NCIA Regional Noise Management Plan (RNMP) Report

(covering the 2022 and 2023 Calendar Years)

Prepared for the

Albert Energy Regulator (AER)

And

The Alberta Utilities Commission (AUC)

May 2024

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NCIA Regional Noise Management Plan (RNMP)

2024 Annual Report to the Alberta Energy Regulator (AER) and

The Alberta Utilities Commission (AUC)

(covering the calendar years 2022 and 2023)

1 Executive Summary

The NCIA Regional Noise Model (RNM) was updated in 2023 (last update was in 2018). Details of the update are included in Section 3 and Appendix 1 of this report. As part of the discussion and continuous improvement of the RNMP and RNM, it was decided that for simplicity and consistency, the number of scenarios (Cases) presented will be reduced from three to two. The following cases have been presented:

- Case 1: Existing Case
  - Includes submitted sound models of existing facilities of NCIA member companies.
  - Includes sound models of existing non-member facilities voluntarily submitted or from data collected as part of other studies shared with the NCIA.
- Case 2: Future Case
  - Includes all facilities from Case 1.
  - Includes proposed facilities expected to be constructed within 1-5 years.

Previously, Case 1 only included NCIA member facilities, while non-member facilities were not included, even if they were AER or AUC regulated for noise. Meanwhile, the previous Case 3: Model Validation Case included all existing facilities for which sound models were available to the NCIA but without the explicit downwind conditions specified in the regulations.

Several NCIA member site level noise models were updated and included in this RNM update, along with facilities that were not included in the previous 2018 RNM. Site level model updates were due mostly to expansions or changes at these facilities since the last model update in 2018. Major changes to the RNM model from 2018 include:

- Addition of Air Products Scotford facility site model (not an NCIA member).
- Addition of AltaLink Scotford 409S Substation site model (not an NCIA member).
- Updated Cenovus Bruderheim Terminal site model.
- Addition of Inter Pipeline HPC facility site model.
- Addition of North West Redwater Sturgeon Refinery updated site model to Case 1 and removal of the previous model from Case 2.
- Updated Nutrien Redwater Fertilizer site model.
- Updated Pebmina Redwater site models (two of them).

- Addition of Pembina CDH site model.
- Updated Plains Midstream site model.
- Remove Suncor Sturgeon Refinery from Case 2.

Field validation measurements for the Regional Noise Model were completed in 2022 and 2023 (conducted by ACI Acoustical Consultants Inc.). Measured versus modeled results for the 2022 and 2023 field data are shown in Tables 3 and 4 and Figure 3. A discussion of the results is presented in Section 4 of this report.

The field validation measurements are compared to the 2023 RNM in Section 4. Results of the comparisons show good agreement between the model predictions and monitoring results. Most monitored nighttime sound levels fall within the stated range of uncertainty of ISO 9613-2 predictions. Compared to prior RNM iterations, the updated model better predicts the levels at both near and far receptors (monitoring locations) with one set of environmental parameters.

Figure 4 shows trend analysis that was completed for any location that had at least 4 years or more of data. It is evident from this Figure that there are no significant trends (either up or down) in the sound levels of the measured data over time when one considers the variability created by the meteorological conditions.

2 AER Audits of NCIA Member Facilities

No Audits of NCIA member companies' Regional Noise Management Plans were conducted by AER in 2022 or 2023.

3 Regional Noise Model Update (2023, Appendix 1)

Several NCIA member site level noise models were updated since 2018, mostly due to expansions or changes at these facilities, and those were included in the 2023 RNM update (as explained in the Executive Summary). Also, facilities that were not included in the previous regional model were added.

Road traffic data was also updated for the 2023 RNM (see Appendix 1) along with the railway noise data (see Appendix 1). These are provided as layers in the model (available on the NCIA website) that can be turned on or off depending on what the users interest is. A version of the 2023 RNM is available on the NCIA website for Case 1.

Tables 1 is reproduced from Appendix 1 and shows the current state of the site level models that make up the 2023 NCIA Regional Noise Model.

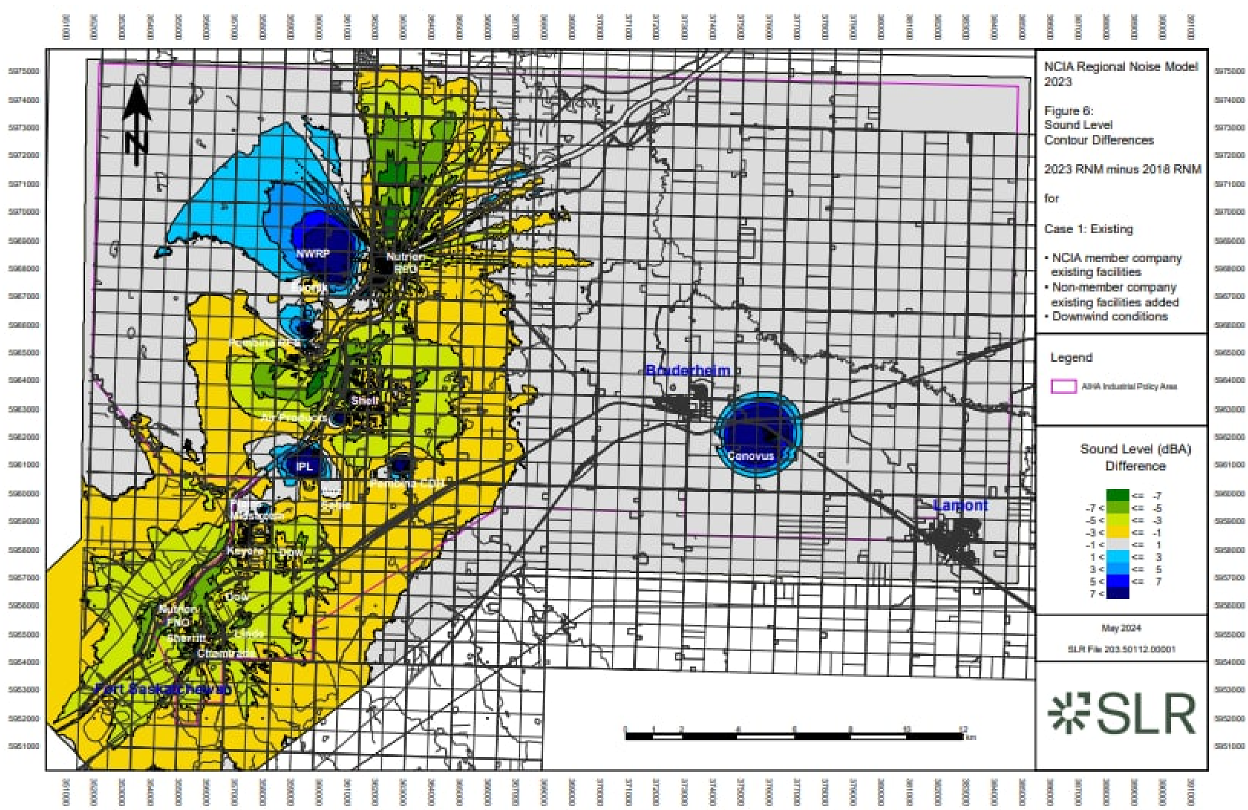
Figure 1, reproduced from Appendix 1, below shows the difference map between the 2023 model and the 2018 regional model.

Table 1
Site Noise Models in 2023 RNM Prepared by SLR

Facility	2018 RNM Case	2023 RNM Case	NCIA Member	Model Changes	Comments
Air Liquide Scotford Cogen	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Air Products Scotford	N/A	1 - Existing	☐	☑	Newly added 2023 model based on fence line measurements.
AltaLink Scotford 409S Substation	N/A	1 - Existing	☐	☑	Newly added, updated 2023 desktop model.
Aux Sable Canada Extraction Plant	2 - Future Regulatory	N/A	☑	☒	Removed.
Aux Sable Canada Offgas Plant	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Cenovus Bruderheim Terminal	1 - Existing Regulatory	1 - Existing	☑	☑	Updated 2019 model based on detailed site measurements.
Chemtrade Central Service Center	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Chemtrade Sulfides Facility	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Corefco	3 - Model Validation	1 - Existing	☐	☐	Part of Sherritt Integrated Site. No changes.
Dow Chemical Canada	1 - Existing Regulatory	1 - Existing	☑	☐	Ethylene; Fractionator; Polyethylene I, II & III; Ethylene Oxide/Glycol; Ethane Storage; Power & Utilities; Cogen. No changes.
Evonik Hydrogen Peroxide Plant	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Inter Pipeline Ltd. HPC	N/A	1 - Existing	☑	☑	IPL Heartland Petrochemical Complex. Newly added, 2023 field-verified desktop model.
Keyera KFS	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Linde Canada Air Separation Plant	1 - Existing Regulatory	1 - Existing	☑	☐	Renamed, formerly Praxair.
Linde Canada Carbon Dioxide Plant	1 - Existing Regulatory	1 - Existing	☑	☐	Renamed, formerly Praxair.
North West Redwater Sturgeon Refinery	2 - Future Regulatory	1 - Existing	☑	☑	Newly added, 2023 3rd-party model. Moved to Case 1 (existing) from future case.

Facility	2018 RNM Case	2023 RNM Case	NCIA Member	Model Changes	Comments
Nutrien FNO	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Nutrien RFO	1 - Existing Regulatory	1 - Existing	☑	☑	Updated 2022 desktop model.
Oerlikon Metco	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Pembina CDH	N/A	1 - Existing	☑	☑	Newly added, 2019 3rd-party model.
Pembina RFS	1 - Existing Regulatory	1 - Existing	☑	☑	ROF, RFS 1-3, Perimeters, Brine Pond 6, and Cogen. Model updated with field measurements in 2019, 2022.
Pembina RFS 4	N/A	2 - Future	☑	☑	Newly added 2023 model for proposed expansion, based on 2022 measurements of similar equipment at RFS 2 and RFS 3.
Plains Midstream PFS	1 - Existing Regulatory	1 - Existing	☑	☑	Updated 2023 model with Debottleneck project added.
Shell Canada	1 - Existing Regulatory	1 - Existing	☑	☐	Refinery; Upgrader (base plant and expansion plant); Cogen facilities. No changes.
Shell Chemicals	1 - Existing Regulatory	1 - Existing	☑	☐	Styrene; MEG facilities. No changes.
Sherritt International	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Smith & Nephew	3 - Model Validation	1 - Existing	☐	☐	Part of Sherritt Integrated Site. No changes.
Suncor Sturgeon Upgrader	2 - Future Regulatory	N/A	☑	☒	Removed.
Tidewater Midstream FSEEP	3 - Model Validation	1 - Existing	☐	☐	Renamed, formerly ATCO Midstream.
Umicore	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Value Creation Inc. Upgrader	2 - Future Regulatory	2 - Future	☑	☐	No changes.
Wolf Midstream Sturgeon Terminal	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.

Figure 1
Contours of modeled differences between 2023 and 2018 RNM's



Following the calculation of the RNM 2023 sound contours, a difference map has been generated comparing the RNM 2018 Case 1: Existing Regulatory (downwind) contours, typically used as a baseline for previous NIAs in the AIH area, to the RNM 2023 Case 1: Existing contours. This is presented in the appended Figure 6 difference map, where the RNM 2018 contours are subtracted from the RNM 2023 contours. Positive results indicate an increase in predicted sound levels, in this case mostly due to the addition of new facility models, and negative results indicate a reduction in sound level, in this case mostly nearer to the modelled facilities due to the change in calculation standard from CONCAWE to ISO 9613-2. Far-field results are relatively consistent which is important for representing the impact of industrial sound on the neighboring communities.

4 2022 and 2023 Monitoring results for Regional Noise Model (Appendix 2 and 3)

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) prespecified 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. 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 July 2022 by P. Froment, B.Sc., P.L.(Eng.).

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

Table 2
Monitoring Location Details

Monitoring Location	UTM Coordinates (Approximate)		Start Time	End Time
	Easting (m)	Northing (m)		
1E	355210	5954157	7/20/22 13:00	7/22/22 13:00
2C	358256	5957216	7/22/22 12:00	7/24/22 12:00
3B	358361	5959283	7/22/22 12:00	7/24/22 12:00
4C	361665	5960870	7/20/22 12:00	7/22/22 12:00
5A	361777	5964711	7/20/22 12:00	7/22/22 12:00
6A	364322	5967894	7/20/22 12:00	7/22/22 12:00
8A	358897	5965430	7/20/22 10:00	7/22/22 10:00
9A	355872	5957574	7/22/22 12:00	7/24/22 12:00
10A	355925	5955818	7/20/22 13:00	7/22/22 13:00
11A	358430	5963804	7/20/22 09:00	7/22/22 09:00
12B (1st 48-hour)	368223	5963070	7/20/22 10:00	7/22/22 10:00
12B (2nd 48-hour)			7/22/22 13:00	7/24/22 13:00
13A	358667	5970180	7/20/22 09:30	7/22/22 09:30

The complete reports are included as Appendix 2 and 3 of this report.

Figure 2: NCIA Regional Noise Monitoring Locations (as per Table 2)

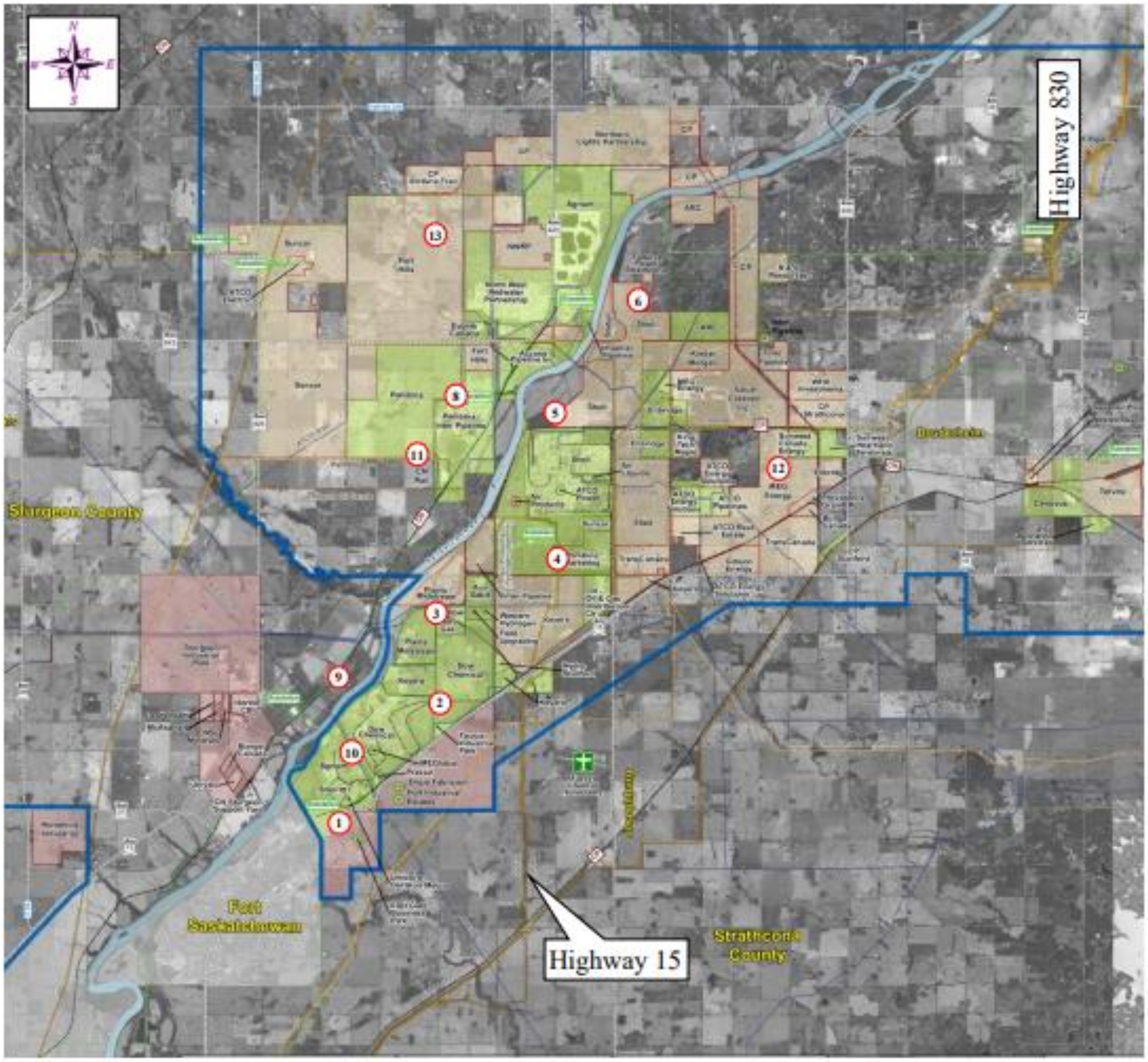


Table 3

Comparison of Measured versus Modelled results for 2022

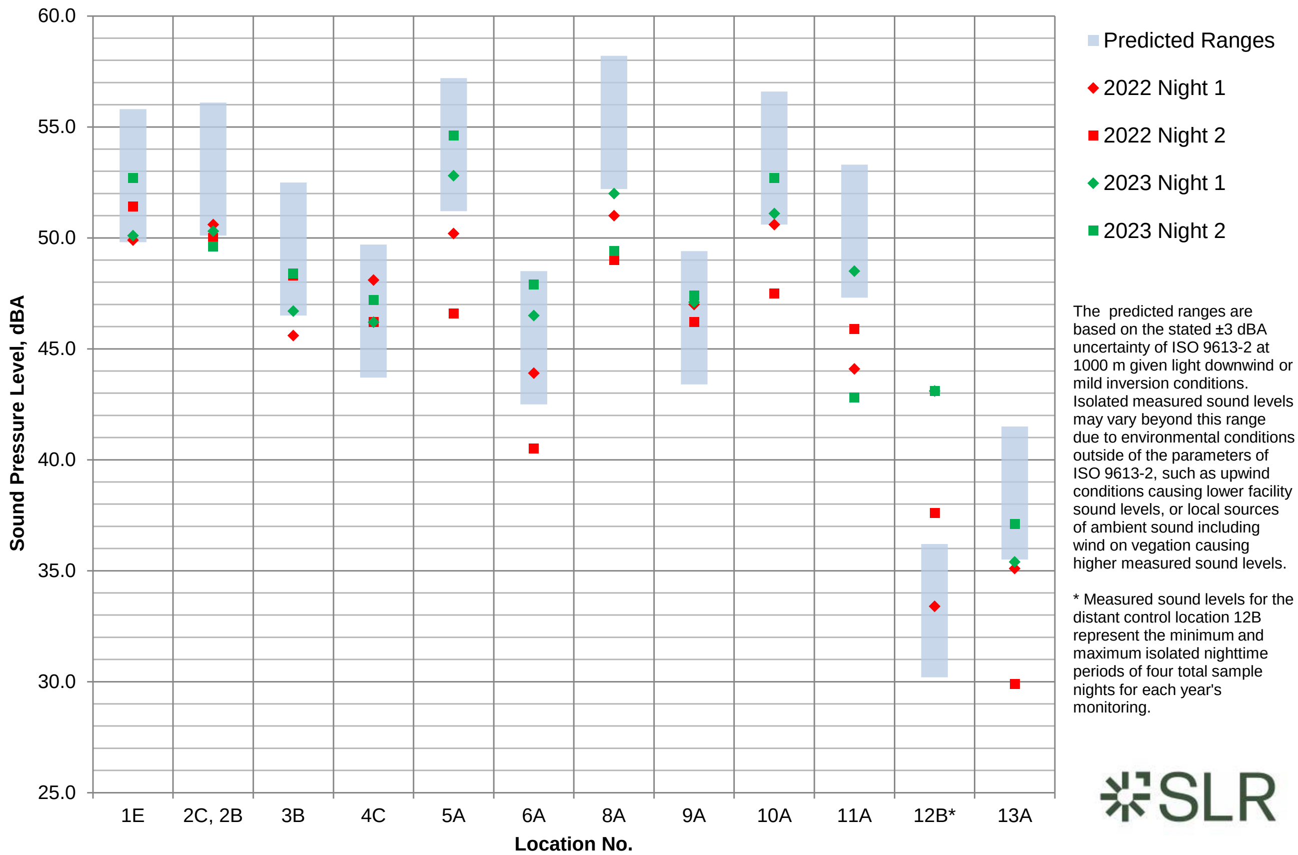
Location	1st Nighttime Period			2nd Nighttime Period			Average Difference (dBA)
	Measured	Predicted	delta (Predicted - Measured)	Measured	Predicted	delta (Predicted - Measured)	
1E	49.9	52.8	2.9	51.4	52.8	1.4	2.2
2C	50.6	53.3	2.7	50.0	53.3	3.3	3.0
3B	45.6	49.5	3.9	48.3	49.5	1.2	2.6
4C	48.1	46.7	-1.4	46.2	46.7	0.5	-0.4
5A	50.2	54.2	4.0	46.6	54.2	7.6	5.8
6A	43.9	45.5	1.6	40.5	45.5	5.0	3.3
8A	51.0	55.2	4.2	49.0	55.2	6.2	5.2
9A	47.0	46.4	-0.6	46.2	46.4	0.2	-0.2
10A	50.6	53.6	3.0	47.5	53.6	6.1	4.6
11A	44.1	50.3	6.2	45.9	50.3	4.4	5.3
12B (1st 48 hour)	36.6	33.2	-3.4	33.4	33.2	-0.2	-1.8
12B (2nd 48 hour)	37.6	33.2	-4.4	36.6	33.2	-3.4	-3.9
13A	35.1	38.5	3.4	29.9	38.5	8.6	6.0

Table 4

Comparison of Measured versus Modelled results for 2023

Location	1st Nighttime Period			2nd Nighttime Period			Average Difference (dBA)
	Measured	Predicted	delta (Predicted - Measured)	Measured	Predicted	delta (Predicted - Measured)	
1E	50.1	52.8	2.7	52.7	52.8	0.1	1.4
2B	50.3	52.8	2.5	49.6	52.8	3.2	2.9
3B	46.7	49.5	2.8	48.4	49.5	1.1	2.0
4C	46.2	46.7	0.5	47.2	46.7	-0.5	0.0
5A	52.8	54.2	1.4	54.6	54.2	-0.4	0.5
6A	46.5	45.5	-1.0	47.9	45.5	-2.4	-1.7
8A	52.0	55.2	3.2	49.4	55.2	5.8	4.5
9A	47.1	46.4	-0.7	47.4	46.4	-1.0	-0.9
10A	51.1	53.6	2.5	52.7	53.6	0.9	1.7
11A	48.5	50.3	1.8	42.8	50.3	7.5	4.7
12B (1st 48 hour)	43.1	33.2	-9.9	42.3	33.2	-9.1	-9.5
12B (2nd 48 hour)	37.9	33.2	-4.7	40.1	33.2	-6.9	-5.8
13A	35.4	38.5	3.1	37.1	38.5	1.4	2.3

Figure 3: Predicted versus Measured Sound Levels (2022 and 2023)



The sound monitoring data comes from two reports completed by Acoustical Consultants Inc. (ACI) of Edmonton, Alberta, both titled "Regional Noise Model Annual Field Validation Monitoring" and dated January 22, 2023, for the 2022 reporting period and February 2, 2024, for the 2023 reporting period.

With the 2023 RNM update, an investigation into the modeling parameters was undertaken to better understand discrepancies between the results from the sound modelling and those from the monitoring program. Prior monitoring comparisons used the calculation standard "CONCAWE" with special environmental conditions providing ranges of sound propagation conditions as well as tailored environmental parameters based on weather conditions recorded during monitoring.

However, this approach suffered from accuracy issues, and the RNM outputs used as baseline sound levels for Noise Impact Assessments (NIAs) conducted in the area were even more divergent from monitoring results. The results of the investigation found that modelling with the ISO 9613-2 standard was most accurate, even with its default settings of a mild downwind condition, across all monitoring data. This allows for a single modelling case to best represent baseline conditions and for validation of the model by comparison to the monitoring results. Therefore ISO 9613-2 has been adopted as the standard across all RNM calculations.

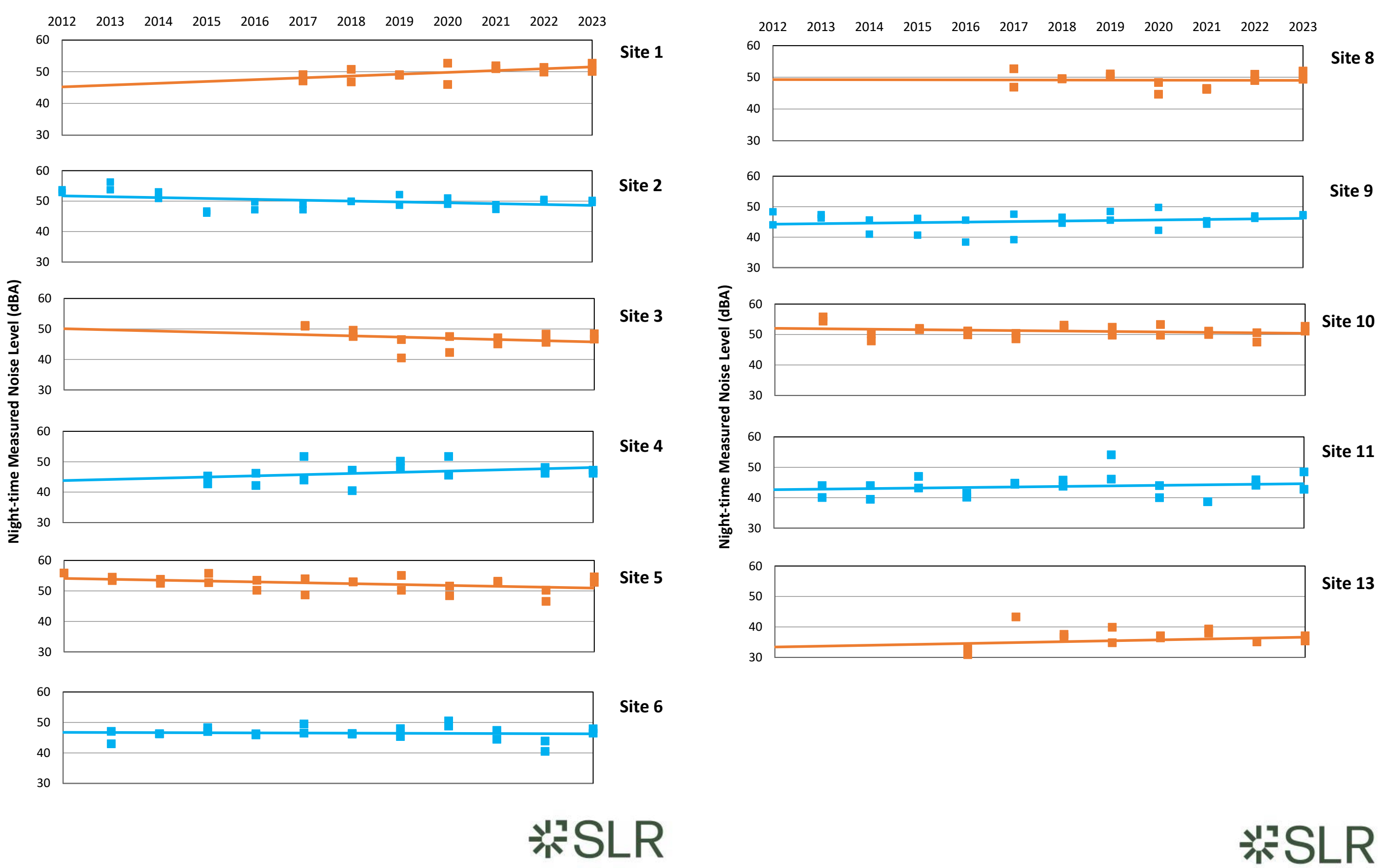
The predicted sound levels from the 2023 RNM (using the ISO 9613-2 standard) were compared to the measured, isolated nighttime energy-equivalent sound levels at all the monitoring locations. Table 3 and Table 4 above detail the results of the comparison for the 2022 and 2023 monitoring periods, respectively. A positive result in the Predicted minus Measured column indicates the model overpredicted the sound levels, while a negative result indicates the monitored sound levels were higher than the model prediction.

As can be seen in the preceding Figure 3 and Tables 3 and 4, the results of the comparisons show good agreement between the model predictions and monitoring results. Most monitored nighttime sound levels fall within the stated range of uncertainty of ISO 9613-2 predictions. Compared to prior RNM iterations, the updated model better predicts the levels at both near and far receptors (monitoring locations) with one set of environmental parameters, whereas CONCAWE tended to overpredict levels significantly at nearby receptors under downwind or inversion conditions and underpredict far receptors under calm or lapse conditions.

Most of the divergence of monitoring results from the predictions is due to three main factors: first, ISO 9613-2 simulates a downwind (favourable) sound propagation condition from all sound sources towards all receptors. This does not occur in reality, except during normally short duration temperature inversion conditions. Therefore, some overprediction (typically up to 3 dB) for receptors with significant or nearby sound sources in multiple directions is expected. Next, more distant receptors outside the main built-up industrial areas, especially to the west, may not experience downwind conditions during the monitoring periods. In the NCIA study area, the prevailing winds are northerly and westerly. Appendix 1 presents maps (titled Figure 2 and Figure 3) that better illustrate this, with a greater degree of overprediction expected at locations 8, 11, and 13.

Finally, the only significant underprediction of sound levels was found, and expected, at location 12B, which is 3-5 km to the east of major NCIA facilities. Local sound sources such as farming and other activities, environmental sound including wind disturbing vegetation and across the microphone windscreen, and distant road and rail sound can cause significantly higher measured sound levels than the facility contributions. Even with these extraneous sound sources being common and affecting the majority of measured nights, the model agreed well with 3 of the 8 total measured nighttime sound levels suggesting the predicted industrial sound contribution of approximately 33 dBA may be reasonable.

Figure 4: Trend Analysis of Measured Data (2012 to 2023)



Measured sound levels are plotted year over year from 2012 to 2023 (above) for the monitoring locations to identify trends in the measured sound levels. The data for some locations have gaps due to the monitor having been relocated due to various reasons. There are no clearly identifiable general trends in sound levels, with large variations across different monitoring periods, in some cases with a range exceeding 10 decibels (dB) due to weather conditions and other sound propagation factors or temporary sources of local sound.

5 NCIA Member Compliance

Table 5 summarizes the compliance requirements for NCIA member and non-member companies' vis-a-vis the NCIA RNMP.

Table 5
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 6 summarizes the NCIA member companies and their status with respect to Table 5 above.

Table 6
Summary of NCIA Member Company Information for RNMP

NCIA Member	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2022 & 2023 (Appendix 4 & 5)	Developed a Site Noise Management Plan
Air Liquide Canada	Not regulated	No & No	Yes
Aux Sable Canada	Regulated under Section 11 of the OSCA and therefore D-038.	No & No	Yes
Conifer Energy	AER regulated under Noise Control Directive 038.	No & No	In Draft form under review
Bunge Canada	Not Regulated	No & Yes	No
Cenovus Energy	Not regulated	No & No	Yes
Chemtrade West	Not regulated	Yes & Yes	Yes
Dow Chemical Canada	Regulated under D-038 Operator No. 0F05	No & Yes	Yes

NCIA Member	AER Regulated Status for Noise Control Directive 038	Filed an Annual Update with NCIA for 2022 & 2023 (Appendix 4 & 5)	Developed a Site Noise Management Plan
Enbridge Pipelines	Is regulated	Yes & Yes	Yes
Evonik	Not regulated	Yes & Yes	Yes
Inter Pipeline HPC	Not Regulated	No & No	Yes
Keyera Corp.	Regulated under D-038 Operator No. A5W1 LSD - 02-14-055-22W4 Facility No. F-12695	Yes & No	Yes
Linde Canada	Not regulated	No & No	Partly
MEGlobal	Not regulated	Included with Dow's submission	Yes
North West Redwater Partnership	Is regulated. LSD - E1/2-18-56-21-W4M	No & Yes	Yes
Nutrien Fort Saskatchewan	Not regulated	No & Yes	Yes
Nutrien Redwater	Not regulated	Yes & Yes	Yes
Oerlikon Metco (Canada)	Not regulated	No & Yes	Yes
Pembina NGL Corporation	Regulated under D-038	Yes & Yes	Yes
Plains Midstream Canada	Regulated under D-038 Operator No. 60 LSD - 14-55-22 W4M Facility No. 12699	No & No	Yes
Shell Chemicals	Not regulated	No & Yes	Yes
Shell Refinery	Regulated under Section 11 of the OSCA and therefore Noise Control Directive 038. AER Approval No. 11640.	No & Yes	Yes
Shell Upgrader	AER Approval No. 8522 regulated under D-038.	No & Yes	Yes
Sherritt International	Not regulated	Yes & Yes	Yes
Umicore Canada	Not regulated	No & No	Yes
Wolf Midstream	AER regulated under Noise Control Directive 038.	Yes & No	Yes

6 Regional Noise Model General

6.1 Improvements/Corrective Actions implemented in 2022 (Appendix 4)

1. Nutrien Redwater – Redwater facility updated the site noise model in 2022. There were four external noise complaints for the Redwater facility in 2022 (see summary in Appendix 4).
2. Pembina – Measurements in RFS II/III were completed in 2022 by SLR to finalize the noise model from theoretical to actual.

6.2 Improvements/Corrective Actions implemented in 2023 (Appendix 5)

1. Dow – Dow started up a new ethylene cracking furnace, H-091, on April 13, 2021. This new cracking furnace will be included in our next site noise model update. The Hydrocarbons Plant noise assessment was updated in 2022 to include H-091. It shows that the noise from the new cracking furnace is similar to that from the other 11 cracking furnaces. As such, Dow does not believe that the expansion is having any offsite impact and therefore does not need to be included in the regional noise model at this time. Environmental Operations noise assessment was updated in 2023.
2. North West Redwater Sturgeon Refinery – NWR completed the site noise survey in May 2023 for the purpose of updating the NCIA regional noise model. Data was provided to SLR and the regional noise model will be updated accordingly. NWR's noise levels showed improvements related to the late fall 2022 maintenance turnaround. A failed silencer was replaced and improved the refinery reliability resulting in less shutdown/start-up events that resulted in increased noise levels during these transitions. NWR received one noise complaint in April 2023 related to our bird cannons. Bird cannons are required to be on 24/7 from spring to fall to prevent birds from accessing our POWs pond. NWR did a site audit near the source of the complaint and verified that the NWR cannons were audible. Cannons were repositioned, propane volumes reduced and follow-up communication with the neighbour was completed.
3. Pembina – NCIA Regional Noise Monitoring was completed by ACI for the purpose of field validation for the regional noise model.
4. Shell Scotford – Anticipated changes to the noise model expected following initiation of project Polaris.

6.3 Other Items for Follow-up Based on 2022 and 2023 Field Measurements

1. We will continue to conduct annual field monitoring and compare it to the RNM.
2. 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.

6.4 Next Steps for 2024/2025

1. The largest change to this model will be the Dow Path2Zero project. Once that is complete and operational it will be added into the model.

APPENDIX 1

Northeast Capital Industrial Association
2024 Regional Noise Model Update

2023 Regional Noise Model Update

Northeast Capital Industrial Association Regional Noise Management Plan

Northeast Capital Industrial Association

204 - 9902 102 Street, Fort Saskatchewan, AB T8L 2C3

Prepared by:

SLR Consulting (Canada) Ltd.

200 - 708 11th Avenue SW, Calgary, AB T2R 0E4

SLR Project No.: 203.50112.00001

May 15, 2024

Revision: 0

Revision Record

Revision	Date	Prepared By	Checked By	Authorized By
0	May 15, 2024	CM	DC	AK

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Executive Summary

The Regional Noise Management Plan Steering Committee of the Northeast Capital Industrial Association (NCIA) developed a Regional Noise Management Plan (RNMP) in 2012 for their member companies in Alberta's Industrial Heartland (AIH) in collaboration with the Alberta Energy Regulator (AER) and the Alberta Utilities Commission (AUC). As part of the ongoing development of the Regional Noise Model (RNM) created for the RNMP, SLR Consulting (Canada) Ltd. (SLR) (previously HFP Acoustical Consultants Ltd.) was commissioned by the NCIA to perform various tasks to update and improve the RNM.

This report presents the details of the 2023 update to the RNM including:

- The facility RNM sound model inventory.
- Predicted facility sound levels for Case 1: Existing and Case 2: Future.
- Validation with 2022 and 2023 measurement data for the facility cases, which shows an improved correlation due to streamlining of calculation methodology to ISO 9613-2:1996.
- Road and rail (wheel and engine) sound level predictions using the latest available data.
- Recommendations for consistent implementation and standardization for Noise Impact Assessments (NIAs) in the assessment region.

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1.0 Introduction

The Regional Noise Management Plan Steering Committee of the Northeast Capital Industrial Association (NCIA) developed a Regional Noise Management Plan (RNMP) in 2012 for their member companies in Alberta's Industrial Heartland (AIH) in collaboration with the Alberta Energy Regulator (AER) and the Alberta Utilities Commission (AUC). As part of the ongoing development of the Regional Noise Model (RNM) created for the RNMP, SLR Consulting (Canada) Ltd. (SLR) (previously HFP Acoustical Consultants Ltd. (HFP)) was commissioned by the NCIA to perform various tasks to update and improve the RNM.

This report presents the details of the 2023 update to the RNM. The initial version of the model was presented in a report entitled "NCIA Regional Noise Model Project" dated March 12, 2012, as issued by HFP, and subsequent revisions of the model were presented in reports titled "NCIA Regional Noise Model, 2015 Noise Model Update," dated June 18, 2015, and "NCIA Regional Noise Model, 2018 Noise Model Update (rev2)," dated September 22, 2020, as issued by SLR.

As this report is intended to update and complement the previous reports and is intended for review by the RNMP Steering Committee and regulators already familiar with acoustical concepts and the RNM, the content of the report has been limited to discussing relevant details this 2023 update only, with limited additional context or discussion of acoustical concepts. For more background information on the RNM, please refer to the prior reports.

2.0 Scope of Report

This update to the RNM consists of the following:

- Add, update, or remove individual facility sound models as required from the existing and future cases.
- Validate the RNM using sound monitoring data collected for the 2022 and 2023 years by the NCIA and look for ways to improve the accuracy of the model predictions.
- Provide updated sound propagation contours for the existing and future cases, in the form of report figures and grid exports for use in SoundPLAN and CadnaA software packages by NCIA member companies, their acoustics consults, and other authorized parties.
- Compare and discuss changes to the RNM compared to the previous (2018) iteration, including a difference map showing changes to the sound contours.
- Update and standardize modelling parameters and communicate recommendations to improve consistency in sound modelling and use of the RNM sound contours as a baseline for future Noise Impact Assessments (NIAs) in the AIH area.
- Update the road and rail sound propagation contour layers with the most recently available traffic data.
- Update the interactive, public, online sound contour maps hosted by SLR and shared on the NCIA website.

Each of these elements are presented in the following sections.

3.0 Facility Sound Model Inventory

As part of the discussion and continuous improvement of the RNMP and RNM, it was decided that for simplicity and consistency, the number of scenarios (Cases) presented will be reduced from three to two. The following cases have been presented:

- Case 1: Existing Case
  - Includes submitted sound models of existing facilities of NCIA member companies.
  - Includes sound models of existing non-member facilities voluntarily submitted or from data collected as part of other studies shared with the NCIA.
- Case 2: Future Case
  - Includes all facilities from Case 1.
  - Includes proposed facilities expected to be constructed within 1-5 years.

Previously, Case 1 only included NCIA member facilities, while non-member facilities were not included, even if they were AER or AUC regulated for noise. Meanwhile, the previous Case 3: Model Validation Case included all existing facilities for which sound models were available to the NCIA but without the explicit downwind conditions specified in the regulations.

Table 1 below is an inventory of all sound models included in the RNM, the applicable Case, and a description of any changes for the 2023 RNM update.

Table 1: List of Facilities in the Regional Noise Management

Facility	2018 RNM Case	2023 RNM Case	NCIA Member	Model Changes	Comments
Air Liquide Scotford Cogen	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Air Products Scotford	N/A	1 - Existing	☐	☑	Newly added 2023 model based on fence line measurements.
AltaLink Scotford 409S Substation	N/A	1 - Existing	☐	☑	Newly added, updated 2023 desktop model.
Aux Sable Canada Extraction Plant	2 - Future Regulatory	N/A	☑	☒	Removed.
Aux Sable Canada Offgas Plant	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Cenovus Bruderheim Terminal	1 - Existing Regulatory	1 - Existing	☑	☑	Updated 2019 model based on detailed site measurements.
Chemtrade Central Service Center	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Chemtrade Sulfides Facility	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.

Facility	2018 RNM Case	2023 RNM Case	NCIA Member	Model Changes	Comments
Corefco	3 - Model Validation	1 - Existing	☐	☐	Part of Sherritt Integrated Site. No changes.
Dow Chemical Canada	1 - Existing Regulatory	1 - Existing	☑	☐	Ethylene; Fractionator; Polyethylene I, II, and III; Ethylene Oxide/Glycol; Ethane Storage; Power and Utilities; Cogen. No changes.
Evonik Hydrogen Peroxide Plant	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Inter Pipeline Ltd. HPC	N/A	1 - Existing	☑	☑	IPL Heartland Petrochemical Complex. Newly added, 2023 field-verified desktop model.
Keyera KFS	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.
Linde Canada Air Separation Plant	1 - Existing Regulatory	1 - Existing	☑	☐	Renamed, formerly Praxair.
Linde Canada Carbon Dioxide Plant	1 - Existing Regulatory	1 - Existing	☑	☐	Renamed, formerly Praxair.
North West Redwater Sturgeon Refinery	2 - Future Regulatory	1 - Existing	☑	☑	Newly added, 2023 3rd-party model. Moved to Case 1 (existing) from future case.
Nutrien FNO	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Nutrien RFO	1 - Existing Regulatory	1 - Existing	☑	☑	Updated 2022 desktop model.
Oerlikon Metco	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Pembina CDH	N/A	1 - Existing	☑	☑	Newly added, 2019 3rd-party model.
Pembina RFS	1 - Existing Regulatory	1 - Existing	☑	☑	ROF, RFS 1-3, Perimeters, Brine Pond 6, and Cogen. Model updated with field measurements in 2019, 2022.
Pembina RFS 4	N/A	2 - Future	☑	☑	Newly added 2023 model for proposed expansion, based on 2022 measurements of similar equipment at RFS 2 and RFS 3.
Plains Midstream PFS	1 - Existing Regulatory	1 - Existing	☑	☑	Updated 2023 model with Debottleneck project added.
Shell Canada	1 - Existing Regulatory	1 - Existing	☑	☐	Refinery; Upgrader (base plant and expansion plant); Cogen facilities. No changes.

Facility	2018 RNM Case	2023 RNM Case	NCIA Member	Model Changes	Comments
Shell Chemicals	1 - Existing Regulatory	1 - Existing	☑	☐	Styrene; MEG facilities. No changes.
Sherritt International	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Smith & Nephew	3 - Model Validation	1 - Existing	☐	☐	Part of Sherritt Integrated Site. No changes.
Suncor Sturgeon Upgrader	2 - Future Regulatory	N/A	☑	☒	Removed.
Tidewater Midstream FSEEP	3 - Model Validation	1 - Existing	☐	☐	Renamed, formerly ATCO Midstream.
Umicore	1 - Existing Regulatory	1 - Existing	☑	☐	Part of Sherritt Integrated Site. No changes.
Value Creation Inc. Upgrader	2 - Future Regulatory	2 - Future	☑	☐	No changes.
Wolf Midstream Sturgeon Terminal	1 - Existing Regulatory	1 - Existing	☑	☐	No changes.

3.1 Validation

Following the update of the facility sound models, an investigation into the modelling methods was undertaken for any discrepancies between the results from the modelling and those from the annual NCIA environmental sound monitoring program. The monitoring data used for validation of the RNM comes from two reports completed by Acoustical Consultants Inc. of Edmonton, Alberta, titled “Regional Noise Model Annual Field Validation Monitoring” and dated January 22, 2023, for the 2022 monitoring data and February 2, 2024, for 2023 data.

Prior monitoring comparisons used the calculation standard “CONCAWE” with special environmental parameters providing ranges of sound propagation conditions and tailored parameters based on weather conditions during the monitoring. However, the RNM Case 1 outputs used as baseline sound levels for Noise Impact Assessments (NIAs) conducted in the area were even more divergent from monitoring results.

Modelling with the ISO 9613-2:1996 (ISO 9613-2) standard was most accurate, with its default settings of a mild downwind condition, compared across all monitoring data for 2022 and 2023. This enables a single modelling case to represent the current average sound levels and validate with the monitoring results. Therefore ISO 9613-2 has been adopted as the standard across all facility RNM calculations.

The predicted facility sound levels from the 2023 RNM (using the ISO 9613-2 standard) were compared to the measured, isolated nighttime energy-equivalent sound levels at all the monitoring locations. Table 2 and Table 3 detail the comparison for the 2022 and 2023 monitoring periods, respectively. A positive result in the Predicted minus Measured column indicates the model overpredicted the sound levels, where a negative result indicates the monitored sound levels were higher than the model prediction.

Table 2: Comparison of 2022 Measurement Data with 2023 Model Predictions

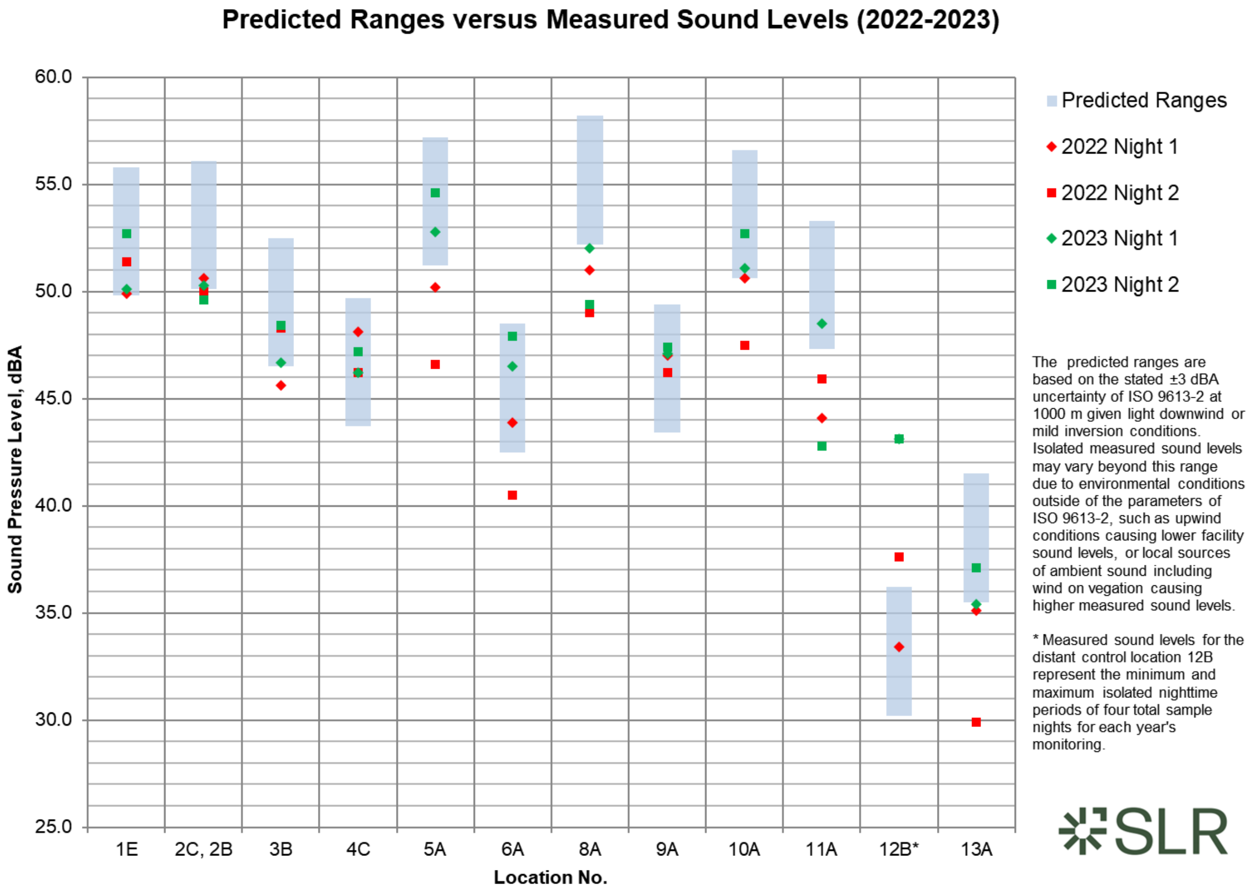
Location	1st Nighttime Period			2nd Nighttime Period			Average Difference (dBA)
	Measured	Predicted	(Predicted minus Measured)	Measured	Predicted	(Predicted minus Measured)	
1E	49.9	52.8	2.9	51.4	52.8	1.4	2.2
2C	50.6	53.3	2.7	50.0	53.3	3.3	3.0
3B	45.6	49.5	3.9	48.3	49.5	1.2	2.6
4C	48.1	46.7	-1.4	46.2	46.7	0.5	-0.4
5A	50.2	54.2	4.0	46.6	54.2	7.6	5.8
6A	43.9	45.5	1.6	40.5	45.5	5.0	3.3
8A	51.0	55.2	4.2	49.0	55.2	6.2	5.2
9A	47.0	46.4	-0.6	46.2	46.4	0.2	-0.2
10A	50.6	53.6	3.0	47.5	53.6	6.1	4.6
11A	44.1	50.3	6.2	45.9	50.3	4.4	5.3
12B (1st 48 hrs)	36.6	33.2	-3.4	33.4	33.2	-0.2	-1.8
12B (2nd 48 hrs)	37.6	33.2	-4.4	36.6	33.2	-3.4	-3.9
13A	35.1	38.5	3.4	29.9	38.5	8.6	6.0

Table 3: Comparison of 2023 Measurement Data with 2023 Model Predictions

Location	1st Nighttime Period			2nd Nighttime Period			Average Difference (dBA)
	Measured	Predicted	(Predicted - Measured)	Measured	Predicted	(Predicted - Measured)	
1E	50.1	52.8	2.7	52.7	52.8	0.1	1.4
2B	50.3	52.8	2.5	49.6	52.8	3.2	2.9
3B	46.7	49.5	2.8	48.4	49.5	1.1	2.0
4C	46.2	46.7	0.5	47.2	46.7	-0.5	0.0
5A	52.8	54.2	1.4	54.6	54.2	-0.4	0.5
6A	46.5	45.5	-1.0	47.9	45.5	-2.4	-1.7
8A	52.0	55.2	3.2	49.4	55.2	5.8	4.5
9A	47.1	46.4	-0.7	47.4	46.4	-1.0	-0.9
10A	51.1	53.6	2.5	52.7	53.6	0.9	1.7
11A	48.5	50.3	1.8	42.8	50.3	7.5	4.7
12B (1st 48 hrs)	43.1	33.2	-9.9	42.3	33.2	-9.1	-9.5
12B (2nd 48 hrs)	37.9	33.2	-4.7	40.1	33.2	-6.9	-5.8
13A	35.4	38.5	3.1	37.1	38.5	1.4	2.3

Figure 1 compares the 2022 and 2023 monitoring results to the 2023 RNM sound level predictions at each monitoring location.

Figure 1: Model Prediction Range and Monitoring Comparison Chart



The results of the comparisons show good agreement between the facility model predictions and monitoring results. Most monitored nighttime sound levels fall within the stated range of uncertainty of ISO 9613-2 predictions. Compared to prior RNM facility iterations, the updated model better predicts the levels at both near and far receptors (monitoring locations) with one set of environmental parameters, whereas CONCAWE tended to overpredict levels significantly at nearby receptors under downwind or inversion conditions and underpredict far receptors under calm or lapse conditions.

Most of the remaining divergence of monitoring results from the predictions is due to three main factors: first, ISO 9613-2 simulates a downwind (favourable) sound propagation condition from all sound sources towards all receptors. This is not realistic, except during normally short-duration temperature inversion conditions. Therefore, some overprediction (typically up to 3 dB) for receptors with significant or nearby sound sources in multiple directions is expected.

Next, receptors further from the main built-up industrial areas, especially to the west, may not experience downwind conditions during the monitoring periods. In the NCIA study area, the prevailing winds are northerly and westerly. The maps of monitoring locations and validation results in appended Figure 2 and Figure 3 better illustrate this, with a greater degree of overprediction expected at locations 8, 11, and 13.

Finally, the only significant underprediction of facility sound levels was found, and expected, at location 12B, which is 3-5 km to the east of major NCIA facilities. Local sound sources such as farming and other activities, environmental sound including wind disturbing vegetation and across the microphone windscreen, and distant road and rail sound can cause significantly higher measured sound levels than the facility contributions. Even with these extraneous sound sources being common and affecting most measured nights, the model agreed well with 3 of the 8 total measured nighttime sound levels suggesting the predicted industrial sound contribution of approximately 33 dBA may be reasonable.

3.2 Outputs and Discussion

Sound level contours have been calculated for the updated facility RNM for the two scenarios, Case 1: Existing, and Case 2: Future, using the standard ISO 9613-2 with default settings (ISO/TR 17534-3:2015 compliant) in the environmental sound propagation modelling software package SoundPLAN version 9.0. This standard simulates a long-term average light downwind or mild inversion condition favourable to sound propagation in all directions from all sources.

ISO 9613-2 is the prevalent standard for the prediction of industrial sound propagation and is the favoured standard for NIAs completed in Alberta by acoustical practitioners. Adoption of ISO 9613-2 allows for consistency between NIA results for input sound models and the RNM predictions and fulfils the AER Directive 038: Noise Control requirement for sound modelling with a downwind condition while providing better accuracy at all distances and for most environmental conditions.

Appended Figure 4 and Figure 5 show the facility RNM 2023 sound level contours for Case 1: Existing and Case 2: Future, respectively. The contour files in SoundPLAN and CadnaA formats are provided to the NCIA for sharing with members and their acoustical practitioners and other authorized parties.

Following the calculation of the RNM 2023 sound contours, a difference map has been generated comparing the RNM 2018 Case 1: Existing Regulatory (downwind) contours, typically used as a baseline for previous NIAs in the AIH area, to the RNM 2023 Case 1: Existing contours. This is presented in the appended Figure 6 difference map, where the RNM 2018 contours are subtracted from the RNM 2023 contours. Positive results indicate an increase in predicted sound levels, in this case mostly due to the addition of new facility models, and negative results indicate a reduction in sound level, in this case mostly nearer to the modelled facilities due to the change in calculation standard from CONCAWE to ISO 9613-2. Far-field results are relatively consistent which is important for representing the impact of industrial sound on the neighboring communities.

4.0 Road and Rail Regional Noise Management Sound

4.1 Road

Road traffic sound levels were calculated using the Traffic Noise Model (TNM) 3.0 calculation procedure developed by the US Federal Highway Administration (FHWA). Road traffic data was updated for the 2023 RNM based on average hourly traffic volumes as derived from Annual Average Daily Traffic (WAADT) data for 2022 (Alberta Highways 1-986, Traffic Volume, Vehicle Classification, Travel and ESAL Statistics Report 2022, produced June 28, 2023). This was the most current data available for the 2023 RNM Update. The daytime and nighttime splits in traffic were set to be 90% and 10% respectively for all roads.

Sound level values were calculated separately for daytime and nighttime traffic and then averaged as a combined value for the sound level contours. No additions or penalties have been applied to the nighttime sound level to calculate the average for daytime and nighttime.

The combined road traffic and facility sound levels are presented in Figure 7.

4.2 Rail

Substantial changes were made to the rail sound predictions in the 2018 RNM. The 2018 RNM included the rail engine, wheel, and whistle sound in the 2018 RNM. The 2023 RNM included engine and wheel sound only, as including the whistle sound was deemed to be inappropriate due to not being representative of the current rail whistle usage (general for emergency use) in the region, and that the sound model is for general understanding of the underlying sound levels in the region from transportations sources.

Average rail volumes and speeds were obtained for Canadian National (CN) and Canadian Pacific (CP) for the main rail lines throughout the region for 2023 data.

The rail sound level contributions were calculated using the Ontario Ministry of Environment (MoE) Sound from Trains Environmental Analysis Method (STEAM) method to determine the source sound power levels. The calculated source sound power levels were then used to calibrate the sound propagation model using the Calculation of Railway Noise (CoRN) calculation standard to calculate sound from railways in the assessment area.

The calculated rail sound values are 24-hour equivalent continuous sound levels. These values represent the composite average of the daytime and nighttime sound levels, calculated for a typical day and night.

The combined rail traffic and facility sound levels are presented in Figure 8. The combined road and rail traffic and facility sound levels are presented in Figure 9.

5.0 Standardization and Recommendations

To create a more consistent implementation of the RNM contours for cumulative industrial sound consideration in NIAs conducted for facilities in the AIH this iteration of the RNM has updated recommendations for modelling and usage of the Cases.

Subject to the review and approval of the Regional Noise Management Plan Steering Committee, the AER, and the AUC, SLR recommends the following be communicated to NCIA members and their acoustical practitioners, or to any new facility proponent that is required to complete an NIA in the area:

- Preferred sound propagation modelling software and parameters:
    - Facility sound models should be constructed in a modern and up-to-date software package, preferably SoundPLAN or CadnaA that complies fully with the standard ISO 9613-2.
        - Other software is acceptable, if a QSI model export format is available and detailed results from the original model are made available for models meant to be integrated into the RNM.
    - ISO 9613-2 is the preferred calculation standard, using default settings compliant with ISO/TR 17534-3:2015. When ISO 9613-2:2024 is implemented in sound modelling software, it can be used in the next RNM iteration.
    - Modelling parameters and recommended settings:
        - At least 1 order of reflection with search radii from source to reflector and receptor to reflector of appropriate distances for the NIA’s receptors.
        - 3D buildings and barriers with appropriate absorption coefficients.
        - Environmental conditions that represent summer nighttime conditions in the AIH area:
            - 940 millibar or hPa absolute air pressure; 15°C air temperature; 70% relative humidity.
            - Standard downwind conditions (Cmet = 0).
        - Appropriate ground factors for facility ground areas, water bodies, and a ground factor of 0.8 for the remainder of the study area.
    - Avoid the use of “vertical area sources” and unscreened point sources in buildings in CadnaA, as they cannot be easily converted into SoundPLAN compatible sources and will increase the time and cost of model conversion and import into the RNM.
    - Avoid unusual or unnecessary (for distant ground-level receptors) modelling techniques and objects such as “3D reflectors” or “bridges” as a way of elevating sources and barriers, and construct models using relative height attributes.
- Scenarios and use of the RNM contours.
    - Case 1: Existing is the default scenario to be used to represent third-party facility sound levels (for included sites/sources) for all new NIAs in the AIH area and against which no-net increase criteria can be compared.
    - The road and rail sound contour layers are intended for informational purposes only, and the prescribed Ambient Sound Levels (ASL) from AER Directive 038 or AUC Rule 012 should still be applied as required.
    - For a new facility or an existing facility not included in the 2023 RNM, its sound contributions should be added logarithmically (energetically) to the sound levels for Case 1, available in a 25x25 meter resolution across the entire AIH area, down to 30 dBA.

- For the update of facility sound models already included in the RNM, first the existing model contributions (for the version of the model included in the 2023 RNM) for the entire subject facility should be logarithmically subtracted from the sound level from Case 1, then the updated model contributions can be recombined with the Case 1 contours.
  - Alternatively, for the addition of minor sources or facilities, if a no-net increase approach is applicable, only the contribution of the added source(s) can be added to Case 1 sound levels that include the rest of the subject facility.

In addition to these recommendations for implementation of the 2023 RNM, SLR suggests the following actions to improve the next iteration of the RNM:

- Update the AIH area Digital Elevation Model (DEM) with new LiDAR based elevation contours that better reflect changes to the terrain due to facility construction including spill piles and graded areas, as well as natural changes to the North Saskatchewan River path and valley.
- Update and combine all special ground absorption areas such as water bodies (including large storage ponds) and facility ground areas into a common layer.
- Explore options for the study and inclusion of road and rail sound layers that may better represent local ambient, or baseline sound levels compared to prescribed ASLs.
- Make these data sets available to NCIA members, their acoustical practitioners, and authorized third parties, in addition to the RNM sound contours, to standardize methodology and improve the consistency of facility NIA models with the RNM.
- Continue to assess and include non-member facilities and in the RNM, encourage new facility proponents to become NCIA members and participate in the RNMP, inventory and include missing NCIA-member facilities, and update the outdated, simple, or theoretical existing facility sound models with field measured or verified models.

With the simplification and standardization of the RNM and input NIA models, more frequent RNM updates could be possible without necessarily increasing overall costs to the NCIA. Annual RNM updates to go along with the annual sound monitoring program and reporting could become standard and help improve noise management and the RNM's relevance.

6.0 Interactive Sound Level Map

An interactive map using the ESRI ArcGIS Online platform is available at https://www.ncia.ab.ca/our-environment/noise-management. This online cloud-based platform allows users to access the latest model output maps through a web-based application. All Figures in this report are available there for public information.

7.0 Closure

We trust that the information contained in this report meets your needs; however, should you require anything further, please contact SLR.

SLR Consulting (Canada) Ltd.

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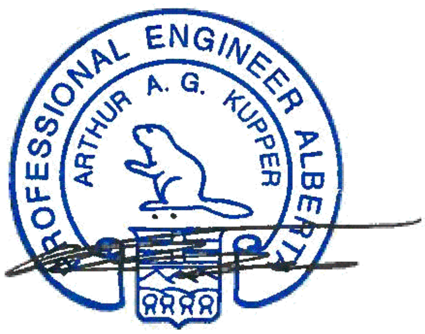
Senior Acoustics Consultant

Dan Clayton, B.Sc., MIoA
Technical Discipline Manager – Acoustics and Vibration



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PERMIT TO PRACTICE
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RM SIGNATURE: Arthur Kupper, P.Eng.
RM APEGA ID #: 77708
DATE: 2024-05-16
PERMIT NUMBER: P005449
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Arthur Kupper, P.Eng.
Principal Acoustics Engineer

Figures

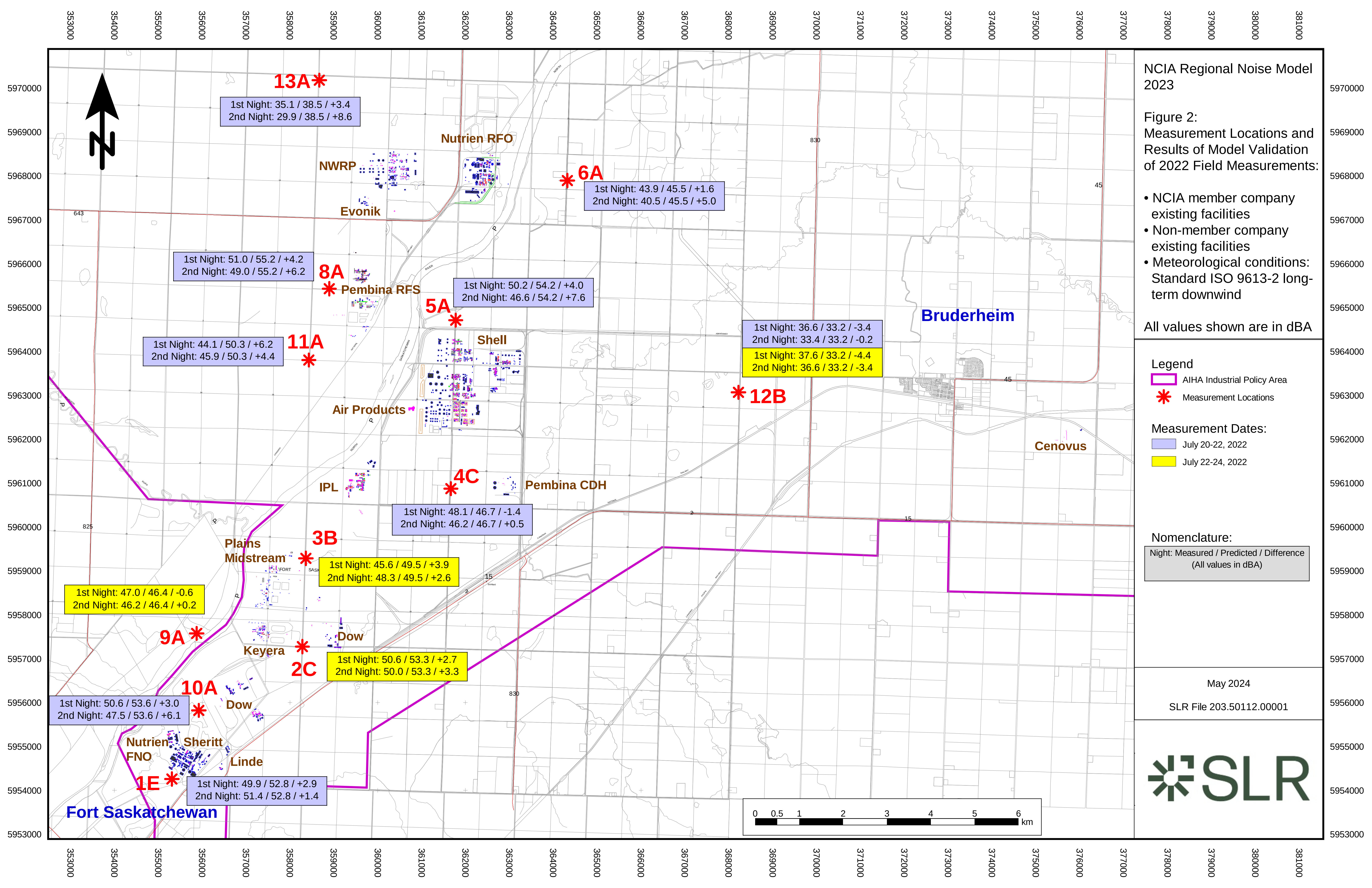
2023 Regional Noise Model Update

Northeast Capital Industrial Association Regional Noise Management Plan

Northeast Capital Industrial Association

SLR Project No.: 203.50112.00001

May 15, 2024


NCIA Regional Noise Model 2023
Figure 2:
Measurement Locations and Results of Model Validation of 2022 Field Measurements:
• NCIA member company existing facilities
• Non-member company existing facilities
• Meteorological conditions: Standard ISO 9613-2 long-term downwind
All values shown are in dBA
Legend
AIHA Industrial Policy Area
Measurement Locations
Measurement Dates:
July 20-22, 2022
July 22-24, 2022
Nomenclature:
Night: Measured / Predicted / Difference
(All values in dBA)
May 2024
SLR File 203.50112.00001
SLR
13A
1st Night: 35.1 / 38.5 / +3.4
2nd Night: 29.9 / 38.5 / +8.6
6A
1st Night: 43.9 / 45.5 / +1.6
2nd Night: 40.5 / 45.5 / +5.0
8A
1st Night: 51.0 / 55.2 / +4.2
2nd Night: 49.0 / 55.2 / +6.2
5A
1st Night: 50.2 / 54.2 / +4.0
2nd Night: 46.6 / 54.2 / +7.6
11A
1st Night: 44.1 / 50.3 / +6.2
2nd Night: 45.9 / 50.3 / +4.4
12B
1st Night: 36.6 / 33.2 / -3.4
2nd Night: 33.4 / 33.2 / -0.2
1st Night: 37.6 / 33.2 / -4.4
2nd Night: 36.6 / 33.2 / -3.4
4C
1st Night: 48.1 / 46.7 / -1.4
2nd Night: 46.2 / 46.7 / +0.5
3B
1st Night: 45.6 / 49.5 / +3.9
2nd Night: 48.3 / 49.5 / +2.6
9A
1st Night: 47.0 / 46.4 / -0.6
2nd Night: 46.2 / 46.4 / +0.2
2C
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10A
1st Night: 50.6 / 53.6 / +3.0
2nd Night: 47.5 / 53.6 / +6.1
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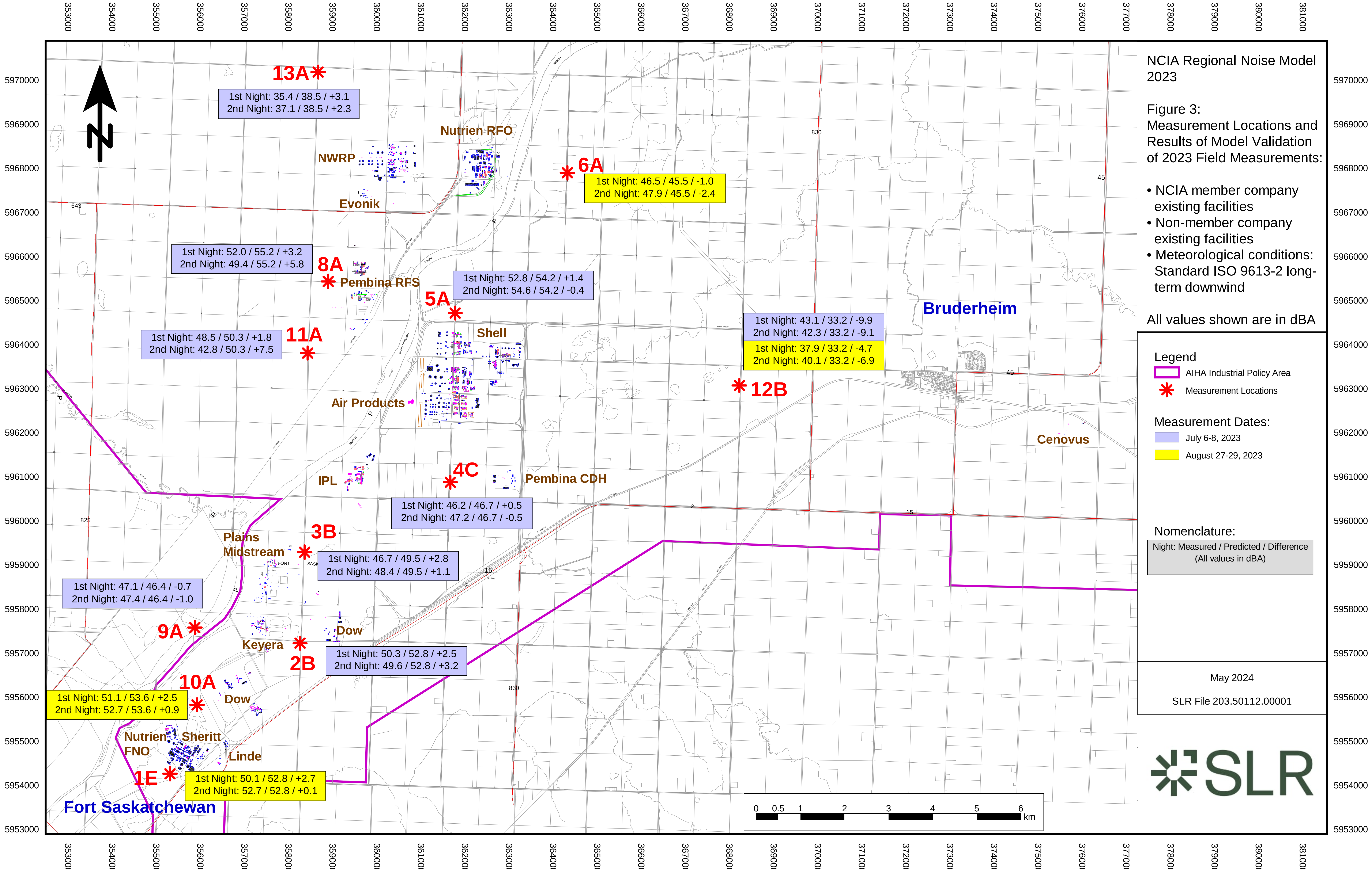
1st Night: 49.9 / 52.8 / +2.9
2nd Night: 51.4 / 52.8 / +1.4
Nutrien RFO
NWRP
Evonik
Pembina RFS
Shell
Air Products
IPL
Pembina CDH
Plains Midstream
Keyera
Dow
Dow
Nutrien FNO
Sheritt
Linde
Fort Saskatchewan
Bruderheim
Cenovus
0 0.5 1 2 3 4 5 6 km


NCIA Regional Noise Model 2023
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• Non-member company existing facilities
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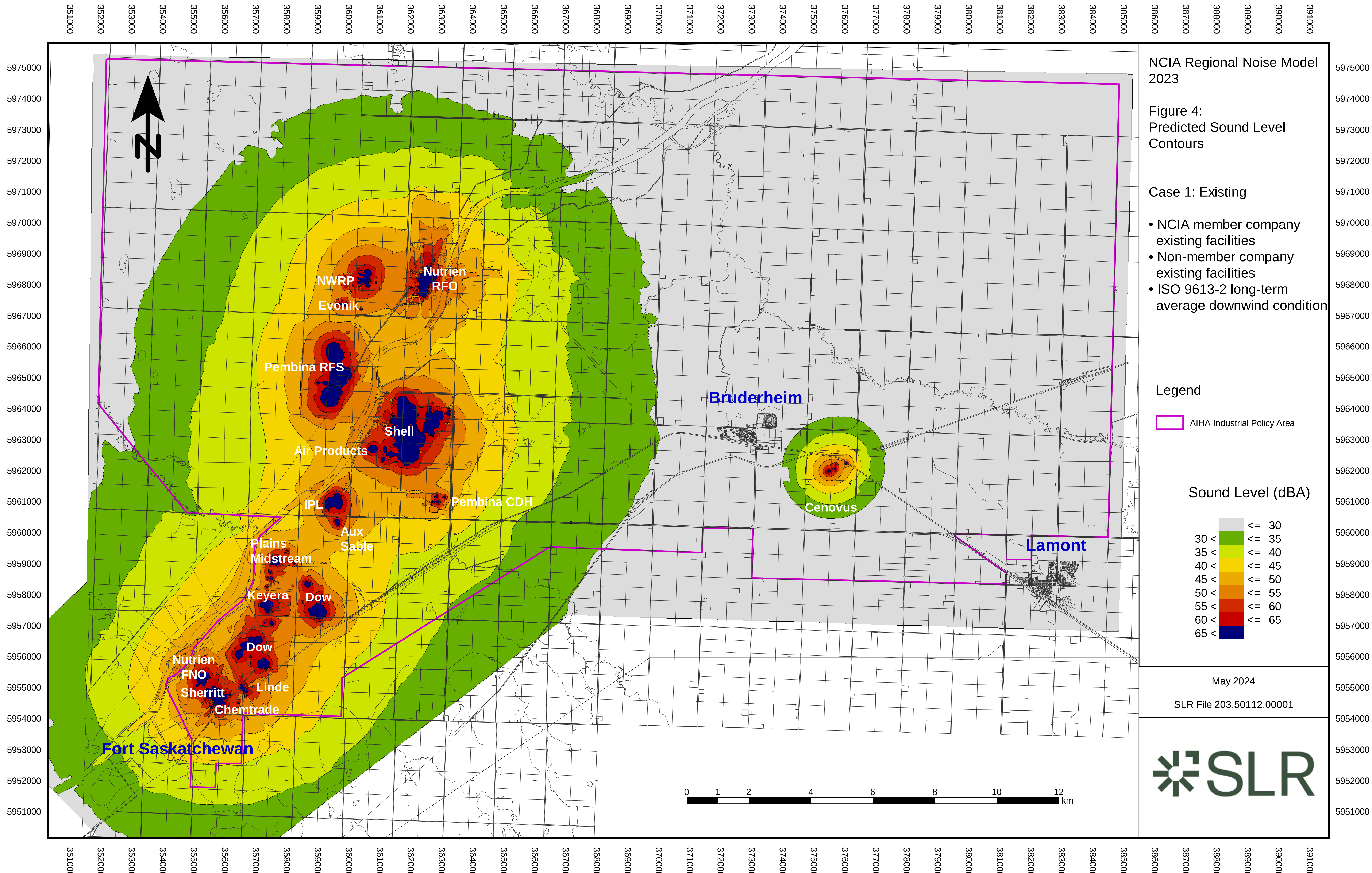
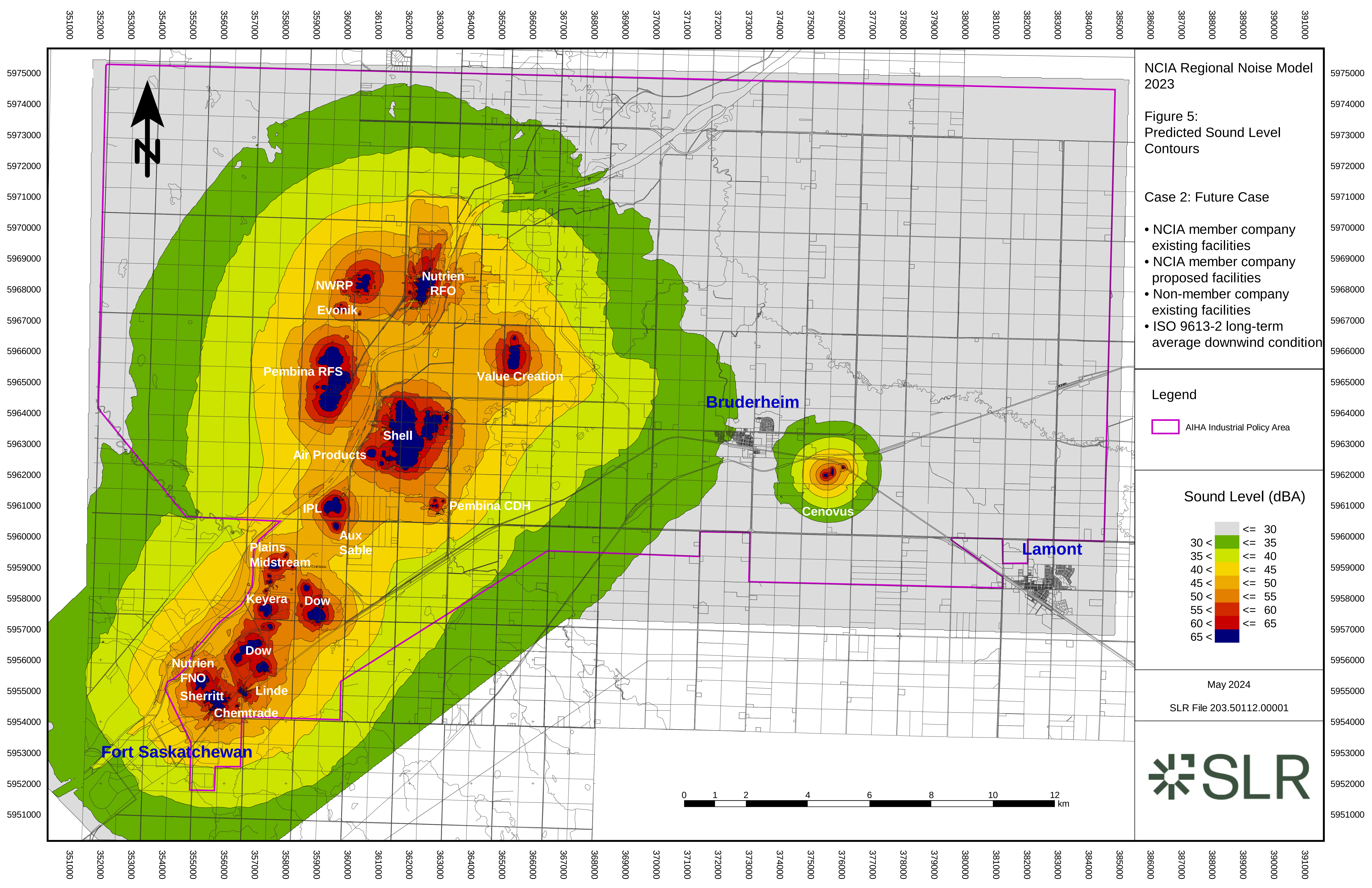
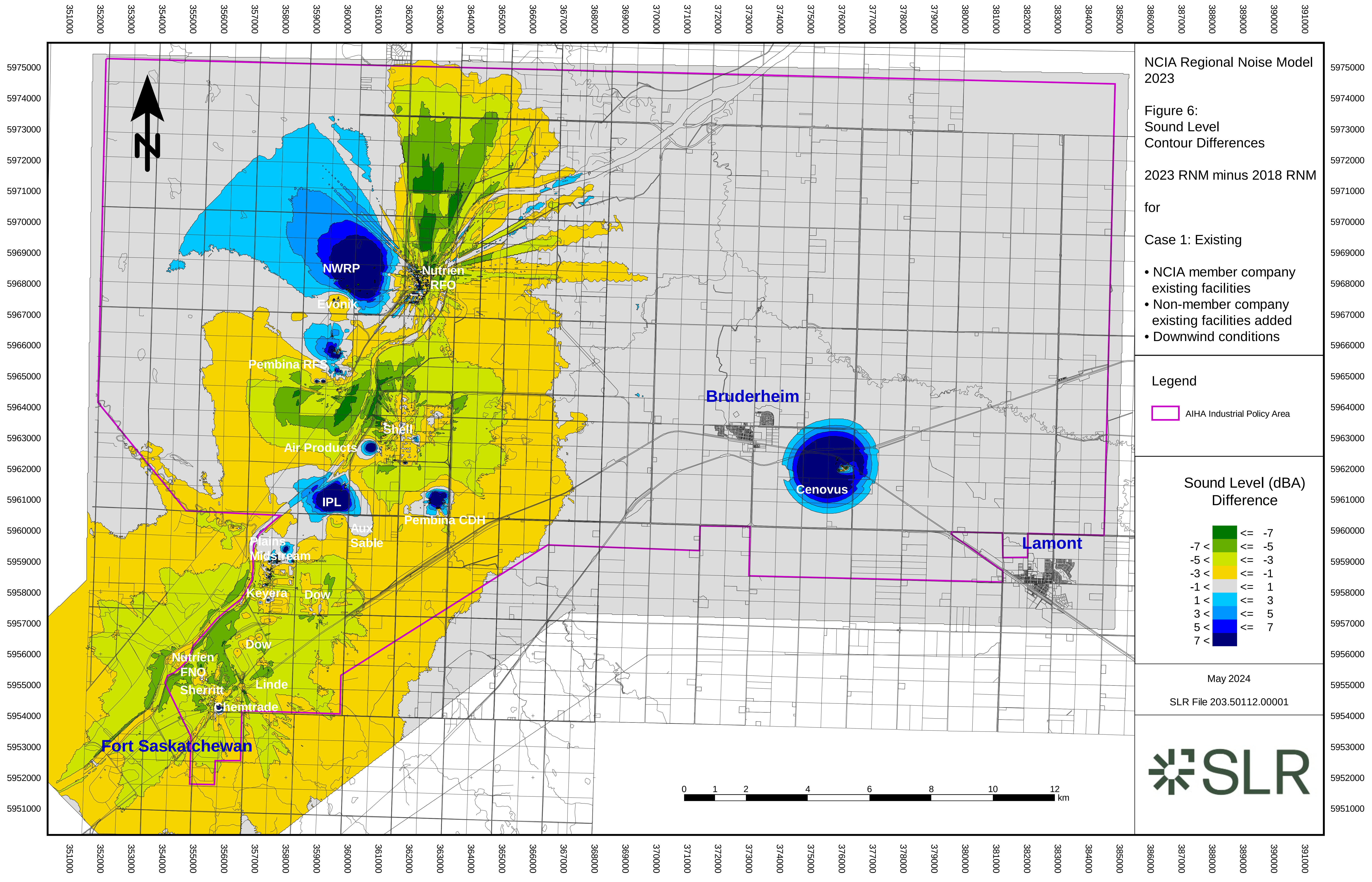
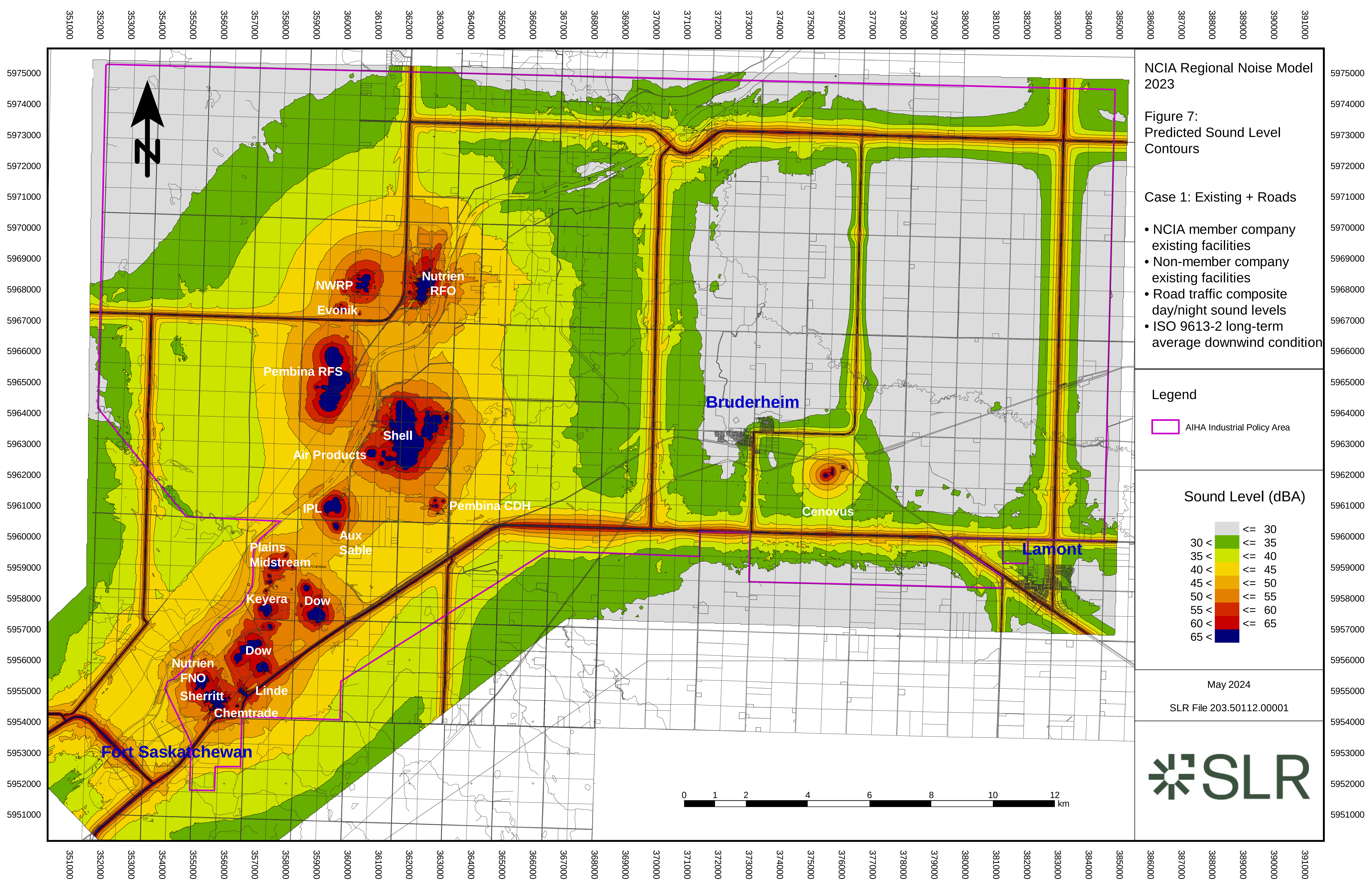
All values shown are in dBA
Legend
AIHA Industrial Policy Area
Measurement Locations
Measurement Dates:
July 6-8, 2023
August 27-29, 2023
Nomenclature:
Night: Measured / Predicted / Difference
(All values in dBA)
May 2024
SLR File 203.50112.00001
SLR
13A
1st Night: 35.4 / 38.5 / +3.1
2nd Night: 37.1 / 38.5 / +2.3
6A
1st Night: 46.5 / 45.5 / -1.0
2nd Night: 47.9 / 45.5 / -2.4
8A
1st Night: 52.0 / 55.2 / +3.2
2nd Night: 49.4 / 55.2 / +5.8
5A
1st Night: 52.8 / 54.2 / +1.4
2nd Night: 54.6 / 54.2 / -0.4
11A
1st Night: 48.5 / 50.3 / +1.8
2nd Night: 42.8 / 50.3 / +7.5
12B
1st Night: 43.1 / 33.2 / -9.9
2nd Night: 42.3 / 33.2 / -9.1
1st Night: 37.9 / 33.2 / -4.7
2nd Night: 40.1 / 33.2 / -6.9
4C
1st Night: 46.2 / 46.7 / +0.5
2nd Night: 47.2 / 46.7 / -0.5
3B
1st Night: 46.7 / 49.5 / +2.8
2nd Night: 48.4 / 49.5 / +1.1
9A
1st Night: 47.1 / 46.4 / -0.7
2nd Night: 47.4 / 46.4 / -1.0
2B
1st Night: 50.3 / 52.8 / +2.5
2nd Night: 49.6 / 52.8 / +3.2
10A
1st Night: 51.1 / 53.6 / +2.5
2nd Night: 52.7 / 53.6 / +0.9
1E
1st Night: 50.1 / 52.8 / +2.7
2nd Night: 52.7 / 52.8 / +0.1
Nutrien RFO
NWRP
Evonik
Pembina RFS
Shell
Air Products
IPL
Pembina CDH
Plains Midstream
Dow
Keyera
Dow
Nutrien FNO
Sheritt
Linde
Bruderheim
Cenovus
Fort Saskatchewan
0 0.5 1 2 3 4 5 6 km
353000 354000 355000 356000 357000 358000 359000 360000 361000 362000 363000 364000 365000 366000 367000 368000 369000 370000 371000 372000 373000 374000 375000 376000 377000 378000 379000 380000 381000
5970000 5969000 5968000 5967000 5966000 5965000 5964000 5963000 5962000 5961000 5960000 5959000 5958000 5957000 5956000 5955000 5954000 5953000


NCIA Regional Noise Model 2023
Figure 4:
Predicted Sound Level Contours
Case 1: Existing
• NCIA member company existing facilities
• Non-member company existing facilities
• ISO 9613-2 long-term average downwind condition
Legend
AIHA Industrial Policy Area
Sound Level (dBA)
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 <
May 2024
SLR File 203.50112.00001
SLR
NWRP
Nutrien RFO
Evonik
Pembina RFS
Shell
Air Products
IPL
Pembina CDH
Aux Sable
Plains Midstream
Keyera
Dow
Dow
Nutrien FNO
Sherritt
Linde
Chemtrade
Fort Saskatchewan
Bruderheim
Cenovus
Lamont
0 1 2 4 6 8 10 12 km


NCIA Regional Noise Model 2023
Figure 5:
Predicted Sound Level Contours
Case 2: Future Case
• NCIA member company existing facilities
• NCIA member company proposed facilities
• Non-member company existing facilities
• ISO 9613-2 long-term average downwind condition
Legend
AIHA Industrial Policy Area
Sound Level (dBA)
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 <
May 2024
SLR File 203.50112.00001
SLR
NWRP
Nutrien RFO
Evonik
Pembina RFS
Value Creation
Shell
Air Products
IPL
Pembina CDH
Aux Sable
Plains Midstream
Keyera
Dow
Dow
Nutrien FNO
Sherritt
Linde
Chemtrade
Fort Saskatchewan
Bruderheim
Cenovus
Lamont
0 1 2 4 6 8 10 12 km



NCIA Regional Noise Model 2023
Figure 6:
Sound Level
Contour Differences
2023 RNM minus 2018 RNM
for
Case 1: Existing
• NCIA member company existing facilities
• Non-member company existing facilities added
• Downwind conditions
Legend
AIHA Industrial Policy Area
Sound Level (dBA) Difference
<= -7
-7 < <= -5
-5 < <= -3
-3 < <= -1
-1 < <= 1
1 < <= 3
3 < <= 5
5 < <= 7
7 <
May 2024
SLR File 203.50112.00001
SLR
NWRP
Nutrien RFO
Evonik
Pembina RFS
Shell
Air Products
IPL
Pembina CDH
Aux Sable
Plains Midstream
Keyera
Dow
Dow
Nutrien FNO
Sherritt
Linde
Chemtrade
Fort Saskatchewan
Bruderheim
Cenovus
Lamont
0 1 2 4 6 8 10 12 km

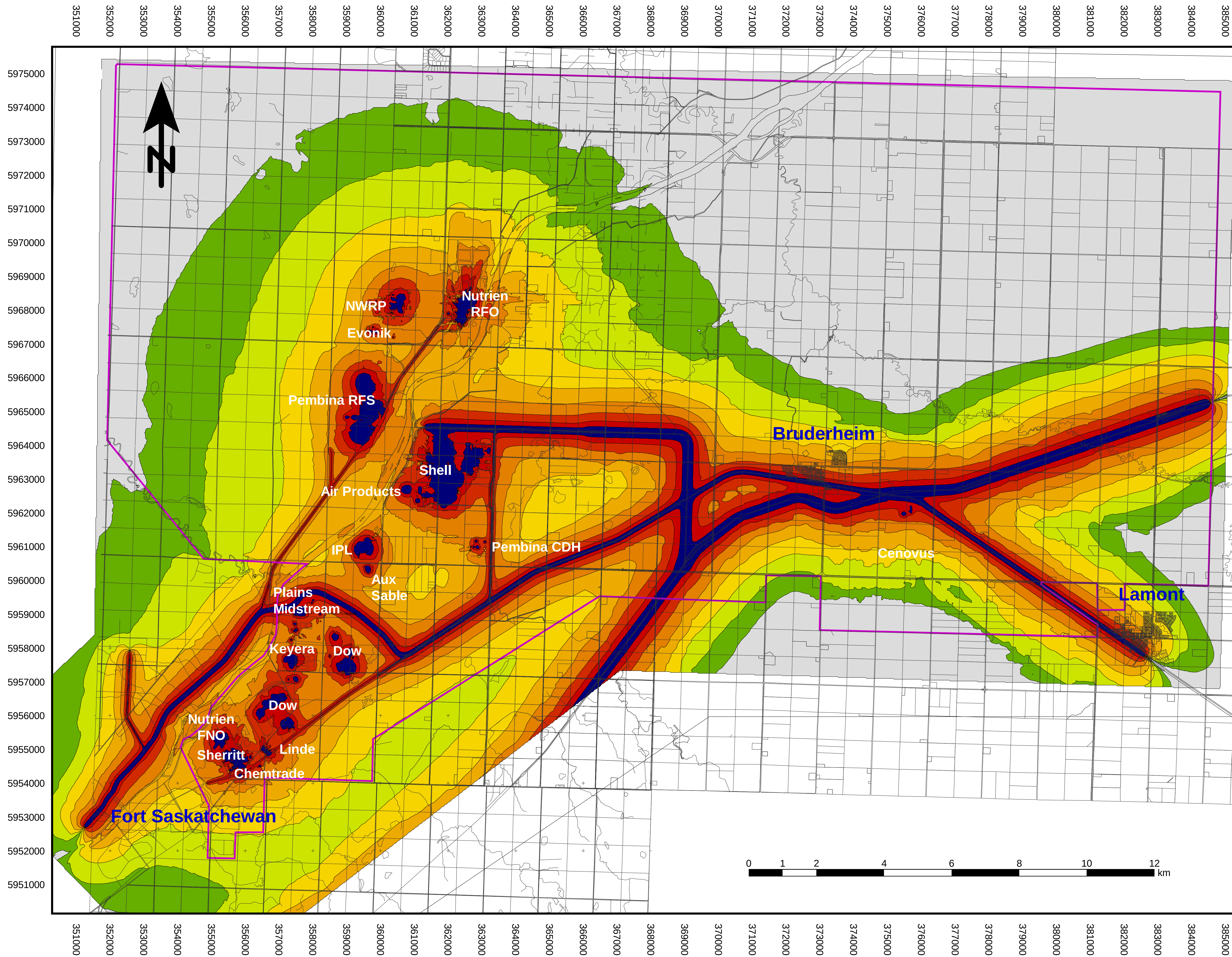

NCIA Regional Noise Model 2023
Figure 7:
Predicted Sound Level Contours
Case 1: Existing + Roads
• NCIA member company existing facilities
• Non-member company existing facilities
• Road traffic composite day/night sound levels
• ISO 9613-2 long-term average downwind condition
Legend
AIHA Industrial Policy Area
Sound Level (dBA)
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 <
May 2024
SLR File 203.50112.00001
SLR
NWRP
Nutrien RFO
Evonik
Pembina RFS
Shell
Air Products
IPL
Pembina CDH
Aux Sable
Plains Midstream
Keyera
Dow
Dow
Nutrien FNO
Sherritt
Linde
Chemtrade
Fort Saskatchewan
Bruderheim
Cenovus
Lamont
0 1 2 4 6 8 10 12 km

NCIA Regional Noise Model 2023

Figure 8:
Predicted Sound Level Contours

Case 1: Existing + Rail

- NCIA member company existing facilities
- Non-member company existing facilities
- Rail traffic composite day/night sound levels
- ISO 9613-2 long-term average downwind condition



Legend

AIHA Industrial Policy Area

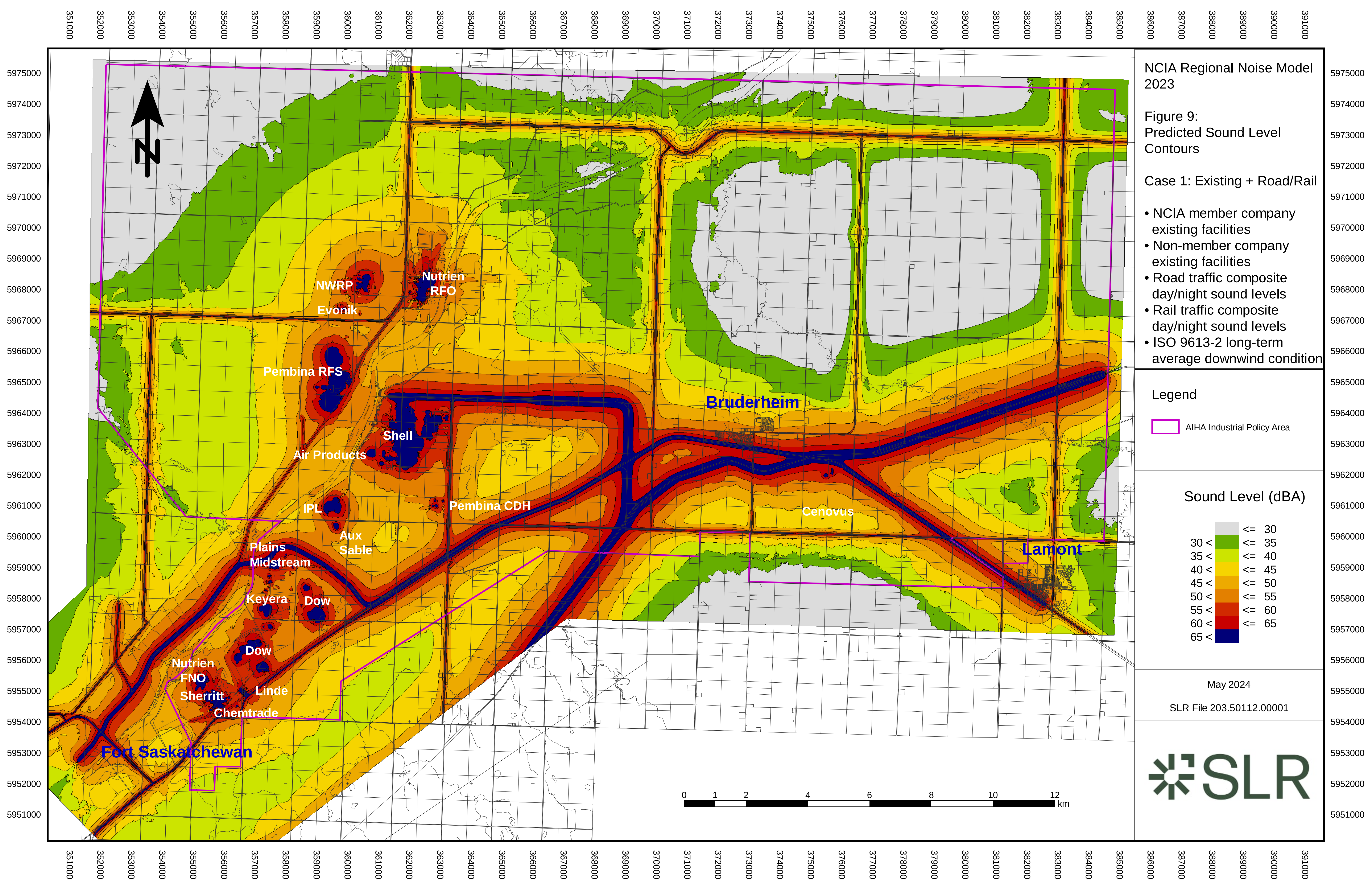
Sound Level (dBA)

	<= 30
30 <	<= 35
35 <	<= 40
40 <	<= 45
45 <	<= 50
50 <	<= 55
55 <	<= 60
60 <	<= 65
65 <	

May 2024

SLR File 203.50112.00001

SLR


NCIA Regional Noise Model 2023
Figure 9:
Predicted Sound Level Contours
Case 1: Existing + Road/Rail
• NCIA member company existing facilities
• Non-member company existing facilities
• Road traffic composite day/night sound levels
• Rail traffic composite day/night sound levels
• ISO 9613-2 long-term average downwind condition
Legend
AIHA Industrial Policy Area
Sound Level (dBA)
<= 30
30 < <= 35
35 < <= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 <
May 2024
SLR File 203.50112.00001
SLR
NWRP
Nutrien RFO
Evonik
Pembina RFS
Shell
Air Products
IPL
Pembina CDH
Aux Sable
Plains Midstream
Keyera
Dow
Dow
Nutrien FNO
Sherritt
Linde
Chemtrade
Fort Saskatchewan
Bruderheim
Cenovus
Lamont
N
0 1 2 4 6 8 10 12 km
351000 352000 353000 354000 355000 356000 357000 358000 359000 360000 361000 362000 363000 364000 365000 366000 367000 368000 369000 370000 371000 372000 373000 374000 375000 376000 377000 378000 379000 380000 381000 382000 383000 384000 385000 386000 387000 388000 389000 390000 391000
5975000 5974000 5973000 5972000 5971000 5970000 5969000 5968000 5967000 5966000 5965000 5964000 5963000 5962000 5961000 5960000 5959000 5958000 5957000 5956000 5955000 5954000 5953000 5952000 5951000

Making Sustainability Happen

APPENDIX 2

2022 Regional Noise Model Annual Field Validation Monitoring Report

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www.aciacoustical.com

2022 Environmental Noise Survey

For The

Regional Noise Model Annual Field Validation Monitoring

Prepared for:

Northeast Capital Industrial Association

Prepared by:
P. Froment, B.Sc., B.Ed., P.L.(Eng.)
aci Acoustical Consultants Inc.
Edmonton, Alberta
APEGA Permit to Practice #P7735

PERMIT TO PRACTICE
ACI ACOUSTICAL CONSULTANTS INC.
Signature P. F.
Date 01/22/2023
PERMIT NUMBER: P 7735
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

01/22/2023

aci Project #: 21-021
January 22, 2023

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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 the noise monitoring 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 July 2022 by P. Froment, B.Sc., P.L.(Eng.).

As part of the study, a total of thirteen (13) 48-hour noise monitorings 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 typical noise climate of each noise monitoring location. As such, the isolated noise levels and 1/3 octave band L_{eq} sound levels were consistent between night-time periods and 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. In comparison to the 2021 noise monitoring results where the noise levels were more stabile, the 2022 results indicated greater fluctuation with some of the lowest measured noise levels. In most cases, this could most likely be attributed to the wind direction, however, this should be further examined in 2023.

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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 the noise monitoring 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 July 2022 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 Measurements Methods

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted at 12 locations[1] throughout the AIH, as indicated in Figure 2. The monitorings 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, 4 & 11[2], all noise monitoring locations were identical to those conducted during the 2021 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[3]. In particular, the chosen noise monitoring periods avoided any major shutdowns or outages[4] 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.

Local weather monitoring stations were used for each of the two (2) 48-hour time monitoring periods, three (3) stations were utilized for July 20 – 22, 2022, while two (2) were utilized for July 22 – 24, 2022. 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.

[1] Once again, it should be noted that two (2) 48-hour monitoring were conducted at Monitoring Location 12.
[2] As discussion for each will be found in the following section.
[3] This was verified by all the various company representatives.
[4] 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)		
1E	355210	5954157	7/20/22 13:00	7/22/22 13:00
2C	358256	5957216	7/22/22 12:00	7/24/22 12:00
3B	358361	5959283	7/22/22 12:00	7/24/22 12:00
4C	361665	5960870	7/20/22 12:00	7/22/22 12:00
5A	361777	5964711	7/20/22 12:00	7/22/22 12:00
6A	364322	5967894	7/20/22 12:00	7/22/22 12:00
8A	358897	5965430	7/20/22 10:00	7/22/22 10:00
9A	355872	5957574	7/22/22 12:00	7/24/22 12:00
10A	355925	5955818	7/20/22 13:00	7/22/22 13:00
11A	358430	5963804	7/20/22 09:00	7/22/22 09:00
12B (1st 48-hour)	368223	5963070	7/20/22 10:00	7/22/22 10:00
12B (2nd 48-hour)			7/22/22 13:00	7/24/22 13:00
13A	358667	5970180	7/20/22 09:30	7/22/22 09:30

4.1. Noise Monitor Location 1E

The noise monitor at Location 1 was located approximately 45 m north of 100 Avenue[2], 36 m west of 114 Street and approximately 350 m northwest of Highway 15 as indicated in Figure 2 and Figure 3. This put the noise monitor approximately 180 m southwest of the entrance to 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, 114 Street and the Sherritt International Corporation facility. There was no significant vegetation between the noise monitor and the facilities to

[1] The letters accompanying the noise monitoring location refer to their location.
[2] This is consistent with the new location chosen last year.

the north. This location was modified from previous years in an effort to avoid the influence of 100 Avenue on the noise monitoring results.

4.2. Noise Monitor Location 2C

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 3B

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 4C

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. This location was moved back to its previous location since the construction in 2021 was completed.

4.5. Noise Monitor Location 5A

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 6A

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 2 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. In addition, a weather monitor was placed at this location adjacent to the noise monitor for the duration of the July 20 – 22, 2022 noise monitoring period.

4.7. Noise Monitor Location 8A

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 9A

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 10A

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

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

the 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. In addition, a weather monitor was placed at this location adjacent to the noise monitor for the duration of the July 20 – 24, 2022 noise monitoring period.

4.10. Noise Monitor Location 11A

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. Lastly, the noise monitor was moved back to its previous location as the 2021 noise monitoring results were heavily influenced by the Cando Sturgeon Rail Terminal.

4.11. Noise Monitor Location 12B

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 13A

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 monitorings 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 monitorings 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. 2022 - 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
1E	48.5	50.3	49.9	51.7	51.5	51.4	53.8
2C	53.7	52.7	50.6	51.4	52.4	50.0	50.9
3B	53.5	53.1	45.6	50.0	50.5	48.3	54.8
4C	46.2	48.2	48.1	50.5	46.5	46.2	45.6
5	50.5	51.0	50.2	54.6	49.9	46.6	48.0
6A	50.6	45.1	43.9	50.8	43.8	40.5	47.9
8A	68.9	58.7	51.0	72.6	58.4	49.0	73.1
9A	47.3	47.4	47.0	51.9	46.8	46.2	46.9
10A	57.7	54.8	50.6	58.6	53.4	47.5	60.0
11A	50.5	45.2	44.1	51.0	46.3	45.9	49.9
12B (1st 48-hour)	49.9	40.8	36.6	46.8	42.6	33.4	44.2
12B (2nd 48-hour)	43.8	43.7	37.6	43.0	44.3	36.6	43.6
13A	46.0	40.9	35.1	48.0	38.8	29.9	43.2

[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 1E

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 in Table 2 are relatively consistent between the two night-time periods (1.5 dBA) although the traces found in Figures 15 – 18 indicate more variability between the two night-time periods. Despite the differences in the traces, the L_{eq}Night noise levels correspond well with previous years, particularly 2021 where the values were 51.0 and 51.9 dBA, respectively.

Despite the relative difference in traces between both nights the 1/3 octave band L_{eq} sound levels have very similar traces. They both have relatively higher noise levels in the lower frequency bands that decrease as the frequency increases. Since both nights have similar values and they agree with previous L_{eq}Night measured values, it is anticipated that the isolated values of both night-time periods are representative of the typical noise climate of the area.

6.1.2. Noise Monitoring Location 2

The results of the noise monitoring conducted at Location 2 are provided in Table 2 and Figures 22 - 28. The isolated L_{eq}Night values from Table 2 and the traces found in Figures 22 – 23 indicate very consistent noise levels between the two night-time periods (difference of 0.6 dBA). 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. Similarly to previous years, there were a significant number of “non-typical” incidents associated with rail activity. The removal of data due to the rail yard is consistent with previous years.

The isolated L_{eq}Night results and the 1/3 octave band spectral data indicate that the 2022 noise monitoring are reflective of the typical noise climate of the area.

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. Similarly to previous years, the isolated L_{eq}Night values vary between the two nights with a difference of 2.7 dBA. Although the trace for the night-time periods varies, their 1/3 octave band spectral data are similar with the second night being slightly higher than the first night. This was also the case during the 2021 monitoring period.

When comparing the noise levels of each night-time period to previous years, the L_{eq}Night values of both nights are indicative of the typical noise levels for this 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. It should again be noted that this location was moved back to its "typical" location for the 2022 monitoring period.

Unlike previous years, where there tends to be a higher fluctuation between nights, the isolated L_{eq}Night values between the two night-time periods were similar. Both night-time periods indicate a very consistent trace with stable noise levels. In addition, the 1/3 octave band spectral data are almost identical between nights. As a result, the isolated L_{eq}Night results for the 2022 noise monitoring are reflective of the typical range of noise levels for this area.

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. Although the traces in Figures 43 – 46 indicate consistent isolated L_{eq}Night noise levels for both night-time periods, the measured noise levels for the second night (July 21 - 22, 2022) are significantly lower than what would be expected at this location. Specifically, the measured L_{eq}Night value of 46.6 dBA is the lowest ever recorded measurement. In reviewing the weather data from Monitoring Location #6, it is possible that the lower levels can be attributed to the wind being from the north. This should be further investigated in 2023.

Therefore, when compared to previous years, it can thus be concluded that the measured L_{eq}Night values from the July 20 – 21, 2022 night-time period are reflective of the noise climate of the area.

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 15-second L_{eq} traces of both night-time periods indicates relatively consistent noise levels throughout. During the site visit it was noted that the dominant noise source was from the facility to the west, however crickets could be heard. This was noted in last year's report as well.

As shown in Appending IV, there were a significant number of instances in which data was removed for miscellaneous animal sounds. In reviewing the associated audio files and in looking at previous monitoring notes and data, these animal sounds were not present in previous years. There animal contributions were consistent for both night-time periods.

Additionally, similarly to Location #5, the measured noise levels for the second night (July 21, 2022) are significantly lower than what would be expected at this location. Specifically, the measured L_{eq}Night value of 40.5 dBA is the lowest ever recorded. Again it is likely that this can be attributed to the wind being from the north, though it should be further investigated in 2023.

When compared to previous years, it can thus be concluded that the measured L_{eq}Night values from the July 20 – 21, 2022 night-time period are reflective of the lower range of the noise climate of the area.

Lastly, in 2023, special attention should be paid to the overall noise levels and to the miscellaneous animal sounds.

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 very consistent noise levels for both night-time periods. In addition, the 1/3 octave band L_{eq} sound levels are consistent between nights and in comparing to previous years. Therefore, the isolated noise levels of both night-time periods are representative of the typical noise climate of this area.

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 and 1/3 octave band L_{eq} sound levels values are very consistent between both night-time periods despite the 15-second traces showing greater variation, as seen in Figures 64 – 65. When comparing the values of each night-time period to previous years the results of each night are indicative of the typical noise climate of the area.

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. Although the traces in Figures 71 – 72 indicate consistent isolated L_{eq}Night noise levels for both night-time periods (although there was greater variation for the night of July 20 – 21, 2022), the measured noise levels for the second night (July 21 – 22, 2022) are significantly lower than what would be expected at this location. Specifically, the measured L_{eq}Night value of 47.5 dBA is the lowest ever recorded measurement. In reviewing the weather data from Monitoring Location #10, there was no corroboration between the wind direction and the traces in Figures 71 – 72. This should be further investigated in 2023.

Therefore, when compared to previous years, it can thus be concluded that the measured L_{eq}Night values from the July 20 – 21, 2022 night-time period are most reflective of the noise climate of the area.

6.1.10. Noise Monitoring Location 11A

The results of the noise monitoring conducted at Location 11 are provided in Table 2 and in Figures 78 - 84. It should again be noted that this location was moved back to its previous location due to the significant amount of rail activity during the night-time monitoring data from 2021.

Despite the dissimilar 15-second traces between night-time periods, as shown in Figures 78 – 79, the isolated L_{eq}Night and 1/3 octave band L_{eq} sound levels, in particular, were very consistent between both night-time periods despite. When comparing the values of each night-time period to previous years the results are indicative of the typical noise climate of the 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 significant differences 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 and thus influences from the CP rail line and vehicular traffic tend to dominate the noise climate when present. As indicated in Appendix IV, there were significant noise contributions from the rail line, the morning rush (on area roadways) and the morning chorus (birds chirping). These noise sources totally dominated the noise climate and thus large portions of this time period were removed[1].

The L_{10} L_{eq} sound levels and the 1/3 octave band sound levels (in the absence of the vehicular or rail activity) and indicate similar values to previous years. In addition the 1/3 octave trace corresponds with 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 isolated L_{eq}Night values are consistent and within range of highest and lowest values from previous years.

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 in Table 2 and the trace found in Figure 99, indicated that the July 20 – 21, 2022 noise levels were relatively consistent, particularly between 00:00 and 3:45. The trace from July 21 – 22, 2022 shows that the noise levels were not as consistent as the previous night and in general, much lower.

Similarly to the results from other monitoring location, the isolated L_{eq}Night values from July 21 – 22, 2022 were some of the lowest measured levels. Therefore, when compared to previous years, it can thus be concluded that the measured L_{eq}Night values from the July 20 – 21, 2022 night-time period are most reflective of the noise climate of the area.

[1] This has been very consistent between the various years.

6.2. 2022 General Subjective Observations and Notes from Site Visits and Data Analysis

- The second night-time period for Locations #5, #6, #10 and #13 resulted in some of the lowest ever recorded L_{eq}Night values. In reviewing the associated weather data, it is possible that these low levels can be associated with the wind causing the monitoring locations being upwind from the dominant noise sources. However, the wind speeds were still in accordance with the AER and AUC criteria.
- The isolated noise levels and 1/3 octave band L_{eq} sound levels for most locations were less consistent than the 2021 noise monitoring period.
- The noise arriving at most monitor locations was similar to previous years in that it consisted 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.
- Rail activity was once again a major noise source within AIH.
- The noise from train passages was prevalent at most locations and tended to dominate the noise climate as they passed through, particularly when there were train whistles. However, certain locations were more heavily influenced when compared to previous years, while other locations were less influenced.
- The newest placement for Location #1 resulted in consistent values. It is recommended that this location be used going forward.
- The noise monitor was at Location 11 was placed at its original location in 2022. The results were more consistent with less of an influence of rail.
- In 2020, the contributions from the morning chorus (birds chirping, animals moving, etc.) were dominant at many locations after approximately 04:30 in the morning. Similarly to 2021, the 2022 noise monitoring schedule was initially trying to avoid performing the noise monitoring near the summer solstice. The noise monitoring was pushed until late July, however, the contributions from the morning chorus were again observed at many locations.

6.3. Night-time Weather Conditions

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. Note that the weather conditions for noise monitoring periods were within acceptable limits as per AER D038. All weather data are presented in Appendix V. A brief discussion of each night-time period can be found below.

6.3.1. July 20 – 21, 2022

Weather Monitor near Noise Monitor Location 6

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr) with a brief period over 10 km/hr. The wind was predominantly from the south-west for the duration of the night-time period. The temperature ranged from 12°C to 20°C and the relative humidity ranged from approximately 49% - 81%. 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 10

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr) with brief periods over 10 km/hr. The wind was predominantly from the south-west/west for the duration of the night-time period. The temperature ranged from 13°C to 21°C and the relative humidity ranged from approximately 47% - 71%. 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 (below 10 km/hr). The wind was primarily from the southwest for the duration of the night-time period. The temperature ranged from 9°C to 17°C and the relative humidity ranged from approximately 60% - 85%. The barometric pressure was consistent and flat at approximately 94 kPa. Lastly, there was no precipitation during the night.

6.3.2. July 21 – 22, 2022

Weather Monitor near Noise Monitor Location 6

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr) with brief periods over 10 km/hr. The wind direction was generally from the north (ranging from northwest to northeast). The temperature ranged from 12°C to 20°C and the relative humidity ranged from approximately 48% - 80%. The barometric pressure was consistent and flat at approximately 94 kPa. There was no precipitation during the night.

Weather Monitor near Noise Monitor Location 10

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr) with brief periods over 10 km/hr. The wind direction was initially from the north before shifting from the west. The temperature ranged from 12°C to 22°C and the relative humidity ranged from approximately 43% - 78%. The barometric pressure was consistent and flat at approximately 94 kPa. There was minimal precipitation from 04:35 – 04:40.

Weather Monitor near Noise Monitor Location 12

The wind conditions during the night-time period were considered moderate (below 10 km/hr). The wind was initially from the northeast before shifting to the north and then south for a few hours. It then shifted back to the north before becoming calm. The temperature ranged from 12°C to 20°C and the relative humidity ranged from approximately 48% - 80%. The barometric pressure was consistent and flat at approximately 94 kPa. There was minimal precipitation from 23:15 – 23:20.

6.3.3. July 22 – 23, 2022

Weather Monitor near Noise Monitor Location 10

Apart from the start of the night-time, the wind conditions throughout the night-time period were considered moderate to calm (below 10 km/hr). The wind direction was generally from the south to east. The temperature ranged from 11°C to 19°C and the relative humidity ranged from approximately 50% - 85%. The barometric pressure was consistent and flat at 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 (primarily below 5km/hr). The wind direction varied throughout the night-time period[1]. The temperature ranged from 7°C to 14°C and the relative humidity ranged from approximately 70% - 89%. The barometric pressure was flat at 94 kPa. Lastly, there was no precipitation.

[1] The wind direction fluctuates more greatly when wind speeds are below 5 km/hr and are essentially calm. In these instances, the wind direction has a minimal influence of the propagation of the sound.

6.3.4. July 23 – 24, 2022

Weather Monitor near Noise Monitor Location 10

The wind conditions during the night-time period were considered moderate (primarily between 5 – 10 km/hr) with brief periods over 10 km/hr. The wind was initially from the north before gradually shifting to the east. The temperature ranged from 15°C to 21°C and the relative humidity ranged from approximately 63% - 80%. The barometric pressure was consistent and flat at 94 kPa. Lastly, there was no precipitation.

Weather Monitor near Noise Monitor Location 12

The wind conditions throughout the night-time period were considered moderate (primarily below 10 km/hr) with brief periods over 10 km/hr. The wind was initially from the northeast before shifting to the west/southwest. The temperature ranged from 12°C to 18°C and the relative humidity ranged from approximately 65% - 88%. The barometric pressure was flat at 94 kPa. Lastly, there was no precipitation.

7.0 Conclusion

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted throughout the Alberta's Industrial Heartland. 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. In comparison to the 2021 noise monitoring results where the noise levels were more stabile, the 2022 results indicated greater fluctuation with some of the lowest measured noise levels. In most cases, this could most likely be attributed to the wind direction, however, this should be further examined in 2023.

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.

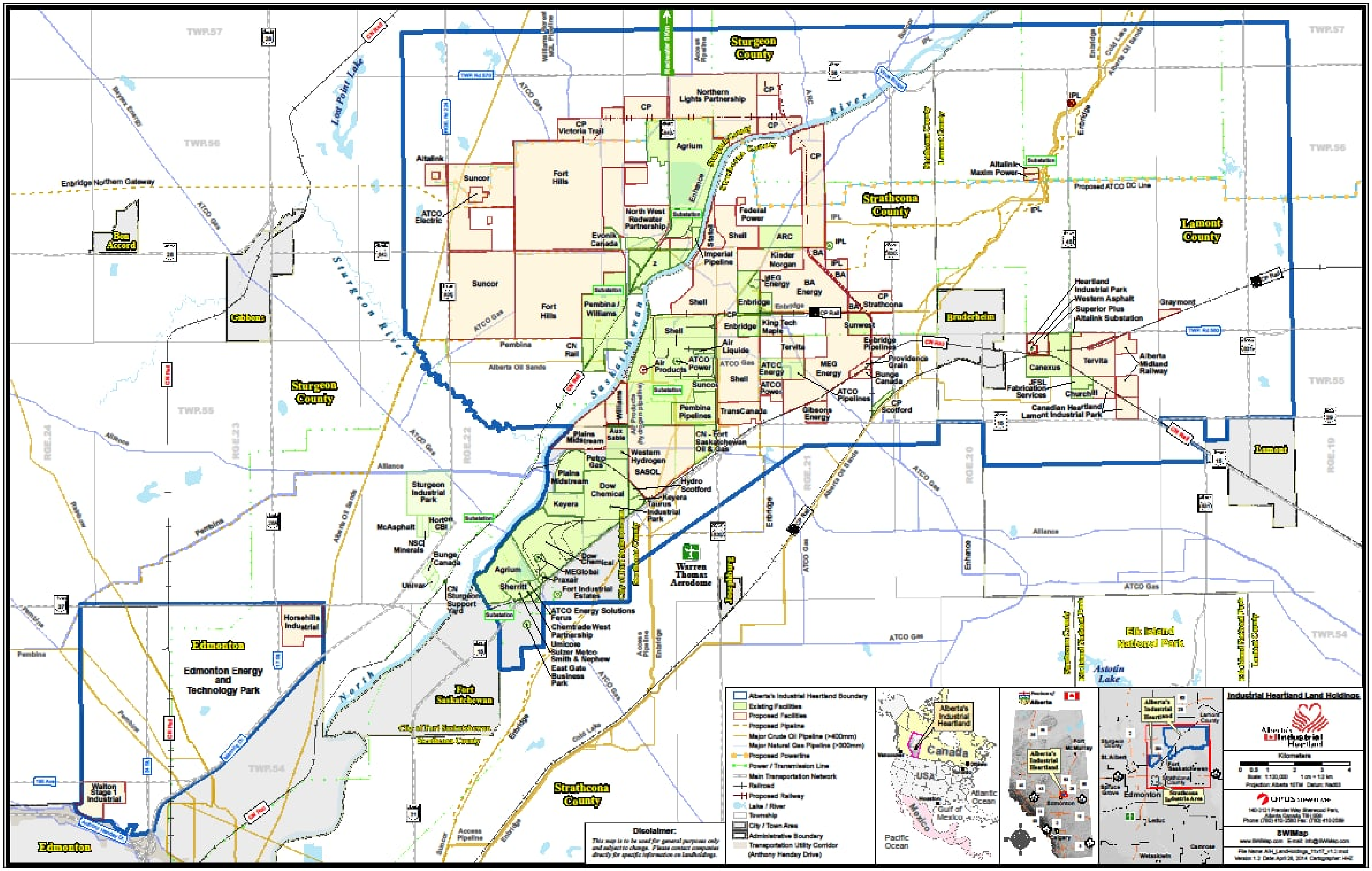

Figure 1. Study Area

aci acoustical consultants inc

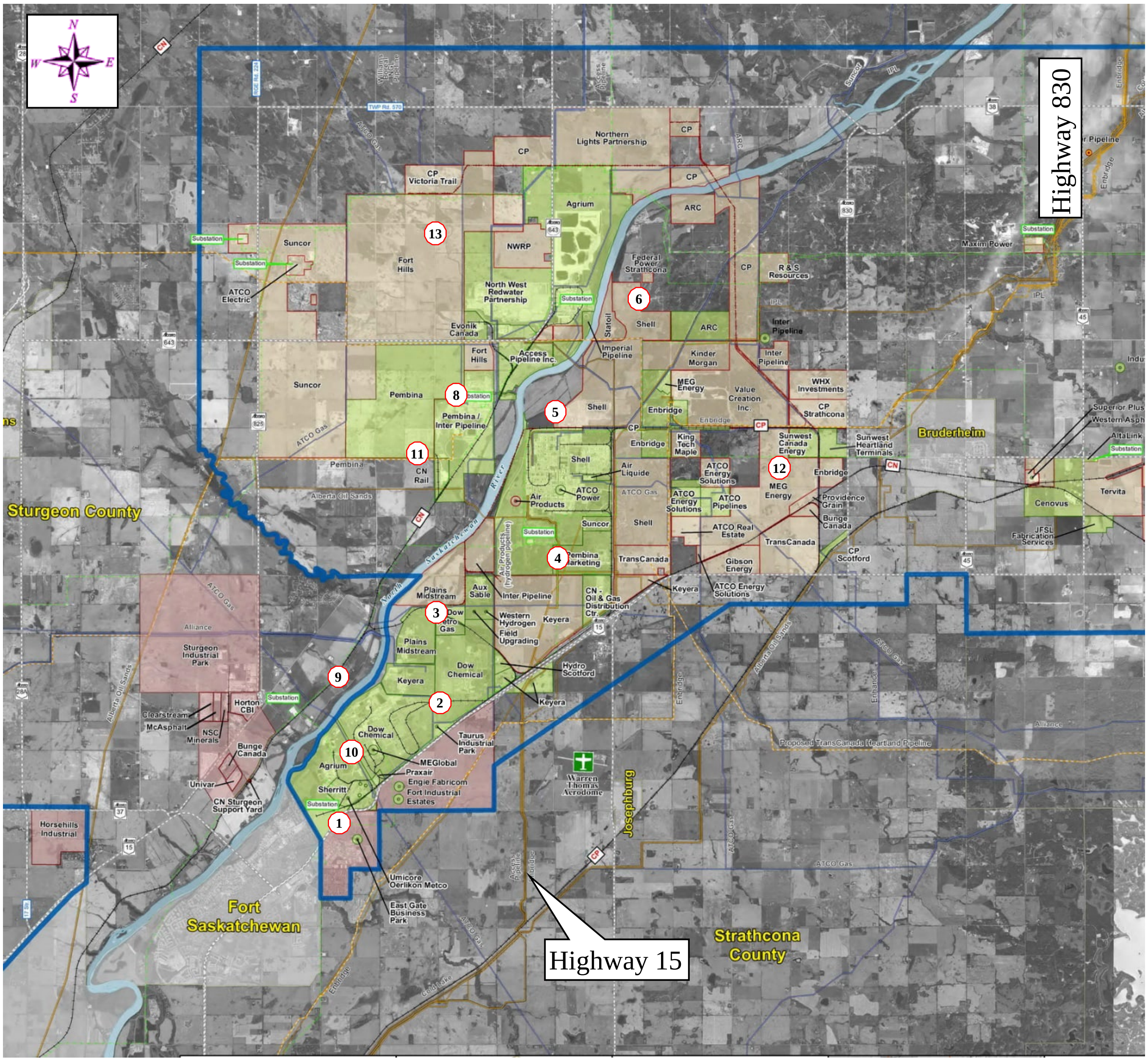

Figure 2. 2022 Study Area (With Noise Monitoring Locations)

Figure 3. Noise Monitor #1

Figure 4. Noise Monitor #2

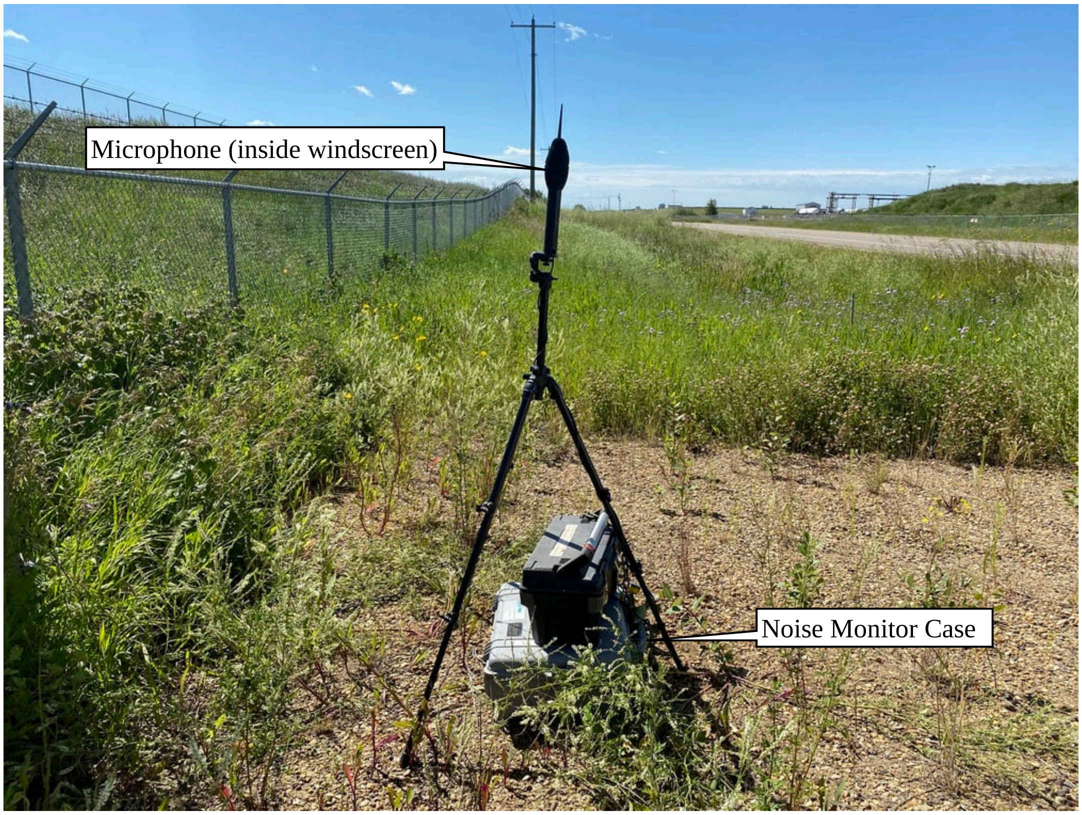

Figure 5. Noise Monitor #3

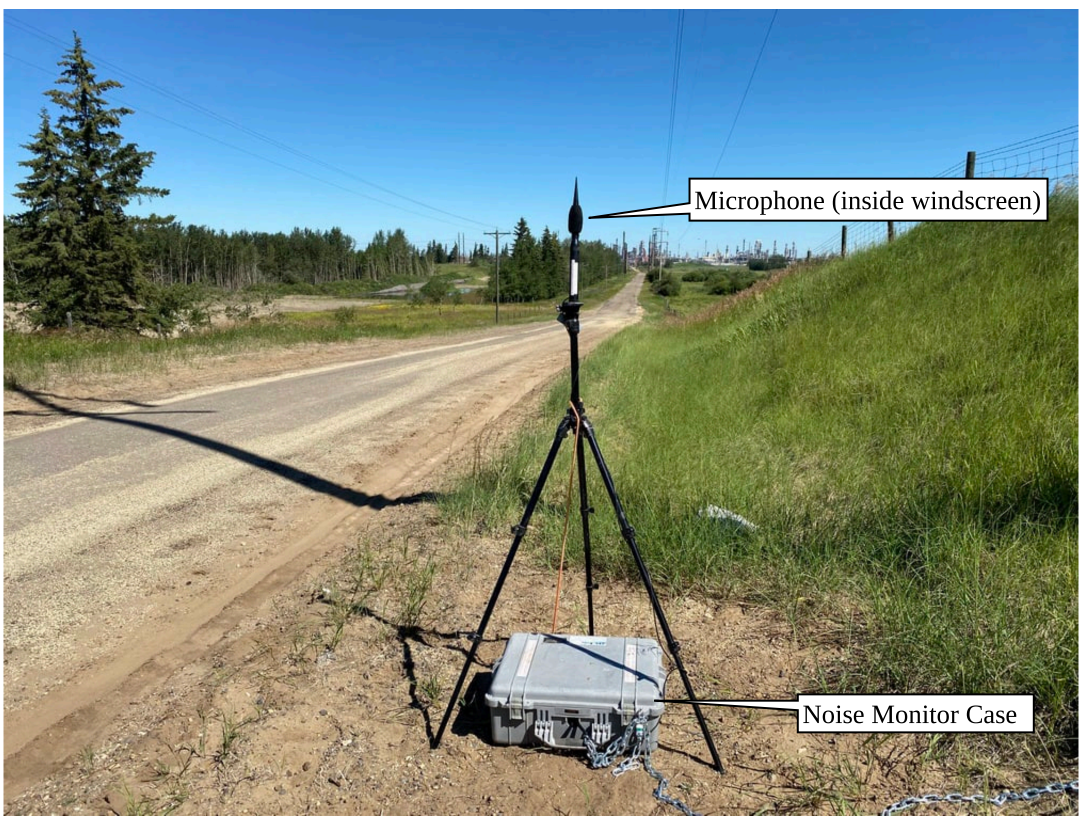

Figure 6. Noise Monitor #4

Figure 7. Noise Monitor #5

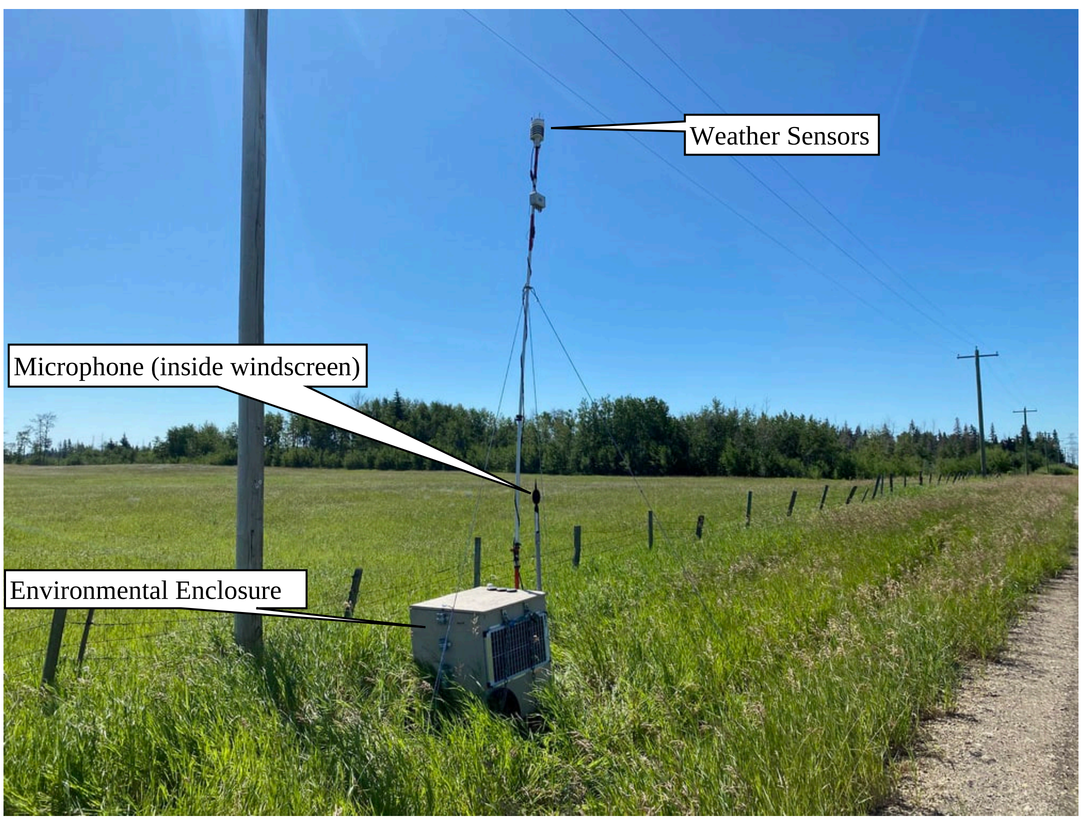

Figure 8. Noise Monitor #6 (With Weather Monitor)

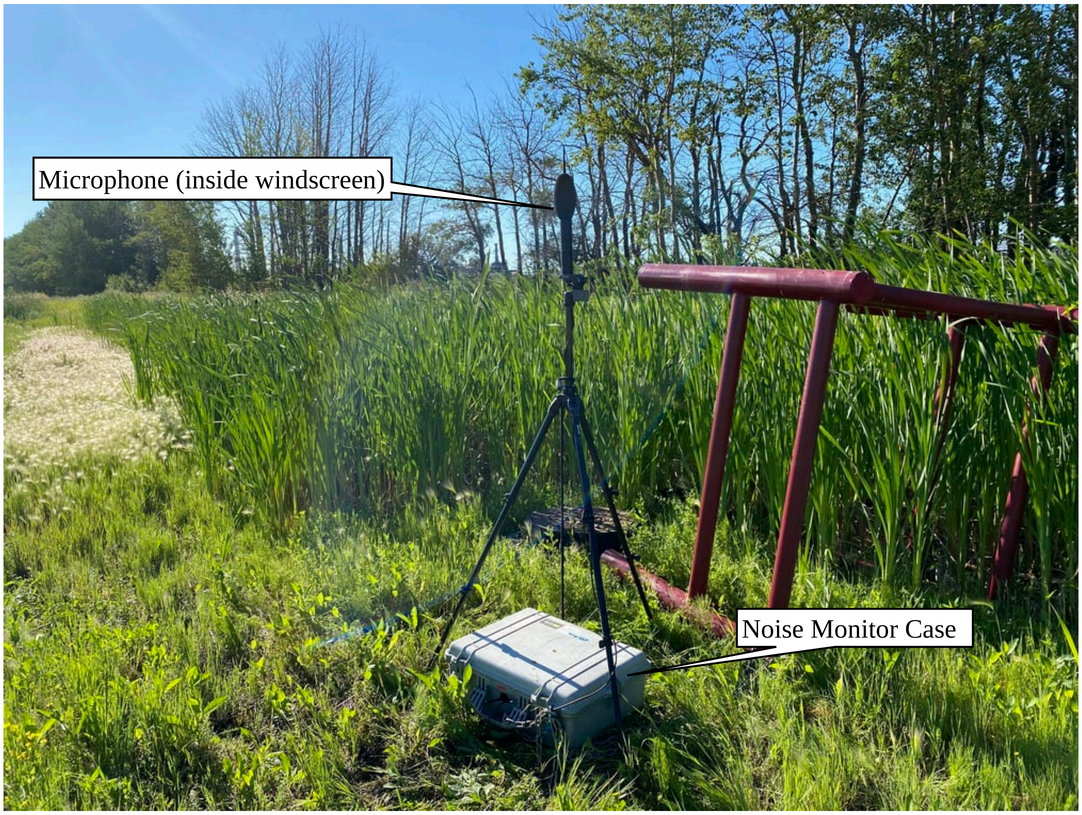

Figure 9. Noise Monitor #8

Figure 10. Noise Monitor #9

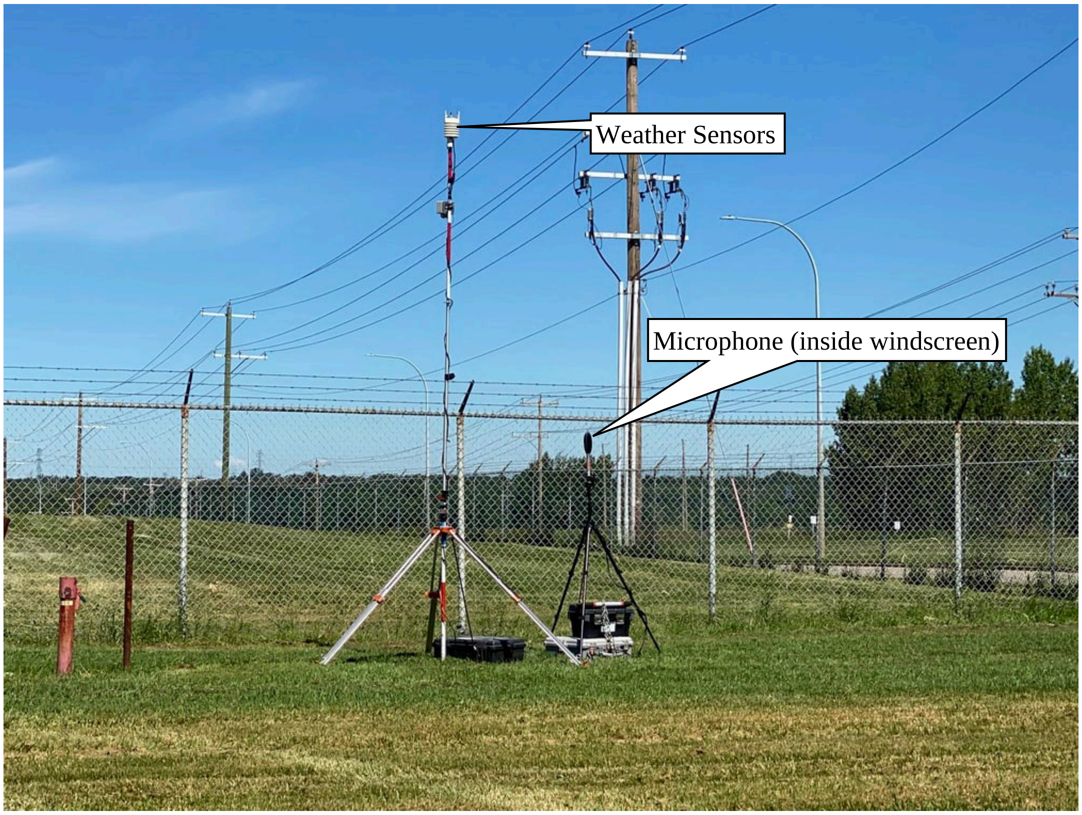

Figure 11. Noise Monitor #10 (With Weather Monitor)

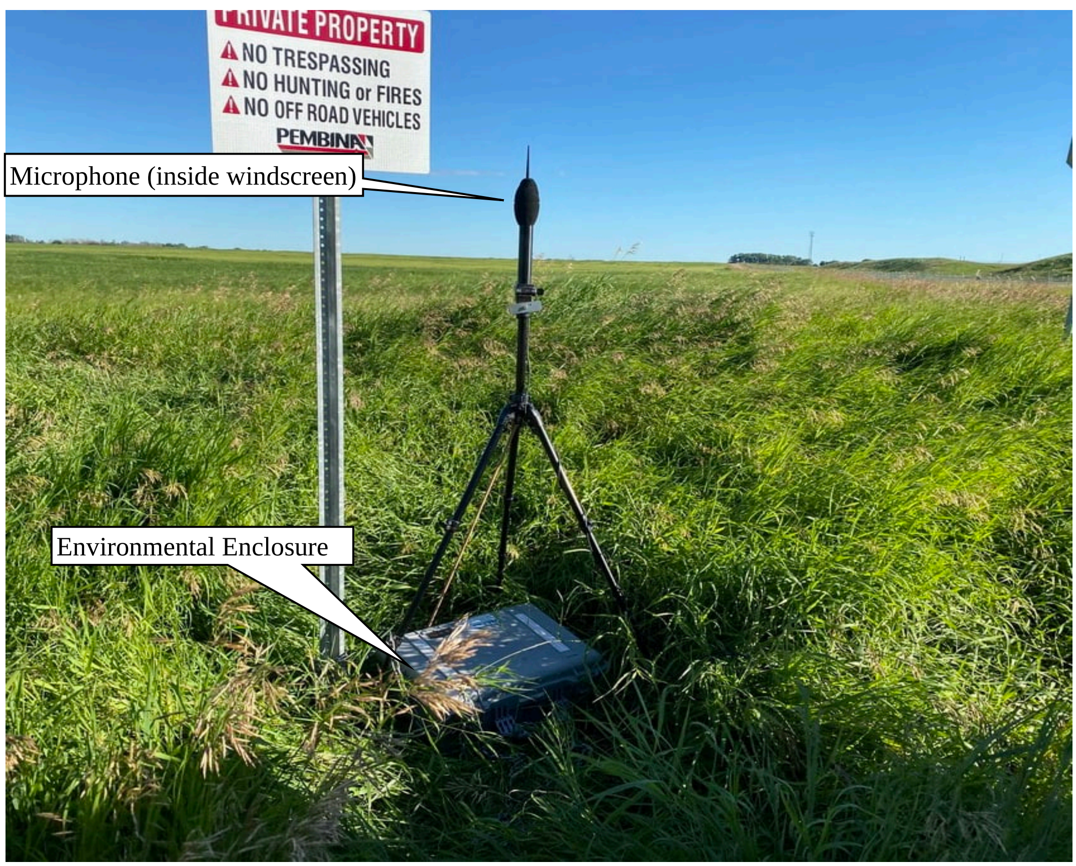

Figure 12. Noise Monitor #11

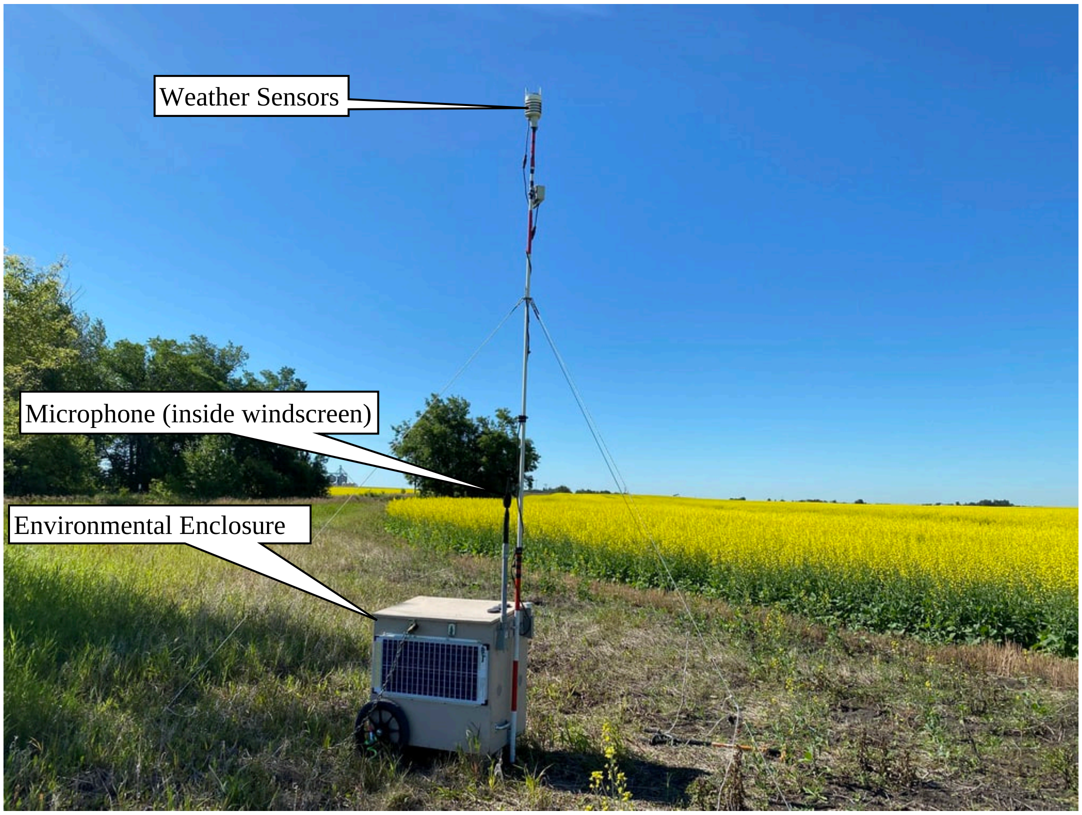

Figure 13. Noise Monitor #12 (Control Site w/ Weather Monitor)

