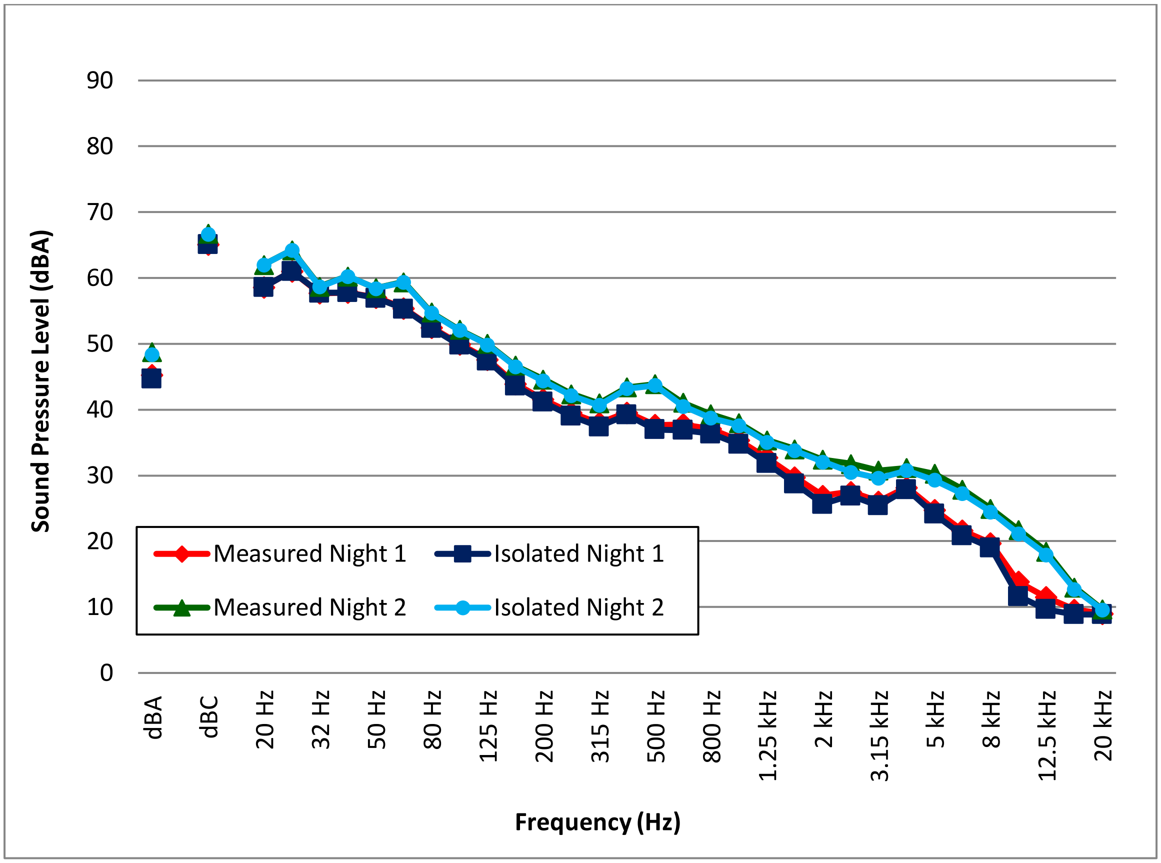

Figure 63. Noise Monitor #8, 1/3 Octave L_{eq} Sound Levels (June 24 – 26, 2020)

Noise Monitor #9

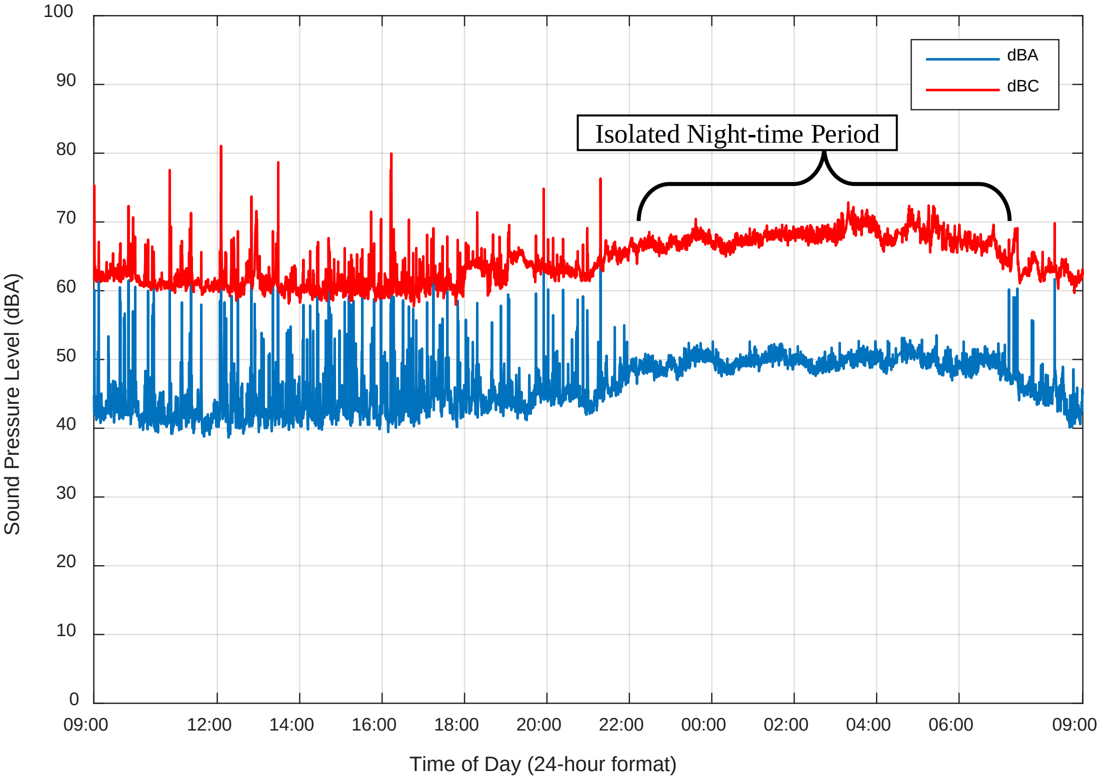

Figure 64. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 27 - 28, 2020)

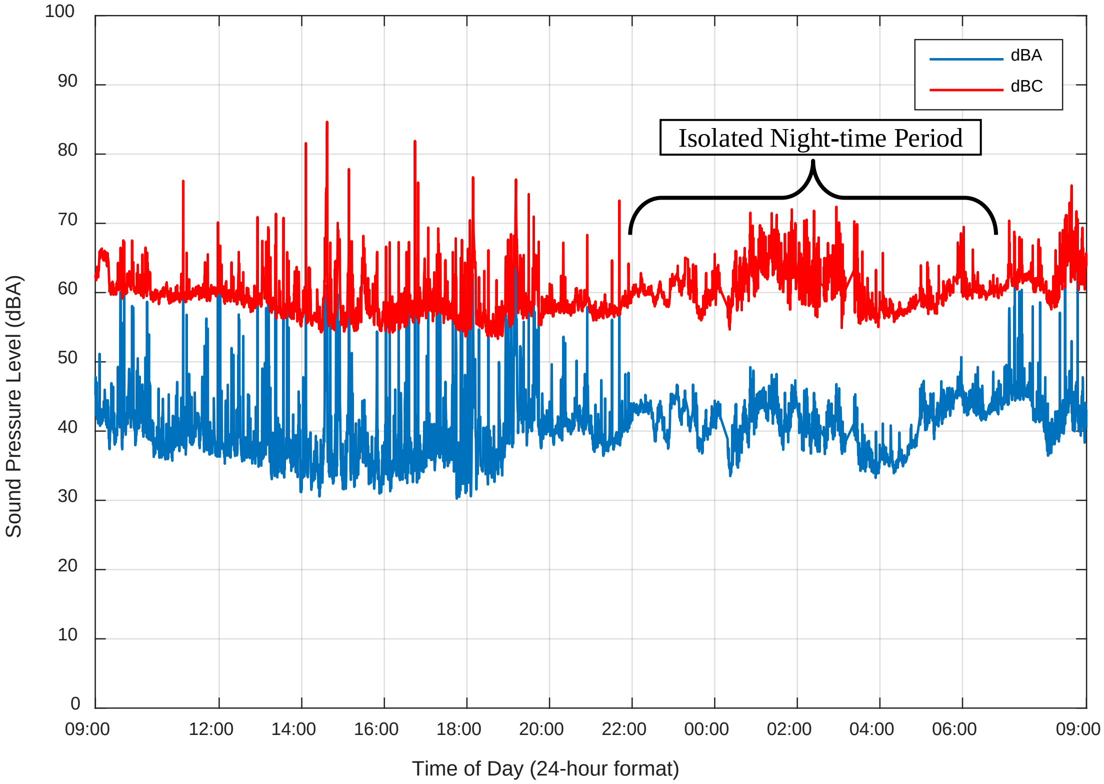

Figure 65. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 28 - 29, 2020)

Noise Monitor #9

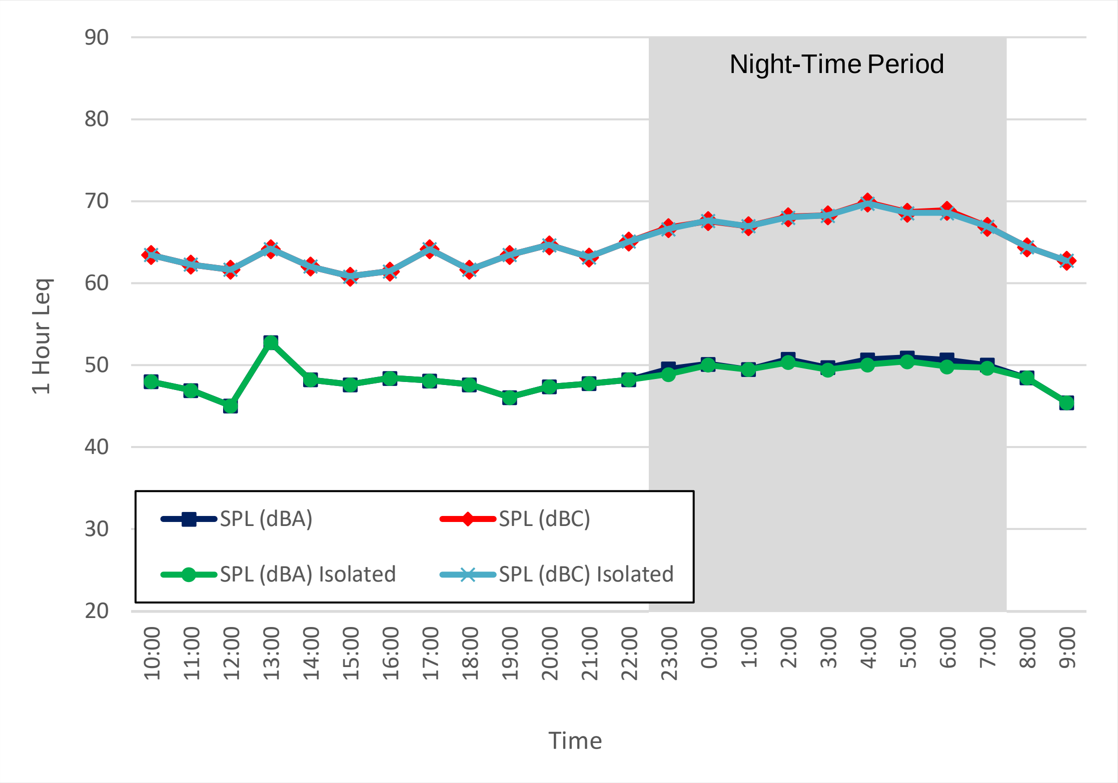

Figure 66. Noise Monitor #9, 1-Hour L$_{eq}$ Sound Levels (July 27 - 28, 2020)

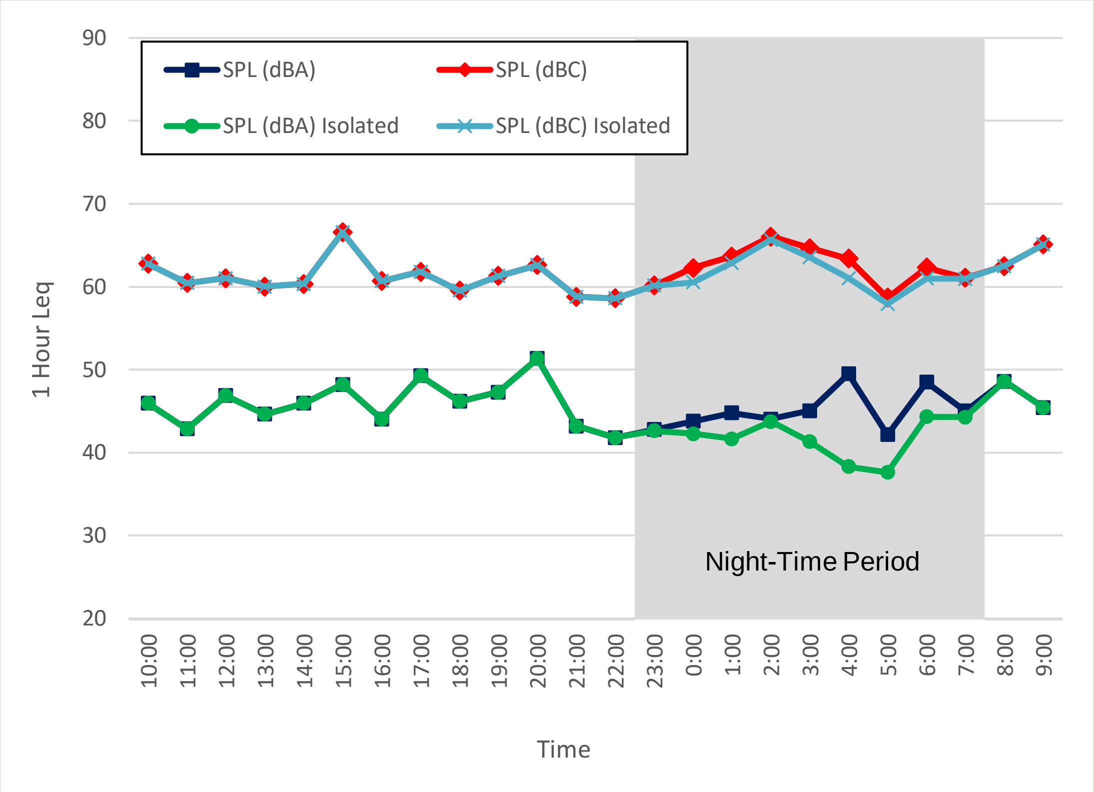

Figure 67. Noise Monitor #9, 1-Hour L$_{eq}$ Sound Levels (July 28 - 29, 2020)

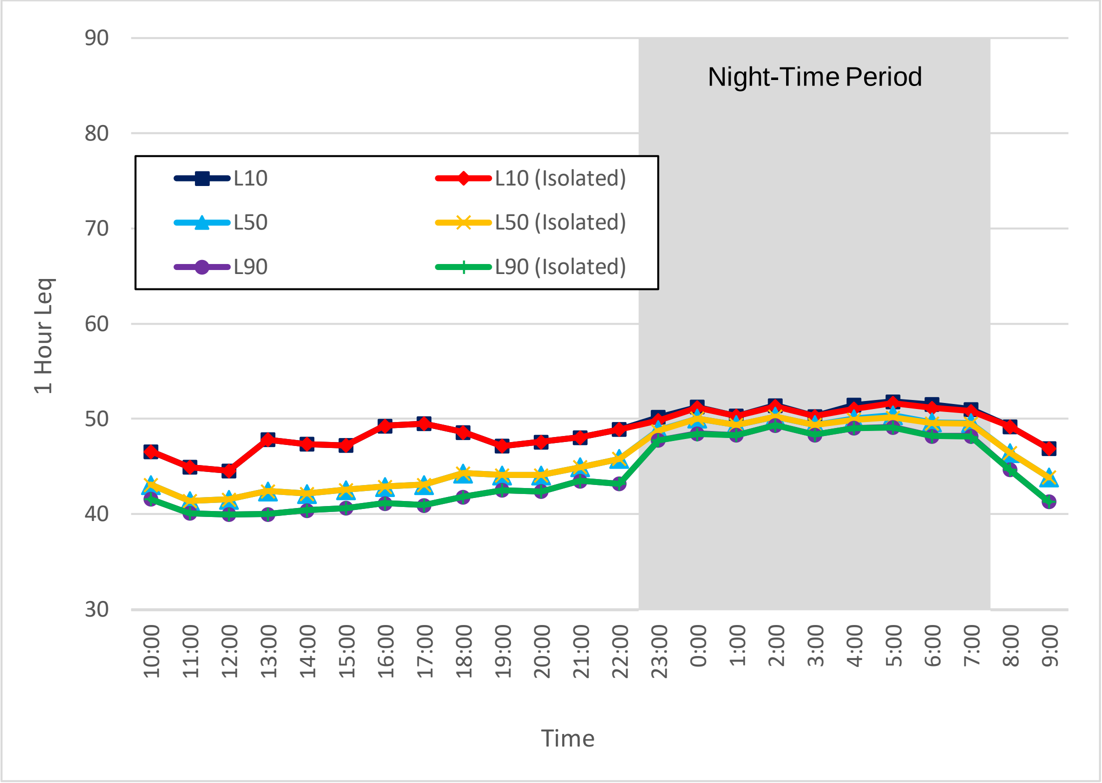

Figure 68. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 27 - 28, 2020)

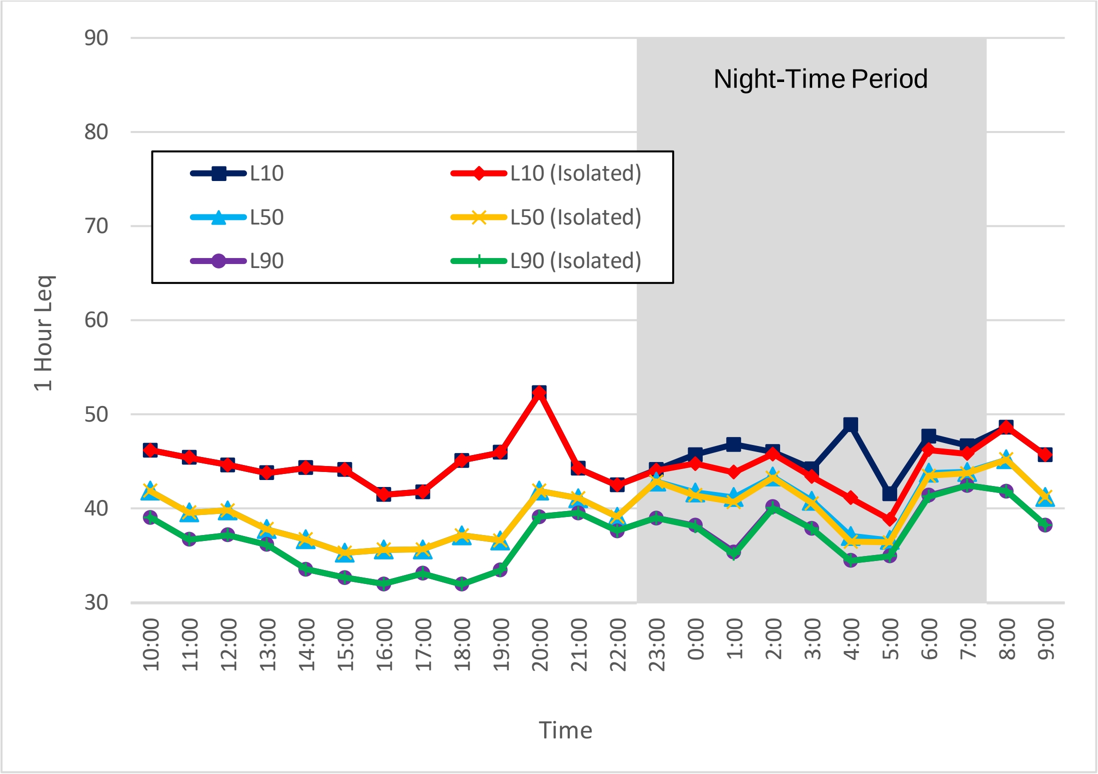

Figure 69. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 28 - 29, 2020)

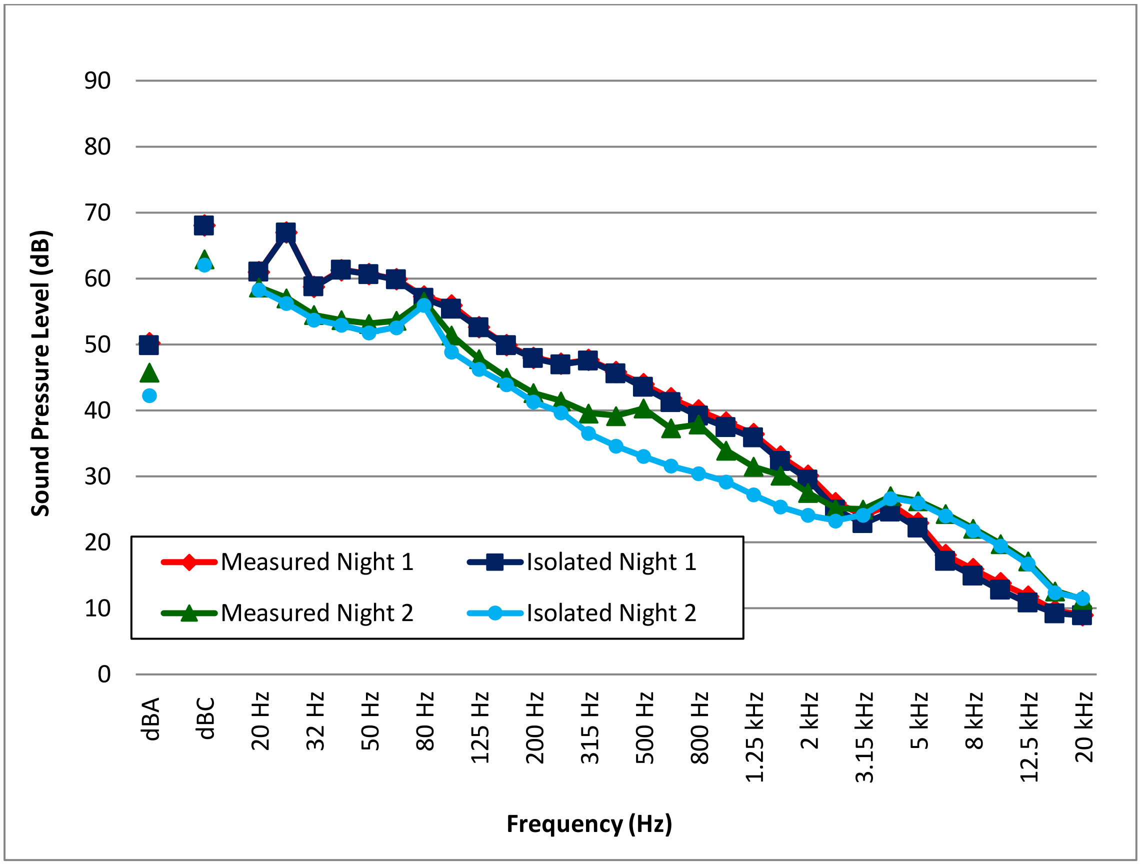

Figure 70. Noise Monitor #9, 1/3 Octave L_{eq} Sound Levels (July 27 - 29, 2020)

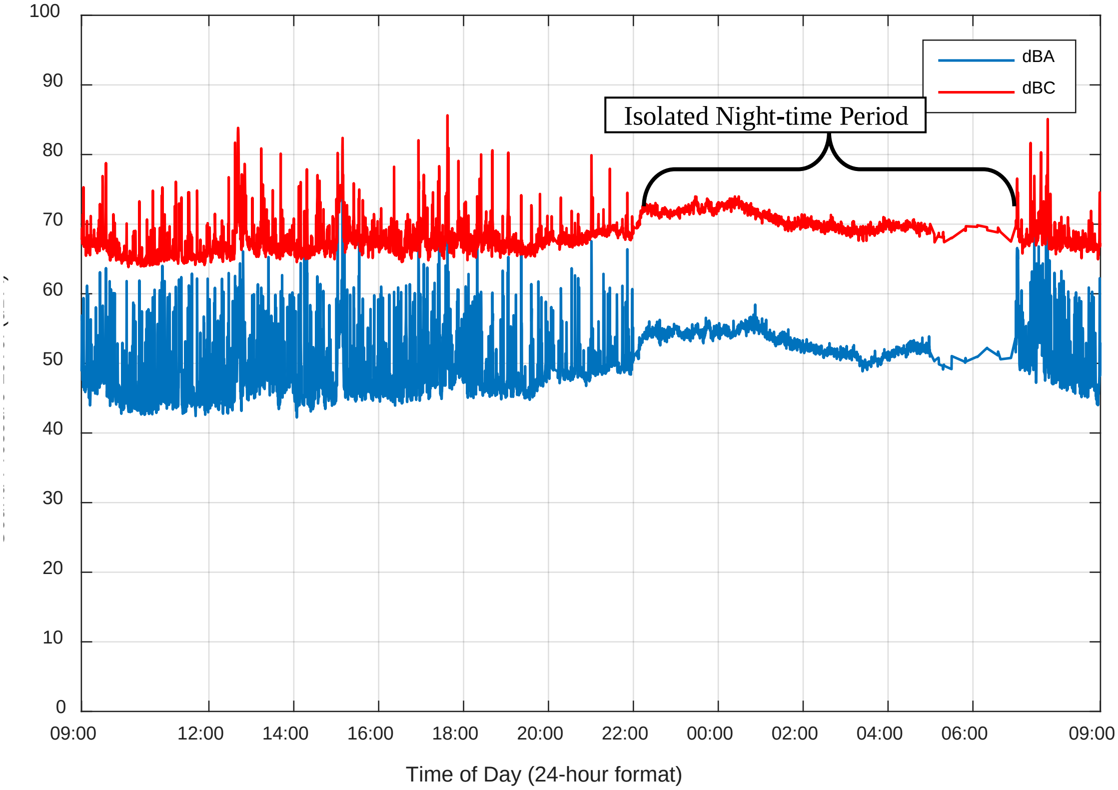

Figure 71. Noise Monitor #10, 15-Second L_{eq} Sound Levels (July 27 - 28, 2020)

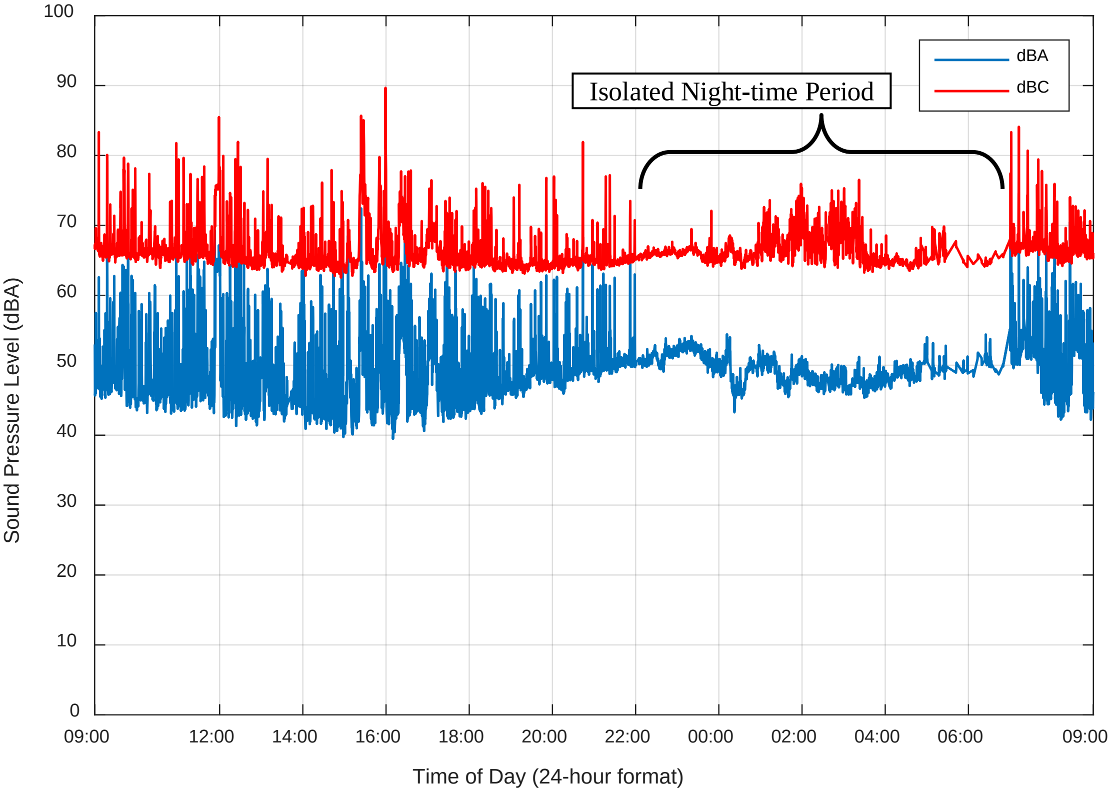

Figure 72. Noise Monitor #10, 15-Second L_{eq} Sound Levels (July 28 - 29, 2020)

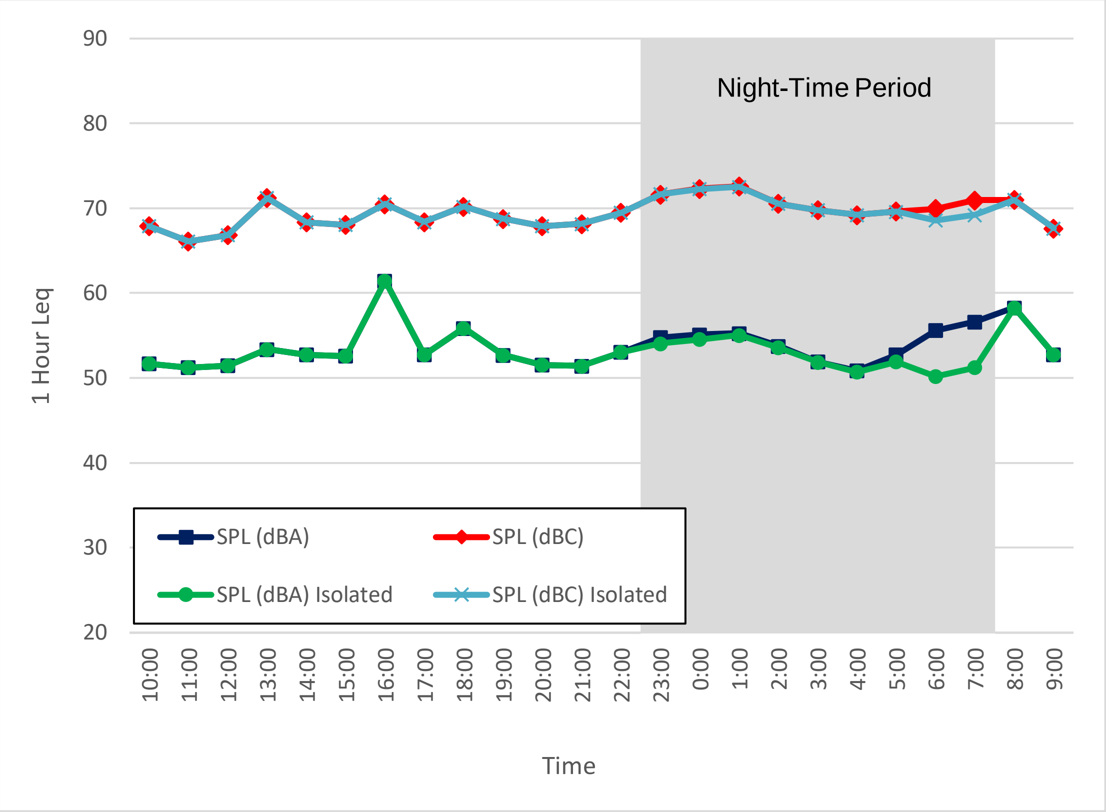

Figure 73. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (July 27 - 28, 2020)

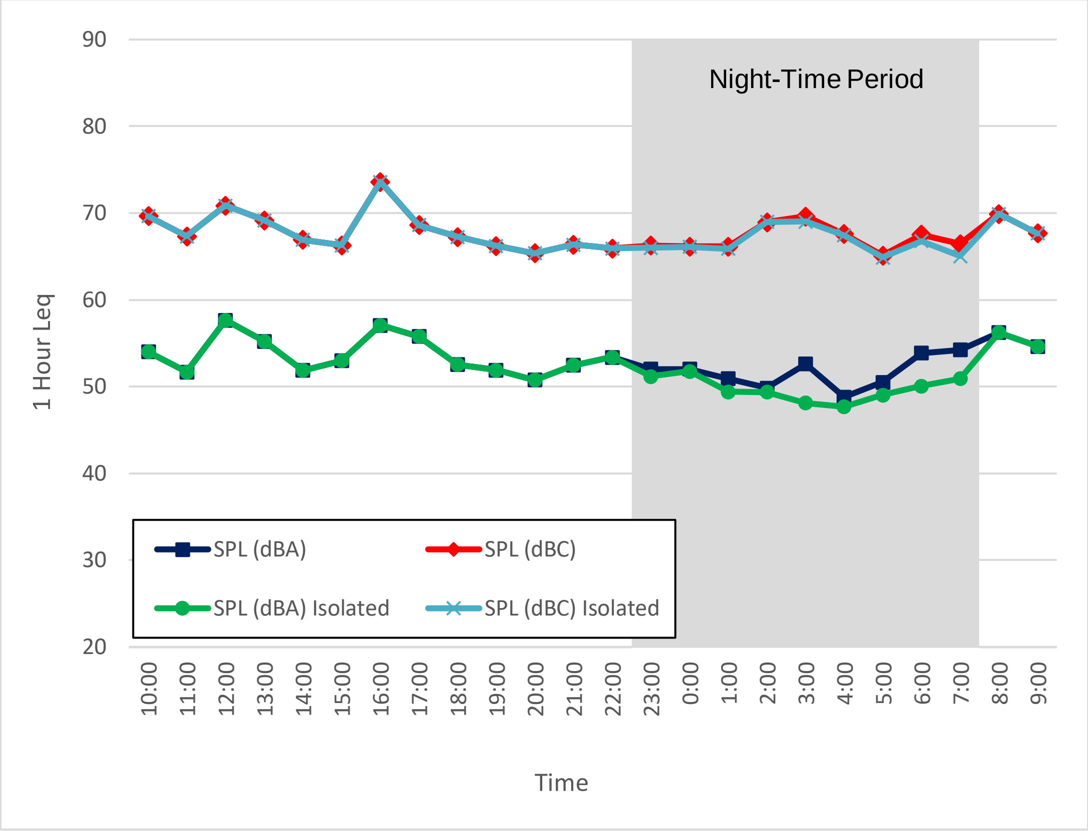

Figure 74. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (July 28 - 29, 2020)

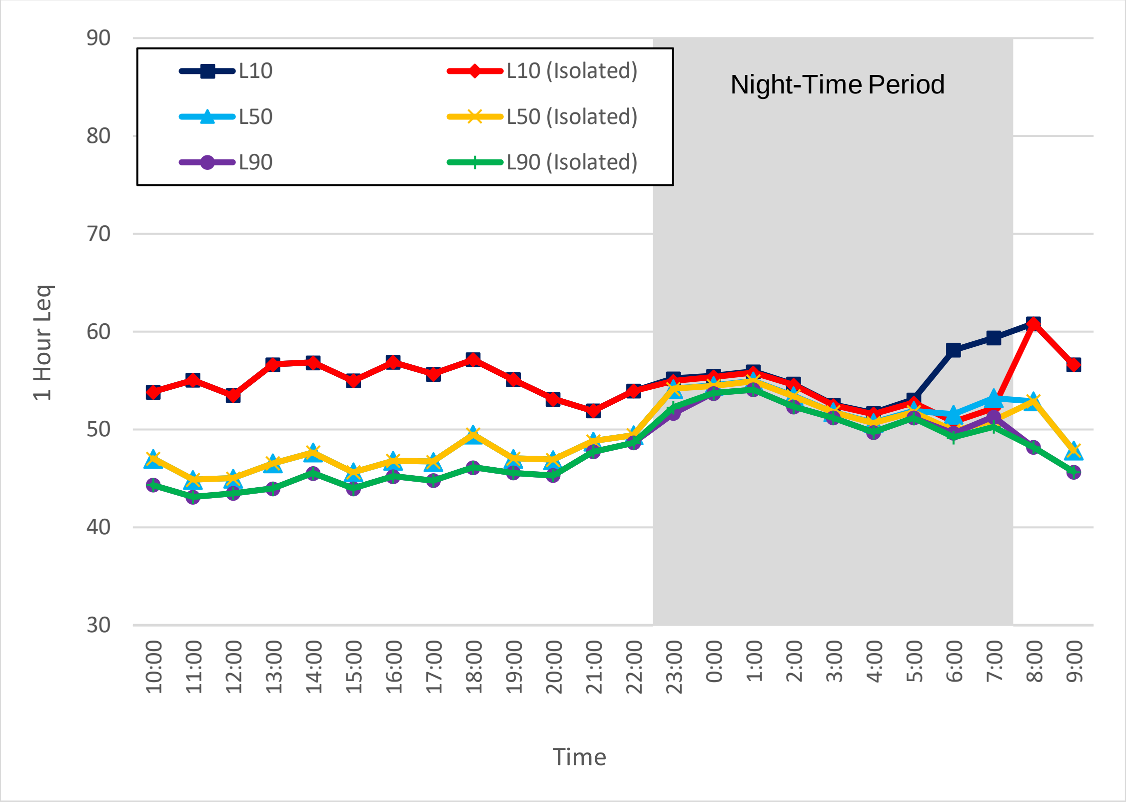

Figure 75. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 27 - 28, 2020)

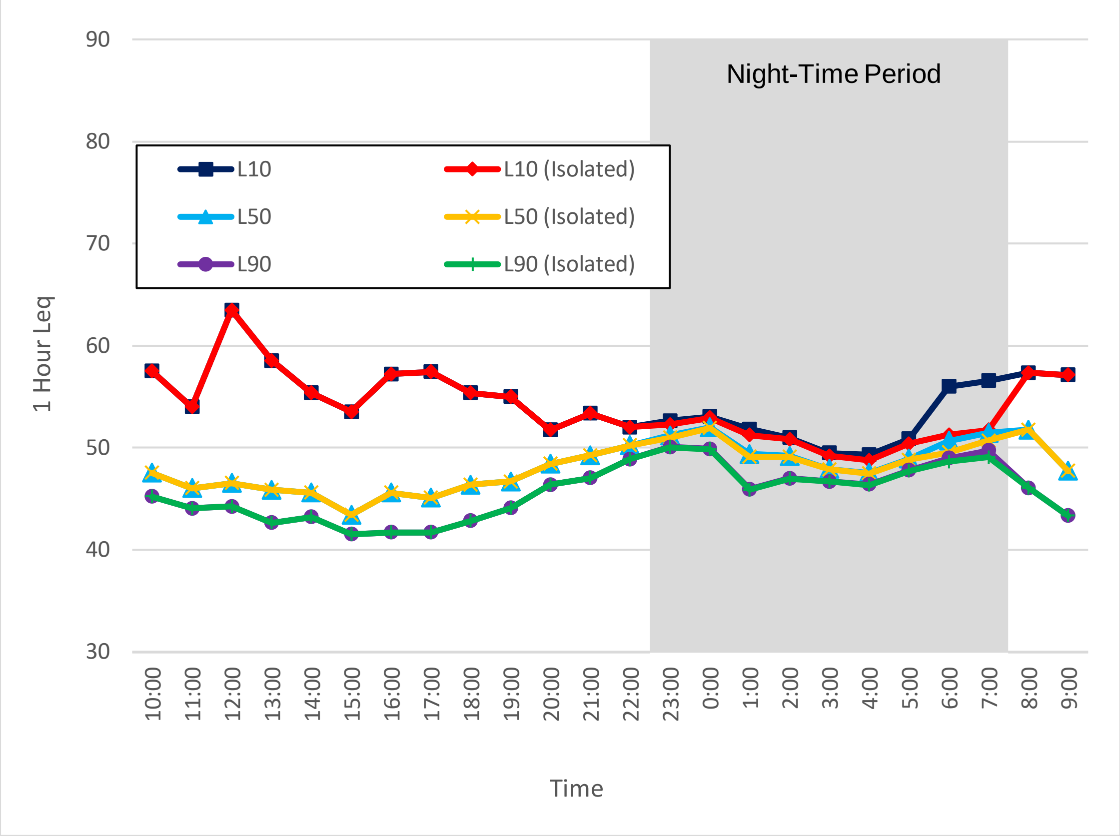

Figure 76. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 28 - 29, 2020)

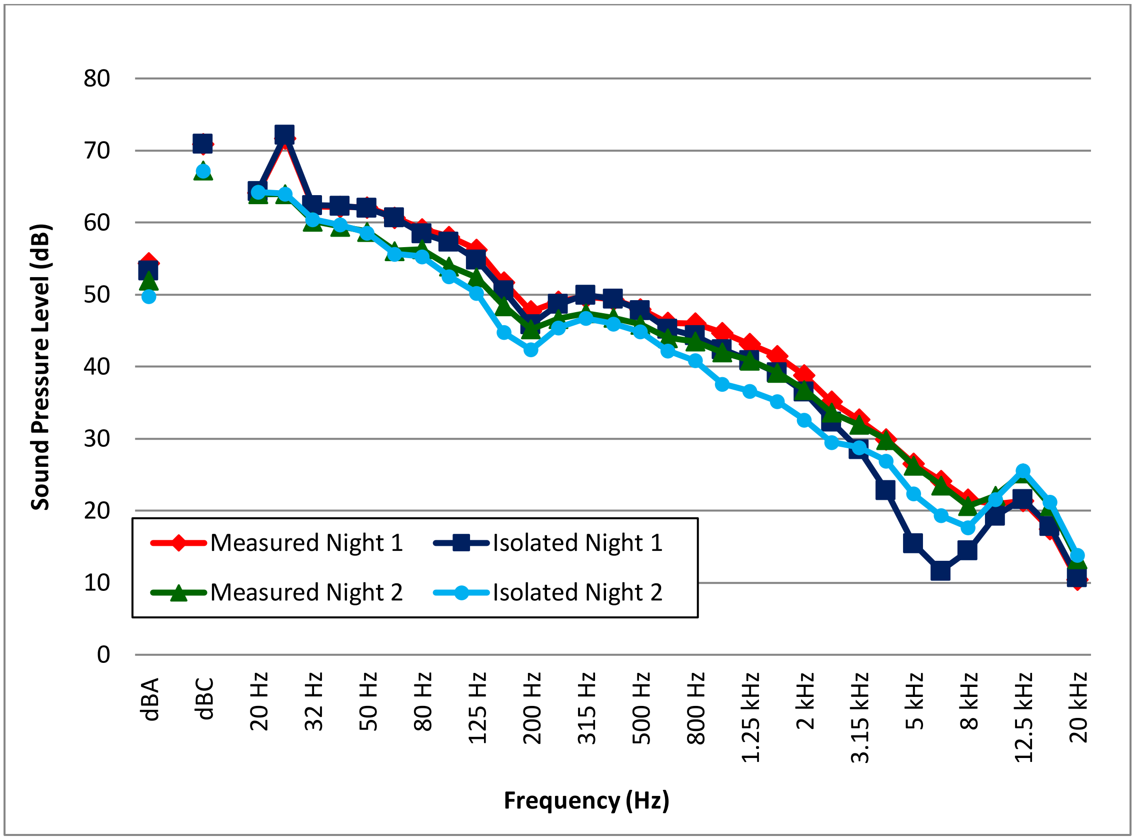

Figure 77. Noise Monitor #10, 1/3 Octave L_{eq} Sound Levels (July 27 - 29, 2020)

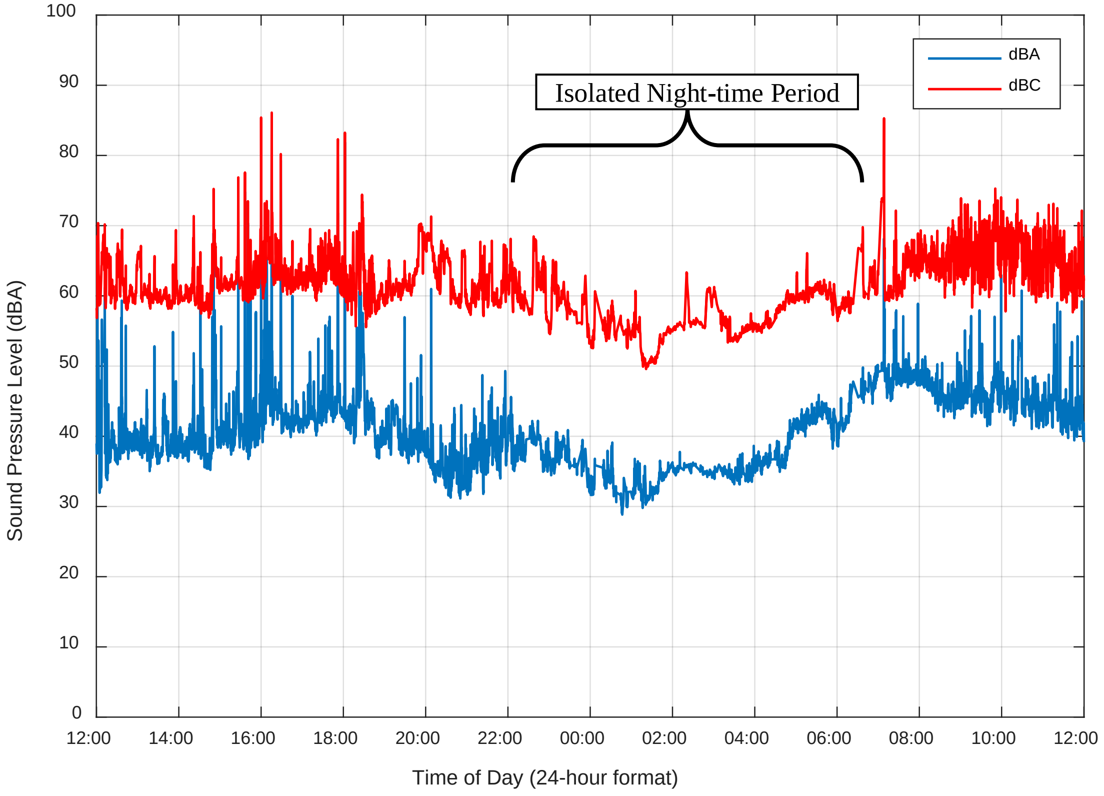

Figure 78. Noise Monitor #11, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

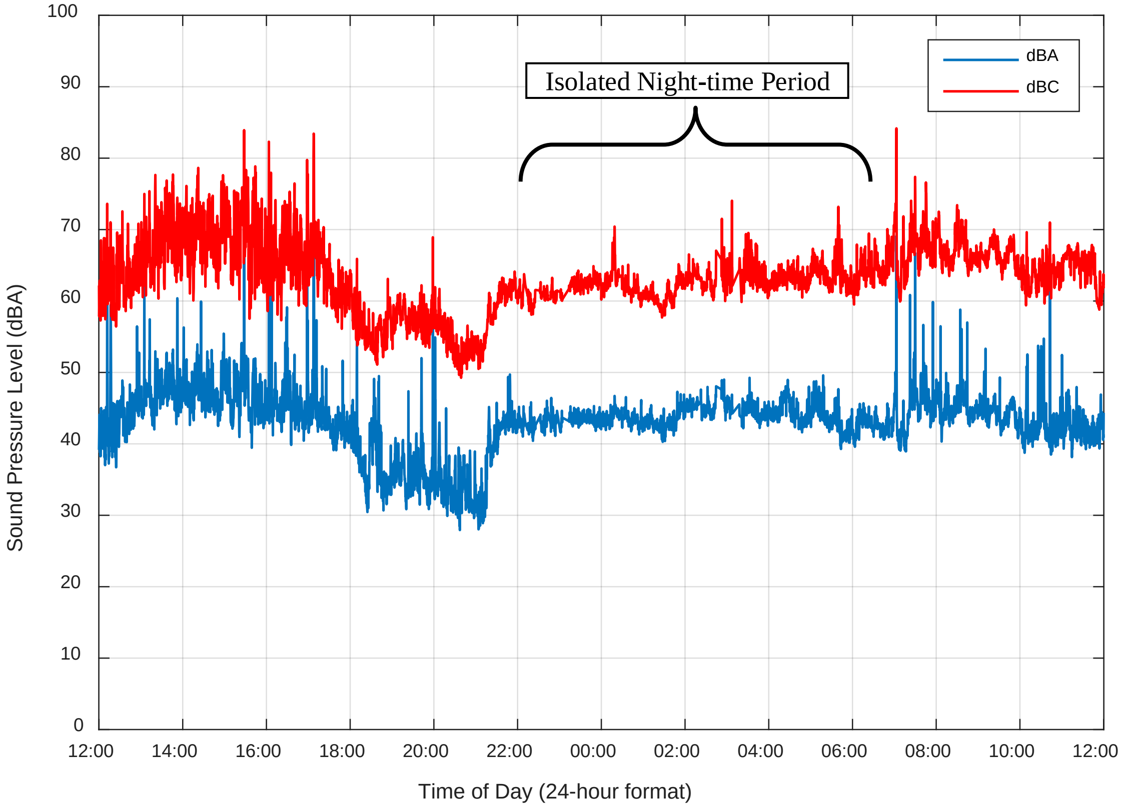

Figure 79. Noise Monitor #11, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

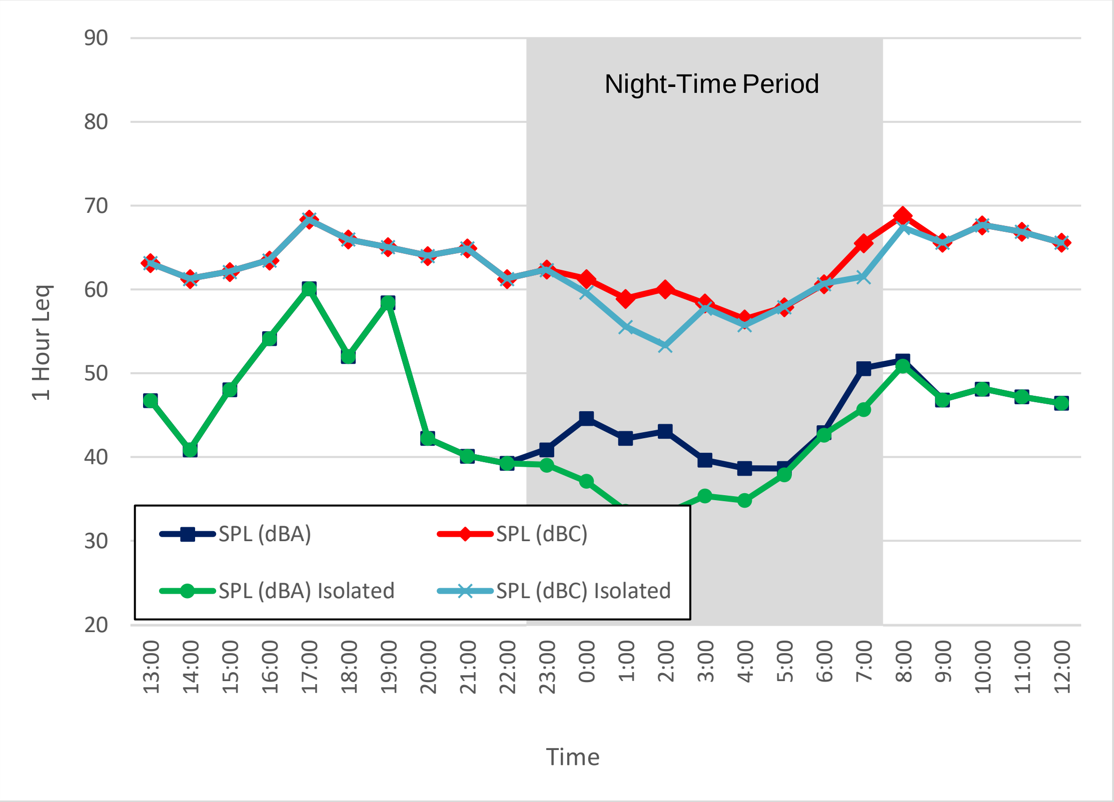

Figure 80. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

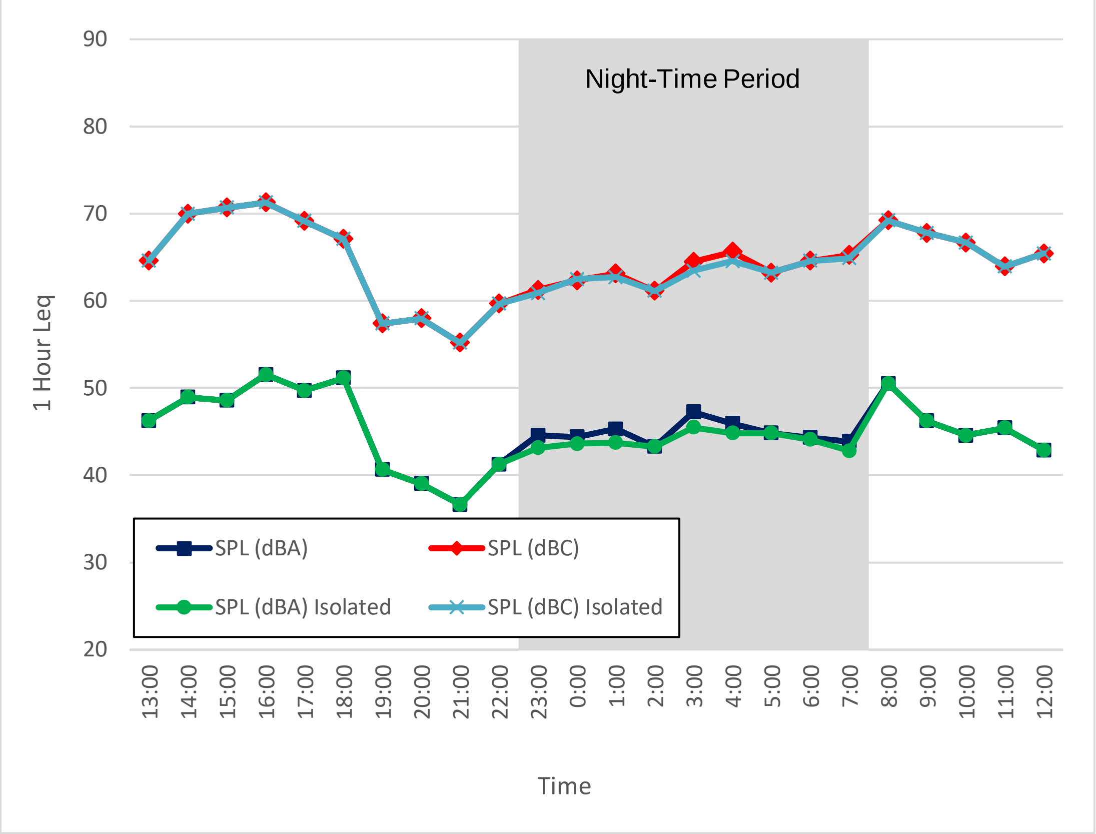

Figure 81. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

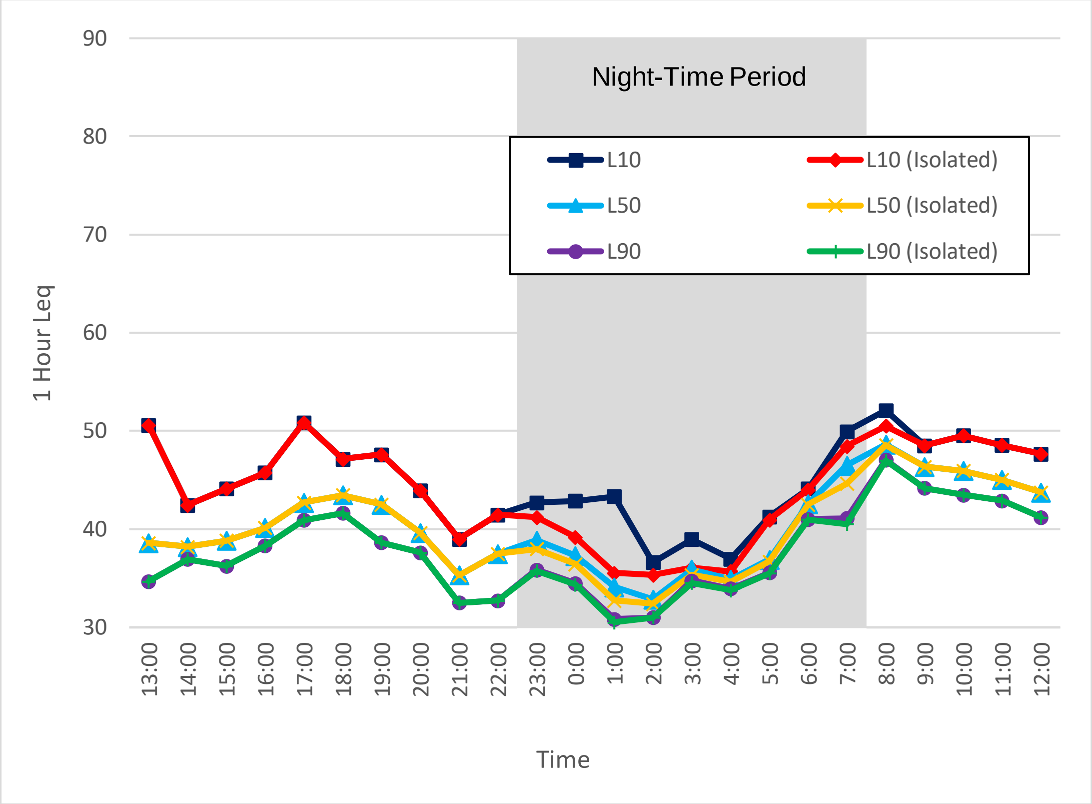

Figure 82. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

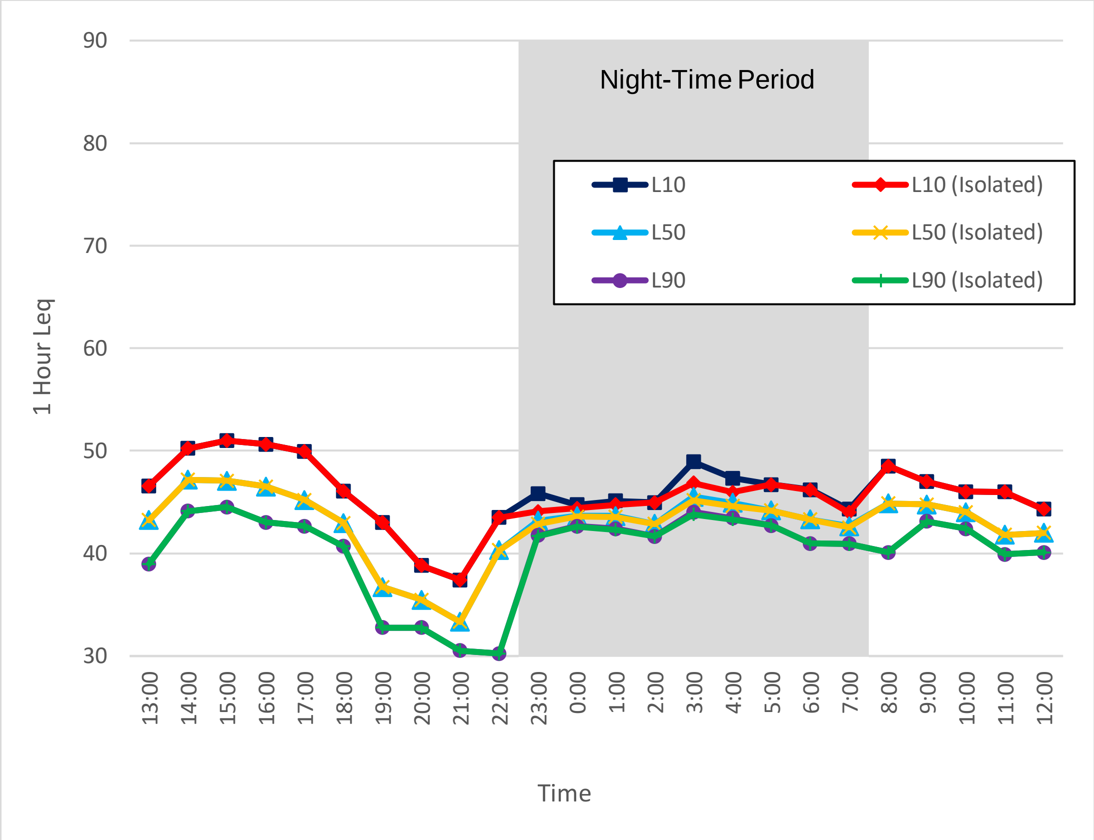

Figure 83. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

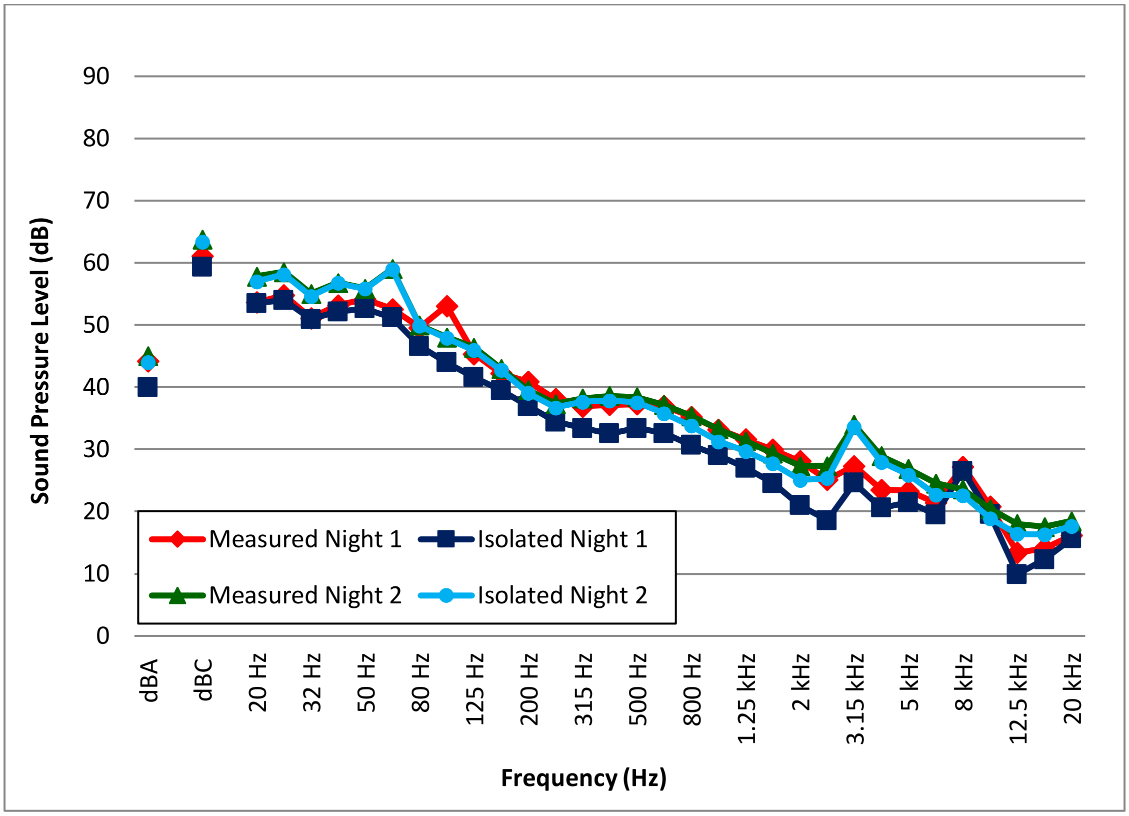

Figure 84. Noise Monitor #11, 1/3 Octave L_{eq} Sound Levels (June 24 – 26, 2020)

Noise Monitor #12 - Period 1

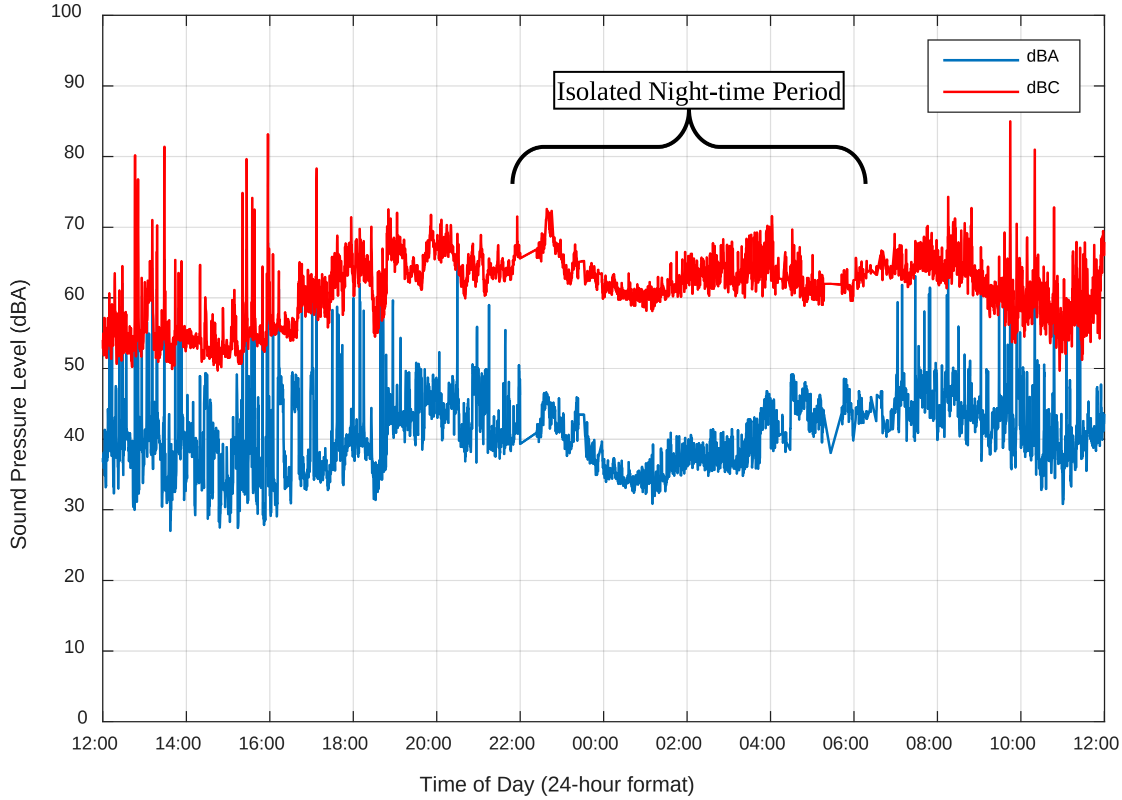

Figure 85. Noise Monitor #12, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

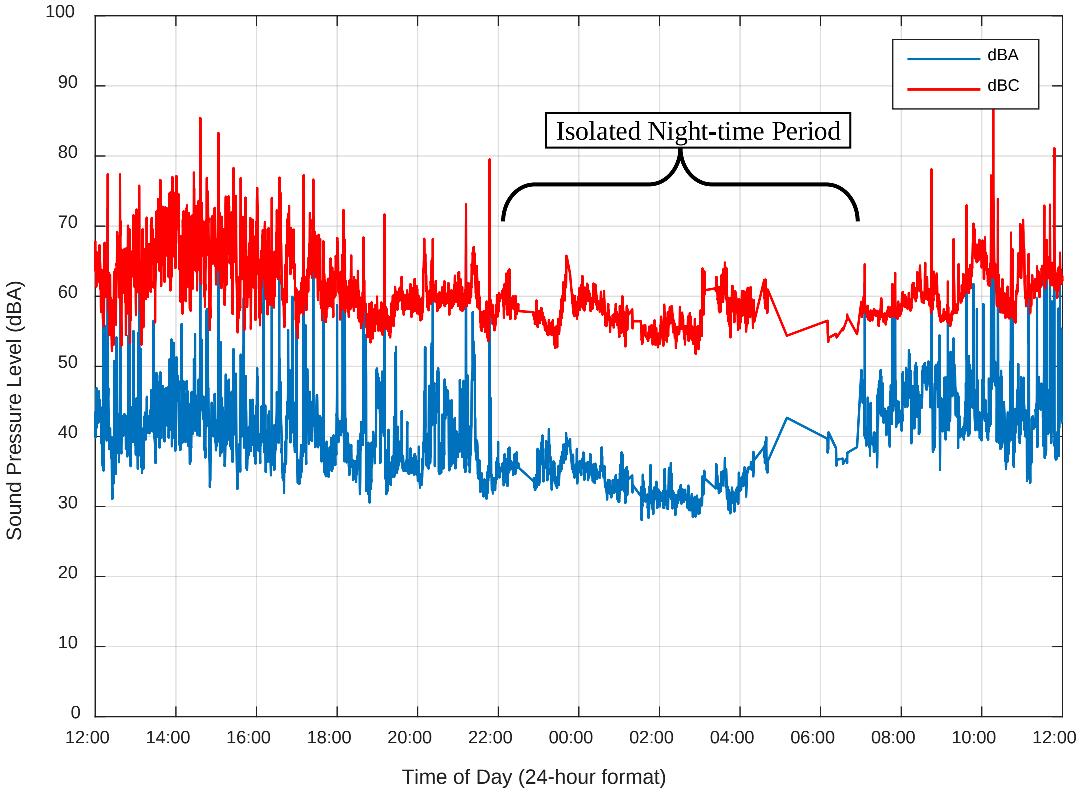

Figure 86. Noise Monitor #12, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

Noise Monitor #12 - Period 1

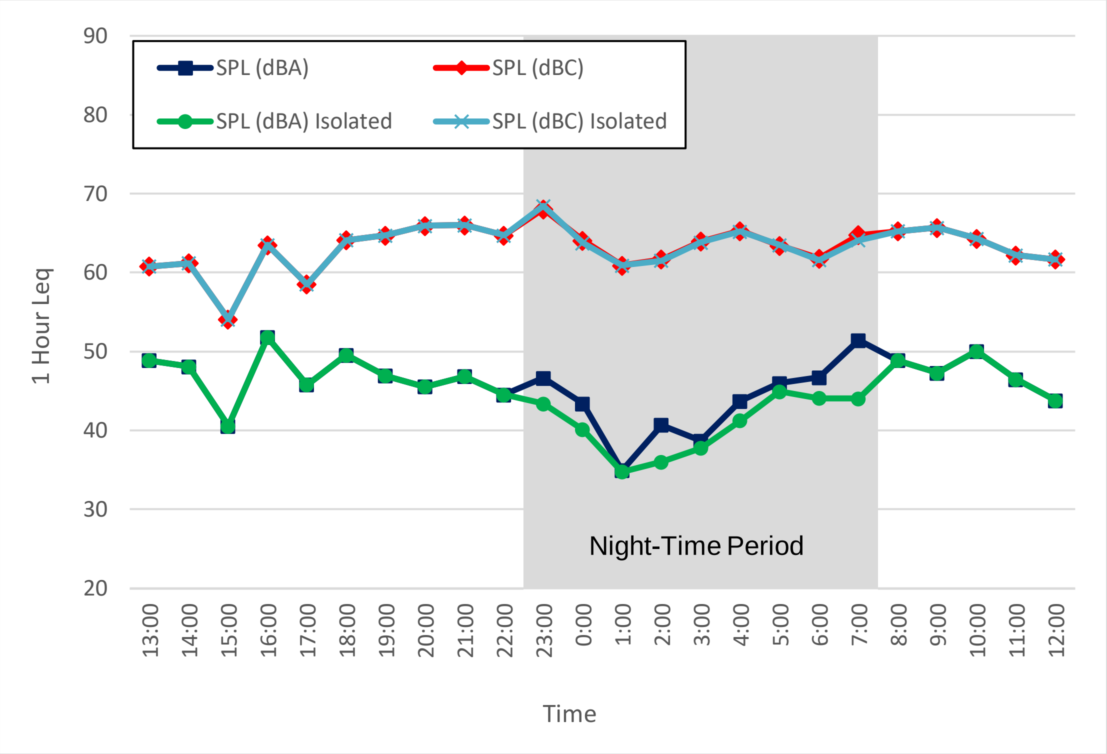

Figure 87. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

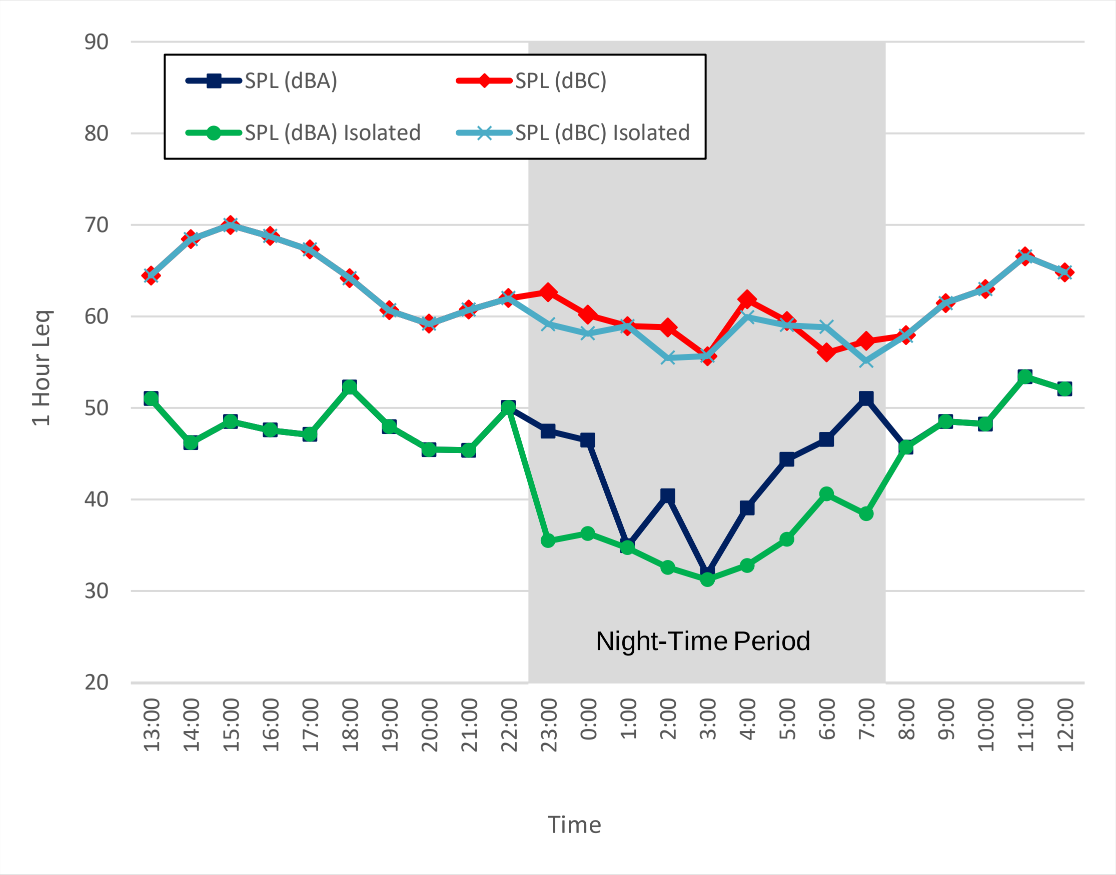

Figure 88. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

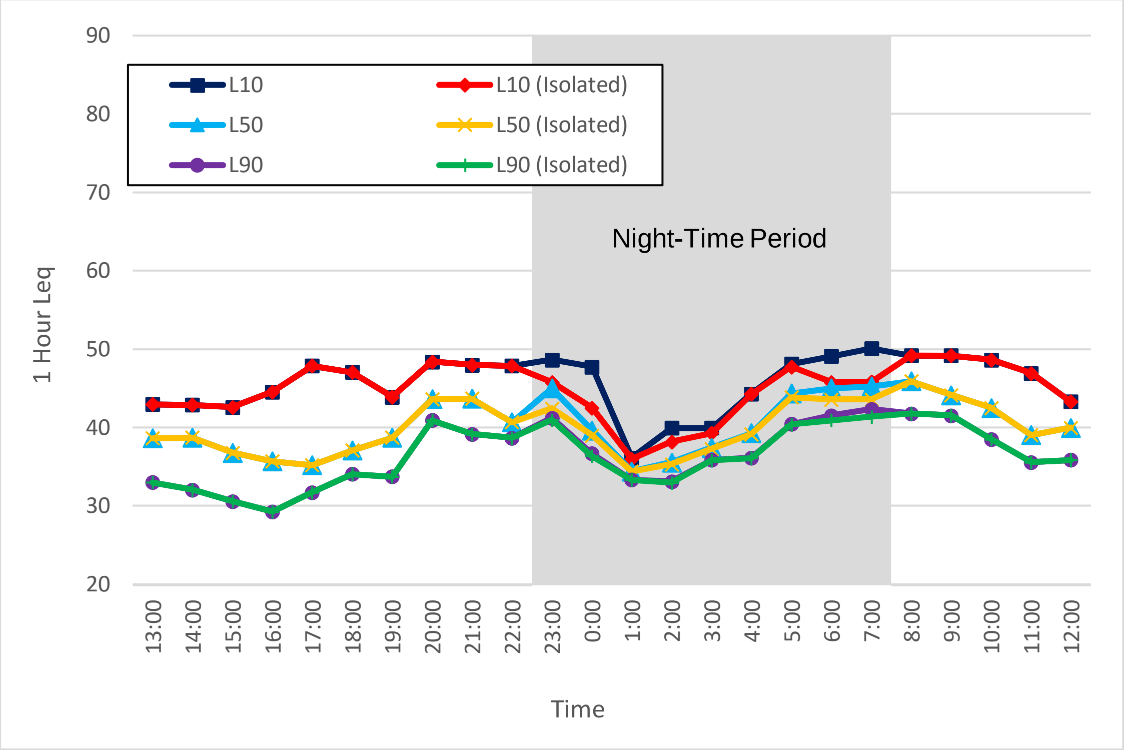

Figure 89. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

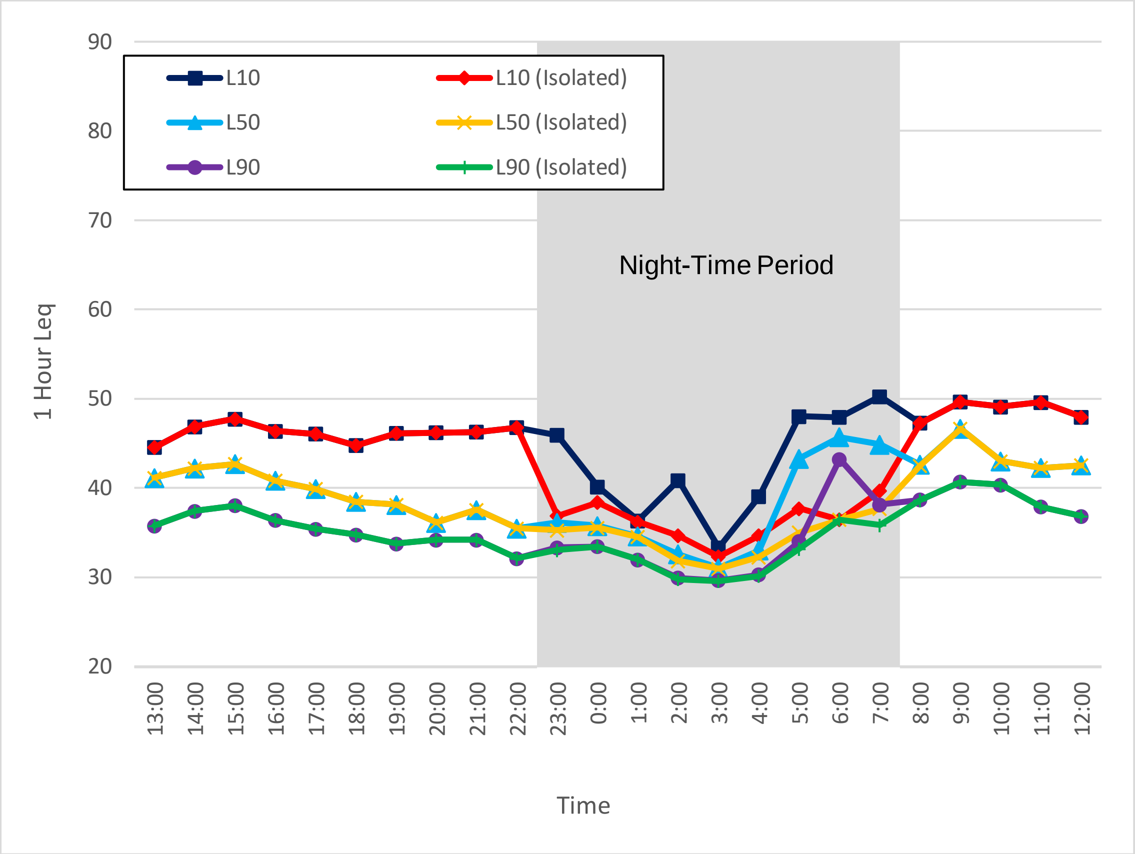

Figure 90. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

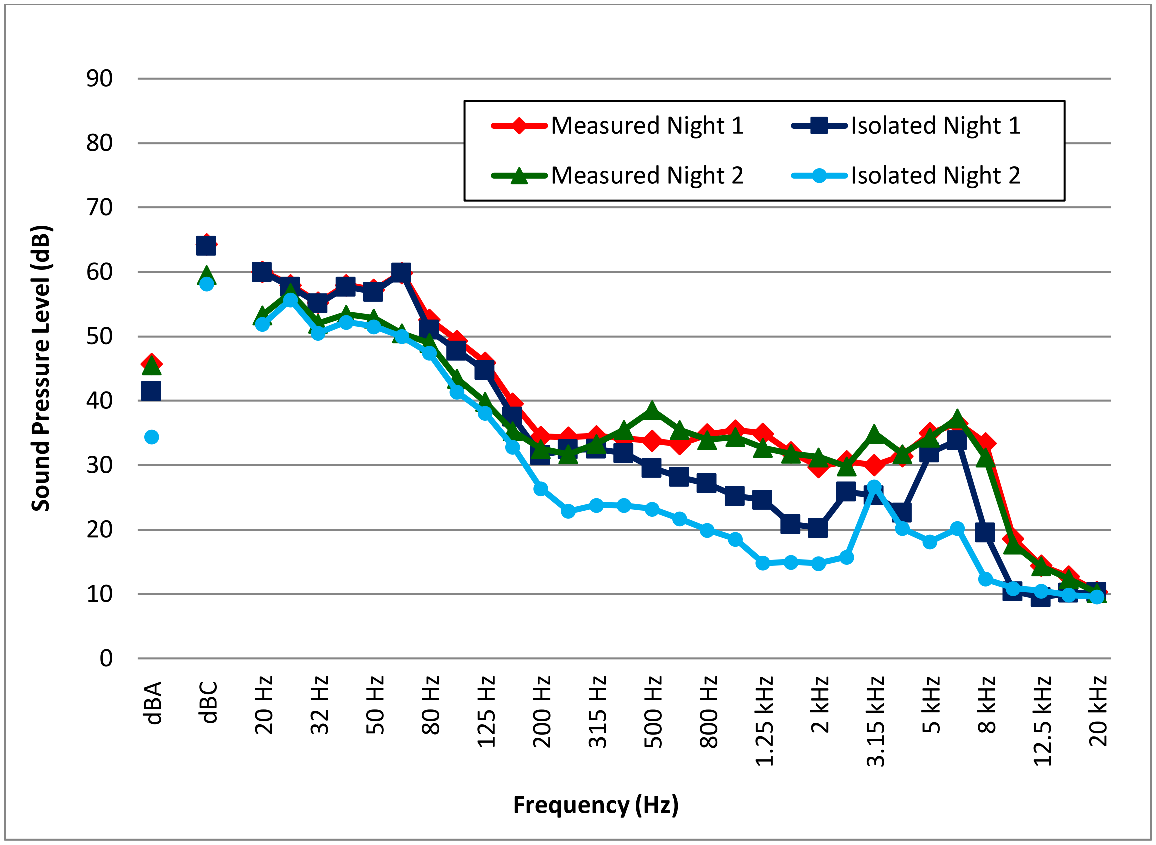

Figure 91. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (June 24 – 26, 2020)

Noise Monitor #12 - Period 2

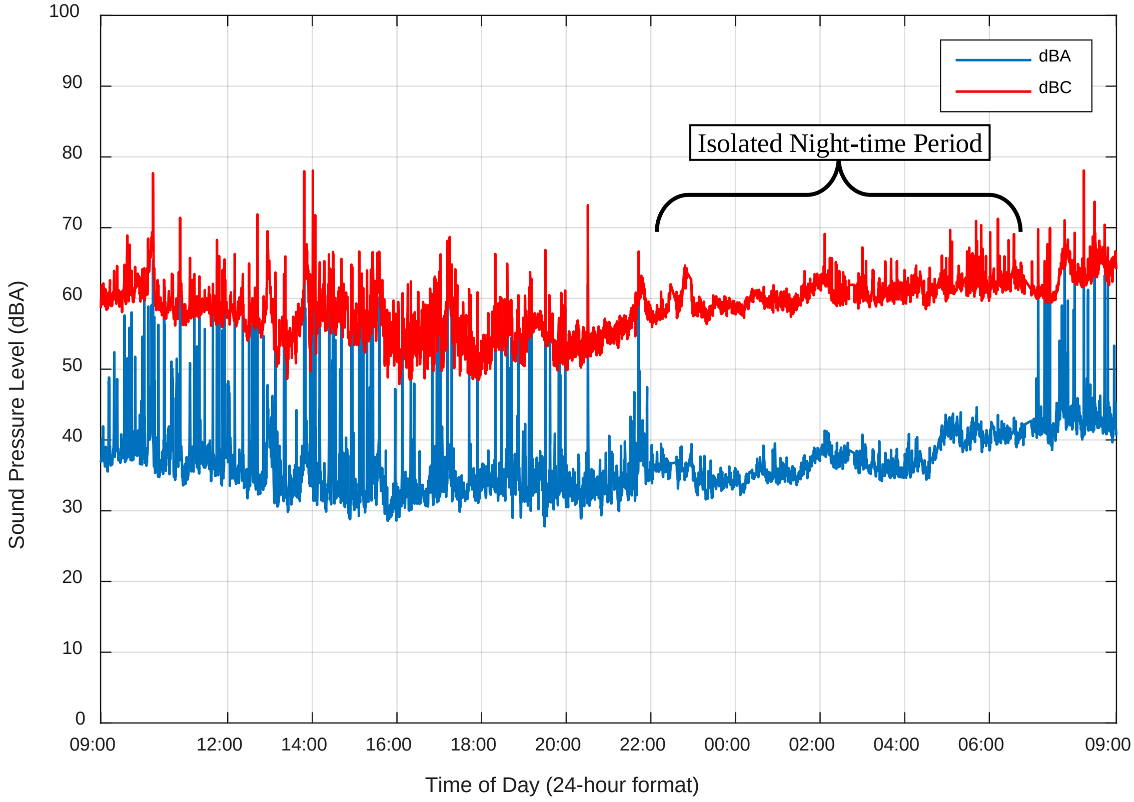

Figure 92. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 27 - 28, 2020)

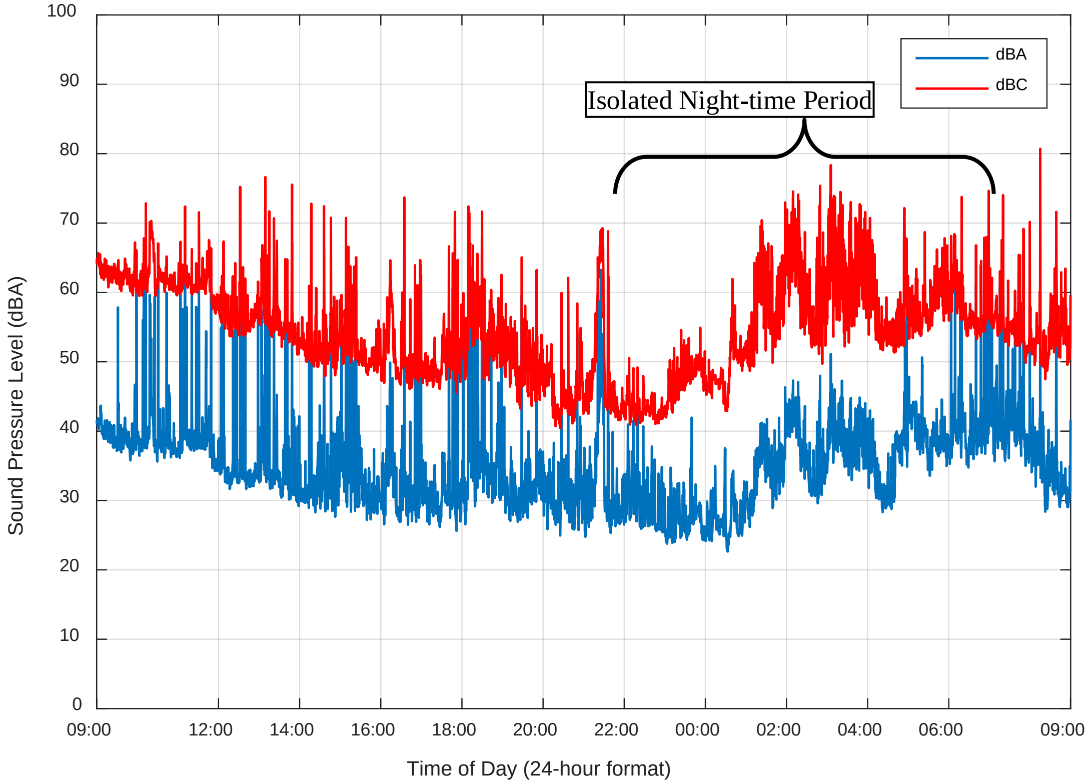

Figure 93. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 28 - 29, 2020)

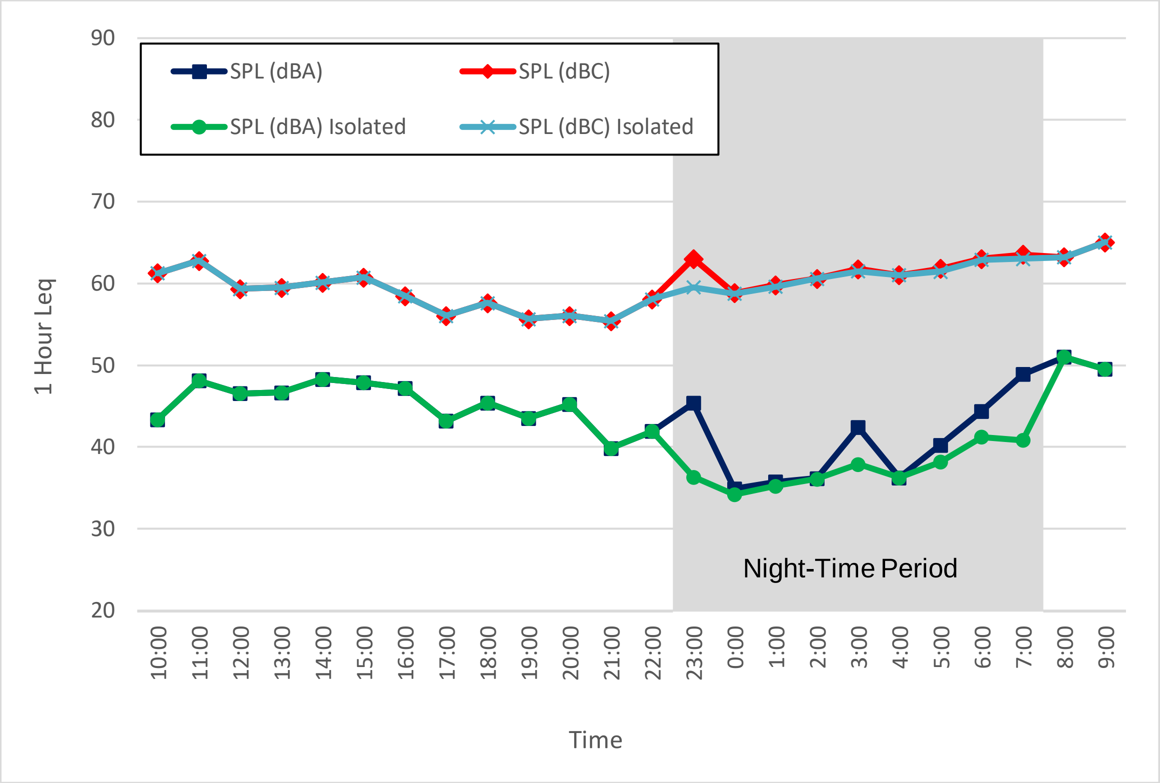

Figure 94. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 27 - 28, 2020)

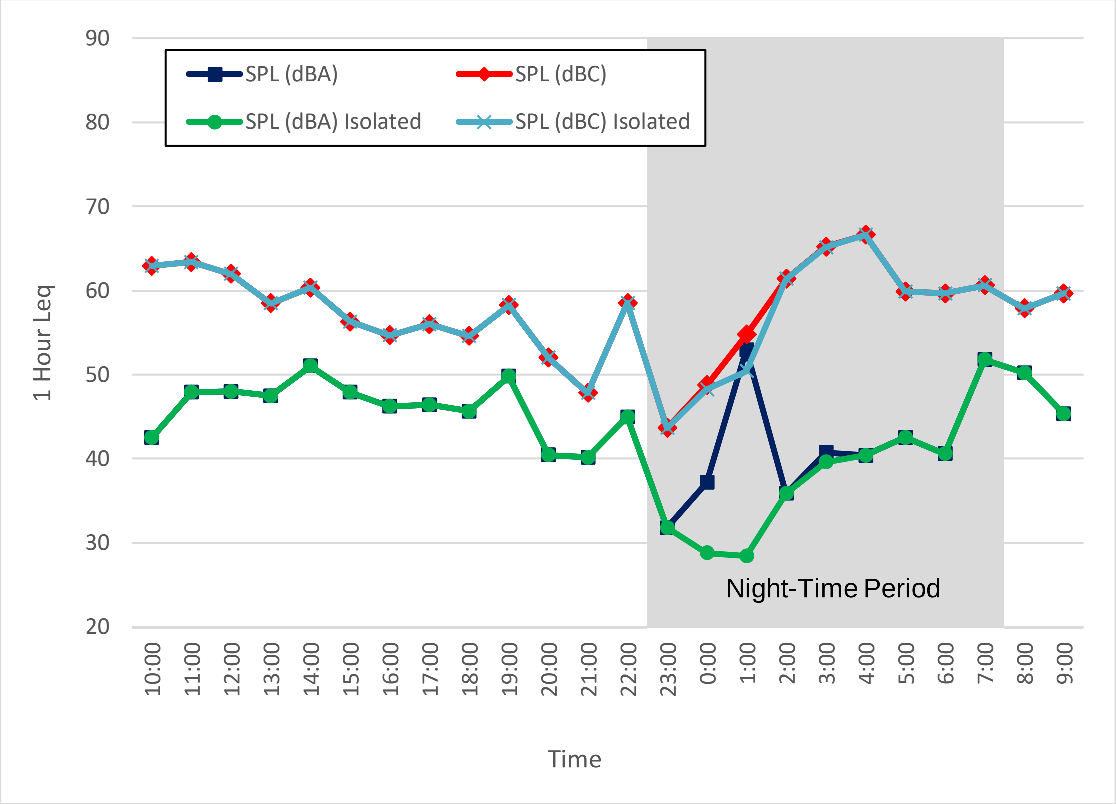

Figure 95. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 28 - 29, 2020)

#12 - Period 2 Noise Monitor

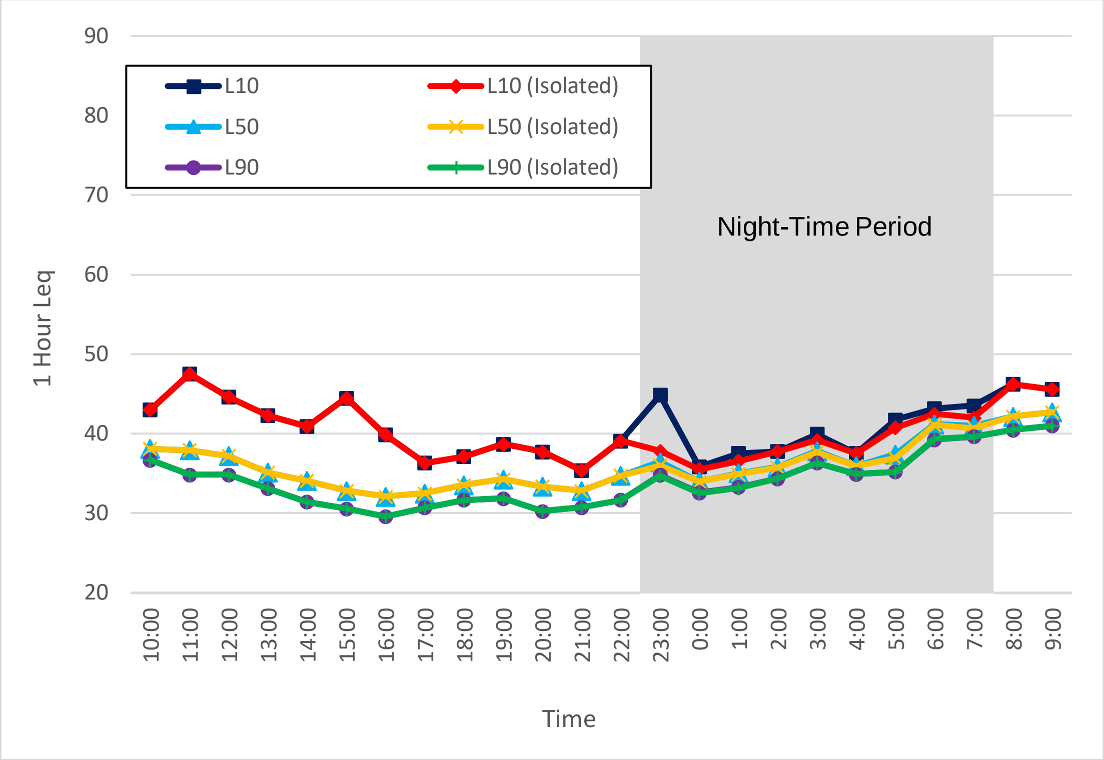

Figure 96. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 27 - 28, 2020)

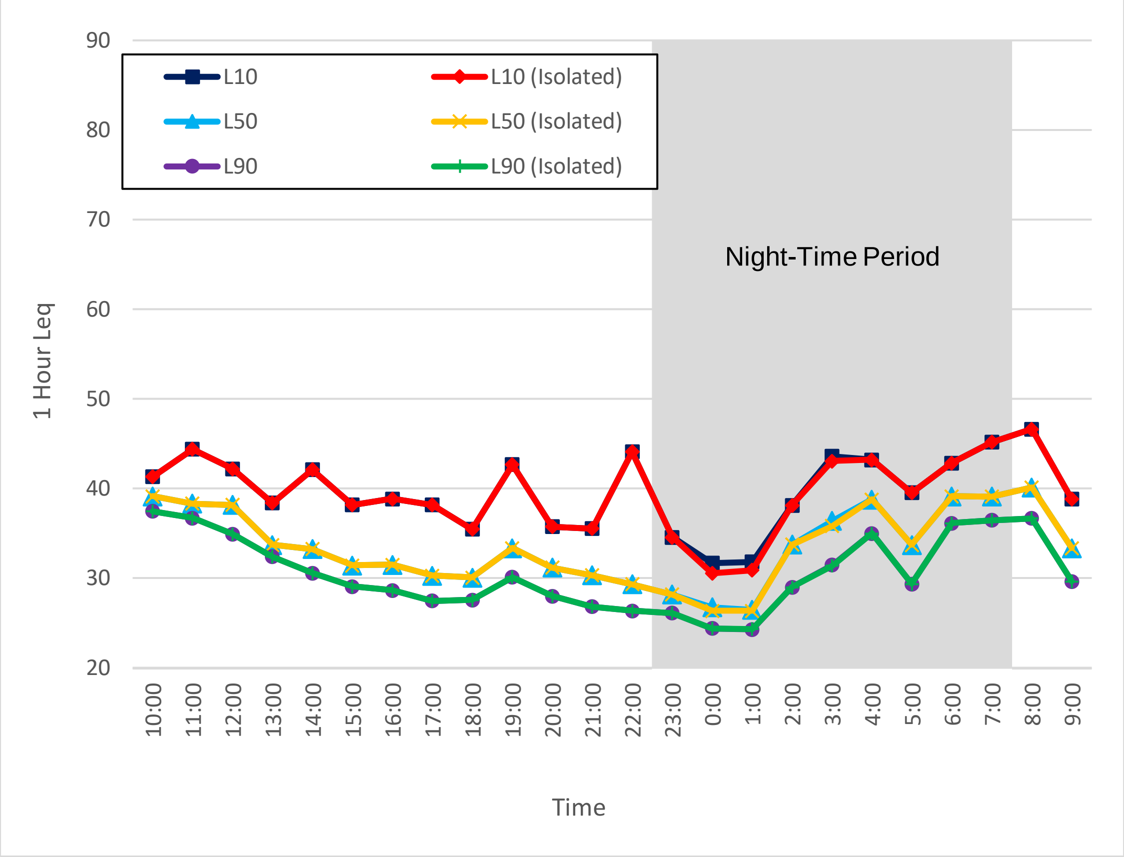

Figure 97. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 28 - 29, 2020)

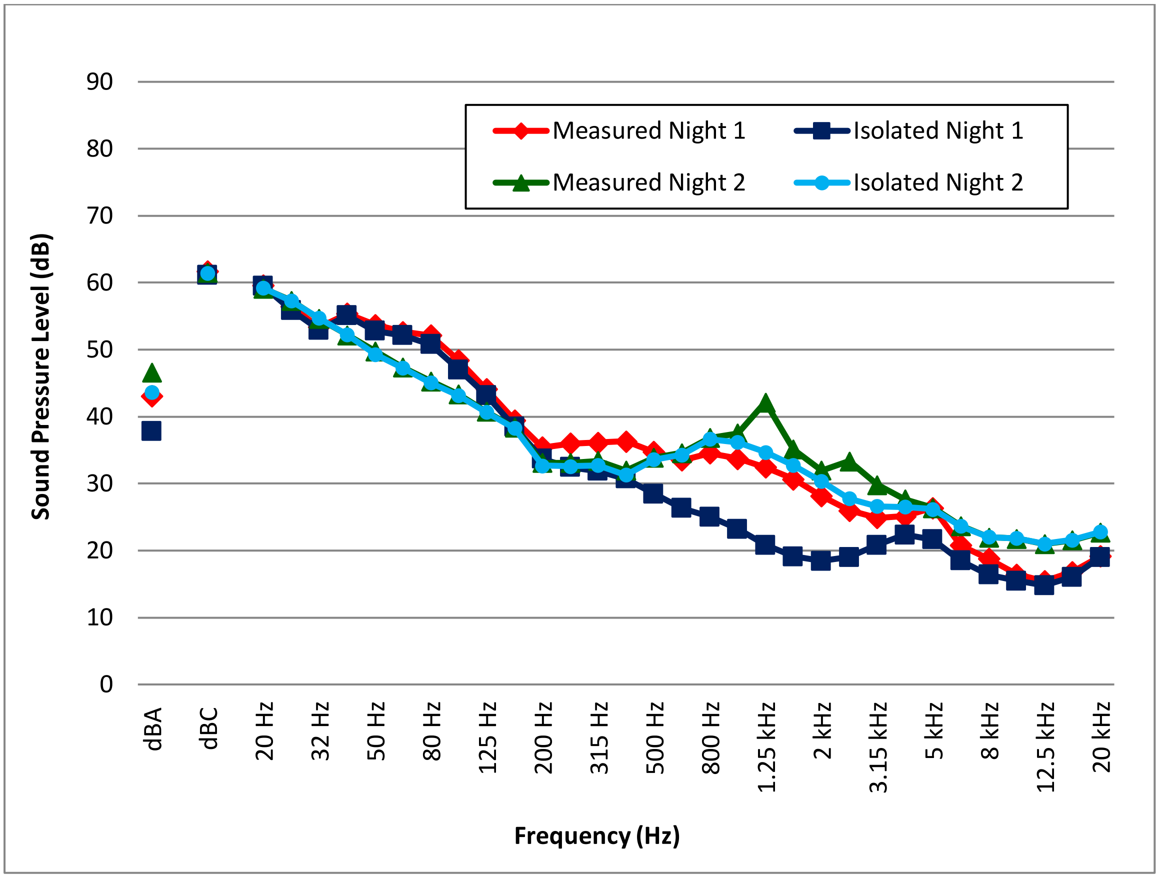

Figure 98. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (July 27 - 29, 2020)

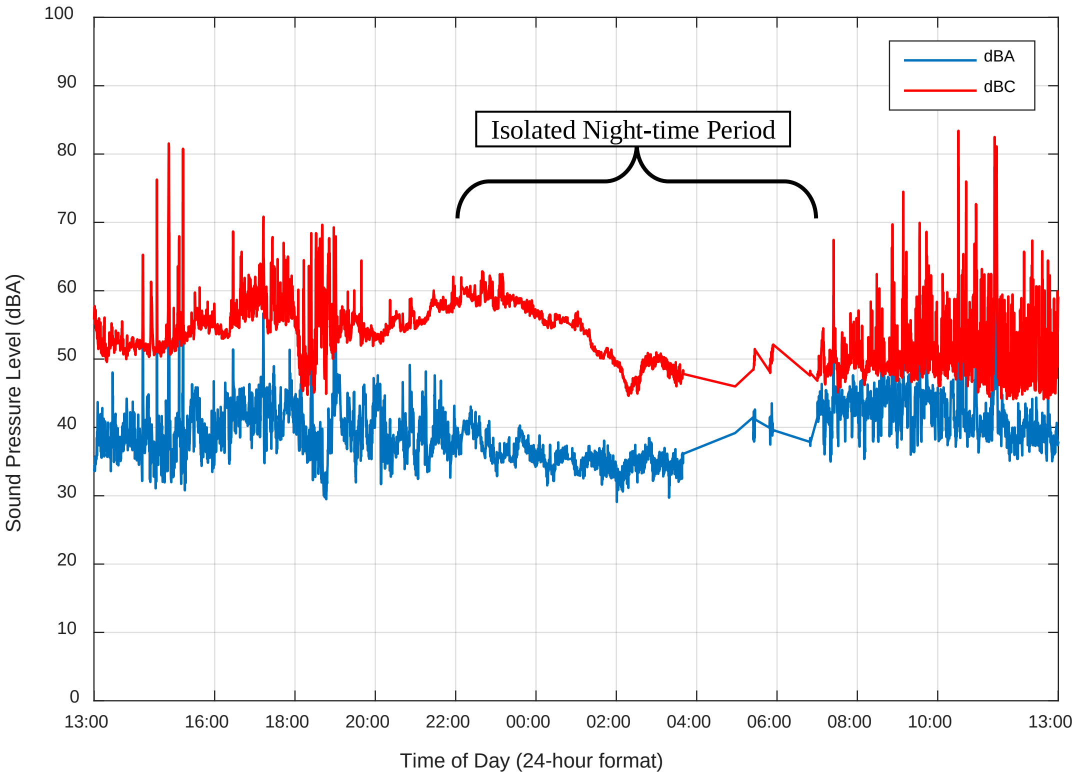

Figure 99. Noise Monitor #13, 15-Second L_{eq} Sound Levels (June 24 – 25, 2020)

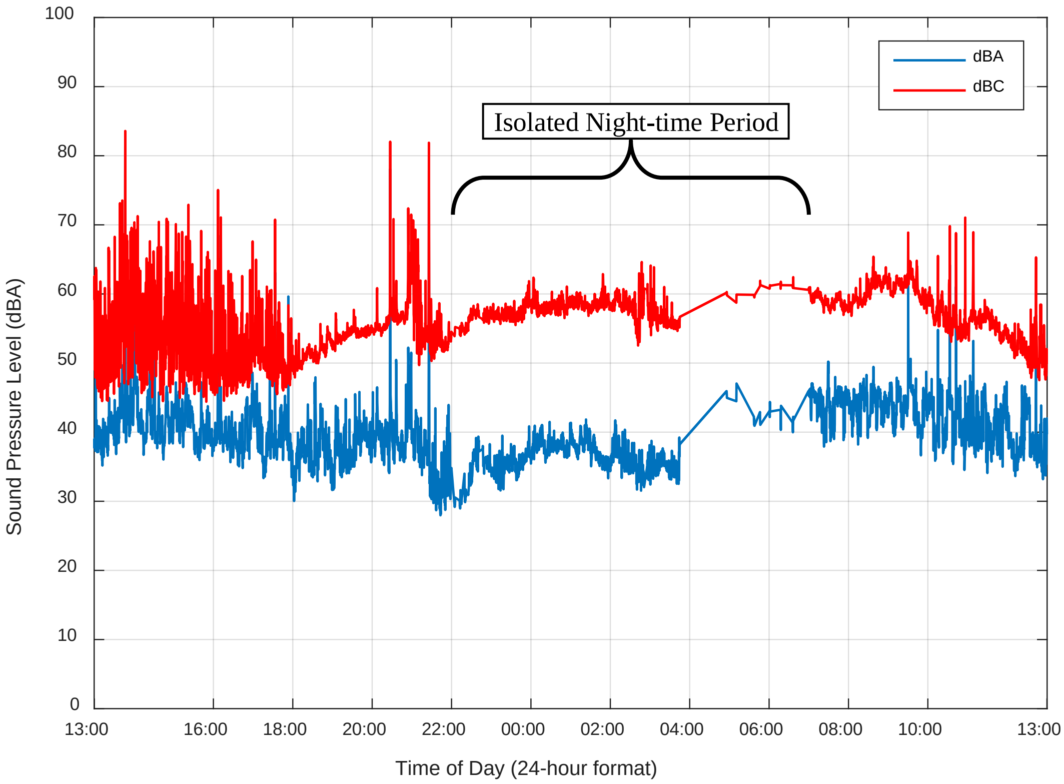

Figure 100. Noise Monitor #13, 15-Second L_{eq} Sound Levels (June 25 – 26, 2020)

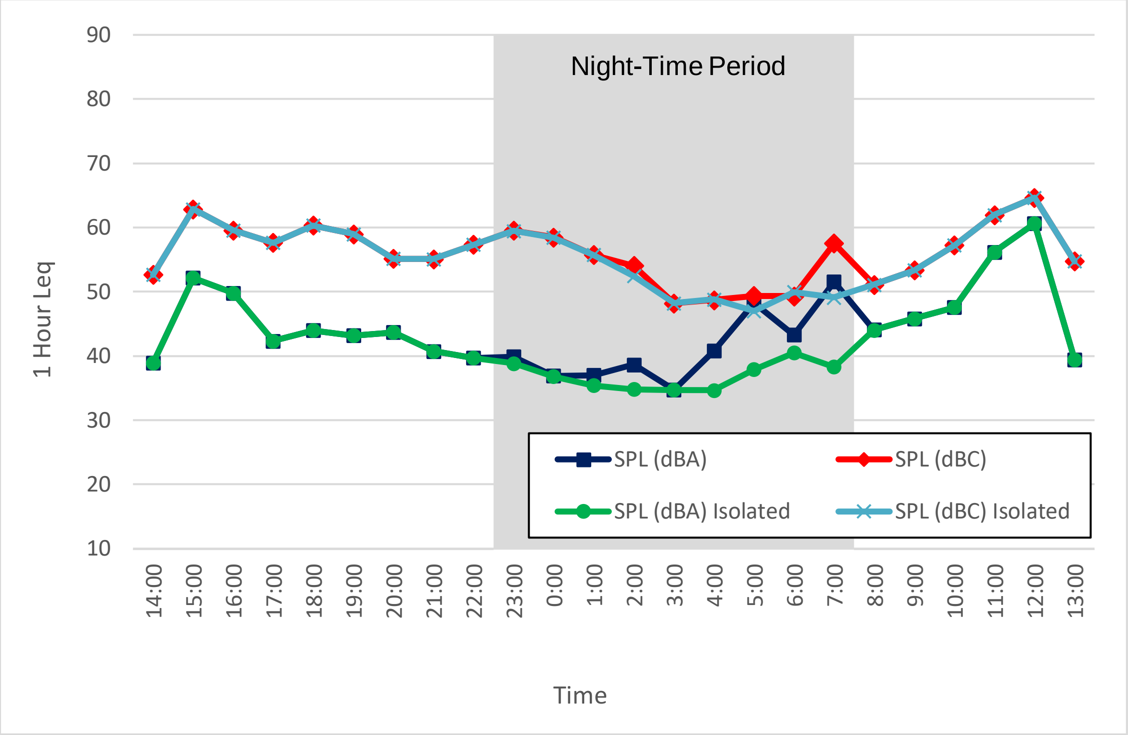

Figure 101. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (June 24 – 25, 2020)

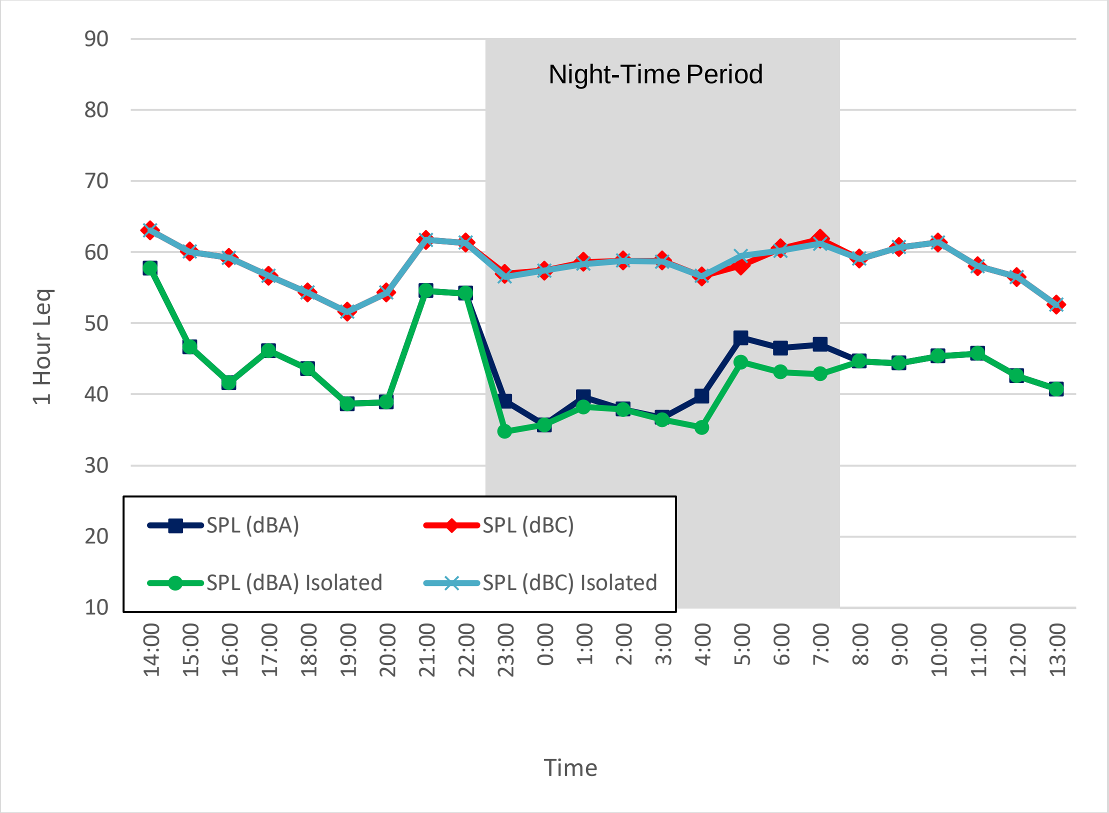

Figure 102. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (June 25 – 26, 2020)

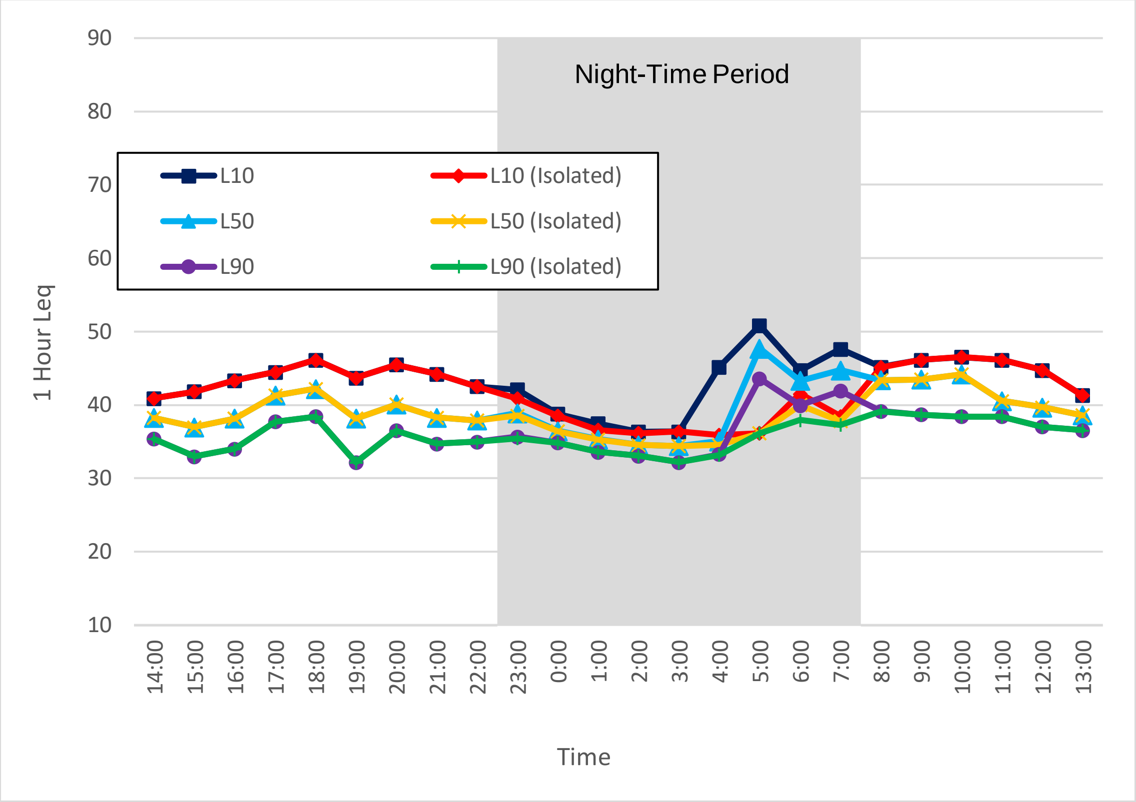

Figure 103. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 24 – 25, 2020)

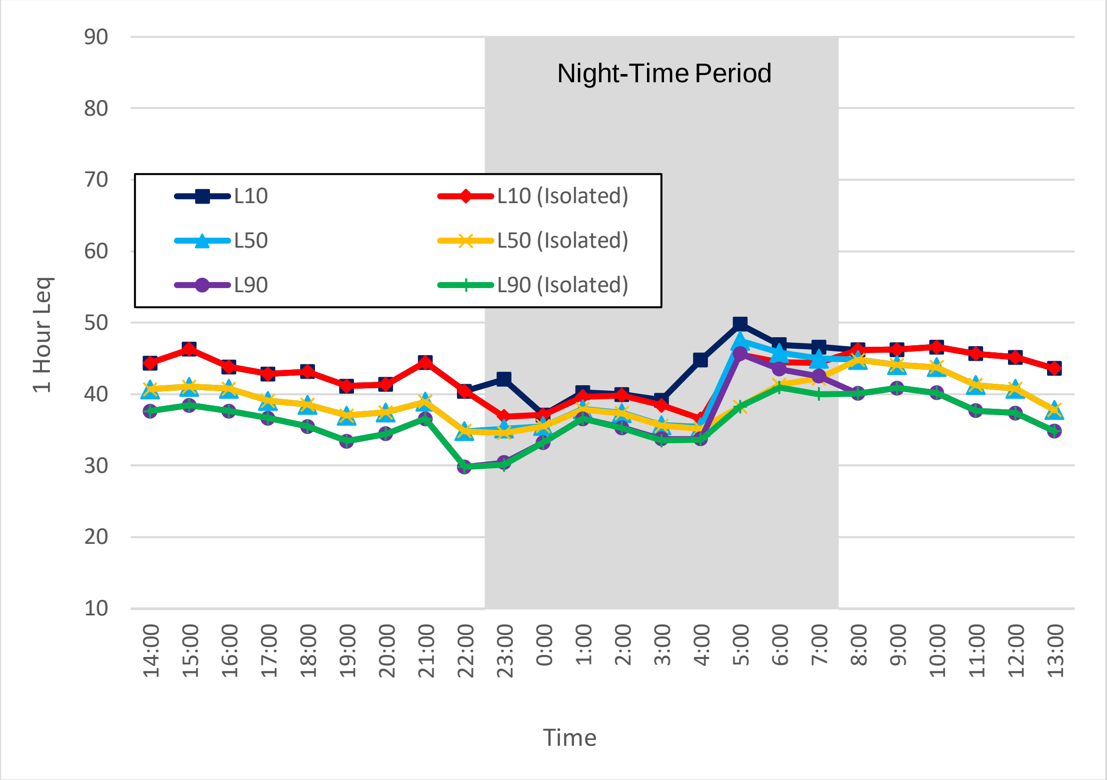

Figure 104. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (June 25 – 26, 2020)

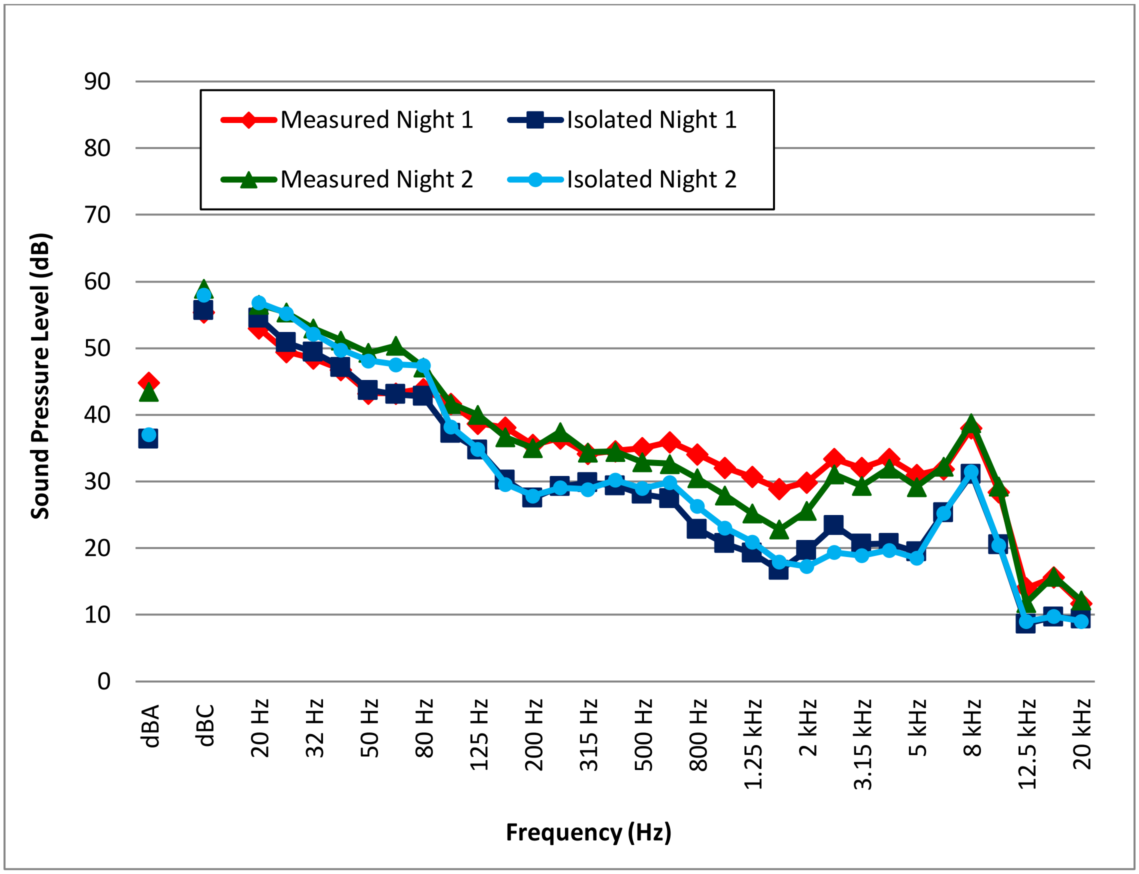

Figure 105. Noise Monitor #13, 1/3 Octave L_{eq} Sound Levels (June 24 – 26, 2020)

Appendix I MEASUREMENT EQUIPMENT USED

Brüel and Kjær 2250/2270

The environmental noise monitoring equipment used consisted of a Brüel and Kjær Type 2250/2270 Precision Integrating Sound Level Meter enclosed in an environmental case, a tripod, a weather protective microphone hood, and in certain cases, an external battery. The system acquired data in 15-second L_{eq} samples using 1/3 octave band frequency analysis and overall A-weighted and C-weighted sound levels. The sound level meter conforms to Type 1, ANSI S1.4, ANSI S1.43, IEC 61672-1, IEC 60651, IEC 60804 and DIN 45657. The 1/3 octave filters conform to S1.11 – Type 0-C, and IEC 61260 – Class 0. The calibrator conforms to IEC 942 and ANSI S1.40. The sound level meter, pre-amplifier and microphone were certified on May 14, 2019 / January 31, 2019 / November 27, 2018 / November 27, 2018 / November 28, 2018 / August 01, 2019 / March 28, 2019 / May 14, 2019 and the calibrator (type B&K 4231) was certified on February 03, 2020 by a NIST NVLAP Accredited Calibration Laboratory for all requirements of ISO 17025: 1999 and relevant requirements of ISO 9002:1994, ISO 9001:2000 and ANSI/NCSL Z540: 1994 Part 1. All measurement methods and instrumentation conform to the requirements of the AER Directive 038. Simultaneous digital audio was recorded directly on the sound level meter using a 8 kHz sample rate for more detailed post-processing analysis. Refer to the next section in the Appendix for a detailed description of the various acoustical descriptive terms used.

Weather Monitor

The weather monitoring equipment used for the study consisted of an Orion Weather Station 9510-A-1 with a WXT520 Self-Aspirating Radiation Shield Sensor Unit, a Weather MicroServer 9590 Data-logger, and a Lightning Arrestor. The Data-logger and batteries were located in a grounded, weather protective case. The Sensor Unit was mounted on a sturdy survey tripod (with supporting guy-wires) at approximately 5.0 m above ground. The system was set up to record data in 1-minute samples obtaining the wind-speed, peak wind-speed, and wind-direction in a rolling 2-minute average as well as the 1-minute temperature, relative humidity, barometric pressure, rain rate and total rain accumulation.

Record of Calibration Results

Description	Date	Time	Pre / Post	Calibration Level	Calibrator Model	Serial Number
Monitor #1	27-Jul-20	8:30	Pre	93.9 dBA	B&K 4231	2656414
Monitor #1	29-Jul-20	14:20	Post	93.8 dBA	B&K 4231	2656414
Monitor #2	27-Jul-20	7:35	Pre	93.9 dBA	B&K 4231	2656414
Monitor #2	29-Jul-20	14:55	Post	93.8 dBA	B&K 4231	2656414
Monitor #3	27-Jul-20	7:25	Pre	93.9 dBA	B&K 4231	2656414
Monitor #3	29-Jul-20	15:10	Post	93.8 dBA	B&K 4231	2656414
Monitor #4	24-Jun-20	10:00	Pre	93.9 dBA	B&K 4231	2656414
Monitor #4	26-Jun-20	12:25	Post	93.9 dBA	B&K 4231	2656414
Monitor #5	24-Jun-20	9:40	Pre	93.9 dBA	B&K 4231	2656414
Monitor #5	26-Jun-20	12:40	Post	93.8 dBA	B&K 4231	2656414
Monitor #6	24-Jun-20	8:40	Pre	93.9 dBA	B&K 4231	2656414
Monitor #6	26-Jun-20	13:05	Post	93.8 dBA	B&K 4231	2656414
Monitor #8	24-Jun-20	11:35	Pre	93.9 dBA	B&K 4231	2656414
Monitor #8	26-Jun-20	14:45	Post	93.8 dBA	B&K 4231	2656414
Monitor #9	27-Jul-20	8:55	Pre	93.9 dBA	B&K 4231	2656414
Monitor #9	29-Jul-20	13:45	Post	93.8 dBA	B&K 4231	2656414
Monitor #10	27-Jul-20	7:55	Pre	93.9 dBA	B&K 4231	2656414
Monitor #10	29-Jul-20	14:40	Post	93.8 dBA	B&K 4231	2656414
Monitor #11	24-Jun-20	11:00	Pre	93.9 dBA	B&K 4231	2656414
Monitor #11	26-Jun-20	14:35	Post	93.9 dBA	B&K 4231	2656414
Monitor #12 #1	24-Jun-20	7:45	Pre	93.9 dBA	B&K 4231	2656414
Monitor #12 #1	26-Jun-20	13:35	Post	93.9 dBA	B&K 4231	2656414
Monitor #12 #2	27-Jul-20	6:58	Pre	93.9 dBA	B&K 4231	2656414
Monitor #12 #2	29-Jul-20	15:35	Post	93.8 dBA	B&K 4231	2656414
Monitor #13	24-Jun-20	12:20	Pre	93.9 dBA	B&K 4231	2656414
Monitor #13	26-Jun-20	14:05	Post	93.8 dBA	B&K 4231	2656414

B&K 2250 Unit #1 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.42870

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2488495**
Tested with: **Microphone 4189 s/n 2471133**
Preamplifier ZC0032 s/n 3271
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **5/14/2019** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: ___**Yes** _**X**_ **No**
Calibration service: ___ **Basic** _**X**_ **Standard**
Address: **5031 - 210 Street, Edmonton,**
Alberta, CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	**Description**	**S/N**	**Cal. Date**	**Traceability evidence** **Cal. Lab / Accreditation**	**Cal. Due**
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2018	Scantek, Inc./ NVLAP	Oct 31, 2019
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 1, 2018	ACR Env. / A2LA	Oct 1, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.6	99.61	45.1

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	5/14/2019	Date	5/15/2019

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored Z:\Calibration Lab\SLM 2019\BNK2250_2488495_M1.doc

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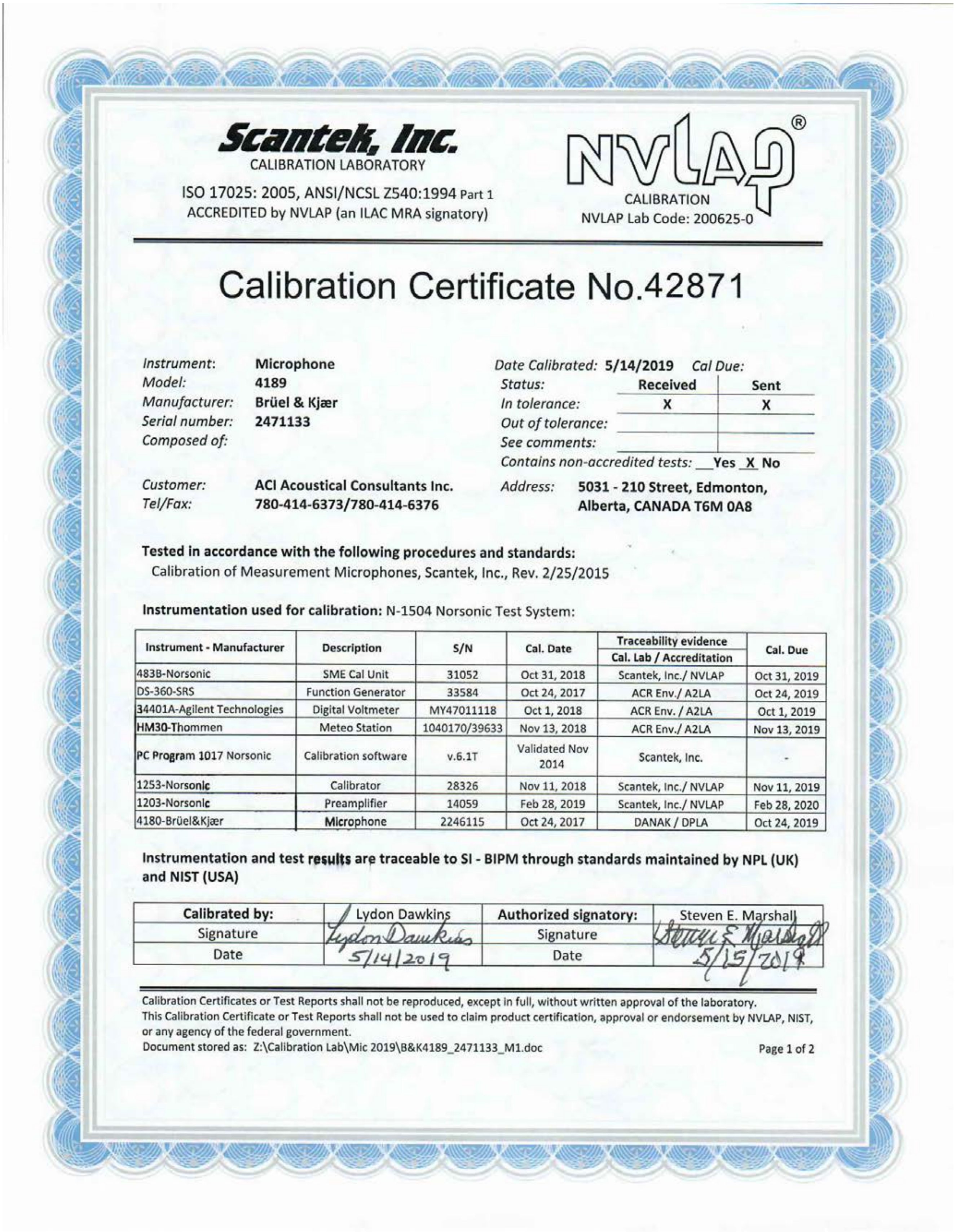
B&K 2250 Unit #1 Microphone Calibration Certificate



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.42871

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2471133**
Composed of:

Date Calibrated: **5/14/2019** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __**Yes** _**X**_ **No**

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373/780-414-6376**

Address: **5031 - 210 Street, Edmonton,**
Alberta, CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2018	Scantek, Inc./ NVLAP	Oct 31, 2019
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 1, 2018	ACR Env. / A2LA	Oct 1, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019
1203-Norsonic	Preamplifier	14059	Feb 28, 2019	Scantek, Inc./ NVLAP	Feb 28, 2020
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	5/14/2019	Date	5/15/2019

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This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
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B&K 2270 Unit #2 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.42223

Instrument: **Sound Level Meter**
Model: **2270**
Manufacturer: **Brüel and Kjær**
Serial number: **3002718**
Tested with: **Microphone 4189 s/n 2850742**
Preamplifier ZC0032 s/n 18754
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **1/31/2019** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		

See comments:
Contains non-accredited tests: __**Yes** _**X**_ **No**
Calibration service: __ **Basic** _**X**_ **Standard**
Address: **5031 - 210 Street**
Edmonton, Alberta
CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.9	101.84	39.7

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	1/31/19	Date	1/31/2019

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This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
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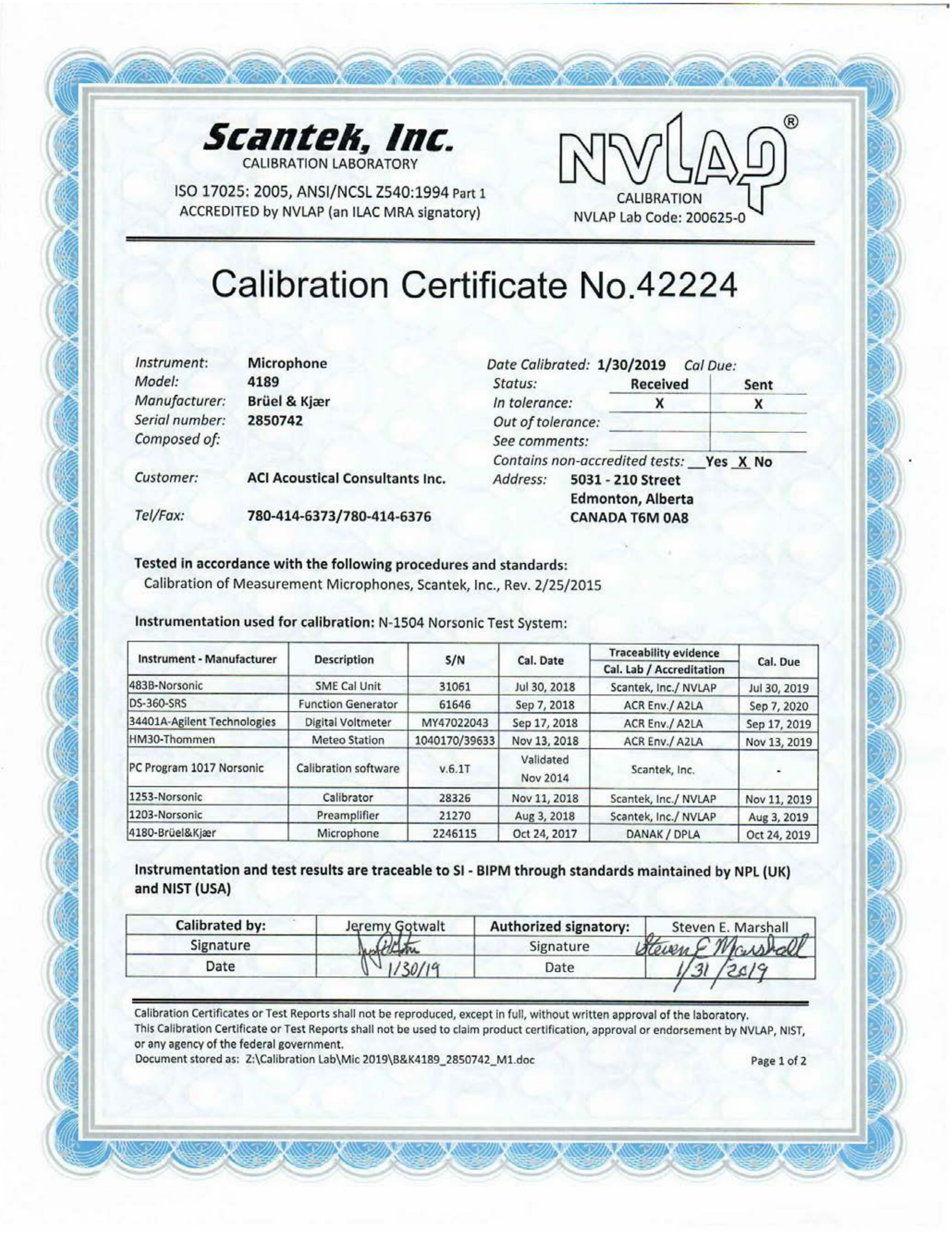
B&K 2270 Unit #2 Microphone Calibration Certificate



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.42224

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2850742**
Composed of:

Customer: **ACI Acoustical Consultants Inc.**

Tel/Fax: **780-414-6373/780-414-6376**

Date Calibrated: **1/30/2019** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __**Yes** _**X** **No**

Address:
5031 - 210 Street
Edmonton, Alberta
CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	**Description**	**S/N**	**Cal. Date**	**Traceability evidence**	**Cal. Due**
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019
1203-Norsonic	Preamplifier	21270	Aug 3, 2018	Scantek, Inc./ NVLAP	Aug 3, 2019
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	1/30/19	Date	1/31/2019

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This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
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B&K 2270 Unit #4 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41885

Instrument:	**Sound Level Meter**
Model:	**2270**
Manufacturer:	**Brüel and Kjær**
Serial number:	**2644639**
Tested with:	**Microphone 4189 s/n 2643219** **Preamplifier ZC0032 s/n 8255**
Type (class):	**1**
Customer:	**ACI Acoustical Consultants Inc.**
Tel/Fax:	**780-414-6373 / 780-414-6376**

Date Calibrated: **11/27/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __**Yes** **X No**

Calibration service: __ **Basic** **X Standard**

Address: **5031 - 210 Street**
Edmonton, Alberta, CANADA
T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	**Description**	**S/N**	**Cal. Date**	**Traceability evidence**	**Cal. Due**
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.5	98.91	44.7

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	11/27/18	Date	11/28/2018

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B&K 2270 Unit #4 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41886

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2643219**
Composed of:

Date Calibrated: **11/26/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373/780-414-6376**

Address:
5031 - 210 Street
Edmonton, Alberta, CANADA
T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019
1203-Norsonic	Preamplifier	21270	Aug 3, 2018	Scantek, Inc./ NVLAP	Aug 3, 2019
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	11/26/18	Date	11/28/2018

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B&K 2250 Unit #5 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41887

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2722894**
Tested with: **Microphone 4189 s/n 2719777**
Preamplifier ZC0032 s/n 13895
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **11/27/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __ **Yes** _X_ **No**
Calibration service: __ **Basic** _X_ **Standard**
Address: **5031 - 210 Street**
Edmonton, Alberta, CANADA
T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	**Description**	**S/N**	**Cal. Date**	**Traceability evidence**	**Cal. Due**
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.1	98.74	36.8

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	11/27/18	Date	11/28/2018

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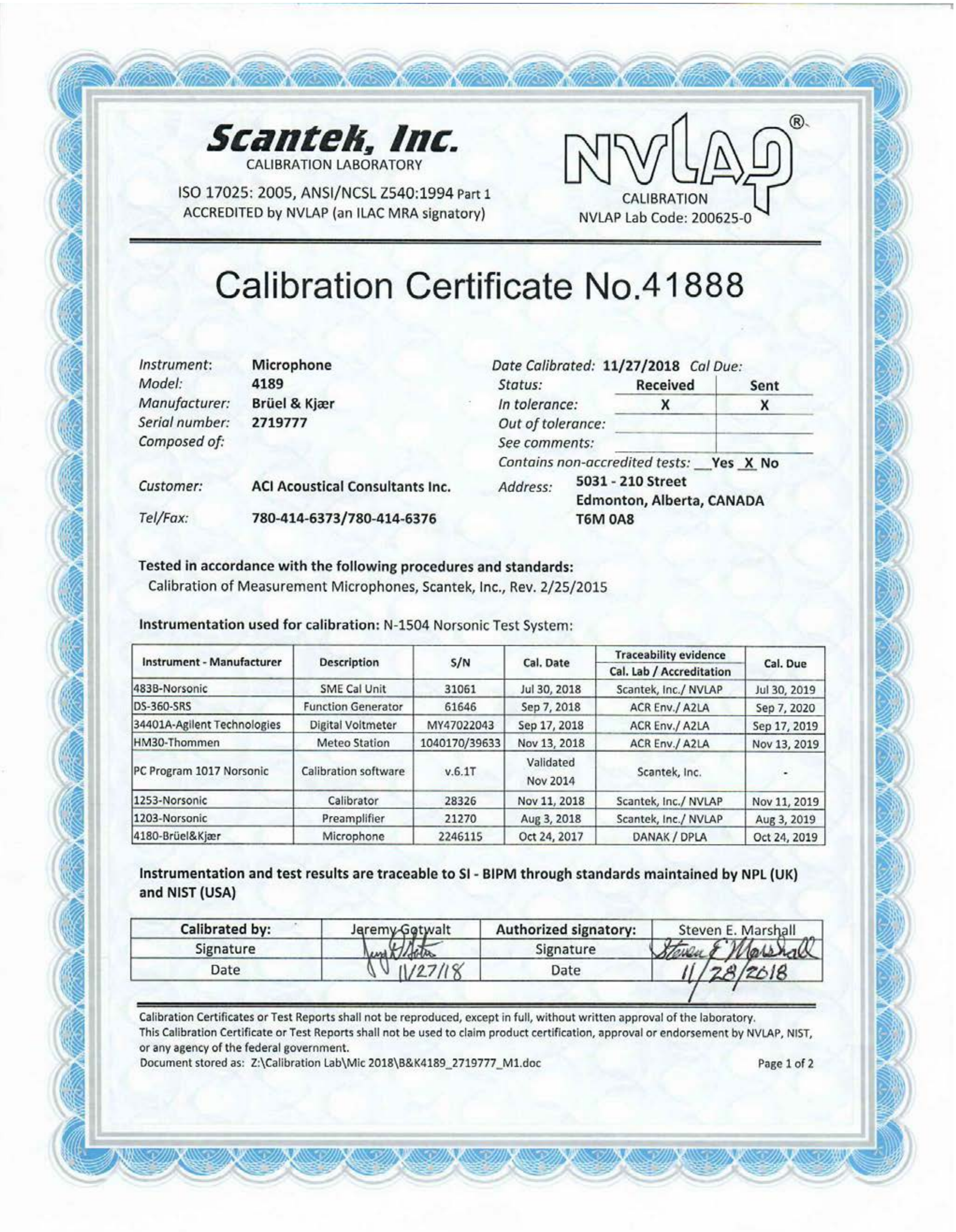
B&K 2250 Unit #5 Microphone Calibration Certificate



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41888

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2719777**
Composed of:

Date Calibrated: **11/27/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373/780-414-6376**

Address:
5031 - 210 Street
Edmonton, Alberta, CANADA
T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019
1203-Norsonic	Preamplifier	21270	Aug 3, 2018	Scantek, Inc./ NVLAP	Aug 3, 2019
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	11/27/18	Date	11/28/2018

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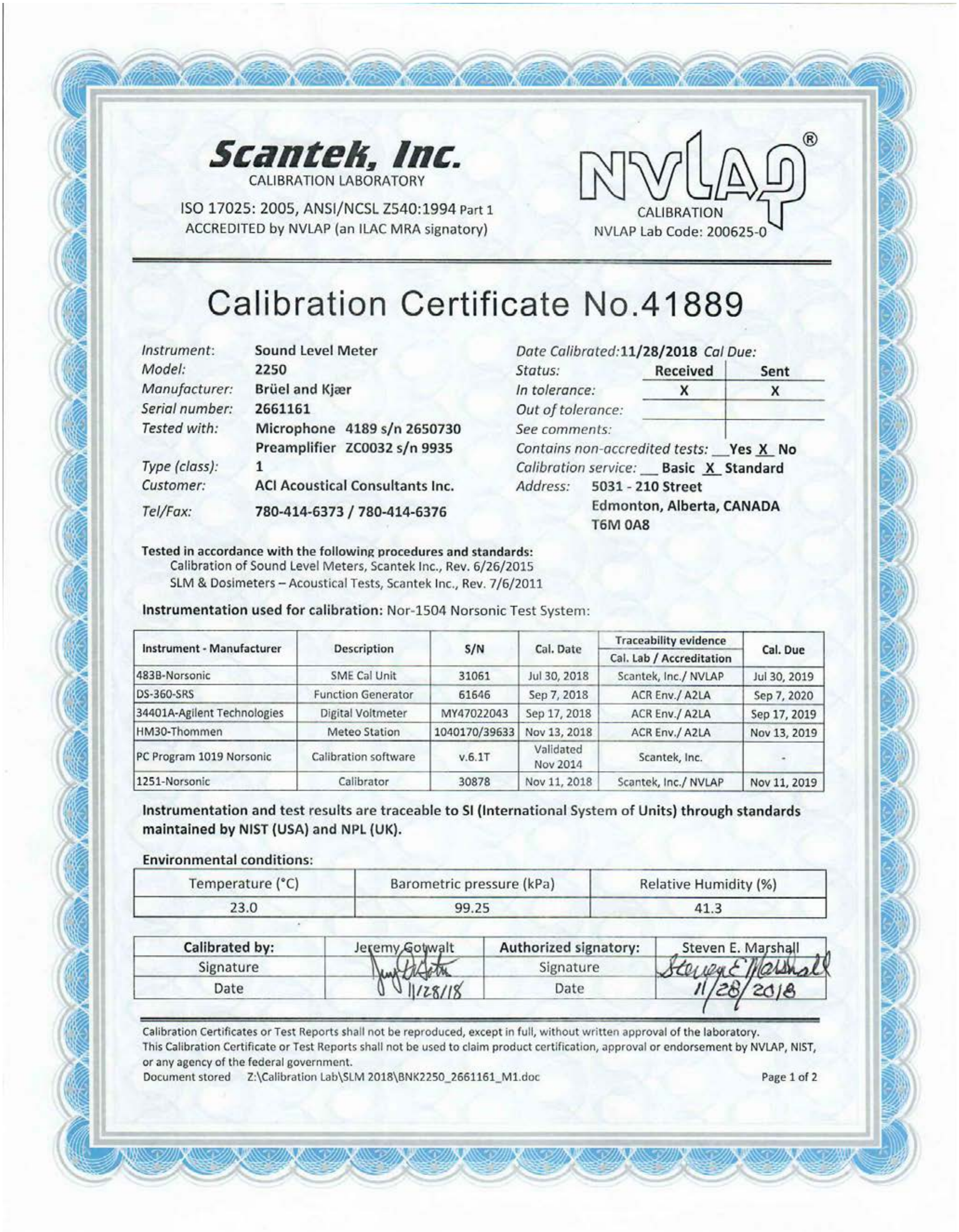
B&K 2250 Unit #6 SLM Calibration Certificate



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41889

Instrument:	**Sound Level Meter**
Model:	**2250**
Manufacturer:	**Brüel and Kjær**
Serial number:	**2661161**
Tested with:	**Microphone 4189 s/n 2650730** **Preamplifier ZC0032 s/n 9935**
Type (class):	**1**
Customer:	**ACI Acoustical Consultants Inc.**
Tel/Fax:	**780-414-6373 / 780-414-6376**

Date Calibrated: **11/28/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ **Basic** X **Standard**

Address:
5031 - 210 Street
Edmonton, Alberta, CANADA
T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0	99.25	41.3

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	11/28/18	Date	11/28/2018

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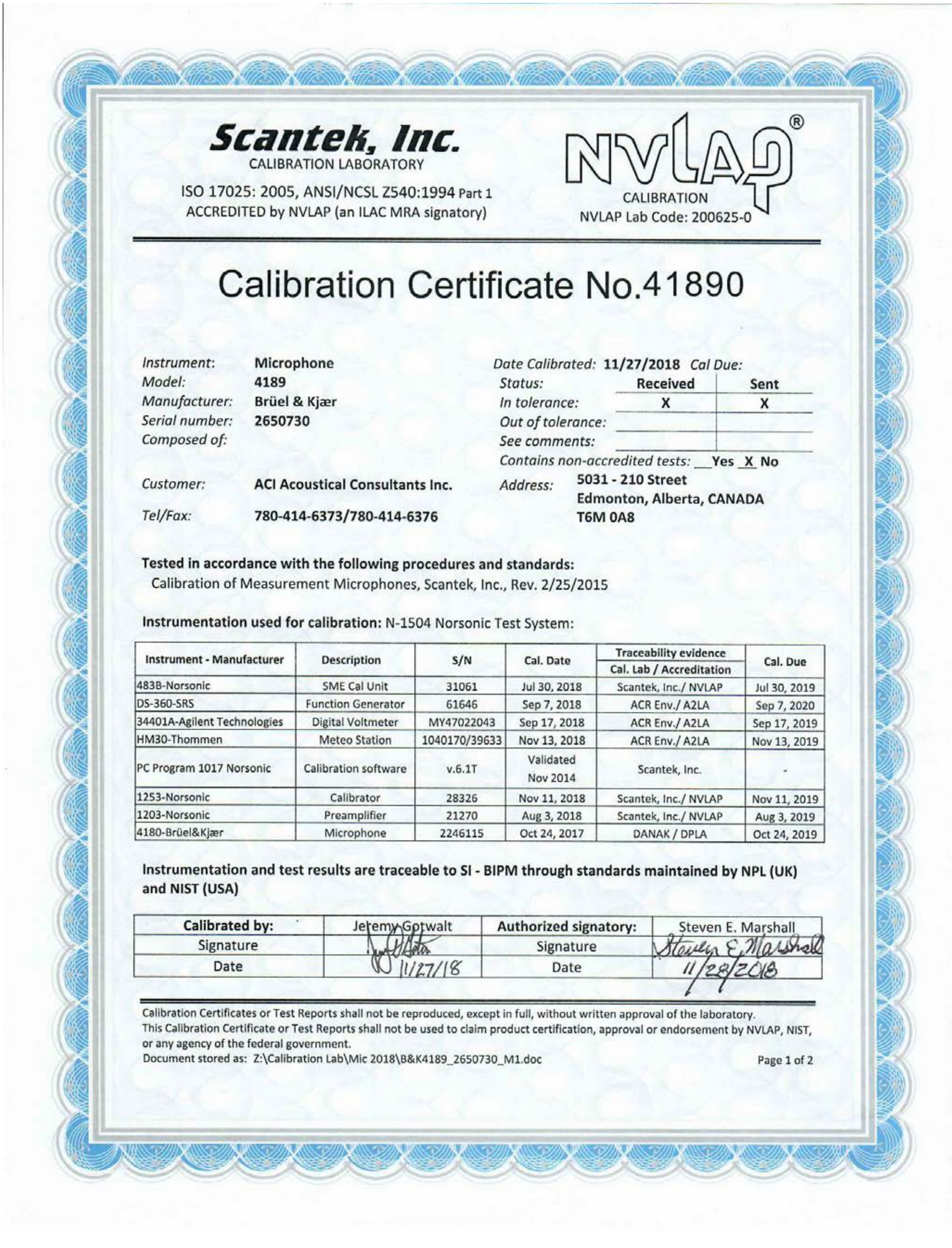
B&K 2250 Unit #6 Microphone Calibration Certificate



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41890

Instrument:	**Microphone**
Model:	**4189**
Manufacturer:	**Brüel & Kjær**
Serial number:	**2650730**
Composed of:	
Customer:	**ACI Acoustical Consultants Inc.**
Tel/Fax:	**780-414-6373/780-414-6376**

Date Calibrated: **11/27/2018** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __**Yes** _**X** **No**

Address:
5031 - 210 Street
Edmonton, Alberta, CANADA
T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 30, 2018	Scantek, Inc./ NVLAP	Jul 30, 2019
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 17, 2018	ACR Env./ A2LA	Sep 17, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019
1203-Norsonic	Preamplifier	21270	Aug 3, 2018	Scantek, Inc./ NVLAP	Aug 3, 2019
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E. Marshall
Date	11/27/18	Date	11/28/2018

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This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
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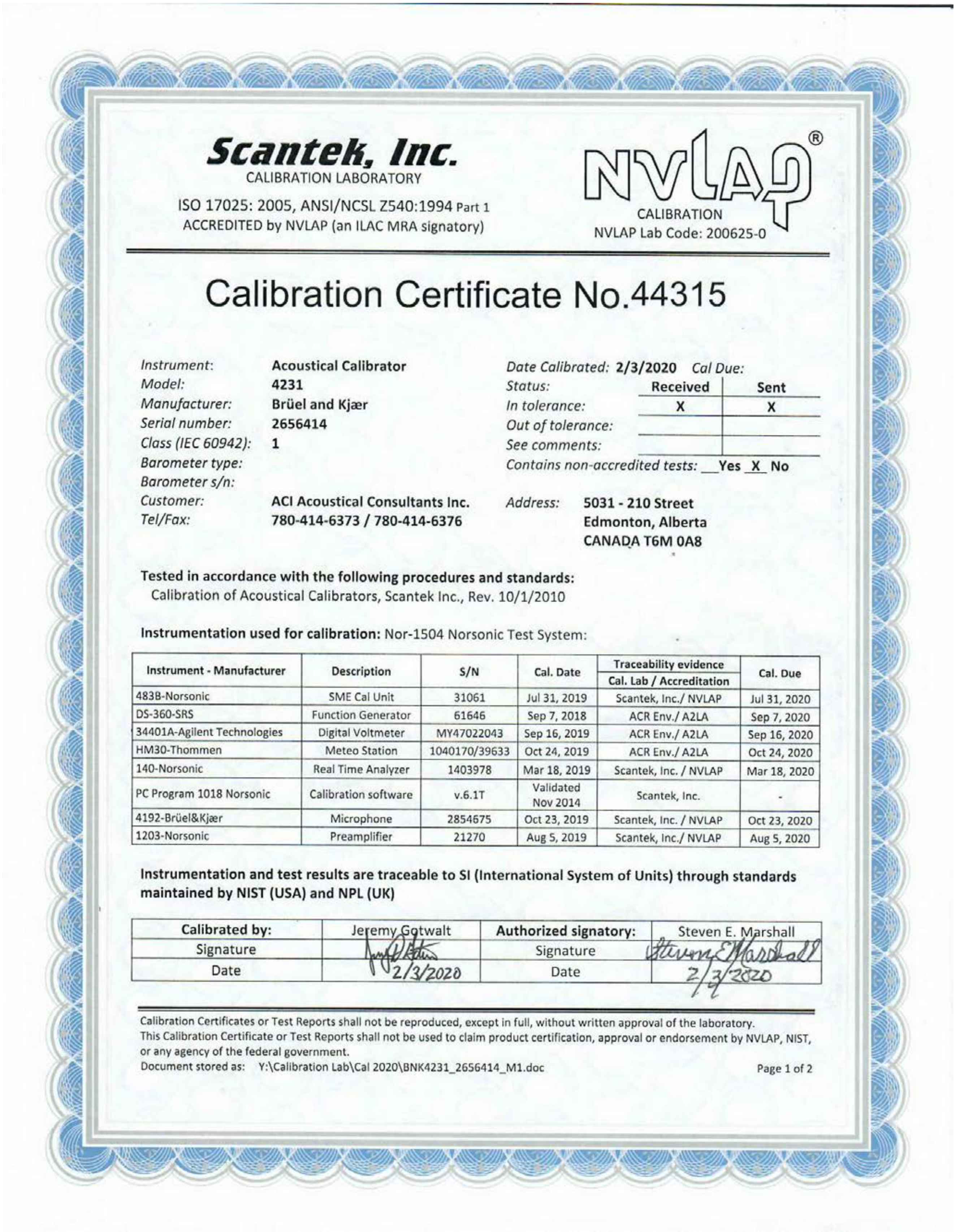
Page 1 of 2

B&K 4231 Unit #6 Calibrator Calibration Certificate



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.44315

Instrument: **Acoustical Calibrator**
Model: **4231**
Manufacturer: **Brüel and Kjær**
Serial number: **2656414**
Class (IEC 60942): **1**
Barometer type:
Barometer s/n:
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **2/3/2020** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __**Yes** _**X**_ **No**

Address:
5031 - 210 Street
Edmonton, Alberta
CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 31, 2019	Scantek, Inc./ NVLAP	Jul 31, 2020
DS-360-SRS	Function Generator	61646	Sep 7, 2018	ACR Env./ A2LA	Sep 7, 2020
34401A-Agilent Technologies	Digital Voltmeter	MY47022043	Sep 16, 2019	ACR Env./ A2LA	Sep 16, 2020
HM30-Thommen	Meteo Station	1040170/39633	Oct 24, 2019	ACR Env./ A2LA	Oct 24, 2020
140-Norsonic	Real Time Analyzer	1403978	Mar 18, 2019	Scantek, Inc. / NVLAP	Mar 18, 2020
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4192-Brüel&Kjær	Microphone	2854675	Oct 23, 2019	Scantek, Inc. / NVLAP	Oct 23, 2020
1203-Norsonic	Preamplifier	21270	Aug 5, 2019	Scantek, Inc./ NVLAP	Aug 5, 2020

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Jeremy Gotwalt	**Authorized signatory:**	Steven E. Marshall
Signature		Signature	Steven E Marshall
Date	2/3/2020	Date	2/3/2020

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Page 1 of 2

B&K 2250 Unit #8 SLM Calibration Certificate

Brüel & Kjær

MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2250--W00-** Serial No. **3028218**
has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to national or international standards or by ratio measurements.