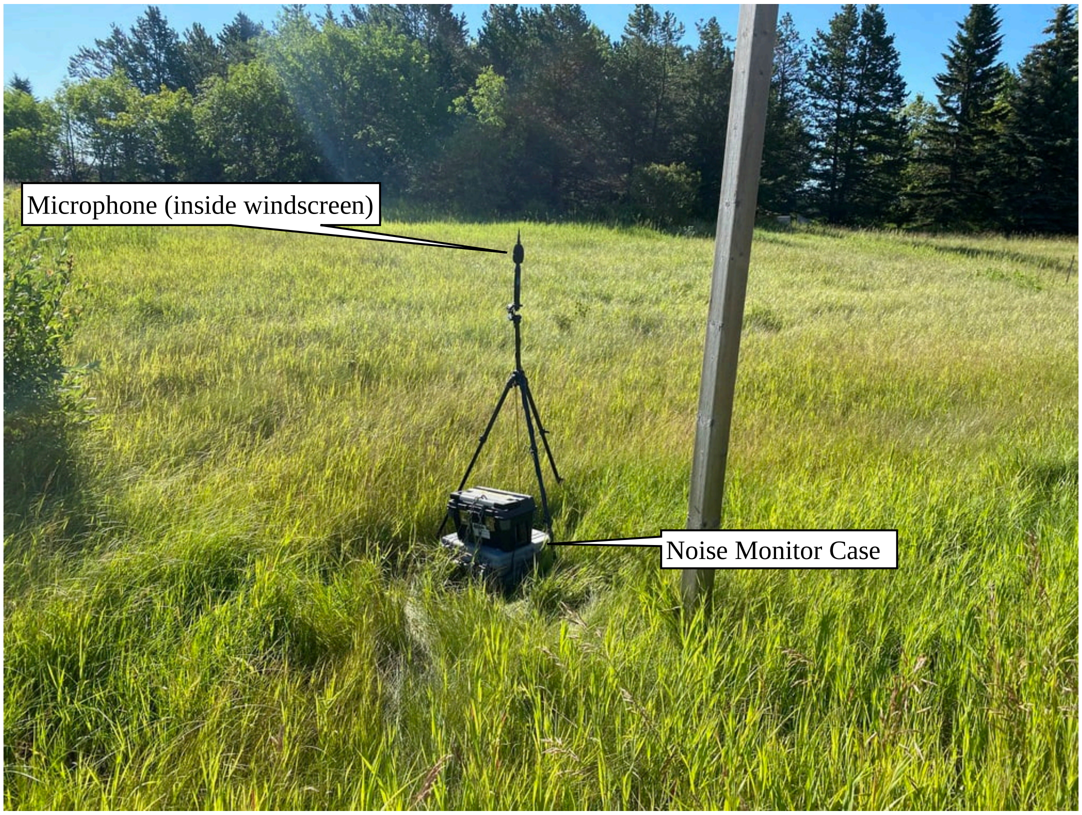

Figure 14. Noise Monitor #13

Noise Monitor #1

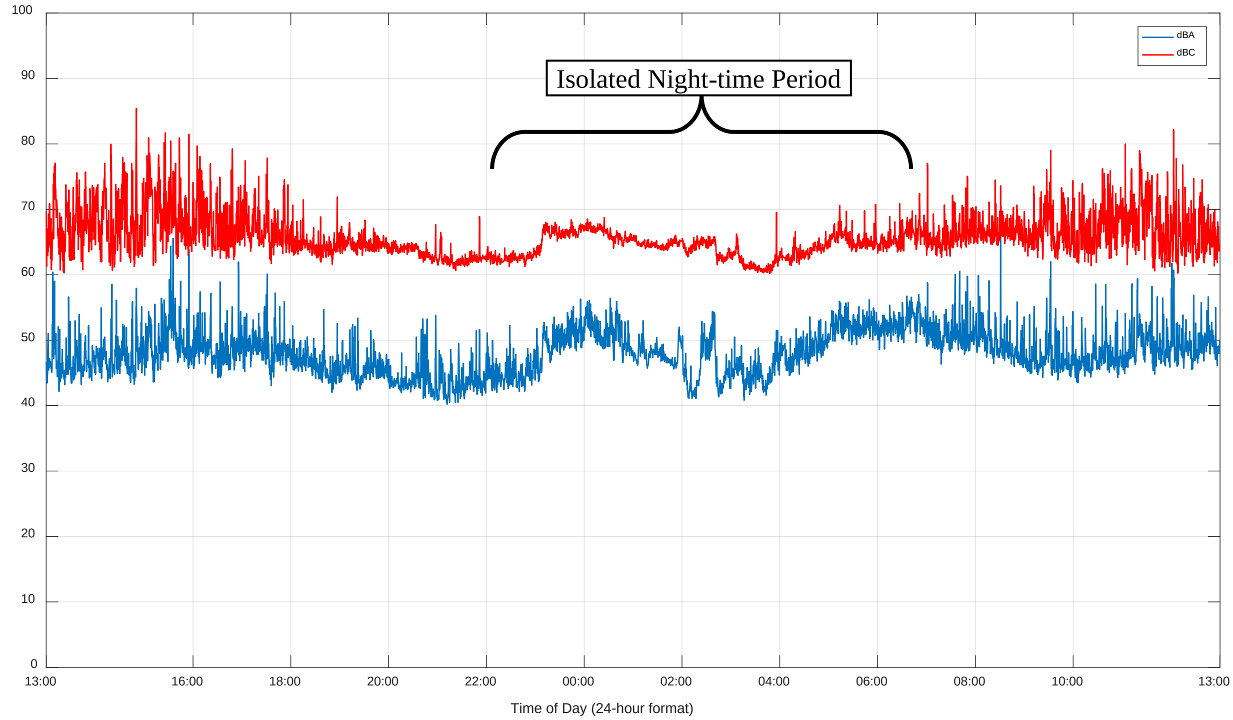

Figure 15. Noise Monitor #1, 15-Second L$_{eq}$ Sound Levels (July 20 - 21, 2022)

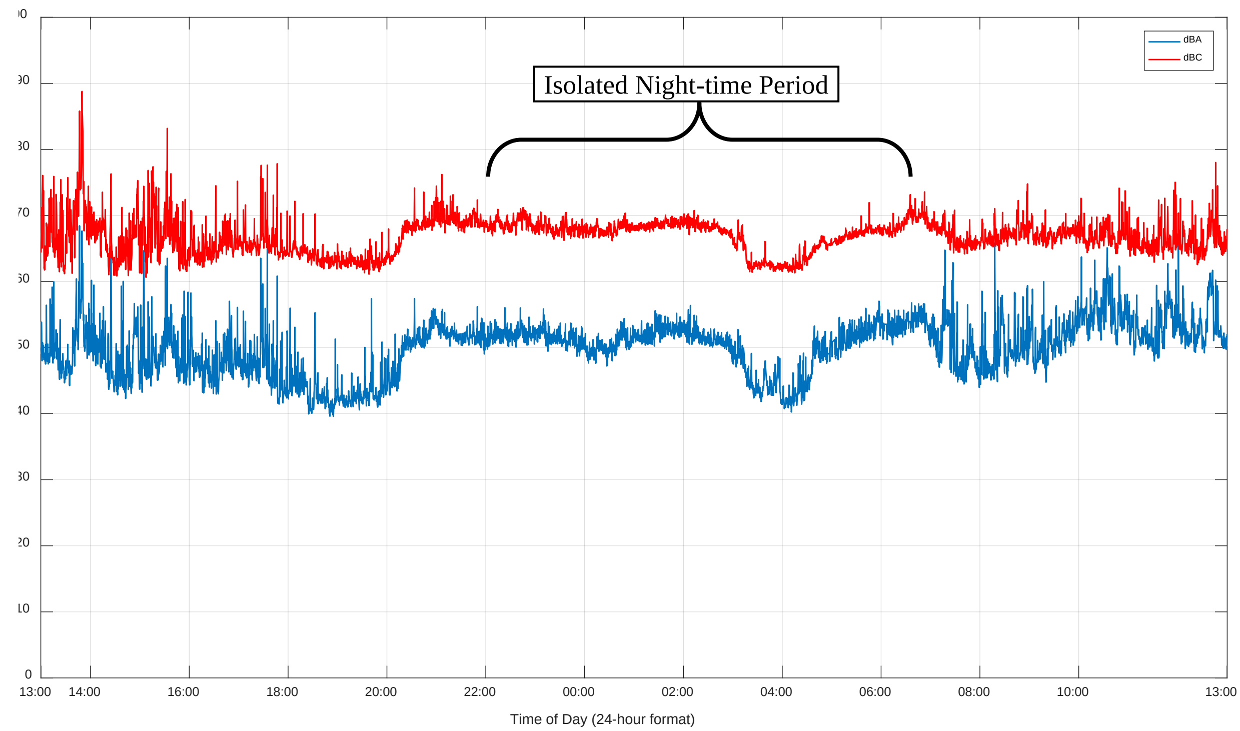

Figure 16. Noise Monitor #1, 15-Second L$_{eq}$ Sound Levels (July 21 - 22, 2022)

Noise Monitor #1

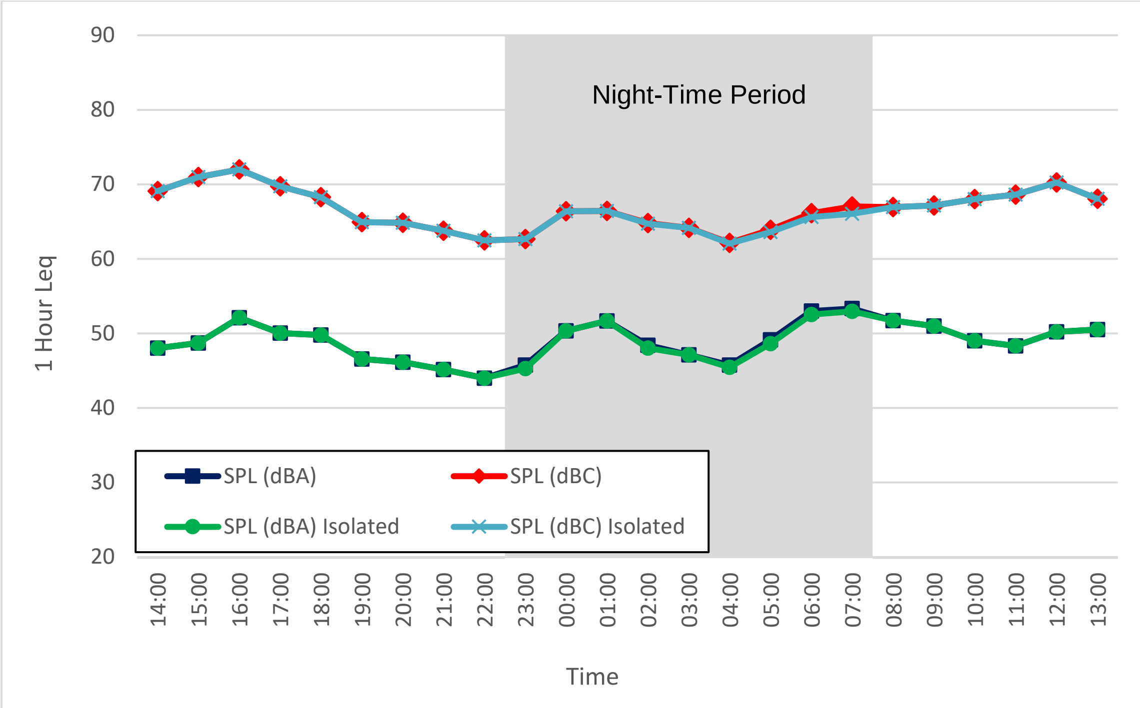

Figure 17. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

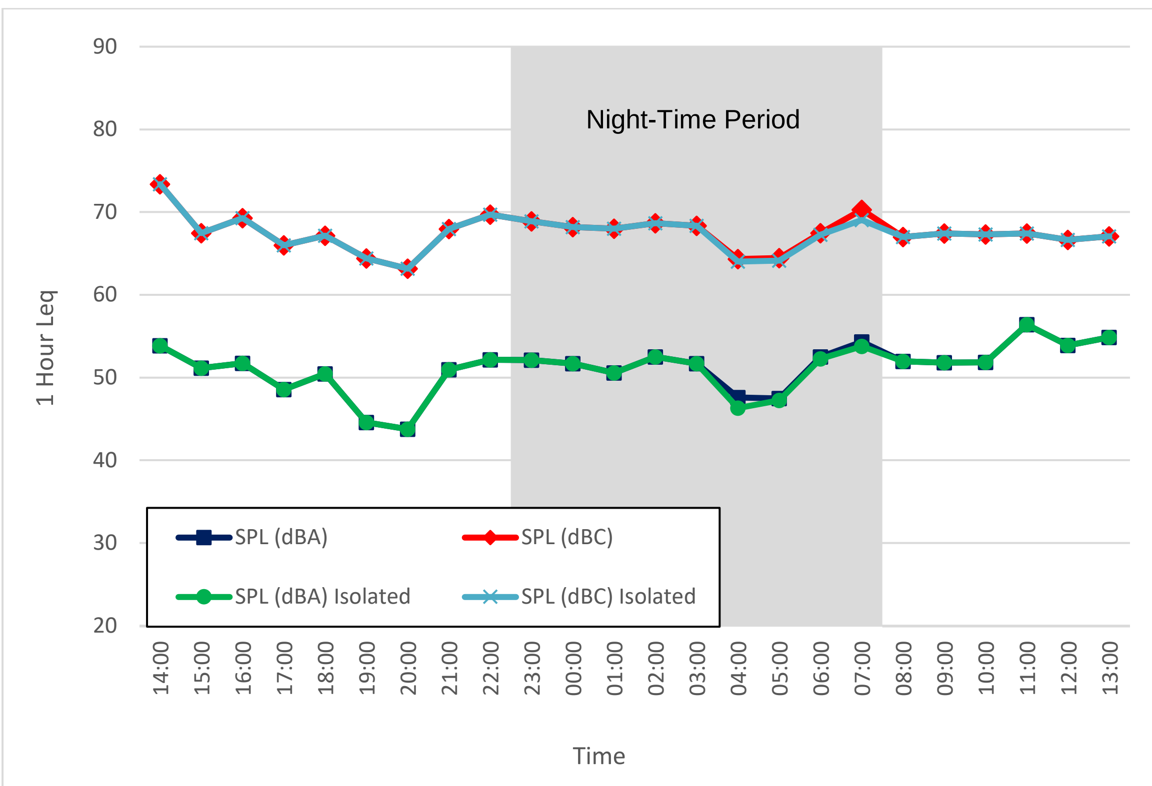

Figure 18. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #1

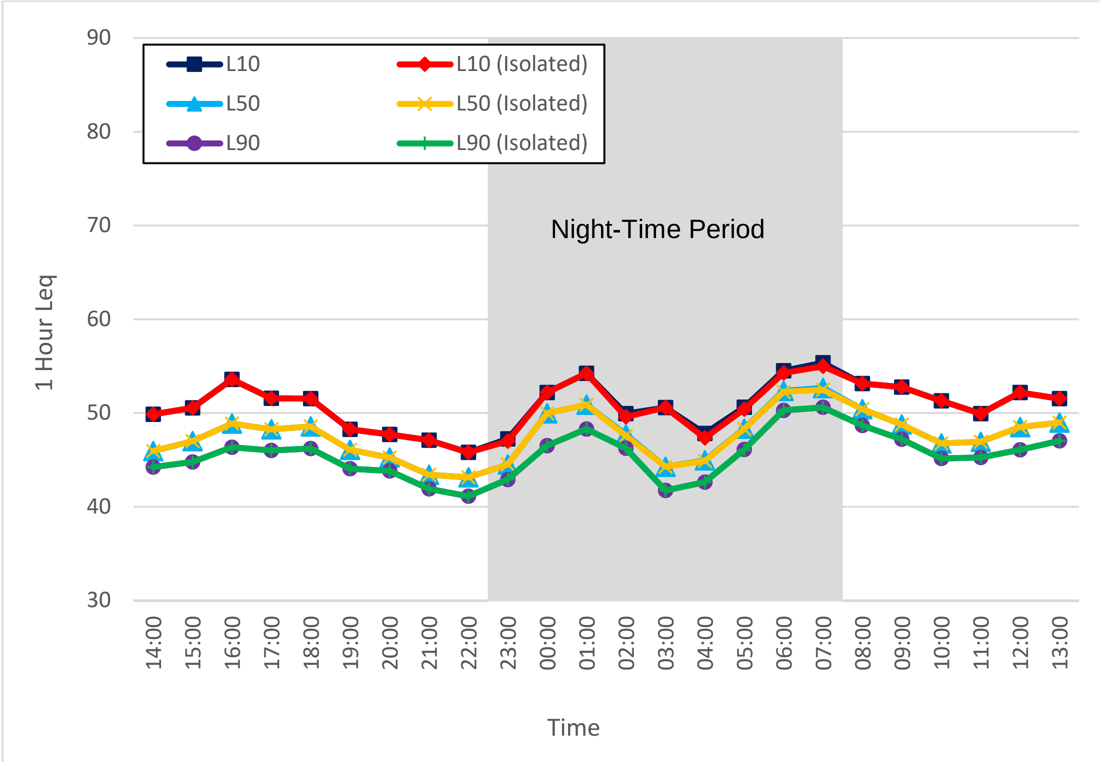

Figure 19. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

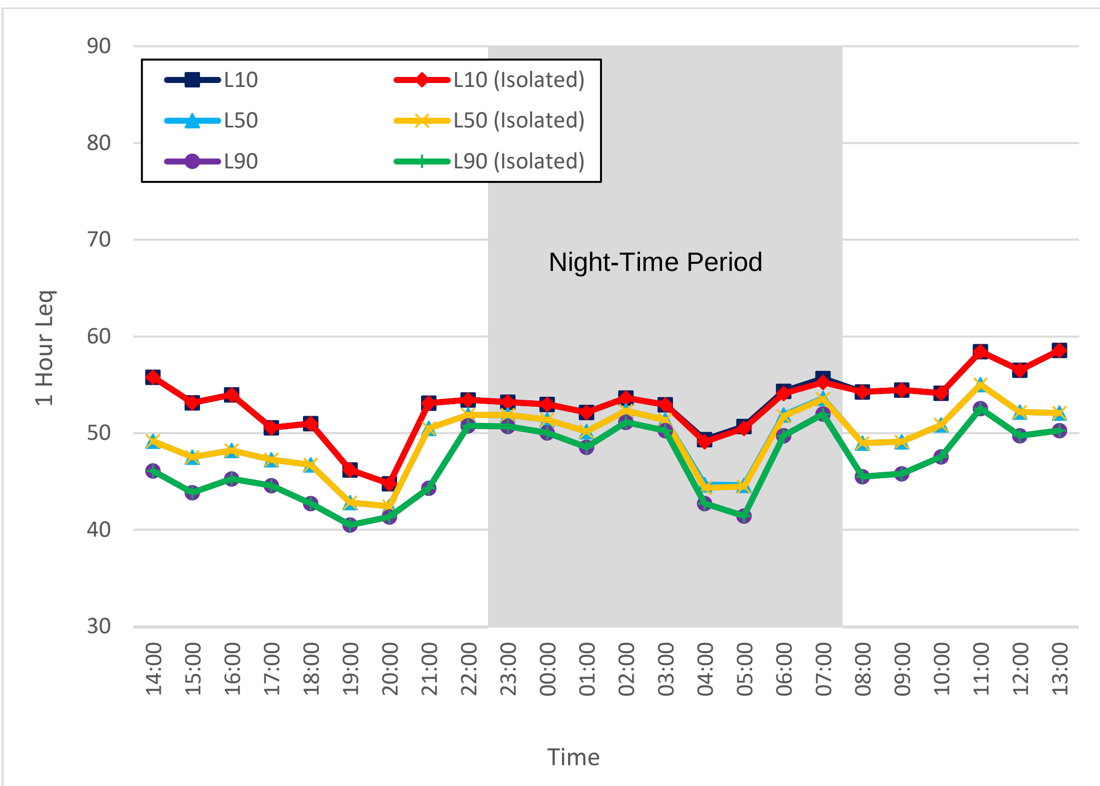

Figure 20. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

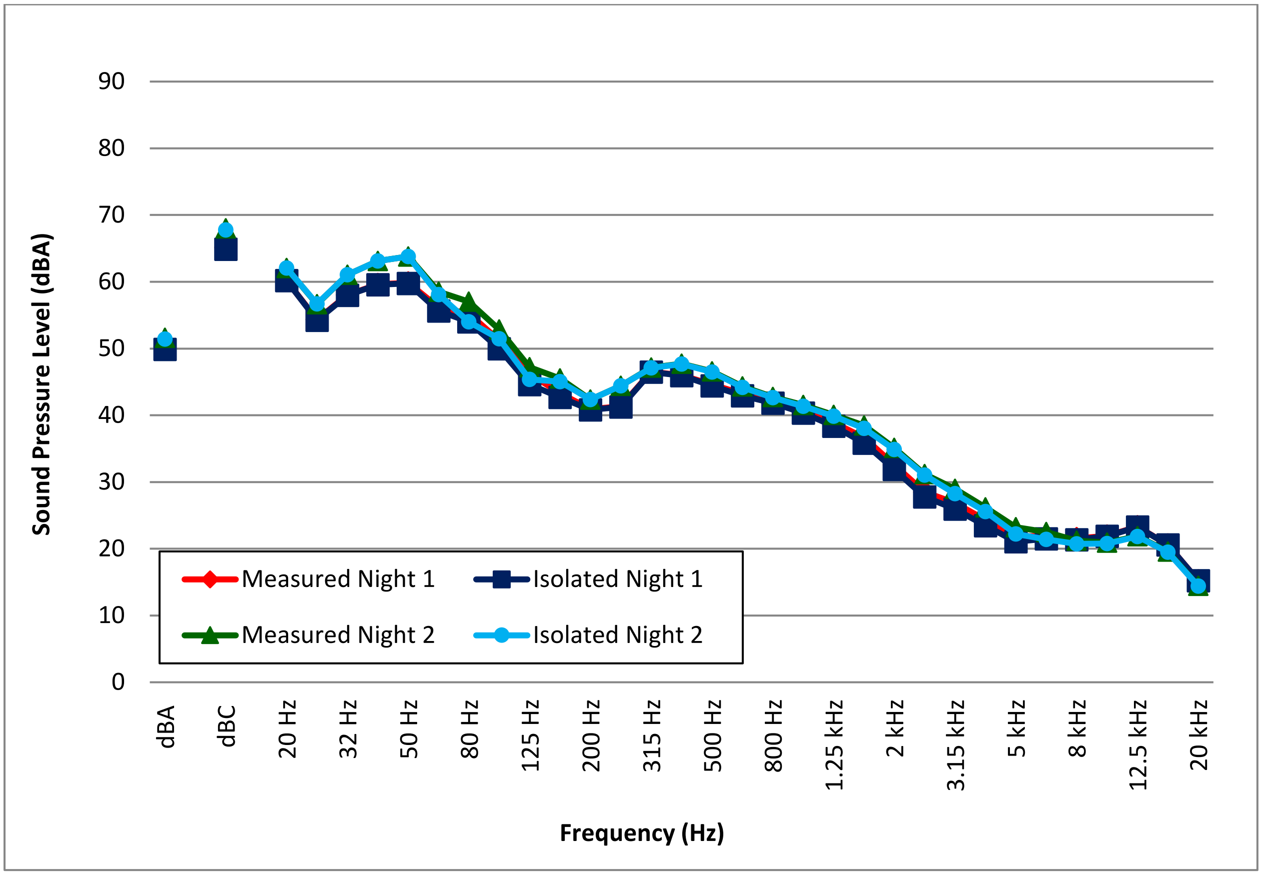

Figure 21. Noise Monitor #1, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #2

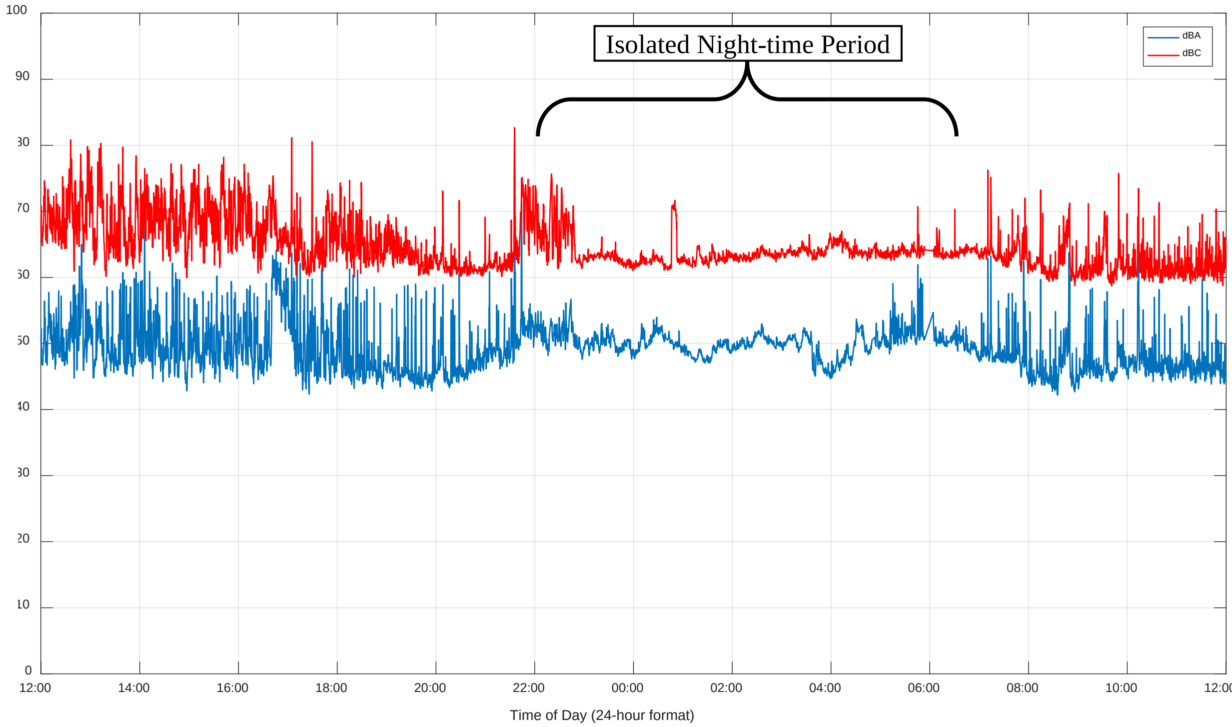

Figure 22. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

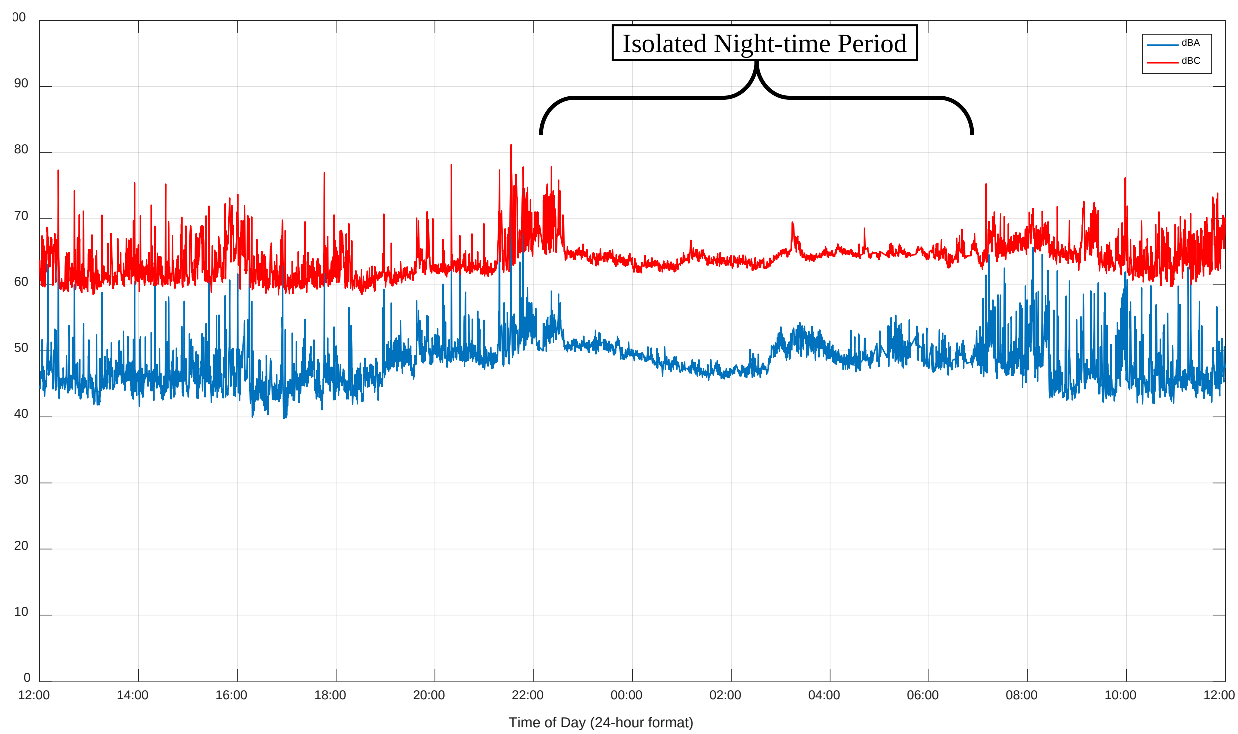

Figure 23. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #2

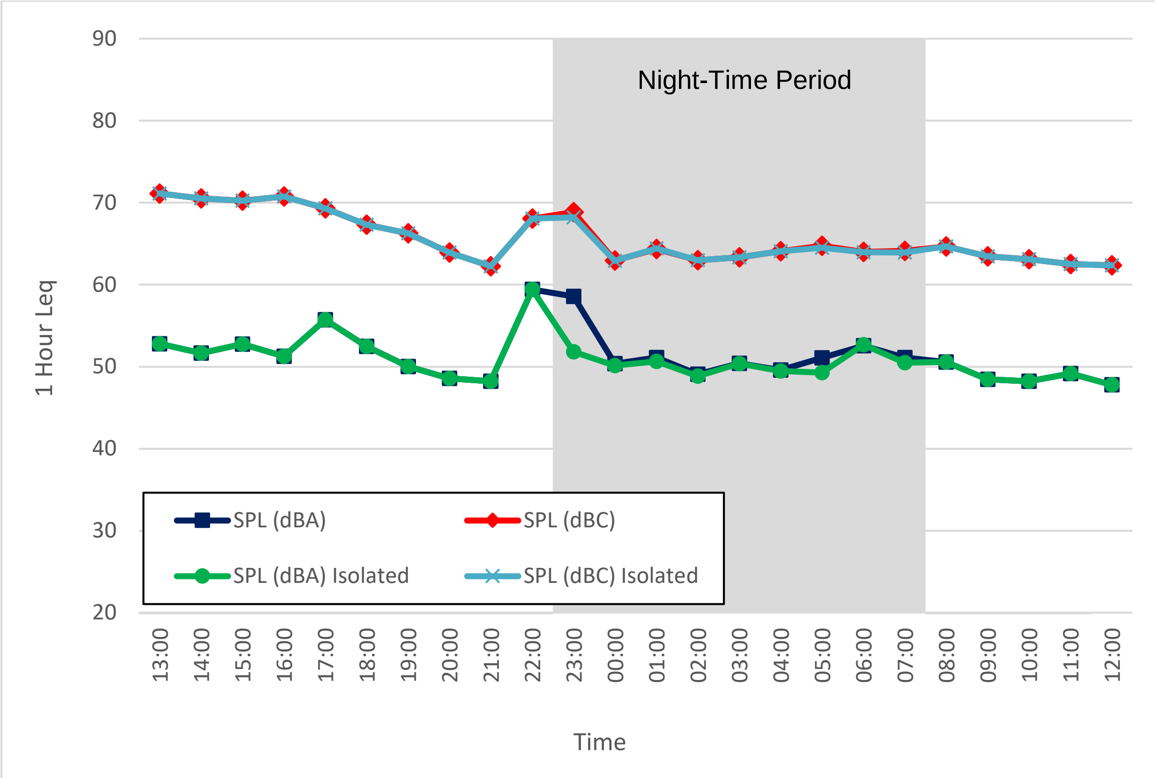

Figure 24. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

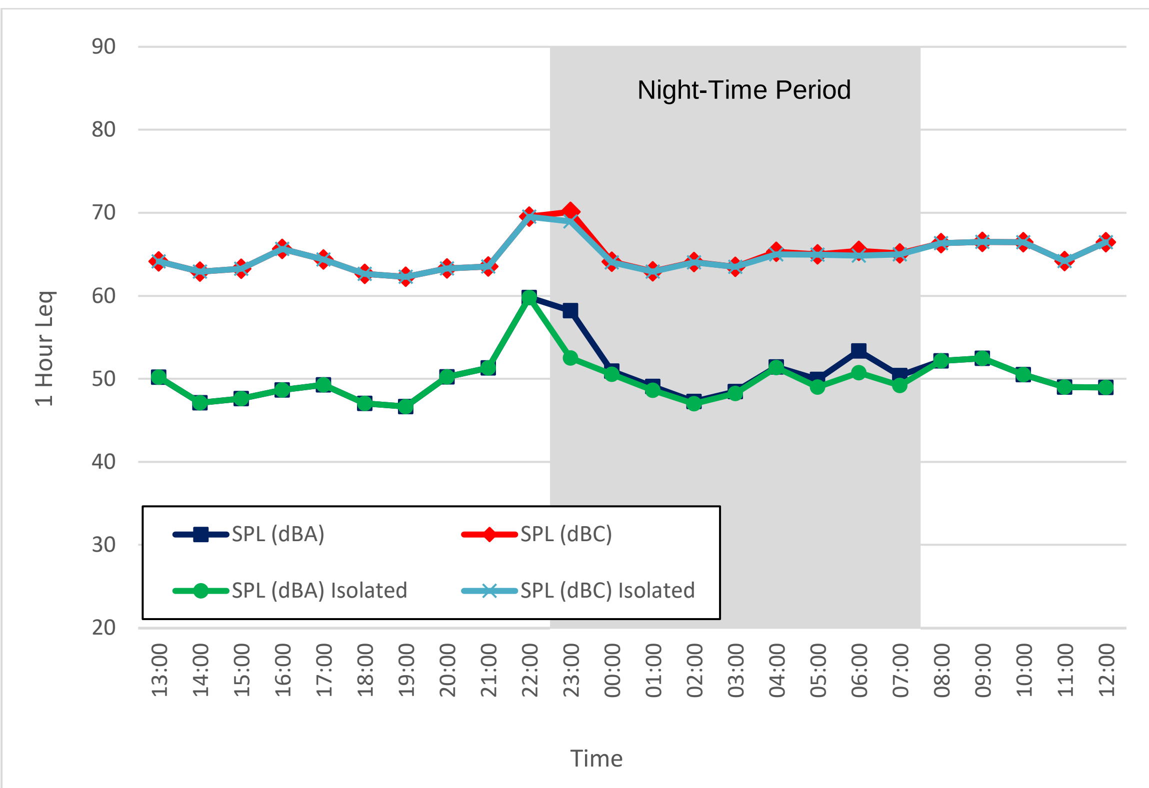

Figure 25. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

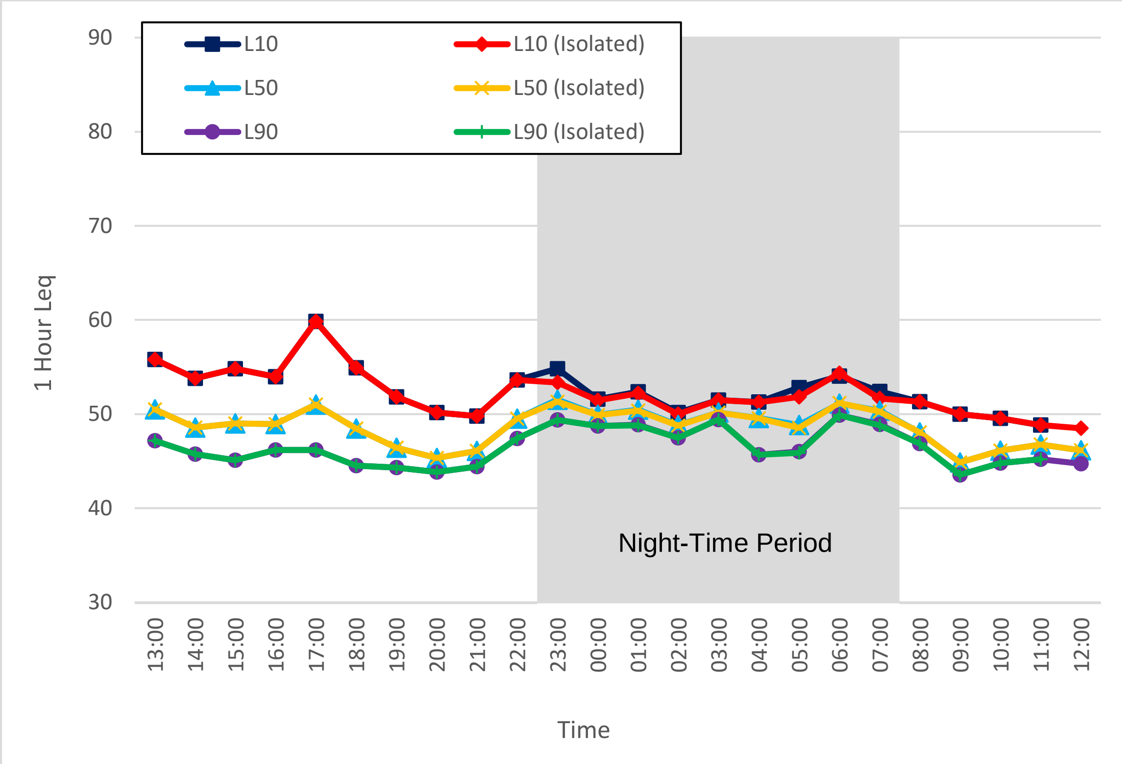

Figure 26. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

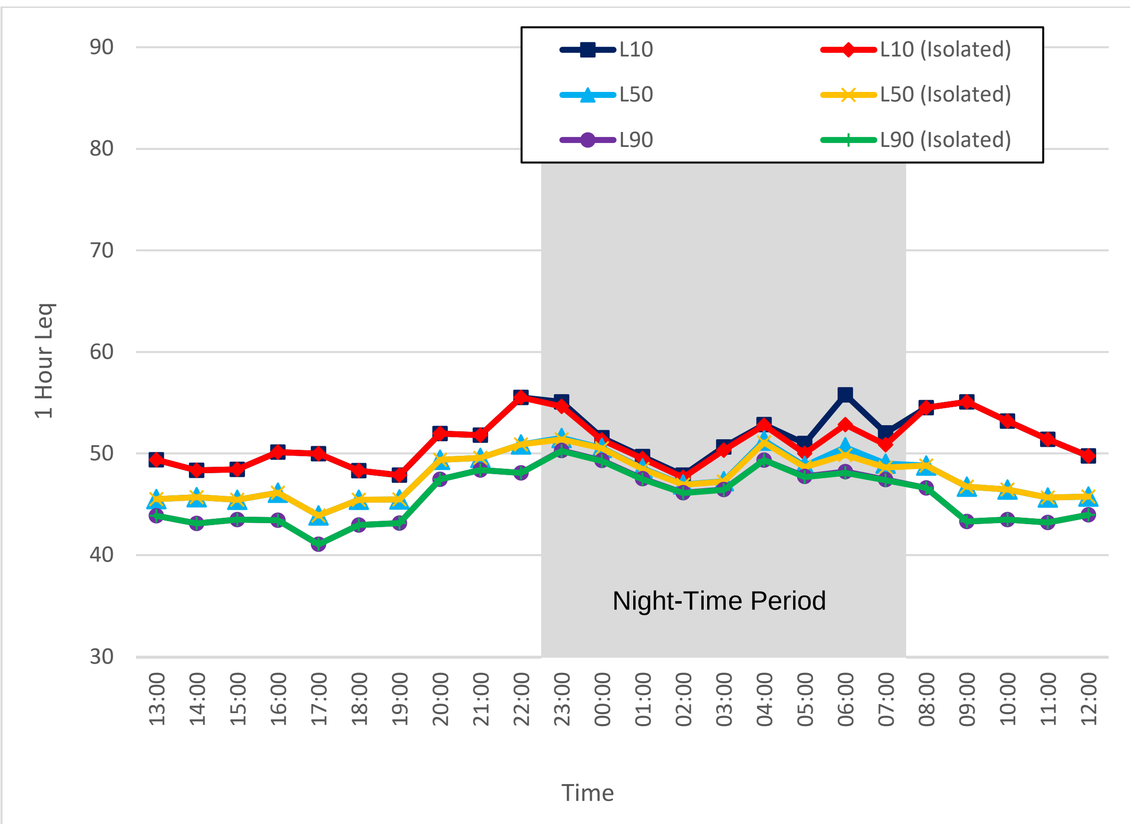

Figure 27. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #2

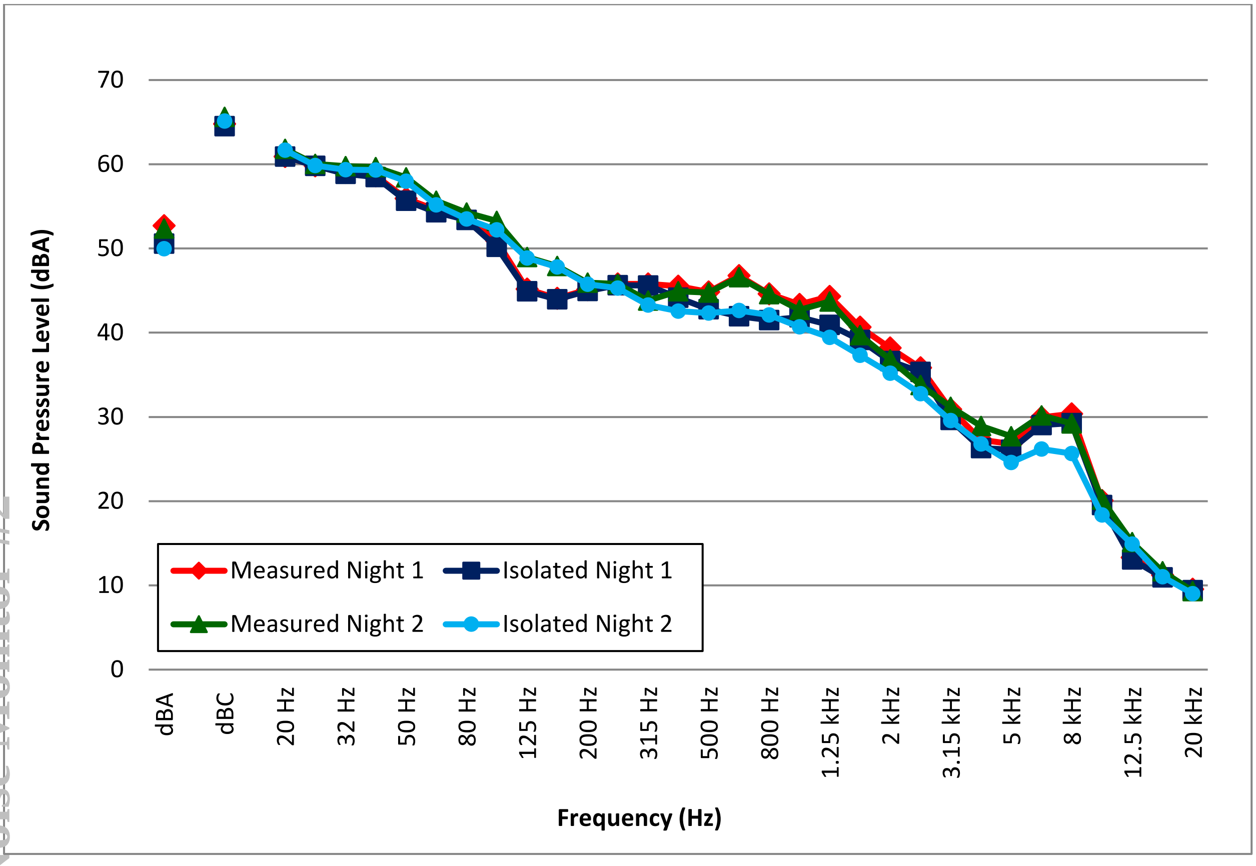

Figure 28. Noise Monitor #2, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)

Noise Monitor #3

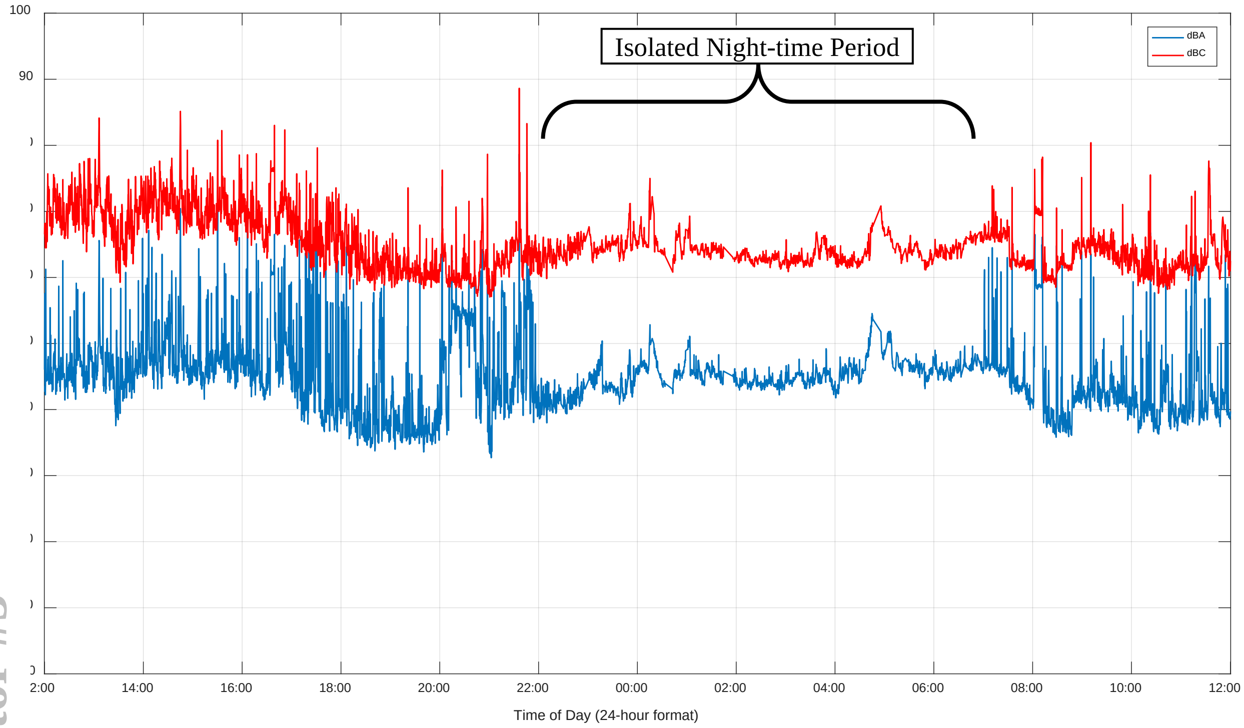

Figure 29. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

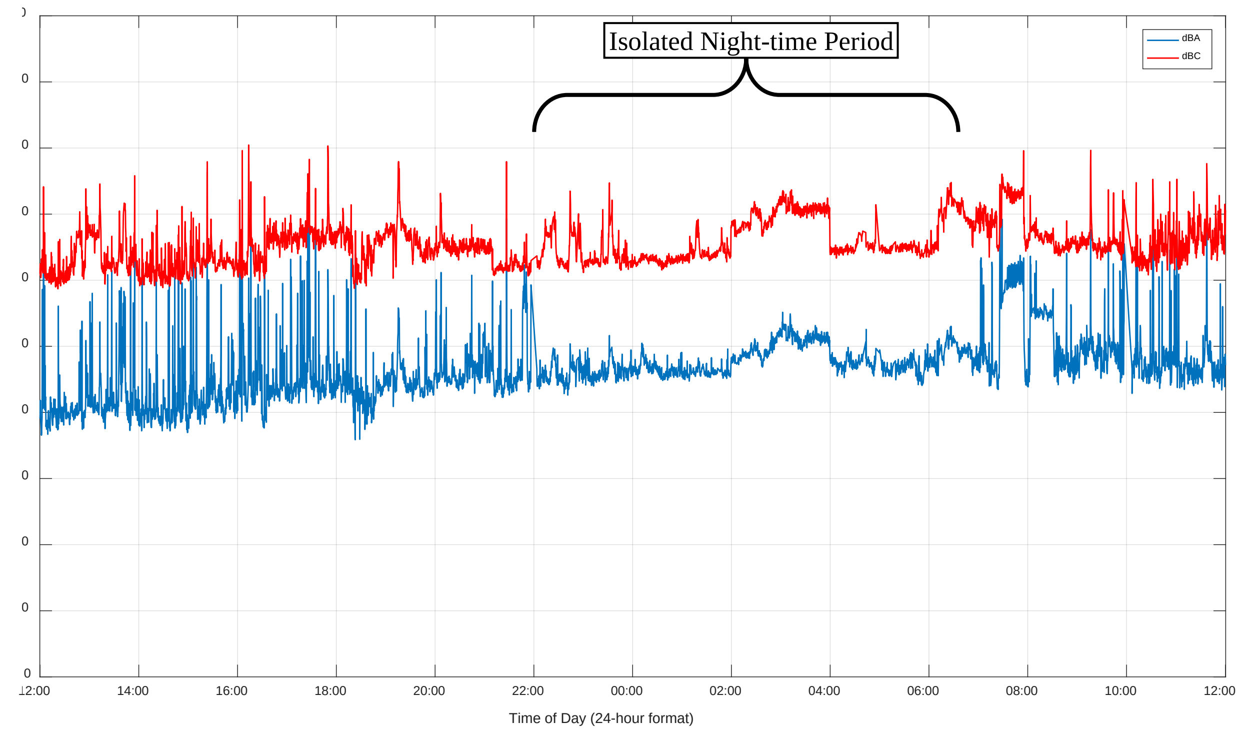

Figure 30. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

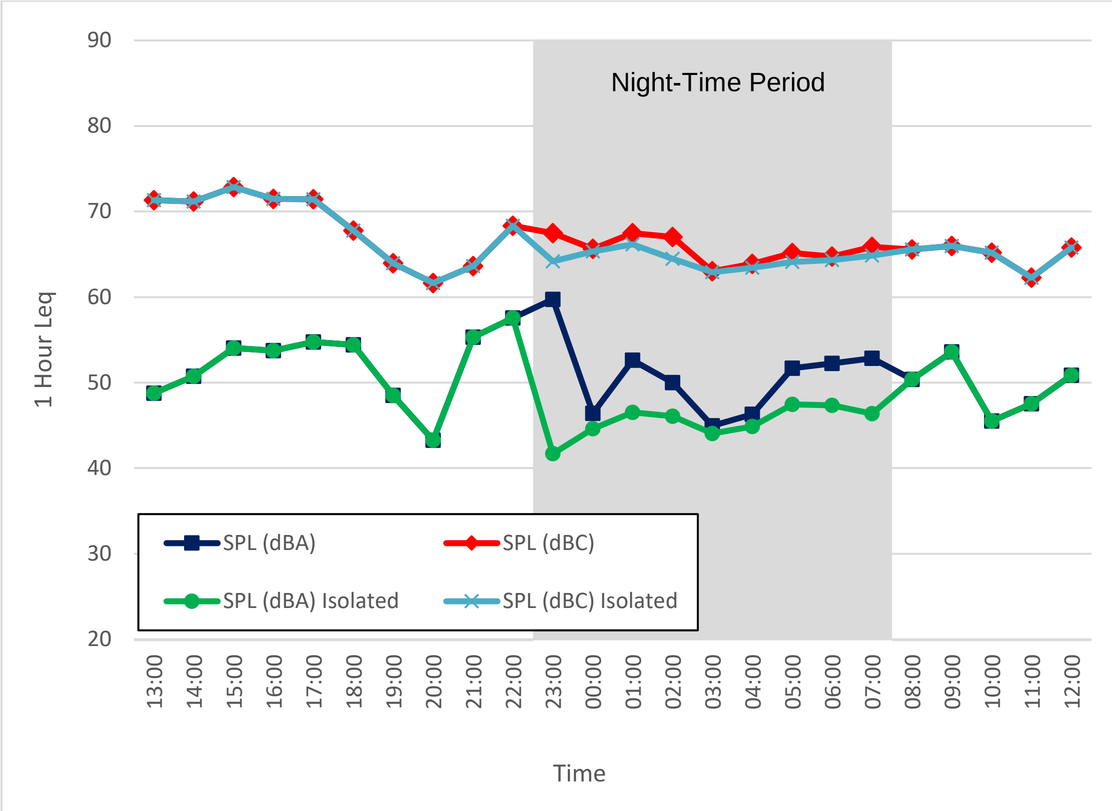

Figure 31. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

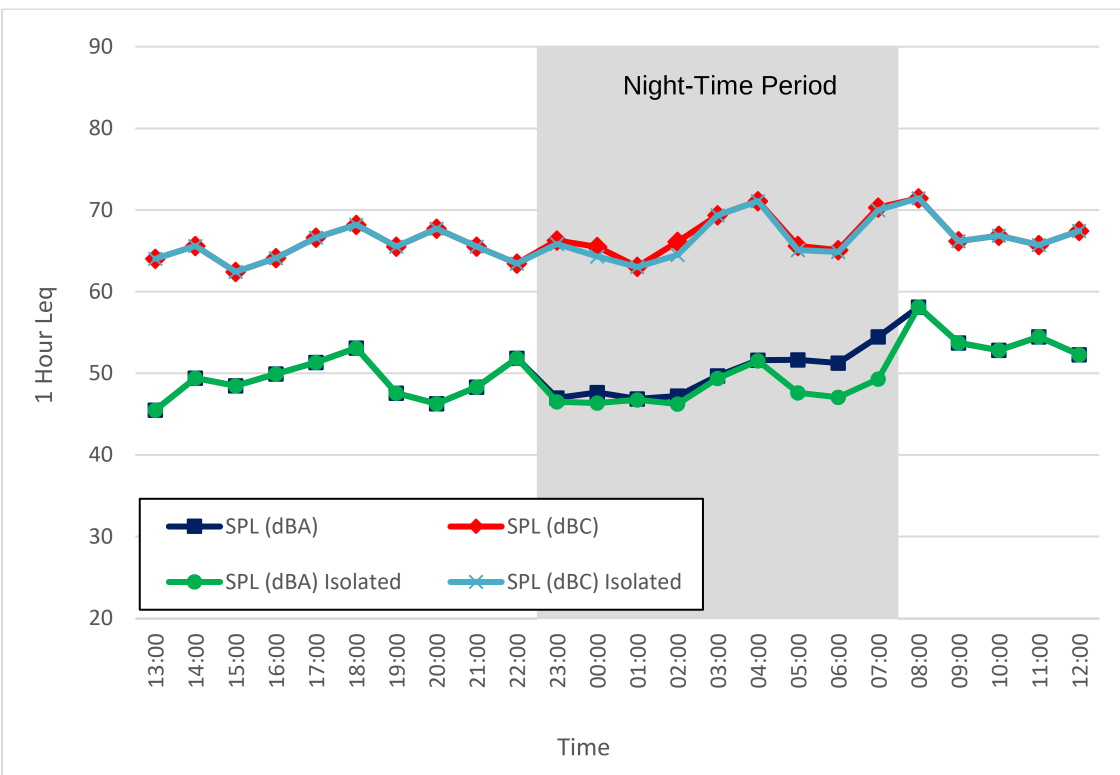

Figure 32. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

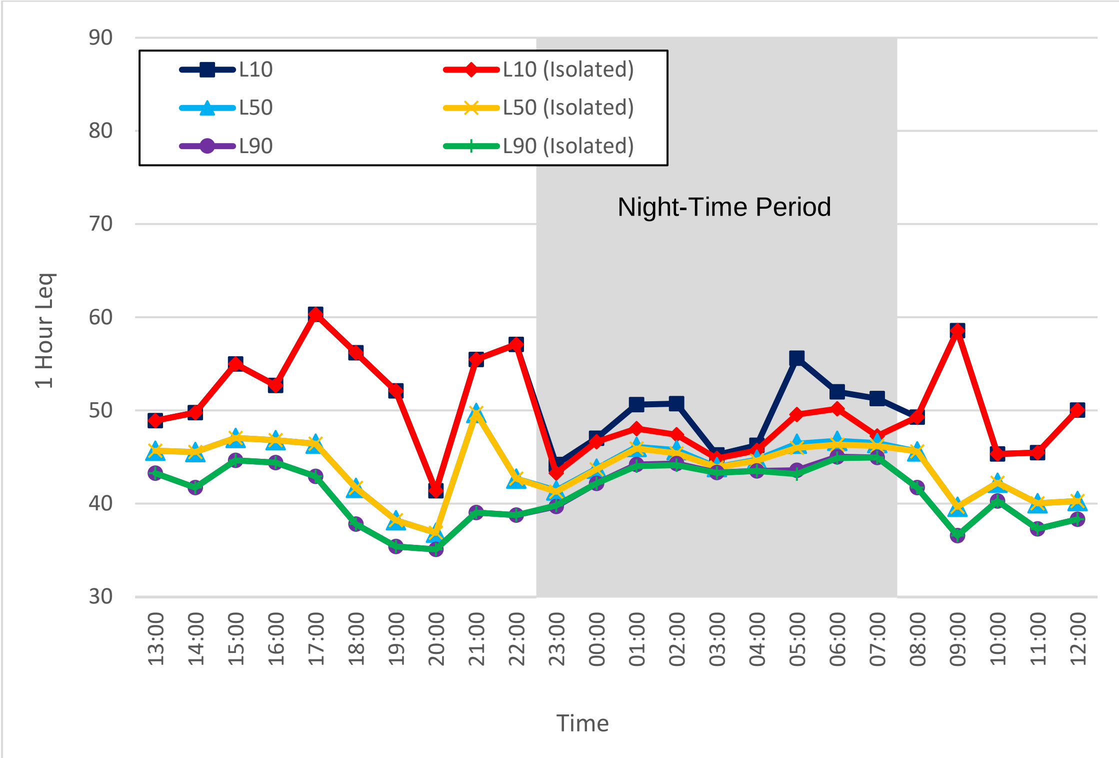

Figure 33. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

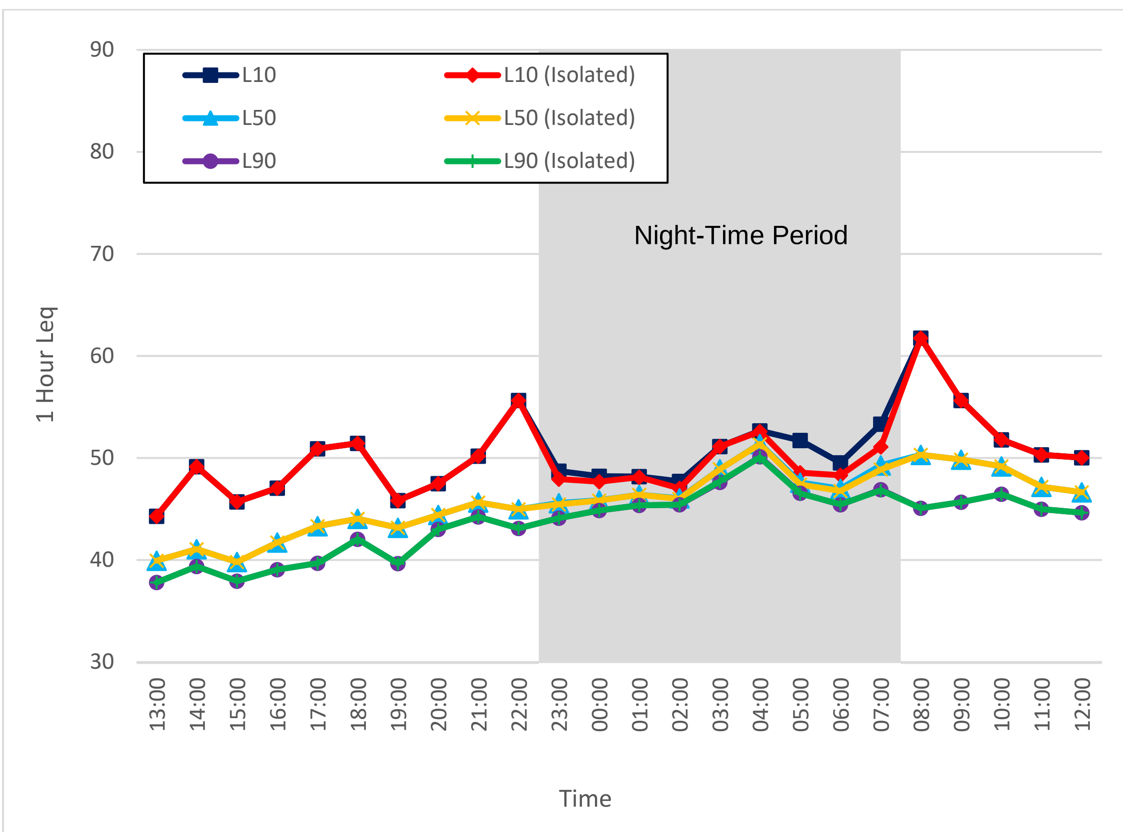

Figure 34. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #3

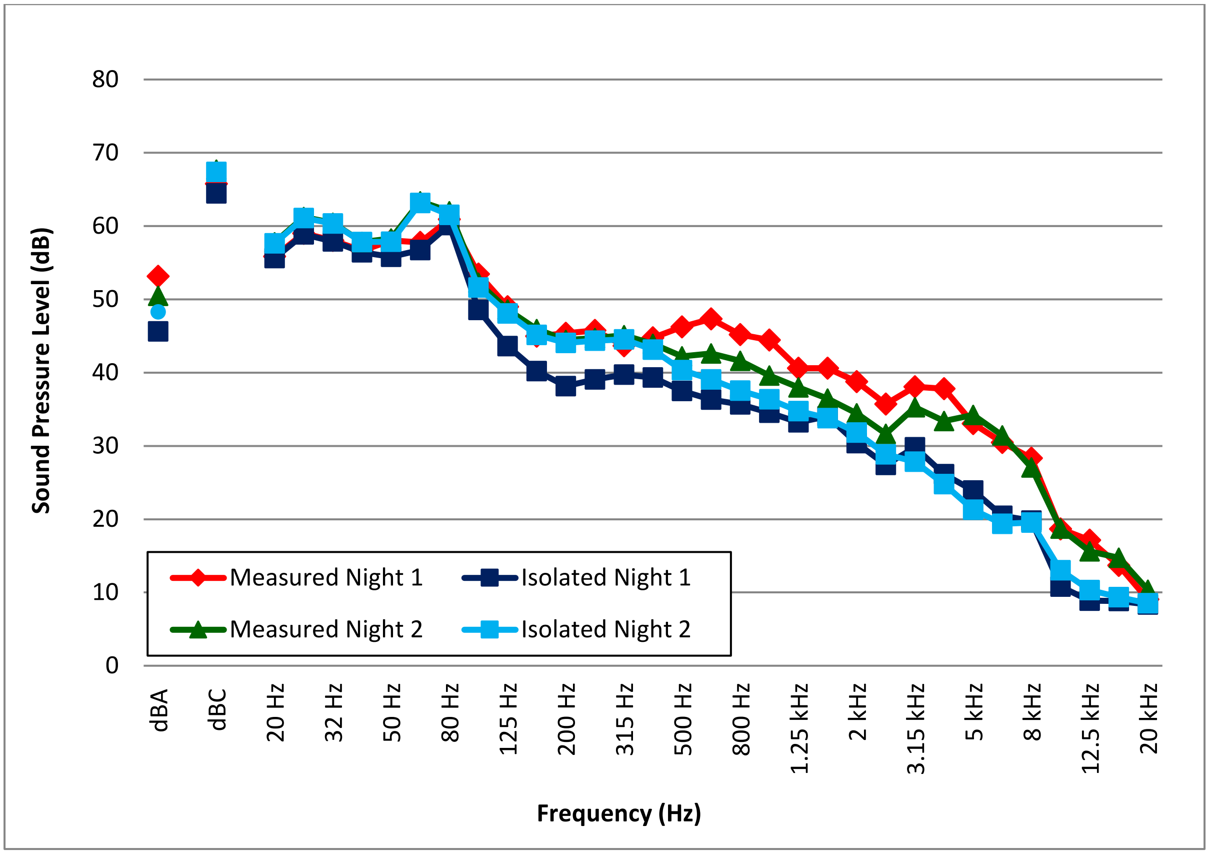

Figure 35. Noise Monitor #3, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)

Noise Monitor #4

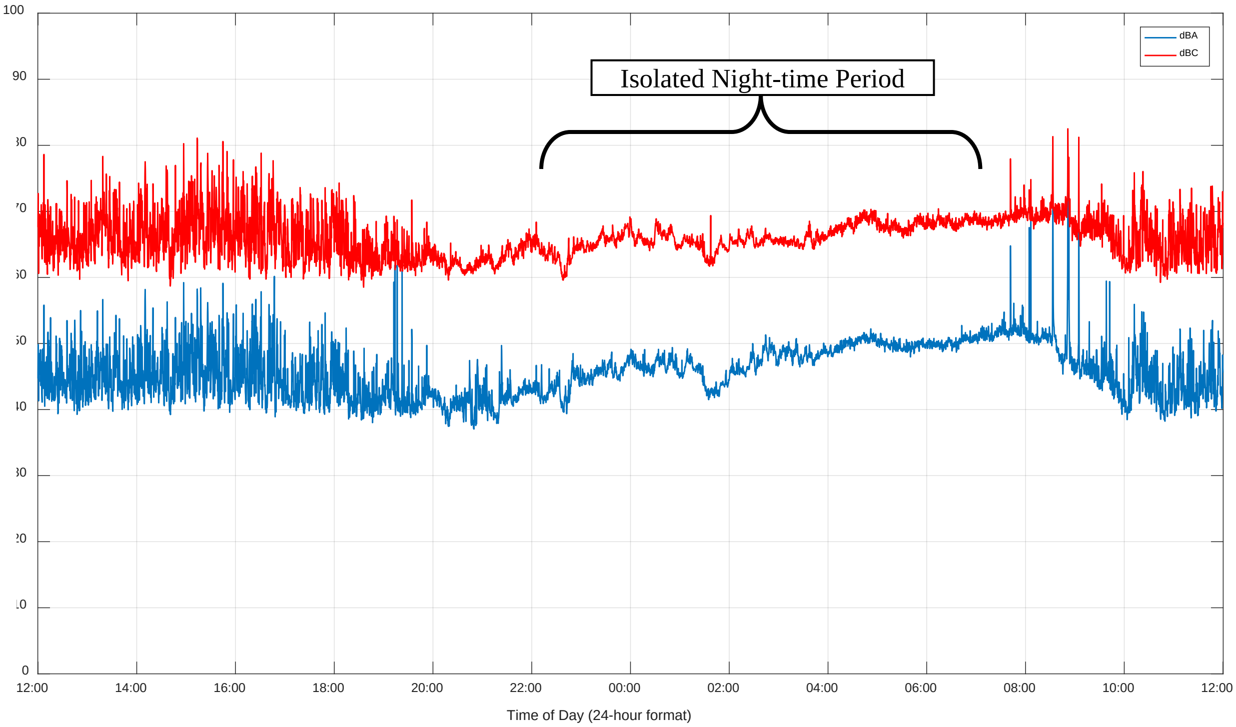

Figure 36. Noise Monitor #4, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

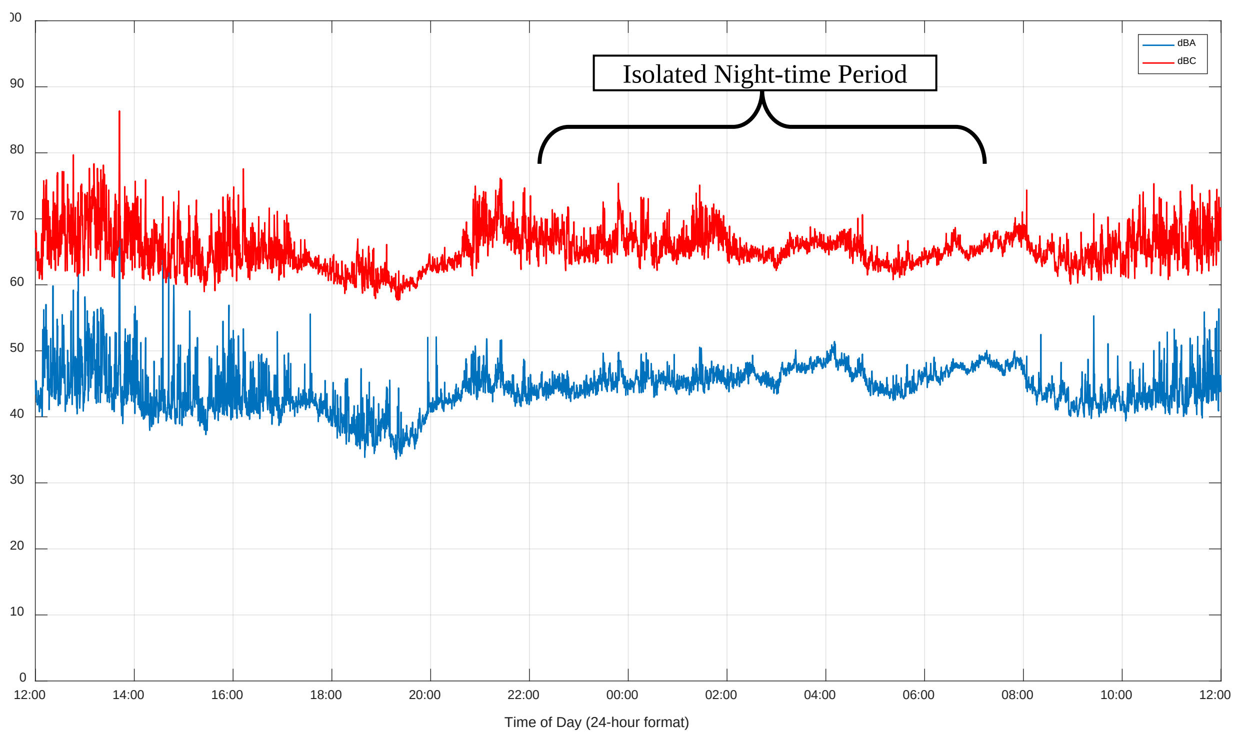

Figure 37. Noise Monitor #4, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #4

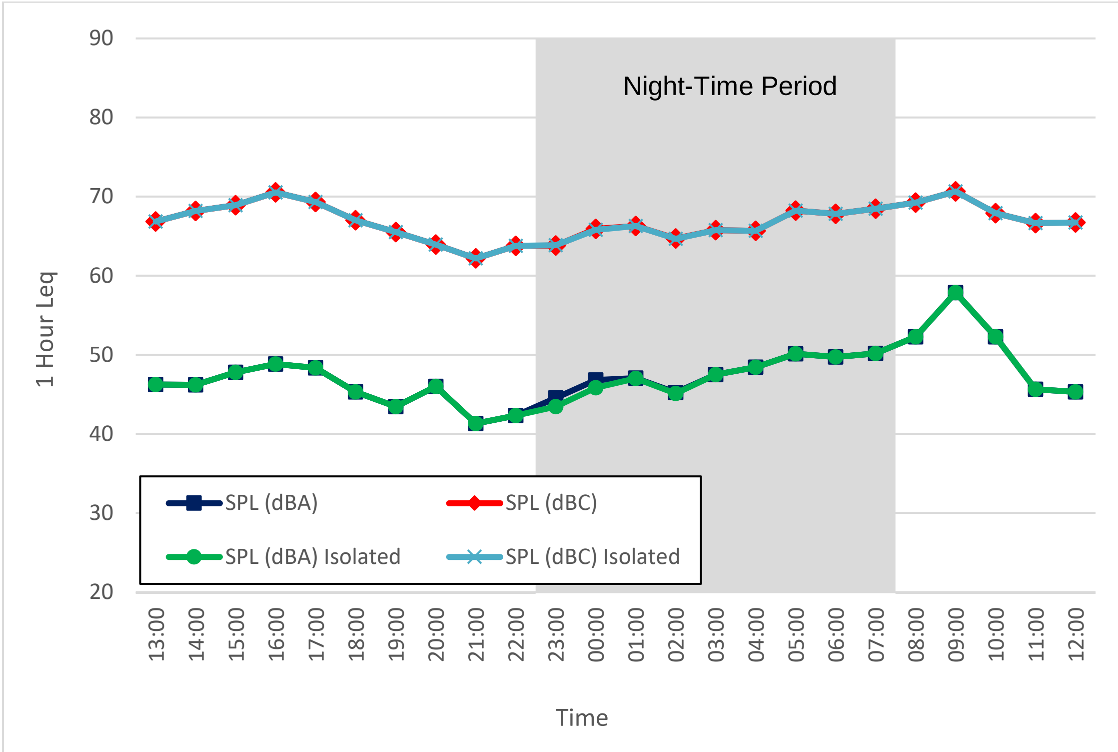

Figure 38. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

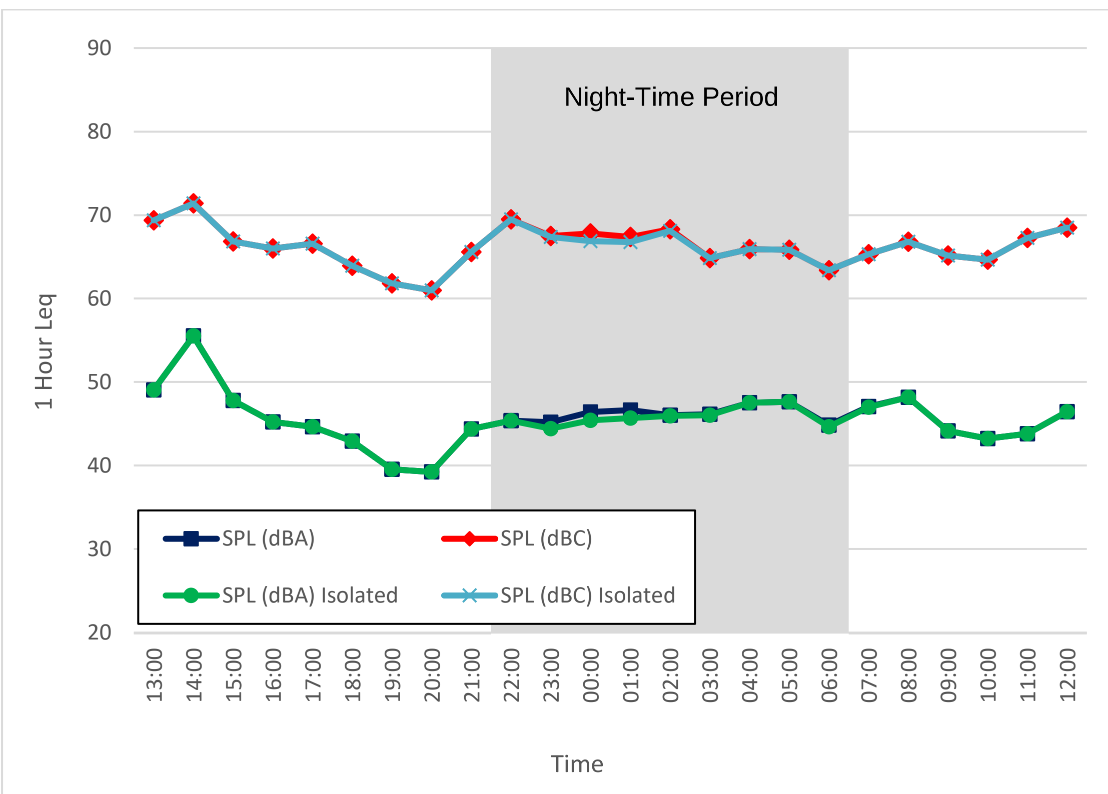

Figure 39. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

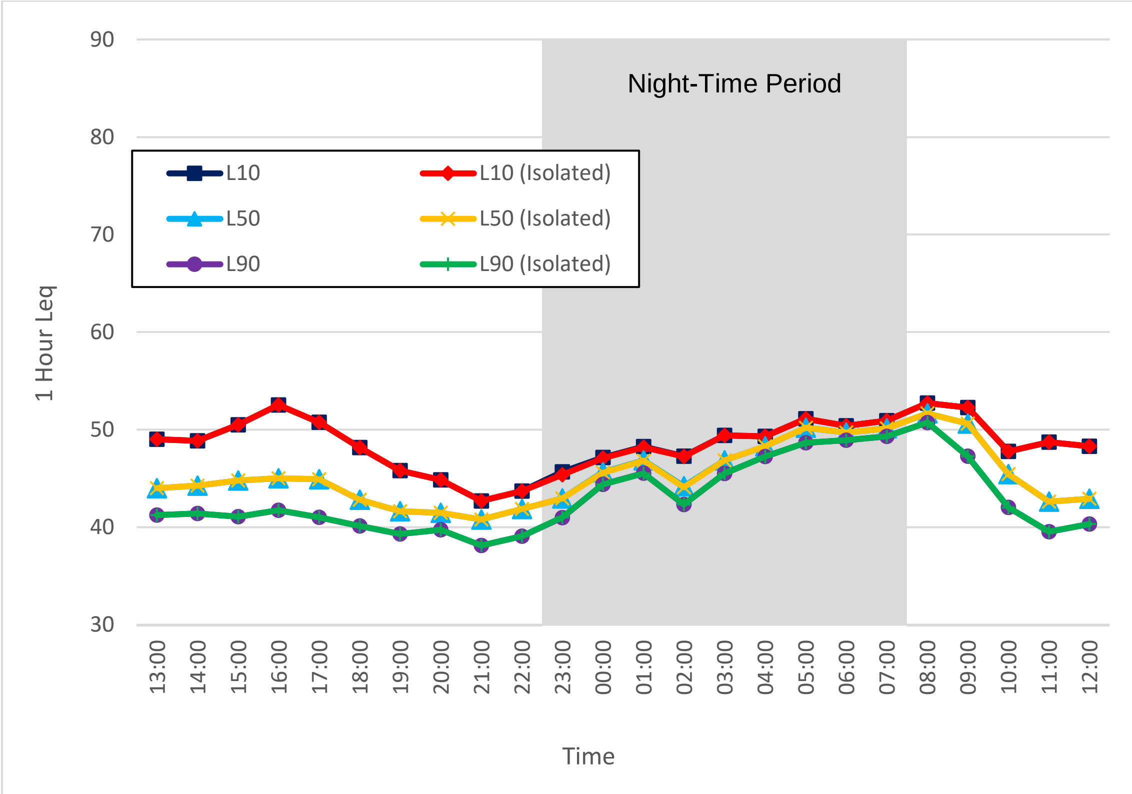

Figure 40. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

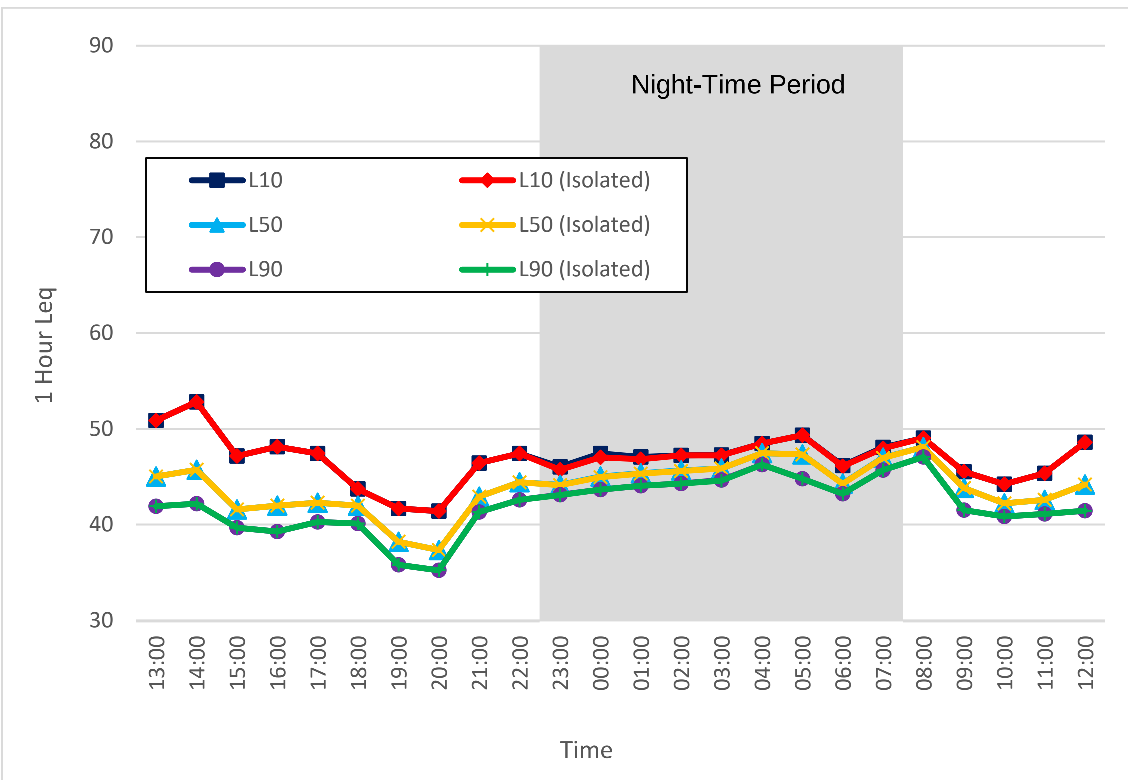

Figure 41. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #4

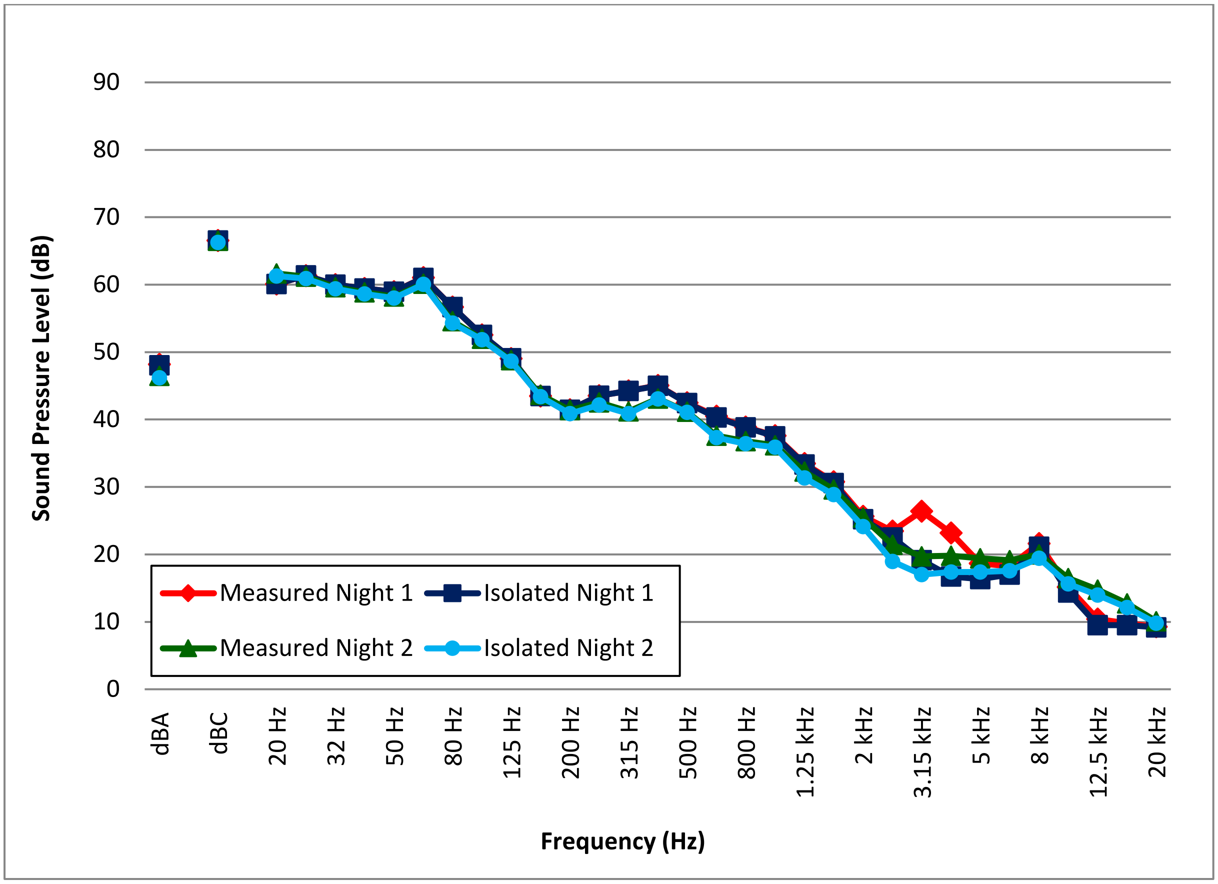

Figure 42. Noise Monitor #4, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #5

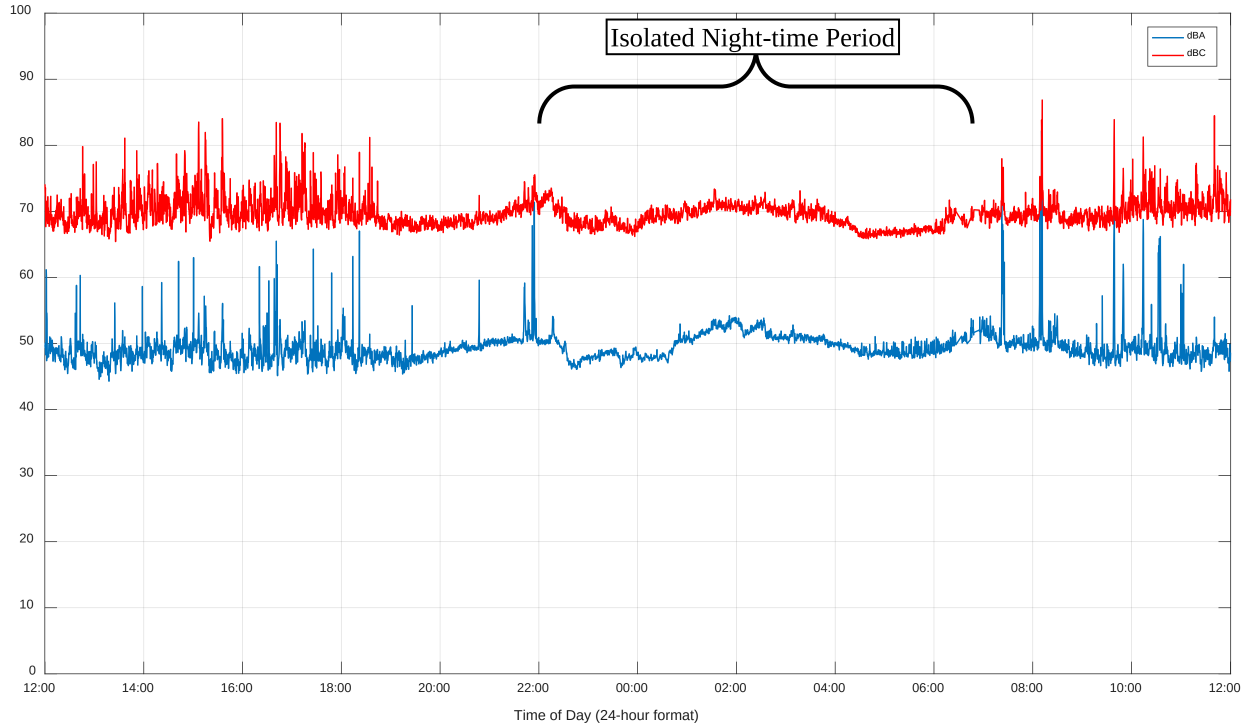

Figure 43. Noise Monitor #5, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

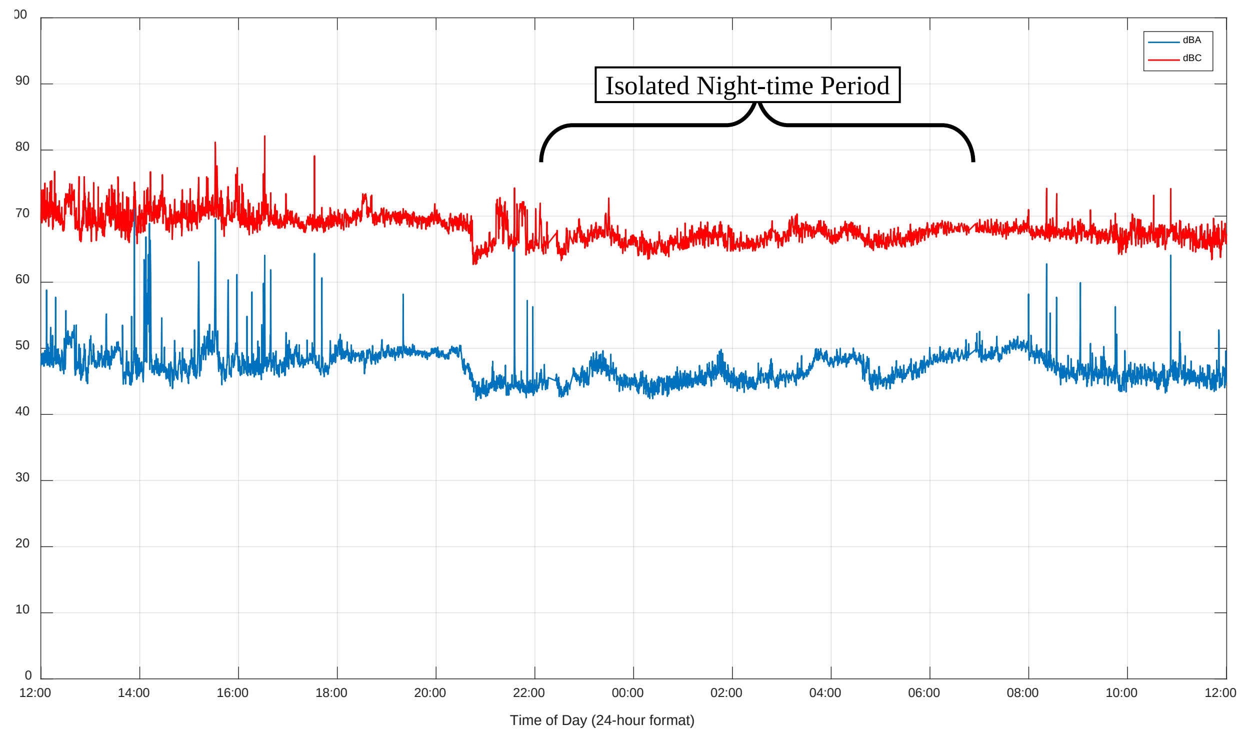

Figure 44. Noise Monitor #5, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

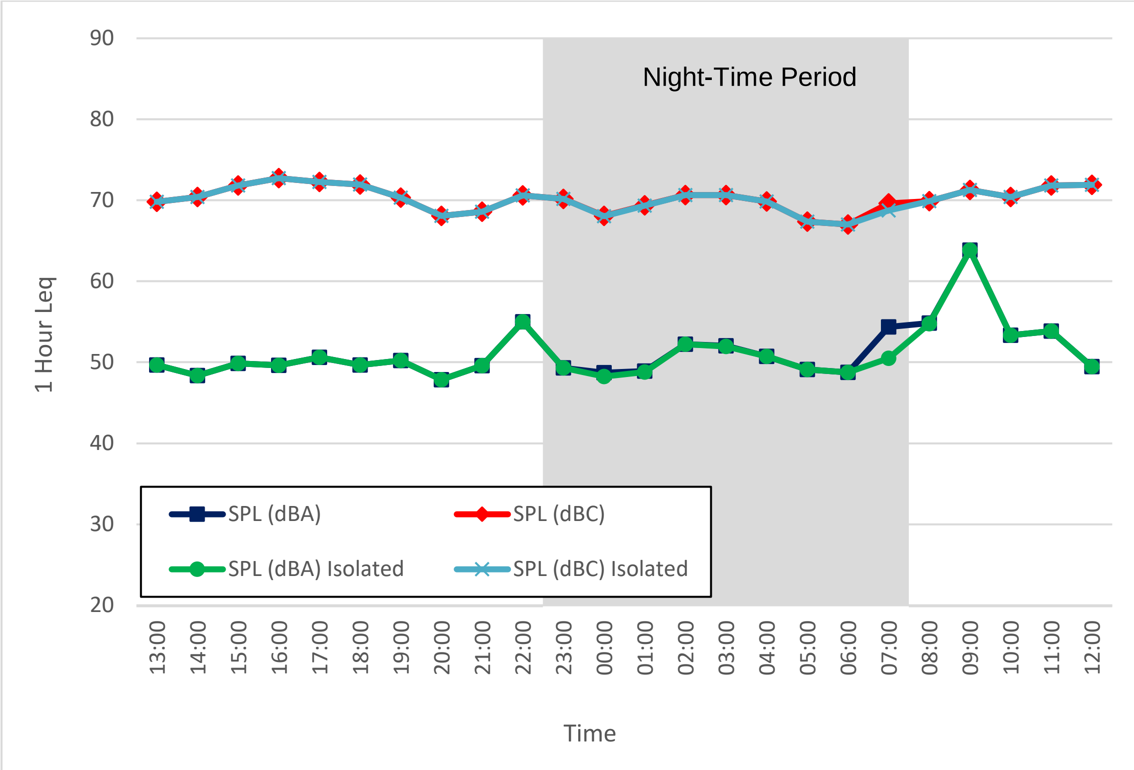

Figure 45. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

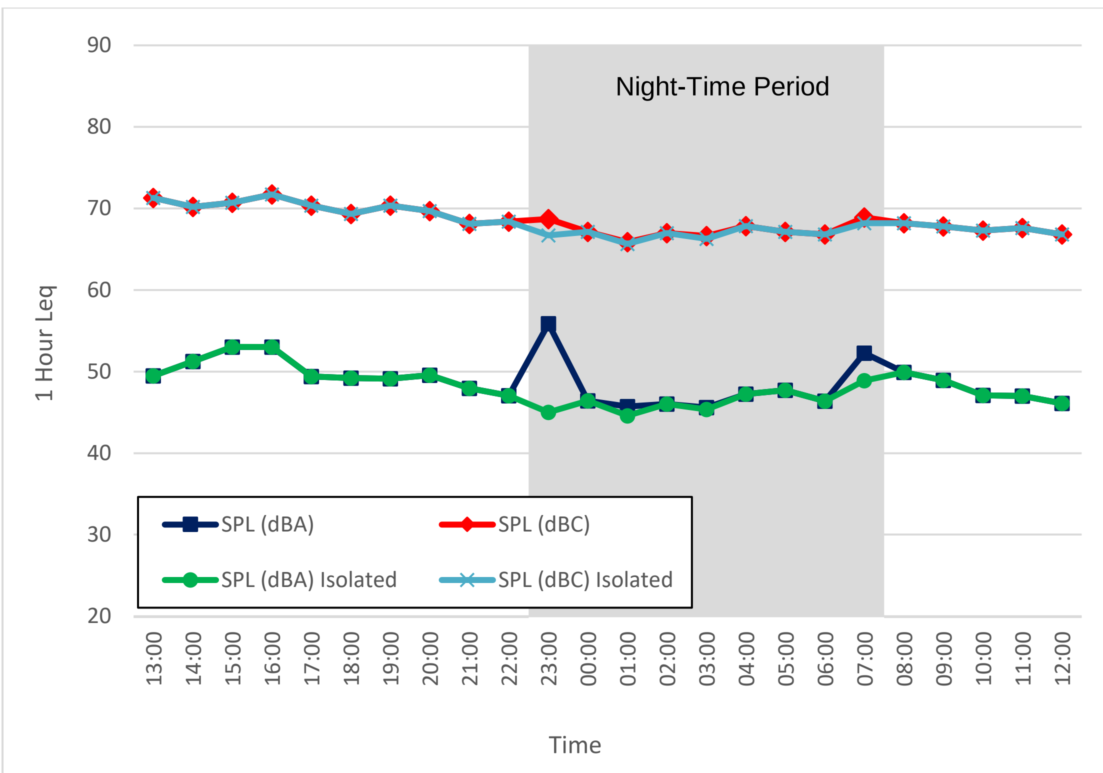

Figure 46. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #5

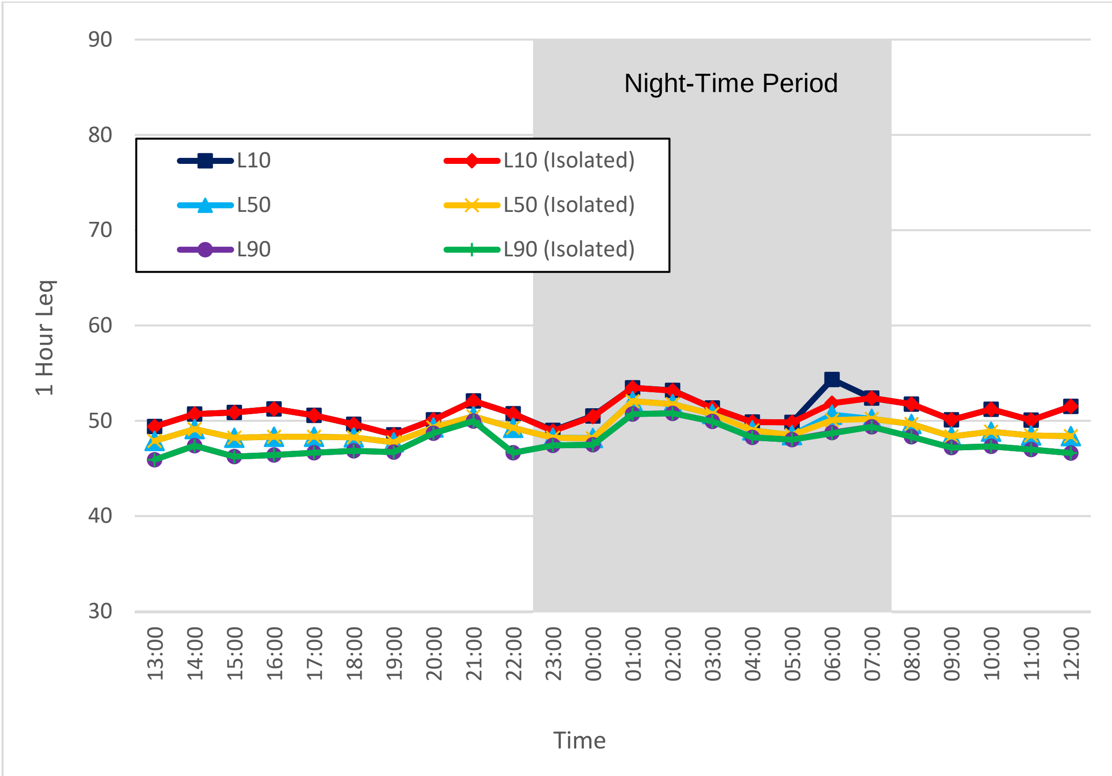

Figure 47. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

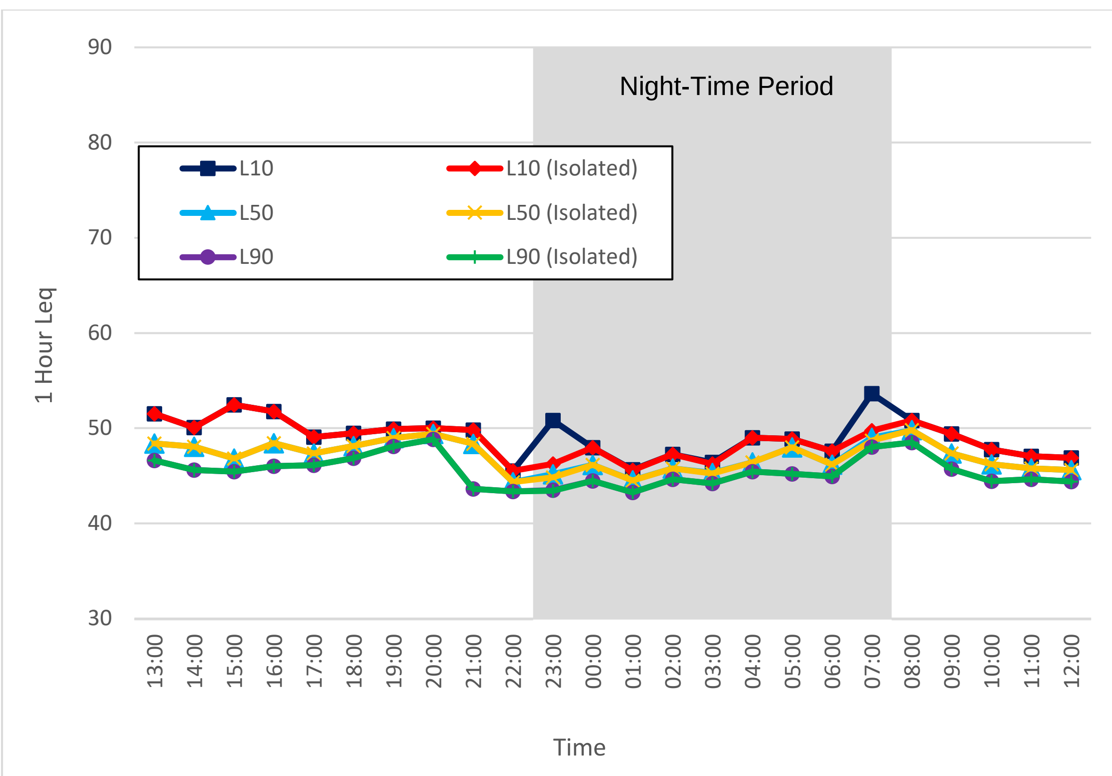

Figure 48. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

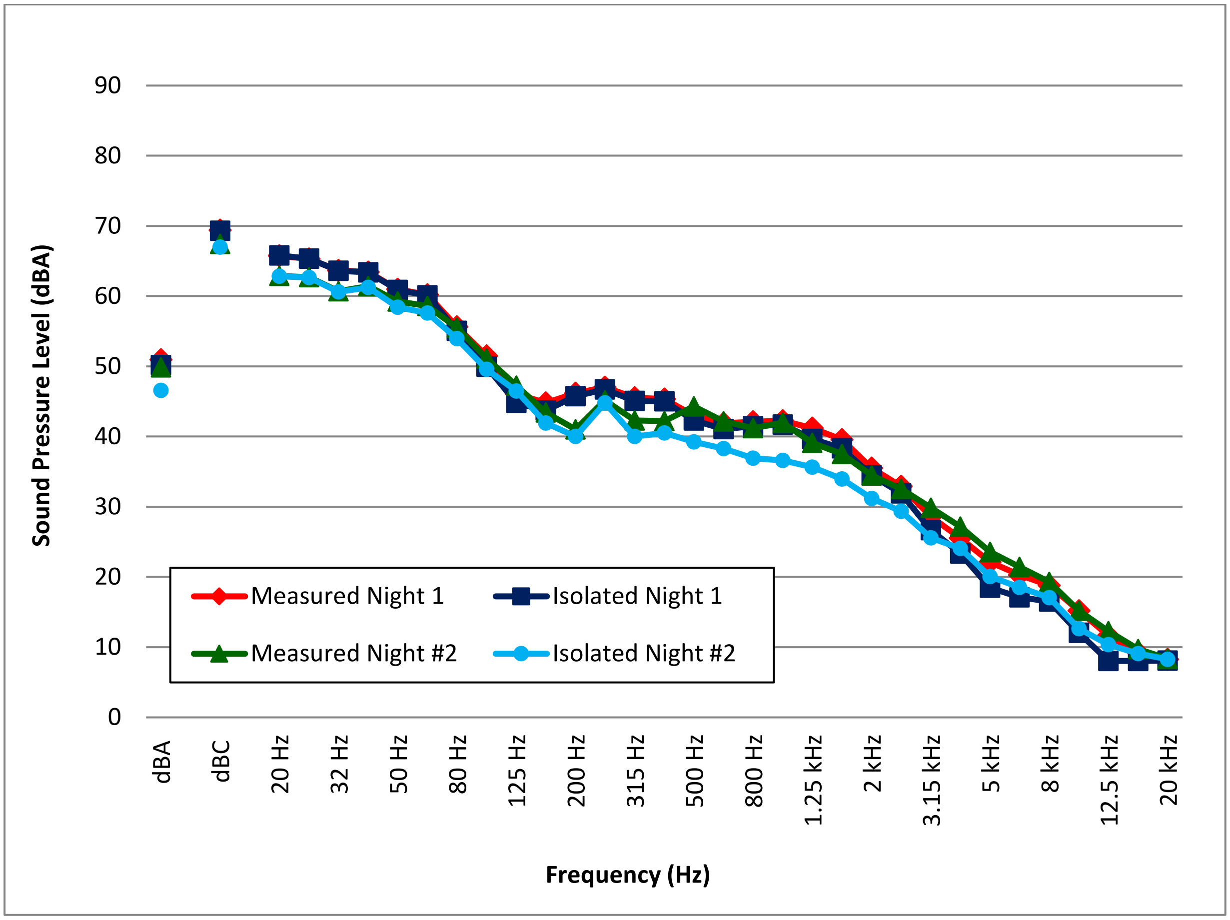

Figure 49. Noise Monitor #5, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #6

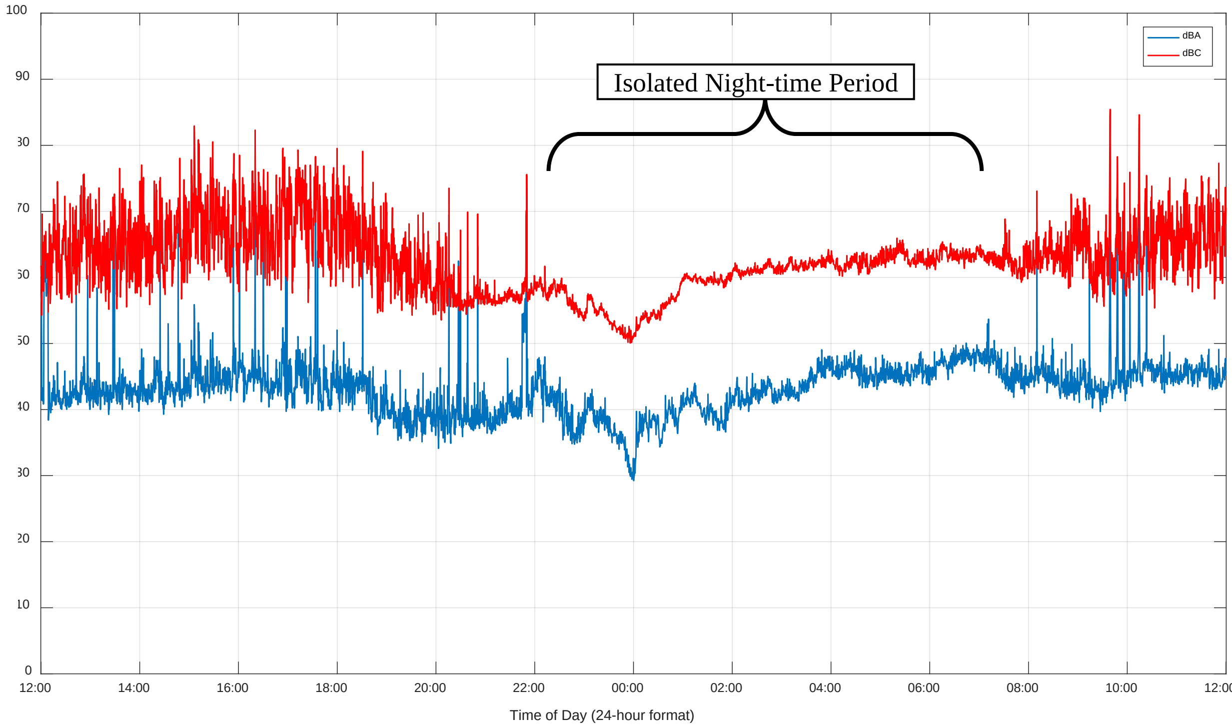

Figure 50. Noise Monitor #6, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

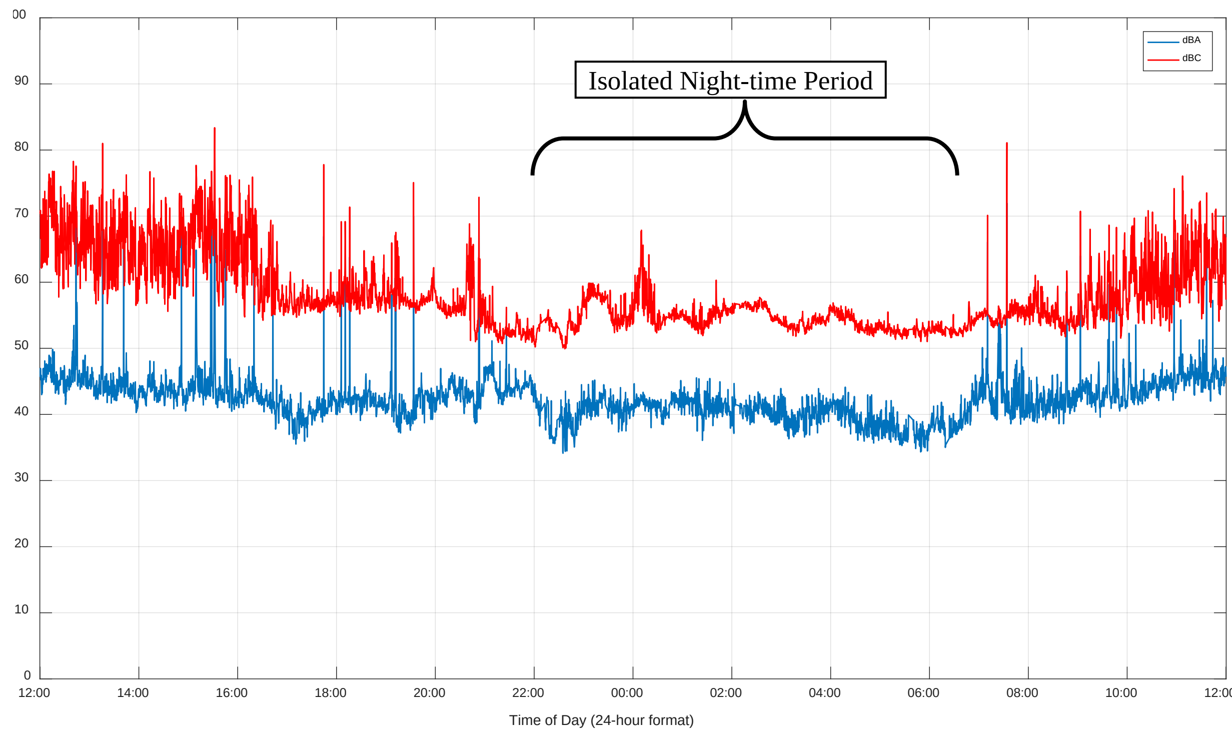

Figure 51. Noise Monitor #6, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #6

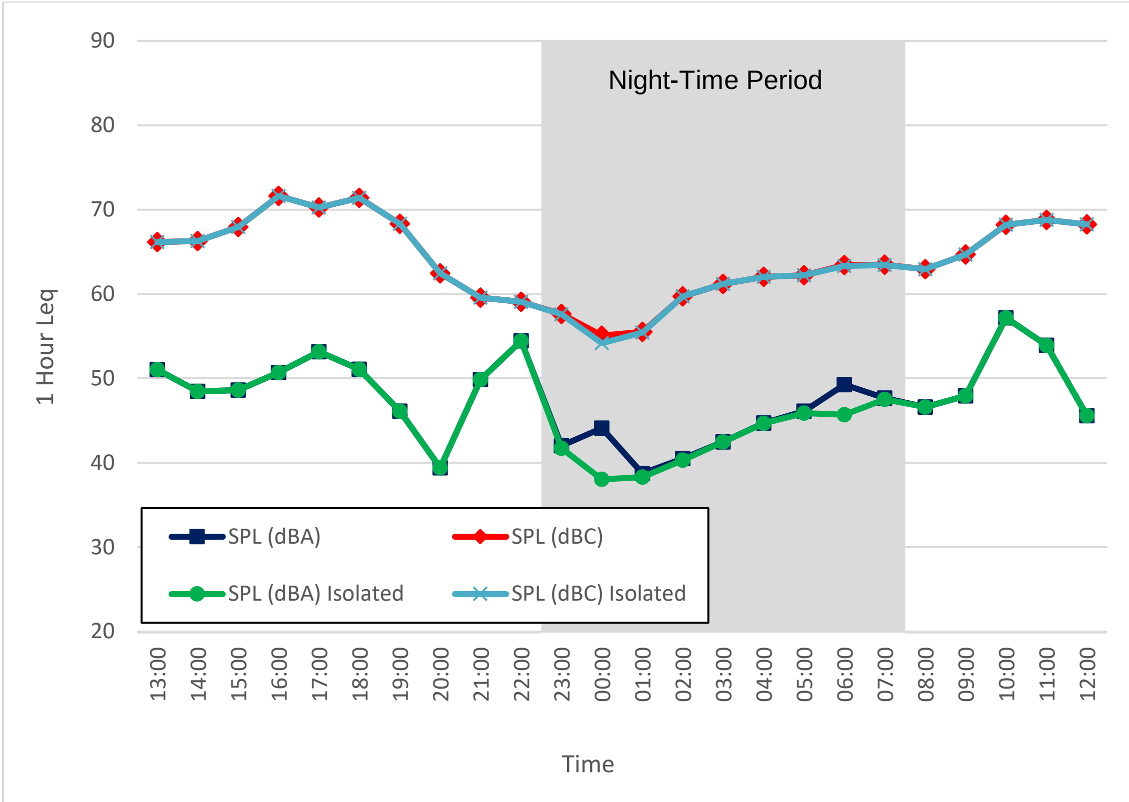

Figure 52. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

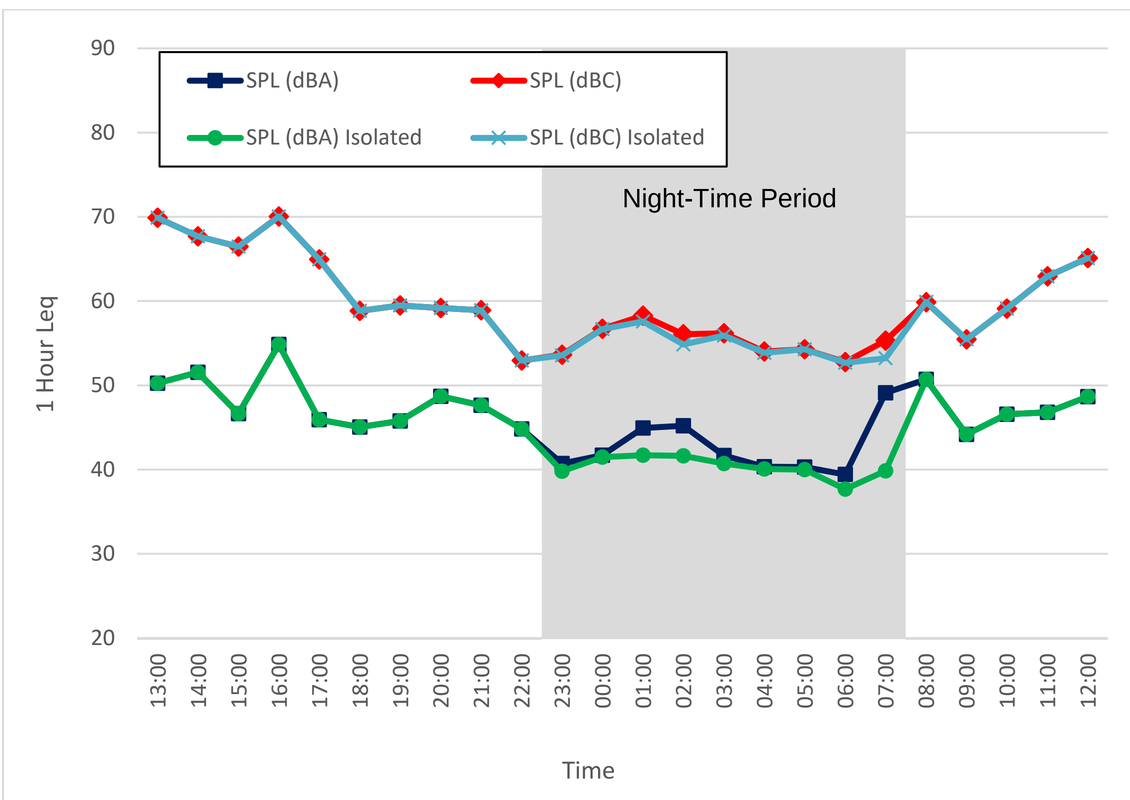

Figure 53. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #6

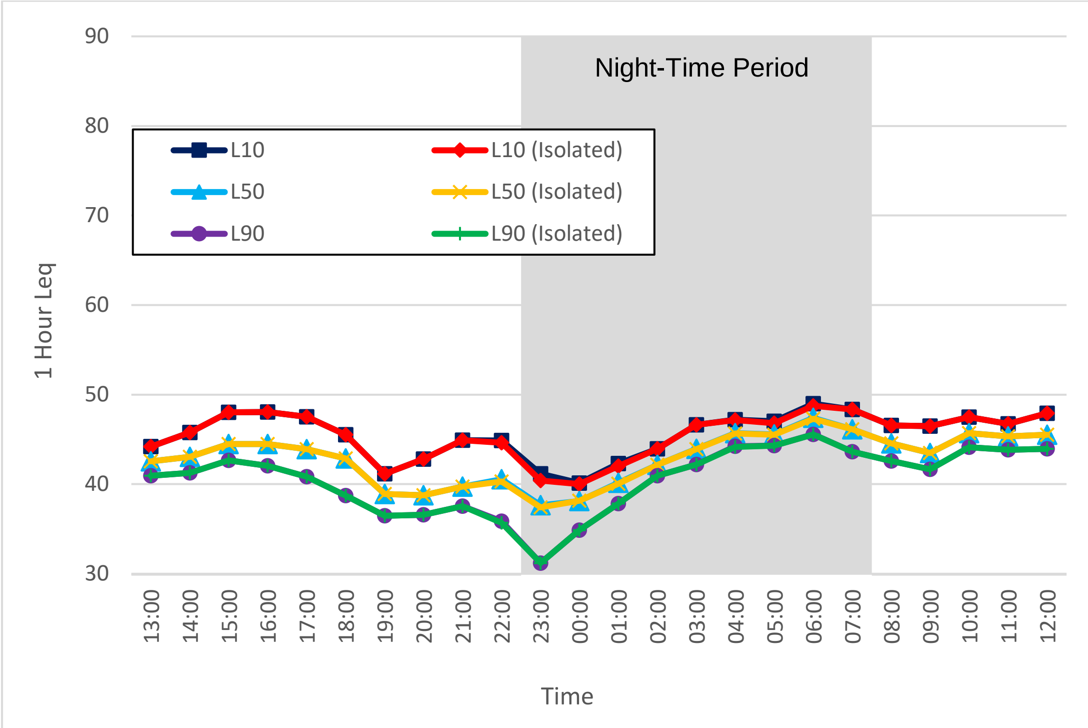

Figure 54. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

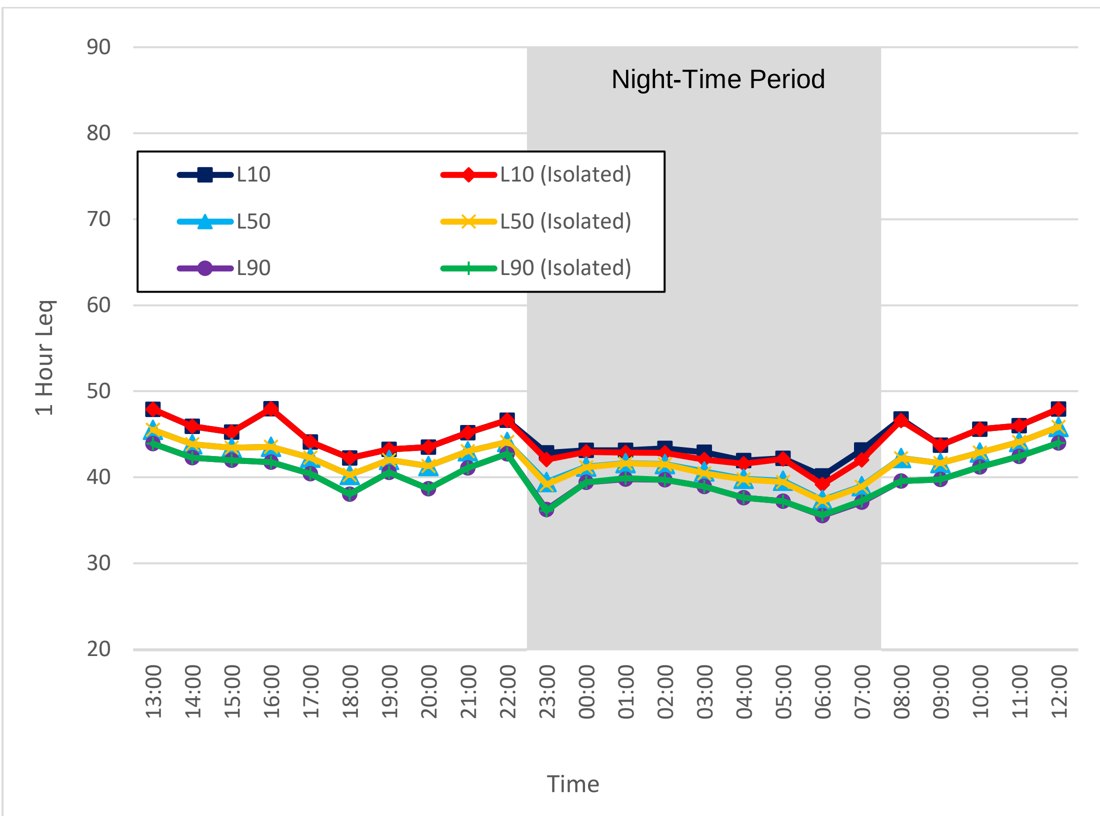

Figure 55. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

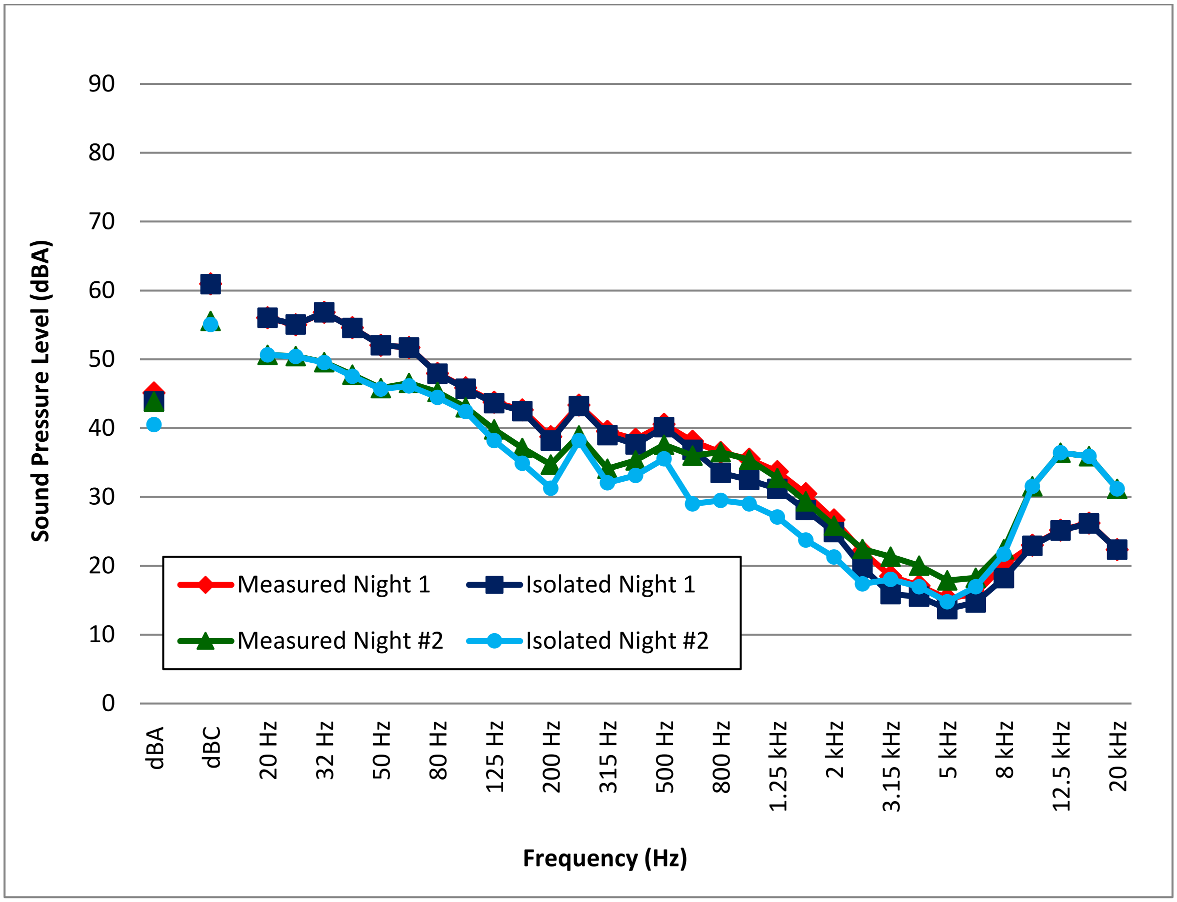

Figure 56. Noise Monitor #6, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #6

Noise Monitor #8

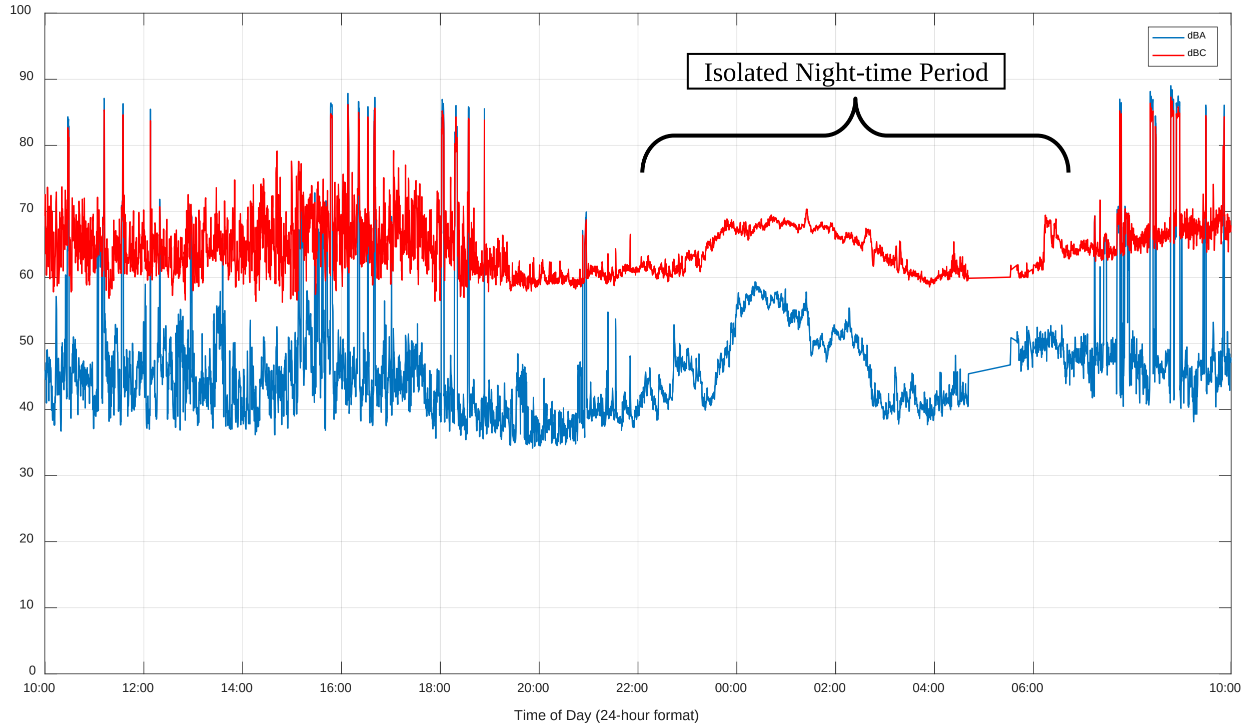

Figure 57. Noise Monitor #8, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

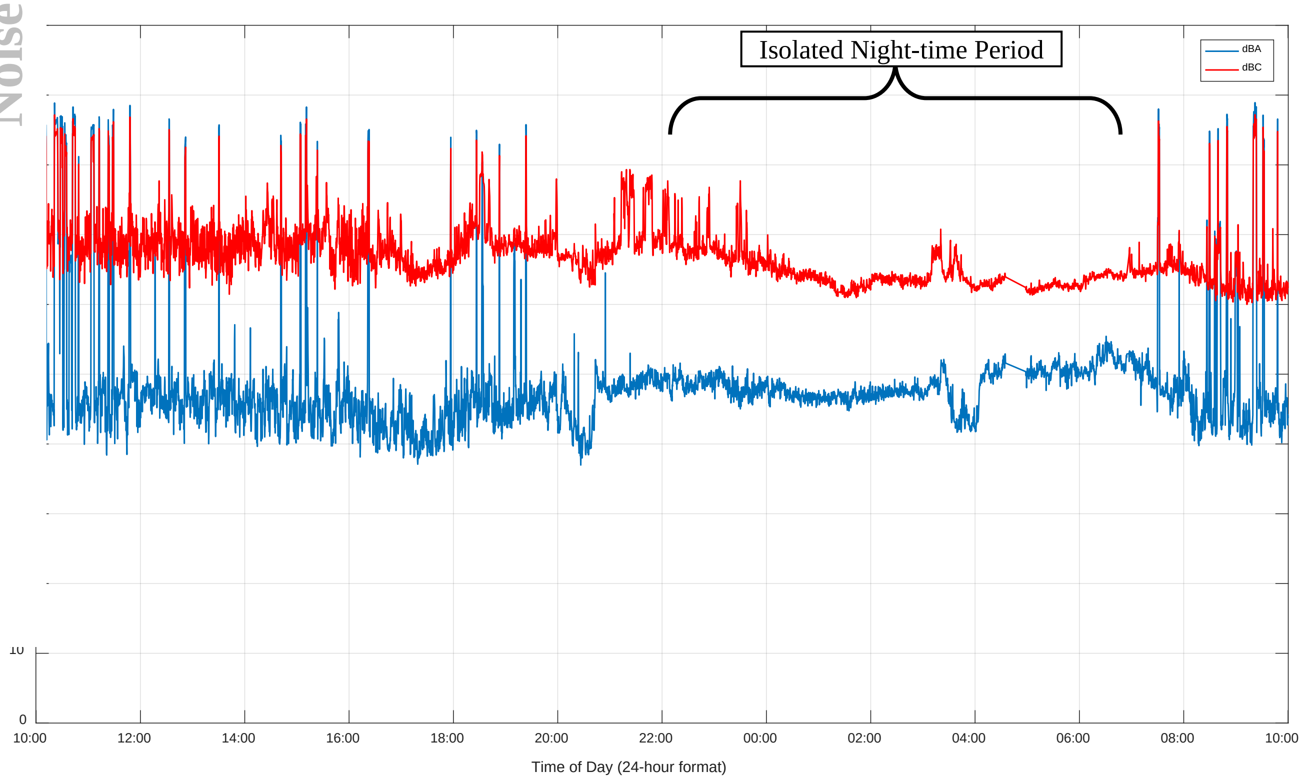

Figure 58. Noise Monitor #8, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #8

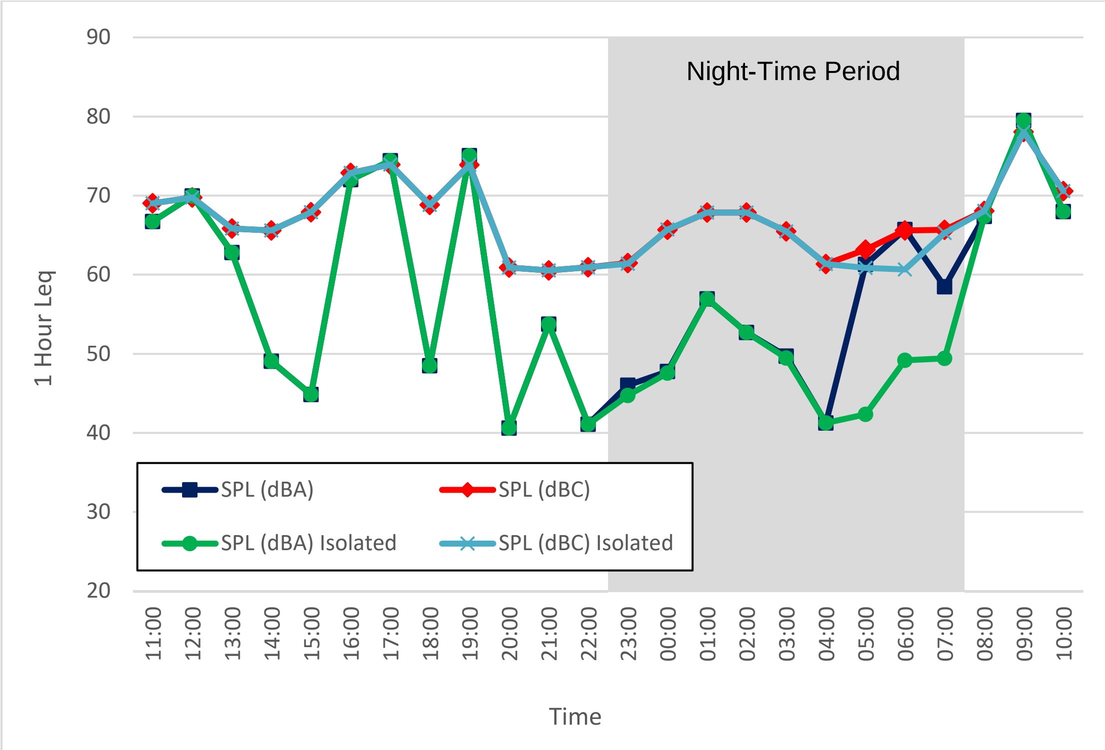

Figure 59. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

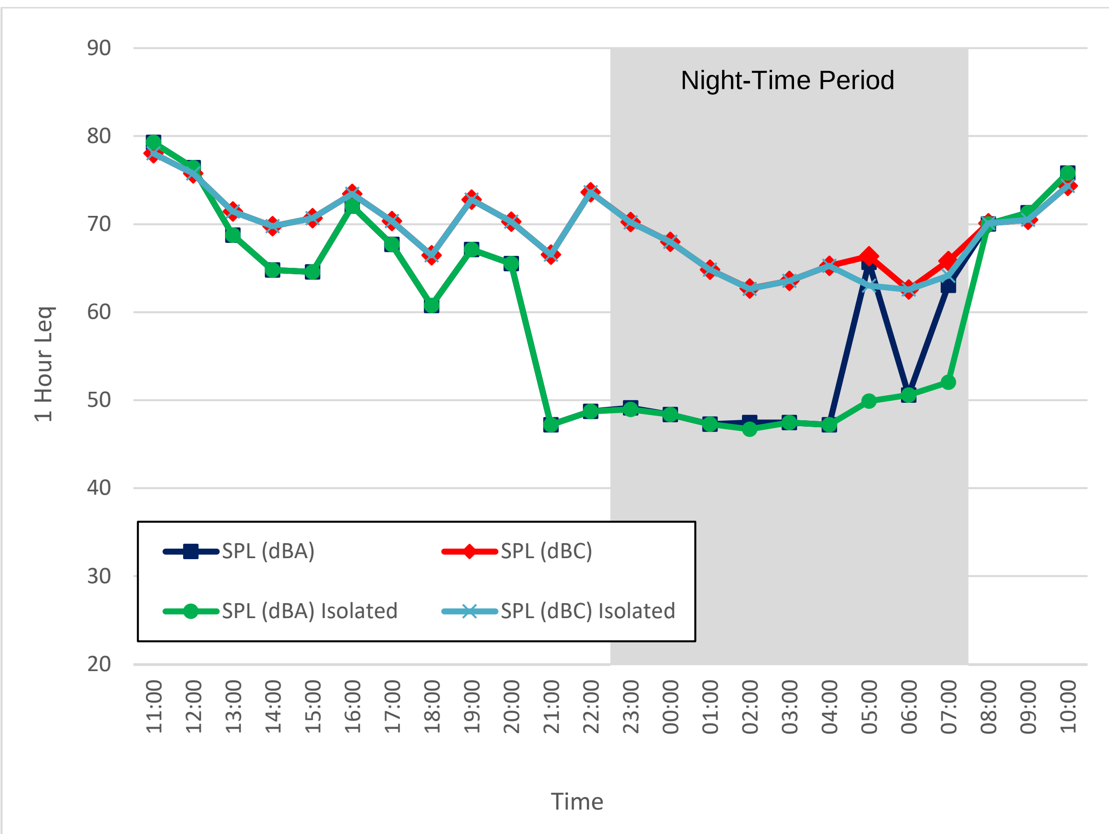

Figure 60. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

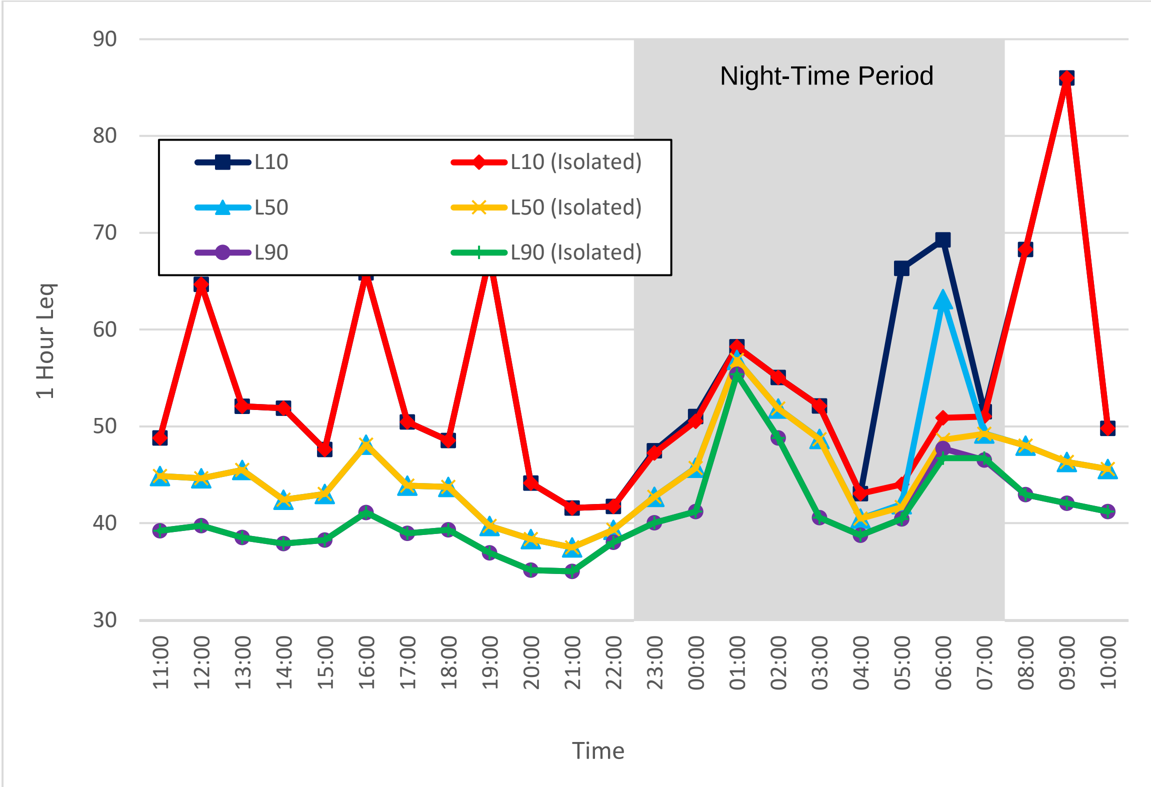

Figure 61. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

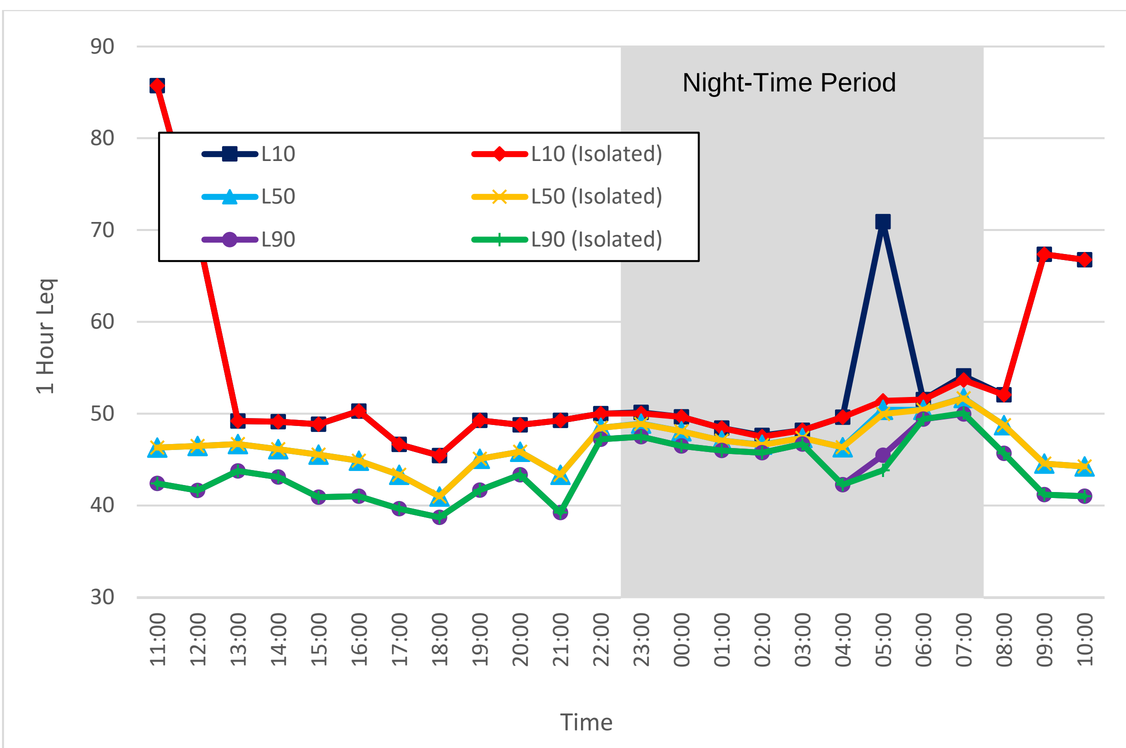

Figure 62. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #8

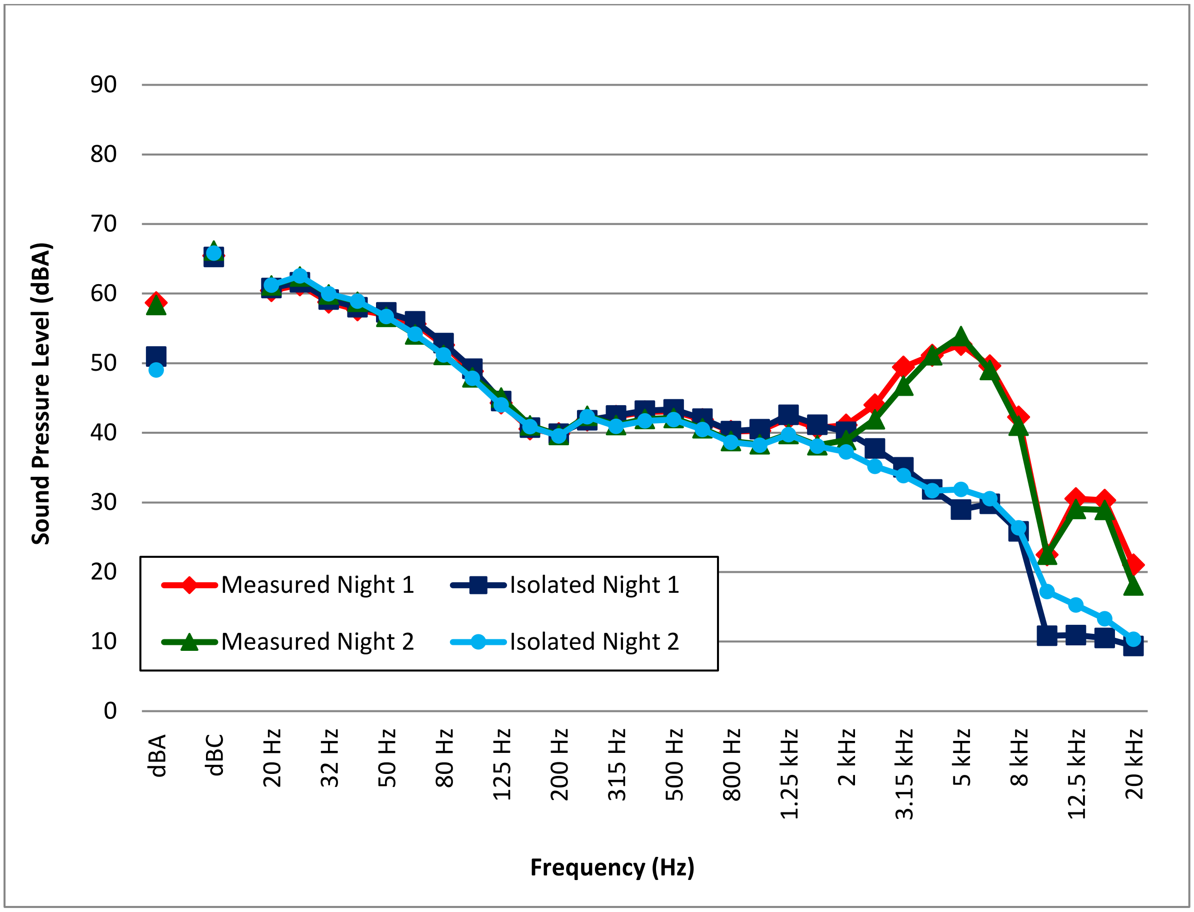

Figure 63. Noise Monitor #8, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