Brüel & Kjær is certified under ISO 9001 assuring that all test data is retained on file and is available for inspection upon request.

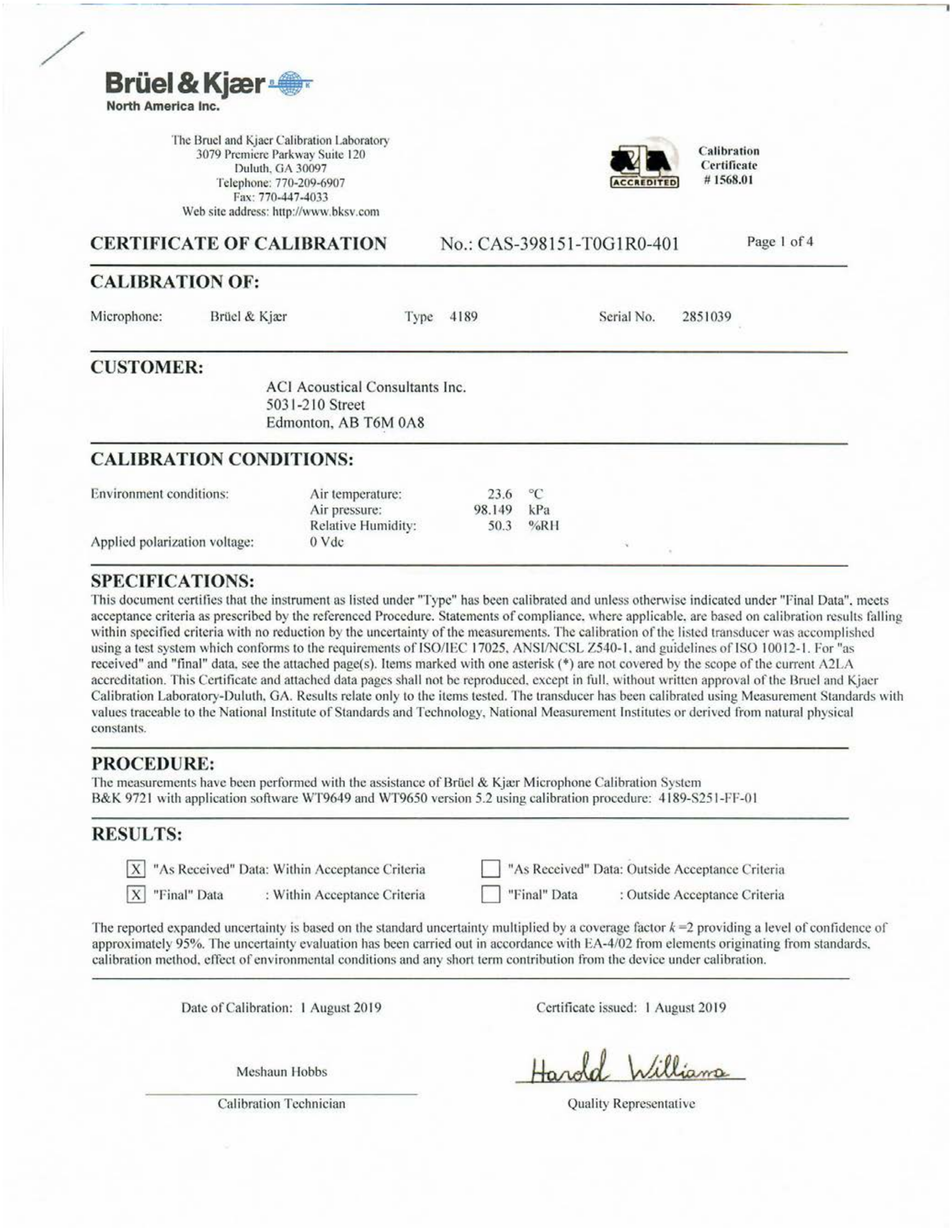
Nærum 23-aug-2019

Torben Bjørn
Vice President, Operations

Please note that this document is not a calibration certificate.
For information on our calibration services please go to www.bksv.com/service.

BA 0238 – 20

B&K 2250 Unit #8 Microphone Calibration Certificate



Brüel & Kjær
North America Inc.

The Bruel and Kjaer Calibration Laboratory
3079 Premiere Parkway Suite 120
Duluth, GA 30097
Telephone: 770-209-6907
Fax: 770-447-4033
Web site address: http://www.bksv.com

ACCREDITED

Calibration Certificate # 1568.01

CERTIFICATE OF CALIBRATION No.: CAS-398151-T0G1R0-401 Page 1 of 4

CALIBRATION OF:

Microphone:	Brüel & Kjær	Type	4189	Serial No.	2851039

CUSTOMER:

ACI Acoustical Consultants Inc.
5031-210 Street
Edmonton, AB T6M 0A8

CALIBRATION CONDITIONS:

Environment conditions:	Air temperature:	23.6	°C
	Air pressure:	98.149	kPa
	Relative Humidity:	50.3	%RH
Applied polarization voltage:	0 Vdc		

SPECIFICATIONS:

This document certifies that the instrument as listed under "Type" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. Statements of compliance, where applicable, are based on calibration results falling within specified criteria with no reduction by the uncertainty of the measurements. The calibration of the listed transducer was accomplished using a test system which conforms to the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and guidelines of ISO 10012-1. For "as received" and "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without written approval of the Bruel and Kjaer Calibration Laboratory-Duluth, GA. Results relate only to the items tested. The transducer has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Microphone Calibration System B&K 9721 with application software WT9649 and WT9650 version 5.2 using calibration procedure: 4189-S251-FF-01

RESULTS:

☒ "As Received" Data: Within Acceptance Criteria ☐ "As Received" Data: Outside Acceptance Criteria
☒ "Final" Data : Within Acceptance Criteria ☐ "Final" Data : Outside Acceptance Criteria

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from standards, calibration method, effect of environmental conditions and any short term contribution from the device under calibration.

Date of Calibration: 1 August 2019 Certificate issued: 1 August 2019

Meshaun Hobbs Harold Williams
Calibration Technician Quality Representative

B&K 2250 Unit #9 SLM Calibration Certificate

Brüel & Kjær

MANUFACTURER'S CERTIFICATE OF CONFORMANCE

We certify that Brüel & Kjær **-2250--D01-** Serial No. **3027810** has been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

The final test has been performed using calibrated equipment, traceable to national or international standards or by ratio measurements.

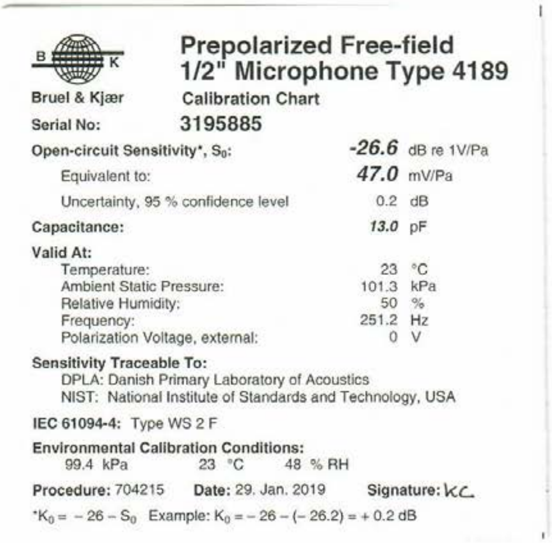
Brüel & Kjær is certified under ISO 9001 assuring that all test data is retained on file and is available for inspection upon request.

Nærum 28-mar-2019

Torben Bjørn
Vice President, Operations

Please note that this document is not a calibration certificate.
For information on our calibration services please go to www.bksv.com/service.

BA 0238 - 20



Bruel & Kjær

Prepolarized Free-field 1/2" Microphone Type 4189

Calibration Chart

Serial No: 3195885

Open-circuit Sensitivity*, S_0: -26.6 dB re 1V/Pa

Equivalent to: 47.0 mV/Pa

Uncertainty, 95 % confidence level 0.2 dB

Capacitance: 13.0 pF

Valid At:

Temperature: 23 °C
Ambient Static Pressure: 101.3 kPa
Relative Humidity: 50 %
Frequency: 251.2 Hz
Polarization Voltage, external: 0 V

Sensitivity Traceable To:

DPLA: Danish Primary Laboratory of Acoustics
NIST: National Institute of Standards and Technology, USA

IEC 61094-4: Type WS 2 F

Environmental Calibration Conditions:

99.4 kPa 23 °C 48 % RH

Procedure: 704215 **Date:** 29. Jan. 2019 **Signature:** KC

$^*K_0 = -26 - S_0$ Example: $K_0 = -26 - (-26.2) = +0.2$ dB

B&K 2250 Unit #10 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.42868

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **3007542**
Tested with: **Microphone 4189 s/n 2978664**
Preamplifier ZC0032 s/n 22379
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **5/14/2019** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	**X**	**X**
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes **X** No
Calibration service: __ Basic **X** Standard
Address: **5031 - 210 Street, Edmonton,**
Alberta, CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2018	Scantek, Inc./ NVLAP	Oct 31, 2019
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 1, 2018	ACR Env. / A2LA	Oct 1, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.7	99.56	45.2

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	5/14/2019	Date	5/15/2019

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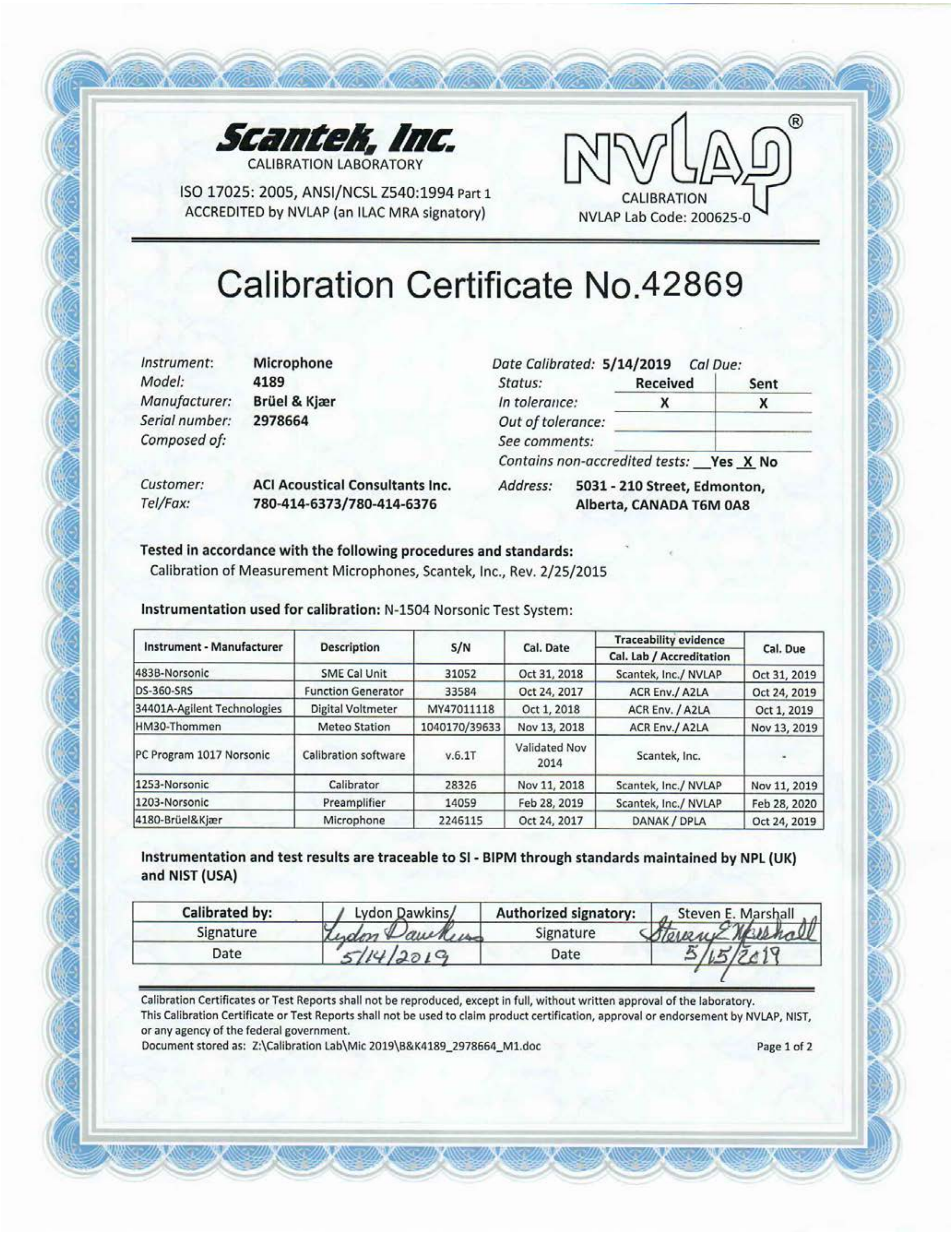
Page 1 of 2

B&K 2250 Unit #10 Microphone Calibration Certificate



Scantek, Inc.
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ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
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NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.42869

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2978664**
Composed of:

Date Calibrated: **5/14/2019** *Cal Due:*

Status:	**Received**	**Sent**
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: **__Yes _X_ No**

Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373/780-414-6376**

Address: **5031 - 210 Street, Edmonton,**
Alberta, CANADA T6M 0A8

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 2/25/2015

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2018	Scantek, Inc./ NVLAP	Oct 31, 2019
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 1, 2018	ACR Env. / A2LA	Oct 1, 2019
HM30-Thommen	Meteo Station	1040170/39633	Nov 13, 2018	ACR Env./ A2LA	Nov 13, 2019
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 11, 2018	Scantek, Inc./ NVLAP	Nov 11, 2019
1203-Norsonic	Preamplifier	14059	Feb 28, 2019	Scantek, Inc./ NVLAP	Feb 28, 2020
4180-Brüel&Kjær	Microphone	2246115	Oct 24, 2017	DANAK / DPLA	Oct 24, 2019

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	5/14/2019	Date	5/15/2019

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Appendix II THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

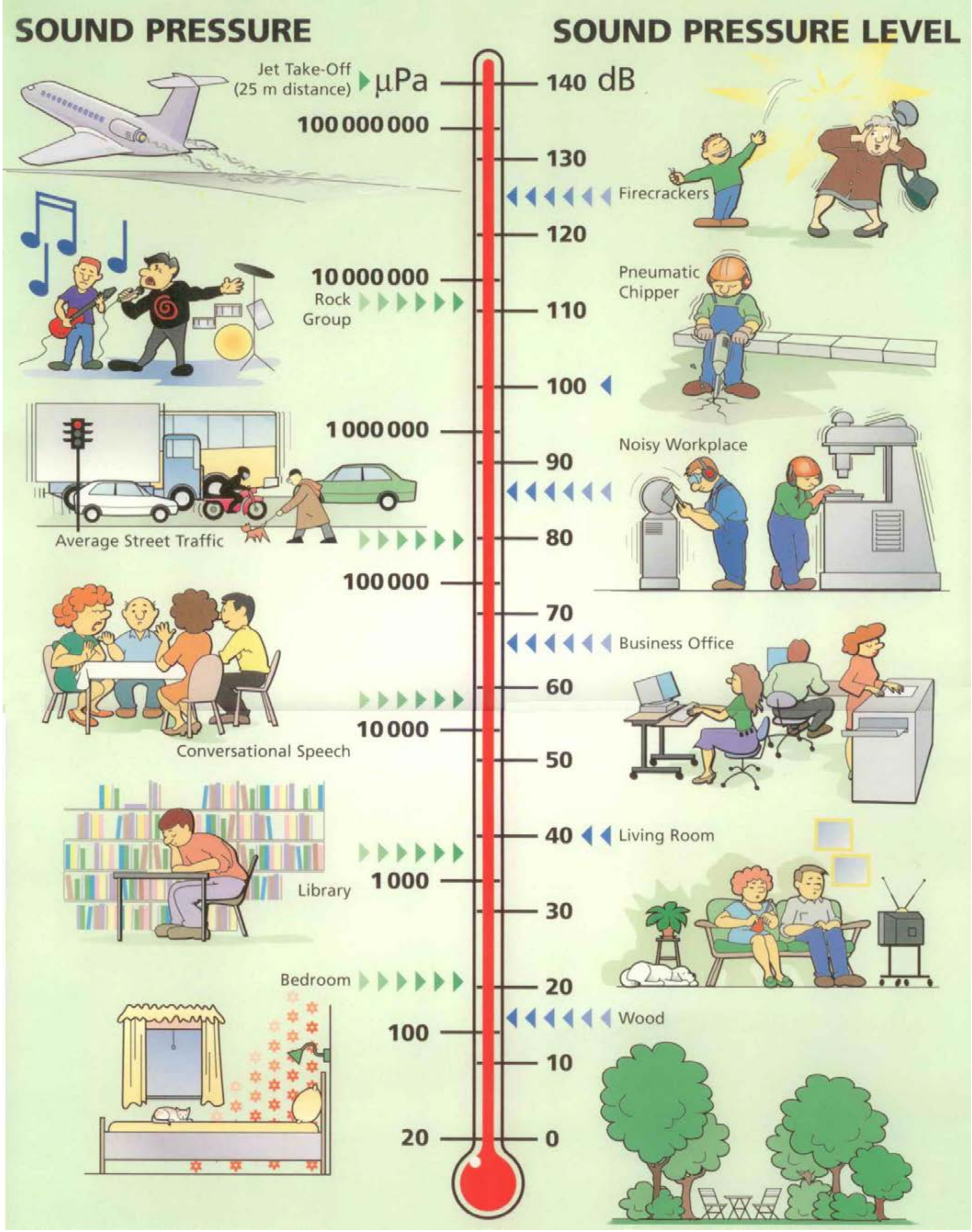
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we measure pressure we typically measure the RMS sound pressure.

$$SPL = 10\log_{10}\left[\frac{P_{RMS}^{2}}{P_{ref}^{2}}\right] = 20\log_{10}\left[\frac{P_{RMS}}{P_{ref}}\right]$$

Where: SPL = Sound Pressure Level in dB
P_{RMS} = Root Mean Square measured pressure (Pa)
P_{ref} = Reference sound pressure level ($P_{ref} = 2\text{x}10^{-5}$ Pa = 20 μPa)

This reference sound pressure level is an internationally agreed upon value. It represents the threshold of human hearing for "typical" people based on numerous testing. It is possible to have a threshold which is lower than 20 μPa which will result in negative dB levels. As such, zero dB does not mean there is no sound!

In general, a difference of 1 – 2 dB is the threshold for humans to notice that there has been a change in sound level. A difference of 3 dB (factor of 2 in acoustical energy) is perceptible and a change of 5 dB is strongly perceptible. A change of 10 dB is typically considered a factor of 2. This is quite remarkable when considering that 10 dB is 10-times the acoustical energy!


SOUND PRESSURE
SOUND PRESSURE LEVEL
Jet Take-Off
(25 m distance)
µPa
140 dB
100 000 000
130
Firecrackers
120
10 000 000
Rock
Group
110
Pneumatic
Chipper
100
1 000 000
Noisy Workplace
90
Average Street Traffic
80
100 000
70
Business Office
60
10 000
Conversational Speech
50
40
Living Room
Library
1000
30
Bedroom
20
Wood
100
10
20
0

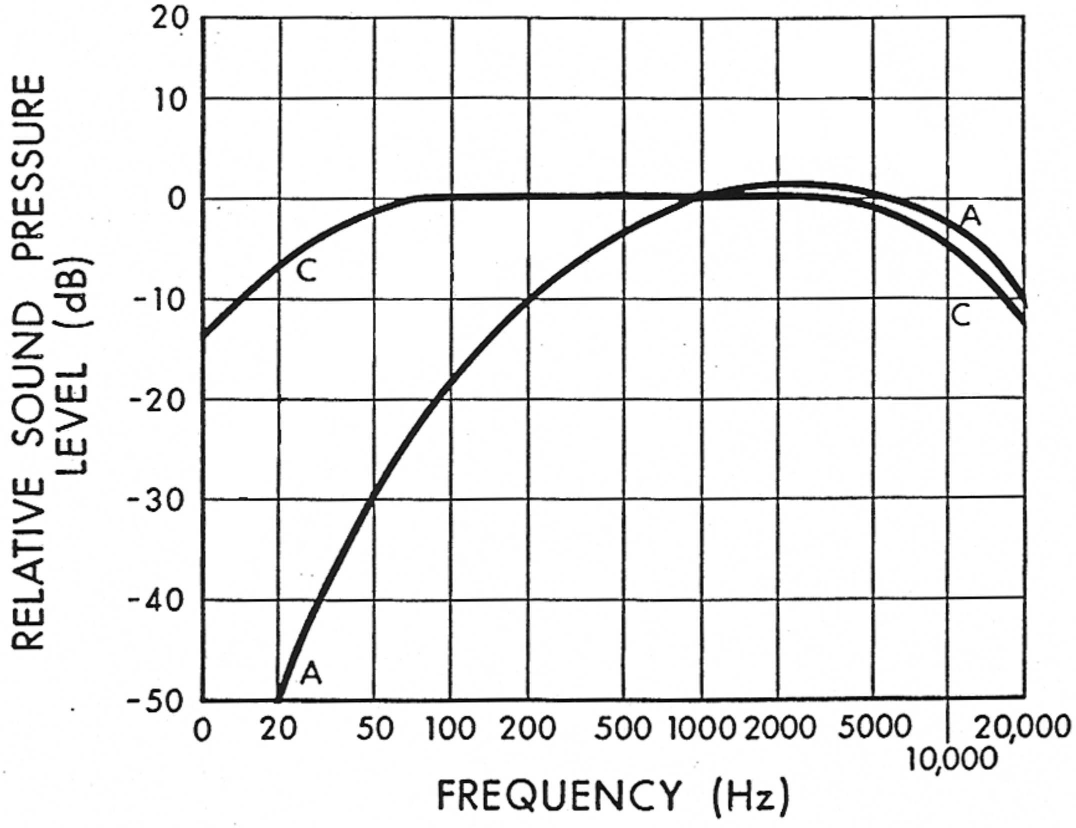
Frequency

The range of frequencies audible to the human ear ranges from approximately 20 Hz to 20 kHz. Within this range, the human ear does not hear equally at all frequencies. It is not very sensitive to low frequency sounds, is very sensitive to mid frequency sounds and is slightly less sensitive to high frequency sounds. Due to the large frequency range of human hearing, the entire spectrum is often divided into 31 bands, each known as a 1/3 octave band.

The internationally agreed upon center frequencies and upper and lower band limits for the 1/1 (whole octave) and 1/3 octave bands are as follows:

	Whole Octave			1/3 Octave	
Lower Band Limit	**Center Frequency**	**Upper Band Limit**	**Lower Band Limit**	**Center Frequency**	**Upper Band Limit**
11	**16**	22	14.1	**16**	17.8
			17.8	**20**	22.4
22	**31.5**	44	22.4	**25**	28.2
			28.2	**31.5**	35.5
			35.5	**40**	44.7
44	**63**	88	44.7	**50**	56.2
			56.2	**63**	70.8
			70.8	**80**	89.1
88	**125**	177	89.1	**100**	112
			112	**125**	141
			141	**160**	178
177	**250**	355	178	**200**	224
			224	**250**	282
			282	**315**	355
355	**500**	710	355	**400**	447
			447	**500**	562
			562	**630**	708
710	**1000**	1420	708	**800**	891
			891	**1000**	1122
			1122	**1250**	1413
1420	**2000**	2840	1413	**1600**	1778
			1778	**2000**	2239
			2239	**2500**	2818
2840	**4000**	5680	2818	**3150**	3548
			3548	**4000**	4467
			4467	**5000**	5623
5680	**8000**	11360	5623	**6300**	7079
			7079	**8000**	8913
			8913	**10000**	11220
11360	**16000**	22720	11220	**12500**	14130
			14130	**16000**	17780
			17780	**20000**	22390

Human hearing is most sensitive at approximately 3500 Hz which corresponds to the ¼ wavelength of the ear canal (approximately 2.5 cm). Because of this range of sensitivity to various frequencies, we typically apply various weighting networks to the broadband measured sound to more appropriately account for the way humans hear. By default, the most common weighting network used is the so-called “A-weighting”. It can be seen in the figure that the low frequency sounds are reduced significantly with the A-weighting.



Combination of Sounds

When combining multiple sound sources the general equation is:

$$\Sigma SPL_n = 10\log_{10}\left[\sum_{i=1}^{n} 10^{\frac{SPL_i}{10}}\right]$$

Examples:

- Two sources of 50 dB each add together to result in 53 dB.
- Three sources of 50 dB each add together to result in 55 dB.
- Ten sources of 50 dB each add together to result in 60 dB.
- One source of 50 dB added to another source of 40 dB results in 50.4 dB

It can be seen that, if multiple similar sources exist, removing or reducing only one source will have little effect.

Sound Level Measurements

Over the years a number of methods for measuring and describing environmental noise have been developed. The most widely used and accepted is the concept of the Energy Equivalent Sound Level (L_{eq}) which was developed in the US (1970's) to characterize noise levels near US Air-force bases. This is the level of a steady state sound which, for a given period of time, would contain the same energy as the time varying sound. The concept is that the same amount of annoyance occurs from a sound having a high level for a short period of time as from a sound at a lower level for a longer period of time.
The L_{eq} is defined as:

$$L_{eq} = 10\log_{10}\left[\frac{1}{T}\int_0^T 10^{\frac{dB}{10}}\,dT\right] = 10\log_{10}\left[\frac{1}{T}\int_0^T \frac{P^2}{P_{ref}^2}\,dT\right]$$

We must specify the time period over which to measure the sound. i.e. 1-second, 10-seconds, 15-seconds, 1-minute, 1-day, etc**. An L_{eq} is meaningless if there is no time period associated**.

In general there a few very common L_{eq} sample durations which are used in describing environmental noise measurements. These include:

- L_{eq}24 - Measured over a 24-hour period
- L_{eq}Night - Measured over the night-time (typically 22:00 – 07:00)
- L_{eq}Day - Measured over the day-time (typically 07:00 – 22:00)
- L_{DN} - Same as L_{eq}24 with a 10 dB penalty added to the night-time

Statistical Descriptor

Another method of conveying long term noise levels utilizes statistical descriptors. These are calculated from a cumulative distribution of the sound levels over the entire measurement duration and then determining the sound level at xx % of the time.

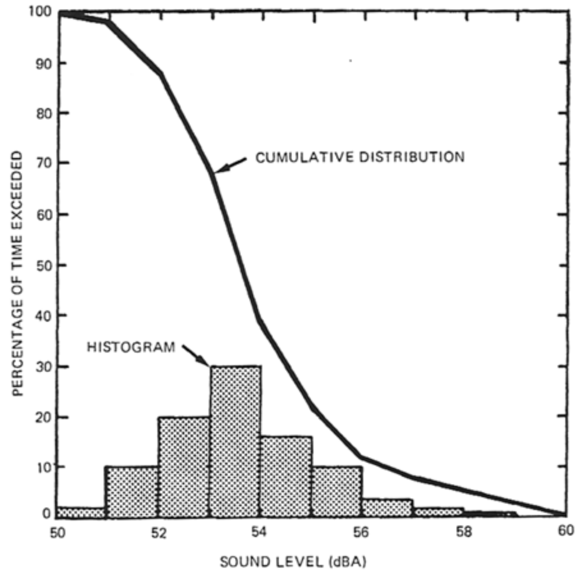


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

Industrial Noise Control, Lewis Bell, Marcel Dekker, Inc. 1994

The most common statistical descriptors are:

L_{min} - minimum sound level measured
L_{01} - sound level that was exceeded only 1% of the time
L_{10} - sound level that was exceeded only 10% of the time.
    - Good measure of intermittent or intrusive noise
    - Good measure of Traffic Noise
L_{50} - sound level that was exceeded 50% of the time (arithmetic average)
    - Good to compare to L_{eq} to determine steadiness of noise
L_{90} - sound level that was exceeded 90% of the time
    - Good indicator of typical "ambient" noise levels
L_{99} - sound level that was exceeded 99% of the time
L_{max} - maximum sound level measured

These descriptors can be used to provide a more detailed analysis of the varying noise climate:

- If there is a large difference between the L_{eq} and the L_{50} (L_{eq} can never be any lower than the L_{50}) then it can be surmised that one or more short duration, high level sound(s) occurred during the time period.
- If the gap between the L_{10} and L_{90} is relatively small (less than 15 – 20 dBA) then it can be surmised that the noise climate was relatively steady.

Sound Propagation

In order to understand sound propagation, the nature of the source must first be discussed. In general, there are three types of sources. These are known as ‘point’, ‘line’, and ‘area’. This discussion will concentrate on point and line sources since area sources are much more complex and can usually be approximated by point sources at large distances.

Point Source

As sound radiates from a point source, it dissipates through geometric spreading. The basic relationship between the sound levels at two distances from a point source is:

$$\therefore SPL_1 - SPL_2 = 20\log_{10}\left(\frac{r_2}{r_1}\right)$$

Where: SPL_1 = sound pressure level at location 1, SPL_2 = sound pressure level at location 2
r_1 = distance from source to location 1, r_2 = distance from source to location 2

Thus, the reduction in sound pressure level for a point source radiating in a free field is **6 dB per doubling of distance**. This relationship is independent of reflectivity factors provided they are always present. Note that this only considers geometric spreading and does not take into account atmospheric effects. Point sources still have some physical dimension associated with them, and typically do not radiate sound equally in all directions in all frequencies. The directionality of a source is also highly dependent on frequency. As frequency increases, directionality increases.

Examples (note no atmospheric absorption):

- A point source measuring 50 dB at 100m will be 44 dB at 200m.
- A point source measuring 50 dB at 100m will be 40.5 dB at 300m.
- A point source measuring 50 dB at 100m will be 38 dB at 400m.
- A point source measuring 50 dB at 100m will be 30 dB at 1000m.

Line Source

A line source is similar to a point source in that it dissipates through geometric spreading. The difference is that a line source is equivalent to a long line of many point sources. The basic relationship between the sound levels at two distances from a line source is:

$$SPL_1 - SPL_2 = 10\log_{10}\left(\frac{r_2}{r_1}\right)$$

The difference from the point source is that the ‘20’ term in front of the ‘log’ is now only 10. Thus, the reduction in sound pressure level for a line source radiating in a free field is **3 dB per doubling of distance**.

Examples (note no atmospheric absorption):

- A line source measuring 50 dB at 100m will be 47 dB at 200m.
- A line source measuring 50 dB at 100m will be 45 dB at 300m.
- A line source measuring 50 dB at 100m will be 44 dB at 400m.
- A line source measuring 50 dB at 100m will be 40 dB at 1000m.

Atmospheric Absorption

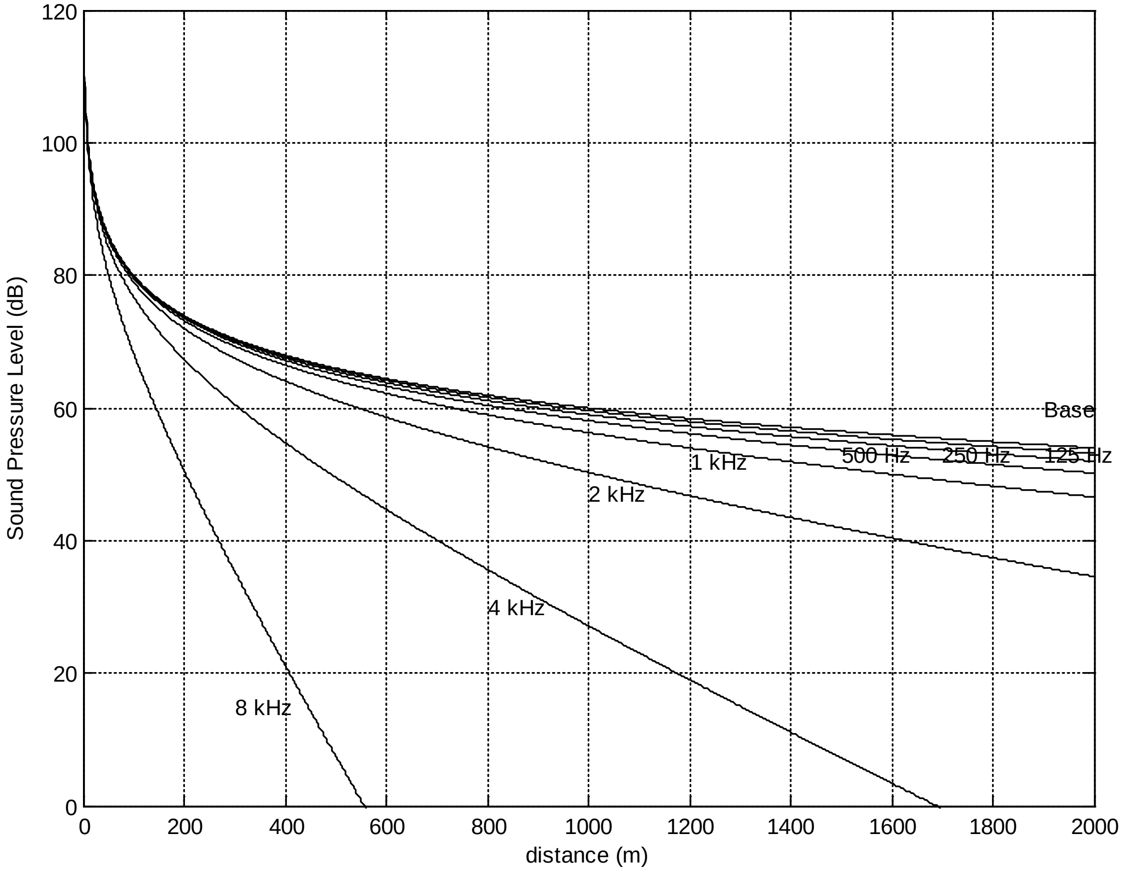
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

1) **Viscous Effects** - Dissipation of acoustic energy due to fluid friction which results in thermodynamically irreversible propagation of sound.
2) **Heat Conduction Effects** - Heat transfer between high and low temperature regions in the wave which result in non-adiabatic propagation of the sound.
3) **Inter Molecular Energy Interchanges** - Molecular energy relaxation effects which result in a time lag between changes in translational kinetic energy and the energy associated with rotation and vibration of the molecules.

The following table illustrates the attenuation coefficient of sound at standard pressure (101.325 kPa) in units of dB/100m.

Temperature	Relative Humidity	Frequency (Hz)					
^{o}C	(%)	125	250	500	1000	2000	4000
30	20	0.06	0.18	0.37	0.64	1.40	4.40
	50	0.03	0.10	0.33	0.75	1.30	2.50
	90	0.02	0.06	0.24	0.70	1.50	2.60
20	20	0.07	0.15	0.27	0.62	1.90	6.70
	50	0.04	0.12	0.28	0.50	1.00	2.80
	90	0.02	0.08	0.26	0.56	0.99	2.10
10	20	0.06	0.11	0.29	0.94	3.20	9.00
	50	0.04	0.11	0.20	0.41	1.20	4.20
	90	0.03	0.10	0.21	0.38	0.81	2.50
0	20	0.05	0.15	0.50	1.60	3.70	5.70
	50	0.04	0.08	0.19	0.60	2.10	6.70
	90	0.03	0.08	0.15	0.36	1.10	4.10

- As frequency increases, absorption tends to increase
- As Relative Humidity increases, absorption tends to decrease
- There is no direct relationship between absorption and temperature
- **The net result of atmospheric absorption is to modify the sound propagation of a point source from 6 dB/doubling-of-distance to approximately 7 – 8 dB/doubling-of-distance (based on anecdotal experience)**



Atmospheric Absorption at 10ºC and 70% RH

Meteorological Effects

There are many meteorological factors which can affect how sound propagates over large distances. These various phenomena must be considered when trying to determine the relative impact of a noise source either after installation or during the design stage.

Wind

- Can greatly alter the noise climate away from a source depending on direction
- Sound levels downwind from a source can be increased due to refraction of sound back down towards the surface. This is due to the generally higher velocities as altitude increases.
- Sound levels upwind from a source can be decreased due to a “bending” of the sound away from the earth’s surface.
- Sound level differences of ±10dB are possible depending on severity of wind and distance from source.
- Sound levels crosswind are generally not disturbed by an appreciable amount
- Wind tends to generate its own noise, however, and can provide a high degree of masking relative to a noise source of particular interest.

Temperature

- Temperature effects can be similar to wind effects
- Typically, the temperature is warmer at ground level than it is at higher elevations.
- If there is a very large difference between the ground temperature (very warm) and the air aloft (only a few hundred meters) then the transmitted sound refracts upward due to the changing speed of sound.
- If the air aloft is warmer than the ground temperature (known as an *inversion*) the resulting higher speed of sound aloft tends to refract the transmitted sound back down towards the ground. This essentially works on Snell’s law of reflection and refraction.
- Temperature inversions typically happen early in the morning and are most common over large bodies of water or across river valleys.
- Sound level differences of ±10dB are possible depending on gradient of temperature and distance from source.

Rain

- Rain does not affect sound propagation by an appreciable amount unless it is very heavy
- The larger concern is the noise generated by the rain itself. A heavy rain striking the ground can cause a significant amount of highly broadband noise. The amount of noise generated is difficult to predict.
- Rain can also affect the output of various noise sources such as vehicle traffic.

Summary

- In general, these wind and temperature effects are difficult to predict
- Empirical models (based on measured data) have been generated to attempt to account for these effects.
- Environmental noise measurements must be conducted with these effects in mind. Sometimes it is desired to have completely calm conditions, other times a “worst case” of downwind noise levels are desired.

Topographical Effects

Similar to the various atmospheric effects outlined in the previous section, the effect of various geographical and vegetative factors must also be considered when examining the propagation of noise over large distances.

Topography

- One of the most important factors in sound propagation.
- Can provide a natural barrier between source and receiver (i.e. if berm or hill in between).
- Can provide a natural amplifier between source and receiver (i.e. large valley in between or hard reflective surface in between).
- Must look at location of topographical features relative to source and receiver to determine importance (i.e. small berm 1km away from source and 1km away from receiver will make negligible impact).

Grass

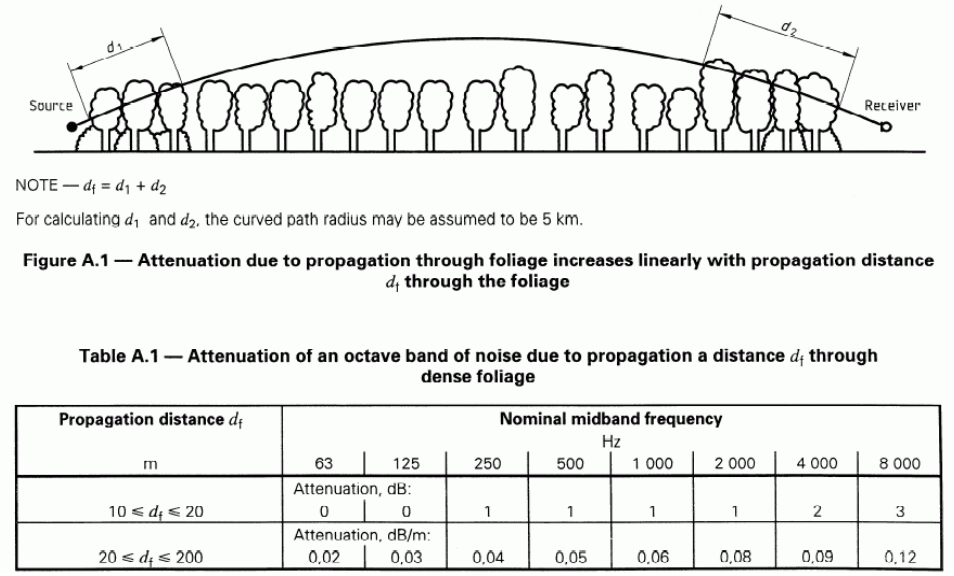
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of thumb based on empirical data is:

$$A_g = 18 \log_{10}(f) - 31 \qquad (dB/100m)$$

Where: A_g is the absorption amount

Trees

- Provide absorption due to foliage
- Deciduous trees are essentially ineffective in the winter
- Absorption depends heavily on density and height of trees
- No data found on absorption of various kinds of trees
- Large spans of trees are required to obtain even minor amounts of sound reduction
- In many cases, trees can provide an effective visual barrier, even if the noise attenuation is negligible.



NOTE — $d_f = d_1 + d_2$

For calculating d_1 and d_2, the curved path radius may be assumed to be 5 km.

Figure A.1 — Attenuation due to propagation through foliage increases linearly with propagation distance d_f through the foliage

Table A.1 — Attenuation of an octave band of noise due to propagation a distance d_f through dense foliage

Propagation distance d_f m	Nominal midband frequency Hz 63	125	250	500	1 000	2 000	4 000	8 000
$10 \leqslant d_f \leqslant 20$	Attenuation, dB: 0	0	1	1	1	1	2	3
$20 \leqslant d_f \leqslant 200$	Attenuation, dB/m: 0,02	0,03	0,04	0,05	0,06	0,08	0,09	0,12

Tree/Foliage attenuation from ISO 9613-2:1996

Bodies of Water

- Large bodies of water can provide the opposite effect to grass and trees.
- Reflections caused by small incidence angles (grazing) can result in larger sound levels at great distances (increased reflectivity, Q).
- Typically air temperatures are warmer high aloft since air temperatures near water surface tend to be more constant. Result is a high probability of temperature inversion.
- Sound levels can “carry” much further.

Snow

- Covers the ground for approximately 1/2 of the year in northern climates.
- Can act as an absorber or reflector (and varying degrees in between).
- Freshly fallen snow can be quite absorptive.
- Snow which has been sitting for a while and hard packed due to wind can be quite reflective.
- Falling snow can be more absorptive than rain, but does not tend to produce its own noise.
- Snow can cover grass which might have provided some means of absorption.
- Typically sound propagates with less impedance in winter due to hard snow on ground and no foliage on trees/shrubs.

Appendix III SOUND LEVELS OF FAMILIAR NOISE SOURCES

Used with Permission Obtained from the Alberta Energy Regulator (AER) Directive 038 (February 2007)

Source[1]	**Sound Level (dBA)**
Bedroom of a country home	30
Soft whisper at 1.5 m	30
Quiet office or living room	40
Moderate rainfall	50
Inside average urban home	50
Quiet street	50
Normal conversation at 1 m	60
Noisy office	60
Noisy restaurant	70
Highway traffic at 15 m	75
Loud singing at 1 m	75
Tractor at 15 m	78-95
Busy traffic intersection	80
Electric typewriter	80
Bus or heavy truck at 15 m	88-94
Jackhammer	88-98
Loud shout	90
Freight train at 15 m	95
Modified motorcycle	95
Jet taking off at 600 m	100
Amplified rock music	110
Jet taking off at 60 m	120
Air-raid siren	130

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[1] Cottrell, Tom, 1980, *Noise in Alberta*, Table 1, p.8, ECA80 - 16/1B4 (Edmonton: Environment Council of Alberta).

SOUND LEVELS GENERATED BY COMMON APPLIANCES

Used with Permission Obtained from the Alberta Energy Regulator (AER) Directive 038 (February 2007)

Source[1]	**Sound level at 3 feet (dBA)**
Freezer	38-45
Refrigerator	34-53
Electric heater	47
Hair clipper	50
Electric toothbrush	48-57
Humidifier	41-54
Clothes dryer	51-65
Air conditioner	50-67
Electric shaver	47-68
Water faucet	62
Hair dryer	58-64
Clothes washer	48-73
Dishwasher	59-71
Electric can opener	60-70
Food mixer	59-75
Electric knife	65-75
Electric knife sharpener	72
Sewing machine	70-74
Vacuum cleaner	65-80
Food blender	65-85
Coffee mill	75-79
Food waste disposer	69-90
Edger and trimmer	81
Home shop tools	64-95
Hedge clippers	85
Electric lawn mower	80-90

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[1] Reif, Z. F., and Vermeulen, P. J., 1979, “Noise from domestic appliances, construction, and industry,” Table 1, p.166, in Jones, H. W., ed., *Noise in the Human Environment*, vol. 2, ECA79-SP/1 (Edmonton: Environment Council of Alberta).

Appendix IV DATA REMOVAL

Data Removal Noise Monitoring Location #1

Start Time	End Time	Duration (min)	Reason
7/27/20 22:12	7/27/20 22:14	1.3	Loud Vehicle Pass by
7/27/20 22:22	7/27/20 22:24	1.3	Emergency Sirens
7/27/20 22:25	7/27/20 22:26	0.8	Loud Vehicle Pass by
7/27/20 22:29	7/27/20 22:31	2.3	Loud Vehicle Pass by
7/27/20 22:35	7/27/20 22:36	1.0	Loud Vehicle Pass by
7/27/20 22:51	7/27/20 22:53	1.8	Loud Vehicle Pass by
7/27/20 22:58	7/27/20 23:00	1.3	Loud Vehicle Pass by
7/27/20 23:22	7/27/20 23:23	1.8	Loud Vehicle Pass by
7/27/20 23:25	7/27/20 23:26	0.8	Loud Vehicle Pass by
7/27/20 23:26	7/27/20 23:28	2.3	Loud Vehicle Pass by
7/27/20 23:28	7/27/20 23:30	1.5	Loud Vehicle Pass by
7/27/20 23:36	7/27/20 23:37	1.0	Loud Vehicle Pass by
7/27/20 23:38	7/27/20 23:39	1.0	Loud Vehicle Pass by
7/27/20 23:41	7/27/20 23:42	0.8	Loud Vehicle Pass by
7/27/20 23:43	7/27/20 23:44	1.3	Loud Vehicle Pass by
7/27/20 23:46	7/27/20 23:47	1.0	Loud Vehicle Pass by
7/27/20 23:47	7/27/20 23:48	1.3	Train Pass by
7/27/20 23:54	7/27/20 23:57	3.0	Loud Vehicle Pass by
7/28/20 0:07	7/28/20 0:08	1.0	Loud Vehicle Pass by
7/28/20 0:08	7/28/20 0:09	0.8	Loud Vehicle Pass by
7/28/20 0:16	7/28/20 0:17	1.3	Loud Vehicle Pass by
7/28/20 0:22	7/28/20 0:23	1.0	Loud Vehicle Pass by
7/28/20 0:24	7/28/20 0:25	0.5	Loud Vehicle Pass by
7/28/20 0:26	7/28/20 0:27	0.3	Loud Vehicle Pass by
7/28/20 0:46	7/28/20 0:48	2.8	Loud Vehicle Pass by
7/28/20 0:49	7/28/20 0:51	1.5	Loud Vehicle Pass by
7/28/20 0:51	7/28/20 0:52	1.3	Loud Vehicle Pass by
7/28/20 0:52	7/28/20 0:54	1.8	Loud Vehicle Pass by
7/28/20 0:55	7/28/20 0:57	2.5	Loud Vehicle Pass by
7/28/20 1:02	7/28/20 1:06	4.0	Aircraft Flyover
7/28/20 1:06	7/28/20 1:08	2.5	Aircraft Flyover
7/28/20 1:11	7/28/20 1:12	1.5	Aircraft Flyover
7/28/20 1:14	7/28/20 1:16	2.0	Aircraft Flyover
7/28/20 1:17	7/28/20 1:23	5.5	Aircraft Flyover
7/28/20 1:25	7/28/20 1:26	0.8	Aircraft Flyover
7/28/20 1:30	7/28/20 1:31	1.0	Loud Vehicle Pass by
7/28/20 1:32	7/28/20 1:33	1.5	Aircraft Flyover
7/28/20 2:02	7/28/20 2:04	2.5	Loud Vehicle Pass by
7/28/20 2:07	7/28/20 2:08	1.3	Loud Vehicle Pass by
7/28/20 2:20	7/28/20 2:22	2.8	Abnormal Noise
7/28/20 2:26	7/28/20 2:29	2.8	Loud Vehicle Pass by
7/28/20 2:35	7/28/20 2:37	1.5	Abnormal Noise
7/28/20 3:00	7/28/20 3:01	1.0	Train Pass by
7/28/20 3:05	7/28/20 3:06	1.5	Train Pass by
7/28/20 3:12	7/28/20 3:14	2.5	Abnormal Noise

Data Removal Noise Monitoring Location #1 Cont.

Start Time	End Time	Duration (min)	Reason
7/28/20 3:12	7/28/20 3:14	2.5	Abnormal Noise
7/28/20 3:55	7/28/20 3:56	1.0	Train Pass by
7/28/20 4:00	7/28/20 4:00	0.8	Loud Vehicle Pass by
7/28/20 4:26	7/28/20 4:29	2.8	Loud Vehicle Pass by
7/28/20 4:30	7/28/20 4:31	0.8	Loud Vehicle Pass by
7/28/20 4:35	7/28/20 4:58	23.5	Loud Vehicle Pass by
7/28/20 4:59	7/28/20 5:01	2.0	Loud Vehicle Pass by
7/28/20 5:05	7/28/20 5:12	7.3	Loud Vehicle Pass by
7/28/20 5:12	7/28/20 5:29	16.8	Loud Vehicle Pass by
7/28/20 5:29	7/28/20 5:37	8.3	Loud Vehicle Pass by
7/28/20 5:38	7/28/20 6:00	22.5	Loud Vehicle Pass by
7/28/20 6:00	7/28/20 6:10	10.0	Loud Vehicle Pass by
7/28/20 6:11	7/28/20 6:30	19.3	Loud Vehicle Pass by
7/28/20 6:30	7/28/20 7:00	29.5	Loud Vehicle Pass by
7/28/20 22:22	7/28/20 22:22	0.8	Loud Vehicle Pass by
7/28/20 22:23	7/28/20 22:24	1.5	Loud Vehicle Pass by
7/28/20 22:25	7/28/20 22:26	1.0	Loud Vehicle Pass by
7/28/20 22:48	7/28/20 22:49	0.8	Loud Vehicle Pass by
7/28/20 23:03	7/28/20 23:03	0.5	Loud Vehicle Pass by
7/28/20 23:10	7/28/20 23:11	1.5	Loud Vehicle Pass by
7/28/20 23:23	7/28/20 23:24	1.0	Loud Vehicle Pass by
7/28/20 23:32	7/28/20 23:33	1.5	Loud Vehicle Pass by
7/28/20 23:55	7/28/20 23:56	1.0	Loud Vehicle Pass by
7/29/20 0:08	7/29/20 0:08	0.8	Loud Vehicle Pass by
7/29/20 0:58	7/29/20 0:59	0.5	Loud Vehicle Pass by
7/29/20 1:11	7/29/20 1:12	1.0	Loud Vehicle Pass by
7/29/20 1:23	7/29/20 1:24	0.8	Loud Vehicle Pass by
7/29/20 1:53	7/29/20 1:53	0.5	Loud Vehicle Pass by
7/29/20 2:30	7/29/20 2:30	0.8	Loud Vehicle Pass by
7/29/20 2:36	7/29/20 2:38	2.0	Aircraft Flyover
7/29/20 2:42	7/29/20 2:43	1.0	Loud Vehicle Pass by
7/29/20 3:17	7/29/20 3:18	1.3	Train Pass by
7/29/20 3:20	7/29/20 3:21	1.0	Train Pass by
7/29/20 3:58	7/29/20 3:59	1.0	Loud Vehicle Pass by
7/29/20 4:12	7/29/20 4:17	5.0	Loud Vehicle Pass by
7/29/20 4:32	7/29/20 4:33	1.3	Loud Vehicle Pass by
7/29/20 4:35	7/29/20 4:35	0.8	Loud Vehicle Pass by
7/29/20 4:37	7/29/20 4:39	2.3	Loud Vehicle Pass by
7/29/20 4:43	7/29/20 4:45	2.0	Loud Vehicle Pass by
7/29/20 4:50	7/29/20 4:51	1.3	Loud Vehicle Pass by
7/29/20 4:53	7/29/20 4:59	6.5	Loud Vehicle Pass by
7/29/20 5:05	7/29/20 5:11	6.3	Loud Vehicle Pass by
7/29/20 5:14	7/29/20 5:15	1.8	Loud Vehicle Pass by
7/29/20 5:16	7/29/20 5:25	9.0	Loud Vehicle Pass by
7/29/20 5:27	7/29/20 5:29	2.3	Loud Vehicle Pass by
7/29/20 5:30	7/29/20 5:38	7.3	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #1 Cont.

Start Time	End Time	Duration (min)	Reason
7/29/20 5:38	7/29/20 5:40	1.8	Loud Vehicle Pass by
7/29/20 5:41	7/29/20 5:44	3.3	Loud Vehicle Pass by
7/29/20 5:44	7/29/20 5:58	14.3	Loud Vehicle Pass by
7/29/20 5:59	7/29/20 6:00	1.0	Loud Vehicle Pass by
7/29/20 6:01	7/29/20 6:15	14.5	Loud Vehicle Pass by
7/29/20 6:16	7/29/20 6:28	12.3	Loud Vehicle Pass by
7/29/20 6:29	7/29/20 6:38	9.3	Loud Vehicle Pass by
7/29/20 6:38	7/29/20 6:56	18.5	Loud Vehicle Pass by
7/29/20 6:57	7/29/20 6:59	2.8	Loud Vehicle Pass by
	Total Night #1	**218**	
	Total Night #2	**360**	
	Total Data	**578**	

Data Removal Noise Monitoring Location #2

Start Time	End Time	Duration (min)	Reason
7/27/20 22:00	7/27/20 22:04	3.8	Train Pass by
7/27/20 22:08	7/27/20 22:09	1.5	Train Pass by
7/27/20 22:21	7/27/20 22:22	1.3	Train Pass by
7/27/20 22:26	7/27/20 22:34	7.3	Train Pass by
7/27/20 22:34	7/27/20 22:44	9.5	Train Pass by
7/27/20 22:46	7/27/20 22:47	0.5	Train Pass by
7/27/20 22:48	7/27/20 23:08	19.8	Train Pass by
7/27/20 23:09	7/27/20 23:15	5.3	Train Pass by
7/27/20 23:28	7/27/20 23:29	1.0	Train Pass by
7/27/20 23:31	7/27/20 23:36	4.8	Train Pass by
7/27/20 23:40	7/27/20 23:41	1.5	Train Pass by
7/27/20 23:58	7/28/20 0:00	1.3	Train Pass by
7/28/20 0:36	7/28/20 0:41	5.5	Train Pass by
7/28/20 0:48	7/28/20 0:51	3.0	Loud Vehicle Pass by
7/28/20 3:17	7/28/20 3:21	3.8	Train Pass by
7/28/20 4:16	7/28/20 4:17	0.8	Train Pass by
7/28/20 4:31	7/28/20 4:35	3.3	Train Pass by
7/28/20 4:50	7/28/20 4:56	6.8	Train Pass by
7/28/20 5:36	7/28/20 5:37	1.3	Loud Vehicle Pass by
7/28/20 5:40	7/28/20 5:45	4.5	Loud Vehicle Pass by
7/28/20 6:24	7/28/20 6:25	0.8	Loud Vehicle Pass by
7/28/20 6:31	7/28/20 6:33	1.5	Loud Vehicle Pass by
7/28/20 6:57	7/28/20 6:59	2.0	Train Pass by
7/28/20 22:01	7/28/20 22:03	2.0	Train Pass by
7/28/20 22:18	7/28/20 22:28	10.0	Train Pass by
7/28/20 22:29	7/28/20 22:47	17.5	Train Pass by
7/28/20 22:53	7/28/20 23:22	28.5	Train Pass by
7/28/20 23:26	7/28/20 23:34	8.3	Train Pass by
7/28/20 23:34	7/28/20 23:37	2.5	Train Pass by
7/29/20 0:14	7/29/20 0:40	26.0	Train Pass by
7/29/20 0:42	7/29/20 0:43	1.5	Loud Vehicle Pass by
7/29/20 0:54	7/29/20 0:55	1.5	Train Pass by
7/29/20 1:34	7/29/20 1:35	1.3	Train Pass by
7/29/20 2:13	7/29/20 2:14	1.5	Loud Vehicle Pass by
7/29/20 2:30	7/29/20 2:32	2.0	Train Pass by
7/29/20 2:34	7/29/20 2:37	3.0	Aircraft Flyover
7/29/20 2:54	7/29/20 2:57	3.3	Loud Vehicle Pass by
7/29/20 3:01	7/29/20 3:05	4.3	Loud Vehicle Pass by
7/29/20 3:10	7/29/20 3:14	3.8	Train Pass by
7/29/20 3:21	7/29/20 3:23	1.8	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #2 Cont.

Start Time	End Time	Duration (min)	Reason
7/29/20 3:59	7/29/20 4:00	1.0	Loud Vehicle Pass by
7/29/20 4:17	7/29/20 4:18	1.3	Loud Vehicle Pass by
7/29/20 4:30	7/29/20 4:31	1.8	Loud Vehicle Pass by
7/29/20 4:33	7/29/20 4:35	2.3	Loud Vehicle Pass by
7/29/20 4:46	7/29/20 4:47	0.8	Loud Vehicle Pass by
7/29/20 4:55	7/29/20 4:58	2.3	Loud Vehicle Pass by
7/29/20 5:01	7/29/20 5:02	1.0	Loud Vehicle Pass by
7/29/20 5:05	7/29/20 5:05	0.8	Loud Vehicle Pass by
7/29/20 5:13	7/29/20 5:17	4.0	Loud Vehicle Pass by
7/29/20 5:21	7/29/20 5:23	2.3	Loud Vehicle Pass by
7/29/20 5:27	7/29/20 5:35	8.3	Loud Vehicle Pass by
7/29/20 5:37	7/29/20 5:48	11.0	Loud Vehicle Pass by
7/29/20 5:56	7/29/20 6:04	8.0	Loud Vehicle Pass by
7/29/20 6:05	7/29/20 6:18	13.5	Train Pass by
7/29/20 6:19	7/29/20 6:27	7.5	Loud Vehicle Pass by
7/29/20 6:30	7/29/20 6:32	1.3	Loud Vehicle Pass by
7/29/20 6:36	7/29/20 6:58	22.0	Loud Vehicle Pass by
	Total Night #1	**90**	
	Total Night #2	**207**	
	Total Data	**298**	

Data Removal Noise Monitoring Location #3

Start Time	End Time	Duration (min)	Reason
7/27/20 22:01	7/27/20 22:03	1.8	Aircraft Flyover
7/27/20 22:05	7/27/20 22:07	2.3	Loud Vehicle Pass by
7/27/20 22:37	7/27/20 22:38	1.3	Loud Vehicle Pass by
7/27/20 22:40	7/27/20 22:42	1.3	Loud Vehicle Pass by
7/27/20 22:48	7/27/20 22:50	2.0	Loud Vehicle Pass by
7/27/20 22:55	7/27/20 22:56	1.0	Loud Vehicle Pass by
7/27/20 23:17	7/27/20 23:18	1.0	Abnormal Noise
7/28/20 3:13	7/28/20 3:15	1.5	Train Pass by
7/28/20 3:17	7/28/20 3:22	4.5	Train Pass by
7/28/20 3:24	7/28/20 3:27	2.5	Train Pass by
7/28/20 3:29	7/28/20 3:38	9.0	Train Pass by
7/28/20 4:15	7/28/20 4:16	1.8	Train Pass by
7/28/20 4:22	7/28/20 4:23	1.8	Loud Vehicle Pass by
7/28/20 4:33	7/28/20 4:36	2.8	Train Pass by
7/28/20 4:44	7/28/20 4:44	0.8	Train Pass by
7/28/20 4:48	7/28/20 4:50	2.5	Excessive Bird Noise
7/28/20 4:52	7/28/20 4:55	3.8	Loud Vehicle Pass by
7/28/20 4:57	7/28/20 4:59	1.8	Excessive Bird Noise
7/28/20 5:00	7/28/20 5:01	1.5	Excessive Bird Noise
7/28/20 5:02	7/28/20 5:09	6.5	Train Pass by
7/28/20 5:10	7/28/20 5:14	3.3	Loud Vehicle Pass by
7/28/20 5:18	7/28/20 5:22	4.0	Loud Vehicle Pass by
7/28/20 5:27	7/28/20 5:39	12.0	Loud Vehicle Pass by
7/28/20 5:41	7/28/20 5:47	6.3	Loud Vehicle Pass by
7/28/20 5:47	7/28/20 5:48	0.8	Excessive Bird Noise
7/28/20 5:49	7/28/20 5:55	6.5	Loud Vehicle Pass by
7/28/20 5:58	7/28/20 6:01	3.3	Loud Vehicle Pass by
7/28/20 6:07	7/28/20 6:09	2.3	Train Pass by
7/28/20 6:11	7/28/20 6:13	2.3	Loud Vehicle Pass by
7/28/20 6:15	7/28/20 6:19	3.8	Loud Vehicle Pass by
7/28/20 6:21	7/28/20 6:26	4.5	Loud Vehicle Pass by
7/28/20 6:27	7/28/20 6:30	2.5	Loud Vehicle Pass by
7/28/20 6:32	7/28/20 6:59	27.3	Loud Vehicle Pass by
7/28/20 21:48	7/28/20 21:50	2.0	Train Pass by
7/28/20 21:54	7/28/20 21:56	2.3	Train Pass by
7/28/20 21:58	7/28/20 22:01	2.8	Loud Vehicle Pass by
7/28/20 22:11	7/28/20 22:13	1.8	Loud Vehicle Pass by
7/28/20 22:20	7/28/20 22:21	1.3	Loud Vehicle Pass by
7/28/20 22:56	7/28/20 22:56	0.8	Loud Vehicle Pass by
7/28/20 23:00	7/28/20 23:11	11.0	Train Pass by

Data Removal Noise Monitoring Location #3 (cont.)