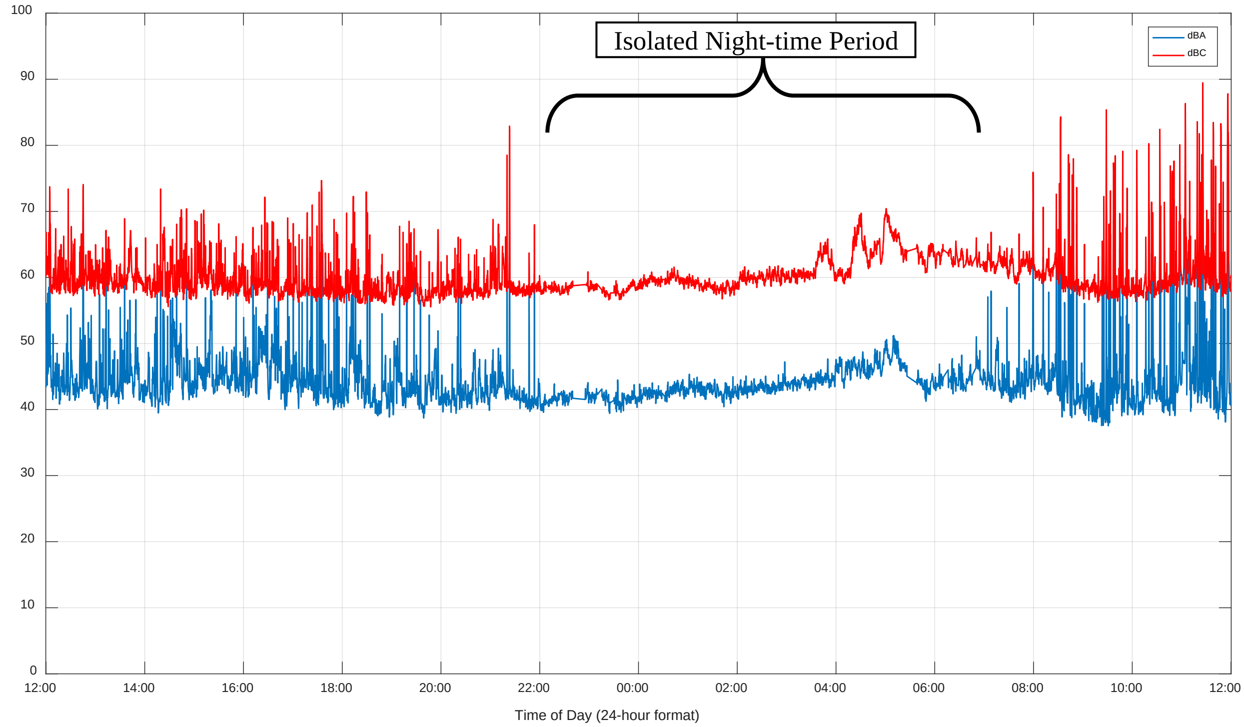

Figure 64. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

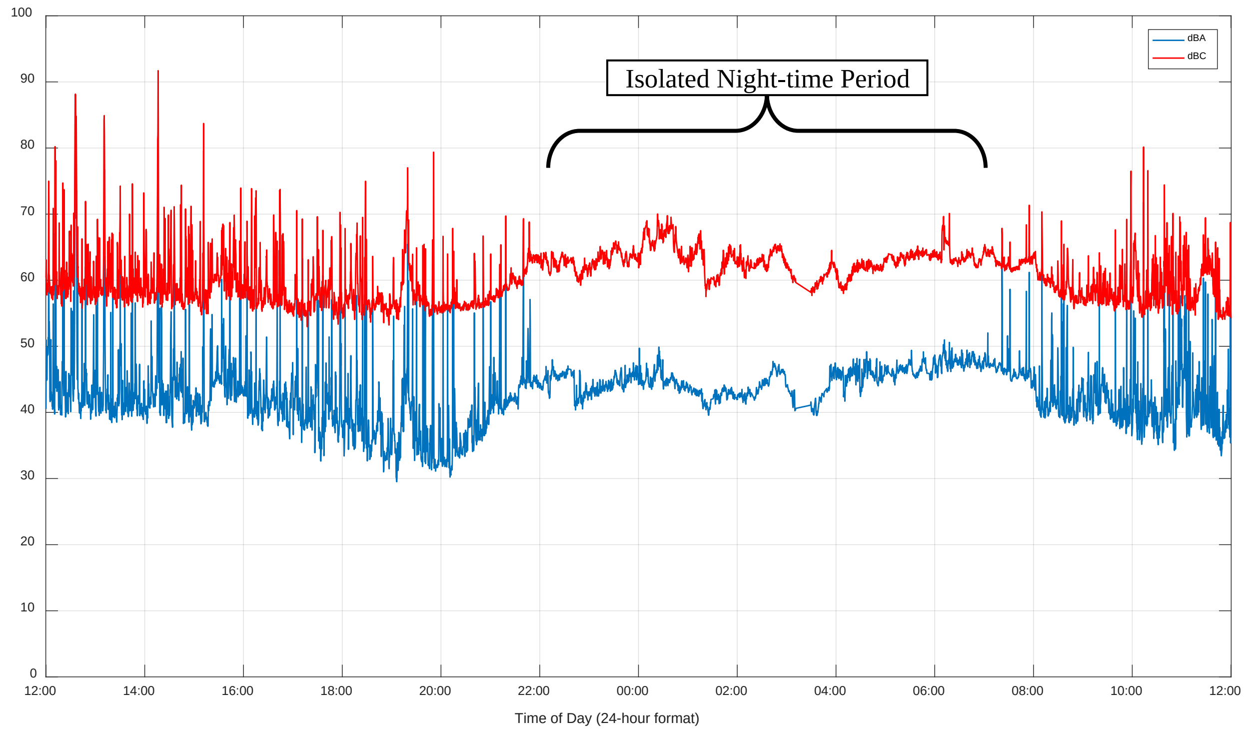

Figure 65. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

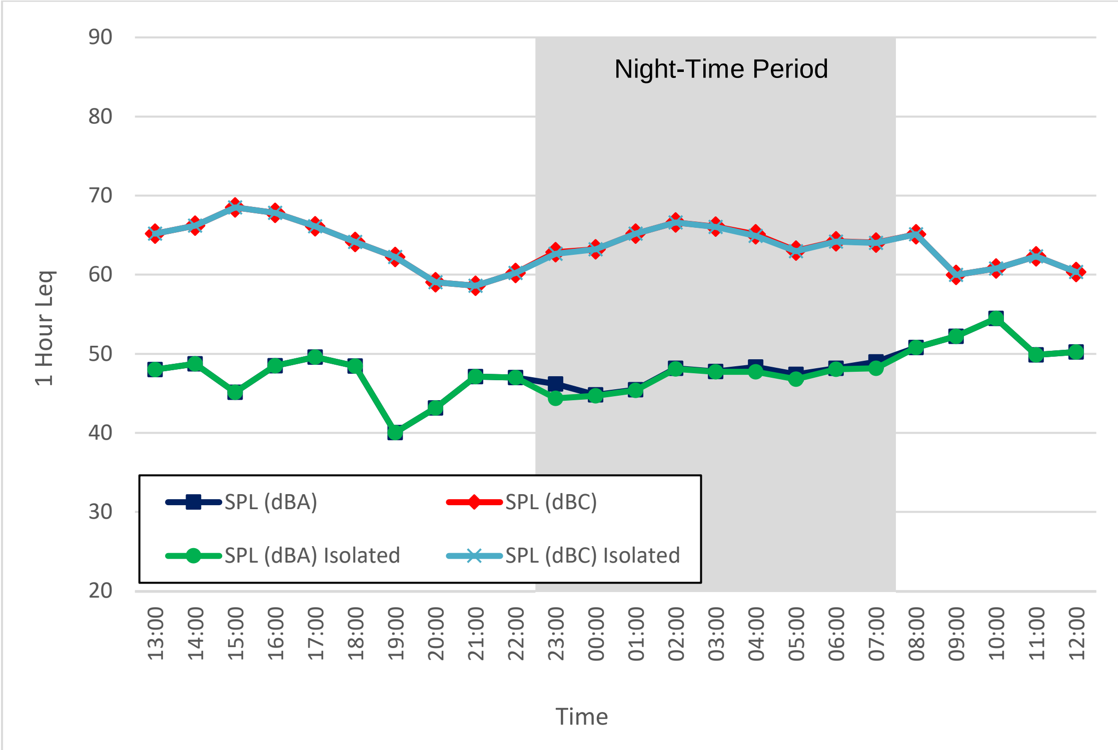

Figure 66. Noise Monitor #9, 1-Hour L$_{eq}$ Sound Levels (July 22 - 23, 2022)

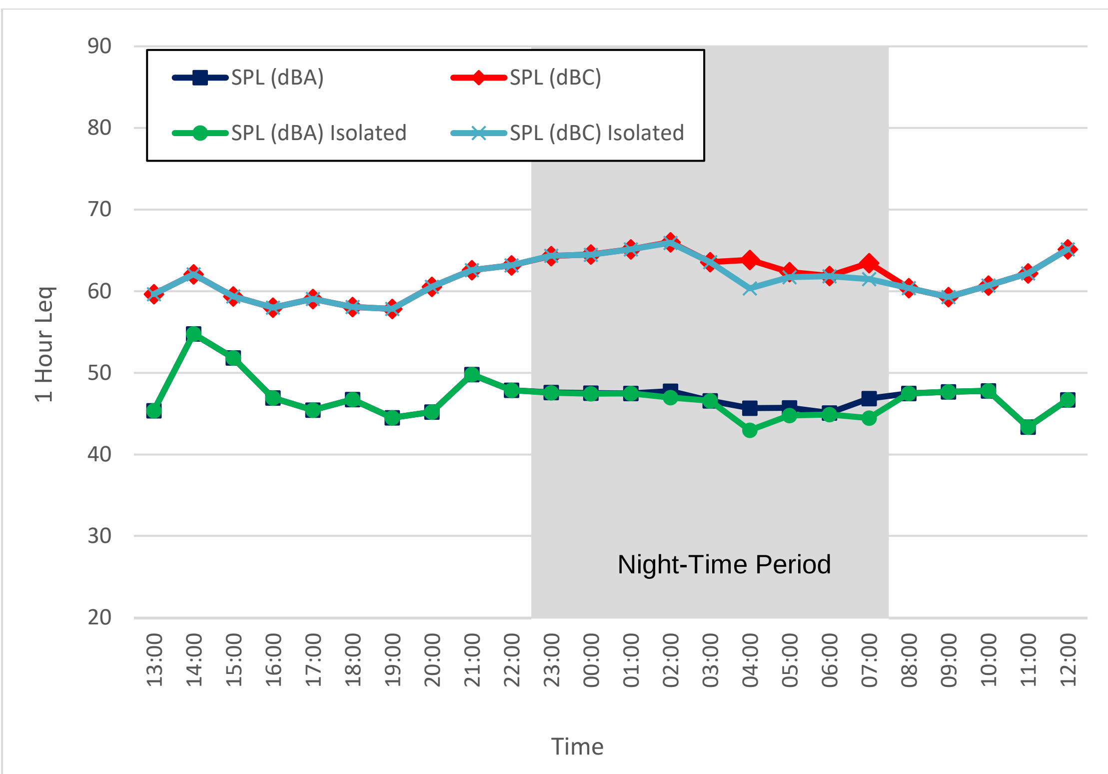

Figure 67. Noise Monitor #9, 1-Hour L$_{eq}$ Sound Levels (July 23 - 24, 2022)

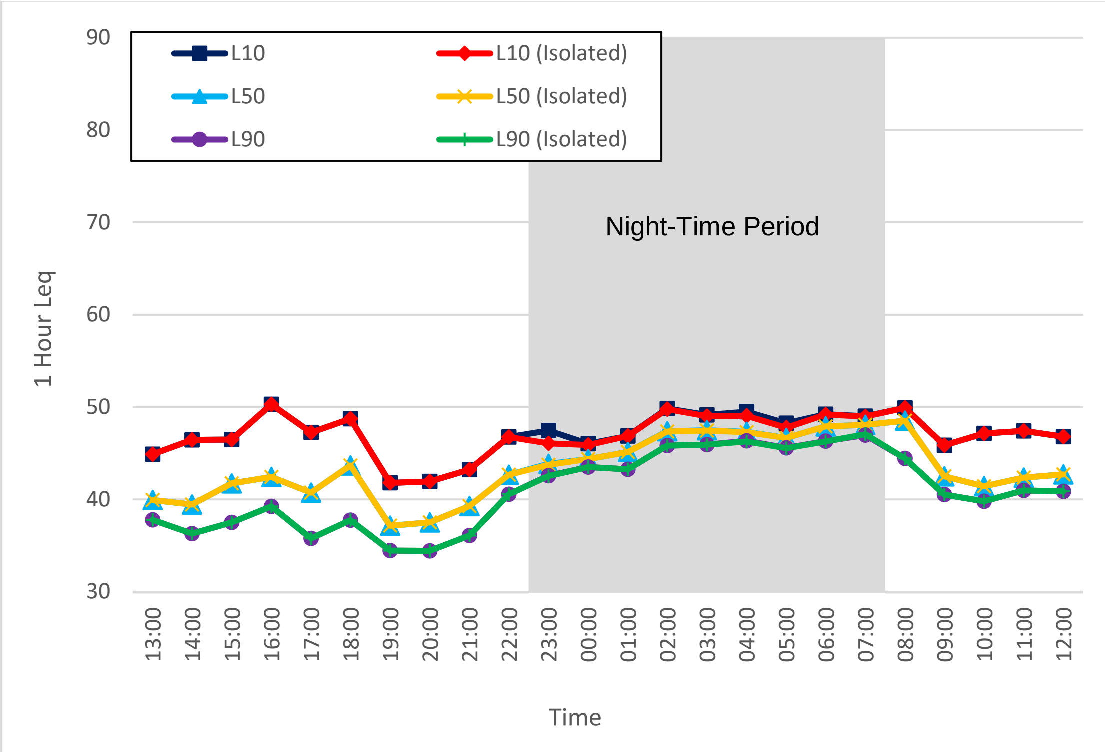

Figure 68. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

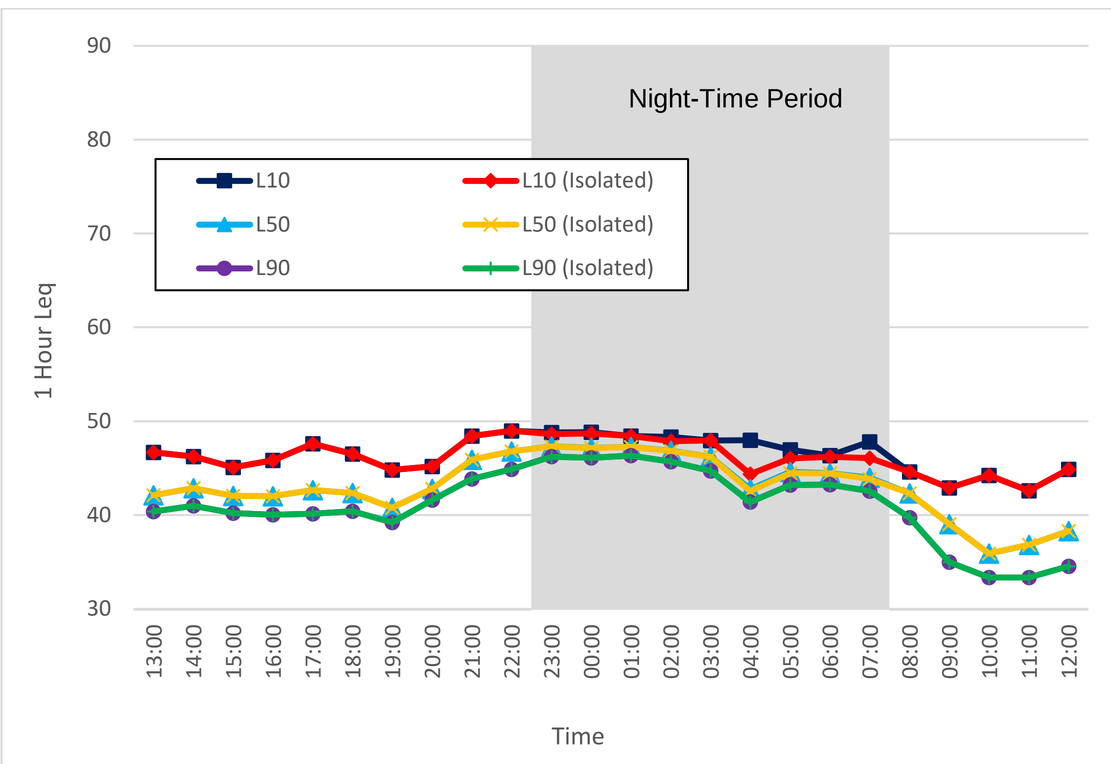

Figure 69. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

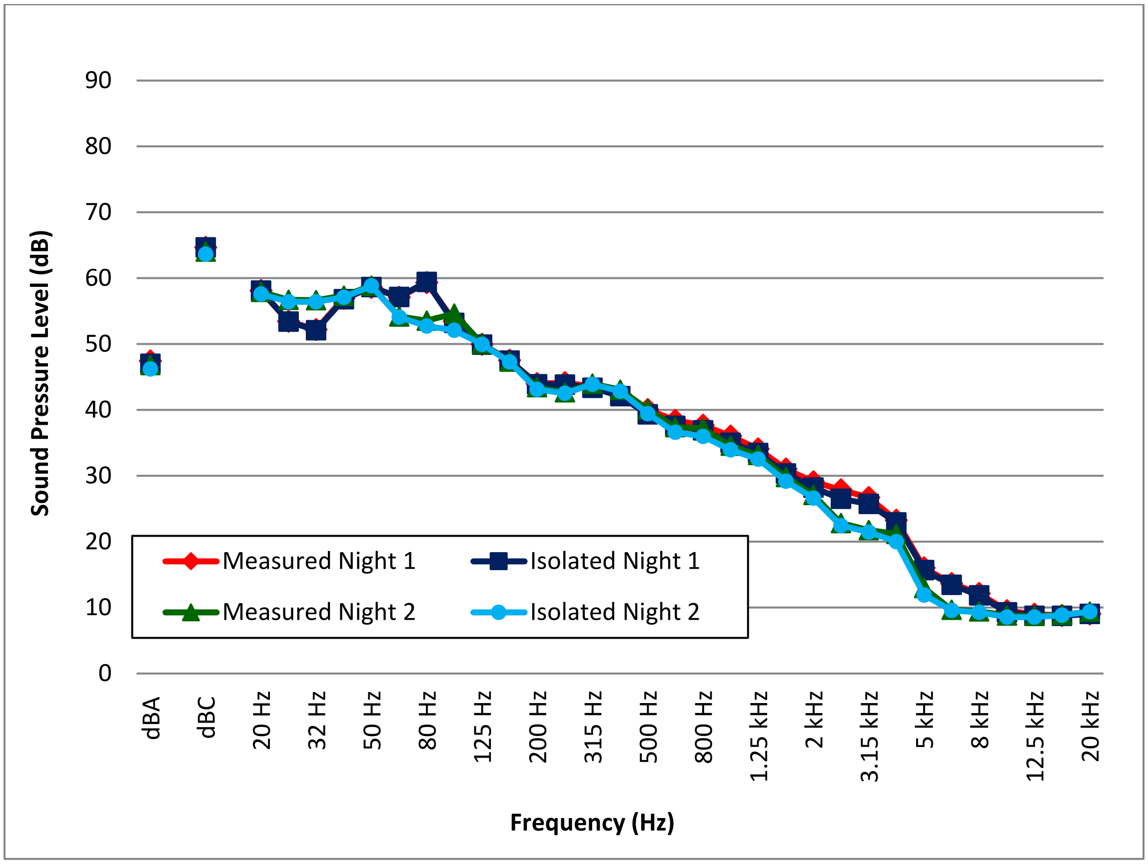

Figure 70. Noise Monitor #9, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)

Noise Monitor #9

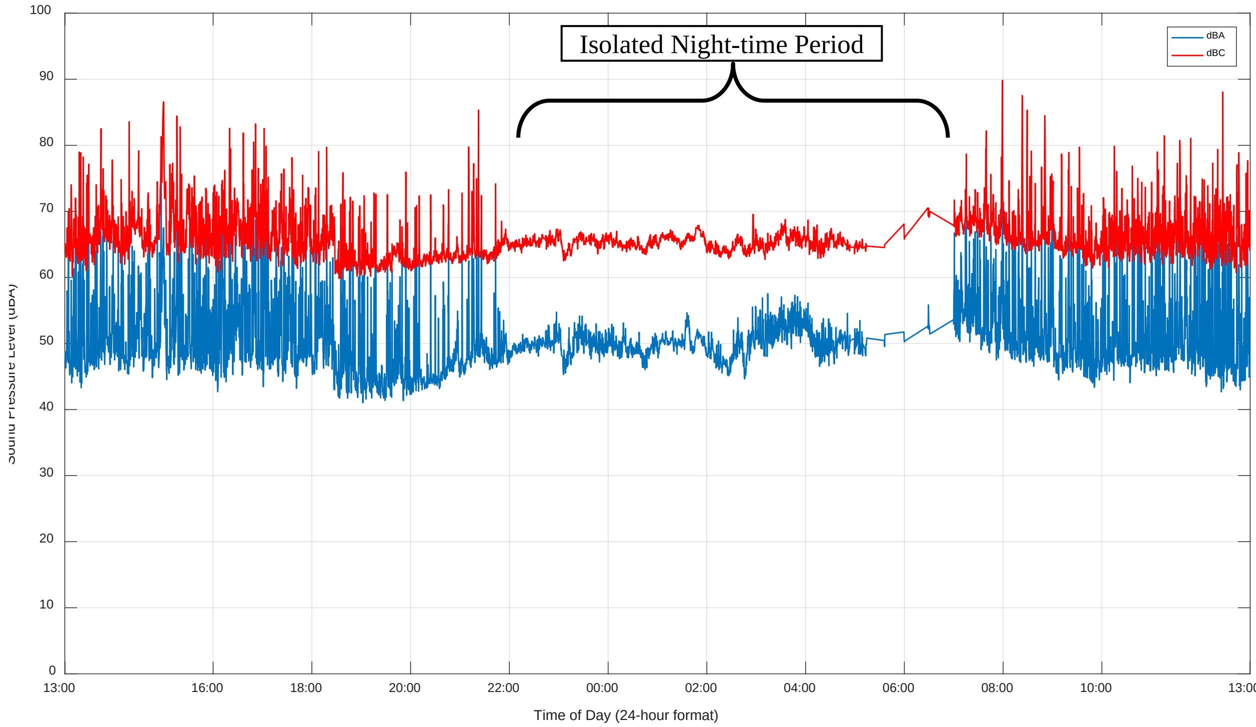

Figure 71. Noise Monitor #10, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

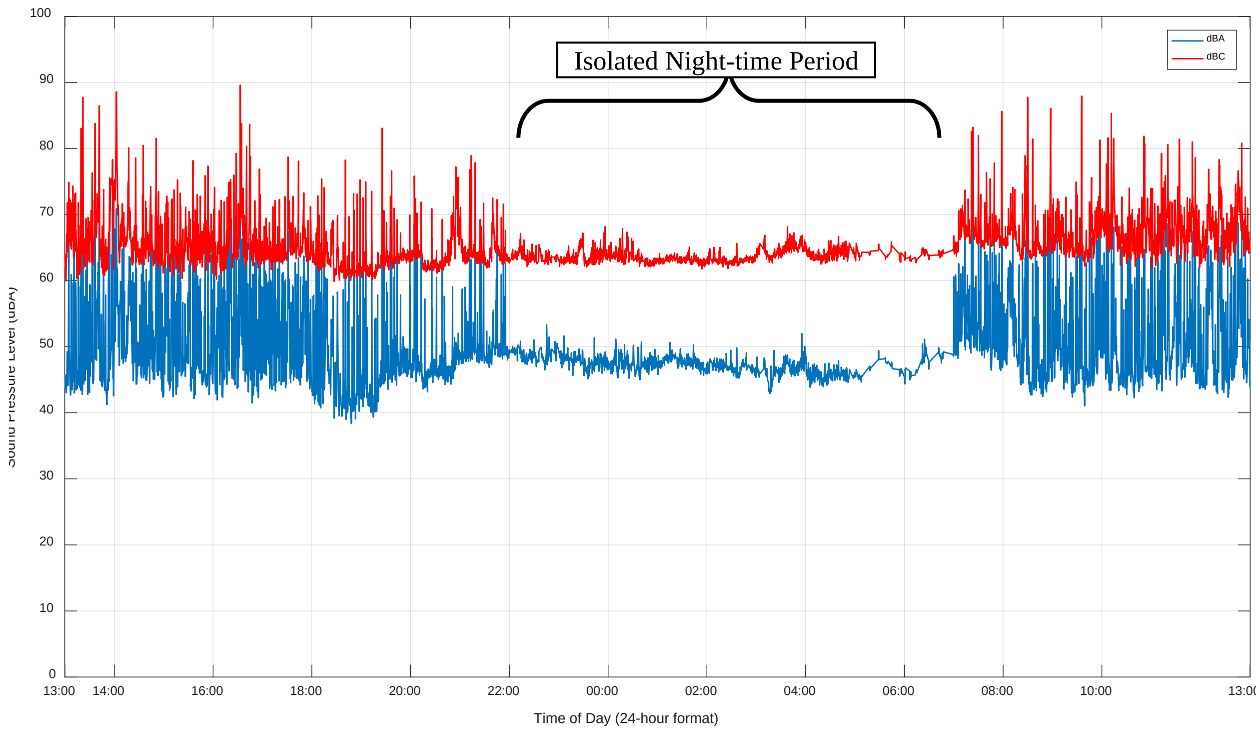

Figure 72. Noise Monitor #10, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #10

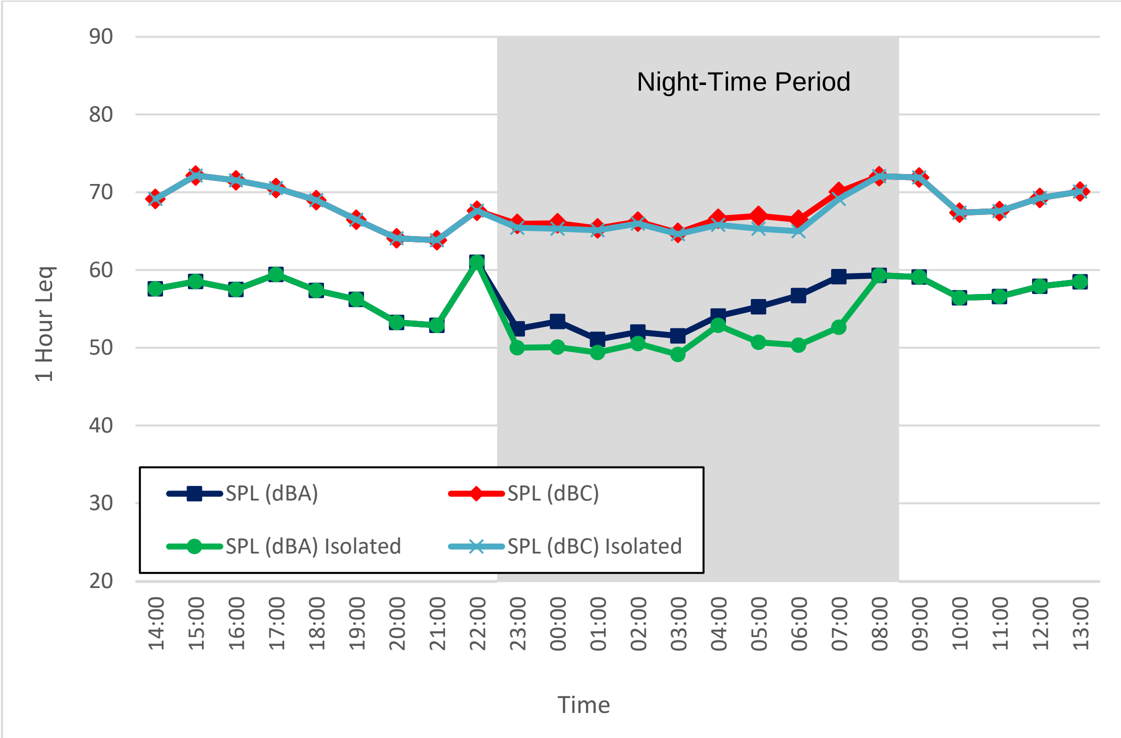

Figure 73. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

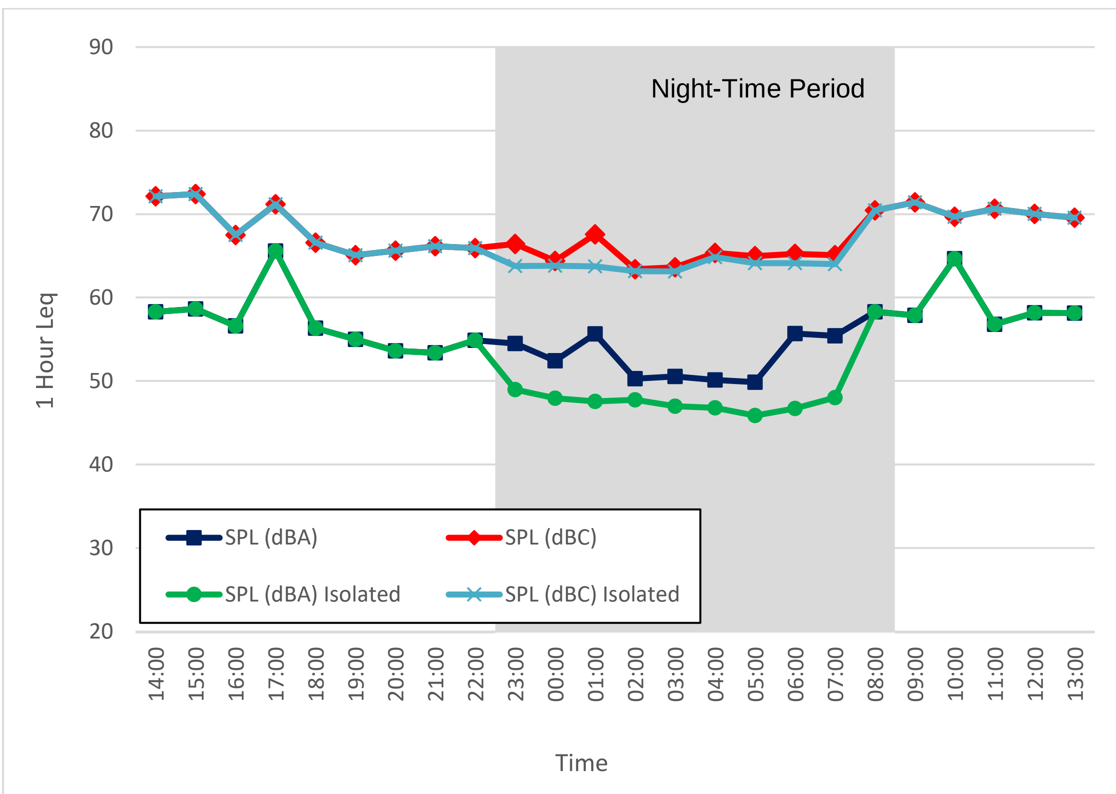

Figure 74. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

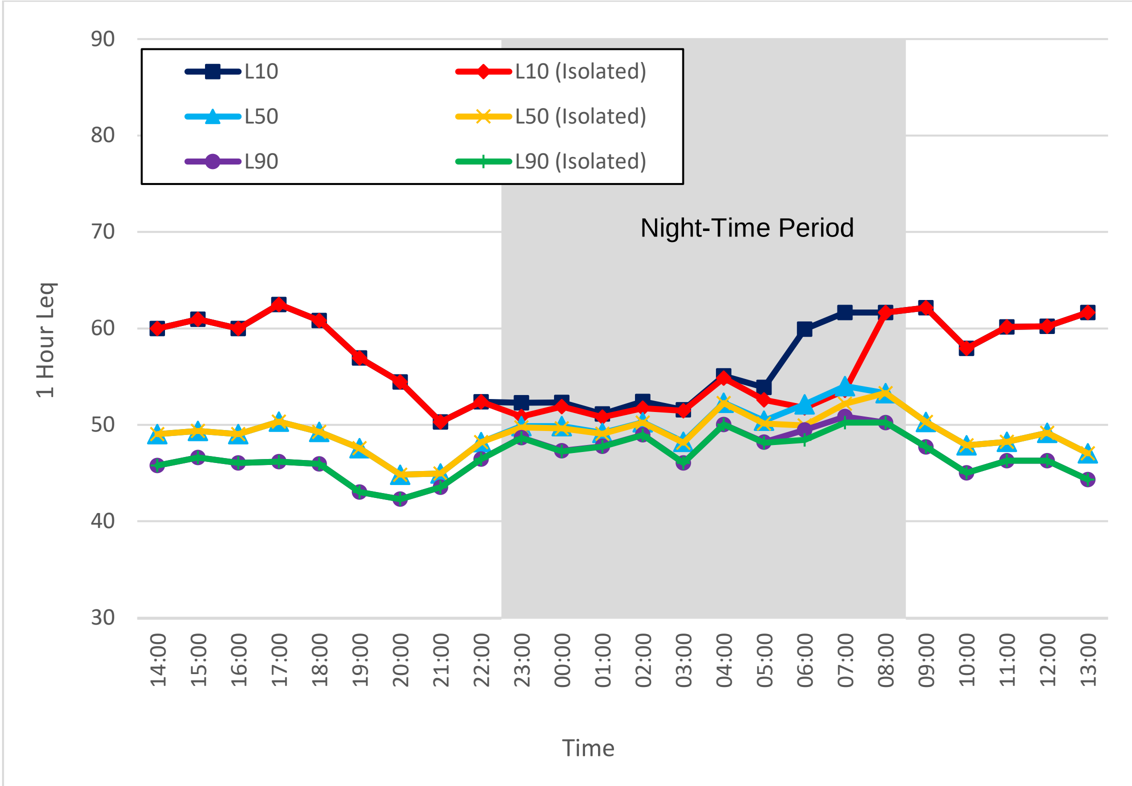

Figure 75. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

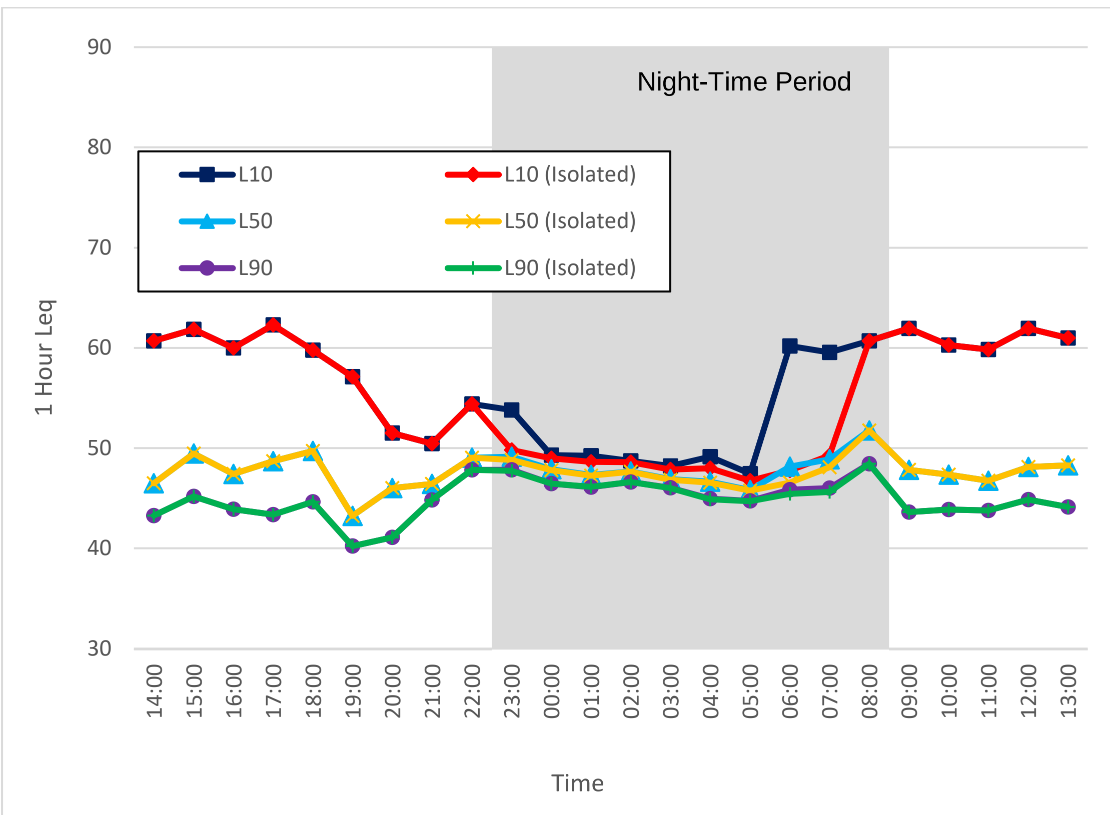

Figure 76. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #10

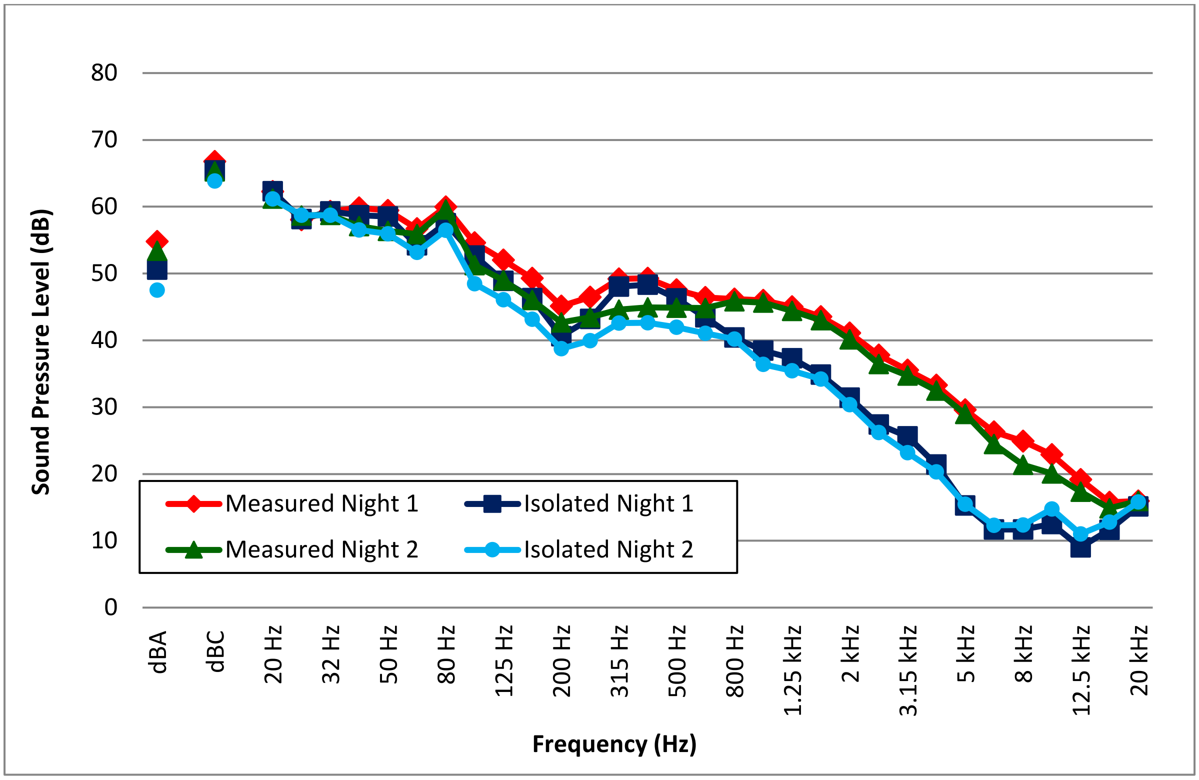

Figure 77. Noise Monitor #10, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #11

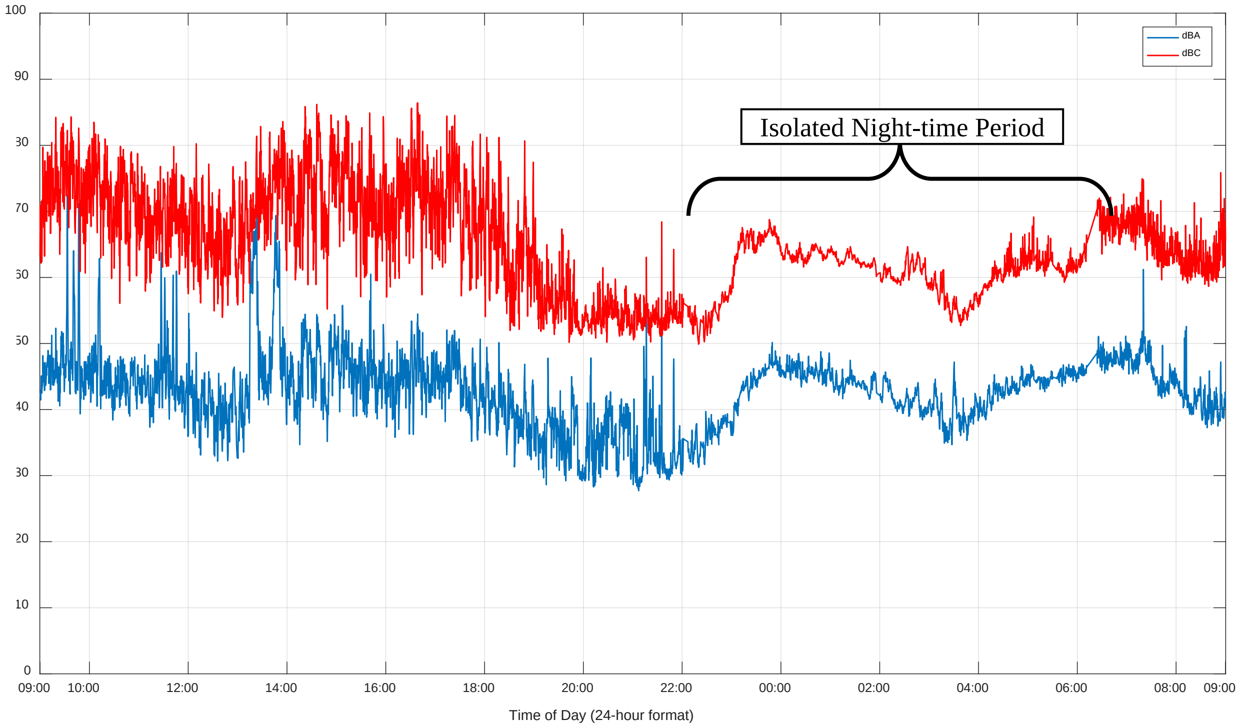

Figure 78. Noise Monitor #11, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

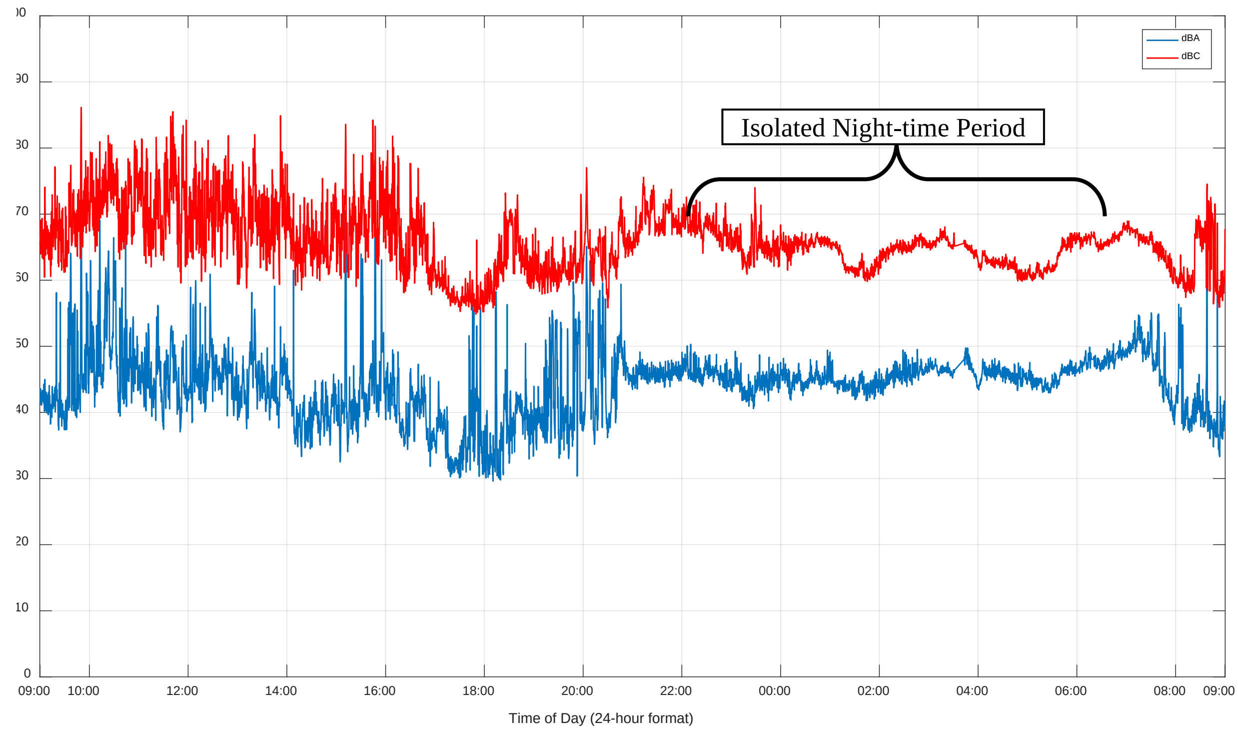

Figure 79. Noise Monitor #11, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

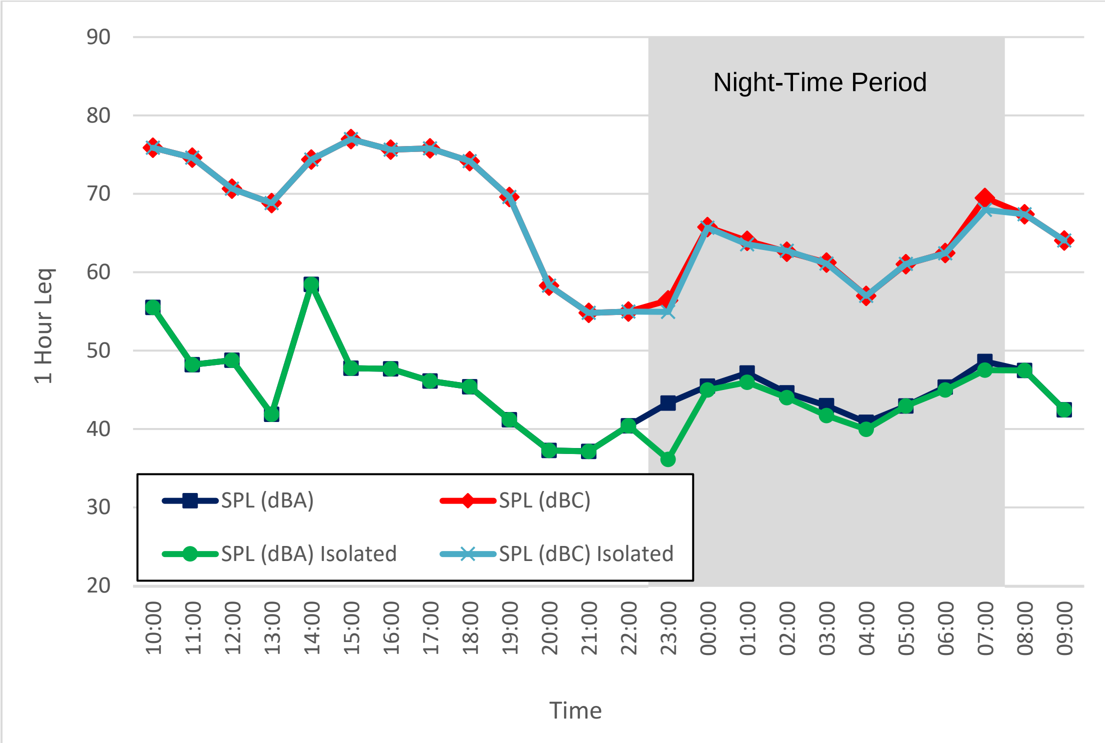

Figure 80. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

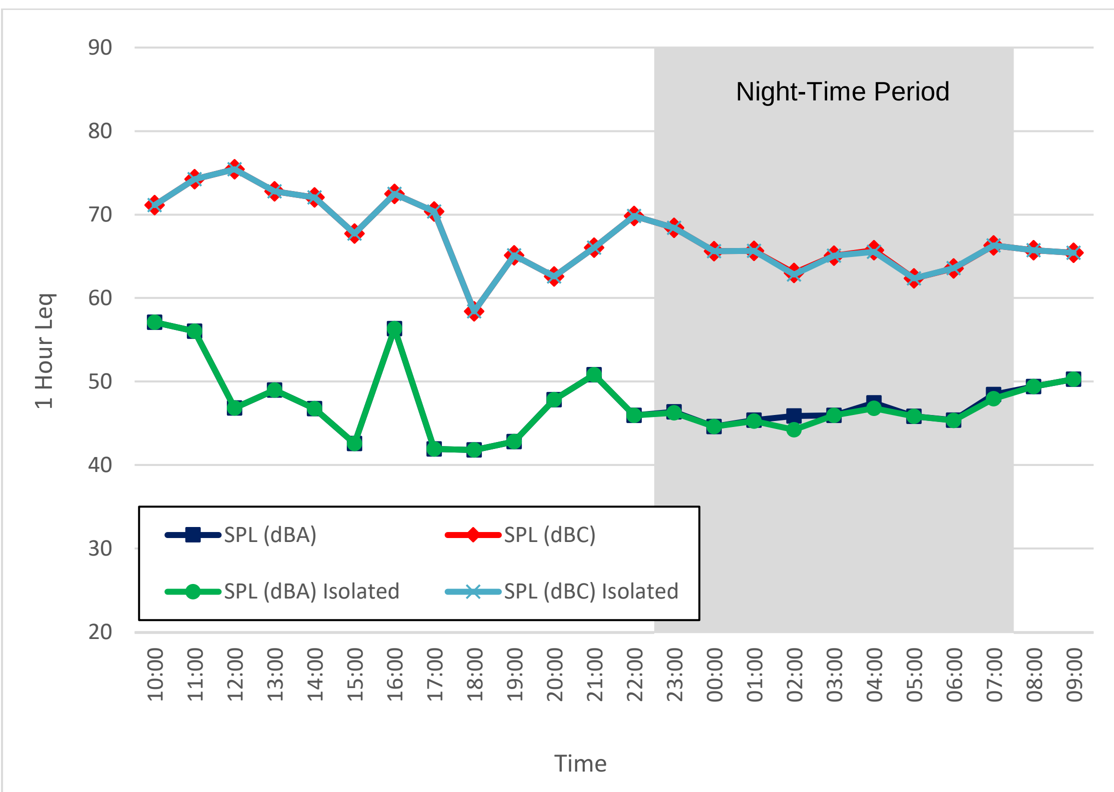

Figure 81. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

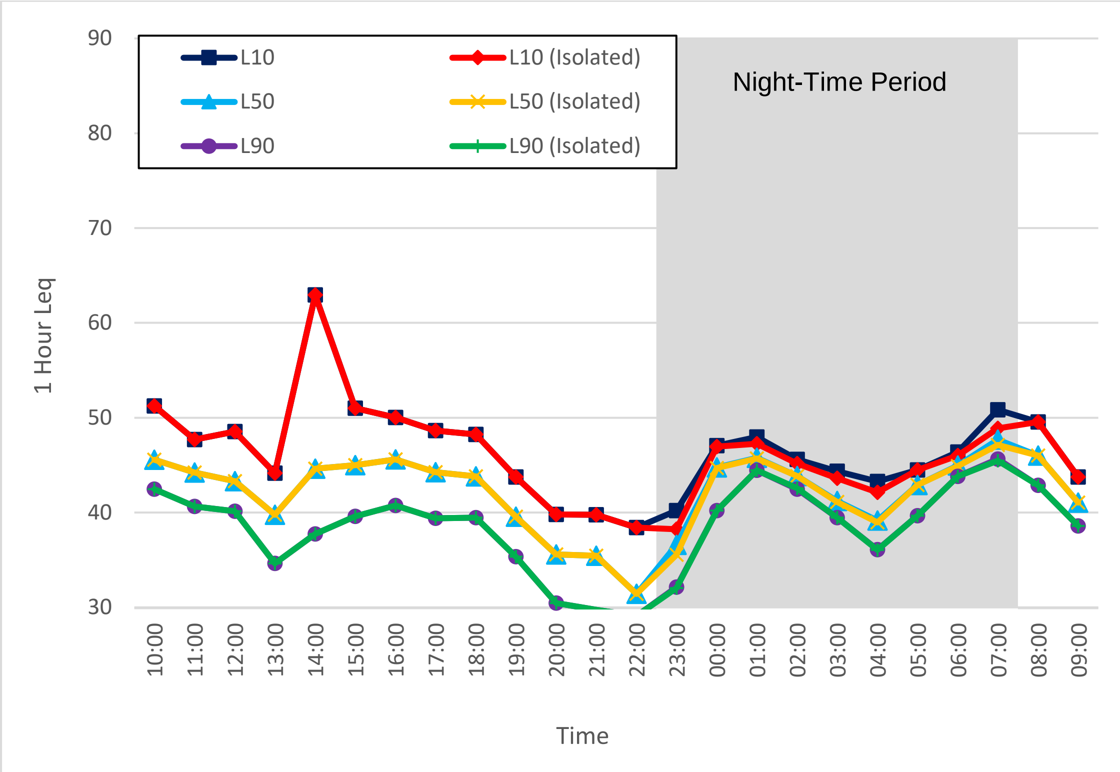

Figure 82. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

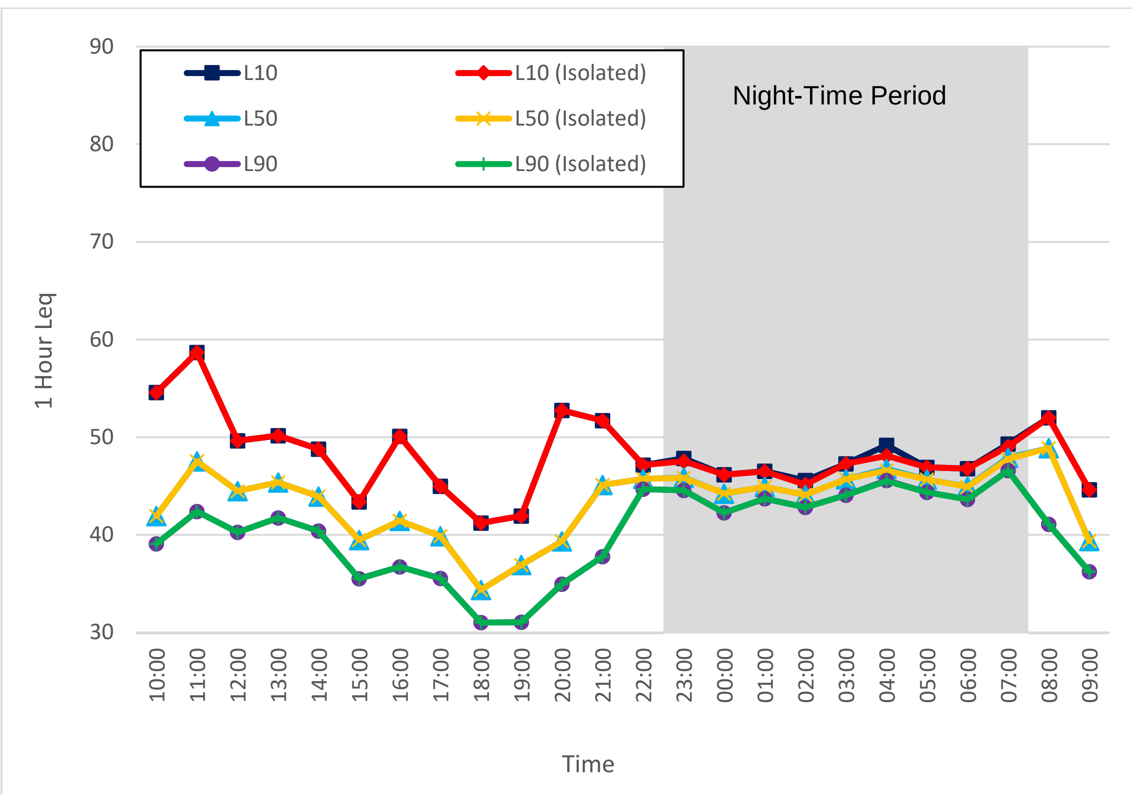

Figure 83. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #11

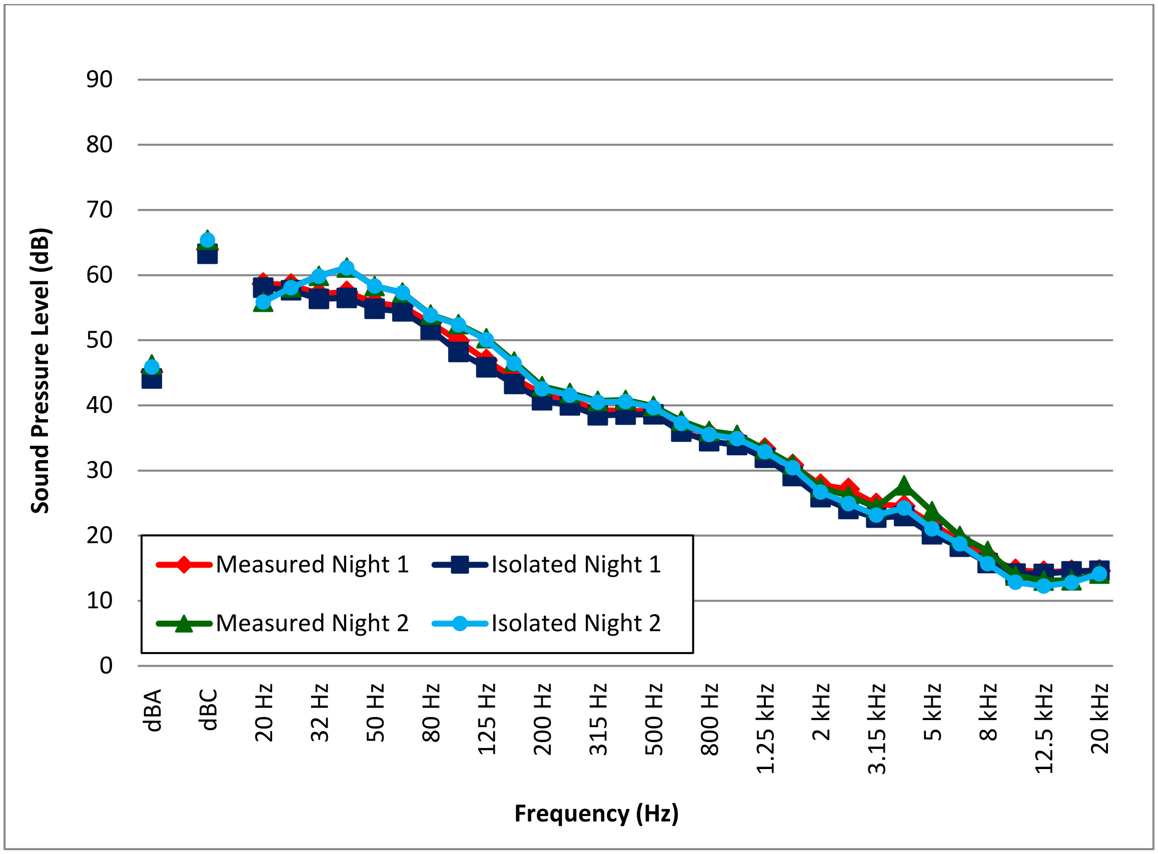

Figure 84. Noise Monitor #11, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

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Noise Monitor #12 - Period 1

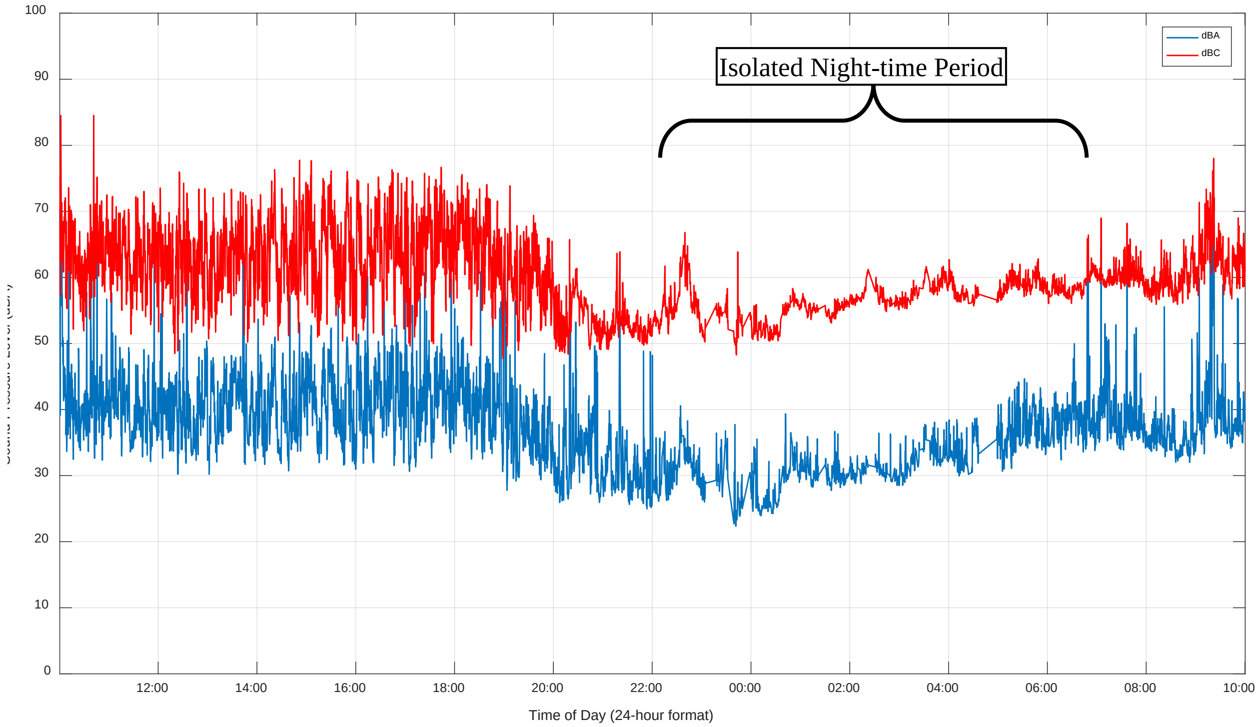

Figure 85. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

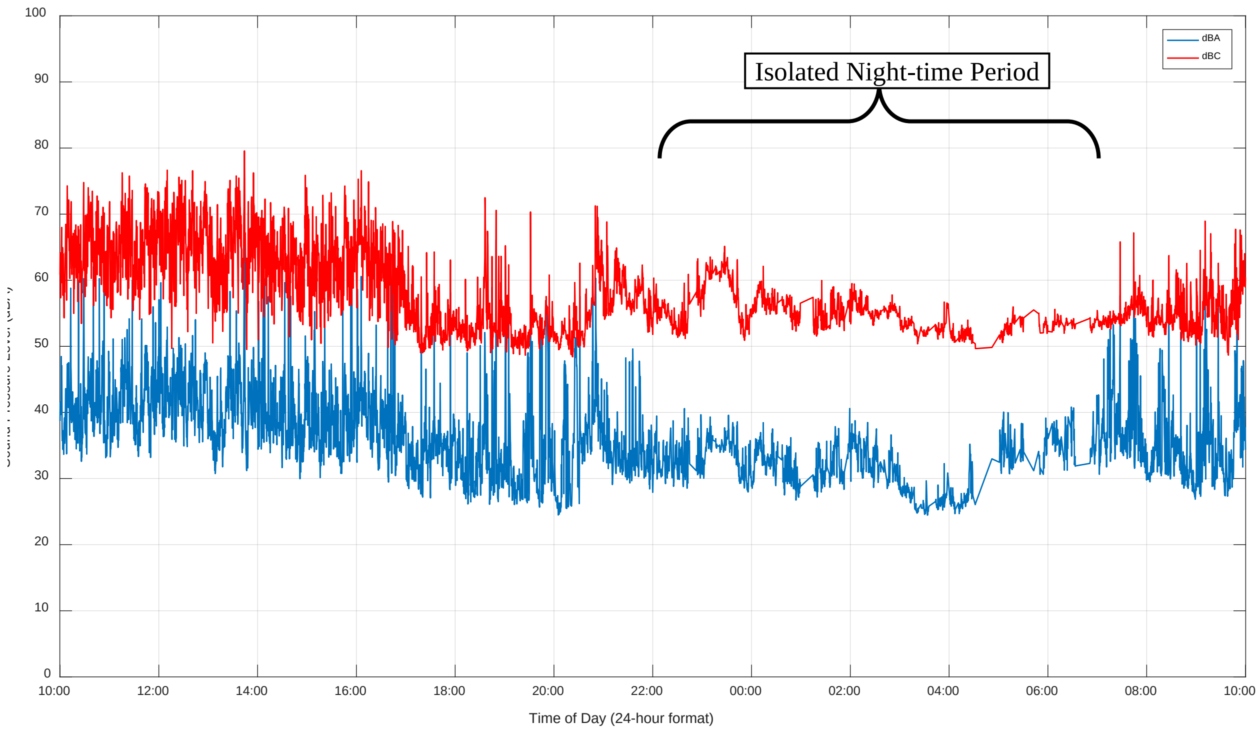

Figure 86. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

aci acoustical consultants inc

Noise Monitor #12 - Period 1

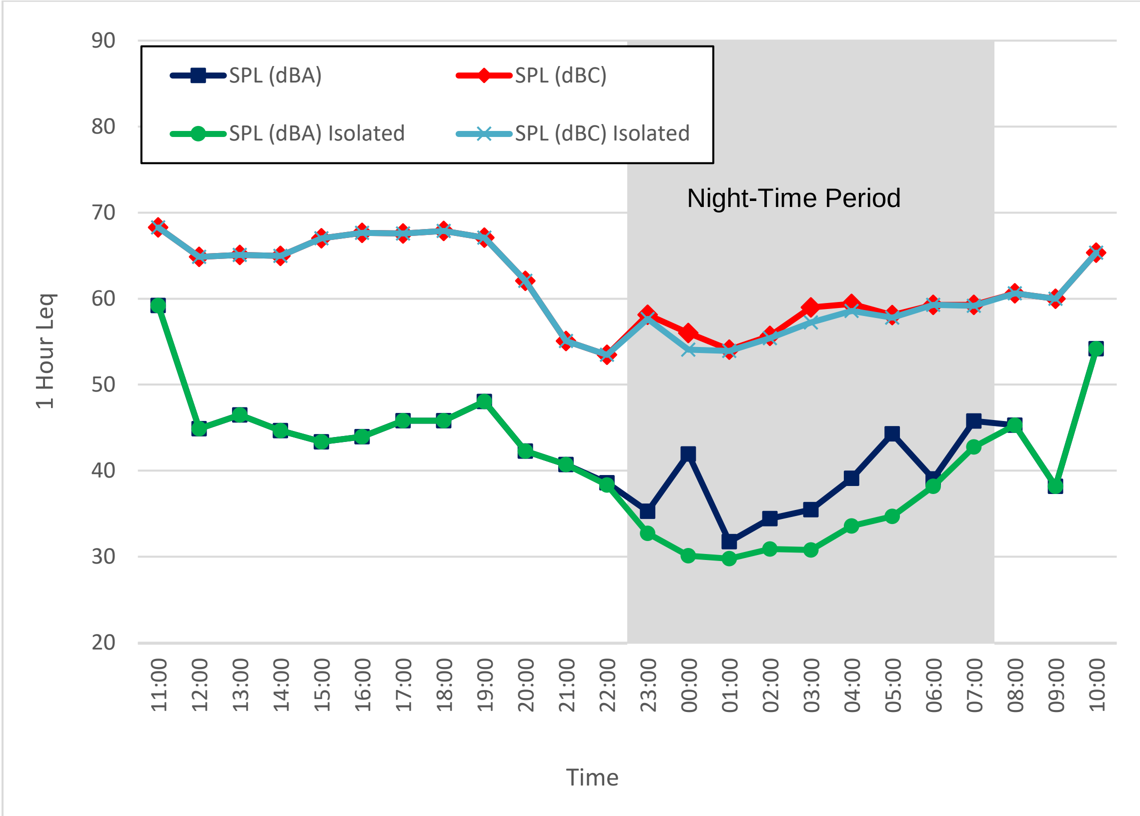

Figure 87. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

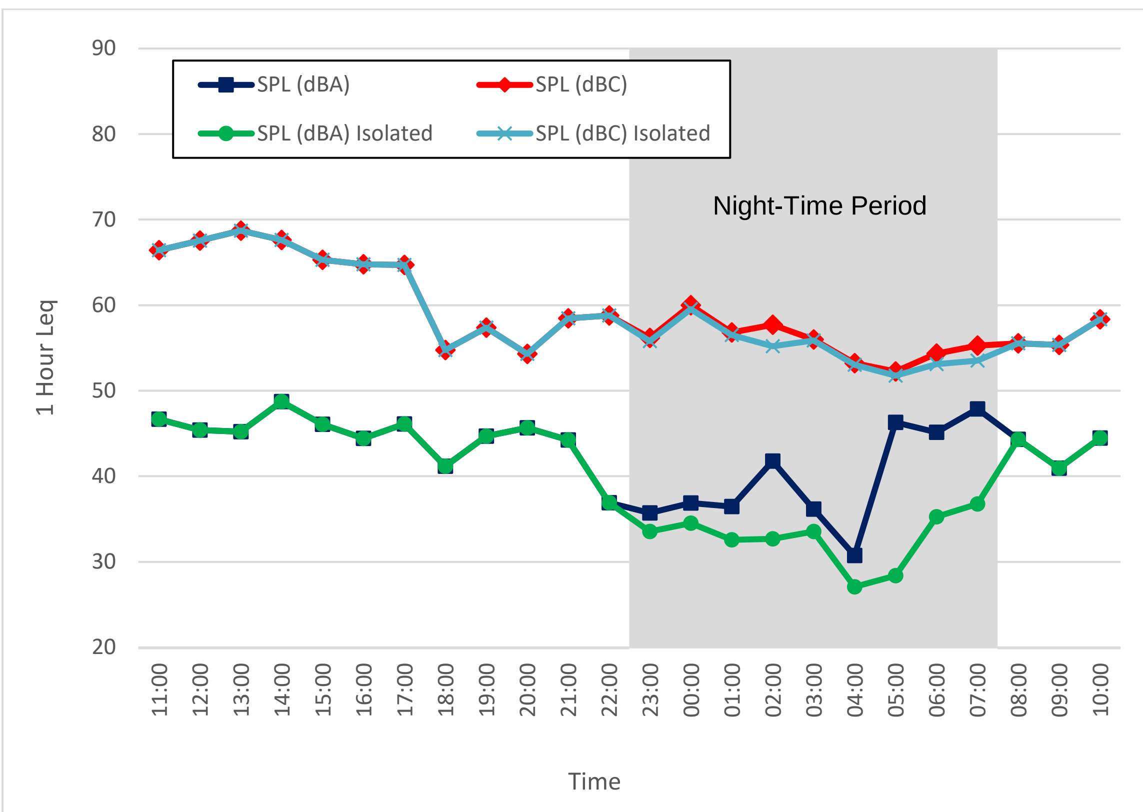

Figure 88. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #12 - Period 1

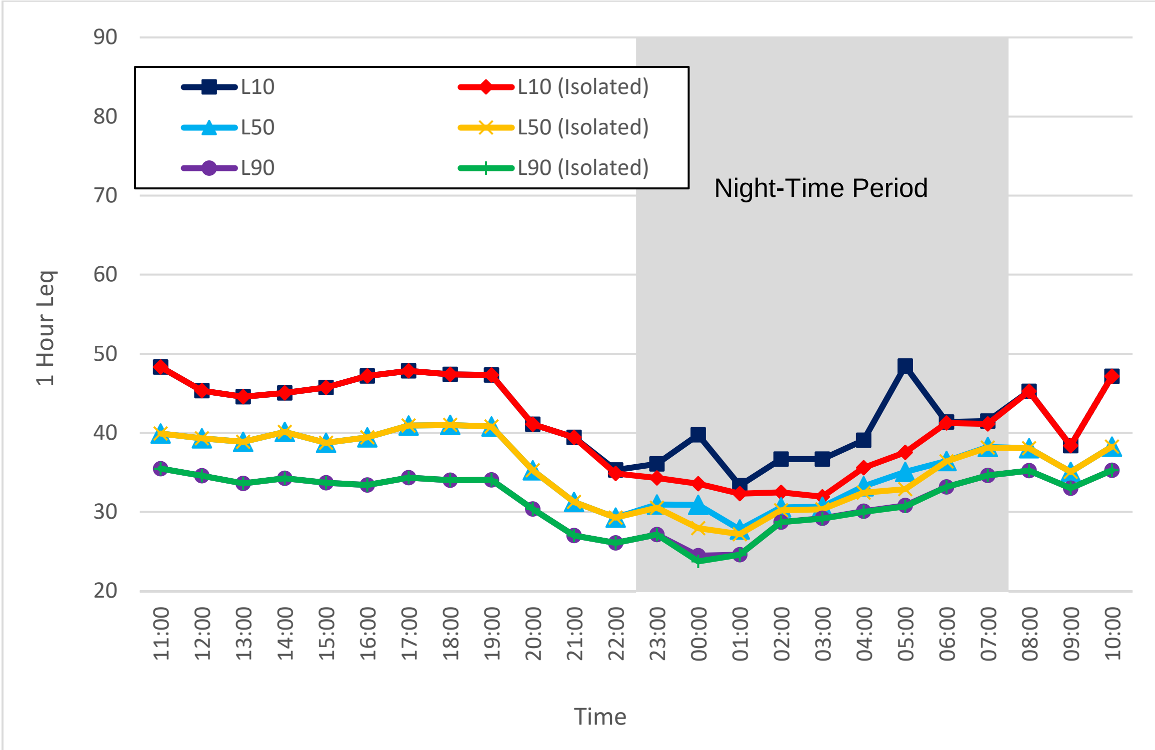

Figure 89. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

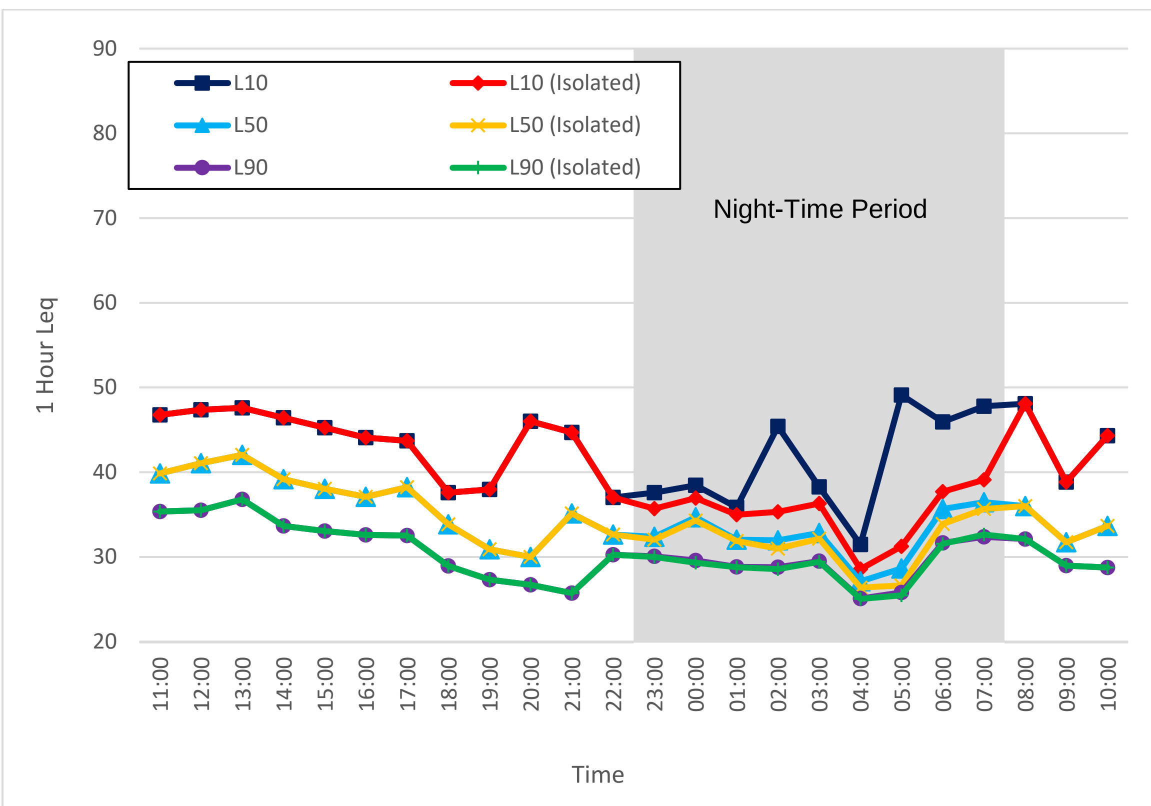

Figure 90. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

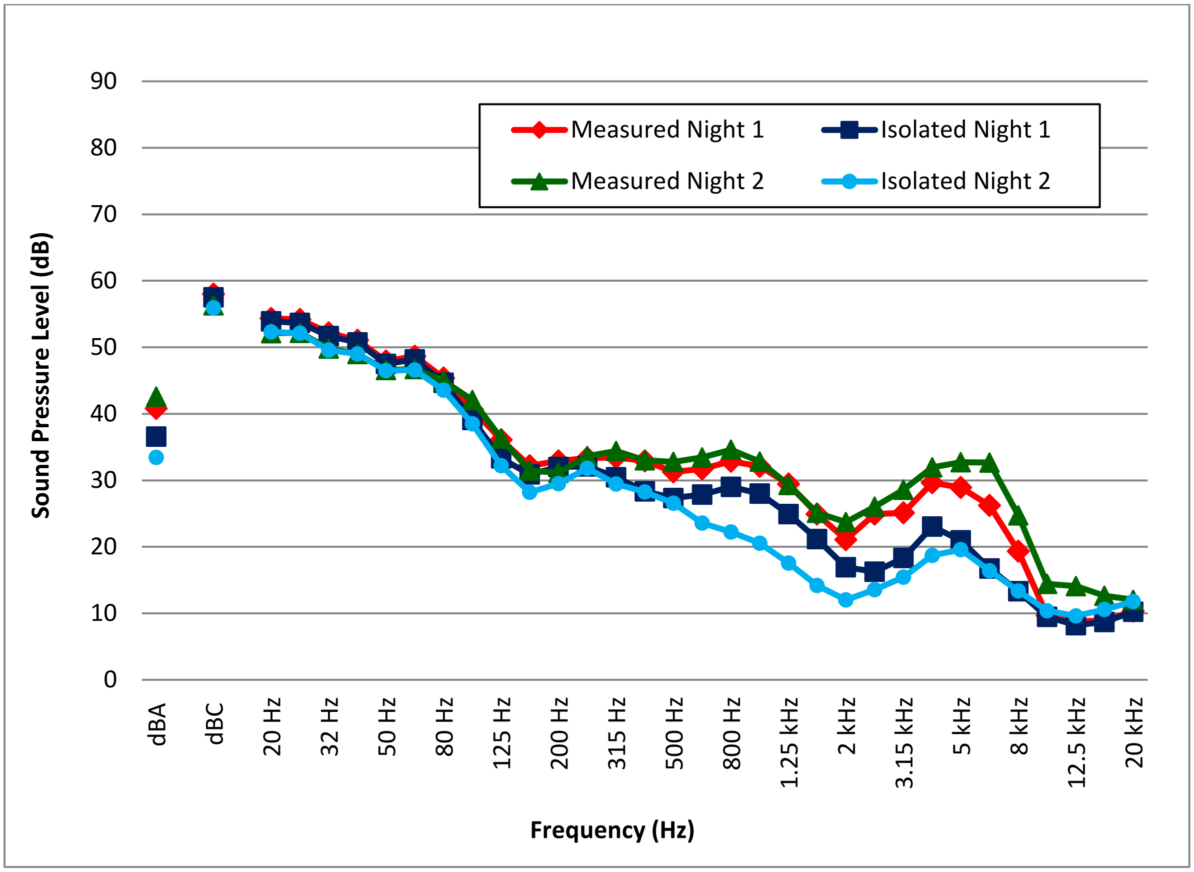

Figure 91. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #12 - Period 2

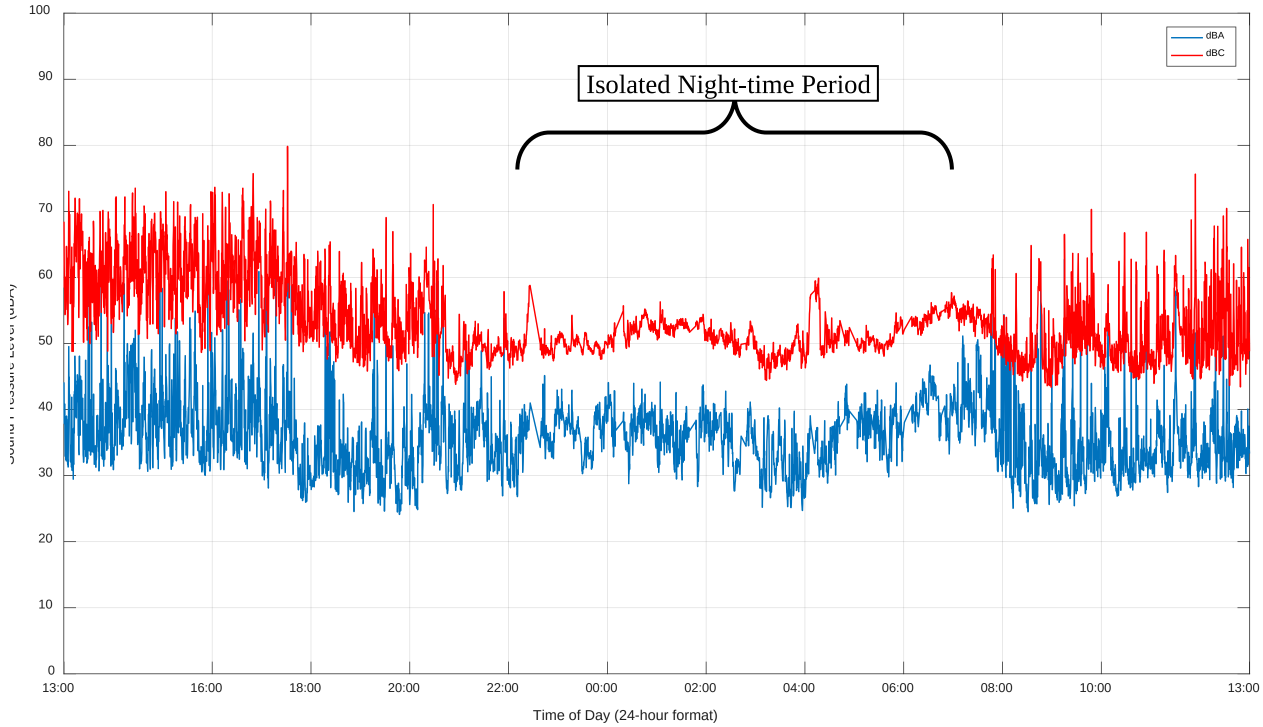

Figure 92. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

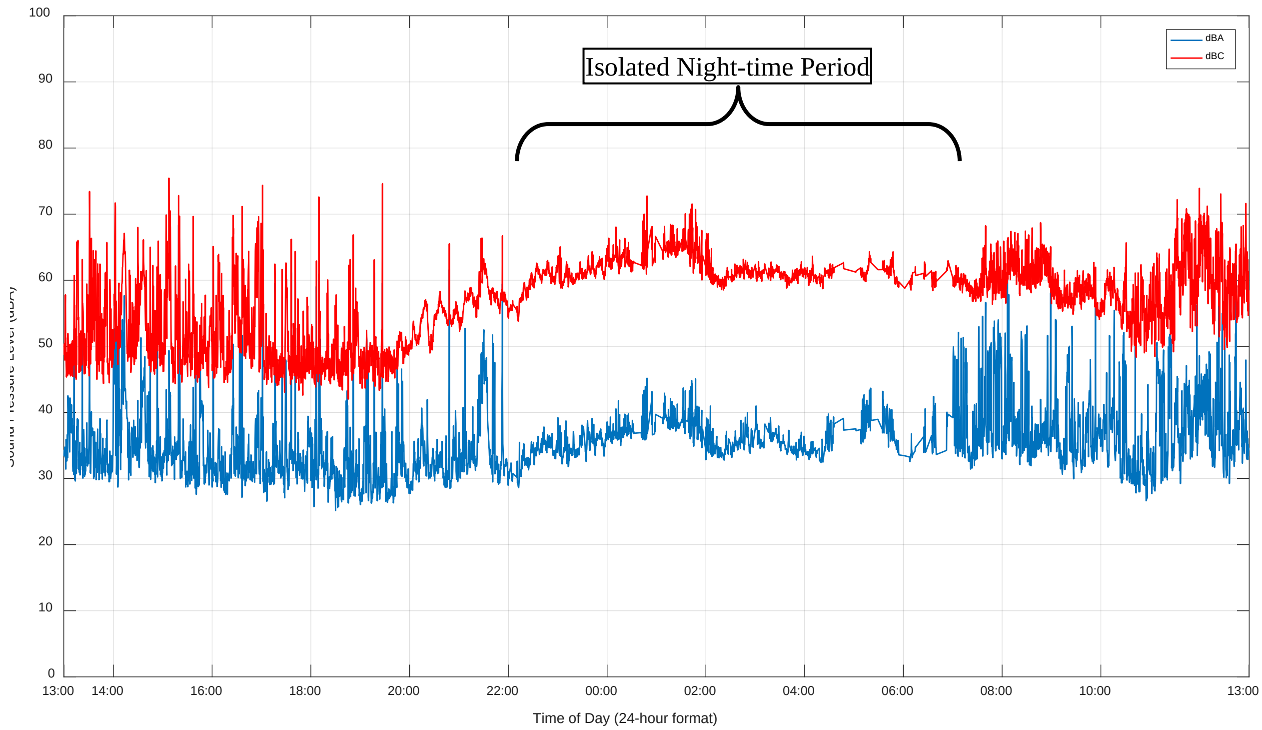

Figure 93. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

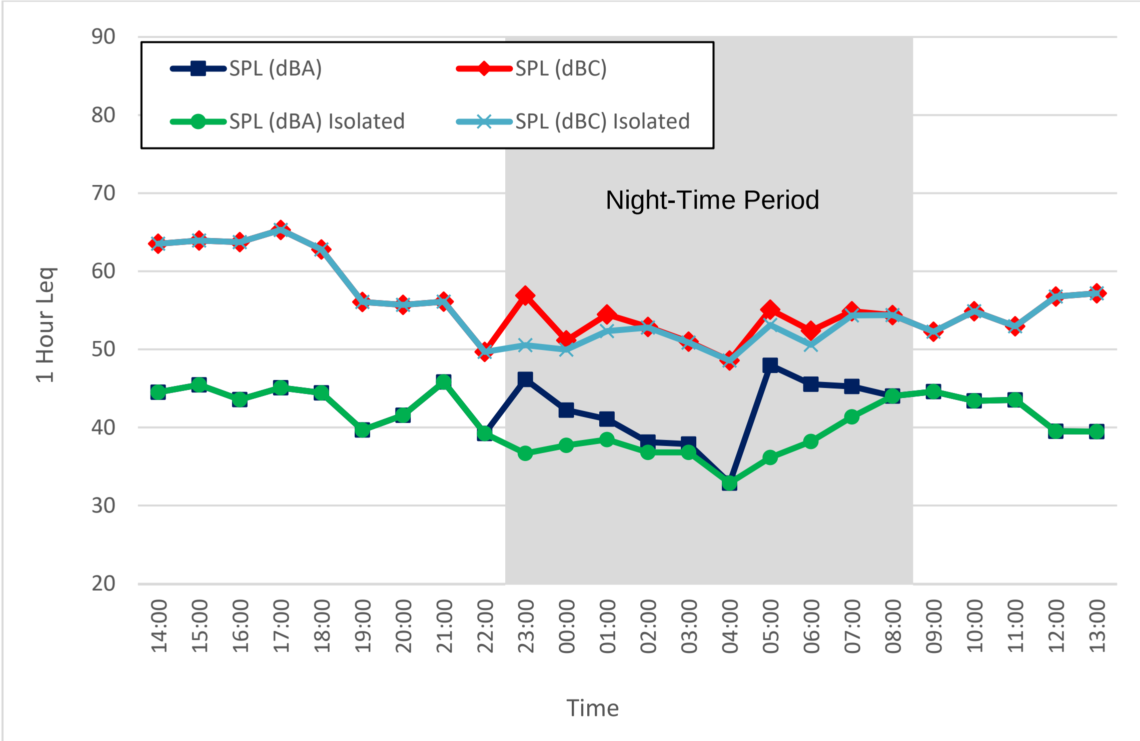

Figure 94. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

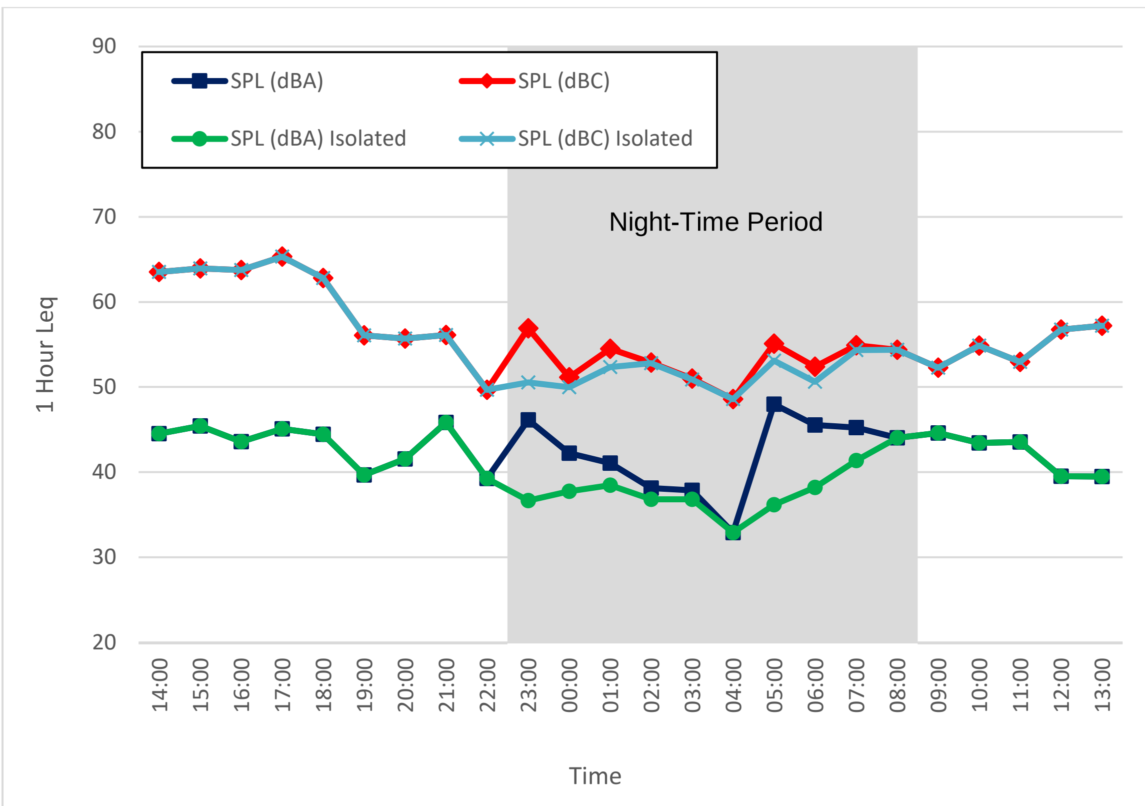

Figure 95. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

#12 - Period 2

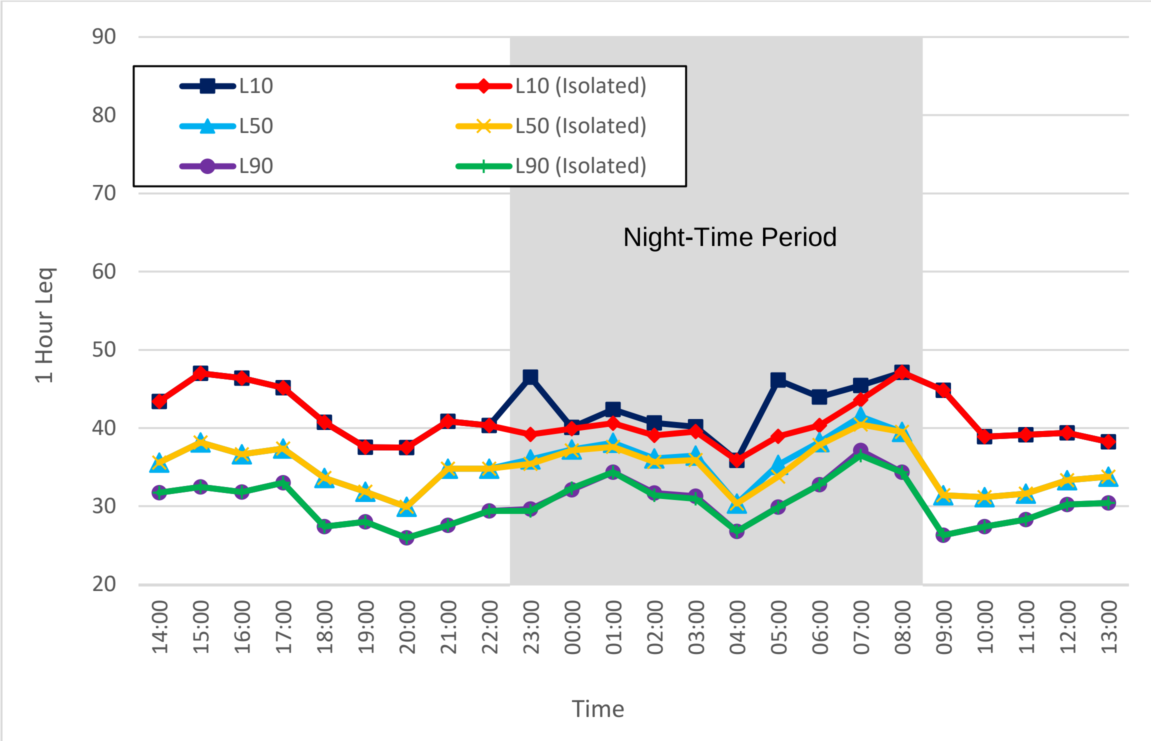

Figure 96. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

Noise Monitor

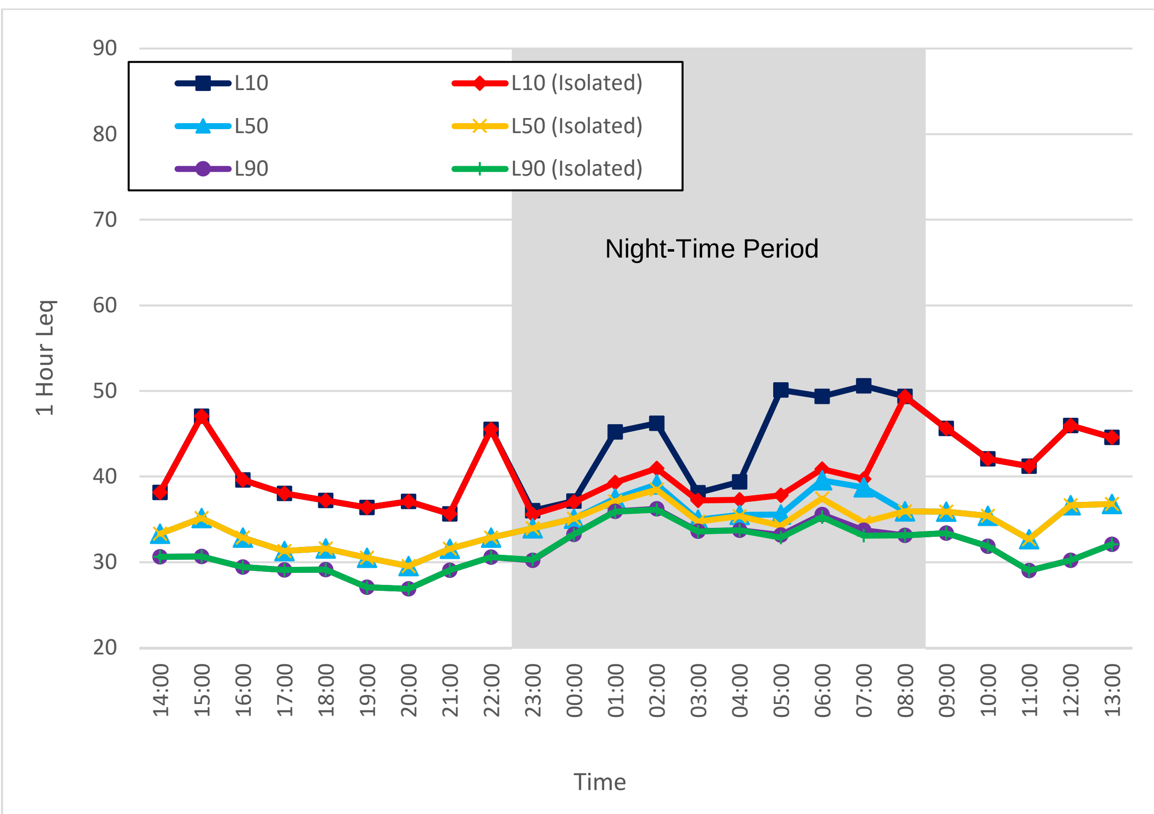

Figure 97. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

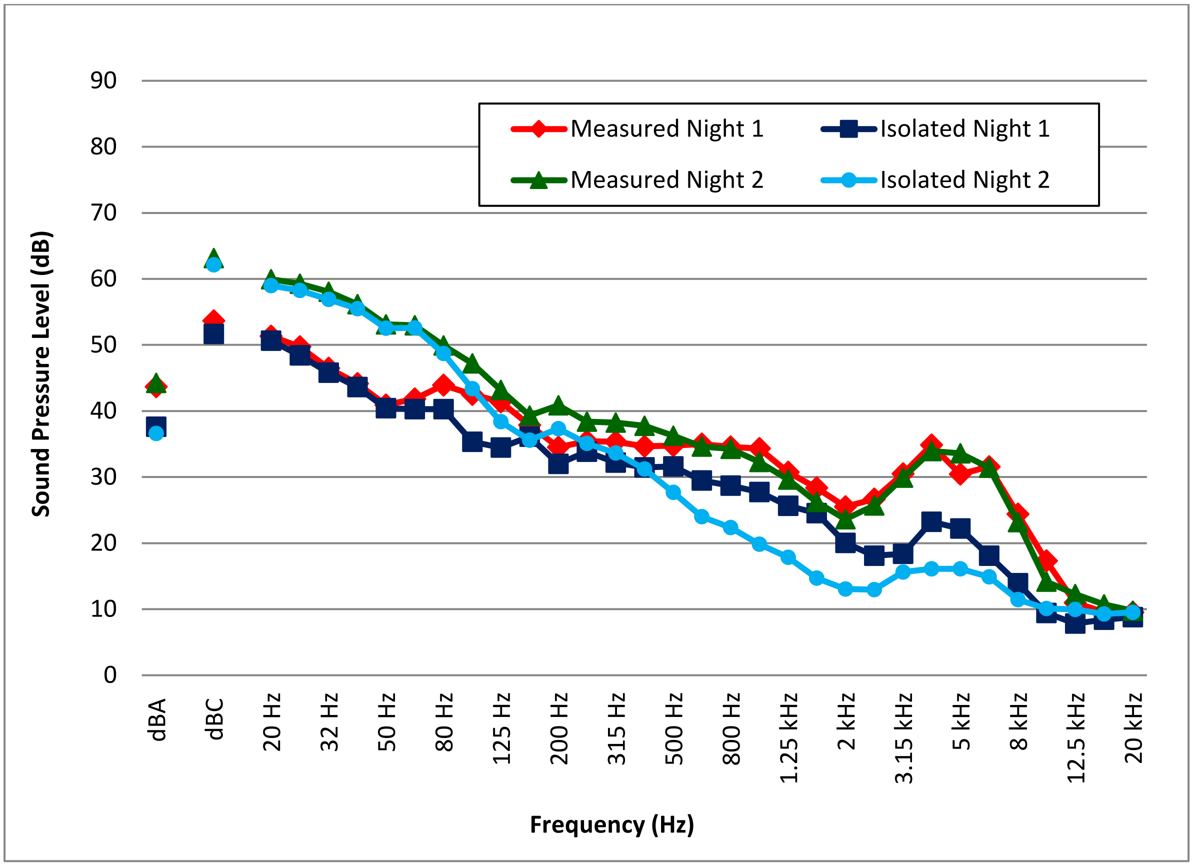

Figure 98. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)

Noise Monitor #13

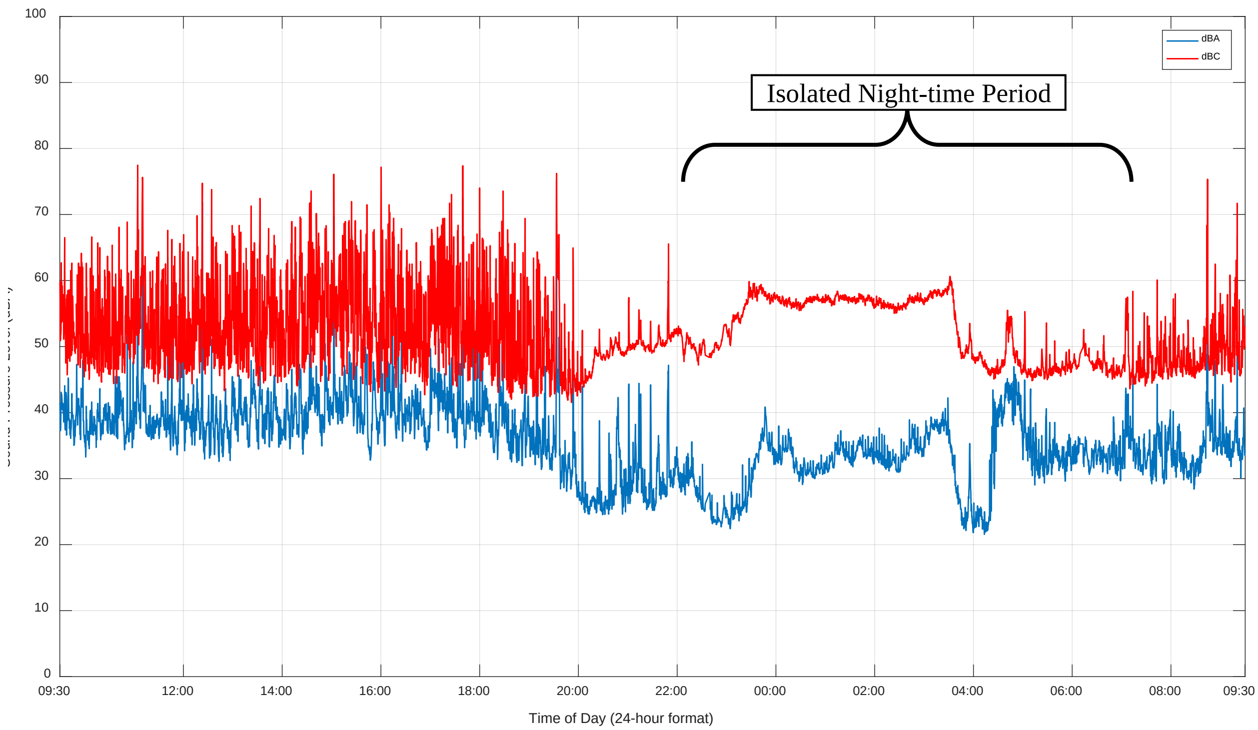

Figure 99. Noise Monitor #13, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

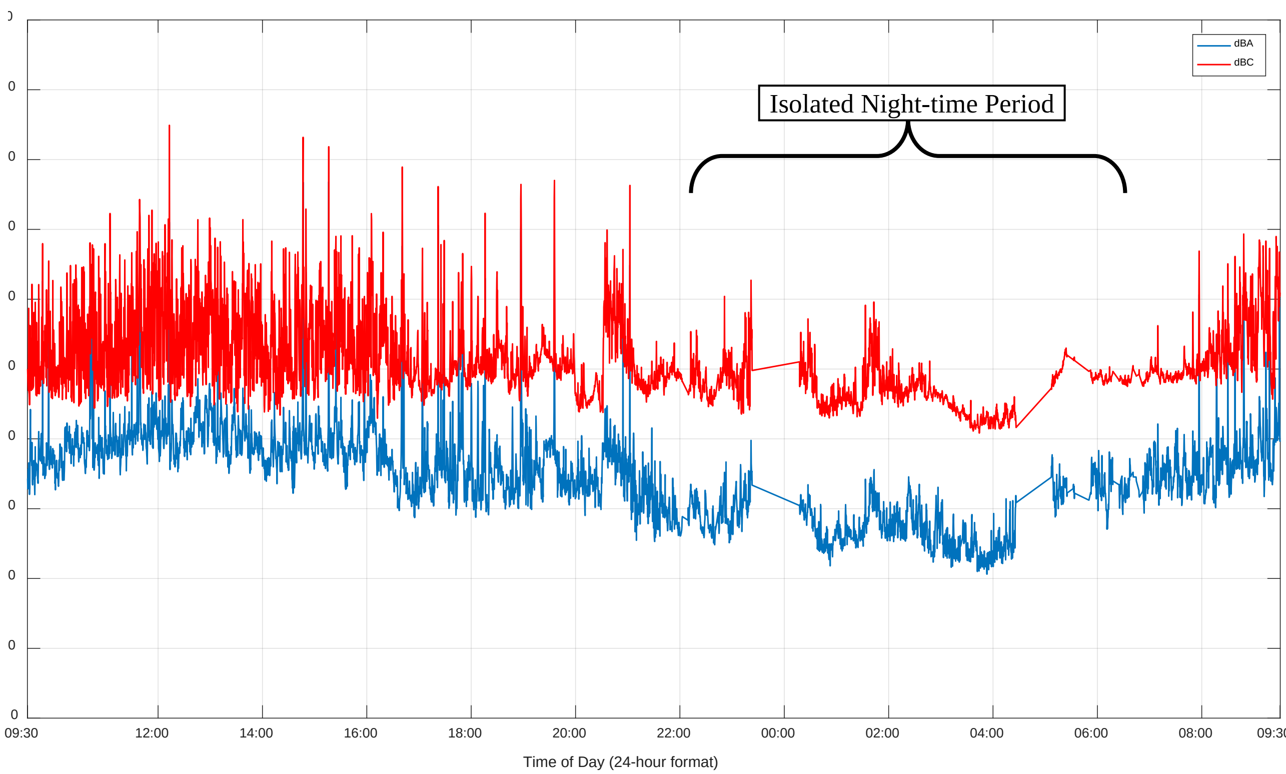

Figure 100. Noise Monitor #13, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

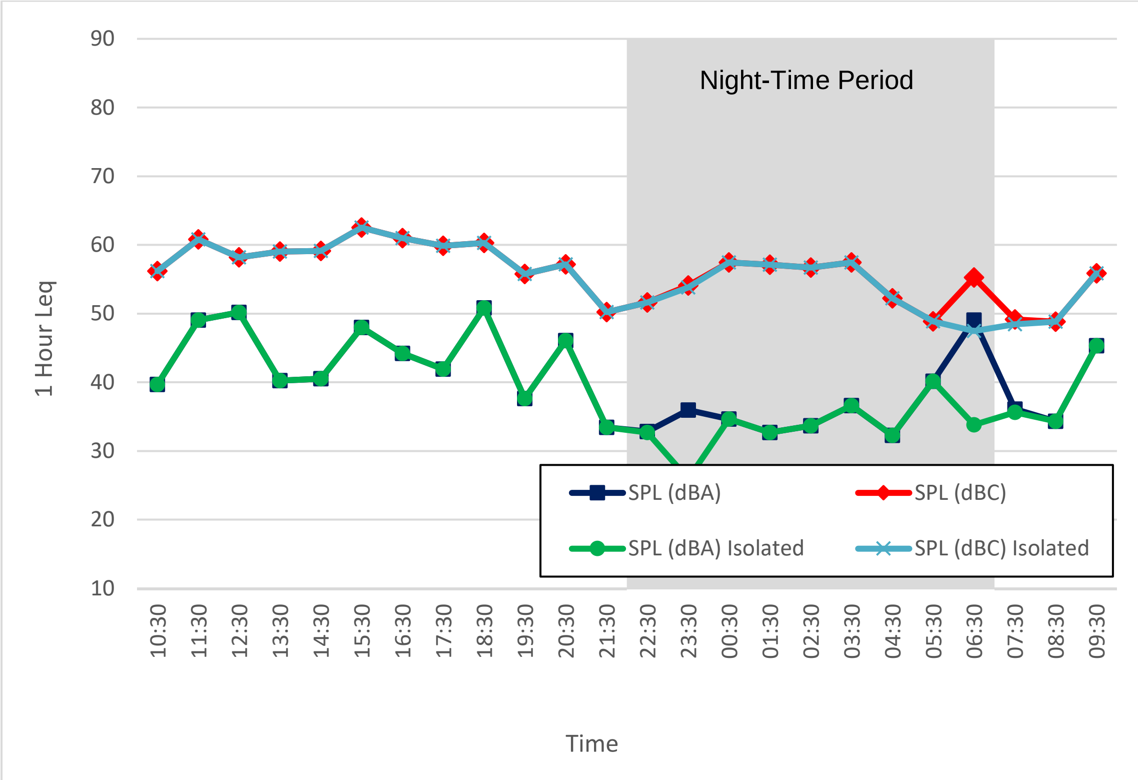

Figure 101. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

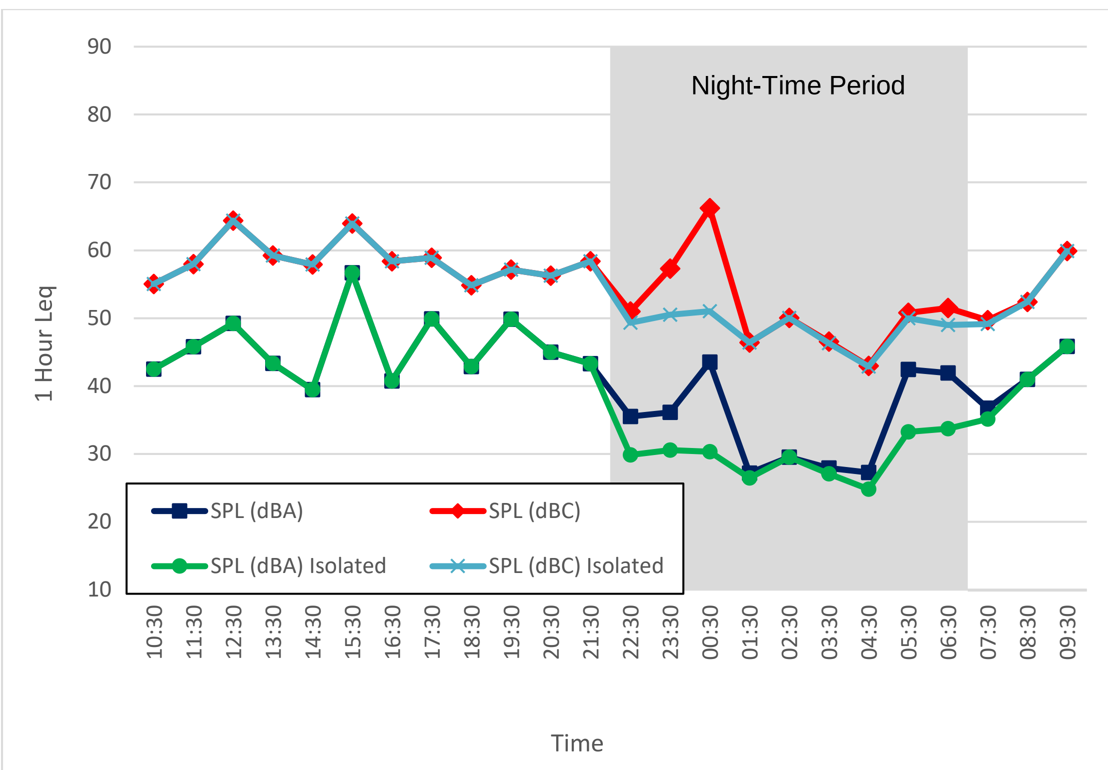

Figure 102. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

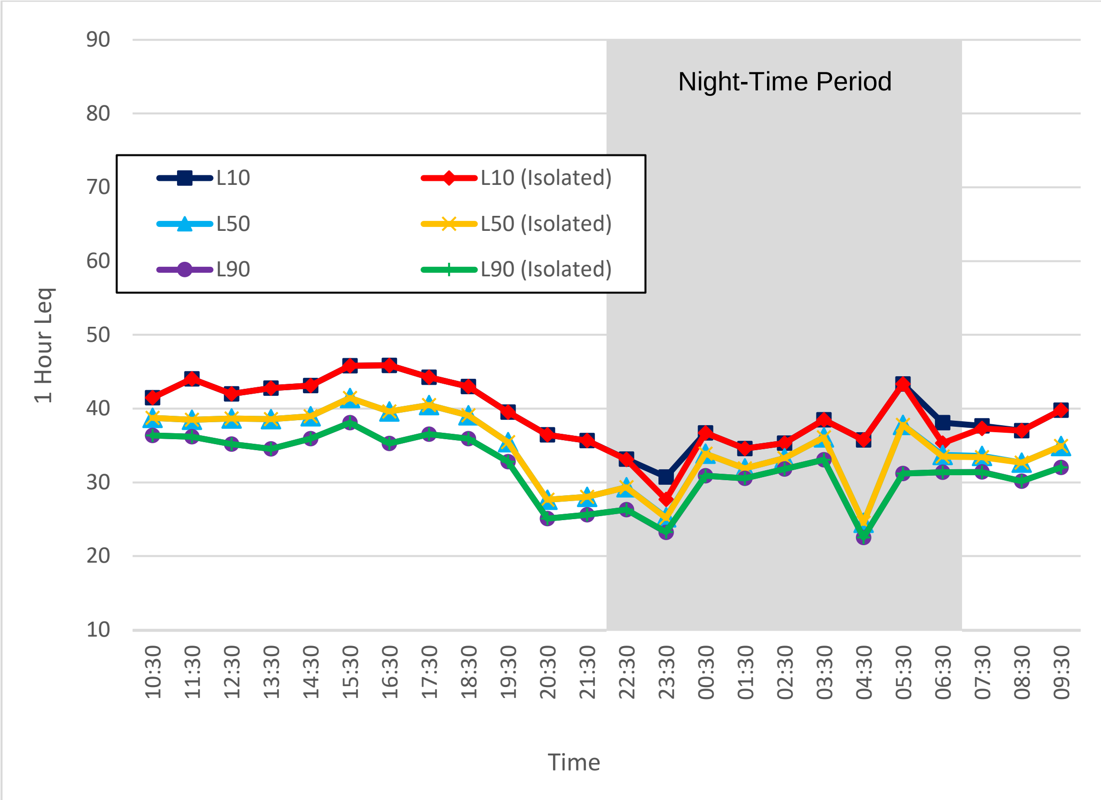

Figure 103. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

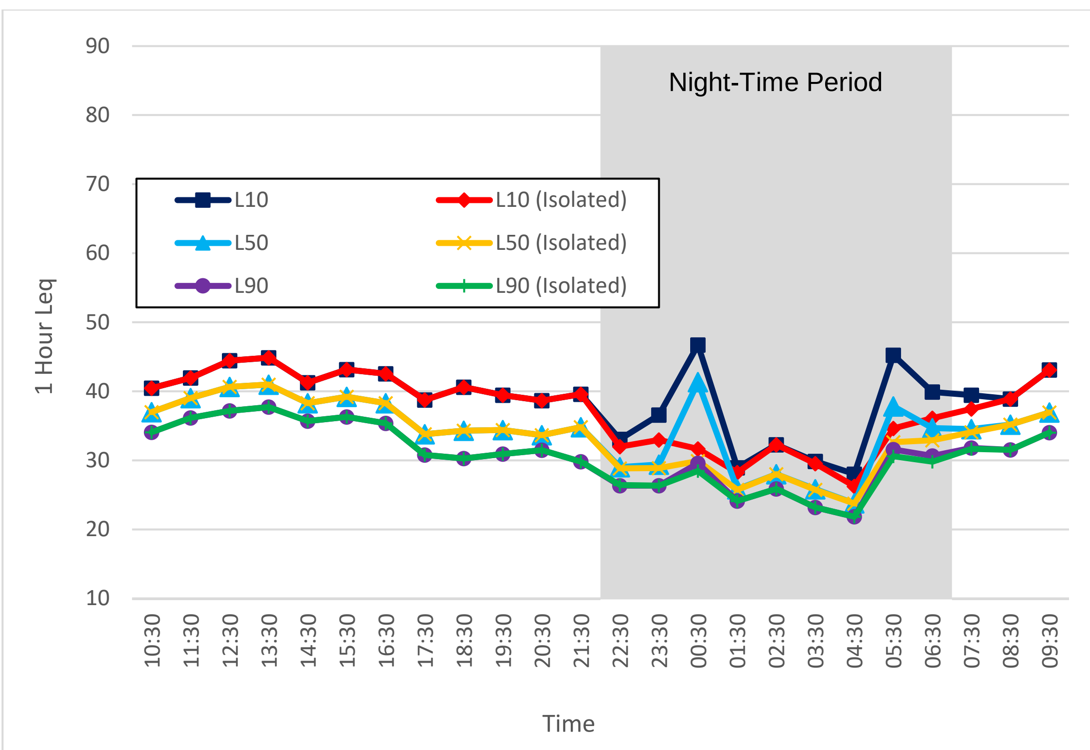

Figure 104. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

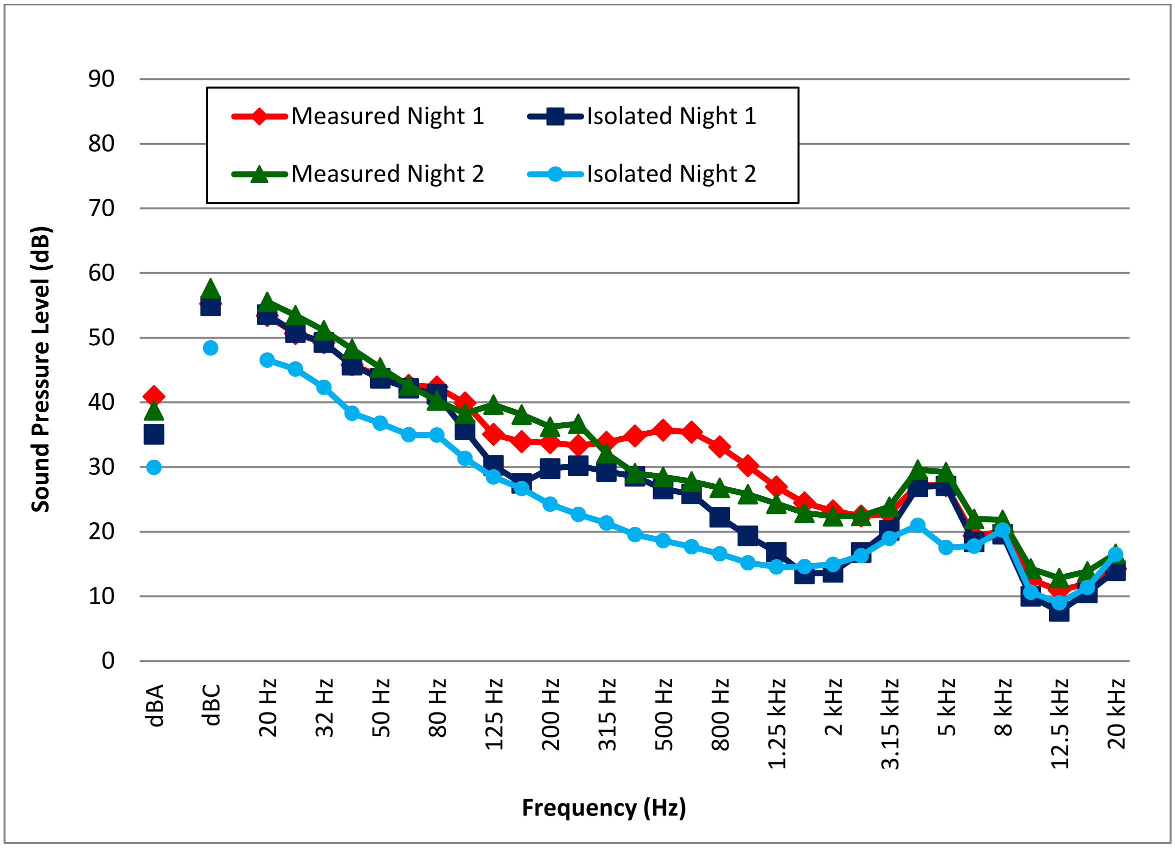

Figure 105. Noise Monitor #13, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

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 April 07, 2021 / April 07, 2021 / March 04, 2021 / March 04, 2021 April 07, 2021 / August 26, 2021 / April 07, 2021 / April 07, 2021 and the calibrator (type B&K 4231) was certified on January 24, 2022 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 / AUC Rule 012. 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	20-Jul-21	12:20	Pre	93.9 dBA	B&K 4231	2575493
Monitor #1	22-Jul-21	13:30	Post	93.9 dBA	B&K 4231	2575493
Monitor #2	22-Jul-21	11:30	Pre	93.9 dBA	B&K 4231	2575493
Monitor #2	24-Jul-21	19:30	Post	93.8 dBA	B&K 4231	2575493
Monitor #3	22-Jul-21	11:45	Pre	93.9 dBA	B&K 4231	2575493
Monitor #3	24-Jul-21	19:15	Post	93.9 dBA	B&K 4231	2575493
Monitor #4	20-Jul-21	11:25	Pre	93.9 dBA	B&K 4231	2575493
Monitor #4	22-Jul-21	12:05	Post	93.8 dBA	B&K 4231	2575493
Monitor #5	20-Jul-21	11:05	Pre	93.9 dBA	B&K 4231	2575493
Monitor #5	22-Jul-21	12:10	Post	93.8 dBA	B&K 4231	2575493
Monitor #6	20-Jul-21	10:40	Pre	93.9 dBA	B&K 4231	2575493
Monitor #6	22-Jul-21	12:35	Post	93.8 dBA	B&K 4231	2575493
Monitor #8	20-Jul-21	08:45	Pre	93.9 dBA	B&K 4231	2575493
Monitor #8	22-Jul-21	10:05	Post	93.9 dBA	B&K 4231	2575493
Monitor #9	22-Jul-21	10:30	Pre	93.9 dBA	B&K 4231	2575493
Monitor #9	24-Jul-21	20:05	Post	93.8 dBA	B&K 4231	2575493
Monitor #10	20-Jul-21	12:00	Pre	93.9 dBA	B&K 4231	2575493
Monitor #10	22-Jul-21	14:00	Post	93.9 dBA	B&K 4231	2575493
Monitor #11	20-Jul-21	08:25	Pre	93.9 dBA	B&K 4231	2575493
Monitor #11	22-Jul-21	09:50	Post	93.9 dBA	B&K 4231	2575493
Monitor #12 #1	20-Jul-21	10:00	Pre	93.9 dBA	B&K 4231	2575493
Monitor #12 #1	22-Jul-21	12:55	Post	93.8 dBA	B&K 4231	2575493
Monitor #12 #2	22-Jul-21	12:55	Pre	93.9 dBA	B&K 4231	2575493
Monitor #12 #2	24-Jul-21	18:30	Post	93.9 dBA	B&K 4231	2575493
Monitor #13	20-Jul-21	09:05	Pre	93.9 dBA	B&K 4231	2575493
Monitor #13	22-Jul-21	09:40	Post	93.8 dBA	B&K 4231	2575493

B&K 2270 Unit #2 SLM Calibration Certificate

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: ACI ACCOUSTICAL CONSULTANTS IN
5031-210 STREET NW
EDMONTON, AB T6M 0A8

PO Number: BILAWCHUK

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY

ANAB AC-2489.07

ilac-MRA

Certificate/SO Number: 17-Q1X3X-100-1 Revision 0

Manufacturer: Bruel & Kjaer
Model Number: 2270
Description: Sound Level Meter
Serial Number: 3002718/2850742
ID: UNIT 2

As-Found: In Tolerance
As-Left: In Tolerance

Issue Date: Apr 07, 2021
Calibration Date: Apr 07, 2021

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC28548-3

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2017. Accredited calibrations performed within the Lab?s Scope of Accreditation are indicated by the presence of the Accrediting Body?s Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab?s Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000, the customer?s Purchase Order and/or Quality Agreement requirements, ISO 9001:2015, ANSI/NCSL Z540.1-1994 (R2002) or NQA-1, as applicable. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed on this certificate.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology(NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

A binary decision rule, utilizing simple acceptance, and simple rejection criteria is used for the determination of compliance, unless otherwise superseded by the client?s Decision Rule. When Calibration Tolerance compliance statements are present, they are reported without factoring in the effects of uncertainty and comply with the guidelines established by ASME B89.7.3.1-2001(R2019) as follows:
-The acceptance zone is defined as: less than or equal to the high calibration tolerance limit, and/or greater than or equal to the low calibration tolerance limit. The rejection zones are defined as greater than the high calibration tolerance limit and/or less than the low calibration tolerance limit.
-Single measurement results in the acceptance zone are be identified as in-tolerance. Single measurement results in the rejection zone are identified as out-of-tolerance (OOT).
-When all measurement results are in the acceptance zone for repeated measurements, for the same characteristic, the test is identified as in-tolerance. For repeated characteristic measurements, a single measurement result in the rejection zone, will cause the test to be identified as out-of-tolerance (OOT).

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers(OEM?s) warranted specifications or the client?s requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: March 19, 2021
Service Level : R9

Certificate - Page 1 of 7

Customer Number: 9-330269-000
OPS-F20-014R8 04/01/21 FP014R0 4/2/2021

B&K 4231 Unit #2 Calibrator Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.47413

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **1/24/2022** *Cal Due:*		
Model:	**4231**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2575493**	*Out of tolerance:*		
Class (IEC 60942):	**1**	*See comments:*		
Barometer type:		*Contains non-accredited tests:* __Yes **X** No		
Barometer s/n:				
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	31052	Nov 8, 2021	Scantek, Inc./ NVLAP	Nov 8, 2022
DS-360-SRS	Function Generator	88077	Dec 3, 2020	ACR Env./ A2LA	Dec 3, 2022
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
PTU300-Vaisala	EnvironmentalMonitor	P5011262	Sept 10, 2021	ACR Env./ A2LA	Sept 10, 2022
140-Norsonic	Real Time Analyzer	1406423	Nov 8, 2021	Scantek / NVLAP	Nov 8, 2022
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Nov 8, 2021	Scantek, Inc. / NVLAP	Nov 8, 2022
1203-Norsonic	Preamplifier	14059	March 3, 2021	Scantek, Inc./ NVLAP	March 3, 2022

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

Calibrated by:	Bailey Partoza	Authorized signatory:	William Gallagher
Signature		Signature	
Date	1/24/22	Date	1/25/2022

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 as: Y:\Calibration Lab\Cal 2022\BNK4231_2575493_M2.doc

Page 1 of 2

B&K 2270 Unit #3 SLM Calibration Certificates

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: ACI ACCOUSTICAL CONSULTANTS IN
5031-210 STREET NW
EDMONTON, AB T6M 0A8

PO Number: BILAWCHUK

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY
ANAB AC-2489.07

ilac-MRA

Certificate/SO Number: 17-Q1X3X-80-1 Revision 0

Manufacturer: Bruel & Kjaer
Model Number: 2270
Description: Sound Level Meter
Serial Number: 3002730/2850741
ID: UNIT 3

As-Found: In Tolerance
As-Left: In Tolerance

Issue Date: Apr 07, 2021
Calibration Date: Apr 07, 2021

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC28548-3

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2017. Accredited calibrations performed within the Lab?s Scope of Accreditation are indicated by the presence of the Accrediting Body?s Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab?s Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000, the customer?s Purchase Order and/or Quality Agreement requirements, ISO 9001:2015, ANSI/NCSL Z540.1-1994 (R2002) or NQA-1, as applicable. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed on this certificate.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology(NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

A binary decision rule, utilizing simple acceptance, and simple rejection criteria is used for the determination of compliance, unless otherwise superseded by the client?s Decision Rule. When Calibration Tolerance compliance statements are present, they are reported without factoring in the effects of uncertainty and comply with the guidelines established by ASME B89.7.3.1-2001 (R2019) as follows:
-The acceptance zone is defined as: less than or equal to the high calibration tolerance limit, and/or greater than or equal to the low calibration tolerance limit. The rejection zones are defined as greater than the high calibration tolerance limit and/or less than the low calibration tolerance limit.
-Single measurement results in the acceptance zone are be identified as in-tolerance. Single measurement results in the rejection zone are identified as out-of-tolerance (OOT).
-When all measurement results are in the acceptance zone for repeated measurements, for the same characteristic, the test is identified as in-tolerance. For repeated characteristic measurements, a single measurement result in the rejection zone, will cause the test to be identified as out-of-tolerance (OOT).

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers(OEM?s) warranted specifications or the client?s requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: March 19, 2021
Service Level : R9

Certificate - Page 1 of 7

Customer Number: 9-330269-000
OPS-F20-014R8 04/01/21 FP014R0 4/2/2021

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.46085

Instrument:	**Sound Level Meter**
Model:	**2270**
Manufacturer:	**Brüel and Kjær**
Serial number:	**2644639**
Tested with:	**Microphone 4189 s/n 2595637** **Preamplifier ZC0032 s/n 5842**
Type (class):	**1**
Customer:	**ACI Acoustical Consultants Inc.**
Tel/Fax:	**780-414-6373 / 780-414-6376**

Date Calibrated: **3/5/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021

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	100.24	39.5

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William D. Gallagher
Signature	Lydon Dawkins	Signature	William D. Gallagher
Date	3/5/2021	Date	3/5/2021

Document stored Y:\Calibration Lab\SLM 2021\BNK2270_2644639_M1.doc Page 1 of 2

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.46086

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2595637**
Composed of:

Date Calibrated: **3/4/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021
1203-Norsonic	Preamplifier	14059	March 3, 2021	Scantek, Inc./ NVLAP	March 3, 2022
4180-Brüel&Kjær	Microphone	2246115	Oct 1, 2019	DPLA / DANAK	Oct 1, 2021

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

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William D. Gallagher
Signature	Lydon Dawkins	Signature	William D Gallagher
Date	3/4/2021	Date	3/5/2021

Document stored as: Y:\Calibration Lab\Mic 2021\B&K4189_2595637_M1.doc Page 1 of 2

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.46081

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2722894**
Tested with: **Microphone 4189 s/n 271977**
Preamplifier ZC0032 s/n 13895
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **3/4/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021

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 (%)
22.8	99.52	44.9

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William D. Gallagher
Signature	Lydon Dawkins	Signature	William D Gallagher
Date	3/4/2021	Date	3/5/2021

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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.46082

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **271977**
Composed of:

Date Calibrated: **3/4/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021
1203-Norsonic	Preamplifier	14059	March 3, 2021	Scantek, Inc./ NVLAP	March 3, 2022
4180-Brüel&Kjær	Microphone	2246115	Oct 1, 2019	DPLA / DANAK	Oct 1, 2021

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

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William D. Gallagher
Signature	Lydon Dawkins	Signature	William D Gallagher
Date	3/4/2021	Date	3/5/2021

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.
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B&K 2250 Unit #7 SLM and Mic Calibration Certificate

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: ACI ACCOUSTICAL CONSULTANTS IN
5031-210 STREET NW
EDMONTON, AB T6M 0A8

PO Number: BILAWCHUK

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY
ANAB AC-2489.07

ilac-MRA

Certificate/SO Number: 17-Q1X3X-20-1 Revision 0

Manufacturer: Bruel & Kjaer
Model Number: 2250
Description: Sound Level Meter
Serial Number: 2722859/2710791
ID: UNIT #7

As-Found: In Tolerance
As-Left: In Tolerance

Issue Date: Apr 07, 2021
Calibration Date: Apr 07, 2021

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC28548-3

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2017. Accredited calibrations performed within the Lab?s Scope of Accreditation are indicated by the presence of the Accrediting Body?s Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab?s Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000, the customer?s Purchase Order and/or Quality Agreement requirements, ISO 9001:2015, ANSI/NCSL Z540.1-1994 (R2002) or NQA-1, as applicable. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed on this certificate.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology(NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

A binary decision rule, utilizing simple acceptance, and simple rejection criteria is used for the determination of compliance, unless otherwise superseded by the client?s Decision Rule. When Calibration Tolerance compliance statements are present, they are reported without factoring in the effects of uncertainty and comply with the guidelines established by ASME B89.7.3.1-2001 (R2019) as follows:
-The acceptance zone is defined as: less than or equal to the high calibration tolerance limit, and/or greater than or equal to the low calibration tolerance limit. The rejection zones are defined as greater than the high calibration tolerance limit and/or less than the low calibration tolerance limit.
-Single measurement results in the acceptance zone are be identified as in-tolerance. Single measurement results in the rejection zone are identified as out-of-tolerance (OOT).
-When all measurement results are in the acceptance zone for repeated measurements, for the same characteristic, the test is identified as in-tolerance. For repeated characteristic measurements, a single measurement result in the rejection zone, will cause the test to be identified as out-of-tolerance (OOT).

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers(OEM?s) warranted specifications or the client?s requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: March 19, 2021
Service Level : R9

Certificate - Page 1 of 7

Customer Number: 9-330269-000
OPS-F20-014R8 04/01/21 FP014R0 4/2/2021

B&K 2250 Unit #8 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.46829

Instrument:	**Sound Level Meter**
Model:	**2250**
Manufacturer:	**Brüel and Kjær**
Serial number:	**3028218**
Tested with:	**Microphone 4189 s/n 2851039** **Preamplifier ZC0032 s/n 20742**
Type (class):	**1**
Customer:	**ACI Acoustical Consultants Inc.**
Tel/Fax:	**780-414-6373 / 780-414-6376**

Date Calibrated: **8/26/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021

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 (%)
22.1	100.31	40.9

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	8/26/2021	Date	8/27/2021

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.
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B&K 2250 Unit #8 Microphone Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.46830

Instrument: **Microphone**
Model: **4189**
Manufacturer: **Brüel & Kjær**
Serial number: **2851039**
Composed of:

Date Calibrated: **8/24/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021
1203-Norsonic	Preamplifier	14059	March 3, 2021	Scantek, Inc./ NVLAP	March 3, 2022
4180-Brüel&Kjær	Microphone	2246115	Oct 1, 2019	DPLA / DANAK	Oct 1, 2021

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

Calibrated by:	Lydon Dawkins	Authorized signatory:	William Gallagher
Signature	Lydon Dawkins	Signature	William D Gallagher
Date	8/24/2021	Date	8/27/2021

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B&K 2250 Unit #9 SLM Calibration Certificate

CALIBRATED BY TRANSCAT CERTIFICATE OF CALIBRATION

Customer: ACI ACCOUSTICAL CONSULTANTS IN
5031-210 STREET NW
EDMONTON, AB T6M 0A8

PO Number: BILAWCHUK

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY
ANAB AC-2489.07

ilac-MRA

Certificate/SO Number: 17-Q1X3X-40-1 Revision 0

Manufacturer: Bruel & Kjaer
Model Number: 2250
Description: Sound Level Meter
Serial Number: 3027810/3195885
ID: UNIT 9

As-Found: In Tolerance
As-Left: In Tolerance

Issue Date: Apr 07, 2021
Calibration Date: Apr 07, 2021

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC28548-3

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2017. Accredited calibrations performed within the Lab?s Scope of Accreditation are indicated by the presence of the Accrediting Body?s Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab?s Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000, the customer?s Purchase Order and/or Quality Agreement requirements, ISO 9001:2015, ANSI/NCSL Z540.1-1994 (R2002) or NQA-1, as applicable. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed on this certificate.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology(NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

A binary decision rule, utilizing simple acceptance, and simple rejection criteria is used for the determination of compliance, unless otherwise superseded by the client?s Decision Rule. When Calibration Tolerance compliance statements are present, they are reported without factoring in the effects of uncertainty and comply with the guidelines established by ASME B89.7.3.1-2001 (R2019) as follows:
-The acceptance zone is defined as: less than or equal to the high calibration tolerance limit, and/or greater than or equal to the low calibration tolerance limit. The rejection zones are defined as greater than the high calibration tolerance limit and/or less than the low calibration tolerance limit.
-Single measurement results in the acceptance zone are be identified as in-tolerance. Single measurement results in the rejection zone are identified as out-of-tolerance (OOT).
-When all measurement results are in the acceptance zone for repeated measurements, for the same characteristic, the test is identified as in-tolerance. For repeated characteristic measurements, a single measurement result in the rejection zone, will cause the test to be identified as out-of-tolerance (OOT).

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers(OEM?s) warranted specifications or the client?s requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: March 19, 2021
Service Level : R9

Certificate - Page 1 of 7

Customer Number: 9-330269-000
OPS-F20-014R8 04/01/21 FP014R0 4/2/2021

B&K 2250 Unit #10 SLM Calibration Certificate

CALIBRATED BY TRANSCAT

CERTIFICATE OF CALIBRATION

Customer: ACI ACCOUSTICAL CONSULTANTS IN
5031-210 STREET NW
EDMONTON, AB T6M 0A8

PO Number: BILAWCHUK

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY
ANAB AC-2489.07
ilac-MRA

Certificate/SO Number: 17-Q1X3X-60-1 Revision 0

Manufacturer: Bruel & Kjaer
Model Number: 2250
Description: Sound Level Meter
Serial Number: 3007542/2978664
ID: UNIT #10

As-Found: In Tolerance
As-Left: In Tolerance

Issue Date: Apr 07, 2021
Calibration Date: Apr 07, 2021

Calibrated To: Manufacturer Specification
Calibration Procedure: 1-AC28548-3

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2017. Accredited calibrations performed within the Lab?s Scope of Accreditation are indicated by the presence of the Accrediting Body?s Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab?s Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000, the customer?s Purchase Order and/or Quality Agreement requirements, ISO 9001:2015, ANSI/NCSL Z540.1-1994 (R2002) or NQA-1, as applicable. Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed on this certificate.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology(NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

A binary decision rule, utilizing simple acceptance, and simple rejection criteria is used for the determination of compliance, unless otherwise superseded by the client?s Decision Rule. When Calibration Tolerance compliance statements are present, they are reported without factoring in the effects of uncertainty and comply with the guidelines established by ASME B89.7.3.1-2001(R2019) as follows:
-The acceptance zone is defined as: less than or equal to the high calibration tolerance limit, and/or greater than or equal to the low calibration tolerance limit. The rejection zones are defined as greater than the high calibration tolerance limit and/or less than the low calibration tolerance limit.
-Single measurement results in the acceptance zone are be identified as in-tolerance. Single measurement results in the rejection zone are identified as out-of-tolerance (OOT).
-When all measurement results are in the acceptance zone for repeated measurements, for the same characteristic, the test is identified as in-tolerance. For repeated characteristic measurements, a single measurement result in the rejection zone, will cause the test to be identified as out-of-tolerance (OOT).

Uncertainties are reported with a coverage factor k=2, providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm³.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers(OEM?s) warranted specifications or the client?s requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

Date Received: March 19, 2021
Service Level : R9

Certificate - Page 1 of 7

Customer Number: 9-330269-000
OPS-F20-014R8 04/01/21 FP014R0 4/2/2021

Appendix II THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

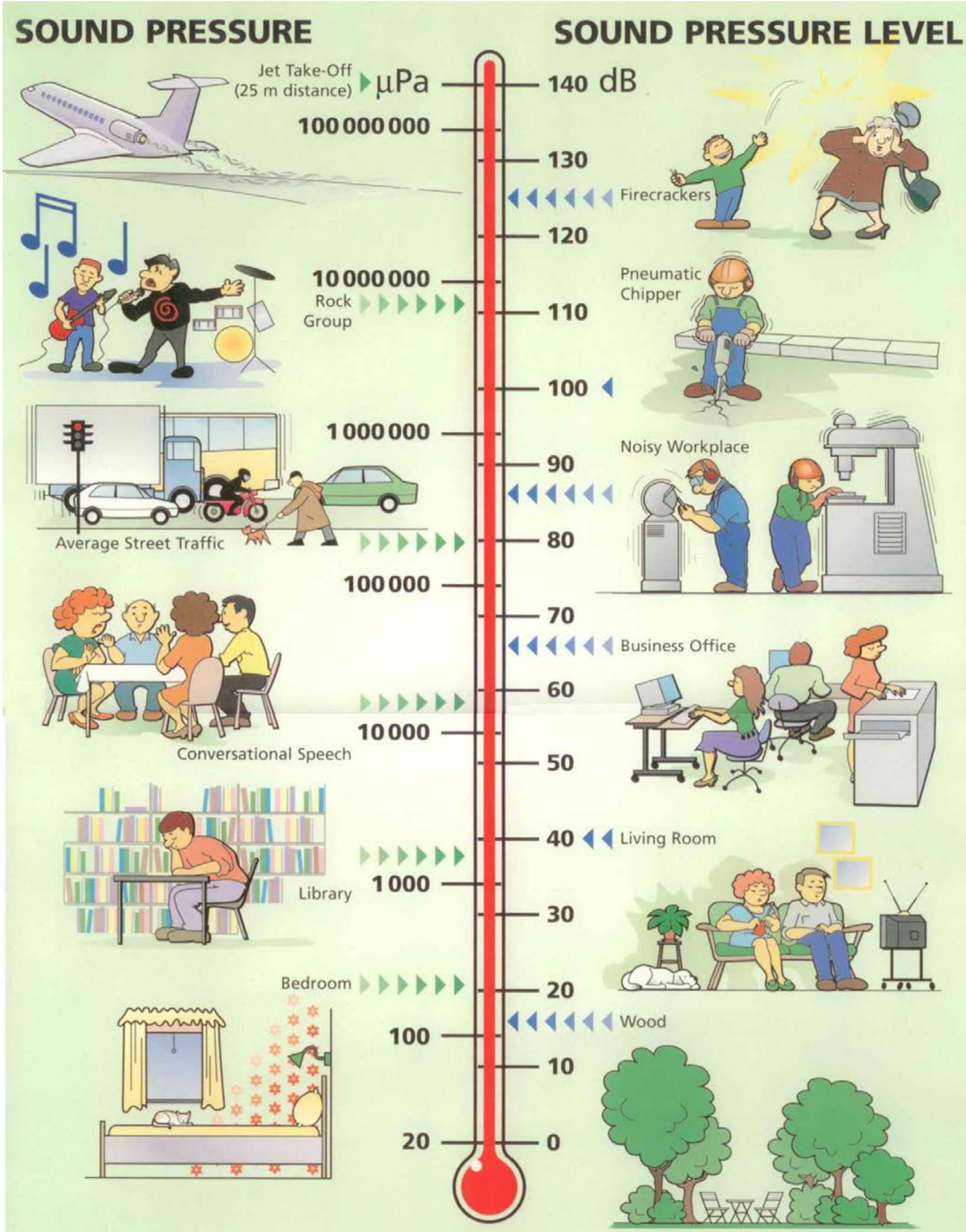
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we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

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

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



acoustical consultants inc

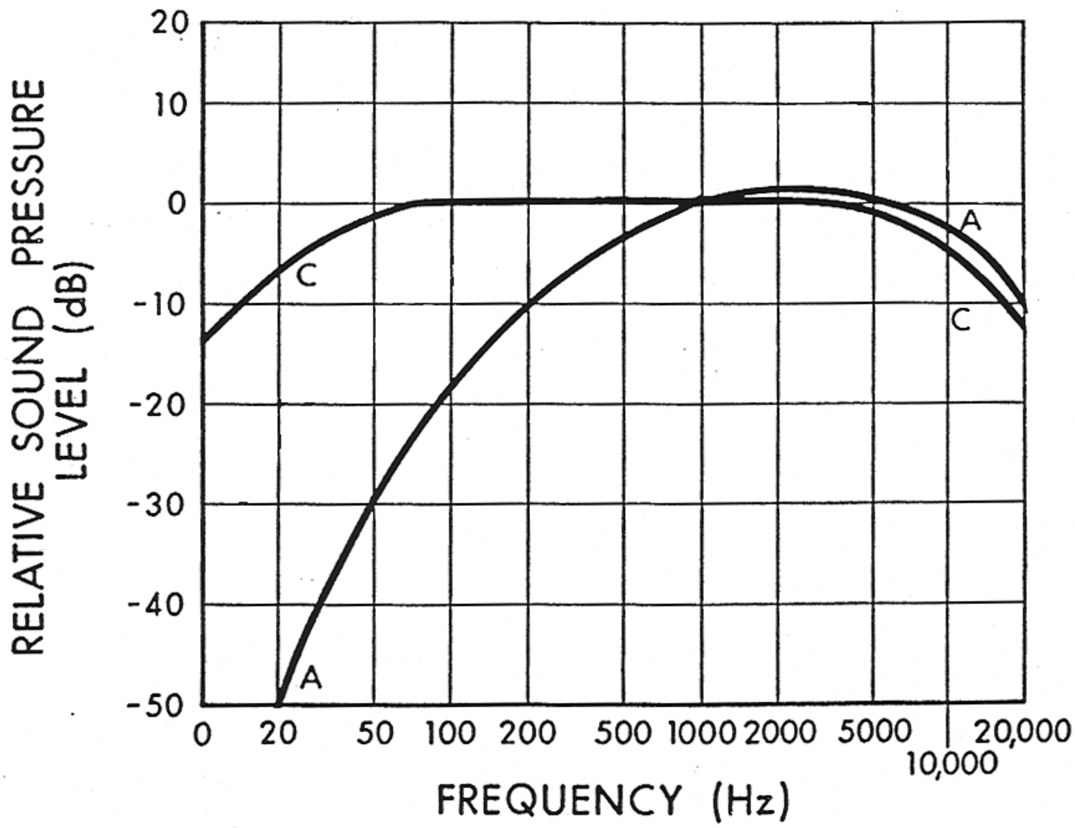
Frequency

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

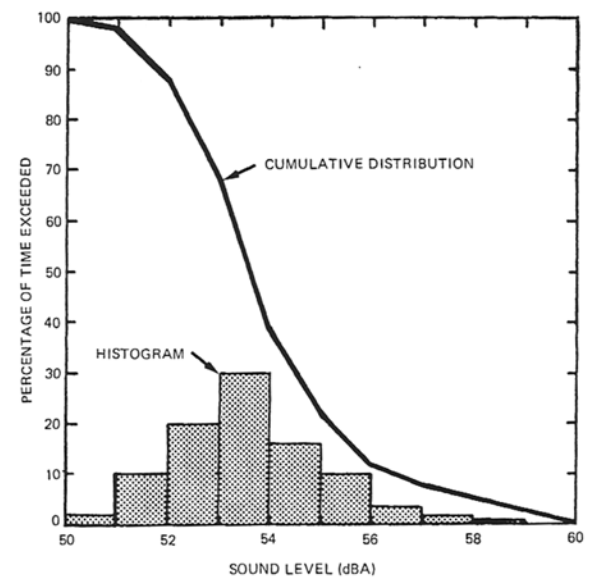


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

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

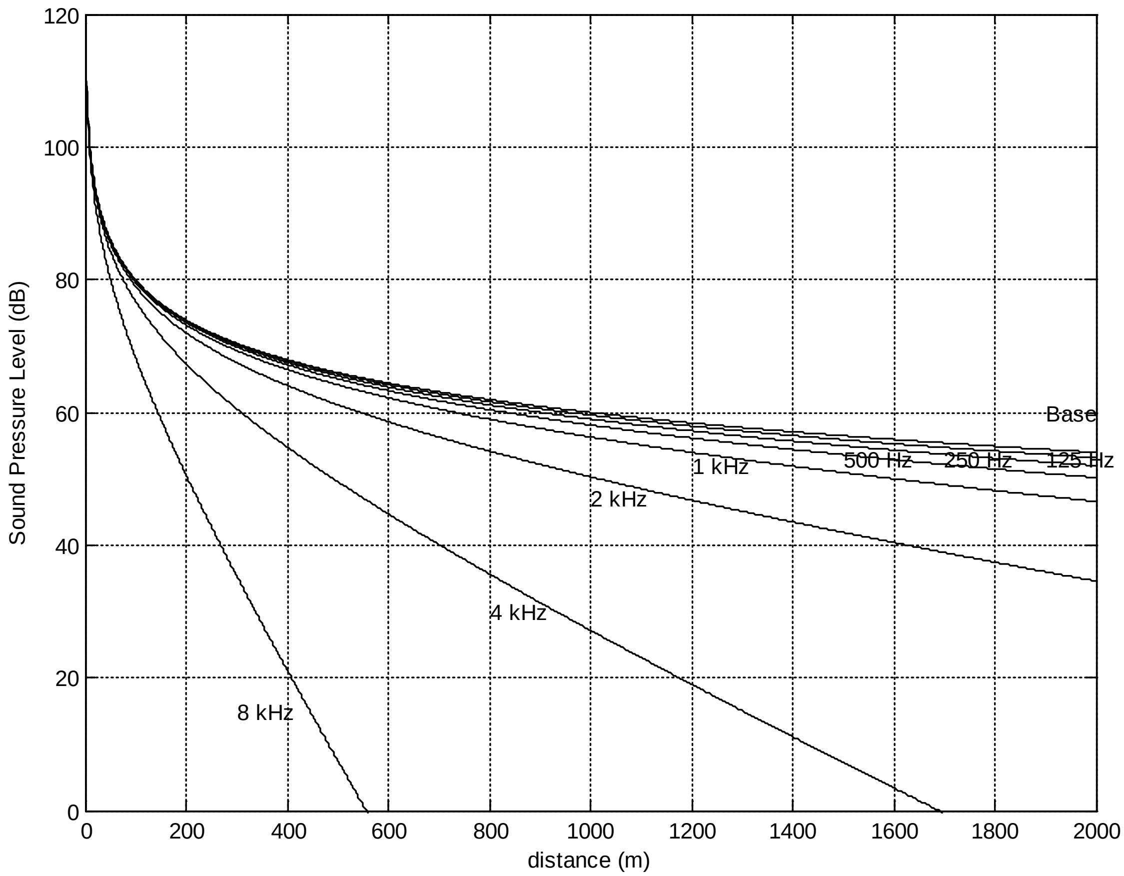
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

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 °C	Relative Humidity (%)	Frequency (Hz)					
		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

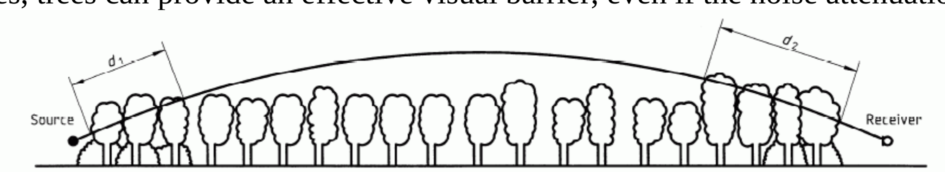
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of 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
	Attenuation, dB:							
$10 \leq d_f \leq 20$	0	0	1	1	1	1	2	3
	Attenuation, dB/m:							
$20 \leq d_f \leq 200$	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

[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

[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	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:19	7/20/22 22:21	51.9	2	Emergency Sirens
7/21/22 01:54	7/21/22 01:56	53.2	1.25	Loud Vehicle Passby
7/21/22 01:57	7/21/22 01:59	52.4	1.75	Aircraft Flyover
7/21/22 03:35	7/21/22 03:36	49.0	1	Loud Vehicle Passby
7/21/22 03:37	7/21/22 03:38	48.6	1.5	Loud Vehicle Passby
7/21/22 03:53	7/21/22 03:53	50.3	0.75	Loud Vehicle Passby
7/21/22 04:04	7/21/22 04:06	53.4	2.25	Loud Vehicle Passby
7/21/22 04:32	7/21/22 04:33	50.7	0.75	Train Passby
7/21/22 04:43	7/21/22 04:45	52.7	1.5	Loud Vehicle Passby
7/21/22 05:00	7/21/22 05:01	57.5	0.5	Loud Vehicle Passby
7/21/22 05:06	7/21/22 05:07	55.4	0.75	Loud Vehicle Passby
7/21/22 05:10	7/21/22 05:11	55.0	1.5	Loud Vehicle Passby
7/21/22 05:18	7/21/22 05:19	56.4	0.5	Loud Vehicle Passby
7/21/22 05:27	7/21/22 05:28	54.1	1.25	Loud Vehicle Passby
7/21/22 05:30	7/21/22 05:30	56.3	0.5	Loud Vehicle Passby
7/21/22 05:48	7/21/22 05:49	57.1	0.75	Loud Vehicle Passby
7/21/22 05:57	7/21/22 05:58	57.0	0.5	Loud Vehicle Passby
7/21/22 06:04	7/21/22 06:05	54.9	1	Loud Vehicle Passby
7/21/22 06:10	7/21/22 06:11	54.9	0.5	Loud Vehicle Passby
7/21/22 06:17	7/21/22 06:19	55.0	1.75	Loud Vehicle Passby
7/21/22 06:32	7/21/22 06:34	53.8	1.75	Loud Vehicle Passby
7/21/22 06:43	7/21/22 06:45	55.8	2	Loud Vehicle Passby
7/21/22 06:53	7/21/22 06:54	55.0	1.25	Loud Vehicle Passby
7/21/22 06:54	7/21/22 06:55	54.6	1	Loud Vehicle Passby
7/22/22 03:13	7/22/22 03:14	51.4	1	Train Passby
7/22/22 03:39	7/22/22 03:40	48.4	1.25	Loud Vehicle Passby
7/22/22 03:53	7/22/22 03:54	48.6	1.25	Loud Vehicle Passby
7/22/22 03:55	7/22/22 03:56	57.9	1.25	Loud Vehicle Passby
7/22/22 04:55	7/22/22 04:57	52.2	1.5	Loud Vehicle Passby
7/22/22 05:01	7/22/22 05:03	53.6	2.75	Excessive Bird Noise
7/22/22 05:10	7/22/22 05:11	53.5	0.5	Loud Vehicle Passby
7/22/22 05:17	7/22/22 05:19	55.4	1.25	Loud Vehicle Passby
7/22/22 05:55	7/22/22 05:56	55.6	1	Train Passby
7/22/22 06:04	7/22/22 06:06	55.5	2.5	Loud Vehicle Passby
7/22/22 06:31	7/22/22 06:33	56.5	1.25	Train Passby
7/22/22 06:34	7/22/22 06:35	59.4	1.5	Loud Vehicle Passby
7/22/22 06:46	7/22/22 06:46	58.9	0.5	Loud Vehicle Passby
7/22/22 06:55	7/22/22 06:56	55.6	0.75	Loud Vehicle Passby
		Total Night #1	28.25	
		Total Night #2	18.25	
		Total Data	**46.5**	

Data Removal Noise Monitoring Location #2

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 22:05	7/22/22 22:06	60.6	0.5	Train Passby
7/22/22 22:18	7/22/22 22:19	68.5	1.5	Train Passby
7/22/22 22:30	7/22/22 22:31	57.5	1	Loud Vehicle Passby
7/22/22 22:36	7/22/22 22:36	60.1	0.75	Train Passby
7/22/22 22:42	7/22/22 22:43	72.3	1.25	Train Passby
7/22/22 22:51	7/22/22 22:53	57.0	1.25	Train Passby
7/22/22 22:56	7/22/22 22:57	53.5	1	Loud Vehicle Passby
7/22/22 22:58	7/22/22 22:59	57.7	1.5	Train Passby
7/22/22 23:14	7/22/22 23:15	54.2	1	Train Passby
7/22/22 23:16	7/22/22 23:17	53.1	0.75	Train Passby
7/22/22 23:53	7/22/22 23:54	52.9	1	Train Passby
7/23/22 00:09	7/23/22 00:09	52.5	0.75	Train Passby
7/23/22 00:16	7/23/22 00:18	54.0	2.5	Train Passby
7/23/22 00:26	7/23/22 00:27	54.3	0.5	Train Passby
7/23/22 00:39	7/23/22 00:41	54.6	1.75	Train Passby
7/23/22 01:07	7/23/22 01:08	52.4	1	Train Passby
7/23/22 01:09	7/23/22 01:10	51.5	1.25	Train Passby
7/23/22 01:13	7/23/22 01:14	51.3	1.25	Train Passby
7/23/22 02:11	7/23/22 02:12	53.0	0.75	Train Passby
7/23/22 03:02	7/23/22 03:03	53.8	1	Train Passby
7/23/22 04:19	7/23/22 04:20	56.1	0.75	Train Passby
7/23/22 04:26	7/23/22 04:26	57.6	0.75	Train Passby
7/23/22 04:33	7/23/22 04:34	58.2	0.75	Train Passby
7/23/22 04:34	7/23/22 04:35	57.7	1	Train Passby
7/23/22 04:35	7/23/22 04:36	55.7	0.75	Train Passby
7/23/22 04:40	7/23/22 04:41	53.1	1.25	Train Passby
7/23/22 04:50	7/23/22 04:53	54.3	3.5	Train Passby
7/23/22 04:55	7/23/22 04:56	53.1	0.75	Train Passby
7/23/22 05:11	7/23/22 05:13	52.8	1.25	Train Passby
7/23/22 05:14	7/23/22 05:16	55.4	1.25	Train Passby
7/23/22 05:17	7/23/22 05:18	54.7	0.75	Train Passby
7/23/22 05:38	7/23/22 05:39	54.3	1	Train Passby
7/23/22 05:45	7/23/22 05:46	57.4	1	Train Passby
7/23/22 05:46	7/23/22 05:47	54.8	1.5	Train Passby
7/23/22 05:48	7/23/22 05:52	57.1	3.5	Excessive Bird Noise
7/23/22 06:08	7/23/22 06:10	55.2	1.5	Loud Vehicle Passby
7/23/22 06:22	7/23/22 06:23	54.1	1	Train Passby
7/23/22 06:24	7/23/22 06:25	52.0	1	Train Passby
7/23/22 06:40	7/23/22 06:41	53.3	0.75	Train Passby
7/23/22 06:47	7/23/22 06:49	52.9	1.75	Train Passby
7/23/22 06:52	7/23/22 06:53	52.9	1	Train Passby
7/23/22 22:07	7/23/22 22:11	66.5	4	Train Passby
7/23/22 22:28	7/23/22 22:29	67.8	1.5	Train Passby
7/23/22 22:33	7/23/22 22:35	63.0	1.75	Train Passby
7/23/22 22:49	7/23/22 22:49	53.9	0.75	Loud Vehicle Passby
7/23/22 23:03	7/23/22 23:04	54.7	1	Loud Vehicle Passby
7/23/22 23:05	7/23/22 23:06	54.9	1	Loud Vehicle Passby
7/23/22 23:22	7/23/22 23:24	53.8	2	Loud Vehicle Passby
7/24/22 00:12	7/24/22 00:13	52.2	1.75	Train Passby
7/24/22 00:28	7/24/22 00:28	52.6	0.75	Train Passby

Data Removal Noise Monitoring Location #2 Cont.

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/24/22 00:28	7/24/22 00:28	52.6	0.75	Train Passby
7/24/22 00:56	7/24/22 00:57	53.4	1.75	Train Passby
7/24/22 01:05	7/24/22 01:07	49.2	2	Loud Vehicle Passby
7/24/22 01:39	7/24/22 01:40	52.1	1.25	Loud Vehicle Passby
7/24/22 02:06	7/24/22 02:07	49.8	1	Loud Vehicle Passby
7/24/22 02:49	7/24/22 02:50	53.6	1.25	Loud Vehicle Passby
7/24/22 03:11	7/24/22 03:12	52.9	1	Train Passby
7/24/22 03:14	7/24/22 03:15	53.9	1.25	Train Passby
7/24/22 04:37	7/24/22 04:39	51.6	1.75	Loud Vehicle Passby
7/24/22 04:43	7/24/22 04:44	54.8	0.75	Loud Vehicle Passby
7/24/22 04:44	7/24/22 04:45	56.7	1	Loud Vehicle Passby
7/24/22 04:52	7/24/22 04:56	52.6	4.25	Loud Vehicle Passby
7/24/22 05:02	7/24/22 05:08	55.1	6.5	Train Passby
7/24/22 05:38	7/24/22 05:44	58.9	5.75	Excessive Bird Noise
7/24/22 05:48	7/24/22 05:51	56.0	3	Loud Vehicle Passby
7/24/22 06:00	7/24/22 06:03	54.8	2.75	Loud Vehicle Passby
7/24/22 06:20	7/24/22 06:21	71.3	0.25	Train Passby
7/24/22 06:29	7/24/22 06:31	51.3	2.75	Loud Vehicle Passby
7/24/22 06:38	7/24/22 06:39	52.9	1.25	Loud Vehicle Passby
7/24/22 06:40	7/24/22 06:41	54.7	0.75	Loud Vehicle Passby
7/24/22 06:44	7/24/22 06:45	51.8	1.25	Loud Vehicle Passby
7/24/22 06:46	7/24/22 06:51	52.1	4.75	Loud Vehicle Passby
		Total Night #1	49	
		Total Night #2	60.75	
		Total Data	**109.75**	

Data Removal Noise Monitoring Location #3

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 22:04	7/22/22 22:05	46.0	1	Excessive Bird Noise
7/22/22 22:23	7/22/22 22:24	46.5	0.75	Train Passby
7/22/22 22:27	7/22/22 22:30	70.6	2.75	Loud Vehicle Passby
7/22/22 22:56	7/22/22 22:57	53.4	1	Loud Vehicle Passby
7/22/22 22:57	7/22/22 23:01	68.4	3.5	Train Passby
7/22/22 23:19	7/22/22 23:20	57.7	1.5	Train Passby
7/23/22 00:16	7/23/22 00:18	64.4	2	Train Passby
7/23/22 00:18	7/23/22 00:20	53.0	1.75	Train Passby
7/23/22 00:25	7/23/22 00:27	51.1	2	Train Passby
7/23/22 00:52	7/23/22 00:54	51.7	1.5	Train Passby
7/23/22 00:58	7/23/22 01:01	59.2	2.25	Train Passby
7/23/22 01:07	7/23/22 01:08	50.0	0.75	Train Passby
7/23/22 01:14	7/23/22 01:15	61.2	1.25	Train Passby
7/23/22 01:16	7/23/22 01:17	47.0	0.75	Train Passby
7/23/22 01:23	7/23/22 01:23	49.0	0.5	Train Passby
7/23/22 01:34	7/23/22 01:35	47.8	0.5	Train Passby
7/23/22 01:44	7/23/22 01:56	51.3	11.25	Train Passby
7/23/22 01:56	7/23/22 01:57	50.7	1	Loud Vehicle Passby
7/23/22 02:01	7/23/22 02:02	46.7	0.75	Loud Vehicle Passby
7/23/22 02:12	7/23/22 02:13	54.0	1	Train Passby
7/23/22 02:27	7/23/22 02:28	48.1	1.25	Loud Vehicle Passby
7/23/22 02:38	7/23/22 02:38	46.4	0.5	Loud Vehicle Passby
7/23/22 02:46	7/23/22 02:47	47.3	0.75	Loud Vehicle Passby
7/23/22 02:56	7/23/22 02:57	49.1	0.5	Loud Vehicle Passby
7/23/22 03:27	7/23/22 03:28	48.2	0.5	Loud Vehicle Passby
7/23/22 03:38	7/23/22 03:39	53.9	1.75	Train Passby
7/23/22 03:44	7/23/22 03:45	51.8	1.75	Train Passby
7/23/22 03:52	7/23/22 03:53	51.6	1	Train Passby
7/23/22 04:10	7/23/22 04:11	47.5	0.75	Excessive Bird Noise
7/23/22 04:24	7/23/22 04:25	48.3	0.75	Excessive Bird Noise
7/23/22 04:34	7/23/22 04:36	49.3	2.25	Train Passby
7/23/22 04:46	7/23/22 04:55	57.9	9.75	Train Passby
7/23/22 05:00	7/23/22 05:03	57.5	3	Train Passby
7/23/22 05:10	7/23/22 05:12	57.5	2.25	Train Passby
7/23/22 05:14	7/23/22 05:15	50.9	0.75	Loud Vehicle Passby
7/23/22 05:15	7/23/22 05:16	52.6	1.5	Loud Vehicle Passby
7/23/22 05:22	7/23/22 05:25	53.2	2.75	Train Passby
7/23/22 05:25	7/23/22 05:27	53.5	1.25	Loud Vehicle Passby
7/23/22 05:27	7/23/22 05:27	49.0	0.75	Loud Vehicle Passby
7/23/22 05:28	7/23/22 05:29	55.1	1.25	Loud Vehicle Passby
7/23/22 05:43	7/23/22 05:45	50.0	1.75	Train Passby
7/23/22 05:45	7/23/22 05:48	60.2	2.75	Loud Vehicle Passby
7/23/22 05:59	7/23/22 06:01	57.6	1.75	Train Passby
7/23/22 06:03	7/23/22 06:04	55.3	1	Loud Vehicle Passby
7/23/22 06:06	7/23/22 06:07	53.9	1.25	Loud Vehicle Passby
7/23/22 06:16	7/23/22 06:17	59.3	1.5	Loud Vehicle Passby
7/23/22 06:17	7/23/22 06:18	53.7	1	Loud Vehicle Passby
7/23/22 06:24	7/23/22 06:26	54.9	2.25	Loud Vehicle Passby
7/23/22 06:33	7/23/22 06:35	54.6	1.75	Loud Vehicle Passby
7/23/22 06:40	7/23/22 06:43	57.4	3	Loud Vehicle Passby

Data Removal Noise Monitoring Location #3 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/23/22 06:48	7/23/22 06:50	58.0	1.75	Loud Vehicle Passby
7/23/22 06:51	7/23/22 06:51	51.6	0.75	Loud Vehicle Passby
7/23/22 06:53	7/23/22 06:55	60.2	2.5	Loud Vehicle Passby
7/23/22 22:08	7/23/22 22:09	49.0	1	Train Passby
7/23/22 22:22	7/23/22 22:23	54.0	0.75	Train Passby
7/23/22 22:52	7/23/22 22:54	50.0	2	Train Passby
7/23/22 23:06	7/23/22 23:07	50.8	0.5	Loud Vehicle Passby
7/23/22 23:32	7/23/22 23:34	56.6	2	Train Passby
7/23/22 23:55	7/23/22 23:57	47.8	1.75	Train Passby
7/24/22 00:51	7/24/22 00:51	50.3	0.75	Loud Vehicle Passby
7/24/22 00:52	7/24/22 00:53	49.9	0.75	Loud Vehicle Passby
7/24/22 01:12	7/24/22 01:13	50.2	1	Loud Vehicle Passby
7/24/22 01:17	7/24/22 01:18	49.3	0.75	Train Passby
7/24/22 01:28	7/24/22 01:29	49.2	1	Train Passby
7/24/22 01:43	7/24/22 01:46	53.6	2.75	Train Passby
7/24/22 02:05	7/24/22 02:06	55.8	1	Loud Vehicle Passby
7/24/22 02:24	7/24/22 02:25	53.0	0.75	Train Passby
7/24/22 03:07	7/24/22 03:08	54.3	1	Train Passby
7/24/22 04:15	7/24/22 04:15	49.4	0.5	Train Passby
7/24/22 04:28	7/24/22 04:30	50.1	1.25	Train Passby
7/24/22 04:34	7/24/22 04:34	50.8	0.75	Loud Vehicle Passby
7/24/22 04:36	7/24/22 04:38	50.1	1.75	Loud Vehicle Passby
7/24/22 04:39	7/24/22 04:41	53.0	1.75	Loud Vehicle Passby
7/24/22 04:41	7/24/22 04:43	56.6	1.75	Excessive Bird Noise
7/24/22 04:44	7/24/22 04:45	51.3	1.25	Train Passby
7/24/22 04:55	7/24/22 05:00	60.1	4.25	Excessive Bird Noise
7/24/22 05:00	7/24/22 05:02	55.2	1.5	Excessive Bird Noise
7/24/22 05:15	7/24/22 05:16	54.5	1	Loud Vehicle Passby
7/24/22 05:16	7/24/22 05:17	54.2	0.5	Loud Vehicle Passby
7/24/22 05:17	7/24/22 05:19	58.8	2	Loud Vehicle Passby
7/24/22 05:21	7/24/22 05:22	51.7	1	Loud Vehicle Passby
7/24/22 05:42	7/24/22 05:43	56.9	1.25	Loud Vehicle Passby
7/24/22 05:50	7/24/22 05:51	57.3	1	Loud Vehicle Passby
7/24/22 05:51	7/24/22 05:53	60.5	1.25	Loud Vehicle Passby
7/24/22 05:53	7/24/22 05:54	56.9	0.75	Loud Vehicle Passby
7/24/22 06:02	7/24/22 06:03	55.4	0.75	Loud Vehicle Passby
7/24/22 06:12	7/24/22 06:14	55.9	2	Loud Vehicle Passby
7/24/22 06:16	7/24/22 06:17	53.7	0.75	Train Passby
7/24/22 06:18	7/24/22 06:20	53.6	1.5	Train Passby
7/24/22 06:21	7/24/22 06:22	59.6	1.5	Train Passby
7/24/22 06:31	7/24/22 06:33	57.1	2.5	Train Passby
7/24/22 06:37	7/24/22 06:37	57.4	0.5	Loud Vehicle Passby
7/24/22 06:39	7/24/22 06:39	55.3	0.75	Loud Vehicle Passby
7/24/22 06:41	7/24/22 06:42	61.6	1	Loud Vehicle Passby
7/24/22 06:43	7/24/22 06:44	66.3	1.25	Loud Vehicle Passby
7/24/22 06:46	7/24/22 06:47	52.4	1	Train Passby
7/24/22 06:48	7/24/22 06:49	53.2	0.75	Loud Vehicle Passby
7/24/22 06:49	7/24/22 06:49	74.1	0.25	Loud Vehicle Passby
7/24/22 06:54	7/24/22 06:55	56.4	1.25	Loud Vehicle Passby
7/24/22 06:59	7/24/22 06:59	59.6	0.75	Loud Vehicle Passby

Data Removal Noise Monitoring Location #3 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
		Total Night #1	95.75	
		Total Night #2	57.75	
		Total Data	**153.5**	

Data Removal Noise Monitoring Location #4

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:48	7/20/22 22:49	56.0	1	Excessive Bird Noise
7/20/22 23:54	7/20/22 23:55	52.7	1	Loud Vehicle Passby
7/20/22 23:55	7/20/22 23:56	55.1	1.5	Train Passby
7/21/22 00:10	7/21/22 00:11	49.4	1	Train Passby
7/21/22 00:52	7/21/22 00:53	48.3	0.75	Train Passby
7/21/22 01:17	7/21/22 01:18	48.6	1.5	Train Passby
7/21/22 22:03	7/21/22 22:04	47.6	1	Train Passby
7/21/22 22:06	7/21/22 22:07	46.5	1.25	Train Passby
7/21/22 22:52	7/21/22 22:53	55.9	0.75	Loud Vehicle Passby
7/21/22 23:00	7/21/22 23:01	55.9	0.75	Loud Vehicle Passby
7/21/22 23:40	7/21/22 23:41	49.1	1	Train Passby
7/21/22 23:49	7/21/22 23:51	52.2	1.75	Excessive Wind Noise
7/22/22 00:22	7/22/22 00:23	49.9	0.75	Loud Vehicle Passby
7/22/22 00:25	7/22/22 00:27	53.9	2.5	Site_Visit
7/22/22 01:45	7/22/22 01:46	49.8	0.75	Train Passby
7/22/22 02:35	7/22/22 02:37	49.3	1.25	Aircraft Flyover
7/22/22 05:18	7/22/22 05:19	47.8	1	Excessive Bird Noise
7/22/22 05:20	7/22/22 05:20	46.8	0.75	Excessive Bird Noise
7/22/22 05:33	7/22/22 05:34	47.1	1	Excessive Bird Noise
7/22/22 05:40	7/22/22 05:41	47.6	0.5	Excessive Bird Noise
7/22/22 06:23	7/22/22 06:24	48.5	1	Loud Vehicle Passby
7/22/22 06:48	7/22/22 06:48	49.3	0.75	Excessive Bird Noise
		Total Night #1	6.75	
		Total Night #2	16.75	
		Total Data	**23.5**	

Data Removal Noise Monitoring Location #5

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 23:06	7/20/22 23:07	50.7	1.25	Loud Vehicle Passby
7/20/22 23:44	7/20/22 23:45	54.1	1	Loud Vehicle Passby
7/20/22 23:48	7/20/22 23:49	53.8	1.25	Loud Vehicle Passby
7/21/22 00:54	7/21/22 00:55	52.2	1.25	Train Passby
7/21/22 02:00	7/21/22 02:01	56.4	0.5	Loud Vehicle Passby
7/21/22 06:27	7/21/22 06:33	57.6	6.5	Loud Vehicle Passby
7/21/22 06:40	7/21/22 06:44	54.8	3.75	Loud Vehicle Passby
7/21/22 06:48	7/21/22 06:51	57.4	2.5	Loud Vehicle Passby
7/21/22 06:51	7/21/22 06:55	61.5	3.75	Machinery Noise
7/21/22 06:59	7/21/22 07:00	58.7	0.75	Loud Vehicle Passby
7/21/22 22:02	7/21/22 22:04	47.1	1.5	Train Passby
7/21/22 22:16	7/21/22 22:25	51.5	8.75	Train Passby
7/21/22 22:36	7/21/22 22:37	50.3	1	Train Passby
7/21/22 22:40	7/21/22 22:42	53.5	1.75	Loud Vehicle Passby
7/21/22 22:43	7/21/22 22:46	67.6	3.5	Train Passby
7/22/22 00:32	7/22/22 00:33	52.6	1.25	Loud Vehicle Passby
7/22/22 00:36	7/22/22 00:37	54.7	0.75	Loud Vehicle Passby
7/22/22 00:57	7/22/22 00:58	52.8	0.75	Loud Vehicle Passby
7/22/22 02:35	7/22/22 02:36	47.8	1	Aircraft Flyover
7/22/22 02:49	7/22/22 02:51	48.3	2.5	Train Passby
7/22/22 06:10	7/22/22 06:11	50.0	1	Train Passby
7/22/22 06:27	7/22/22 06:29	51.2	1.5	Loud Vehicle Passby
7/22/22 06:30	7/22/22 06:32	54.4	2	Loud Vehicle Passby
7/22/22 06:36	7/22/22 06:38	53.1	1.75	Loud Vehicle Passby
7/22/22 06:39	7/22/22 06:40	54.4	1.75	Loud Vehicle Passby
7/22/22 06:47	7/22/22 06:55	58.1	7.75	Train Passby
7/22/22 06:58	7/22/22 06:58	51.9	0.75	Loud Vehicle Passby
		Total Night #1	11.75	
		Total Night #2	29	
		Total Data	**40.75**	

Data Removal Noise Monitoring Location #6

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:16	7/20/22 22:17	46.6	0.75	Animal Noise
7/20/22 22:18	7/20/22 22:18	46.8	0.75	Animal Noise
7/20/22 22:28	7/20/22 22:29	44.8	0.75	Animal Noise
7/20/22 22:32	7/20/22 22:32	63.6	0.25	Animal Noise
7/20/22 22:34	7/20/22 22:35	41.9	0.75	Animal Noise
7/20/22 23:32	7/20/22 23:33	59.0	1.25	Loud Vehicle Passby
7/20/22 23:34	7/20/22 23:35	41.8	1	Animal Noise
7/20/22 23:38	7/20/22 23:39	49.0	1.5	Loud Vehicle Passby
7/20/22 23:40	7/20/22 23:41	46.2	1.25	Loud Vehicle Passby
7/20/22 23:50	7/20/22 23:51	43.7	0.75	Loud Vehicle Passby
7/21/22 00:49	7/21/22 00:49	43.8	0.5	Site Alarm
7/21/22 00:49	7/21/22 00:50	46.4	0.5	Site Alarm
7/21/22 00:53	7/21/22 00:53	45.8	0.5	Site Alarm
7/21/22 01:13	7/21/22 01:14	44.0	0.75	Animal Noise
7/21/22 01:18	7/21/22 01:20	42.5	1.75	Animal Noise
7/21/22 01:32	7/21/22 01:33	42.5	0.75	Animal Noise
7/21/22 01:45	7/21/22 01:45	40.6	0.75	Animal Noise
7/21/22 03:02	7/21/22 03:03	45.6	1	Train Passby
7/21/22 03:21	7/21/22 03:22	45.6	1	Animal Noise
7/21/22 04:03	7/21/22 04:04	49.1	1.25	Train Passby
7/21/22 04:14	7/21/22 04:16	49.0	1.5	Train Passby
7/21/22 05:38	7/21/22 05:39	47.9	1.75	Animal Noise
7/21/22 05:53	7/21/22 05:54	63.6	1.25	Loud Vehicle Passby
7/21/22 06:09	7/21/22 06:11	49.0	1.25	Train Passby
7/21/22 06:18	7/21/22 06:19	48.5	1.25	Excessive Bird Noise
7/21/22 06:57	7/21/22 06:58	51.0	1.25	Train Passby
7/21/22 22:04	7/21/22 22:05	43.4	1.25	Site Alarm
7/21/22 22:08	7/21/22 22:12	44.0	4	Loud Vehicle Passby
7/21/22 22:16	7/21/22 22:17	43.2	1	Animal Noise
7/21/22 22:23	7/21/22 22:24	41.3	1	Train Passby
7/21/22 22:28	7/21/22 22:30	41.5	2.5	Misc.
7/21/22 22:35	7/21/22 22:36	42.7	0.75	Loud Vehicle Passby
7/21/22 22:47	7/21/22 22:48	43.6	1.25	Loud Vehicle Passby
7/21/22 22:54	7/21/22 22:54	44.2	0.5	Misc.
7/21/22 23:04	7/21/22 23:05	45.1	0.5	Animal Noise
7/21/22 23:26	7/21/22 23:29	44.3	2.5	Animal Noise
7/22/22 00:08	7/22/22 00:09	47.8	1.25	Train Passby
7/22/22 00:22	7/22/22 00:23	45.4	1	Train Passby
7/22/22 00:36	7/22/22 00:36	44.5	0.5	Animal Noise
7/22/22 00:41	7/22/22 00:43	56.1	2	Loud Vehicle Passby
7/22/22 00:44	7/22/22 00:46	49.1	1.75	Loud Vehicle Passby
7/22/22 01:09	7/22/22 01:11	44.2	1.5	Misc.
7/22/22 01:38	7/22/22 01:39	47.4	0.75	Loud Vehicle Passby
7/22/22 01:46	7/22/22 01:47	60.2	1	Loud Vehicle Passby
7/22/22 01:50	7/22/22 01:52	44.5	1.75	Misc.
7/22/22 01:56	7/22/22 01:57	43.5	1	Misc.
7/22/22 02:04	7/22/22 02:09	44.9	4.75	Misc.
7/22/22 02:10	7/22/22 02:11	45.1	0.75	Misc.
7/22/22 02:11	7/22/22 02:12	61.8	0.25	Misc.
7/22/22 02:15	7/22/22 02:16	43.2	1.75	Misc.

Data Removal Noise Monitoring Location #6 (Cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 02:34	7/22/22 02:36	45.2	2	Aircraft Flyover
7/22/22 03:01	7/22/22 03:02	42.5	1.25	Misc.
7/22/22 03:22	7/22/22 03:24	43.9	2	Aircraft Flyover
7/22/22 04:00	7/22/22 04:01	43.4	1	Animal Noise
7/22/22 04:06	7/22/22 04:06	42.8	0.75	Animal Noise
7/22/22 04:25	7/22/22 04:25	42.7	0.5	Misc.
7/22/22 04:39	7/22/22 04:40	42.6	1.5	Animal Noise
7/22/22 04:42	7/22/22 04:42	42.9	0.75	Animal Noise
7/22/22 04:53	7/22/22 04:54	42.2	0.75	Misc.
7/22/22 05:10	7/22/22 05:11	45.7	1.25	Excessive Bird Noise
7/22/22 05:27	7/22/22 05:27	41.8	0.5	Misc.
7/22/22 05:34	7/22/22 05:40	44.5	5.25	Animal Noise
7/22/22 05:50	7/22/22 05:51	42.5	0.75	Animal Noise
7/22/22 05:55	7/22/22 05:56	40.4	1	Animal Noise
7/22/22 06:01	7/22/22 06:02	63.3	1.25	Loud Vehicle Passby
7/22/22 06:06	7/22/22 06:07	43.3	0.5	Excessive Bird Noise
7/22/22 06:08	7/22/22 06:09	61.0	1.25	Loud Vehicle Passby
7/22/22 06:19	7/22/22 06:24	43.4	4.25	Loud Vehicle Passby
7/22/22 06:40	7/22/22 06:41	42.1	1	Misc.
7/22/22 06:52	7/22/22 06:53	44.5	0.75	Excessive Bird Noise
7/22/22 06:59	7/22/22 07:00	46.1	1.5	Excessive Bird Noise
		Total Night #1	26	
		Total Night #2	65	
		Total Data	**91**	

Data Removal Noise Monitoring Location #8

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:38	7/20/22 22:38	52.9	0.75	Loud Vehicle Passby
7/20/22 22:39	7/20/22 22:41	55.1	1.75	Loud Vehicle Passby
7/20/22 23:03	7/20/22 23:04	52.8	0.75	Loud Vehicle Passby
7/20/22 23:07	7/20/22 23:08	51.3	1	Loud Vehicle Passby
7/21/22 02:07	7/21/22 02:07	55.2	0.5	Loud Vehicle Passby
7/21/22 02:29	7/21/22 02:30	54.4	1	Loud Vehicle Passby
7/21/22 04:41	7/21/22 05:32	66.0	50.5	Excessive Bird Noise
7/21/22 05:33	7/21/22 05:40	70.2	6.75	Excessive Bird Noise
7/21/22 05:54	7/21/22 05:58	68.8	4.25	Excessive Bird Noise
7/21/22 06:00	7/21/22 06:02	67.1	2	Excessive Bird Noise
7/21/22 06:30	7/21/22 06:32	70.6	2	Excessive Bird Noise
7/21/22 06:55	7/21/22 06:56	66.5	1	Excessive Bird Noise
7/21/22 22:07	7/21/22 22:08	52.3	0.75	Loud Vehicle Passby
7/21/22 22:44	7/21/22 22:45	51.6	1.5	Aircraft Flyover
7/22/22 01:21	7/22/22 01:22	53.1	0.75	Loud Vehicle Passby
7/22/22 01:22	7/22/22 01:23	54.0	0.75	Loud Vehicle Passby
7/22/22 01:23	7/22/22 01:24	54.1	1.25	Loud Vehicle Passby
7/22/22 04:35	7/22/22 04:58	69.8	22.75	Excessive Bird Noise
7/22/22 06:03	7/22/22 06:04	66.9	1.25	Excessive Bird Noise
7/22/22 06:04	7/22/22 06:05	62.2	0.75	Loud Vehicle Passby
7/22/22 06:54	7/22/22 06:57	76.7	2.25	Excessive Bird Noise
		Total Night #1	72.25	
		Total Night #2	32	
		Total Data	**104.25**	

Data Removal Noise Monitoring Location #9

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 22:05	7/22/22 22:05	45.9	0.75	Train Passby
7/22/22 22:09	7/22/22 22:10	45.9	1	Train Passby
7/22/22 22:15	7/22/22 22:15	65.2	0.25	Animal Noise
7/22/22 22:19	7/22/22 22:19	48.4	0.75	Train Passby
7/22/22 22:31	7/22/22 22:32	51.5	1.25	Loud Vehicle Passby
7/22/22 22:34	7/22/22 22:35	48.0	0.75	Animal Noise
7/22/22 22:42	7/22/22 22:43	51.9	0.75	Train Passby
7/22/22 22:53	7/22/22 22:54	50.6	1.25	Train Passby
7/22/22 22:55	7/22/22 22:56	55.6	1.25	Train Passby
7/22/22 23:16	7/22/22 23:16	66.9	0.25	Train Passby
7/22/22 23:30	7/22/22 23:30	48.2	0.75	Train Passby
7/23/22 00:28	7/23/22 00:29	48.8	1	Animal Noise
7/23/22 01:09	7/23/22 01:10	52.6	0.75	Animal Noise
7/23/22 02:17	7/23/22 02:17	52.3	0.5	Animal Noise
7/23/22 03:39	7/23/22 03:40	54.0	1	Train Passby
7/23/22 03:52	7/23/22 03:54	53.5	1.5	Train Passby
7/23/22 03:56	7/23/22 03:57	51.8	0.75	Train Passby
7/23/22 04:00	7/23/22 04:01	50.5	1	Train Passby
7/23/22 04:33	7/23/22 04:37	49.9	4.25	Train Passby
7/23/22 04:48	7/23/22 04:50	50.8	2.25	Excessive Bird Noise
7/23/22 05:46	7/23/22 05:47	51.3	1.25	Animal Noise
7/23/22 05:55	7/23/22 05:56	50.2	0.5	Animal Noise
7/23/22 06:09	7/23/22 06:10	57.2	0.75	Loud Vehicle Passby
7/23/22 06:31	7/23/22 06:32	53.5	0.75	Loud Vehicle Passby
7/23/22 06:35	7/23/22 06:36	55.9	1	Loud Vehicle Passby
7/23/22 22:03	7/23/22 22:04	49.2	1	Loud Vehicle Passby
7/23/22 23:03	7/23/22 23:04	51.8	0.5	Loud Vehicle Passby
7/24/22 01:23	7/24/22 01:26	53.9	3	Train Passby
7/24/22 03:11	7/24/22 03:21	50.8	10.25	Train Passby
7/24/22 04:40	7/24/22 04:46	49.9	6.5	Train Passby
7/24/22 05:45	7/24/22 05:46	50.7	1	Loud Vehicle Passby
7/24/22 06:14	7/24/22 06:14	69.5	0.25	Loud Vehicle Passby
7/24/22 06:15	7/24/22 06:20	53.5	5.25	Train Passby
7/24/22 06:21	7/24/22 06:21	69.5	0.25	Loud Vehicle Passby
		Total Night #1	26.25	
		Total Night #2	28	
		Total Data	**54.25**	

Data Removal Noise Monitoring Location #10

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:04	7/20/22 22:05	61.7	0.75	Loud Vehicle Passby
7/20/22 22:10	7/20/22 22:11	55.6	1.25	Loud Vehicle Passby
7/20/22 22:12	7/20/22 22:13	52.4	0.75	Loud Vehicle Passby
7/20/22 22:17	7/20/22 22:18	55.0	0.75	Loud Vehicle Passby
7/20/22 22:23	7/20/22 22:23	53.7	0.5	Loud Vehicle Passby
7/20/22 22:29	7/20/22 22:29	55.3	0.5	Loud Vehicle Passby
7/20/22 22:40	7/20/22 22:43	57.3	2.75	Loud Vehicle Passby
7/20/22 22:47	7/20/22 22:48	62.8	0.75	Loud Vehicle Passby
7/20/22 22:51	7/20/22 22:52	55.9	0.75	Loud Vehicle Passby
7/20/22 23:03	7/20/22 23:05	62.3	1.25	Loud Vehicle Passby
7/20/22 23:20	7/20/22 23:21	61.6	1.25	Loud Vehicle Passby
7/20/22 23:34	7/20/22 23:36	61.0	2	Loud Vehicle Passby
7/20/22 23:40	7/20/22 23:41	60.2	1	Loud Vehicle Passby
7/20/22 23:59	7/21/22 00:00	54.4	0.75	Train Passby
7/21/22 00:02	7/21/22 00:03	53.6	1	Train Passby
7/21/22 00:07	7/21/22 00:07	55.4	0.75	Loud Vehicle Passby
7/21/22 00:19	7/21/22 00:20	62.4	1.25	Loud Vehicle Passby
7/21/22 01:11	7/21/22 01:11	59.9	0.75	Loud Vehicle Passby
7/21/22 01:45	7/21/22 01:46	54.6	0.5	Train Passby
7/21/22 01:47	7/21/22 01:48	54.9	1.5	Train Passby
7/21/22 01:51	7/21/22 01:52	62.7	1	Loud Vehicle Passby
7/21/22 02:07	7/21/22 02:08	63.0	1	Loud Vehicle Passby
7/21/22 02:29	7/21/22 02:30	62.3	1	Loud Vehicle Passby
7/21/22 02:57	7/21/22 02:58	54.8	0.5	Loud Vehicle Passby
7/21/22 03:00	7/21/22 03:01	62.3	1	Loud Vehicle Passby
7/21/22 03:06	7/21/22 03:06	59.3	0.75	Loud Vehicle Passby
7/21/22 03:33	7/21/22 03:33	73.5	0.25	Loud Vehicle Passby
7/21/22 03:44	7/21/22 03:45	64.5	0.5	Loud Vehicle Passby
7/21/22 03:52	7/21/22 03:52	72.3	0.25	Loud Vehicle Passby
7/21/22 04:10	7/21/22 04:10	68.3	0.75	Loud Vehicle Passby
7/21/22 04:32	7/21/22 04:33	62.2	0.75	Loud Vehicle Passby
7/21/22 04:40	7/21/22 04:41	62.7	1	Loud Vehicle Passby
7/21/22 04:43	7/21/22 04:44	54.8	1.25	Loud Vehicle Passby
7/21/22 04:45	7/21/22 04:47	61.7	2	Loud Vehicle Passby
7/21/22 04:49	7/21/22 04:50	61.2	1	Loud Vehicle Passby
7/21/22 04:52	7/21/22 04:53	57.1	1.25	Loud Vehicle Passby
7/21/22 04:54	7/21/22 04:59	54.3	4.75	Loud Vehicle Passby
7/21/22 05:03	7/21/22 05:04	58.6	0.5	Loud Vehicle Passby
7/21/22 05:06	7/21/22 05:08	58.9	1.5	Loud Vehicle Passby
7/21/22 05:09	7/21/22 05:12	56.8	2.5	Loud Vehicle Passby
7/21/22 05:14	7/21/22 05:35	55.9	21.25	Loud Vehicle Passby
7/21/22 05:36	7/21/22 05:59	58.4	23	Loud Vehicle Passby
7/21/22 06:00	7/21/22 06:28	57.9	28	Loud Vehicle Passby
7/21/22 06:31	7/21/22 06:59	60.4	28.5	Loud Vehicle Passby
7/21/22 22:00	7/21/22 22:01	61.5	1	Loud Vehicle Passby
7/21/22 22:01	7/21/22 22:02	54.0	1	Loud Vehicle Passby
7/21/22 22:03	7/21/22 22:04	52.7	0.75	Loud Vehicle Passby
7/21/22 22:05	7/21/22 22:06	56.1	1.5	Loud Vehicle Passby
7/21/22 22:07	7/21/22 22:08	53.5	0.75	Loud Vehicle Passby
7/21/22 22:10	7/21/22 22:12	61.2	1.25	Loud Vehicle Passby

Data Removal Noise Monitoring Location #10 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/21/22 22:20	7/21/22 22:20	61.8	0.75	Loud Vehicle Passby
7/21/22 22:31	7/21/22 22:31	54.7	0.75	Loud Vehicle Passby
7/21/22 22:33	7/21/22 22:35	52.1	2	Loud Vehicle Passby
7/21/22 22:36	7/21/22 22:37	60.0	1.25	Loud Vehicle Passby
7/21/22 22:38	7/21/22 22:38	62.7	0.75	Loud Vehicle Passby
7/21/22 22:40	7/21/22 22:42	56.1	1.5	Loud Vehicle Passby
7/21/22 22:43	7/21/22 22:44	52.7	1.25	Loud Vehicle Passby
7/21/22 22:49	7/21/22 22:50	60.9	1	Loud Vehicle Passby
7/21/22 22:51	7/21/22 22:55	56.4	3.25	Loud Vehicle Passby
7/21/22 22:58	7/21/22 23:00	60.1	2.75	Loud Vehicle Passby
7/21/22 23:07	7/21/22 23:08	59.7	1.25	Loud Vehicle Passby
7/21/22 23:13	7/21/22 23:15	53.5	1.25	Loud Vehicle Passby
7/21/22 23:27	7/21/22 23:28	63.3	1	Loud Vehicle Passby
7/21/22 23:36	7/21/22 23:37	54.8	0.75	Loud Vehicle Passby
7/21/22 23:38	7/21/22 23:40	61.4	1.25	Loud Vehicle Passby
7/22/22 00:26	7/22/22 00:28	67.0	1.5	Train Passby
7/22/22 00:31	7/22/22 00:33	59.7	1.25	Loud Vehicle Passby
7/22/22 00:42	7/22/22 00:43	69.2	1.25	Train Passby
7/22/22 01:18	7/22/22 01:19	51.4	1.25	Train Passby
7/22/22 01:22	7/22/22 01:23	62.7	1.5	Loud Vehicle Passby
7/22/22 01:57	7/22/22 01:58	50.8	0.75	Train Passby
7/22/22 02:04	7/22/22 02:06	59.6	1.5	Loud Vehicle Passby
7/22/22 02:10	7/22/22 02:11	51.8	1	Train Passby
7/22/22 02:21	7/22/22 02:22	52.0	1	Loud Vehicle Passby
7/22/22 02:26	7/22/22 02:27	58.8	1	Loud Vehicle Passby
7/22/22 02:49	7/22/22 02:50	52.4	1.75	Loud Vehicle Passby
7/22/22 02:52	7/22/22 02:53	61.7	1	Train Passby
7/22/22 03:04	7/22/22 03:09	52.5	4.5	Train Passby
7/22/22 03:14	7/22/22 03:15	59.9	1	Loud Vehicle Passby
7/22/22 03:24	7/22/22 03:26	59.5	2	Loud Vehicle Passby
7/22/22 03:30	7/22/22 03:31	53.2	0.75	Loud Vehicle Passby
7/22/22 04:03	7/22/22 04:04	50.9	0.5	Human Activity
7/22/22 04:23	7/22/22 04:23	54.2	0.5	Loud Vehicle Passby
7/22/22 04:33	7/22/22 04:34	61.8	1	Loud Vehicle Passby
7/22/22 04:40	7/22/22 04:41	53.4	1.25	Loud Vehicle Passby
7/22/22 04:43	7/22/22 04:44	48.7	0.75	Train Passby
7/22/22 04:53	7/22/22 04:58	54.5	4.5	Loud Vehicle Passby
7/22/22 04:58	7/22/22 04:59	57.8	1	Loud Vehicle Passby
7/22/22 05:01	7/22/22 05:04	58.1	2.5	Loud Vehicle Passby
7/22/22 05:06	7/22/22 05:07	52.1	1.75	Loud Vehicle Passby
7/22/22 05:08	7/22/22 05:17	56.5	8.5	Loud Vehicle Passby
7/22/22 05:19	7/22/22 05:28	56.2	9.5	Loud Vehicle Passby
7/22/22 05:29	7/22/22 05:36	53.7	7.5	Loud Vehicle Passby
7/22/22 05:37	7/22/22 05:39	60.3	1.75	Loud Vehicle Passby
7/22/22 05:40	7/22/22 05:43	57.2	3.25	Loud Vehicle Passby
7/22/22 05:45	7/22/22 05:53	57.6	8.25	Loud Vehicle Passby
7/22/22 05:56	7/22/22 06:00	56.9	4	Loud Vehicle Passby
7/22/22 06:01	7/22/22 06:06	55.6	4.75	Loud Vehicle Passby
7/22/22 06:08	7/22/22 06:13	53.3	4.5	Loud Vehicle Passby
7/22/22 06:15	7/22/22 06:21	55.1	6	Loud Vehicle Passby

Data Removal Noise Monitoring Location #10 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 06:27	7/22/22 06:29	52.2	2.5	Loud Vehicle Passby
7/22/22 06:30	7/22/22 06:41	56.9	11	Loud Vehicle Passby
7/22/22 06:43	7/22/22 06:44	56.1	1	Loud Vehicle Passby
7/22/22 06:47	7/22/22 06:59	59.0	11.25	Loud Vehicle Passby
		Total Night #1	145	
		Total Night #2	147.5	
		Total Data	**292.5**	

Data Removal Noise Monitoring Location #11

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:02	7/20/22 22:07	39.6	5	Train Passby
7/20/22 22:18	7/20/22 22:19	39.6	1	Train Passby
7/20/22 22:22	7/20/22 22:25	39.9	2.5	Train Passby
7/20/22 22:29	7/20/22 22:30	51.9	1.5	Loud Vehicle Passby
7/20/22 22:32	7/20/22 22:34	41.1	1.25	Loud Vehicle Passby
7/20/22 22:34	7/20/22 22:35	51.8	1	Loud Vehicle Passby
7/20/22 22:40	7/20/22 22:42	52.5	2	Loud Vehicle Passby
7/20/22 22:46	7/20/22 22:47	40.8	1	Loud Vehicle Passby
7/20/22 22:55	7/20/22 22:58	50.4	2.5	Loud Vehicle Passby
7/20/22 23:09	7/20/22 23:10	51.8	1.5	Loud Vehicle Passby
7/20/22 23:43	7/20/22 23:44	48.2	1.5	Train Passby
7/21/22 00:14	7/21/22 00:15	51.2	0.5	Train Passby
7/21/22 00:16	7/21/22 00:17	50.6	0.75	Train Passby
7/21/22 00:34	7/21/22 00:35	48.6	0.75	Train Passby
7/21/22 00:42	7/21/22 00:46	53.4	3.5	Train Passby
7/21/22 01:12	7/21/22 01:13	48.5	1	Train Passby
7/21/22 01:30	7/21/22 01:30	67.3	0.25	Train Passby
7/21/22 01:52	7/21/22 01:52	47.3	0.5	Train Passby
7/21/22 01:53	7/21/22 01:54	47.9	0.5	Train Passby
7/21/22 01:55	7/21/22 01:55	47.2	0.5	Train Passby
7/21/22 01:56	7/21/22 02:00	47.6	4	Train Passby
7/21/22 02:05	7/21/22 02:06	46.5	1	Train Passby
7/21/22 02:22	7/21/22 02:23	42.7	1	Train Passby
7/21/22 02:26	7/21/22 02:27	42.8	0.75	Train Passby
7/21/22 02:32	7/21/22 02:33	53.6	0.75	Loud Vehicle Passby
7/21/22 02:37	7/21/22 02:37	42.7	0.5	Train Passby
7/21/22 03:33	7/21/22 03:36	45.9	2.5	Train Passby
7/21/22 03:44	7/21/22 03:45	44.2	1.25	Train Passby
7/21/22 03:48	7/21/22 03:50	44.3	1.5	Train Passby
7/21/22 03:56	7/21/22 03:57	44.2	1.25	Train Passby
7/21/22 04:05	7/21/22 04:06	42.8	1	Train Passby
7/21/22 05:07	7/21/22 05:10	47.5	2.5	Excessive Bird Noise
7/21/22 05:25	7/21/22 05:27	46.6	1.75	Excessive Bird Noise
7/21/22 05:30	7/21/22 05:34	46.9	4.25	Excessive Bird Noise
7/21/22 06:12	7/21/22 06:24	50.9	12	Train Passby
7/21/22 06:47	7/21/22 06:49	51.8	1.75	Excessive Bird Noise
7/21/22 22:36	7/21/22 22:36	48.9	0.75	Train Passby
7/21/22 22:41	7/21/22 22:41	48.6	0.75	Train Passby
7/21/22 22:42	7/21/22 22:43	48.7	1	Train Passby
7/22/22 00:40	7/22/22 00:41	49.4	1	Loud Vehicle Passby
7/22/22 01:12	7/22/22 01:13	53.2	1.25	Loud Vehicle Passby
7/22/22 01:18	7/22/22 01:18	51.1	0.75	Loud Vehicle Passby
7/22/22 01:24	7/22/22 01:25	55.7	1.25	Loud Vehicle Passby
7/22/22 03:22	7/22/22 03:23	49.4	0.75	Loud Vehicle Passby
7/22/22 03:31	7/22/22 03:42	49.5	11	Train Passby
7/22/22 05:09	7/22/22 05:10	47.4	0.5	Train Passby
7/22/22 05:22	7/22/22 05:22	46.7	0.5	Train Passby
7/22/22 06:18	7/22/22 06:20	49.4	2.25	Train Passby
7/22/22 06:26	7/22/22 06:27	52.9	1	Loud Vehicle Passby
7/22/22 06:41	7/22/22 06:42	53.2	1	Loud Vehicle Passby
7/22/22 06:47	7/22/22 06:48	51.6	1.25	Loud Vehicle Passby

Data Removal Noise Monitoring Location #11 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
		Total Night #1	66.75	
		Total Night #2	25	
		Total Data	**91.75**	

Data Removal Noise Monitoring Location #12 (1st– 48 Hour Period)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:00	7/20/22 22:00	47.6	0.5	Excessive Bird Noise
7/20/22 22:01	7/20/22 22:02	40.9	0.7	Excessive Bird Noise
7/20/22 22:12	7/20/22 22:13	44.5	1.5	Aircraft Flyover
7/20/22 22:30	7/20/22 22:32	37.4	2.2	Train Passby
7/20/22 22:36	7/20/22 22:38	42.9	2.2	Train Passby
7/20/22 23:05	7/20/22 23:17	43.7	12.5	Train Passby
7/20/22 23:25	7/20/22 23:28	36.6	2.7	Train Passby
7/20/22 23:32	7/20/22 23:38	37.9	6.2	Train Passby
7/20/22 23:50	7/20/22 23:58	48.2	8.5	Train Passby
7/21/22 00:28	7/21/22 00:28	36.3	1.0	Loud Vehicle Passby
7/21/22 00:36	7/21/22 00:38	36.4	2.0	Loud Vehicle Passby
7/21/22 00:48	7/21/22 00:50	41.4	1.7	Train Passby
7/21/22 01:22	7/21/22 01:30	39.6	8.0	Train Passby
7/21/22 01:39	7/21/22 01:40	42.8	1.5	Train Passby
7/21/22 01:58	7/21/22 01:59	36.0	0.7	Train Passby
7/21/22 02:10	7/21/22 02:12	38.3	2.2	Train Passby
7/21/22 02:22	7/21/22 02:30	41.8	8.5	Train Passby
7/21/22 02:45	7/21/22 02:48	34.8	2.5	Train Passby
7/21/22 02:51	7/21/22 02:54	34.4	2.7	Train Passby
7/21/22 03:10	7/21/22 03:12	36.3	2.5	Train Passby
7/21/22 03:21	7/21/22 03:21	36.9	0.7	Train Passby
7/21/22 03:24	7/21/22 03:28	47.7	4.2	Train Passby
7/21/22 03:33	7/21/22 03:37	43.3	4.2	Train Passby
7/21/22 03:38	7/21/22 03:39	41.8	1.7	Train Passby
7/21/22 04:23	7/21/22 04:24	48.5	1.2	Loud Vehicle Passby
7/21/22 04:24	7/21/22 04:27	41.0	3.5	Train Passby
7/21/22 04:36	7/21/22 04:58	48.0	21.7	Morning Chorus
7/21/22 05:27	7/21/22 05:29	46.5	2.2	Morning Chorus
7/21/22 06:02	7/21/22 06:03	57.0	1.0	Loud Vehicle Passby
7/21/22 06:04	7/21/22 06:05	46.6	1.5	Loud Vehicle Passby
7/21/22 06:07	7/21/22 06:07	59.1	0.7	Loud Vehicle Passby
7/21/22 06:28	7/21/22 06:28	45.0	1.0	Excessive Bird Noise
7/21/22 22:16	7/21/22 22:17	42.0	0.5	Train Passby
7/21/22 22:45	7/21/22 22:52	40.9	8.0	Excessive Rain Noise
7/21/22 23:03	7/21/22 23:04	41.9	1.0	Train Passby
7/21/22 23:13	7/21/22 23:15	40.7	2.7	Train Passby
7/21/22 23:18	7/21/22 23:20	44.2	2.2	Train Passby
7/21/22 23:24	7/21/22 23:25	39.1	1.5	Train Passby
7/21/22 23:30	7/21/22 23:30	43.7	0.7	Train Passby
7/21/22 23:34	7/21/22 23:35	40.1	1.2	Train Passby
7/22/22 00:09	7/22/22 00:09	42.8	0.5	Train Passby
7/22/22 00:32	7/22/22 00:36	37.8	4.7	Train Passby
7/22/22 00:59	7/22/22 01:14	47.6	15.2	Train Passby
7/22/22 01:32	7/22/22 01:34	37.3	2.5	Loud Vehicle Passby
7/22/22 01:44	7/22/22 01:44	39.0	0.7	Train Passby
7/22/22 01:53	7/22/22 01:56	38.7	3.7	Train Passby
7/22/22 02:22	7/22/22 02:23	40.6	1.2	Train Passby
7/22/22 02:24	7/22/22 02:24	40.4	1.0	Train Passby
7/22/22 02:26	7/22/22 02:26	37.2	0.5	Loud Vehicle Passby
7/22/22 02:30	7/22/22 02:31	45.2	1.2	Train Passby
7/22/22 02:35	7/22/22 02:36	40.5	1.7	Loud Vehicle Passby
7/22/22 02:37	7/22/22 02:40	38.6	3.2	Train Passby

Data Removal Noise Monitoring Location #12 (1st– 48 Hour Period) Cont.

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 02:41	7/22/22 02:42	41.2	1.2	Loud Vehicle Passby
7/22/22 02:43	7/22/22 02:44	37.7	1.5	Loud Vehicle Passby
7/22/22 02:52	7/22/22 02:52	36.9	0.5	Loud Vehicle Passby
7/22/22 03:04	7/22/22 03:05	33.4	0.7	Loud Vehicle Passby
7/22/22 03:15	7/22/22 03:17	32.2	1.7	Train Passby
7/22/22 03:23	7/22/22 03:25	34.2	2.5	Aircraft Flyover
7/22/22 03:26	7/22/22 03:28	29.8	1.7	Excessive Rain Noise
7/22/22 03:35	7/22/22 03:42	31.4	7.2	Train Passby
7/22/22 03:55	7/22/22 03:56	34.3	1.2	Train Passby
7/22/22 03:59	7/22/22 04:00	40.7	2.0	Train Passby
7/22/22 04:07	7/22/22 04:11	31.0	3.5	Loud Vehicle Passby
7/22/22 04:29	7/22/22 04:31	38.8	2.5	Train Passby
7/22/22 04:32	7/22/22 04:51	49.4	19.7	Morning Chorus
7/22/22 04:52	7/22/22 05:01	49.5	9.0	Morning Chorus
7/22/22 05:08	7/22/22 05:09	49.4	1.5	Excessive Bird Noise
7/22/22 05:20	7/22/22 05:26	43.7	5.7	Excessive Bird Noise
7/22/22 05:30	7/22/22 05:42	44.9	12.0	Morning Chorus
7/22/22 05:43	7/22/22 05:48	46.5	5.7	Morning Chorus
7/22/22 05:51	7/22/22 05:54	52.5	3.5	Loud Vehicle Passby
7/22/22 06:00	7/22/22 06:05	53.2	4.7	Loud Vehicle Passby
7/22/22 06:16	7/22/22 06:19	41.5	3.0	Excessive Bird Noise
7/22/22 06:24	7/22/22 06:27	54.9	3.2	Loud Vehicle Passby
7/22/22 06:33	7/22/22 06:50	47.4	17.2	Morning Chorus
7/22/22 06:58	7/22/22 06:59	57.4	1.0	Loud Vehicle Passby
		Total Night #1	114.2	
		Total Night #2	166.8	
		Total Data	**281.0**	

Data Removal Noise Monitoring Location #12 (2nd – 48 Hour Period)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/22/22 22:23	7/22/22 22:24	55.7	0.8	Train Passby
7/22/22 22:26	7/22/22 22:38	51.7	12.0	Train Passby
7/22/22 22:42	7/22/22 22:42	56.0	0.5	Loud Vehicle Passby
7/22/22 23:06	7/22/22 23:07	54.1	1.0	Loud Vehicle Passby
7/22/22 23:25	7/22/22 23:27	48.4	2.0	Loud Vehicle Passby
7/22/22 23:38	7/22/22 23:39	54.4	1.0	Loud Vehicle Passby
7/23/22 00:10	7/23/22 00:19	46.7	8.8	Train Passby
7/23/22 01:26	7/23/22 01:26	42.8	0.8	Loud Vehicle Passby
7/23/22 01:40	7/23/22 01:47	42.4	7.3	Train Passby
7/23/22 02:14	7/23/22 02:15	41.2	1.5	Train Passby
7/23/22 02:16	7/23/22 02:18	42.7	1.8	Train Passby
7/23/22 02:42	7/23/22 02:48	40.9	5.8	Machinery Noise
7/23/22 04:07	7/23/22 04:11	42.6	4.5	Train Passby
7/23/22 04:42	7/23/22 04:48	57.6	5.5	Morning Chorus
7/23/22 04:54	7/23/22 05:03	49.7	8.8	Morning Chorus
7/23/22 05:09	7/23/22 05:10	41.9	1.3	Excessive Bird Noise
7/23/22 05:20	7/23/22 05:23	54.2	2.5	Loud Vehicle Passby
7/23/22 05:37	7/23/22 05:39	46.4	1.8	Excessive Bird Noise
7/23/22 05:53	7/23/22 05:55	46.1	2.0	Train Passby
7/23/22 05:57	7/23/22 05:58	46.4	1.0	Excessive Bird Noise
7/23/22 05:59	7/23/22 06:00	54.9	1.5	Loud Vehicle Passby
7/23/22 06:01	7/23/22 06:09	45.5	8.8	Excessive Bird Noise
7/23/22 06:12	7/23/22 06:13	43.2	0.8	Excessive Bird Noise
7/23/22 06:18	7/23/22 06:19	52.5	1.5	Loud Vehicle Passby
7/23/22 06:25	7/23/22 06:26	54.9	0.8	Loud Vehicle Passby
7/23/22 06:40	7/23/22 06:42	44.9	1.8	Machinery Noise
7/23/22 06:46	7/23/22 06:49	44.5	3.8	Machinery Noise
7/23/22 22:01	7/23/22 22:03	52.2	1.8	Loud Vehicle Passby
7/23/22 22:05	7/23/22 22:10	42.6	4.5	Loud Vehicle Passby
7/23/22 22:20	7/23/22 22:21	51.4	1.5	Loud Vehicle Passby
7/23/22 23:31	7/23/22 23:33	42.3	1.5	Loud Vehicle Passby
7/23/22 23:39	7/23/22 23:39	43.6	0.5	Loud Vehicle Passby
7/24/22 00:02	7/24/22 00:03	41.3	0.5	Train Passby
7/24/22 00:09	7/24/22 00:10	40.7	0.8	Train Passby
7/24/22 00:22	7/24/22 00:24	41.1	2.0	Train Passby
7/24/22 00:32	7/24/22 00:41	50.7	8.8	Train Passby
7/24/22 00:47	7/24/22 00:47	46.0	0.8	Misc.
7/24/22 00:49	7/24/22 00:54	41.7	4.5	Excessive Wind Noise
7/24/22 00:55	7/24/22 00:57	42.5	2.3	Excessive Wind Noise
7/24/22 00:59	7/24/22 01:07	51.7	8.3	Train Passby
7/24/22 01:11	7/24/22 01:12	47.2	1.5	Excessive Wind Noise
7/24/22 01:13	7/24/22 01:14	44.3	1.0	Excessive Wind Noise
7/24/22 01:15	7/24/22 01:16	45.8	1.0	Excessive Wind Noise
7/24/22 01:19	7/24/22 01:20	48.0	0.5	Excessive Wind Noise
7/24/22 01:21	7/24/22 01:22	45.6	0.8	Excessive Wind Noise
7/24/22 01:27	7/24/22 01:31	43.2	3.3	Excessive Wind Noise
7/24/22 01:35	7/24/22 01:38	44.4	2.8	Excessive Wind Noise
7/24/22 01:56	7/24/22 01:59	42.3	3.5	Excessive Wind Noise
7/24/22 02:28	7/24/22 02:30	39.8	2.3	Aircraft Flyover
7/24/22 02:39	7/24/22 02:40	44.9	1.5	Train Passby
7/24/22 02:43	7/24/22 02:44	40.2	1.0	Train Passby
7/24/22 02:58	7/24/22 03:00	43.0	2.0	Train Passby

Data Removal Noise Monitoring Location #12 (2nd – 48 Hour Period) Cont.

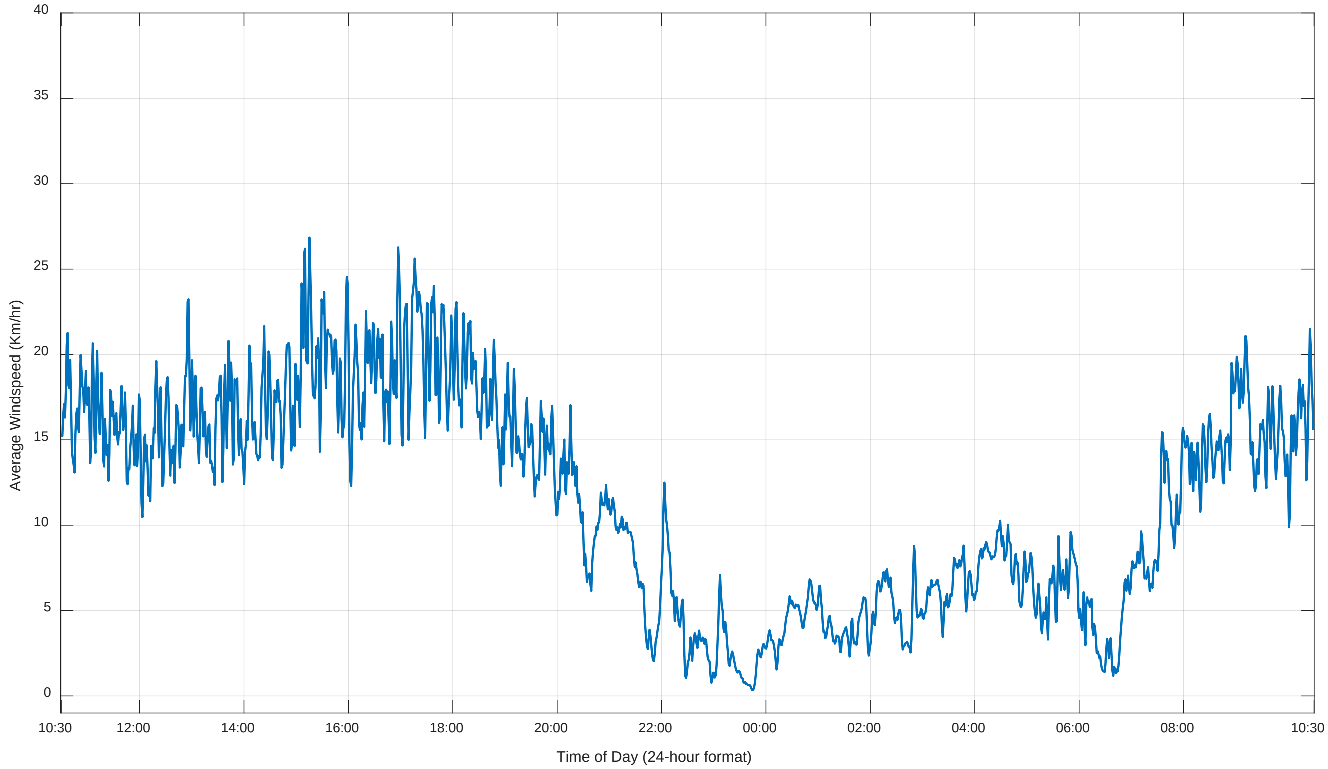
Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/24/22 03:12	7/24/22 03:16	52.8	4.0	Train Passby
7/24/22 03:23	7/24/22 03:24	51.0	1.3	Train Passby
7/24/22 03:32	7/24/22 03:33	40.3	1.3	Train Passby
7/24/22 03:35	7/24/22 03:35	39.2	0.5	Loud Vehicle Passby
7/24/22 03:36	7/24/22 03:37	37.9	1.0	Loud Vehicle Passby
7/24/22 03:41	7/24/22 03:43	51.1	1.8	Loud Vehicle Passby
7/24/22 04:11	7/24/22 04:13	47.1	1.5	Loud Vehicle Passby
7/24/22 04:15	7/24/22 04:17	42.5	1.8	Loud Vehicle Passby
7/24/22 04:23	7/24/22 04:24	39.2	1.3	Train Passby
7/24/22 04:36	7/24/22 04:47	49.5	10.8	Morning Chorus
7/24/22 04:47	7/24/22 05:02	49.5	14.5	Morning Chorus
7/24/22 05:02	7/24/22 05:08	47.8	5.5	Morning Chorus
7/24/22 05:20	7/24/22 05:29	49.3	8.3	Morning Chorus
7/24/22 05:29	7/24/22 05:34	47.1	5.3	Morning Chorus
7/24/22 05:38	7/24/22 05:39	52.5	1.5	Loud Vehicle Passby
7/24/22 05:41	7/24/22 05:42	54.0	1.0	Loud Vehicle Passby
7/24/22 05:48	7/24/22 05:50	42.0	1.5	Train Passby
7/24/22 05:52	7/24/22 05:52	41.3	0.8	Train Passby
7/24/22 05:54	7/24/22 06:01	47.8	7.0	Morning Chorus
7/24/22 06:02	7/24/22 06:07	39.2	5.5	Morning Chorus
7/24/22 06:11	7/24/22 06:14	47.2	2.8	Loud Vehicle Passby
7/24/22 06:15	7/24/22 06:24	49.9	9.5	Morning Chorus
7/24/22 06:27	7/24/22 06:30	53.3	3.5	Loud Vehicle Passby
7/24/22 06:30	7/24/22 06:34	39.3	3.5	Excessive Bird Noise
7/24/22 06:40	7/24/22 06:52	43.8	12.3	Morning Chorus
7/24/22 06:54	7/24/22 07:00	53.2	5.8	Train Passby
		Total Night #1	98.8	
		Total Night #2	161.8	
		Total Data	**260.5**	

Data Removal Noise Monitoring Location #13

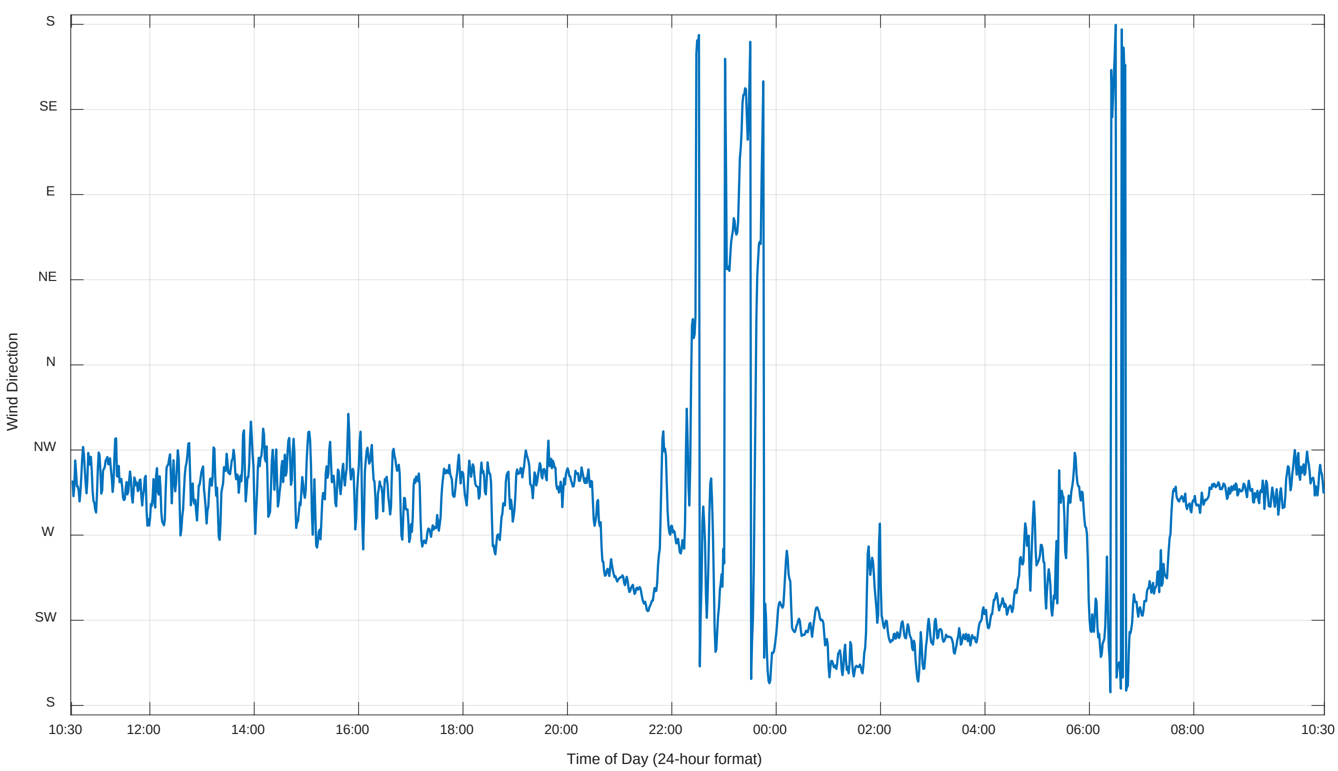
Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:14	7/20/22 22:15	37.9	0.75	Excessive Bird Noise
7/20/22 22:21	7/20/22 22:22	33.2	0.75	Excessive Bird Noise
7/20/22 22:34	7/20/22 22:39	37.0	4.75	Animal Noise
7/20/22 22:50	7/20/22 22:53	47.7	2.75	Loud Vehicle Passby
7/20/22 22:54	7/20/22 22:56	43.0	1.5	Loud Vehicle Passby
7/21/22 04:07	7/21/22 04:08	30.1	0.75	Loud Vehicle Passby
7/21/22 05:46	7/21/22 05:47	62.2	1.5	Loud Vehicle Passby
7/21/22 06:00	7/21/22 06:01	38.5	1.25	Train Passby
7/21/22 06:08	7/21/22 06:09	61.3	1	Loud Vehicle Passby
7/21/22 06:09	7/21/22 06:13	53.8	3.5	Loud Vehicle Passby
7/21/22 06:17	7/21/22 06:19	40.9	1.75	Excessive Bird Noise
7/21/22 06:21	7/21/22 06:23	40.5	2	Excessive Bird Noise
7/21/22 06:39	7/21/22 06:41	40.3	1.5	Loud Vehicle Passby
7/21/22 06:44	7/21/22 06:45	39.6	1.25	Loud Vehicle Passby
7/21/22 06:46	7/21/22 06:48	38.7	2	Human Activity
7/21/22 22:03	7/21/22 22:09	44.1	6.25	Aircraft Flyover
7/21/22 22:41	7/21/22 22:44	41.9	2.75	Aircraft Flyover
7/21/22 23:02	7/21/22 23:04	35.9	2.25	Excessive Wind Noise
7/21/22 23:23	7/22/22 00:17	44.3	54.25	Excessive Wind Noise
7/22/22 01:15	7/22/22 01:16	32.5	1	Animal Noise
7/22/22 01:17	7/22/22 01:19	33.1	2.25	Animal Noise
7/22/22 03:23	7/22/22 03:25	35.8	2	Aircraft Flyover
7/22/22 03:39	7/22/22 03:40	32.5	0.5	Coyote
7/22/22 03:42	7/22/22 03:43	29.5	0.5	Coyote
7/22/22 04:26	7/22/22 04:34	36.9	7.75	Morning Chorus
7/22/22 04:34	7/22/22 05:07	44.7	32.5	Morning Chorus
7/22/22 05:25	7/22/22 05:32	38.5	6.75	Morning Chorus
7/22/22 05:34	7/22/22 05:50	38.5	16.25	Morning Chorus
7/22/22 05:50	7/22/22 05:52	54.1	1.75	Loud Vehicle Passby
7/22/22 06:18	7/22/22 06:24	40.1	6.5	Animal Noise
7/22/22 06:27	7/22/22 06:28	52.3	1.25	Loud Vehicle Passby
7/22/22 06:38	7/22/22 06:41	38.0	2.5	Excessive Bird Noise
7/22/22 06:41	7/22/22 06:44	40.8	3	Excessive Bird Noise
7/22/22 06:45	7/22/22 06:47	42.2	2.75	Human Activity
7/22/22 06:48	7/22/22 06:52	38.8	3.5	Excessive Bird Noise
		Total Night #1	27.00	
		Total Night #2	156.25	
		Total Data	**183.25**	

Appendix V WEATHER DATA

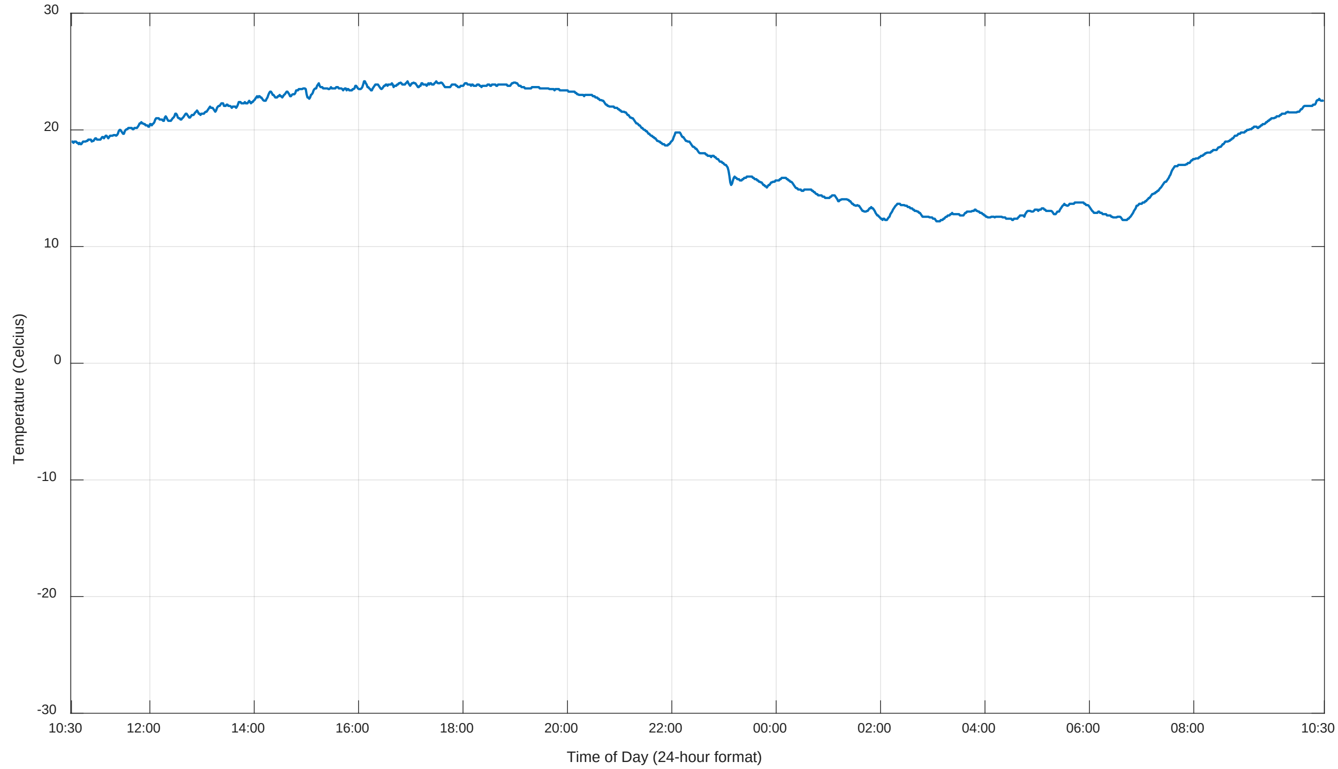
July 20 - 21, 2022 Weather Data



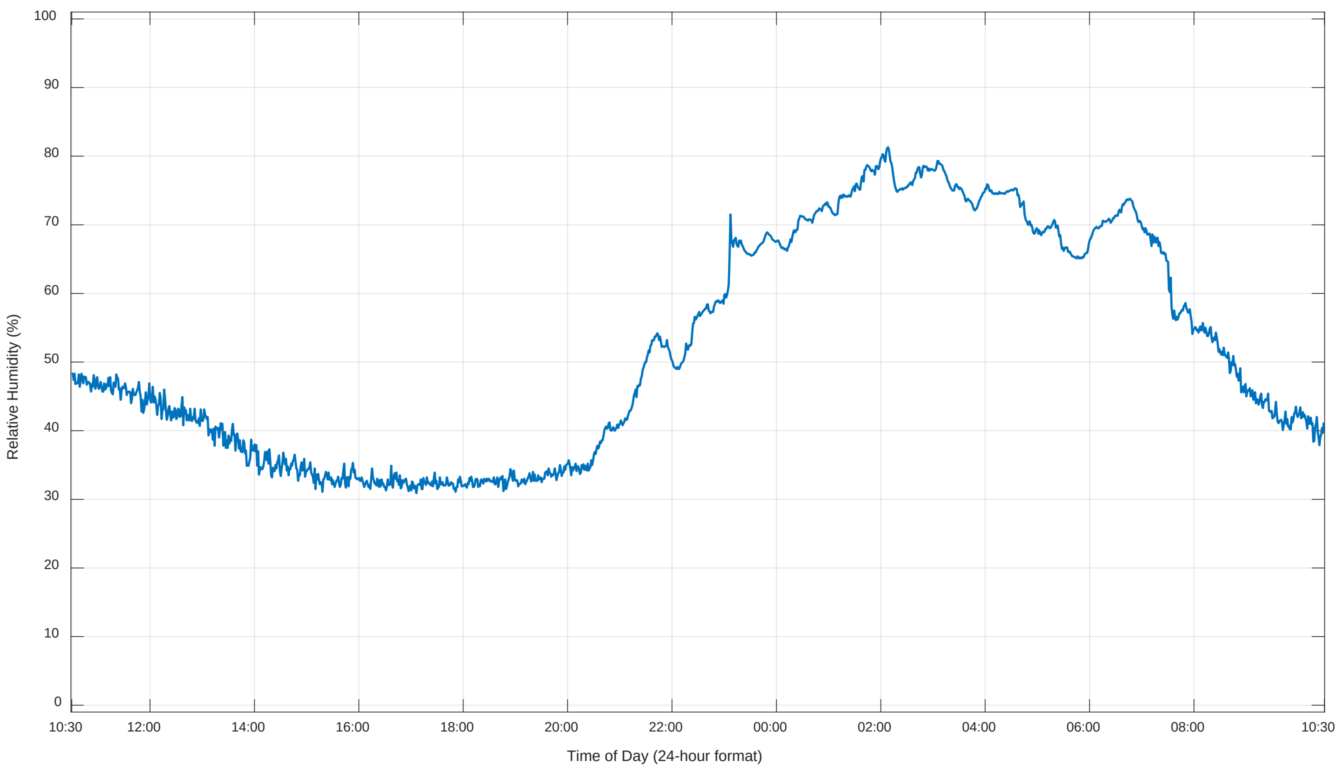
Monitored Wind Speed (July 20 - 21, 2022) at Noise Monitor Location 6



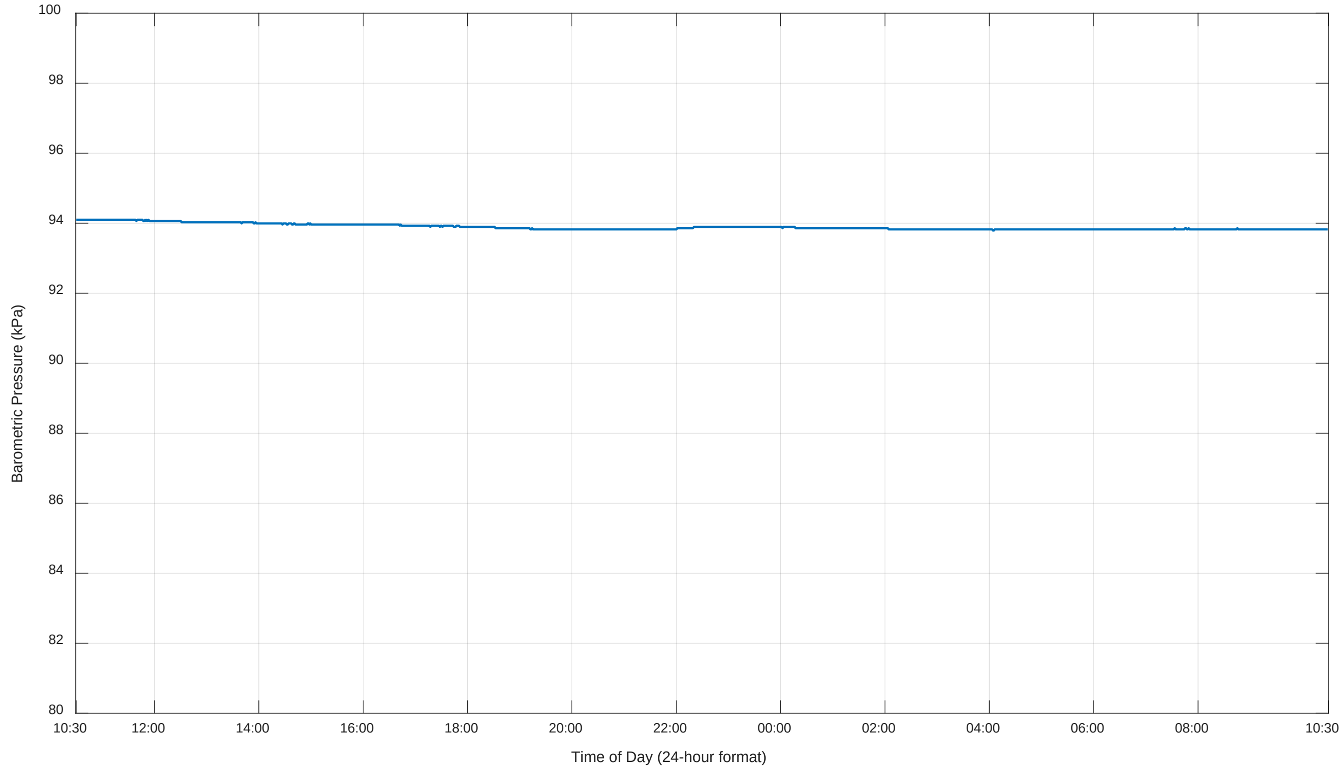
Monitored Wind Direction (July 20 - 21, 2022) at Noise Monitor Location 6



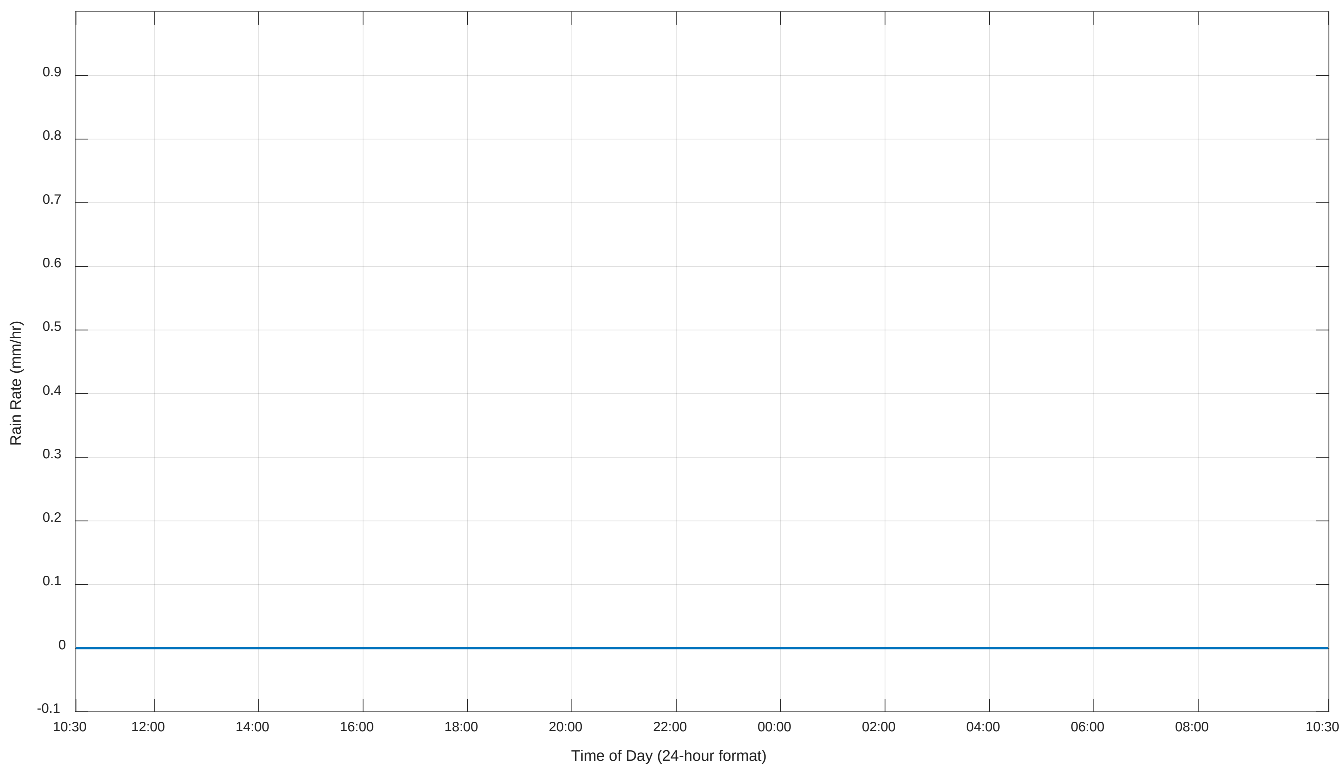
Monitored Temperature (July 20 - 21, 2022) at Noise Monitor Location 6



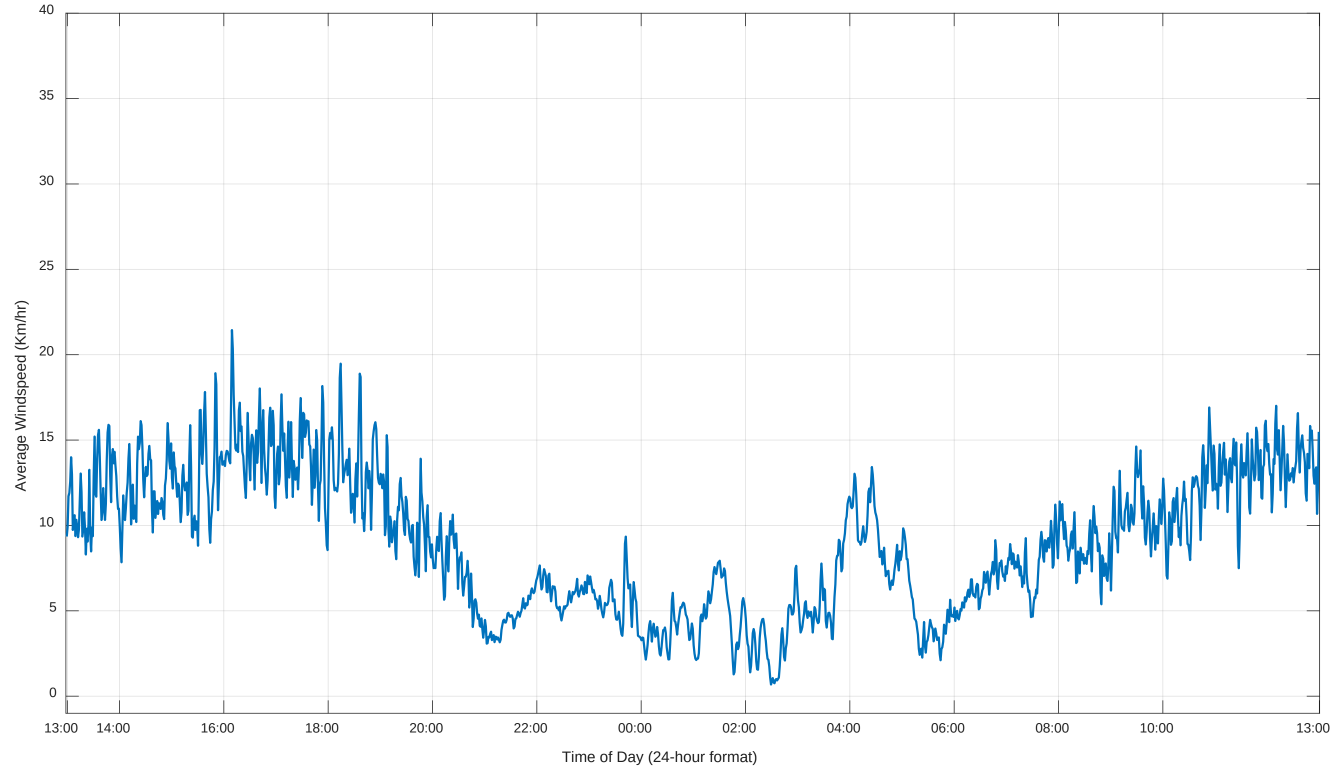
Monitored Humidity (July 20 - 21, 2022) at Noise Monitor Location 6



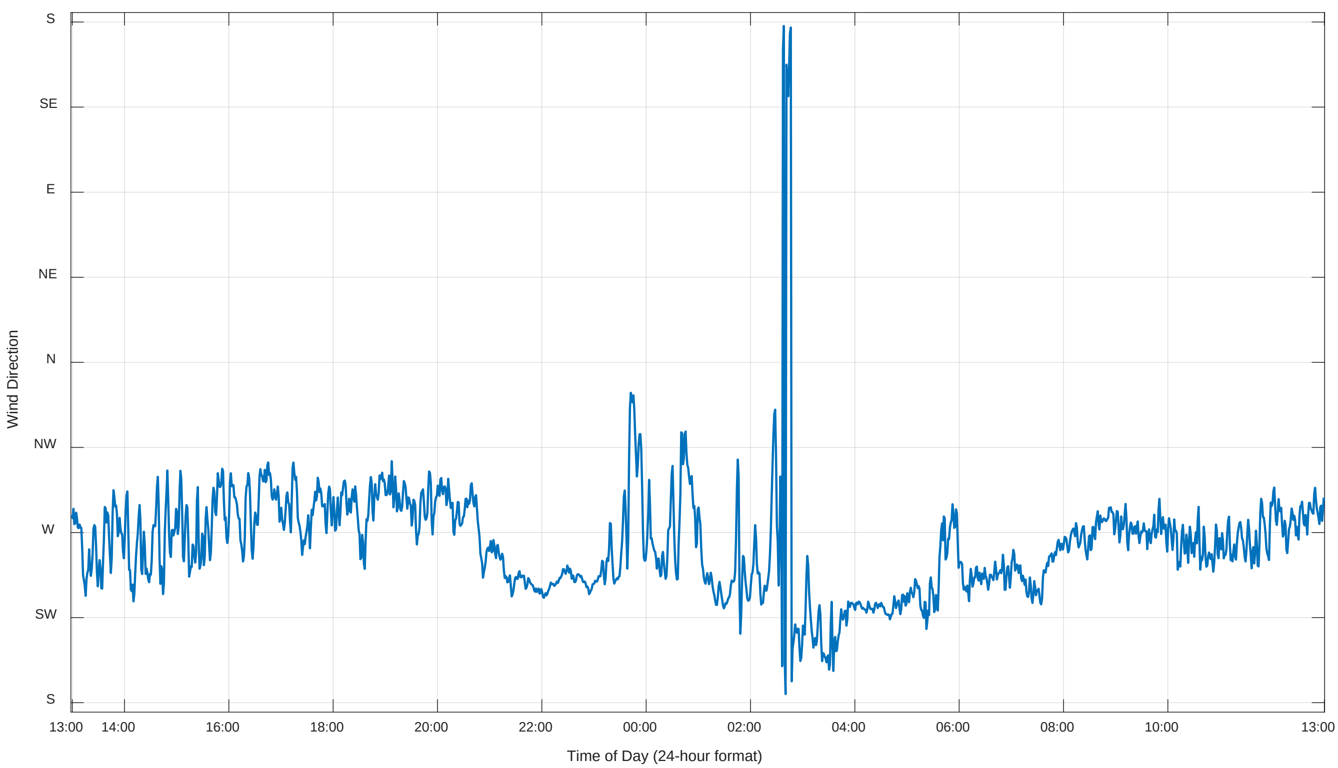
Monitored Barometric Pressure (July 20 - 21, 2022) at Noise Monitor Location 6



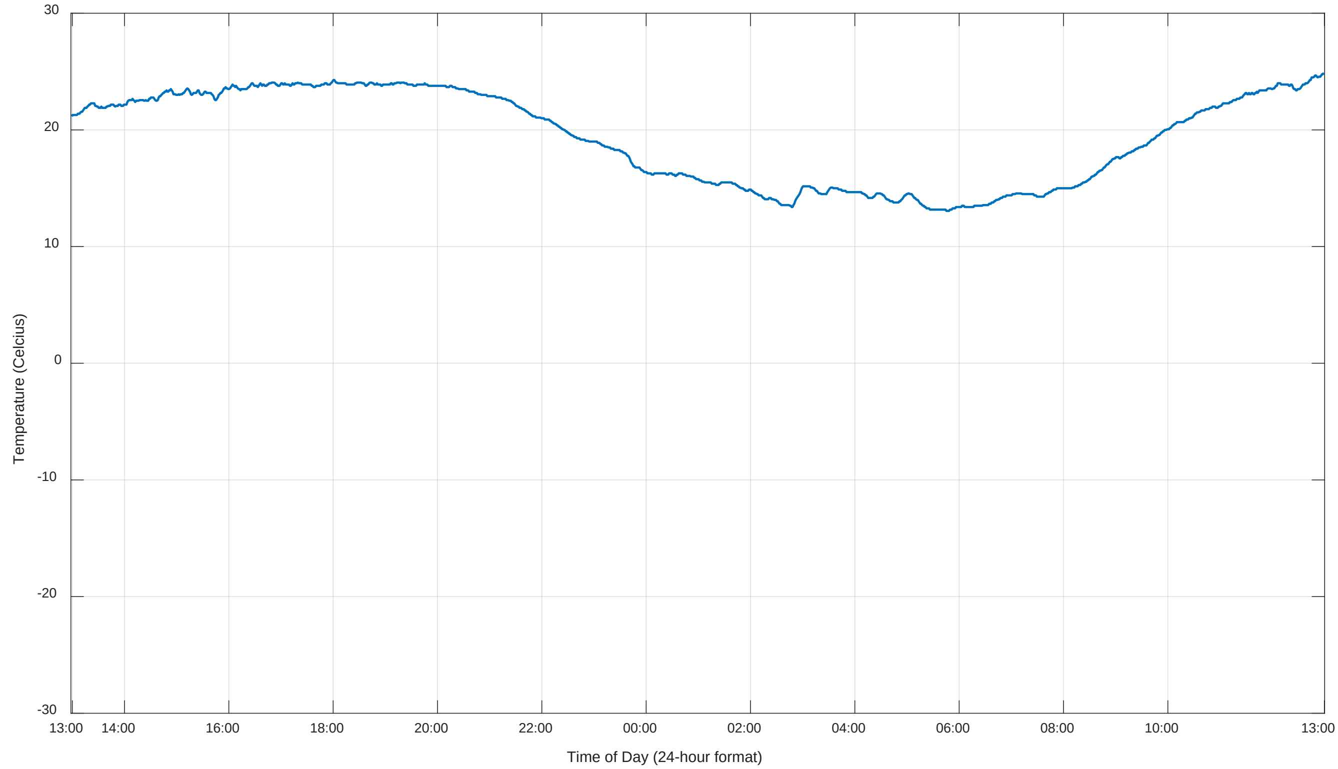
Monitored Rain Rate (July 20 - 21, 2022) at Noise Monitor Location 6



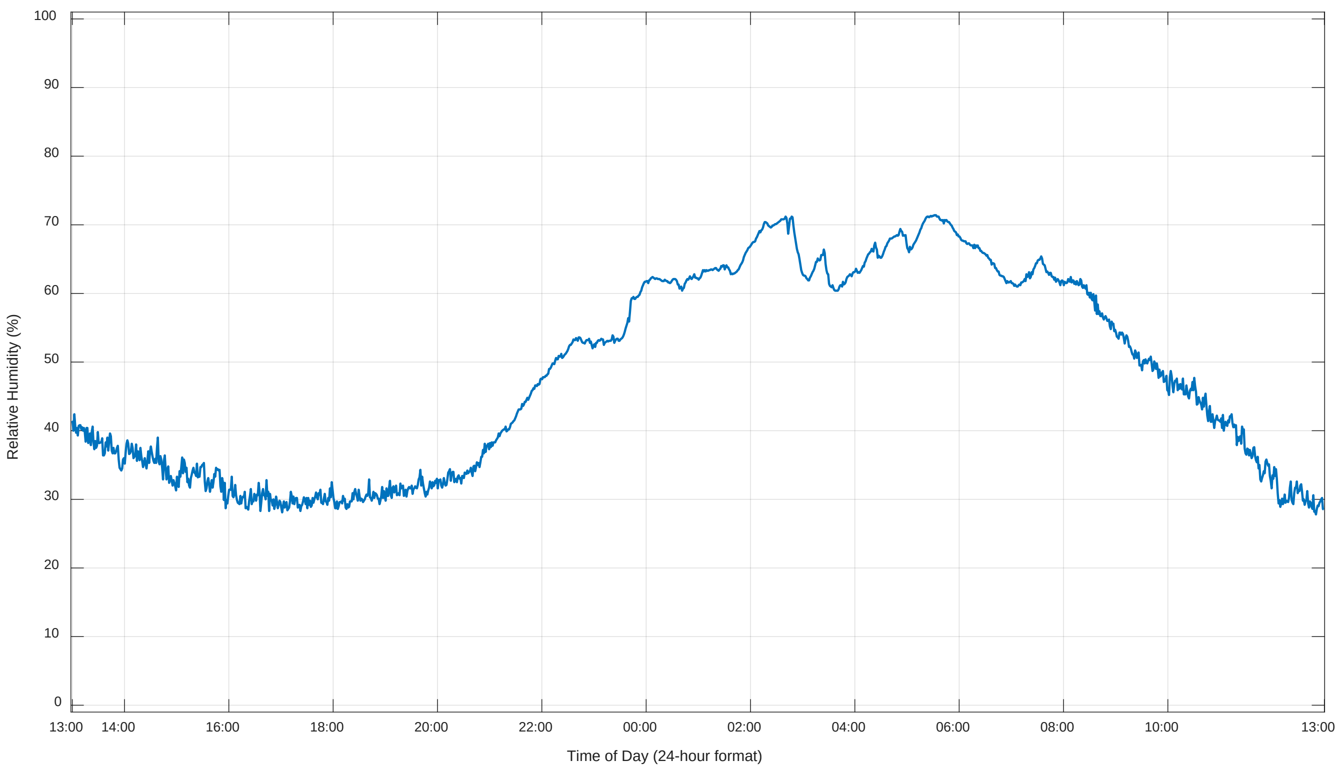
Monitored Wind Speed (July 20 - 21, 2022) at Noise Monitor Location 10



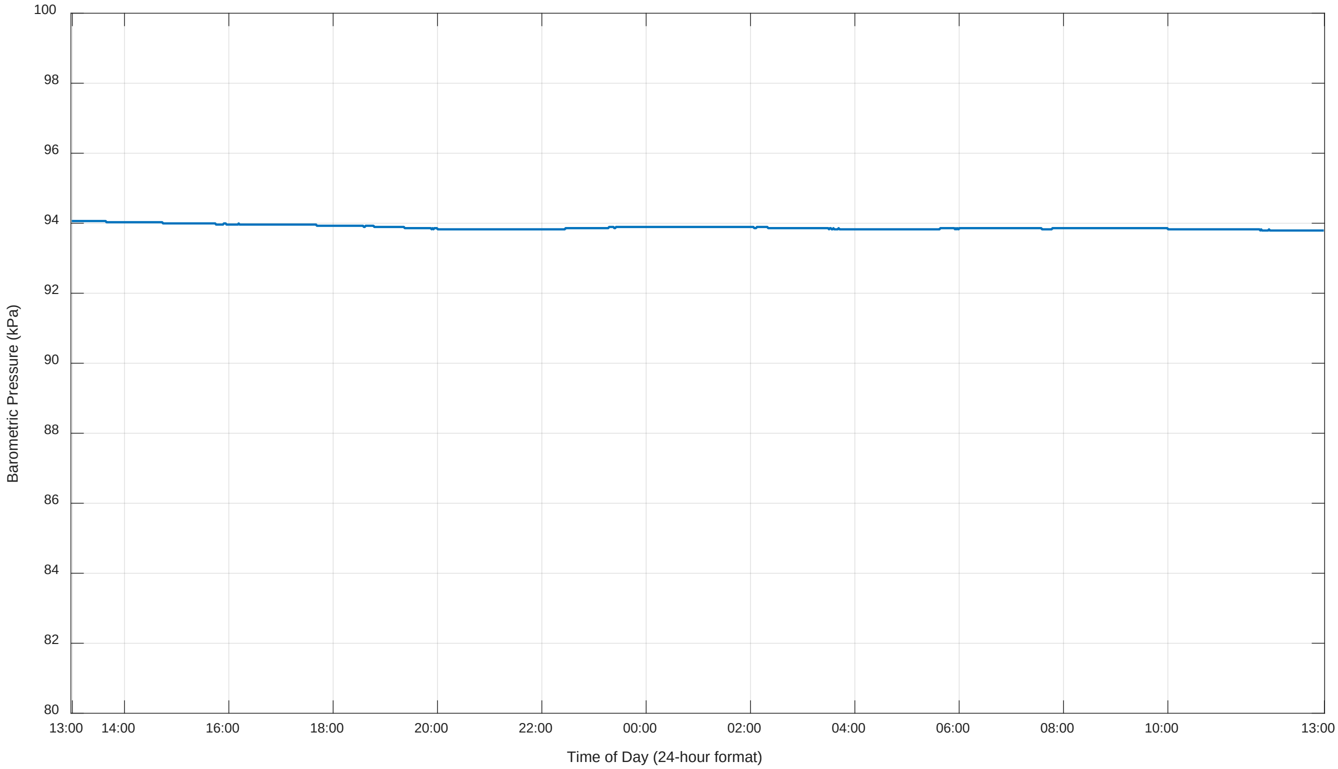
Monitored Wind Direction (July 20 - 21, 2022) at Noise Monitor Location 10



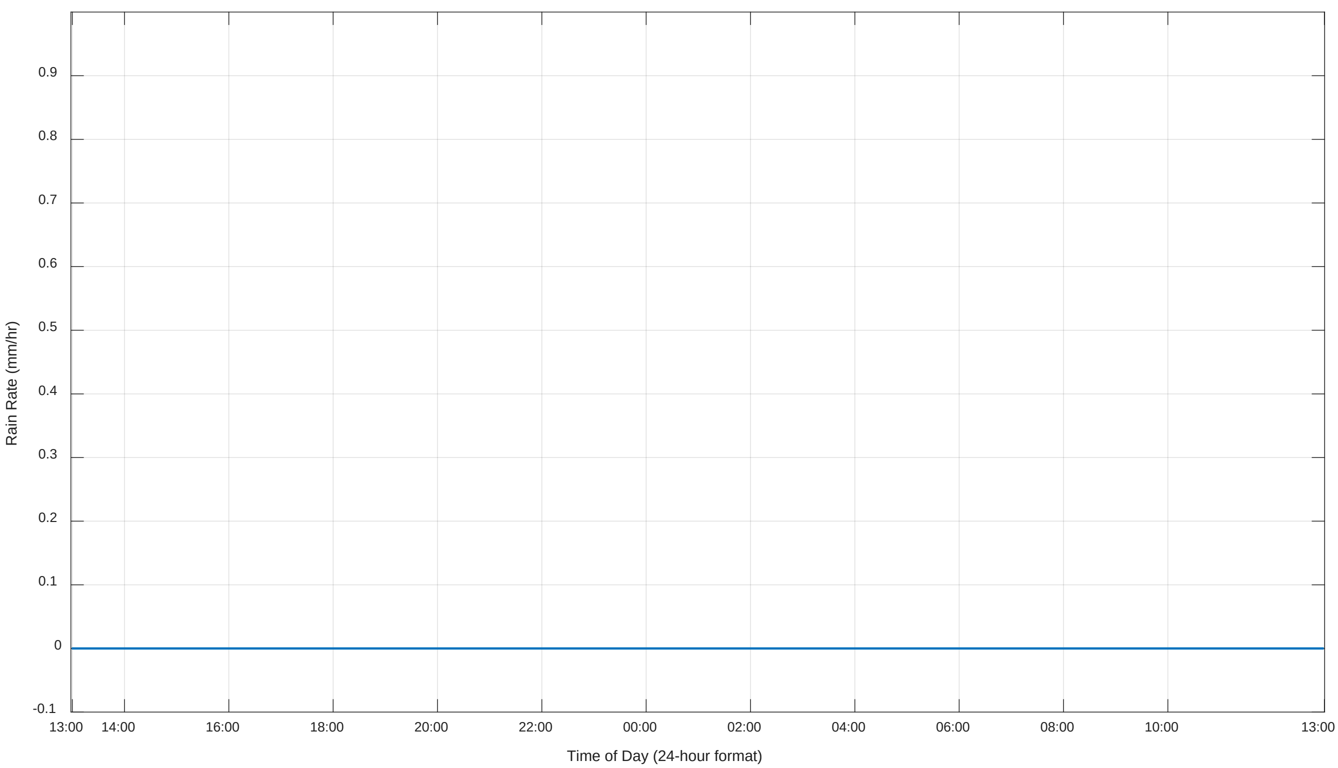
Monitored Temperature (July 20 - 21, 2022) at Noise Monitor Location 10



Monitored Humidity (July 20 - 21, 2022) at Noise Monitor Location 10



Monitored Barometric Pressure (July 20 - 21, 2022) at Noise Monitor Location 10



Monitored Rain Rate (July 20 - 21, 2022) at Noise Monitor Location 10

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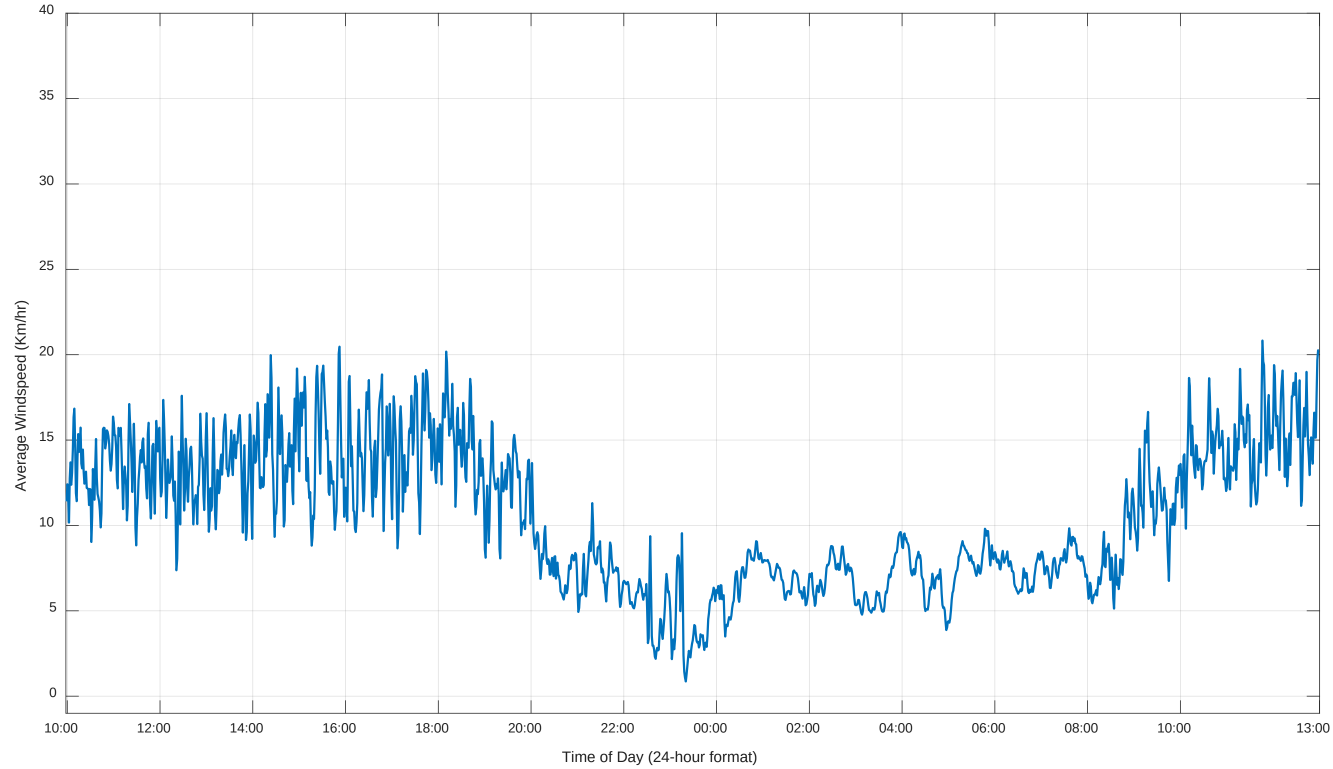
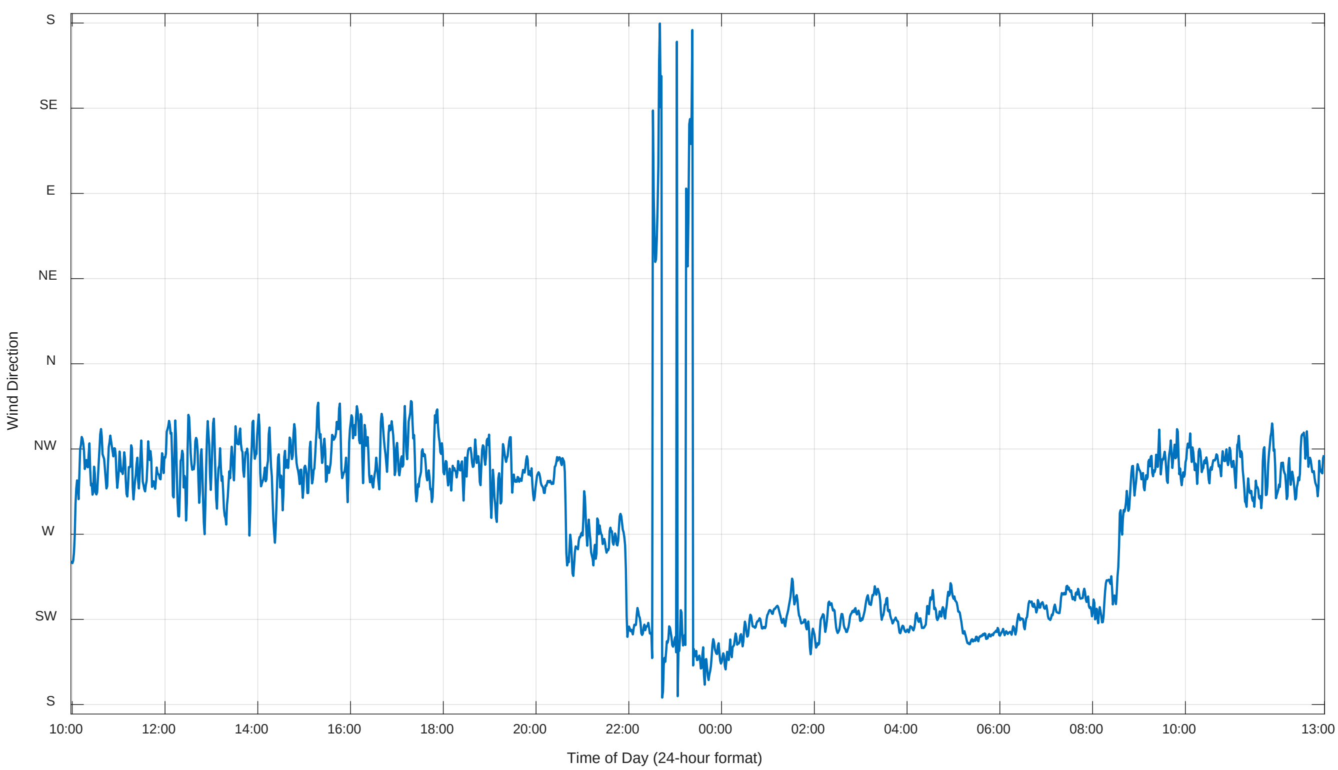
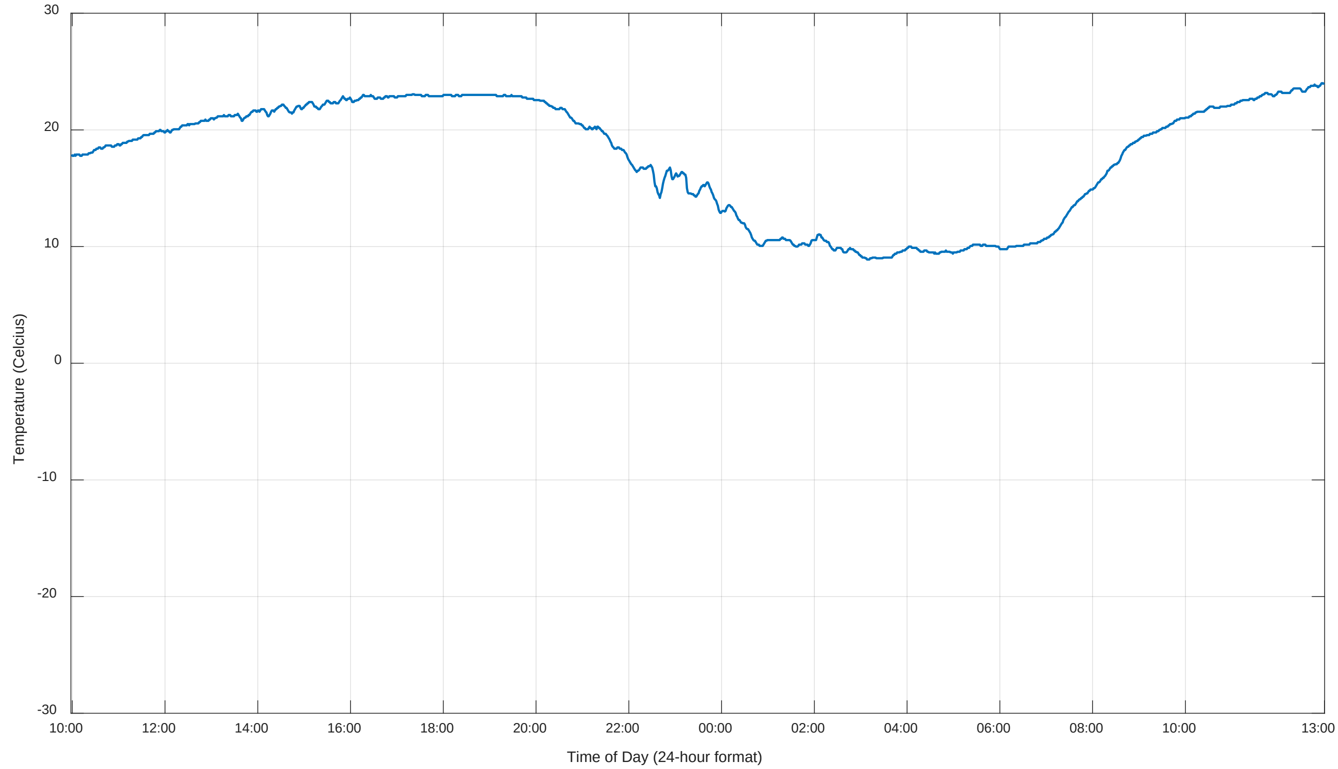


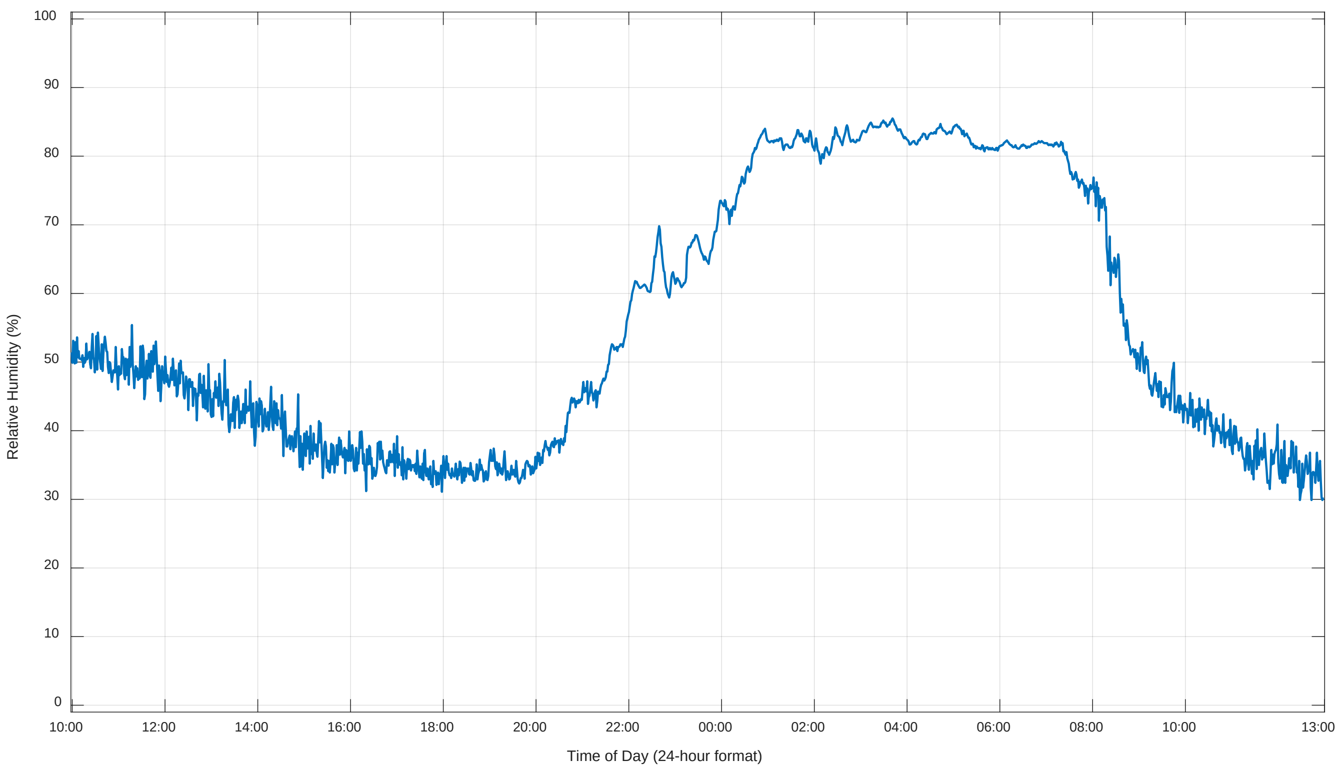
Monitored Wind Speed (July 20 - 21, 2022) at Noise Monitor Location 12



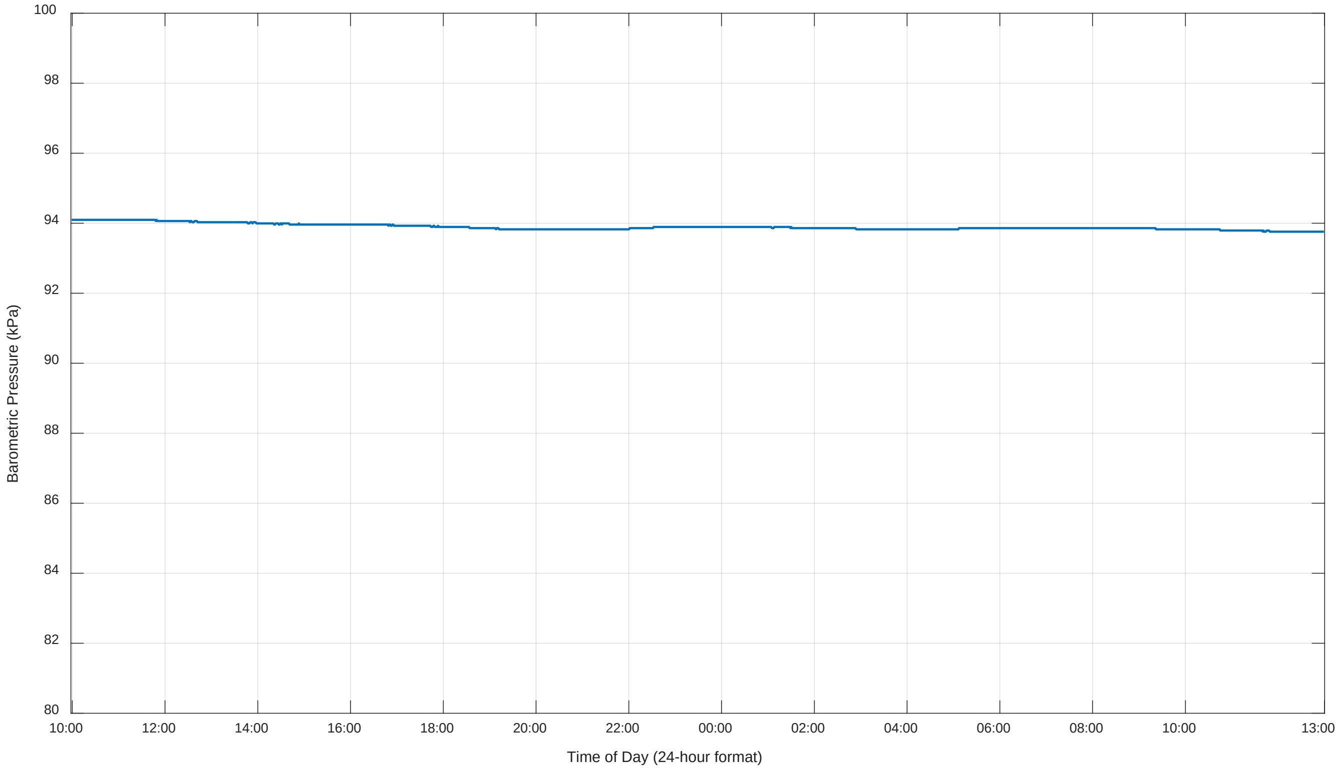
Monitored Wind Direction (July 20 - 21, 2022) at Noise Monitor Location 12



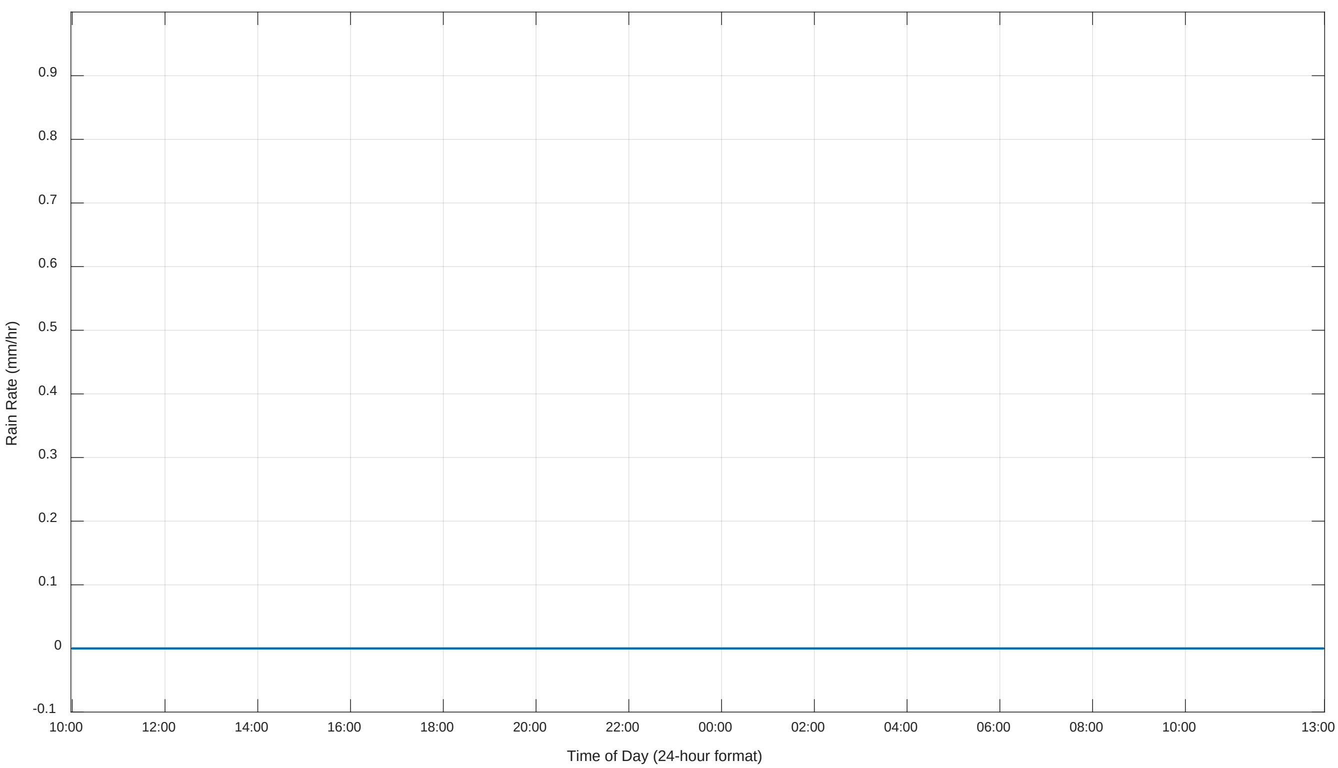
Monitored Temperature (July 20 - 21, 2022) at Noise Monitor Location 12



Monitored Humidity (July 20 - 21, 2022) at Noise Monitor Location 12

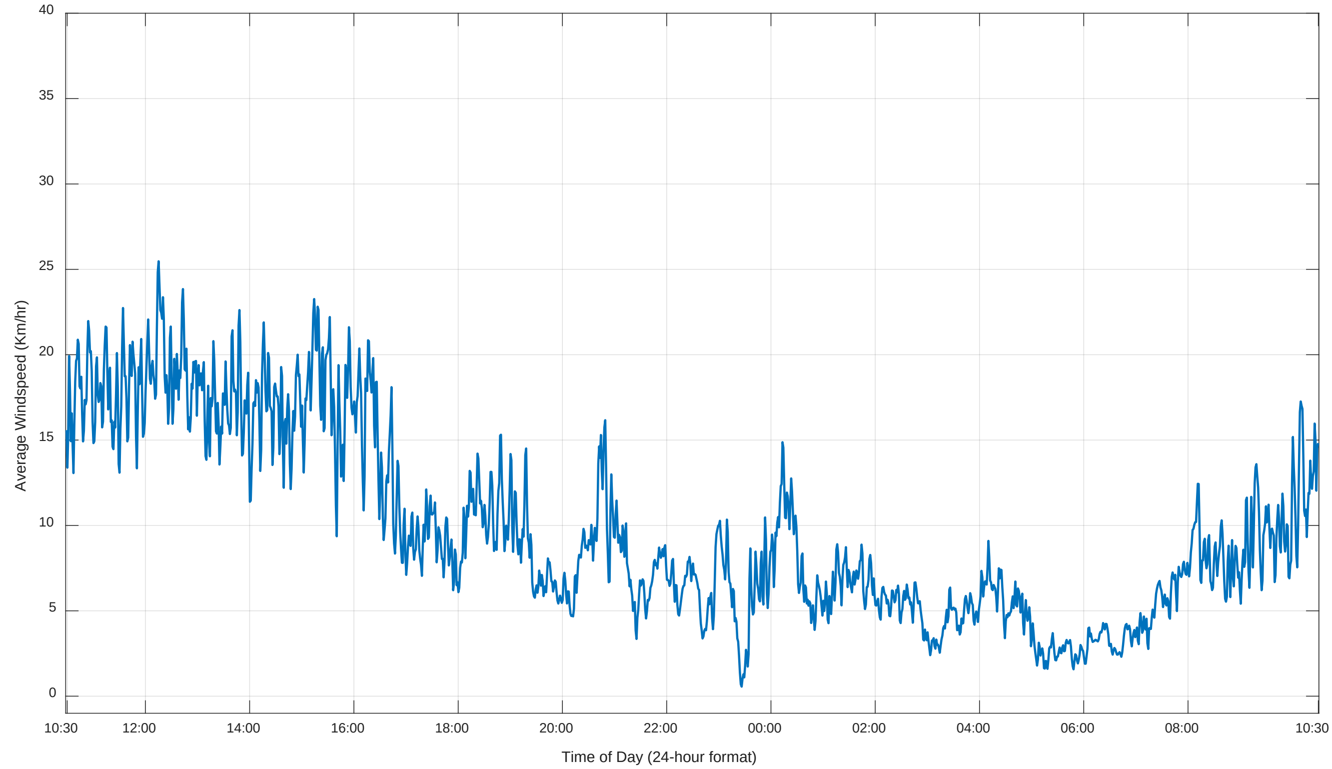


Monitored Barometric Pressure (July 20 - 21, 2022) at Noise Monitor Location 12

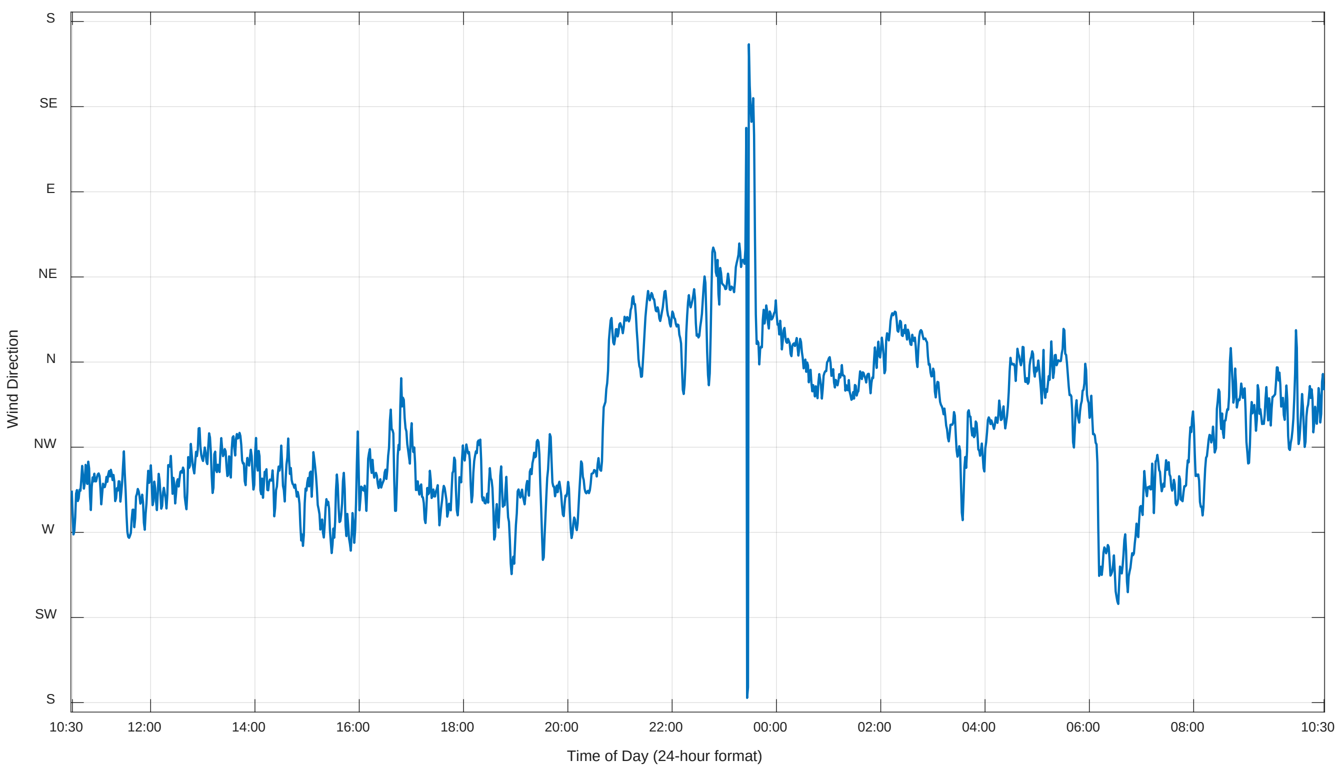


Monitored Rain Rate (July 20 - 21, 2022) at Noise Monitor Location 12

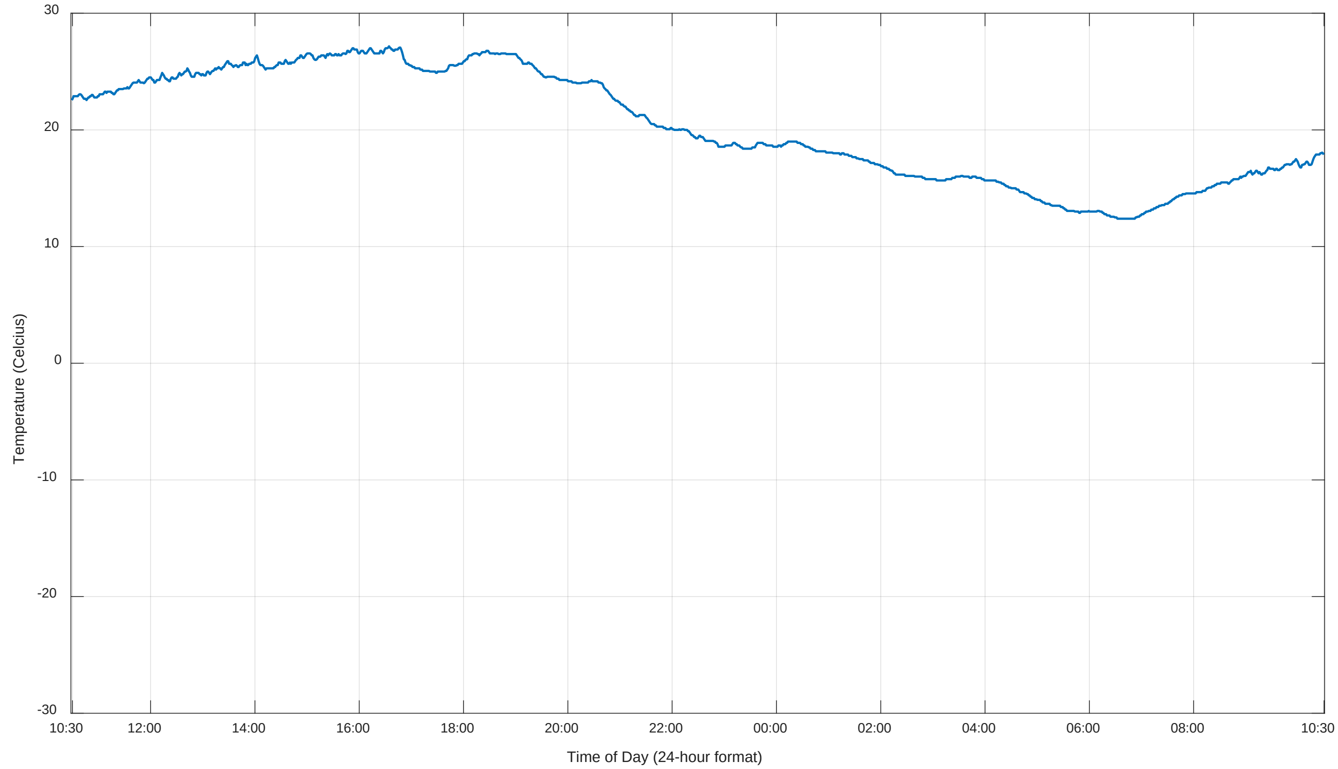
July 21 - 22, 2022 Weather Data



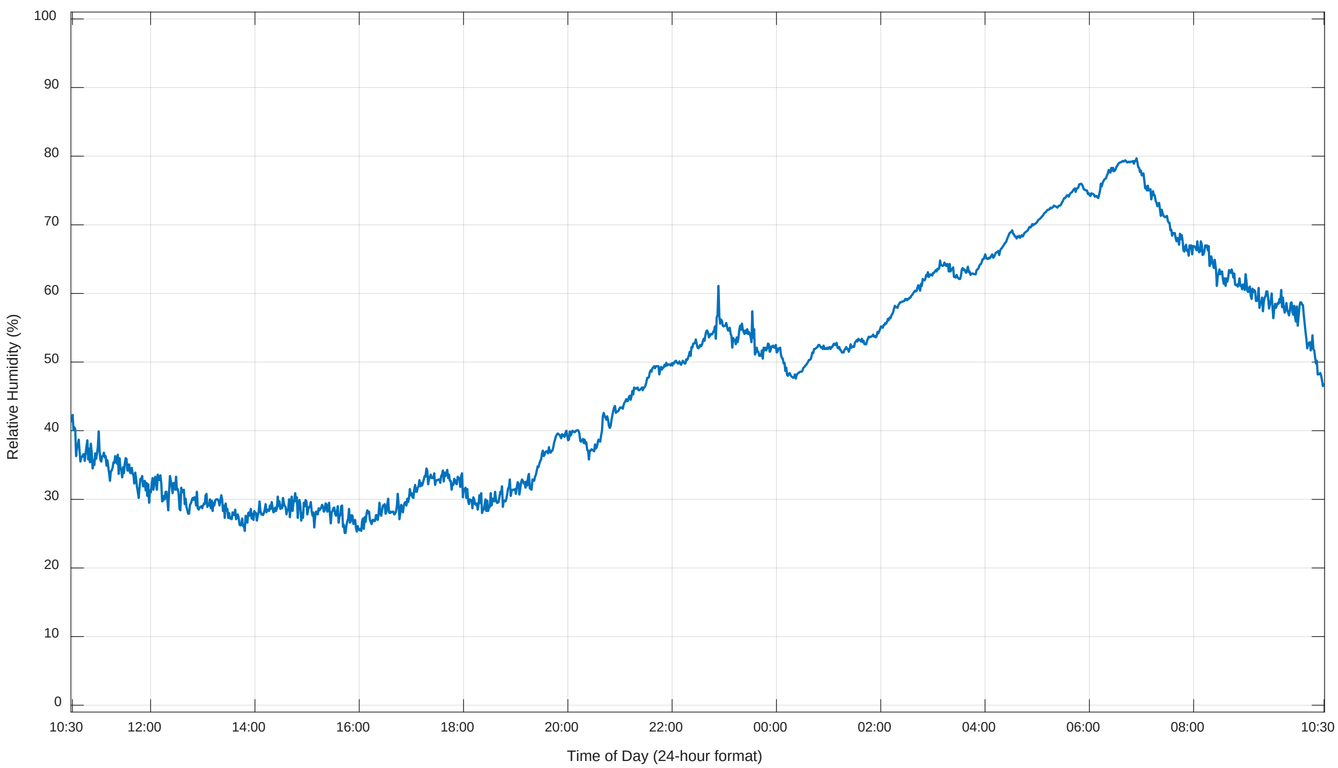
Monitored Wind Speed (July 21 - 22, 2022) at Noise Monitor Location 6