Start Time	End Time	Duration (min)	Reason
7/28/20 23:14	7/28/20 23:35	20.3	Train Pass by
7/28/20 23:58	7/29/20 0:00	2.0	Loud Vehicle Pass by
7/29/20 0:15	7/29/20 0:57	41.8	Train Pass by
7/29/20 1:32	7/29/20 1:33	1.0	Loud Vehicle Pass by
7/29/20 1:45	7/29/20 1:47	2.0	Aircraft Flyover
7/29/20 1:55	7/29/20 1:58	3.0	Excessive Wind Noise
7/29/20 2:02	7/29/20 2:07	5.0	Excessive Wind Noise
7/29/20 2:07	7/29/20 2:18	10.8	Excessive Wind Noise
7/29/20 2:19	7/29/20 2:26	6.8	Excessive Wind Noise
7/29/20 2:26	7/29/20 2:28	2.3	Excessive Wind Noise
7/29/20 2:37	7/29/20 2:38	1.0	Excessive Wind Noise
7/29/20 2:39	7/29/20 2:41	1.8	Excessive Wind Noise
7/29/20 2:43	7/29/20 2:45	2.5	Excessive Wind Noise
7/29/20 2:47	7/29/20 2:49	2.5	Excessive Wind Noise
7/29/20 2:58	7/29/20 3:34	35.5	Train Pass by
7/29/20 3:34	7/29/20 3:50	15.3	Excessive Wind Noise
7/29/20 4:53	7/29/20 5:13	19.8	Excessive Bird Noise
7/29/20 5:14	7/29/20 5:27	12.3	Morning Chorus/Vehicles
7/29/20 5:27	7/29/20 5:49	21.8	Morning Chorus/Vehicles
7/29/20 5:50	7/29/20 6:06	15.3	Morning Chorus/Vehicles
7/29/20 6:06	7/29/20 6:28	22.5	Morning Chorus/Vehicles
7/29/20 6:30	7/29/20 6:59	28.3	Morning Chorus/Vehicles
7/29/20 6:59	7/29/20 7:00	0.5	Morning Chorus/Vehicles
	Total Night #1	**130**	
	Total Night #2	**295**	
	Total Data	**425**	

Data Removal Noise Monitoring Location #4

Start Time	End Time	Duration (min)	Reason
6/24/20 23:22	6/24/20 23:24	1.3	Aircraft Flyover
6/25/20 1:06	6/25/20 1:07	0.8	Loud Vehicle Pass by
6/25/20 1:58	6/25/20 2:01	2.8	Loud Vehicle Pass by
6/25/20 5:51	6/25/20 5:52	1.3	Loud Vehicle Pass by
6/25/20 6:03	6/25/20 6:03	0.8	Loud Vehicle Pass by
6/25/20 6:11	6/25/20 6:11	0.8	Loud Vehicle Pass by
6/25/20 6:24	6/25/20 6:26	2.0	Loud Vehicle Pass by
6/25/20 23:10	6/25/20 23:12	2.0	Train Pass by
6/25/20 23:14	6/25/20 23:15	1.3	Loud Vehicle Pass by
6/26/20 0:10	6/26/20 0:11	0.8	Train Pass by
6/26/20 0:14	6/26/20 0:16	2.0	Train Pass by
6/26/20 0:28	6/26/20 0:29	0.8	Train Pass by
6/26/20 1:04	6/26/20 1:05	1.3	Train Pass by
6/26/20 1:10	6/26/20 1:11	0.8	Train Pass by
6/26/20 2:15	6/26/20 2:18	2.8	Train Pass by
6/26/20 2:22	6/26/20 2:25	3.5	Train Pass by
6/26/20 2:28	6/26/20 2:29	1.3	Train Pass by
6/26/20 2:34	6/26/20 2:35	1.3	Train Pass by
6/26/20 3:16	6/26/20 3:18	2.0	Train Pass by
6/26/20 3:25	6/26/20 3:26	0.8	Train Pass by
6/26/20 4:23	6/26/20 4:25	2.5	Train Pass by
6/26/20 4:28	6/26/20 4:31	2.8	Train Pass by
6/26/20 4:39	6/26/20 4:41	2.0	Train Pass by
6/26/20 5:03	6/26/20 5:07	3.8	Train Pass by
6/26/20 5:09	6/26/20 5:14	5.3	Train Pass by
6/26/20 5:18	6/26/20 5:21	2.8	Train Pass by
6/26/20 6:44	6/26/20 6:47	2.3	Loud Vehicle Pass by
6/26/20 6:49	6/26/20 6:52	2.3	Loud Vehicle Pass by
	Total Night #1	**10**	
	Total Night #2	**44**	
	Total Data	**53**	

Data Removal Noise Monitoring Location #5

Start Time	End Time	Duration (min)	Reason
6/24/20 22:12	6/24/20 22:22	10.8	Train Pass by
6/24/20 22:36	6/24/20 22:37	1.0	Train Pass by
6/24/20 22:39	6/24/20 22:41	2.3	Train Pass by
6/24/20 22:41	6/24/20 22:43	2.0	Train Pass by
6/24/20 23:55	6/24/20 23:57	2.0	Aircraft Flyover
6/25/20 0:05	6/25/20 0:06	1.3	Train Pass by
6/25/20 0:25	6/25/20 0:26	1.0	Train Pass by
6/25/20 1:05	6/25/20 1:08	2.5	Aircraft Flyover
6/25/20 1:49	6/25/20 1:51	2.0	Loud Vehicle Pass by
6/25/20 1:52	6/25/20 1:54	1.3	Loud Vehicle Pass by
6/25/20 3:29	6/25/20 3:31	2.0	Loud Vehicle Pass by
6/25/20 4:27	6/25/20 4:28	0.8	Excessive Bird Noise
6/25/20 5:36	6/25/20 5:37	0.8	Train Pass by
6/25/20 5:39	6/25/20 5:41	2.5	Excessive Bird Noise
6/25/20 6:03	6/25/20 6:05	1.3	Excessive Bird Noise
6/25/20 6:13	6/25/20 6:18	4.5	Excessive Bird Noise
6/25/20 6:20	6/25/20 6:26	5.5	Excessive Bird Noise
6/25/20 6:51	6/25/20 6:55	4.3	Loud Vehicle Pass by
6/25/20 6:58	6/25/20 6:59	1.0	Loud Vehicle Pass by
6/25/20 22:15	6/25/20 22:17	1.3	Train Pass by
6/25/20 22:20	6/25/20 22:22	1.8	Train Pass by
6/25/20 22:23	6/25/20 22:27	4.0	Train Pass by
6/25/20 22:33	6/25/20 22:33	0.5	Train Pass by
6/25/20 22:41	6/25/20 22:41	0.8	Train Pass by
6/25/20 22:43	6/25/20 22:45	2.0	Train Pass by
6/25/20 22:46	6/25/20 22:48	2.0	Train Pass by
6/25/20 22:49	6/25/20 22:50	1.0	Train Pass by
6/25/20 23:20	6/25/20 23:22	1.3	Train Pass by
6/25/20 23:24	6/25/20 23:25	1.0	Train Pass by
6/26/20 0:00	6/26/20 0:01	0.8	Train Pass by
6/26/20 0:02	6/26/20 0:05	3.0	Train Pass by
6/26/20 1:13	6/26/20 1:16	2.5	Train Pass by
6/26/20 1:17	6/26/20 1:19	2.0	Train Pass by
6/26/20 2:46	6/26/20 2:46	0.3	Abnormal Noise
6/26/20 3:26	6/26/20 3:28	1.5	Train Pass by
6/26/20 4:29	6/26/20 4:31	1.3	Train Pass by
6/26/20 4:35	6/26/20 4:36	1.0	Train Pass by
6/26/20 5:03	6/26/20 5:07	3.8	Train Pass by
6/26/20 5:09	6/26/20 5:10	0.5	Train Pass by
6/26/20 5:31	6/26/20 5:33	1.8	Train Pass by
6/26/20 6:19	6/26/20 6:20	1.5	Train Pass by
6/26/20 6:29	6/26/20 6:30	1.3	Excessive Bird Noise
6/26/20 6:30	6/26/20 6:32	1.5	Excessive Bird Noise
6/26/20 6:50	6/26/20 6:51	0.8	Excessive Bird Noise
	Total Night #1	**49**	
	Total Night #2	**39**	
	Total Data	**87**	

Data Removal Noise Monitoring Location #6

Start Time	End Time	Duration (min)	Reason
6/24/20 22:51	6/24/20 22:53	1.5	Animals
6/24/20 23:07	6/24/20 23:10	2.5	Animals
6/24/20 23:11	6/24/20 23:15	3.5	Animals
6/24/20 23:18	6/24/20 23:20	2.0	Aircraft Flyover
6/24/20 23:23	6/24/20 23:24	1.5	Aircraft Flyover
6/24/20 23:31	6/24/20 23:33	2.5	Animals
6/24/20 23:54	6/24/20 23:58	3.5	Aircraft Flyover
6/25/20 1:04	6/25/20 1:07	2.8	Aircraft Flyover
6/25/20 1:25	6/25/20 1:25	0.8	Animals
6/25/20 1:40	6/25/20 1:42	2.0	Loud Vehicle Pass by
6/25/20 1:43	6/25/20 1:45	1.8	Loud Vehicle Pass by
6/25/20 3:29	6/25/20 3:30	1.0	Train Pass by
6/25/20 3:32	6/25/20 3:33	0.8	Train Pass by
6/25/20 5:20	6/25/20 5:21	0.8	Loud Vehicle Pass by
6/25/20 5:35	6/25/20 5:36	1.0	Loud Vehicle Pass by
6/25/20 6:18	6/25/20 6:19	1.0	Loud Vehicle Pass by
6/25/20 22:33	6/25/20 22:34	1.0	Train Pass by
6/25/20 22:36	6/25/20 22:40	3.3	Animals
6/25/20 22:50	6/25/20 22:51	0.8	Excessive Bird Noise
6/25/20 23:00	6/25/20 23:01	1.0	Excessive Bird Noise
6/25/20 23:07	6/25/20 23:15	8.5	Animals
6/25/20 23:21	6/25/20 23:21	0.3	Animals
6/25/20 23:29	6/25/20 23:31	2.3	Loud Vehicle Pass by
6/25/20 23:33	6/25/20 23:35	1.5	Loud Vehicle Pass by
6/25/20 23:41	6/25/20 23:44	2.5	Animals
6/26/20 6:07	6/26/20 6:08	1.0	Loud Vehicle Pass by
6/26/20 6:51	6/26/20 6:53	1.3	Excessive Bird Noise
6/26/20 6:58	6/26/20 6:59	1.0	Loud Vehicle Pass by
	Total Night #1	**29**	
	Total Night #2	**24**	
	Total Data	**53**	

Data Removal Noise Monitoring Location #8

Start Time	End Time	Duration (min)	Reason
6/24/20 22:30	6/24/20 22:31	1.0	Loud Vehicle Pass by
6/24/20 22:34	6/24/20 22:35	1.0	Loud Vehicle Pass by
6/24/20 23:47	6/24/20 23:47	0.5	Train Pass by
6/24/20 23:54	6/24/20 23:56	2.5	Aircraft Flyover
6/25/20 0:00	6/25/20 0:00	0.8	Train Pass by
6/25/20 0:06	6/25/20 0:06	0.5	Aircraft Flyover
6/25/20 0:11	6/25/20 0:13	1.3	Train Pass by
6/25/20 0:18	6/25/20 0:19	1.3	Loud Vehicle Pass by
6/25/20 0:23	6/25/20 0:24	1.0	Loud Vehicle Pass by
6/25/20 0:31	6/25/20 0:33	2.3	Train Pass by
6/25/20 0:44	6/25/20 0:45	0.8	Train Pass by
6/25/20 0:49	6/25/20 0:50	0.8	Loud Vehicle Pass by
6/25/20 0:51	6/25/20 0:52	1.3	Loud Vehicle Pass by
6/25/20 0:53	6/25/20 0:55	1.5	Loud Vehicle Pass by
6/25/20 1:05	6/25/20 1:06	0.8	Train Pass by
6/25/20 1:06	6/25/20 1:08	2.0	Aircraft Flyover
6/25/20 1:12	6/25/20 1:13	1.8	Aircraft Flyover
6/25/20 1:18	6/25/20 1:20	2.3	Loud Vehicle Pass by
6/25/20 2:28	6/25/20 2:29	1.0	Loud Vehicle Pass by
6/25/20 2:32	6/25/20 2:34	1.3	Loud Vehicle Pass by
6/25/20 2:59	6/25/20 3:00	1.5	Loud Vehicle Pass by
6/25/20 3:03	6/25/20 3:04	1.3	Loud Vehicle Pass by
6/25/20 4:45	6/25/20 4:46	0.8	Excessive Bird Noise
6/25/20 4:55	6/25/20 4:56	0.5	Abnormal
6/25/20 5:08	6/25/20 5:09	0.8	Abnormal
6/25/20 5:10	6/25/20 5:12	2.5	Excessive Bird Noise
6/25/20 5:35	6/25/20 5:36	0.5	Loud Bang
6/25/20 6:05	6/25/20 6:06	1.3	Loud Vehicle Pass by
6/25/20 6:09	6/25/20 6:10	0.8	Loud Vehicle Pass by
6/25/20 6:19	6/25/20 6:20	0.8	Excessive Bird Noise
6/25/20 22:02	6/25/20 22:03	1.3	Loud Vehicle Pass by
6/25/20 22:06	6/25/20 22:07	1.0	Loud Vehicle Pass by
6/26/20 0:18	6/26/20 0:19	0.8	Loud Vehicle Pass by
6/26/20 0:20	6/26/20 0:20	0.8	Loud Vehicle Pass by
6/26/20 0:32	6/26/20 0:33	0.8	Loud Vehicle Pass by
6/26/20 0:36	6/26/20 0:36	0.8	Loud Vehicle Pass by
6/26/20 2:45	6/26/20 2:46	0.8	Loud Vehicle Pass by
6/26/20 2:55	6/26/20 2:56	0.5	Loud Vehicle Pass by
6/26/20 3:09	6/26/20 3:10	0.8	Loud Vehicle Pass by
6/26/20 3:15	6/26/20 3:15	0.8	Loud Vehicle Pass by
6/26/20 5:54	6/26/20 5:54	0.5	Loud Vehicle Pass by
6/26/20 5:57	6/26/20 5:57	0.8	Loud Vehicle Pass by
6/26/20 6:58	6/26/20 7:02	3.3	Aircraft Flyover
	Total Night #1	**36**	
	Total Night #2	**13**	
	Total Data	**48**	

Data Removal Noise Monitoring Location #9

Start Time	End Time	Duration (min)	Reason
7/27/20 22:00	7/27/20 22:02	1.8	Train Pass by
7/27/20 22:04	7/27/20 22:05	0.8	Loud Vehicle Pass by
7/27/20 22:07	7/27/20 22:08	1.0	Loud Vehicle Pass by
7/27/20 22:12	7/27/20 22:13	0.8	Loud Vehicle Pass by
7/27/20 22:56	7/27/20 22:57	0.8	Train Pass by
7/27/20 23:02	7/27/20 23:04	1.3	Train Pass by
7/27/20 23:43	7/27/20 23:43	0.5	Train Pass by
7/28/20 1:14	7/28/20 1:16	1.3	Loud Vehicle Pass by
7/28/20 1:43	7/28/20 1:43	0.5	Loud Vehicle Pass by
7/28/20 1:59	7/28/20 2:00	1.0	Loud Vehicle Pass by
7/28/20 2:04	7/28/20 2:04	0.5	Loud Vehicle Pass by
7/28/20 3:13	7/28/20 3:15	2.0	Train Pass by
7/28/20 3:17	7/28/20 3:18	1.5	Train Pass by
7/28/20 3:19	7/28/20 3:22	3.0	Train Pass by
7/28/20 4:30	7/28/20 4:36	5.5	Loud Vehicle Pass by
7/28/20 4:57	7/28/20 4:59	2.0	Train Pass by
7/28/20 5:32	7/28/20 5:34	2.8	Loud Vehicle Pass by
7/28/20 5:44	7/28/20 5:46	1.8	Train Pass by
7/28/20 5:58	7/28/20 6:00	2.0	Train Pass by
7/28/20 6:01	7/28/20 6:03	1.8	Train Pass by
7/28/20 6:27	7/28/20 6:31	3.5	Train Pass by
7/28/20 22:31	7/28/20 22:32	0.5	Aircraft Flyover
7/28/20 22:38	7/28/20 22:39	0.3	Machinery Noise
7/28/20 22:42	7/28/20 22:43	1.5	Machinery Noise
7/28/20 23:13	7/28/20 23:14	1.0	Loud Vehicle Pass by
7/28/20 23:17	7/28/20 23:18	1.3	Train Pass by
7/28/20 23:18	7/28/20 23:21	2.5	Train Pass by
7/28/20 23:25	7/28/20 23:28	2.5	Train Pass by
7/29/20 0:08	7/29/20 0:18	10.0	Train Pass by
7/29/20 1:44	7/29/20 1:45	1.3	Aircraft Flyover
7/29/20 1:54	7/29/20 1:56	2.0	Excessive Wind Noise
7/29/20 1:58	7/29/20 2:02	3.8	Excessive Wind Noise
7/29/20 2:34	7/29/20 2:38	4.0	Aircraft Flyover
7/29/20 2:47	7/29/20 2:49	1.8	Loud Vehicle Pass by
7/29/20 3:10	7/29/20 3:21	11.3	Train Pass by
7/29/20 4:00	7/29/20 4:03	2.8	Train Pass by
7/29/20 4:37	7/29/20 4:39	1.8	Loud Vehicle Pass by
7/29/20 4:53	7/29/20 4:58	4.3	Loud Vehicle Pass by
7/29/20 5:20	7/29/20 5:22	1.5	Train Pass by
7/29/20 5:26	7/29/20 5:28	2.8	Loud Vehicle Pass by
7/29/20 5:38	7/29/20 5:40	1.5	Train Pass by
7/29/20 5:43	7/29/20 5:45	1.8	Train Pass by
7/29/20 5:47	7/29/20 5:51	3.5	Train Pass by
7/29/20 6:34	7/29/20 6:39	4.5	Loud Vehicle Pass by
7/29/20 6:58	7/29/20 6:59	1.5	Train Pass by
	Total Night #1	**36**	
	Total Night #2	**69**	
	Total Data	**105**	

Data Removal Noise Monitoring Location #10

Start Time	End Time	Duration (min)	Reason
7/27/20 22:01	7/27/20 22:01	0.7	Train Pass by
7/27/20 22:01	7/27/20 22:02	1.0	Train Pass by
7/27/20 22:02	7/27/20 22:03	0.7	Train Pass by
7/27/20 22:03	7/27/20 22:04	1.5	Loud Vehicle Pass by
7/27/20 22:09	7/27/20 22:09	0.5	Loud Vehicle Pass by
7/27/20 22:11	7/27/20 22:12	1.0	Loud Vehicle Pass by
7/27/20 22:24	7/27/20 22:25	1.0	Loud Vehicle Pass by
7/27/20 22:47	7/27/20 22:47	0.2	Loud Vehicle Pass by
7/27/20 22:56	7/27/20 22:57	1.0	Loud Vehicle Pass by
7/27/20 22:58	7/27/20 23:00	1.7	Train Pass by
7/27/20 23:01	7/27/20 23:02	0.7	Loud Vehicle Pass by
7/27/20 23:12	7/27/20 23:13	0.7	Loud Vehicle Pass by
7/27/20 23:19	7/27/20 23:20	0.7	Loud Vehicle Pass by
7/27/20 23:21	7/27/20 23:22	1.0	Loud Vehicle Pass by
7/27/20 23:25	7/27/20 23:25	0.7	Loud Vehicle Pass by
7/28/20 0:03	7/28/20 0:04	1.0	Loud Vehicle Pass by
7/28/20 0:08	7/28/20 0:09	0.7	Loud Vehicle Pass by
7/28/20 0:31	7/28/20 0:32	1.2	Loud Vehicle Pass by
7/28/20 1:28	7/28/20 1:28	0.7	Loud Vehicle Pass by
7/28/20 1:40	7/28/20 1:41	1.0	Loud Vehicle Pass by
7/28/20 2:49	7/28/20 2:50	1.0	Loud Vehicle Pass by
7/28/20 3:13	7/28/20 3:14	1.2	Train Pass by
7/28/20 3:22	7/28/20 3:22	0.2	Train Pass by
7/28/20 3:42	7/28/20 3:43	1.7	Loud Vehicle Pass by
7/28/20 3:57	7/28/20 3:57	0.5	Train Pass by
7/28/20 4:16	7/28/20 4:18	2.5	Loud Vehicle Pass by
7/28/20 4:32	7/28/20 4:33	1.7	Loud Vehicle Pass by
7/28/20 4:38	7/28/20 4:39	1.0	Loud Vehicle Pass by
7/28/20 4:49	7/28/20 4:51	2.5	Loud Vehicle Pass by
7/28/20 4:55	7/28/20 4:56	0.7	Loud Vehicle Pass by
7/28/20 4:59	7/28/20 5:05	5.7	Loud Vehicle Pass by
7/28/20 5:06	7/28/20 5:11	5.2	Loud Vehicle Pass by
7/28/20 5:12	7/28/20 5:17	5.0	Loud Vehicle Pass by
7/28/20 5:19	7/28/20 5:29	10.2	Loud Vehicle Pass by
7/28/20 5:30	7/28/20 5:48	18.5	Loud Vehicle Pass by
7/28/20 5:50	7/28/20 6:05	15.7	Loud Vehicle Pass by
7/28/20 6:06	7/28/20 6:19	13.5	Loud Vehicle Pass by
7/28/20 6:20	7/28/20 6:35	14.7	Loud Vehicle Pass by
7/28/20 6:35	7/28/20 6:38	3.2	Loud Vehicle Pass by
7/28/20 6:39	7/28/20 6:53	14.5	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #10 Cont.

Start Time	End Time	Duration (min)	Reason
7/28/20 6:54	7/28/20 7:00	6.2	Loud Vehicle Pass by
7/28/20 22:01	7/28/20 22:03	2.2	Loud Vehicle Pass by
7/28/20 22:05	7/28/20 22:06	1.0	Loud Vehicle Pass by
7/28/20 22:10	7/28/20 22:11	1.0	Loud Vehicle Pass by
7/28/20 22:14	7/28/20 22:15	0.7	Loud Vehicle Pass by
7/28/20 22:21	7/28/20 22:22	1.0	Loud Vehicle Pass by
7/28/20 22:26	7/28/20 22:27	1.0	Loud Vehicle Pass by
7/28/20 22:28	7/28/20 22:29	1.5	Loud Vehicle Pass by
7/28/20 22:38	7/28/20 22:39	1.2	Loud Vehicle Pass by
7/28/20 22:57	7/28/20 22:58	1.5	Loud Vehicle Pass by
7/28/20 23:05	7/28/20 23:06	1.0	Loud Vehicle Pass by
7/28/20 23:32	7/28/20 23:33	1.5	Loud Vehicle Pass by
7/29/20 0:34	7/29/20 0:35	1.7	Loud Vehicle Pass by
7/29/20 0:47	7/29/20 0:48	1.5	Machinery Noise
7/29/20 0:50	7/29/20 0:53	2.5	Train Pass by
7/29/20 0:58	7/29/20 1:01	3.5	Loud Vehicle Pass by
7/29/20 1:30	7/29/20 1:31	1.5	Loud Vehicle Pass by
7/29/20 2:35	7/29/20 2:38	3.2	Aircraft Flyover
7/29/20 2:54	7/29/20 2:55	1.5	Loud Vehicle Pass by
7/29/20 2:57	7/29/20 2:58	1.2	Loud Vehicle Pass by
7/29/20 3:04	7/29/20 3:05	1.7	Loud Vehicle Pass by
7/29/20 3:11	7/29/20 3:12	1.2	Train Pass by
7/29/20 3:14	7/29/20 3:15	1.5	Train Pass by
7/29/20 3:17	7/29/20 3:17	0.7	Train Pass by
7/29/20 3:25	7/29/20 3:26	1.2	Loud Vehicle Pass by
7/29/20 4:02	7/29/20 4:03	1.0	Loud Vehicle Pass by
7/29/20 4:03	7/29/20 4:04	1.2	Loud Vehicle Pass by
7/29/20 4:14	7/29/20 4:14	0.7	Loud Vehicle Pass by
7/29/20 4:26	7/29/20 4:28	2.5	Loud Vehicle Pass by
7/29/20 4:41	7/29/20 4:44	2.5	Loud Vehicle Pass by
7/29/20 4:52	7/29/20 4:55	3.7	Loud Vehicle Pass by
7/29/20 5:01	7/29/20 5:06	5.7	Loud Vehicle Pass by
7/29/20 5:12	7/29/20 5:16	4.7	Loud Vehicle Pass by
7/29/20 5:19	7/29/20 5:23	4.2	Loud Vehicle Pass by
7/29/20 5:28	7/29/20 5:35	7.7	Loud Vehicle Pass by
7/29/20 5:36	7/29/20 5:41	6.0	Loud Vehicle Pass by
7/29/20 5:43	7/29/20 5:51	9.0	Loud Vehicle Pass by
7/29/20 5:53	7/29/20 5:58	5.0	Loud Vehicle Pass by
7/29/20 5:59	7/29/20 6:06	7.7	Loud Vehicle Pass by
7/29/20 6:07	7/29/20 6:12	5.5	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #10 Cont.

Start Time	End Time	Duration (min)	Reason
7/29/20 6:14	7/29/20 6:18	5.0	Loud Vehicle Pass by
7/29/20 6:19	7/29/20 6:23	3.7	Loud Vehicle Pass by
7/29/20 6:27	7/29/20 6:29	2.5	Loud Vehicle Pass by
7/29/20 6:33	7/29/20 6:39	5.7	Loud Vehicle Pass by
7/29/20 6:39	7/29/20 6:43	4.0	Loud Vehicle Pass by
7/29/20 6:44	7/29/20 6:49	5.7	Loud Vehicle Pass by
7/29/20 6:50	7/29/20 6:59	9.2	Loud Vehicle Pass by
	Total Night #1	**144**	
	Total Night #2	**140**	
	Total Data	**283**	

Data Removal Noise Monitoring Location #11

Start Time	End Time	Duration (min)	Reason
6/24/20 22:04	6/24/20 22:05	0.8	Train Pass by
6/24/20 22:07	6/24/20 22:08	0.5	Loud Vehicle Pass by
6/24/20 22:12	6/24/20 22:13	0.8	Train Pass by
6/24/20 22:15	6/24/20 22:15	0.8	Loud Vehicle Pass by
6/24/20 22:27	6/24/20 22:31	4.5	Crickets
6/24/20 22:32	6/24/20 22:35	2.5	Crickets
6/24/20 22:38	6/24/20 22:39	1.8	Loud Vehicle Pass by
6/24/20 23:15	6/24/20 23:16	1.0	Train Pass by
6/24/20 23:22	6/24/20 23:23	1.3	Aircraft Flyover
6/24/20 23:24	6/24/20 23:25	1.0	Loud Vehicle Pass by
6/24/20 23:31	6/24/20 23:36	4.5	Train Pass by
6/24/20 23:38	6/24/20 23:39	1.5	Machinery Noise
6/24/20 23:41	6/24/20 23:47	6.3	Train Pass by
6/24/20 23:51	6/24/20 23:52	1.5	Train Pass by
6/24/20 23:53	6/24/20 23:56	3.0	Aircraft Flyover
6/25/20 0:07	6/25/20 0:18	11.3	Train Pass by
6/25/20 0:20	6/25/20 0:20	0.5	Train Pass by
6/25/20 0:27	6/25/20 0:29	1.5	Loud Vehicle Pass by
6/25/20 0:38	6/25/20 0:44	5.5	Train Pass by
6/25/20 0:47	6/25/20 0:48	1.3	Loud Vehicle Pass by
6/25/20 0:49	6/25/20 0:52	3.0	Loud Vehicle Pass by
6/25/20 0:55	6/25/20 0:59	4.3	Train Pass by
6/25/20 1:00	6/25/20 1:01	1.3	Train Pass by
6/25/20 1:06	6/25/20 1:09	2.8	Aircraft Flyover
6/25/20 1:18	6/25/20 1:19	0.8	Loud Vehicle Pass by
6/25/20 1:48	6/25/20 1:50	2.0	Loud Bang
6/25/20 1:51	6/25/20 1:53	2.3	Loud Bang
6/25/20 1:54	6/25/20 1:56	1.8	Loud Bang
6/25/20 1:58	6/25/20 2:00	2.0	Loud Bang
6/25/20 2:01	6/25/20 2:03	1.5	Loud Bang
6/25/20 2:05	6/25/20 2:06	1.8	Loud Bang
6/25/20 2:08	6/25/20 2:10	1.8	Loud Bang
6/25/20 2:11	6/25/20 2:16	5.0	Loud Vehicle Pass by
6/25/20 2:17	6/25/20 2:20	2.5	Loud Bang
6/25/20 2:21	6/25/20 2:23	1.8	Loud Bang
6/25/20 2:24	6/25/20 2:25	1.3	Loud Bang
6/25/20 2:27	6/25/20 2:30	2.3	Loud Bang
6/25/20 2:31	6/25/20 2:33	2.0	Loud Bang
6/25/20 2:34	6/25/20 2:40	5.3	Loud Vehicle Pass by
6/25/20 2:41	6/25/20 2:43	2.0	Loud Bang

Data Removal Noise Monitoring Location #11 Cont.

Start Time	End Time	Duration (min)	Reason
6/25/20 2:44	6/25/20 2:46	2.0	Loud Bang
6/25/20 2:47	6/25/20 2:50	2.3	Loud Bang
6/25/20 2:51	6/25/20 2:53	1.8	Loud Bang
6/25/20 2:54	6/25/20 2:57	2.5	Train Pass by
6/25/20 2:58	6/25/20 3:00	2.3	Loud Bang
6/25/20 3:02	6/25/20 3:04	2.8	Loud Bang
6/25/20 3:05	6/25/20 3:07	2.8	Loud Vehicle Pass by
6/25/20 3:08	6/25/20 3:10	2.0	Loud Bang
6/25/20 3:11	6/25/20 3:12	1.0	Loud Bang
6/25/20 3:15	6/25/20 3:16	1.0	Loud Bang
6/25/20 3:18	6/25/20 3:20	1.8	Loud Bang
6/25/20 3:21	6/25/20 3:22	1.3	Loud Bang
6/25/20 3:25	6/25/20 3:26	1.0	Loud Bang
6/25/20 3:28	6/25/20 3:29	1.0	Loud Bang
6/25/20 3:44	6/25/20 3:46	1.8	Loud Bang
6/25/20 3:58	6/25/20 3:58	0.3	Loud Bang
6/25/20 4:08	6/25/20 4:08	0.8	Train Pass by
6/25/20 4:12	6/25/20 4:12	0.8	Loud Bang
6/25/20 4:23	6/25/20 4:29	5.8	Excessive Bird Noise
6/25/20 4:37	6/25/20 4:39	2.0	Loud Vehicle Pass by
6/25/20 4:51	6/25/20 4:52	0.8	Excessive Bird Noise
6/25/20 5:20	6/25/20 5:22	1.3	Loud Vehicle Pass by
6/25/20 5:56	6/25/20 5:59	3.3	Loud Vehicle Pass by
6/25/20 6:13	6/25/20 6:15	1.8	Loud Vehicle Pass by
6/25/20 6:21	6/25/20 6:23	2.5	Loud Vehicle Pass by
6/25/20 6:24	6/25/20 6:31	7.0	Loud Vehicle Pass by
6/25/20 6:31	6/25/20 6:35	3.8	Loud Vehicle Pass by
6/25/20 6:41	6/25/20 6:45	4.0	Loud Vehicle Pass by
6/25/20 6:48	6/25/20 6:51	2.5	Loud Vehicle Pass by
6/25/20 6:56	6/25/20 6:57	0.8	Loud Vehicle Pass by
6/25/20 7:00	6/25/20 7:04	4.8	Loud Vehicle Pass by
6/25/20 22:03	6/25/20 22:05	1.8	Train Pass by
6/25/20 22:09	6/25/20 22:11	1.5	Loud Vehicle Pass by
6/25/20 22:11	6/25/20 22:14	3.3	Train Pass by
6/25/20 22:22	6/25/20 22:23	1.0	Train Pass by
6/25/20 22:26	6/25/20 22:27	1.0	Train Pass by
6/25/20 22:27	6/25/20 22:32	5.0	Train Pass by
6/25/20 22:34	6/25/20 22:37	2.5	Train Pass by
6/25/20 22:39	6/25/20 22:40	1.0	Train Pass by
6/25/20 22:44	6/25/20 22:47	3.3	Train Pass by

Data Removal Noise Monitoring Location #11 Cont.

Start Time	End Time	Duration (min)	Reason
6/25/20 22:56	6/25/20 23:01	4.5	Train Pass by
6/25/20 23:04	6/25/20 23:13	9.0	Train Pass by
6/26/20 0:16	6/26/20 0:17	1.0	Loud Vehicle Pass by
6/26/20 0:25	6/26/20 0:29	3.3	Train Pass by
6/26/20 0:31	6/26/20 0:32	1.3	Loud Vehicle Pass by
6/26/20 0:40	6/26/20 0:41	0.8	Loud Vehicle Pass by
6/26/20 2:01	6/26/20 2:02	1.0	Train Pass by
6/26/20 2:10	6/26/20 2:10	0.5	Train Pass by
6/26/20 2:13	6/26/20 2:16	3.0	Train Pass by
6/26/20 2:19	6/26/20 2:22	3.5	Train Pass by
6/26/20 2:27	6/26/20 2:28	1.0	Loud Vehicle Pass by
6/26/20 2:42	6/26/20 2:43	1.0	Loud Vehicle Pass by
6/26/20 2:44	6/26/20 2:52	7.3	Train Pass by
6/26/20 2:59	6/26/20 3:00	0.8	Loud Vehicle Pass by
6/26/20 3:08	6/26/20 3:14	6.3	Train Pass by
6/26/20 3:14	6/26/20 3:17	3.3	Train Pass by
6/26/20 3:18	6/26/20 3:21	2.5	Loud Vehicle Pass by
6/26/20 5:48	6/26/20 5:50	2.0	Loud Vehicle Pass by
6/26/20 6:00	6/26/20 6:01	1.0	Loud Vehicle Pass by
6/26/20 6:29	6/26/20 6:30	0.8	Train Pass by
6/26/20 6:52	6/26/20 6:56	3.5	Train Pass by
	Total Night #1	**167**	
	Total Night #2	**77**	
	Total Data	**245**	

Data Removal Noise Monitoring Location #12 (Night 1)

Start Time	End Time	Duration (min)	Reason
6/24/20 22:00	6/24/20 22:23	23.5	Excessive Bird Noise
6/24/20 22:36	6/24/20 22:37	1.3	Train Pass by
6/24/20 22:40	6/24/20 22:40	0.8	Train Pass by
6/24/20 22:45	6/24/20 22:48	2.5	Train Pass by
6/24/20 22:53	6/24/20 22:55	1.5	Train Pass by
6/24/20 22:59	6/24/20 23:00	1.0	Train Pass by
6/24/20 23:24	6/24/20 23:31	7.3	Train Pass by
6/24/20 23:32	6/24/20 23:33	1.5	Train Pass by
6/24/20 23:34	6/24/20 23:35	1.3	Train Pass by
6/24/20 23:42	6/24/20 23:44	1.5	Train Pass by
6/24/20 23:52	6/24/20 23:57	4.3	Train Pass by
6/25/20 0:04	6/25/20 0:06	1.5	Train Pass by
6/25/20 1:02	6/25/20 1:03	1.8	Train Pass by
6/25/20 1:07	6/25/20 1:08	1.3	Train Pass by
6/25/20 1:14	6/25/20 1:15	1.3	Loud Vehicle Pass by
6/25/20 1:25	6/25/20 1:27	2.0	Train Pass by
6/25/20 1:31	6/25/20 1:31	0.8	Train Pass by
6/25/20 1:37	6/25/20 1:38	0.8	Loud Vehicle Pass by
6/25/20 1:42	6/25/20 1:44	1.5	Train Pass by
6/25/20 1:49	6/25/20 1:50	1.3	Loud Vehicle Pass by
6/25/20 1:54	6/25/20 1:55	1.5	Train Pass by
6/25/20 2:02	6/25/20 2:03	1.0	Train Pass by
6/25/20 2:03	6/25/20 2:05	1.5	Train Pass by
6/25/20 2:26	6/25/20 2:27	1.3	Train Pass by
6/25/20 2:49	6/25/20 2:51	1.5	Train Pass by
6/25/20 2:58	6/25/20 2:59	0.8	Train Pass by
6/25/20 3:08	6/25/20 3:09	1.0	Train Pass by
6/25/20 3:11	6/25/20 3:12	0.8	Train Pass by
6/25/20 3:15	6/25/20 3:17	2.0	Train Pass by
6/25/20 3:21	6/25/20 3:22	1.3	Train Pass by
6/25/20 3:26	6/25/20 3:27	0.8	Train Pass by
6/25/20 3:33	6/25/20 3:35	2.0	Loud Vehicle Pass by
6/25/20 4:12	6/25/20 4:16	4.8	Excessive Bird Noise
6/25/20 4:18	6/25/20 4:21	3.3	Excessive Bird Noise
6/25/20 4:23	6/25/20 4:28	5.0	Excessive Bird Noise
6/25/20 4:44	6/25/20 4:45	0.8	Train Pass by
6/25/20 5:11	6/25/20 5:12	1.3	Loud Vehicle Pass by
6/25/20 5:17	6/25/20 5:26	9.5	Morning Chorus
6/25/20 5:26	6/25/20 5:42	15.3	Morning Chorus
6/25/20 5:59	6/25/20 6:02	2.8	Train Pass by

Data Removal Noise Monitoring Location #12 (Night 1) Cont.

Start Time	End Time	Duration (min)	Reason
6/25/20 6:03	6/25/20 6:05	2.3	Excessive Bird Noise
6/25/20 6:08	6/25/20 6:10	1.8	Loud Vehicle Pass by
6/25/20 6:14	6/25/20 6:16	2.5	Loud Vehicle Pass by
6/25/20 6:18	6/25/20 6:23	4.3	Loud Vehicle Pass by
6/25/20 6:24	6/25/20 6:26	1.5	Loud Vehicle Pass by
6/25/20 6:26	6/25/20 6:32	5.8	Loud Vehicle Pass by
6/25/20 6:33	6/25/20 6:38	4.8	Train Pass by
6/25/20 6:41	6/25/20 6:46	4.3	Train Pass by
6/25/20 6:49	6/25/20 6:52	3.5	Train Pass by
6/25/20 6:56	6/25/20 6:58	2.0	Train Pass by
6/25/20 22:01	6/25/20 22:01	0.5	Train Pass by
6/25/20 22:02	6/25/20 22:06	4.0	Machinery Noise
6/25/20 22:19	6/25/20 22:21	2.3	Excessive Bird Noise
6/25/20 22:28	6/25/20 22:29	1.0	Train Pass by
6/25/20 22:30	6/25/20 22:32	2.5	Loud Vehicle Pass by
6/25/20 22:32	6/25/20 22:52	19.8	Train Pass by
6/25/20 23:08	6/25/20 23:09	0.8	Loud Vehicle Pass by
6/25/20 23:37	6/25/20 23:39	1.5	Loud Vehicle Pass by
6/25/20 23:43	6/25/20 23:47	4.0	Loud Vehicle Pass by
6/25/20 23:47	6/25/20 23:49	2.0	Loud Vehicle Pass by
6/26/20 0:28	6/26/20 0:30	1.8	Aircraft Flyover
6/26/20 1:13	6/26/20 1:19	6.3	Train Pass by
6/26/20 1:20	6/26/20 1:22	2.0	Train Pass by
6/26/20 1:22	6/26/20 1:32	9.5	Train Pass by
6/26/20 1:39	6/26/20 1:42	2.8	Train Pass by
6/26/20 2:02	6/26/20 2:05	3.0	Train Pass by
6/26/20 2:40	6/26/20 2:41	1.5	Train Pass by
6/26/20 2:47	6/26/20 2:48	1.0	Train Pass by
6/26/20 3:08	6/26/20 3:23	15.8	Train Pass by
6/26/20 3:53	6/26/20 3:55	2.8	Train Pass by
6/26/20 4:09	6/26/20 4:10	1.3	Excessive Wind Noise
6/26/20 4:12	6/26/20 4:15	3.3	Excessive Wind Noise
6/26/20 4:21	6/26/20 4:36	14.8	Morning Chorus
6/26/20 4:41	6/26/20 5:09	28.3	Morning Chorus
6/26/20 5:10	6/26/20 5:36	26.8	Morning Chorus
6/26/20 5:36	6/26/20 5:37	0.3	Morning Chorus
6/26/20 5:37	6/26/20 5:37	0.5	Morning Chorus
6/26/20 5:37	6/26/20 5:38	0.8	Morning Chorus
6/26/20 5:38	6/26/20 6:10	32.0	Morning Chorus
6/26/20 6:12	6/26/20 6:23	11.0	Morning Chorus

Data Removal Noise Monitoring Location #12 (Night 1) Cont.

Start Time	End Time	Duration (min)	Reason
6/26/20 6:24	6/26/20 6:33	9.0	Morning Chorus
6/26/20 6:33	6/26/20 6:39	5.8	Loud Vehicle Pass by
6/26/20 6:40	6/26/20 6:54	14.3	Morning Chorus
6/26/20 6:54	6/26/20 7:00	6.0	Morning Chorus
	Total Night #1	**149**	
	Total Night #2	**238**	
	Total Data	**387**	

Data Removal Noise Monitoring Location #12 (Night 2)

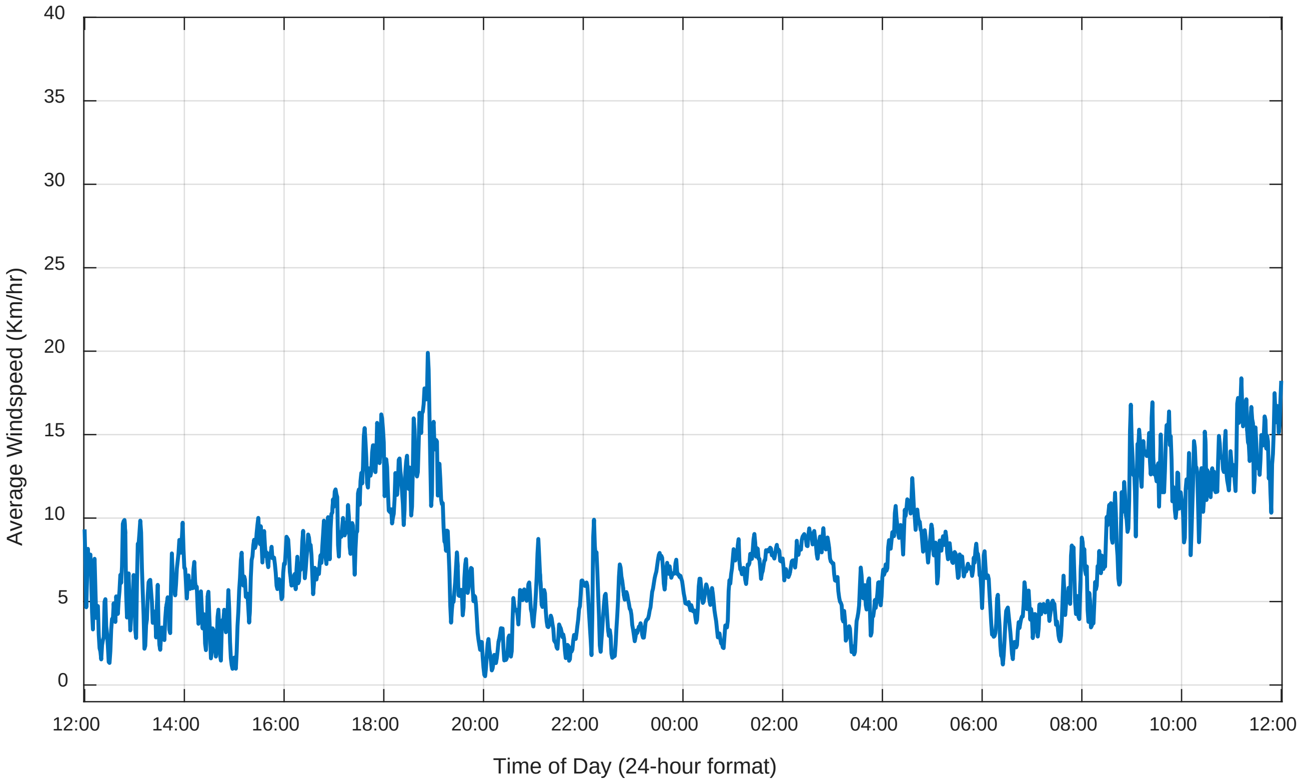
Start Time	End Time	Duration (min)	Reason
7/28/20 0:46	7/28/20 0:47	1.8	Aircraft Flyover
7/28/20 1:31	7/28/20 1:32	0.8	Loud Vehicle Pass by
7/28/20 2:41	7/28/20 2:48	6.8	Train Pass by
7/28/20 4:22	7/28/20 4:25	3.5	Train Pass by
7/28/20 4:36	7/28/20 4:39	2.5	Train Pass by
7/28/20 4:45	7/28/20 4:48	3.0	Train Pass by
7/28/20 4:54	7/28/20 4:56	1.3	Loud Vehicle Pass by
7/28/20 5:10	7/28/20 5:13	2.8	Excessive Bird Noise
7/28/20 5:22	7/28/20 5:26	3.5	Excessive Bird Noise
7/28/20 5:51	7/28/20 5:54	2.8	Excessive Bird Noise
7/28/20 5:56	7/28/20 5:59	3.0	Loud Vehicle Pass by
7/28/20 6:03	7/28/20 6:06	3.5	Loud Vehicle Pass by
7/28/20 6:23	7/28/20 6:24	1.0	Loud Vehicle Pass by
7/28/20 6:28	7/28/20 6:29	1.5	Loud Vehicle Pass by
7/28/20 6:30	7/28/20 6:34	3.5	Loud Vehicle Pass by
7/28/20 6:50	7/28/20 6:59	8.8	Loud Vehicle Pass by
7/28/20 23:17	7/28/20 23:18	1.0	Train Pass by
7/28/20 23:47	7/28/20 23:50	3.0	Loud Vehicle Pass by
7/29/20 0:03	7/29/20 0:05	1.3	Loud Vehicle Pass by
7/29/20 0:11	7/29/20 0:14	2.5	Loud Vehicle Pass by
7/29/20 0:16	7/29/20 0:18	1.8	Loud Vehicle Pass by
7/29/20 2:30	7/29/20 2:34	3.3	Loud Vehicle Pass by
	Total Night #1	**50**	
	Total Night #2	**13**	
	Total Data	**63**	

Data Removal Noise Monitoring Location #13

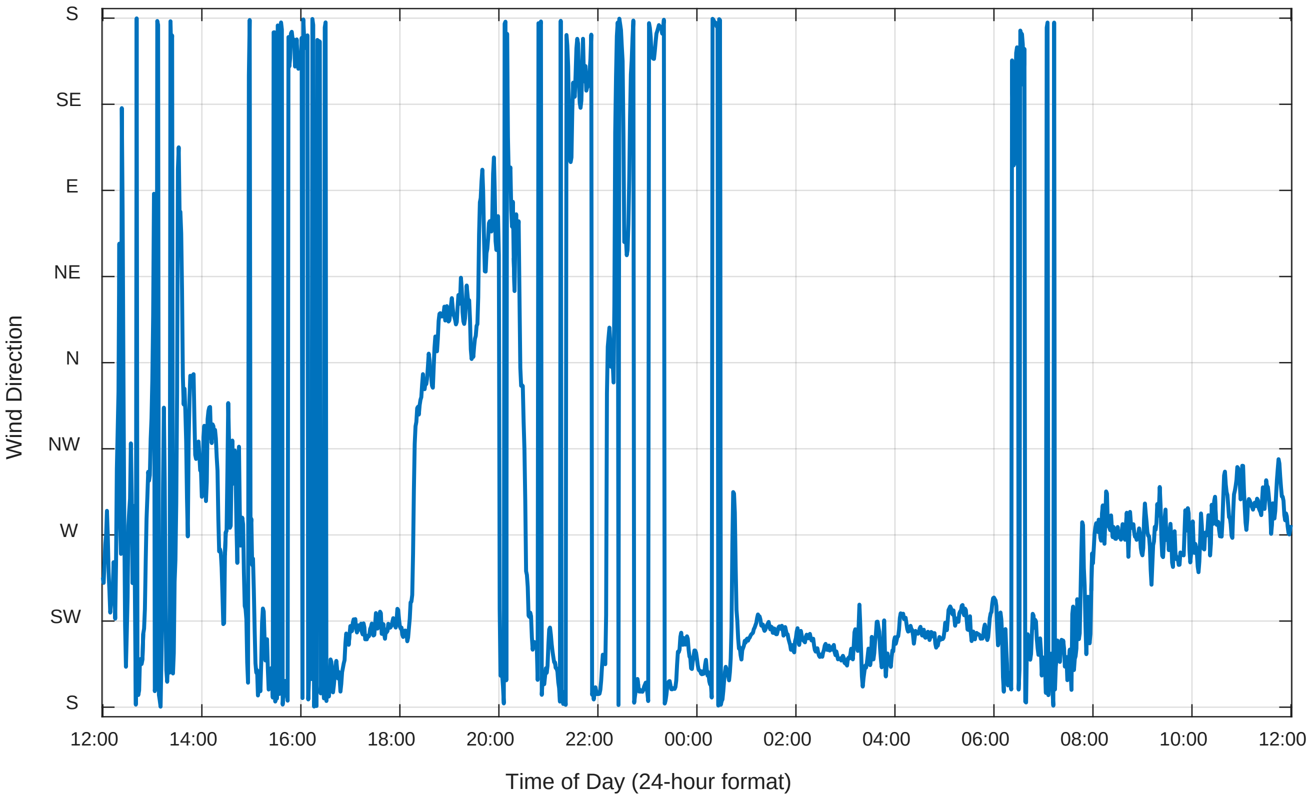
Start Time	End Time	Duration (min)	Reason
6/24/20 22:27	6/24/20 22:28	1.8	Excessive Bird Noise
6/24/20 22:41	6/24/20 22:44	2.8	Excessive Bird Noise
6/24/20 23:09	6/24/20 23:09	0.8	Excessive Bird Noise
6/24/20 23:22	6/24/20 23:24	2.0	Aircraft Flyover
6/25/20 0:47	6/25/20 0:53	6.0	Excessive Bird Noise
6/25/20 1:04	6/25/20 1:06	2.0	Loud Vehicle Pass by
6/25/20 1:08	6/25/20 1:09	1.0	Loud Vehicle Pass by
6/25/20 1:28	6/25/20 1:29	0.5	Excessive Bird Noise
6/25/20 1:48	6/25/20 1:49	1.0	Excessive Bird Noise
6/25/20 3:40	6/25/20 4:57	77.3	Morning Chorus
6/25/20 4:57	6/25/20 5:05	7.8	Morning Chorus
6/25/20 5:05	6/25/20 5:24	19.0	Morning Chorus
6/25/20 5:27	6/25/20 5:48	21.3	Morning Chorus
6/25/20 5:54	6/25/20 6:12	18.0	Morning Chorus
6/25/20 6:12	6/25/20 6:49	36.8	Morning Chorus
6/25/20 6:50	6/25/20 7:00	10.0	Morning Chorus
6/25/20 22:03	6/25/20 22:04	0.3	Excessive Bird Noise
6/25/20 22:05	6/25/20 22:12	6.5	Excessive Bird Noise
6/25/20 22:15	6/25/20 22:19	3.8	Aircraft Flyover
6/25/20 22:22	6/25/20 22:24	2.3	Excessive Bird Noise
6/25/20 22:34	6/25/20 22:35	1.8	Loud Vehicle Pass by
6/25/20 22:41	6/25/20 22:47	5.3	Excessive Bird Noise
6/25/20 22:50	6/25/20 22:51	1.8	Loud Vehicle Pass by
6/26/20 0:06	6/26/20 0:09	2.8	Loud Vehicle Pass by
6/26/20 0:17	6/26/20 0:18	1.3	Animals
6/26/20 1:45	6/26/20 1:46	1.3	Excessive Bird Noise
6/26/20 2:51	6/26/20 2:55	4.3	Excessive Bird Noise
6/26/20 3:39	6/26/20 3:40	0.5	Excessive Bird Noise
6/26/20 3:45	6/26/20 4:29	43.8	Morning Chorus
6/26/20 4:29	6/26/20 4:55	26.8	Morning Chorus
6/26/20 4:56	6/26/20 5:10	14.0	Morning Chorus
6/26/20 5:11	6/26/20 5:31	20.0	Morning Chorus
6/26/20 5:31	6/26/20 5:37	6.0	Morning Chorus
6/26/20 5:38	6/26/20 5:46	8.0	Morning Chorus
6/26/20 5:47	6/26/20 6:00	13.8	Morning Chorus
6/26/20 6:01	6/26/20 6:17	15.5	Morning Chorus
6/26/20 6:18	6/26/20 6:35	17.3	Morning Chorus
6/26/20 6:37	6/26/20 6:59	22.5	Morning Chorus
	Total Night #1	**208**	
	Total Night #2	**219**	
	Total Data	**427**	

Appendix V WEATHER DATA

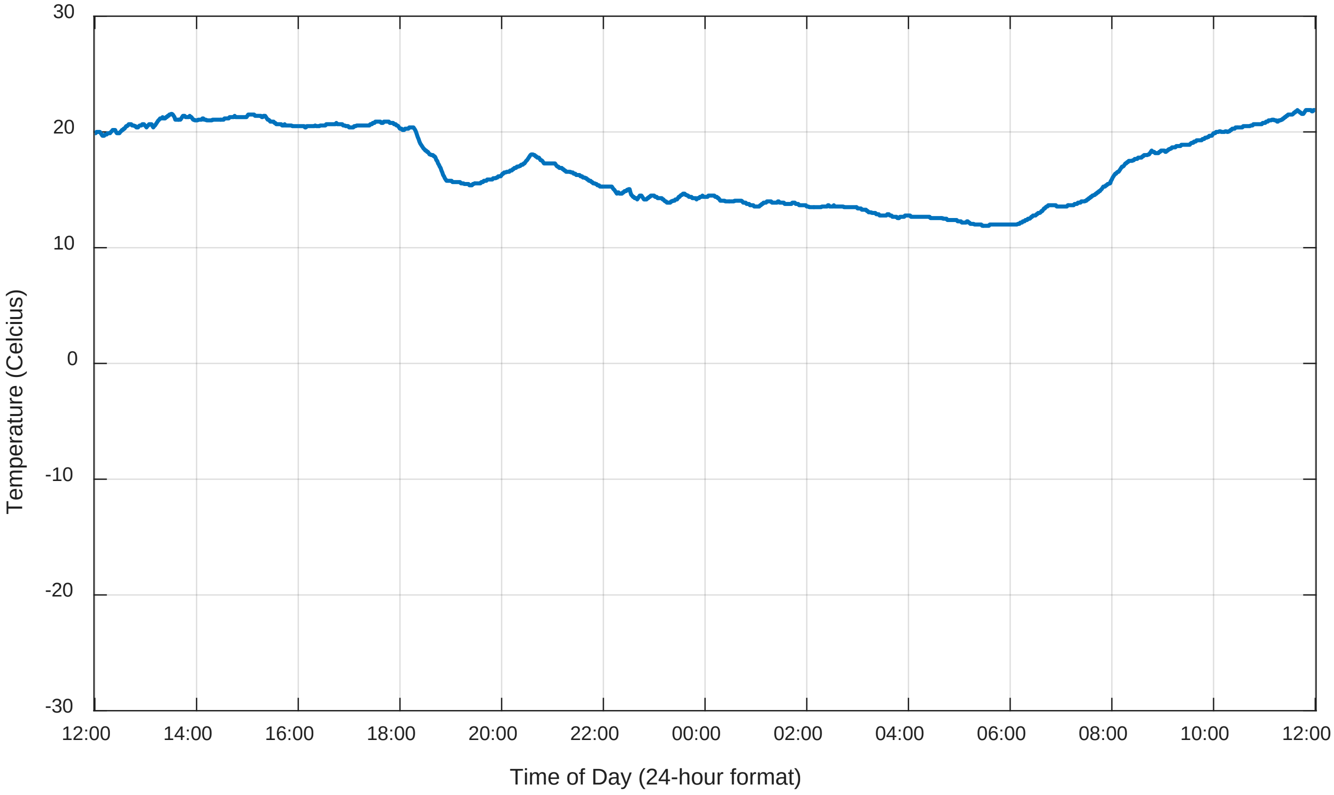
June 24 - 25, 2020 Weather Data



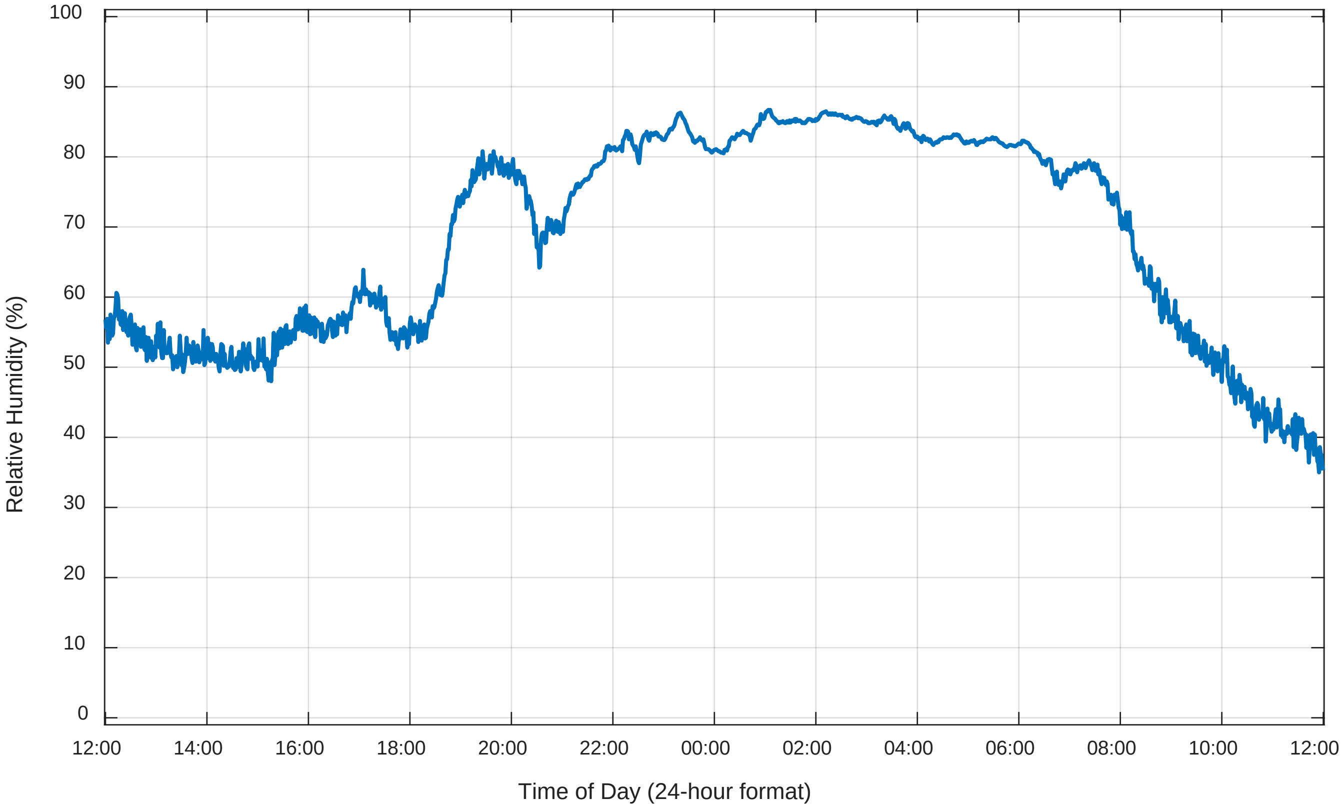
Monitored Wind Speed (June 24 - 25, 2020) at Noise Monitor Location 6



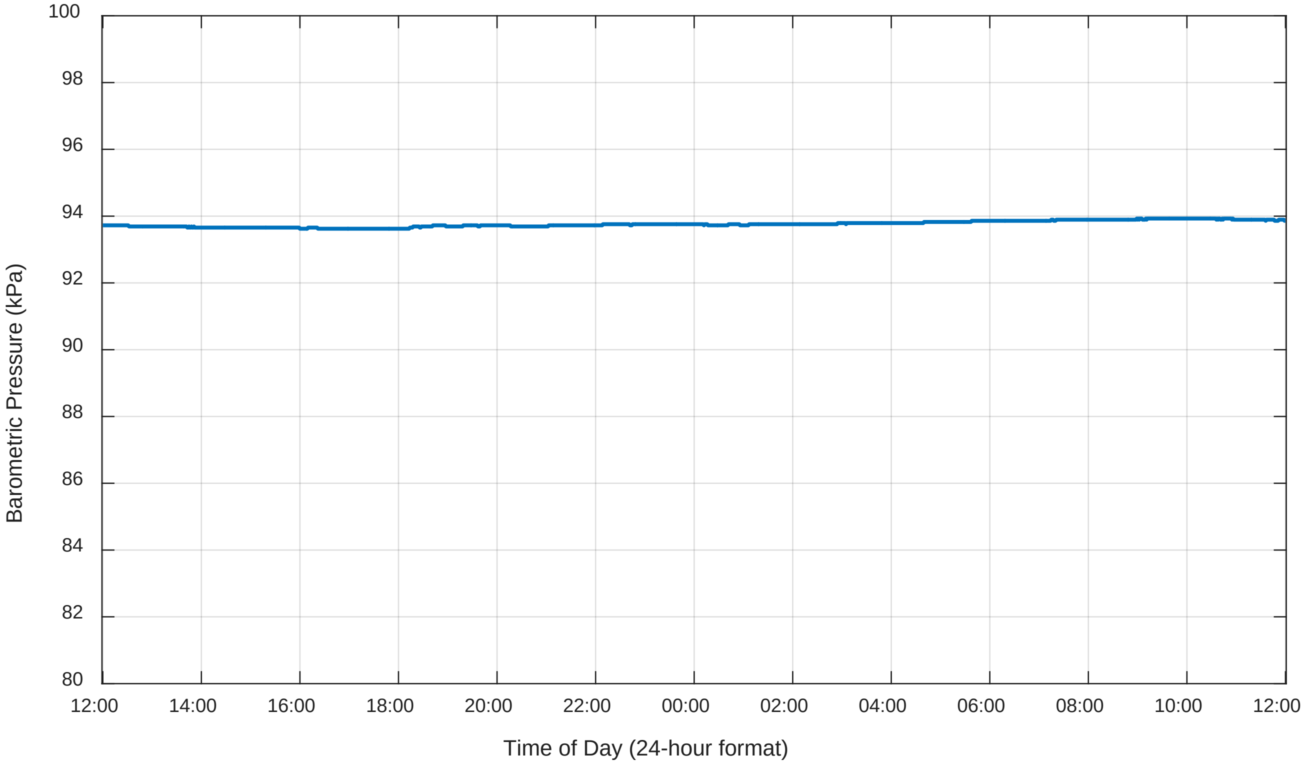
Monitored Wind Direction (June 24 - 25, 2020) at Noise Monitor Location 6



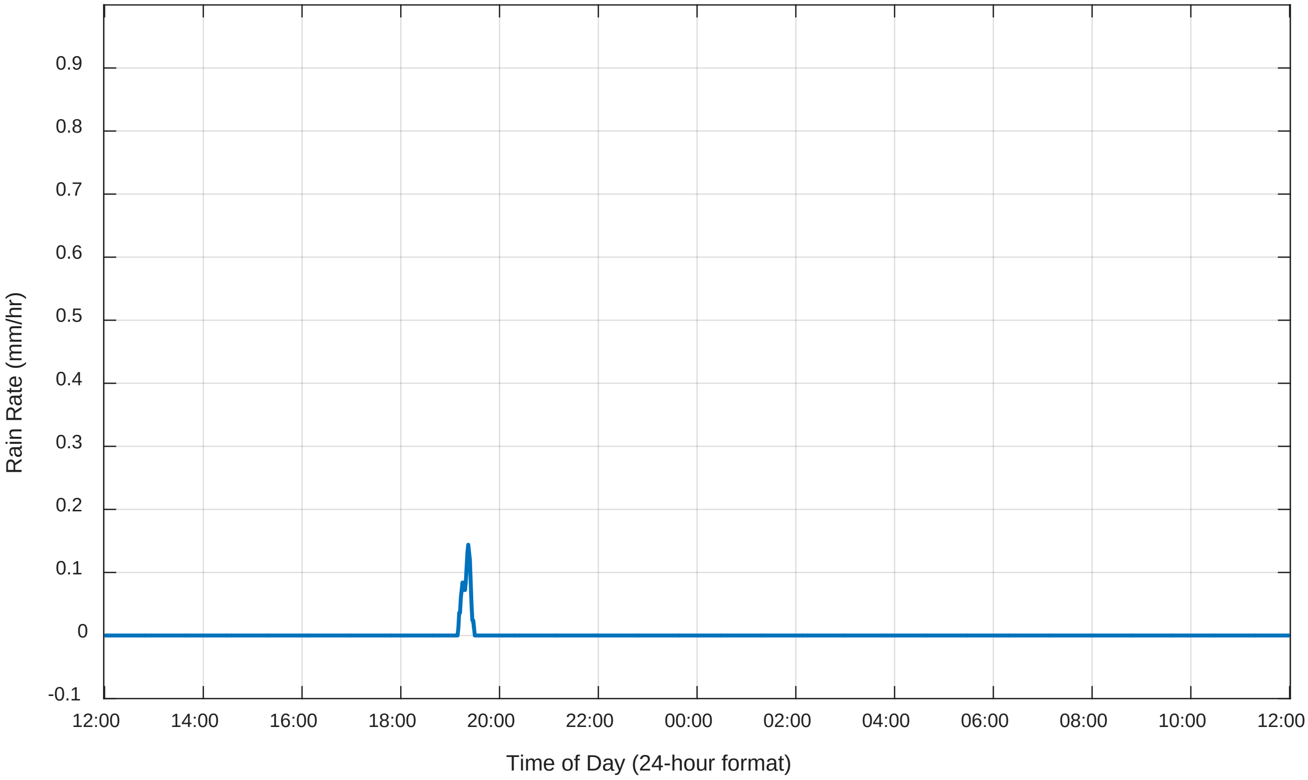
Monitored Temperature (June 24 - 25, 2020) at Noise Monitor Location 6



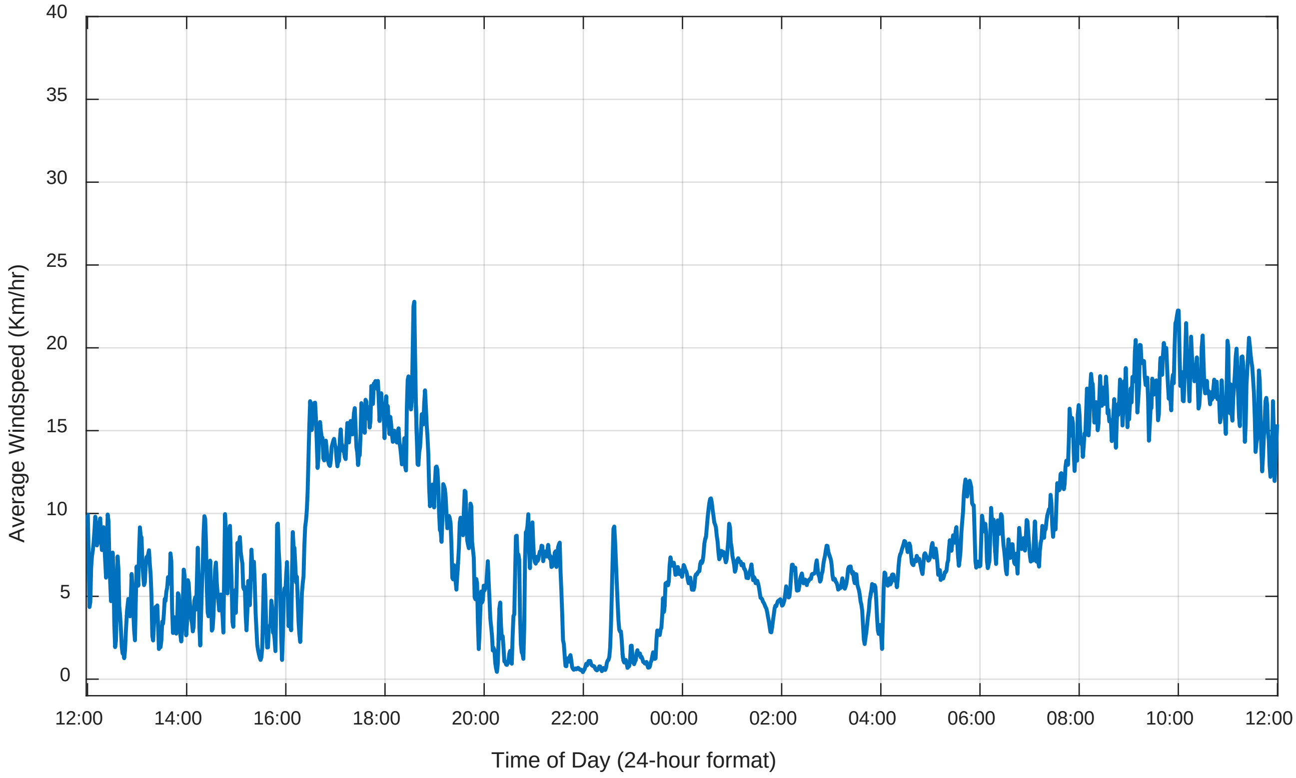
Monitored Humidity (June 24 - 25, 2020) at Noise Monitor Location 6



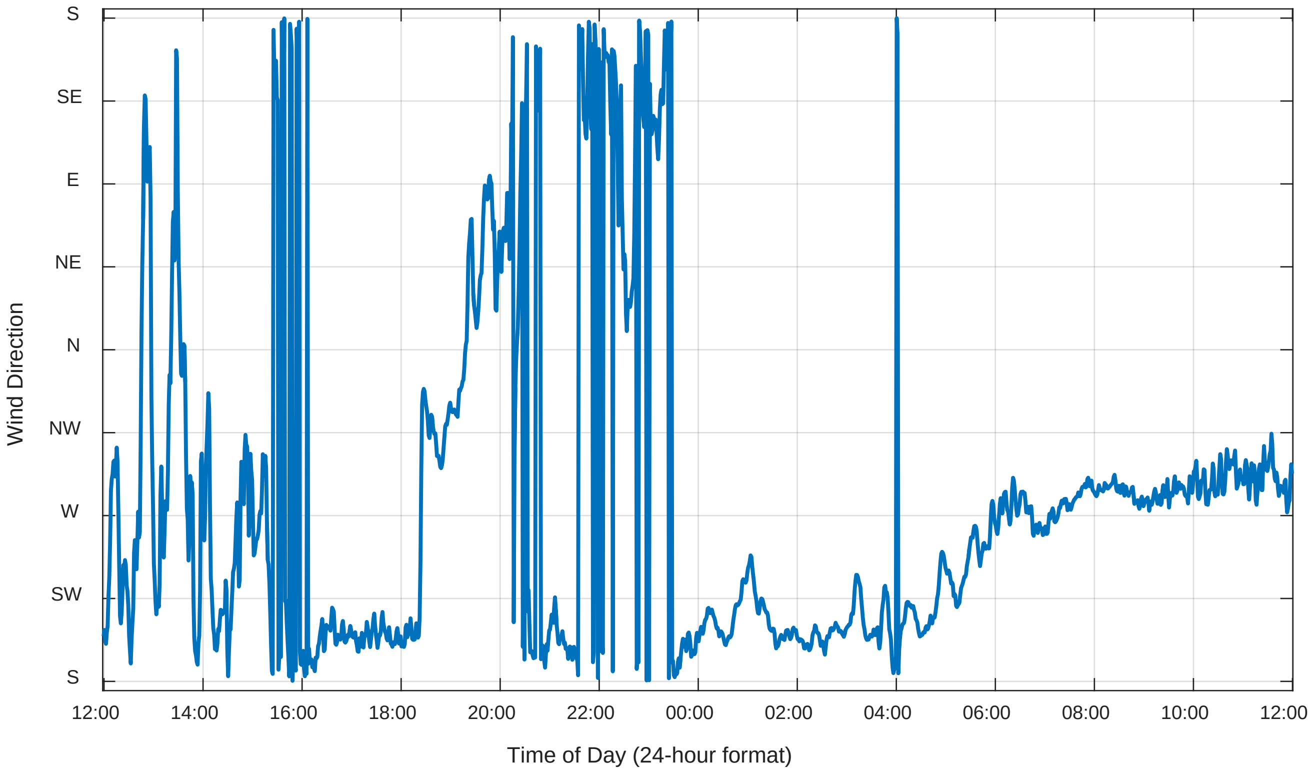
Monitored Barometric Pressure (June 24 - 25, 2020) at Noise Monitor Location 6



Monitored Rain Rate (June 24 - 25, 2020) at Noise Monitor Location 6



Monitored Wind Speed (June 24 - 25, 2020) at Noise Monitor Location 11



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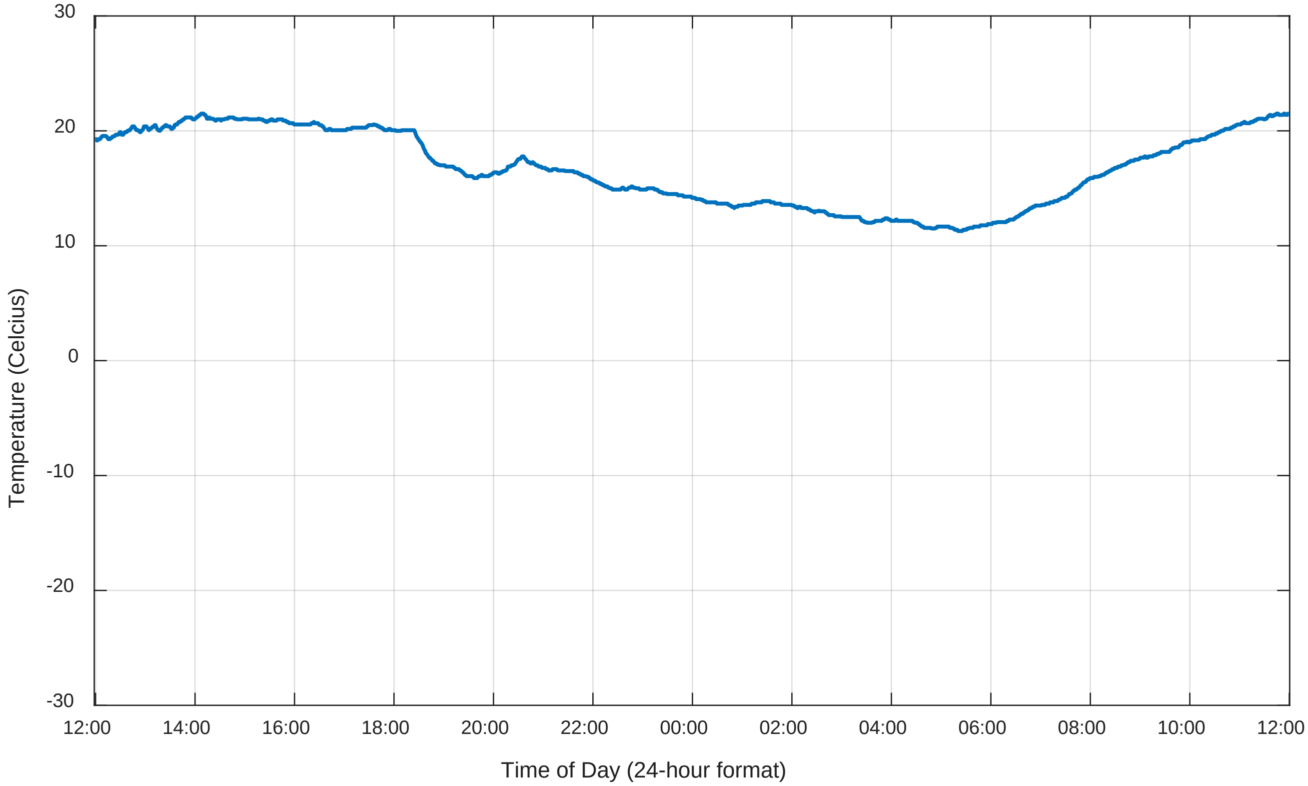
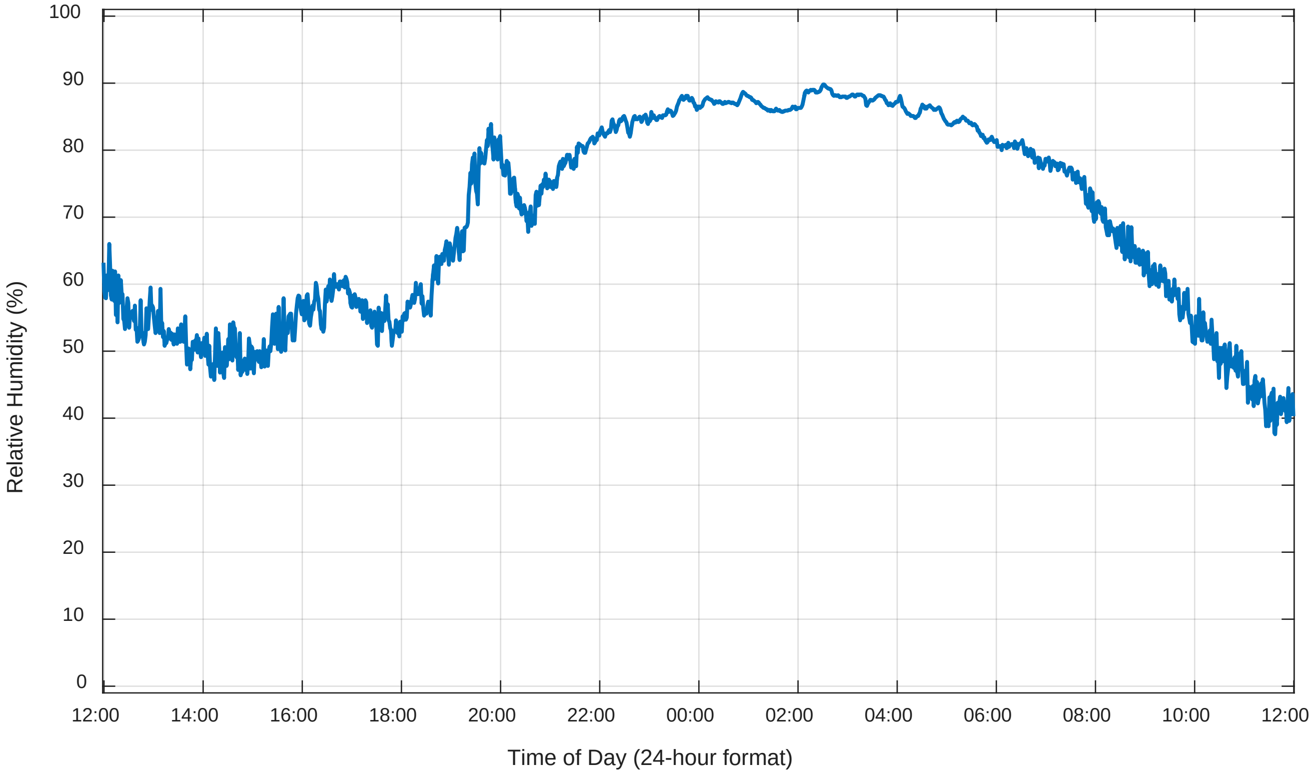


Monitored Temperature (June 24 - 25, 2020) at Noise Monitor Location 11



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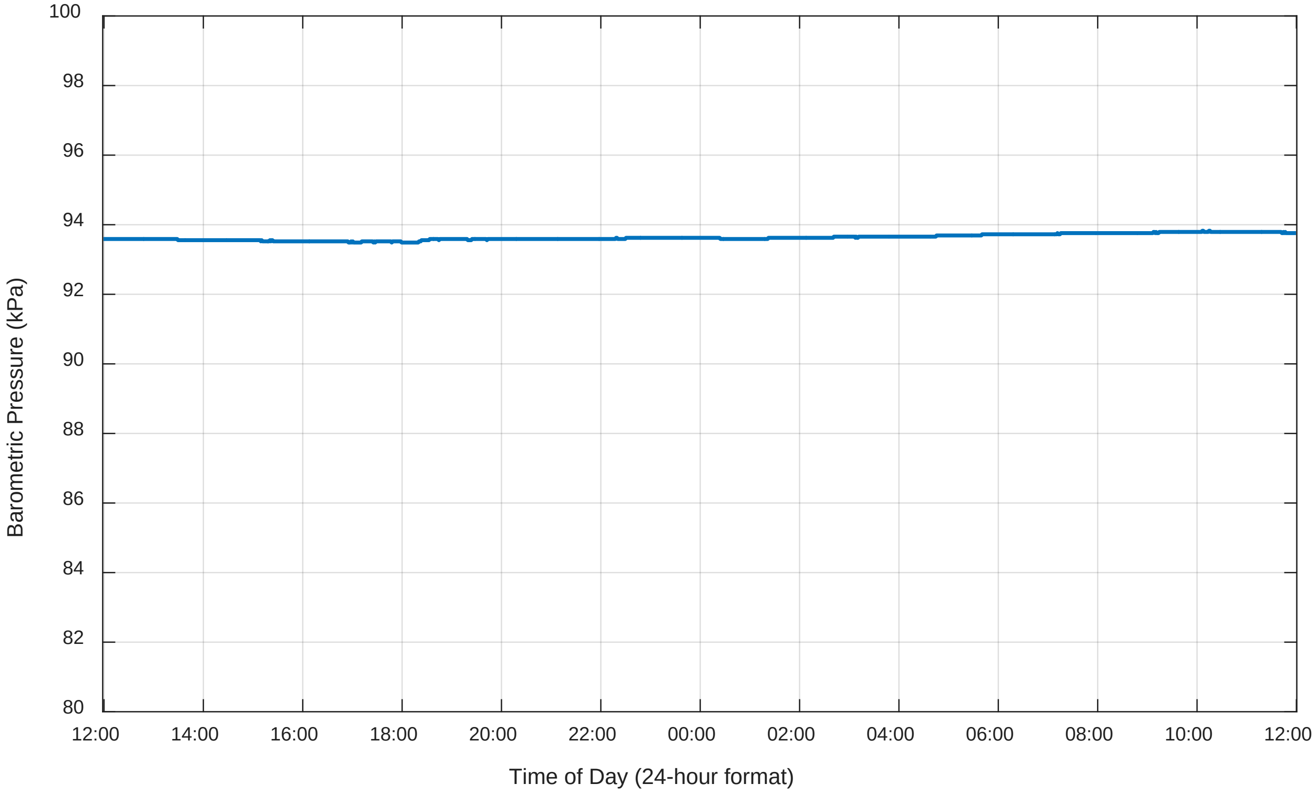

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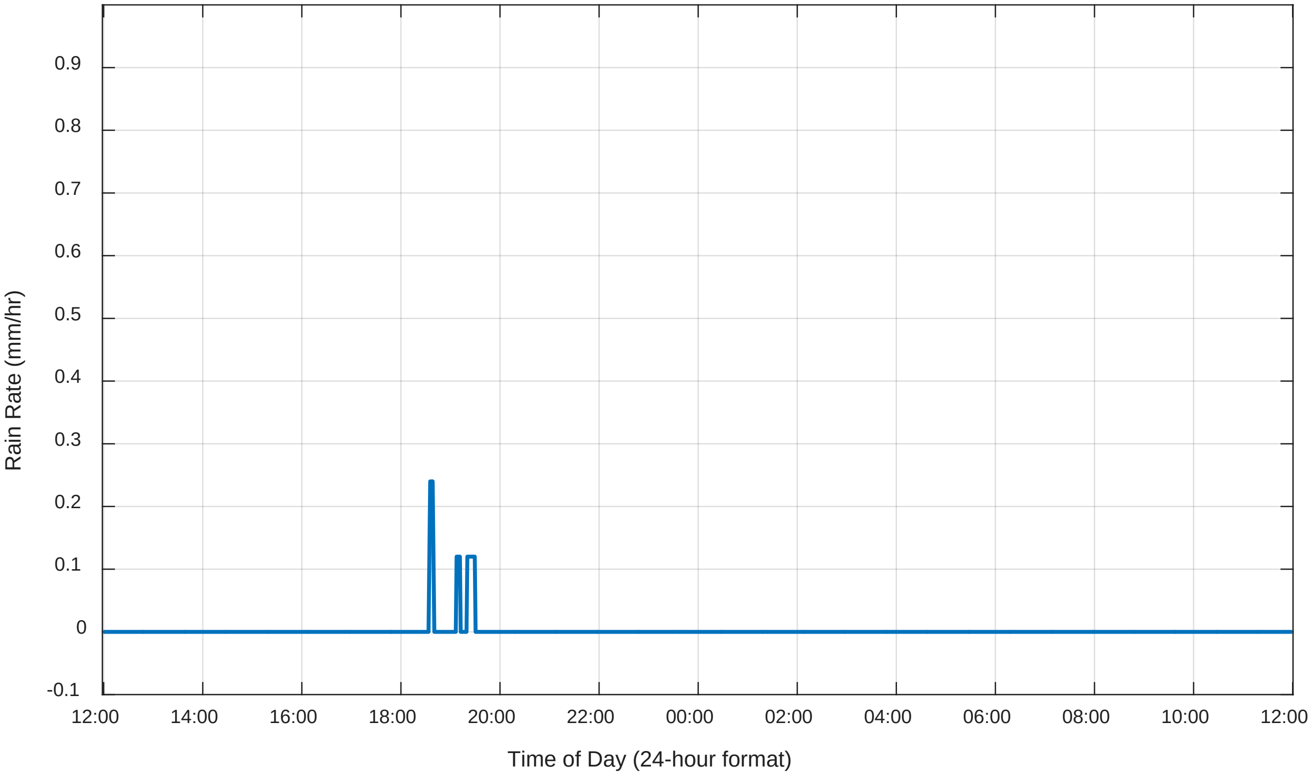
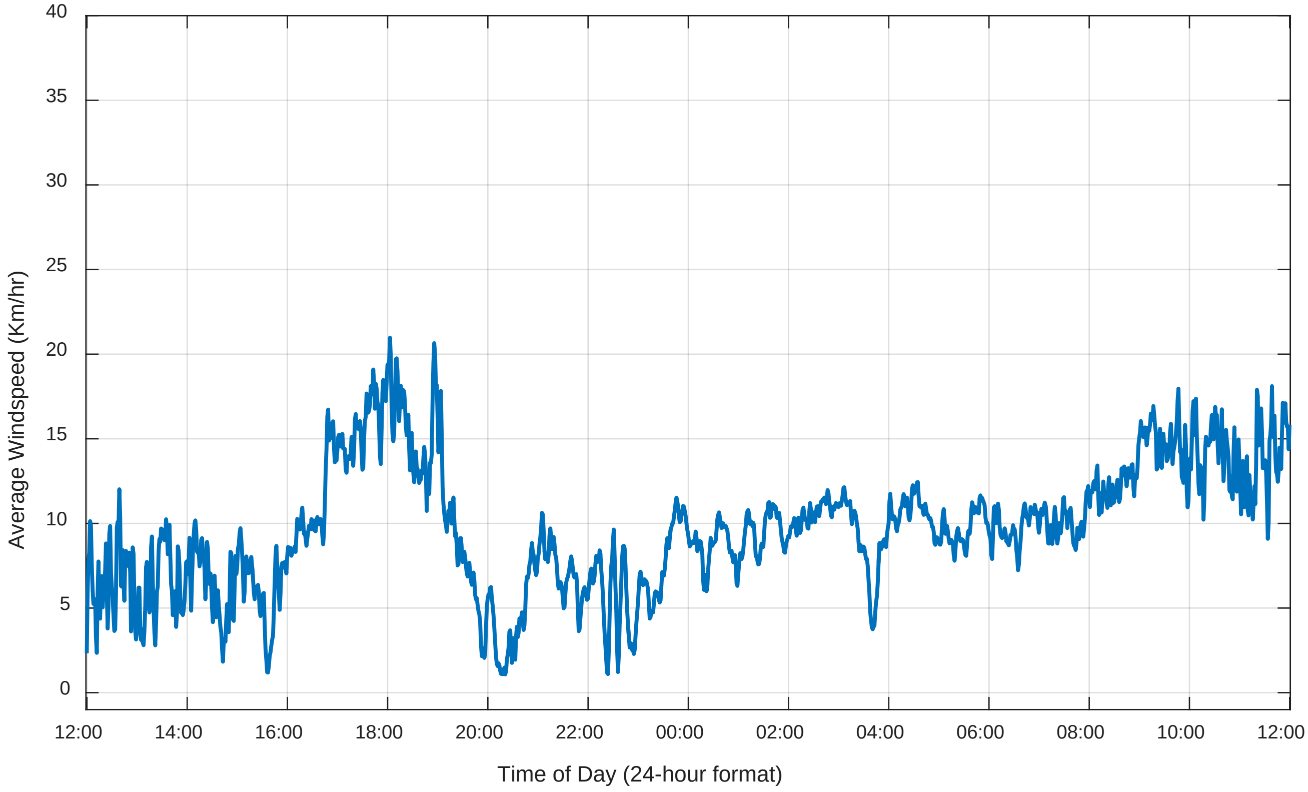
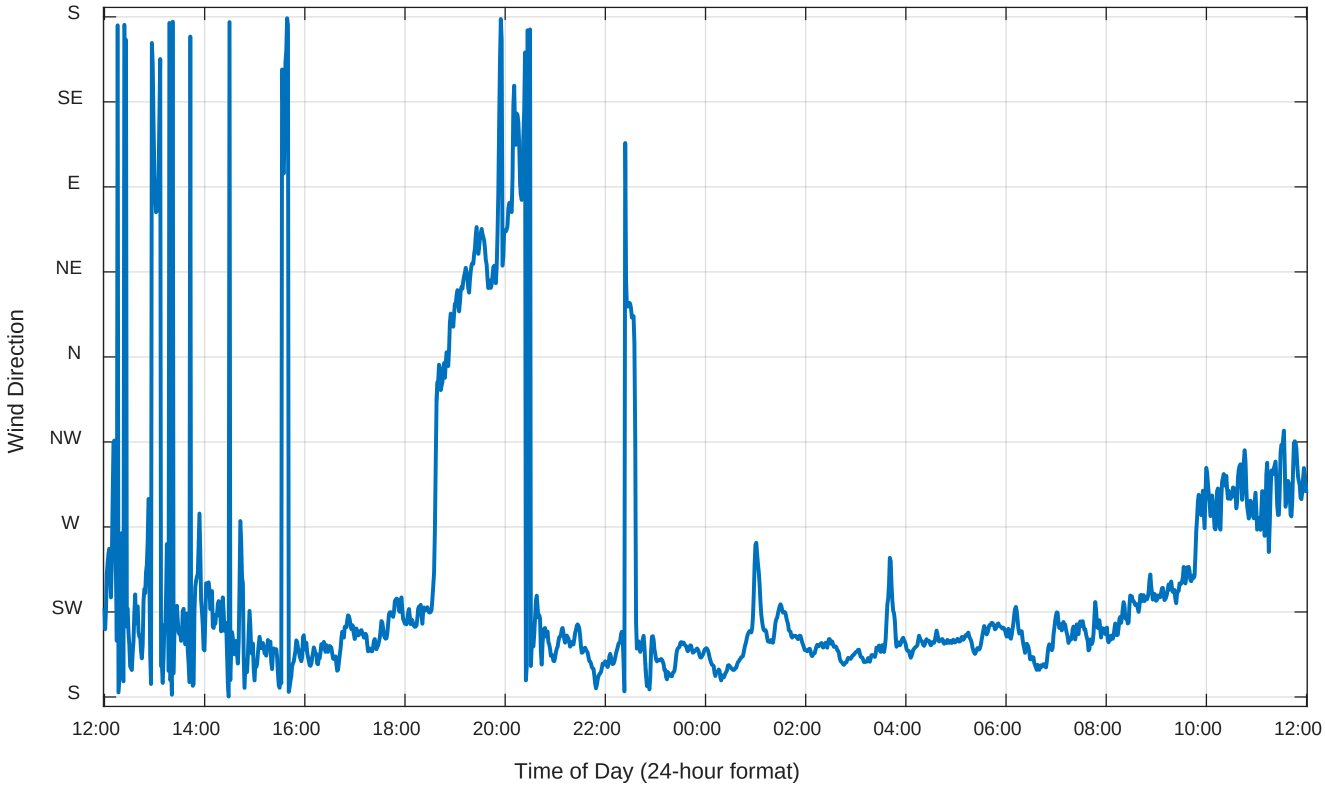


Monitored Rain Rate (June 24 - 25, 2020) at Noise Monitor Location 11



Monitored Wind Speed (June 24 - 25, 2020) at Noise Monitor Location 12



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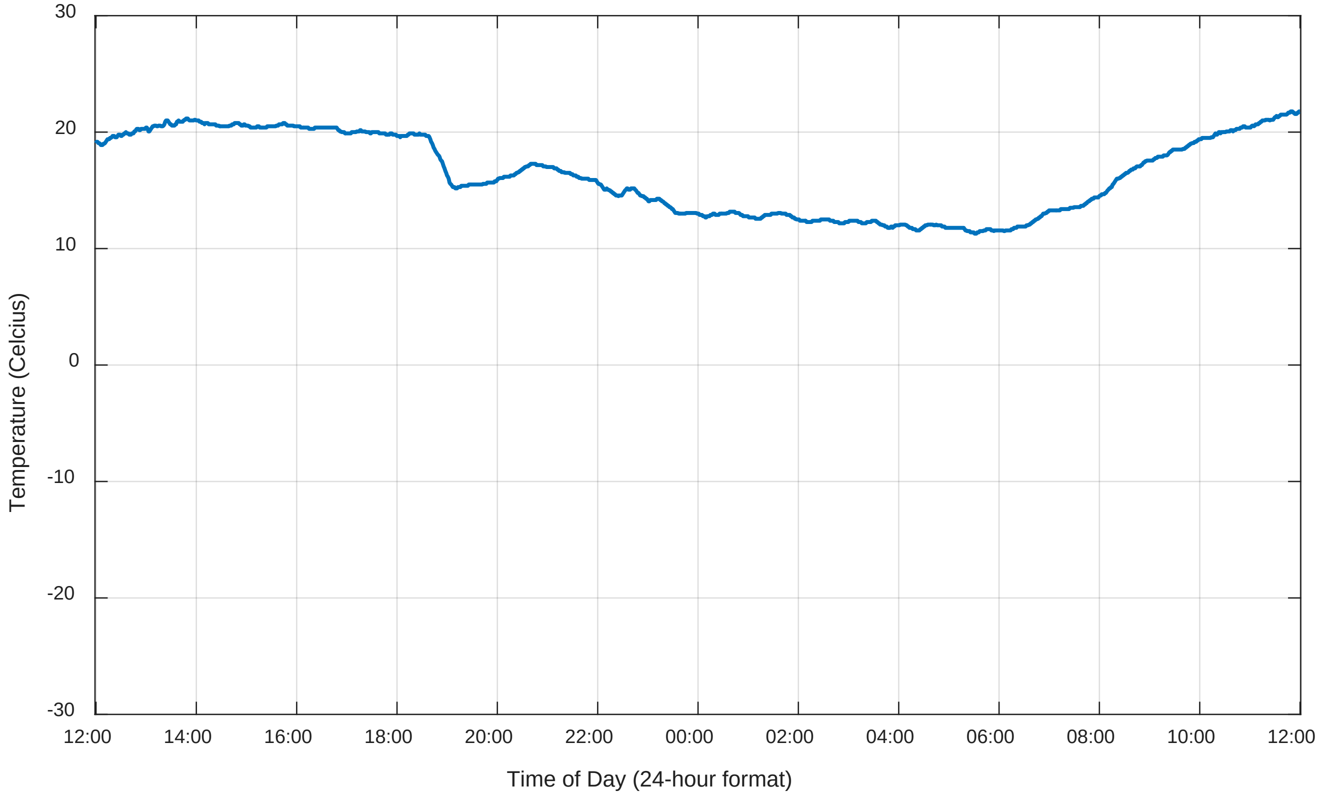
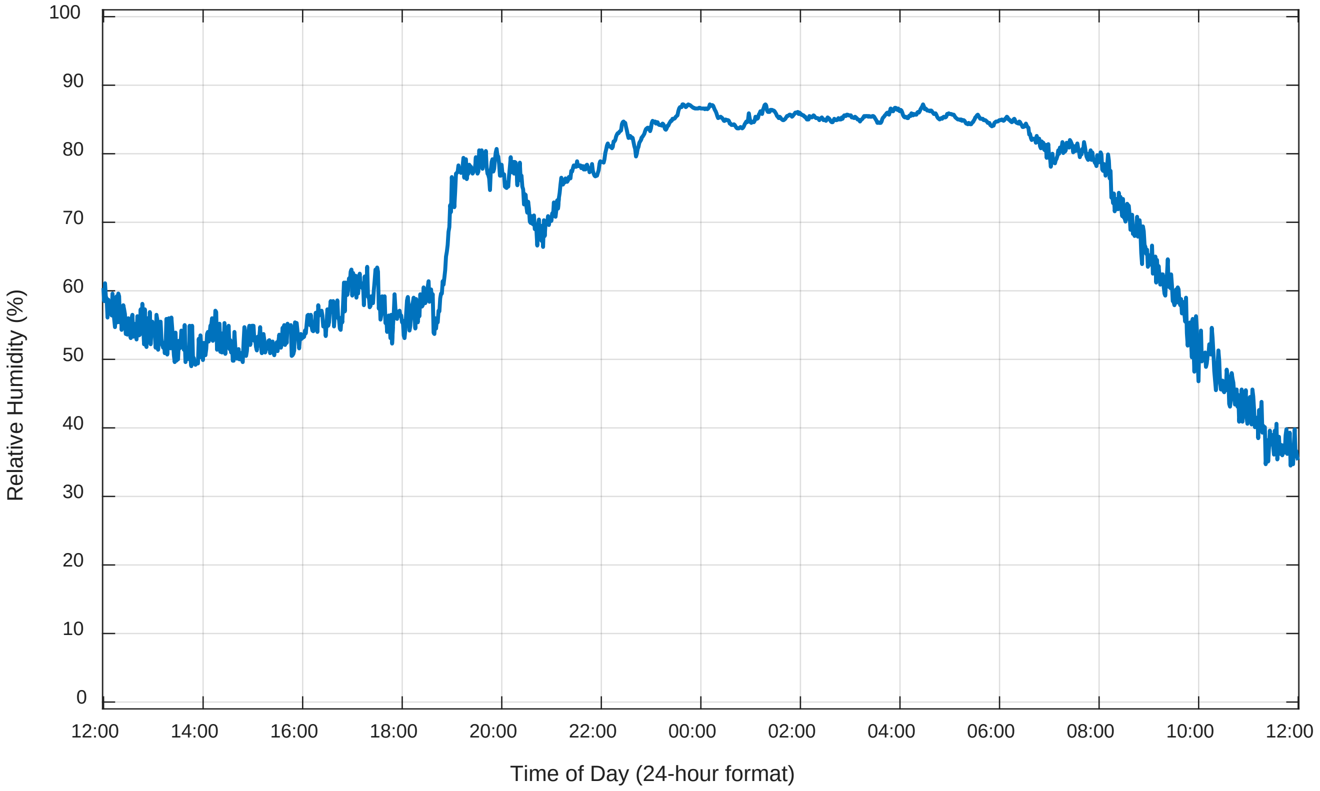


Monitored Temperature (June 24 - 25, 2020) at Noise Monitor Location 12



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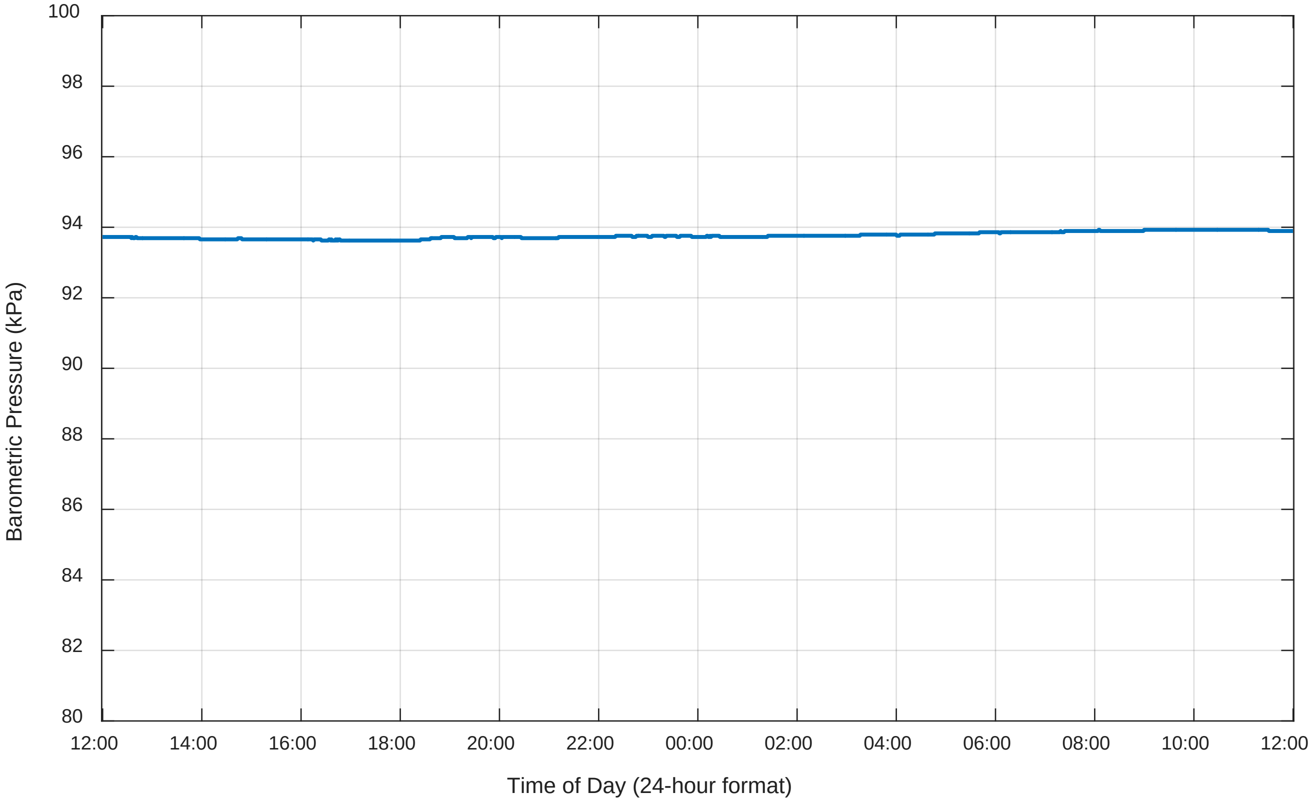
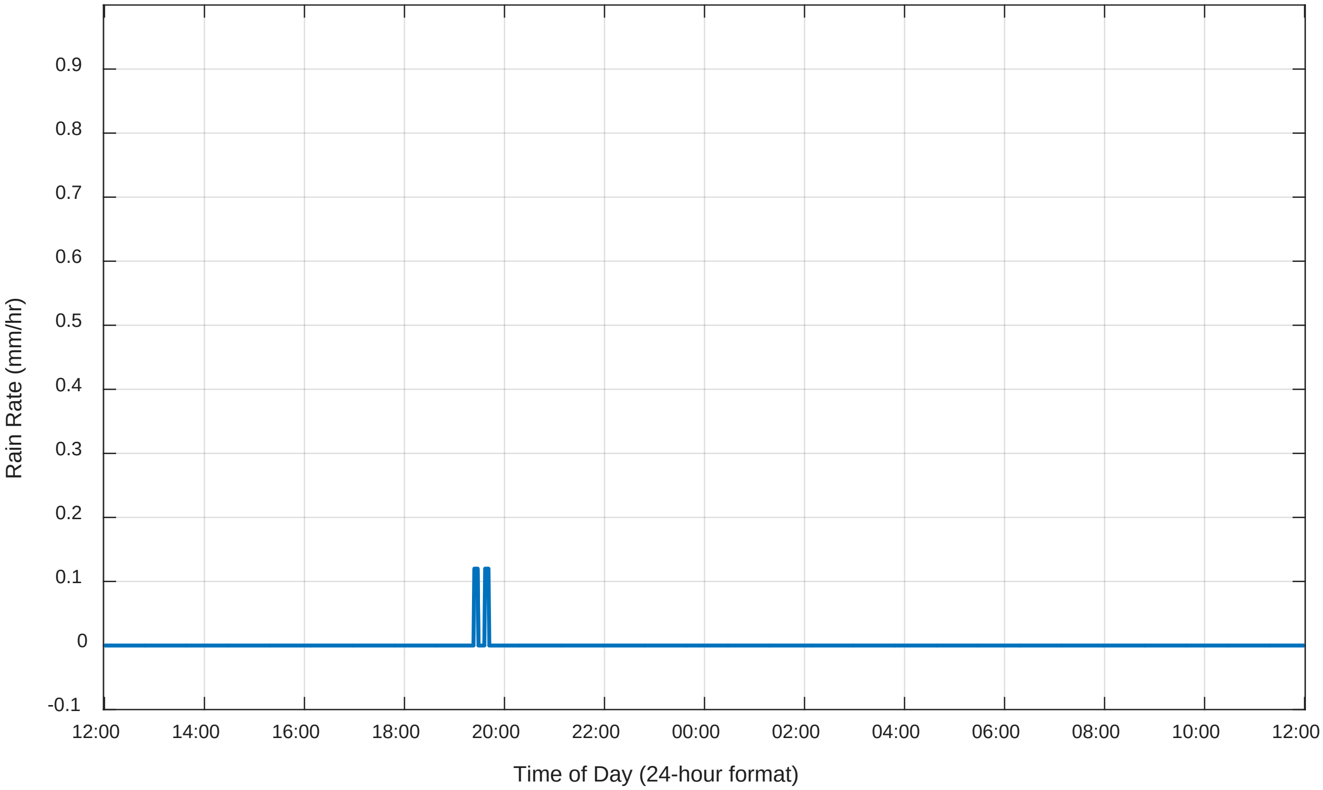
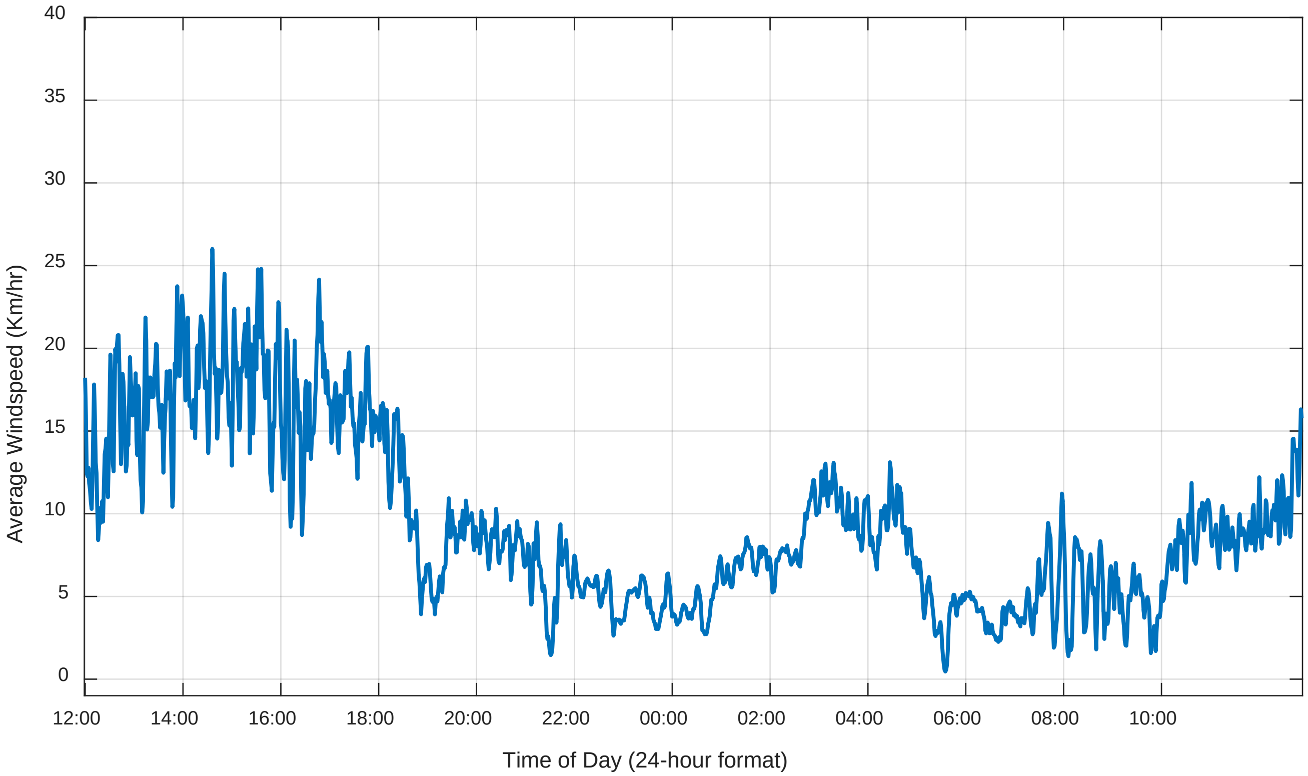


Monitored Barometric Pressure (June 24 - 25, 2020) at Noise Monitor Location 12

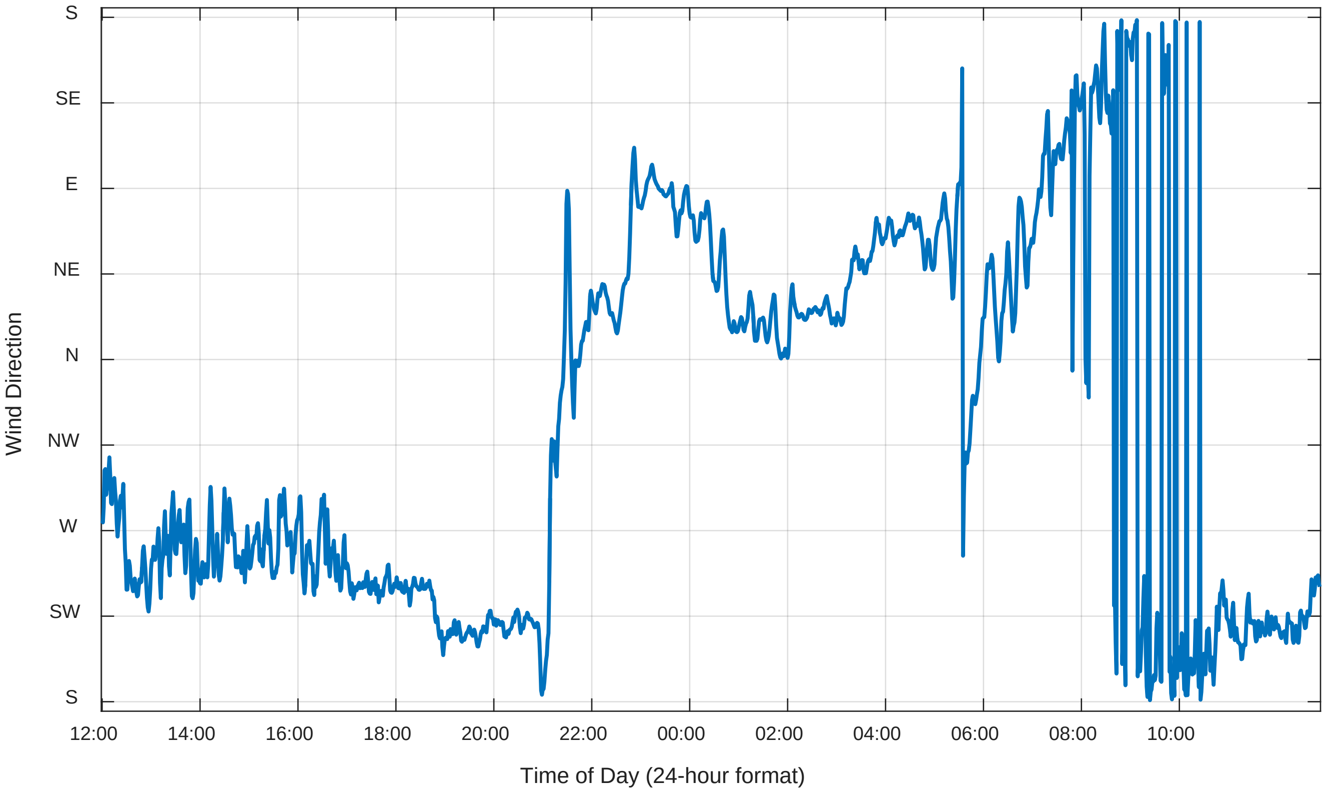


Monitored Rain Rate (June 24 - 25, 2020) at Noise Monitor Location 12

June 25 – 26, 2020 Weather Data



Monitored Wind Speed (June 25 - 26, 2020) at Noise Monitor Location 6



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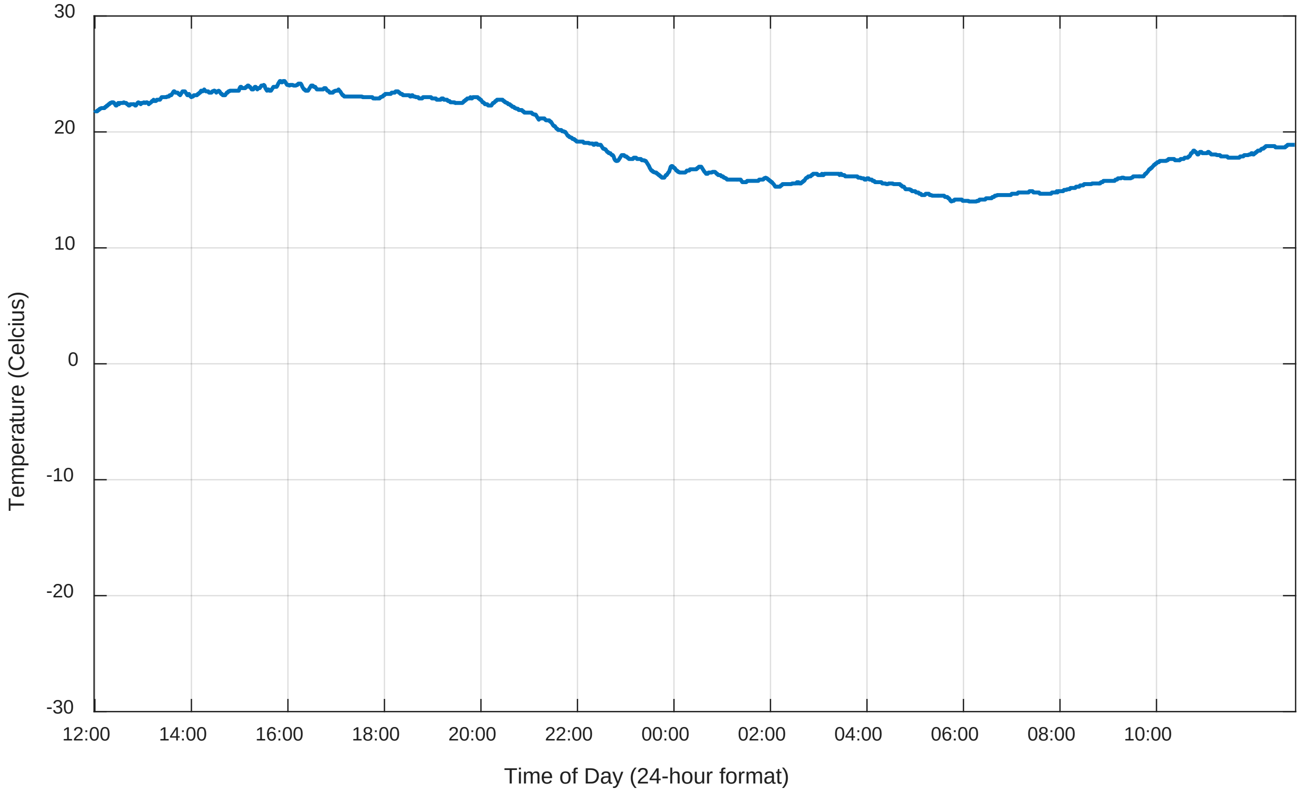
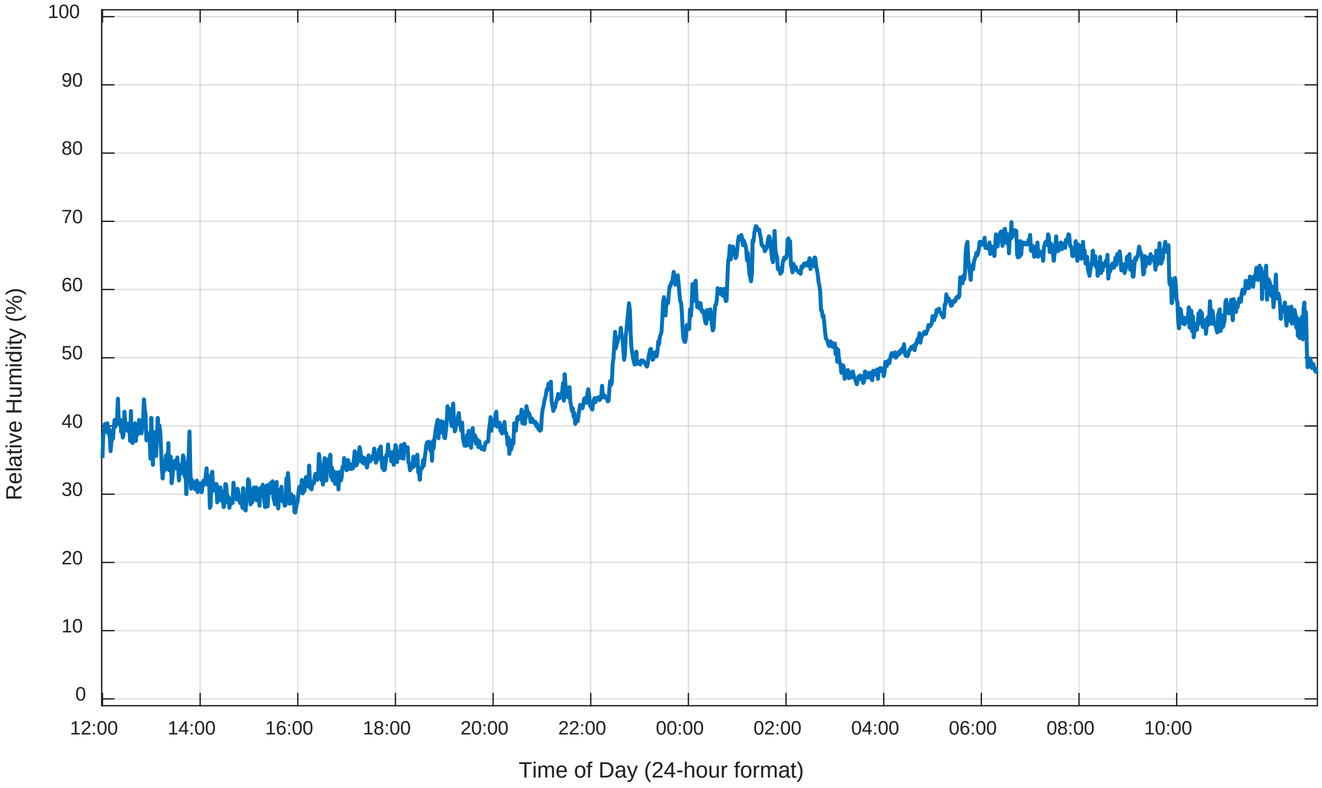


Monitored Temperature (June 25 - 26, 2020) at Noise Monitor Location 6



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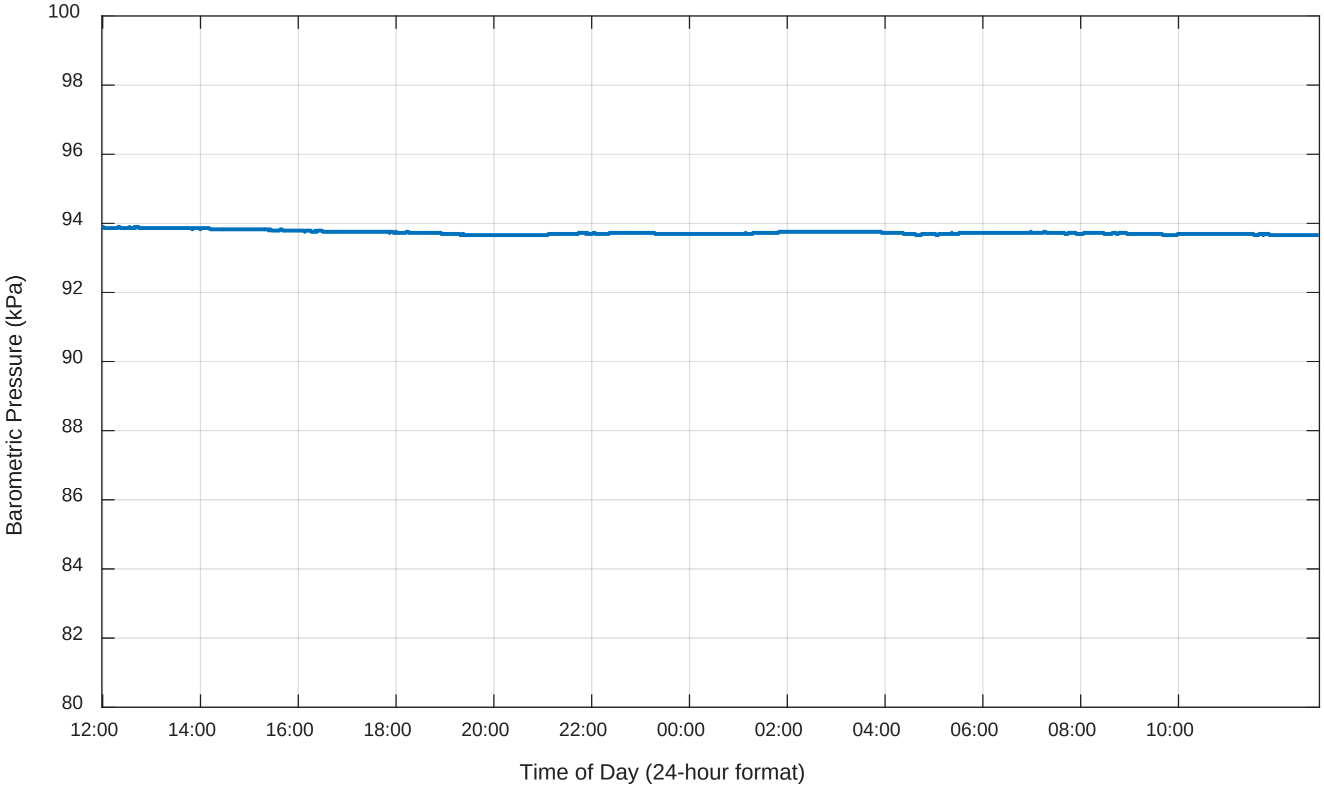
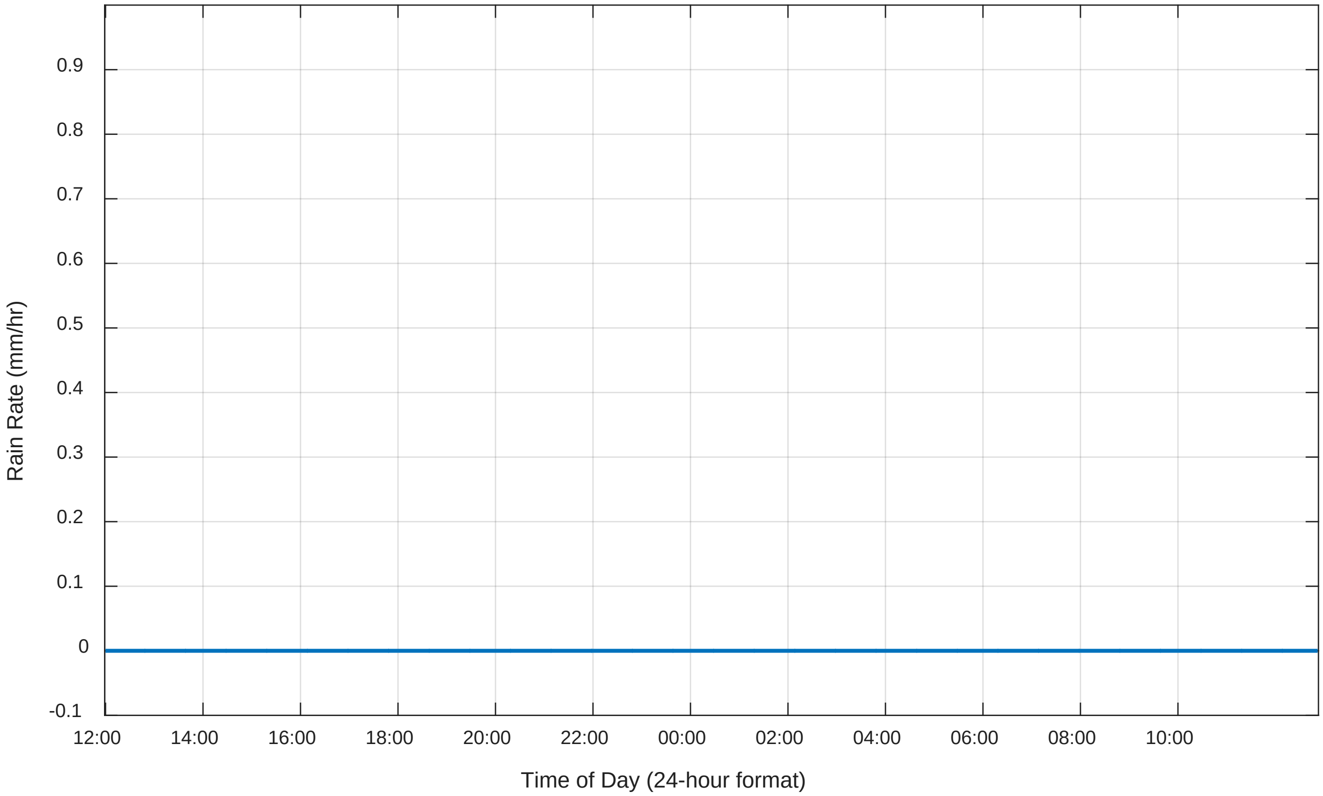
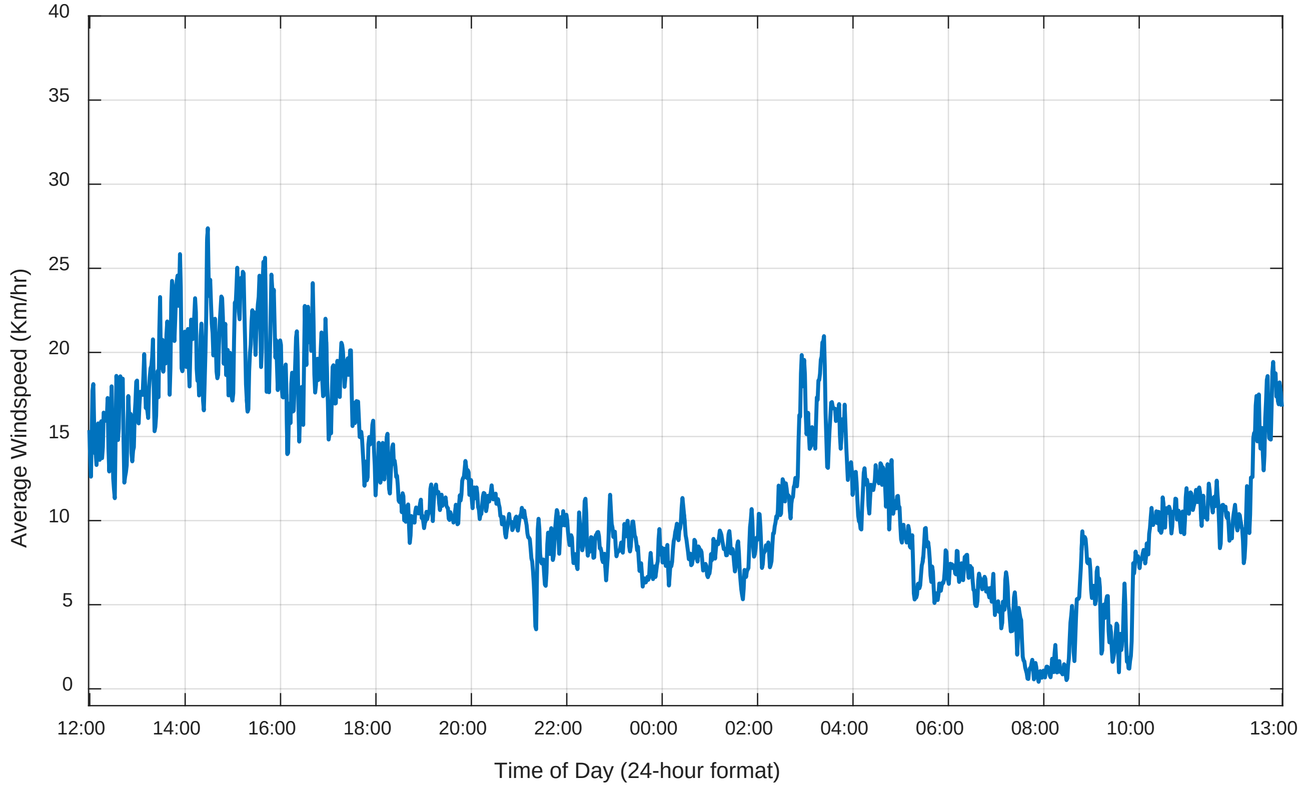


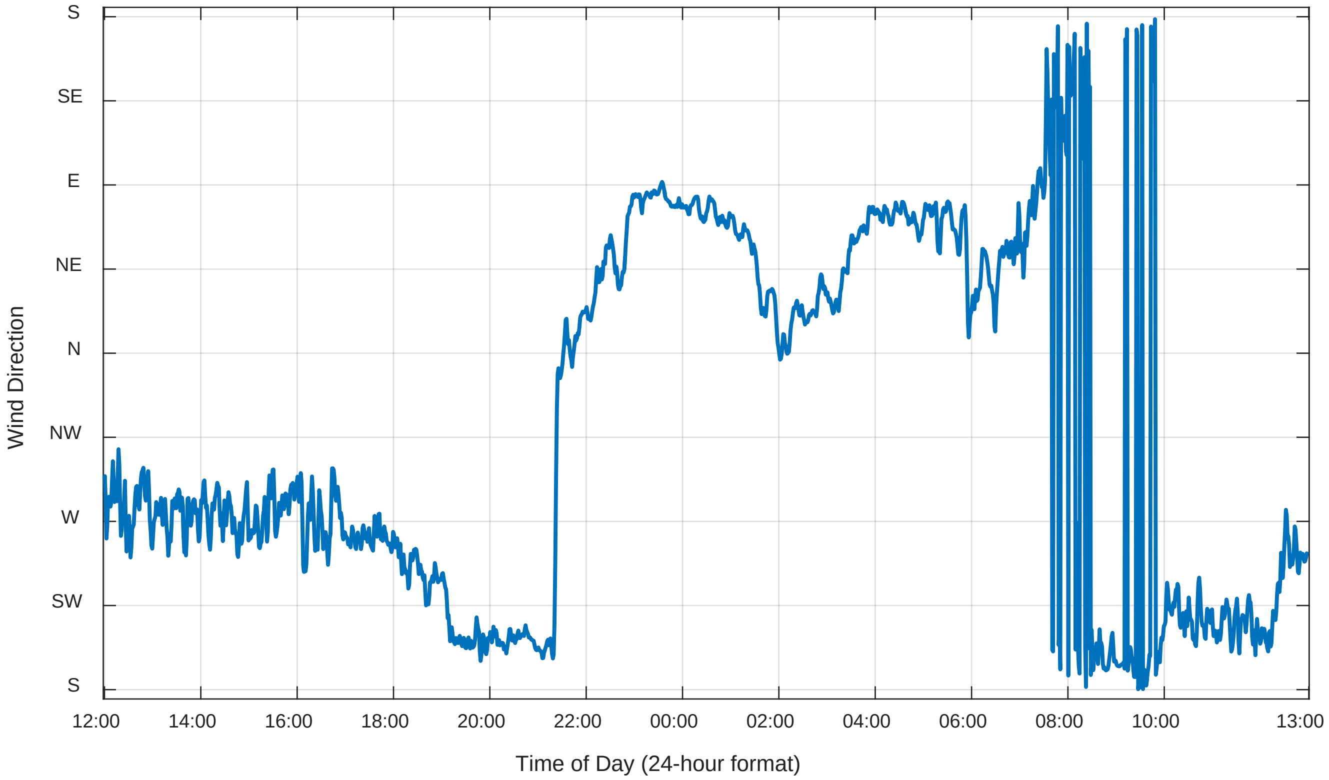
Monitored Barometric Pressure (June 25 - 26, 2020) at Noise Monitor Location 6



Monitored Rain Rate (June 25 - 26, 2020) at Noise Monitor Location 6



Monitored Wind Speed (June 25 - 26, 2020) at Noise Monitor Location 11



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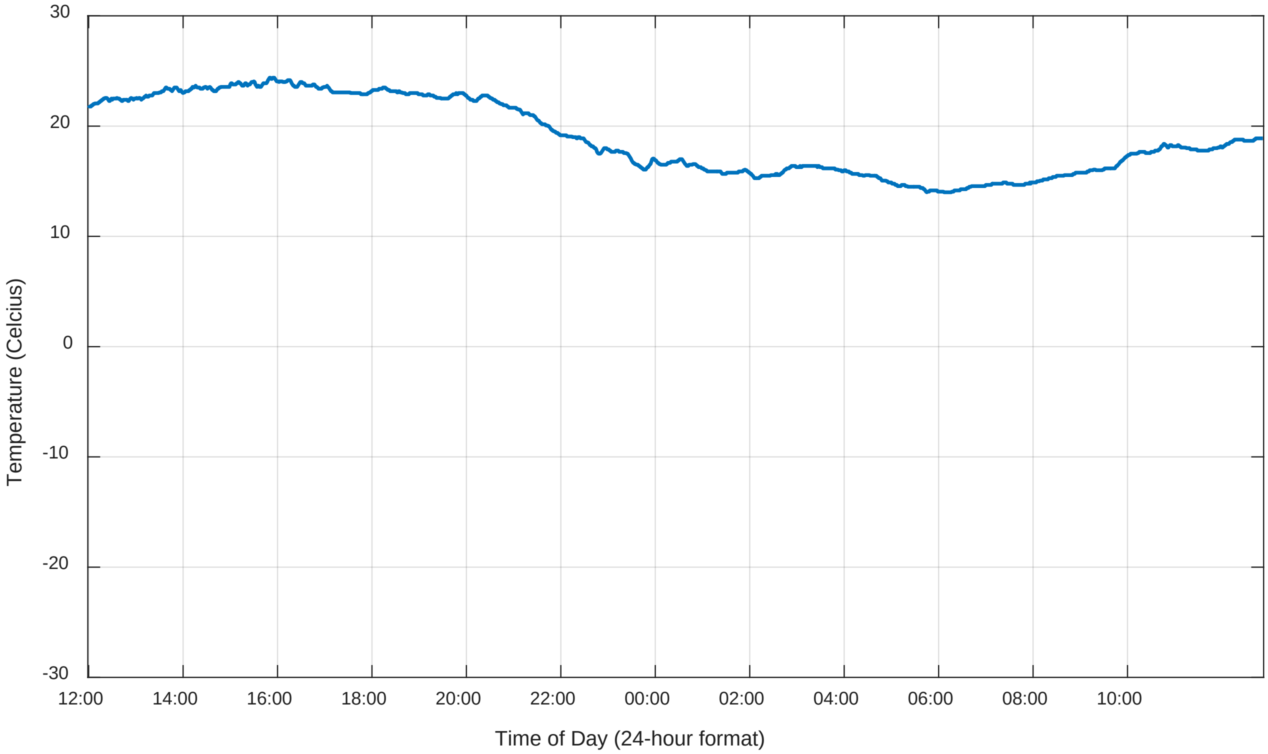
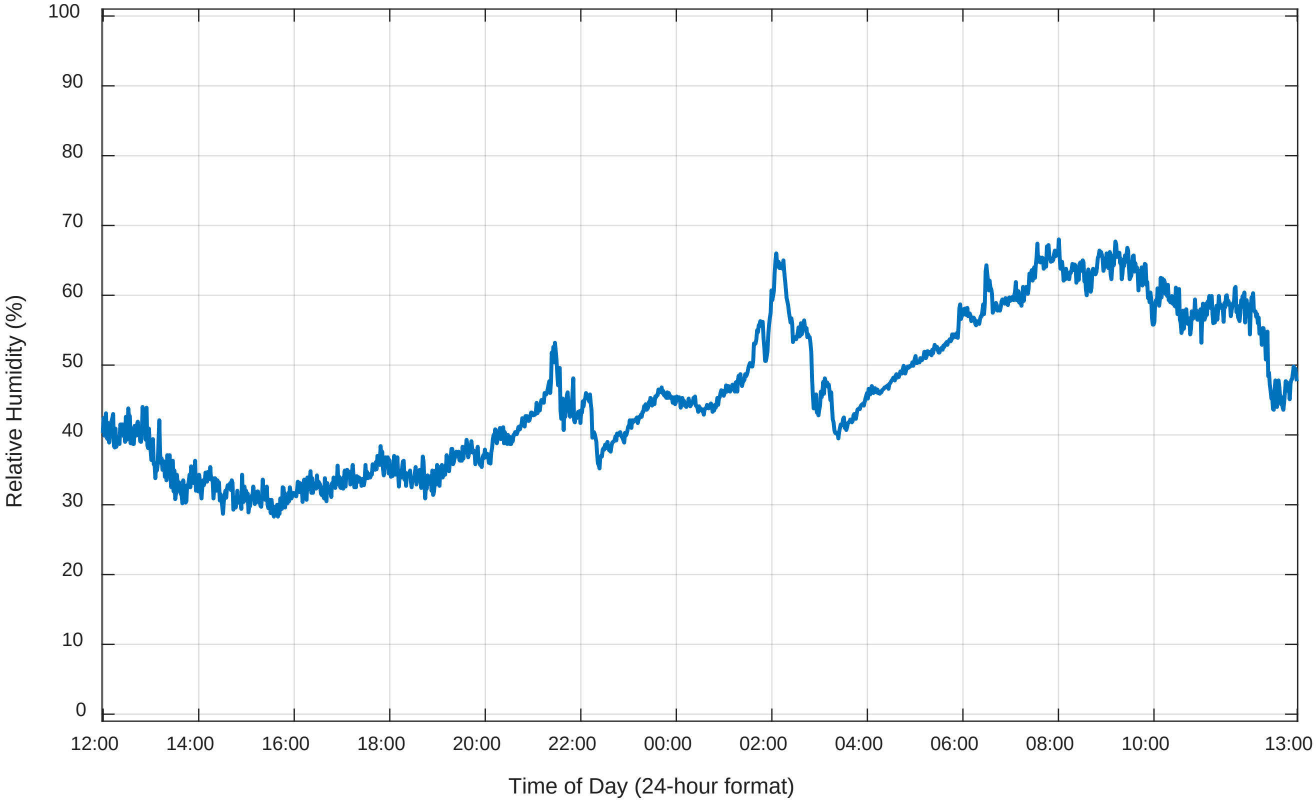


Monitored Temperature (June 25 - 26, 2020) at Noise Monitor Location 11



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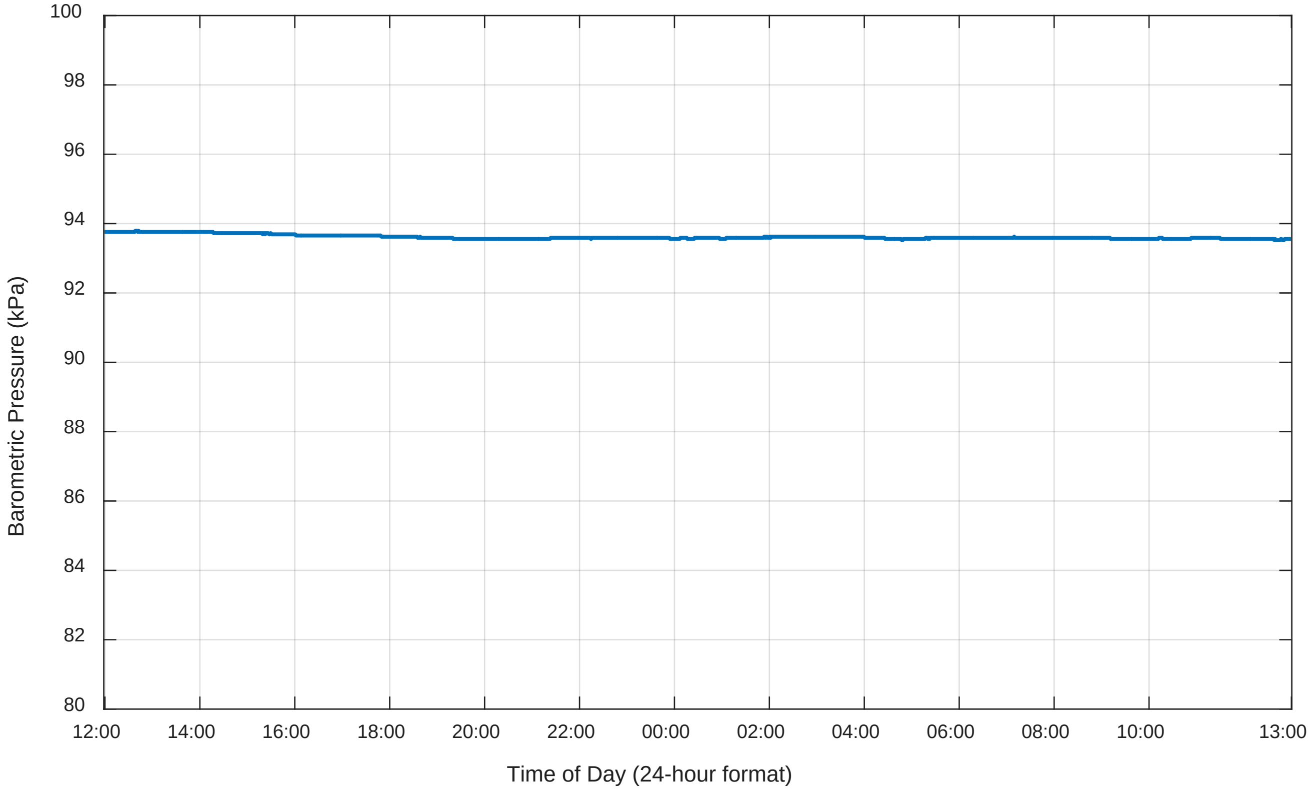

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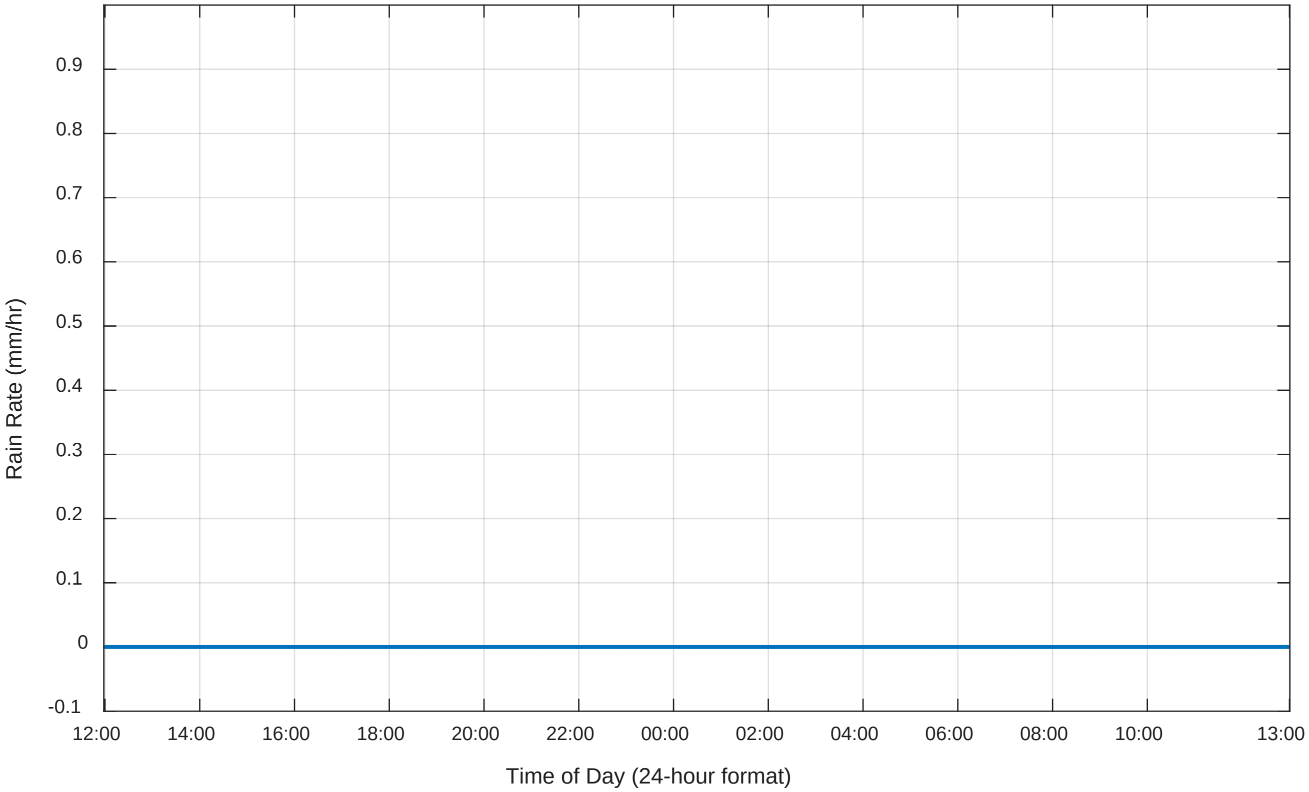

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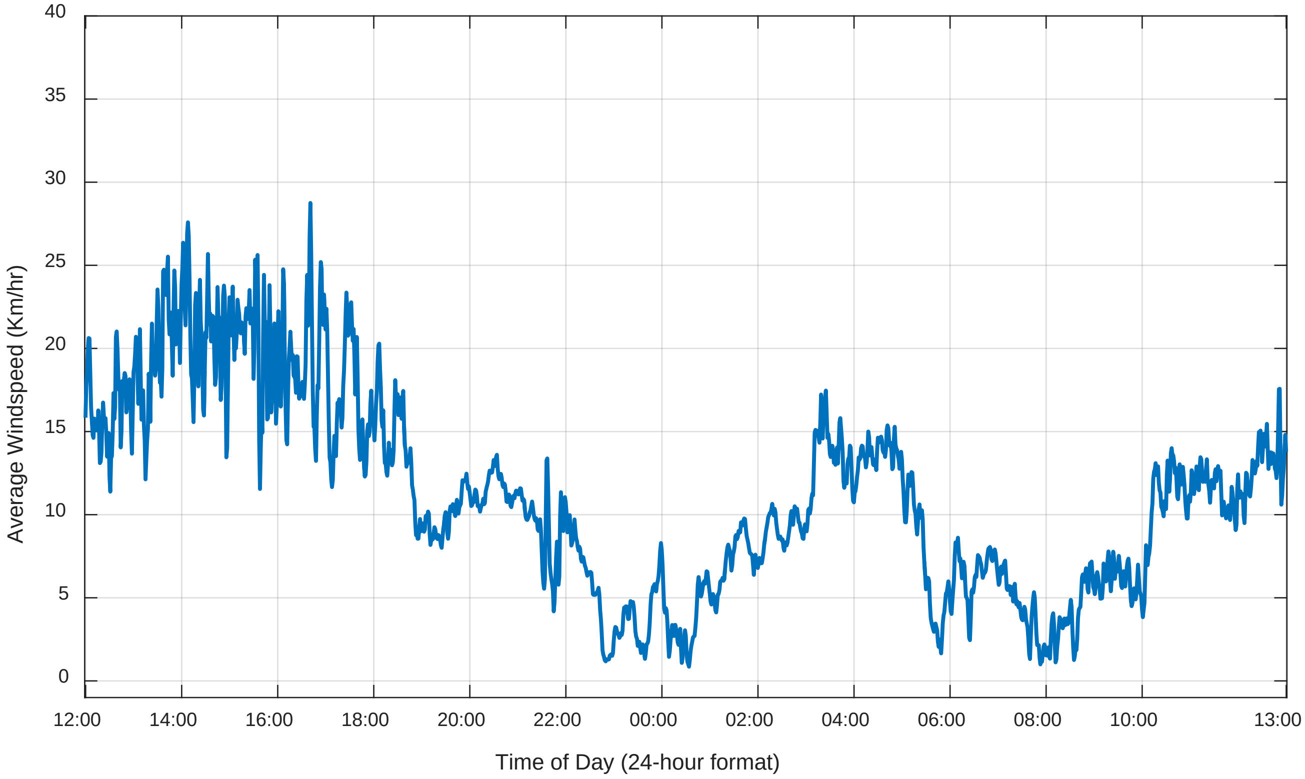
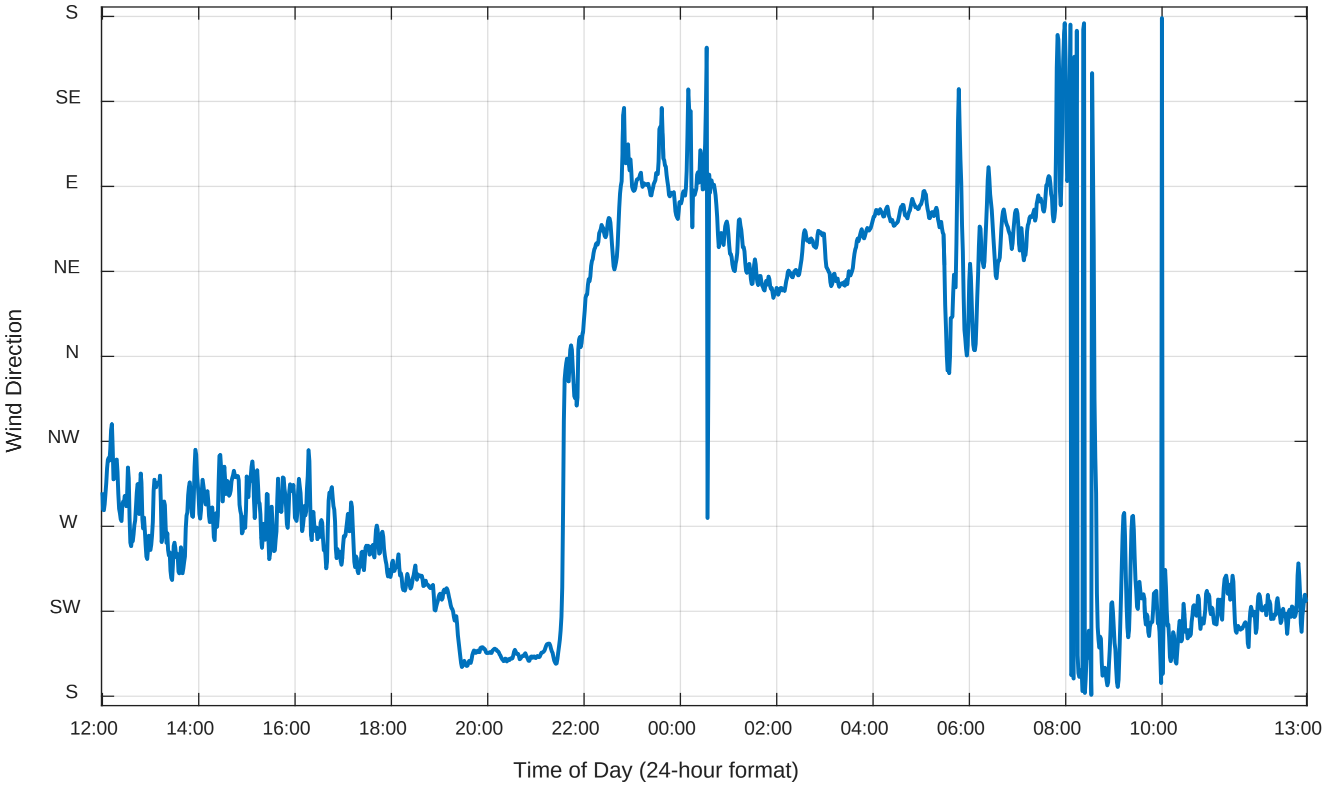


Monitored Wind Speed (June 25 - 26, 2020) at Noise Monitor Location 12



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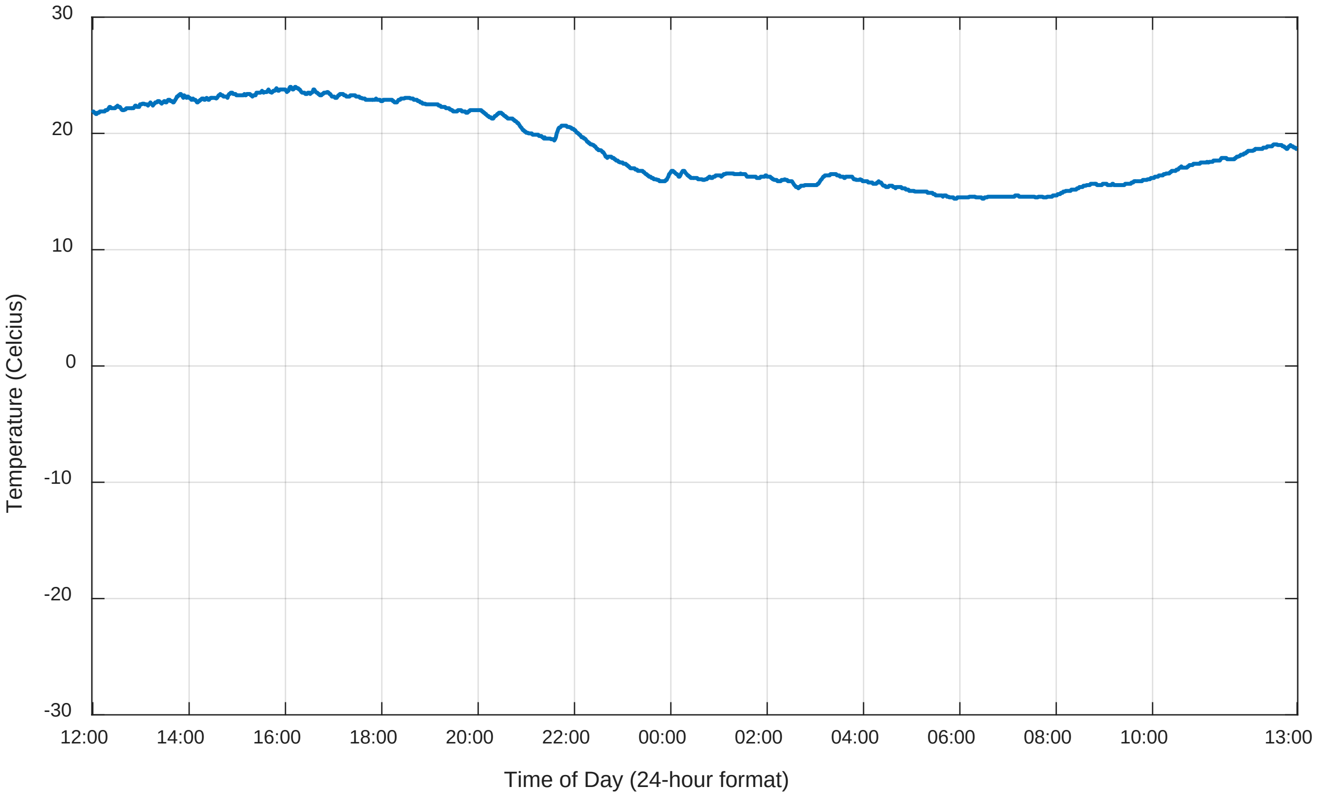
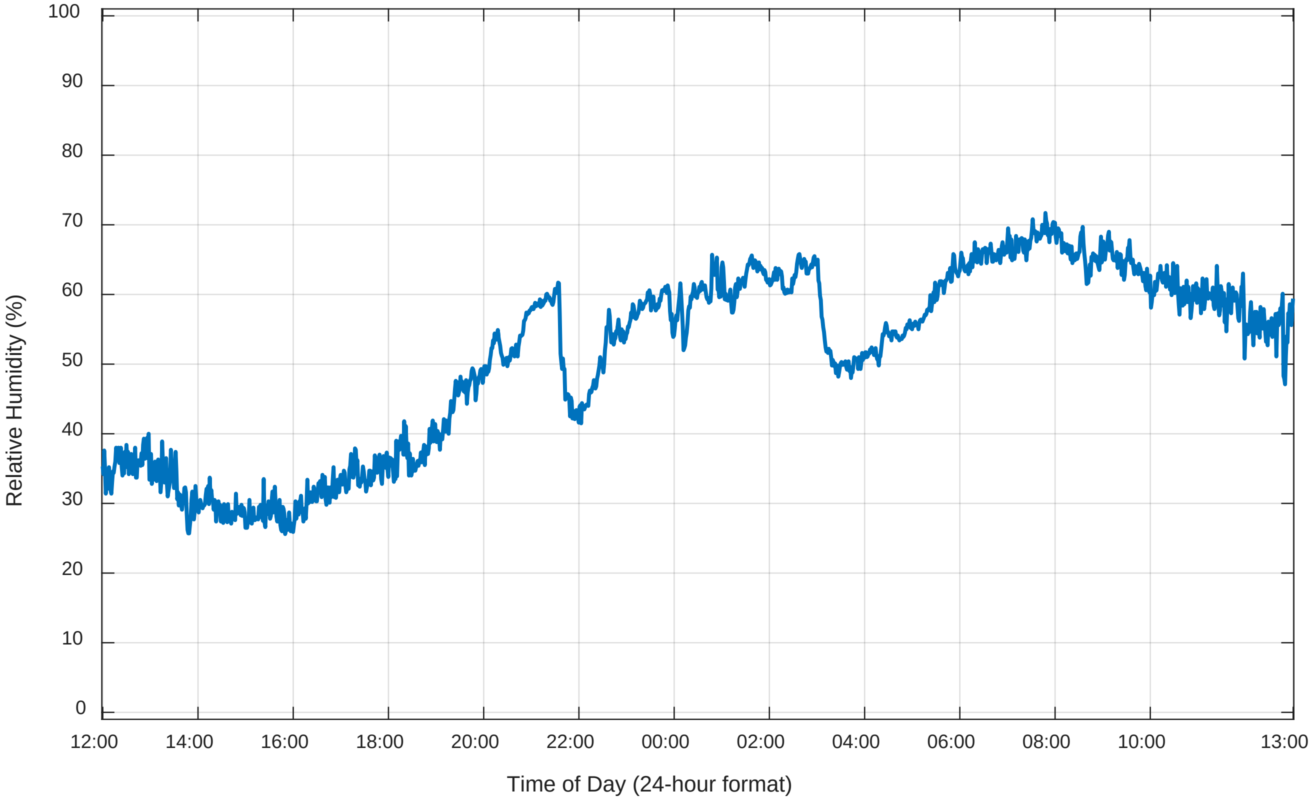