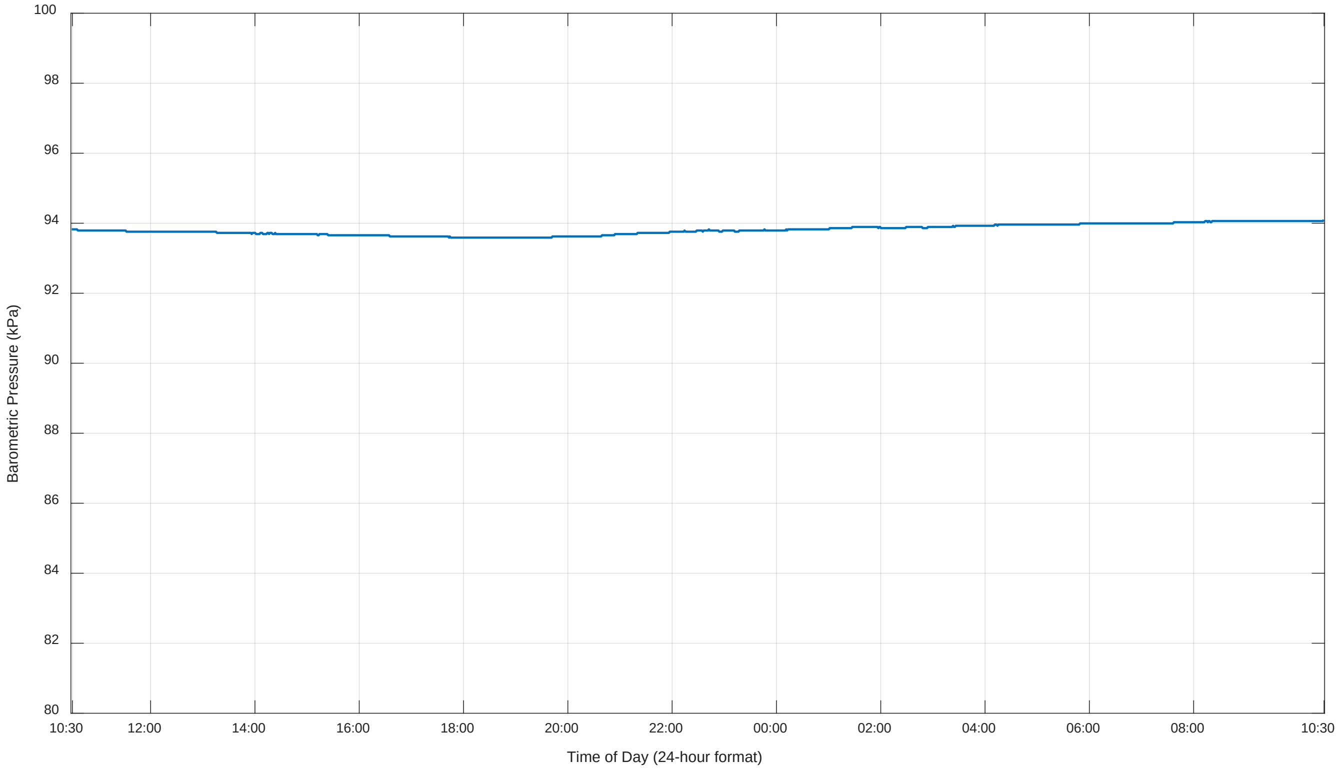
Monitored Wind Direction (July 21 - 22, 2022) at Noise Monitor Location 6



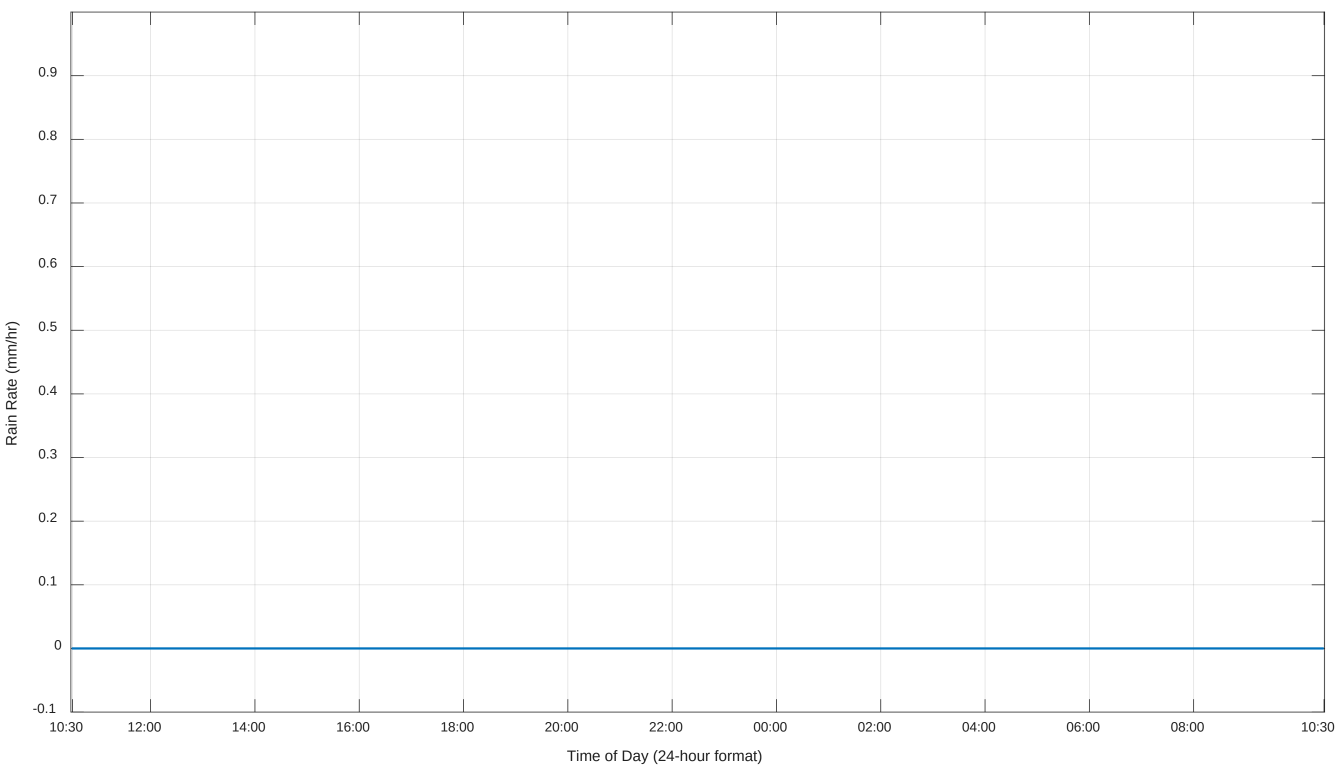
Monitored Temperature (July 21 - 22, 2022) at Noise Monitor Location 6



Monitored Humidity (July 21 - 22, 2022) at Noise Monitor Location 6



Monitored Barometric Pressure (July 21 - 22, 2022) at Noise Monitor Location 6



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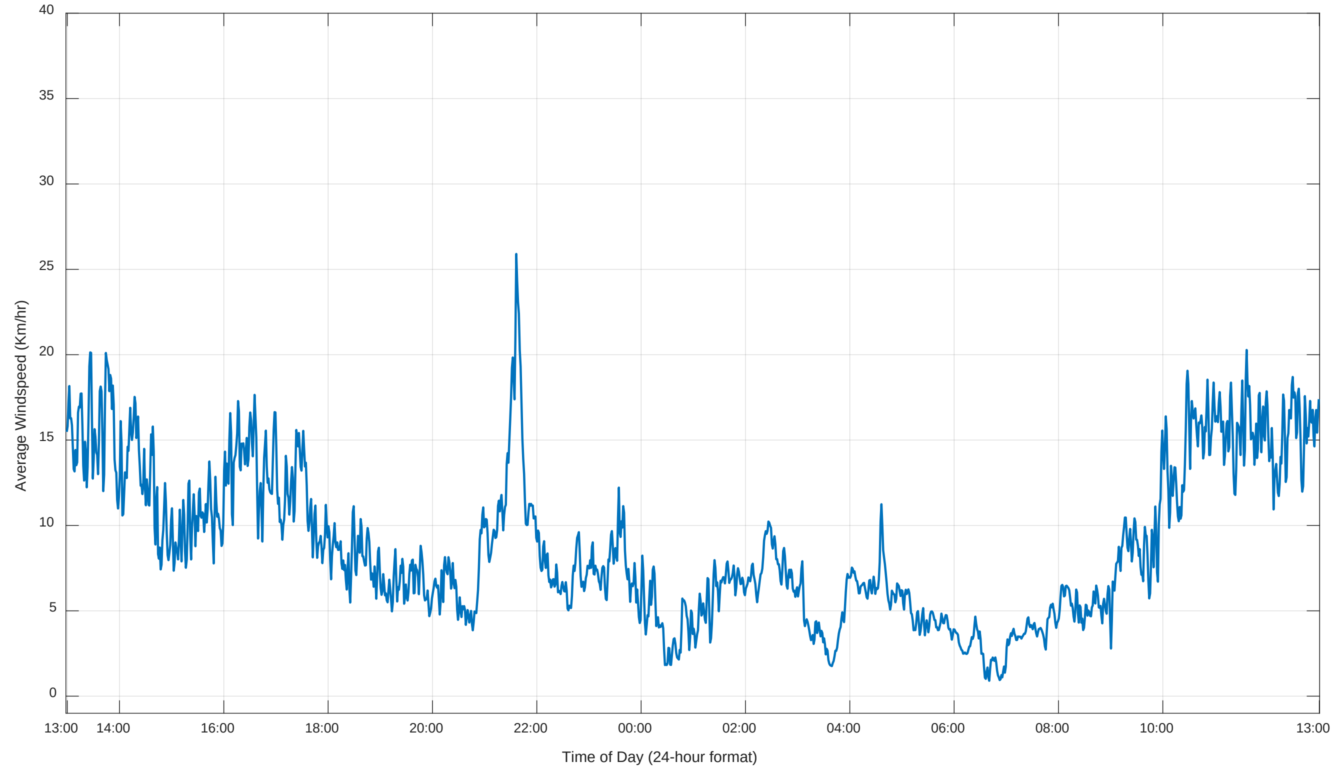

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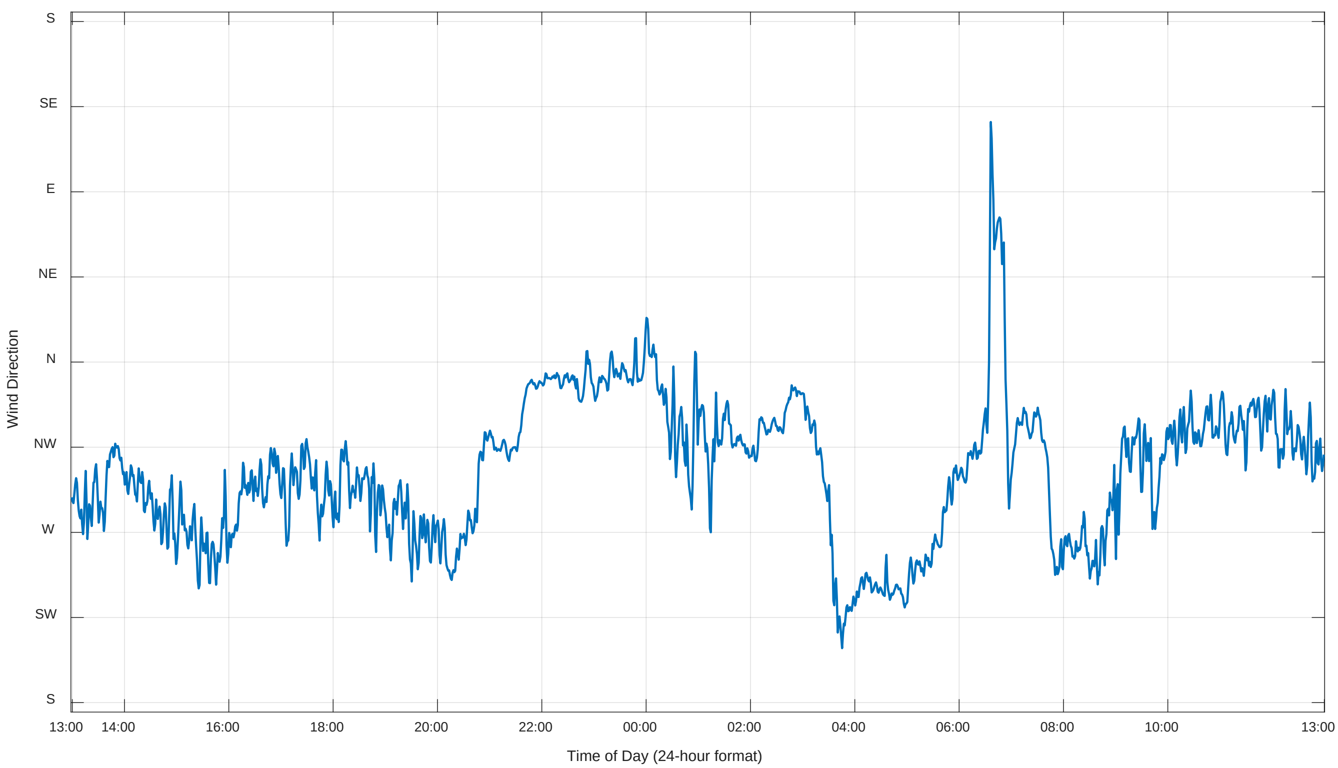

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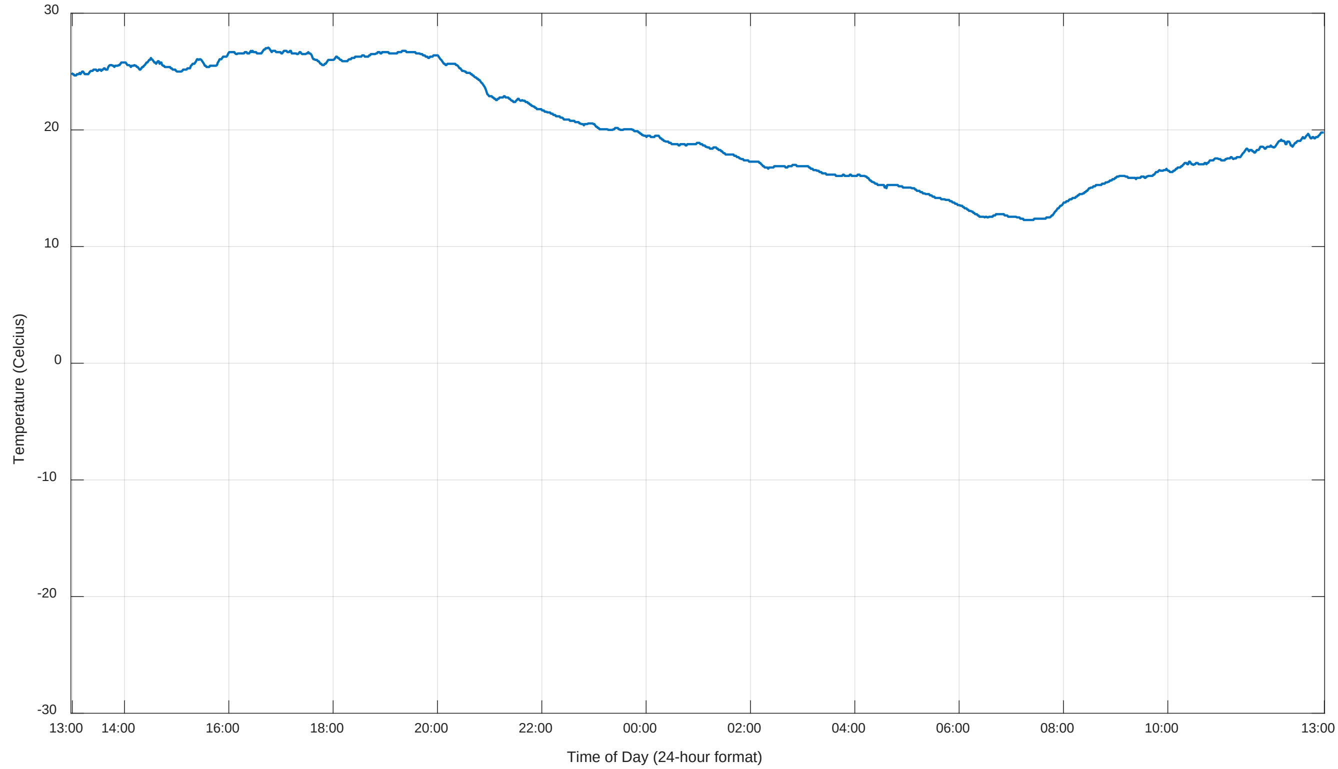

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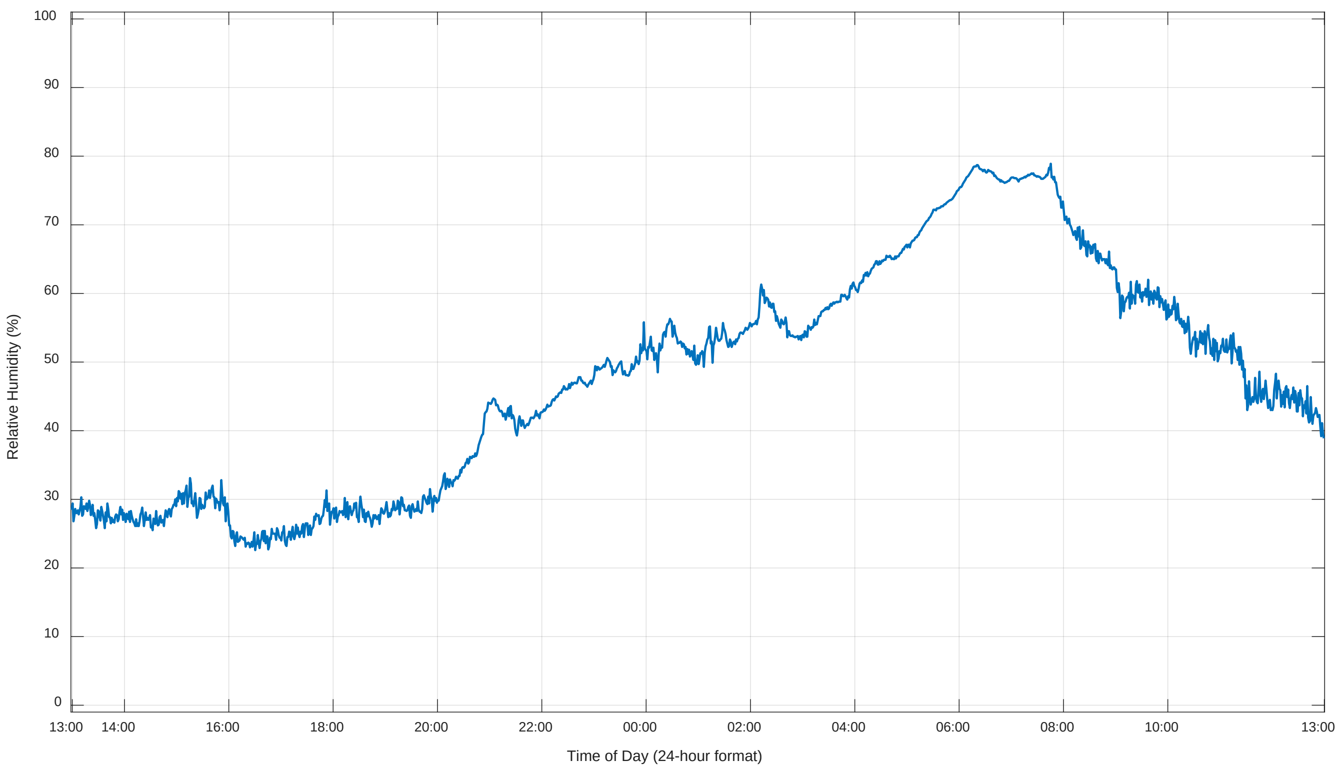

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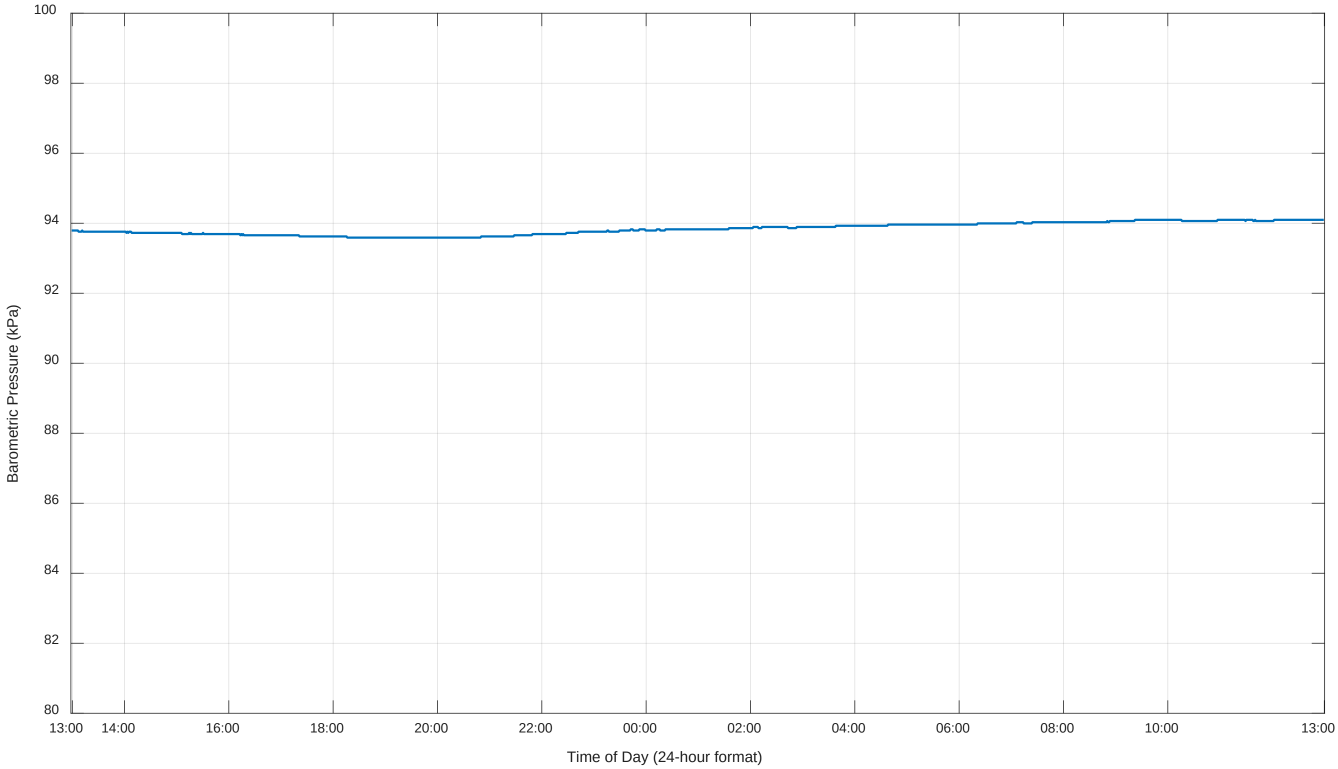

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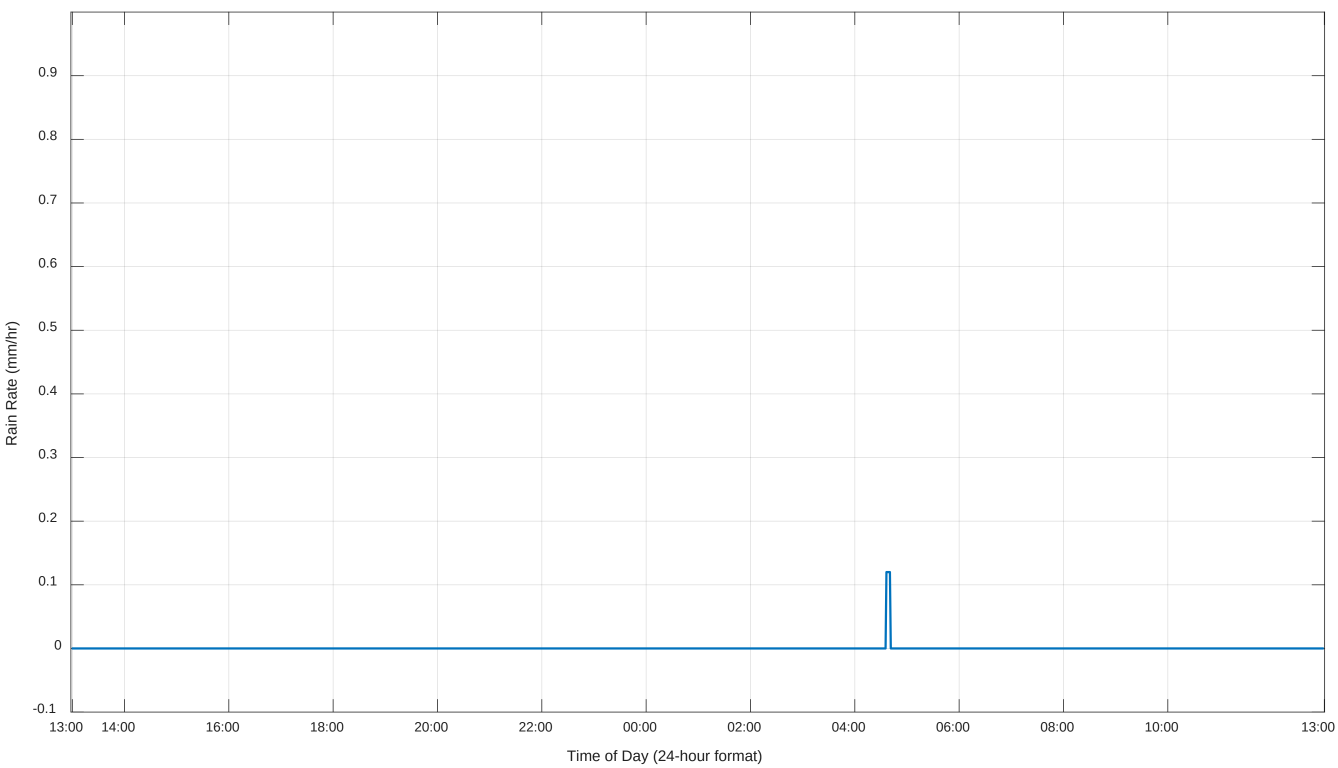

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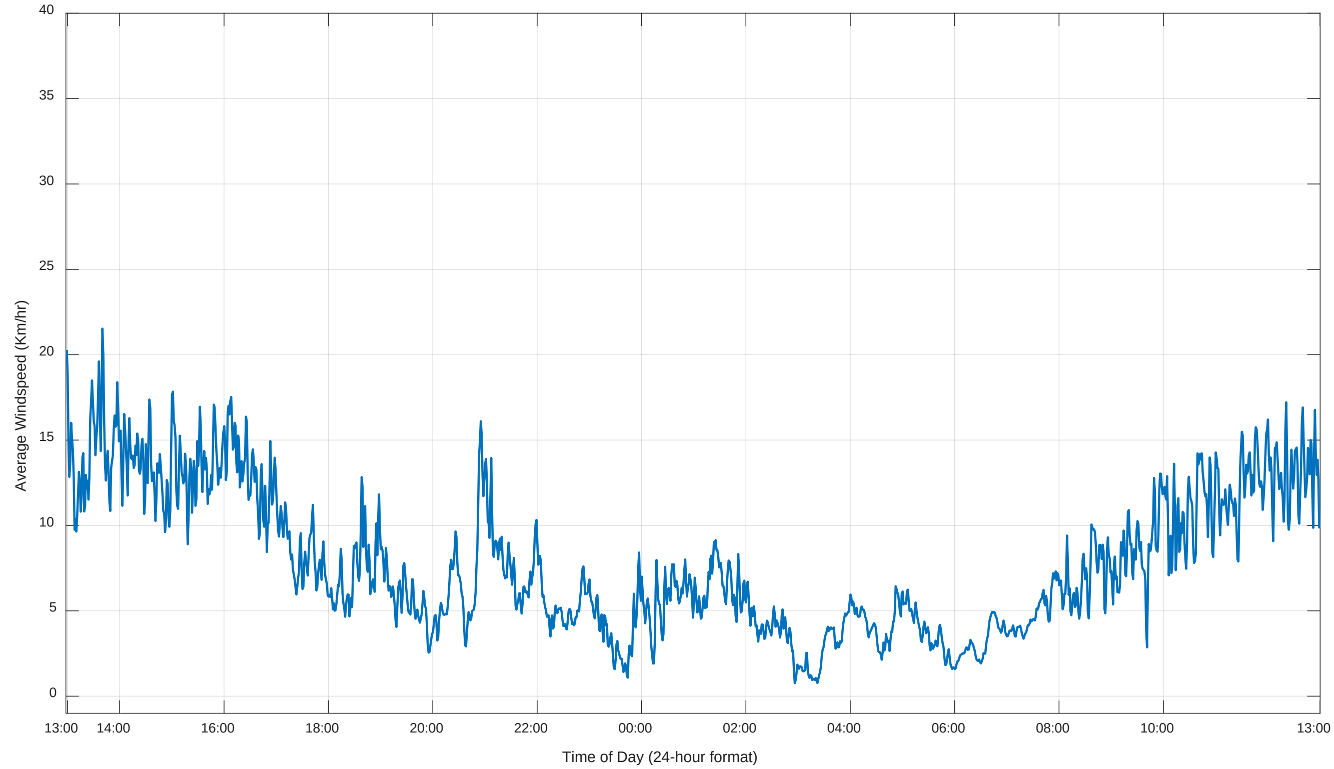

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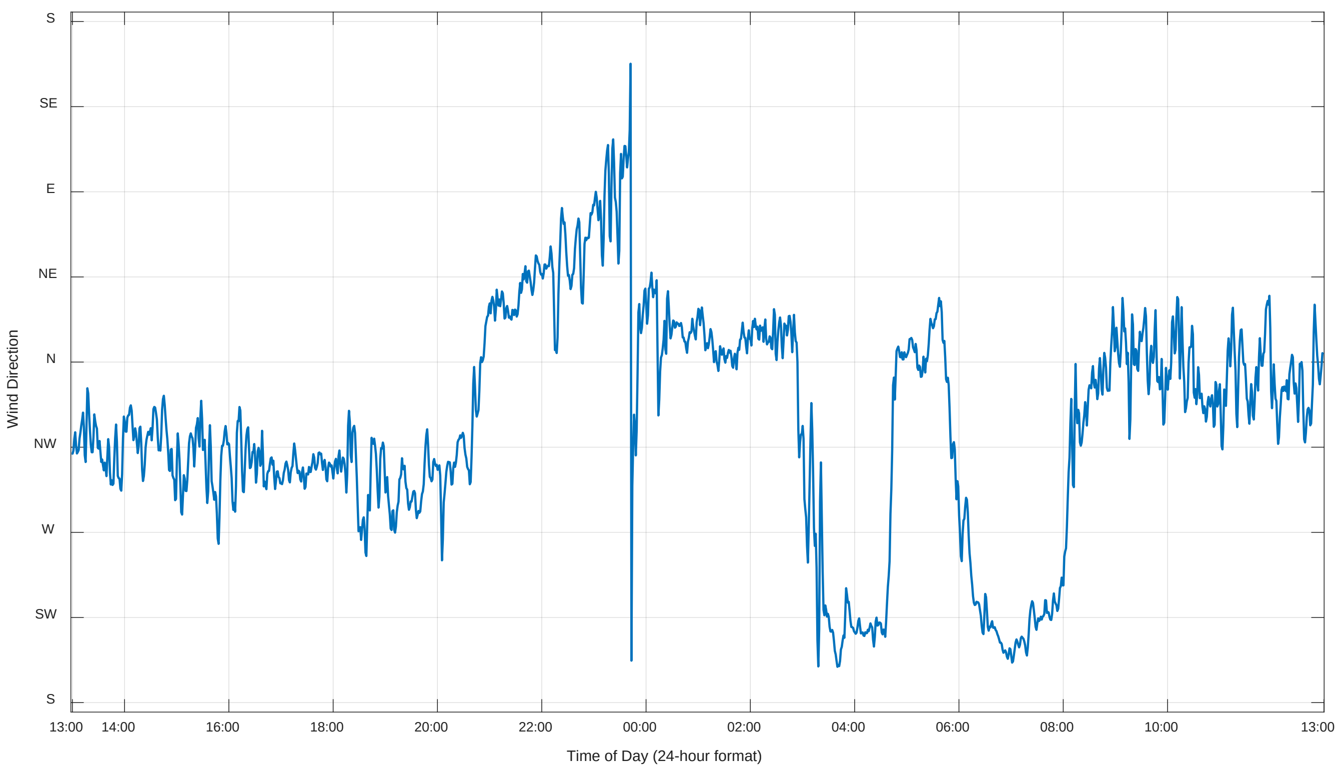

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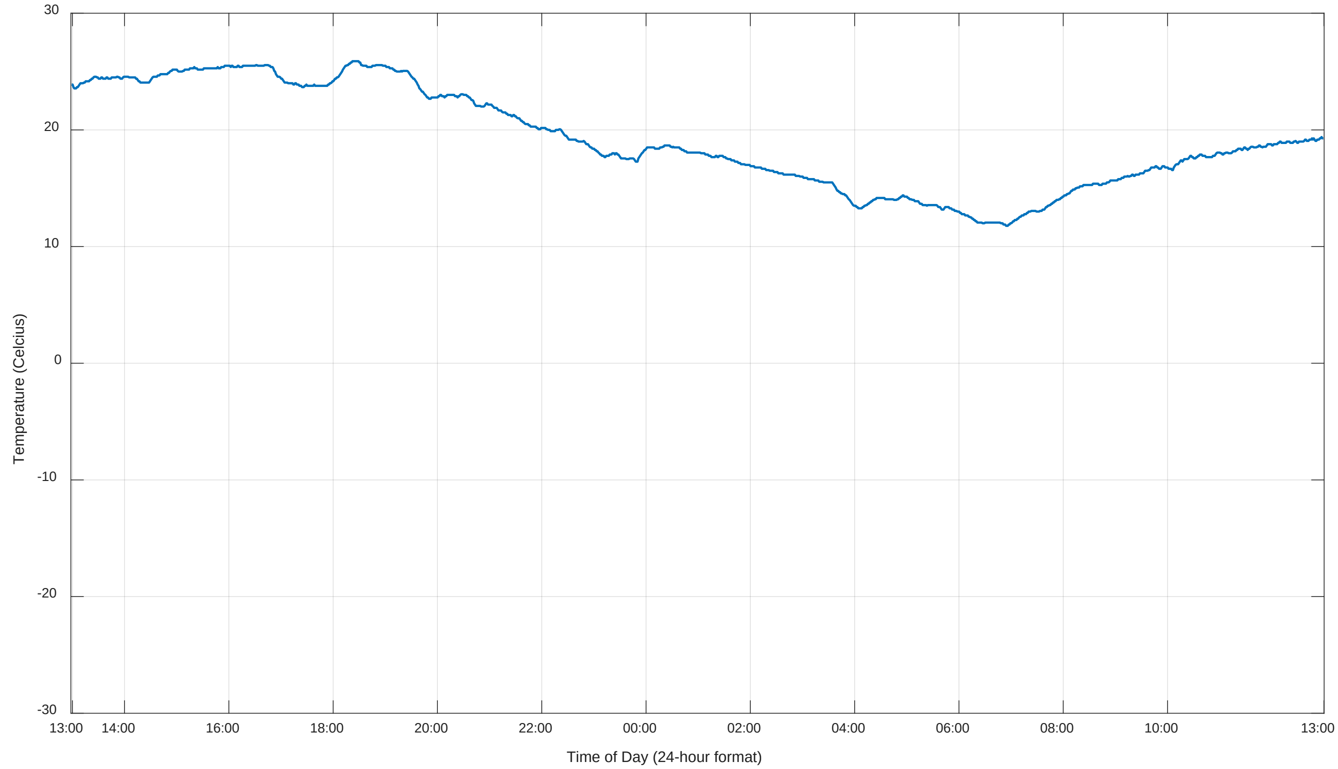

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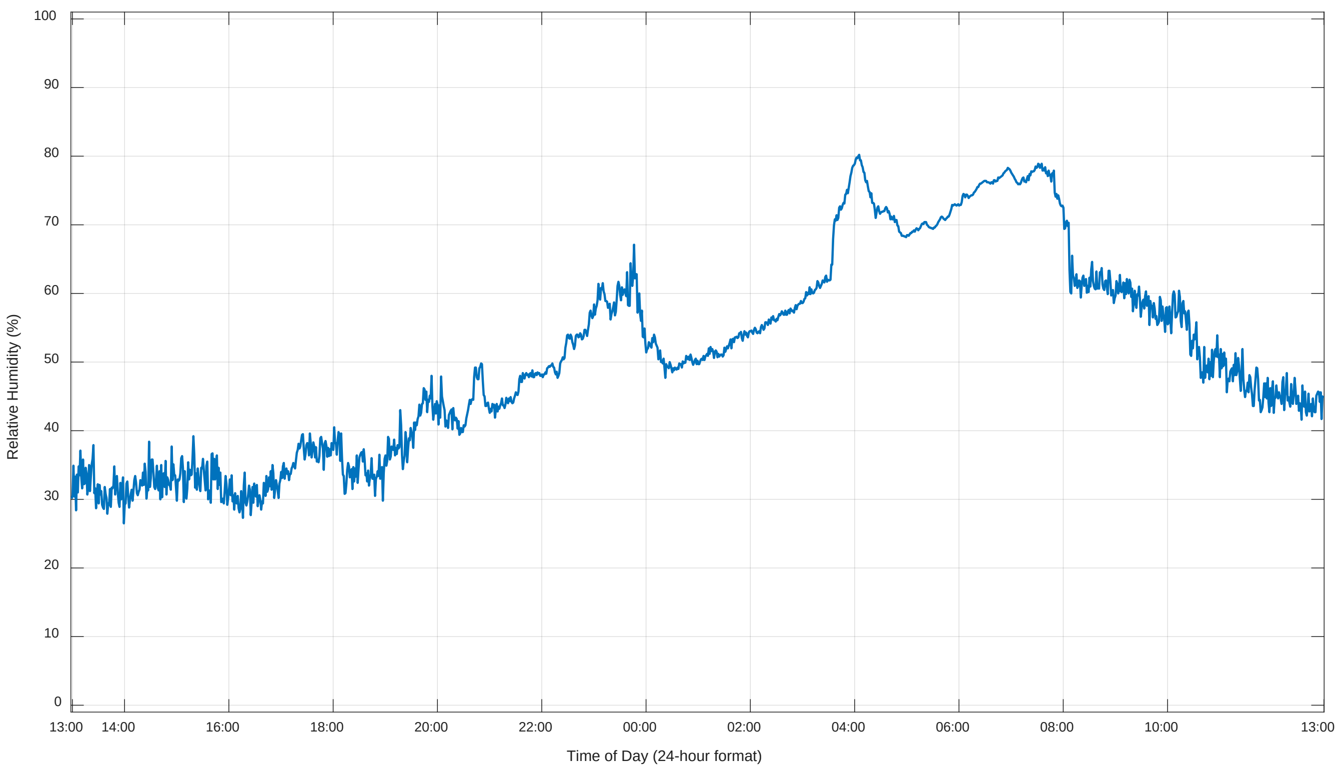

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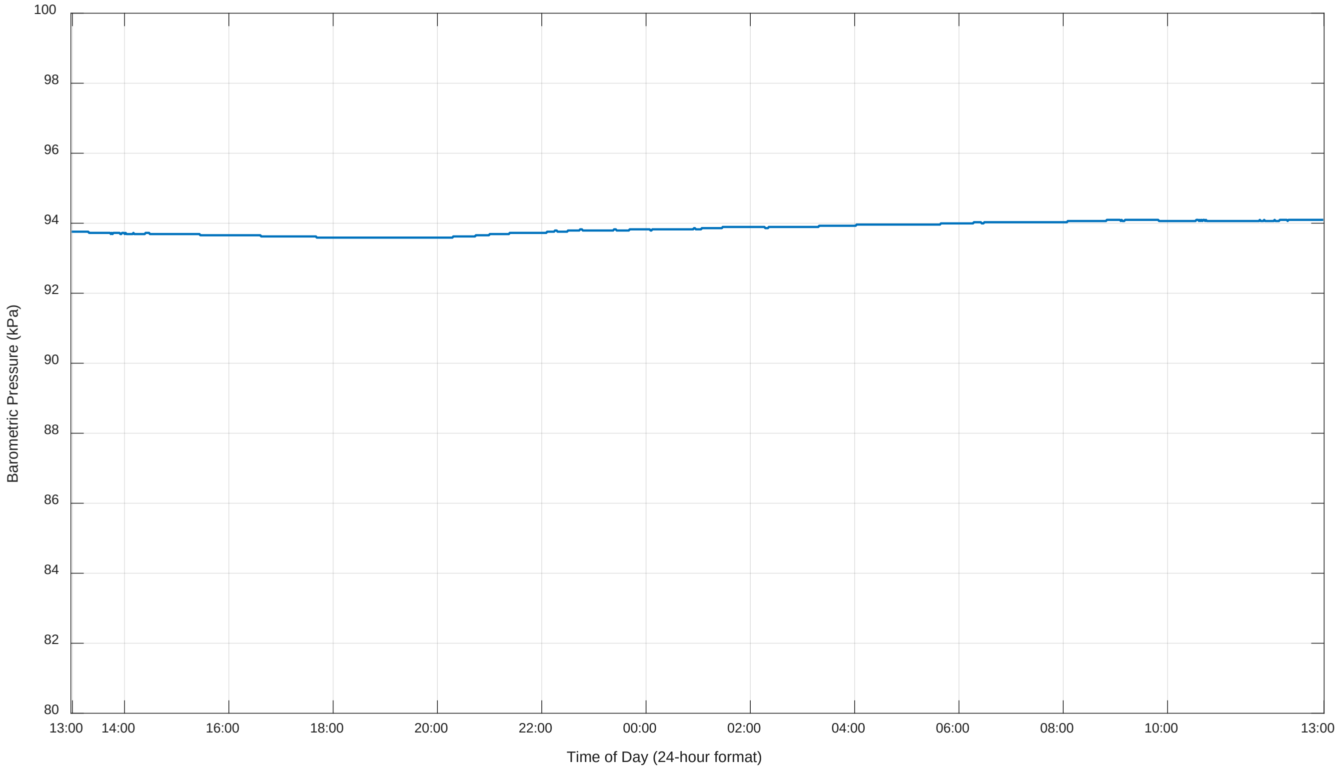

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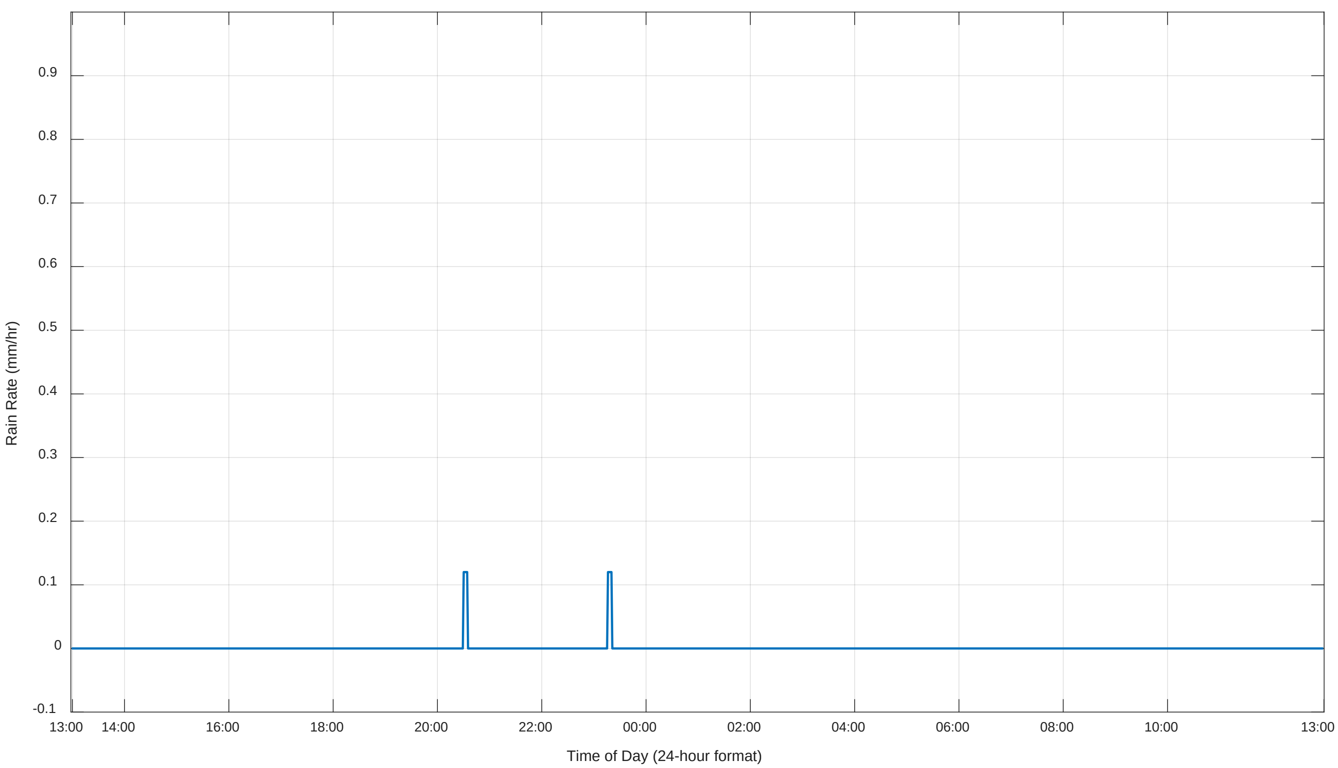

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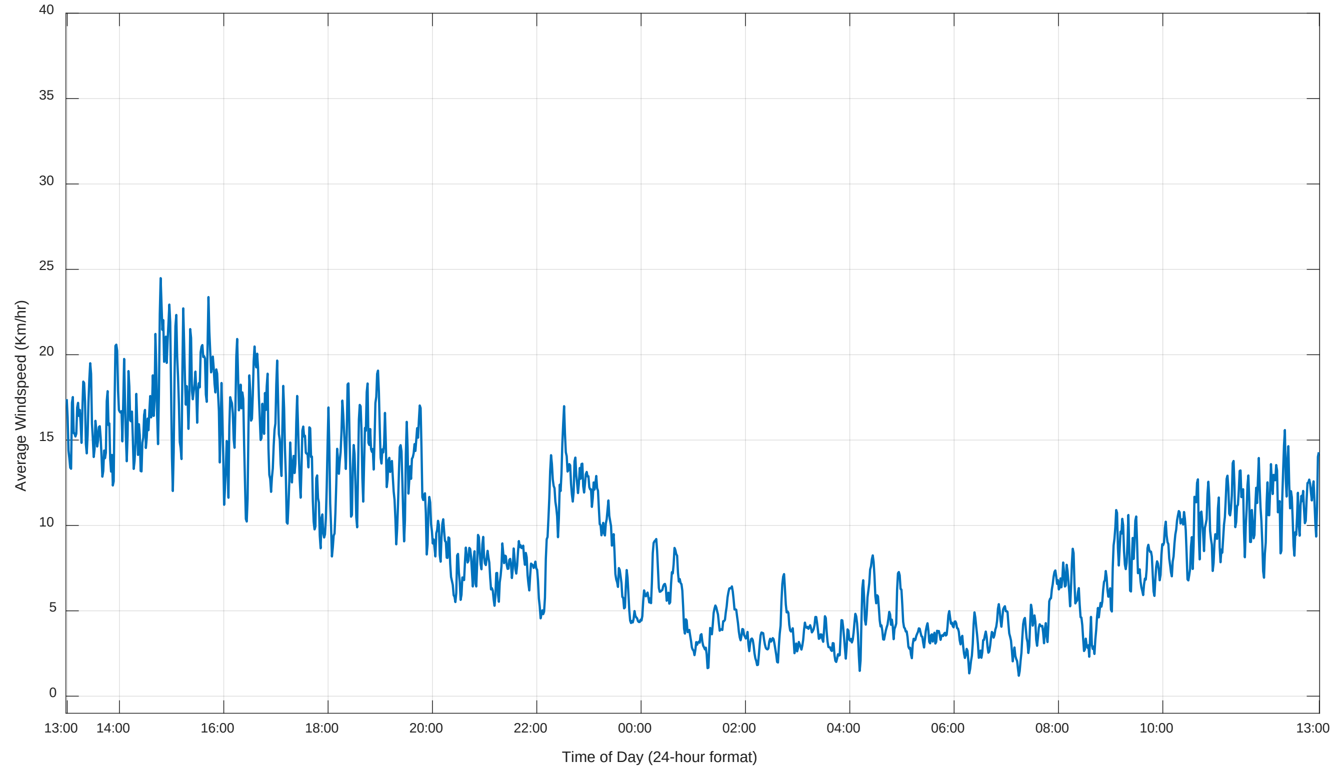
July 22 – 23, 2022 Weather Data



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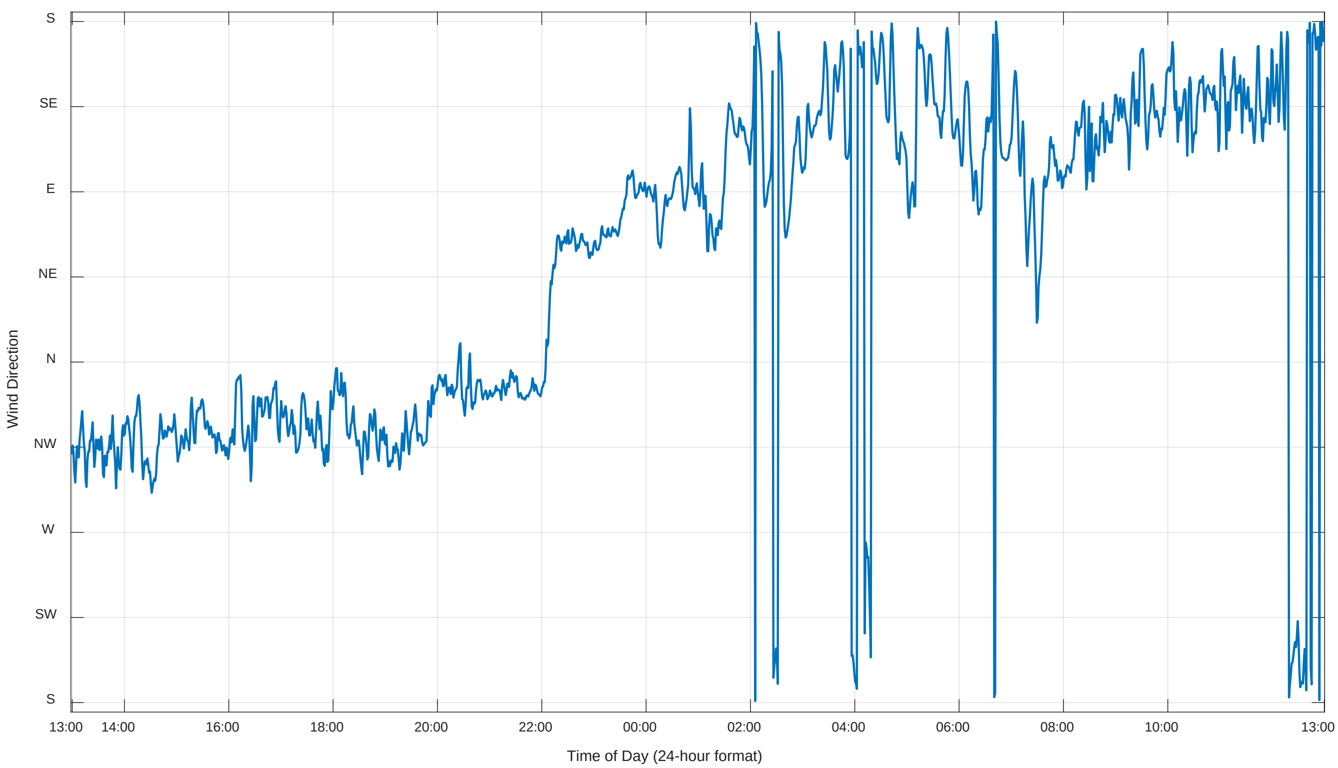

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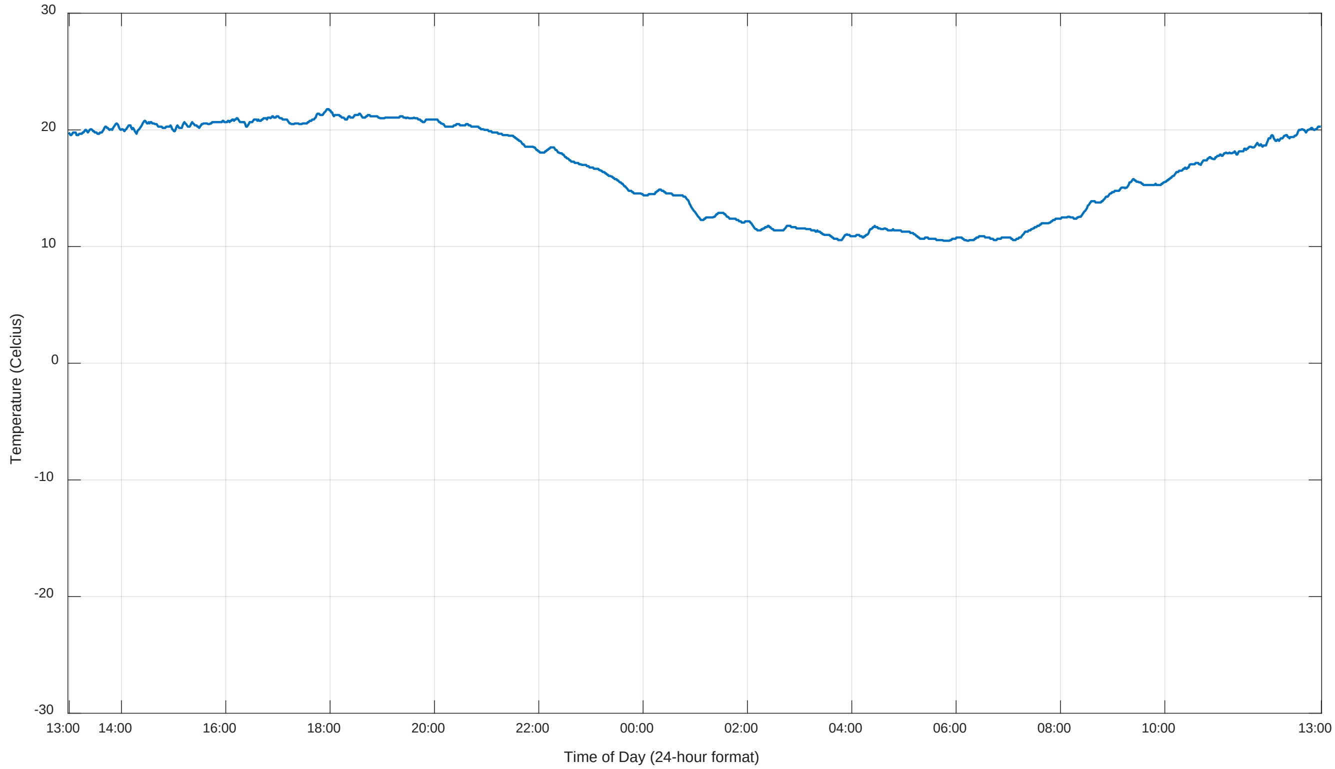

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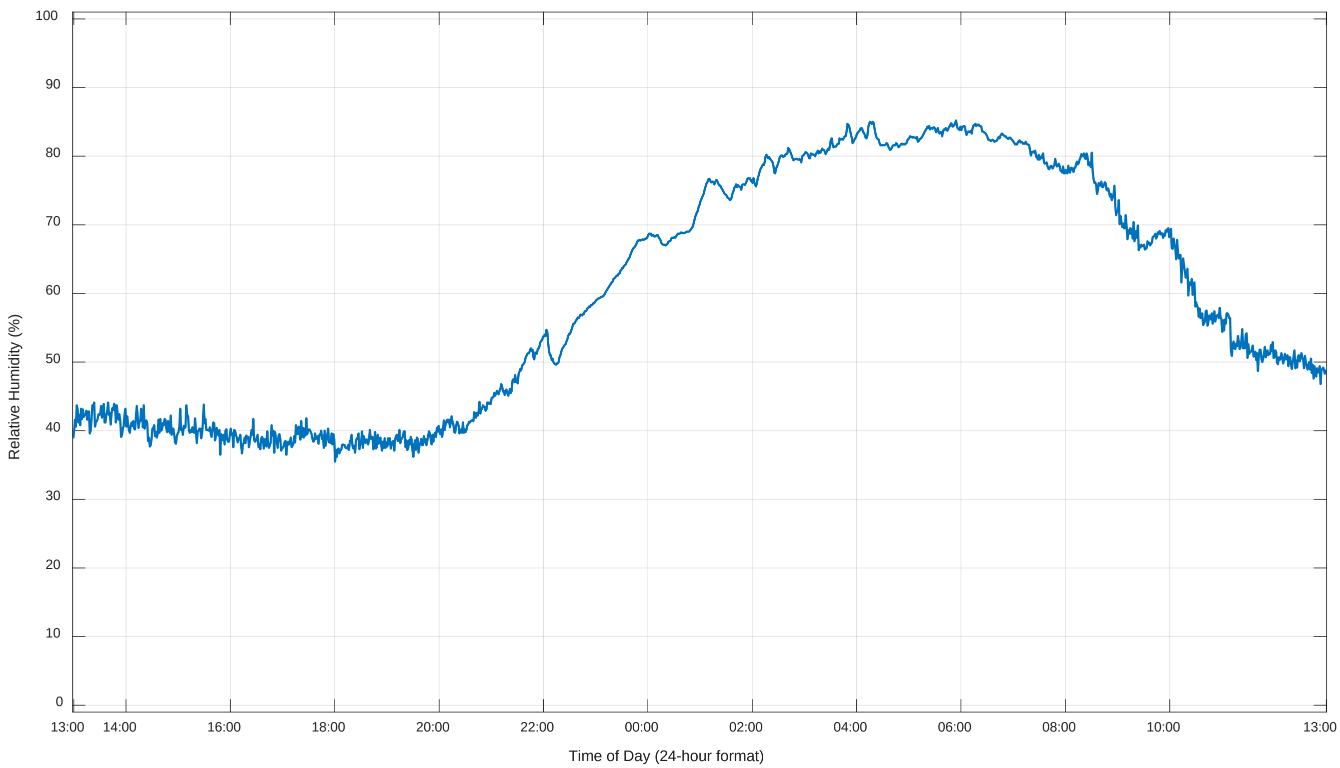

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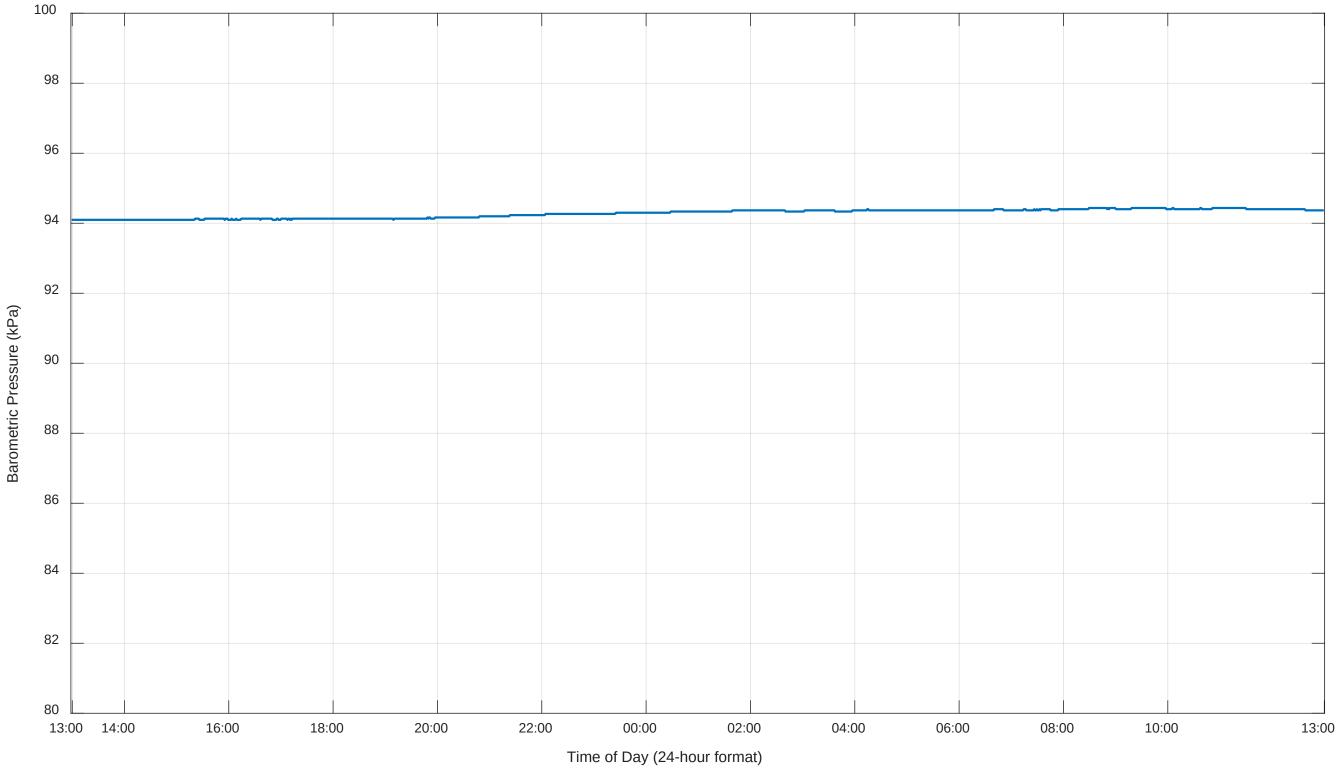

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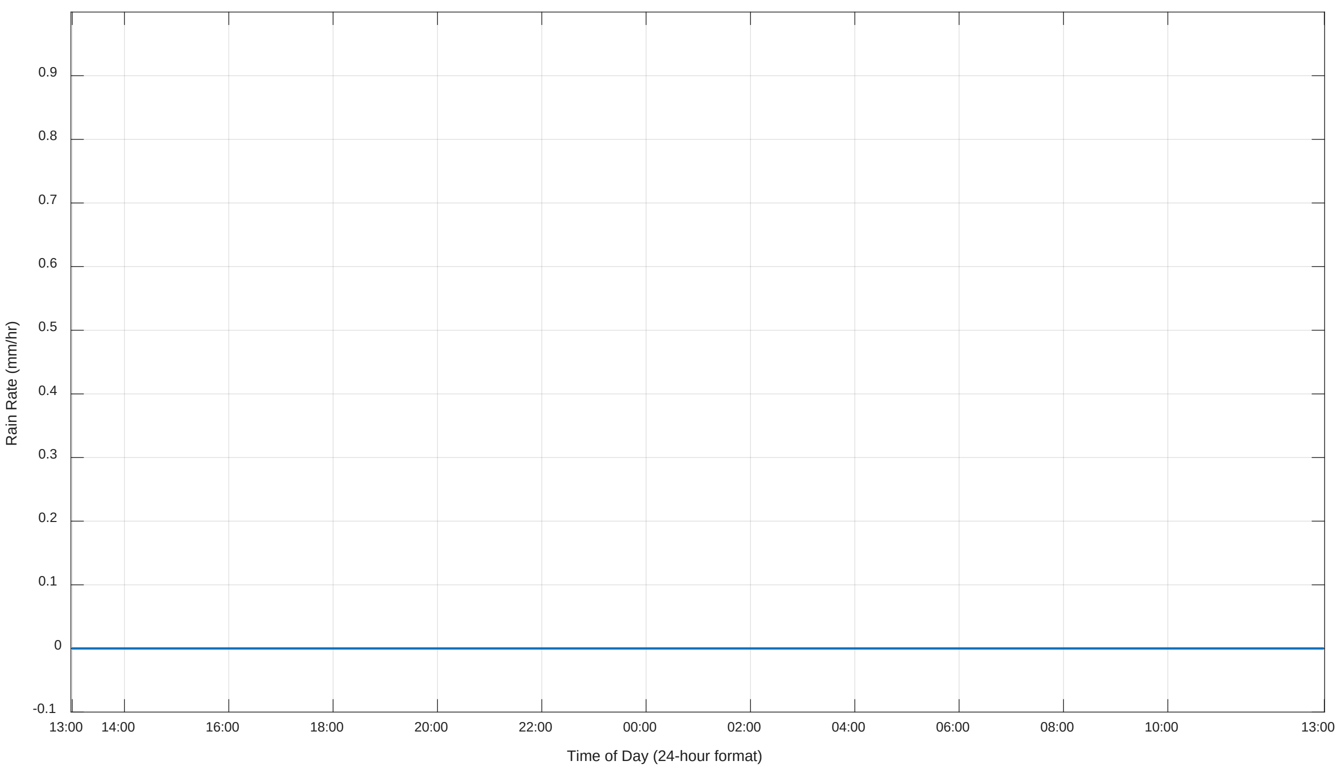

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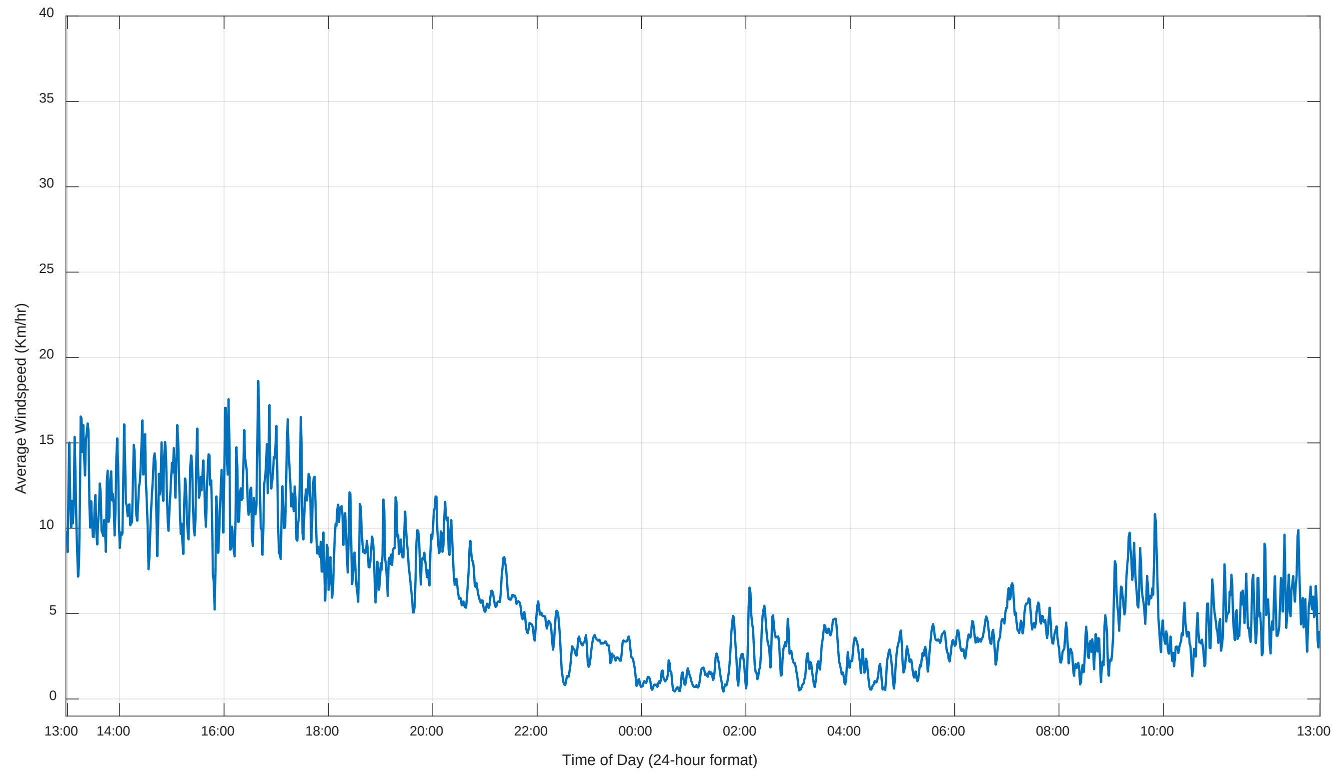

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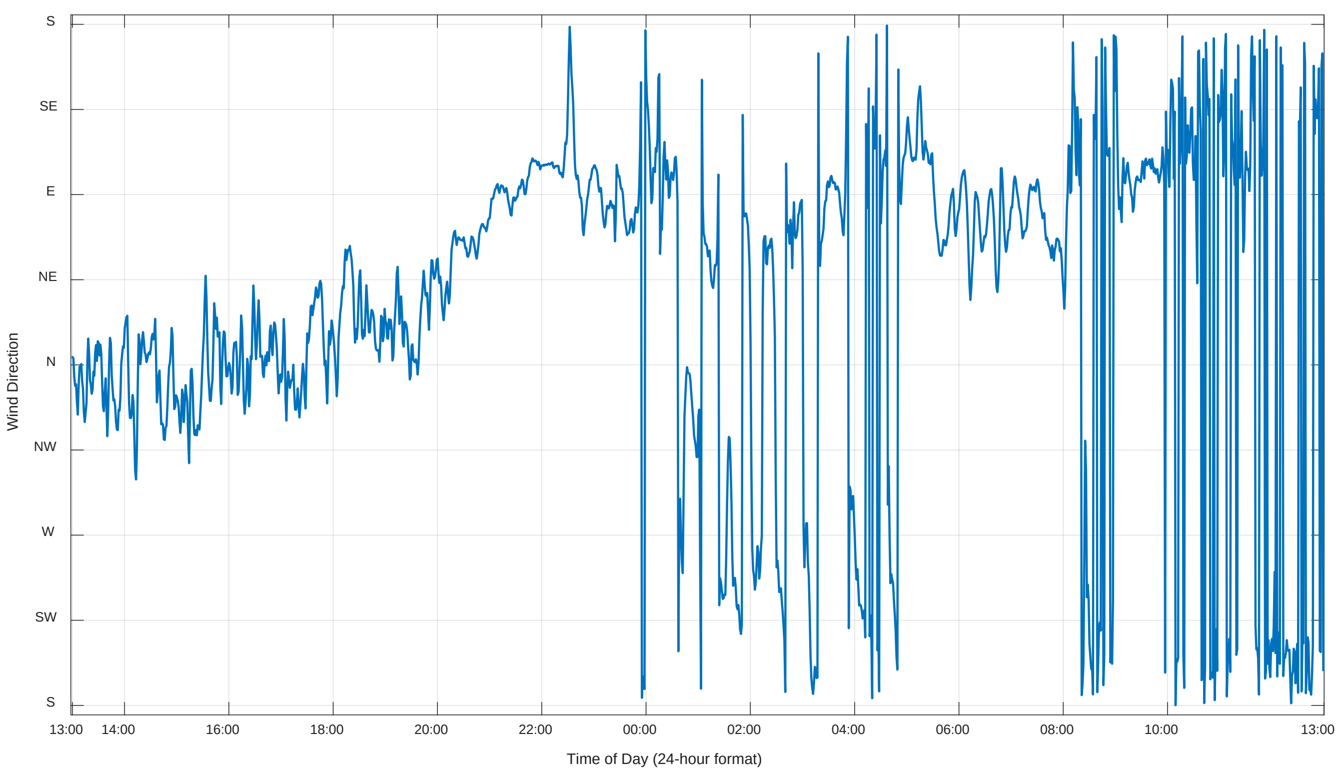

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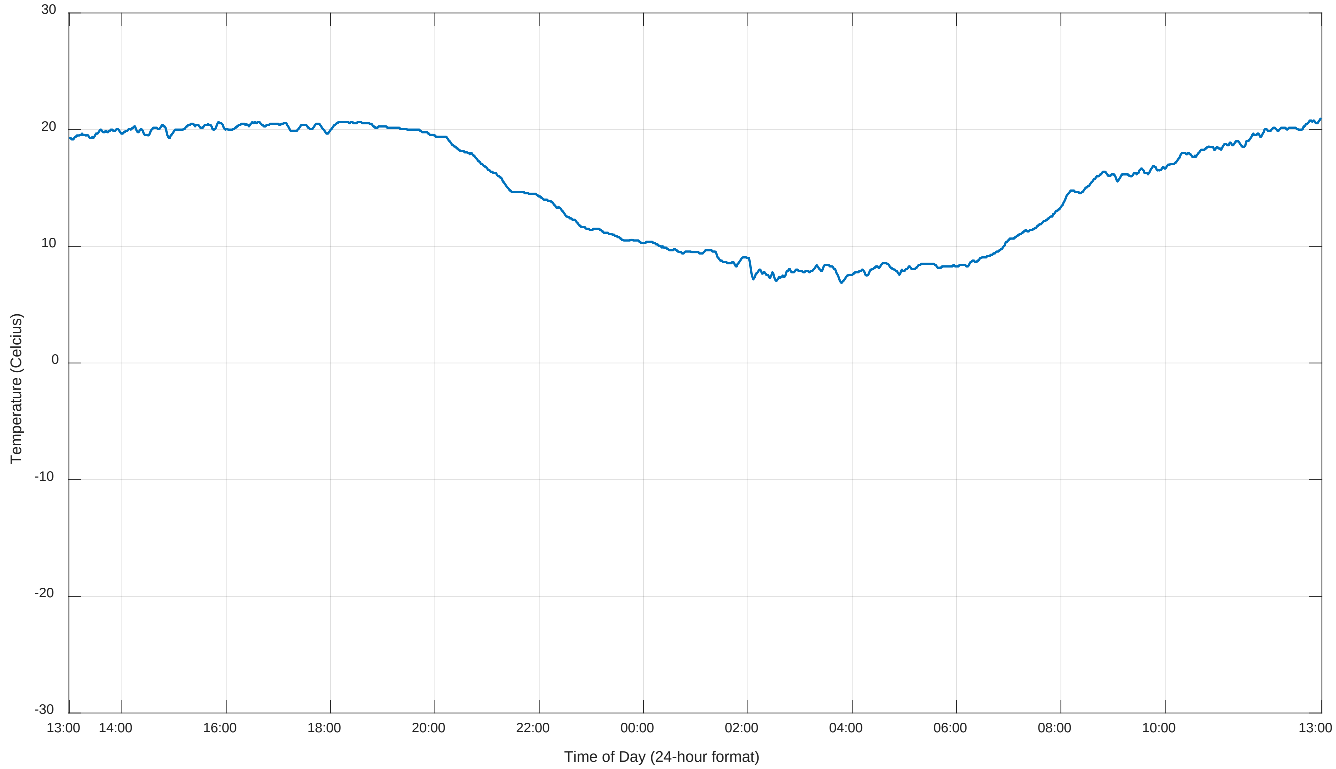

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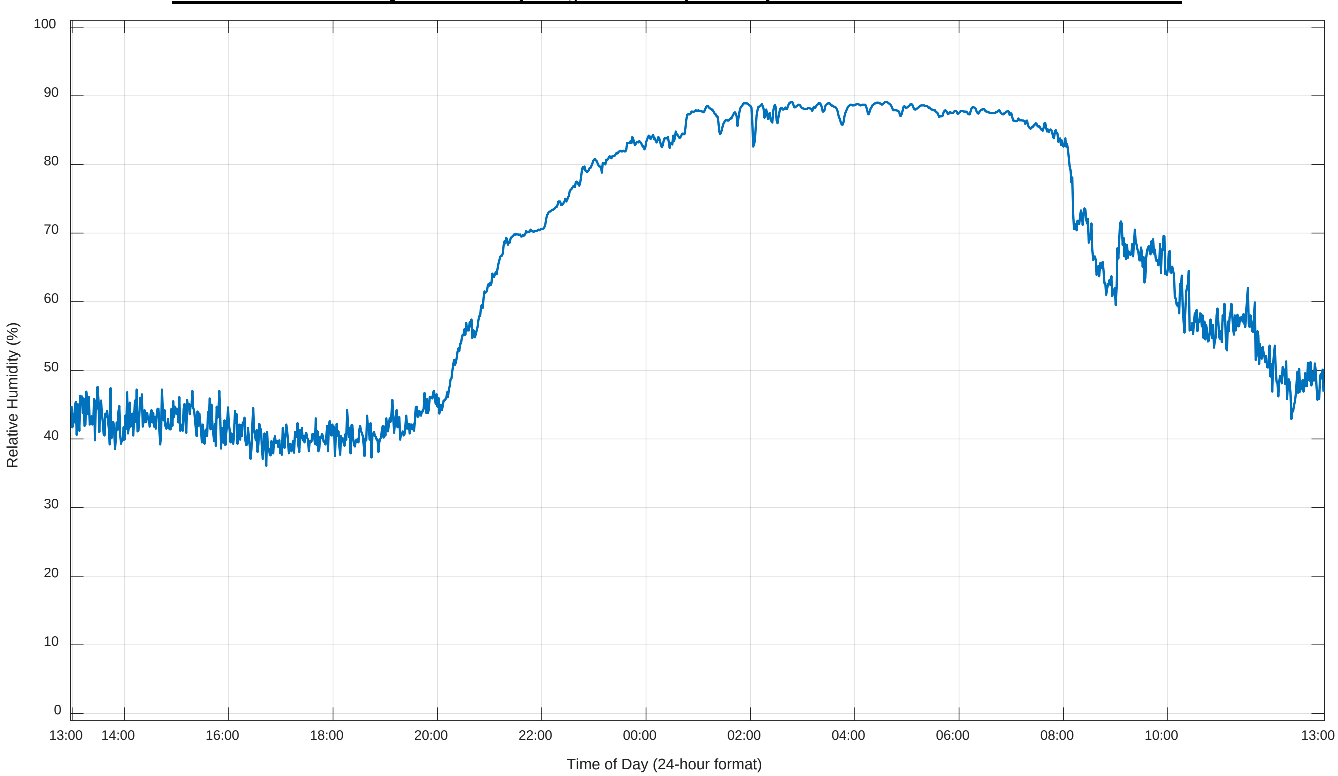

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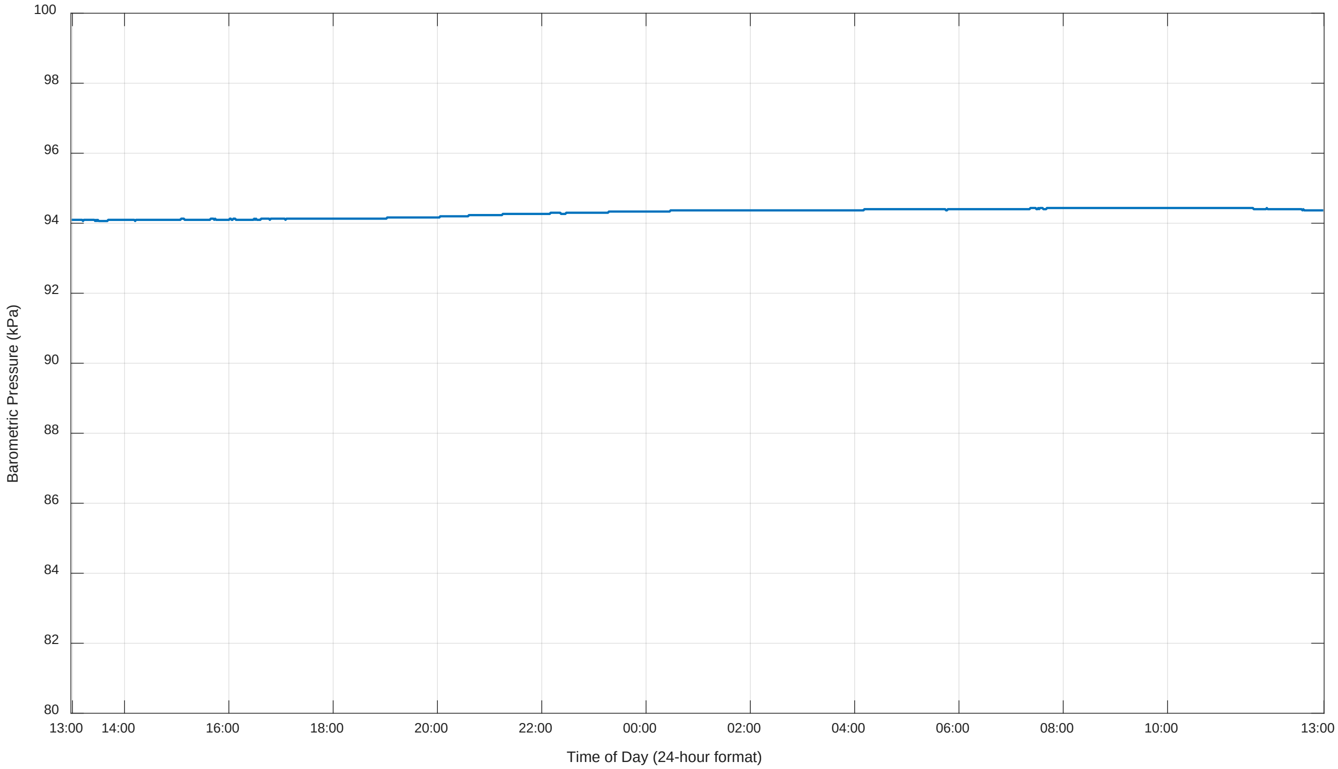

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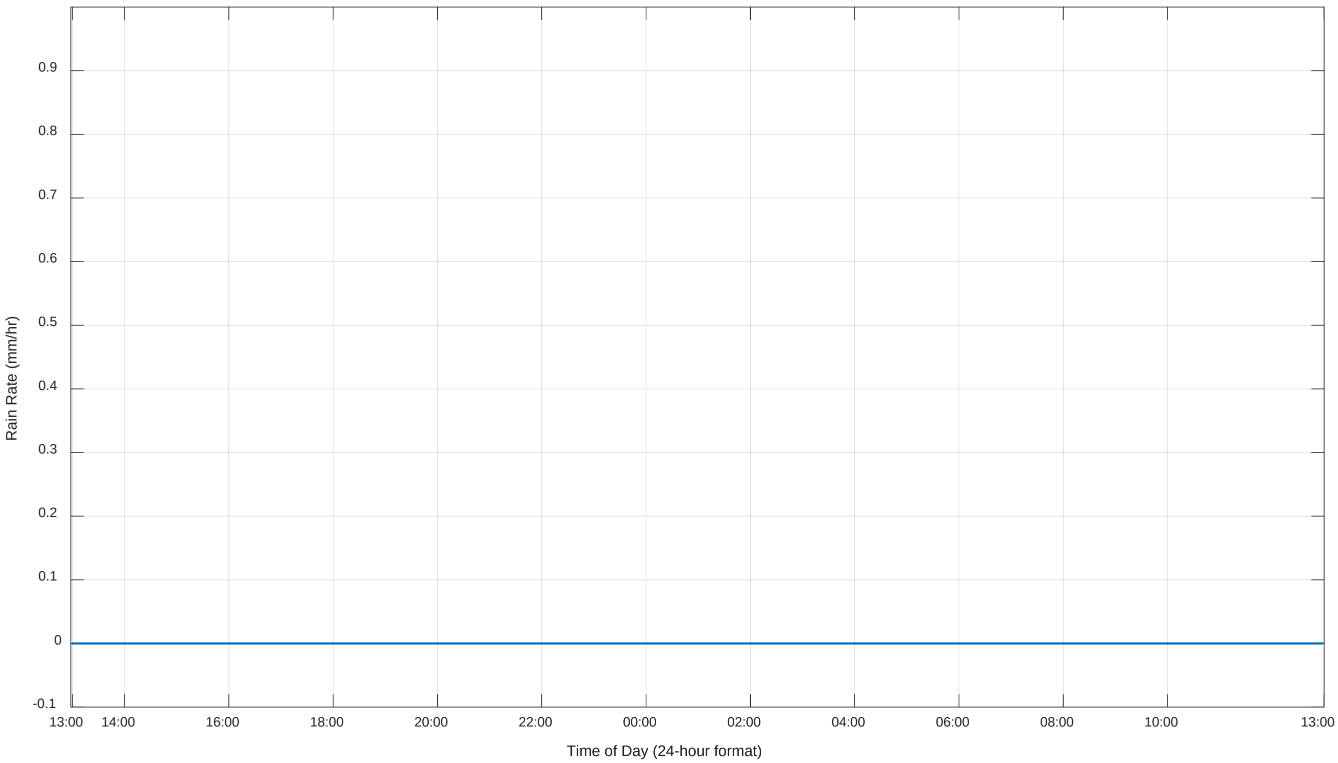
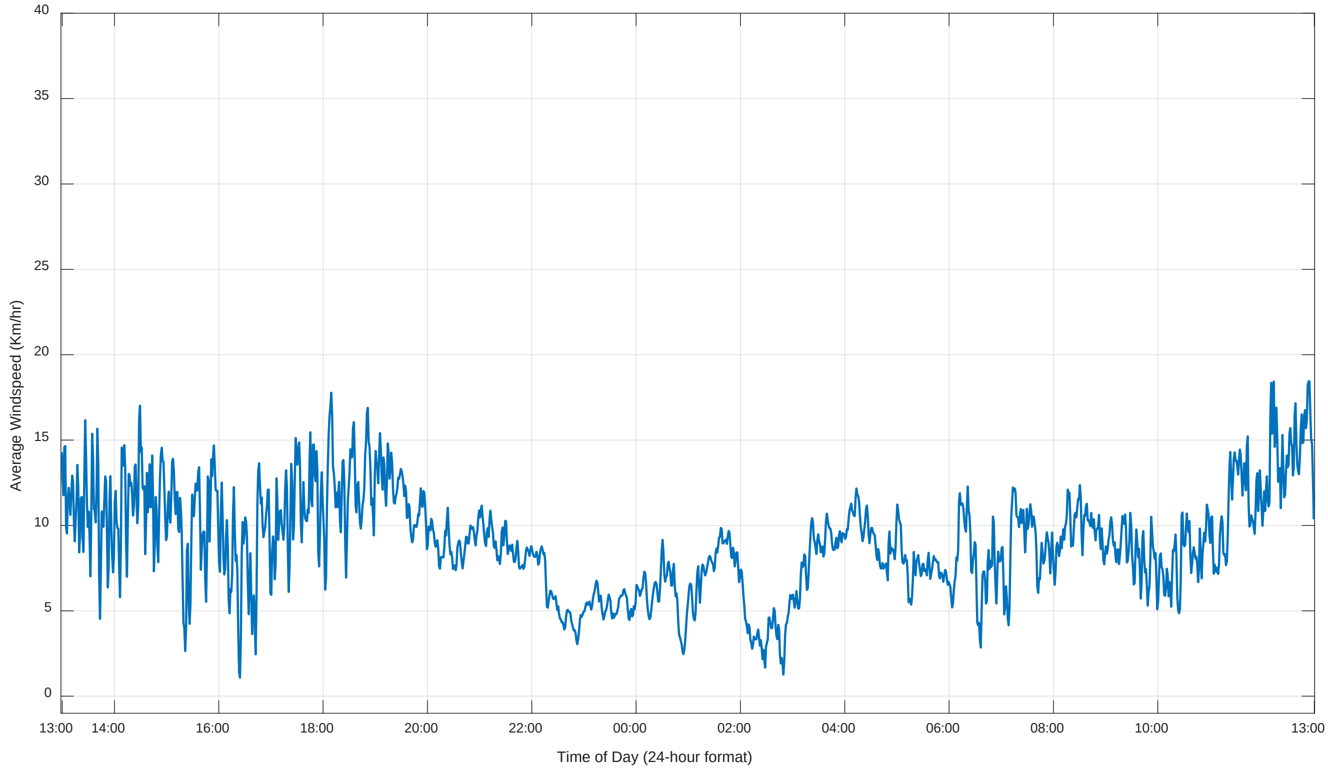


Monitored Rain Rate (July 22 - 23, 2022) at Noise Monitor Location 12

July 23 - 24, 2022 Weather Data



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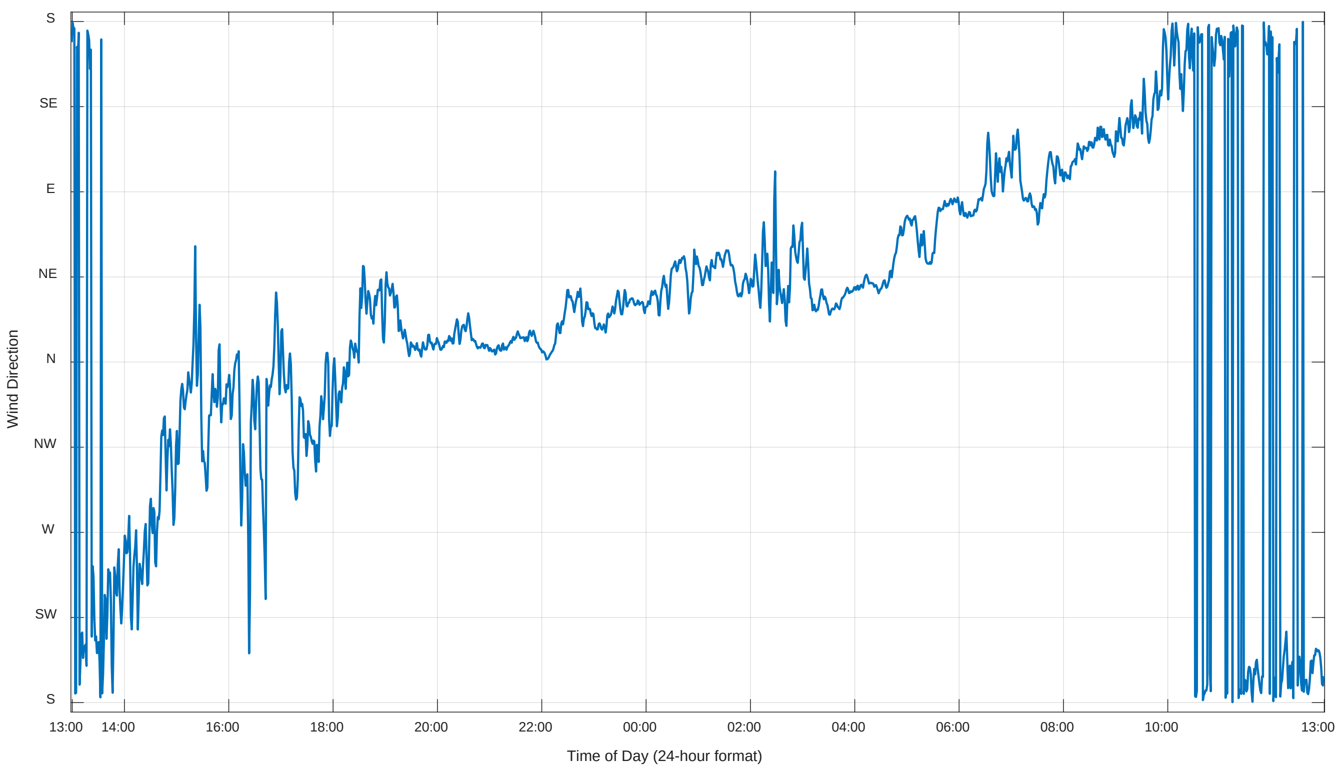

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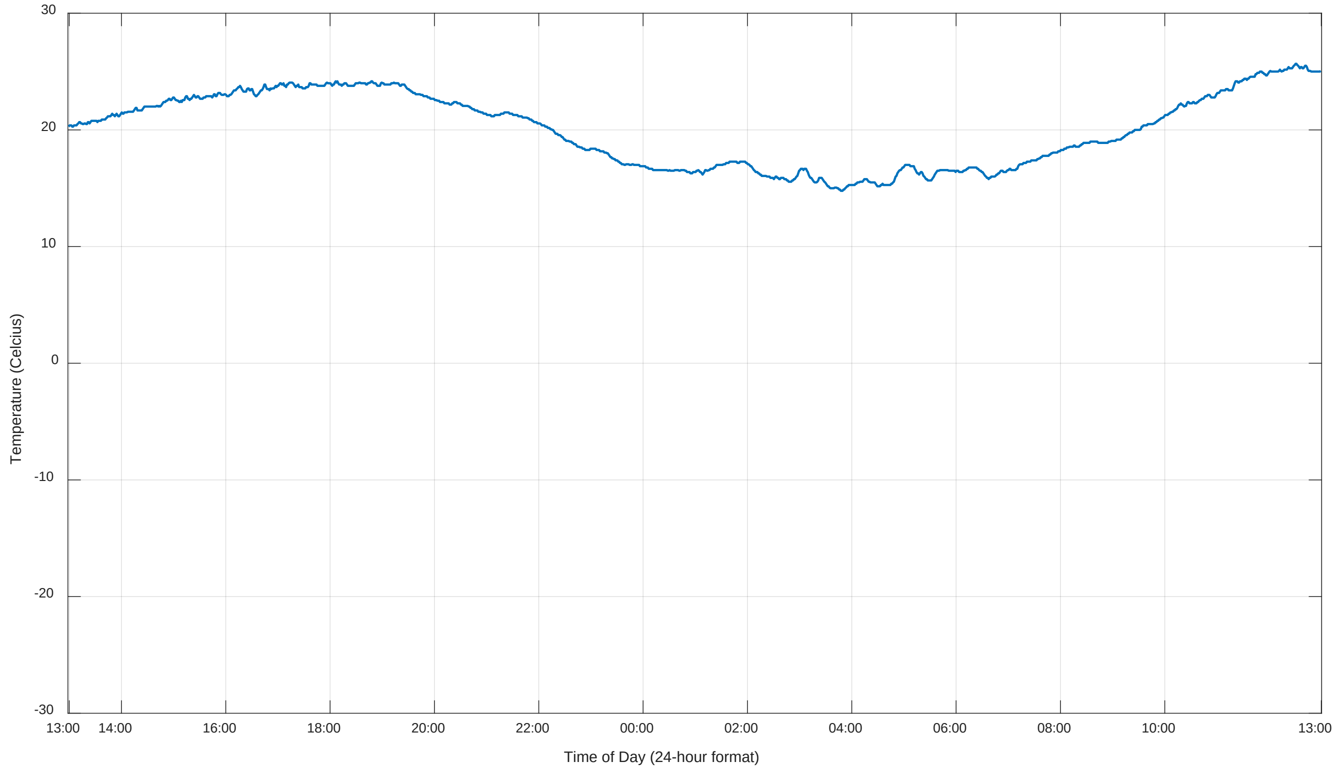

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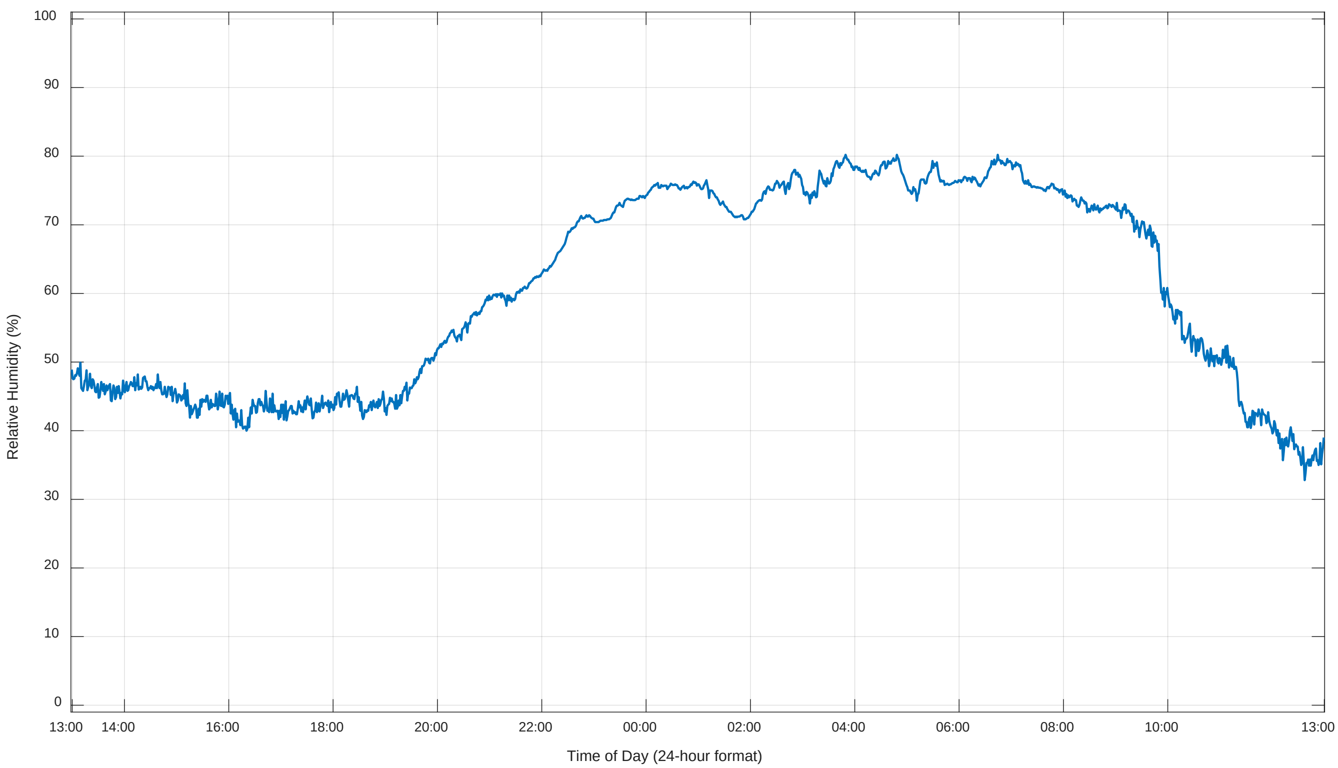

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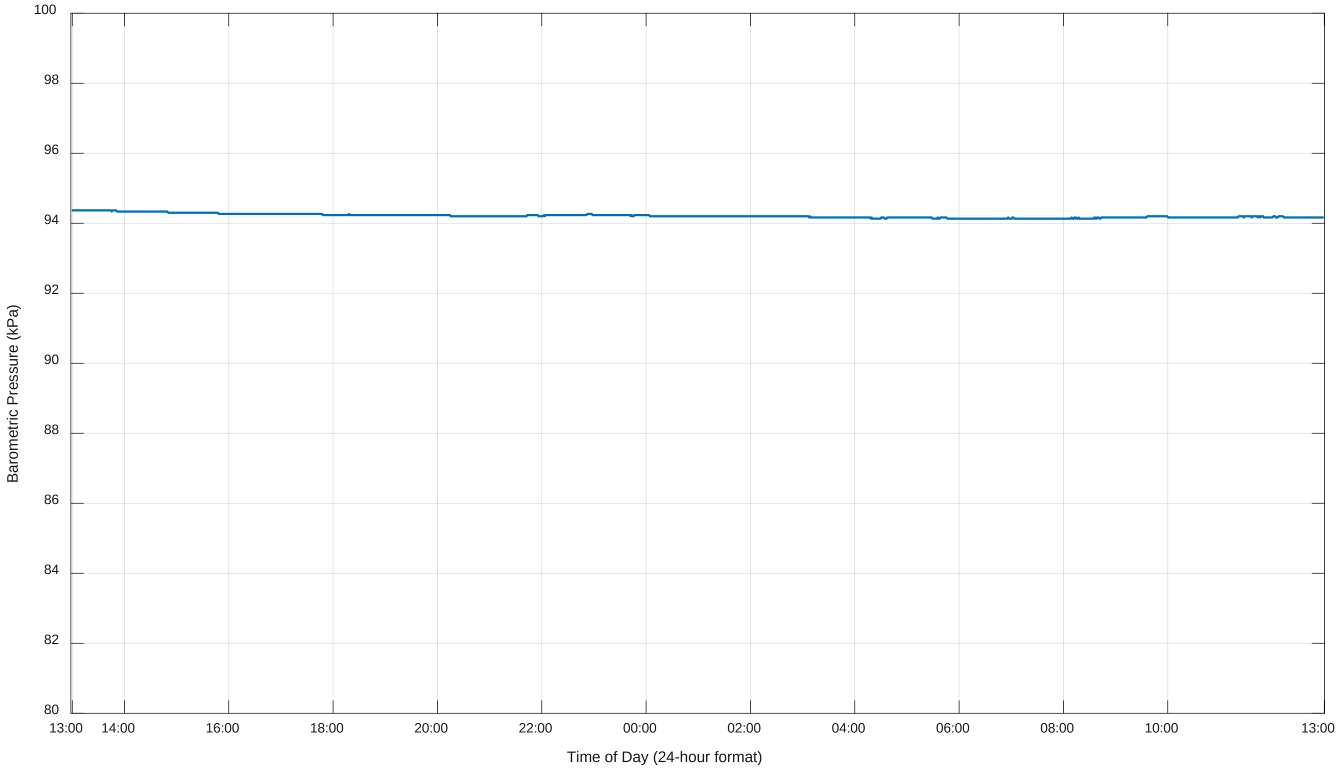

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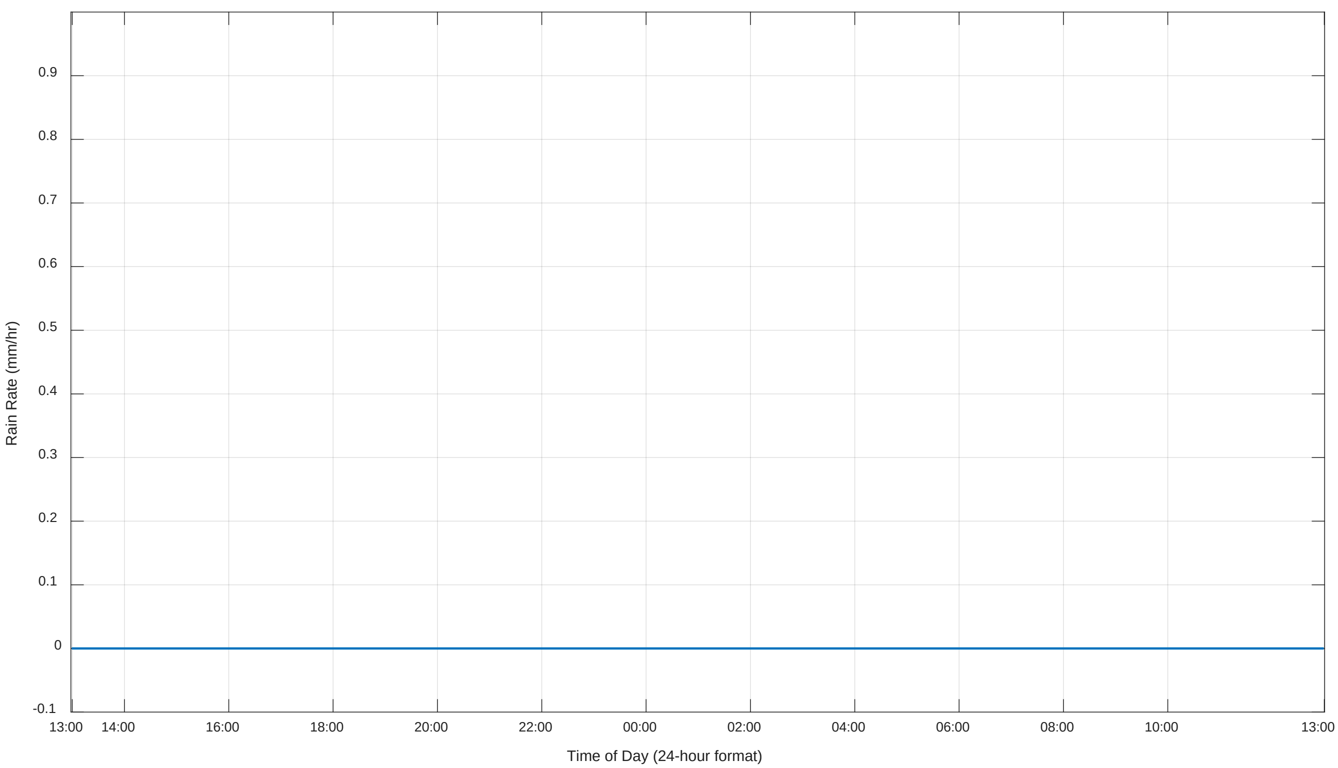

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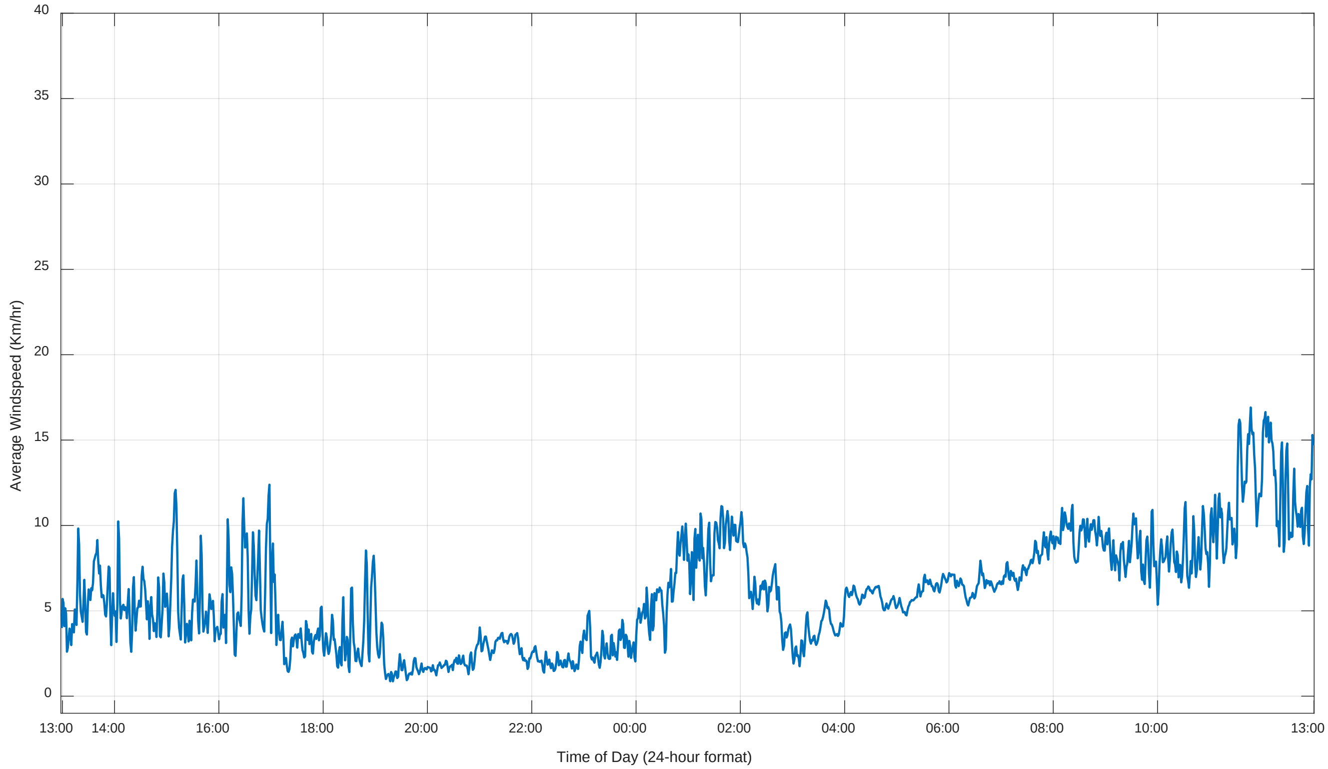

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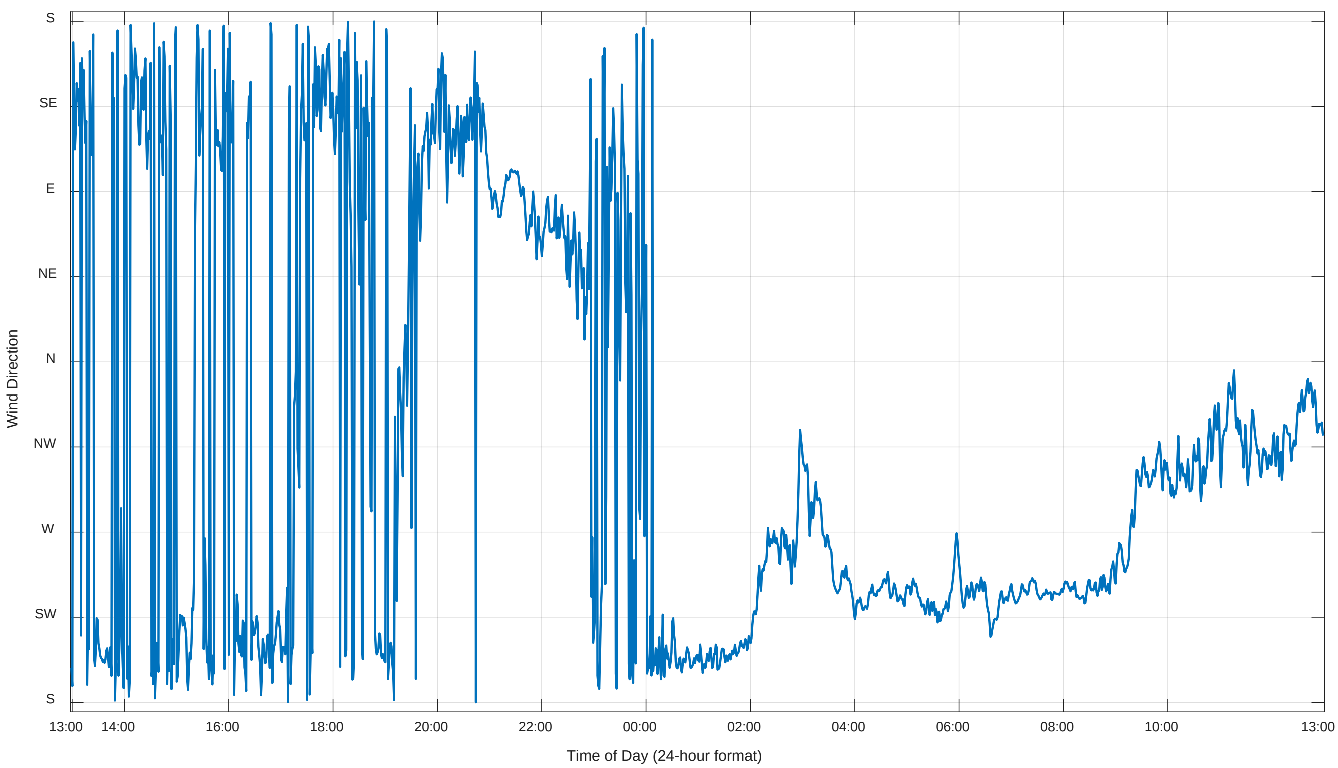

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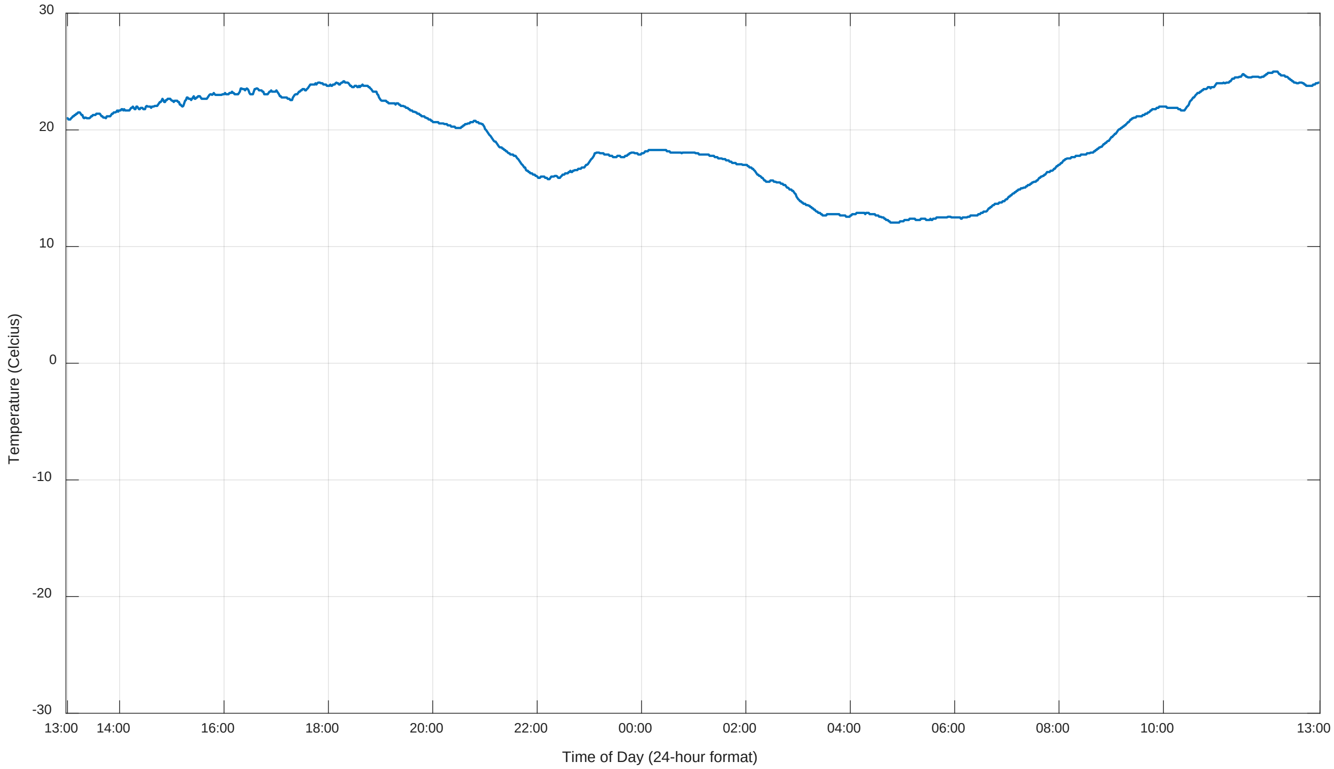

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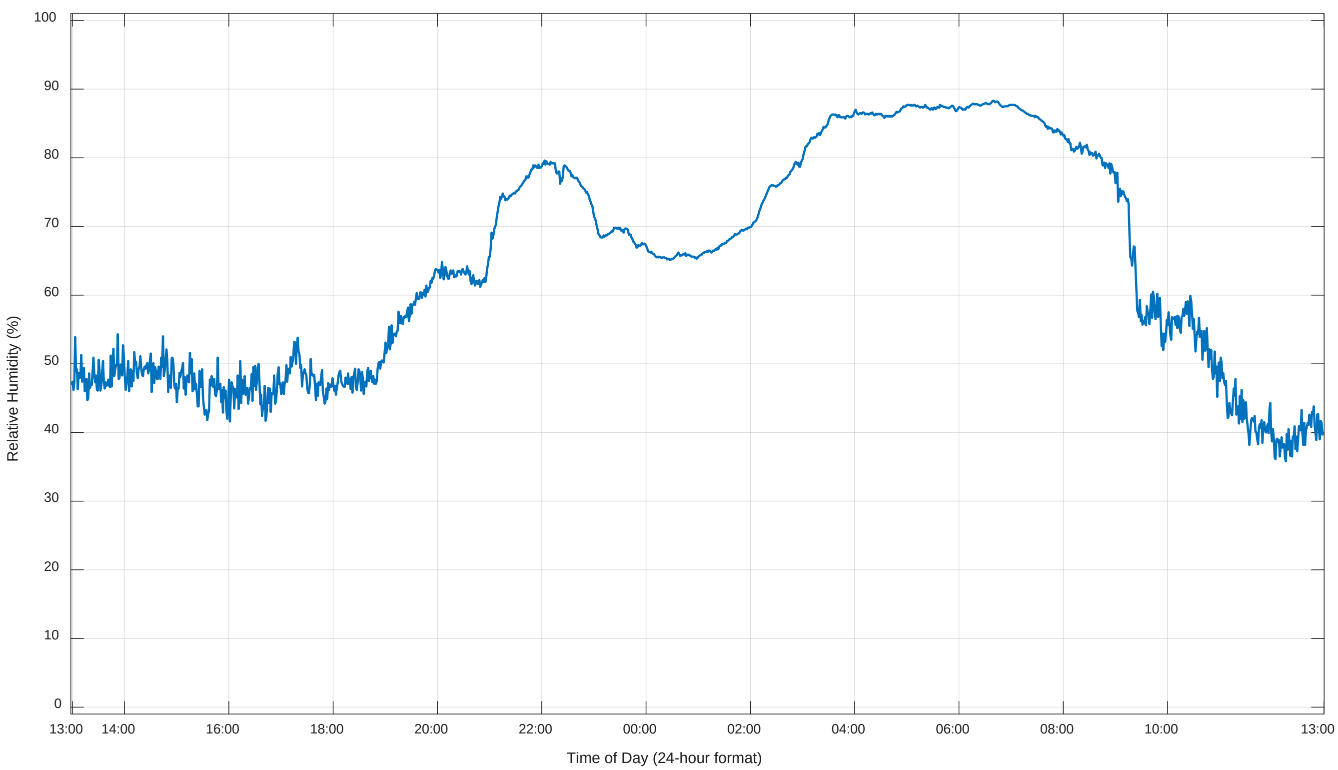

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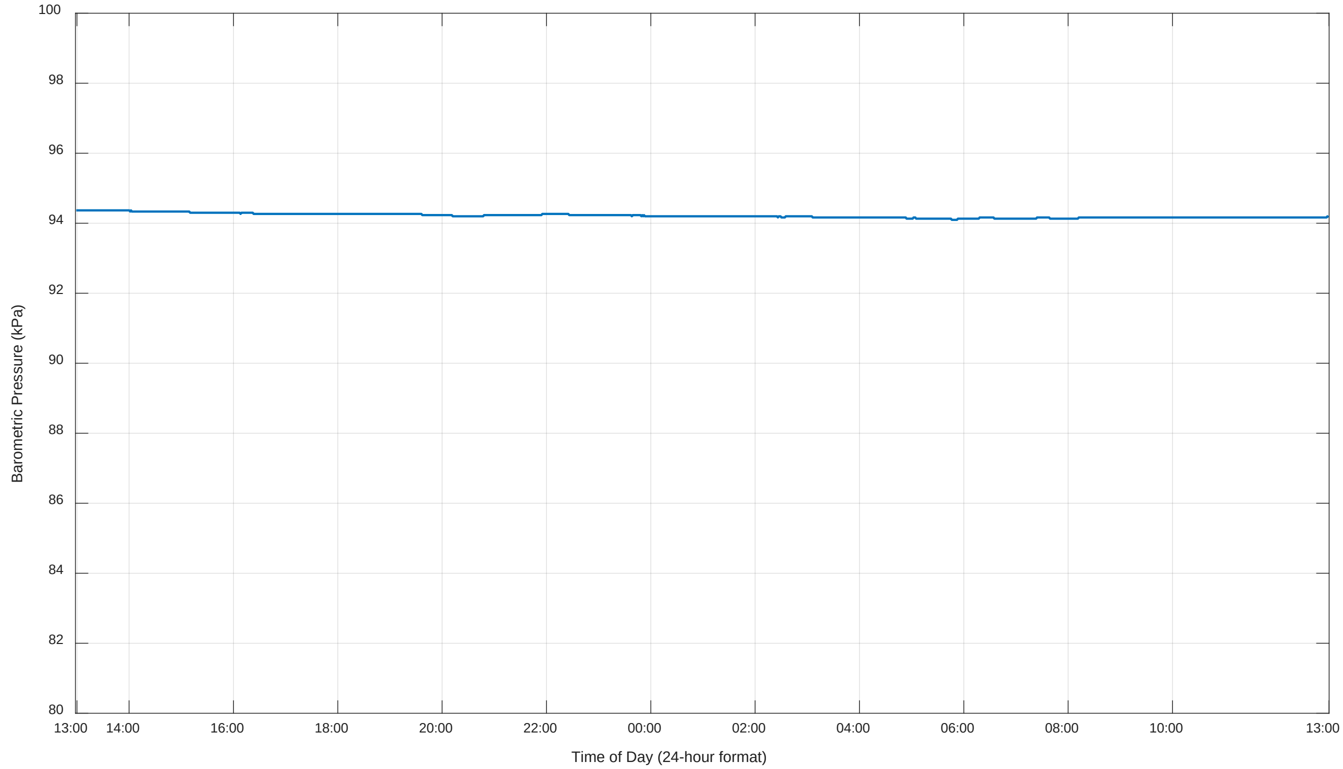

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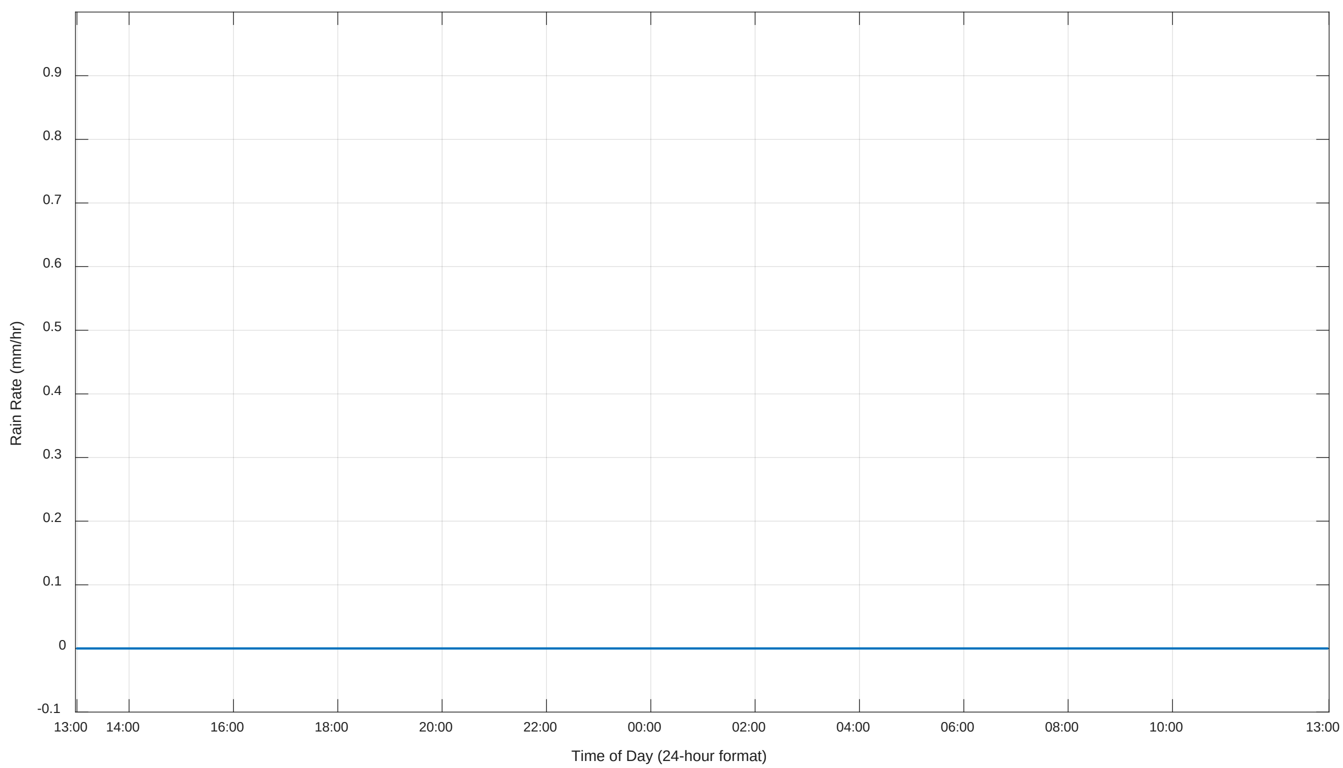

Monitored Rain Rate (July 23 - 24, 2022) at Noise Monitor Location 12

APPENDIX 3

2023 Regional Noise Model Annual Field Validation Monitoring Report

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2023 Environmental Noise Survey

For The

Regional Noise Model Annual Field Validation Monitoring

Prepared for:

Northeast Capital Industrial Association

Prepared by:
P. Froment, B.Sc., B.Ed., P.L.(Eng.)
aci Acoustical Consultants Inc.
Edmonton, Alberta
APEGA Permit to Practice #P7735

PERMIT TO PRACTICE
ACI ACOUSTICAL CONSULTANTS INC.
Signature P. F
Date 02/02/2024
PERMIT NUMBER: P 7735
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

02/02/2024

aci Project #: 23-014
February 2, 2024

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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 the noise monitoring 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 July & August 2023 by P. Froment, B.Sc., P.L.(Eng.).

As part of the study, a total of thirteen (13) 48-hour noise monitorings 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 typical noise climate of each noise monitoring location. As such, the isolated noise levels and 1/3 octave band L_{eq} sound levels were consistent between nighttime periods and when compared to previous years.

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted throughout the Alberta's Industrial Heartland. 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. In comparison to the 2022 noise monitoring, the results from 2023 were significantly more stable. This can be attributed to the almost ideal weather conditions during the nighttime.

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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 the noise monitoring 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 July & August 2023 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 Measurements Methods

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

All noise monitoring locations were identical to those conducted during the 2022 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 shutdowns 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.

Local weather monitoring stations were used for each of the two (2) 48-hour time monitoring periods, three (3) stations were utilized for July 6 – 8, 2023, while two (2) were utilized for August 27– 29, 2023. 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.

[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)		
1E	355210	5954157	8/27/23 10:00	8/29/23 10:00
2B	358256	5957216	7/06/23 10:00	7/08/23 10:00
3B	358361	5959283	7/06/23 09:30	7/08/23 09:30
4C	361665	5960870	7/06/23 09:15	7/08/23 09:15
5A	361777	5964711	7/06/23 09:00	7/08/23 09:00
6A	364322	5967894	8/27/23 10:00	8/29/23 10:00
8A	358897	5965430	7/06/23 09:45	7/08/23 09:45
9A	355872	5957574	7/06/23 07:00	7/08/23 07:00
10A	355925	5955818	8/27/23 10:00	8/29/23 10:00
11A	358430	5963804	7/06/23 07:30	7/08/23 07:30
12B (1st 48-hour)	368223	5963070	7/06/23 08:30	7/08/23 08:30
12B (2nd 48-hour)			8/27/23 10:00	8/29/23 10:00
13A	358667	5970180	7/06/23 10:00	7/08/23 10:00

4.1. Noise Monitor Location 1E

The noise monitor at Location 1 was located approximately 45 m north of 100 Avenue[2], 36 m west of 114 Street and approximately 350 m northwest of Highway 15 as indicated in Figure 2 and Figure 3. This put the noise monitor approximately 180 m southwest of the entrance to 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, 114 Street and the Sherritt International Corporation facility. There was no significant vegetation between the noise monitor and the facilities to

[1] The letters accompanying the noise monitoring location refer to their location.
[2] This is consistent with the new location chosen last year.

the north. In addition, a weather monitor was placed at this location adjacent to the noise monitor for the duration of the August 27 – 29, 2023 noise monitoring period.

4.2. Noise Monitor Location 2B

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. In addition, a weather monitor was placed at this location adjacent to the noise monitor for the duration of the July 6 – 8, 2023 noise monitoring period.

4.3. Noise Monitor Location 3B

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 4C

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 5A

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 6A

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 2 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.

4.7. Noise Monitor Location 8A

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/Inter Pipelines facility. At this location, there was direct line-of-sight to the Pembina/Inter Pipelines 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 9A

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 10A

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

[1] This has been observable during the nighttime period.

the 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 11A

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/Inter Pipelines facility and approximately 330 m west of the Pembina/Inter Pipelines rail yard. At this location, there was direct line-of-sight to the Pembina/Inter Pipelines 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. In addition, a weather monitor was placed at this location adjacent to the noise monitor for the duration of the July 6 – 8, 2023 noise monitoring period.

4.11. Noise Monitor Location 12B

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 13A

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 daytime (07:00 to 22:00) L_{eq}Day and nighttime (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 nighttime (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 monitorings 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 nighttime periods. The isolation analysis for the nighttime 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 monitorings 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. 2023 - L_{eq} 24-Hour Results[4]

Monitoring Location	1st Daytime Period	1st Nighttime Period (Non-isolated)	1st Nighttime Period (Isolated)	2nd Daytime Period	2nd Nighttime Period (Non-isolated)	2nd Nighttime Period (Isolated)	3rd Daytime Period
1E	53.1	51.0	50.1	55.1	53.5	52.7	58.0
2B	46.7	52.2	50.3	51.1	50.2	49.6	50.9
3B	53.7	52.0	46.7	52.6	52.3	48.4	49.8
4C	46.0	46.6	46.2	47.5	48.3	47.2	54.7
5	56.9	56.0	52.8	58.7	60.7	54.6	64.0
6A	62.2	46.5	46.5	50.5	47.9	47.9	52.7
8A	48.3	52.3	52.0	48.8	50.0	49.4	48.8
9A	60.5	48.6	47.1	47.8	48.1	47.4	N/A
10A	52.3	54.5	51.1	56.2	59.7	52.7	64.1
11A	48.5	49.8	48.5	48.1	47.1	42.8	45.6
12B (1st 48-hour)	47.2	46.4	43.1	46.7	46.1	42.3	44.8
12B (2nd 48-hour)	42.0	45.6	37.9	51.2	47.0	40.1	48.0
13A	38.2	40.3	35.4	42.8	39.2	37.1	45.8

[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 nighttime 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 nighttime 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 1E

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 in Table 2 are relatively consistent between the two nighttime periods in addition to the traces found in Figures 15 – 18. The first L_{eq}Night noise levels correspond well with previous years, while the second nighttime period equaled the highest measured (2020). However, it should be noted that this location has been moved closer to the major facilities to the north, when compared to earlier monitoring years (particularly before 2019).

The 1/3 octave band L_{eq} sound levels have very similar traces with slightly higher levels during the second nighttime period. They both have relatively higher noise levels in the lower frequency bands that decrease as the frequency increases. Since both nights have similar values and they agree with previous L_{eq}Night measured values, it is anticipated that the isolated values of both nighttime periods are representative of the typical noise climate of the area.

6.1.2. Noise Monitoring Location 2B

The results of the noise monitoring conducted at Location 2 are provided in Table 2 and Figures 22 - 28. The isolated L_{eq}Night values from Table 2 and the traces found in Figures 22 – 23 indicate very consistent noise levels between the two nighttime periods (difference of 0.8 dBA). The isolated 1/3 octave figures show relatively broadband noise levels, particularly in the mid-frequency bands. Differently from previous years, there was a drop in the 125 Hz frequency band, before increasing and flattening in the mid-frequency bands. Despite this dip at 125 Hz, the remainder of the trace is similar to previous years. Similarly to previous years, there were a significant number of “non-typical” incidents associated with rail activity.

The isolated L_{eq}Night results, and the 1/3 octave band spectral data indicate that the 2023 noise monitoring are reflective of the typical noise climate of the area.

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. For 2023, the isolated L_{eq}Night values were very consistent the two nights with a difference of 1.7 dBA. This is also reflected in 1/3 octave band spectral data which shows that the frequency contributions were very consistent between the two nights. When comparing to previous years, the 2023 noise monitoring are reflective of the average 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 isolated L_{eq}Night values from Table 2 and the traces found in Figure 36 – 38 indicate very consistent noise levels between the two nighttime periods (difference of 1.0 dBA). This is a similar result to last year, in which the two nighttime periods had similar values. In addition, the 1/3 octave band spectral data are almost identical between nights. As a result, the isolated L_{eq}Night results for the 2023 noise monitoring are reflective of the typical range of noise levels for this area.

6.1.5. Noise Monitoring Location 5A

The results of the noise monitoring conducted at Location 5 are provided in Table 2 and in Figures 43 - 49. The traces in Figures 43 – 46 indicate consistent isolated L_{eq}Night noise levels for both nighttime periods, which is further supported in reviewing the 1/3 octave band spectral data. Although 52.8 dBA and 54.6 dBA, respectively, are in the higher range, they still correspond with previous years. In 2022, the second nighttime period resulted in lower than anticipated noise levels. Based on the results from this year, it is anticipated that the 2022 result was anomalous. As a result, the isolated L_{eq}Night results for the 2023 noise monitoring are reflective of the typical range of noise levels for this area.

6.1.6. Noise Monitoring Location 6A

The results of the noise monitoring conducted at Location 6 are provided in Table 2 and in Figures 50 - 56. The isolated 15-second L_{eq} traces of both nighttime periods indicates relatively consistent noise levels throughout. During the site visit it was noted that the dominant noise source was from the facility to the west, however crickets could be heard. This is the third consecutive year that this was noted.

As shown in Appending IV, there were a significant number of instances in which data was removed for miscellaneous animal sounds. This is consistent with the 2022 monitoring period. Additionally, there was an instrument malfunction that occurred from 23:03 – 23:16 on August 27, 2023. Luckily, an alert was sent while performing the nighttime site visits and the instrument was reset. Thus, the hourly data in Figures 52 – 56 will show very high levels for the measured data (vs. the isolated data).

When compared to previous years, it can thus be concluded that the measured L_{eq}Night values from 2023 are consistent with the anticipated noise levels at this noise monitoring 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. Although, the isolated L_{eq}Night values varied by 2.5 dBA between nights, the trace of the 1/3 octave band L_{eq} sound levels were very consistent. Therefore, it is anticipated that the weather conditions (very calm) during the July 7 – 8, 2023 nighttime period allowed for favorable propagation of noise contributions from the sites to the noise monitor. When compared to previous years, it can thus be concluded that the measured L_{eq}Night values from 2023 are consistent with the normal to higher range of the anticipated noise levels at this noise monitoring location.

6.1.8. Noise Monitoring Location 9A

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 and 1/3 octave band L_{eq} sound levels values are very consistent between both nighttime periods with only a 0.3 dBA difference between nights. This is particularly true when reviewing the 1/3 octave band L_{eq} trace of the measurements which are almost identical. Additionally, when comparing the values of each nighttime period to previous years, the results of each night are indicative of the typical noise climate of the area.

6.1.9. Noise Monitoring Location 10A

The results of the noise monitoring conducted at Location 10 are provided in Table 2 and in Figures 71 - 77. The traces in Figures 71 – 72 indicate consistent isolated L_{eq}Night noise levels for both nighttime periods. As shown in Appending IV, there were a significant number of instances in which data was removed for vehicle pass-bys. Initially, it was thought that this monitoring year (2023) had more instances of traffic, however the overall data removed (in terms of time) was consistent with 2022.

Additionally, during the 2022 noise monitoring period, one of the two nighttime periods measured the lowest recorded L_{eq}Night value (47.5 dBA). Based on the results from this year (51.1 dBA & 52.7 dBA, respectively), it is anticipated that this 2022 result was anomalous. When compared to previous years, it can thus be concluded that the 2023 measured L_{eq}Night values are reflective of the noise climate of the area.

6.1.10. Noise Monitoring Location 11A

The results of the noise monitoring conducted at Location 11 are provided in Table 2 and in Figures 78 - 84. The measured noise levels between the two nights varies significantly (5.7 dBA).

However, when reviewing the 1/3 octave band L_{eq} sound levels, the traces are very consistent. Therefore, it is anticipated that the weather conditions (caused downwind conditions) during the July 6 – 7, 2023 nighttime period allowed for favorable propagation of noise contributions from the sites to the noise monitor. However, the July 6 – 7, 2023 nighttime period did results in the highest measured noise levels. This should be reviewed during the 2024 noise monitoring to determine if the noise levels have increased at this location or if the noise contributions during the July 6 – 7, 2023 nighttime period were irregular.

6.1.11. Noise Monitoring Location 12B

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, the nighttime periods show significant differences between the non-isolated L_{eq}Night noise levels in comparison to the isolated L_{eq}Night noise levels. Again, this can be attributed to this location being relatively far any major facility and thus influences from the CP rail line and vehicular traffic tend to dominate the noise climate when present.

In the reviewing the 1/3 octave band sound levels (in the absence of the vehicular or rail activity) there was 630 Hz tone that was present. This tone was audible in the audio recording but was not observed during the site visits. It is recommended that this tone be investigated further in 2024. Also, due to this tone, the isolated L_{eq}Night values are higher than in previous years.

6.1.12. Noise Monitoring Location 13A

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 and 1/3 octave band L_{eq} sound levels values are relatively consistent between both nighttime periods (1.7 dBA) difference. There similarities are particularly true when reviewing the 1/3 octave band L_{eq} trace of the measurements. Additionally, when comparing the values of each nighttime period to previous years the results of each night are indicative of the typical noise climate of the area, thus it can be concluded that the 2023 measured L_{eq}Night values are reflective of the noise climate of the area.

6.2. 2023 General Subjective Observations and Notes from Site Visits and Data Analysis

- The weather conditions were almost ideal for all nighttime periods.
- After measuring relatively low values at certain locations in 2022, the 2023 measured nighttime noise levels were within the typical range if not higher than in previous years.
- The isolated noise levels and 1/3 octave band L_{eq} sound levels for most locations were significantly more consistent than the 2022 noise monitoring period.
- The frequency content at each location was again, similar between nights and similar to previous years.
- None of the sites indicated any specific low frequency tonal components.
- Rail activity was once again a major noise source within AIH. Further, the noise from train passages was prevalent at most locations and tended to dominate the noise climate as they passed through, particularly when there were train whistles. However, certain locations were less influenced this year, while others were more significantly influence.
- The results from Location #1 resulted in consistent values again, thus justifying its relocation in 2022.
- The morning chorus was observed at a few locations, but it was not as prevalent as in previous years.

6.3. Nighttime Weather Conditions

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. Note that the weather conditions for noise monitoring periods were within acceptable limits as per AER D038. All weather data are presented in Appendix V. A brief discussion of each nighttime period can be found below.

6.3.1. July 6 – 7, 2023

Weather Monitor near Noise Monitor Location 2B

The wind conditions during the nighttime period were mild (entirely below 10 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 12°C to 20°C and the relative humidity ranged from approximately 49% - 81%. 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 11A

The wind conditions during the nighttime period were considered moderate (primarily between 5 – 10 km/hr) with brief periods over 10 km/hr. The wind was predominantly from the north (northwest to northeast) for the duration of the nighttime period. The temperature ranged from 9°C to 20°C and the relative humidity ranged from approximately 63% - 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 12B

The wind conditions during the nighttime period were mild (entirely below 10 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 9°C to 20°C and the relative humidity ranged from approximately 62% - 90%. The barometric pressure was consistent and flat at approximately 94 kPa. Lastly, there was no precipitation during the night.

[1] The wind direction fluctuates more greatly when wind speeds are below 5 km/hr and are essentially calm. In these instances, the wind direction has a minimal influence of the propagation of the sound.

6.3.2. July 7 – 8, 2023

Weather Monitor near Noise Monitor Location 2B

The wind conditions during the nighttime period were calm (entirely below 5 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 12°C to 20°C and the relative humidity ranged from approximately 60% - 77%. 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 11A

The wind conditions during the nighttime period were mild (entirely below 10 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 12°C to 22°C and the relative humidity ranged from approximately 43% - 83%. 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 12B

The wind conditions during the nighttime period were mild (entirely below 10 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 10°C to 18°C and the relative humidity ranged from approximately 61% - 90%. The barometric pressure was consistent and flat at approximately 94 kPa. Lastly, there was no precipitation during the night.

[1] The wind direction fluctuates more greatly when wind speeds are below 5 km/hr and are essentially calm. In these instances, the wind direction has a minimal influence of the propagation of the sound.

6.3.3. August 27 – 28, 2023

Weather Monitor near Noise Monitor Location 1E

The wind conditions during the nighttime period were calm (almost entirely below 5 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 13°C to 19°C and the relative humidity ranged from approximately 65% - 84%. 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 12B

The wind conditions throughout the nighttime period were considered calm (primarily below 5km/hr). The wind was predominantly from the southwest (northwest to northeast) for the duration of the nighttime period. The temperature ranged from 10°C to 15°C and the relative humidity ranged from approximately 77% - 88%. The barometric pressure was flat at 94 kPa. Lastly, there was no precipitation.