Monitored Temperature (June 25 - 26, 2020) at Noise Monitor Location 12



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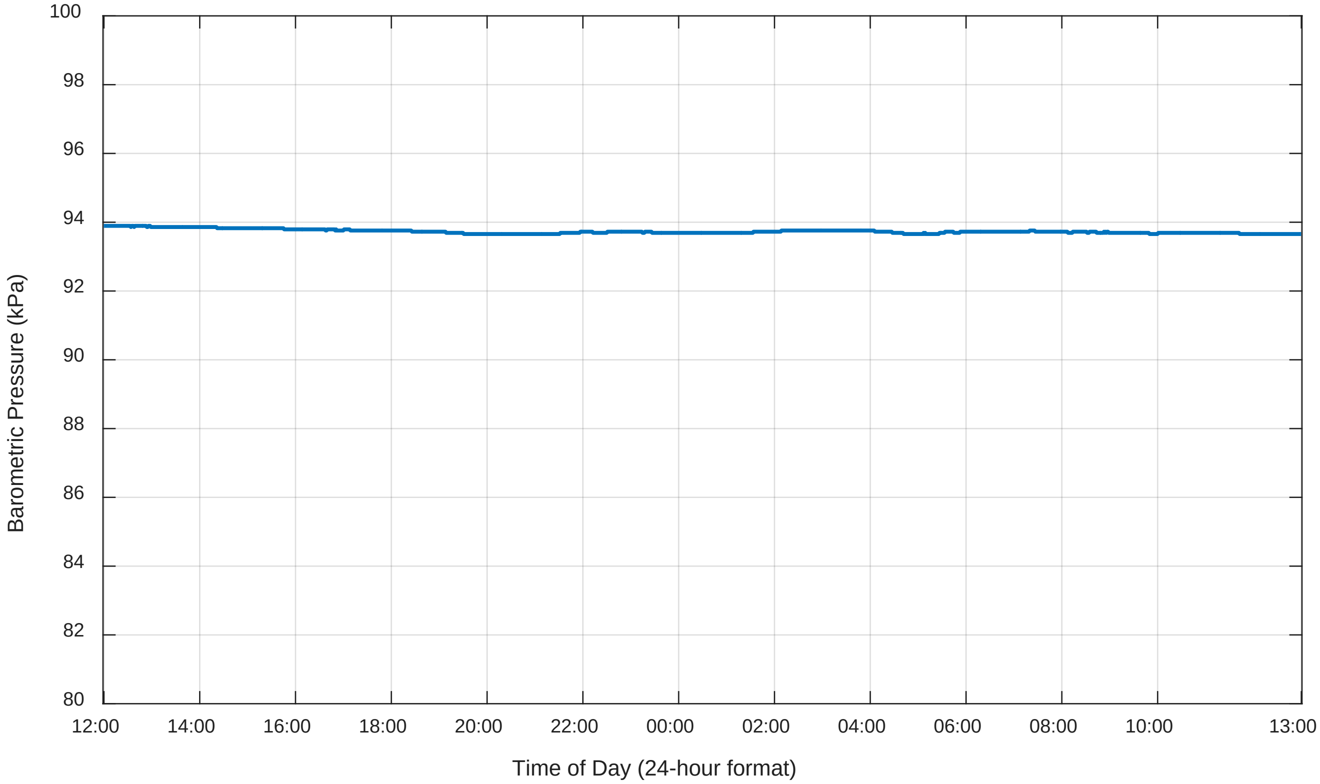
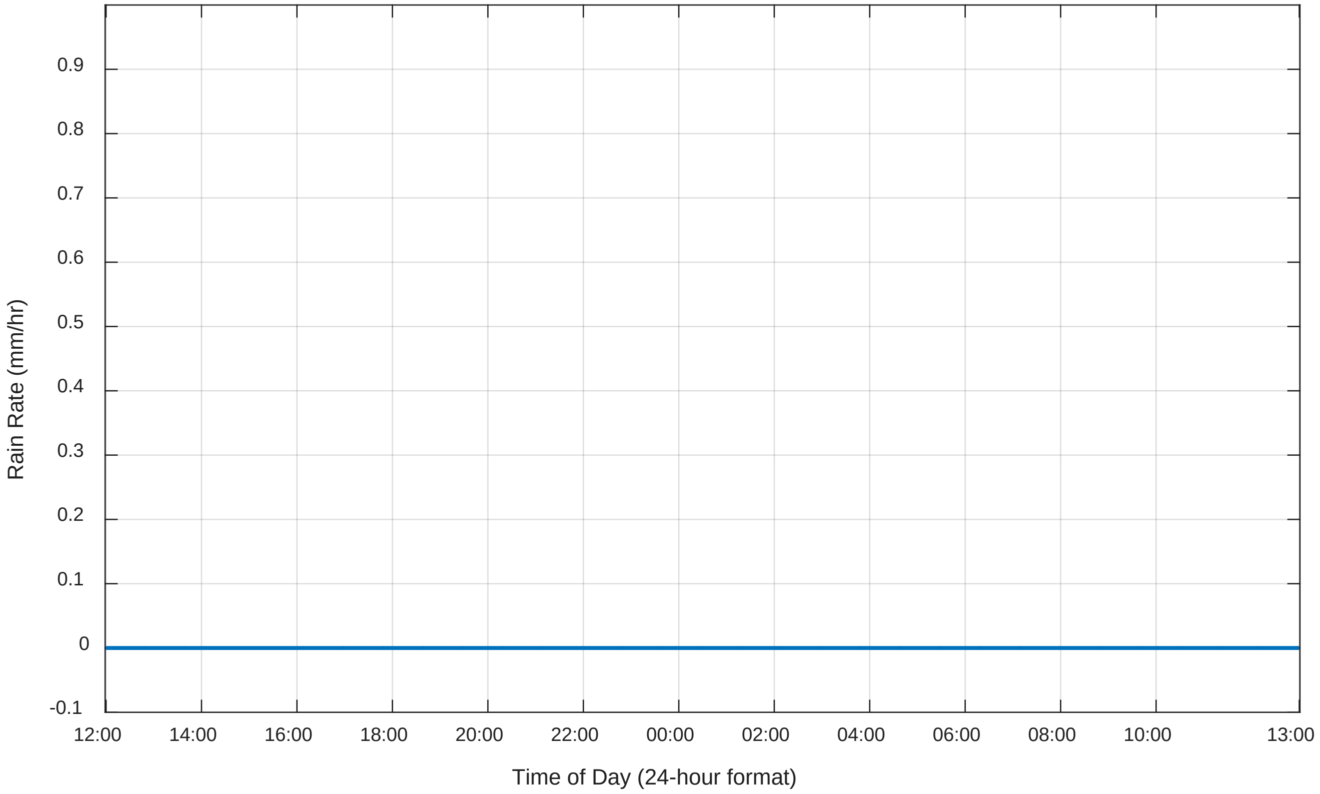
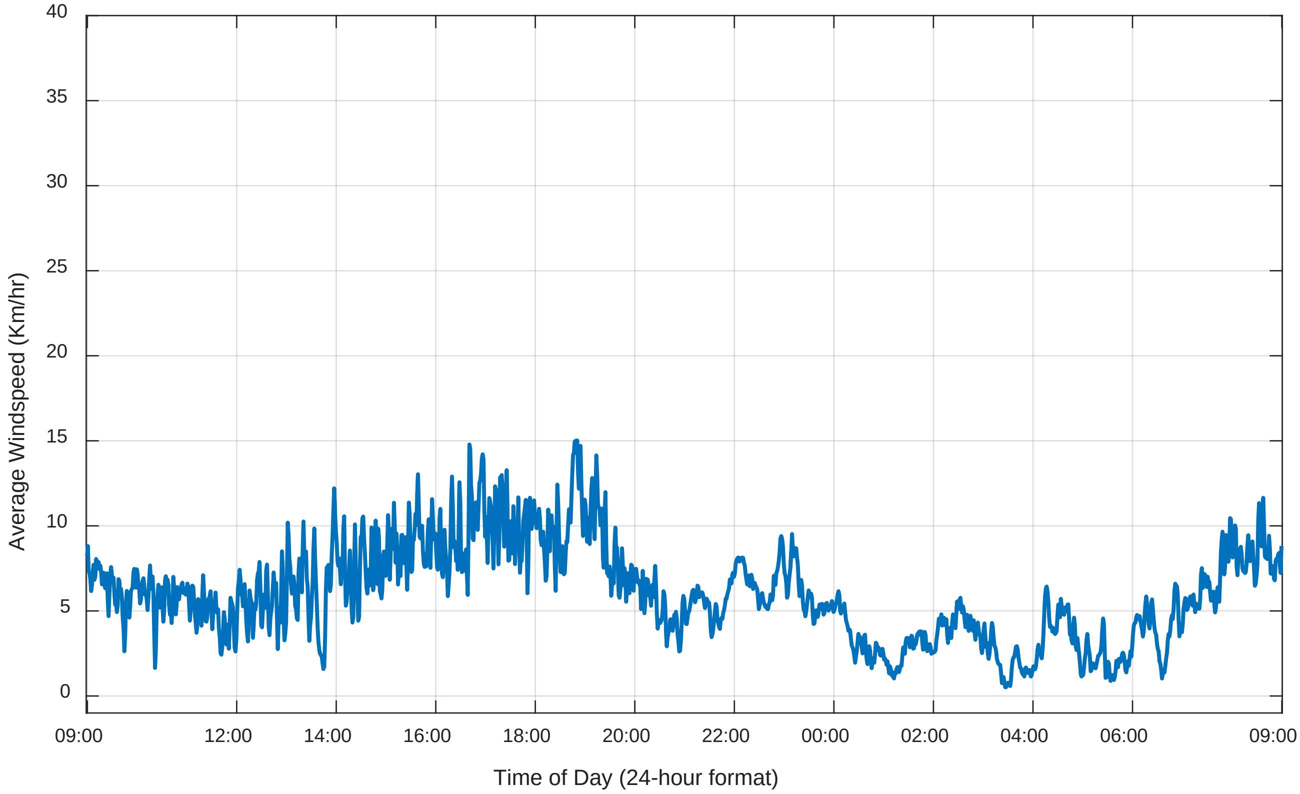


Monitored Barometric Pressure (June 25 - 26, 2020) at Noise Monitor Location 12

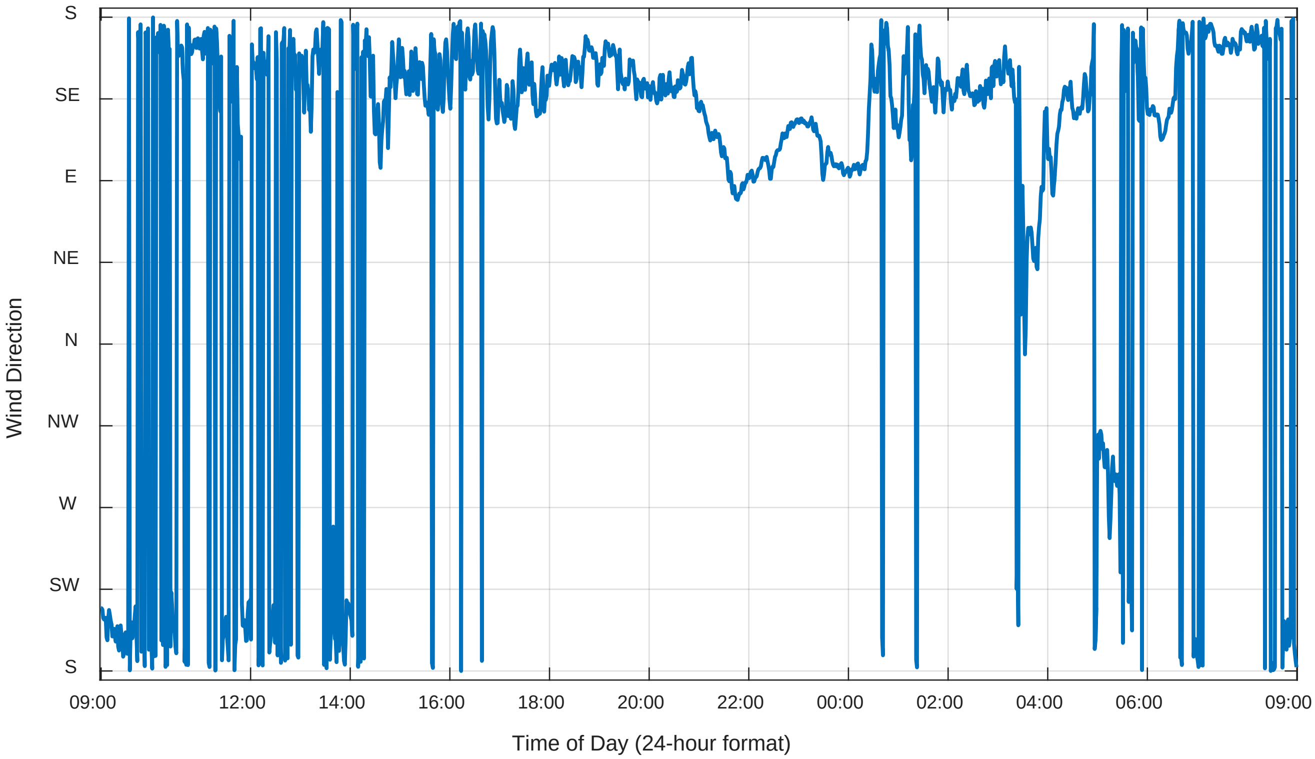


Monitored Rain Rate (June 25 - 26, 2020) at Noise Monitor Location 12

July 27 – 28, 2020 Weather Data



Monitored Wind Speed (July 27 - 28, 2020) at Noise Monitor Location 1



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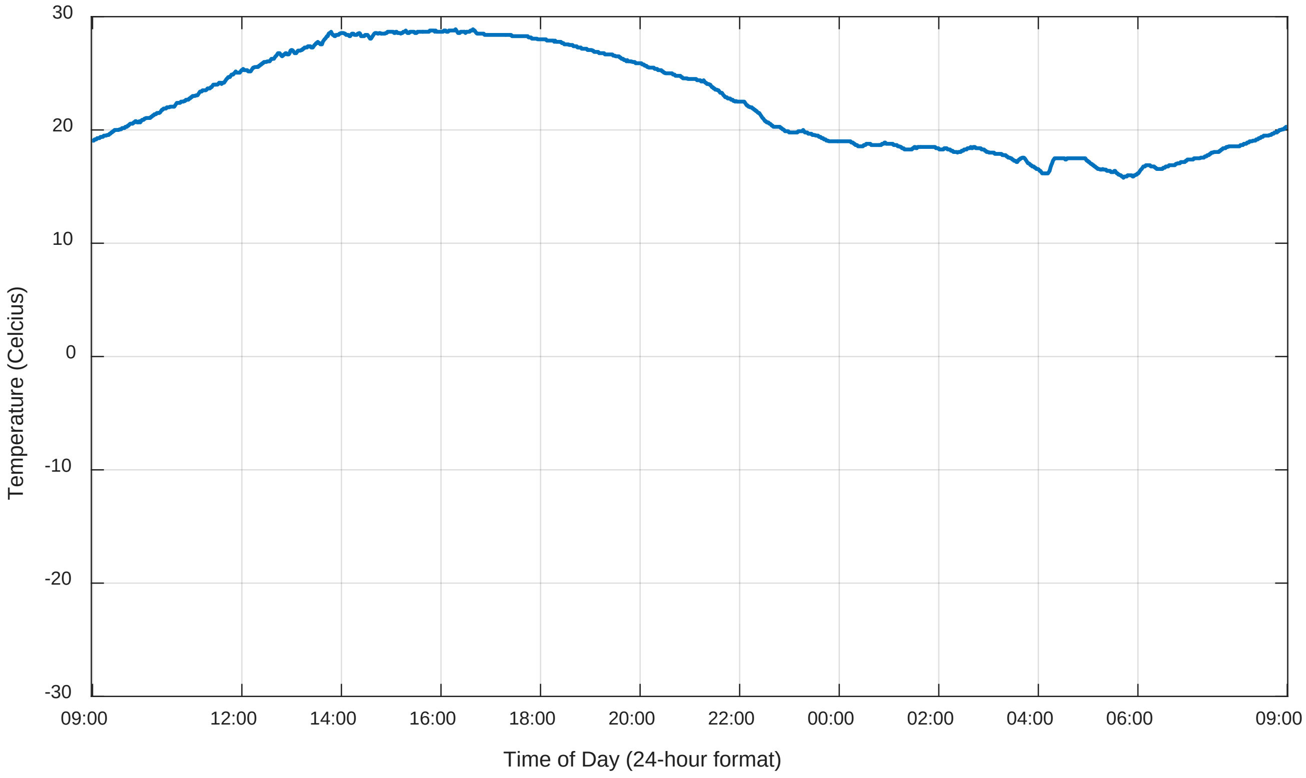

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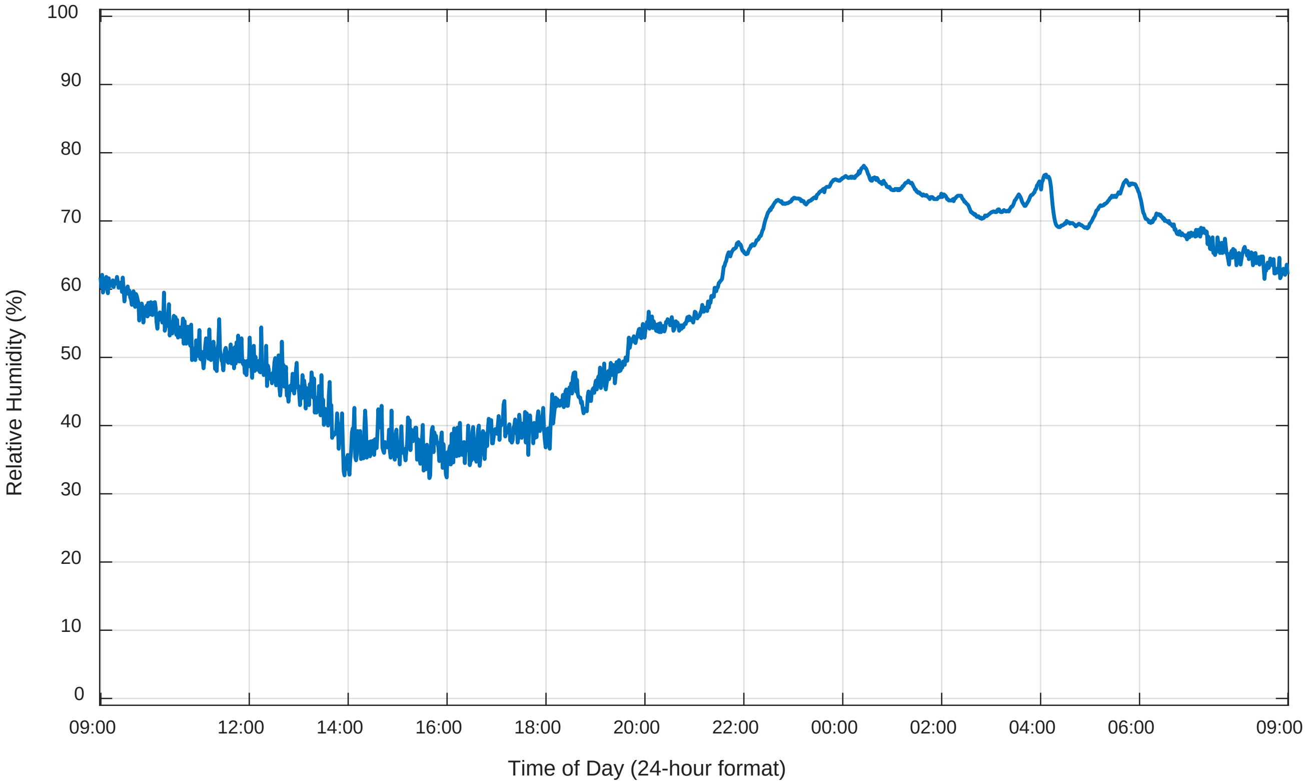

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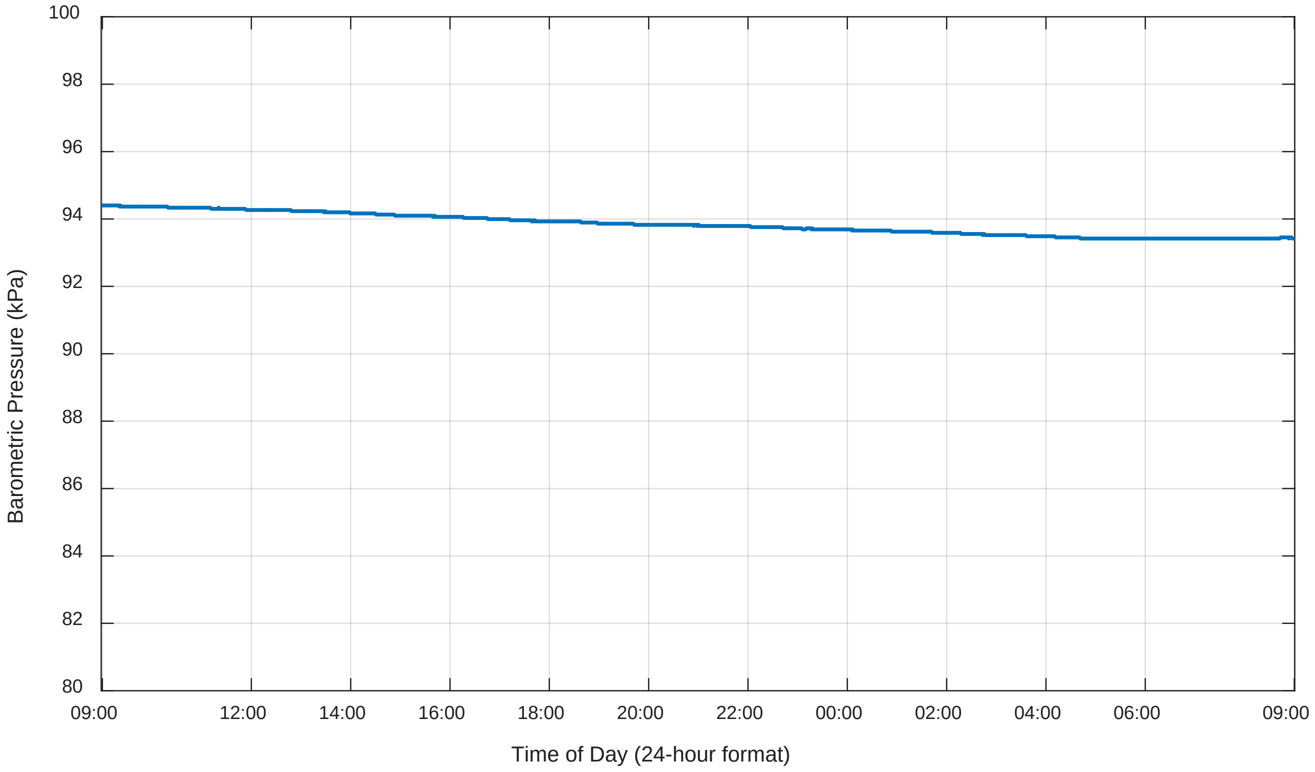

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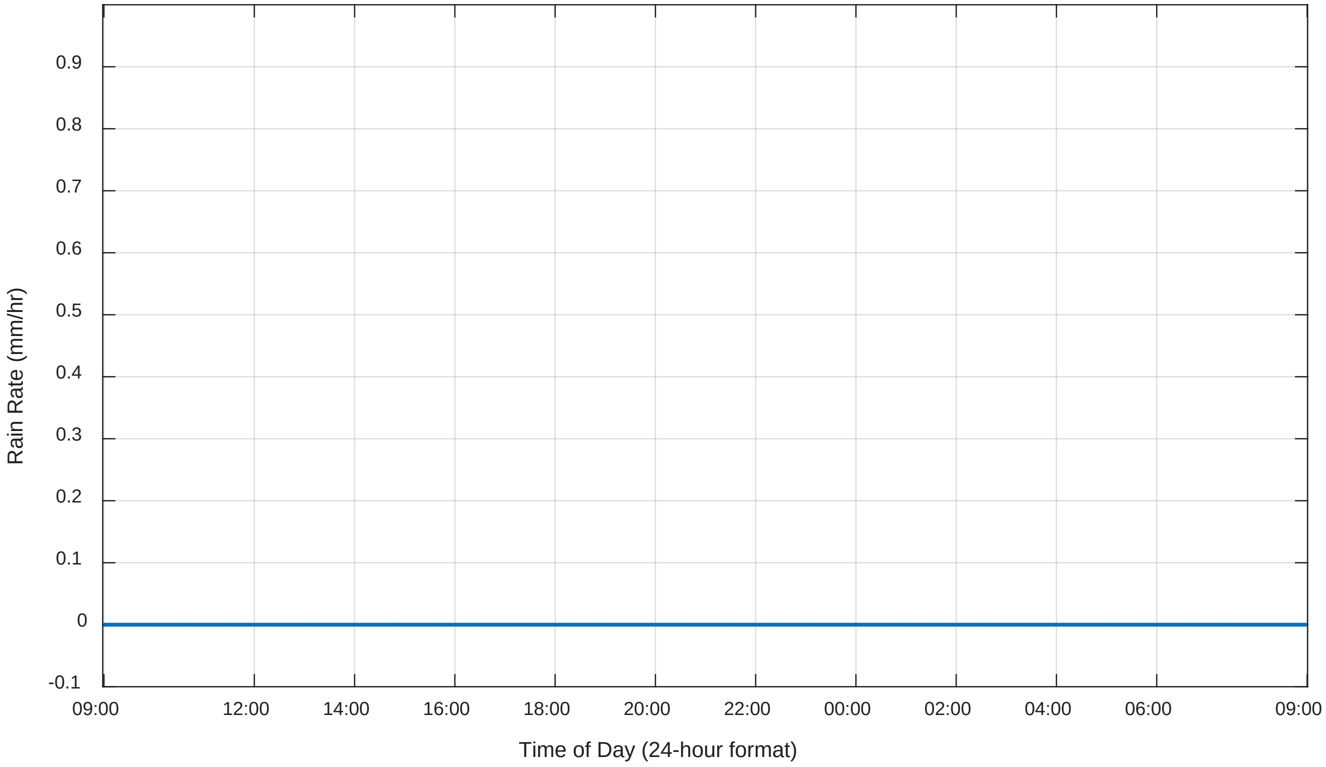

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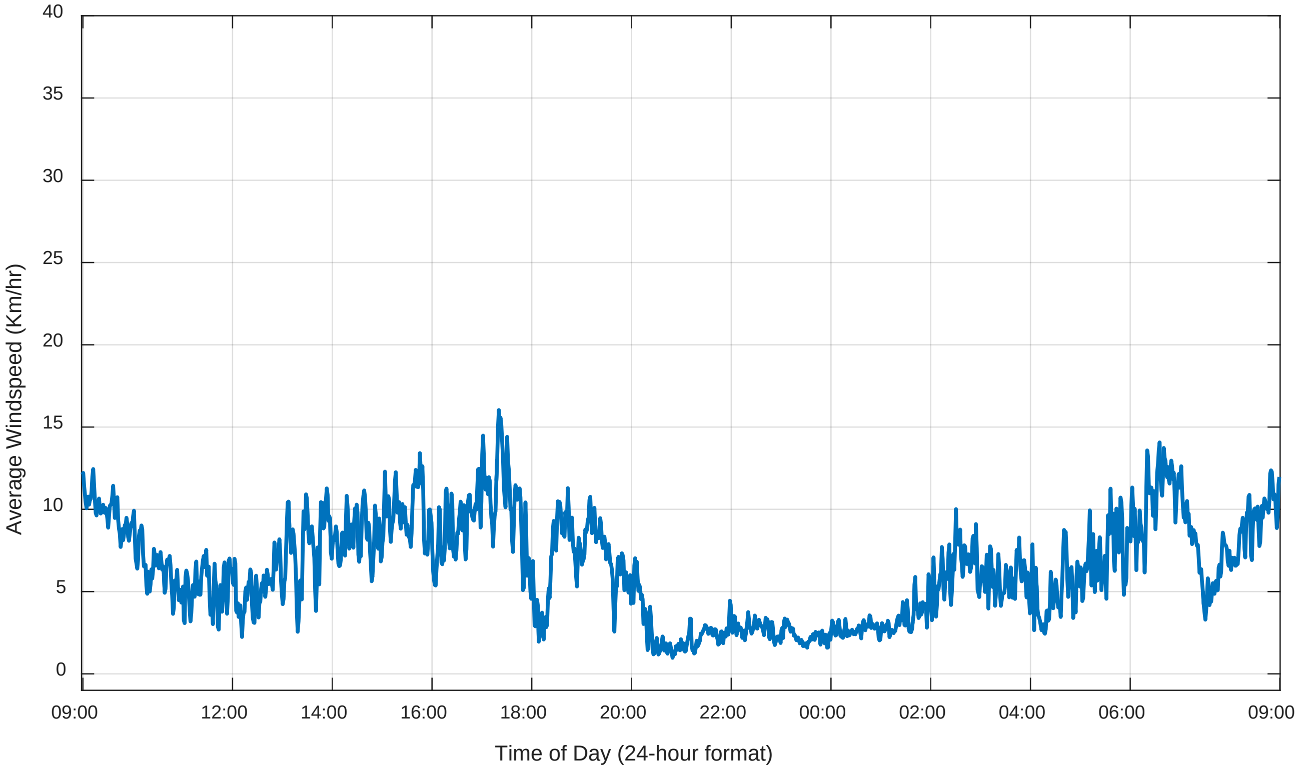
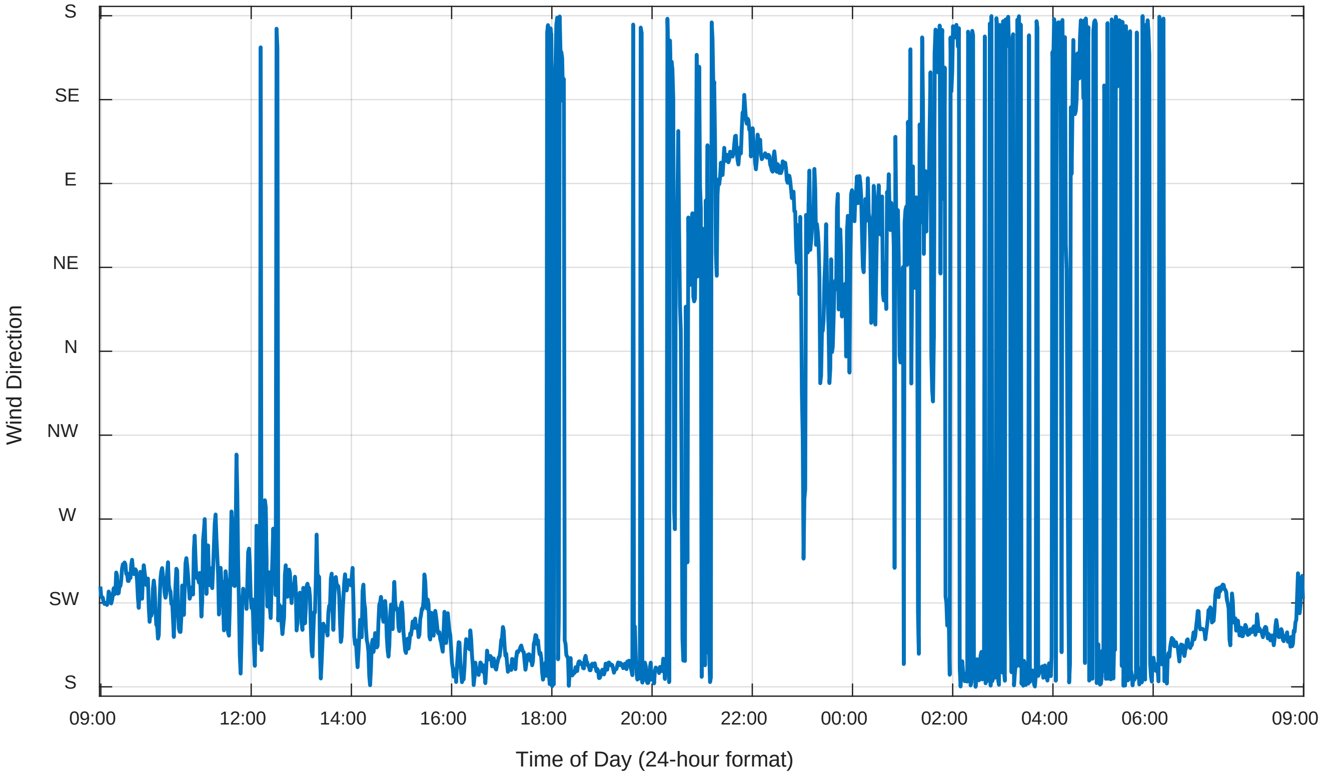


Monitored Wind Speed (July 27 - 28, 2020) at Noise Monitor Location 12



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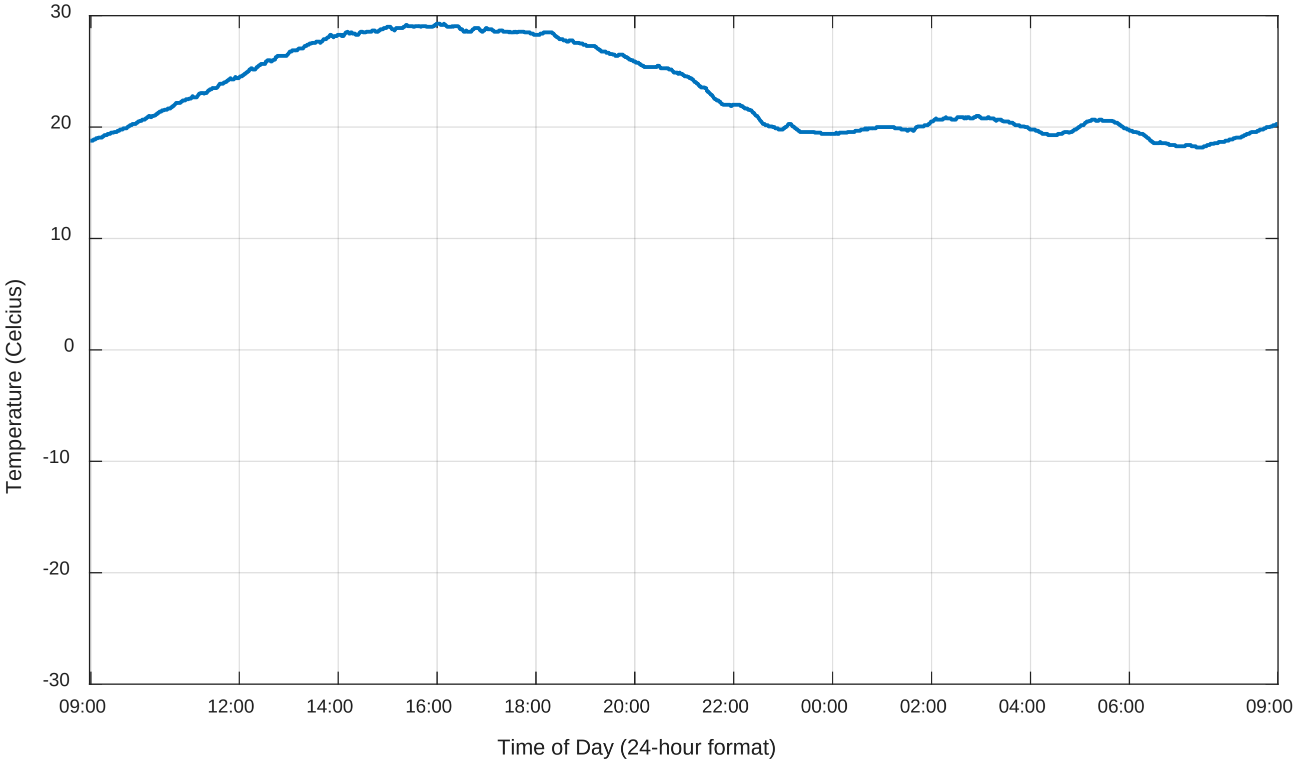
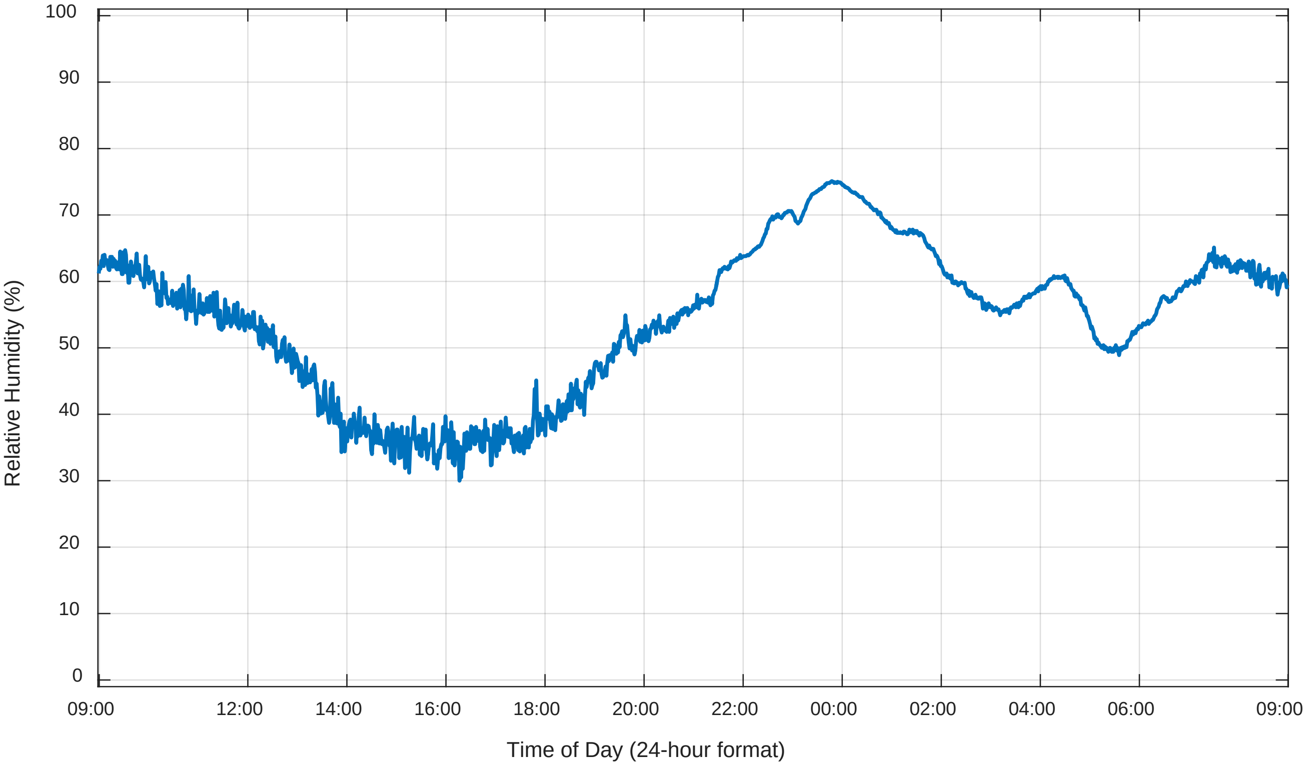
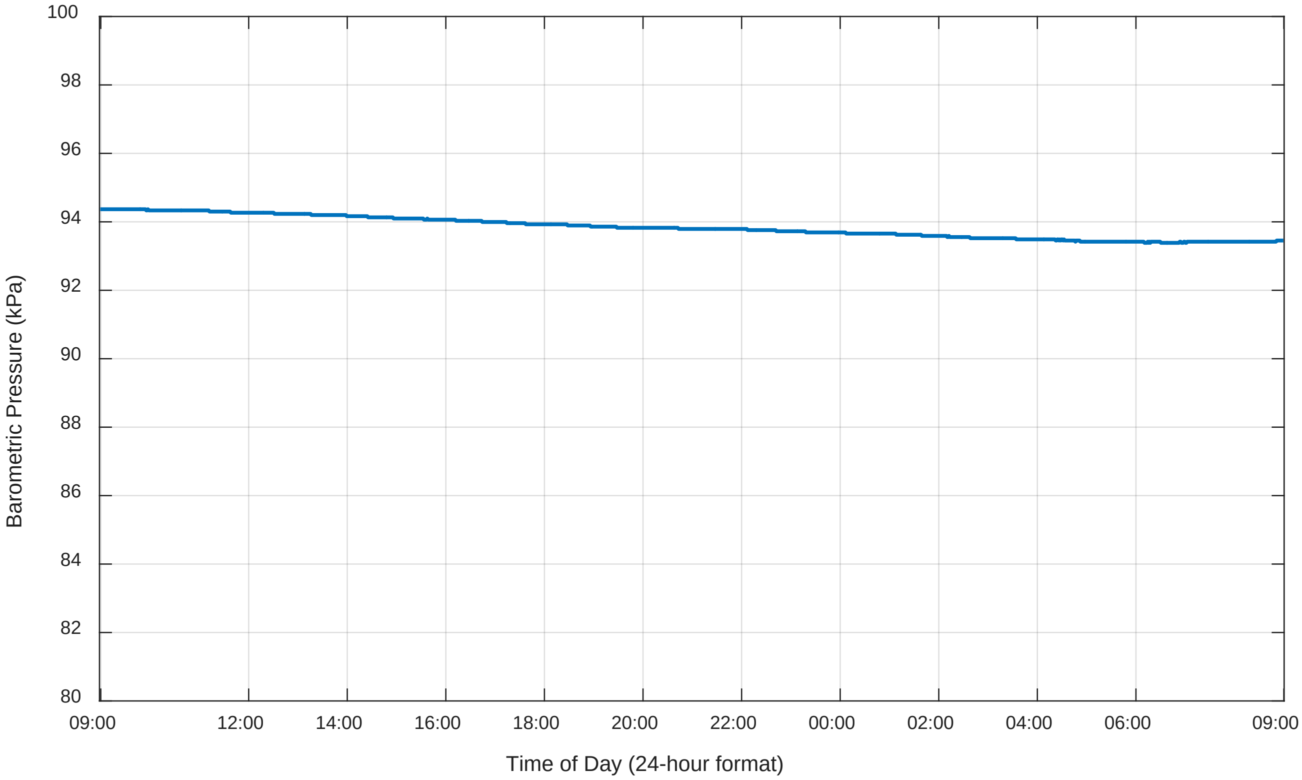


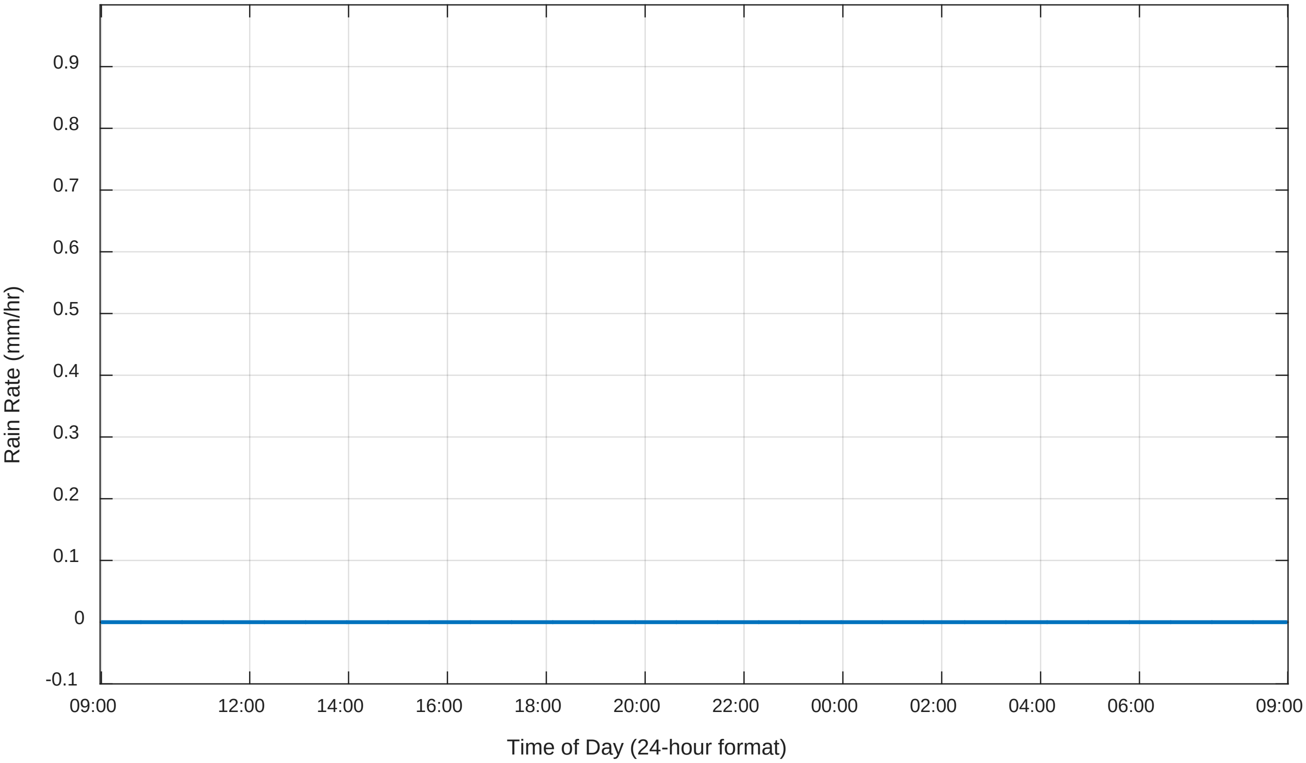
Monitored Temperature (July 27 - 28, 2020) at Noise Monitor Location 12



Monitored Humidity (July 27 - 28, 2020) at Noise Monitor Location 12

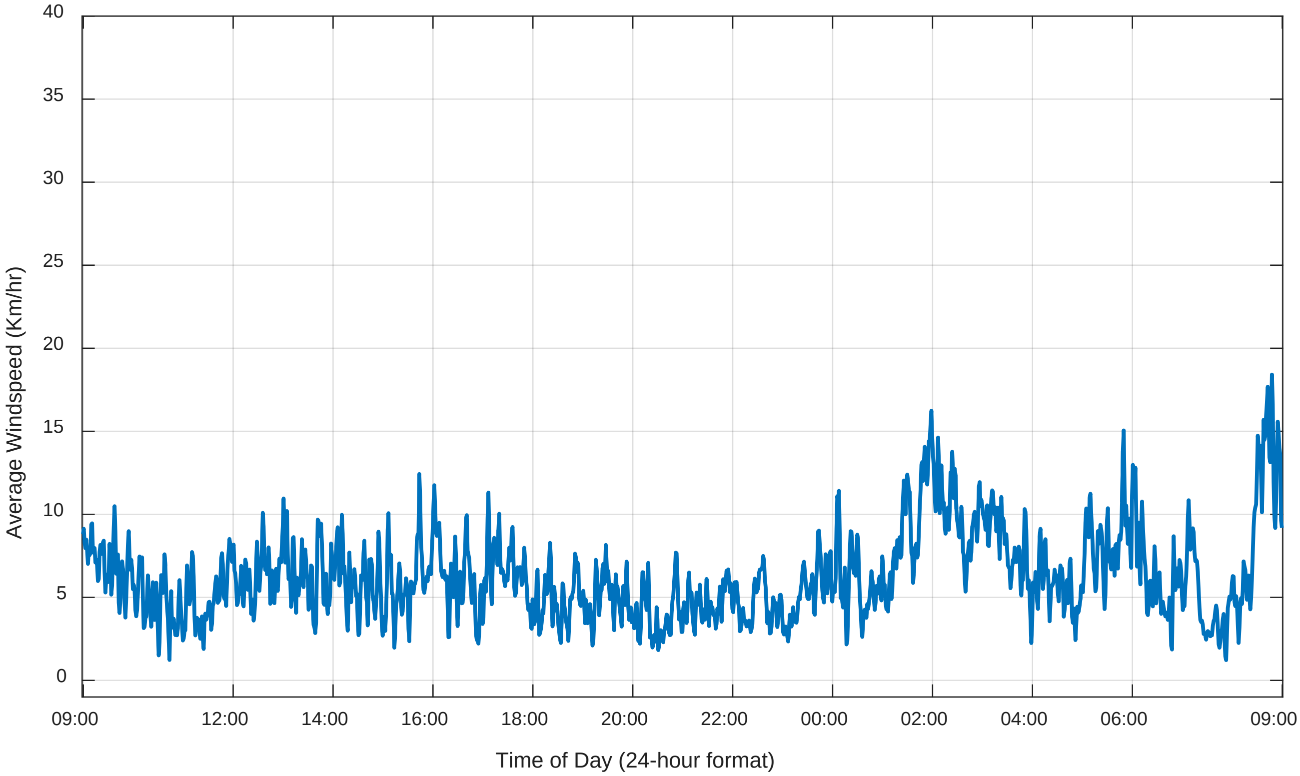


Monitored Barometric Pressure (July 27 - 28, 2020) at Noise Monitor Location 12

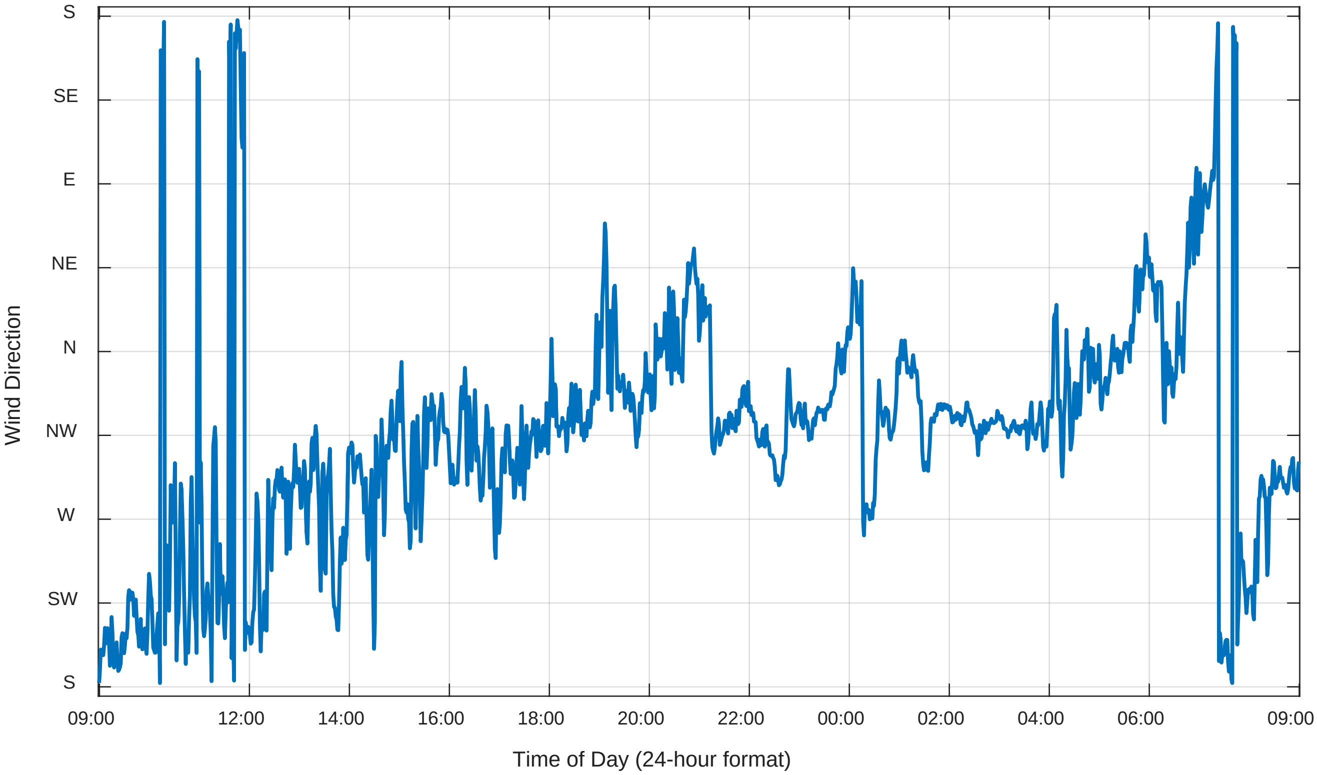


Monitored Rain Rate (July 27 - 28, 2020) at Noise Monitor Location 12

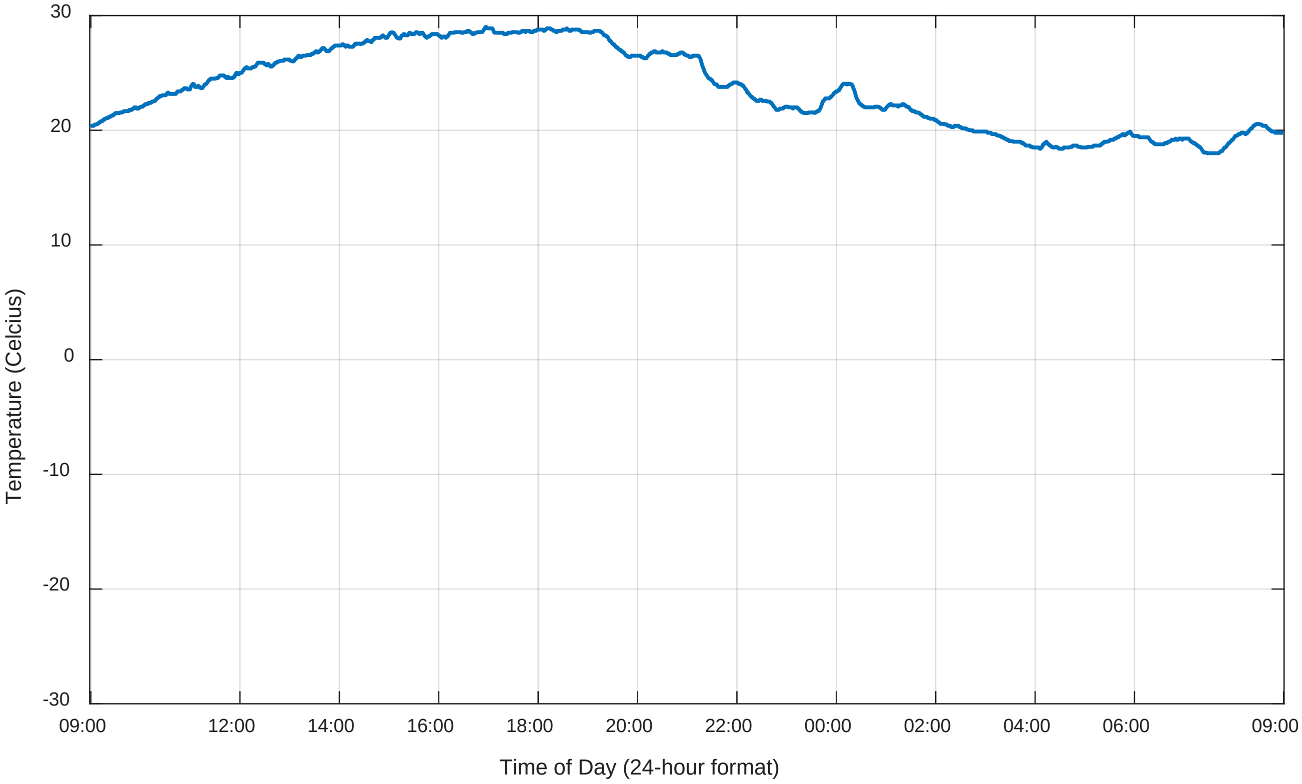
July 28 - 29, 2020 Weather Data



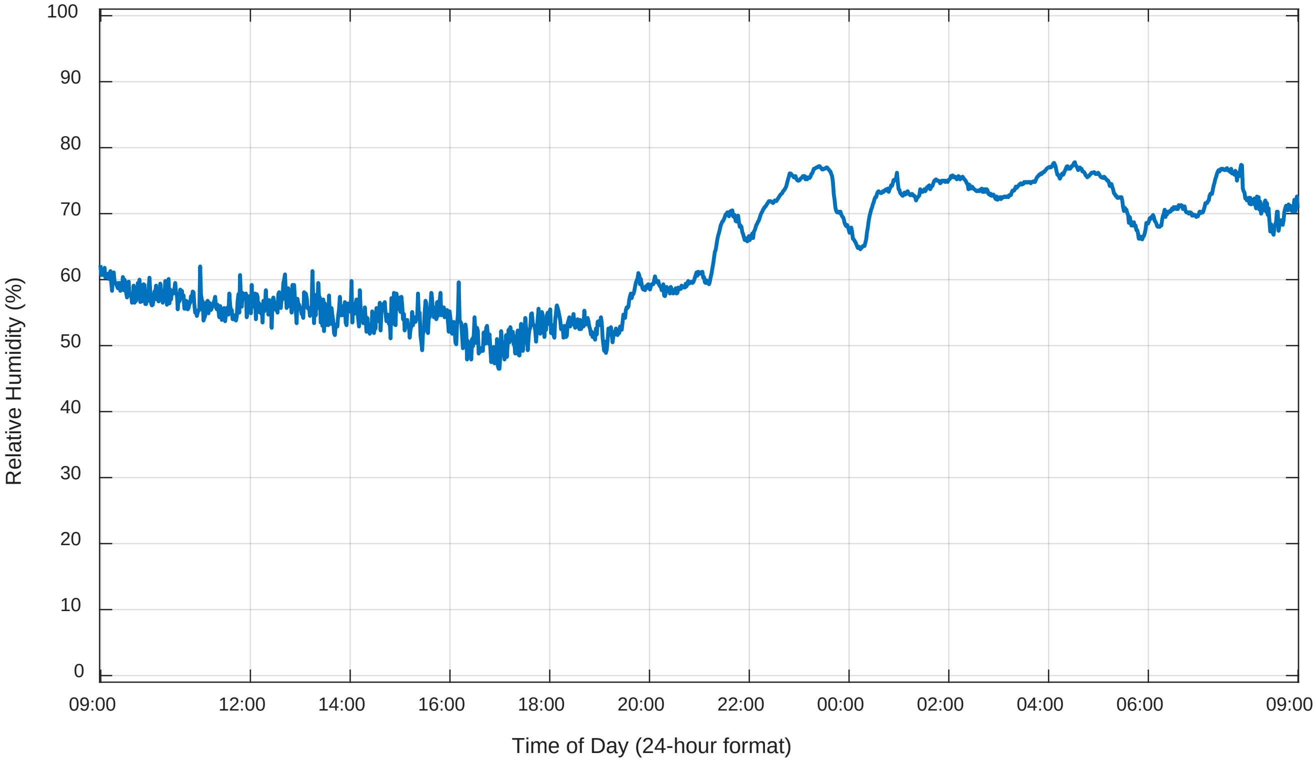
Monitored Wind Speed (July 28 - 29, 2020) at Noise Monitor Location 1



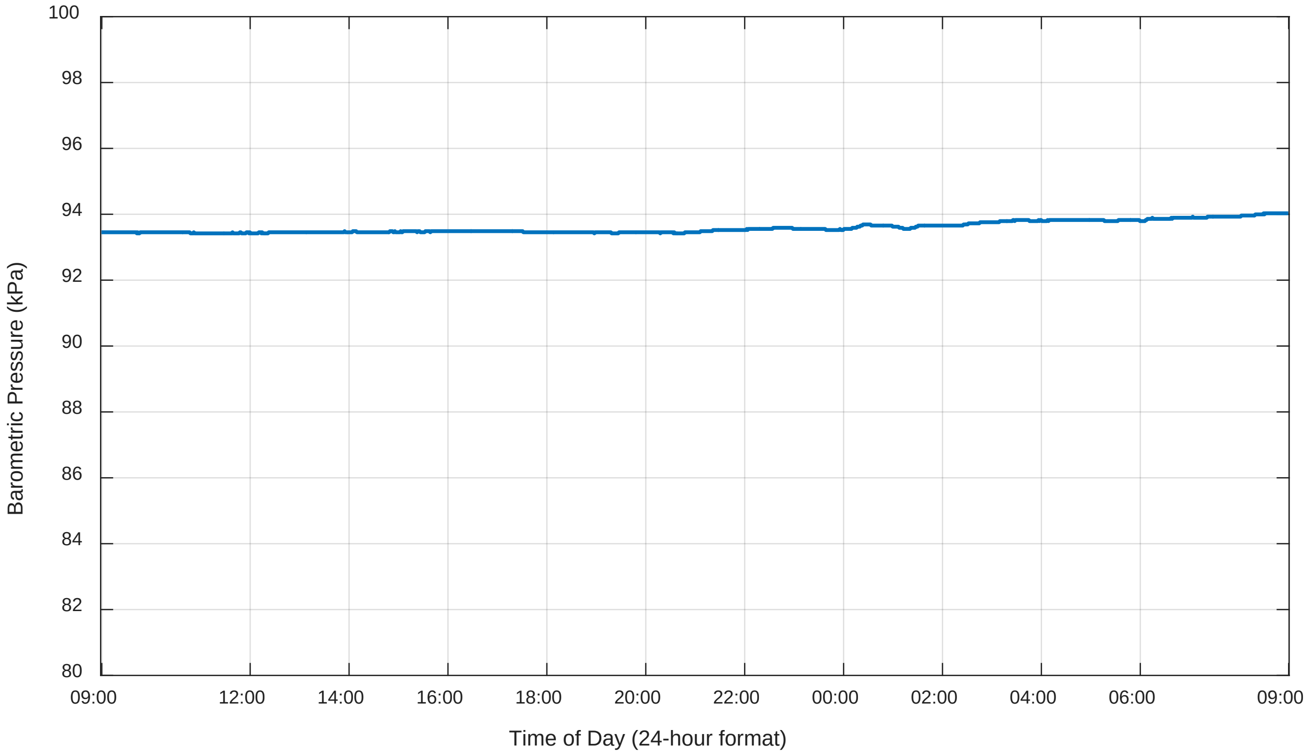
Monitored Wind Direction (July 28 - 29, 2020) at Noise Monitor Location 1



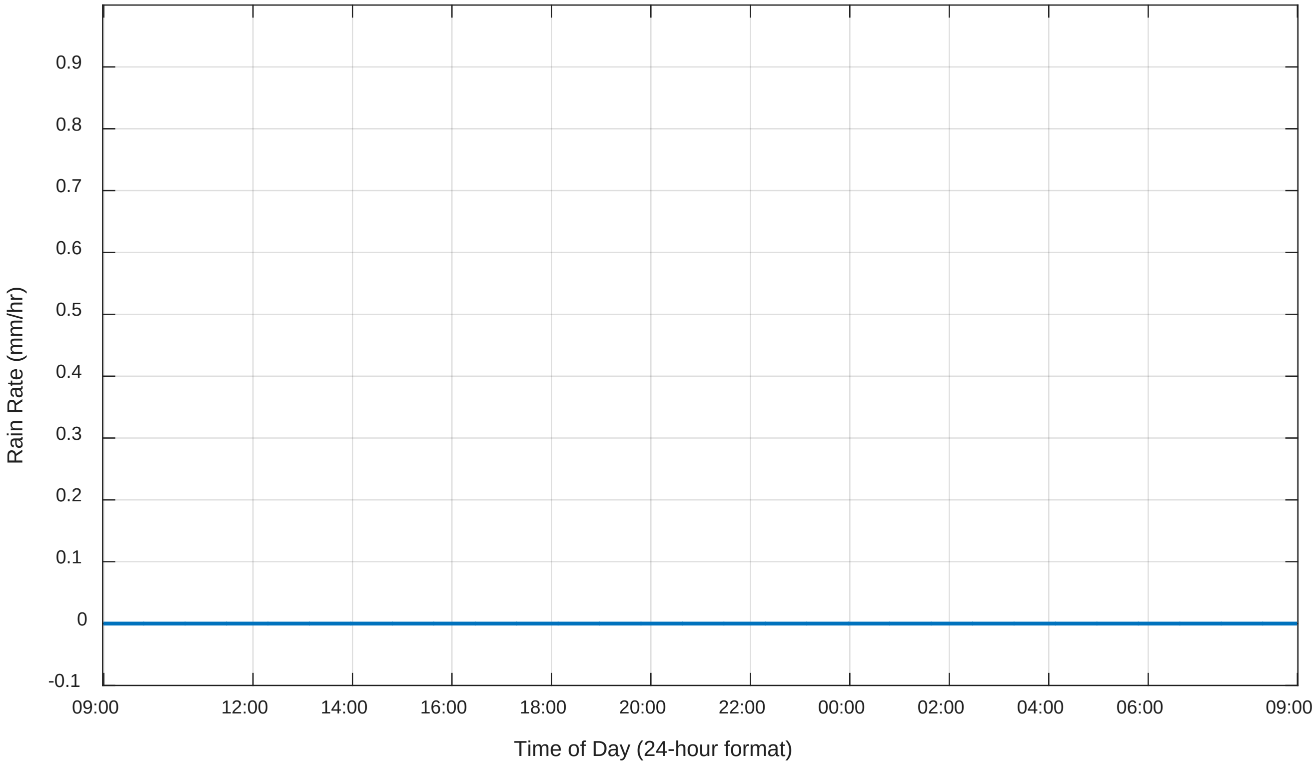
Monitored Temperature (July 28 - 29, 2020) at Noise Monitor Location 1



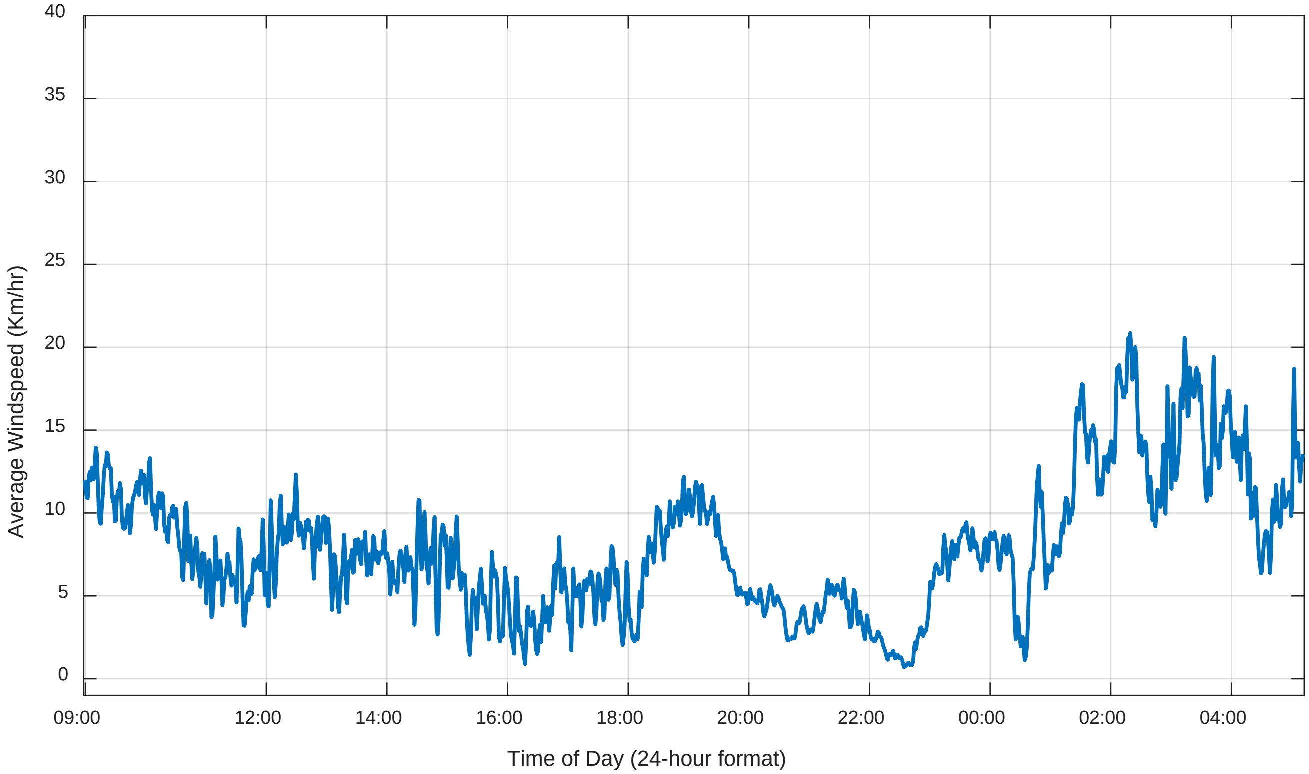
Monitored Humidity (July 28 - 29, 2020) at Noise Monitor Location 1



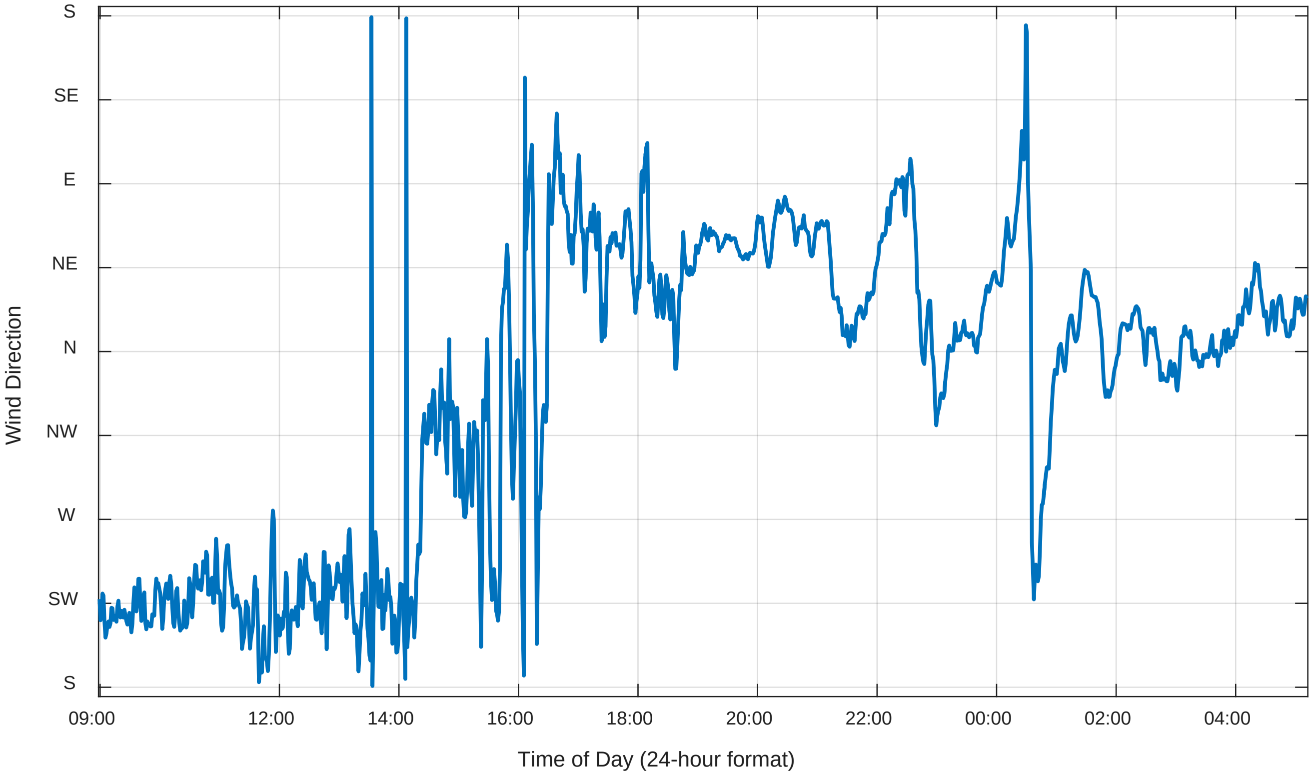
Monitored Barometric Pressure (July 28 - 29, 2020) at Noise Monitor Location 1



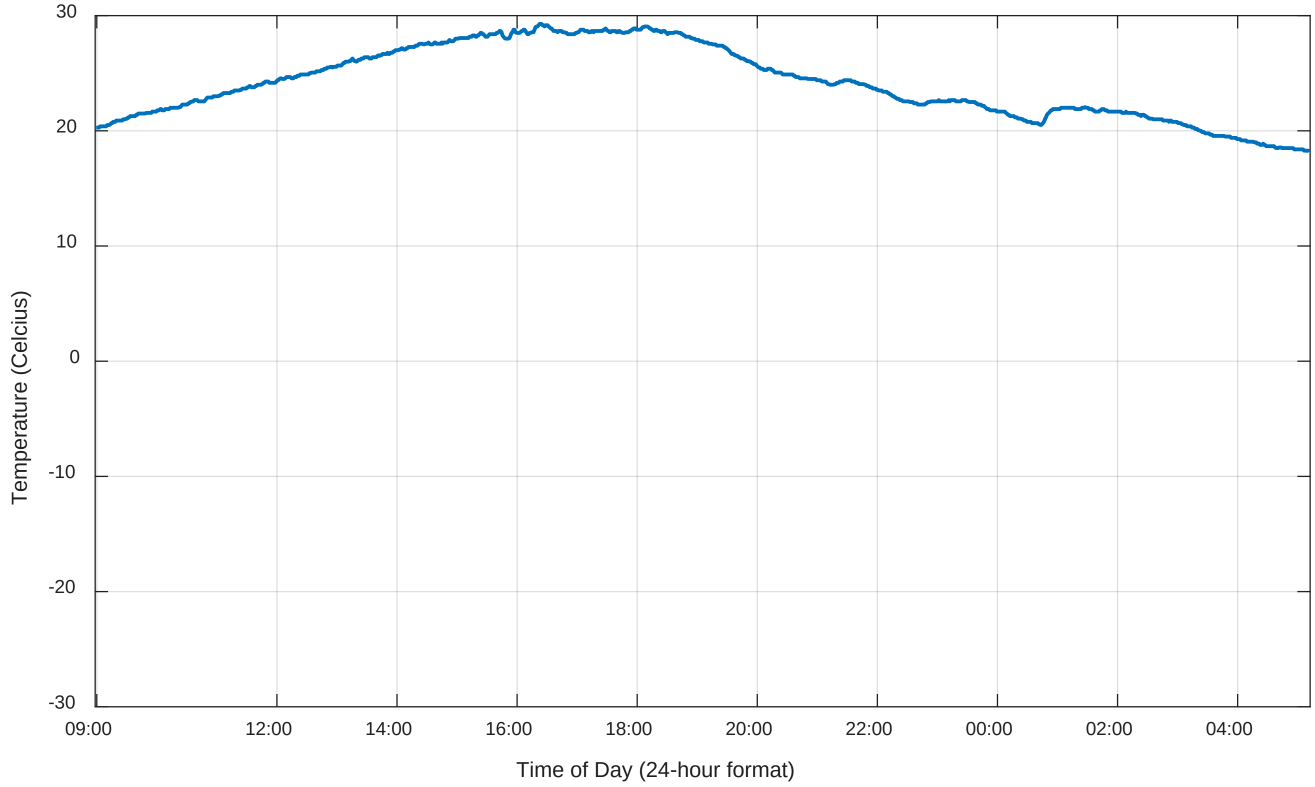
Monitored Rain Rate (July 28 - 29, 2020) at Noise Monitor Location 1



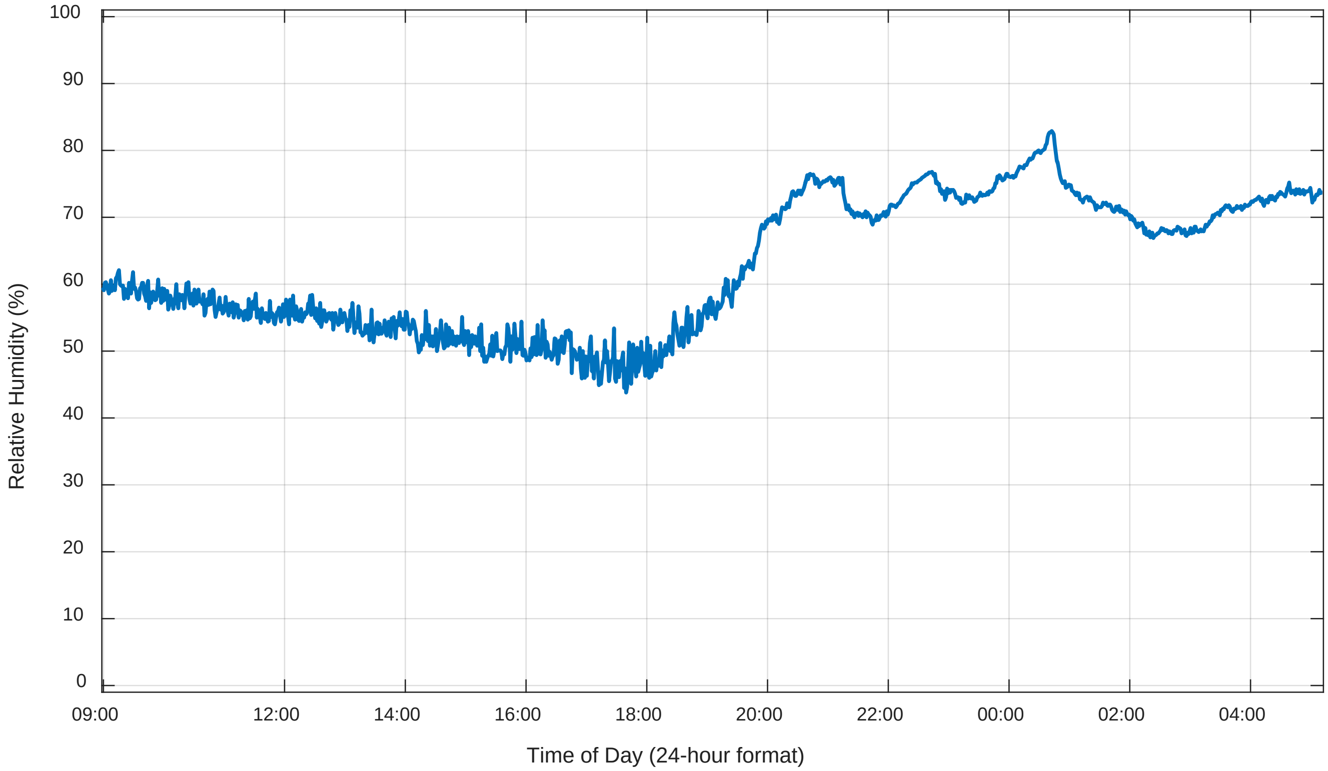
Monitored Wind Speed (July 28 - 29, 2020) at Noise Monitor Location 12



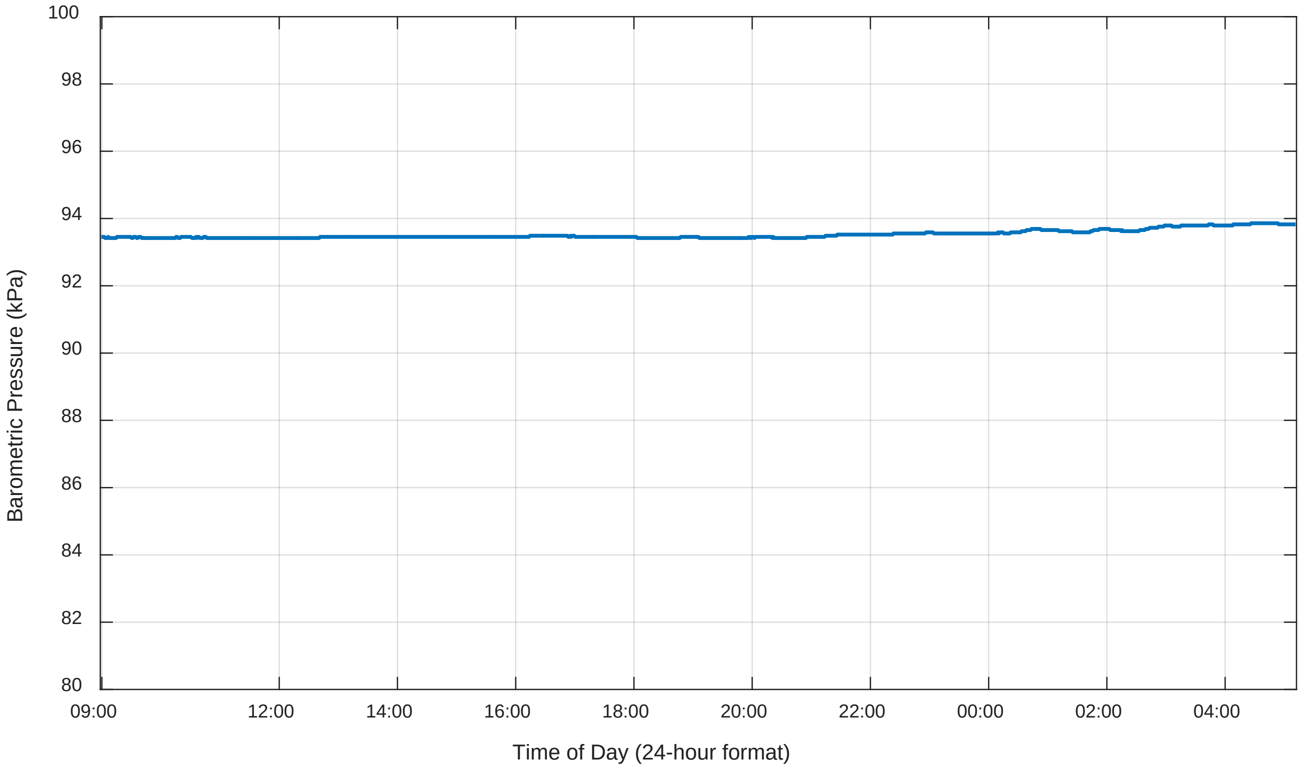
Monitored Wind Direction (July 28 - 29, 2020) at Noise Monitor Location 12



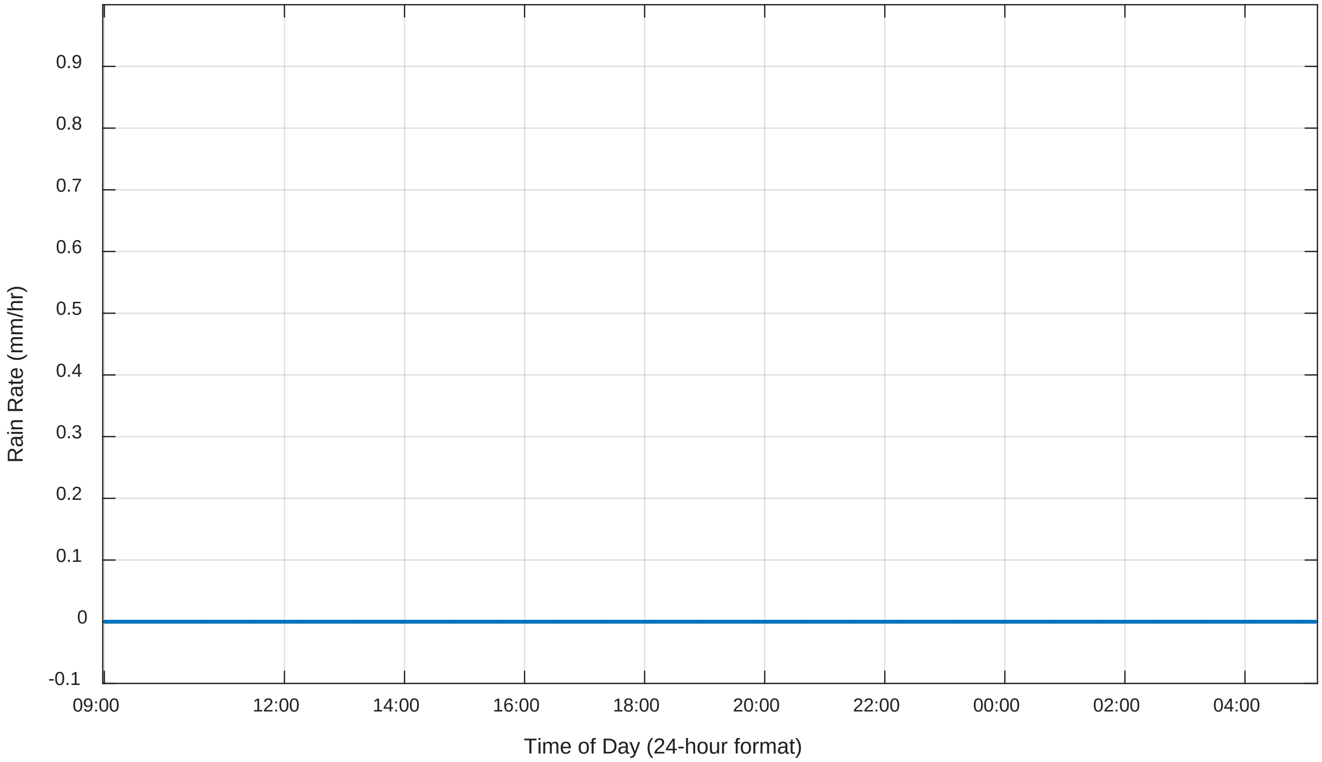
Monitored Temperature (July 28 - 29, 2020) at Noise Monitor Location 12



Monitored Humidity (July 28 - 29, 2020) at Noise Monitor Location 12



Monitored Barometric Pressure (July 28 - 29, 2020) at Noise Monitor Location 12



Monitored Rain Rate (July 28 - 29, 2020) at Noise Monitor Location 12

APPENDIX 2

NCIA Member Company Noise Management Plan Updates for 2020

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date 31-March 2016	Rev. 0

Insert your Company Name here:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Signs have been posted to inform of double hearing protection required within plant areas. Annual review of Standard Operating Procedures SFD/CGN-06-101 Hearing Conservation Program to ensure compliance
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	Noise survey conducted in Sep 2020 and provided as attached. New Generator set was added as peak chasing and backup electricity purpose. PDF 269787 Report Noise Survey Air Liquid Scot
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Continue with Winterization with insulation on critical equipment including outside equipment. New noise survey conducted in September 2020 with new addition of generator set.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Maintain current program.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	A self-audit conducted on the Hearing Protection and Conservative Program. Senior leader in plant reviewed this every 2 years with no findings. Attached is the Hearing Conservation & Protection Program PDF SFD-CGN-06-101 Rev2 Hearing Conser
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	None in 2020

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Air Liquide	**Scotford Complex**	Reference: **SFD/CGN-06-101** Revision: 2 Date: 20 August 2018 Page: 1 of 7 Owner: Maintenance Manager

Hearing Conservation & Protection Program | Scotford Complex

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This document supersedes the following document(s):

Rev.	Date	Prepared by	Verified by	Approved by	Comments/Changes
0	01 March 2011	Steve Courchesne *Maintenance Manager*	Steve Courchesne *Maintenance Manager*	Abraham Mathew *Plant Manager*	Converted to CGP numbering
1	17 Oct 2013	Josie Doll *Quality & IMS Facilitator*	Robert Harnish *Maintenance Manager*	Terry Fung *Plant Manager*	updated survey maps
2	20 August 2018	Sara Stephens *Quality & IMS Facilitator*	Troy Ayrey *Maintenance Manager*	Terry Fung *Plant Manager*	

1. PURPOSE AND SCOPE

The purpose of this Hearing Protection Program is to ascertain that not one of the employees of the Scotford Complex is exposed to noise of such level and duration as to cause possible impairment (permanent or temporary) to his hearing while at this work place.

Scotford Complex Hearing Protection Program is the local application of requirement § 5.3 Hearing Conservation Program, of HSEQ-HEA-002 Hearing Conservation and Protection.

2. RESPONSIBILITIES

Plant Manager

- Investigate practicable options for noise control;
- Prepare, implement, review and update this program annually;
- Supply hearing protection devices;
- Monitor and ensure the wearing of hearing protection in all posted areas;
- Ensure workers attend training;
- Schedule audiometric testing and ensure workers attend audiometric testing;
- Assess new noise sources and arrange for noise measurements if changes in noise Sources.

Employees

- Report noise related concerns to their supervisor;
- Participate in the Hearing Conservation and Protection program;
- Use and care for hearing protection devices where required;
- Participate in the hearing tests;
- Participate in training

Supervisors

- Bring to the attention of the Plant Manager noise related concerns reported to them by their employees;
- Monitor and ensure the wearing of hearing protection in all posted areas.

Quality & IMS Facilitator

- Maintain hearing protection training records

3. NOISE MEASUREMENTS:

Plant Noise Survey

Sound level measurements were taken at a number of locations within the plant both indoors and outdoors.

Attached figures 1 to 4 illustrate the sound levels measured throughout the Scotford Site in the form of color-contoured noise maps. Figure 1 is a noise map of the exterior noise levels on the Scotford Site grounds and Figures 2 to 4 are noise maps of buildings where interior noise levels are displayed.

The highest noise level is inside the ASU building with noise levels registering well above 100 dB(A); the remainder of the buildings and exterior grounds registered noise levels below 100 dB(A). The administration building's interior noise levels are not included in the figures due to the small measurement area making a noise map difficult to produce, however, the noise levels measured inside public areas of the administration building were less than 55 dB(A) on the ground floor (including the maintenance shop) and less than 50 dB(A) on the second floor.

Two isolated interior noise levels are not reported on the noise maps. Those levels are reported as follows: inside the contractor's lunch trailer a noise level of 58 dB(A) was measured and inside the CB/AR MODIN unit a level of 62 dB(A) was measured.

Figure 1

Note that the exterior areas where noise levels are greatest are near the meters/valves underneath the pipe rack north of the scales (96dBA)and near the ASU building's west overhead door (94dBA)

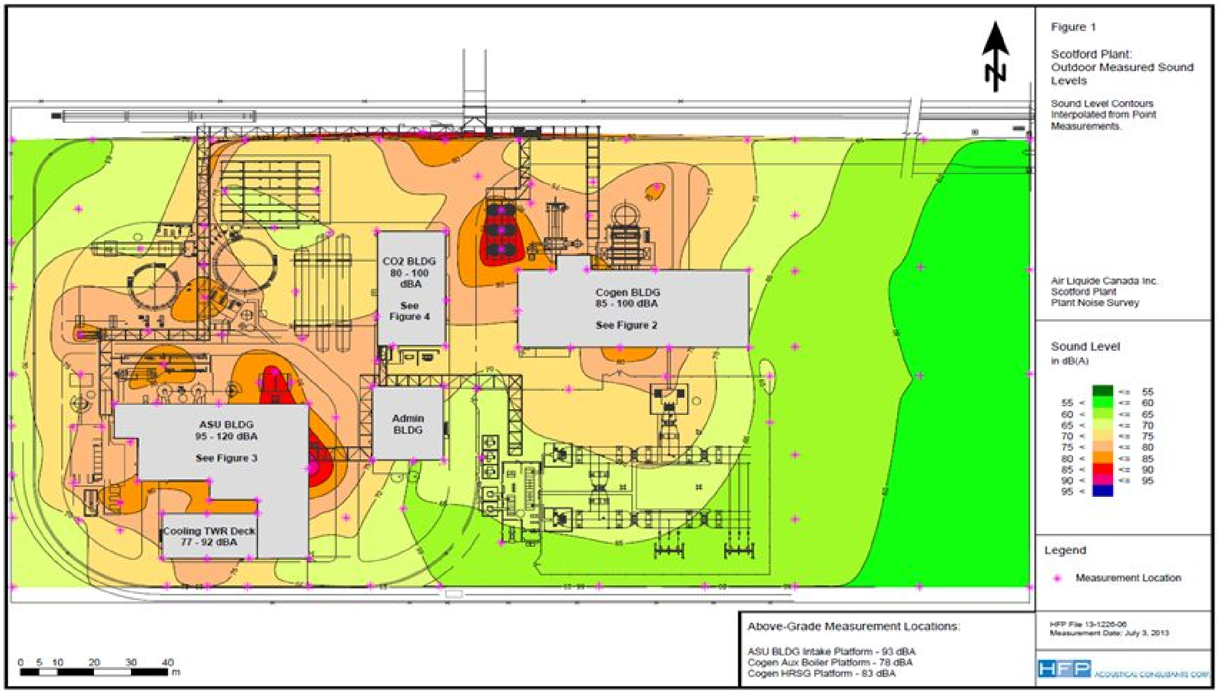


Figure 2

All measurement points located on the expander and the MAC/BAC were taken on the platforms around the equipment. The largest contributor to the overall noise levels measured inside the ASU building is the MAC/BAC. The noise level measured on the east side of the unit was 118 dB(A).

Figure 3

Note that inside the CO2 Plant, the areas where noise levels are greatest are to the north of the NH_3 Compression skid and the CO_2 Compression Skid. Noise levels in those areas were measured at 98 dB(A) and 94 dB(A), respectively

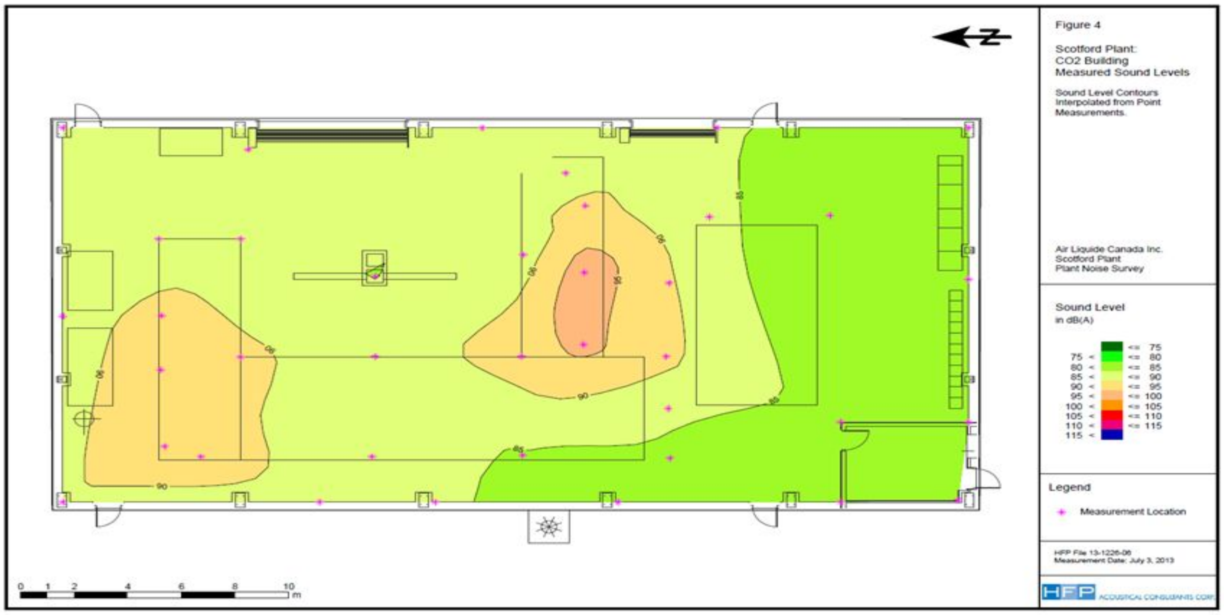
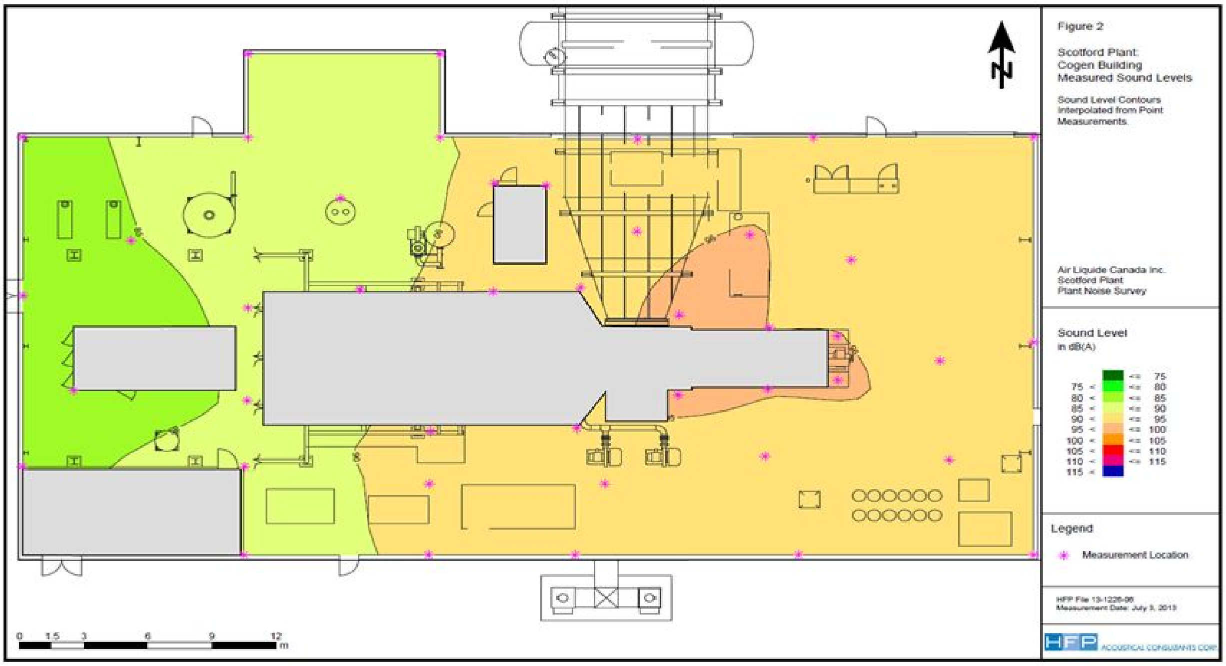


Figure 4

Note that the noise levels inside the COGEN building are greatest near the gas turbine exhaust to the HRSG Stack. The noise levels in that vicinity range from 95 dB(A) to 97 dB(A). The only exception is inside the Gas Valve Mod enclosure where a noise level of 100 dB(A) was measured.



Exposure Level

Exposure level tests have been performed to monitor the exposure of the operators and technicians to noise. The following table describes the exposure level of typical shifts and tasks.

NOISE EXPOSURE OF WORKERS

Scotford site

Job name	Number of workers	Leq dB(A)	Shift duration (hours)	Lex dB(A)	Comments	OK with Regs? (Y/N)	Recommendations
ASU shift (Day & Night)	1	98	24	95	Correction to 12hr shift	N	Grade 3 or Class A HP; Hearing Protection and Prevention Program

Cogen day shift	1	91.8	8	93.3	Correction to 12hr shift	N	Grade 2 or Class B HP; Hearing Protection and Prevention Program
CWP strainer cleaning	2	92.1	1	102.7	Correction to 9hr shift	N	Grade 4 or Class A HP; Hearing Protection and Prevention Program

4. EDUCATION AND TRAINING

All new employees receive information on the effects of noise on hearing, use and maintenance of hearing protection and purpose of the hearing tests during the safety orientation program.

A PowerPoint Presentation on the results of the noise survey, proper use and maintenance of hearing protection and a video on the impact of noise on hearing and hearing testing are reviewed every year with all the employees at risk.

(http://www2.worksafebc.com/Publications/Multimedia/Videos.asp?reportid=34284)

Records of training are recorded by the Quality & IMS Facilitator and kept in the employee's training file.

The audiologist performing audiometric testing will review the selection, care and use of hearing protection with each employee during the audiometric testing.

5. HEARING PROTECTION

Disposable foam earplugs and earmuffs are provided at the plant to the employees and visitors. These hearing protections are available in the Administration building.

The fit and condition of hearing protection is also checked by the audiologist mandated to perform the hearing tests.

Company policy is that hearing protection must be worn by all employees working in a noisy area (which are all posted with warning signs). Because of the high noise level (117 dB(A)), the double hearing protection is mandatory in the ASU building.

6. POSTING OF NOISE HAZARD AREAS

All areas with noise levels greater than 85 dB(A) have been posted with warning signs indicating hearing protection is required (Cogen and CO_2 plant). Double hearing protection signs have been posted on each door of the ASU building. These signs are checked by operation on routine inspections and replaced if necessary.

7. HEARING TESTS

As a result of the noise exposure survey, occupations with noise exposed workers have been identified (see table 1).

Baseline hearing tests are carried out within 70 days on all employees transferred and/or hired into a job where there is potential of exposure to noise levels exceeding 85 dB(A) Lex. Hearing tests are conducted every two years. We are also offering testing to workers that are not exposed to hazardous noise. The schedule for these tests is drawn up by the Plant Manager who ensures all workers attend their tests.

The results of these tests must be given to the employees. In the event copy of a worker's audiometric test is obtained, the Human Resources Department shall keep copy of the audiometric test in the worker's file, as it is medical records. All tests shall be maintained according to confidentiality principles and all applicable laws.

8. ANNUAL PROGRAM REVIEW

Hearing tests participation, statistics, hearing protection use trends and suggestions for improvement are reviewed annually. Any employees with Early Warning Change category receive additional coaching on the use of hearing protection.

In addition, the checklist found in Appendix A of the procedure HSEQ-HEA-002.1 Hearing Conservation and Protection Program Template is used to verify that all necessary program components have been addressed.

The records of the annual review are maintained in Intelex and the information is shared with employees during safety meetings.

Occupational Noise Monitoring Survey

Air Liquide
Scotford Plant Site

Prepared for:

Air Liquide
55555 RR214
Fort Saskatchewan, Alberta

September 23, 2020

Pinchin File: 269787

Issued to:	**Air Liquide**
Issued on:	**September 23, 2020**
Pinchin file:	**269787**
Issuing Office:	**Edmonton, AB**

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EXECUTIVE SUMMARY

On September 9, 2020, Pinchin Ltd. (Pinchin) conducted a noise monitoring survey at the Air Liquide Scotford Plant Site. The objectives of the survey were to evaluate potential worker exposures to noise during representative workplace activities and to evaluate the results of testing against regulated occupational exposure limits and guidelines.

Personal samples of noise were collected on three Operators (one from each of the major plant areas) and a Maintenance staff member. The major plant areas included the Air Separation Unit (ASU), the Co-Generation power facility (Co-Gen), and the Carbon Dioxide (CO_2) Plant. The results of testing indicated that three workers were over the exposure limit for noise and the fourth worker monitored was over the Action Limit of 50% of the exposure limit. All workers were noted to be using adequate hearing protection throughout the assessment and would have been protected provided a proper hearing protector seal was attained. Spot measurements for noise completed during the assessment indicated that some additional noise signage is required to meet the requirements of the Alberta Occupational Health and Safety Code. Select areas of the plant were noted to produce sound levels which would exceed the limit for the use of double hearing protection should workers spend a long enough period in the area and therefore additional administrative controls are recommended.

Recommendations are provided regarding the results:

1. Until or unless engineering or administrative controls can be implemented sufficient to reduce average 8-hour noise exposures to 85 dBA or below, and in order to ensure worker exposures remain as low as reasonably achievable, mandatory use of hearing protectors should continue for all workers entering into operational areas with sound levels exceeding 85 dBA; and
2. In accordance with the legislation, warning signs shall be maintained at every approach to an area in the workplace where the sound level regularly exceeds 85 dBA. Signage must be added to the control valve deck area near the truck loading area (Location 20) and at the entryways to the generators (Location 16). Furthermore, noise signage indicating the need for double hearing protection should be posted at the entryways to the turbine enclosure in the Co-Gen Building to meet Air Liquide policy of having this signage in areas at or over 105 dBA. The required content of the signs is not stipulated in the Regulation, however, may include, but not be limited to:
    - Identification of actual sound level in dBA;
    - Warning of hazardous sound levels;
    - Requirement for mandatory hearing protection in the area;

- Providing the allowable exposure duration for this area, without hearing protection;
- Icons indicating that hearing protection is to be worn; and
- Other forms of controls required.

3. In order to ensure no worker is exposed above the allowable limits for double hearing protection of 110 dBA L_{ex}, updates to the Air Liquide hearing conservation program should be made to ensure that administrative controls are in place to limit time spent within the ASU Building near the operating compressor. If more than one hour throughout the shift is needed, additional engineering controls must be implemented.
4. Periodic noise monitoring should be conducted. The results of this survey are representative of the environmental, operating and production conditions of September 9, 2020. Exposure levels will vary with changing work conditions. For this reason, periodic air monitoring should be conducted to generate personal exposure histories, monitor the efficacy of control equipment and strategies, and evaluate interday and seasonal variations in exposure levels.
5. In accordance with the legislation, the results of this report must be made available to workers (such as posting in a conspicuous place) in the facility and provided to the Joint Health and Safety Committee.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

At the request of Sara Stephens, Quality Facilitator with Air Liquide, a noise monitoring survey was conducted at the Air Liquide Scotford Plant Site by Pinchin Ltd. (Pinchin). The survey was completed by Pinchin on September 9, 2020. The objectives of this survey were to evaluate potential worker exposures to noise during representative workplace conditions and to evaluate the results of testing against regulated occupational exposure limits and guidelines. This report summarizes the survey activities, the results of monitoring, and our conclusions regarding exposure potential.

2.0 METHODOLOGY

2.1 Sampling Strategy

The sampling strategy was developed by Pinchin following a review of information (i.e. facility details) provided by the Quality Facilitator of Air Liquide. The sampling strategy is summarized in Table 1.

Table 1 - Sampling Strategy of September 9, 2020

Location	Agent Monitored	Potential Source of Exposure	Sampling and Analytical Method	Sample Description and Number of Samples
Scotford Plant Site	Noise	Machining Operations	Personal Dosimetry (as per CSA Z107.56) Direct reading instrument with Type II microphone	Three long-term personal samples on Plant Operators and one long-term sample on a Maintenance worker. Spot measurements throughout Site.

Four long-term personal noise measurements were collected from workers to determine average exposures throughout the Facility. Exposures were measured in units of decibels on the A-weighted scale (dBA). Workers were asked to wear a Quest Electronics noise dosimeter for a representative portion of their workday. In accordance with regulatory requirements, the noise dosimeters were set to the following parameters:

A-weighting	threshold level feature turned off
3 dBA exchange rate	85 dBA criterion level

In conformance with Canadian Standards Assocation (CSA) Standard Z107.56 – “Measurement of Noise Exposure”, sequential measurements were taken from workers where possible, that is, at least two separate measurements were taken from most workers monitored (first and second half of shift). Following the measurement period, the A-weighted sound pressure level (i.e. the personal exposure measured in dBA) was read directly from the noise dosimeter.

Additional short-term noise measurements were collected using a 3M Sound Examiner SE-402, hand-held Type 2 integrating sound level meter. Measurements were taken at specific locations to identify predominant noise sources and to identify areas where noise levels regularly exceed 85 dBA.

All noise monitoring equipment was calibrated before and after the survey.

3.0 OCCUPATIONAL EXPOSURE LIMITS/GUIDELINES

The results of testing were evaluated against the occupational exposure limit set in the *Occupational Health and Safety Code, Part 16, Section 218.* The Regulation states that the employer shall ensure that no worker is exposed to an equivalent 8-hour average noise level (L_{ex}) above 85 dBA. It should be noted that exposures exceeding 85 dBA during the workday are permitted, provided that the L_{ex} does not exceed 85 dBA.

Where average personal exposures exceed 85 dBA $L_{ex,}$ *Section 221 and 222* states that protective measures must be implemented. These measures may include engineering controls, administrative controls (e.g. reducing a worker’s exposure time through worker rotation) and use of personal protective equipment (PPE).

Section 221 states that a clearly visible warning sign shall be placed any area where the noise level exceeds 85 dBA.

4.0 RESULTS AND CONCLUSIONS

4.1 Summary of Site Activities

The survey was performed during typical day shift operating and environmental conditions. The work activities/conditions, as reported by the workers involved in the survey, are presented in Table 2. It was reported that the shift for workers at Air Liquide Scotford was eight hours in duration.

4.2 Field Observations

The following field observations were made by the Pinchin hygienist during the survey:

- There are three primary areas of the site: The Air Separation Unit (ASU) building, the Co-Generation power facility (Co-Gen), and the Carbon Dioxide (CO_2) Plant;
- Site required personal protective equipment (PPE) includes hard hats, safety glasses, steel toed boots, and personal gas monitoring equipment (type depends on which building areas entered);
- Hearing protection is required for entry into most process areas, with double hearing protection required if entering the ASU building;

- There is a hearing conservation Code of Practice for the site;
- Signage indicating the need for hearing protection was noted to be posted on the entry to most areas with elevated noise levels; and
- The following foam plugs are available to all workers within the Administration building near the permitting desk area: “Howard Leight Laser Lite” (CSA Class AL) and “Howard Leight Max Lite” (CSA Class AL). Workers were noted to also have hard hat mounted earmuffs (CSA Class A).

Table 2 - Summary of Worker Activities

Job Function	Work Tasks	Task Frequency and Duration	Controls Utilized
Operator	Operators are primarily responsible for performing rounds of their respective work areas (ASU, Co-Gen, or CO_2 Plant) to ensure that equipment is performing properly and trouble shooting issues within the Plant. Workers perform administrative duties within office areas and run sample analysis within lab spaces as well.	Throughout shift	Standard PPE Single CSA Class A hearing protection in most process buildings and double hearing protection in the ASU Building.
Maintenance	Performs maintenance on various processes. Tasks take them into most areas of the plant throughout the day. Throughout morning of the shift the Maintenance worker was within the ASU building. Throughout the afternoon of the shift, the worker was outside of the Co-Gen plant.		

4.3 Noise Monitoring

The personal noise monitoring results are presented in Table A1 of Appendix A. The results of personal noise monitoring are presented as “Average Noise Levels” (as measured over the monitoring periods), and “8-Hour Equivalent Noise Level” (L_{ex}) Exposures. The 8-hour L_{ex} exposure averages the multiple noise measurements taken from a worker.

The results indicated the following:

- Three of the four 8-hour average exposures exceeded the 85 dBA exposure limit;
- The CO_2 Plant Operator was the only worker who did not exceed the exposure limit. However, this worker did exceed the Action Limit of 50% of the exposure limit (82 dBA);
- All workers monitored were wearing adequate levels of hearing protection and would have been protected assuming a proper hearing protector seal was attained; and

- The highest exposures were measured on the Maintenance worker and associated with their time spent in the first half of the shift within the ASU Building near the operating compressor unit (spot measurements reached 118 dBA in this area).

The results of short-term area noise monitoring are presented in Table A2 of Appendix A. A sound level map is also provided in Appendix A. The results indicate the following:

- Multiple areas of the facility had noise levels that would regularly exceed 85 dBA. Most of the areas are already included in a signage program, however, the control valve deck area near the truck loading area (Location 20) and at the entryways to the generators (Location 16) were noted to not have the required noise warning signage. Furthermore, noise signage indicating the need for double hearing protection should be posted at the entryways to the turbine enclosure in the Co-Gen Building to meet Air Liquide policy of having this signage in areas at or over 105 dBA; and
- The area near the operating compressor unit in the North East corner of the ASU Building had noise levels which exceeded the limit for double hearing protection of 110 dBA for eight hours (levels were between 115 to 118 dBA). At these levels, additional controls to limit time spent within the area are required. At 116 dBA, a worker would be able to spend up to two hours within the area with double hearing protection. At 119 dBA, a worker would be able to spend up to one hour within the area with double hearing protection. Based on discussions with staff at the Scotford Plant site, it is unlikely that workers would spend more than an hour of the shift in proximity to the operating compressor unit in the ASU building. However, in order to ensure no worker is exposed above the allowable limits for double hearing protection of 110 dBA L_{ex}, updates to the Air Liquide hearing conservation program should be made to ensure that administrative controls are in place to limit time spent within the ASU Building near the operating compressor. If more than one hour throughout the shift is needed, additional controls must be implemented.

5.0 RECOMMENDATIONS

The following recommendations are provided:

1. Until or unless engineering or administrative controls can be implemented sufficient to reduce average 8-hour noise exposures to 85 dBA or below, and in order to ensure worker exposures remain as low as reasonably achievable, mandatory use of hearing protectors should continue for all workers entering into operational areas with sound levels exceeding 85 dBA; and

2. In accordance with the legislation, warning signs shall be maintained at every approach to an area in the workplace where the sound level regularly exceeds 85 dBA. Signage must be added to the control valve deck area near the truck loading area (location 20) and at the entryways to the generators (location 16). Furthermore, noise signage indicating the need for double hearing protection should be posted at the entryways to the turbine enclosure in the Co-Gen Building to meet Air Liquide policy of having this signage in areas at or over 105 dBA. The required content of the signs is not stipulated in the Regulation, however, may include, but not be limited to:
    - Identification of actual sound level in dBA;
    - Warning of hazardous sound levels;
    - Requirement for mandatory hearing protection in the area;
    - Providing the allowable exposure duration for this area, without hearing protection;
    - Icons indicating that hearing protection is to be worn; and
    - Other forms of controls required.
3. In order to ensure no worker is exposed above the allowable limits for double hearing protection of 110 dBA L_{ex}, updates to the Air Liquide hearing conservation program should be made to ensure that administrative controls are in place to limit time spent within the ASU Building near the operating compressor. If more than one hour throughout the shift is needed, additional engineering controls must be implemented.
4. Periodic noise monitoring should be conducted. The results of this survey are representative of the environmental, operating and production conditions of September 9, 2020. Exposure levels will vary with changing work conditions. For this reason, periodic air monitoring should be conducted to generate personal exposure histories, monitor the efficacy of control equipment and strategies, and evaluate interday and seasonal variations in exposure levels.
5. In accordance with the legislation, the results of this report must be made available to workers (such as posting in a conspicuous place) in the facility and provided to the Joint Health and Safety Committee.

6.0 REFERENCES

1. Alberta *Occupational Health and Safety Act*, http://www.qp.alberta.ca/1266.cfm?page=O02.cfm&leg_type=Acts&isbncln=0779749200
2. Alberta *Occupational Health & Safety Regulation 62/2003*, http://www.qp.alberta.ca/1266.cfm?page=2003_062.cfm&leg_type=Regs&isbncln=077971752X
3. Alberta *Occupational Health & Safety Code 2009*, http://work.alberta.ca/documents/WHS-LEG_ohsc_2009.pdf
4. CSA Standard Z107.56-13 – “Measurement of Noise Exposure”.
5. CSA Standard Z94.2-14 (Revised May 2015) “Hearing Protection Devices – Performance, Selection, Care, and Use”.

7.0 TERMS AND LIMITATIONS

This work was performed subject to the Terms and Limitations presented or referenced in the proposal for this project.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

8.0 CLOSURE

Pinchin would like to express our appreciation to the workers of Air Liquide who were involved with or participated in this survey. If you or the Joint Health and Safety Committee require additional information on this report, or other matters, please do not hesitate to call.

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Template: Alberta Occupational Hygiene Survey Report, OHS, April 8, 2019

APPENDIX A
Results of Noise Monitoring

September 9, 2020

Table A1 - Results of Long-Term Personal Noise Monitoring on September 9, 2020

Sample Number	**Measurement Description**	**Measurement Duration (minutes)**	**Average Noise Level (dBA)**	**8-Hour L_{ex} Exposure (dBA)**
1	ASU Operator Hearing protection worn (CSA Class A + Earmuffs)	8:20 am to 12:02 pm 12:02 pm to 2:59 pm (399)	95.0 95.1	95.0
2	CO_2 Plant Operator Hearing protection worn (CSA Class A)	8:42 am to 12:06 pm 12:06 pm to 2:40 pm (358)	83.7 82.9	83.4
3	Co-Gen Operator Hearing protection worn (CSA Class A)	8:30 am to 3:15 pm (405)	88.9	88.9
4	Maintenance Hearing protection worn (CSA Class A + Earmuffs)	8:20 am to 11:44 am 11:44 am to 3:00 pm (400)	102.0 77.6	99.1

Exposure Limit: 85 dBA L_{ex}

Notes: The 8-hour L_{ex} Exposure (equivalent noise exposure) was calculated based on 8-hour workday.
dBA: decibels measured on the A-weighted scale

Table A2 - Results of Short-Term Area Noise Monitoring on September 9, 2020

Sample Number	Measurement Description	Range of Sound Pressure Levels (dBA)
1	Outside Administration Building	77 to 78
2	Outside Entry to ASU	90 to 91
3	Parking Lot Area	70 to 71
4	Substation Entry Area	65 to 66
5	Between Substation and Co-Gen Area	70 to 71
6	Between CO_2 Building and Administration Building	70 to 71
7	Co-Gen Building – South quadrant	88 to 89
8	Co-Gen Building – West quadrant	82 to 85
9	Co-Gen Building – North quadrant	87 to 94
10	Co-Gen Building – Center area	90 to 91
11	Co-Gen Building – North East	90 to 91
12	Co-Gen Building – South East	91 to 92
13	Co-Gen – Inside turbine enclosure	105 to 107
14	Co-Gen – Maintenance Shop Area	63 to 64
15	Generator Area – Generators on, measurements collected outside of the units throughout the area	77 to 79
16	Generator Area – Within generator units	106 to 107
17	Quonset Hut Area	70 to 75
18	Outside Co-Gen near Heat Exchanger	81 to 84
19	Outside Co-Gen near equipment at west side of building	71 to 77
20	Control valve deck area located near trucking area	91 to 92
21	CO_2 Bullet Area	77 to 78
22	Truck Loading Area	75 to 77
23	O_2 and Argon Gas Storage Tank Area	65 to 66
24	O_2 Pipeline Bunker Area	78 to 80

Sample Number	Measurement Description	Range of Sound Pressure Levels (dBA)
25	ASU – North East near compressor units	115 to 118
26	ASU – South East	104 to 105
27	ASU - Center	106 to 107
28	ASU – West End	100 to 101
29	Outside ASU near Cooling Tower	78 to 80
30	South of ASU and Cooling Tower	72 to 74
31	West of ASU	72 to 73
32	CO_2 Building – Central area near motor unit	93 to 95
33	CO_2 Building – Throughout walkways around the building	83 to 89
34	CO_2 Building – North East area near motor unit	91 to 92
Signage requirement limit:		85 dBA

Notes: Range of Sound Pressure Levels represents minimum and maximum values recorded.
dBA: decibels measured on the A-weighted scale

FIGURES

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LEGEND

◇ NOISE SPOT MEASUREMENT

LEGEND IS COLOUR DEPENDENT
NON-COLOUR COPIES SHOULD NOT BE
USED FOR INTERPRETATION

PINCHIN

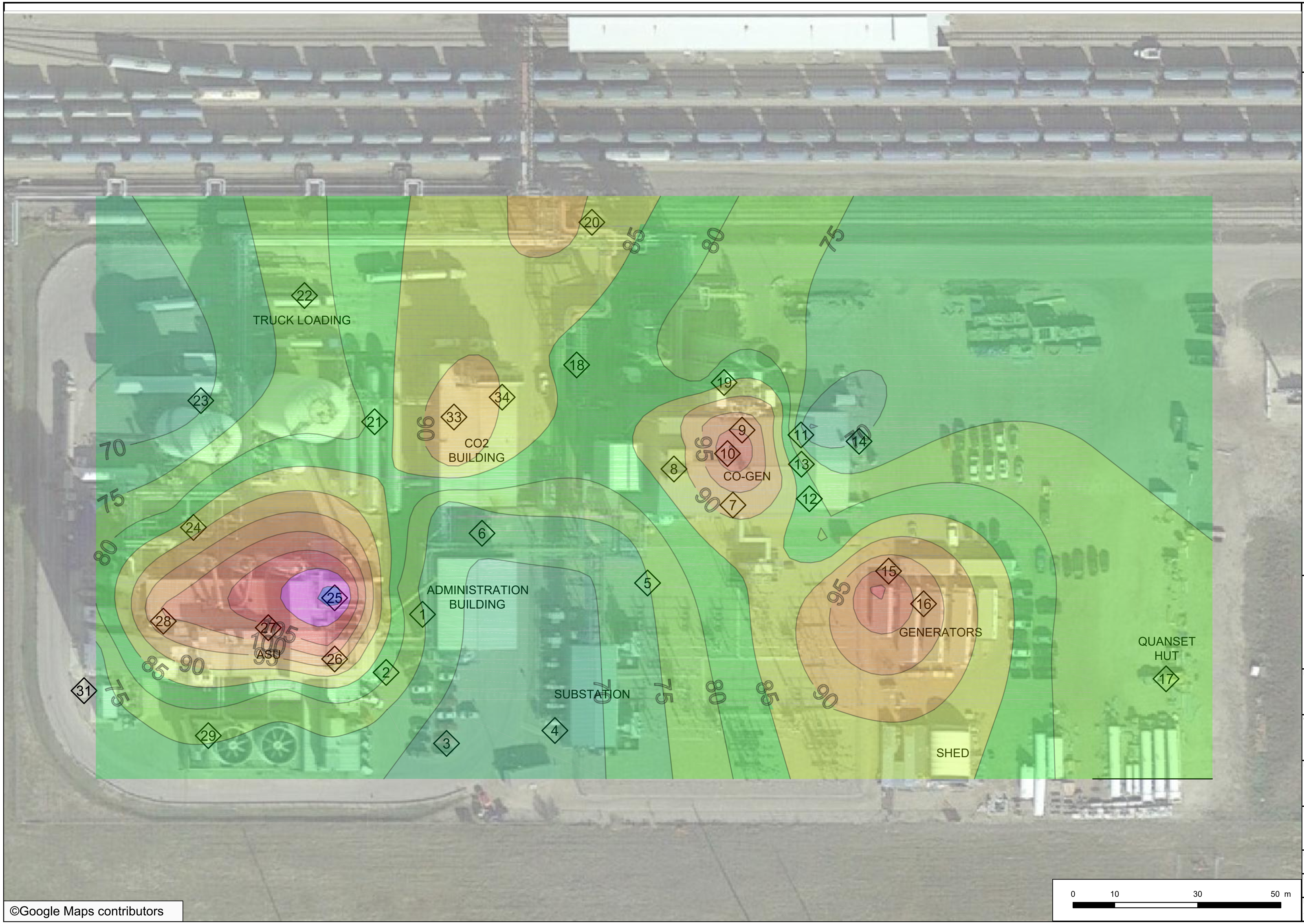
PROJECT NAME:
OCCUPATIONAL NOISE
MONITORING SURVEY

CLIENT NAME:
AIR LIQUIDE CANADA

PROJECT LOCATION:
SCOTFORD PLANT SITE

FIGURE NAME:
NOISE SPOT MEASUREMENTS

PROJECT NUMBER: 269787.000	SCALE: AS SHOWN
DRAWN BY: E.KOURNOSSOV	REVIEWED BY: K.ANDERSON
DATE: SEPTEMBER 2020	FIGURE NUMBER: 1



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N

LEGEND

◇ NOISE SPOT MEASUREMENT

SOUND LEVEL IN dB(A)

	🟩	<= 70
< 70	🟩	<= 75
< 75	🟩	<= 80
< 80	🟩	<= 85
< 85	🟨	<= 90
< 90	🟨	<= 95
< 95	🟧	<= 100
< 100	🟧	<= 105
< 105	🟥	<= 110
< 110	🟪	<= 115
< 115	🟦	

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USED FOR INTERPRETATION

PINCHIN

PROJECT NAME:
OCCUPATIONAL NOISE
MONITORING SURVEY

CLIENT NAME:
AIR LIQUIDE CANADA

PROJECT LOCATION:
SCOTFORD PLANT SITE

FIGURE NAME:
CONTOUR MAP AND
NOISE SPOT MEASUREMENTS

PROJECT NUMBER: 269787.000	SCALE: AS SHOWN
DRAWN BY: E.KOURNOSSOV	REVIEWED BY: K.ANDERSON
DATE: SEPTEMBER 2020	FIGURE NUMBER: 2

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

ACCEL Canada Holdings Limited:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	This is currently a gap. We have a new Health & Safety Advisor in place at Redwater. She has been tasked with producing the applicable noise management practice for the facility. Conifer will advise when complete.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	None completed in 2020
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Installation of new standalone incinerator for sales oil truck loading operation. Noise model was completed as part of EPEA approval amendment. Motive Acoustics – dated February 13th, 2020 (attached to this submission)

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Demolition of old portion of Redwater Gas Plant – will be intermittent, construction related noise during regular work hours. No update to noise model required.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	None completed
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No noise complaints received in 2020

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Noise Impact Assessment

(NIA)

Accel Energy Ltd.

Redwater Gas Plant

1-29-57-21 W4M

Date: February 13th, 2020

Notice

This report has been prepared by Motive Acoustics Inc. (Motive) in response to a specific request for service from, and for the exclusive use of, the Client to whom it is addressed. The findings contained in this report are based, in part, upon information provided by others. The information contained in this study is not intended for the use of, nor is it intended to be relied upon, by any person, firm, or corporation other than the Client to whom it is addressed, except for the applicable regulating authority to whom this document may be submitted. Motive accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use, reliance on, or any decision made based on this report.

Executive Summary

Millenia Engineering Ltd. (Millenia), on behalf of Accel Energy Ltd. (Accel), retained Motive Acoustics Inc. (Motive) to conduct a Noise Impact Assessment (NIA) for the Accel Redwater Gas Plant at LSD 1-29-57-21 W4M, Alberta. There are five (5) residences within 1500 meters from the facility. The purpose of this NIA is to quantify the cumulative noise level at the residences located within 1500m from the Accel site.

The Accel facility is regulated by the Alberta Energy Regulator (AER). Therefore, this noise impact assessment was conducted following the criteria set by the AER Noise Control Directive 038.

The equipment sound power levels (PWL) were obtained from previous studies of the facility provided by Millenia, theoretical calculations and published manufacturers' data. The modelling was performed using the DGMR iNoise V2019.1 Enterprise modelling software.

According to the results of this NIA study, the predicted noise levels at all the residences located within 1500 meters of the Accel Redwater Gas Plant at LSD 1-29-57-21 W4M are expected to be within the Alberta Energy Regulator (AER) Permissible Sound Level (PSL).

Additional noise control measures are not required for the Accel Site at 1-29-57-21 W4M to comply with AER Directive 038.

Table of Contents

Introduction

Millenia Engineering Ltd. (Millenia), on behalf of Accel Energy Ltd. (Accel), retained Motive Acoustics Inc. (Motive) to conduct a Noise Impact Assessment (NIA) for the Accel Redwater Gas Plant at LSD 1-29-57-21 W4M, Alberta. There are five (5) residences within 1500 meters from the facility. The purpose of this NIA is to quantify the cumulative noise level at the residences located within 1500m from the Accel site.

The Accel facility is regulated by the Alberta Energy Regulator (AER). Therefore, this noise impact assessment was conducted following the criteria set by the AER Noise Control Directive 038.

Noise Descriptors

Noise is frequently described as unwanted sound and within this context environmental noise is present in some form in all areas of human activity. The most common measurement of environmental noise is the dB(A) level. The descriptor most often used is L_{Aeq}.T. i.e.. conventional dB (A) level. which would have produced the same A-weighted sound energy at the same time as the actual noise history. The “A weighting” is the most common frequency weighting in current use. which corresponds approximately to the response of the human ear.

When reporting L_{eq} T the period of observation T is frequently understood to be 24 hours unless otherwise stated. The Alberta Energy Regulator Directive 038 establishes L_{eq} criteria for ‘Day.’ defined as the hours of 07:00 to 22:00. and ‘Night.’ defined as the hours of 22:00 to 07:00. The L_{eq} during daytime periods is the 15-hour A-weighted energy equivalent sound level and is denoted as the L_{eq} (Day). Similarly. the L_{eq} during night-time periods is a 9-hour A-weighted energy equivalent sound level and is denoted as the L_{eq} (Night).

The term Sound Pressure Level (SPL) is most often used in measuring the magnitude of sound. It is a relative quantity in that it is the ratio between the actual sound pressure and the fixed reference pressure. Sound pressure is measured at a particular point and may result from several sources of sound.

Sound power is the total amount of sound energy emitted per second by a noise source. A sound source has a given constant sound power that does not change if it is placed in a different environment. The decibel counterpart of sound power is called sound power level abbreviated PWL.

Noise Criteria

This NIA report and analysis have been completed according to the requirements of the Alberta Energy Regulator Directive 038 (Noise Control Guideline).

As specified in the Directive. subjected facility must meet the Permissible Sound Level (PSL) of 40 dBA (L_{eq}) night time at 1500 meter from the facility fence line if there are no closer dwellings. The Permissible Sound Level is the maximum sound level that a facility must not exceed at a point 15m from the nearest or most impacted dwelling unit. The PSL is derived from the BSL by adding the daytime adjustment. Class A adjustment. and Class B adjustment. As per the directive. the PSL definition is based on summertime condition.

If there are dwellings within 1500 meters. the PSL is determined as per the Table 1 of the Directive 038 (Appendix A). This table shows the night-time Basic Sound level (BSL). To determine Daytime noise level. 10 dBA L_{eq} is to be added to the BSL. The Ambient Sound Level is assumed to be 35 dBA L_{eq} (nighttime) as indicated on the directive and minimum BSL is determined to be 40 dBA L_{eq} (5 dBA L_{eq} above ambient level).

As per the Directive 038 section 2.1.2. there are two adjustments to the BSL to define the PSL. Those are Class A adjustment and Class B adjustment. Class A adjustments are based on the nature of the activity and /or the actual ambient sound level in an area. Class B adjustment allows some additional tolerance based upon people’s response to temporary noise generation activities. Table 2 and Table 3 of the Directive 038 shows the adjustment factors for Class A and Class B (refer Appendix A).

In this study, there are five (5) residences located within 1500 meters from the Accel Plant. Residences 1, 2 and 3 are located within 500 meters from a heavily travel road, is surrounded by less than 8 residences within 451 meters and are not qualified for Class A or Class B adjustment. **Therefore, the PSL at residences 1, 2 and 3 is 45 dBA L_{eq} nighttime and 55 dBA L_{eq} daytime.**

The following Table 1 shows the permissible sound level at residences 1, 2 and 3.

Table 1: Permissible Noise Level determination at Receivers

Description	Nighttime Leq (dBA)	Daytime Leq(dBA)
Basic Sound Level (As per Table 1)	45	45
Category 2, 1-8 Dwellings		
Day Time Adjustment	-	10
Class A Adjustment	NA	NA
Class B Adjustment	NA	NA
Permissible Sound Level	**45**	**55**

Residence 4 is located over 500 meters from heavily travel roads, is surrounded by less than 8 residences within 451 meters and is not qualified for Class A or Class B adjustment. **Therefore, the PSL at residence 4 is 40 dBA L_{eq} nighttime and 50 dBA L_{eq} daytime.**

The following Table 2 shows the permissible sound level at residence 4.

Table 2: Permissible Noise Level determination at Receivers

Description	Night Time Leq (dBA)	Day Time Leq(dBA)
Basic Sound Level (As per Table 1)	40	40
Category 1, 1-8 Dwellings		
Day Time Adjustment	-	10
Class A Adjustment	NA	NA
Class B Adjustment	NA	NA
Permissible Sound Level	**40**	**50**

Residence 5 is located over 500 meters from heavily travel roads, is surrounded by more than 8 residences within 451 meters and is not qualified for Class A or Class B adjustment. **Therefore, the PSL at residence 5 is 43 dBA L_{eq} nighttime and 53 dBA L_{eq} daytime.**

The following Table 3 shows the permissible sound level at residence 5.

Table 3: Permissible Noise Level determination at Receivers

Description	Nighttime Leq (dBA)	Daytime Leq(dBA)
Basic Sound Level (As per Table 1)	43	43
Category 1, 9-160 Dwellings		
Day Time Adjustment	-	10
Class A Adjustment	NA	NA
Class B Adjustment	NA	NA
Permissible Sound Level	**43**	**53**

Section 4.1.1 of the Directive 038 specifies the criteria for Low-Frequency Noise (LFN) consideration. If the predicted dBA value is within the permissible level. there may be LFN problem that may increase annoyance at nearby dwellings. If the potential for LFN does exist. the dBC minus dBA sound level is equal to or greater than 20 dB. and there is a clear tonal component at a 1/3 octave frequency of 250 Hz or below. If an LFN is confirmed to exist. a 5 dBA penalty will be added to the measured sound level. As this NIA conducted using theoretically calculated Sound Power Levels (PWL) the data is insufficient to predict the existence of a tonal component at a receiver location.

Study Area Description

The Accel Plant will be located at LSD 1-29-57-21 W4M, Alberta. Based on the information provided by Millenia representatives and Google Earth, the site is located NNW of the Lake Saskatoon and surrounding area are mainly flat farmland. There are five (5) residences within 1500m of the facility. Figure 1 shows the study area and the location of the facility.

Figure 1: Study Area

Equipment List and Operating Condition

Table 4: Major Equipment List

Accel 01-29	
Equipment Description	**Equipment Details**
Proposed Pump	• 10HP Pump equipment.
Proposed Incinerator	• TCI 1200 Incinerator.
Existing 01-29 Redwater Gas Plant	• Two Inlet gas compressor units each comprising of one 738HP Waukesha F3521GSI engine driven compressor; exhaust silenced by GT exhaust silencer; housed in insulated metal building, doors assumed open year-round, cooler 120EF, (10ft diameter, 30.8 HP, 300 rpm.) • Two VRU units each housed in insulated metal building, doors assumed open year-round, meeting 85 dBA @ 1 m for the air cooler and 85 dBA @ 1 m for the electric motor. • One Amine building housing two Booster pumps: Dean Model 1x1.5x6, PH2110. 3.73 kW 460/3/60 TEXP motor (x2); Amine pumps: FMC Model M1218-CS. 29.8 kW 460/3/60 TEXP motors (x2); Reflux pumps: Dean Model 3/4DL-316SS. 1.5 kW 460/3/60 XP motor (x2); Reboiler (outside): Burner – Eclipse with venturi rated 878 kW with heat output of 3 MM Btu/hr; Air-X-Limited Cooler model 72B-2ZF-R located outside rated 19.2 HP, 72 inches diameter and 520 RPM with noise level of 85dBA @ 1m and 66dBA @ 15m; Housed in standard insulated self-framing metal building, assume doors and windows open for summer ventilation. • Refrige building housing Compressor motor: 300 HP, 480 Volt / 3 Phase / 60 Hz TEFC, 3600 RPM; Compressor frame: Single stage rotary screw compressor – MYCOM P200VMD, 3550rpm; Cooler with 2 fans located outside and maximum noise emission of each fan is 65 dBA at 15m; Glycol injection pumps: National Oilwell 5S-2M reciprocating pumps with 1.5kW 460/3/60 XP motor; Housed in standard insulated self-framing metal building, assume doors and windows open for summer ventilation. • Instrument Air building housing three Air Compressors: Each air compressor includes Sullair model 1109e – 15 HP Heavy Duty Industrial Rotary Screw Air Compressor rated 68 dBA at 1 m and with 460V/PH/60HZ TEFC Efficient Motor. Housed in standard insulated self-framing metal building, assume doors and windows open for summer ventilation. • Sulphur Recovery Unit (SRU), including : incinerator, Questor Q250; 3 blowers total, two will run normally, one spare, located outdoors, 30Hp electric drive rotary vane, Noise level 92 dBA@1m; minor pumps, total <20 HP, <3600RPM, typical values, located indoors; SRU Burner/Furnace, 1,000,000 BTU/hr burner used to quantify

	noise emissions from start burner or refraction furnace during operation; Roughneck Heaters, two heaters, both AH-24B, each with two fans, 24” fans, 1725RPM, 1/2HP motors.

Nearby Facilities:

Other Site

Equipment Description	Equipment Details
01-29 Pad Site	• Treaters (2); • Pembina Crude Shipping Pumps; • All other existing equipment will be decommissioned.

Analysis Methodology and Assumptions

The equipment and study area information were provided by Millenia representatives. Motive Acoustics consultants observed the aerial image of the area to identify the existence of residences in the area and topographical significances. All the major noise sources at the facility were considered for the calculation.

The equipment sound power levels (PWL) were obtained from previous studies of the facility provided by Millenia, theoretical calculations and published manufacturers’ data. All sources were modelled as point sources.

Topographic map of the site was obtained from the National Topographic Data Base (NTDB). Canada and was used to model the ground elevation at the site and surrounding area.

The predicted levels at the receivers located within 1500 meters from the site were compared to the permissible sound level to determine if the facility will comply with the AER Directive 038.

Noise Model Parameters

Sound levels were modelled using DGMR iNoise V2019.1 Enterprise noise prediction software. This software is designed to model the environmental sound propagation calculation methods prescribed by the International Organization for Standardization (ISO) Standard 9613 (ISO 1993, 1996). This software also considers geometric spreading. atmospheric sound absorption. ground impedance effects. site topography and geometry. vegetation and environmental conditions. The ISO 9613 sound propagation method predicts noise levels under moderately developed temperature inversion and downwind conditions. which enhance sound propagation to the receptor.

Ground attenuation affects the sound propagation from the source to receiver. This model uses the porous ground category for the study area. and ISO 9613 classification of porous ground includes ground covered by grass. trees or other vegetation. and any other ground surfaces suitable for growth of vegetation i.e. farmland. Temperature and relative humidity of the model were set to 20 ^{0}C and 80% respectively. The ground absorption coefficient was used as 0.6. In order to predict the worst-case scenario at the theoretical receivers located at 1500 meters from the site. existing trees were not included in the model.

The DGMR iNoise V2019.1 Enterprise model calculates the cumulative level at the receiver from all the sources within the study area.

Sound Power Levels

Octave Band Sound Power level for the sources are given in the following table. These sound power levels have been obtained from previous studies of the facility provided by Millenia, theoretical calculations and published manufacturers' data.

Table 5: Octave Band Sound Power Level of Modeled Sources

Noise Source	Data Source*	A Weighted Octave Band Centre Frequency									Overall (dBA)
		31.5	63	125	250	500	1k	2k	4k	8k	
Inlet Compressor 1 - Building Open Area	PP	73	87	96	103	105	109	110	108	106	115
Inlet Compressor 2 - Building Open Area	PP	73	87	96	103	105	109	110	108	106	115
Refrige Building Compressor - Cooler	PP	67	81	90	94	95	95	89	85	77	101
Inlet Compressor 1 - Intake	PP	66	72	80	87	94	100	102	101	91	106
Inlet Compressor 2 - Intake	PP	66	72	80	87	94	100	102	101	91	106
Inlet Compressor 1 - Building Wall	PP	83	91	94	97	97	88	88	79	77	102
Inlet Compressor 2 - Building Wall	PP	83	91	94	97	97	88	88	79	77	102
Refrige Building Compressor	PP	71	77	88	94	101	104	107	103	94	111
Inlet Compressor 1 - Cooler Inlet	PP	67	81	90	94	95	95	89	85	77	101
Inlet Compressor 2 - Cooler Inlet	PP	67	81	90	94	95	95	89	85	77	101
1-29 Crude Pembina Shipping Pumps	PP	64	74	80	80	91	99	92	84	86	101
Inlet Compressor 1 - Cooler Discharge	PP	65	79	88	92	93	93	87	83	75	99
Inlet Compressor 2 - Cooler Discharge	PP	65	79	88	92	93	93	87	83	75	99
Amine - Building Cooler	PP	65	79	88	92	93	93	87	83	75	99
SRU Questor 250 Incinerator	PP	74	81	86	86	89	90	89	93	89	98
Amine - Building Reboiler	PP	62	75	84	89	92	92	90	87	82	98
VRU Compressor 1 - Doors Open	PP	58	63	74	81	87	91	94	90	81	98
VRU Compressor 2 - Doors Open	PP	58	63	74	81	87	91	94	90	81	98
SRU Blowers (X2)	PP	64	78	87	91	92	92	86	82	74	98
SRU Roughneck Heaters (X2 with Fans)	PP	60	76	93	91	88	88	84	78	72	97
1-29 Treaters	PP	67	80	83	83	88	90	92	92	86	98
VRU Compressor 1 - Cooler	PP	64	78	87	91	92	92	86	82	74	98

Noise Source	Data Source*	A Weighted Octave Band Centre Frequency									Overall (dBA)
		31.5	63	125	250	500	1k	2k	4k	8k	
VRU Compressor 2 - Cooler	PP	64	78	87	91	92	92	86	82	74	98
Inlet Compressor 1 - Exhaust	PP	38	51	72	78	86	94	92	86	80	97
Inlet Compressor 2 - Exhaust	PP	38	51	72	78	86	94	92	86	80	97
SRU - Total Minor Pumps	PP	55	63	73	80	89	92	91	86	77	96
Amine - Building Pump 1	PP	52	60	69	77	84	88	87	82	73	92
Amine - Building Pump 2	PP	52	60	69	77	84	88	87	82	73	92
SRU Burner	PP	41	64	84	81	67	70	71	61	59	86
Amine - Building Booster Pump 1	PP	40	49	57	65	71	74	77	74	68	81
Amine - Building Booster Pump 2	PP	40	49	57	65	71	74	77	74	68	81
Amine - Reflux Pump 1	PP	37	46	54	61	68	73	71	67	58	77
Amine - Reflux Pump 2	PP	37	46	54	61	68	73	71	67	58	77
Refrige Building - Glycol Injection Pump	PP	37	46	54	61	68	73	71	67	58	77
Proposed Incinerator Inlet	T&M	42	57	64	66	68	67	69	63	59	75
Proposed Incinerator Discharge	T&M	39	60	67	78	85	83	80	71	59	89
Proposed Pump	T&M	38	53	64	73	79	85	83	79	71	88
Air Compressor Door Closed	PP	36	55	55	63	70	73	74	57	43	78
Air Compressor Air Intake	PP	24	51	54	61	72	76	73	66	53	79
Air Compressor Air Outlet	PP	30	52	68	78	79	84	84	79	67	89

*Data Source:

- T&M - Theoretical Calculations and Manufacturers’ Data
- PP – Previously Projects

Accuracy and Limitations

The AER Directive 038 have recommended the ISO 9613 standards as one of the international standards to use in environmental noise model. The DGMR iNoise V2019.1 Enterprise noise modeling software follows the ISO 9613 calculation algorithm. According to the standards. the attenuation of sound propagating outdoors between fixed source and the receiver fluctuates due to variations in the meteorological conditions along the propagation path.

As per the standard. the estimated accuracy of the broadband noise of downwind calculation is given in Table 6 below.

Table 6: Estimated Accuracy of the Noise Propagation

Height (h)*1	Distance (d)*2	
	0<d<100m	100<d<1000 m
0<h<5m	+/- 3dB	+/-3 dB
5m<h<30m	+/- 1 dB	+/- 3 dB

*1 - h is the mean height of the source and receiver.
*2 - d is the distance between the source and receiver.

The estimates have been made from situations where there are no effects due to reflection or attenuation due to screening. Accuracy level for the distance greater than 1000m are not published in the standard and assumed same as 100m to 1000m based on professional experience.

Modeling Results

The predictions for the residences located in the study area are summarized in the table below along with the permissible sound levels (PSLs).

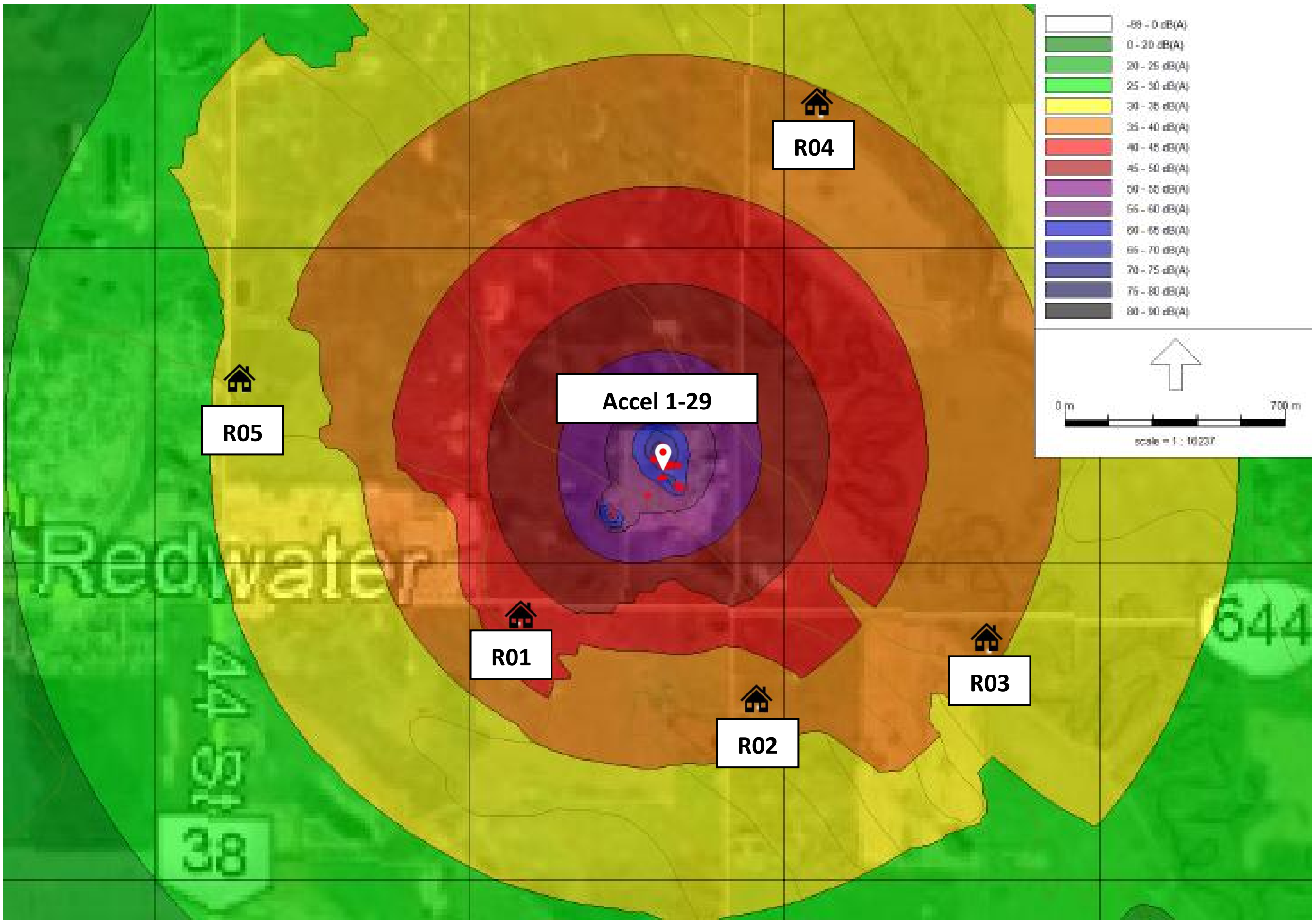
Table 7: Predicted Sound Level at the Residences located within 1500m

Receiver	Receiver Distance & Direction	Predicted Sound Level		Ambient sound Level (dBA)	AER PSL (dBA)
		Without Ambient (dBA)	With Ambient (dBA)		
R_01	670 WSW	42.6	44.5	40	45
R_02	775m S	36.6	41.6	40	45
R_03	1000m ESE	35.5	41.3	40	45
R_04	1250m NNW	35.8	38.4	35	40
R_05	1375m WNW	31.0	38.8	38	43

Predicted Noise Contour Map

Figures 2 shows the predicted sound levels for the study area. The sound levels labelled on the noise map are predicted sound levels from the energy industry facility without the ambient sound level.

Figure 2: Predicted Noise Contour Map of the Study Area



Ranking of the Sources

There are five (5) residences in this study area. The predicted noise levels were calculated at all residences located within 1500 meters from the site. The source order ranking for normal operating condition at the most impacted residence (R01) is presented in Table 8.

Table 8: Source Order Ranking at the Most Impacted Residence (R01)

Ranking	Noise Source	Levels (dBA)
1	Inlet Compressor 2 - Building Open Area	37.8
2	1-29 Crude Pembina Shipping Pumps	35.0
3	Inlet Compressor 1 - Building Open Area	33.9
4	Inlet Compressor 2 - Building Wall	28.8
5	Inlet Compressor 1 - Building Wall	28.5
6	Inlet Compressor 1 - Intake	28.2
7	Inlet Compressor 2 - Intake	28.0
8	Refrige Building Compressor	26.7
9	Inlet Compressor 1 - Cooler Discharge	24.5
10	Inlet Compressor 2 - Cooler Discharge	24.4
11	SRU Questor 250 Incenerator	24.1
12	SRU Roughneck Heaters (X2 with Fans)	23.7
13	SRU Blowers (X2)	23.6
14	VRU Compressor 2 - Cooler	23.3
15	Proposed Incinerator Discharge	23.1
16	Amine - Building Reboiler	23.0
17	Refrige Building Compressor - Cooler	22.1
18	Inlet Compressor 1 - Cooler Inlet	21.9
19	Air Compressor Air Outlet	21.4
20	Inlet Compressor 1 - Exhaust	21.1
21	SRU - Total Minor Pumps	21.1
22	Inlet Compressor 2 - Exhaust	20.9
23	VRU Compressor 2 - Doors Open	20.4
24	Proposed Pump	20.3
25	Amine - Building Cooler	20.1
26	VRU Compressor 1 - Cooler	18.6
27	Inlet Compressor 2 - Cooler Inlet	16.5
28	SRU Burner	13.4
29	Sum of Minor Sources	22.2
	Total Facility Sound Level	**42.6**
	Average Ambient Level	40.0
	Total Facility Plus Ambient	**44.5**
	AER PSL	45.0

Conclusion

According to the results of this NIA study, the predicted noise levels at all the residences located within 1500 meters from Accel Gas Plant at LSD 1-29-57-21 W4M are expected to be within the Alberta Energy Regulator (AER) Permissible Sound Level (PSL).

Additional noise control measures are not required for the Accel Gas Plant at LSD 1-29-57-21 W4M to comply with AER Directive 038.

Appendix A

Permissible Sound Level Determination Table

Table 1: Residences 1, 2 and 3 Nighttime Basic Sound Level

	Dwelling Unit Density per Quarter Section of Land		
Proximity to Transportation	**1-8 Dwelling dBA L_{eq}**	**9-160 Dwellings dBA L_{eq}**	**>160 Dwellings dBA L_{eq}**
Category 1	40	43	46
Category 2	45	48	51
Category 3	50	53	56

Category 1: Dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 2: Dwelling units more than 30 m but less than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 3: Dwelling units less than 30 m from heavily travelled roads and/or rail lines and/or subject to frequent aircraft flyovers.

- Density per quarter section: Refers to a quarter section with the affected dwelling at the centre (a 451 m radius). For quarter sections with various land uses or with mixed densities. the density chosen is then averaged for the area under consideration.

(Source: AER Directive 038)

Table 2: Class A Adjustment

Class	**Reason for Adjustment**	**Value (dBA L_{eq})**
A1	Seasonal Adjustment (wintertime Condition)	0 to +5
A2	Ambient monitoring adjustment	-10 to +10

(Source: AER Directive 038)

Table 3: Class B Adjustment

Class	**Duration of the Activity**	**Value (dBA L_{eq})**
B1	1 day	+15
B2	7 days	+10
B3	<= 60 days	+5
B4	>60 days	0

(Source: AER Directive 038)

Table 1: Residence 4 Nighttime Basic Sound Level

Proximity to Transportation	Dwelling Unit Density per Quarter Section of Land 1-8 Dwelling dBA L_{eq}	9-160 Dwellings dBA L_{eq}	>160 Dwellings dBA L_{eq}
Category 1	40	43	46
Category 2	45	48	51
Category 3	50	53	56

Category 1: Dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.

Category 2: Dwelling units more than 30 m but less than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.

Category 3: Dwelling units less than 30 m from heavily travelled roads and/or rail lines and/or subject to frequent aircraft flyovers.

- Density per quarter section: Refers to a quarter section with the affected dwelling at the centre (a 451 m radius). For quarter sections with various land uses or with mixed densities. the density chosen is then averaged for the area under consideration.

(Source: AER Directive 038)

Table 2: Class A Adjustment

Class	Reason for Adjustment	Value (dBA L_{eq})
A1	Seasonal Adjustment (wintertime Condition)	0 to +5
A2	Ambient monitoring adjustment	-10 to +10

(Source: AER Directive 038)

Table 3: Class B Adjustment

Class	Duration of the Activity	Value (dBA L_{eq})
B1	1 day	+15
B2	7 days	+10
B3	<= 60 days	+5
B4	>60 days	0

(Source: AER Directive 038)

Table 1: Residence 5 Nighttime Basic Sound Level

Proximity to Transportation	Dwelling Unit Density per Quarter Section of Land 1-8 Dwelling dBA L_{eq}	 9-160 Dwellings dBA L_{eq}	 >160 Dwellings dBA L_{eq}
Category 1	40	43	46
Category 2	45	48	51
Category 3	50	53	56

Category 1: Dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 2: Dwelling units more than 30 m but less than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
Category 3: Dwelling units less than 30 m from heavily travelled roads and/or rail lines and/or subject to frequent aircraft flyovers.

- Density per quarter section: Refers to a quarter section with the affected dwelling at the centre (a 451 m radius). For quarter sections with various land uses or with mixed densities. the density chosen is then averaged for the area under consideration.

(Source: AER Directive 038)

Table 2: Class A Adjustment

Class	Reason for Adjustment	Value (dBA L_{eq})
A1	Seasonal Adjustment (wintertime Condition)	0 to +5
A2	Ambient monitoring adjustment	-10 to +10

(Source: AER Directive 038)

Table 3: Class B Adjustment

Class	Duration of the Activity	Value (dBA L_{eq})
B1	1 day	+15
B2	7 days	+10
B3	<= 60 days	+5
B4	>60 days	0

(Source: AER Directive 038)

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Bruderheim Energy Terminal

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	As per our 2019 response companywide Cenovus manages noise through an internal "Hearing Conservation Practice. The hearing conservation program has the following elements: 1. Worker education and training 2. Facility Noise Survey 3. Personal Exposure assessment 4. Noise control strategies 5. Audiometric testing 6. Annual review of program Roles and responsibilities are clearly defined in the practice as well as training and records management. Given the size of the Brudereheim Energy Terminal we believe the Cenovus internal practice document is sufficient to meet the requirements of the NCIA Standards and Guideline document for a noise management plan.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No exterior to the facility noise monitoring completed in 2020.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No significant changes to operation of the terminal in 2020. In 2019 the noise model was updated as part of the licensing of an injection building at the eastern (Manifest) area of the terminal.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	No significant improvements/projects are planned. The noise model will be updated as required.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	In 2020 no audit/self-assessment completed. Site noise survey for operator exposure was completed in May 2019
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No noise complaints in 2020.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Insert your Company Name here: Chemtrade - 2020

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	All equipment that produce noise above 85db are placed in buildings to reduce noise and to provide a safe working area.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No monitoring was done at the site level
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No changers were implemented

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	No major improvements have been authorised or equipment purchased that would have an impact.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	Routine internal audits are carried out.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No complaints were received.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

August 3, 2021

Northeast Capital Industrial Association
Laurie Danielson, Executive Director
#204, 9902 - 102 Street
Fort Saskatchewan, AB T8L 2C3

Dear Dr. Danielson,

Subject: 2020 Noise Management Annual Report
Dow Chemical Canada ULC (Dow) Fort Saskatchewan Site

Please find attached Dow Chemical Canada ULC (Dow) input into the NCIA Regional Noise Management Plan report to the Alberta Energy Regulator (AER) for the Dow Fort Saskatchewan Industrial Site. MEGlobal Canada ULC (MEGlobal) operates a production facility within the Dow Site and is included in this submission.

Please call Marcella deJong at 780 - 992 - 8529 or myself at 780 - 992 - 4148 if you require any further information or clarification.

Yours truly,

Stephen Tong, P. Eng.
Responsible Care Director
Dow Alberta Operations

Copy: Andrew Maile, Responsible Care Leader MEGlobal Canada ULC

Dow Chemical Canada ULC
Bag 16, Highway 15 | Fort Saskatchewan, Alberta T8L 2P4 | Canada

Dow Fort Saskatchewan Site
2020 Noise Management Annual Report
Prepared for Northeast Capital Industrial Association (NCIA)

This report provides Dow and MEGlobal's 2020 input to the NCIA Regional Noise Management Plan report to be submitted to the AER. Based on AER licensed assets on the Fort Saskatchewan Site, Dow is required to follow AER Noise Directive 38 and provide input into the NCIA report. The Dow power plant is governed by the Alberta utilities Commission Rule 012: Noise Control. MEGlobal participates in the Noise Management Plan and provides this information on a voluntary basis.