[1] The wind direction fluctuates more greatly when wind speeds are below 5 km/hr and are essentially calm. In these instances, the wind direction has a minimal influence of the propagation of the sound.

6.3.4. August 28 – 29, 2023

Weather Monitor near Noise Monitor Location 1E

The wind conditions during the nighttime period were calm (entirely below 5 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 12°C to 19°C and the relative humidity ranged from approximately 70% - 91%. 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 12B

The wind conditions throughout the nighttime period were considered mild (entirely below 10 km/hr). The wind direction varied throughout the nighttime period[1]. The temperature ranged from 11°C to 15°C and the relative humidity ranged from approximately 77% - 90%. The barometric pressure was flat at 94 kPa. Lastly, there was no precipitation.

[1] The wind direction fluctuates more greatly when wind speeds are below 5 km/hr and are essentially calm. In these instances, the wind direction has a minimal influence of the propagation of the sound.

7.0 Conclusion

As part of the study, a total of thirteen (13) 48-hour noise monitorings were conducted throughout the Alberta's Industrial Heartland. 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. In comparison to the 2022 noise monitoring, the results from 2023 were significantly more stable. This can be attributed to the almost ideal weather conditions during the nighttime.

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 – 2022)
- 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.

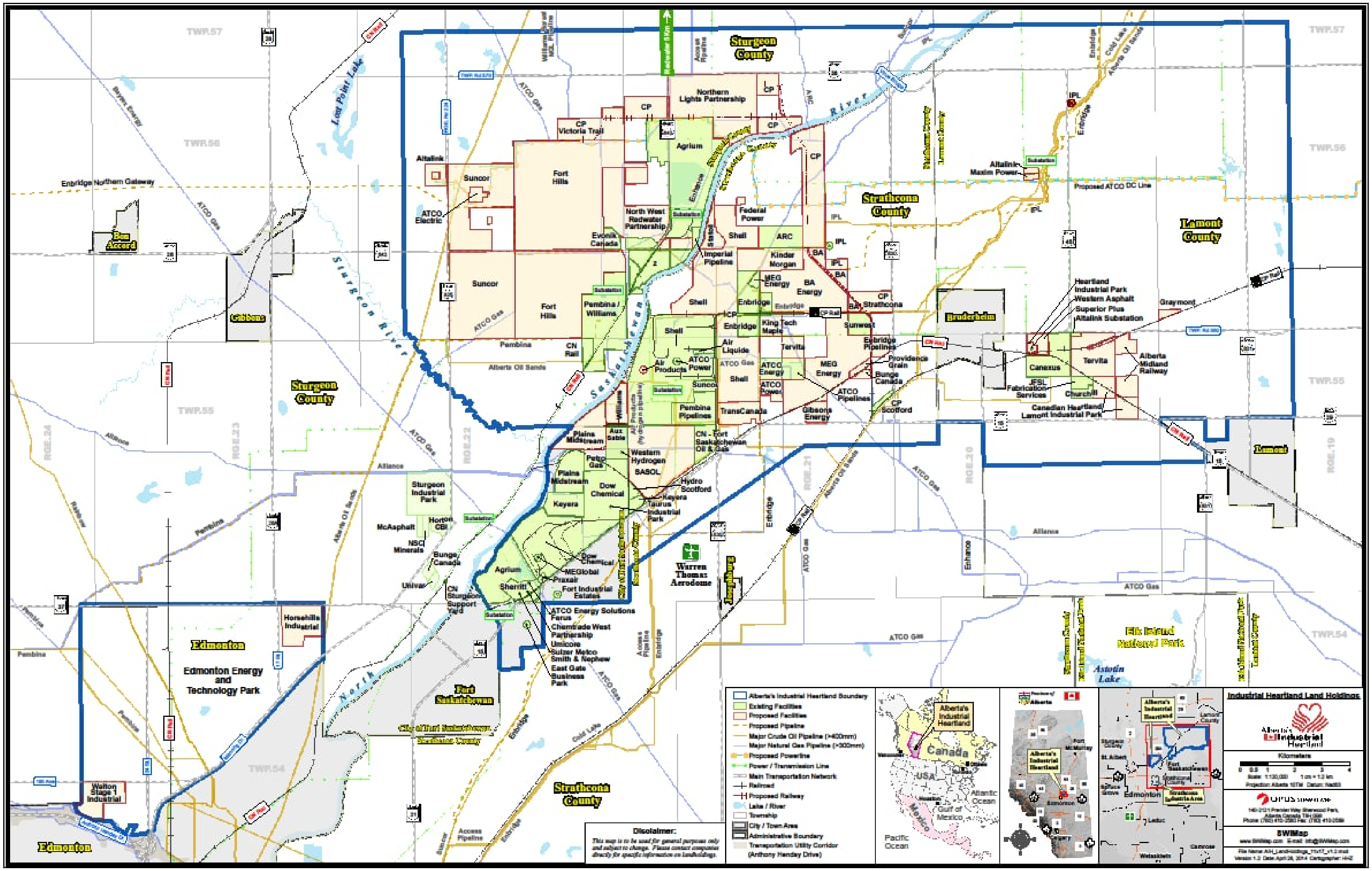

Figure 1. Study Area

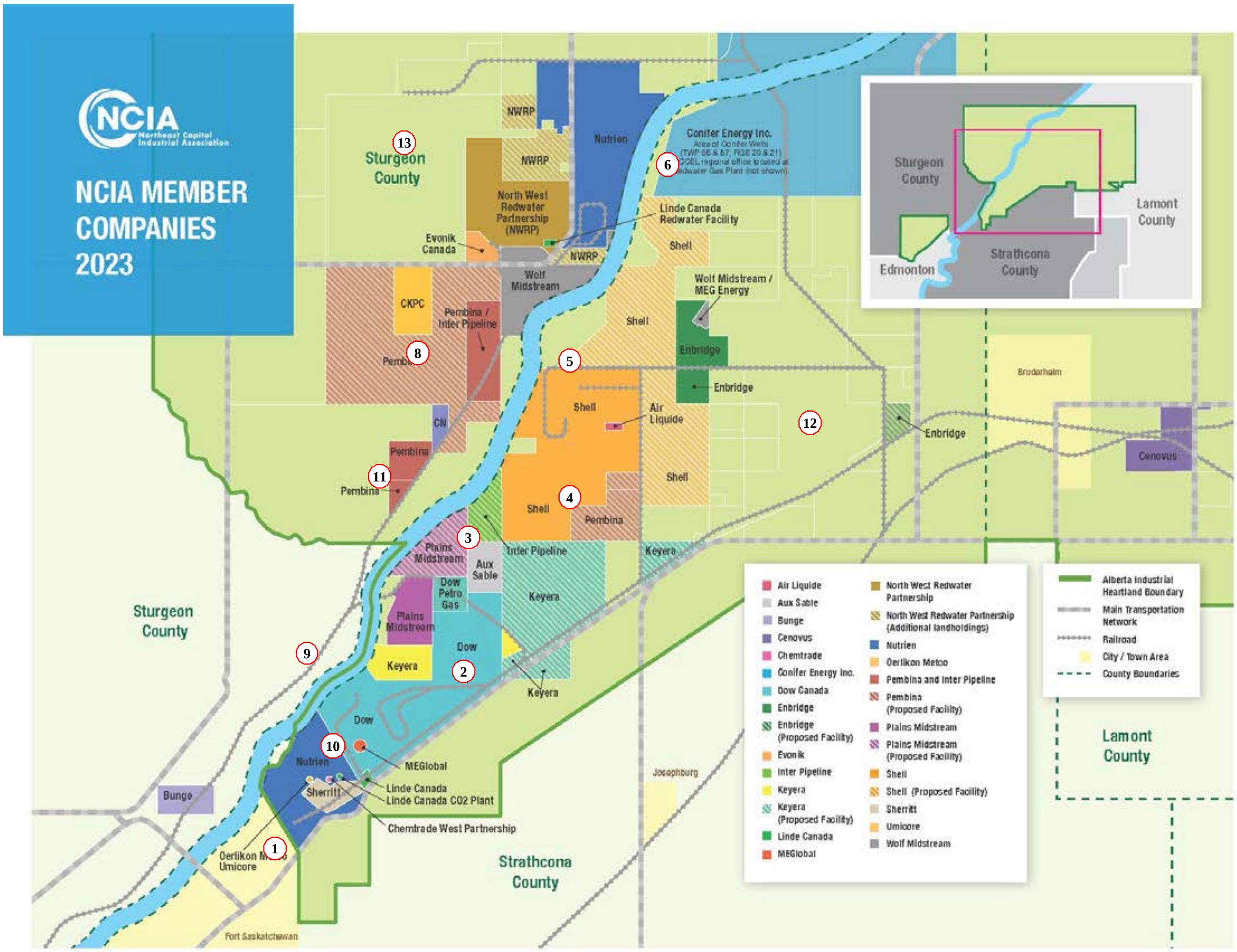

Figure 2. 2023 Study Area (With Noise Monitoring Locations)

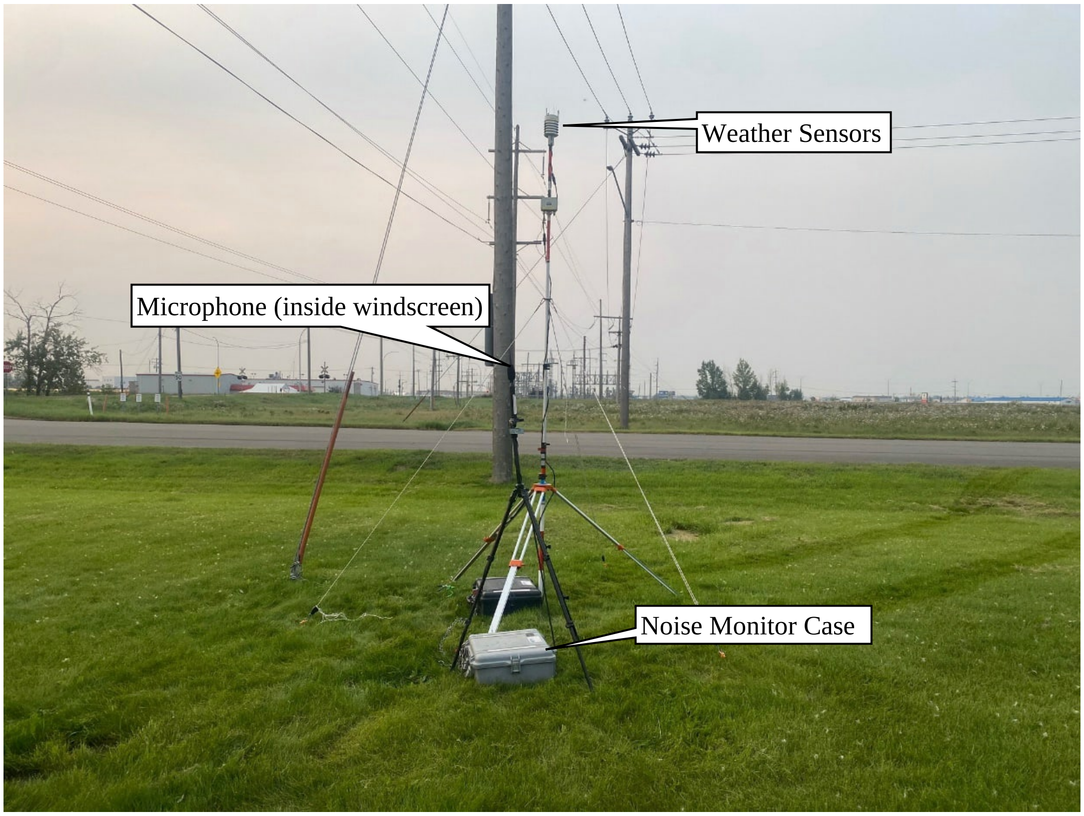

Figure 3. Noise Monitor #1

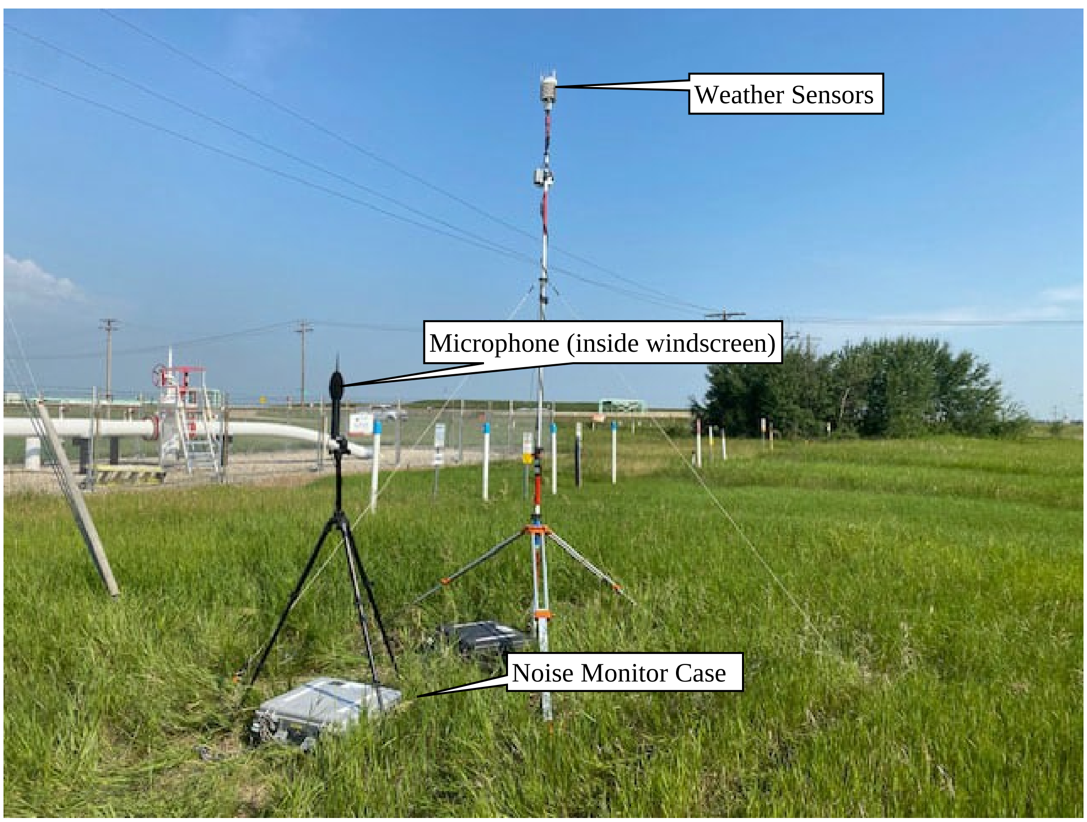

Figure 4. Noise Monitor #2

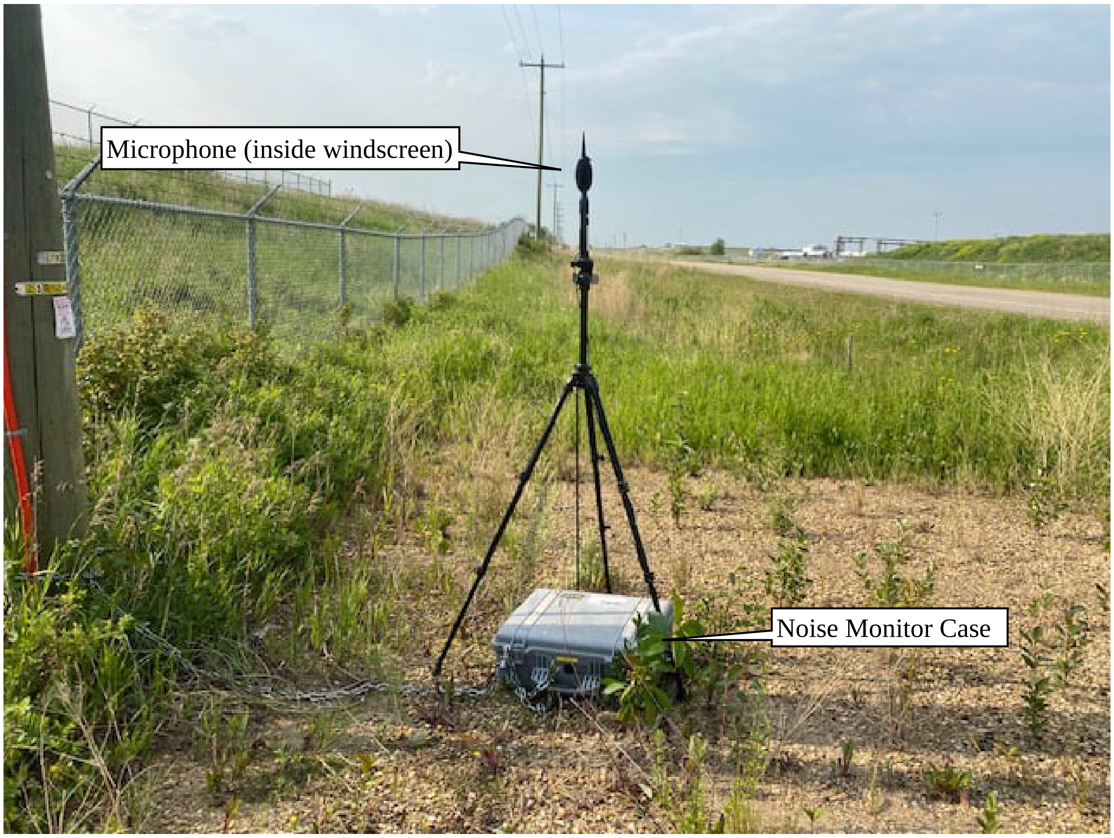

Figure 5. Noise Monitor #3

Figure 6. Noise Monitor #4

Figure 7. Noise Monitor #5

Figure 8. Noise Monitor #6 (With Weather Monitor)

Figure 9. Noise Monitor #8

Figure 10. Noise Monitor #9

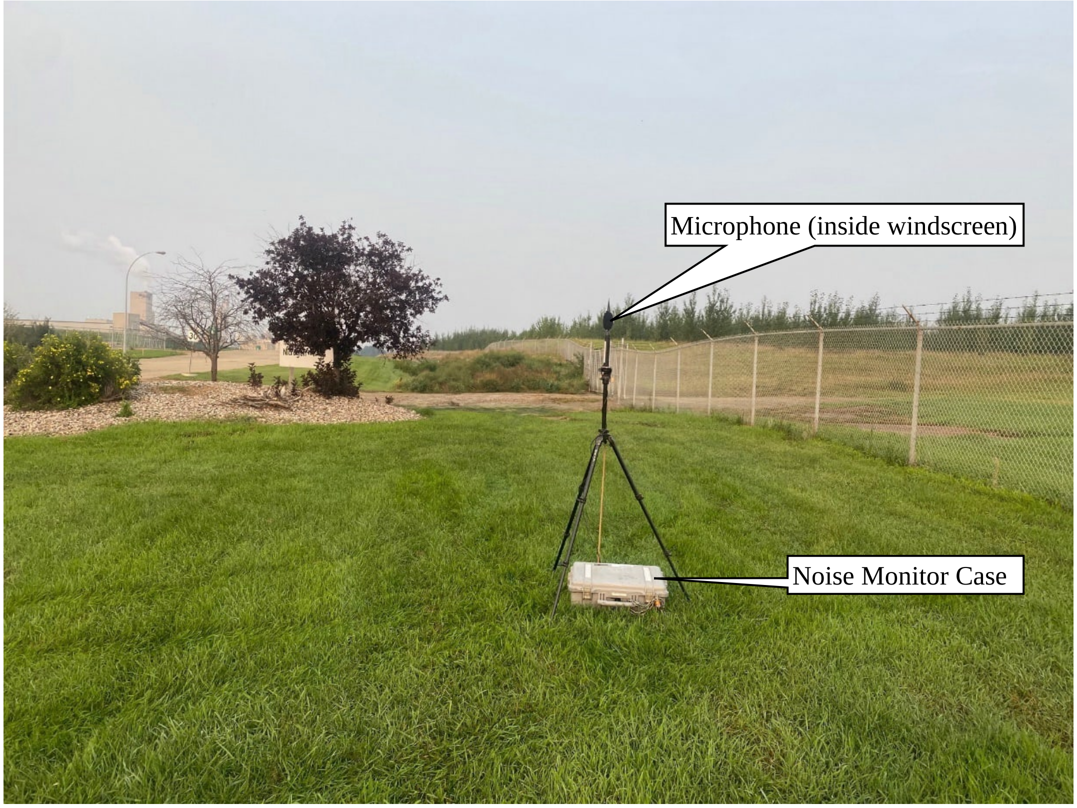

Figure 11. Noise Monitor #10 (With Weather Monitor)

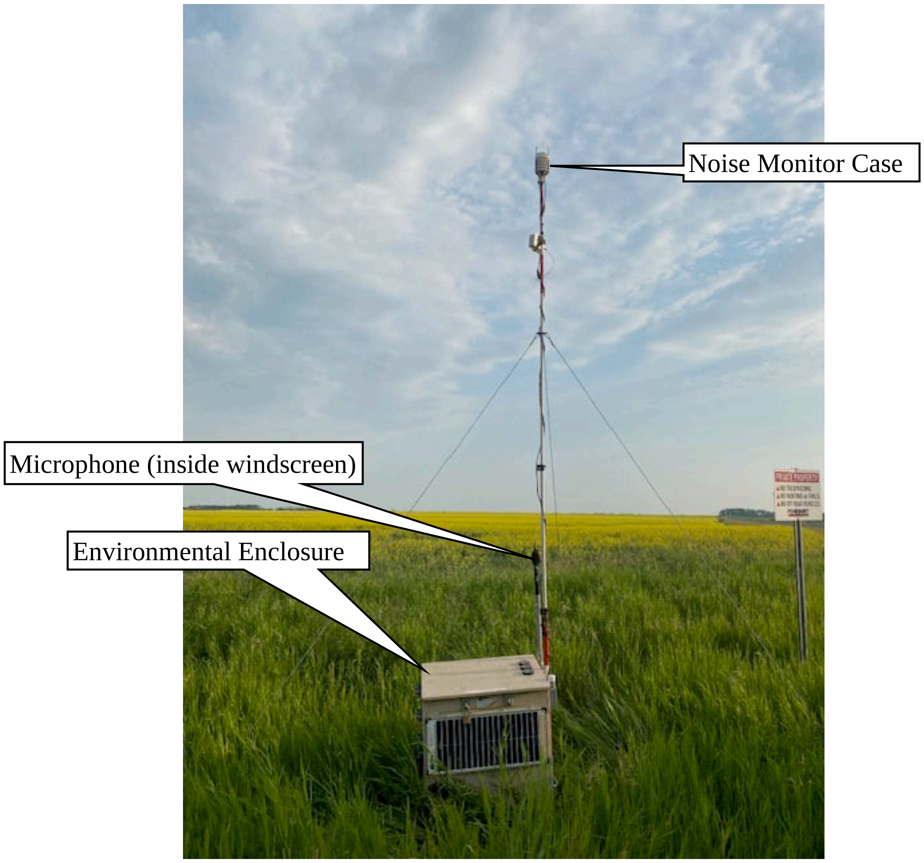

Figure 12. Noise Monitor #11

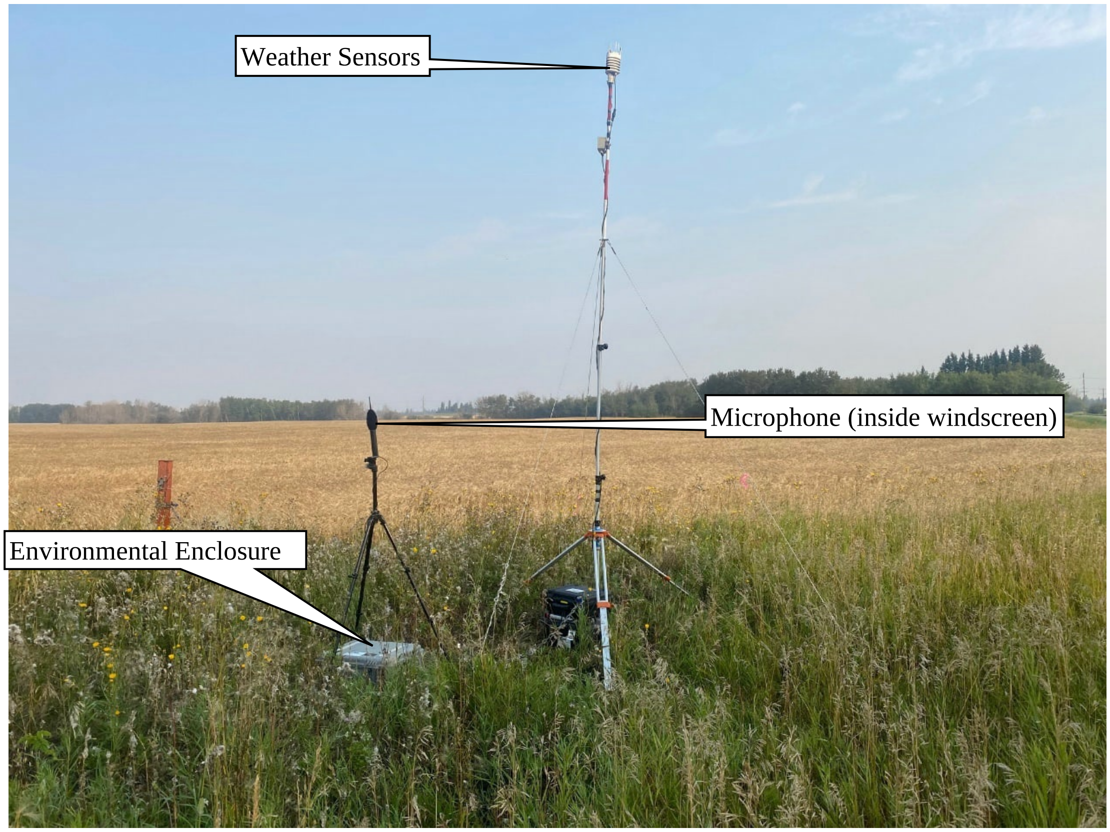

Figure 13. Noise Monitor #12 (Control Site w/ Weather Monitor)

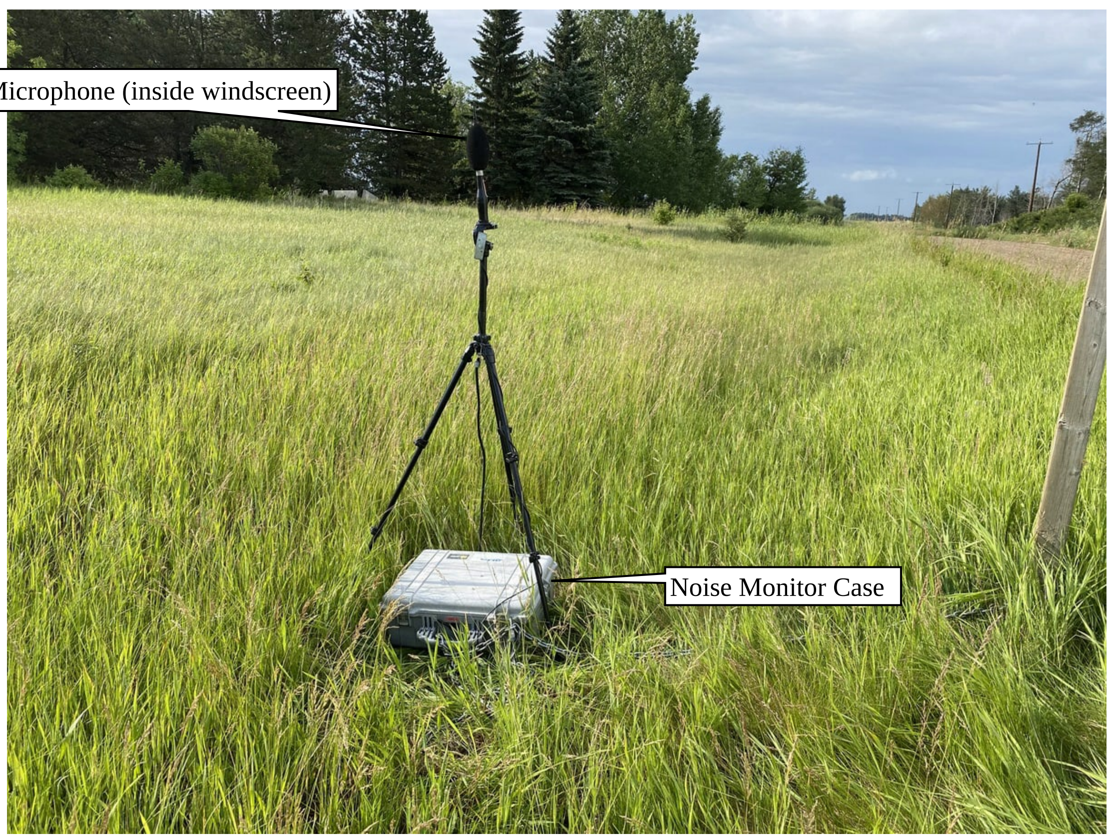

Figure 14. Noise Monitor #13

Noise Monitor #1

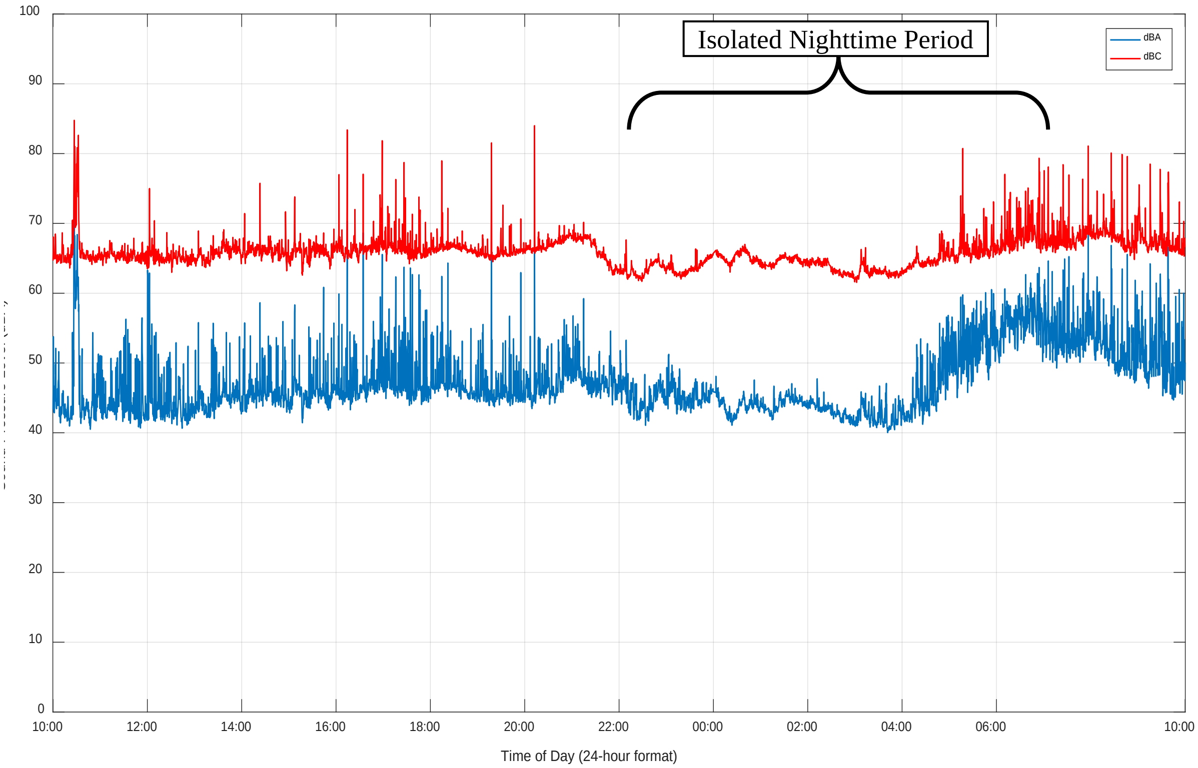

Figure 15. Noise Monitor #1, 15-Second L_{eq} Sound Levels (August 27 - 28, 2023)

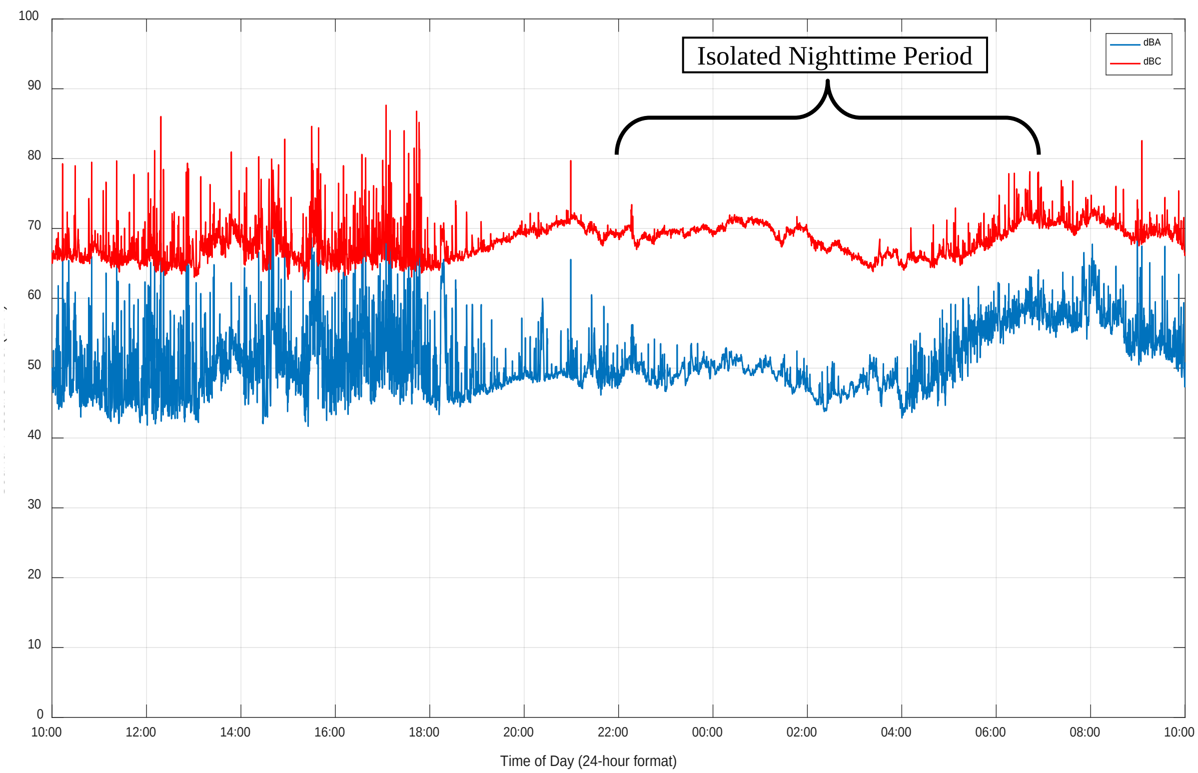

Figure 16. Noise Monitor #1, 15-Second L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #1

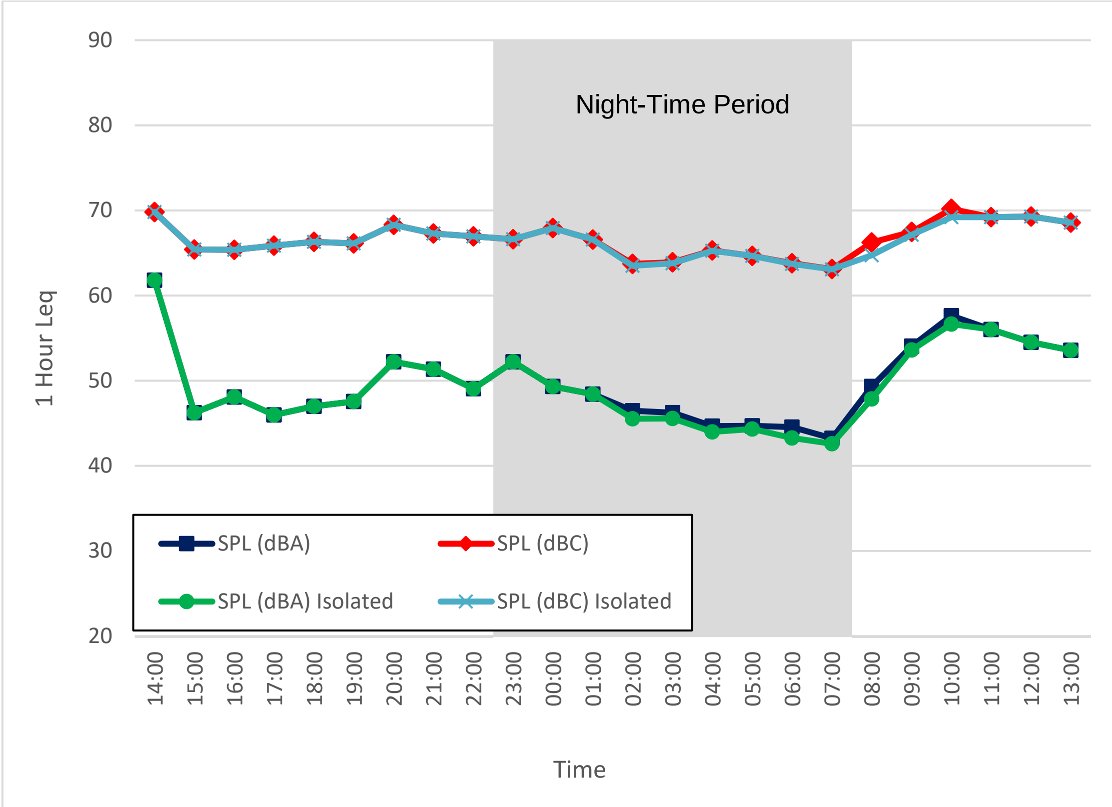

Figure 17. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (August 27 - 28, 2023)

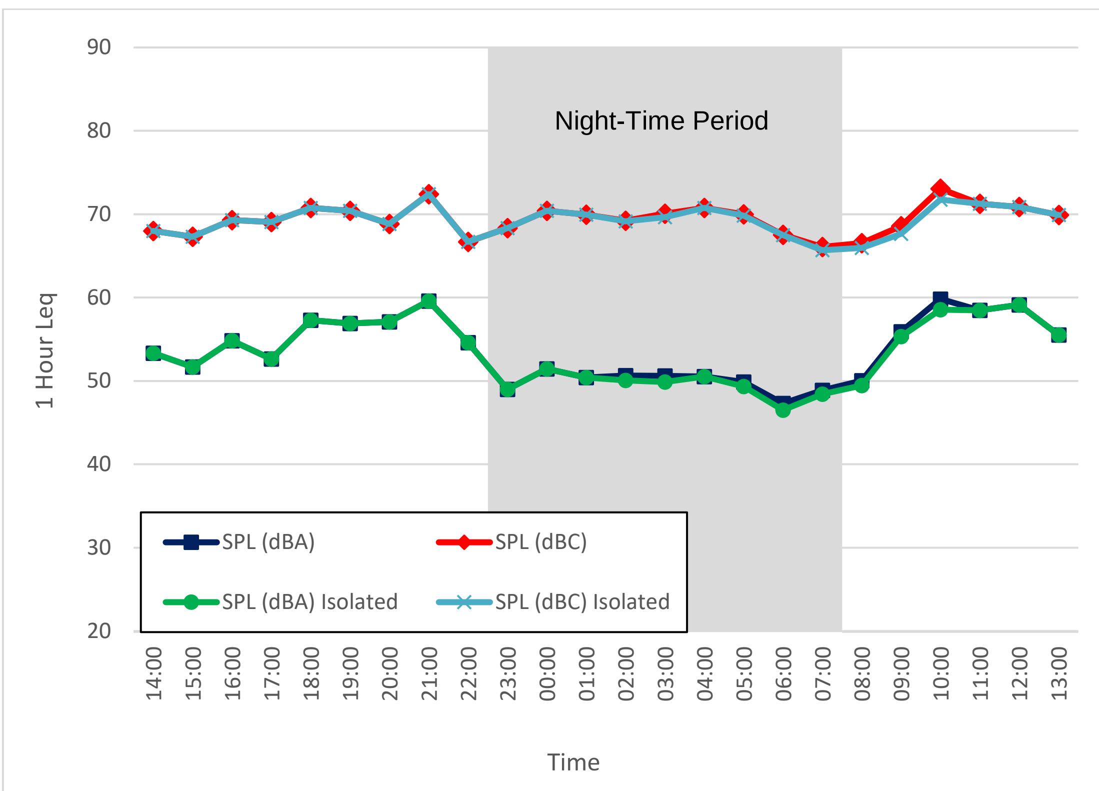

Figure 18. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (August 28 - 29, 2023)

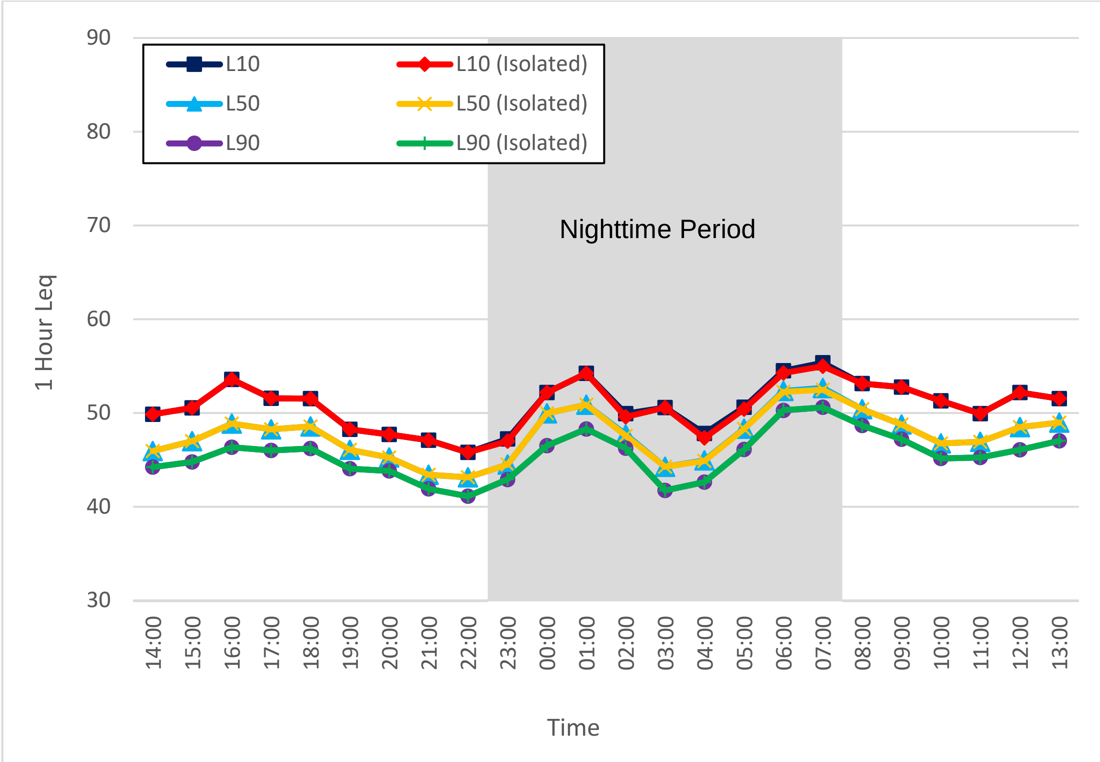

Figure 19. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 27 - 28, 2023)

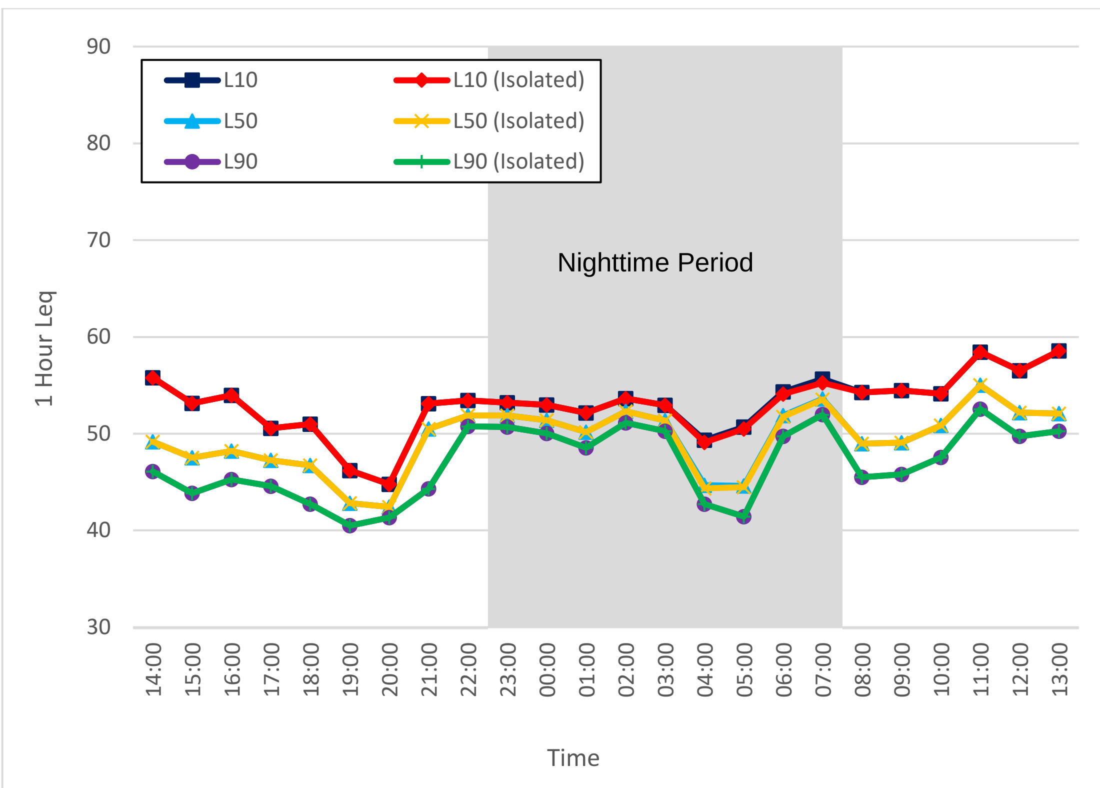

Figure 20. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 28 - 29, 2023)

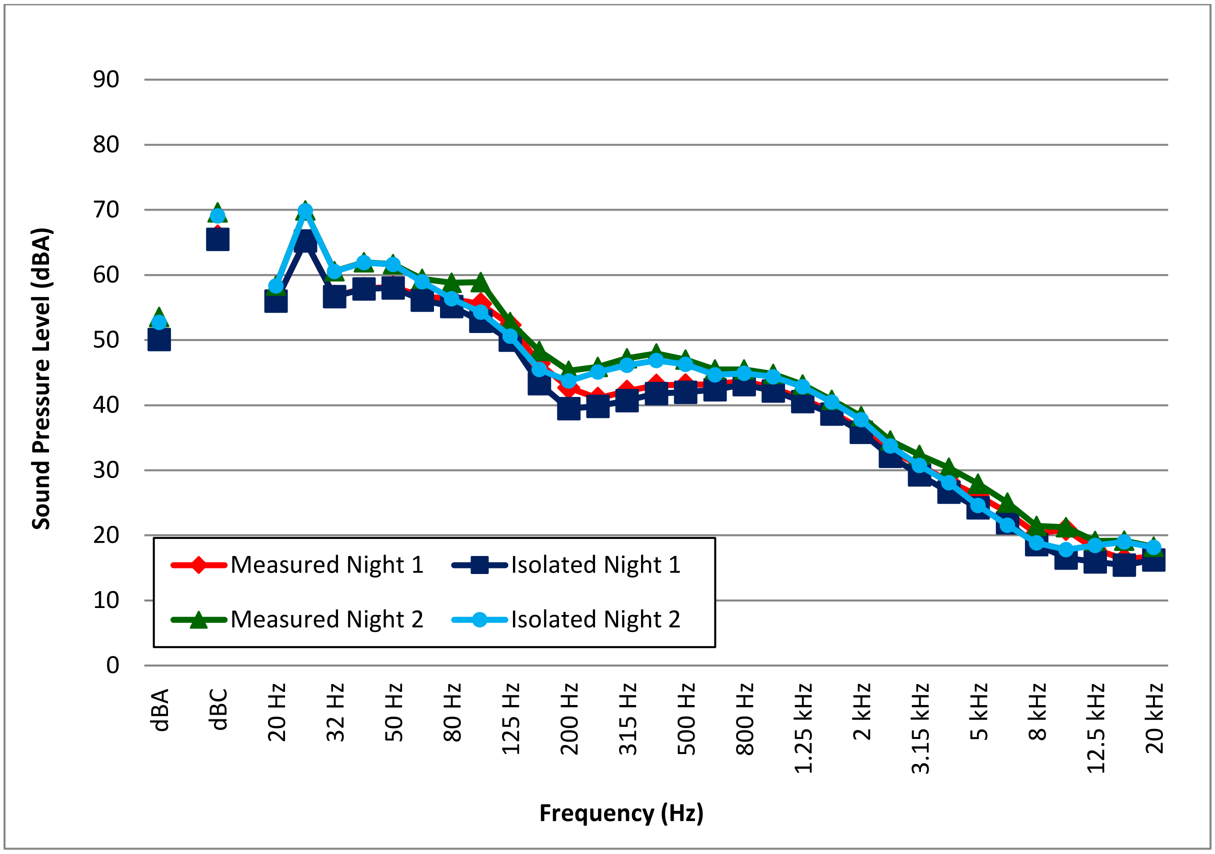

Figure 21. Noise Monitor #1, 1/3 Octave L_{eq} Sound Levels (August 27 - 29, 2023)

Noise Monitor #2

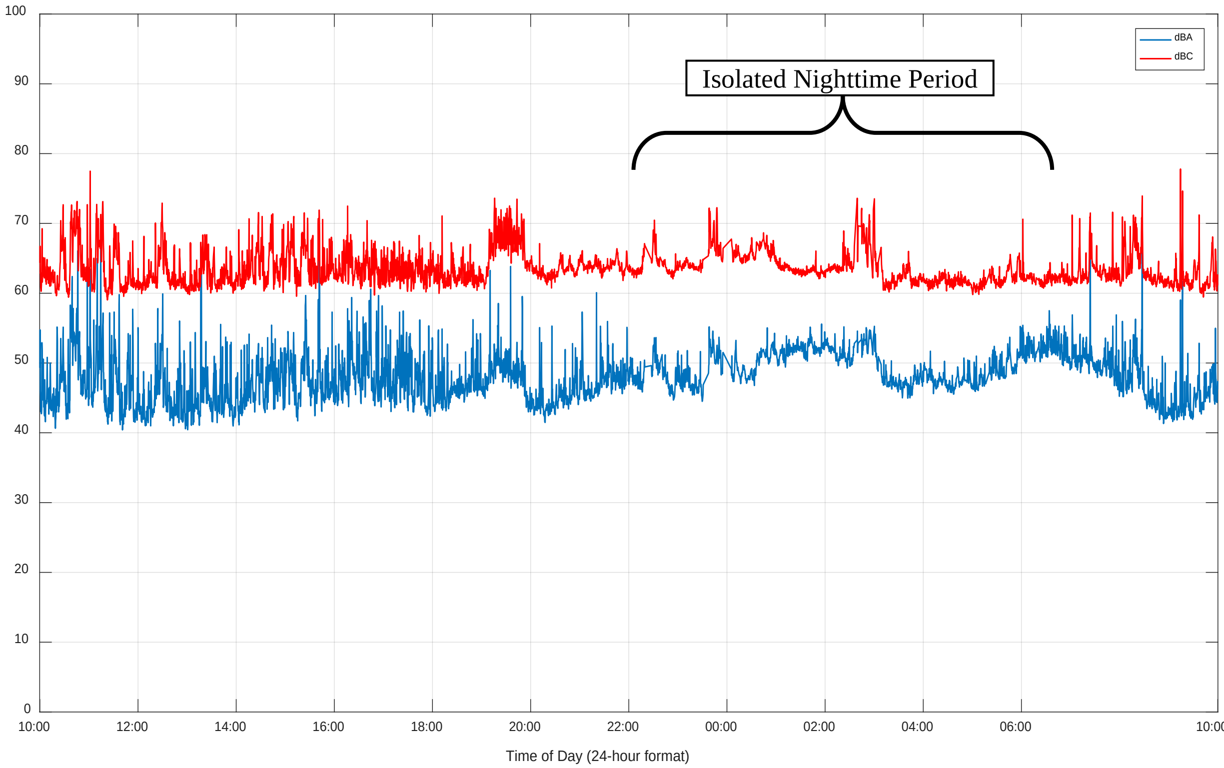

Figure 22. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

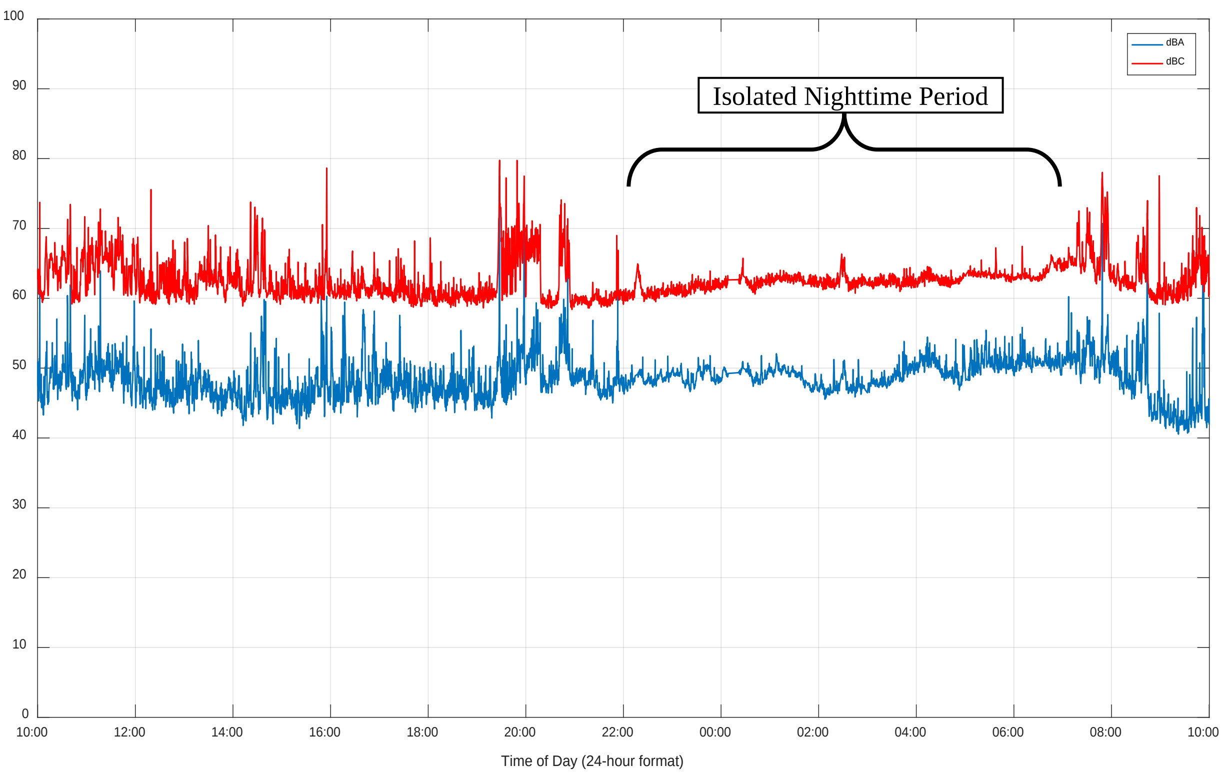

Figure 23. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #2

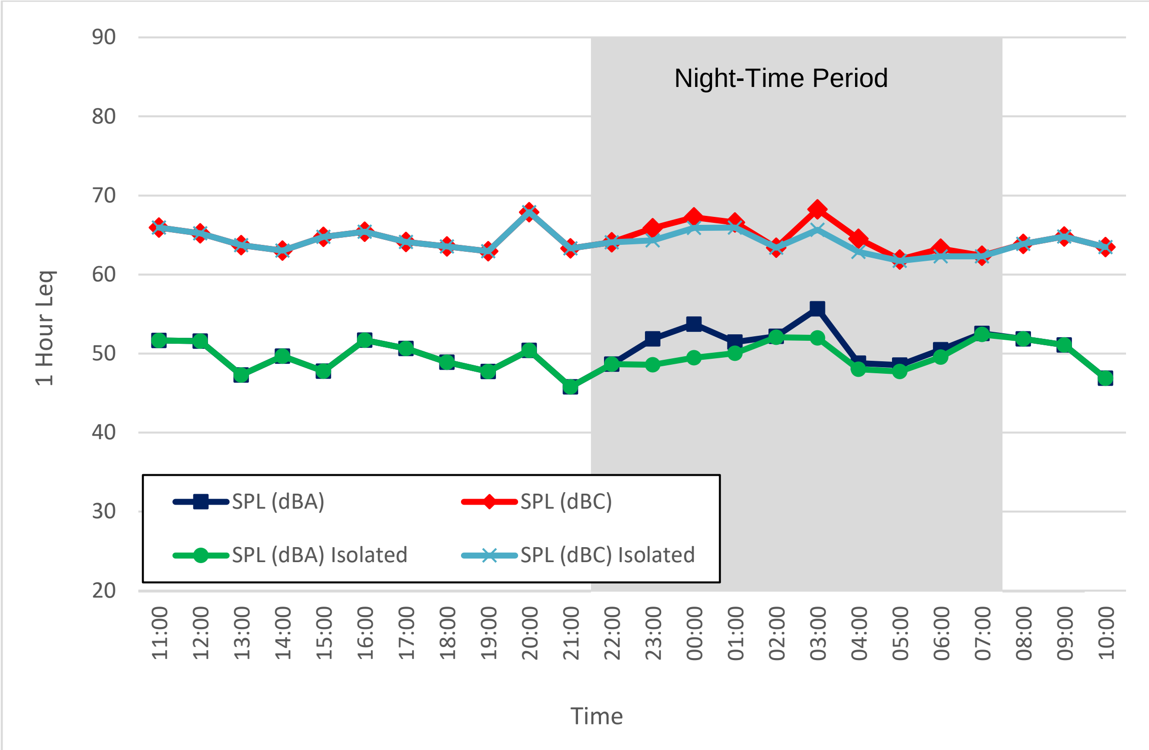

Figure 24. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

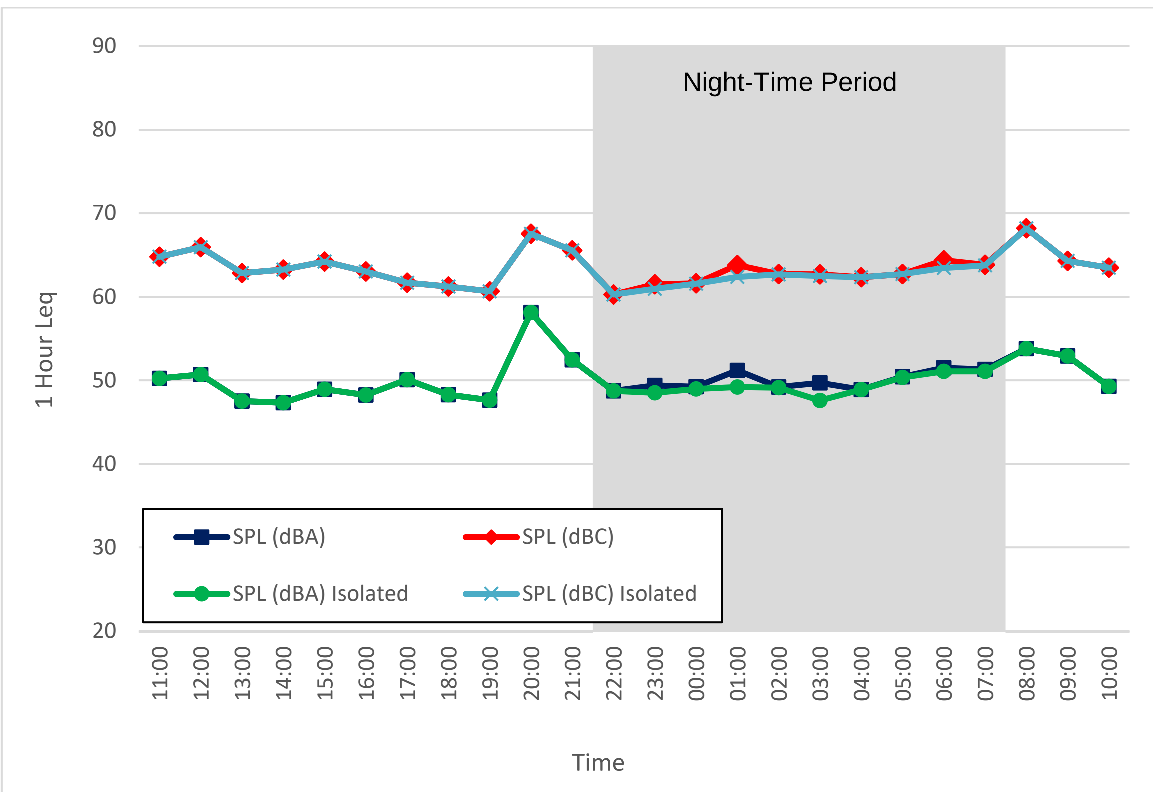

Figure 25. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

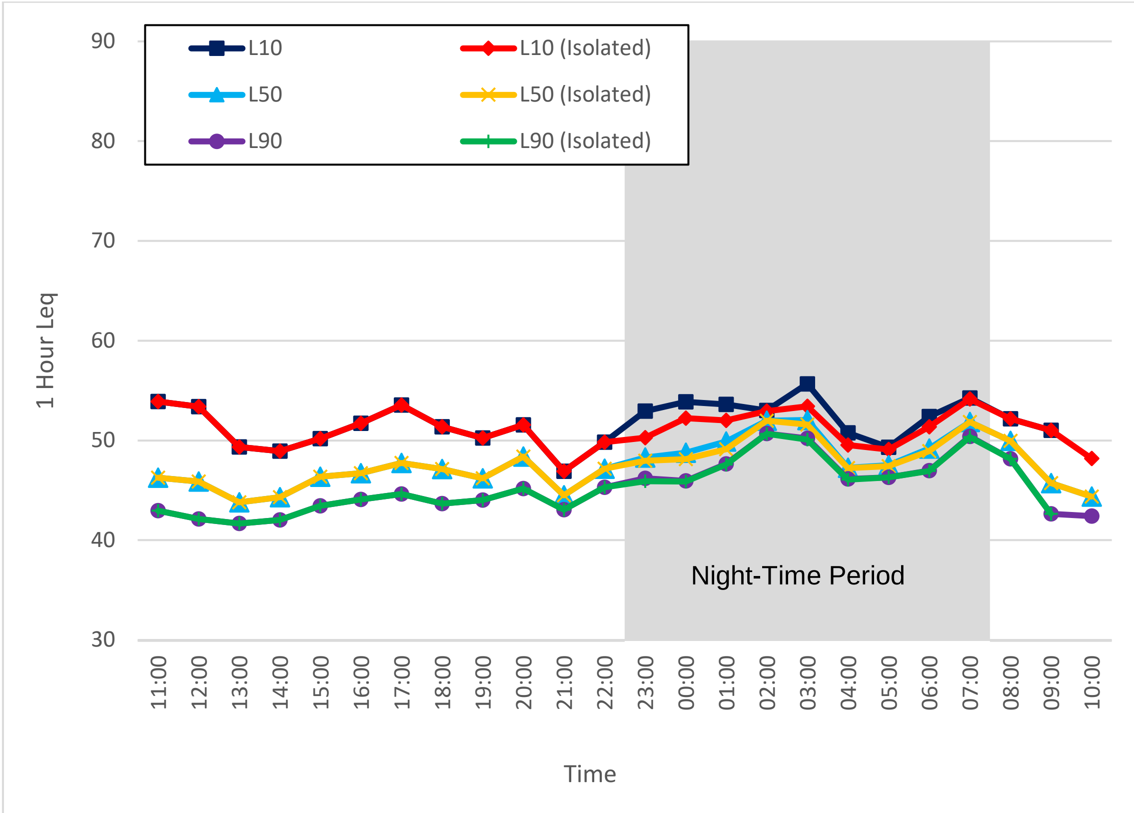

Figure 26. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

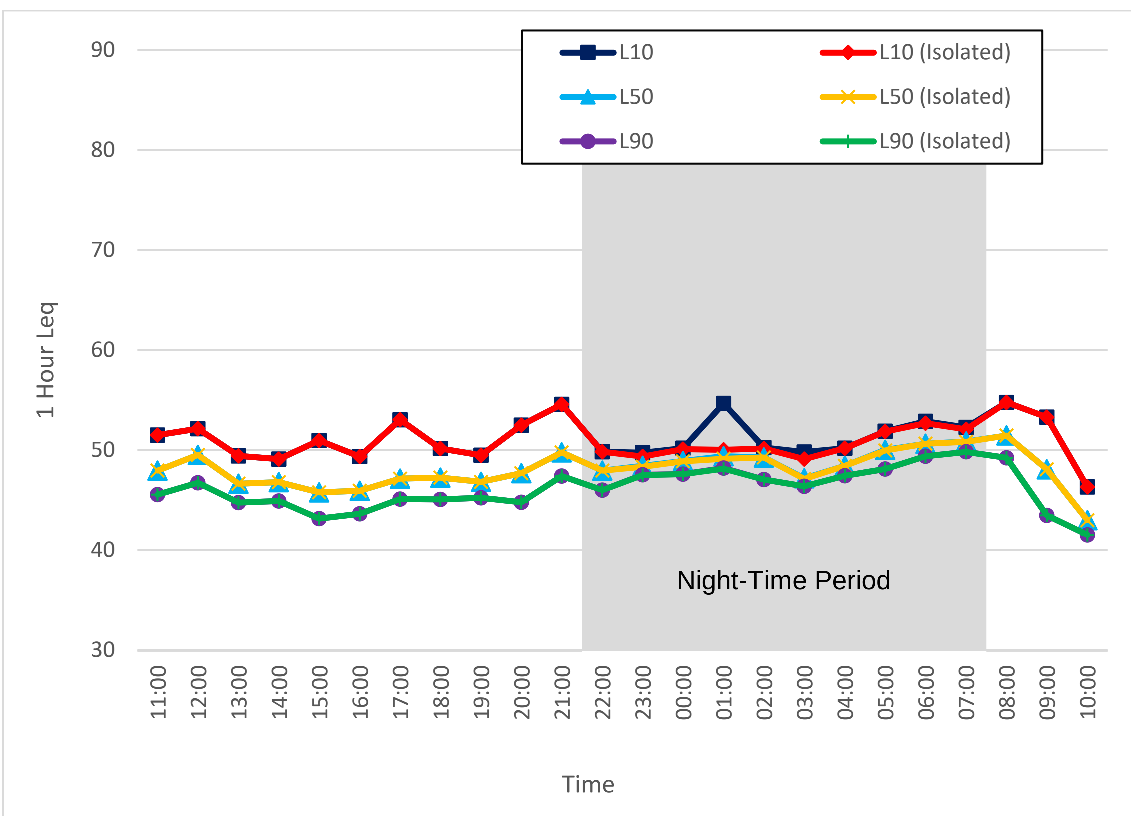

Figure 27. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #2

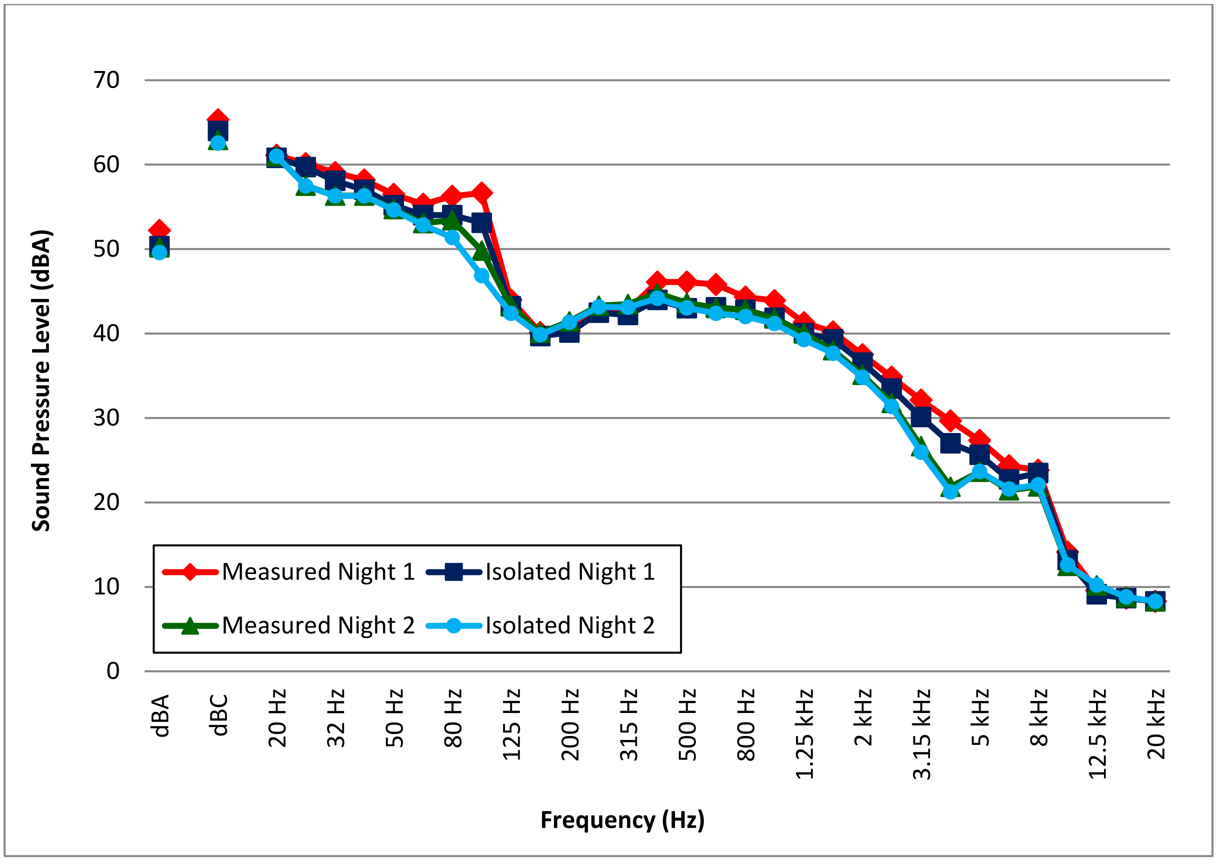

Figure 28. Noise Monitor #2, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #3

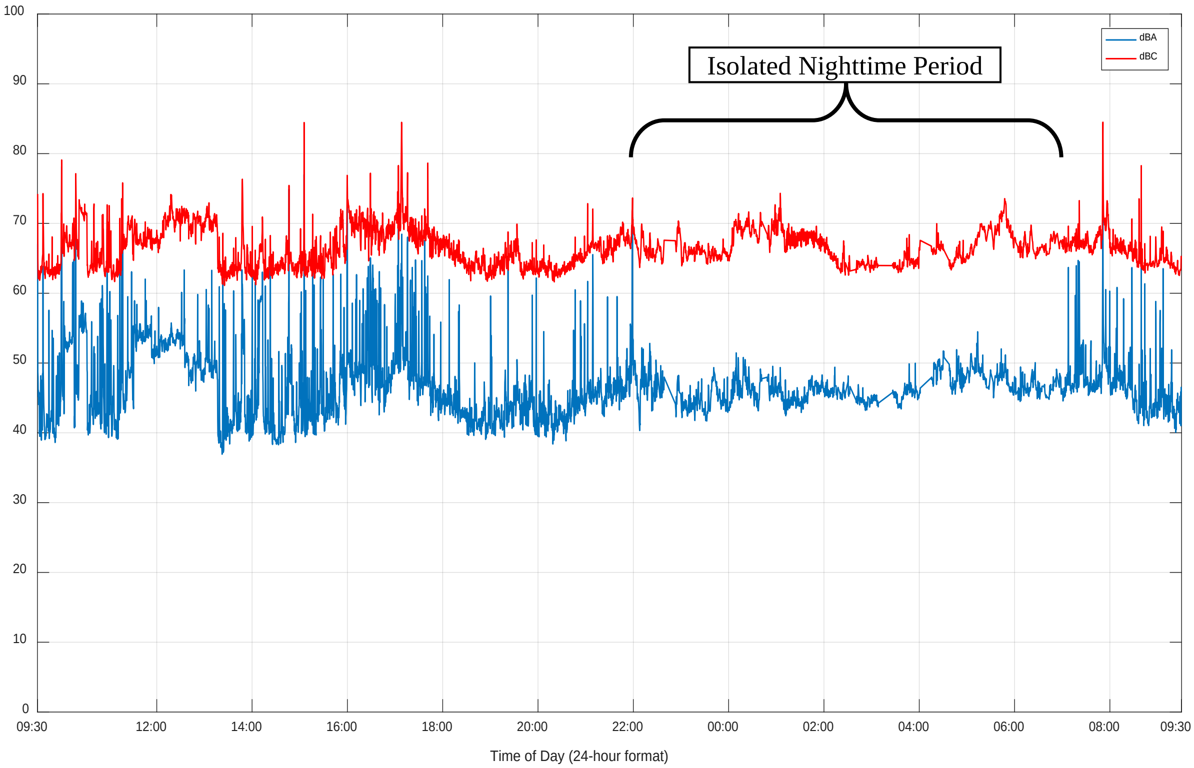

Figure 29. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

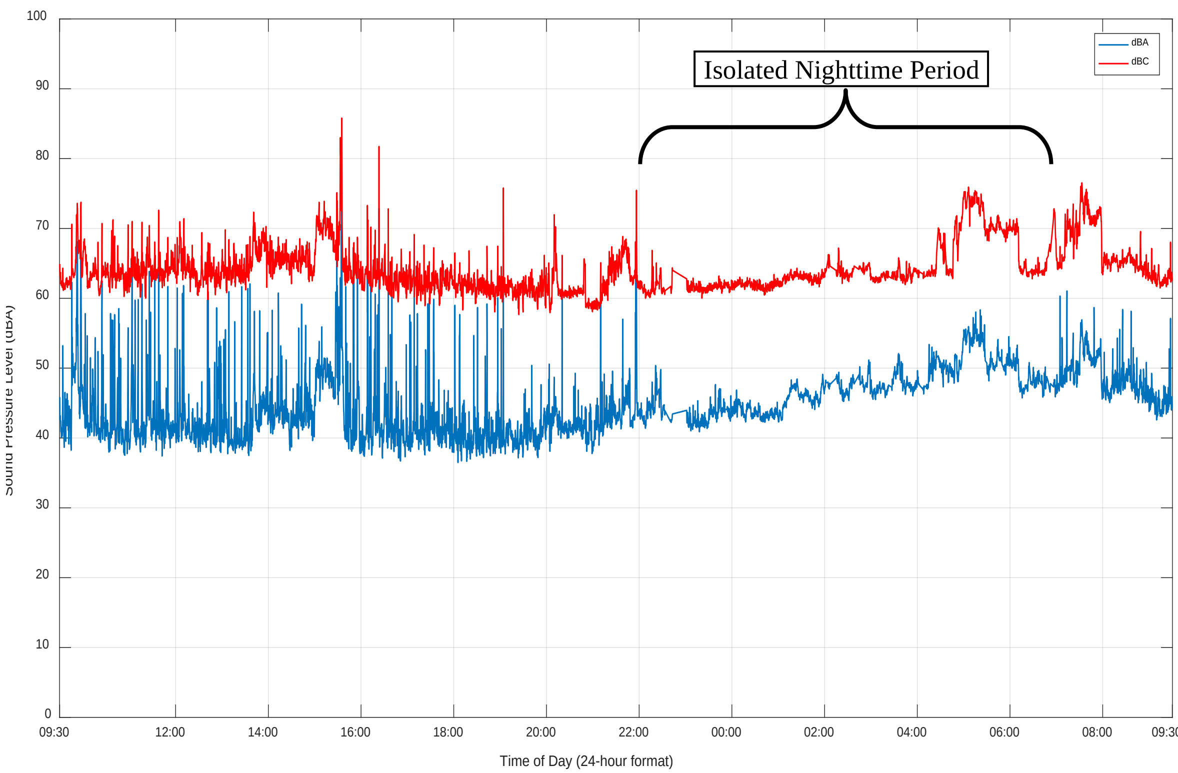

Figure 30. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #3

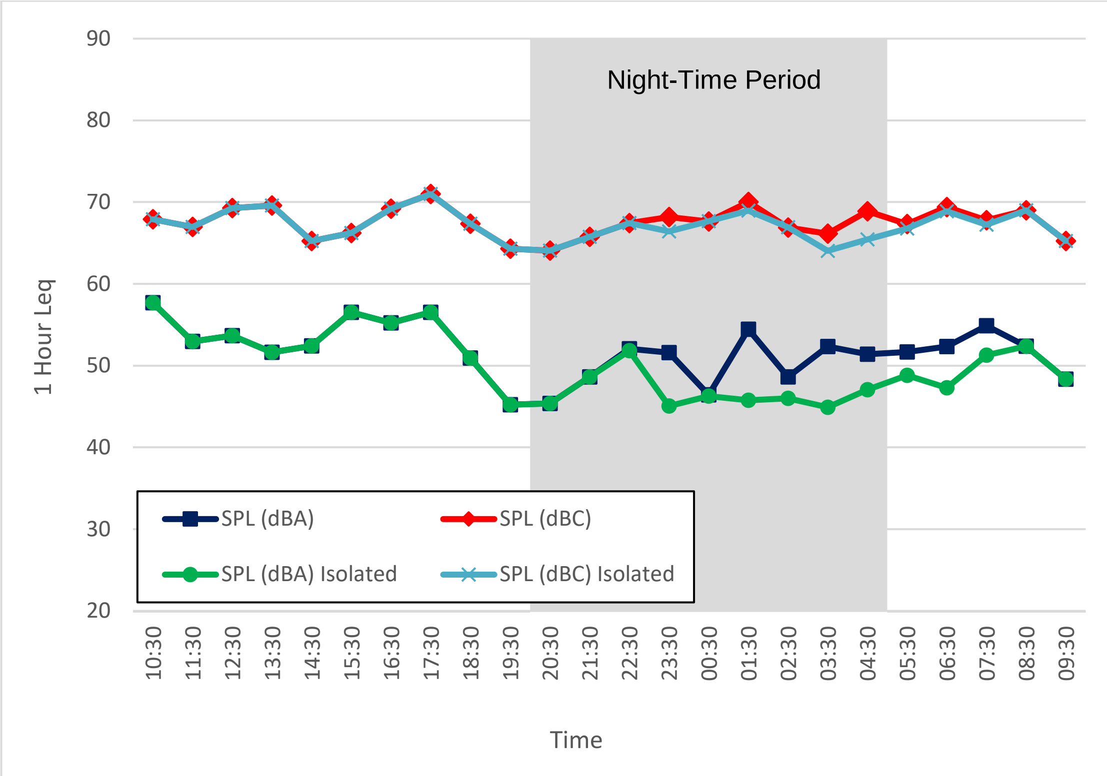

Figure 31. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

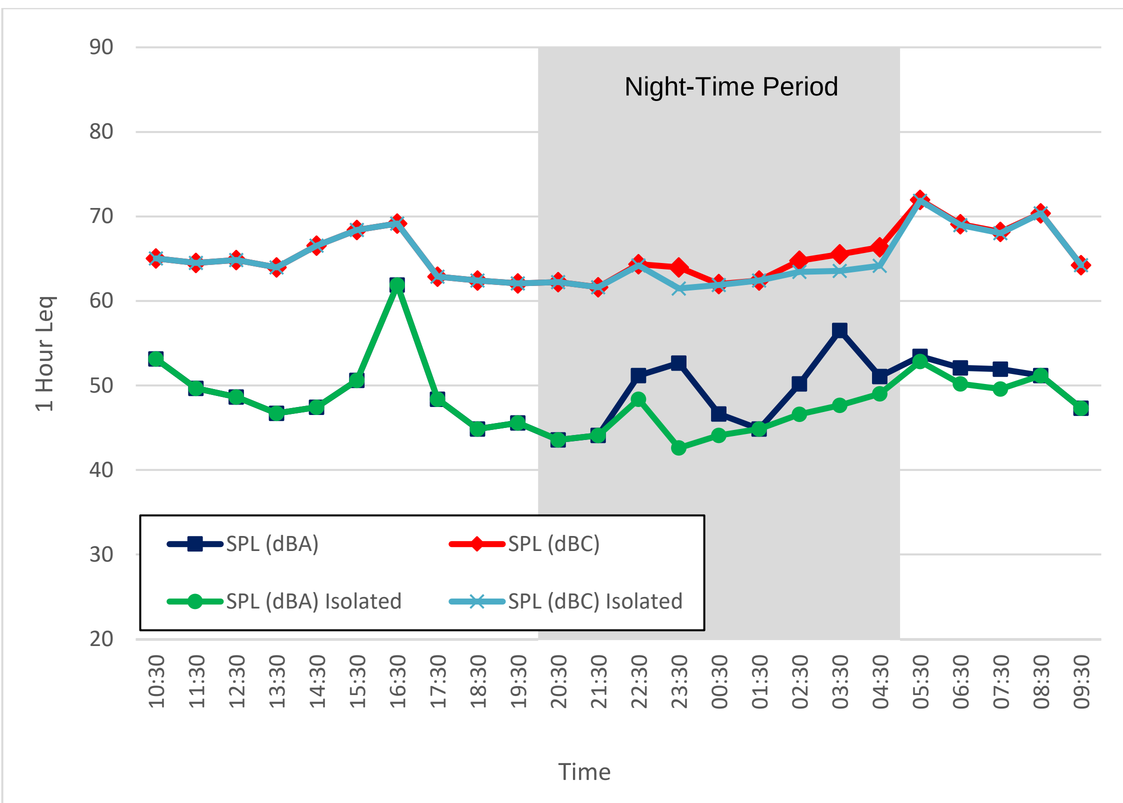

Figure 32. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #3

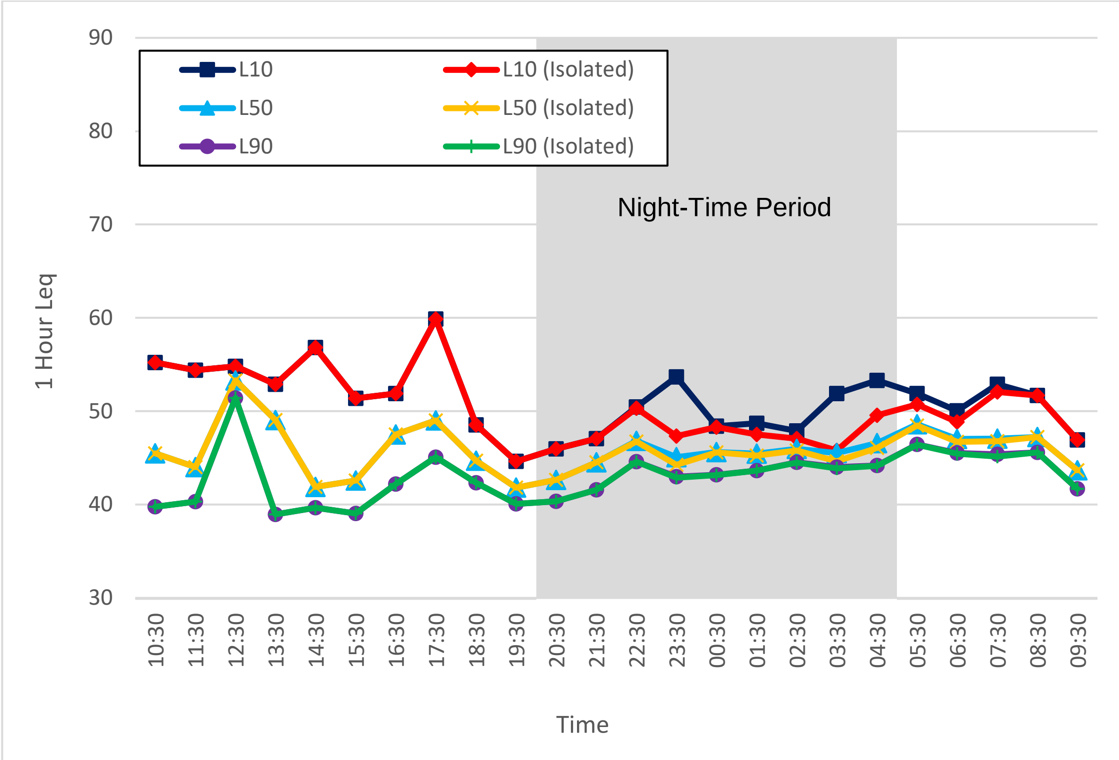

Figure 33. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

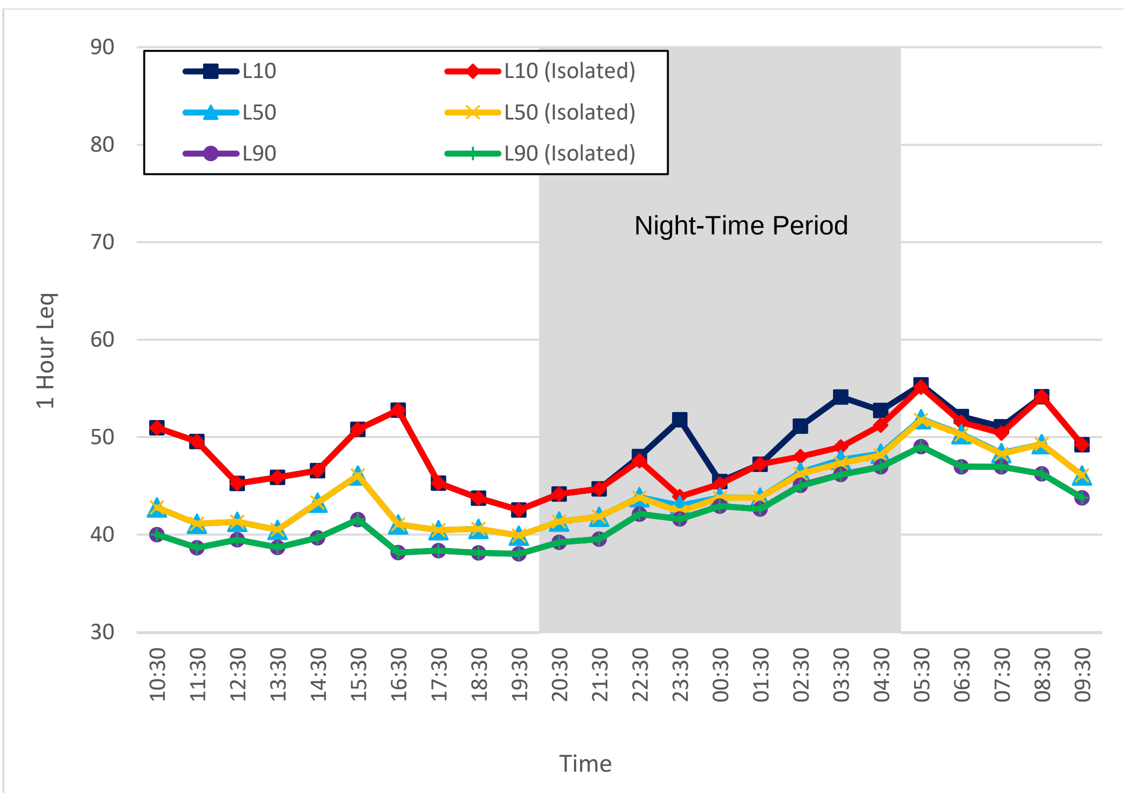

Figure 34. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

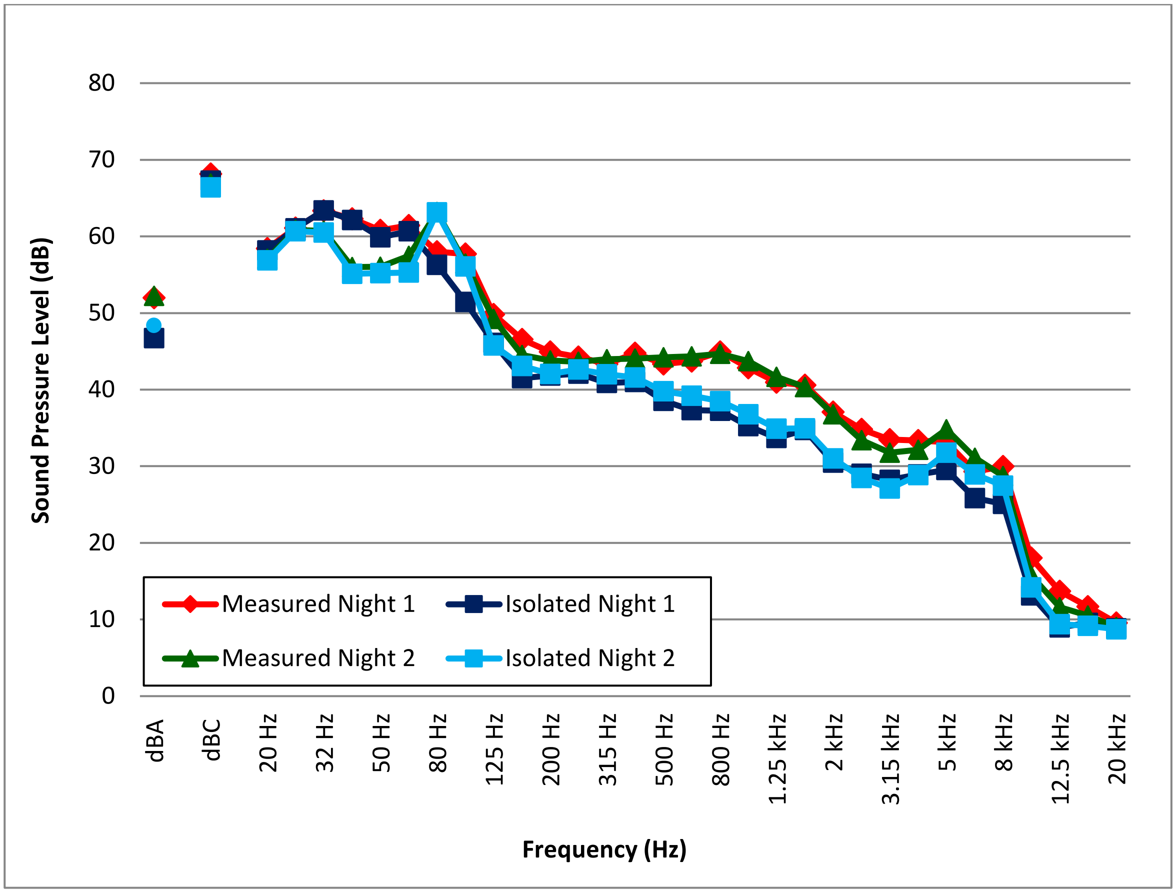

Figure 35. Noise Monitor #3, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #4

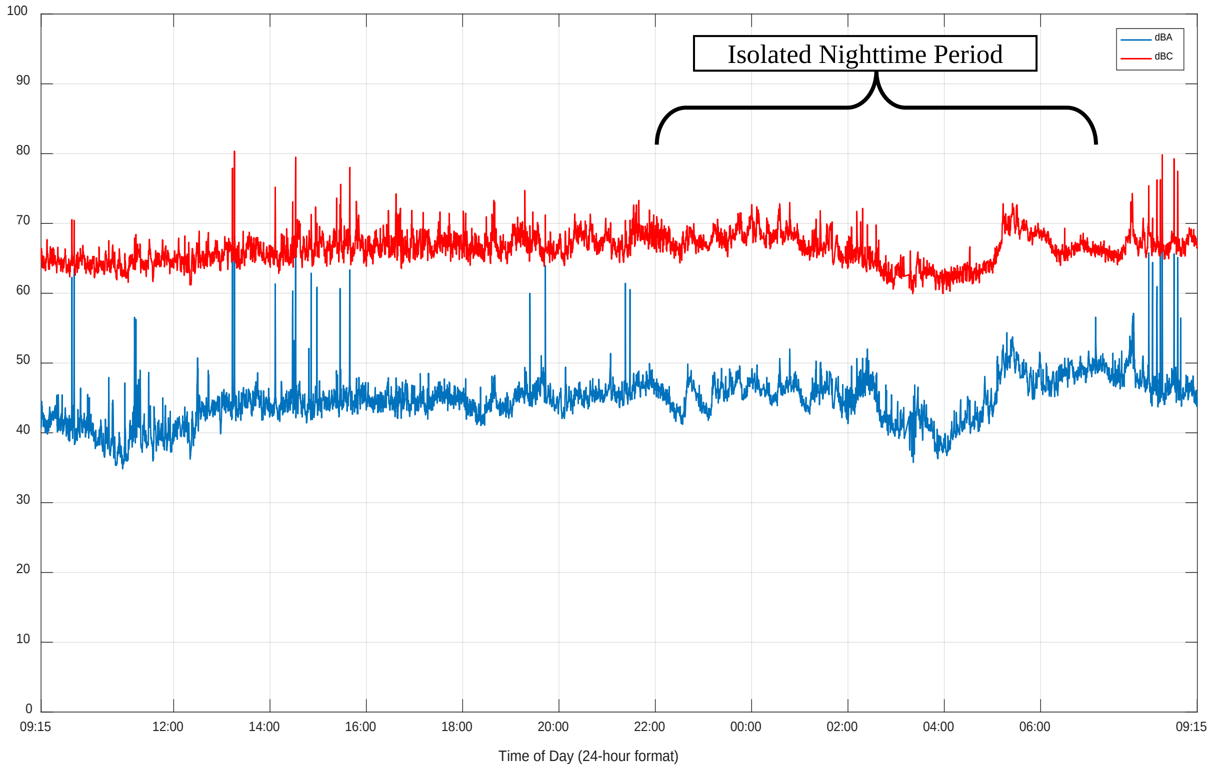

Figure 36. Noise Monitor #4, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

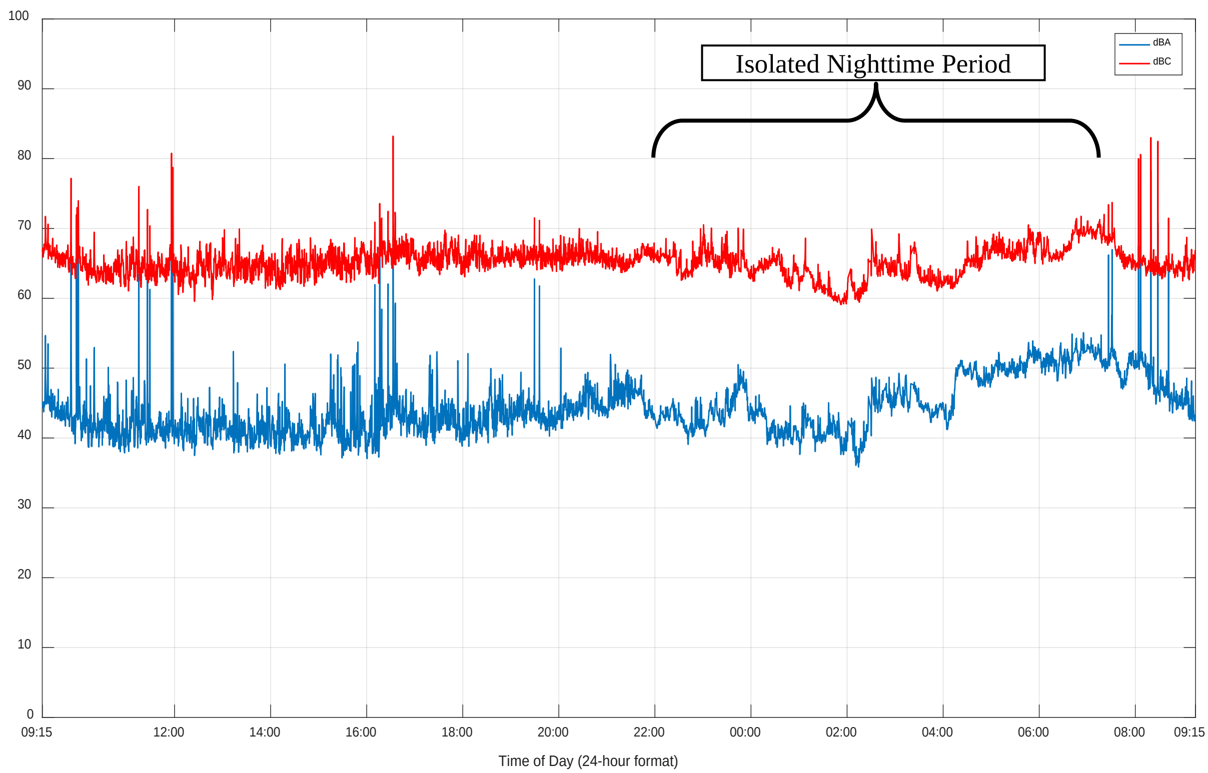

Figure 37. Noise Monitor #4, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

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Noise Monitor #4

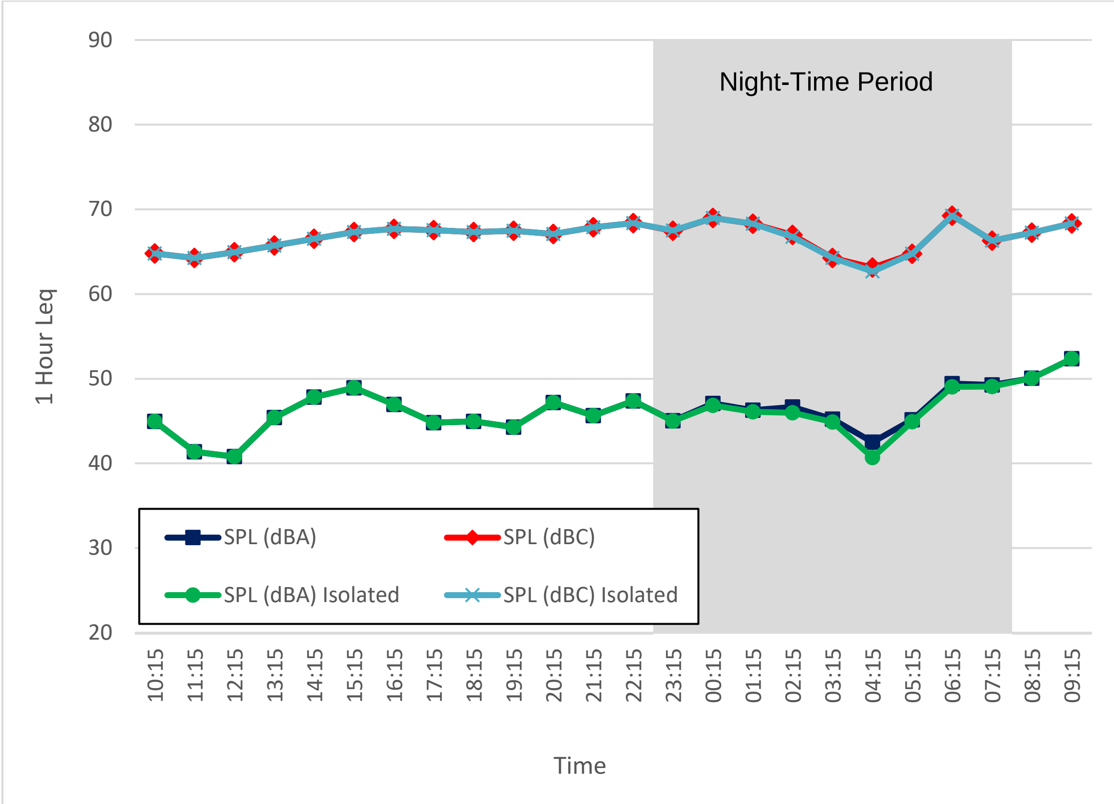

Figure 38. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

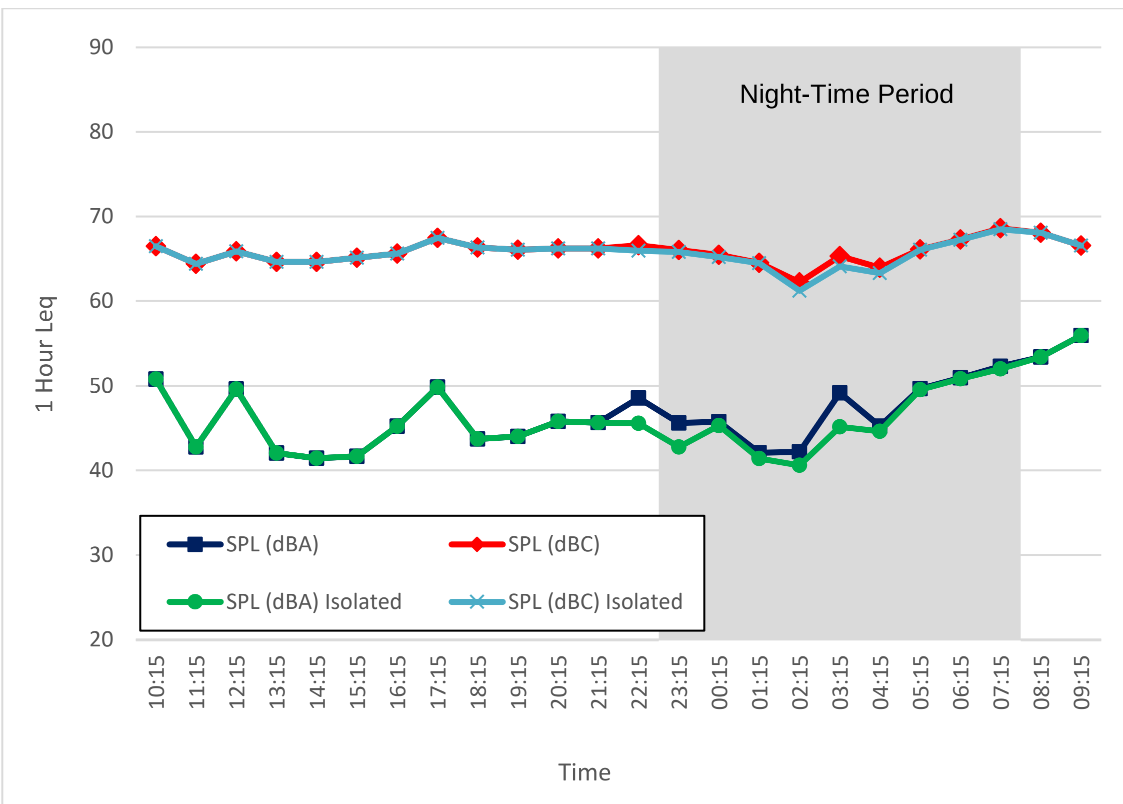

Figure 39. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

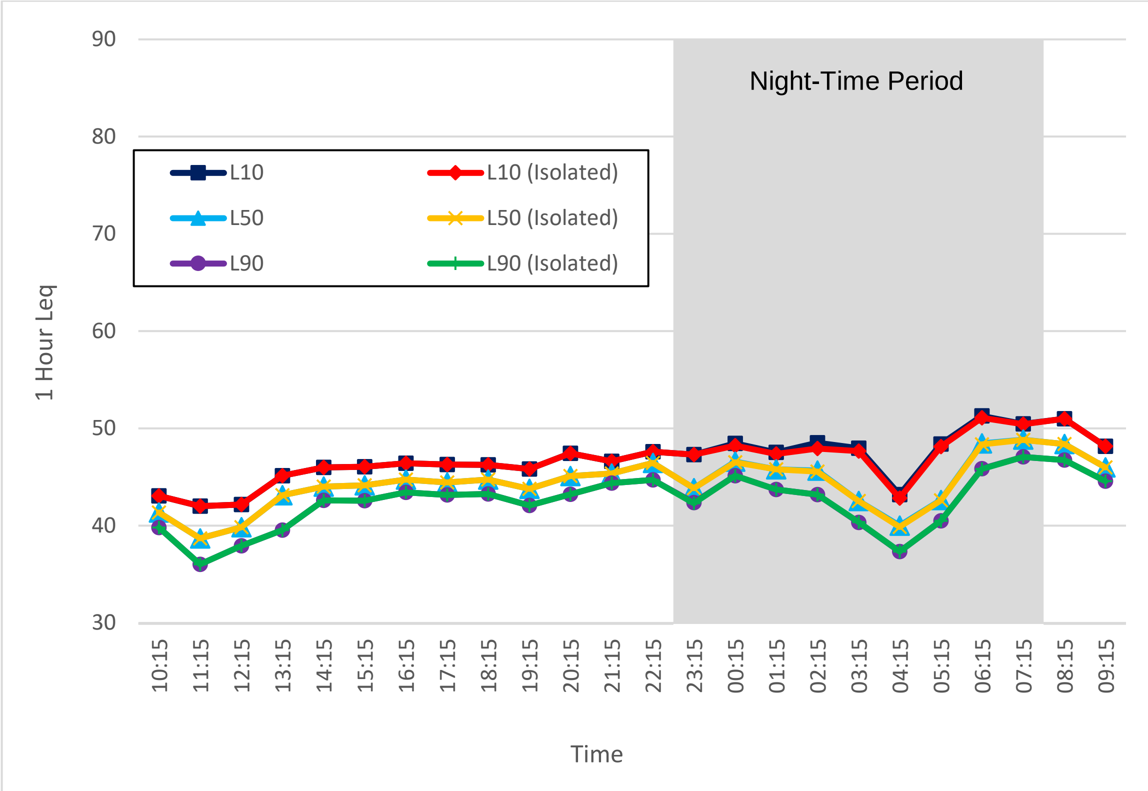

Figure 40. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

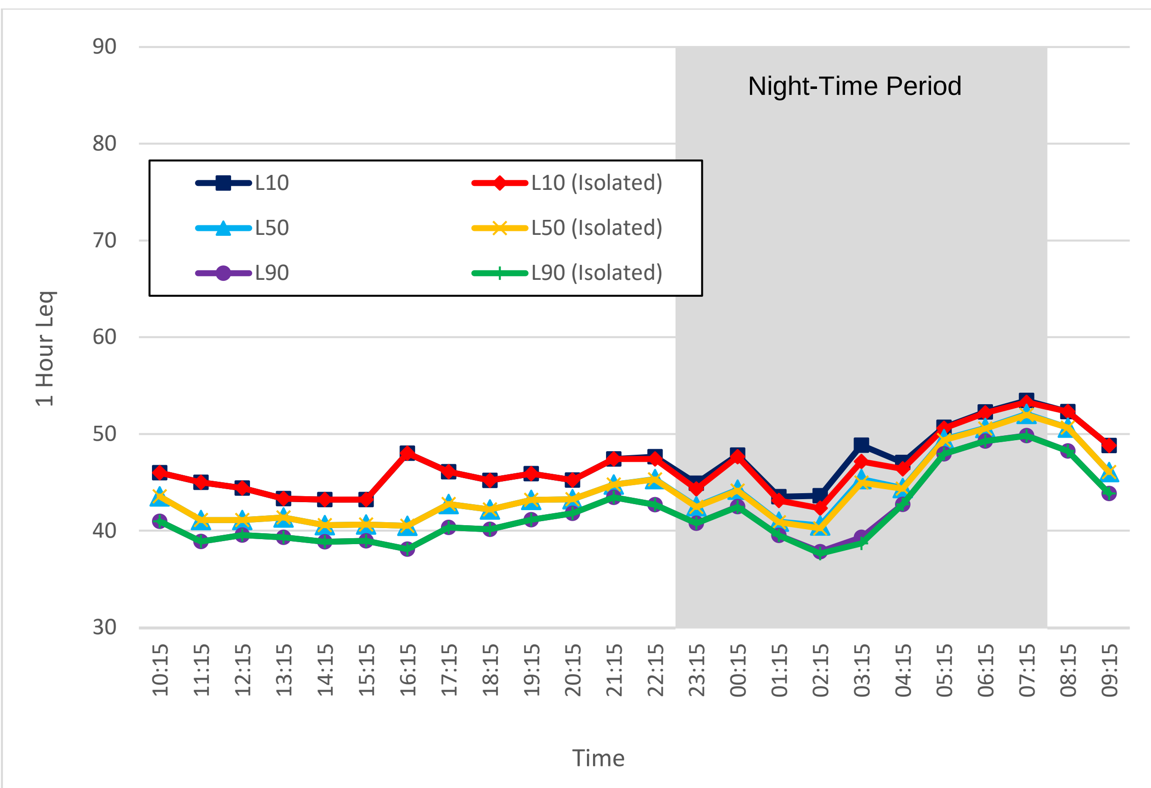

Figure 41. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

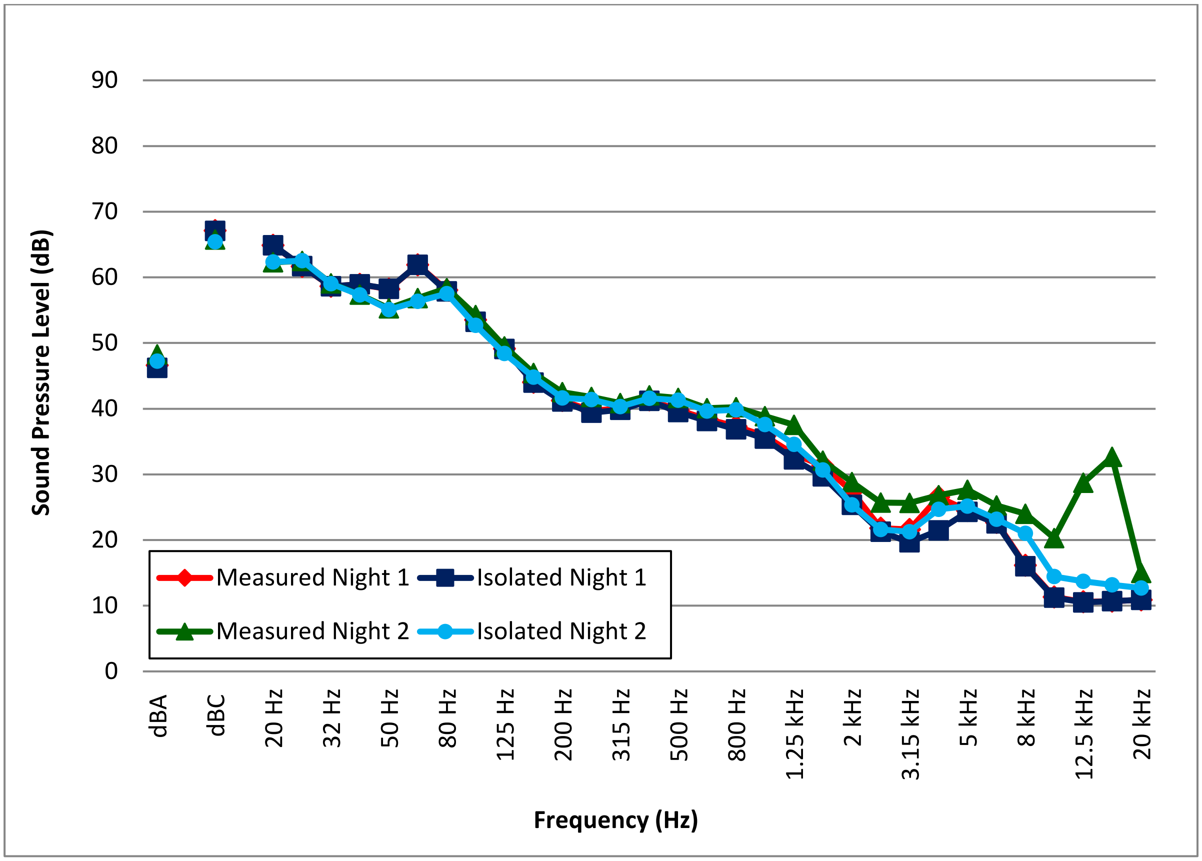

Figure 42. Noise Monitor #4, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #4

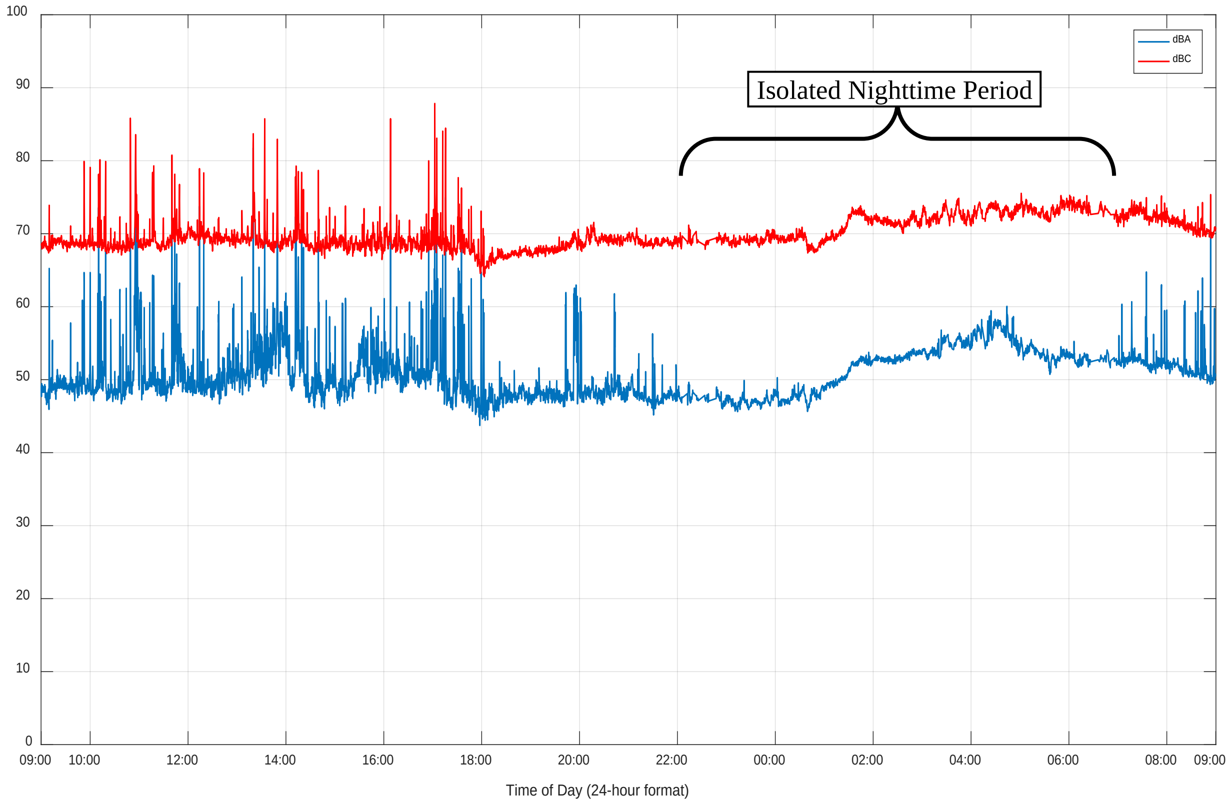

Figure 43. Noise Monitor #5, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

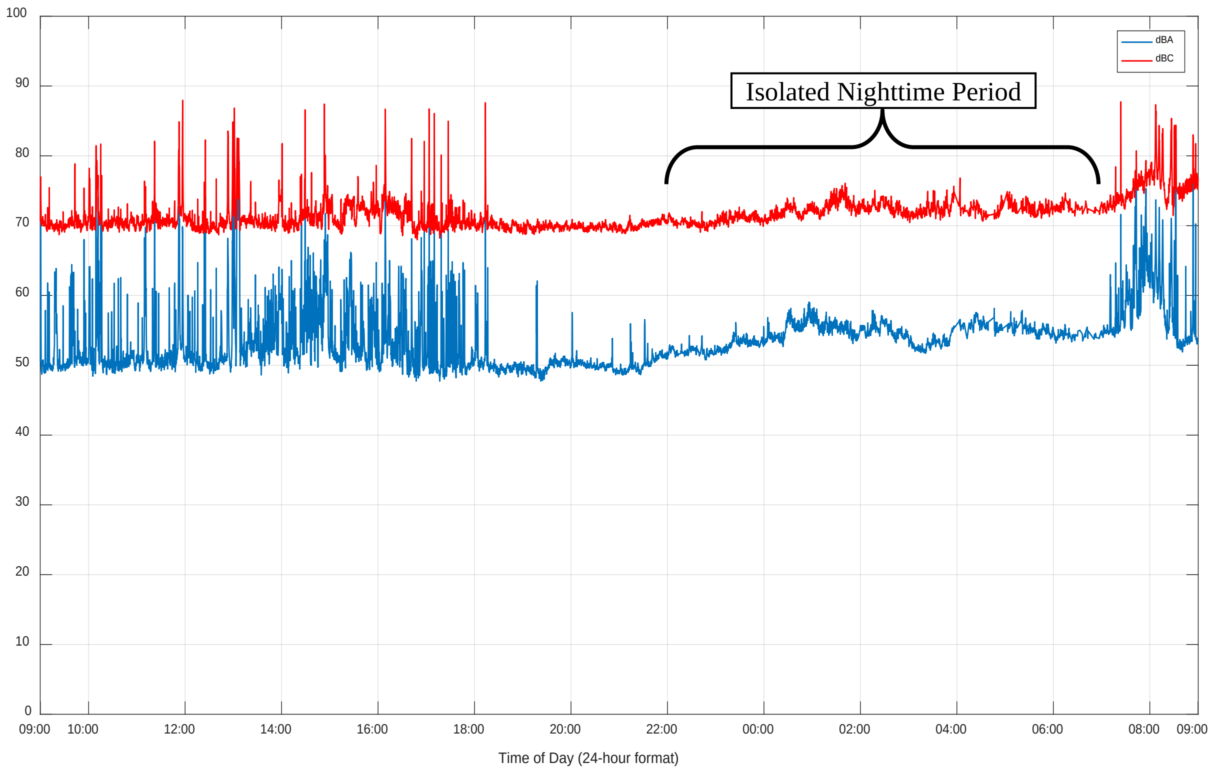

Figure 44. Noise Monitor #5, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #5

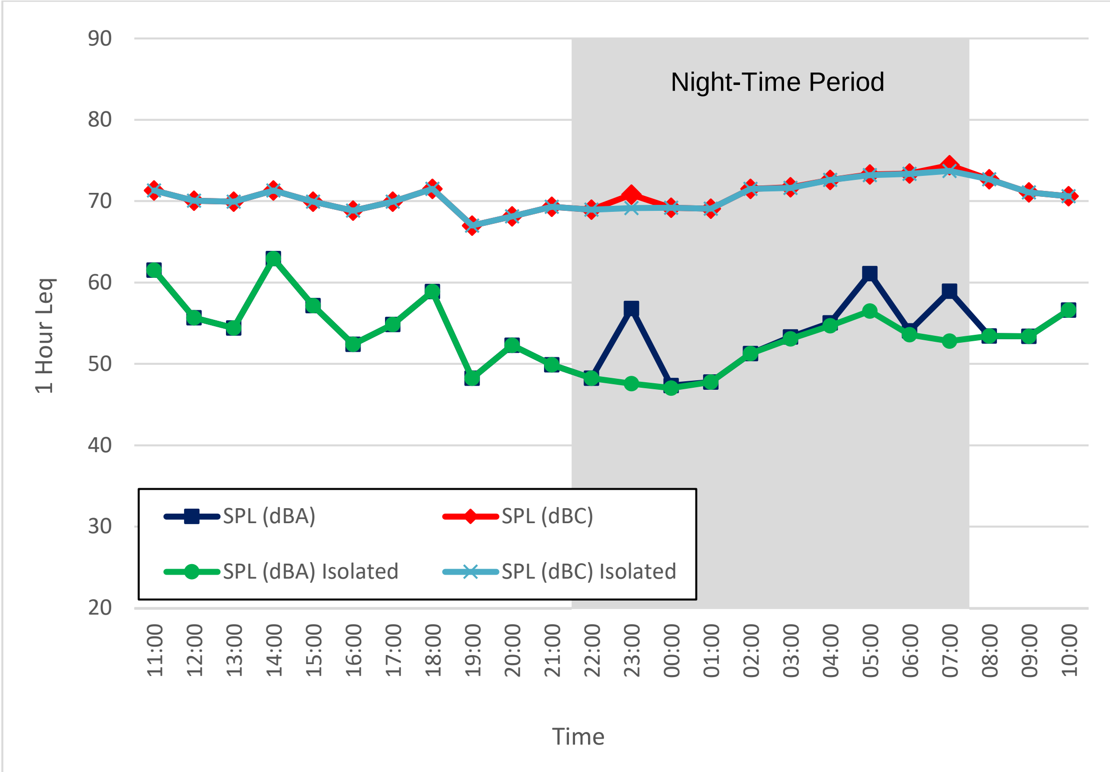

Figure 45. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

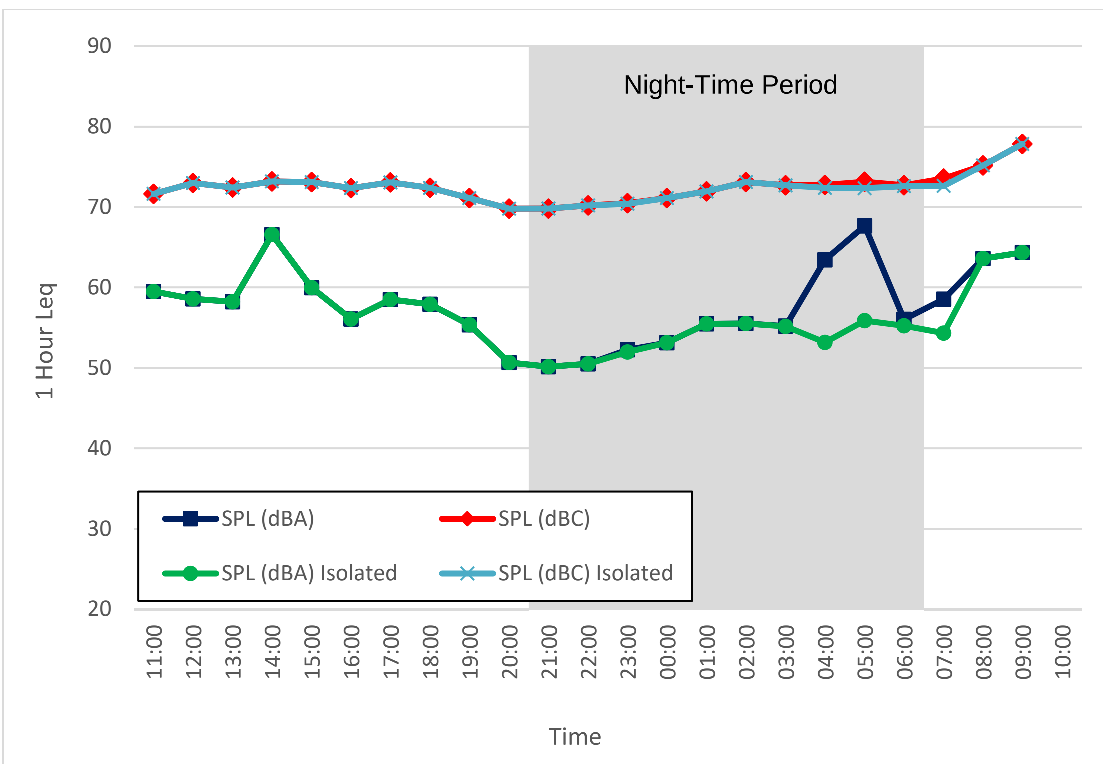

Figure 46. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

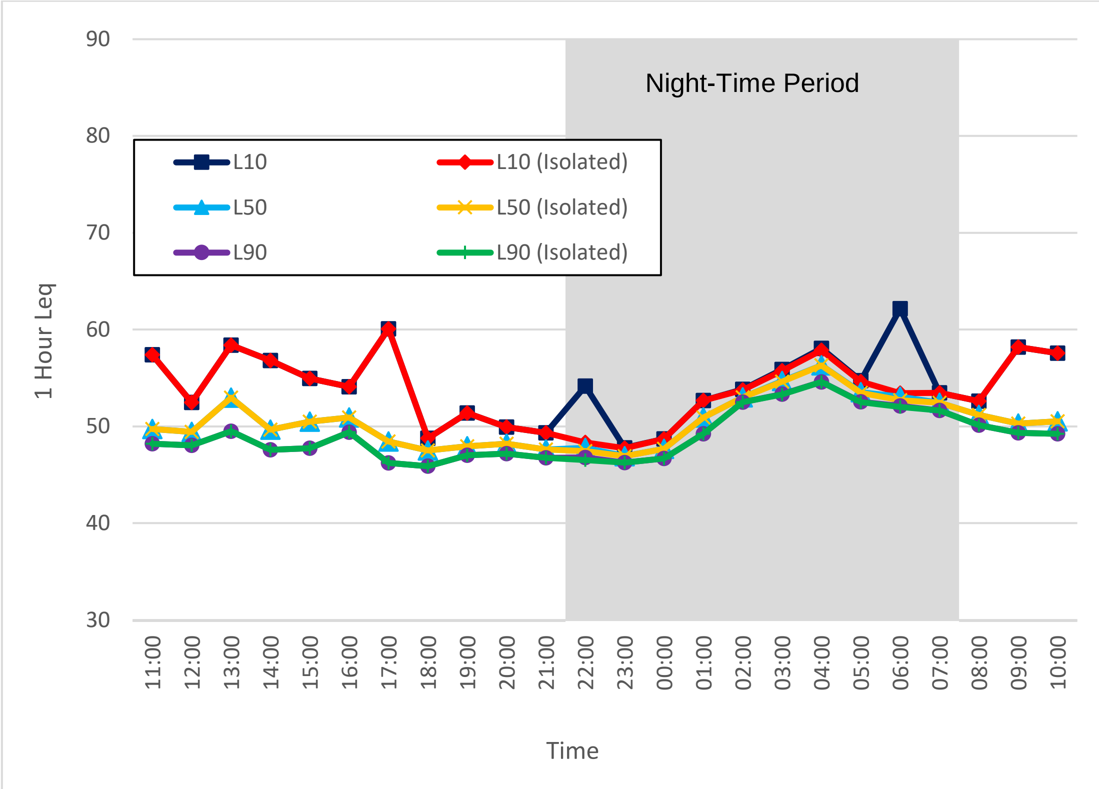

Figure 47. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

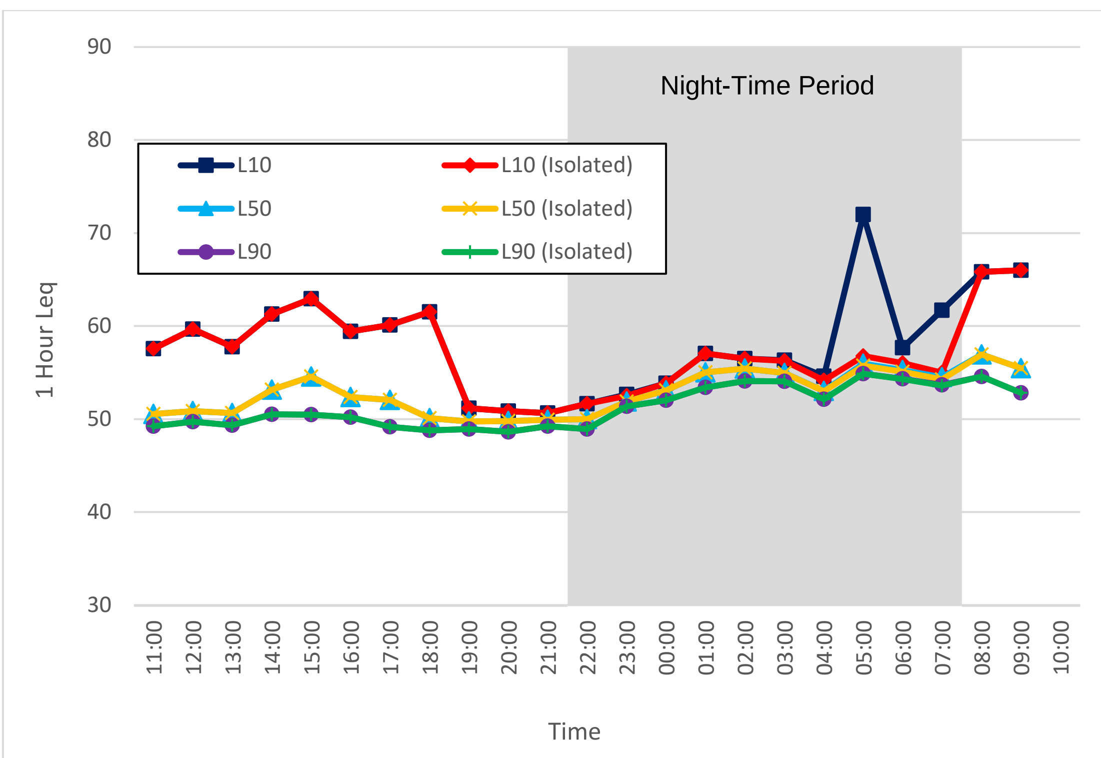

Figure 48. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #5

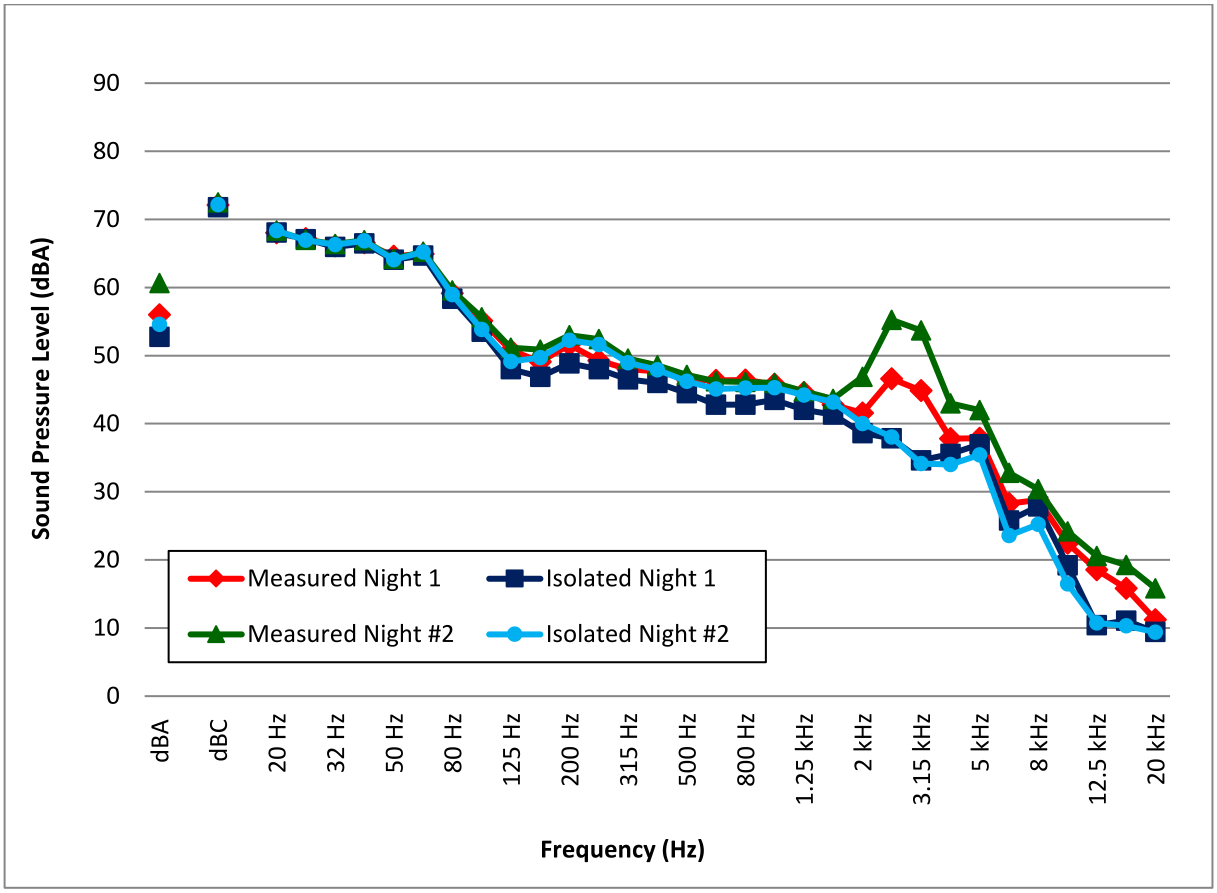

Figure 49. Noise Monitor #5, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #6

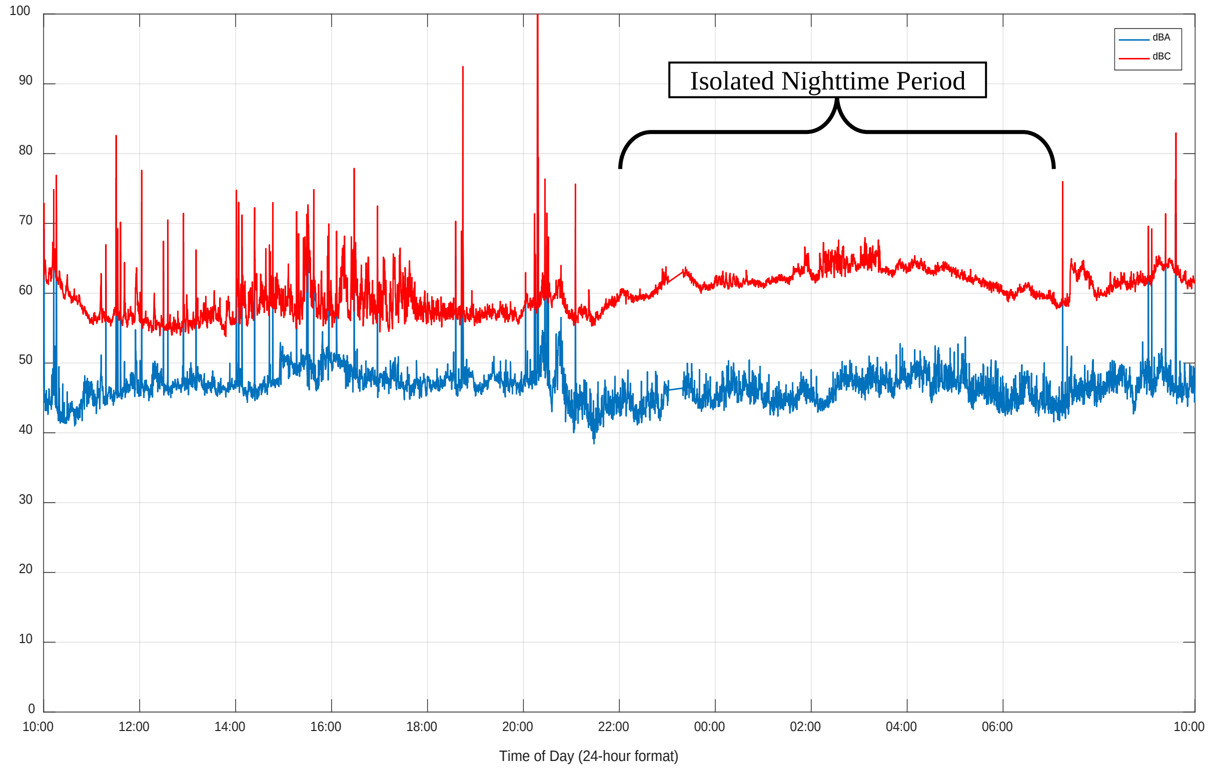

Figure 50. Noise Monitor #6, 15-Second L_{eq} Sound Levels (August 27 - 28, 2023)

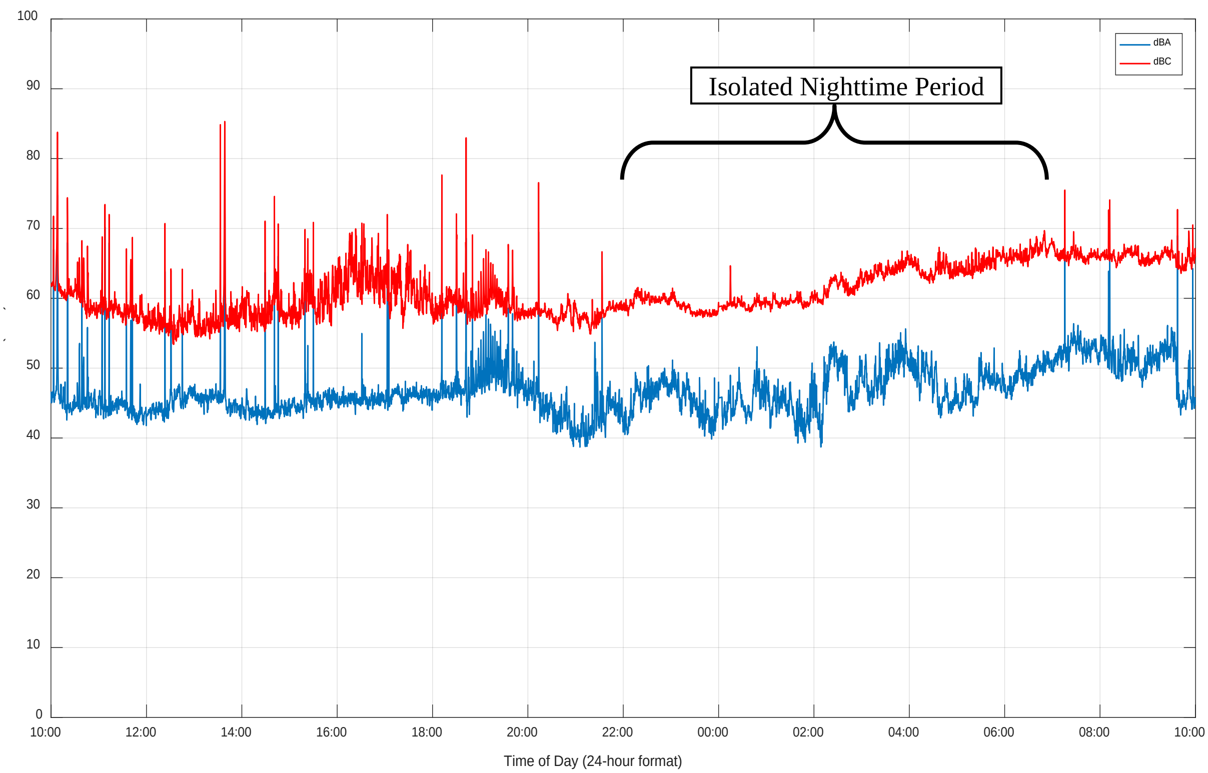

Figure 51. Noise Monitor #6, 15-Second L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #6

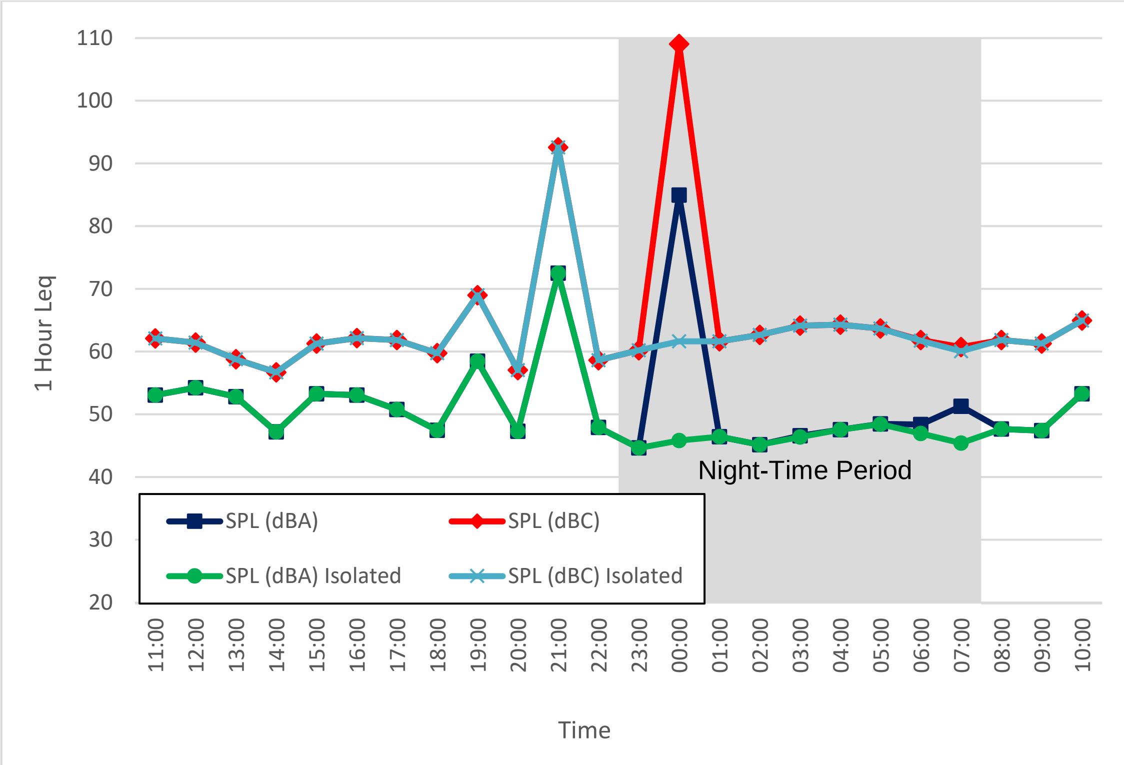

Figure 52. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (August 27 - 28, 2023)

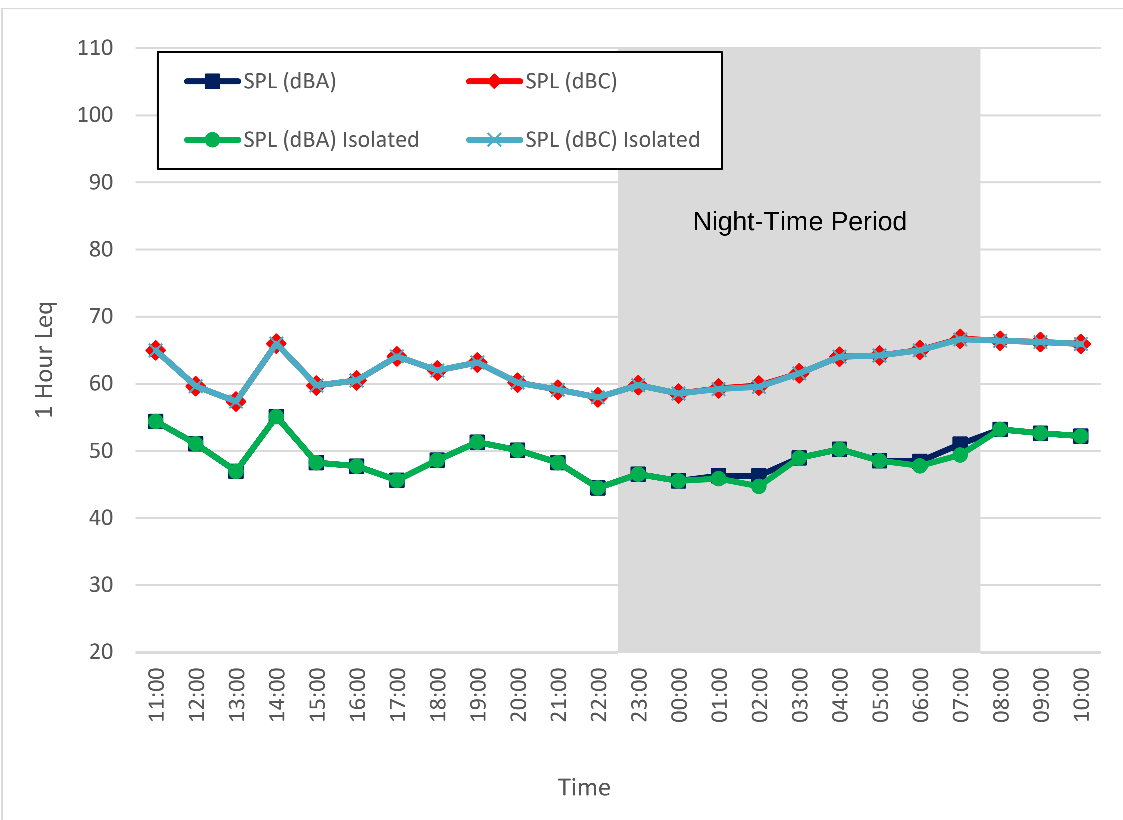

Figure 53. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (August 28 - 29, 2023)