Input Description	Dow and MEGlobal Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference.	A Noise Management Plan was developed by Dow and MEGlobal for submission to NCIA for inclusion in the 2011 NCIA report to the AER. A copy of the most recent version is included with this report. Noise management is done on a site wide basis without separation of which facilities are required to follow AER Directive 38 and AUC Rule 012.
Attach results of any monitoring (fenceline outward) completed in 2020. *Note, you are not required to conduct any off-site monitoring.*	No noise monitoring (fenceline outward) was completed in 2020. The site noise model was updated in 2014 for all sources (other than on-site transportation) within the Dow Fort Saskatchewan Site, including MEGlobal. Recent updates to the Dow site model have been incorporated into the NCIA regional noise model.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). *Did those changes result in a requirement to update your site noise model?* *If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?*	Changes were made to a Dow site steam turbine in 2012 which has resulted in significantly less venting of a seasonally operated steam vent during the summer season. Since the spring 2012 turnaround, we have seen a significant decrease in the number of days that this steam vent has been open. However, the intensity of the venting remains similar to prior to the turnaround. This source was removed from the NCIA regional noise model during the most recent update but remains in the Dow site model as part of a worst case.
Disclose any improvements/projects that are approved for 2020 that would impact the noise level output for your site (either up or down). *Will these changes result in a requirement to update your site noise model?*	In 2021, Dow will continue track the frequency of time that the steam vent is operated as well as the valve position to ensure that the frequency remains reduced from pre-2012 turnaround and will plan for field monitoring only if the intensity of the sound when the vent is operating changes over time.

If so, when do you anticipate having an updated site model available?	In addition, Dow will continue to track external complaints related to site operations.

Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	The noise management plan falls within the Pollution Prevention section of Dow and MEGlobal's Operating Discipline Management System (ODMS). A site management system review was most recently conducted in December 2020 by the site leader. No actions or gaps were identified related to the Noise Management Plan. In March 2014, the AER conducted an audit of the Dow Site Noise Management Plan. Dow participated fully in the audit and provided all requested information to the AER auditor including, most recently, an updated source order ranking for each residence near the Dow site in January 2015. No additional noise self-assessments were completed in 2020.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	Dow received two calls on August 31, 2020 related to thumping/noise of new LHC flare tip during startup after the flare tip replacement. There were no other noise complaints related to Dow or MEGlobal operations at the site in 2020.

Dow Fort Saskatchewan Site Noise Management Plan

Policy

The Dow Chemical Canada ULC Fort Saskatchewan site follows the Operating Discipline Management System (ODMS) of the Dow Chemical Company to manage environmental noise and hearing conservation.

MEGlobal Canada ULC (MEGlobal) Operations on the Dow Fort Saskatchewan Site follows the EQUATE Chemical Company ODMS and is included in this Noise Management Plan.

Scope

This document is created to define how the Dow Chemical Canada ULC Fort Saskatchewan site complies with the ODMS requirements concerning Noise Minimization and Hearing Conservation outlined in:

- Section E (noise minimization to meet community expectations and applicable government requirements) of 06.07 L1 Pollution Prevention
- Section C14 (employee hearing conservation) of 06.05 L1 Employee Health and Safety
- Section A2 (all equipment must be designed to control noise levels) of 06.03 EH&S Engineering Design and Control

Purpose

This document summarizes how the Dow Fort Saskatchewan Site meets the Northeast Capital Industrial Association (NCIA) requirement for a Noise Management Plan including identification, evaluation and control of noise impacts at this site.

This Noise Management Plan meets the requirements of NCIA Standard and Guideline #2010-003, as amended.

Based on AER licensed assets on the Fort Saskatchewan Site, Dow is required to follow AER Noise Directive 38 and provide input into the NCIA report. The Dow power plant is governed by the Alberta Utilities Commission Rule 012: Noise Control.

Goals / Objectives

Dow and MEGlobal, as Responsible Care® Companies will:

- Minimize, to the extent possible, noise levels impacting on the environment including minimizing nighttime and low frequency noise
- Maintain a noise monitoring program to reduce the likelihood of noise impacts on the environment
- Assign employees to manage the site noise monitoring, mitigation and continuous improvement.
- Ensure employees associated with noise sources are aware of the impact on the environment and the processes in place to control
- Design new and modified equipment to minimize noise.

Training Requirements

Workers are educated on noise through:

- All workers receive initial and three year recurring Environmental Training (Instructor led or online), which includes environmental noise.
- Noise exposed workers receive training on hearing conservation.
- Personnel conducting noise monitoring receive training from the Industrial Hygiene specialists.
- Personnel delivering unit industrial hygiene programs receive training on these programs.
- Training is tracked in a corporate web based system.

Abatement Strategies

New facilities and modifications to existing facilities are designed and built to control noise levels. Engineering controls are addressed through the Management of Change process and ODMS 06.03 EH&S Design and Control.

All projects are reviewed by EH&S regulatory personnel opposite the Alberta Operations Project Regulatory Review Checklist, which includes noise abatement and models. The Dow Management of Change system includes a similar review for changes to site facilities.

Onsite / Offsite Monitoring Requirements

Dow and MEGlobal follow ODMS and AER regulatory requirements for noise monitoring on site. Offsite noise monitoring is addressed through the NCIA regional noise model.

Dow has a current Noise Model prepared by SLR Consulting Ltd. which includes all significant site sources within the fenceline other than on-site transportation sources. The site noise model is updated if equipment is added or removed from the site that would significantly impact noise levels.

The regional noise model is validated periodically by NCIA. If any discrepancies are noted during NCIA field validation related to the Dow site, Dow will work toward resolving the discrepancy and may validate the Dow noise model with field measurements if required.

Dow responds to external noise complaints appropriately, including monitoring if necessary.

Dispatch Noise Complaint Procedure
EH&S On-Call Noise Complaint Logsheet

Individual production units do their own noise surveys at least every five years, or when equipment is added, modified or removed.

The onsite noise monitoring program is managed as per in ODMS 06.05.C14

Personal noise dosimetry is done periodically on a frequency depending on exposure.

Site Noise Sources

Site noise sources are detailed in the site Noise Model and included in the NCIA regional noise model. In addition, each unit has an area noise map.

Audit / Self Assessment Requirements

Intensive EH&S ODMS based integrated audits are conducted at 3 to 5 year frequencies for all site units/departments and include ODMS elements related to noise and hearing conservation.

Periodic self-assessments are conducted by unit/department ODMS element owners and results are reviewed with leaders at unit and department management system reviews. Results of unit, department and site self-assessments are reviewed by the Site Leader at the annual site management system review. These self-assessments include environmental noise and hearing conservation.

The hearing conservation program is designed to minimize job induced hearing loss and meets the Alberta OH&S Code as well as Dow corporate requirements for a noise exposure and control program. This program is reviewed annually.

This Noise Management Plan is reviewed once per year by the Responsible Care Leader.

Reporting Requirements	Annual reports will be generated for the NCIA. This report will include the following information for the calendar year: • Confirmation that the site has implemented a Noise Management Program and that it has been reviewed/updated as required. • Results of any monitoring / assessments (fenceline outward) • Improvements/Corrective Actions implemented • Improvement / projects that have resulted in changed noise levels on the site • Audit/Self-Assessment evaluation • Information on any external noise complaints received and actions taken
Ownership	The AER Regulatory Specialist manages the Noise Management Program and reports to NCIA as required.

Revision History

Approval

Approved by Date: January 2012

Carol Moen (Dow Responsible Care Leader)

Pravind Ramdial (MEGlobal Responsible Care Leader)

Review History

The following documents the review history for this file.

Date	Reviewed By	Position
April 2013	Mike Dziarmaga	Dow Responsible Care Leader
May 2014	Mike Dziarmaga	Dow Responsible Care Leader
August 2015	Mike Dziarmaga	Dow Responsible Care Leader
June 2016	Mike Dziarmaga	Dow Responsible Care Leader
June 2017	Jacint Domenech	Dow Responsible Care Leader
October 2018	Jacint Domenech	Dow Responsible Care Leader
October 2019	Jacint Domenech	Dow Responsible Care Leader
July 2020	Stephen Tong	Dow Responsible Care Leader
August 2021	Stephen Tong	Dow Responsible Care Leader

Revision History

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes
January 2012	Marcella deJong	New document.
April 2013	Marcella deJong	Updated Reporting Requirements to match with updated NCIA NMP Standard dated 5-Mar-13.
May 2014	Marcella deJong	Updated with clarifications suggested during AER audit of the Noise Management Plan and to meet the current NCIA standard revised in April 2014.
May 2016	Marcella deJong	Updated MEGlobal Canada Inc. to MEGlobal Canada ULC. Updated HFP to SLR.
June 2017	Marcella deJong	Replaced “MyLearning” with “online”.
October 2018	Marcella deJong	Updated Broken Links
July 2020	Marcella deJong	Updated Broken Links

NCIA **Northeast Capital Industrial Association**	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Enbridge Pipelines (Athabasca) Inc.

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Enbridge has implemented a best management practice to address environmental noise as per the NCIA Noise Management Plan.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No offsite monitoring was conducted in 2020.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No improvements/corrective actions were implemented in 2020 that would impact the noise level output.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	No improvements/projects were approved for 2021 that would impact the noise level output.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	No audit/self-assessment evaluation was completed in 2020.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No noise complaints were received in 2020.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

	NCIA Standards and Guidelines	**Document Number** **2010-003**

Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard	**Rev. Date** **31-March 2016**	**Rev.** **0**

Evonik Canada Inc.

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Confirmed. Relevant Evonik site policy was provided in 2014 and has remained unchanged since then.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No monitoring or assessment required or carried out in 2020.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	None to disclose at this time.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**		**Document Number** **2010-003**
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None to disclose at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	2016 assessment and evaluation conducted by Evonik ESHQ/OH experts. Suitable report excerpt available upon request.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No complaints.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Inter Pipeline HPC Facility

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Inter Pipeline has engaged SLR to develop a Noise Management Plan for their site (completed).
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	None
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	None, still in construction phase.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Post start-up in 2022, SLR will validate the predicted noise levels (scheduled for spring 2023) and the site noise model will be updated for inclusion in the NCIA Regional Noise Model update.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	None
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	None

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Insert your Company Name here: Keyera Energy Ltd. (2020)

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Keyera has implemented a best management practice to address environmental noise as per standard 2010-003. Keyera updated the Noise Management Plan in 2020 and has provided an electronic copy of the site plan to NCIA.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No monitoring was completed outside the fence line in 2020.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Following the installation and commissioning of a new hot oil heater, new glycol boiler and new MCC building, an update to the NIA was completed in 2020. The results of the assessment indicated that the facility is expected to meet the no-net noise increase from the baseline. The results of this assessment and updated model have been provided to NCIA.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	There are currently no improvements or projects planned for 2021 that would impact the noise level output from site.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	None completed in 2020.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	There were no noise complaints received for 2020 for this site.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

PATCHING ASSOCIATES
ACOUSTICAL ENGINEERING LTD

2020 Noise Management Plan Update
Keyera Energy Ltd.
Fort Saskatchewan (KFS) Facility
2-14-55-22 W4M
Noise Dosimetry and Sound Pressure Level Mapping
Revision 0

Prepared for:
Surbhi Bhargava, M.Sc, P. Chem
Keyera Energy Ltd.

Prepared by:
Patching Associates Acoustical Engineering Ltd.
Consultants in Acoustics, Noise Control and Vibration

2020-11-13
Document ID: 5793-NMP-000

Notice

This report has been prepared by Patching Associates Acoustical Engineering Ltd (PAAE) in response to a specific request for service from, and for the exclusive use of, the Client to whom it is addressed. The findings contained in this report are based, in part, upon information provided by others. The information contained in this study is not intended for the use of, nor is it intended to be relied upon, by any person, firm, or Energy other than the Client to whom it is addressed, with the exception of the applicable regulating authority to whom this document may be submitted.

PAAE accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

Professional Authentication and Validation

Authenticating Engineer	Validating Responsible Member
Date: 2020-11-13	Date: 2020-11-13
Company: Patching Associates Acoustical Engineering Ltd.	Permit Holder: Patching Associates Acoustical Engineering Ltd.
Title: Principal	Title: Principal
Name: Justin Caskey, P.Eng.	Name: Justin Caskey, P.Eng.

Prepared by:

Analyst and Report Author:	Amir Saghaeian B.Sc., E.I.T.
Principal In Charge:	Justin Caskey, P.Eng.
Engineer of Record:	Justin Caskey, P.Eng.
Project Manager:	Anne-Marie Wilms

Table of Contents

Introduction

Keyera Energy Ltd. (Keyera) retained Patching Associates Acoustical Engineering Ltd. (PAAE) to complete a Noise Management Plan (NMP) that meets the requirements of the Northeast Capital Industrial Association (NCIA) Standards and Guidelines 2010-003 issued 3-Sep-10, revised 31-Mar-16. The Keyera NMP would be provided as an input into the NCIA Regional Noise Management Plan (RNMP) report to the Alberta Energy Regulator (AER) for the Keyera Fort Saskatchewan KFS Facility (KFS) located at 2-14-55-22 W4M.

Keyera is committed to reducing the environmental noise impacts of its operations to the extent practical. This Site NMP is part of the Keyera's ongoing commitment to the environment, our neighbours, and social performance. The Keyera Leadership Team is committed to controlling noise and supports the contents of this Site NMP. Appendix A summarizes the Keyera Environmental, Health & Safety (EH&S) Policy.

This study has been commissioned to support Keyera's commitment to:

- Minimize to the extent practical, noise levels impacting on the environment.
- Maintain a fence line noise monitoring program to evaluate the facility noise level trend and to determine if there are any significant changes to sound emanating from the facility.
- Assign employees to manage the site noise monitoring, mitigation, and continuation improvement programs.
- Ensure employees associated with noise sources are aware of the impact on the environment and the processes to control it, which are to be consistent with the company's industrial hygiene and occupational noise exposure control objectives.
- Design new and modified equipment with the intent to minimize occupational and environmental noise.

Specifically, this report consists of two components:

- Noise Dosimetry Study: A worker noise exposure assessment.
- Sound Mapping: Mapping of Sound Pressure Levels in and around the facility buildings and equipment, extending to the fence line of the facility

The noise dosimetry study quantifies actual, typical worker exposure to noise over the course of their daily work shift. The sound mapping quantifies and visualizes noise levels in buildings and around equipment as well as propagation outwards from the facility into the environment. The sound mapping measurements were conducted in the existing case, which is the normal operating scenario, with the intent to capture normal noise emissions.

These two components combined and reviewed annually, and compared to prior year studies (2018 Noise Management Plan, PAAE Document ID 5092-NMP-000), are intended to help fulfil Keyera's commitments as described above, namely trending, monitoring, mitigation, and continual improvement of the management of environmental and occupational noise.

Explanation of technical details regarding sound measurement and analysis, such as the decibel scale, weightings, and other concepts referenced in this report can be found in Appendix A.

Noise Dosimetry Study

The noise dosimetry study serves to quantify actual, typical worker exposure to noise over the course of their daily work shift.

This assessment has been conducted in accordance with CSA Standard Z107.56-06 “Procedures for the Measurement of Occupational Noise Exposure”. The results of this assessment have been compared to the noise exposure limits in Schedule 3, Table 1 of the Alberta Occupational Health and Safety Code 2009 and a total noise exposure level of 85 dBA averaged over the entire workday.

Noise Criteria

If workers are, or may be, exposed to noise at a work site in excess of the noise exposure limits stated in “Part 16 Noise Exposure” of the Alberta Occupational Health and Safety Code AR 87/2009 (OHS Code), then the employer is required to do a noise exposure assessment.

Under “Section 218 Worker Exposure to Noise” of Part 16 the OHS Code, employers must ensure that workers exposure to noise does not exceed:

a) the noise exposure limits in Schedule 3, Table 1, and
b) 85 dBA L_{ex} daily exposure level.

Table 1 – Summary of Noise Exposure Limits from Schedule 3 of the OHS Code

Exposure Level (dBA)	Exposure Duration
82	16 Hours
83	12 Hours and 41 Minutes
84	10 Hours and 4 Minutes
85	8 Hours
88	4 Hours
91	2 Hours
94	1 Hour
97	30 Minutes
100	15 Minutes
103	8 Minutes
106	4 Minutes
109	2 Minutes
112	56 Seconds
115 ≤	0

The daily exposure level, L_{ex}, is the noise exposure dose over the worker’s normal daily shift energy-averaged to an eight-hour period. The daily exposure level takes into account the noise levels encountered over a worker’s shift and the duration of the shift. Appendix A provides a more detailed explanation of common sound level measures.

To satisfy the OHS Code noise exposure, measurements must be performed in accordance with CSA Standard Z107.56-06, be updated if there is a change in equipment or process that affects the noise level or the length of time a worker is exposed to noise, and the equipment used for the measurements must meet the requirements in Section 219 of the OHS Code.

Employers must ensure that a copy of the results of a noise exposure assessment is available on request to an affected worker or an officer, and that record of the noise exposure assessment is retained for as long as the employer operates in Alberta.

If a noise exposure assessment confirms that workers are exposed to excess noise at a work site, to satisfy Section 221 of the OHS Code, the employer must develop and implement a noise management program that includes the following policies and procedures:

a) A plan to educate workers in the hazards of exposure to excess noise and to train workers in the correct use of control measures and hearing protection;
b) The methods and procedures to be used when measuring or monitoring worker exposure to noise;
c) The posting of suitable warning signs in any work area where the noise level exceeds 85 dBA;
d) The methods of noise control to be used;
e) The selection, use, and maintenance of hearing protection devices to be worn by workers;
f) The requirements for audiometric testing and the maintenance of test records;
g) An annual review of the policies and procedures to address
    i. The effectiveness of the education and training plan,
    ii. The need for further noise measurement, and
    iii. The adequacy of the noise control measures.

Further specific requirements for the mandatory provision and maintenance of hearing protection equipment for workers are outlined in Section 222 of the OHS Code. Further specific requirements for the mandatory provision of audiometric testing for workers exposed to excess noise are outlined in Section 223 of the OHS Code.

Part 16 of the Alberta Occupational Health and Safety Code AR 87/2009 contains a complete listing of employer responsibilities in relation to noise exposure at the workplace. The Alberta OHS Act, Regulation and Code are available on the Government of Alberta Human Services website:
http://work.alberta.ca/occupational-health-safety/ohs-act-regulation-and-code.html

As vibration exposure is not regulated in Alberta, it was not assessed in this study.

Methodology

This noise exposure assessment has been conducted in accordance with CSA Standard Z107.56-06 "Procedures for the Measurement of Occupational Noise Exposure."

The noise exposure measurements were conducted on November 4-5, 2020. PAAE staff were advised that the facility was operating normally on these dates.

The noise exposure levels of four categories of workers were assessed:

- Plant Operator – regular checking and operating of facility equipment throughout the facility
    - 12-hour day shift, from 06:00 to 18:00
    - 12-hour night shift, from 18:00 to 06:00
- Maintenance – routine and as-required repair and maintenance of various facility equipment
    - 9-hour shift, from 07:30 to 17:00
- Management – mainly office based, with some direct exposure to facility equipment noise
    - 8-hour shift, from 07:00 to 15:30

Brüel & Kjær Type 4448B logging noise dosimeters were used to conduct the noise exposure assessment per each worker category. These instruments qualify as acceptable noise dosimeters under CSA Standard Z107.56-06 and satisfy the Type 2 tolerance requirements of ANSI standard S1.25-1991 (R1997). The microphone of the dosimeter was attached to the outside edge of the wearer's shoulder or as close as feasible. The dosimeters were calibrated before and after measurements. Table 2 shows a summary of the dosimeters used for this survey and the calibration dates for this equipment.

Table 2 – Instrumentation Summary

Equipment	Manufacturer/ Model	Instrument Serial No.	Last Traceable Calibration*	Calibration Interval Valid
Dosimeter – Plant Operator (Day)	Brüel & Kjær Type 4448	4311575	Not Applicable	Not Applicable
Dosimeter – Plant Operator (Night)	Brüel & Kjær Type 4448	4311576	Not Applicable	Not Applicable
Dosimeter – Maintenance	Brüel & Kjær Type 4448	4311574	Not Applicable	Not Applicable
Dosimeter – Management	Brüel & Kjær Type 4448	4311573	Not Applicable	Not Applicable
Dosimeter Calibrator	Brüel & Kjær Type 4231	3010042	2019-09-05	Yes

*Factory calibration was conducted by Brüel & Kjær. As per CSA Z107.56-06, traceable calibration is not required for dosimeters.

Noise exposures were based on logging of noise levels experienced by each worker over the course of their shift, a few minutes shorter than their scheduled time due to the setup, fitting, and removal of the dosimeters at the beginning and end of their shifts. The logged levels were then extrapolated to cover the full extent of each shift (the L_{eq}, or energy-equivalent sound level) and calculations were based on this result.

Results

The results of the dosimetry study, and recommendation for hearing protection are presented below.

Table 3 – Dosimetry Results

Job Description	Operator – Day	Operator – Night	Maintenance	Management
Run Time	07:16:00	12:00:00	08:16:00	7:12:00
Start Date	November 5, 2020	November 4, 2020	November 4, 2020	November 4, 2020
Start Time	05:56:41	17:59:31	08:44:22	08:48:39
Stop Date	November 5, 2020	November 4, 2020	November 4, 2020	November 4, 2020
Stop Time	13:12:52	05:59:31	17:00:22	16:00:39
Pre-Calibration Date	November 4, 2020	November 4, 2020	November 4, 2020	November 4, 2020
Pre-Calibration Time	07:24:46	07:26:02	07:23:19	07:19:14
Post-Calibration Date	November 6, 2020	November 6, 2020	November 6, 2020	November 6, 2020
Post-Calibration Time	12:08:33	12:10:13	12:06:20	12:03:16
Calibration Deviation (dB)	0.1	0.3	0.1	0.1
Sample Period	1 minute	1 minute	1 minute	1 minute
Periods (min)	436	720	496	432
Note	12-hour day shift 06:00-18:00	12-hour night shift 18:00-06:00	10-hour day shift 07:30-17:30	8-hour day shift 07:00-16:00
Results				
Dose	120.7%	12.8%	13.0%	5.3%
L_{eq} (dBA)	84.1	74.3	75.2	72.2
$L_{eq,max}$ (dBA)	101.2	94.7	88.15	90.4
L_{Peak} (dBC)	130.2	128.1	130.7	119.8
L_{ex} (8 hr, dBA)	85.8	76.1	76.1	72.2
Criteria & Measurement Setup				
Exch. Rate (dB)	3	3	3	3
Threshold (dB)	0	0	0	0
Criterion (dBA)	85	85	85	85
Crit. Duration (hrs)	8	8	8	8
RMS Weight	A Weighting	A Weighting	A Weighting	A Weighting
Peak Weight	C Weighting	C Weighting	C Weighting	C Weighting
Detector	Slow	Slow	Slow	Slow
Gain	0	0	0	0

Plant Operator – Day Shift:

The Plant Operator day shift position had the highest noise exposure, with a Lex of 85.8 dBA or 120.7% of the daily allowed noise dose (in energy terms) for a Leq limit of 85.0 dBA for an 8-hour shift. This is a slight decrease to the 2018 study levels (PAAE Document ID 5092-NMP-000). In addition, this position had a C-weighted peak level of 130.2, enough to potentially cause hearing damage in a short period without adequate protection, which could be due to equipment noise exposure. The loudest level recorded was 101.2 dBA, exposure to which would exceed the daily limit in approximately 11 minutes. Therefore, hearing protection is required for this position. Additionally, in colder conditions such as in wintertime, operators may spend more time in warm buildings, increasing their noise exposure beyond what was measured in this study.

Plant Operator – Night Shift:

The Plant Operator night shift position had a lower average noise exposure than the Operator day shift position, with an Lex of 76.1 dBA or 12.8% of the daily allowed noise dose (in energy terms) for a Leq limit of 85.0 dBA for an 8-hour shift. This is a slight increase to the 2019 study levels. In addition, this position had a C-weighted peak level of 128.1, enough to potentially cause hearing damage in a short period without adequate protection, which could be due to equipment noise exposure. The loudest level recorded was 94.7 dBA, exposure to which would exceed the daily limit in approximately 50 minutes. Based on this study, hearing protection is not required for this position. However, hearing protection is still recommended in areas where noise levels are greater than 85 dBA.

Note that this dosimetry test was only done for a single shift; and although it is considered representative, it may not have captured the worst-case conditions experienced throughout the year. If the Plant Operator night shift position is sometimes similar to the day shift position, then hearing protection would be required.

Maintenance:

The Maintenance position had a slightly higher average noise exposure than the Operator night shift position, with a Lex of 76.1 dBA or 13.0% of the daily allowed noise dose (in energy terms) for a Leq limit of 85.0 dBA for an 10-hour shift. In addition, this position had a C-weighted peak level of 125.5, enough to potentially cause hearing damage in a short period without adequate protection, which could be due to equipment noise exposure. The loudest level recorded was 88.15 dBA, exposure to which would exceed the daily limit in approximately 3 hours and 50 minutes. Based on this study, hearing protection is not required for this position. However, hearing protection is still recommended in areas where noise levels are greater than 85 dBA.

Management:

The Management position had the lowest noise exposure, with a Lex of 72.2 dBA or 5.3% of the daily allowed noise dose (in energy terms) for a Leq limit of 85.0 dBA for an 8-hour shift. The loudest level recorded was 90.4 dBA, exposure to which would exceed the daily limit in approximately 2 hours and 15 minutes. Based on this study, hearing protection is not required for this position. However, hearing protection is still recommended in areas where noise levels are greater than 85 dBA.

A time history graph for each position/shift are shown in Figures 1 to 4 below. The blue line shows the LAeq, and the green line shows the LCpeak.

Figure 1 – Operator, 12-hour day shift

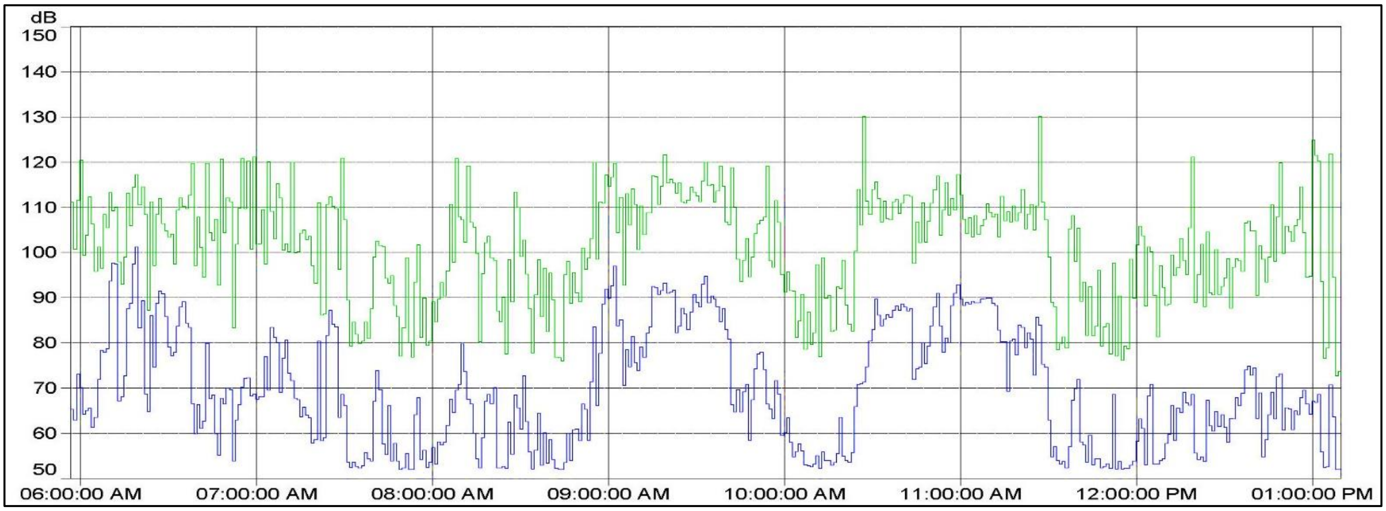


Figure 2 – Operator, 12-hour night shift

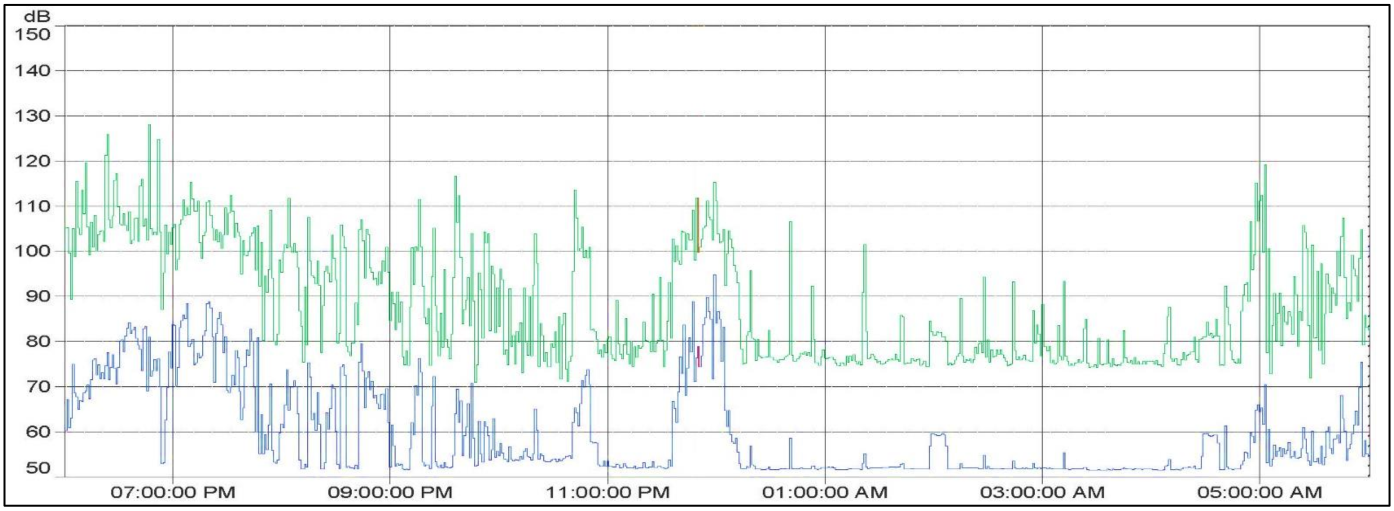


Figure 3 – Maintenance, 10-hour shift

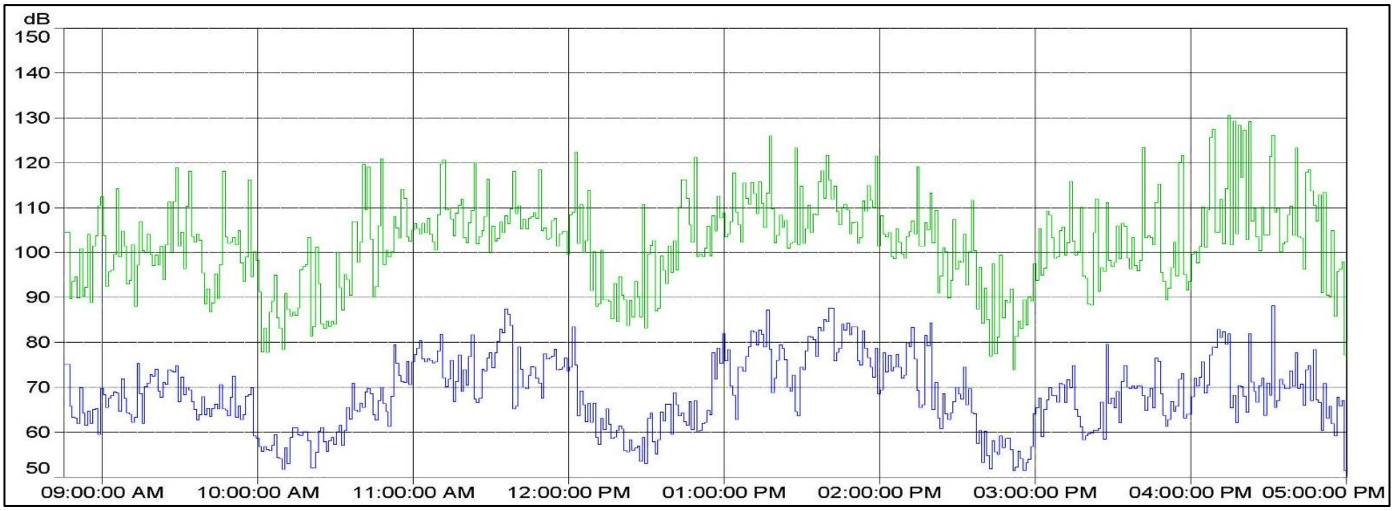
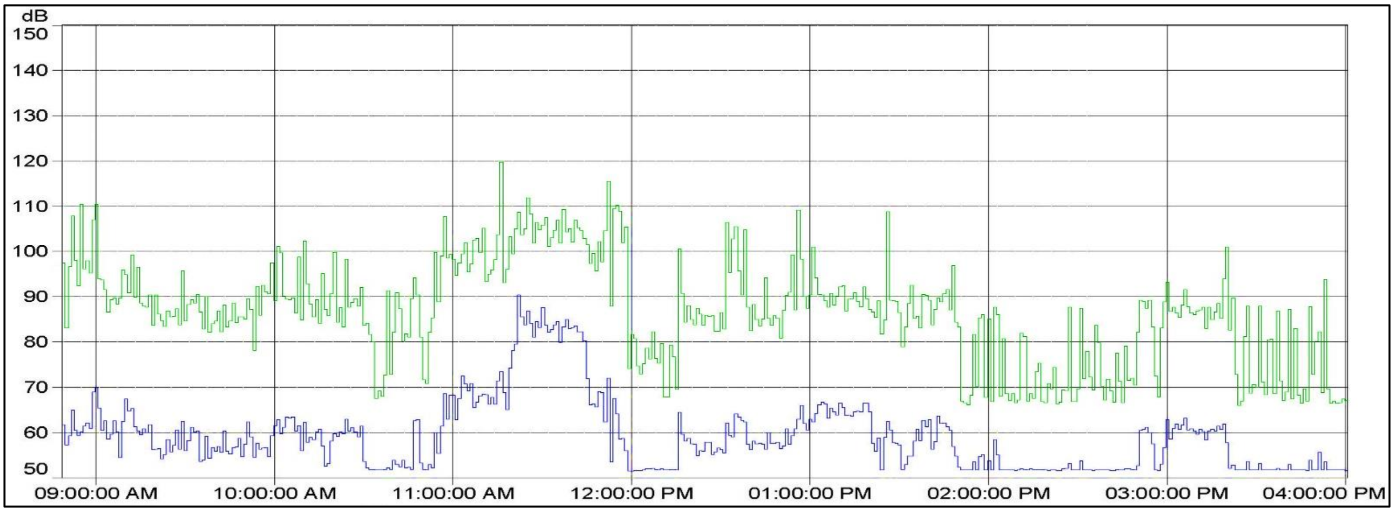


Figure 4 – Management, 8-hour shift



Noise Maps

The noise maps serve to visualize noise levels in buildings and around equipment as well as propagation outwards from the facility equipment into the environment within the fence line.

Sound pressure levels in and around all the buildings, around outdoor noise emitting equipment, across the grounds and around the perimeter of the facility were measured with a Brüel & Kjær Type 2270, Class 1 integrating logging sound level meter. The existing case, which is the normal operating situation, was mapped.

The major change from the previous study (PAAE Document ID 5092-NMP-000) is to upgrade the Hot Oil Heater-Radiant Coil (Tag no. HR-1502) which has reduced noise emitting level at the site.

The noise maps are attached in Appendix B. They can be used for visual reference, worker education, visitor orientation, and placing of signage related to noise levels. As well, the propagation of sound from the facility can be visually estimated, and levels noted around the fence line can be compared from year to year as part of the annual noise mitigation strategy.

Areas and buildings with sound pressure levels in excess of 85 dBA should be marked with warning signs for hearing protection, and areas where levels exceed 105 dBA should be marked for double hearing protection. CSA Z94.2-02 (R2007) Hearing Protection Devices should be referenced for more detailed definitions and to determine appropriate specifications.

Conclusion

Keyera Energy Ltd. retained Patching Associates Acoustical Engineering Ltd. to complete a Noise Management Plan (NMP) that meets the requirements of the Northeast Capital Industrial Association (NCIA) Standards and Guidelines 2010-003 issued 3-Sep-10, revised 31-Mar-16.

The Keyera NMP would be provided as an input into the NCIA Regional Noise Management Plan (RNMP) report to the Alberta Energy Regulator (AER) for the Keyera Fort Saskatchewan KFS facility located at 2-14-55-22W4M.

This report consists of two components, designed to help fulfil Keyera's commitments to the RNMP. The noise dosimetry study quantifies actual, typical worker exposure to noise over the course of their daily work shift, and the noise maps quantify and visualize noise levels in buildings and around equipment as well as propagation outwards from the facility into the environment.

The dosimetry study was the second instance analyzed by PAAE, and comparison to prior data can be made. There was a slightly decrease from the previous year. Only the Plant Operation day shift position exceeded the daily exposure limits, but all positions were exposed to very high noise levels that could cause hearing damage in a very short amount of time without adequate protection. Hearing protection is not generally required for the Operator night shift, Maintenance, and management positions, but is recommended in areas where noise levels are greater than 85 dBA. All the positions assessed except the management position had exposure to levels above 120 dBC peak, considered loud enough to instantly damage hearing without protection.

For selection of hearing protection, CSA Grade 1 or Class C ear plugs or muffs (minimum CSA ratings) would be sufficient based on the measured noise exposure levels for all positions. Workers may choose style or type on preference, as long as it meets the Grade or Class and is CSA certified.

The noise maps are attached in Appendix B. They can be used for visual reference, worker education, visitor orientation, and placing of signage related to noise levels. As well, the propagation of sound from the facility can be visually estimated, and levels noted around the fence line can be compared from year to year as part of the annual noise mitigation strategy.

Keyera has committed to sharing and discussing the results of this study with workers, in keeping with the company's health and safety policies, and as part of implementation of their Noise Management Plan. Specifically, the report and noise maps will be posted on-site, and reviewed with facility operators and other relevant staff during a safety meeting.

See Appendix C for the NCIA Annual Submission Form for 2017.

Appendix A:

Explanation of Technical Details Regarding Sound Measurement and Analysis

Technical Details

Sound is the phenomena of vibrations transmitted through air, or other medium such as water or a building structure. The range of pressure amplitudes, intensities, and frequencies of the sound energy is very wide, and many specialized fields have developed using different ranges of these variables, such as room acoustics and medical ultrasound.

Due to the wide range of intensities, which are perceived as sound, standard engineering units become inconvenient. Sound levels are commonly measured on a logarithmic scale, with the level (in decibels, or dB) being proportional to ten times the common logarithm of the sound energy or intensity. Normal human hearing covers a range of about twelve to fourteen orders of magnitude in energy, from the threshold of hearing to the threshold of pain. On the decibel scale, the threshold of hearing is set as zero, written as 0 dB, while the threshold of pain varies between 120 to 140 dB. The most usual measure of sound is the sound pressure level (SPL), with 0 dB SPL set at 2.0 X 10^{-5} N/m^2 (also written 20 μPa), which corresponds to a sound intensity of 10^{-12} Watts/m^2 (or 1 picoWatt/m^2, written 1 pW/m^2).

Normal human hearing spans a frequency range from about 20 Hertz (Hz, or cycles per second) to about 20,000 Hz (written 20 KHz). However, the sensitivity of human hearing is not the same at all frequencies. To accommodate the variation in sensitivity, various frequency-weighting scales have been developed. The most common is the A-weighting scale, which is based on the sensitivity of human hearing at moderate levels; this scale reflects the low sensitivity to sounds of very high or very low frequencies. Sound levels measured on the A-weighted scale are written in A-weighted decibels, commonly shown as dBA or dB(A).

When sound is measured using the A-weighting scale, the reading is often called the “Noise level”, to confirm that human sensitivity and reactions are being addressed. A table of some common noise sources and their associated noise levels are shown in Table A1.

When the A-weighting scale is not used, the measurement is said to have a “linear” weighting, or to be un-weighted, and may be called a “linear” level. As the linear reading is an accurate measurement of the physical (sound) pressure, the term “Sound Pressure Level”, or SPL, is usually (but not universally) reserved for un-weighted measurements.

Noise is usually defined as “unwanted sound”, which indicates that it is not just the physical sound that is important, but also the human reaction to the sound that leads to the perception of sound as noise. It implies a judgment of the quality or quantity of sound experienced. As a human reaction to sound is involved, noise levels are usually given in A-weighted decibels (dBA). An alternate definition of noise is “sound made by somebody else”, which emphasizes that the ability to control the level of the sound alters the perception of noise.

Table A1- Noise Levels of Familiar Sources

Source Or Environment	Noise Level (dBA)
High Pressure Steam Venting To Atmosphere (3m)	121
Steam Boiler (2m)	90-95
Drilling Rig (10m)	80-90
Pneumatic Drill (15m)	85
Pump Jack (10m)	68-72
Truck (15m)	65-70
Business Office	65
Conversational Speech (1m)	60
Light Auto Traffic (30m)	50
Living Room	40
Library	35
Soft Whisper (5m)	20-35

The single number A-weighted level is often inadequate for engineering purposes, although it does supply a good estimate of people's reaction to a noise environment. As noise sources, control measures, and materials differ in the frequency dependence of their noise responses or production, sound is measured with a narrower frequency bandwidth; the specific methodology varies with the application. For most work, the acoustic frequency range is divided into frequency bands where the center frequency of each band is twice the frequency of the next lower band; these are called "Octave" bands, as their frequency relation is called an "Octave" in music, where the field of acoustics has its roots. For more detailed work, the octave bands, and certain standard octave and 1/3 octave bands have been specified by international agreements.

Where the noise at the receiver is steady, it is easy to assess the noise level. However, both the production of noise at the source and the transmission of noise can vary with time; most noise levels are not constant, either because of the motion of the noise source (as in traffic noise), because the noise source itself varies, or because the transmission of sound to the receiver location is not steady as over long distances. This is almost always the case for environmental noise studies. Several single number descriptors have been developed and are used to assess noise in these conditions.

The most common is the measurement of the "equivalent continuous" sound level, or L_{eq}, which is the level of a hypothetical source of a constant level which would give the same total sound energy as is measured during the sampling period. This is the "energy" average noise level. Typical sampling periods are one hour, nighttime (9 hours) or one day (24 hours); the sampling period used must be reported when using this unit.

The greatest value of the L_{eq} is that the contributions of different sources to the total noise level can be assessed, or in a case where a new noise source is to be added to an existing environment, the total noise level from new and old sources can be easily calculated. It is also sensitive to short term high noise levels.

Statistical noise levels are sometimes used to assess an unsteady noise environment. They indicate the levels that are exceeded a fixed percentage of the measurement time period measured. For example, the 10%-ile level, written L_{10}, is the levels exceeded 10% of the time; this level is a good measure of frequent noisy occurrences such as steady road traffic. The 90% level, L_{90}, is the level exceeded 90% of the time, and is the background level, or noise floor. A steady noise source will modify the background level, while an intermittent noise source such as road or rail traffic will affect the short-term levels only.

One disadvantage with the L_{eq} measure, when used alone, is that nearby loud sources (e.g. dogs barking, or birds singing) can confuse the assessment of the situation when it is the noise from a distant plant that is the concern. For this reason, the equivalent level and the statistical levels can be used together to better understand the noise environment. One such indication is the difference between the L_{eq} and the L_{90} levels. A large difference between the L_{eq} and L_{90}, greater than 10 dB, indicates the intrusion of short-term noise events on the general background level. A small difference, less than 5 dB, indicates a very steady noise environment. If the L_{eq} value exceeds the L_{10} value this indicates the presence of significant short-term loud events.

For most noise measurement, instruments are adjusted so that the time response of the instrument is similar to the response of the human ear; this is the “Fast” setting. Measurement with the “Fast” setting therefore assesses the sound environment according to the way humans would hear it and react to it. Where the noise level varies substantially and an average level is wanted without the complexity of and L_{eq} or statistical measurement, the “Slow” setting is used on the sound level meter. The “Slow” setting is also typically used in industrial settings where hearing damage is a concern. Where the noise level changes very rapidly, for example due to impacts or detonations, the “Fast” and “Slow” settings do not respond quickly enough to assess the maximum levels, and the “Impulse” meter setting us used.

The Sound Power Level (abbreviated L_w, SWL or PWL) is the decibel equivalent of the total energy emitted from a source in the form of noise. The reference level for the sound power is 10^{-12} Watts, or 1 picoWatt (abbreviated pW). The sound power level is given by:

$$L_w, \text{SWL}, \text{PWL} = 10 \times \log_{10} (\text{Emitted Power} / 1 \text{ pW}) \text{ dB}$$

Therefore, a source emitting 1 Watt of power in the form of sound would have a sound power level of 120 dB. Sound power levels can be expressed in terms of frequency bands, an overall linear-weighted level or A-weighted, as is the case for sound pressure levels. However, sound power levels are inherent to the source of noise, whereas the sound pressure level is dependent on the source, but also on the distance from the source and other environmental factors.

Appendix B:

Keyera Energy Ltd. Health, Safety, and Environment Policy

Health, Safety and Environment Policy

We at Keyera are committed to achieving an injury free workplace. We will strive to be a leading performer in our industry. We believe every job can be done safely and in an environmentally responsible manner by following these guiding principles in all of our daily activities and decisions. We expect this commitment will be embraced by everyone at our worksites and it will not be compromised.

LEADERSHIP – Management and Supervisors are accountable for the health and safety of all persons on our worksites. We believe everyone can be a safety leader by making health and safety a daily priority.

RESPONSIBILITY – We - managers, supervisors, employees, contractors and visitors - are responsible for the health and safety of ourselves and those around us. We will cooperate with all efforts to enhance health and safety at our worksites.

PREVENTION – We will identify hazards and take the necessary measures to control risk.

WORKER INVOLVEMENT – We will make safe behaviors an integral part of every task performed, including taking the time to do it right. We will care enough to intervene when we see an unsafe condition or behavior.

TRAINING – We will be adequately trained and competent. We will apply that training to perform our work safely.

ENVIRONMENTAL STEWARDSHIP – We are committed to environmental protection, mitigation and restoration as an integral part of our business. We will take steps to reduce the impact of our activities on the environment.

CONTINUOUS IMPROVEMENT – We will continuously improve by openly communicating our successes and our challenges, and through the application of learnings.

COMPLIANCE – We will comply with all laws and regulations applicable to our operations.

At Keyera, no job is more important, no service more urgent, than maintaining a safe, healthy and environmentally responsible workplace. Please join us in making this commitment a daily priority.

David S Smith

David G. Smith
President and Chief Executive Officer
Keyera Corp.

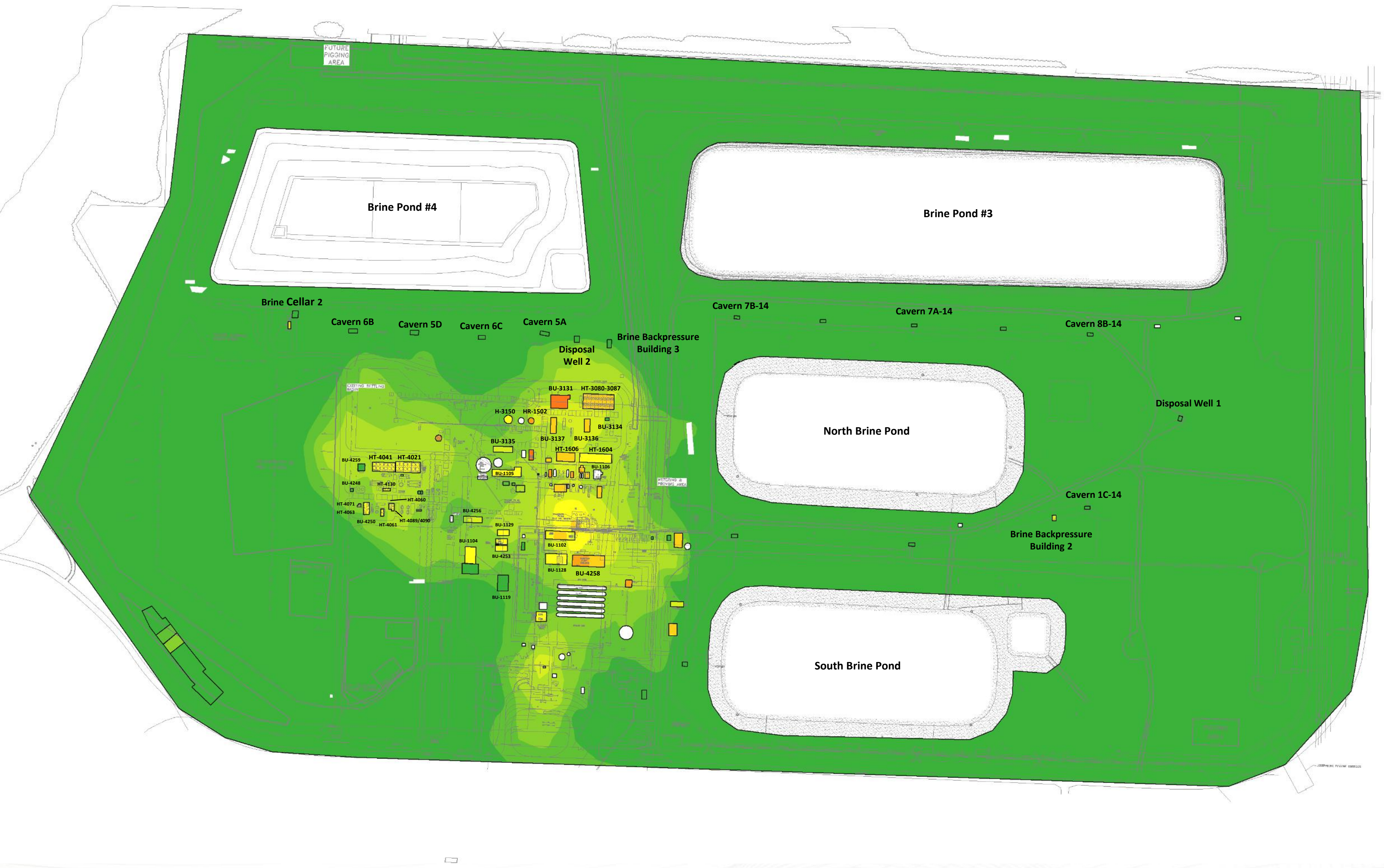
EFFECTIVE DATE: MARCH 2017

Appendix C:

Noise Maps

Sound Pressure Levels dB(A)

Alberta OHS regulations require workers exposed to levels greater than 85 dBA based on a daily shift length of 8 hours to wear appropriate hearing protection. Areas with such levels should be marked with warning signs. For daily exposure levels greater than 105 dBA, double hearing protection is required.



🟩	< 60
🟩	60 - 65
🟩	65 - 70
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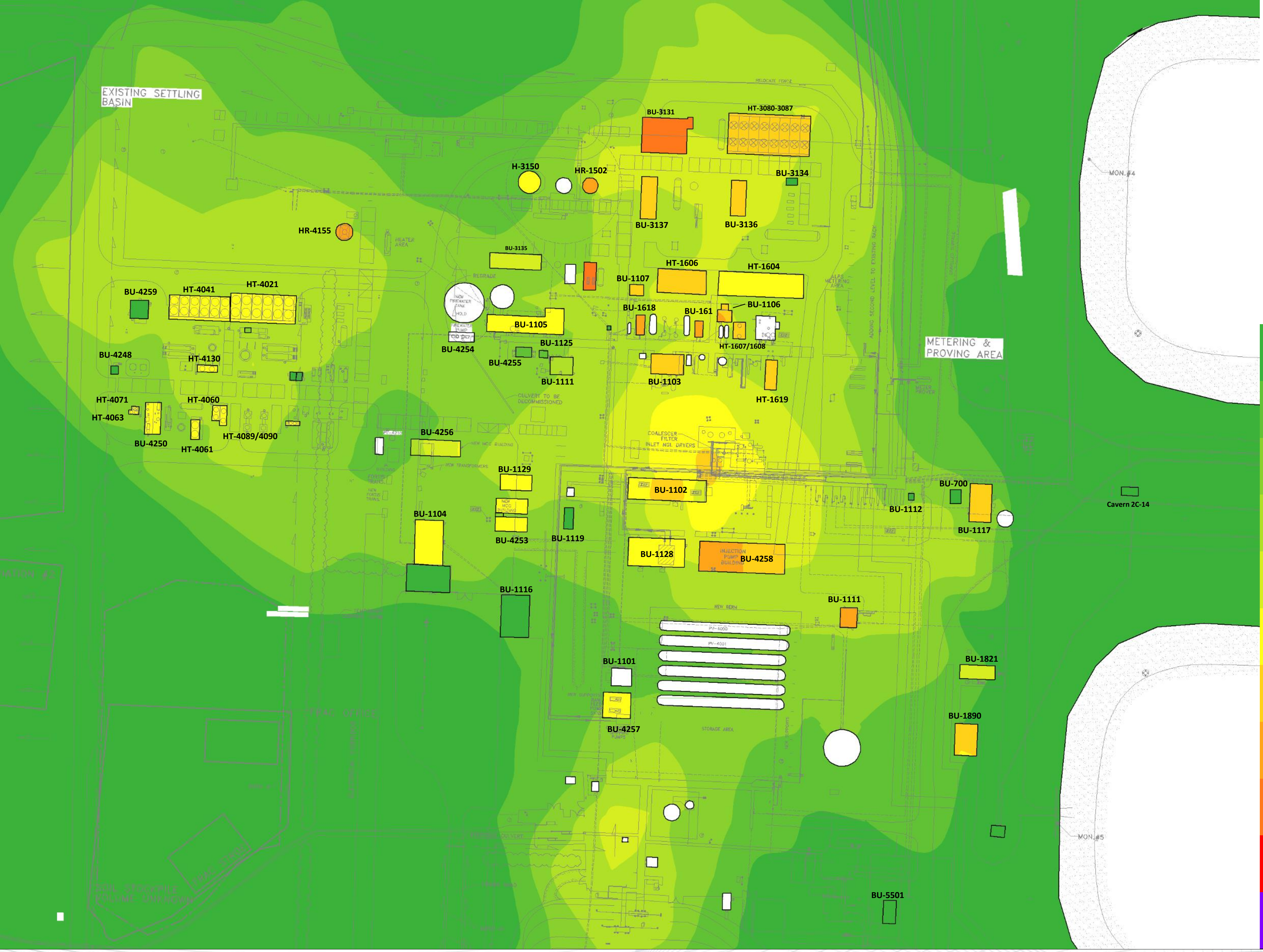
🟧	90 - 95
🟧	95 - 100
🟥	100 - 105
🟪	105 <

Facility Name	Scenario	Location	Measurement Height	Measurement Date	Document ID
Keyera Fort Saskatchewan	**Summertime Normal Operations Ongoing**	**02-14-55-22 W4M**	**2.0m**	**2020-11-04**	**5793-NAW-000**

PATCHING ASSOCIATES
ACOUSTICAL ENGINEERING LTD



Sound Pressure Levels dB(A)

Alberta OHS regulations require workers exposed to levels greater than 85 dBA based on a daily shift length of 8 hours to wear appropriate hearing protection. Areas with such levels should be marked with warning signs. For daily exposure levels greater than 105 dBA, double hearing protection is required.

🟩	< 60
🟩	60 - 65
🟩	65 - 70
🟩	70 - 75
🟨	75 - 80
🟨	80 - 85
🟧	85 - 90
🟧	90 - 95
🟧	95 - 100
🟥	100 - 105
🟪	105 <

Facility Name	Scenario	Location	Measurement Height	Measurement Date	Document ID
Keyera Fort Saskatchewan	**Summertime Normal Operations Ongoing**	**02-14-55-22 W4M**	**2.0m**	**2020-11-04**	**5793-NAW-000**

PATCHING ASSOCIATES
ACOUSTICAL ENGINEERING LTD

Appendix D:

NCIA Annual Submission Form

NCIA Standards and Guidelines

Document Number
2010-003

Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard

Rev. Date
31-March 2016

Rev.
0

Keyera Corporation
Keyera Fort Saskatchewan (KFS) Facility
2018

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Keyera has implemented a best management practice to address environmental noise as per standard 2010-003. Keyera has provided an electronic copy of the site plan to NCIA.
Provide a summary of any monitoring (fence line outward completed in 2018. Note, you are not required to conduct any off-site monitoring.	No monitoring was completed outside the fence line in 2018.
Disclose any improvements/corrective actions implemented in 2018 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	In 2018, Keyera removed a couple of existing air intake silencers. The silencers were proven to be a fire hazard and were thus removed for safety reasons. Keyera expanded the injection facilities and installed an Inlet Quality (IQ) building (IQ building expected to have a negligible noise impact). The above changes have been assessed by Patching Associates Acoustical Engineering Ltd. in June 2018. The results of the assessment indicate that these changes do not result in any perceivable noise increase at the nearby residences. The noise impact assessment report, including an updated noise model, have been provided.

Disclose any improvements/projects that are approved for 2019 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Work began on the replacement of the Hot Oil Heater in Frac 1 in 2019 which will reduce the overall site noise level when the new heater is commissioned in Q2 2020.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2018.	In 2018, Keyera completed a self-assessment with the assistance of Patching Associates Acoustical Engineering Ltd (provided). This assessment included: detailed diagnostic noise measurements and modeling including cumulative impact assessment for the adjacent facilities existing in the Alberta Industrial Heartland, occupational noise mapping within the facility fence line, and a noise exposure assessment using noise dosimeters. The assessment documentation has been produced with the participation and review of the senior staff.
Provide a Noise Complaint summary for all noise complaints received in 2018 including any actions taken to address them.	There were no noise complaints received for 2018 for this site.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

<u>Nutrien Redwater and Fort Saskatchewan:</u>

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Nutrien has a Noise Management Plan. The plan consists of the following documents: • ESP 3.07.01 Noise Management Overview • ESP 3.07.02 Noise Management Program • ESP 3.07.03 Noise Source List • ESP 3.07.04 Monitoring Program
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	There was no offsite monitoring completed in 2020 for the Redwater or the Fort Saskatchewan facilities.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	There were no improvements or corrective actions implemented in 2020 for the Redwater and Fort Saskatchewan facility.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Redwater Sounds barriers were installed on the 30# Steam Vents in spring 2021, as identified in the Noise Model Update. This may reduce the noise level. Nitric Acid Process Unit – silencers were installed in summer 2021 on the compressor kickback line, as well as, the centrifugal air compressor discharge vent line (CVM exit vent line). This should reduce the noise level. As stated in the 2013-2015 reports, Redwater engaged both SLR and Noise Solutions to proactively provide noise control options for the compressor / gas turbine (CGT-902) replacement project. This assessment is primarily Occupational Hygiene, but it is anticipated that Environmental Noise will also be reduced. The CGT-902 replacement project will be completed in summer 2021. Fort Saskatchewan No improvement/projects planned for 2021.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	The Noise Management Plan, program and associated documents were not reviewed in 2020.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	There were no external noise complaints for the Fort Saskatchewan facility in 2020. There was one noise complaint for the Redwater facility in 2020 (see attached summary).

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Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date 31-March 2016	Rev. 0

Insert your Company Name here:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Yes and a copy was provided
Provide a summary of any monitoring (fence line outward completed in 2019. Note, you are not required to conduct any off-site monitoring.	No outside. There was a noise map of the interior of the production area
Disclose any improvements/corrective actions implemented in 2019 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	None completed No N/A

Disclose any improvements/projects that are approved for 2020 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None N/A N/A
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2019.	No audit/self-assessments
Provide a Noise Complaint summary for all noise complaints received in 2019 including any actions taken to address them.	No noise complaints received

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

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NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Pembina NGL Corporation – Redwater Facilities:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Pembina Redwater facilities have a Noise Management Program, which includes implementation of Best Management Practices to address environmental noise as per the NCIA Noise Management Plan.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No fence line outward monitoring conducted in 2020.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No changes made in 2020. Final measurements required in RFS II/III to finalize model from theoretical to actual. Work was postponed in 2020 due to Covid-19 site restrictions....work will be completed in 2021.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Actual measurements in the RFS II/III facilities will be completed in 2021 to finalize the site noise model. This will require an update to the RNM, which will be updated in 2022.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	None completed
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No complaints received

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NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
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Plains Midstream Canada:

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	The Facility has an Environmental Noise Management Practice. The practice is part of PMC’s Operational Management System (FSK-P-36-00-12).
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	No monitoring/assessments were completed in 2020.
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Construction activities commenced on the installation of new pumps to support cavern storage activities. The new pumps have not commenced operation in 2020. The new pumps may result in changes that require the facility to update the Regional Noise Model. An update, if required, will be conducted in conjunction with the next regional noise model update.

	NCIA Standards and Guidelines	**Document Number** **2010-003**	
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Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down).	The continued installation of new pumps to support cavern storage activities.
Will these changes result in a requirement to update your site noise model?	These activities may result in changes that require the facility to update the Regional Noise Model. This will be evaluated as we proceed with expansion activities.
If so, when do you anticipate having an updated site model available?	An update, if required, will be conducted in conjunction with the next regional noise model update.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	No audits or self-assessment evaluations were completed in 2020.
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No noise complaints were received by the Facility in 2020.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
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<u>Shell Scotford Site</u>

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	In 2014, Shell Scotford amalgamated individual (Refinery, Chemicals, and Upgrader) Site NMPs into one document. It is called the Shell Scotford Site Noise Management Plan (SUG.HSSE.ENV.AIR.NOIS.M.002). Document attached. SUG.HSSE.ENV.NOIS .M.002_Site_Noise_
Provide a summary of any monitoring (fence line outward completed in 2019. Note, you are not required to conduct any off-site monitoring.	
Disclose any improvements/corrective actions implemented in 2019 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	No improvements/corrective actions implemented in 2020

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
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Disclose any improvements/projects that are approved for 2020 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	No improvements/projects approved for 2021 that would impact the noise level output for the site
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2019.	No audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for Scotford site noise management plan in 2020.
Provide a Noise Complaint summary for all noise complaints received in 2019 including any actions taken to address them.	No noise complaints received in 2020.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

Shell Scotford Site Noise Management Plan

Document Review and Approval		
Reviewed By		
Elaine Rippon		
Maurice Ouellet		
Wendy Konsorada		
Michael Frigge		
Achim Schempp		
APPROVED BY	**DATE**	**SIGNATURE**

Version 3

27-November-2018

Scotford Upgrader	**Area: Noise Monitoring**	Document Number: SUG.HSSE.ENV.AIR.NOIS.M.002
	Title: Shell Scotford Site Noise Management Plan	Rev No: 2 Date: Nov 27-18
Document Owner: Environment Manager		Document Focal: Noise Focal

CONTENTS

Scotford Upgrader	**Area: Noise Monitoring**	Document Number: SUG.HSSE.ENV.AIR.NOIS.M.002
	Title: Shell Scotford Site Noise Management Plan	Rev No: 2 Date: Nov 27-18
Document Owner: Environment Manager	Document Focal: Noise Focal	

1 POLICY

Royal Dutch Shell's Commitment and Policy on Health, Security, Safety, the Environment and Social Performance demonstrates commitment for reducing environmental and social impacts resulting from our operations. For Shell Scotford, noise is actively managed by instituting controls, and measures up front when designing or changing parts of the process that generate noise, and by also measuring and monitoring to ensure controls are effective. This Site Noise Management Plan is part of the Scotford's ongoing commitment to the environment, our neighbours, and social performance. The Scotford Leadership Teams are committed to controlling noise and support the contents of this Site Noise Management Plan.

2 NOISE MANAGEMENT PROGRAM

2.1 Goals and Objectives

2.1.1 Regulatory Compliance

Noise is regulated by the Alberta Energy and Resources Conservation Board (ERCB), Directive 038, "Noise Control Directive – User Guide" and applies to all facilities where the ERCB has issued a permit to operate. Section 5.1 of the Noise Control Directive states,

> "A facility is in compliance if a CSL (comprehensive sound level) survey conducted at representative conditions has results equal to or lower than the established PSL (permissible sound level), taking into consideration any LFN (low frequency noise). Alternatively, if the ERCB agrees that a CSL survey is not practical, a detailed Noise Management Plan (NMP) approved by the ERCB may be used."

The Industrial Heartland is considered an area where a CSL survey is not practical due to the large industrial base in a relatively small area. As such, all NCIA (Northeast Capital Industrial Association) member companies in the Industrial Heartland are mandated to participate in the Regional Noise Management Plan developed by the NCIA. The RNMP is designed with the intent of minimizing, to the extent practical, the noise levels impacting on the environment from member companies and their associated industrial facilities. The RNMP ensures that NCIA member companies adopt best practices and principles in noise management and that each member company will implement a Site NMP (noise management plan) independently. Each NMP must include:

- identification of noise sources,
- assessment of current noise mitigation programs,
- performance effectiveness of noise control devices,
- methods of noise measurement,
- best practices programs, and
- continuous improvement programs

Compliance with D-38 is to be demonstrated through conformance with the RNMP on the basis of due diligence for noise control (taking all reasonable steps to reduce a given impact). Key expectations with respect to compliance are as follows:

1. Conformance with individual facility programs – implementing best practices in monitoring, abatement, self audit, annual reporting and other program details.
2. Complaint Resolution – partnership with regulator to determine adequate resources to manage complaints to a "workable resolution".
3. Readiness for potential management system (Site NMP) audit – similar to other regulated activities under current monitoring and enforcement rules.
4. Participation in development and maintenance of a Regional Noise Model – the model provides a baseline for industrial noise and allows for an empirical assessment of potential problem area and sources.
5. Tracking noise management initiatives and providing an annual status to NCIA to facilitate a comprehensive annual report to the ERCB.

Companies that do not demonstrate conformance with the plan would default to Permissible Sound Level (PSL) compliance under Directive 038.

2.1.2 Noise Control Objectives

Shell recognizes that it is not practical or possible to eliminate all sources of noise. However, it is expected that wherever possible, noise control practices and mitigation will be in place to minimize noise, for example, maintaining a noise standard when procuring new equipment or taking into consideration possible noise impacts when instituting plant process changes. It also includes how Shell operates including employing the use of silencers and mufflers, or simply keeping doors on buildings closed.

Shell takes a proactive approach for activities that could have an environmental impact such as noise. When planning work that could generate excessive noise, such as boiler blow downs or flaring for example, it is important to assess the community impact and communicate with stakeholders as required. It is also Shell's approach to avoid practices that create excessive noise during evening hours and weekends whenever possible.

If despite proactive measures a resident expresses concern that they are impacted by plant operation, Shell will immediately initiate a complaint protocol and work in collaboration with the resident to attain resolution.

2.1.3 Continuous Improvement and Best Practices

For Shell, continuous improvement from a noise perspective means to examine noise sources to discover and eliminate problems. Examination of noise sources is accomplished through Industrial Hygiene (IH) noise surveys, noise modelling, and offsite noise surveys. When any of these tools identifies a potential unacceptable noise level, mitigation plans are implemented.

Shell educates and trains their staff on the Noise Management Plan during Operations Compliance Training.

Shell stays current by attending the bi-annual noise conference (hosted by the Alberta Acoustics & Noise Association) and having active representation on the NCIA Noise Best Practices Sub-committee. In the way Shell will be aware of the latest technology and advancements in the noise field and institute best practices accordingly.

2.1.4 Facility Communication Strategies

Where noise has been identified as a potential issue with the community, Shell will notify stakeholders in advance of the activity by utilizing the NRCAER line.

If a noise concern is received from a stakeholder, then SDP11021 Public Concern Response Practice is activated and followed and the

SUG.HSSE.ENV.NOIS.P.001 Noise Sampling Practice is initiated and followed. All relevant information is entered in the SDF11021 Public Concern Form and the SUG.HSSE.ENV.NOIS.TO.001 Fenceline Noise Monitoring Form along with an incident report being entered into FIM (Fountain Incident Management).

2.2 Roles and Responsibilities

Department or Title	**Roles**
Community Affairs	• Notification to neighbours for planned activities. • Reactive communications to neighbours concern. • Monitor operations response to public concern.
Shift Supervisor or Designate	• Initiate investigation for public concern for operating units • Perform fence-line noise surveys. • If required follow-up with concern in off-hours (PA during normal hours).
Environment Department	• Support to Operations for investigation of noise concern, conducting fence-line noise surveys & regulatory notifications. • Data analysis and external noise surveys. • Maintain site noise model.
Industrial Hygiene	• Primary support for onsite noise monitoring.
Security	• Initial contact for public concern.

2.3 Monitoring and Measuring

2.3.1 Fenceline Monitoring

When a public concern is received and the SDP 11021 Public Concern Response Practice is activated, as stated in 2.1.4, or activities on site create the need to monitor noise levels, fenceline noise measurements are conducted.

Fenceline measurements are conducted as per SUG.HSSE.ENV.NOIS.P.001 Noise Sampling Practice and results are recorded on SUG.HSSE.ENV.NOIS.TO.001 Fenceline Noise Monitoring Form.

If the need arises for any other type of noise monitoring, a request can be submitted through SUG.HSSE.ENV.NOIS.TO.002 Request for Non-Routine Noise Sampling.

2.3.2 Industrial Hygiene (IH) Surveys

IH Surveys are done on a request basis, or at a minimum a unit noise survey is conducted every 4 years. All results and reports are stored in Livelink.

Shell is regulated under the Alberta OH&S Code and participates in the Hearing Conversation Program set forth in the code. IH is responsible to ensure that workers get noise dosimeter testing done every 2 years as part of this program.

2.3.3 Noise Modelling

A detailed noise model was developed for the Shell Scotford Upgrader in 2006 and can be viewed here 2006 Noise Model. The model identifies all noise sources within the base Upgrader.

The Upgrader Expansion started operations in June 2011. It is Shell's intent to update the original 2006 Model to include the Expansion facilities, and to identify any changes to the existing Base plant, by the end of 2014.

2.3.4 Routine Monitoring

There is currently no routine monitoring being done at Shell Scotford, due to the fact there has not been a residence complaint since 2004 and the results of the 2005 Noise Model demonstrated satisfactory offsite noise levels.

An offsite noise survey of the Shell facilities will be completed in 2014 to determine the offsite CSL's post Expansion project start up.

The results of this survey along with the information obtained from the upcoming model will determine what, if any, routine monitoring will be conducted.

2.4 Noise Control

Proactively ensuring mitigative measures and controls are considered in order to minimize the impact of noise when implementing facility design changes or purchasing new equipment is a key principle of noise control. When implementing a change at Shell Scotford, whether it's new equipment or a modification to existing equipment, the MOC (Management of Change) process must be followed. For the Upgrader, Shell's definition of a plant change can be found in SUG.CON.MOC.C.001 Definition of Plant Change. For Manufacturing, changes that do not require following the MOC process are listed in SCM-MOC-SP-01 Changes Not Requiring Management of Change (MOC).

The Management of Change Quality Assurance Manual describes the work process for all managed changes within the Shell Scotford Upgrader. The SCM-MOC-PR-01 Management of Change (MOC) Procedure describes the work process for all managed changes within Shell Scotford Manufacturing. Any change that may increase noise as per SUG.CON.MOC.G.001 Environmental Guideline for Noise Producing Equipment.needs to be reviewed and signed off by both the Environment department and Industrial Hygiene as per SUG.CON.MOC.C.003 Discipline Review Parties Matrix for the Upgrader, and the SCM-MOC-G-06 Discipline Reviewer Matrix for Manufacturing

3 AUDIT/SELF ASSESSMENT

Noise is included in the scope of ongoing ISO 14001 audits and the HSSE MS internal audits under social performance. Audit findings are recorded in Fountain Assurance Management (FAM) with related action items assigned to individuals. Audit findings are reviewed by Upgrader Leadership Team.

An internal audit specific to the Site NMP against the NCIA Standards and Guidelines will be done every 3 years.

Audit results and findings will be included in the annual summary to NCIA to be included in the NCIA Annual Noise Report to ERCB.

4 REPORTING

All routine sampling results, non-routine sampling results, monitoring surveys, and modelling results are stored in Shell's Livelink and/or Sharepoint system.

Shell has the responsibility to provide input into the Annual Regional Noise Management Plan report, which is submitted to the ERCB by NCIA. Information to be provided is as follows:

- Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-001 issued 3-Sep-10.
- Procedure/Practice/Standard reference (i.e. SOP-AG-RW-200-002)
- Results of any monitoring/assessments (fenceline outward) completed in the reporting year.
- Improvements implemented for the reporting year.
- Changes that have resulted in increased noise levels on your site for the year reporting on.

- Noise Complaints received and follow up actions taken to address them.

- Planned improvements to noise management practice, noise abatement work or noise model work for the upcoming year.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
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<u>Sherritt International Corporation:</u>

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **<u>This is for the calendar year 2020.</u>**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	The Site has implemented the referenced standard and developed a Code of Practice (FSSMP001-021) which has been previously submitted to NCIA. There were no updates made to the Code of Practice in 2020.
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	None
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	None in 2020. The Site noise model does not require updating at this time.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	None in 2021. The Site noise model does not require updating at this time.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	None
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No noise complaints were received in 2020.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

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Umicore Canada Inc.

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission. **This is for the calendar year 2020.**

If you have any questions, please call Laurie Danielson @ 780.992.1463 or 780.819.9020

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Code of Practice (COP-323-7) Noise Exposure Management Plan included in the Umicore Canada Inc. Management System. Reference to 'environmental noise' included in the Umicore Canada Inc. Air Quality Management Program (COP-319-2)
Provide a summary of any monitoring (fence line outward completed in 2020. Note, you are not required to conduct any off-site monitoring.	Not applicable – noise monitoring conducted inside the plant from an industrial hygiene perspective
Disclose any improvements/corrective actions implemented in 2020 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	Management of Change (MOC) program includes elements to identify potential changes/ impacts with respect to noise exposure. There were no projects in 2020 that impacted noise exposures up or down.

Disclose any improvements/projects that are approved for 2021 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	Many of the projects approved for 2021 will not have any effect on the noise level. All circuits for the most part are located inside of Umicore proper buildings and maintain a rating of approximately 81 - 83 db. No requirement to update site noise model.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2020.	Not applicable – noise monitoring conducted inside the plant from an industrial hygiene perspective
Provide a Noise Complaint summary for all noise complaints received in 2020 including any actions taken to address them.	No complaints received in 2020.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	NCIA Standards and Guidelines	Document Number 2010-003	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		Rev. Date 31-March 2016	Rev. 0

<u>Access Pipeline o/a Wolf Midstream (Sturgeon Terminal)</u>

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	Member Site Comments
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Access abides by AER's Directive 38. We participate in industrial noise monitoring.
Provide a summary of any monitoring (fence line outward completed in 2018. Note, you are not required to conduct any off-site monitoring.	A noise monitoring was not conducted in 2020.
Disclose any improvements/corrective actions implemented in 2018 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	N/A

Disclose any improvements/projects that are approved for 2018 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	There were no anticipated projects or improvement for 2020 that may have impacted noise levels.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2018.	None.
Provide a Noise Complaint summary for all noise complaints received in 2018 including any actions taken to address them.	Wolf Midstream did not receive any noise complaints for the 2020 year.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

<u>Access Pipeline o/a Wolf Midstream (Stonefell Terminal – Operating on Behalf of MEG Energy)</u>

Note, please provide as much detail as you can for the following, attaching any clarifying or required documents with your submission.

If you have any questions, please call Laurie Danielson @ 780.992.1463

Input Description	**Member Site Comments**
Confirmation that site has implemented a best management practice to address environmental noise as per NCIA Noise Management Plan Standard 2010-003 issued 3-Sep-10, revised 5-Mar-13, revised 14-Apr-14, revised 31-Mar-16 including the Procedure/Practice/Standard reference. Note, if you have not provided an electronic copy of your site plan to NCIA, please do so.	Access abides by AER’s Directive 38. We participate in industrial noise monitoring.
Provide a summary of any monitoring (fence line outward completed in 2017. Note, you are not required to conduct any off-site monitoring.	A noise monitoring was not conducted in 2020.
Disclose any improvements/corrective actions implemented in 2017 or status thereof that would impact the noise level output for your site (either up or down). Did those changes result in a requirement to update your site noise model? If so, have you provided your updated site model to SLR Consulting for incorporation into the NCIA Regional Noise Model as per the process outlined for this purpose?	N/A

NCIA Northeast Capital Industrial Association	**NCIA Standards and Guidelines**	**Document Number** **2010-003**	
Noise Management Plan Reporting Requirements as per Section 5.4 of this Standard		**Rev. Date** **31-March 2016**	**Rev.** **0**

Disclose any improvements/projects that are approved for 2018 that would impact the noise level output for your site (either up or down). Will these changes result in a requirement to update your site noise model? If so, when do you anticipate having an updated site model available?	There were no anticipated projects or improvement for 2020 that may have impacted noise levels.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2017.	None.
Provide a Noise Complaint summary for all noise complaints received in 2017 including any actions taken to address them.	Access Pipeline did not receive any noise complaints for the 2020 year.

This information is being collected as per the NMP Standard 2010-003 Revised 31-March-2016. All information provided will be disclosed to the AER as part of the required NCIA Annual Reporting on the Regional Noise Management Plan.

Further, the Annual Report will be a public document available on our website once finalized.