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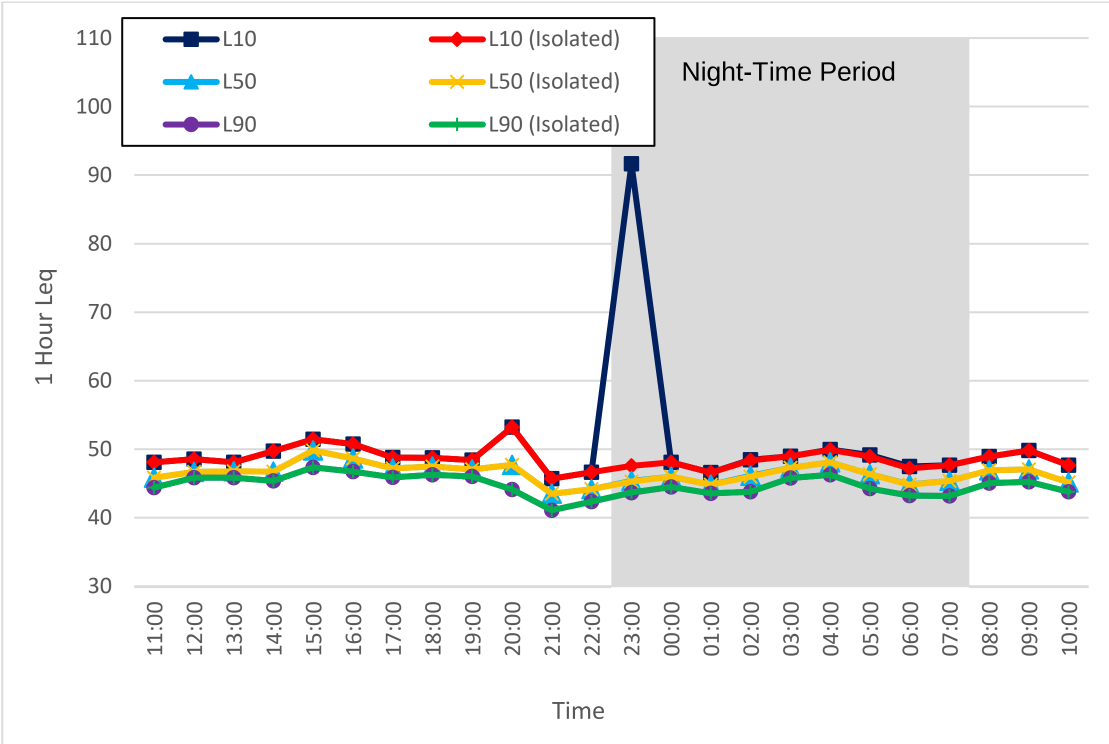

Figure 54. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 27 - 28, 2023)

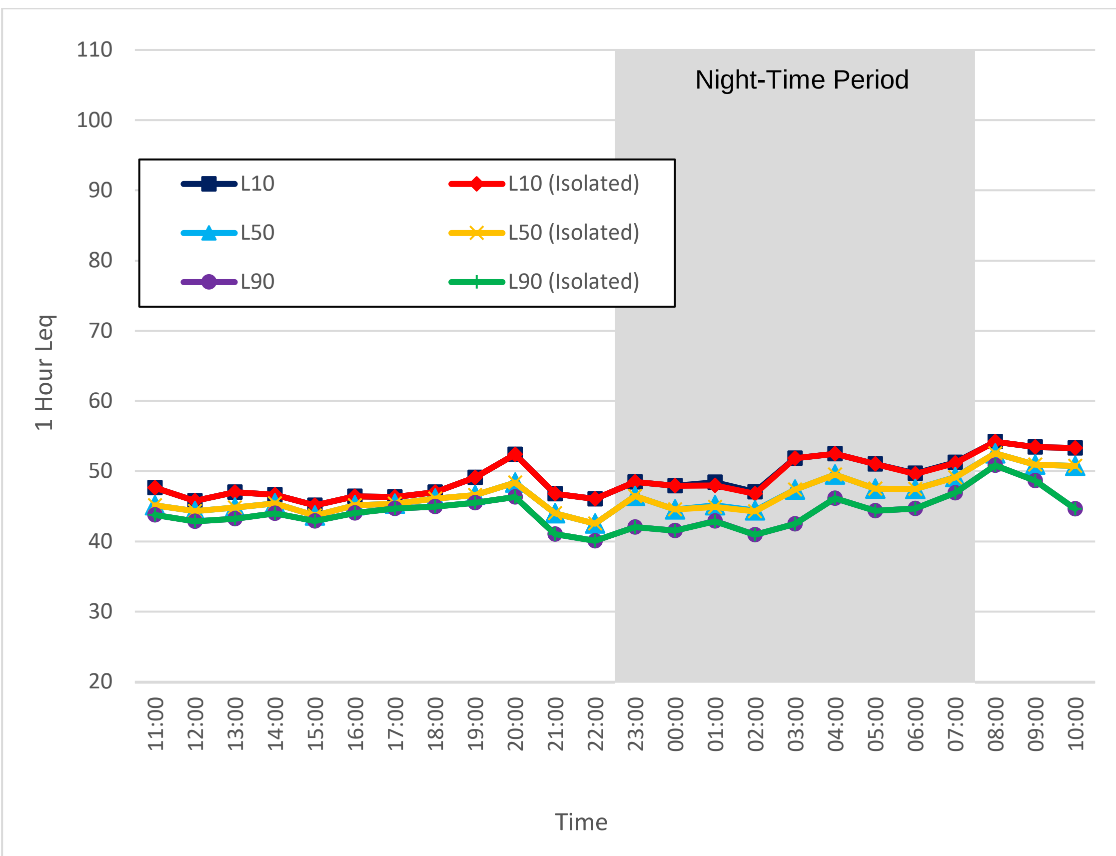

Figure 55. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 28 - 29, 2023)

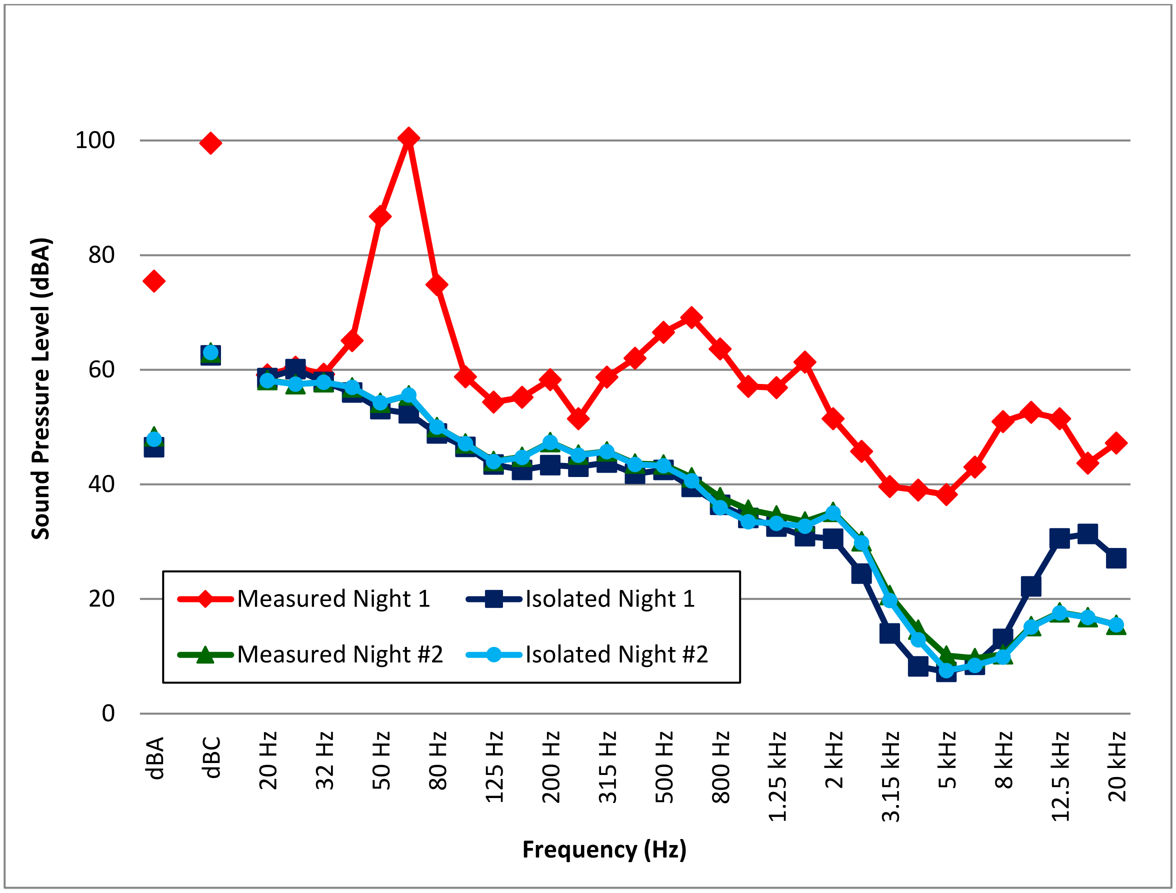

Figure 56. Noise Monitor #6, 1/3 Octave L_{eq} Sound Levels (August 27 - 29, 2023)

Noise Monitor #8

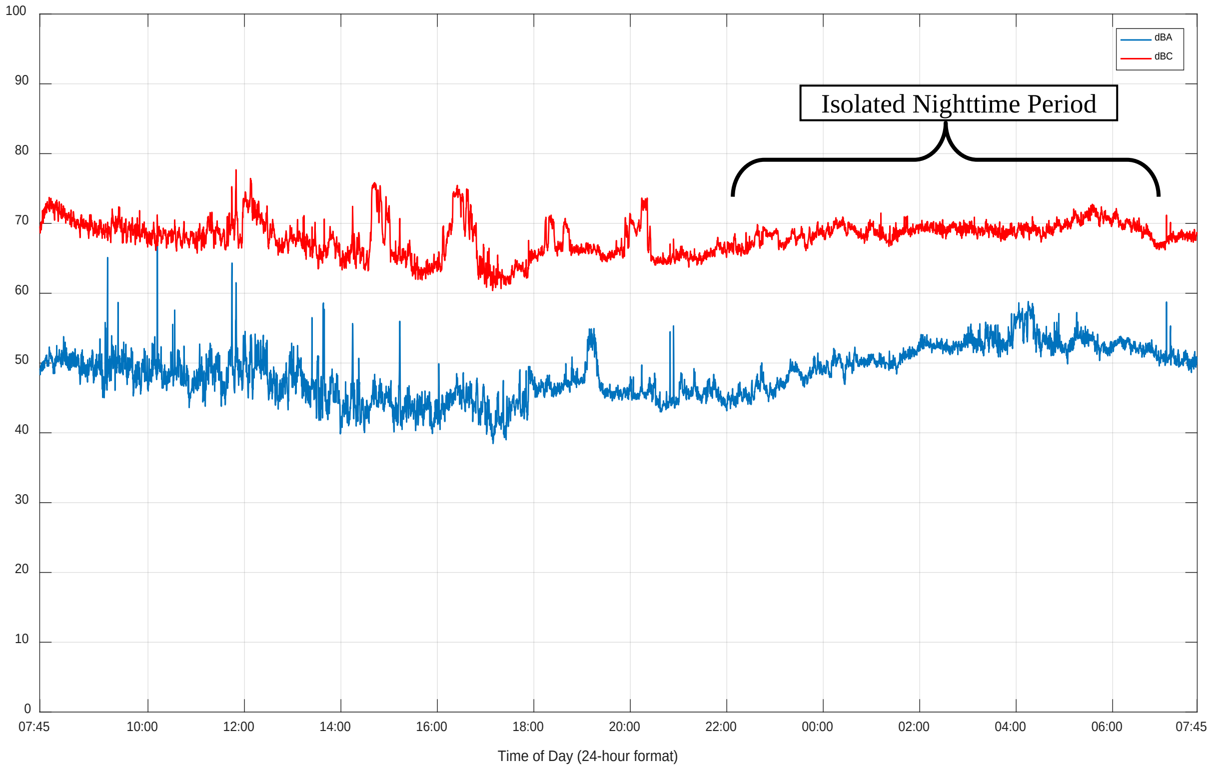

Figure 57. Noise Monitor #8, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

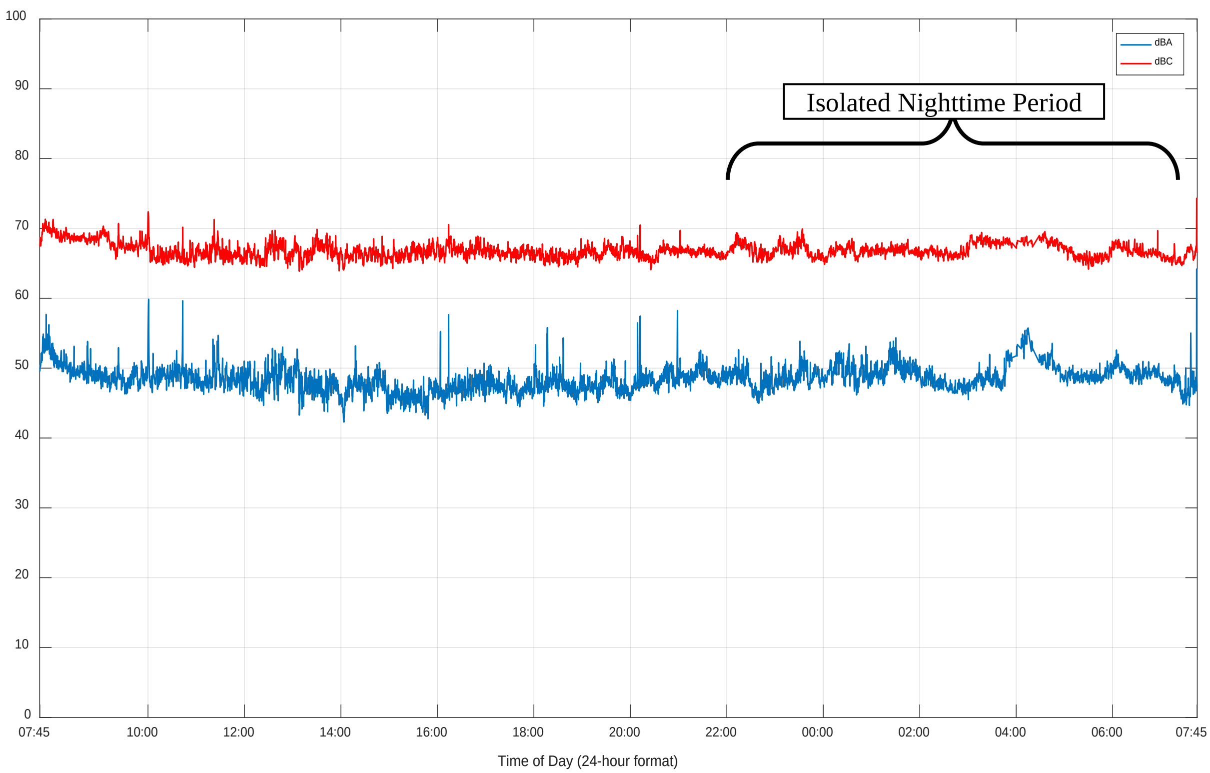

Figure 58. Noise Monitor #8, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #8

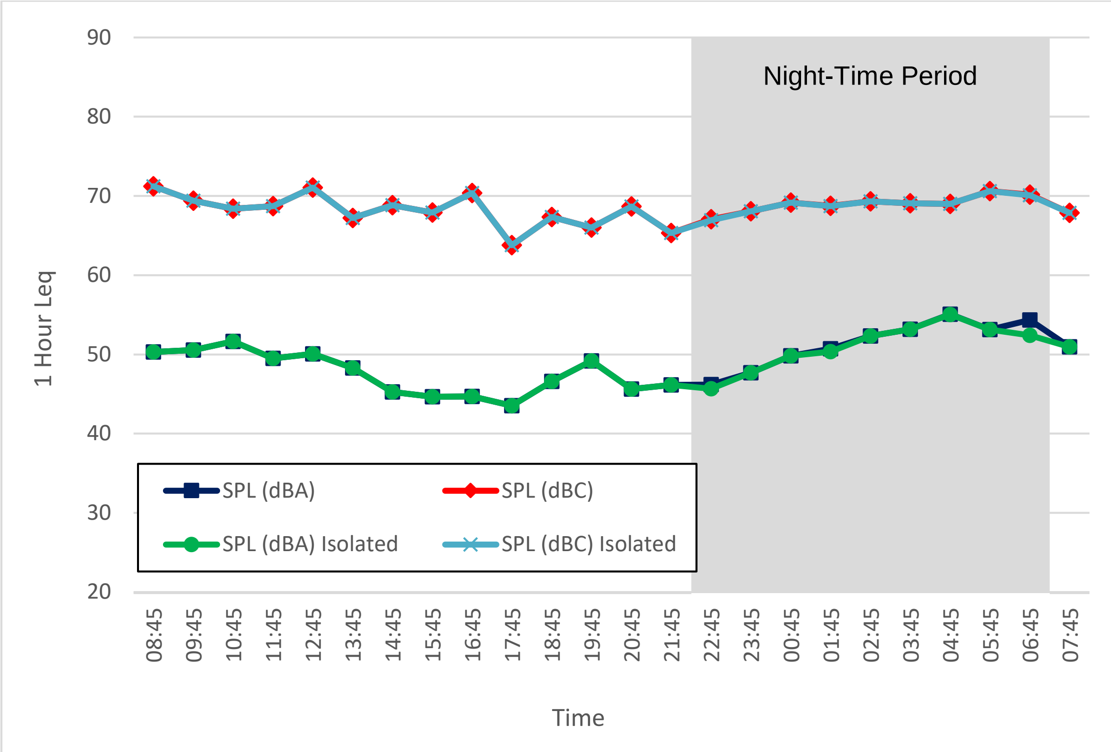

Figure 59. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

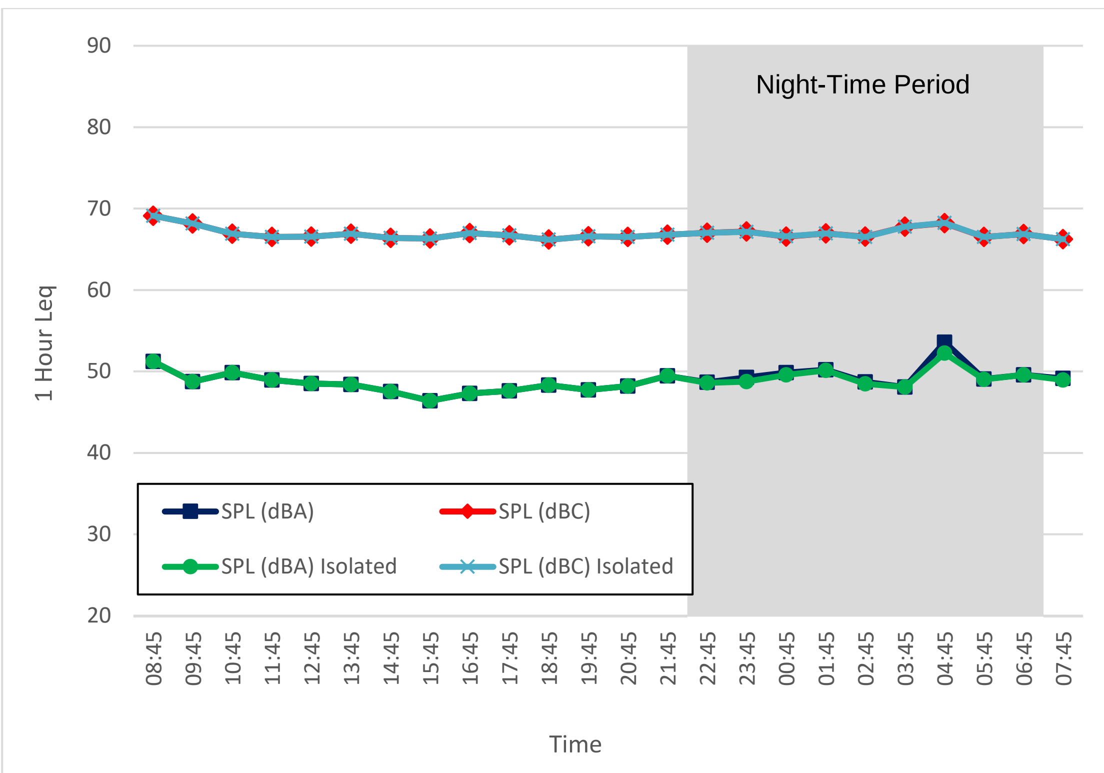

Figure 60. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

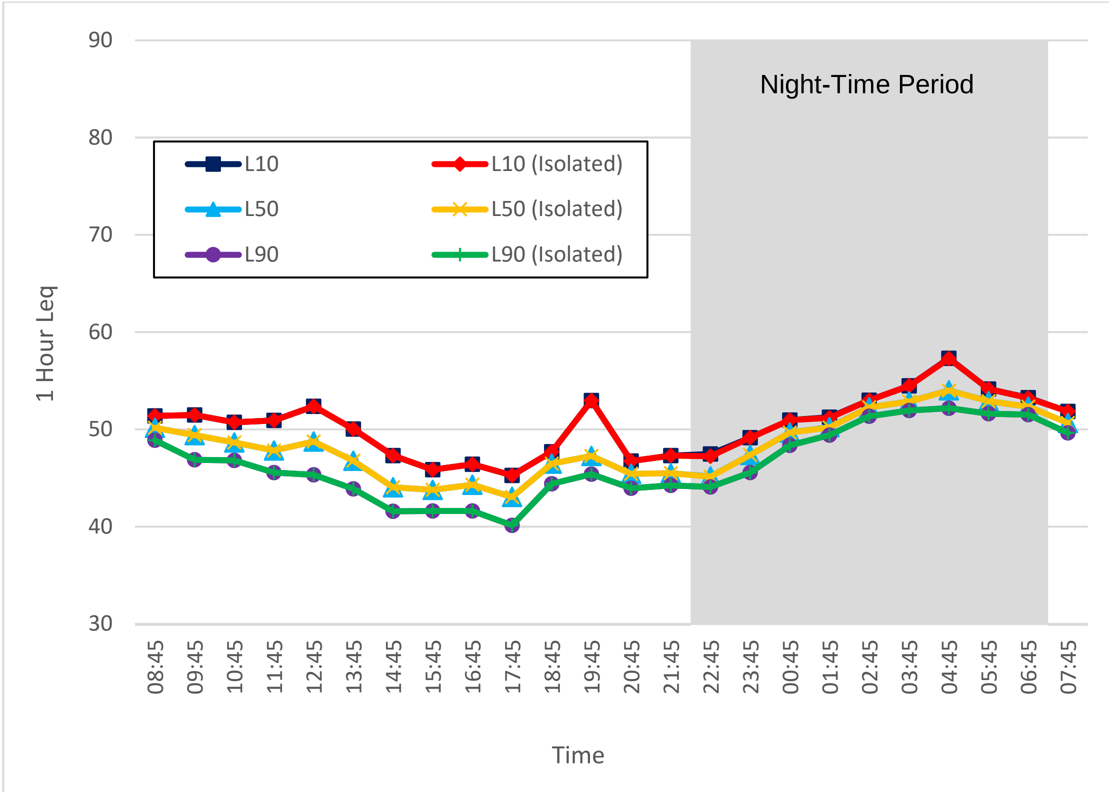

Figure 61. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

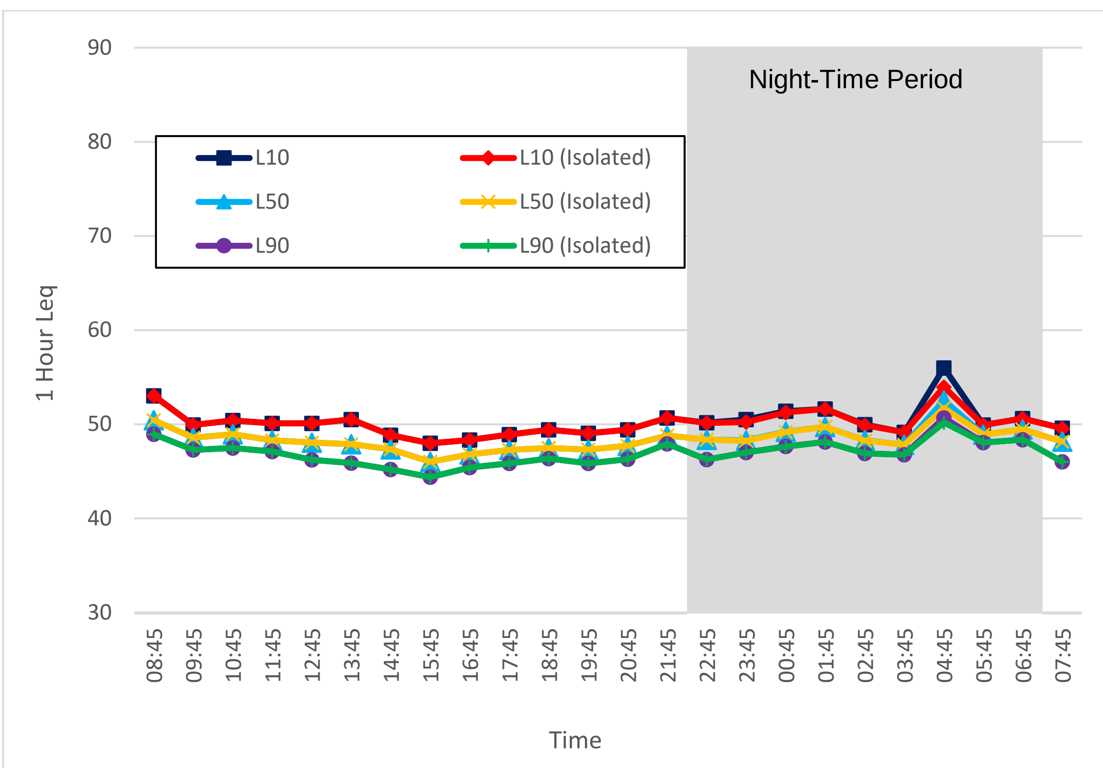

Figure 62. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #8

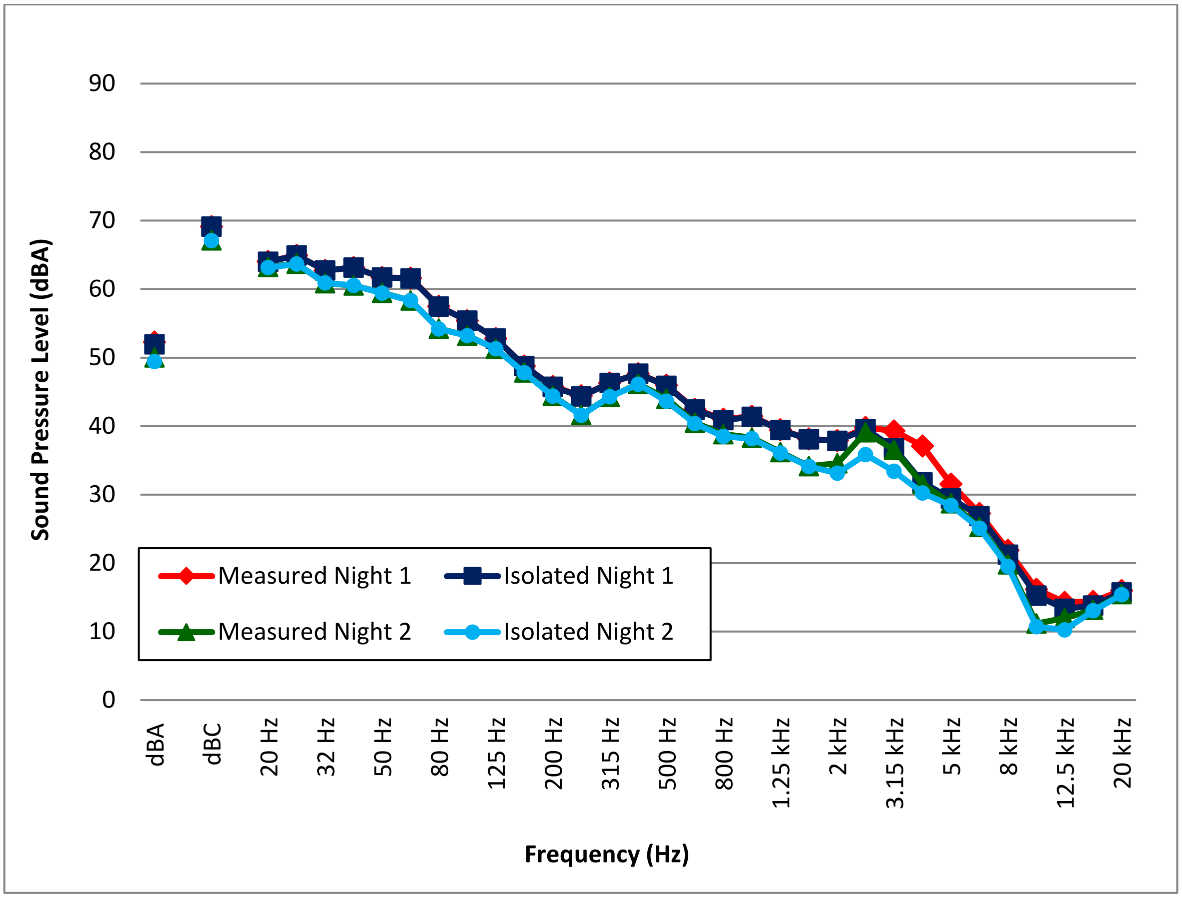

Figure 63. Noise Monitor #8, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #9

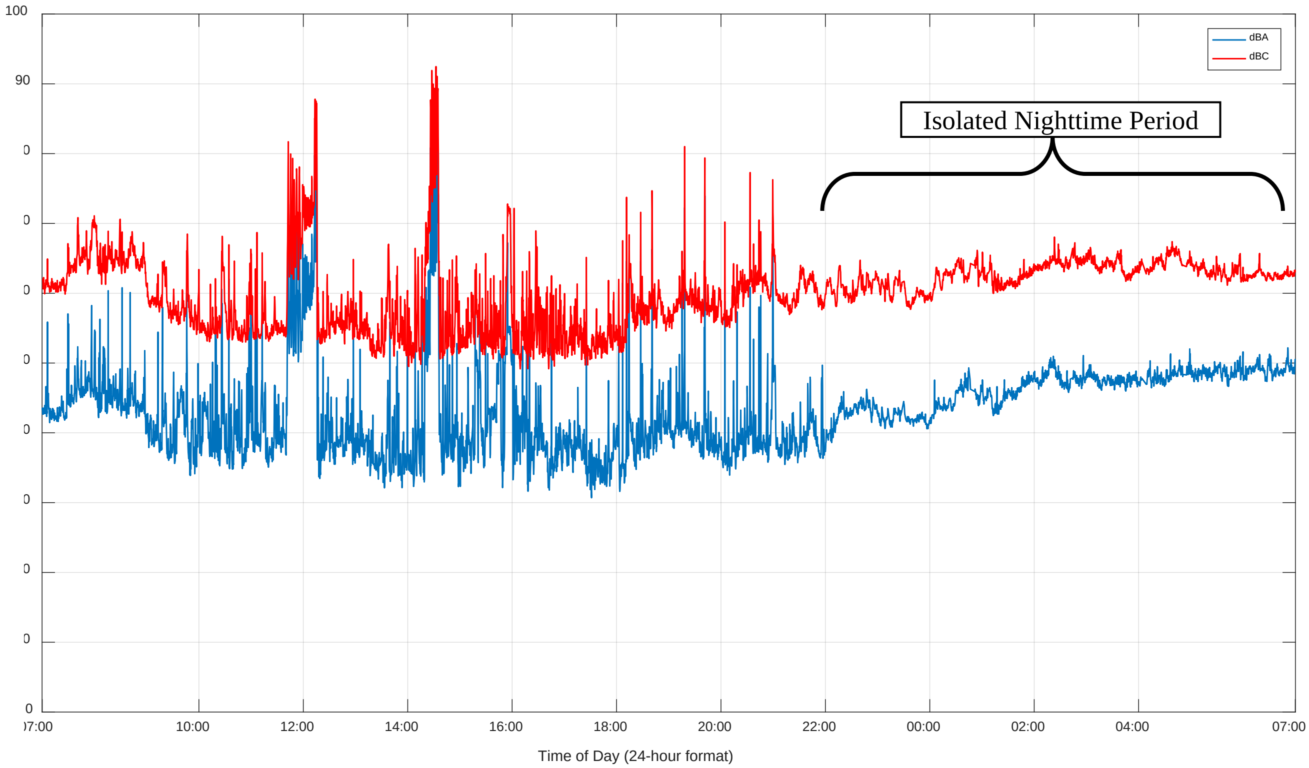

Figure 64. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

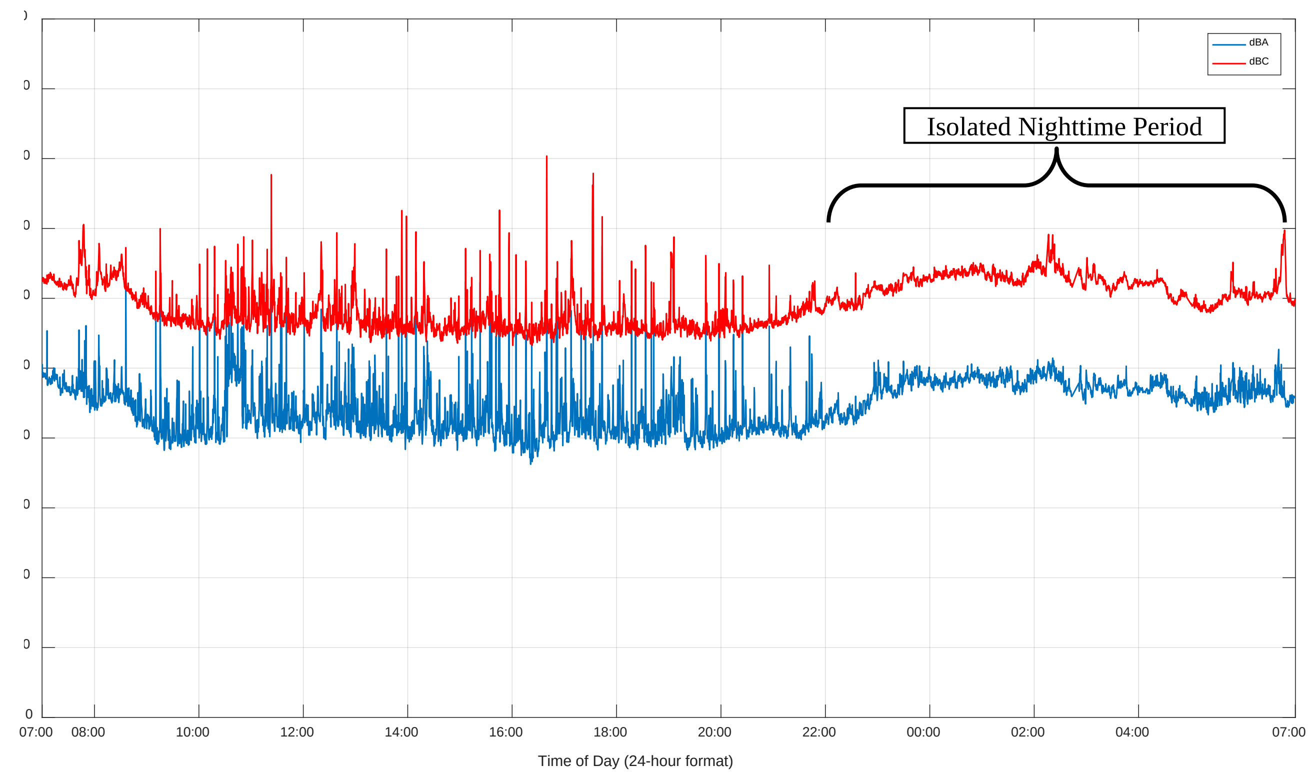

Figure 65. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #9

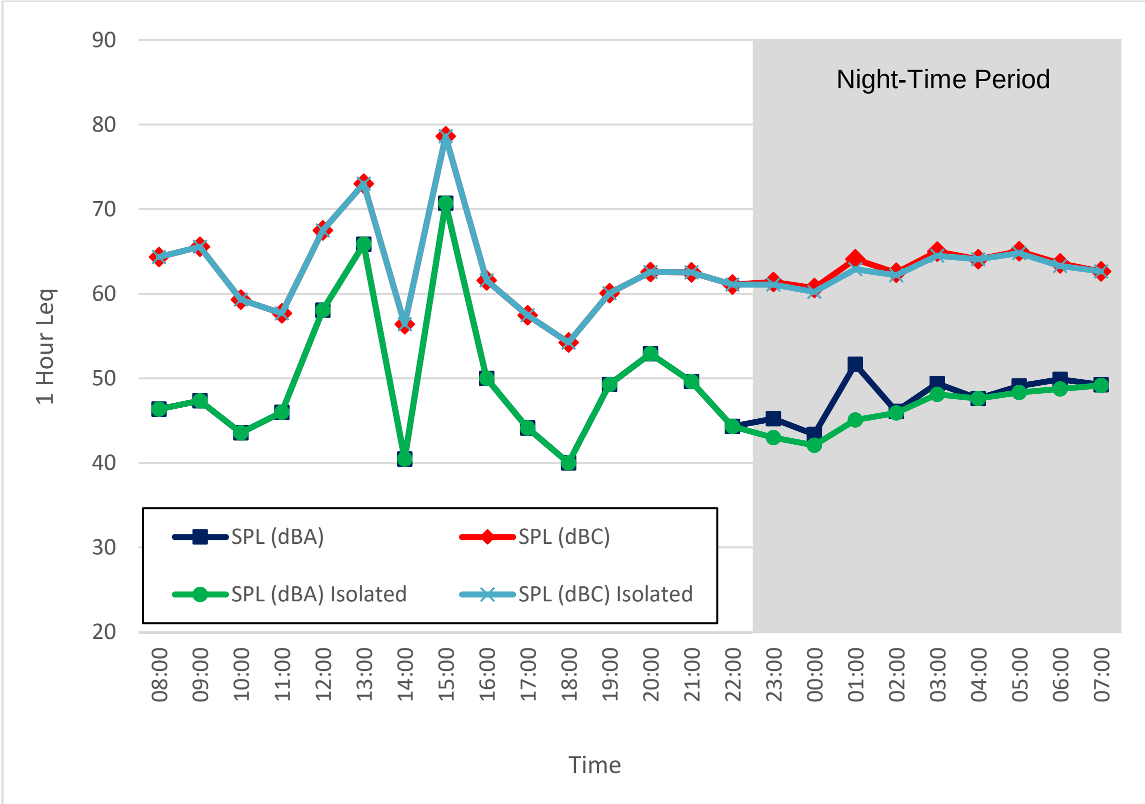

Figure 66. Noise Monitor #9, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

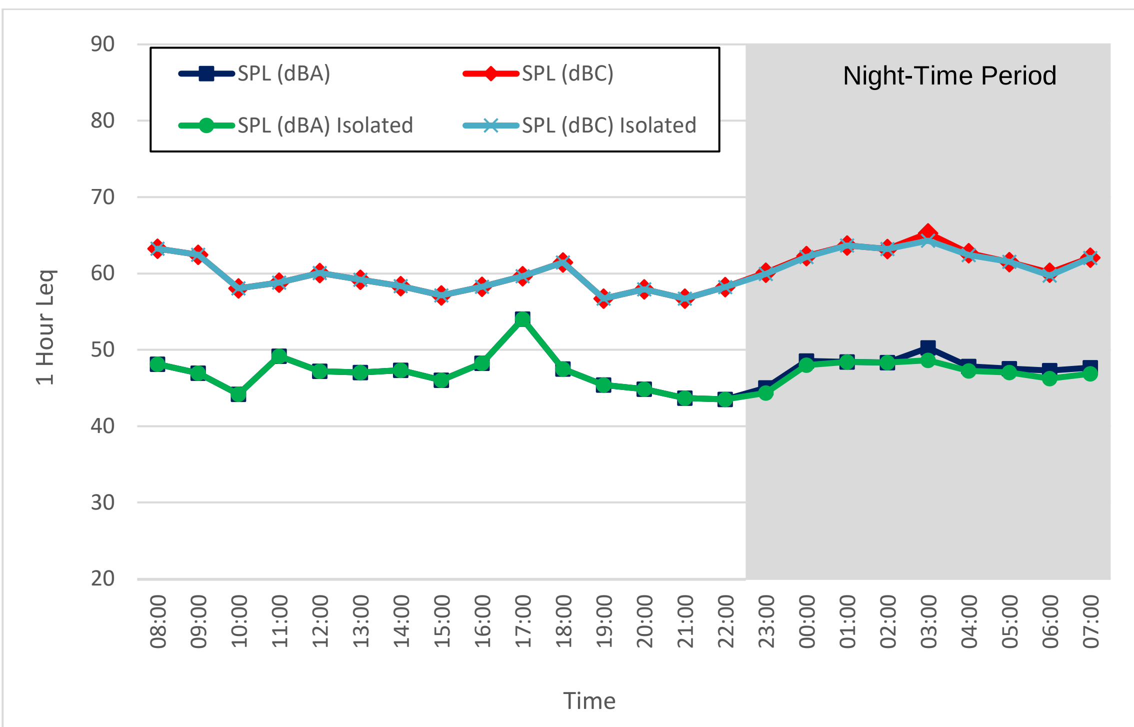

Figure 67. Noise Monitor #9, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #9

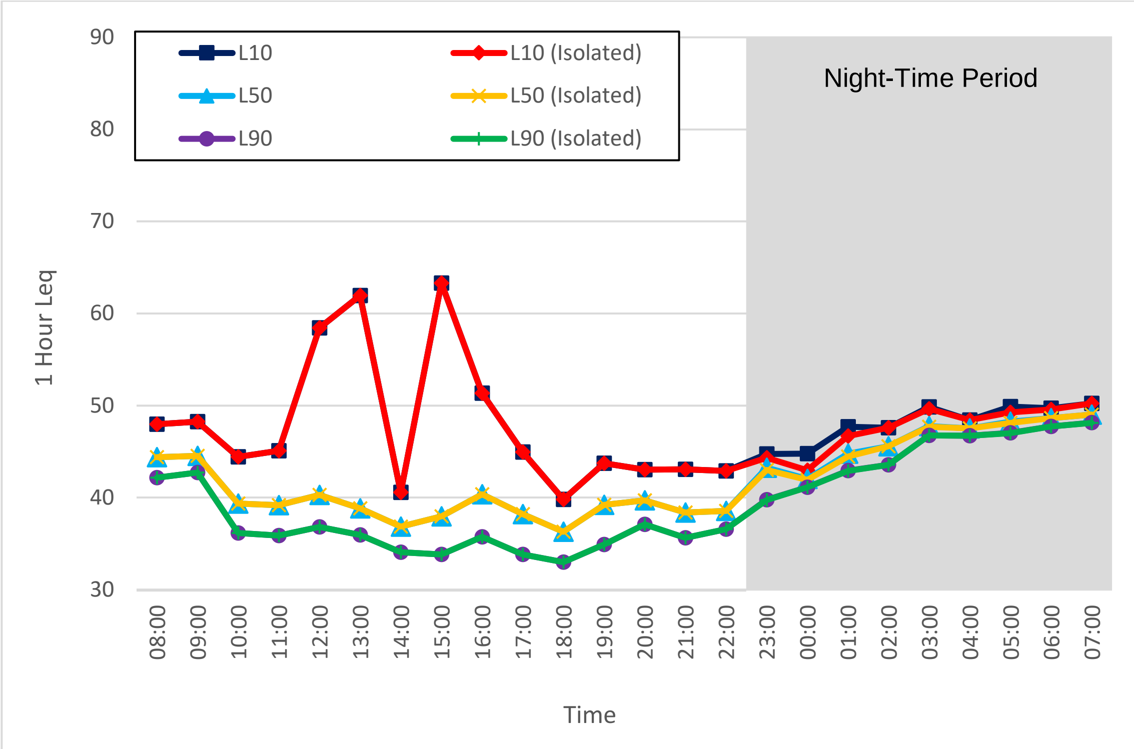

Figure 68. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

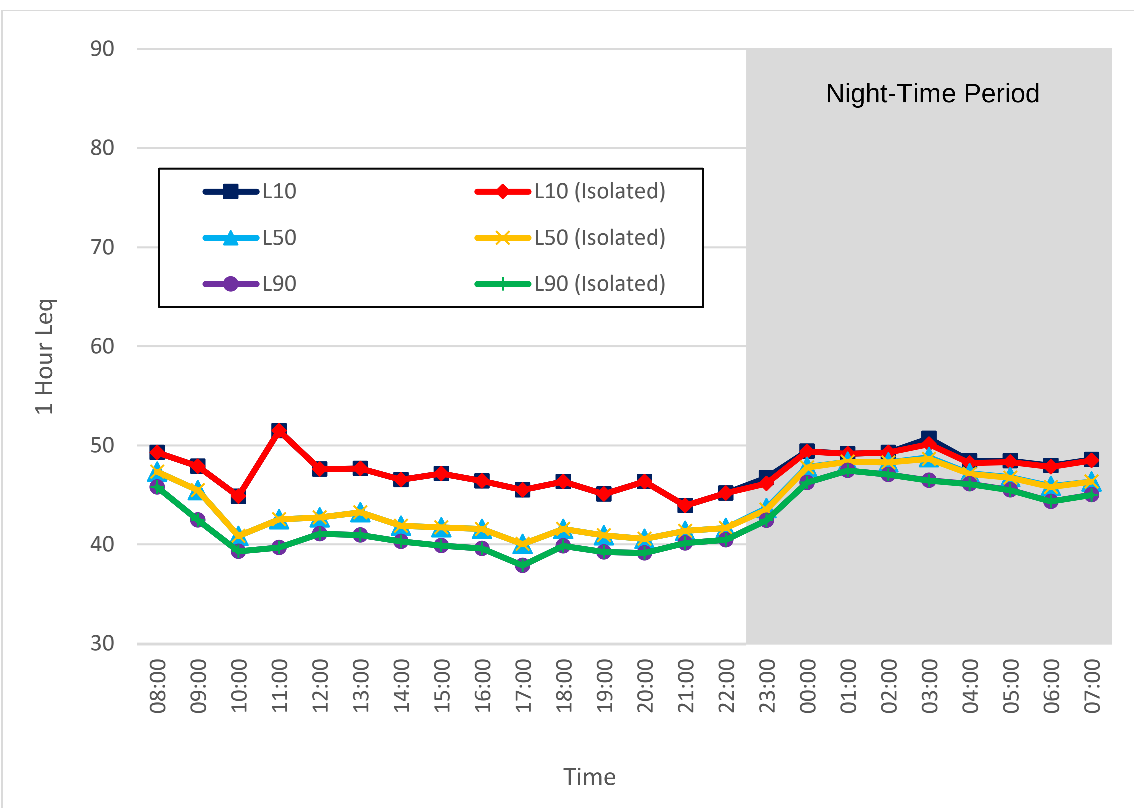

Figure 69. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #9

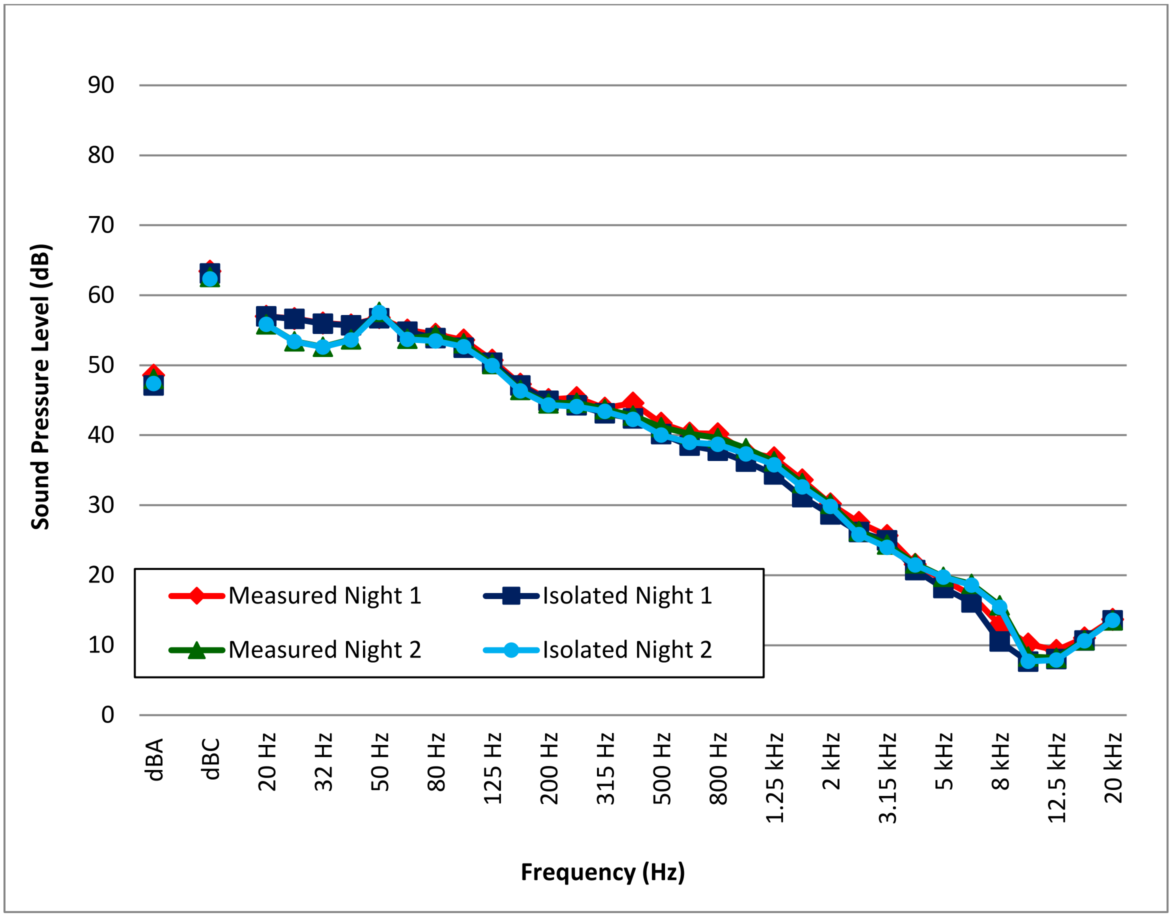

Figure 70. Noise Monitor #9, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #10

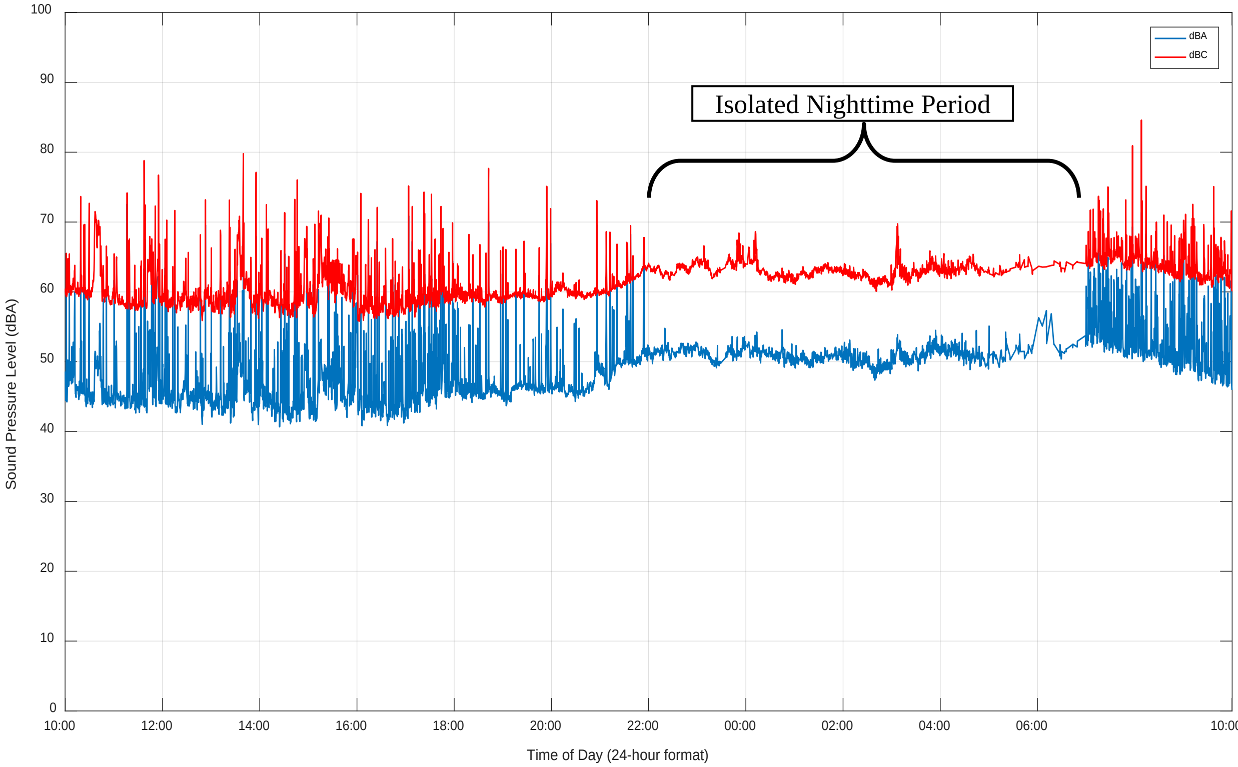

Figure 71. Noise Monitor #10, 15-Second L_{eq} Sound Levels (August 27 - 28, 2023)

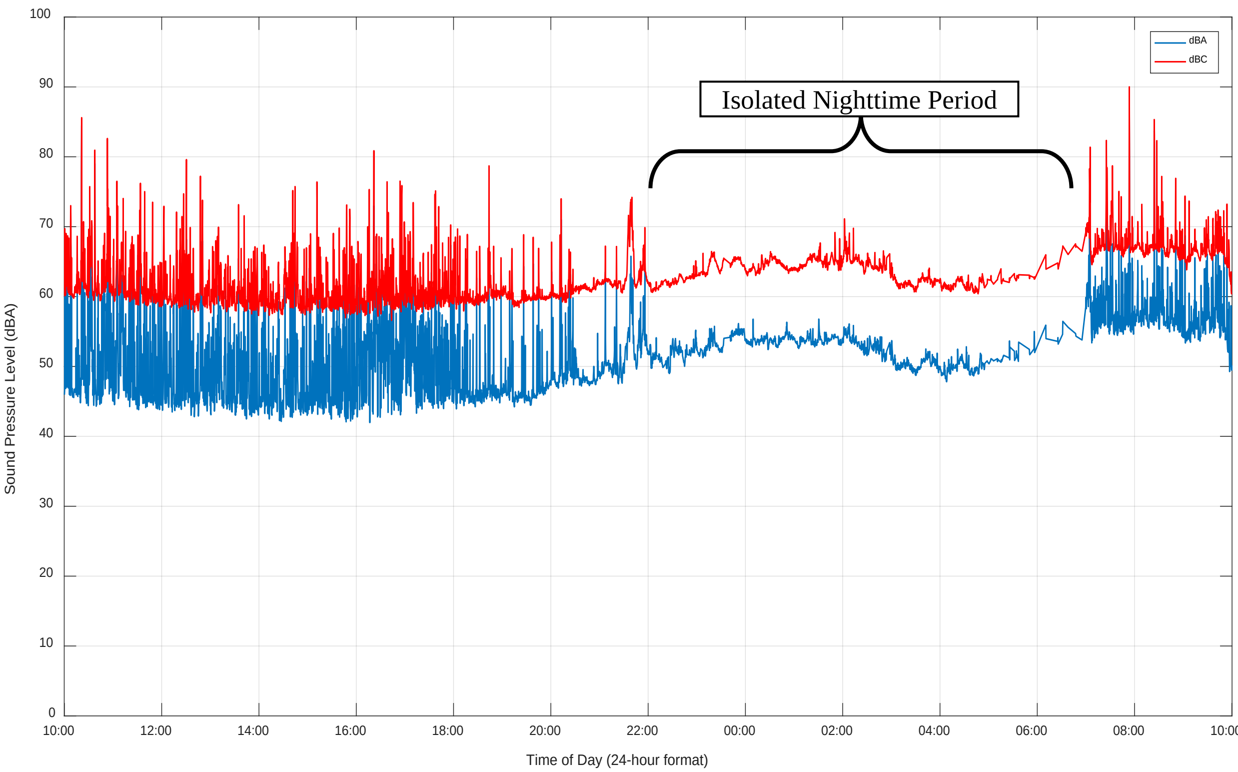

Figure 72. Noise Monitor #10, 15-Second L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #10

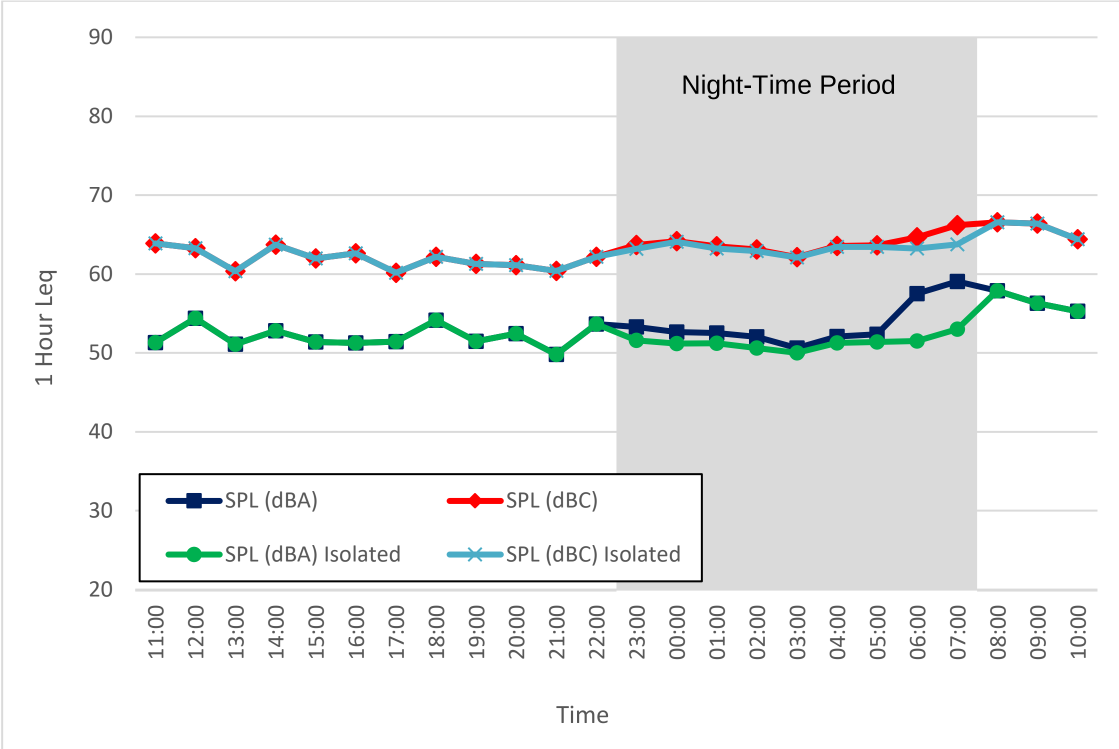

Figure 73. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (August 27 - 28, 2023)

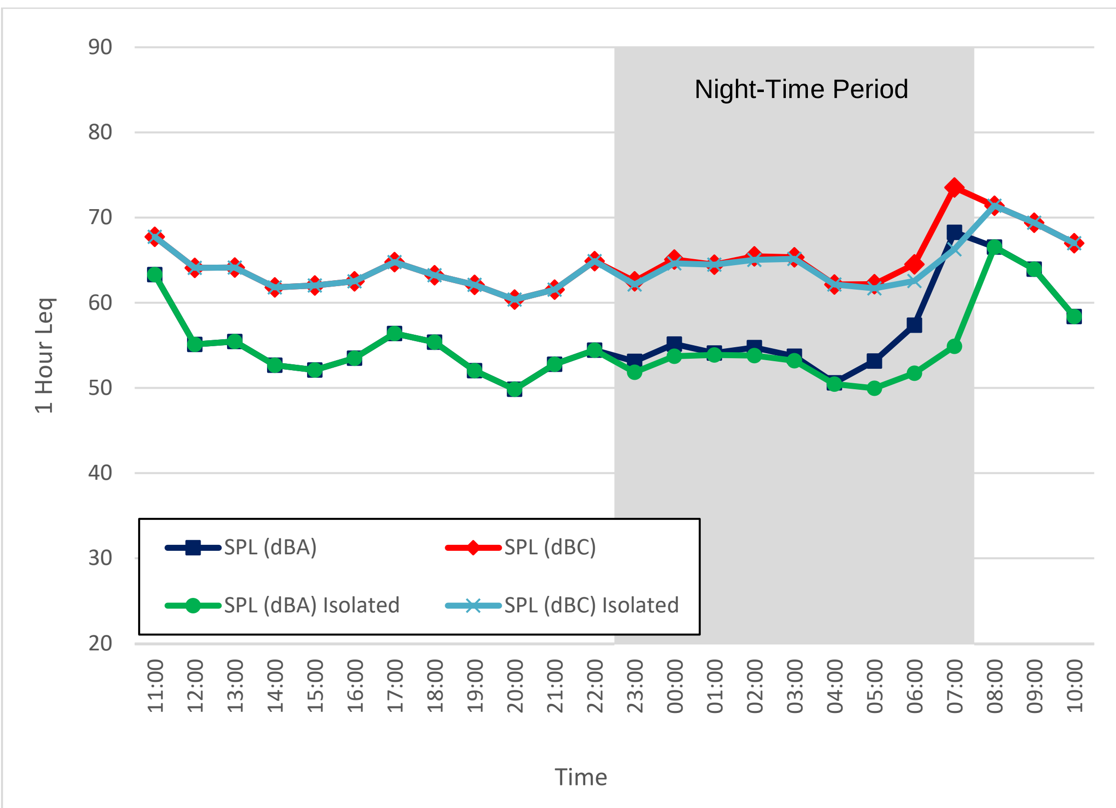

Figure 74. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #10

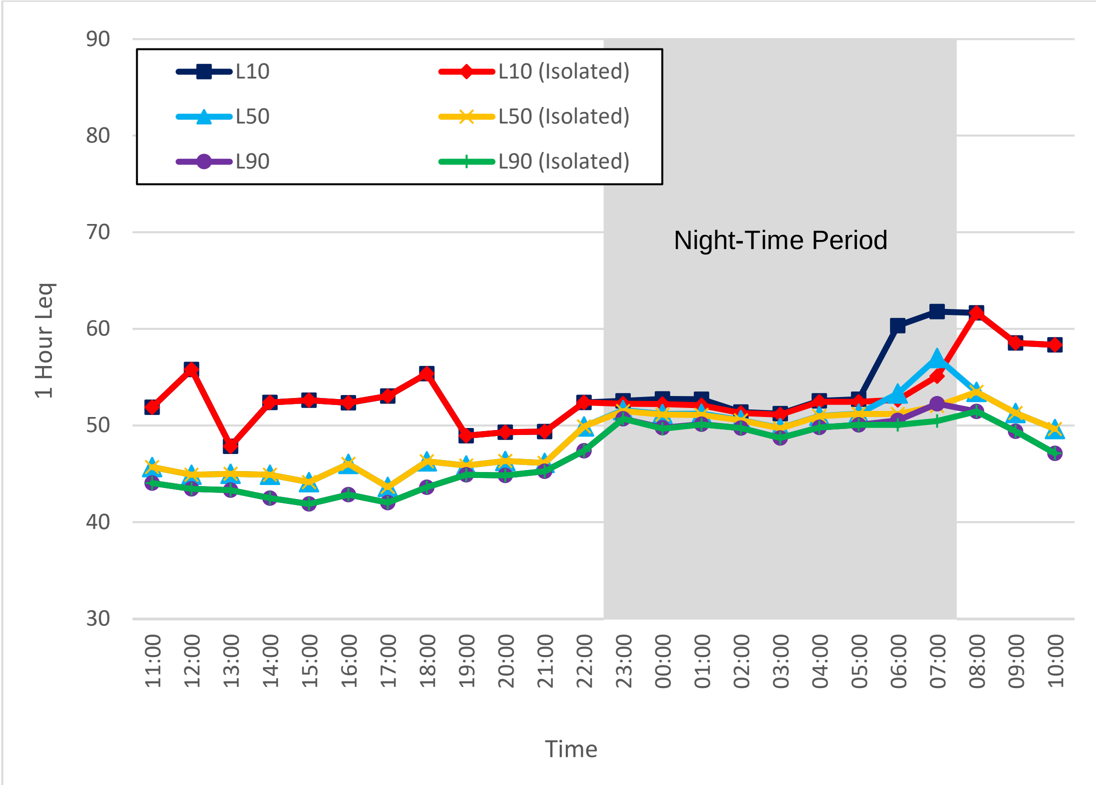

Figure 75. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 27 - 28, 2023)

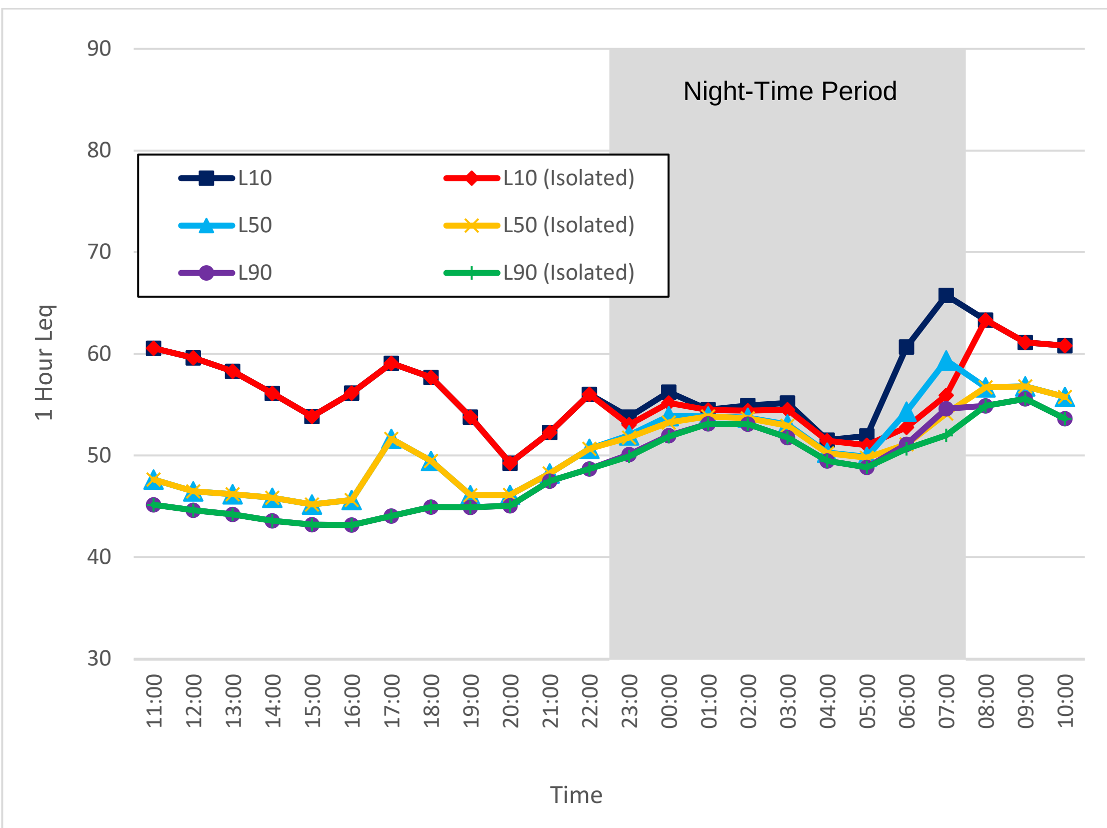

Figure 76. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 28 - 29, 2023)

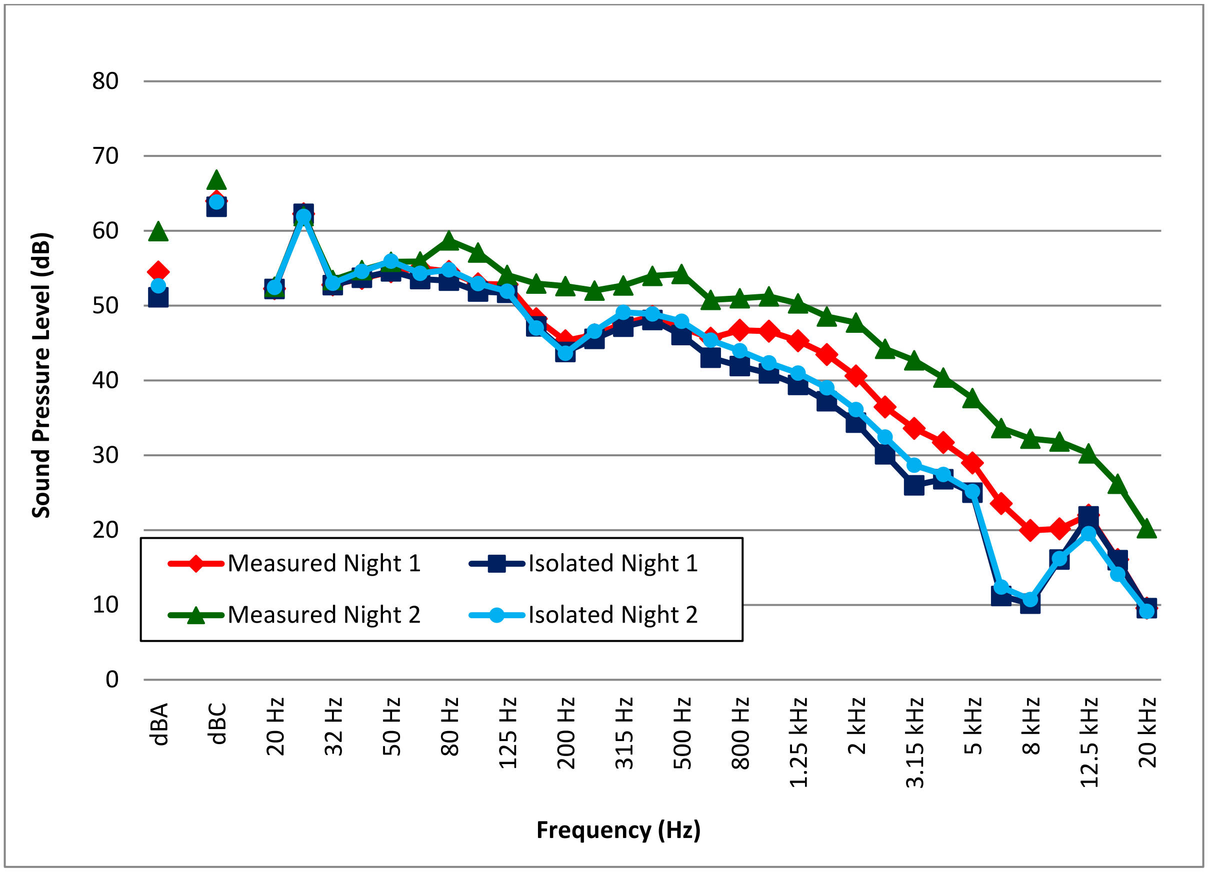

Figure 77. Noise Monitor #10, 1/3 Octave L_{eq} Sound Levels (August 27 - 29, 2023)

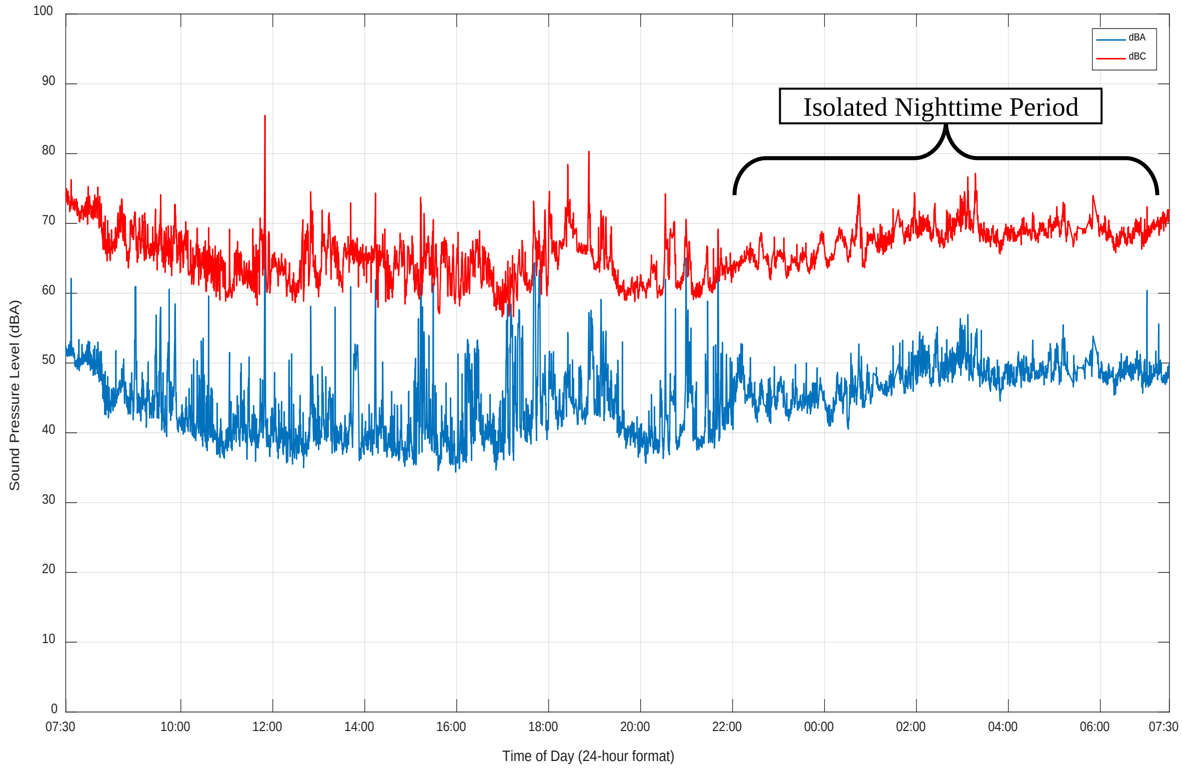

Figure 78. Noise Monitor #11, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

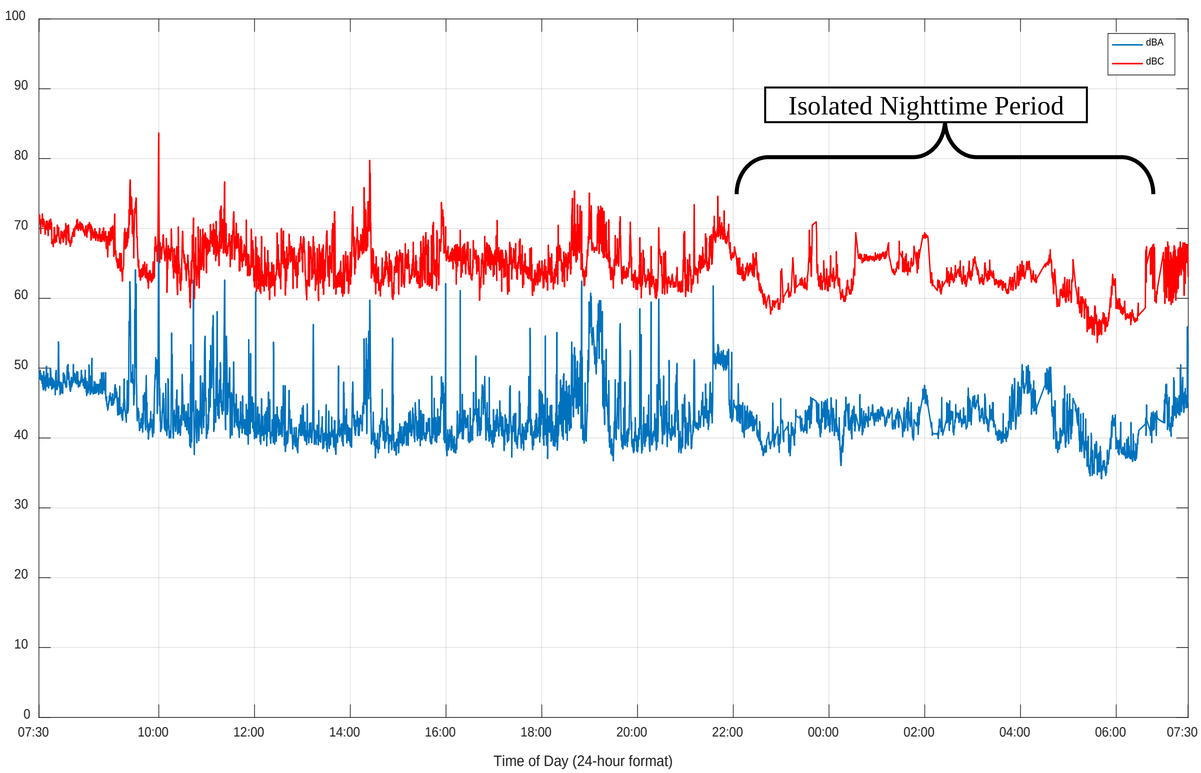

Figure 79. Noise Monitor #11, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #11

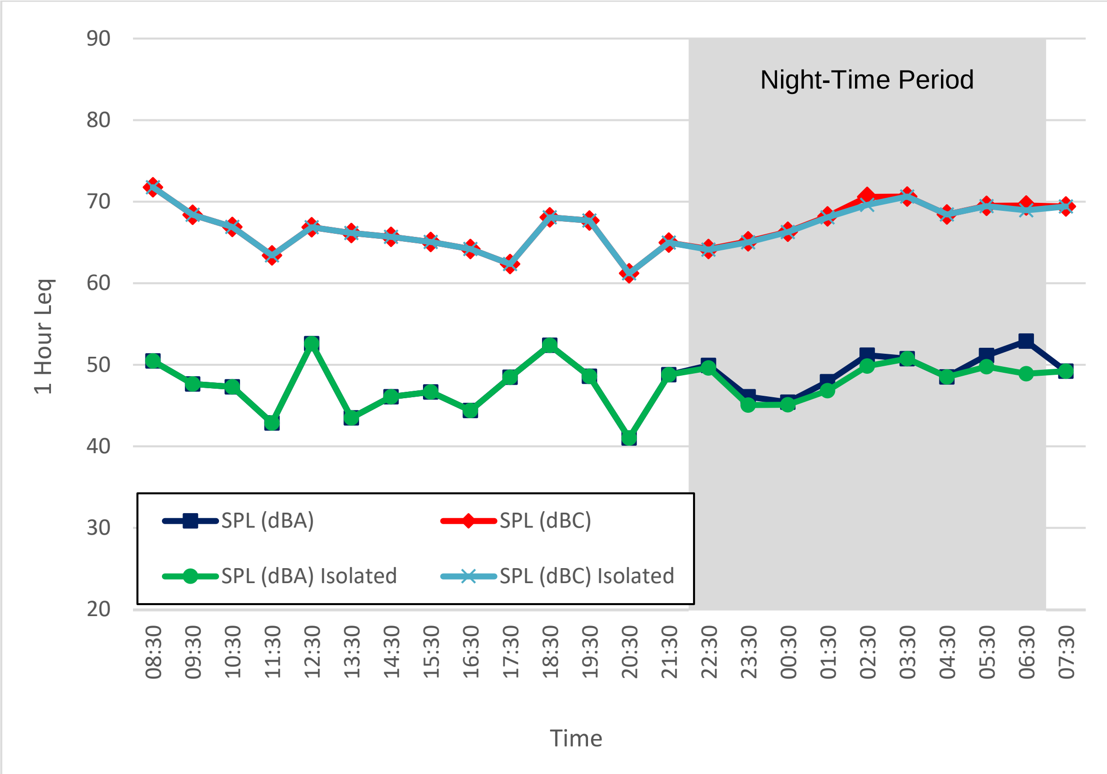

Figure 80. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

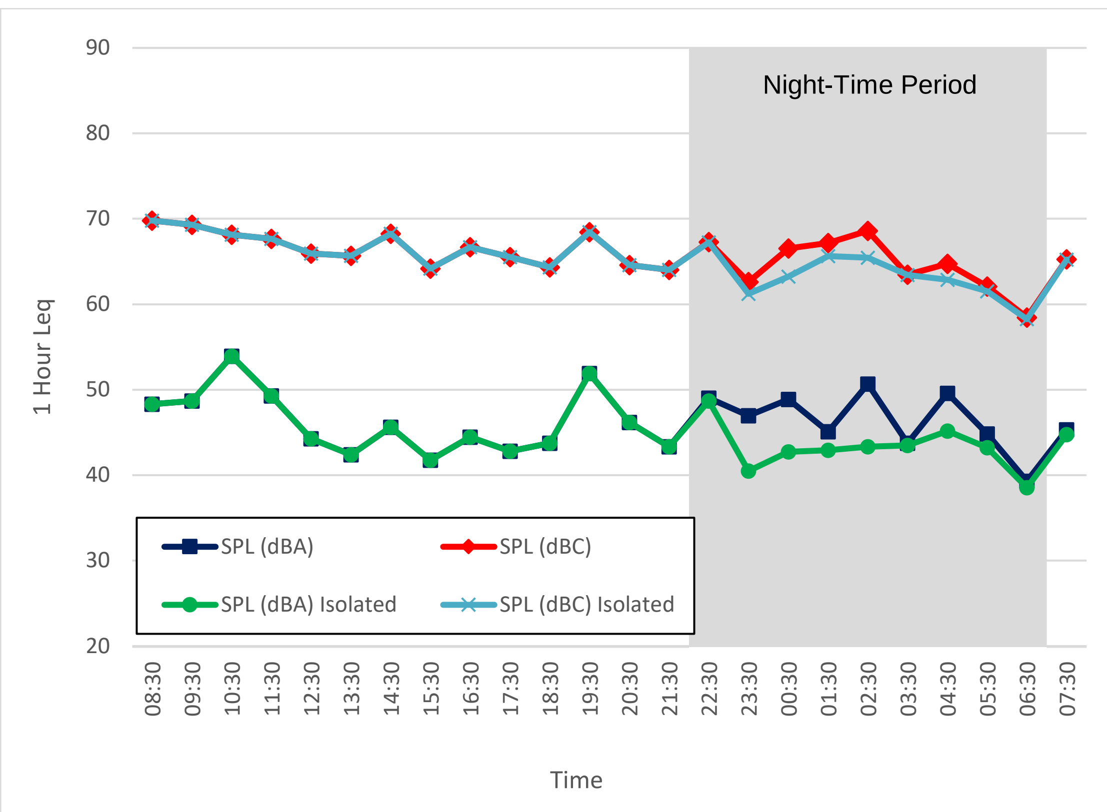

Figure 81. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

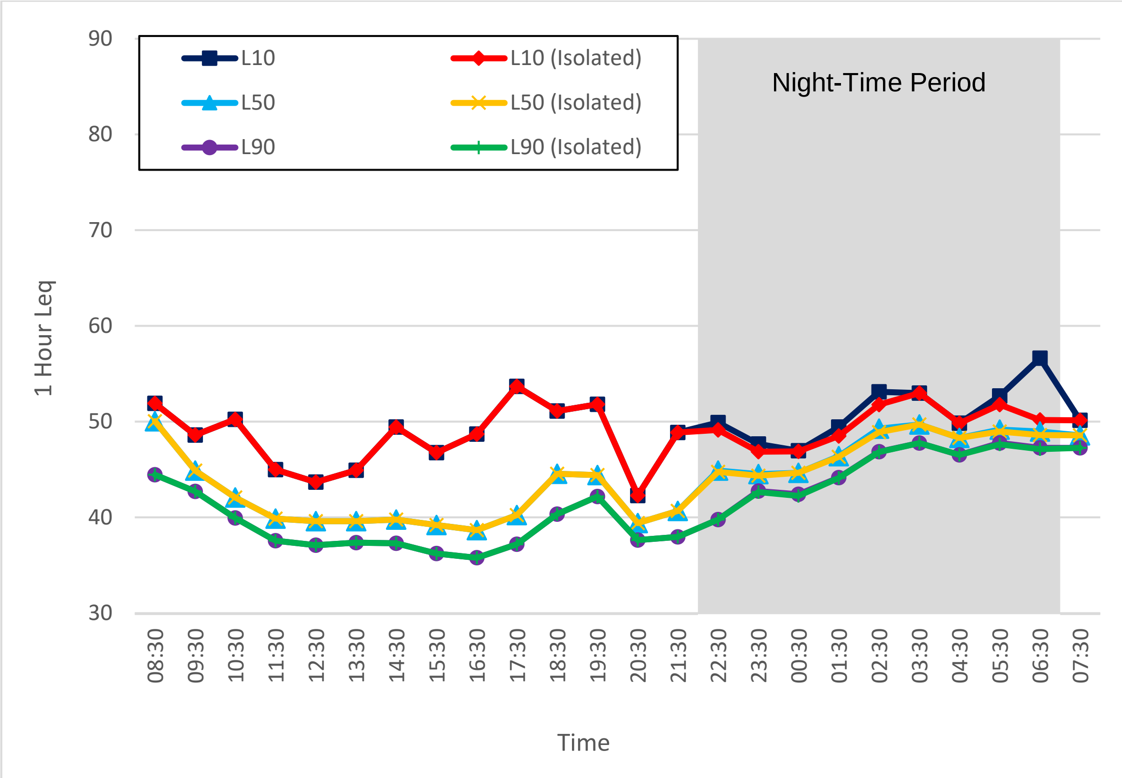

Figure 82. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

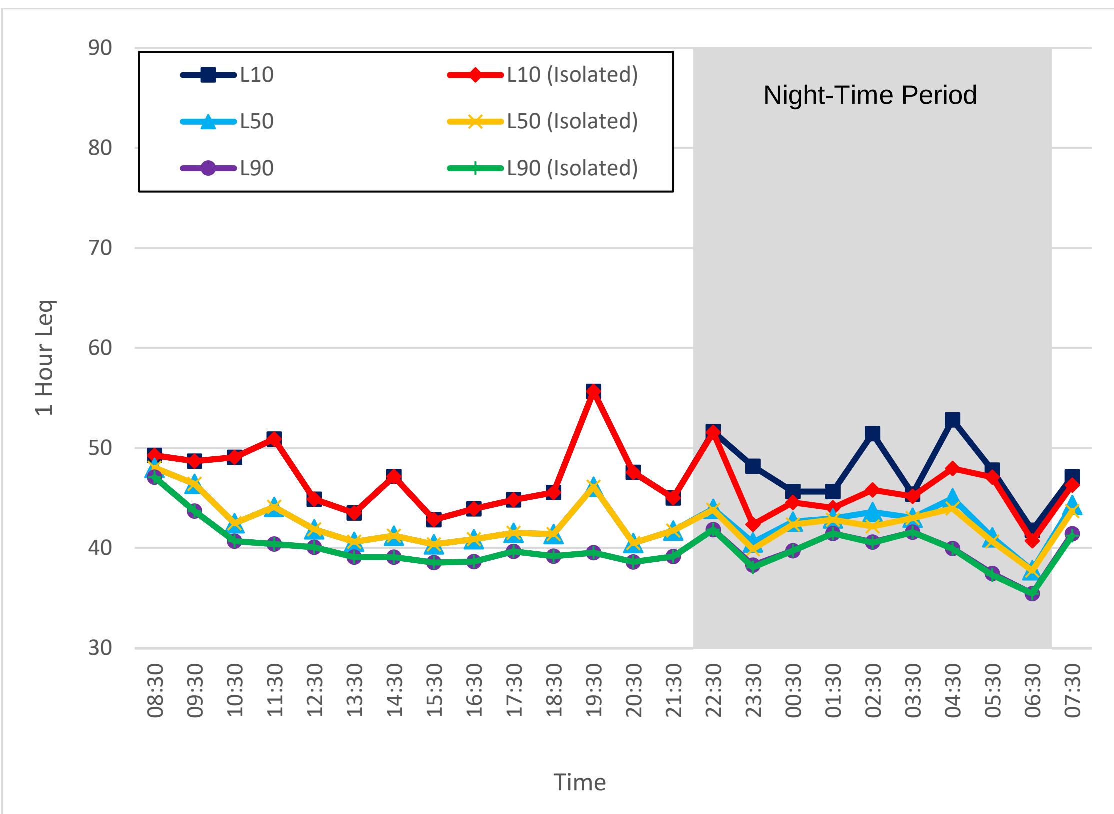

Figure 83. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

Noise Monitor #11

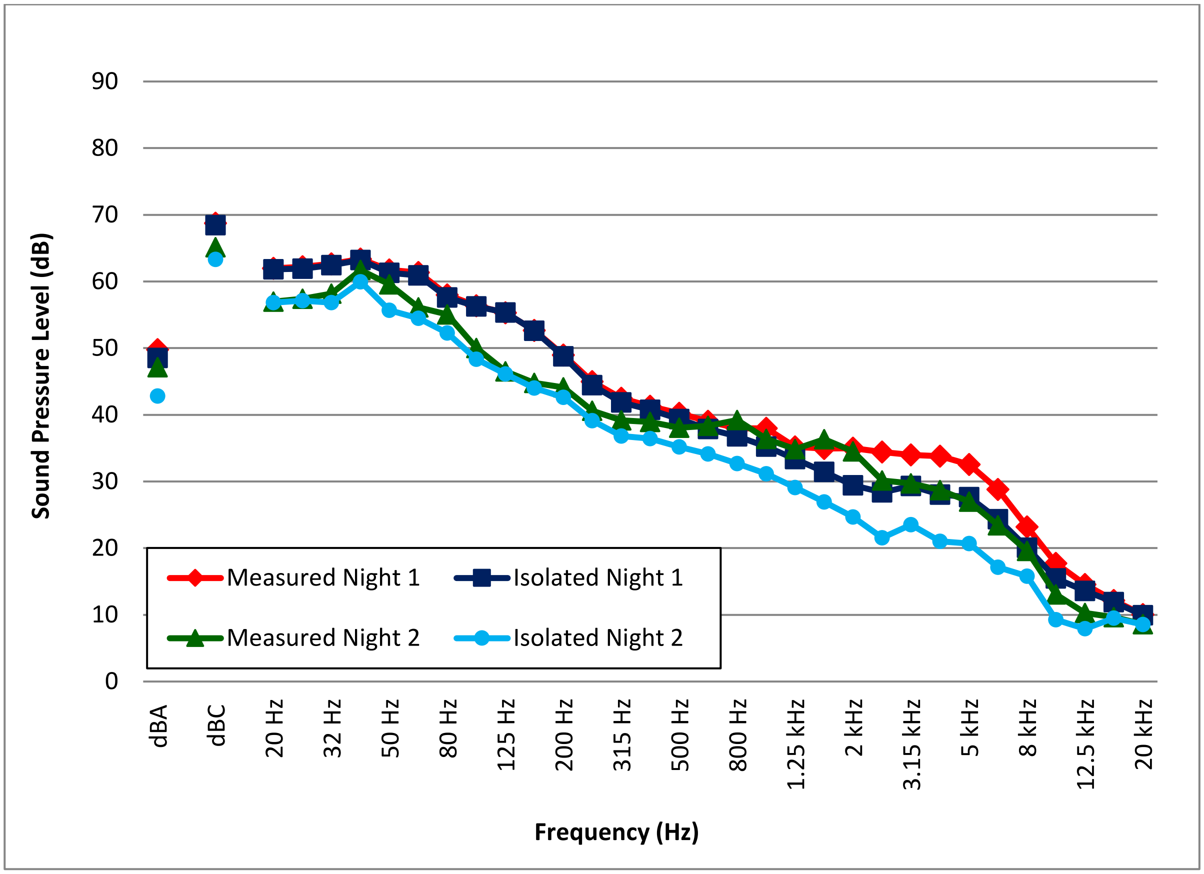

Figure 84. Noise Monitor #11, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #12 - Period 1

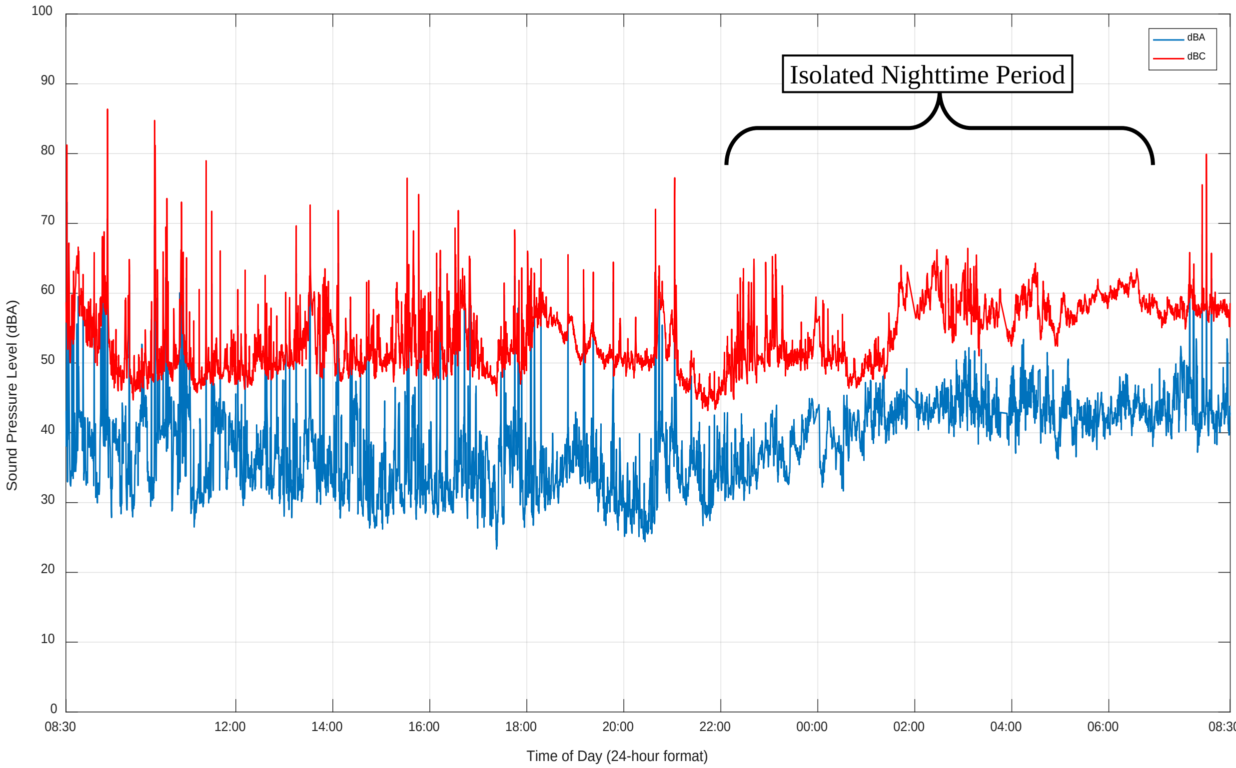

Figure 85. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 6 - 7, 2023)

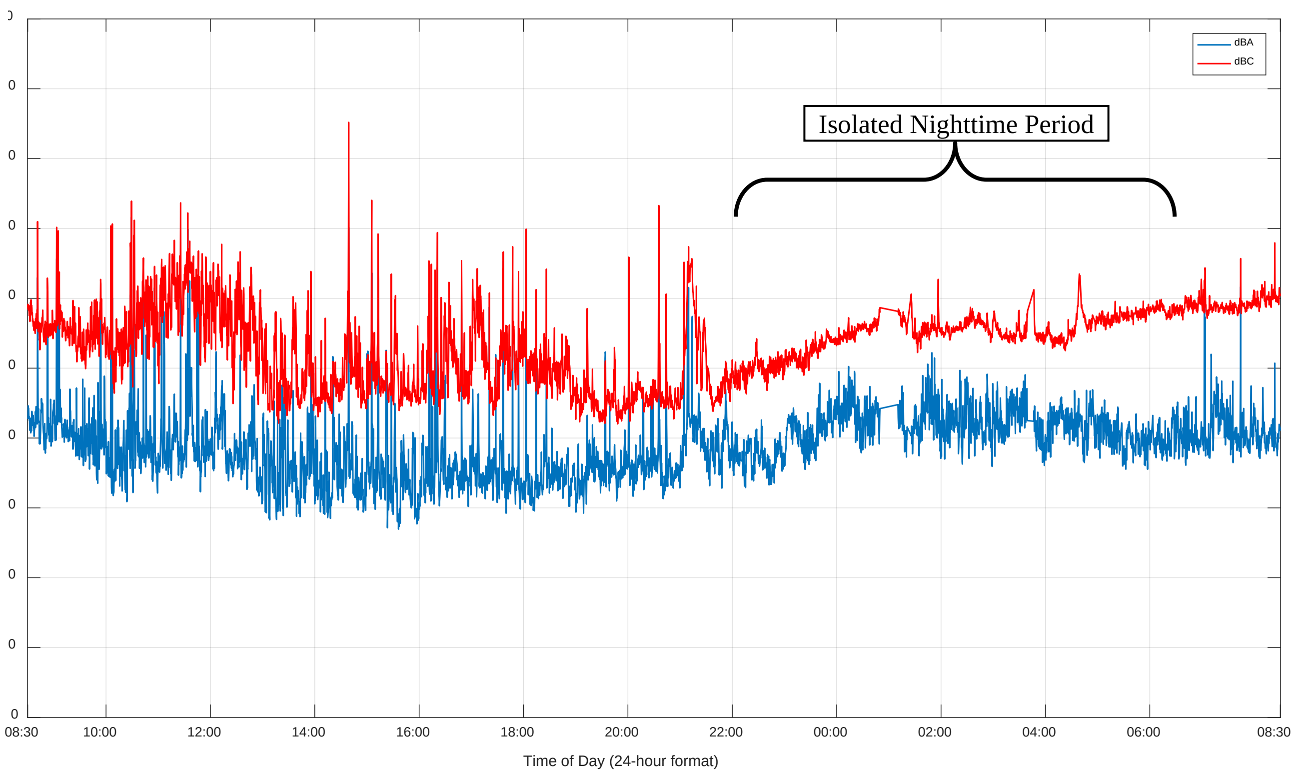

Figure 86. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 7 - 8, 2023)

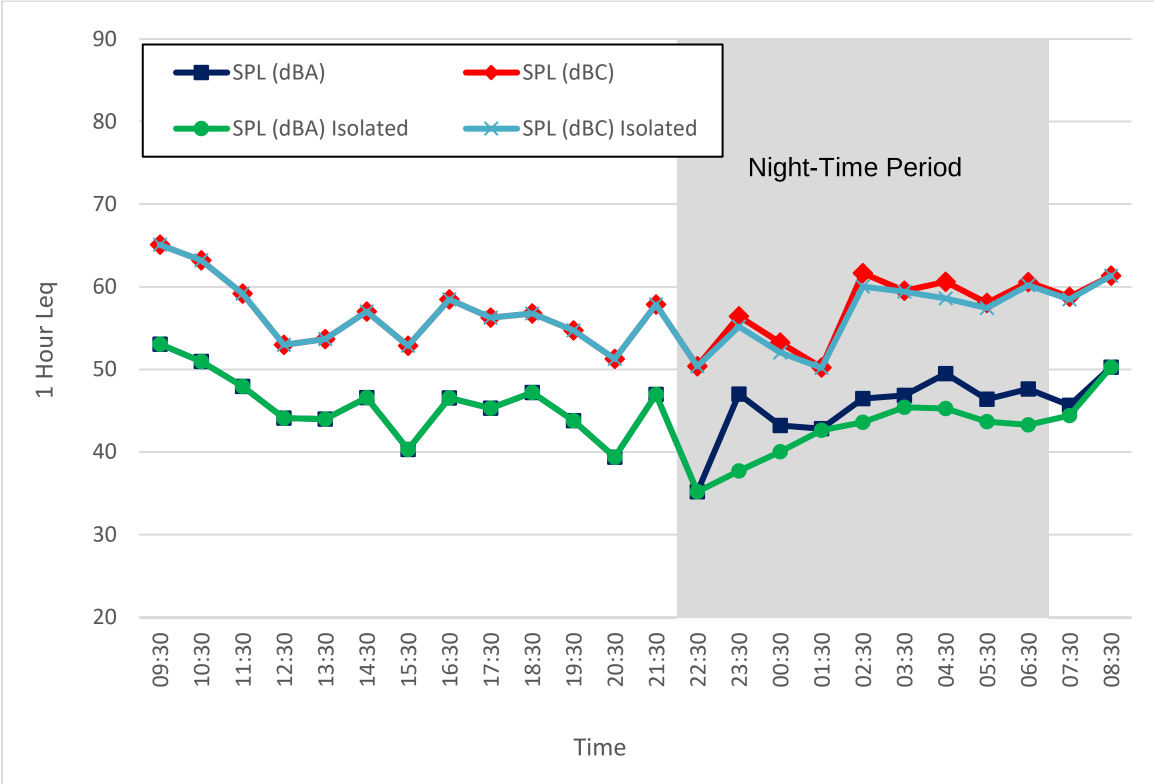

Figure 87. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 6 - 7, 2023)

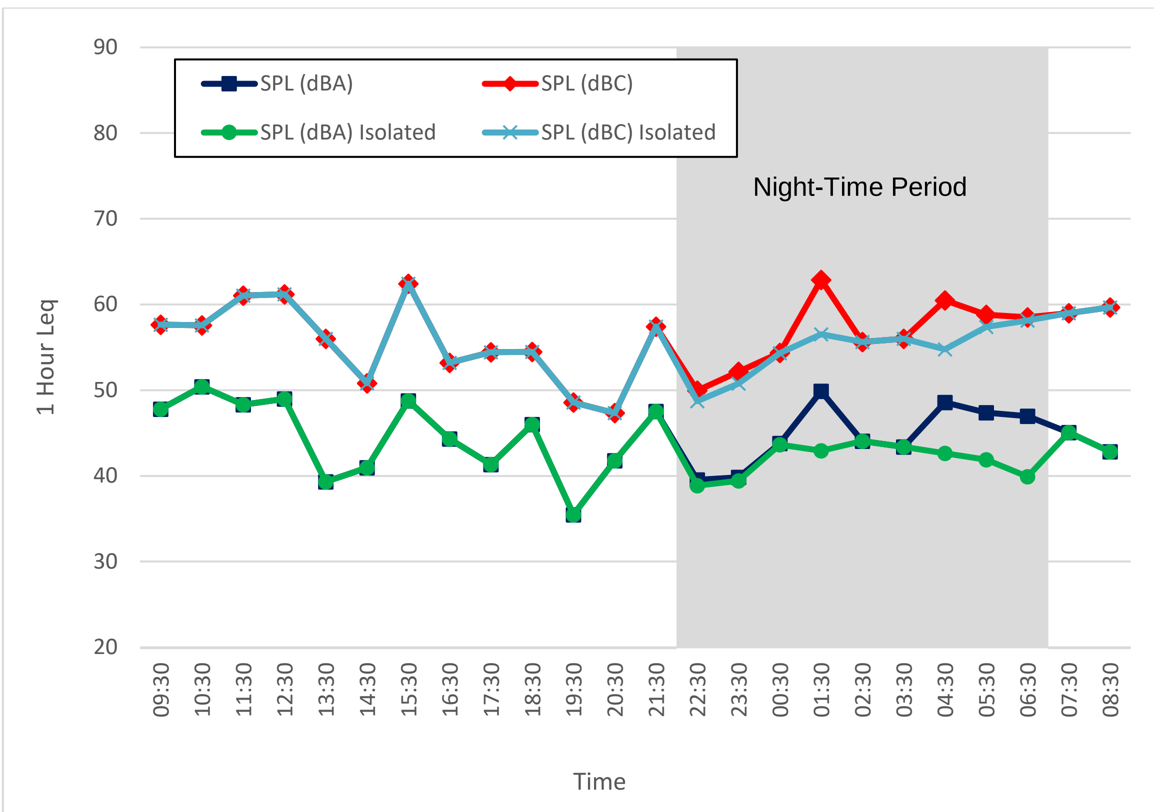

Figure 88. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 7 - 8, 2023)

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Noise Monitor #12 - Period 1

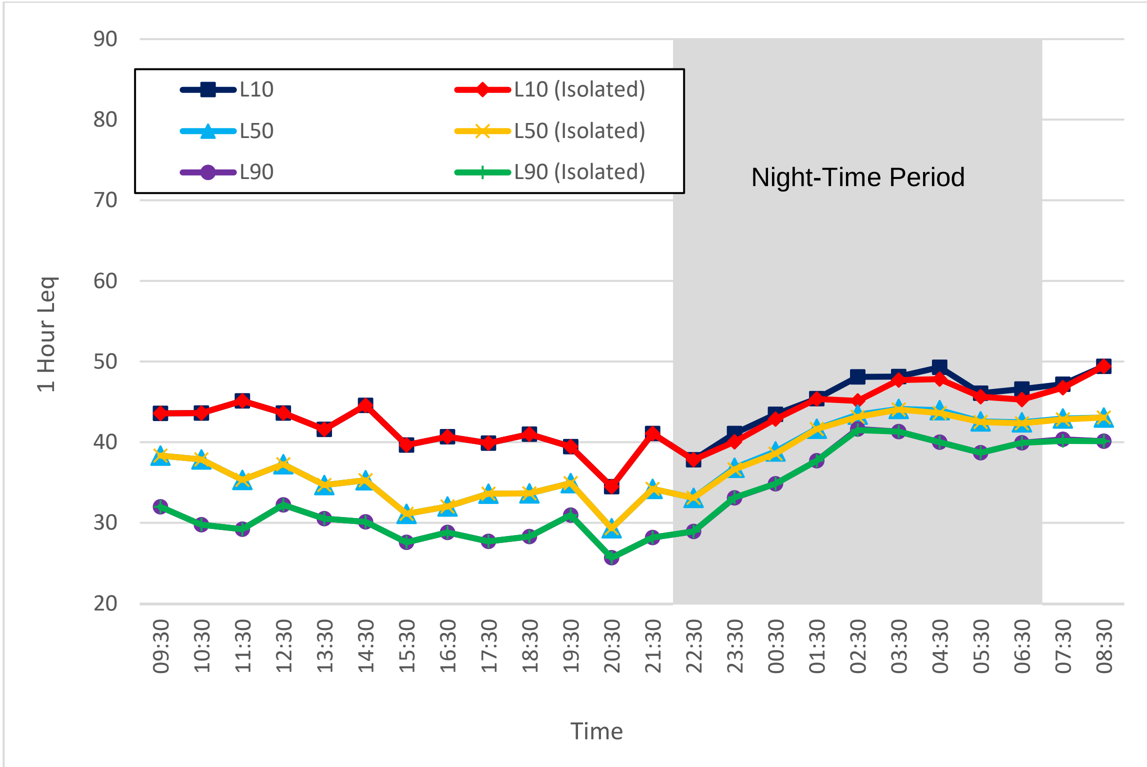

Figure 89. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 6 - 7, 2023)

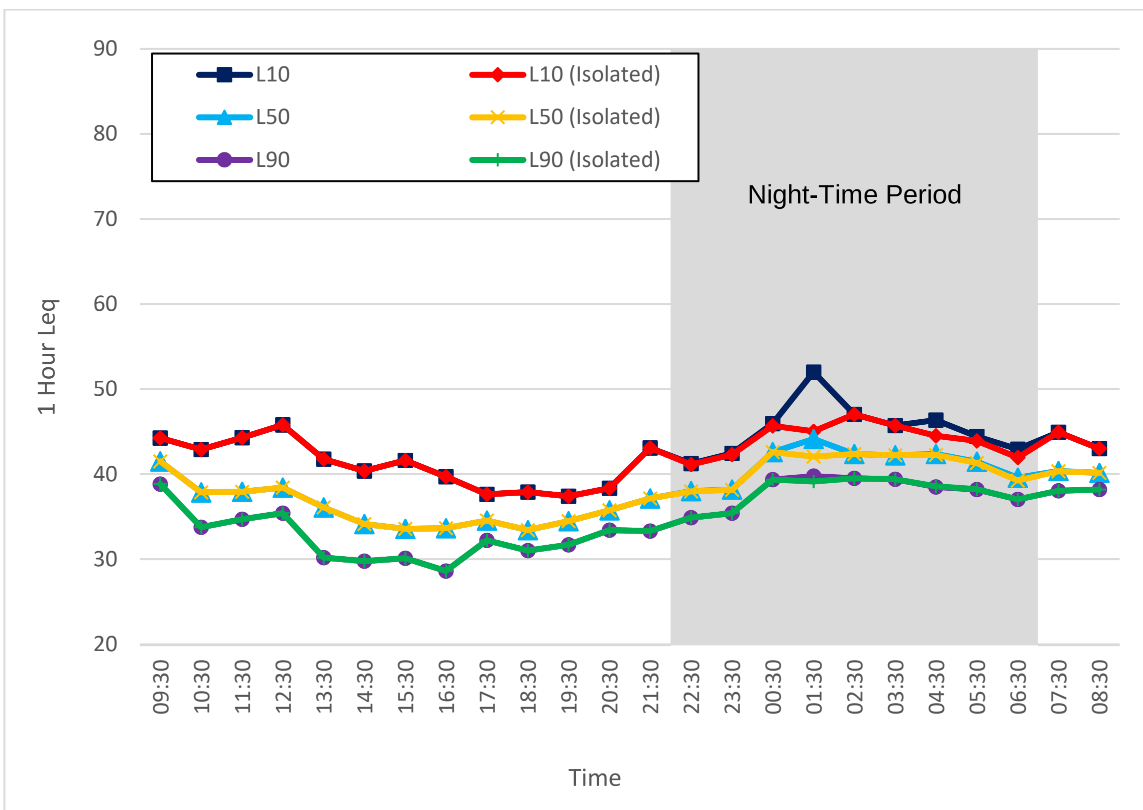

Figure 90. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 7 - 8, 2023)

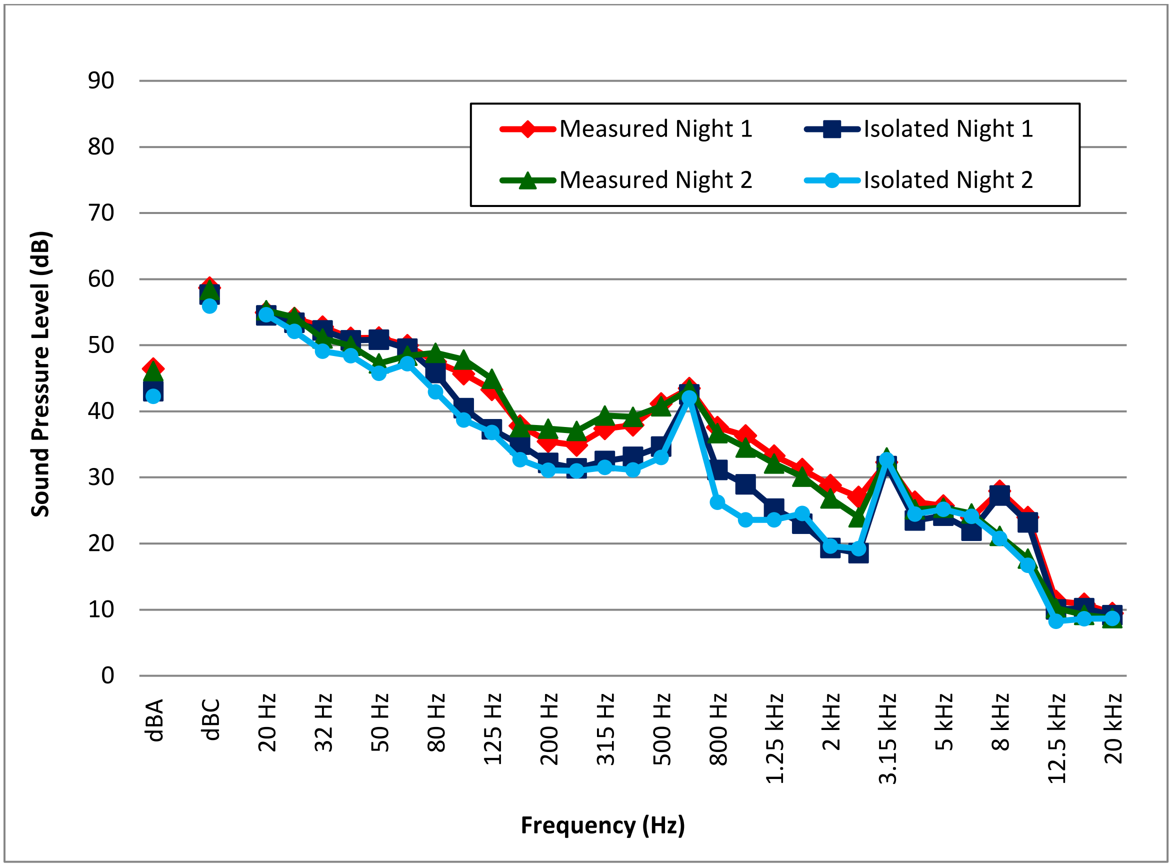

Figure 91. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (July 6 - 8, 2023)

Noise Monitor #12 - Period 2

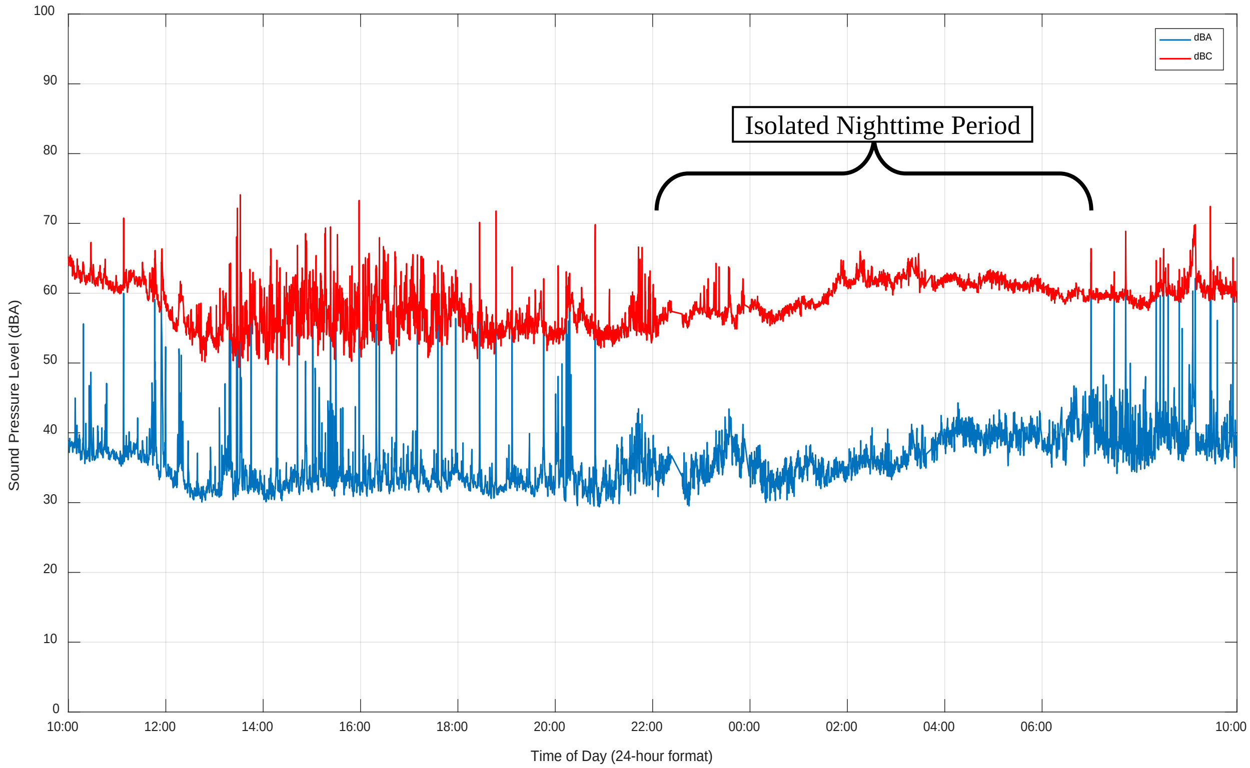

Figure 92. Noise Monitor #12, 15-Second L_{eq} Sound Levels (August 27 - 28, 2023)

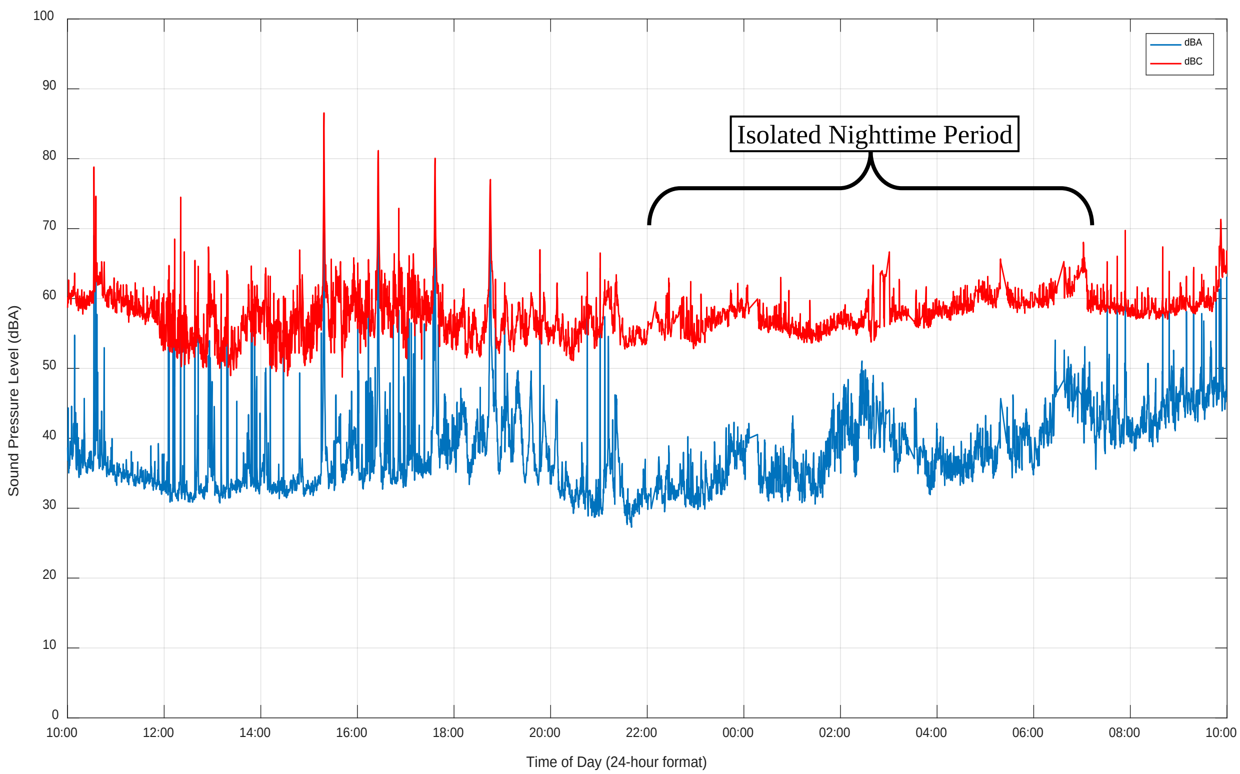

Figure 93. Noise Monitor #12, 15-Second L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #12 - Period 2

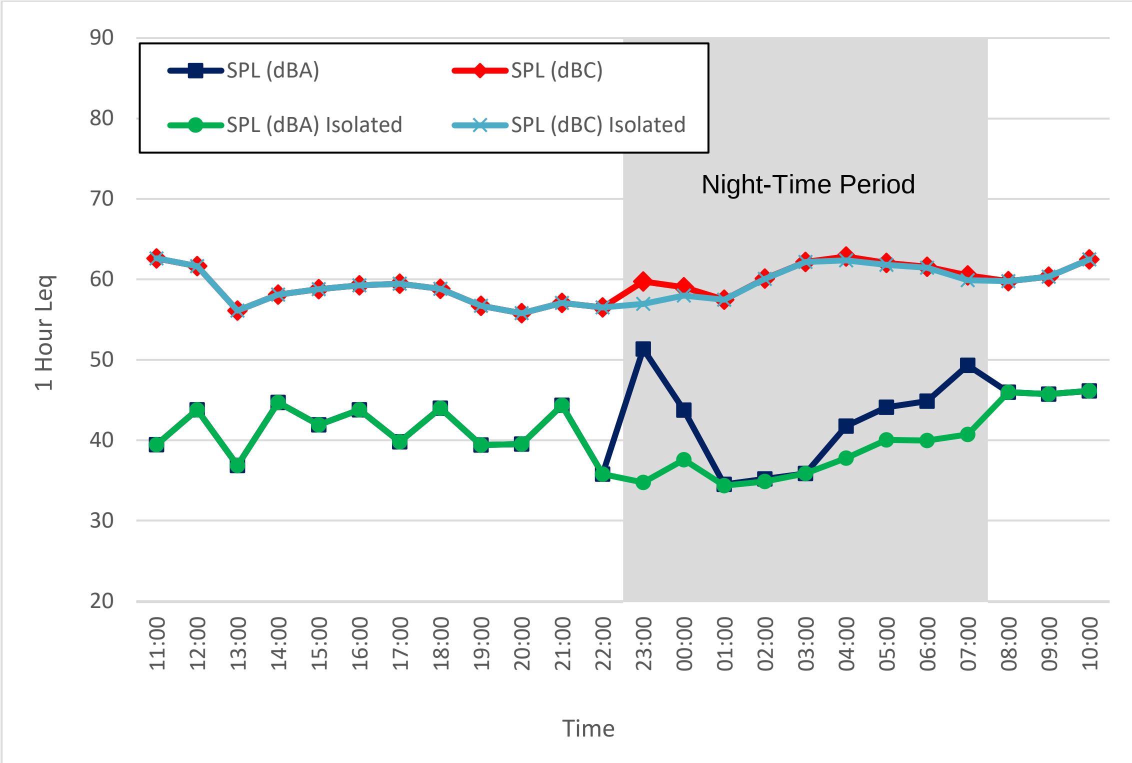

Figure 94. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (August 27 - 28, 2023)

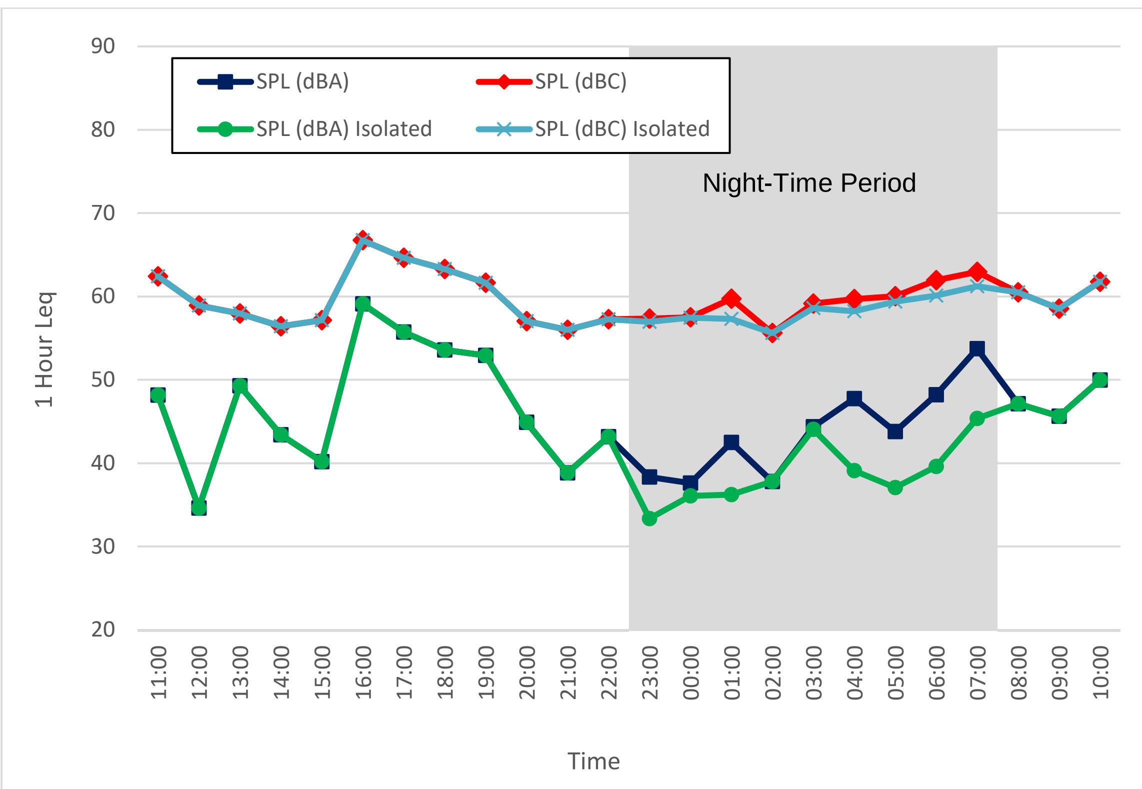

Figure 95. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (August 28 - 29, 2023)

#12 - Period 2 Noise Monitor

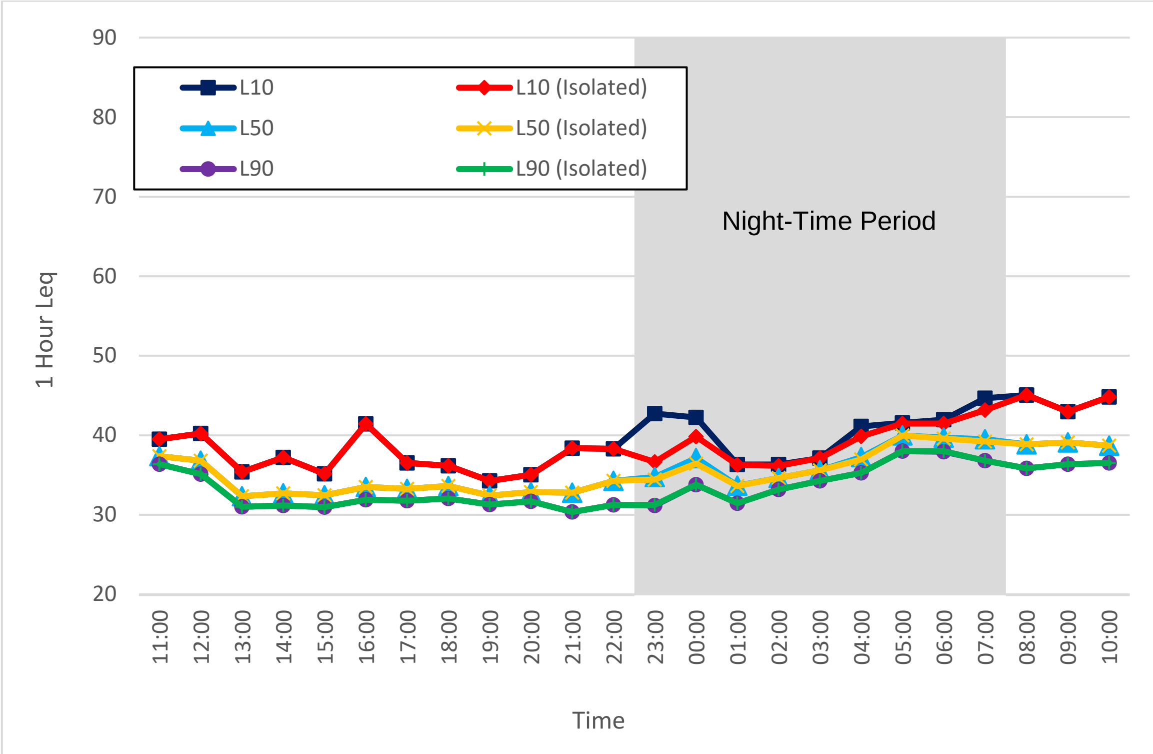

Figure 96. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 27 - 28, 2023)

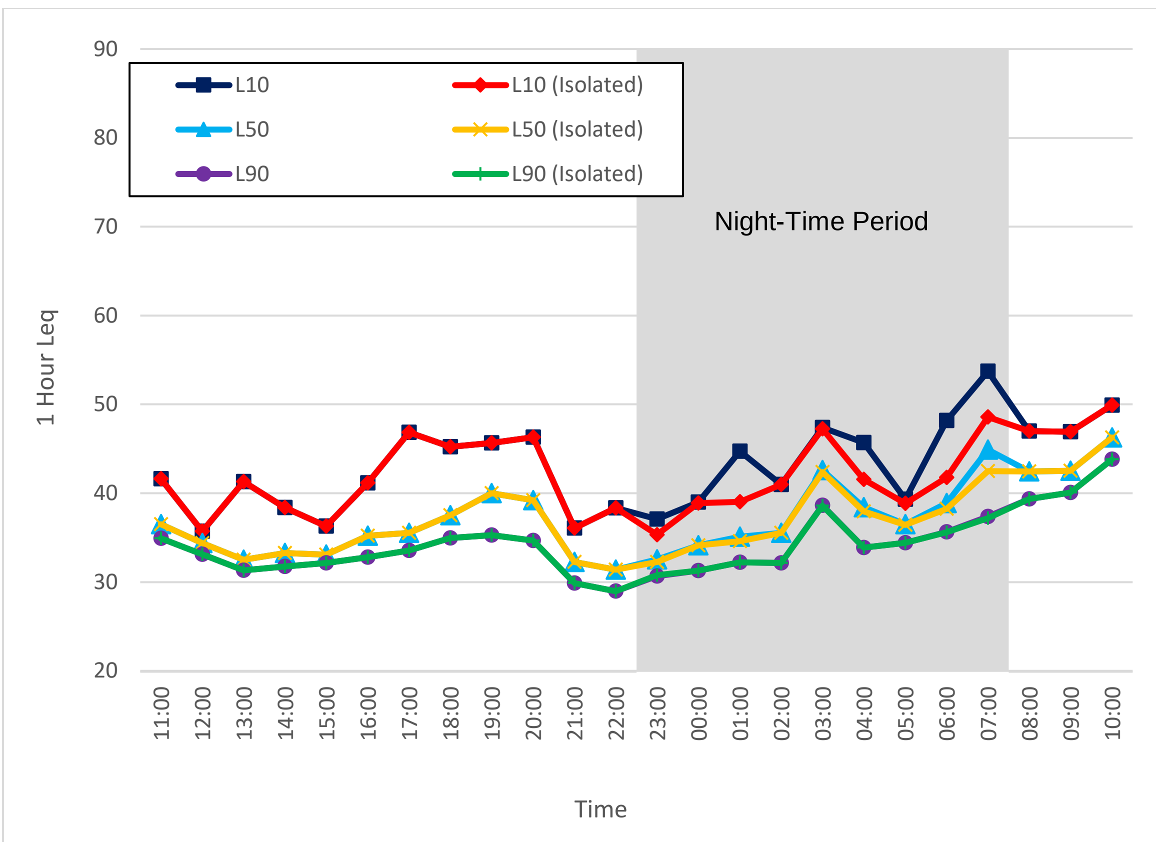

Figure 97. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #12 - Period 2

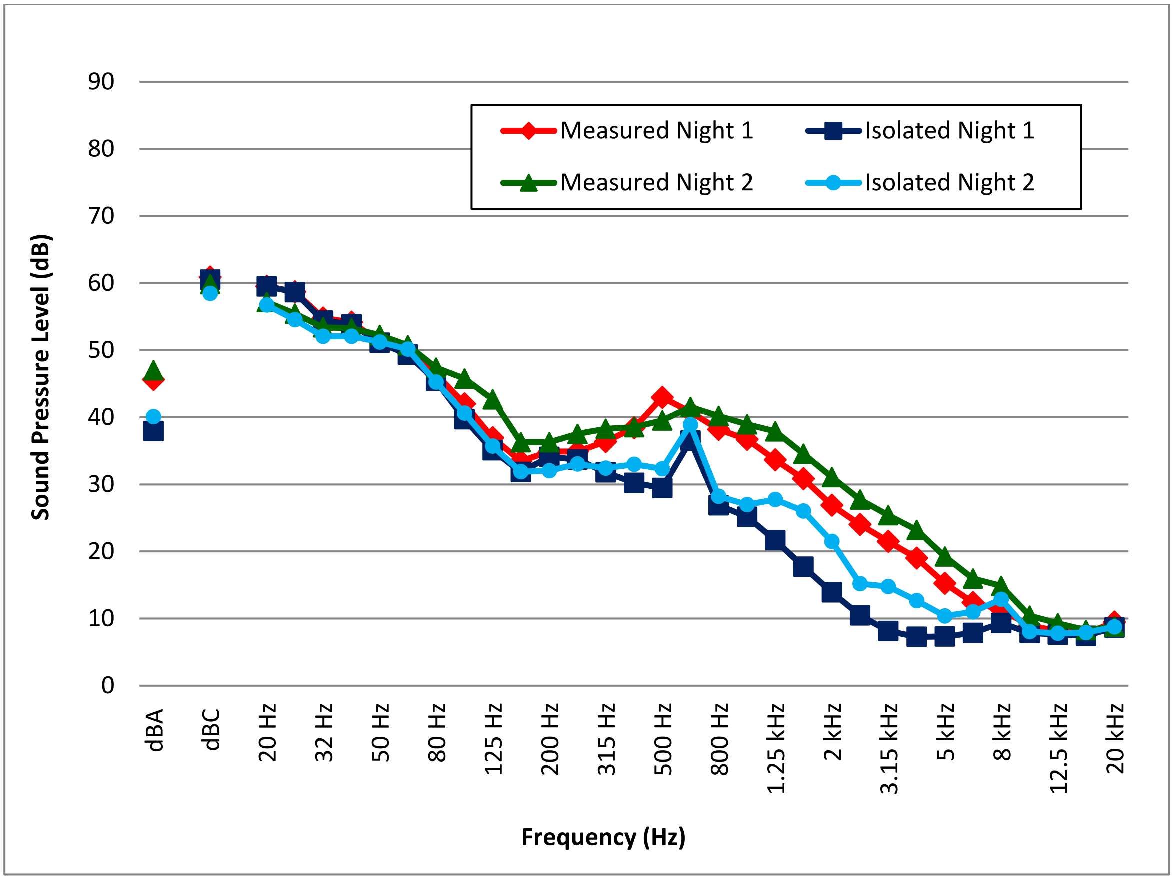

Figure 98. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (August 27 - 29, 2023)

Noise Monitor #13

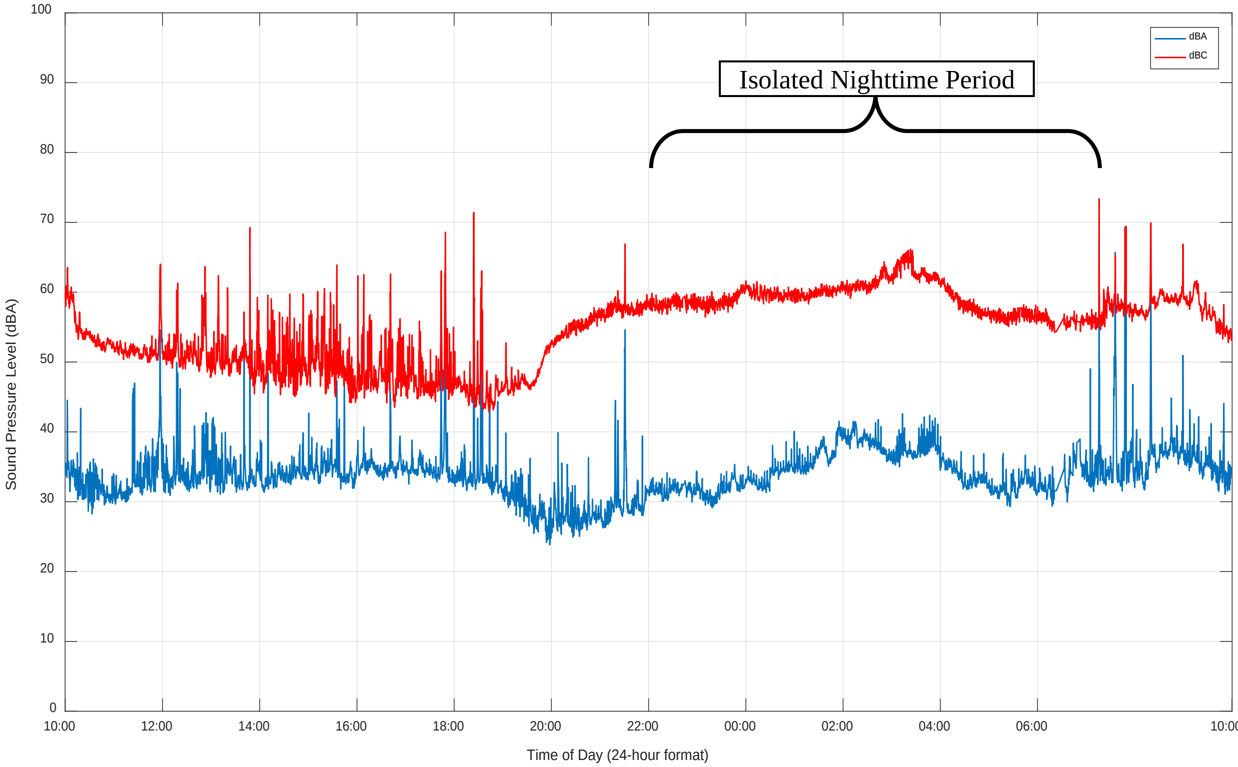

Figure 99. Noise Monitor #13, 15-Second L_{eq} Sound Levels (August 27 - 28, 2023)

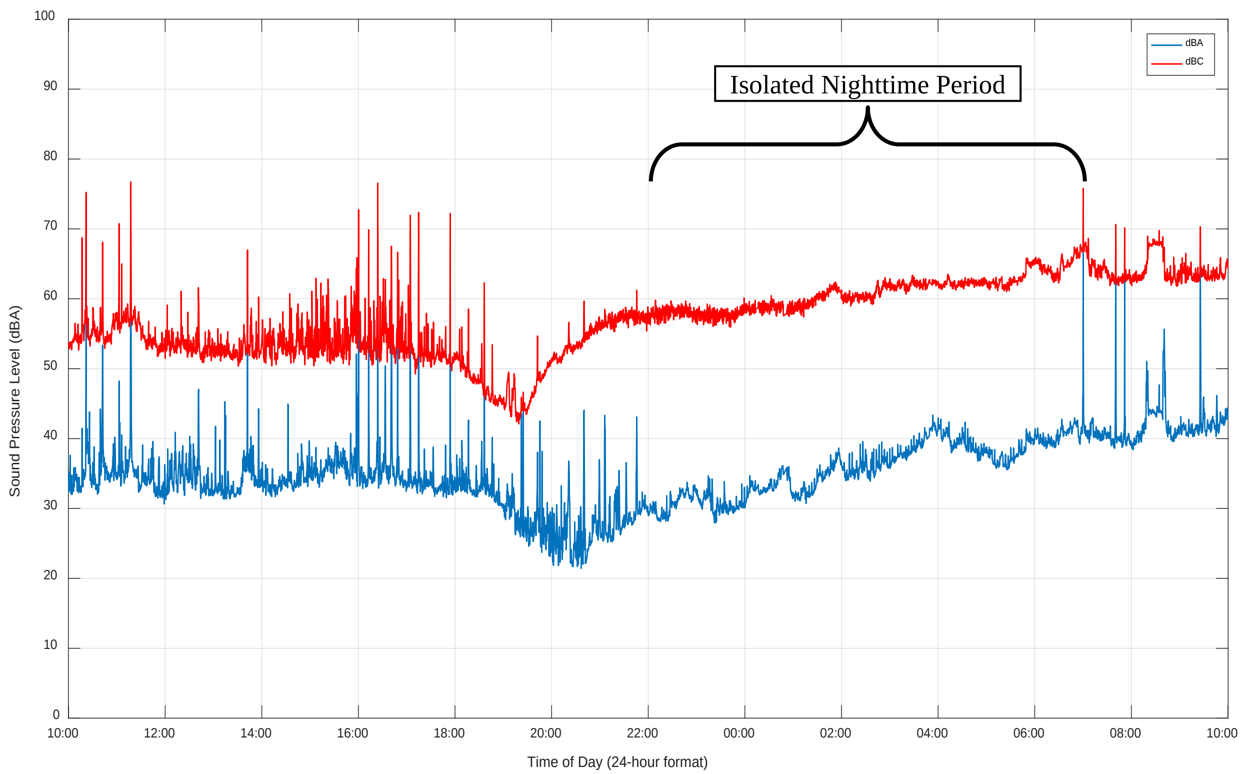

Figure 100. Noise Monitor #13, 15-Second L_{eq} Sound Levels (August 28 - 29, 2023)

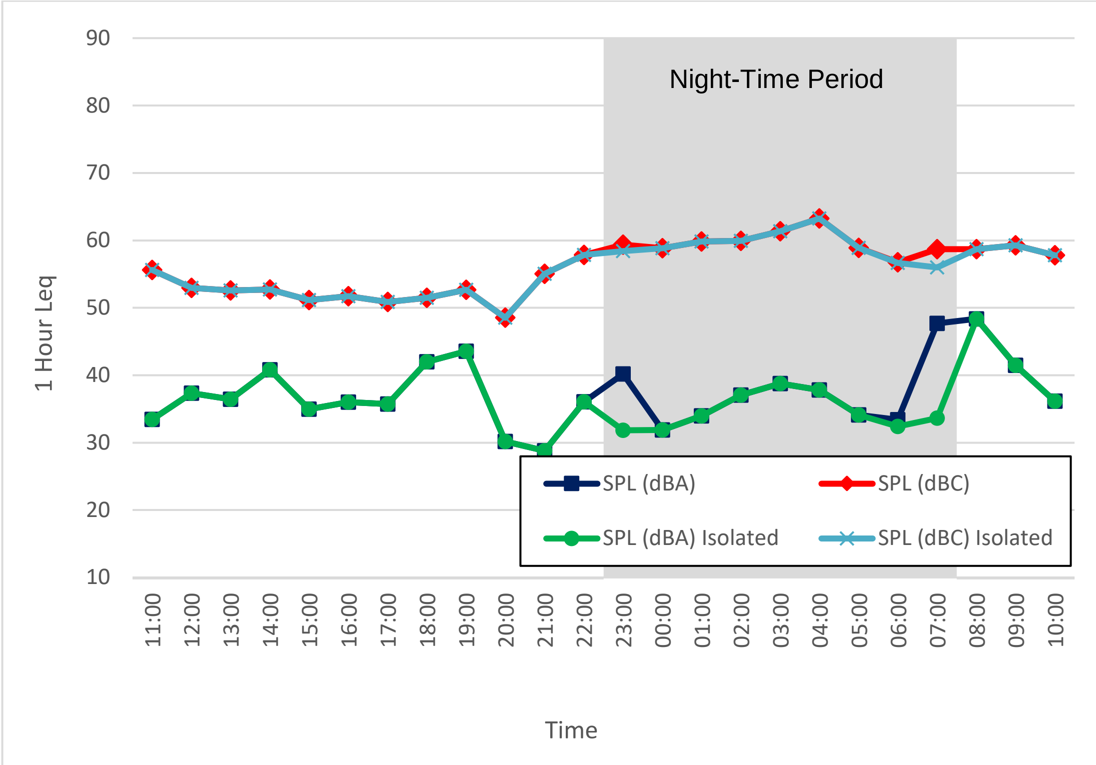

Figure 101. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (August 27 - 28, 2023)

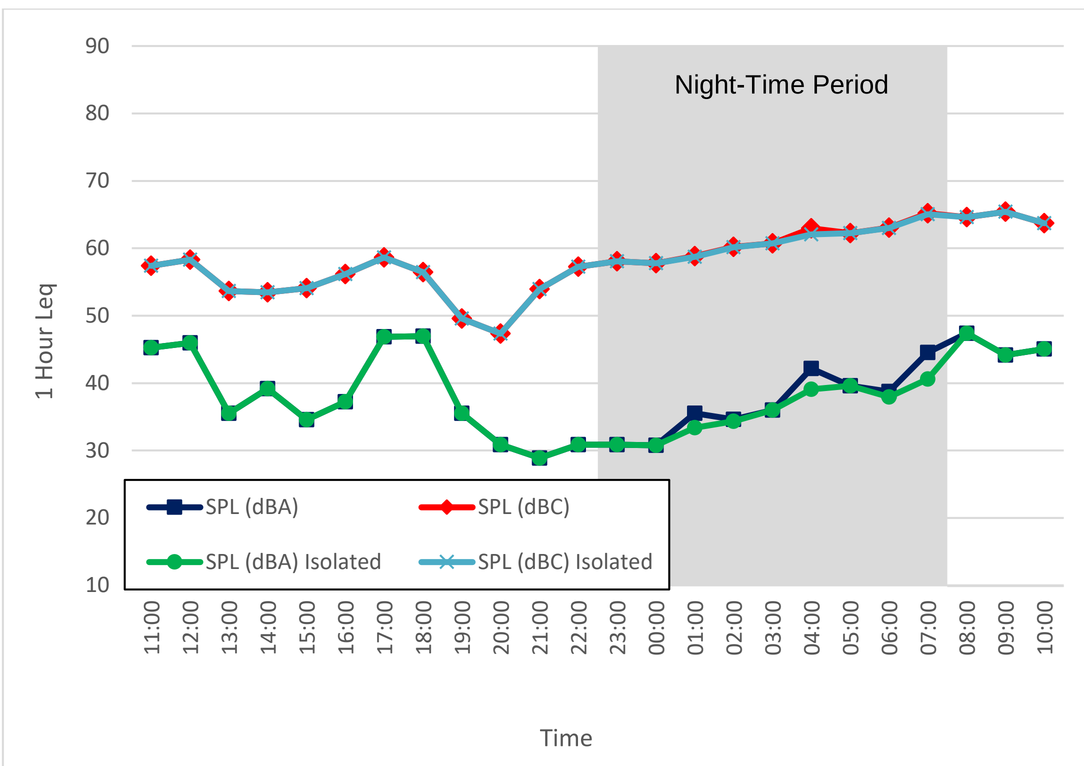

Figure 102. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (August 28 - 29, 2023)

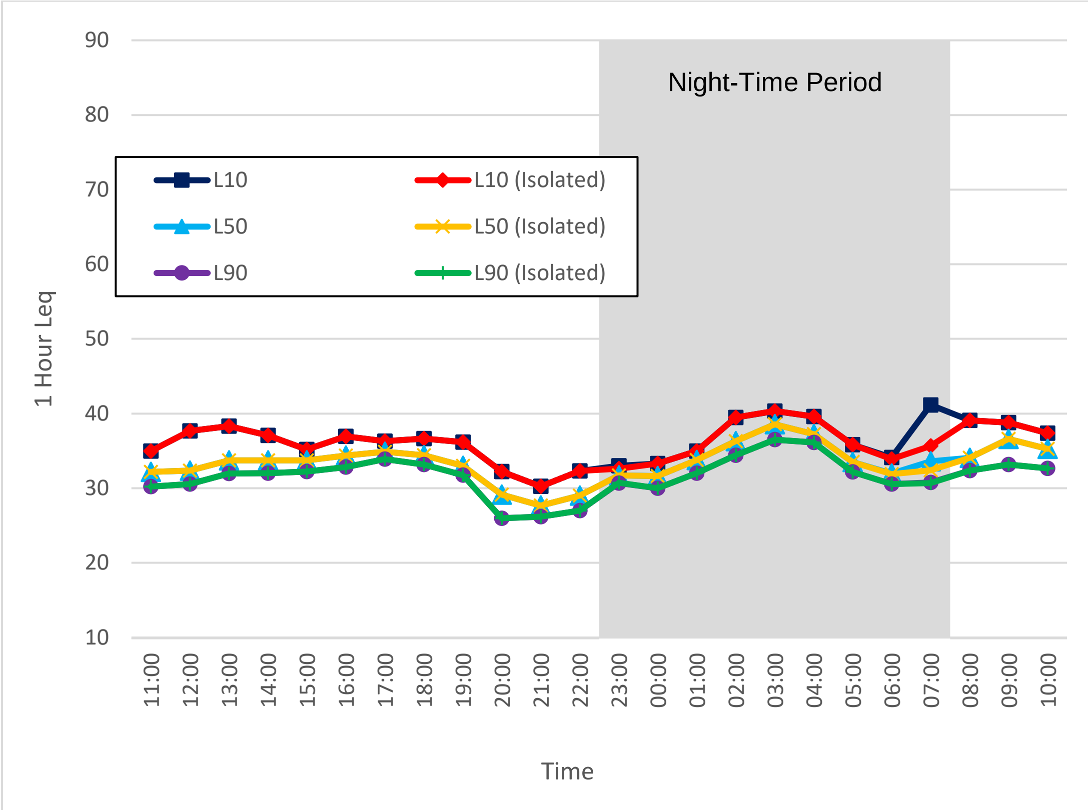

Figure 103. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 27 - 28, 2023)

Noise Monitor #13

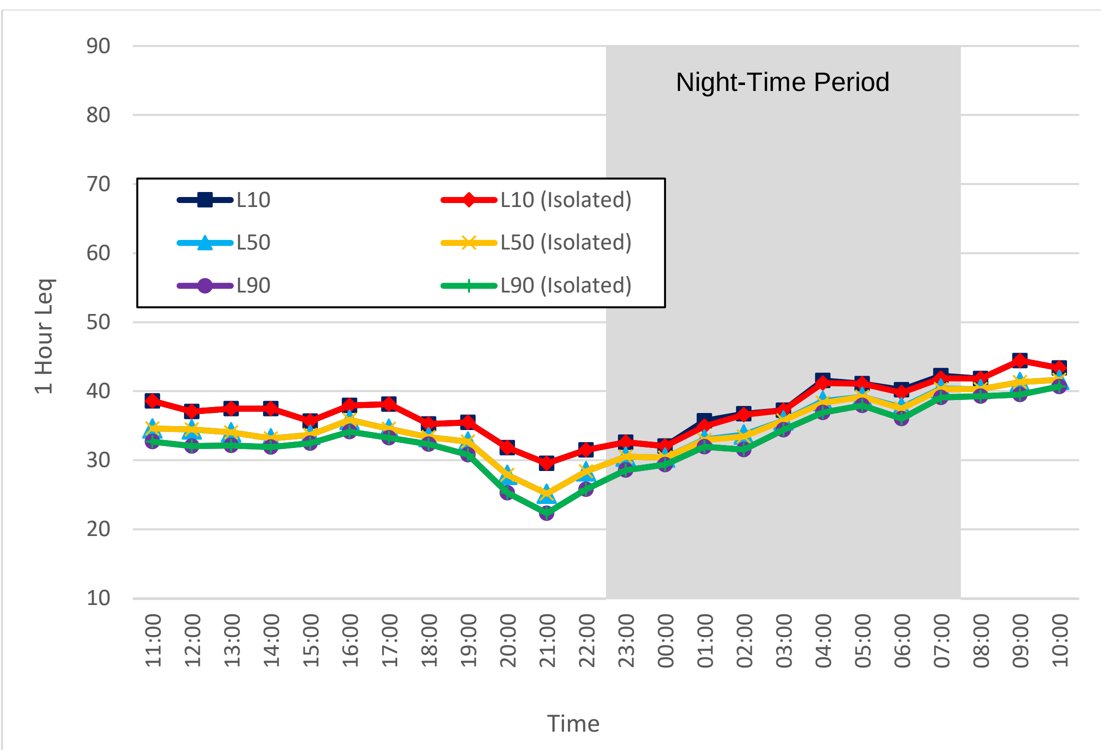

Figure 104. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (August 28 - 29, 2023)

Noise Monitor #13

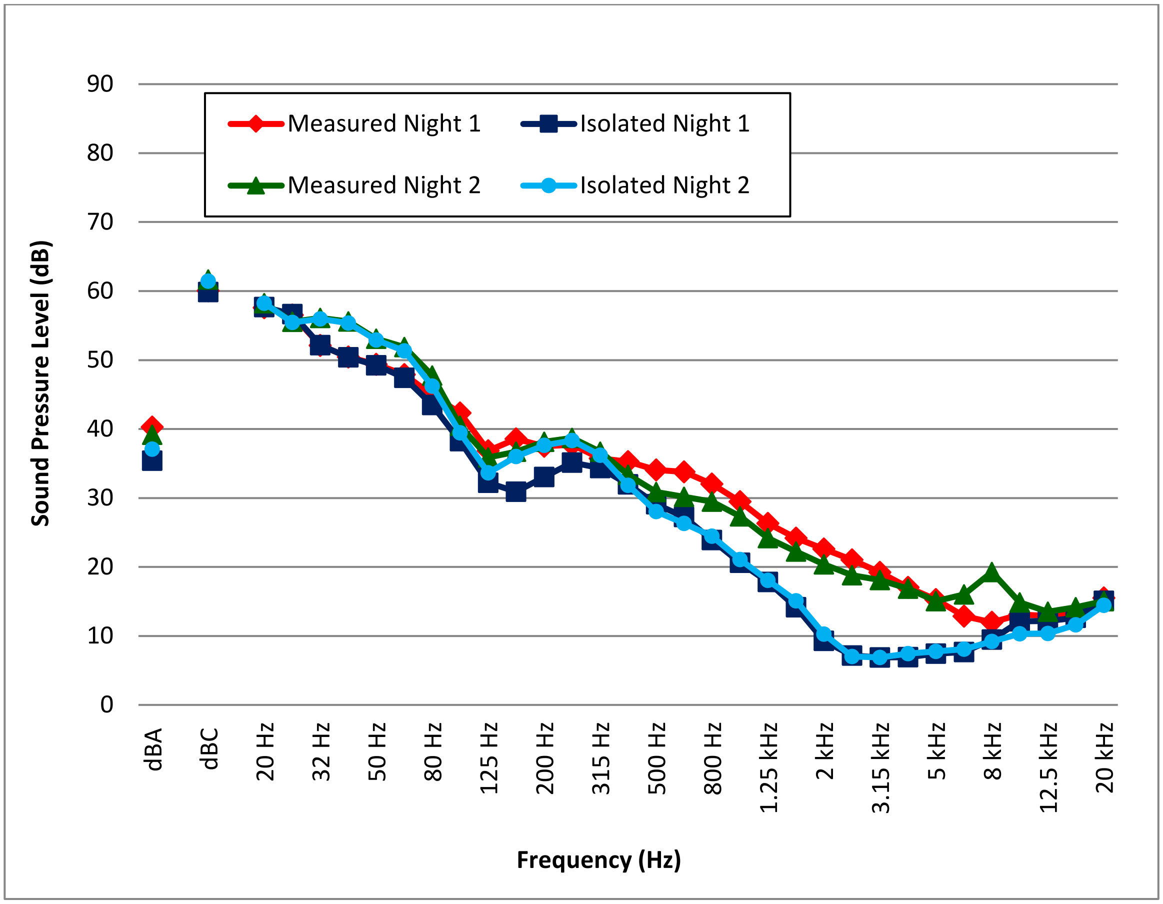

Figure 105. Noise Monitor #13, 1/3 Octave L_{eq} Sound Levels (August 27 - 29, 2023)

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 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 April 12, 2023 / April 12, 2023 / April 13, 2023 / March 15, 2023 / March 15, 2023 / March 14, 2023 / April 14, 2023 / August 26, 2021 / April 13, 2023 / April 13, 2023 and the calibrator (type B&K 4231) was certified on March 14, 2023 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 / AUC Rule 012. 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 #1A	27-Aug-23	07:30	Pre	93.9 dBA	B&K 4231	2575493
Monitor #1A	29-Aug-23	11:55	Post	93.9 dBA	B&K 4231	2575493
Monitor #2B	7-Jul-23	09:55	Pre	93.9 dBA	B&K 4231	2575493
Monitor #2B	9-Jul-23	09:55	Post	93.8 dBA	B&K 4231	2575493
Monitor #3B	7-Jul-23	09:23	Pre	93.9 dBA	B&K 4231	2575493
Monitor #3B	9-Jul-23	09:35	Post	93.9 dBA	B&K 4231	2575493
Monitor #4C	7-Jul-23	09:08	Pre	93.9 dBA	B&K 4231	2575493
Monitor #4C	9-Jul-23	09:28	Post	93.8 dBA	B&K 4231	2575493
Monitor #5A	7-Jul-23	08:48	Pre	93.9 dBA	B&K 4231	2575493
Monitor #5A	9-Jul-23	09:08	Post	93.8 dBA	B&K 4231	2575493
Monitor #6A	27-Aug-23	08:15	Pre	93.9 dBA	B&K 4231	2575493
Monitor #6A	29-Aug-23	12:35	Post	93.8 dBA	B&K 4231	2575493
Monitor #8A	7-Jul-23	08:45	Pre	93.9 dBA	B&K 4231	2575493
Monitor #8A	9-Jul-23	10:05	Post	93.9 dBA	B&K 4231	2575493
Monitor #9A	7-Jul-23	06:30	Pre	93.9 dBA	B&K 4231	2575493
Monitor #9A	9-Jul-23	07:30	Post	93.8 dBA	B&K 4231	2575493
Monitor #10A	27-Aug-23	07:49	Pre	93.9 dBA	B&K 4231	2575493
Monitor #10A	29-Aug-23	12:12	Post	93.9 dBA	B&K 4231	2575493
Monitor #11A	7-Jul-23	07:10	Pre	93.9 dBA	B&K 4231	2575493
Monitor #11A	9-Jul-23	08:00	Post	93.9 dBA	B&K 4231	2575493
Monitor #12B #1	7-Jul-23	08:23	Pre	93.9 dBA	B&K 4231	2575493
Monitor #12B#1	9-Jul-23	08:40	Post	93.8 dBA	B&K 4231	2575493
Monitor #12B #2	27-Aug-23	08:38	Pre	93.9 dBA	B&K 4231	2575493
Monitor #12B #2	29-Aug-23	12:50	Post	93.9 dBA	B&K 4231	2575493
Monitor #13A	7-Jul-23	09:27	Pre	93.9 dBA	B&K 4231	2575493
Monitor #13A	9-Jul-23	13:30	Post	93.9 dBA	B&K 4231	2575493

B&K 2250 Unit #1 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49476

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/12/2023** *Cal Due:*		
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2488495**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2471133** **Preamplifier ZC0032 s/n 3271**	*See comments:*		
		Contains non-accredited tests: __**Yes** **X** **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** **X** **Standard**		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	May 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
22.5	100.62	42.6

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	4/12/2023	Date	4/14/2023

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B&K 2270 Unit #2 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49478

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/12/2023**	*Cal Due:*	
Model:	**2270**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**3002718**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2850742** **Preamplifier ZC0032 s/n 18754**	*See comments:*		
		Contains non-accredited tests: __Yes X No		
Type (class):	**1**	*Calibration service:* __ Basic X Standard		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	May 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
21.7	100.25	40.7

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	4/12/2023	Date	4/14/2023

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B&K 4231 Unit #2 Calibrator Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49309

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **3/14/2023** *Cal Due:*		
Model:	**4231**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2575493**	*Out of tolerance:*		
Class (IEC 60942):	**1**	*See comments:*		
Barometer type:		*Contains non-accredited tests:* __**Yes** **X** **No**		
Barometer s/n:				
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	Apr 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
140-Norsonic	Real Time Analyzer	1403978	Mar 25, 2022	Scantek, Inc. / NVLAP	Mar 25, 2023
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	2854675	Sep 8, 2022	Scantek, Inc./ NVLAP	Sep 8, 2023
1203-Norsonic	Preamplifier	21270	Feb 16, 2023	Scantek, Inc./ NVLAP	Feb 16, 2024

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

Calibrated by:	Lydon Dawkins	Authorized signatory:	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	3/14/2023	Date	3/16/2023

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B&K 2270 Unit #3 SLM Calibration Certificates

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49482

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/13/2023** *Cal Due:*		
Model:	**2270**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**3002730**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2850741** **Preamplifier ZC0032 s/n 18750**	*See comments:*		
		Contains non-accredited tests: __**Yes** _X_ **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** _X_ **Standard**		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	May 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
22.7	100.07	38.4

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	4/13/2023	Date	4/14/2023

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B&K 2270 Unit #4 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49306

Instrument:	**Sound Level Meter**	*Date Calibrated:* **3/15/2023** *Cal Due:*		
Model:	**2270**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2644639**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2595637** **Preamplifier ZC0032 s/n 5842**	*See comments:*		
		Contains non-accredited tests: __ **Yes** _X_ **No**		
Type (class):	**1**	*Calibration service:* __ **Basic** _X_ **Standard**		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	Apr 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
22.3	100.78	39.7

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	3/15/2023	Date	3/16/2023

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B&K 2250 Unit #5 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49304

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **2722894**
Tested with: **Microphone 4189 s/n 2710791**
Preamplifier ZC0032 s/n 13398
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **3/15/2023** *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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	Apr 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
22.9	100.28	42.8

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William D. Gallagher
Date	3/15/2023	Date	3/16/2023

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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 2250 Unit #6 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49302

Instrument:	**Sound Level Meter**	*Date Calibrated:* **3/14/2023** *Cal Due:*		
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2661161**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2650730** **Preamplifier ZC0032 s/n 9935**	*See comments:*		

Contains non-accredited tests: __Yes **X** No
Type (class): **1**
Calibration service: __ Basic **X** Standard
Customer: **ACI Acoustical Consultants Inc.**
Address: **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**
Tel/Fax: **780-414-6373 / 780-414-6376**

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	Apr 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
21.6	100.42	42.0

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	3/14/2023	Date	3/16/2023

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B&K 2250 Unit #7 SLM and Mic Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49486

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/14/2023** *Cal Due:*		
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**2722859**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2719777** **Preamplifier ZC0032 s/n 13895**	*See comments:*		
		Contains non-accredited tests: __Yes _X_ No		
Type (class):	**1**	*Calibration service:* __ Basic _X_ Standard		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	May 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
22.8	100.01	39.7

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	4/14/2023	Date	4/14/2023

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B&K 2250 Unit #8 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.46829

Instrument: **Sound Level Meter**
Model: **2250**
Manufacturer: **Brüel and Kjær**
Serial number: **3028218**
Tested with: **Microphone 4189 s/n 2851039**
Preamplifier ZC0032 s/n 20742
Type (class): **1**
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **8/26/2021** *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, 2020	Scantek, Inc./ NVLAP	Oct 31, 2021
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env./ A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Feb 4, 2021	ACR Env. / A2LA	Feb 4, 2022
HM30-Thommen	Meteo Station	1040170/39633	Dec 7, 2020	ACR Env./ A2LA	Dec 7, 2021
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 26, 2020	Scantek, Inc./ NVLAP	Oct 26, 2021

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 (%)
22.1	100.31	40.9

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	8/26/2021	Date	8/27/2021

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B&K 2250 Unit #9 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49484

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/13/2023** *Cal Due:*		
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**3027810**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 3195885** **Preamplifier ZC0032 s/n 28658**	*See comments:*		
		Contains non-accredited tests: __Yes **X** No		
Type (class):	**1**	*Calibration service:* __ Basic **X** Standard		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	May 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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 (%)
22.8	100.04	38.0

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	4/13/2023	Date	4/14/2023

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B&K 2250 Unit #10 SLM Calibration Certificate

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2017, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP® CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.49480

Instrument:	**Sound Level Meter**	*Date Calibrated:* **4/13/2023**	*Cal Due:*	
Model:	**2250**	*Status:*	**Received**	**Sent**
Manufacturer:	**Brüel and Kjær**	*In tolerance:*	**X**	**X**
Serial number:	**3007542**	*Out of tolerance:*		
Tested with:	**Microphone 4189 s/n 2978664** **Preamplifier ZC0032 s/n 22379**	*See comments:*		
		Contains non-accredited tests: __Yes **X** No		
Type (class):	**1**	*Calibration service:* __ Basic **X** Standard		
Customer:	**ACI Acoustical Consultants Inc.**	*Address:* **5031 - 210 Street, Edmonton, Alberta, CANADA T6M 0A8**		
Tel/Fax:	**780-414-6373 / 780-414-6376**			

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	Aug 3, 2022	Scantek, Inc./ NVLAP	Aug 3, 2023
DS-360-SRS	Function Generator	61646	Dec 21, 2022	ACR Env./ A2LA	Dec 21, 2024
34401A-Keysight	Digital Voltmeter	US36126453	Apr 08, 2022	ACR Env./ A2LA	May 08, 2023
PTU300-Vaisala	Environment Monitor	P5011262	Sept 15, 2022	ACR Env./ A2LA	Sept 15, 2023
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Oct 31, 2022	Scantek, Inc./ NVLAP	Oct 31, 2023

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	100.21	38.4

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	William Gallagher
Signature	Lydon Dawkins	Signature	William Gallagher
Date	4/13/2023	Date	4/14/2023

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Appendix II THE ASSESSMENT OF ENVIRONMENTAL NOISE (GENERAL)

Sound Pressure Level

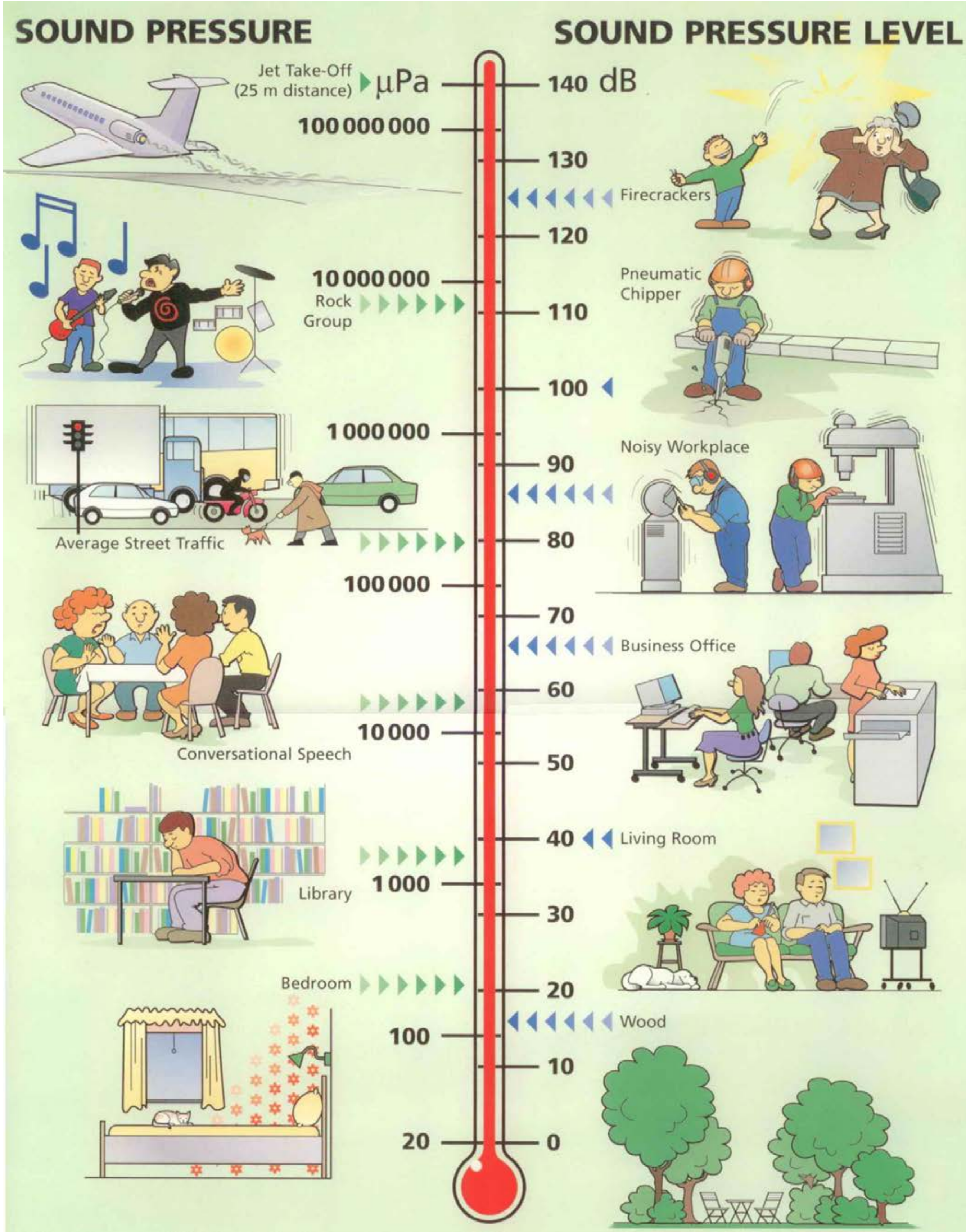
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we 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
Pneumatic Chipper
110
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

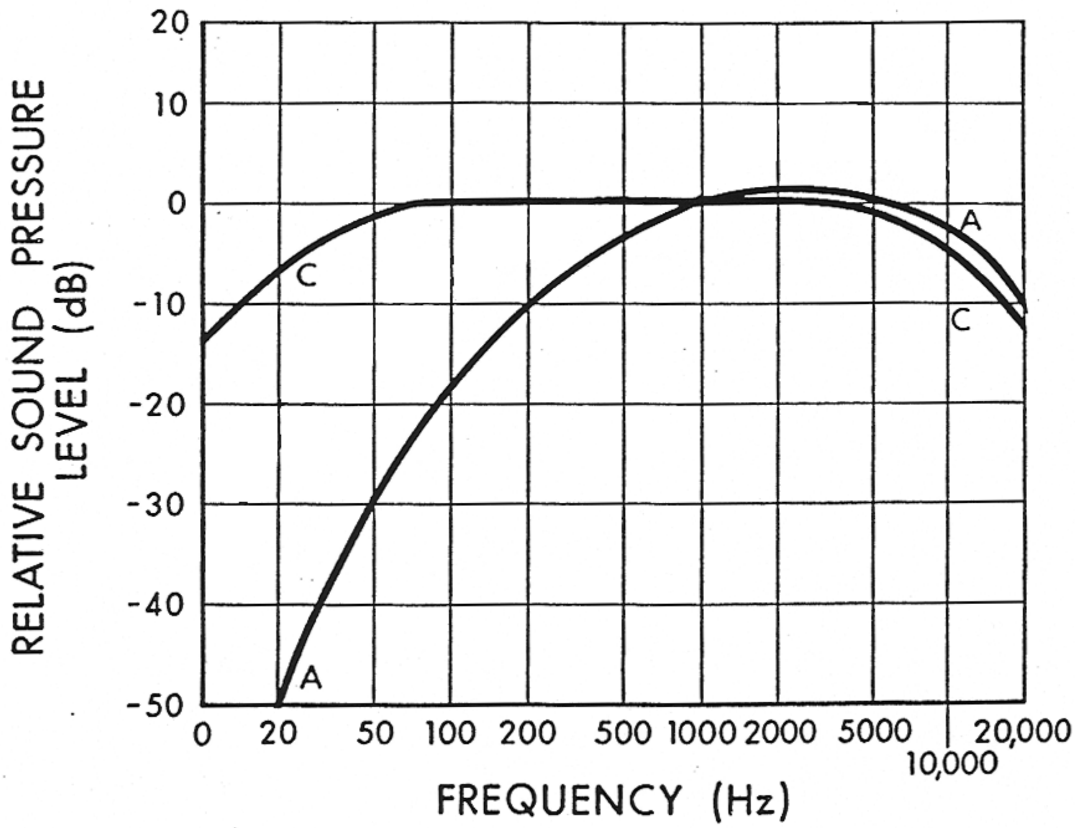
Frequency

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
			22.4	**25**	28.2
22	**31.5**	44	28.2	**31.5**	35.5
			35.5	**40**	44.7
			44.7	**50**	56.2
44	**63**	88	56.2	**63**	70.8
			70.8	**80**	89.1
			89.1	**100**	112
88	**125**	177	112	**125**	141
			141	**160**	178
			178	**200**	224
177	**250**	355	224	**250**	282
			282	**315**	355
			355	**400**	447
355	**500**	710	447	**500**	562
			562	**630**	708
			708	**800**	891
710	**1000**	1420	891	**1000**	1122
			1122	**1250**	1413
			1413	**1600**	1778
1420	**2000**	2840	1778	**2000**	2239
			2239	**2500**	2818
			2818	**3150**	3548
2840	**4000**	5680	3548	**4000**	4467
			4467	**5000**	5623
			5623	**6300**	7079
5680	**8000**	11360	7079	**8000**	8913
			8913	**10000**	11220
			11220	**12500**	14130
11360	**16000**	22720	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 nighttime (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 nighttime

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.

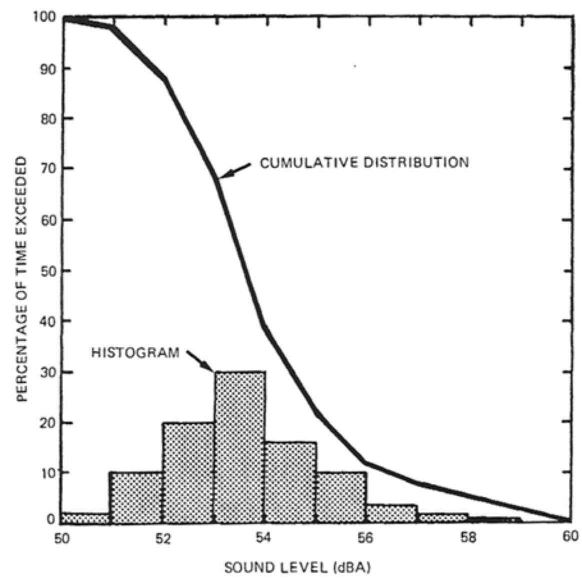


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

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:

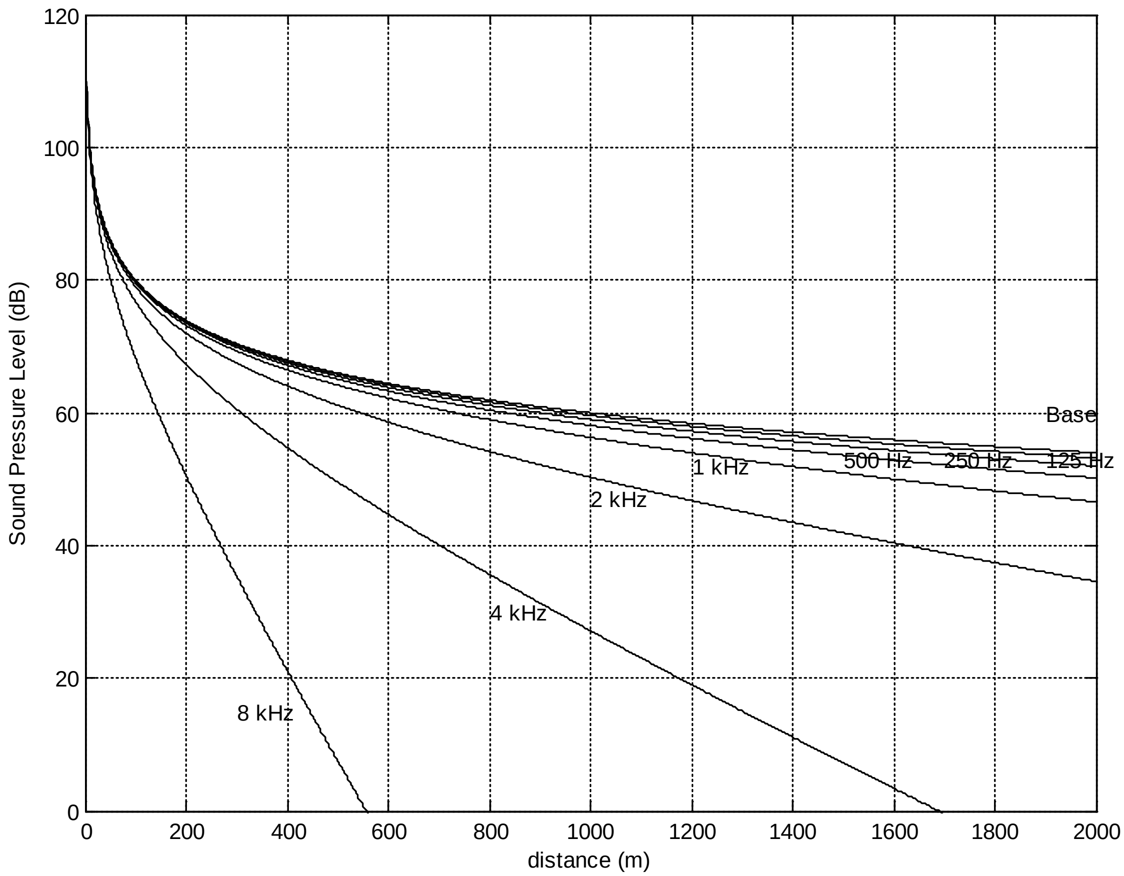
1) **Viscous Effects** - Dissipation of acoustic energy due to fluid friction which results in thermodynamically irreversible propagation of sound.
2) **Heat Conduction Effects** - Heat transfer between high and low temperature regions in the wave which result in non-adiabatic propagation of the sound.
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.

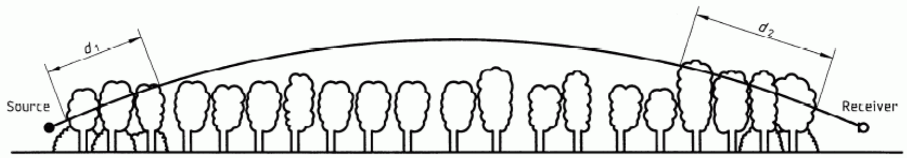
Topography
- One of the most important factors in sound propagation.
- Can provide a natural barrier between source and receiver (i.e. if berm or hill in between).
- Can provide a natural amplifier between source and receiver (i.e. large valley in between or hard reflective surface in between).
- Must 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	**Nominal midband frequency** Hz							
m	63	125	250	500	1 000	2 000	4 000	8 000
	Attenuation, dB:							
$10 \leq d_f \leq 20$	0	0	1	1	1	1	2	3
	Attenuation, dB/m:							
$20 \leq d_f \leq 200$	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

[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

[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	Noise Level (dBA)	Duration (min)	Reason
8/27/23 22:06	8/27/23 22:07	52.8	1.0	Loud Vehicle Pass by
8/27/23 22:09	8/27/23 22:09	47.8	0.5	Loud Vehicle Pass by
8/27/23 22:16	8/27/23 22:17	55.4	0.8	Loud Vehicle Pass by
8/27/23 22:28	8/27/23 22:28	48.3	0.8	Loud Vehicle Pass by
8/27/23 22:31	8/27/23 22:32	50.3	0.8	Loud Vehicle Pass by
8/27/23 22:55	8/27/23 22:55	51.5	0.5	Loud Vehicle Pass by
8/27/23 23:08	8/27/23 23:09	53.0	1.0	Loud Vehicle Pass by
8/27/23 23:36	8/27/23 23:37	53.0	0.8	Loud Vehicle Pass by
8/27/23 23:39	8/27/23 23:39	74.4	0.3	Loud Vehicle Pass by
8/27/23 23:58	8/27/23 23:59	49.2	1.0	Train Pass by
8/28/23 00:00	8/28/23 00:02	49.3	2.3	Coyote
8/28/23 00:02	8/28/23 00:03	51.2	0.8	Loud Vehicle Pass by
8/28/23 00:24	8/28/23 00:25	44.8	0.8	Loud Vehicle Pass by
8/28/23 00:27	8/28/23 00:28	47.9	0.5	Loud Vehicle Pass by
8/28/23 00:47	8/28/23 00:48	46.8	0.8	Loud Vehicle Pass by
8/28/23 01:06	8/28/23 01:10	46.6	3.3	Loud Vehicle Pass by
8/28/23 01:32	8/28/23 01:33	47.8	0.8	Loud Vehicle Pass by
8/28/23 01:36	8/28/23 01:36	48.7	0.8	Loud Vehicle Pass by
8/28/23 01:54	8/28/23 01:55	46.9	1.0	Loud Vehicle Pass by
8/28/23 02:26	8/28/23 02:26	47.8	0.5	Loud Vehicle Pass by
8/28/23 02:27	8/28/23 02:29	53.6	1.5	Loud Vehicle Pass by
8/28/23 02:36	8/28/23 02:37	48.5	0.8	Loud Vehicle Pass by
8/28/23 02:38	8/28/23 02:39	45.6	0.8	Loud Vehicle Pass by
8/28/23 02:49	8/28/23 02:50	46.7	1.0	Loud Vehicle Pass by
8/28/23 02:54	8/28/23 02:55	47.3	1.0	Loud Vehicle Pass by
8/28/23 03:05	8/28/23 03:06	47.8	0.8	Train Pass by
8/28/23 03:09	8/28/23 03:10	50.5	1.3	Train Pass by
8/28/23 03:47	8/28/23 03:48	45.5	1.3	Loud Vehicle Pass by
8/28/23 04:07	8/28/23 04:08	49.0	1.0	Loud Vehicle Pass by
8/28/23 04:11	8/28/23 04:12	49.3	0.5	Loud Vehicle Pass by
8/28/23 04:15	8/28/23 04:16	49.4	1.0	Loud Vehicle Pass by
8/28/23 04:29	8/28/23 04:29	51.5	0.5	Loud Vehicle Pass by
8/28/23 04:38	8/28/23 04:39	53.5	1.3	Loud Vehicle Pass by
8/28/23 04:49	8/28/23 04:50	60.9	1.0	Loud Vehicle Pass by
8/28/23 05:08	8/28/23 05:09	59.5	0.8	Loud Vehicle Pass by
8/28/23 05:19	8/28/23 05:20	58.9	0.8	Loud Vehicle Pass by
8/28/23 05:32	8/28/23 05:33	58.8	0.5	Loud Vehicle Pass by
8/28/23 05:43	8/28/23 05:43	59.8	0.5	Loud Vehicle Pass by
8/28/23 06:02	8/28/23 06:03	58.0	1.3	Loud Vehicle Pass by
8/28/23 06:08	8/28/23 06:09	62.4	0.8	Loud Vehicle Pass by
8/28/23 06:35	8/28/23 06:36	66.9	0.8	Loud Vehicle Pass by
8/28/23 06:48	8/28/23 06:50	62.9	1.8	Loud Vehicle Pass by
8/28/23 22:06	8/28/23 22:07	53.5	0.8	Loud Vehicle Pass by
8/28/23 22:12	8/28/23 22:14	56.8	1.3	Loud Vehicle Pass by
8/28/23 22:27	8/28/23 22:29	54.5	1.5	Train Pass by
8/28/23 23:03	8/28/23 23:05	56.3	1.5	Loud Vehicle Pass by
8/28/23 23:16	8/28/23 23:17	52.8	1.0	Loud Vehicle Pass by
8/28/23 23:19	8/28/23 23:20	53.8	1.5	Train Pass by
8/28/23 23:33	8/28/23 23:34	54.1	1.5	Loud Vehicle Pass by
8/29/23 01:24	8/29/23 01:25	55.3	1.5	Loud Vehicle Pass by
8/29/23 01:44	8/29/23 01:45	51.2	1.5	Train Pass by

Data Removal Noise Monitoring Location #1 Cont.

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
8/29/23 01:52	8/29/23 01:54	53.5	1.8	Train Pass by
8/29/23 02:36	8/29/23 02:37	50.8	1.0	Loud Vehicle Pass by
8/29/23 02:44	8/29/23 02:45	55.5	1.5	Loud Vehicle Pass by
8/29/23 03:00	8/29/23 03:01	51.0	1.0	Loud Vehicle Pass by
8/29/23 03:10	8/29/23 03:10	70.3	0.3	Loud Vehicle Pass by
8/29/23 03:30	8/29/23 03:32	55.5	1.3	Loud Vehicle Pass by
8/29/23 04:11	8/29/23 04:12	53.5	0.5	Loud Vehicle Pass by
8/29/23 04:58	8/29/23 04:59	58.7	1.0	Loud Vehicle Pass by
8/29/23 05:12	8/29/23 05:13	59.2	1.0	Loud Vehicle Pass by
8/29/23 05:26	8/29/23 05:27	64.3	1.0	Loud Vehicle Pass by
8/29/23 06:09	8/29/23 06:10	62.7	0.5	Loud Vehicle Pass by
8/29/23 06:34	8/29/23 06:36	64.8	2.0	Loud Vehicle Pass by
8/29/23 06:57	8/29/23 06:58	71.4	0.8	Loud Vehicle Pass by
		Total Night #1	39.0	
		Total Night #2	25.5	
		Total Data	**64.5**	

Data Removal Noise Monitoring Location #2

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:02	7/06/23 22:03	53.9	1.0	Train Pass by
7/06/23 22:19	7/06/23 22:27	58.0	7.8	Train Pass by
7/06/23 22:38	7/06/23 22:40	53.1	2.3	Train Pass by
7/06/23 22:46	7/06/23 22:47	52.1	0.5	Loud Vehicle Pass by
7/06/23 23:16	7/06/23 23:17	52.7	1.0	Train Pass by
7/06/23 23:23	7/06/23 23:24	50.1	1.0	Loud Vehicle Pass by
7/06/23 23:26	7/06/23 23:26	52.1	0.5	Loud Vehicle Pass by
7/06/23 23:31	7/06/23 23:37	60.7	6.0	Train Pass by
7/06/23 23:51	7/06/23 23:52	54.5	1.0	Train Pass by
7/06/23 23:55	7/07/23 00:05	55.9	10.0	Train Pass by
7/07/23 00:37	7/07/23 00:39	55.2	1.5	Train Pass by
7/07/23 00:42	7/07/23 00:44	55.1	1.5	Train Pass by
7/07/23 00:45	7/07/23 00:47	55.9	1.8	Train Pass by
7/07/23 01:17	7/07/23 01:18	55.6	1.0	Train Pass by
7/07/23 02:36	7/07/23 02:39	61.7	3.3	Train Pass by
7/07/23 02:40	7/07/23 02:44	58.4	3.5	Train Pass by
7/07/23 02:48	7/07/23 02:49	55.9	1.8	Train Pass by
7/07/23 02:52	7/07/23 02:54	56.8	1.3	Train Pass by
7/07/23 02:55	7/07/23 02:57	64.8	2.0	Train Pass by
7/07/23 02:59	7/07/23 03:00	55.5	1.0	Train Pass by
7/07/23 03:05	7/07/23 03:08	53.8	3.3	Train Pass by
7/07/23 04:40	7/07/23 04:41	56.4	1.0	Train Pass by
7/07/23 04:51	7/07/23 04:53	51.6	1.5	Train Pass by
7/07/23 04:57	7/07/23 04:58	52.2	1.5	Loud Vehicle Pass by
7/07/23 04:59	7/07/23 05:00	50.9	1.0	Loud Vehicle Pass by
7/07/23 05:06	7/07/23 05:07	50.2	1.3	Loud Vehicle Pass by
7/07/23 05:16	7/07/23 05:20	53.2	4.3	Train Pass by
7/07/23 05:30	7/07/23 05:31	52.6	1.5	Loud Vehicle Pass by
7/07/23 05:40	7/07/23 05:41	52.5	0.5	Loud Vehicle Pass by
7/07/23 05:46	7/07/23 05:48	55.6	1.5	Train Pass by
7/07/23 05:55	7/07/23 05:56	54.2	0.8	Loud Vehicle Pass by
7/07/23 06:18	7/07/23 06:21	54.6	2.8	Loud Vehicle Pass by
7/07/23 22:14	7/07/23 22:17	52.3	3.0	Loud Vehicle Pass by
7/07/23 22:44	7/07/23 22:46	51.9	2.0	Loud Vehicle Pass by
7/07/23 22:56	7/07/23 22:57	57.5	1.0	Train Pass by
7/07/23 23:13	7/07/23 23:13	52.9	0.5	Train Pass by
7/07/23 23:30	7/07/23 23:31	53.8	0.8	Train Pass by
7/07/23 23:33	7/07/23 23:33	55.4	0.5	Train Pass by
7/08/23 00:09	7/08/23 00:21	53.9	12.5	Train Pass by
7/08/23 00:27	7/08/23 00:30	54.9	2.8	Train Pass by
7/08/23 00:51	7/08/23 00:53	52.8	2.0	Train Pass by
7/08/23 01:44	7/08/23 01:46	51.0	2.3	Train Pass by
7/08/23 02:02	7/08/23 02:03	51.2	0.5	Train Pass by
7/08/23 02:26	7/08/23 02:28	59.1	2.3	Train Pass by
7/08/23 02:57	7/08/23 02:59	54.1	2.0	Train Pass by
7/08/23 04:05	7/08/23 04:06	53.9	0.8	Loud Vehicle Pass by
7/08/23 04:59	7/08/23 05:00	54.9	1.3	Train Pass by
7/08/23 05:01	7/08/23 05:03	52.4	2.5	Train Pass by
7/08/23 05:45	7/08/23 05:47	55.5	2.0	Loud Vehicle Pass by
7/08/23 06:05	7/08/23 06:06	53.7	0.8	Loud Vehicle Pass by
7/08/23 06:24	7/08/23 06:25	54.3	1.0	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #2 Cont.

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/08/23 06:48	7/08/23 06:49	53.7	1.8	Loud Vehicle Pass by
		Total Night #1	70.3	
		Total Night #2	42.0	
		Total Data	**112.3**	

Data Removal Noise Monitoring Location #3

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:06	7/06/23 22:07	58.3	0.8	Loud Vehicle Pass by
7/06/23 22:13	7/06/23 22:14	71.3	0.3	Loud Vehicle Pass by
7/06/23 22:18	7/06/23 22:19	53.4	1.3	Loud Vehicle Pass by
7/06/23 22:31	7/06/23 22:33	56.4	2.0	Train Pass by
7/06/23 22:33	7/06/23 22:33	56.9	0.5	Loud Vehicle Pass by
7/06/23 22:37	7/06/23 22:38	53.2	0.8	Loud Vehicle Pass by
7/06/23 22:39	7/06/23 22:45	58.3	6.0	Train Pass by
7/06/23 22:45	7/06/23 22:53	51.0	8.0	Train Pass by
7/06/23 22:58	7/06/23 22:59	53.6	1.3	Loud Vehicle Pass by
7/06/23 23:27	7/06/23 23:28	56.7	1.5	Loud Vehicle Pass by
7/06/23 23:41	7/06/23 23:42	50.9	1.0	Train Pass by
7/07/23 00:42	7/07/23 00:48	63.6	6.5	Train Pass by
7/07/23 01:08	7/07/23 01:09	48.6	0.8	Train Pass by
7/07/23 01:56	7/07/23 01:57	54.4	1.0	Loud Vehicle Pass by
7/07/23 01:58	7/07/23 01:59	57.6	1.3	Loud Vehicle Pass by
7/07/23 02:14	7/07/23 02:15	50.4	1.0	Loud Vehicle Pass by
7/07/23 02:18	7/07/23 02:20	50.9	2.5	Loud Vehicle Pass by
7/07/23 02:27	7/07/23 02:30	54.9	3.0	Train Pass by
7/07/23 02:33	7/07/23 02:40	57.7	7.3	Train Pass by
7/07/23 02:43	7/07/23 02:44	47.2	0.8	Train Pass by
7/07/23 02:53	7/07/23 02:53	48.6	0.5	Train Pass by
7/07/23 02:55	7/07/23 02:57	48.2	1.8	Train Pass by
7/07/23 03:01	7/07/23 03:02	51.0	1.0	Train Pass by
7/07/23 03:08	7/07/23 03:26	54.1	17.5	Train Pass by
7/07/23 04:01	7/07/23 04:15	56.4	13.8	Train Pass by
7/07/23 04:31	7/07/23 04:37	57.9	6.3	Train Pass by
7/07/23 05:08	7/07/23 05:09	52.9	1.3	Excessive Bird Noise
7/07/23 05:23	7/07/23 05:23	54.5	0.8	Loud Vehicle Pass by
7/07/23 05:24	7/07/23 05:26	50.8	2.0	Loud Vehicle Pass by
7/07/23 05:28	7/07/23 05:29	56.3	1.5	Loud Vehicle Pass by
7/07/23 05:30	7/07/23 05:33	60.0	2.8	Loud Vehicle Pass by
7/07/23 05:34	7/07/23 05:35	55.2	1.5	Loud Vehicle Pass by
7/07/23 05:35	7/07/23 05:36	54.6	1.0	Loud Vehicle Pass by
7/07/23 05:37	7/07/23 05:38	51.5	1.0	Train Pass by
7/07/23 05:56	7/07/23 05:57	56.3	1.0	Loud Vehicle Pass by
7/07/23 06:01	7/07/23 06:04	55.5	2.3	Loud Vehicle Pass by
7/07/23 06:21	7/07/23 06:22	62.4	1.3	Loud Vehicle Pass by
7/07/23 06:23	7/07/23 06:24	54.3	1.0	Loud Vehicle Pass by
7/07/23 06:25	7/07/23 06:26	56.2	1.0	Loud Vehicle Pass by
7/07/23 06:27	7/07/23 06:28	51.1	0.8	Loud Vehicle Pass by
7/07/23 06:32	7/07/23 06:33	58.2	1.0	Loud Vehicle Pass by
7/07/23 06:33	7/07/23 06:34	60.7	1.0	Loud Vehicle Pass by
7/07/23 06:34	7/07/23 06:37	62.5	2.3	Loud Vehicle Pass by
7/07/23 06:38	7/07/23 06:39	56.0	1.0	Loud Vehicle Pass by
7/07/23 06:41	7/07/23 06:42	48.3	0.8	Loud Vehicle Pass by
7/07/23 06:42	7/07/23 06:43	62.0	1.3	Loud Vehicle Pass by
7/07/23 06:43	7/07/23 06:44	49.7	0.8	Loud Vehicle Pass by
7/07/23 06:46	7/07/23 06:47	53.0	1.8	Loud Vehicle Pass by
7/07/23 06:49	7/07/23 06:50	56.1	0.8	Loud Vehicle Pass by
7/07/23 06:51	7/07/23 06:52	55.2	1.0	Loud Vehicle Pass by
7/07/23 06:53	7/07/23 06:53	60.2	0.8	Loud Vehicle Pass by
7/07/23 06:54	7/07/23 06:56	57.6	2.3	Loud Vehicle Pass by
7/07/23 06:57	7/07/23 06:58	59.4	1.3	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #3 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/07/23 06:59	7/07/23 06:59	50.5	0.8	Loud Vehicle Pass by
7/07/23 22:04	7/07/23 22:05	50.5	1.3	Loud Vehicle Pass by
7/07/23 22:23	7/07/23 22:25	62.3	2.3	Train Pass by
7/07/23 22:33	7/07/23 22:40	50.7	7.0	Train Pass by
7/07/23 22:43	7/07/23 23:01	57.3	18.0	Train Pass by
7/07/23 23:51	7/07/23 23:53	57.9	1.5	Loud Vehicle Pass by
7/08/23 00:14	7/08/23 00:15	54.1	1.5	Loud Vehicle Pass by
7/08/23 02:02	7/08/23 02:04	52.0	2.3	Train Pass by
7/08/23 02:07	7/08/23 02:14	56.9	7.5	Train Pass by
7/08/23 02:33	7/08/23 02:34	56.1	1.3	Train Pass by
7/08/23 02:38	7/08/23 02:44	63.4	5.8	Train Pass by
7/08/23 02:46	7/08/23 02:47	61.0	1.0	Train Pass by
7/08/23 02:51	7/08/23 02:53	64.4	2.5	Train Pass by
7/08/23 03:00	7/08/23 03:01	49.3	0.8	Train Pass by
7/08/23 03:09	7/08/23 03:10	50.9	1.3	Loud Vehicle Pass by
7/08/23 03:23	7/08/23 03:26	58.8	3.8	Train Pass by
7/08/23 03:37	7/08/23 03:37	54.8	0.8	Loud Vehicle Pass by
7/08/23 04:03	7/08/23 04:07	53.7	4.5	Train Pass by
7/08/23 04:09	7/08/23 04:11	55.9	2.0	Train Pass by
7/08/23 04:25	7/08/23 04:27	59.0	2.0	Train Pass by
7/08/23 04:36	7/08/23 04:37	53.0	1.0	Train Pass by
7/08/23 04:55	7/08/23 04:55	54.0	0.5	Train Pass by
7/08/23 05:04	7/08/23 05:05	56.5	0.8	Train Pass by
7/08/23 05:08	7/08/23 05:09	57.7	1.3	Train Pass by
7/08/23 05:25	7/08/23 05:26	59.6	0.8	Loud Vehicle Pass by
7/08/23 05:28	7/08/23 05:30	56.6	1.8	Loud Vehicle Pass by
7/08/23 05:36	7/08/23 05:37	57.8	1.0	Loud Vehicle Pass by
7/08/23 05:47	7/08/23 05:49	54.2	1.3	Loud Vehicle Pass by
7/08/23 05:50	7/08/23 05:51	58.1	1.3	Loud Vehicle Pass by
7/08/23 06:14	7/08/23 06:15	57.8	0.8	Loud Vehicle Pass by
7/08/23 06:20	7/08/23 06:21	55.9	1.0	Loud Vehicle Pass by
7/08/23 06:25	7/08/23 06:27	59.7	1.8	Loud Vehicle Pass by
7/08/23 06:39	7/08/23 06:40	60.4	1.8	Loud Vehicle Pass by
7/08/23 06:47	7/08/23 06:49	57.9	1.8	Loud Vehicle Pass by
7/08/23 06:50	7/08/23 06:51	54.5	1.3	Loud Vehicle Pass by
7/08/23 06:52	7/08/23 06:56	55.6	3.8	Train Pass by
		Total Night #1	123.5	
		Total Night #2	88.3	
		Total Data	**211.8**	

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Data Removal Noise Monitoring Location #4

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:27	7/06/23 22:28	47.3	1.3	Animal Noise
7/07/23 00:09	7/07/23 00:10	50.2	1.0	Train Pass by
7/07/23 00:12	7/07/23 00:14	49.9	1.8	Train Pass by
7/07/23 00:50	7/07/23 00:51	52.0	1.0	Train Pass by
7/07/23 01:27	7/07/23 01:28	51.3	0.8	Train Pass by
7/07/23 01:37	7/07/23 01:38	52.0	1.0	Train Pass by
7/07/23 01:42	7/07/23 01:45	50.4	2.5	Train Pass by
7/07/23 01:54	7/07/23 01:56	48.2	1.5	Train Pass by
7/07/23 02:45	7/07/23 02:46	49.6	0.5	Machinery Noise
7/07/23 03:10	7/07/23 03:16	50.0	5.5	Train Pass by
7/07/23 03:25	7/07/23 03:27	48.7	1.5	Loud Vehicle Pass by
7/07/23 04:52	7/07/23 04:54	50.0	1.5	Excessive Bird Noise
7/07/23 05:34	7/07/23 05:36	55.4	1.8	Excessive Bird Noise
7/07/23 06:36	7/07/23 06:38	52.5	1.5	Excessive Bird Noise
7/07/23 06:39	7/07/23 06:40	50.4	1.3	Excessive Bird Noise
7/07/23 06:43	7/07/23 06:44	50.1	1.3	Excessive Bird Noise
7/07/23 22:00	7/07/23 22:02	58.9	1.8	Animal Noise
7/07/23 22:08	7/07/23 22:09	57.1	1.8	Loud Vehicle Pass by
7/07/23 22:20	7/07/23 22:22	56.7	2.3	Animal Noise
7/07/23 22:42	7/07/23 22:44	46.5	2.0	Loud Vehicle Pass by
7/07/23 23:42	7/07/23 23:43	50.6	1.0	Loud Vehicle Pass by
7/07/23 23:48	7/07/23 23:49	50.9	1.5	Train Pass by
7/08/23 00:07	7/08/23 00:08	46.6	1.3	Loud Vehicle Pass by
7/08/23 00:50	7/08/23 00:50	47.5	0.5	Train Pass by
7/08/23 01:02	7/08/23 01:02	43.8	0.5	Train Pass by
7/08/23 01:04	7/08/23 01:05	44.8	0.8	Train Pass by
7/08/23 01:11	7/08/23 01:14	47.8	2.3	Train Pass by
7/08/23 01:15	7/08/23 01:16	46.5	1.3	Train Pass by
7/08/23 01:33	7/08/23 01:35	45.4	2.3	Train Pass by
7/08/23 01:49	7/08/23 01:52	46.5	2.5	Loud Vehicle Pass by
7/08/23 01:53	7/08/23 01:54	41.6	0.8	Train Pass by
7/08/23 02:01	7/08/23 02:04	47.2	3.0	Train Pass by
7/08/23 02:08	7/08/23 02:08	43.9	0.8	Train Pass by
7/08/23 02:27	7/08/23 02:29	51.7	2.8	Train Pass by
7/08/23 02:31	7/08/23 02:33	50.9	2.5	Train Pass by
7/08/23 02:45	7/08/23 02:48	60.3	2.3	Loud Vehicle Pass by
7/08/23 03:05	7/08/23 03:06	50.3	1.5	Train Pass by
7/08/23 03:20	7/08/23 03:23	50.5	3.0	Train Pass by
7/08/23 04:32	7/08/23 04:33	52.0	1.0	Train Pass by
7/08/23 05:11	7/08/23 05:12	51.9	1.3	Train Pass by
7/08/23 05:37	7/08/23 05:39	52.3	2.0	Train Pass by
7/08/23 05:49	7/08/23 05:50	53.1	1.3	Animal Noise
7/08/23 06:42	7/08/23 06:44	53.9	2.0	Loud Vehicle Pass by
7/08/23 06:53	7/08/23 06:53	55.3	0.5	Train Pass by
7/08/23 06:57	7/08/23 06:59	55.3	2.0	Train Pass by
		Total Night #1	25.5	
		Total Night #2	48.0	
		Total Data	**73.5**	

Data Removal Noise Monitoring Location #5

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:06	7/06/23 22:12	52.1	6.0	Train Pass by
7/06/23 22:19	7/06/23 22:23	63.3	3.8	Train Pass by
7/06/23 22:25	7/06/23 22:33	50.4	7.8	Excessive Bird Noise
7/06/23 22:38	7/06/23 22:47	63.0	8.8	Train Pass by
7/06/23 23:12	7/06/23 23:13	53.7	1.0	Train Pass by
7/06/23 23:18	7/06/23 23:20	48.8	1.5	Train Pass by
7/07/23 02:00	7/07/23 02:01	56.5	1.3	Train Pass by
7/07/23 02:07	7/07/23 02:09	55.7	1.8	Train Pass by
7/07/23 03:21	7/07/23 03:22	55.7	1.5	Train Pass by
7/07/23 03:29	7/07/23 03:31	59.3	1.5	Train Pass by
7/07/23 03:37	7/07/23 03:38	57.8	1.5	Loud Vehicle Pass by
7/07/23 04:11	7/07/23 04:12	64.2	0.8	Train Pass by
7/07/23 04:14	7/07/23 04:16	73.0	2.5	Train Pass by
7/07/23 05:20	7/07/23 05:23	56.0	2.8	Loud Vehicle Pass by
7/07/23 05:56	7/07/23 05:57	61.1	1.0	Loud Vehicle Pass by
7/07/23 06:08	7/07/23 06:09	54.9	1.0	Loud Vehicle Pass by
7/07/23 06:20	7/07/23 06:21	58.8	1.5	Loud Vehicle Pass by
7/07/23 06:26	7/07/23 06:36	60.9	9.3	Loud Vehicle Pass by
7/07/23 06:36	7/07/23 06:37	57.2	1.0	Loud Vehicle Pass by
7/07/23 06:38	7/07/23 06:39	58.5	1.3	Loud Vehicle Pass by
7/07/23 06:40	7/07/23 06:42	59.6	2.0	Loud Vehicle Pass by
7/07/23 06:42	7/07/23 06:44	65.5	1.8	Loud Vehicle Pass by
7/07/23 06:44	7/07/23 06:45	64.4	1.0	Loud Vehicle Pass by
7/07/23 06:45	7/07/23 06:46	60.5	1.0	Loud Vehicle Pass by
7/07/23 06:47	7/07/23 06:48	63.2	1.5	Loud Vehicle Pass by
7/07/23 06:49	7/07/23 06:50	59.9	1.8	Loud Vehicle Pass by
7/07/23 06:51	7/07/23 06:53	64.4	1.8	Loud Vehicle Pass by
7/07/23 06:53	7/07/23 06:55	59.7	2.5	Loud Vehicle Pass by
7/07/23 06:56	7/07/23 06:58	61.7	2.0	Loud Vehicle Pass by
7/07/23 06:59	7/07/23 06:59	56.2	0.8	Loud Vehicle Pass by
7/07/23 22:13	7/07/23 22:16	55.4	3.0	Loud Vehicle Pass by
7/07/23 22:19	7/07/23 22:20	53.9	0.5	Loud Vehicle Pass by
7/08/23 02:20	7/08/23 02:21	58.2	0.8	Loud Vehicle Pass by
7/08/23 03:52	7/08/23 03:54	75.9	1.8	Excessive Bird Noise
7/08/23 03:57	7/08/23 04:02	74.5	5.5	Excessive Bird Noise
7/08/23 04:05	7/08/23 04:07	70.8	1.5	Excessive Bird Noise
7/08/23 04:10	7/08/23 04:12	74.6	2.3	Excessive Bird Noise
7/08/23 04:13	7/08/23 04:15	74.9	2.3	Excessive Bird Noise
7/08/23 04:18	7/08/23 04:20	74.6	2.3	Excessive Bird Noise
7/08/23 04:28	7/08/23 04:29	58.6	1.0	Excessive Bird Noise
7/08/23 04:39	7/08/23 04:46	59.2	7.0	Excessive Bird Noise
7/08/23 04:57	7/08/23 05:02	59.8	5.3	Excessive Bird Noise
7/08/23 05:15	7/08/23 05:20	58.1	4.5	Excessive Bird Noise
7/08/23 05:55	7/08/23 05:56	59.0	1.3	Excessive Bird Noise
7/08/23 05:59	7/08/23 06:00	57.2	1.0	Loud Vehicle Pass by
7/08/23 06:06	7/08/23 06:07	58.1	0.8	Loud Vehicle Pass by
7/08/23 06:15	7/08/23 06:18	56.5	2.3	Loud Vehicle Pass by
7/08/23 06:21	7/08/23 06:22	58.8	1.3	Loud Vehicle Pass by
7/08/23 06:24	7/08/23 06:25	57.8	1.0	Loud Vehicle Pass by
7/08/23 06:28	7/08/23 06:30	58.7	2.0	Loud Vehicle Pass by
7/08/23 06:30	7/08/23 06:33	62.6	2.3	Loud Vehicle Pass by
7/08/23 06:33	7/08/23 06:35	58.5	2.5	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #5 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
		Total Night #1	73.3	
		Total Night #2	67.0	
		Total Data	**140.3**	

Data Removal Noise Monitoring Location #6

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
8/27/23 23:02	8/27/23 23:19	90.5	17.0	Machinery Noise
8/28/23 02:44	8/28/23 02:45	50.5	0.8	Loud Vehicle Pass by
8/28/23 02:49	8/28/23 02:49	51.0	0.8	Loud Vehicle Pass by
8/28/23 04:41	8/28/23 04:42	50.9	1.3	Loud Vehicle Pass by
8/28/23 05:28	8/28/23 05:29	60.8	1.0	Loud Vehicle Pass by
8/28/23 06:30	8/28/23 06:31	63.0	1.0	Loud Vehicle Pass by
8/28/23 06:52	8/28/23 06:53	65.1	1.3	Loud Vehicle Pass by
8/29/23 00:00	8/29/23 00:04	50.2	3.8	Train Pass by
8/29/23 01:31	8/29/23 01:33	53.8	2.0	Loud Vehicle Pass by
8/29/23 01:34	8/29/23 01:35	55.1	1.3	Loud Vehicle Pass by
8/29/23 05:25	8/29/23 05:26	58.3	1.0	Loud Vehicle Pass by
8/29/23 06:57	8/29/23 06:58	62.2	1.5	Loud Vehicle Pass by
		Total Night #1	23.0	
		Total Night #2	9.5	
		Total Data	**32.5**	

Data Removal Noise Monitoring Location #8

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:32	7/06/23 22:33	50.4	1.5	Loud Vehicle Pass by
7/06/23 22:35	7/06/23 22:36	51.7	1.5	Loud Vehicle Pass by
7/07/23 01:18	7/07/23 01:21	54.2	2.3	Loud Vehicle Pass by
7/07/23 01:24	7/07/23 01:25	53.5	0.5	Loud Vehicle Pass by
7/07/23 01:39	7/07/23 01:39	54.8	0.5	Loud Vehicle Pass by
7/07/23 01:44	7/07/23 01:44	54.6	0.5	Loud Vehicle Pass by
7/07/23 03:56	7/07/23 03:57	57.2	0.8	Excessive Bird Noise
7/07/23 05:46	7/07/23 05:47	54.7	0.8	Excessive Bird Noise
7/07/23 06:04	7/07/23 06:06	66.0	1.5	Excessive Bird Noise
7/07/23 06:28	7/07/23 06:28	53.5	0.8	Excessive Bird Noise
7/07/23 22:02	7/07/23 22:03	51.4	1.3	Train Pass by
7/07/23 22:59	7/07/23 23:00	52.9	1.0	Loud Vehicle Pass by
7/07/23 23:02	7/07/23 23:03	53.6	1.0	Loud Vehicle Pass by
7/07/23 23:36	7/07/23 23:38	54.2	1.5	Train Pass by
7/07/23 23:51	7/07/23 23:53	53.4	1.5	Train Pass by
7/08/23 00:02	7/08/23 00:03	52.0	0.5	Loud Vehicle Pass by
7/08/23 00:05	7/08/23 00:06	52.9	1.0	Loud Vehicle Pass by
7/08/23 01:44	7/08/23 01:44	54.3	0.8	Loud Vehicle Pass by
7/08/23 02:03	7/08/23 02:04	52.1	1.0	Loud Vehicle Pass by
7/08/23 02:07	7/08/23 02:08	53.4	0.8	Loud Vehicle Pass by
7/08/23 03:55	7/08/23 04:00	53.9	5.3	Excessive Bird Noise
7/08/23 04:01	7/08/23 04:06	55.0	4.5	Excessive Bird Noise
7/08/23 04:15	7/08/23 04:18	55.8	3.8	Excessive Bird Noise
7/08/23 04:20	7/08/23 04:28	55.9	8.3	Excessive Bird Noise
7/08/23 05:40	7/08/23 05:41	51.2	0.8	Excessive Bird Noise
7/08/23 06:56	7/08/23 06:57	54.6	1.0	Excessive Bird Noise
		Total Night #1	10.5	
		Total Night #2	33.8	
		Total Data	**44.3**	

Data Removal Noise Monitoring Location #9

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:04	7/06/23 22:05	45.4	1.0	Loud Vehicle Pass by
7/06/23 22:18	7/06/23 22:19	47.1	1.0	Loud Vehicle Pass by
7/06/23 22:24	7/06/23 22:25	58.3	1.0	Loud Vehicle Pass by
7/06/23 22:31	7/06/23 22:33	46.4	1.3	Loud Vehicle Pass by
7/06/23 22:47	7/06/23 22:48	47.3	1.0	Aircraft Flyover
7/06/23 22:55	7/06/23 22:56	46.2	1.5	Aircraft Flyover
7/06/23 23:05	7/06/23 23:06	46.2	1.3	Loud Vehicle Pass by
7/06/23 23:12	7/06/23 23:13	46.3	1.3	Train Pass by
7/06/23 23:20	7/06/23 23:23	46.8	2.5	Train Pass by
7/06/23 23:24	7/06/23 23:25	50.0	1.3	Loud Vehicle Pass by
7/06/23 23:28	7/06/23 23:30	47.0	1.8	Loud Vehicle Pass by
7/06/23 23:38	7/06/23 23:40	44.7	1.8	Train Pass by
7/07/23 00:02	7/07/23 00:04	44.7	1.5	Train Pass by
7/07/23 00:45	7/07/23 00:46	56.2	1.3	Train Pass by
7/07/23 00:47	7/07/23 00:51	61.4	4.8	Train Pass by
7/07/23 00:57	7/07/23 00:58	49.1	1.0	Train Pass by
7/07/23 01:04	7/07/23 01:05	48.6	0.8	Loud Vehicle Pass by
7/07/23 01:07	7/07/23 01:08	50.1	1.5	Loud Vehicle Pass by
7/07/23 02:41	7/07/23 02:44	57.8	2.5	Train Pass by
7/07/23 04:04	7/07/23 04:08	52.6	4.8	Train Pass by
7/07/23 04:40	7/07/23 04:40	71.0	0.3	Excessive Bird Noise
7/07/23 04:51	7/07/23 04:55	50.9	3.5	Train Pass by
7/07/23 05:27	7/07/23 05:28	52.0	0.8	Train Pass by
7/07/23 05:44	7/07/23 05:45	52.6	1.0	Loud Vehicle Pass by
7/07/23 05:48	7/07/23 05:49	59.3	1.5	Loud Vehicle Pass by
7/07/23 06:38	7/07/23 06:39	52.4	1.0	Loud Vehicle Pass by
7/07/23 22:05	7/07/23 22:06	46.8	1.0	Loud Vehicle Pass by
7/07/23 22:08	7/07/23 22:09	48.2	1.0	Loud Vehicle Pass by
7/07/23 22:11	7/07/23 22:13	49.2	1.8	Loud Vehicle Pass by
7/07/23 22:43	7/07/23 22:45	47.1	1.5	Aircraft Flyover
7/07/23 22:54	7/07/23 22:55	49.8	1.3	Loud Vehicle Pass by
7/07/23 23:31	7/07/23 23:32	52.8	1.0	Train Pass by
7/07/23 23:32	7/07/23 23:33	56.4	1.0	Train Pass by
7/08/23 02:14	7/08/23 02:16	55.4	2.5	Train Pass by
7/08/23 02:43	7/08/23 02:51	54.0	7.5	Train Pass by
7/08/23 03:00	7/08/23 03:00	53.9	0.8	Train Pass by
7/08/23 03:02	7/08/23 03:04	52.0	2.0	Train Pass by
7/08/23 03:42	7/08/23 03:43	51.1	1.0	Train Pass by
7/08/23 03:44	7/08/23 03:45	49.3	0.8	Train Pass by
7/08/23 04:51	7/08/23 04:51	52.1	0.8	Loud Vehicle Pass by
7/08/23 04:55	7/08/23 05:00	50.7	4.5	Loud Vehicle Pass by
7/08/23 05:00	7/08/23 05:01	51.7	0.8	Train Pass by
7/08/23 05:01	7/08/23 05:02	51.7	1.0	Train Pass by
7/08/23 05:46	7/08/23 05:48	55.3	1.8	Loud Vehicle Pass by
7/08/23 06:39	7/08/23 06:41	55.8	1.8	Loud Vehicle Pass by
		Total Night #1	42.5	
		Total Night #2	33.5	
		Total Data	**76.0**	

Data Removal Noise Monitoring Location #10

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
8/27/23 22:00	8/27/23 22:01	56.4	1.0	Loud Vehicle Pass by
8/27/23 22:11	8/27/23 22:12	53.5	0.8	Loud Vehicle Pass by
8/27/23 22:29	8/27/23 22:31	58.7	2.3	Loud Vehicle Pass by
8/27/23 22:35	8/27/23 22:36	56.7	1.0	Loud Vehicle Pass by
8/27/23 22:59	8/27/23 23:00	63.5	1.3	Loud Vehicle Pass by
8/27/23 23:06	8/27/23 23:07	57.8	1.0	Loud Vehicle Pass by
8/27/23 23:09	8/27/23 23:09	54.8	0.8	Train Pass by
8/27/23 23:11	8/27/23 23:11	54.0	0.8	Train Pass by
8/27/23 23:19	8/27/23 23:20	59.4	1.3	Loud Vehicle Pass by
8/27/23 23:29	8/27/23 23:34	52.1	5.5	Train Pass by
8/28/23 00:00	8/28/23 00:01	60.2	1.5	Loud Vehicle Pass by
8/28/23 00:02	8/28/23 00:03	54.9	1.3	Train Pass by
8/28/23 00:19	8/28/23 00:21	55.1	1.3	Train Pass by
8/28/23 00:23	8/28/23 00:24	54.1	0.8	Loud Vehicle Pass by
8/28/23 00:33	8/28/23 00:34	53.5	0.8	Loud Vehicle Pass by
8/28/23 00:42	8/28/23 00:44	58.0	1.5	Loud Vehicle Pass by
8/28/23 01:05	8/28/23 01:07	60.2	1.5	Loud Vehicle Pass by
8/28/23 01:38	8/28/23 01:39	59.9	1.5	Loud Vehicle Pass by
8/28/23 02:57	8/28/23 02:58	60.0	1.0	Loud Vehicle Pass by
8/28/23 03:05	8/28/23 03:06	55.6	1.0	Train Pass by
8/28/23 03:28	8/28/23 03:29	61.2	1.3	Loud Vehicle Pass by
8/28/23 04:03	8/28/23 04:04	55.3	0.8	Loud Vehicle Pass by
8/28/23 04:33	8/28/23 04:34	53.9	0.8	Loud Vehicle Pass by
8/28/23 04:52	8/28/23 04:53	58.8	1.0	Loud Vehicle Pass by
8/28/23 04:54	8/28/23 04:56	57.9	1.8	Loud Vehicle Pass by
8/28/23 04:56	8/28/23 04:58	55.1	2.3	Loud Vehicle Pass by
8/28/23 05:01	8/28/23 05:04	57.4	3.3	Loud Vehicle Pass by
8/28/23 05:04	8/28/23 05:05	54.0	0.8	Loud Vehicle Pass by
8/28/23 05:06	8/28/23 05:08	53.9	2.0	Loud Vehicle Pass by
8/28/23 05:09	8/28/23 05:12	58.8	3.8	Loud Vehicle Pass by
8/28/23 05:13	8/28/23 05:14	55.5	1.0	Loud Vehicle Pass by
8/28/23 05:18	8/28/23 05:20	57.5	1.8	Loud Vehicle Pass by
8/28/23 05:22	8/28/23 05:26	57.3	4.0	Loud Vehicle Pass by
8/28/23 05:26	8/28/23 05:33	58.1	6.8	Loud Vehicle Pass by
8/28/23 05:33	8/28/23 05:36	59.9	2.5	Loud Vehicle Pass by
8/28/23 05:39	8/28/23 05:43	58.5	4.8	Loud Vehicle Pass by
8/28/23 05:44	8/28/23 05:48	56.0	3.8	Loud Vehicle Pass by
8/28/23 05:49	8/28/23 05:53	59.2	4.0	Loud Vehicle Pass by
8/28/23 05:54	8/28/23 06:01	60.8	7.3	Loud Vehicle Pass by
8/28/23 06:01	8/28/23 06:06	62.0	4.3	Loud Vehicle Pass by
8/28/23 06:06	8/28/23 06:11	59.3	4.8	Loud Vehicle Pass by
8/28/23 06:11	8/28/23 06:17	59.9	5.5	Loud Vehicle Pass by
8/28/23 06:17	8/28/23 06:20	60.2	3.0	Loud Vehicle Pass by
8/28/23 06:20	8/28/23 06:27	57.7	6.5	Loud Vehicle Pass by
8/28/23 06:28	8/28/23 06:29	60.2	1.3	Loud Vehicle Pass by
8/28/23 06:30	8/28/23 06:33	58.8	3.3	Loud Vehicle Pass by
8/28/23 06:33	8/28/23 06:35	58.8	1.3	Loud Vehicle Pass by
8/28/23 06:36	8/28/23 06:43	58.6	7.3	Loud Vehicle Pass by
8/28/23 06:44	8/28/23 06:49	58.7	5.0	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #10 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
8/28/23 06:49	8/28/23 06:59	59.8	9.8	Loud Vehicle Pass by
8/28/23 22:10	8/28/23 22:12	55.0	1.8	Train Pass by
8/28/23 22:18	8/28/23 22:21	53.8	2.8	Train Pass by
8/28/23 22:24	8/28/23 22:24	55.1	0.5	Loud Vehicle Pass by
8/28/23 22:29	8/28/23 22:30	60.7	1.3	Loud Vehicle Pass by
8/28/23 22:41	8/28/23 22:42	55.5	0.8	Loud Vehicle Pass by
8/28/23 22:42	8/28/23 22:43	55.9	1.0	Loud Vehicle Pass by
8/28/23 22:48	8/28/23 22:50	57.6	1.5	Loud Vehicle Pass by
8/28/23 22:53	8/28/23 22:54	56.3	0.8	Loud Vehicle Pass by
8/28/23 23:00	8/28/23 23:01	54.6	1.0	Loud Vehicle Pass by
8/28/23 23:05	8/28/23 23:06	57.5	1.8	Loud Vehicle Pass by
8/28/23 23:27	8/28/23 23:27	60.0	0.8	Loud Vehicle Pass by
8/28/23 23:33	8/28/23 23:41	57.7	7.3	Train Pass by
8/28/23 23:49	8/28/23 23:50	61.0	0.8	Loud Vehicle Pass by
8/28/23 23:58	8/28/23 23:59	61.6	0.8	Loud Vehicle Pass by
8/29/23 00:13	8/29/23 00:14	60.2	1.0	Loud Vehicle Pass by
8/29/23 01:32	8/29/23 01:34	59.8	1.5	Loud Vehicle Pass by
8/29/23 01:44	8/29/23 01:45	59.5	1.8	Loud Vehicle Pass by
8/29/23 01:47	8/29/23 01:49	58.4	2.0	Loud Vehicle Pass by
8/29/23 01:52	8/29/23 01:53	56.5	1.8	Train Pass by
8/29/23 02:33	8/29/23 02:35	58.4	2.0	Loud Vehicle Pass by
8/29/23 02:54	8/29/23 02:58	55.8	3.5	Train Pass by
8/29/23 03:12	8/29/23 03:13	55.1	0.8	Loud Vehicle Pass by
8/29/23 03:54	8/29/23 03:56	53.0	1.3	Loud Vehicle Pass by
8/29/23 04:17	8/29/23 04:18	60.2	1.5	Loud Vehicle Pass by
8/29/23 04:45	8/29/23 04:46	61.2	1.3	Loud Vehicle Pass by
8/29/23 04:50	8/29/23 04:51	57.4	1.0	Loud Vehicle Pass by
8/29/23 04:52	8/29/23 04:53	59.9	1.3	Loud Vehicle Pass by
8/29/23 04:55	8/29/23 04:58	57.7	2.8	Loud Vehicle Pass by
8/29/23 04:58	8/29/23 05:00	57.1	1.8	Loud Vehicle Pass by
8/29/23 05:00	8/29/23 05:02	54.9	1.8	Loud Vehicle Pass by
8/29/23 05:03	8/29/23 05:05	55.2	2.3	Loud Vehicle Pass by
8/29/23 05:06	8/29/23 05:10	55.8	4.5	Loud Vehicle Pass by
8/29/23 05:11	8/29/23 05:15	57.2	3.8	Loud Vehicle Pass by
8/29/23 05:16	8/29/23 05:18	56.8	1.5	Loud Vehicle Pass by
8/29/23 05:18	8/29/23 05:25	57.9	6.8	Loud Vehicle Pass by
8/29/23 05:26	8/29/23 05:31	57.4	5.3	Loud Vehicle Pass by
8/29/23 05:32	8/29/23 05:34	58.5	1.8	Loud Vehicle Pass by
8/29/23 05:35	8/29/23 05:36	56.9	1.5	Loud Vehicle Pass by
8/29/23 05:37	8/29/23 05:50	58.7	13.0	Loud Vehicle Pass by
8/29/23 05:51	8/29/23 05:56	57.4	5.0	Loud Vehicle Pass by
8/29/23 05:57	8/29/23 06:10	61.8	13.5	Loud Vehicle Pass by
8/29/23 06:11	8/29/23 06:25	60.1	14.3	Loud Vehicle Pass by
8/29/23 06:26	8/29/23 06:31	58.9	5.3	Loud Vehicle Pass by
8/29/23 06:31	8/29/23 06:38	59.8	6.3	Loud Vehicle Pass by
8/29/23 06:38	8/29/23 06:47	75.9	9.0	Grass Cutting
8/29/23 06:48	8/29/23 06:55	60.9	7.3	Loud Vehicle Pass by
8/29/23 06:55	8/29/23 06:59	62.3	4.0	Loud Vehicle Pass by

Data Removal Noise Monitoring Location #10 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
		Total Night #1	132.5	
		Total Night #2	154.0	
		Total Data	**286.5**	

Data Removal Noise Monitoring Location #11

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:09	7/06/23 22:10	52.1	0.5	Loud Vehicle Pass by
7/06/23 22:17	7/06/23 22:18	52.6	1.0	Loud Vehicle Pass by
7/06/23 22:27	7/06/23 22:28	56.7	0.8	Loud Vehicle Pass by
7/06/23 22:40	7/06/23 22:43	51.3	2.5	Train Pass by
7/06/23 22:51	7/06/23 22:54	49.7	2.3	Train Pass by
7/06/23 23:07	7/06/23 23:08	49.8	1.3	Train Pass by
7/06/23 23:12	7/06/23 23:13	48.5	1.0	Loud Vehicle Pass by
7/06/23 23:52	7/06/23 23:53	50.9	1.5	Train Pass by
7/07/23 01:04	7/07/23 01:07	52.7	3.3	Train Pass by
7/07/23 01:16	7/07/23 01:17	54.8	1.0	Loud Vehicle Pass by
7/07/23 01:26	7/07/23 01:27	53.5	0.8	Loud Vehicle Pass by
7/07/23 01:31	7/07/23 01:36	55.9	5.0	Train Pass by
7/07/23 01:36	7/07/23 01:37	55.6	0.8	Loud Vehicle Pass by
7/07/23 01:42	7/07/23 01:43	51.1	1.3	Train Pass by
7/07/23 01:51	7/07/23 01:52	55.1	0.8	Loud Vehicle Pass by
7/07/23 02:23	7/07/23 02:24	54.7	1.0	Train Pass by
7/07/23 05:18	7/07/23 05:24	56.8	5.3	Train Pass by
7/07/23 05:26	7/07/23 05:28	53.0	1.5	Train Pass by
7/07/23 05:31	7/07/23 05:37	56.9	6.0	Train Pass by
7/07/23 05:38	7/07/23 05:39	55.9	1.0	Loud Vehicle Pass by
7/07/23 05:41	7/07/23 05:45	55.5	4.3	Train Pass by
7/07/23 05:50	7/07/23 05:56	57.8	5.8	Train Pass by
7/07/23 22:01	7/07/23 22:04	53.8	2.3	Train Pass by
7/07/23 22:42	7/07/23 22:44	45.3	2.0	Aircraft Flyover
7/07/23 22:47	7/07/23 22:49	46.1	1.3	Loud Vehicle Pass by
7/07/23 22:52	7/07/23 22:56	51.5	3.3	Loud Vehicle Pass by
7/07/23 23:01	7/07/23 23:02	56.1	1.0	Loud Vehicle Pass by
7/07/23 23:03	7/07/23 23:06	46.4	3.0	Train Pass by
7/07/23 23:06	7/07/23 23:08	53.5	1.5	Loud Vehicle Pass by
7/07/23 23:15	7/07/23 23:16	56.0	1.8	Train Pass by
7/07/23 23:19	7/07/23 23:23	48.0	4.5	Train Pass by
7/07/23 23:26	7/07/23 23:27	68.3	0.3	Train Pass by
7/07/23 23:27	7/07/23 23:28	47.9	1.0	Train Pass by
7/07/23 23:28	7/07/23 23:29	44.7	0.8	Train Pass by
7/07/23 23:33	7/07/23 23:34	48.7	0.5	Train Pass by
7/07/23 23:39	7/07/23 23:44	58.6	4.8	Train Pass by
7/07/23 23:52	7/07/23 23:52	49.5	0.8	Train Pass by
7/08/23 00:00	7/08/23 00:01	46.4	1.0	Train Pass by
7/08/23 00:02	7/08/23 00:03	48.0	0.8	Train Pass by
7/08/23 00:33	7/08/23 00:37	51.5	3.3	Train Pass by
7/08/23 01:13	7/08/23 01:14	46.3	1.3	Train Pass by
7/08/23 01:15	7/08/23 01:19	49.6	3.8	Train Pass by
7/08/23 01:28	7/08/23 01:31	48.2	3.3	Train Pass by
7/08/23 01:43	7/08/23 01:44	44.1	0.8	Train Pass by
7/08/23 01:46	7/08/23 01:49	48.6	3.0	Train Pass by
7/08/23 01:53	7/08/23 01:57	51.8	4.0	Train Pass by
7/08/23 02:04	7/08/23 02:07	54.1	3.5	Train Pass by
7/08/23 02:10	7/08/23 02:15	50.6	5.0	Train Pass by
7/08/23 02:22	7/08/23 02:27	59.5	4.3	Train Pass by
7/08/23 02:40	7/08/23 02:41	48.1	1.5	Train Pass by
7/08/23 02:47	7/08/23 02:48	44.5	0.8	Train Pass by
7/08/23 02:51	7/08/23 02:51	47.1	0.5	Machinery Noise
7/08/23 02:52	7/08/23 02:53	44.1	1.3	Machinery Noise

Data Removal Noise Monitoring Location #11 (cont.)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/08/23 02:54	7/08/23 02:55	44.3	0.5	Machinery Noise
7/08/23 03:54	7/08/23 03:55	50.2	1.0	Train Pass by
7/08/23 04:05	7/08/23 04:07	50.5	1.5	Train Pass by
7/08/23 04:08	7/08/23 04:08	50.2	0.5	Train Pass by
7/08/23 04:12	7/08/23 04:12	49.2	0.5	Train Pass by
7/08/23 04:20	7/08/23 04:31	55.4	10.5	Train Pass by
7/08/23 04:38	7/08/23 04:39	51.4	1.0	Train Pass by
7/08/23 04:51	7/08/23 04:52	46.3	1.3	Train Pass by
7/08/23 05:06	7/08/23 05:08	51.0	2.8	Train Pass by
7/08/23 05:09	7/08/23 05:11	47.6	1.8	Train Pass by
7/08/23 05:19	7/08/23 05:19	43.4	0.8	Excessive Bird Noise
7/08/23 05:51	7/08/23 05:52	42.6	1.8	Excessive Bird Noise
7/08/23 05:53	7/08/23 05:53	66.1	0.3	Train Pass by
7/08/23 06:28	7/08/23 06:36	46.6	8.0	Train Pass by
7/08/23 06:38	7/08/23 06:42	45.7	4.3	Train Pass by
7/08/23 06:45	7/08/23 06:45	72.0	0.3	Train Pass by
7/08/23 06:48	7/08/23 06:48	70.3	0.3	Train Pass by
7/08/23 06:52	7/08/23 06:59	46.3	7.3	Train Pass by
7/08/23 06:59	7/08/23 07:00	71.9	0.3	Train Pass by
		Total Night #1	48.3	
		Total Night #2	110.5	
		Total Data	**158.8**	

Data Removal Noise Monitoring Location #12 (1st– 48 Hour Period)

Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/06/23 22:30	7/06/23 22:32	59.2	2.8	Loud Vehicle Pass by
7/06/23 22:42	7/06/23 22:43	53.5	1.0	Loud Vehicle Pass by
7/06/23 22:47	7/06/23 22:48	51.9	1.3	Loud Vehicle Pass by
7/06/23 23:56	7/06/23 23:57	53.7	1.8	Train Pass by
7/06/23 23:59	7/07/23 00:01	50.1	2.5	Train Pass by
7/07/23 00:19	7/07/23 00:21	45.5	1.5	Loud Vehicle Pass by
7/07/23 00:59	7/07/23 01:00	47.6	1.3	Loud Vehicle Pass by
7/07/23 01:51	7/07/23 02:01	51.7	10.3	Machinery Noise
7/07/23 02:57	7/07/23 02:58	56.9	0.8	Machinery Noise
7/07/23 03:20	7/07/23 03:21	56.1	1.3	Train Pass by
7/07/23 03:46	7/07/23 03:54	56.8	7.5	Train Pass by
7/07/23 04:33	7/07/23 04:34	50.7	1.8	Loud Vehicle Pass by
7/07/23 05:00	7/07/23 05:01	59.4	1.3	Loud Vehicle Pass by
7/07/23 05:31	7/07/23 05:31	59.9	0.8	Loud Vehicle Pass by
7/07/23 05:38	7/07/23 05:39	51.8	1.5	Loud Vehicle Pass by
7/07/23 05:47	7/07/23 05:51	55.9	3.5	Loud Vehicle Pass by
7/07/23 06:34	7/07/23 06:36	49.3	2.0	Excessive Bird Noise
7/07/23 06:44	7/07/23 06:45	49.1	0.8	Loud Vehicle Pass by
7/07/23 06:57	7/07/23 06:58	56.3	1.0	Loud Vehicle Pass by
7/07/23 22:09	7/07/23 22:11	44.2	1.5	Aircraft Flyover
7/07/23 22:28	7/07/23 22:29	48.6	0.8	Loud Vehicle Pass by
7/07/23 22:31	7/07/23 22:33	47.0	1.3	Loud Vehicle Pass by
7/08/23 00:04	7/08/23 00:05	48.7	1.0	Train Pass by
7/08/23 00:50	7/08/23 01:10	53.8	20.5	Train Pass by
7/08/23 01:21	7/08/23 01:25	47.5	4.5	Train Pass by
7/08/23 03:39	7/08/23 03:46	56.8	7.0	Train Pass by
7/08/23 04:40	7/08/23 04:41	58.5	1.0	Train Pass by
7/08/23 04:54	7/08/23 04:56	55.8	2.0	Loud Vehicle Pass by
7/08/23 05:26	7/08/23 05:27	58.0	1.5	Loud Vehicle Pass by
7/08/23 05:36	7/08/23 05:38	52.5	2.0	Loud Vehicle Pass by
7/08/23 05:41	7/08/23 05:43	58.9	2.0	Loud Vehicle Pass by
7/08/23 06:01	7/08/23 06:03	54.7	1.8	Loud Vehicle Pass by
7/08/23 06:10	7/08/23 06:10	44.0	0.8	Excessive Bird Noise
7/08/23 06:16	7/08/23 06:17	46.2	0.8	Excessive Bird Noise
7/08/23 06:47	7/08/23 06:48	45.9	0.5	Excessive Bird Noise
		Total Night #1	44.3	
		Total Night #2	48.8	
		Total Data	**93.0**	

Data Removal Noise Monitoring Location #12 (2nd – 48 Hour Period)

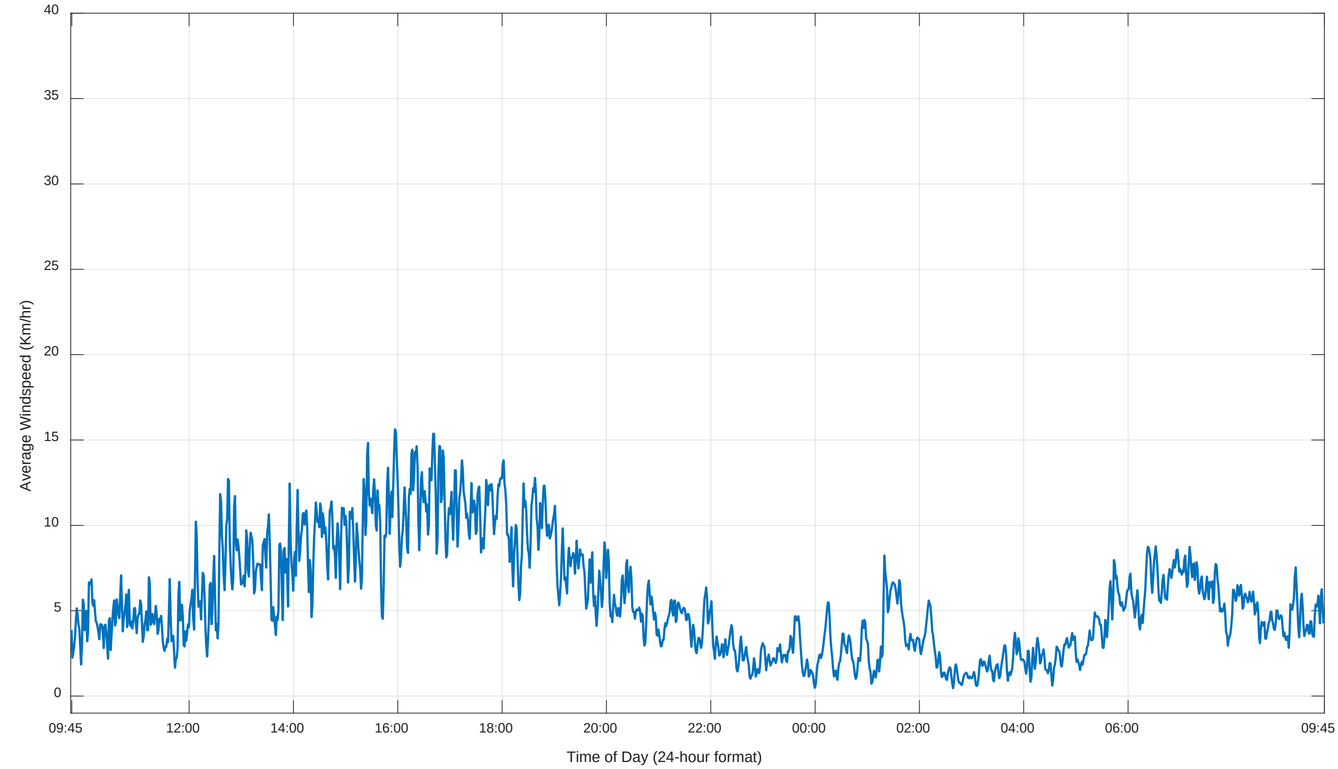
Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
8/27/23 22:23	8/27/23 22:36	58.0	12.8	Train Pass by
8/27/23 22:59	8/27/23 23:00	40.0	1.3	Machinery Noise
8/27/23 23:03	8/27/23 23:04	44.5	0.8	Loud Vehicle Pass by
8/27/23 23:04	8/27/23 23:06	44.5	1.5	Loud Vehicle Pass by
8/27/23 23:23	8/27/23 23:25	47.6	2.0	Train Pass by
8/27/23 23:32	8/27/23 23:33	57.7	1.3	Train Pass by
8/27/23 23:53	8/27/23 23:59	46.2	5.8	Train Pass by
8/28/23 00:14	8/28/23 00:15	63.4	0.3	Loud Vehicle Pass by
8/28/23 01:38	8/28/23 01:39	41.0	1.3	Train Pass by
8/28/23 01:40	8/28/23 01:41	38.2	1.0	Train Pass by
8/28/23 03:20	8/28/23 03:22	50.6	2.0	Train Pass by
8/28/23 03:37	8/28/23 03:43	47.8	6.0	Train Pass by
8/28/23 04:45	8/28/23 04:48	55.1	3.0	Loud Vehicle Pass by
8/28/23 05:35	8/28/23 05:36	54.4	1.0	Loud Vehicle Pass by
8/28/23 05:42	8/28/23 05:43	57.5	1.3	Loud Vehicle Pass by
8/28/23 05:58	8/28/23 05:59	54.7	1.0	Loud Vehicle Pass by
8/28/23 06:03	8/28/23 06:04	57.4	1.5	Loud Vehicle Pass by
8/28/23 06:21	8/28/23 06:23	58.2	2.0	Loud Vehicle Pass by
8/28/23 06:33	8/28/23 06:34	56.1	1.3	Loud Vehicle Pass by
8/28/23 06:42	8/28/23 06:43	59.1	1.3	Loud Vehicle Pass by
8/28/23 06:46	8/28/23 06:49	54.6	3.0	Loud Vehicle Pass by
8/28/23 22:02	8/28/23 22:04	38.8	2.0	Machinery Noise
8/28/23 22:05	8/28/23 22:10	46.1	5.3	Train Pass by
8/28/23 22:16	8/28/23 22:17	47.6	1.3	Train Pass by
8/28/23 23:46	8/28/23 23:47	53.2	0.5	Loud Vehicle Pass by
8/29/23 00:07	8/29/23 00:17	49.3	10.0	Machinery Noise
8/29/23 02:45	8/29/23 02:48	46.7	2.5	Machinery Noise
8/29/23 02:57	8/29/23 03:00	46.3	3.8	Machinery Noise
8/29/23 03:11	8/29/23 03:12	49.6	0.8	Loud Vehicle Pass by
8/29/23 03:22	8/29/23 03:22	64.3	0.3	Train Pass by
8/29/23 03:25	8/29/23 03:31	56.0	6.8	Train Pass by
8/29/23 03:37	8/29/23 03:37	55.1	0.8	Train Pass by
8/29/23 03:39	8/29/23 03:41	47.6	2.3	Train Pass by
8/29/23 03:45	8/29/23 03:46	47.6	1.0	Train Pass by
8/29/23 04:08	8/29/23 04:08	46.7	0.8	Loud Vehicle Pass by
8/29/23 04:10	8/29/23 04:12	44.5	1.3	Loud Vehicle Pass by
8/29/23 04:48	8/29/23 04:50	57.9	1.8	Loud Vehicle Pass by
8/29/23 05:15	8/29/23 05:16	46.5	1.3	Train Pass by
8/29/23 05:19	8/29/23 05:26	54.1	7.3	Train Pass by
8/29/23 05:43	8/29/23 05:44	60.6	1.3	Loud Vehicle Pass by
8/29/23 05:46	8/29/23 05:46	47.1	0.8	Loud Vehicle Pass by
8/29/23 05:56	8/29/23 05:58	49.9	1.8	Loud Vehicle Pass by
8/29/23 06:01	8/29/23 06:04	56.9	2.3	Loud Vehicle Pass by
8/29/23 06:22	8/29/23 06:23	59.8	1.0	Loud Vehicle Pass by
8/29/23 06:25	8/29/23 06:26	61.7	1.3	Loud Vehicle Pass by
8/29/23 06:29	8/29/23 06:37	57.7	8.3	Loud Vehicle Pass by
8/29/23 06:39	8/29/23 06:41	56.1	2.0	Loud Vehicle Pass by
8/29/23 06:48	8/29/23 06:49	54.6	1.0	Loud Vehicle Pass by
8/29/23 06:51	8/29/23 06:53	54.9	2.3	Loud Vehicle Pass by
8/29/23 06:56	8/29/23 06:59	59.0	3.0	Loud Vehicle Pass by
		Total Night #1	51.0	
		Total Night #2	74.0	
		Total Data	**125.0**	

Data Removal Noise Monitoring Location #13

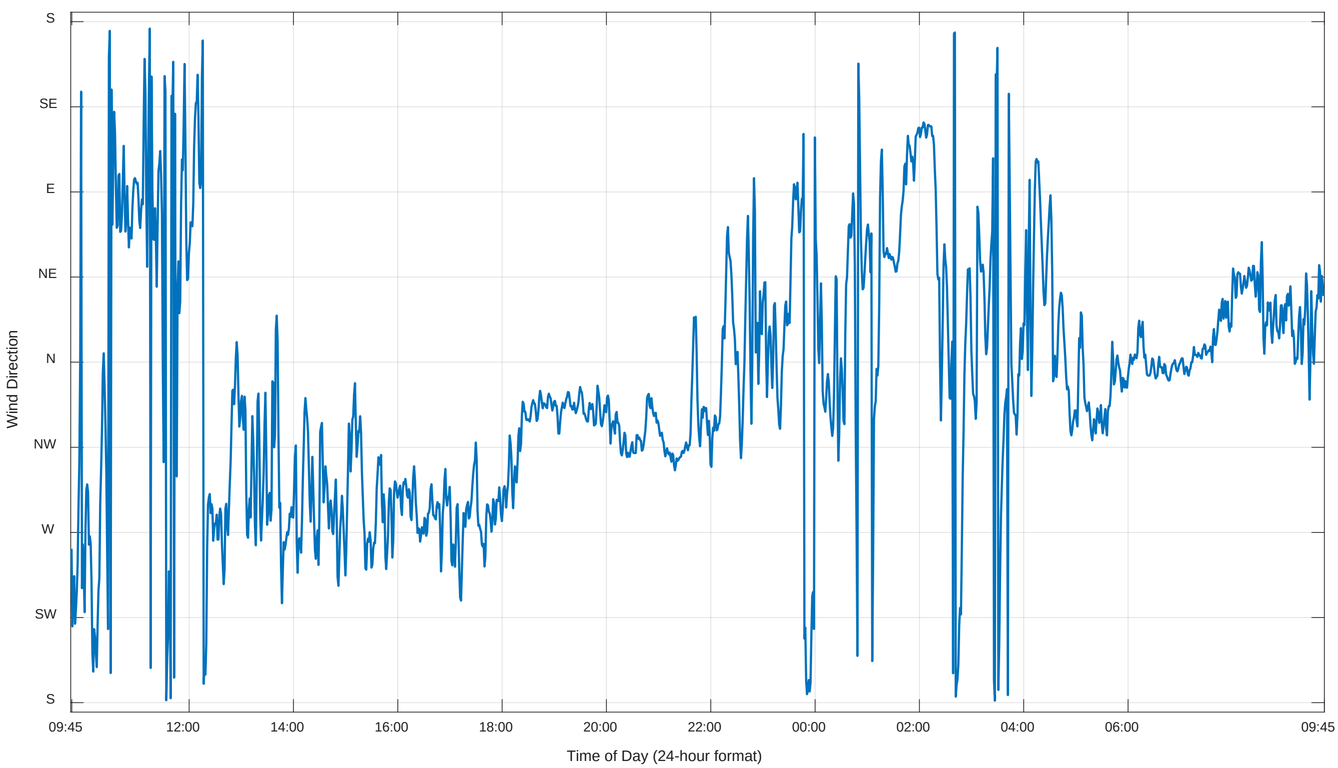
Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
8/27/23 22:45	8/27/23 22:46	48.7	1.5	Loud Vehicle Pass by
8/28/23 05:38	8/28/23 05:40	41.8	2.0	Loud Vehicle Pass by
8/28/23 06:21	8/28/23 06:23	54.4	2.3	Loud Vehicle Pass by
8/28/23 06:23	8/28/23 06:32	42.4	8.8	Machinery Noise
8/28/23 06:34	8/28/23 06:35	35.5	0.8	Loud Vehicle Pass by
8/28/23 06:41	8/28/23 06:43	56.3	2.5	Loud Vehicle Pass by
8/28/23 06:48	8/28/23 06:49	51.8	1.0	Loud Vehicle Pass by
8/28/23 06:49	8/28/23 06:52	47.9	2.8	Machinery Noise
8/28/23 06:57	8/28/23 06:58	37.3	1.0	Loud Vehicle Pass by
8/28/23 06:58	8/28/23 07:00	58.6	1.8	Loud Vehicle Pass by
8/29/23 00:14	8/29/23 00:16	39.1	2.5	Aircraft Flyover
8/29/23 00:48	8/29/23 00:52	43.1	3.8	Coyote
8/29/23 01:57	8/29/23 01:59	39.2	1.8	Coyote
8/29/23 03:46	8/29/23 03:49	51.2	2.5	Loud Vehicle Pass by
8/29/23 03:50	8/29/23 03:52	50.2	2.0	Loud Vehicle Pass by
8/29/23 05:05	8/29/23 05:06	40.4	1.0	Loud Vehicle Pass by
8/29/23 05:17	8/29/23 05:19	40.1	1.8	Loud Vehicle Pass by
8/29/23 05:36	8/29/23 05:37	42.0	1.5	Loud Vehicle Pass by
8/29/23 05:40	8/29/23 05:41	42.4	1.0	Loud Vehicle Pass by
8/29/23 05:56	8/29/23 05:57	46.0	1.3	Loud Vehicle Pass by
8/29/23 06:36	8/29/23 06:38	56.6	1.8	Loud Vehicle Pass by
8/29/23 06:44	8/29/23 06:45	44.7	1.0	Loud Vehicle Pass by
8/29/23 06:47	8/29/23 06:49	52.7	1.3	Loud Vehicle Pass by
		Total Night #1	24.3	
		Total Night #2	23.0	
		Total Data	**47.3**	

Appendix V WEATHER DATA

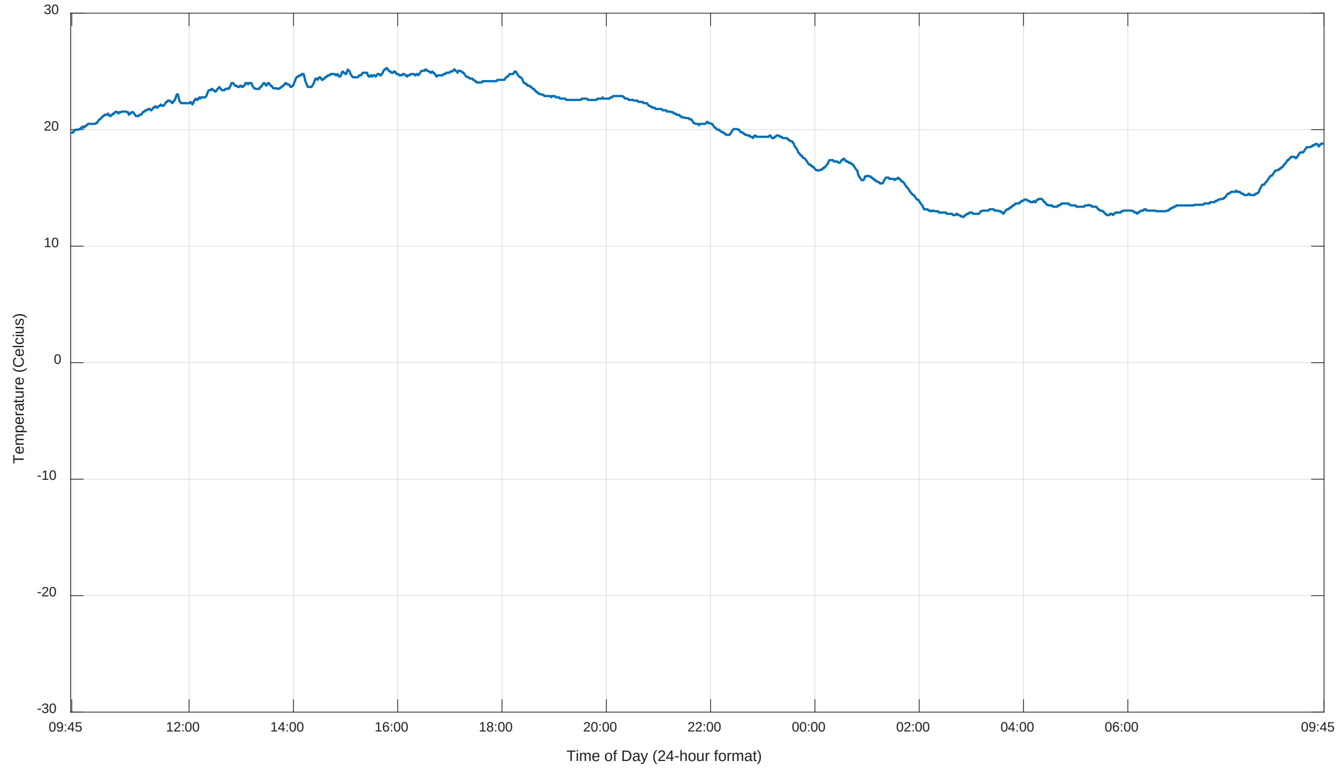
July 6 - 7, 2023 Weather Data



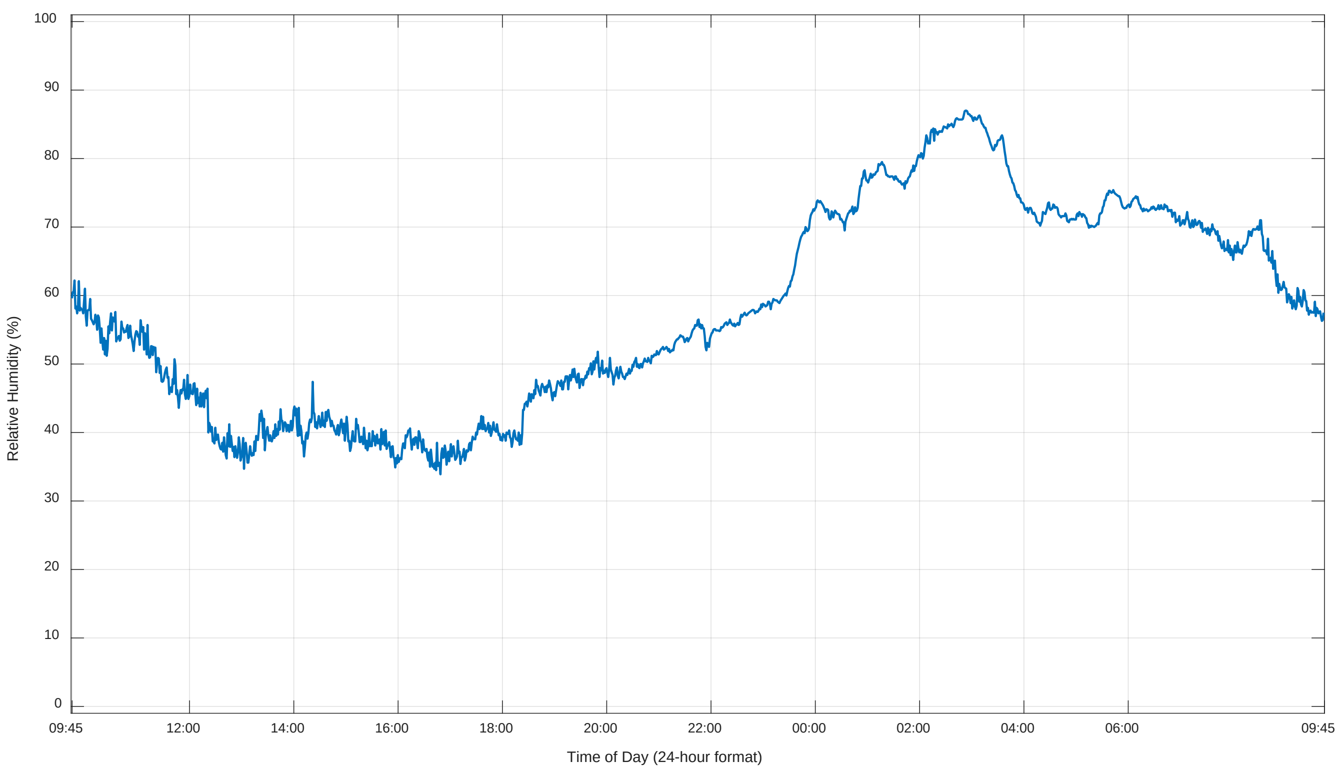
Monitored Wind Speed (July 6 – 7, 2023) at Noise Monitor Location 2



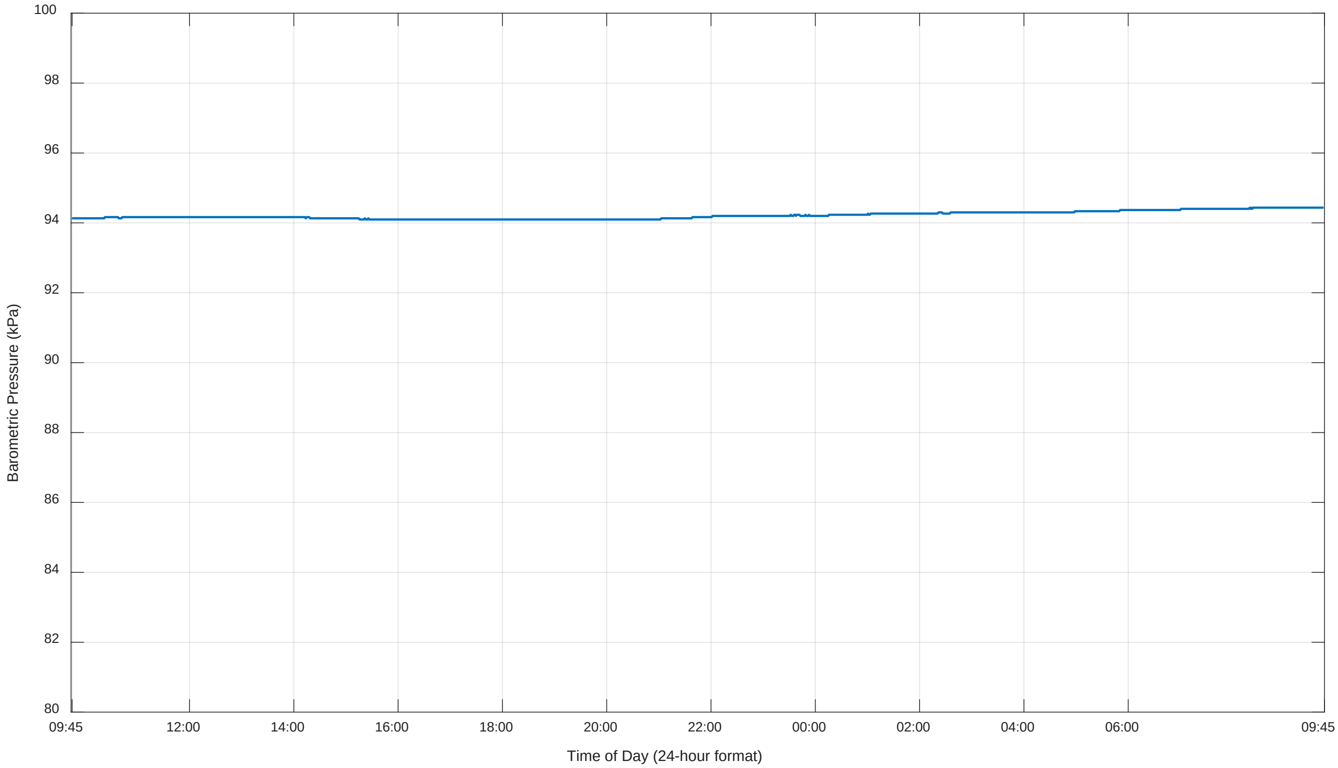
Monitored Wind Direction (July 6 – 7, 2023) at Noise Monitor Location 2



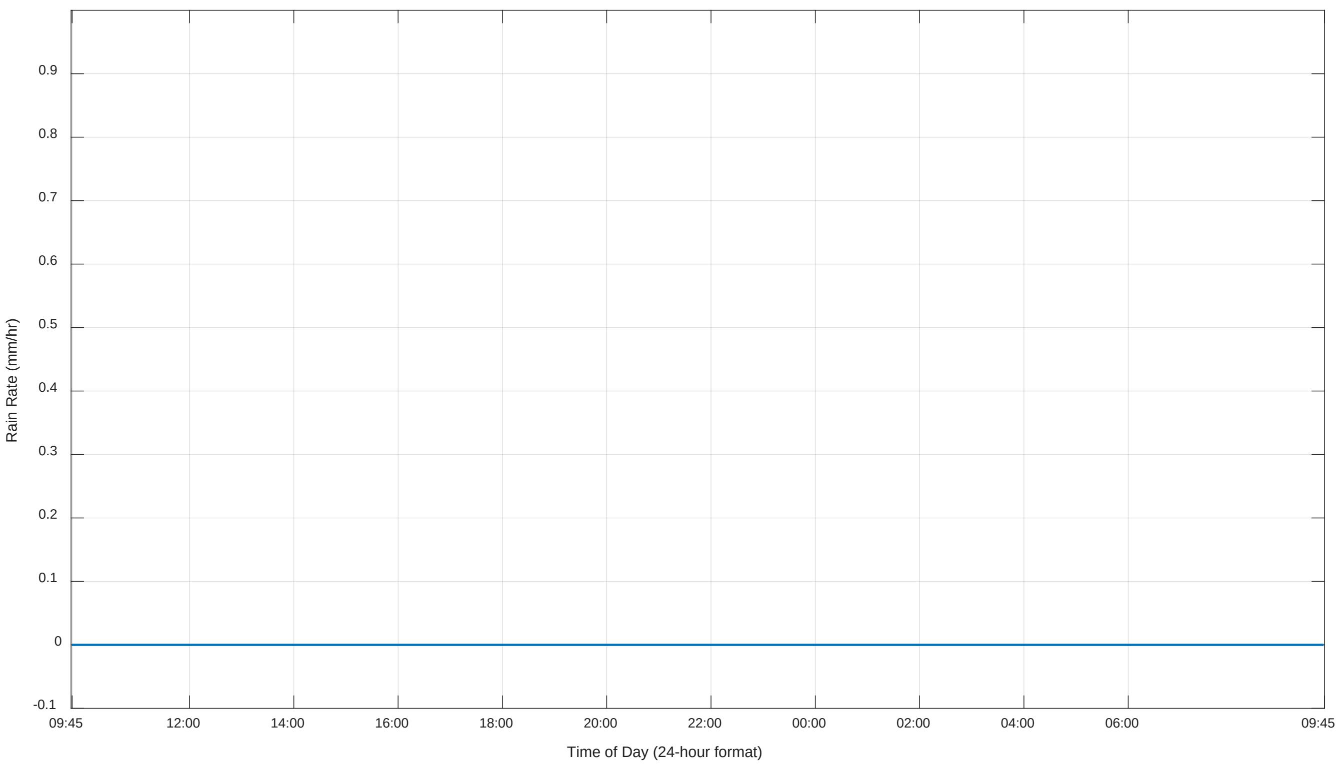
Monitored Temperature (July 6 – 7, 2023) at Noise Monitor Location 2



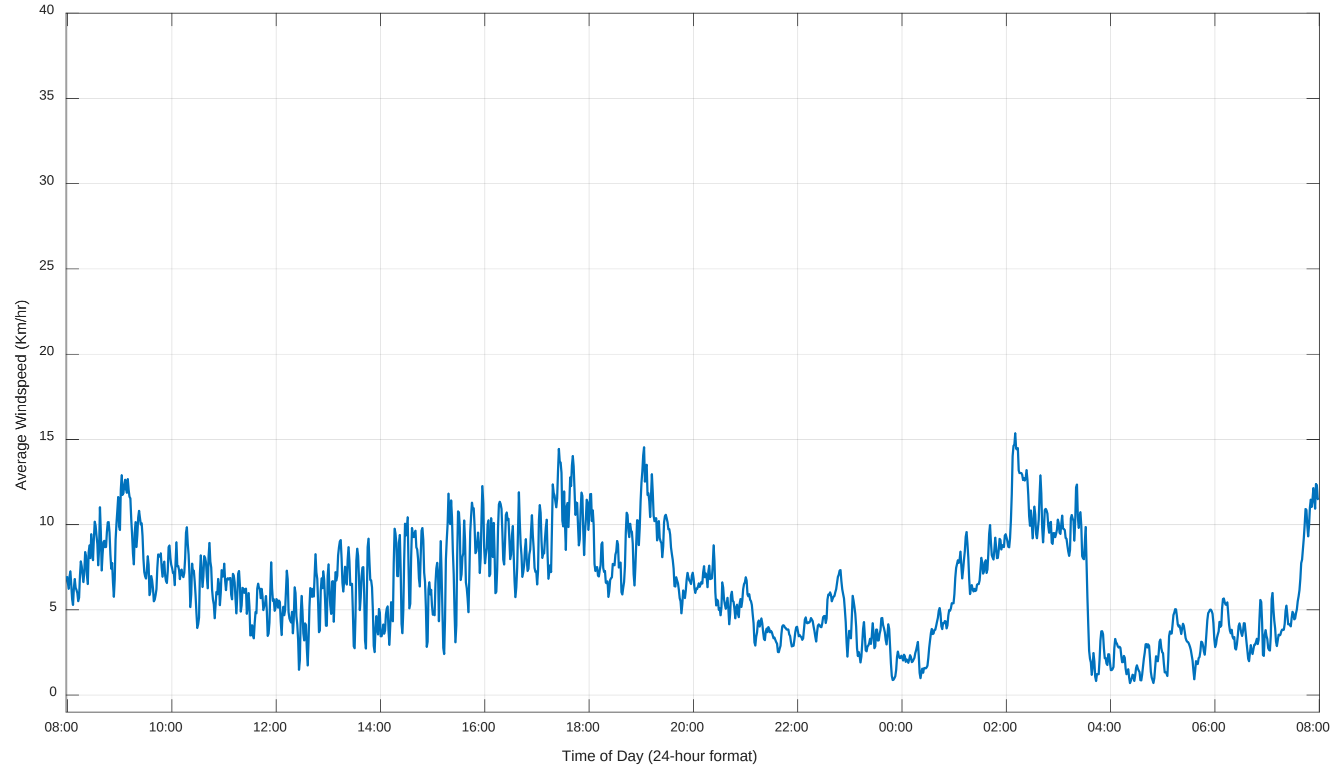
Monitored Humidity (July 6 – 7, 2023) at Noise Monitor Location 2



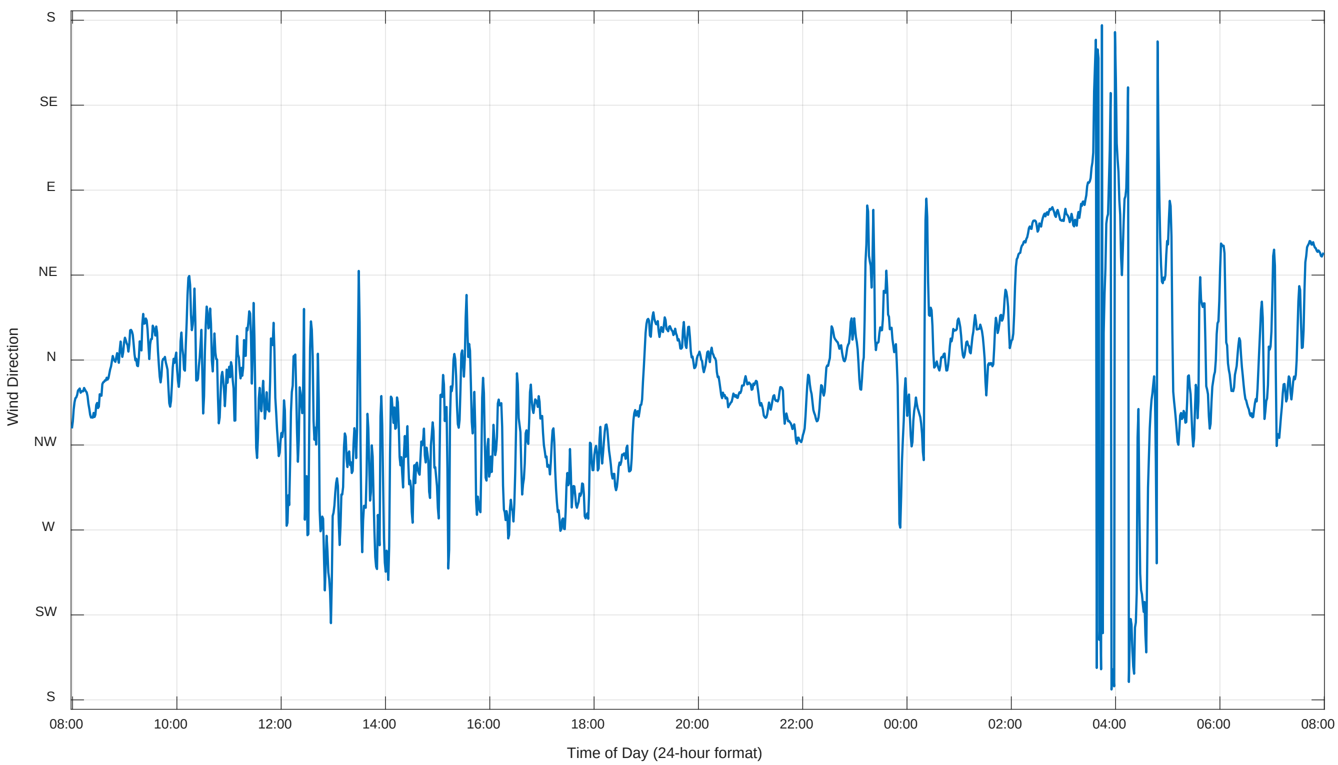
Monitored Barometric Pressure (July 6 – 7, 2023) at Noise Monitor Location 2



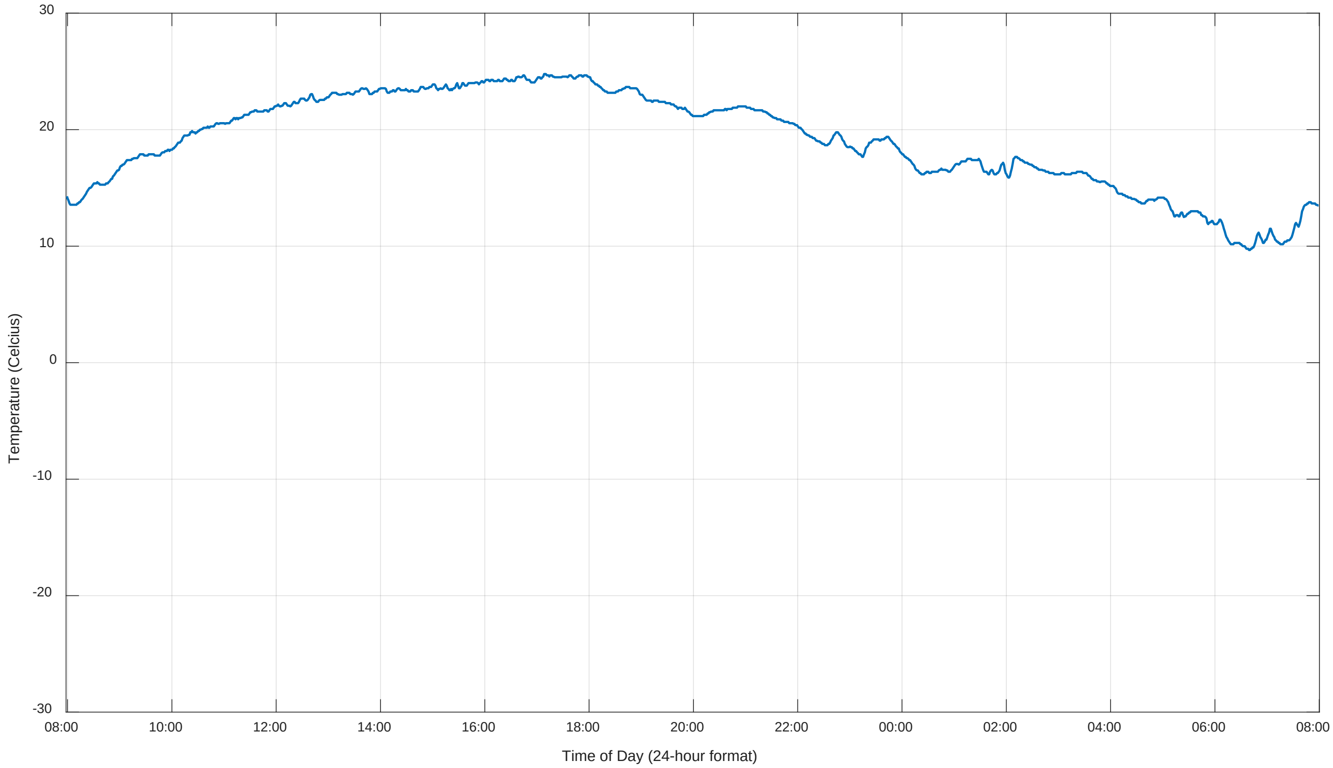
Monitored Rain Rate (July 6 – 7, 2023) at Noise Monitor Location 2



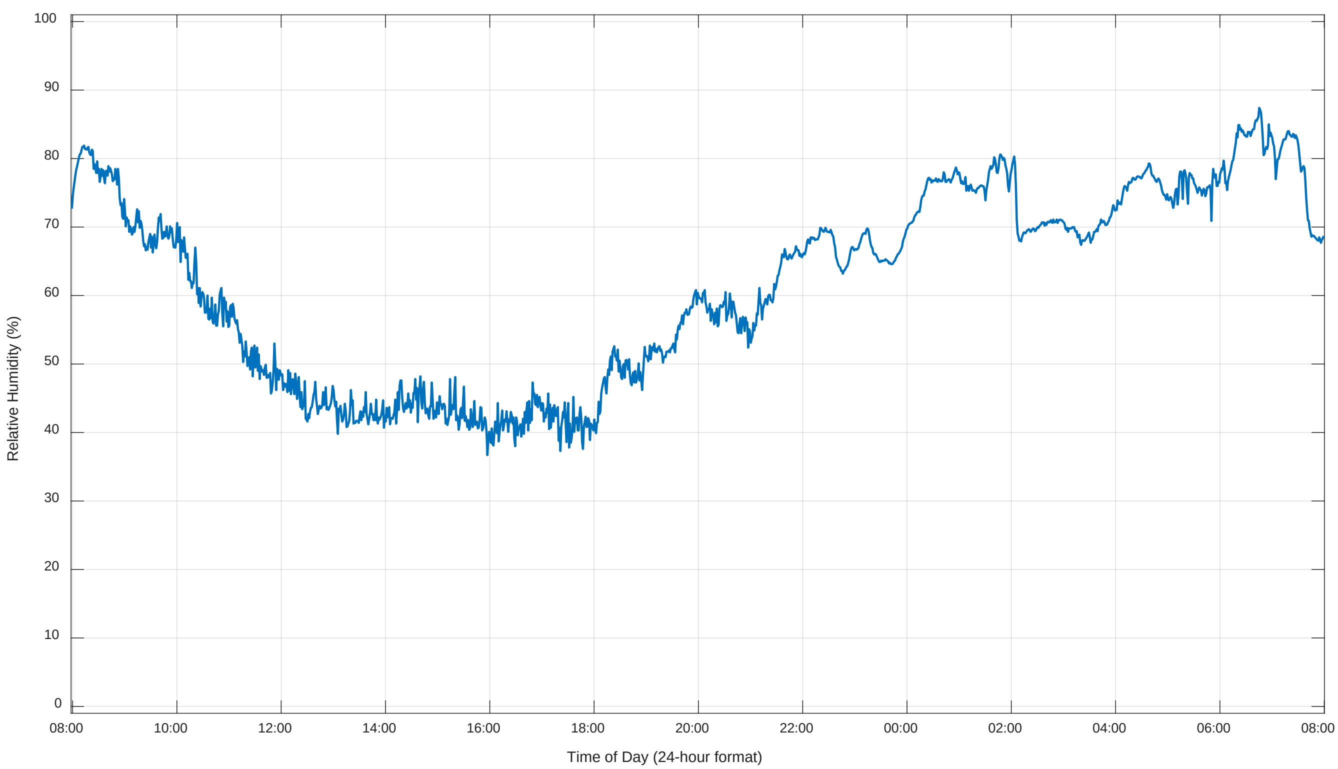
Monitored Wind Speed (July 6 - 7, 2023) at Noise Monitor Location 11



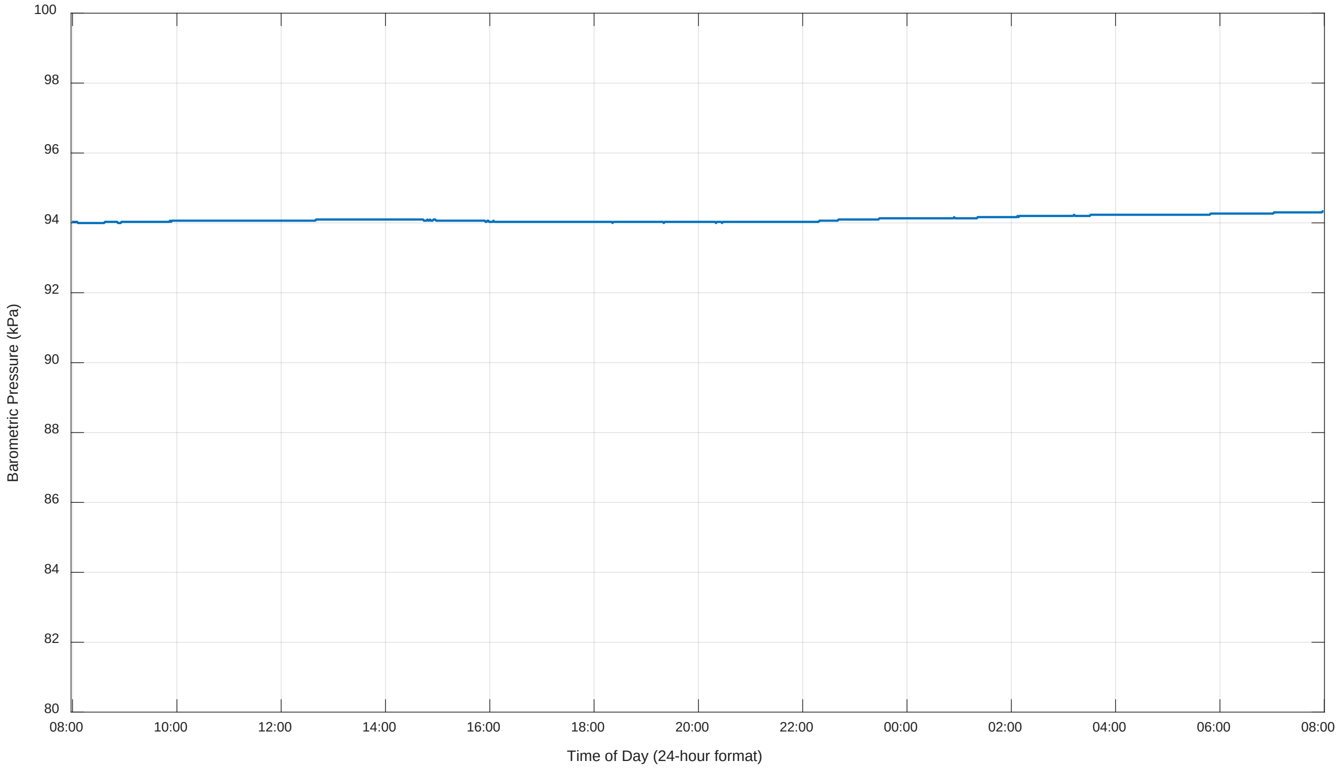
Monitored Wind Direction (July 6 - 7, 2023) at Noise Monitor Location 11



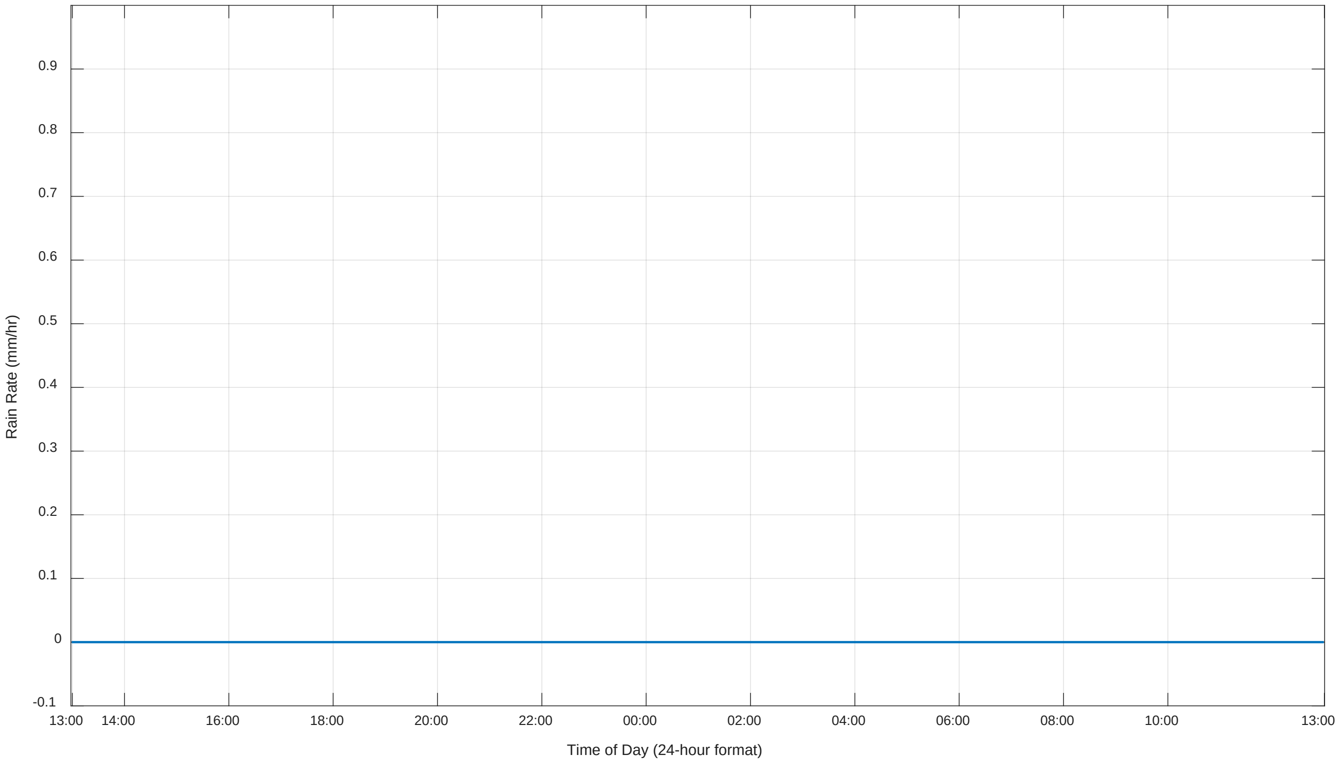
Monitored Temperature (July 6 - 7, 2023) at Noise Monitor Location 11



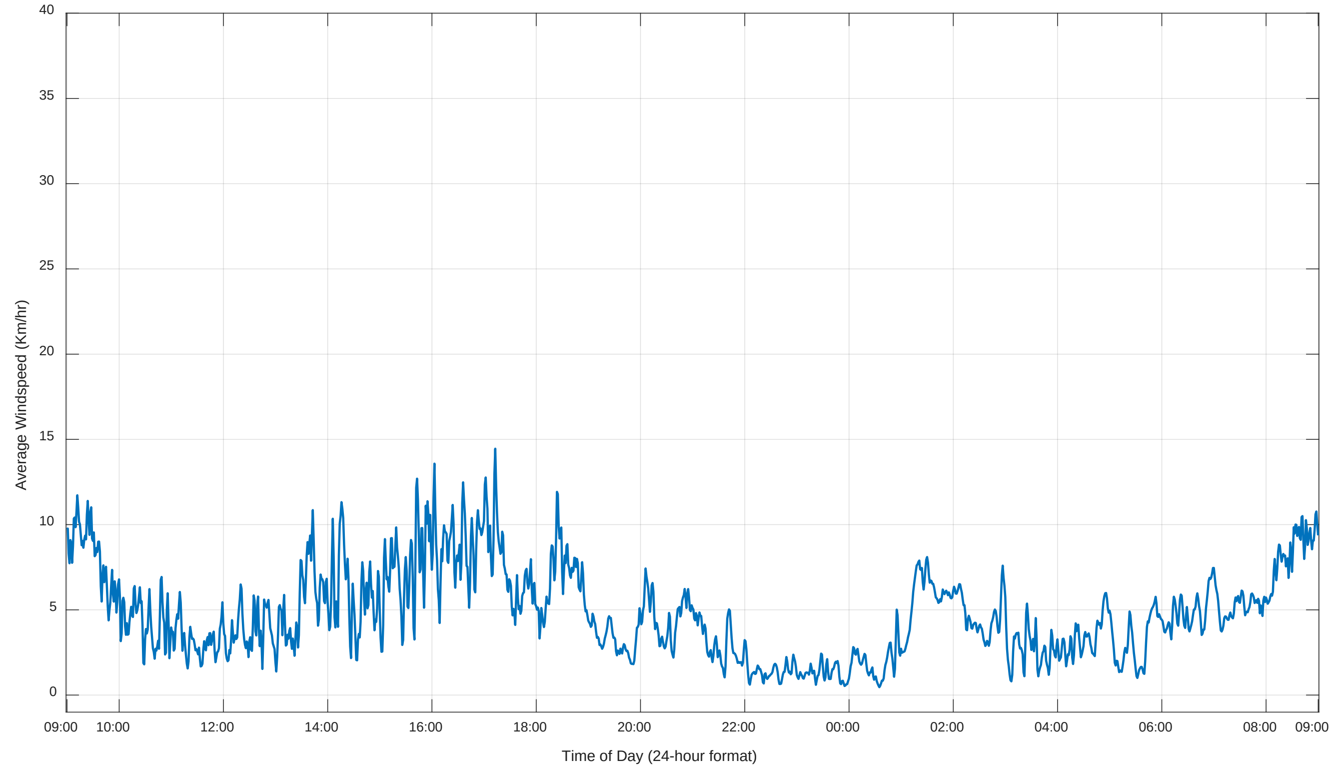
Monitored Humidity (July 6 - 7, 2023) at Noise Monitor Location 11



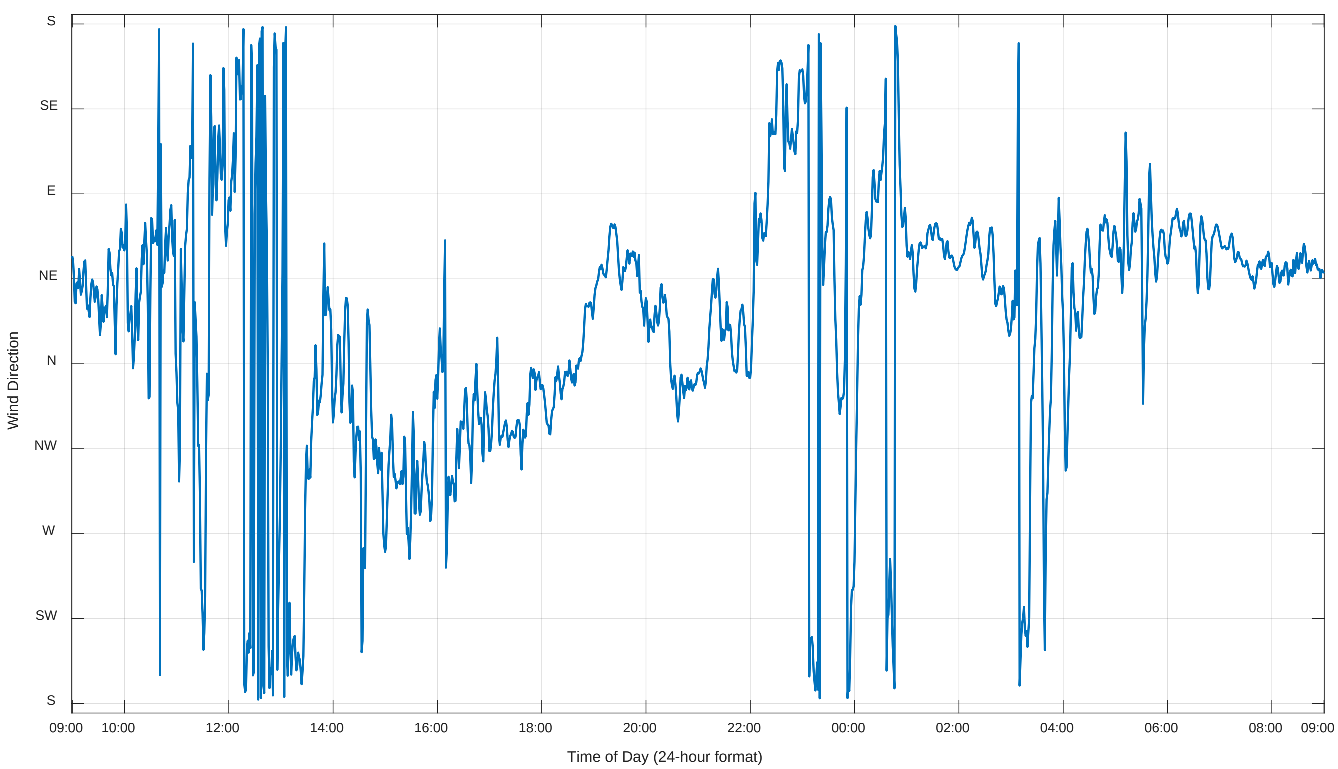
Monitored Barometric Pressure (July 6 - 7, 2023) at Noise Monitor Location 11



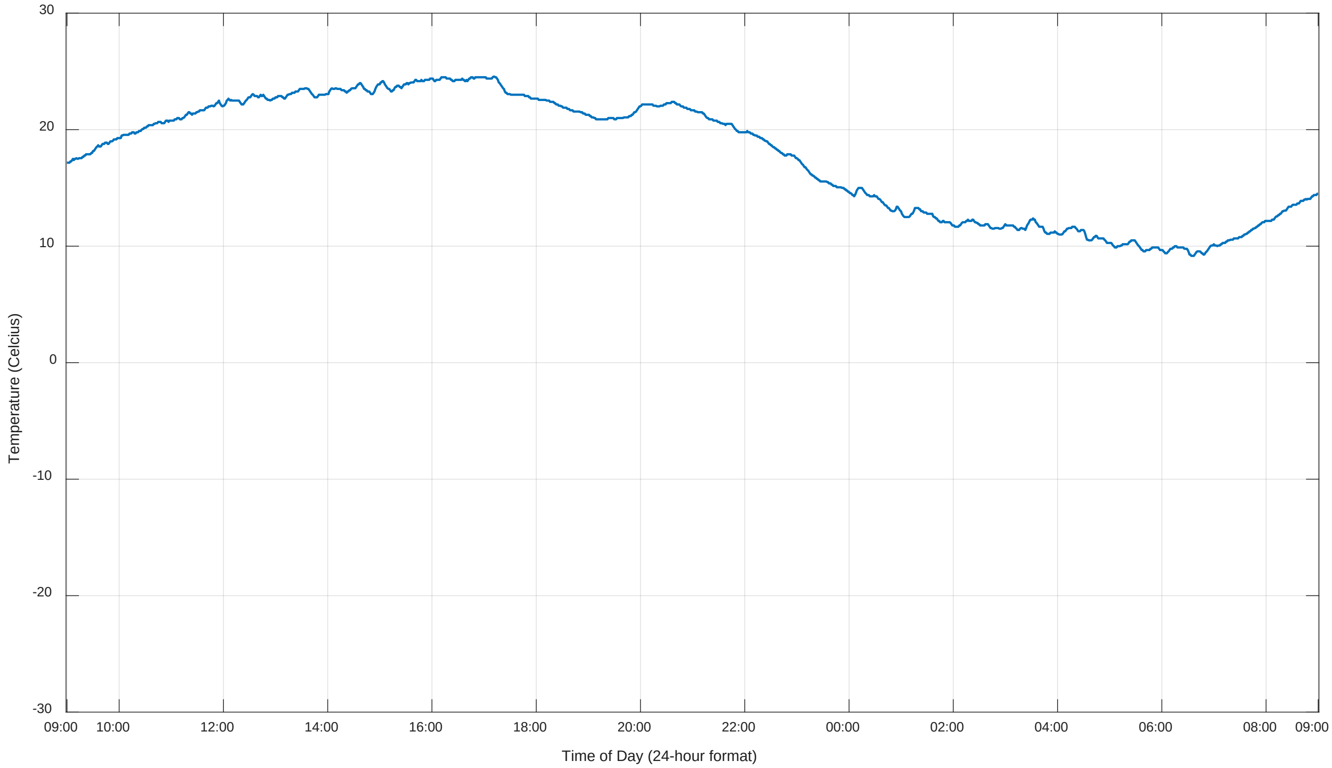
Monitored Rain Rate (July 6 - 7, 2023) at Noise Monitor Location 11



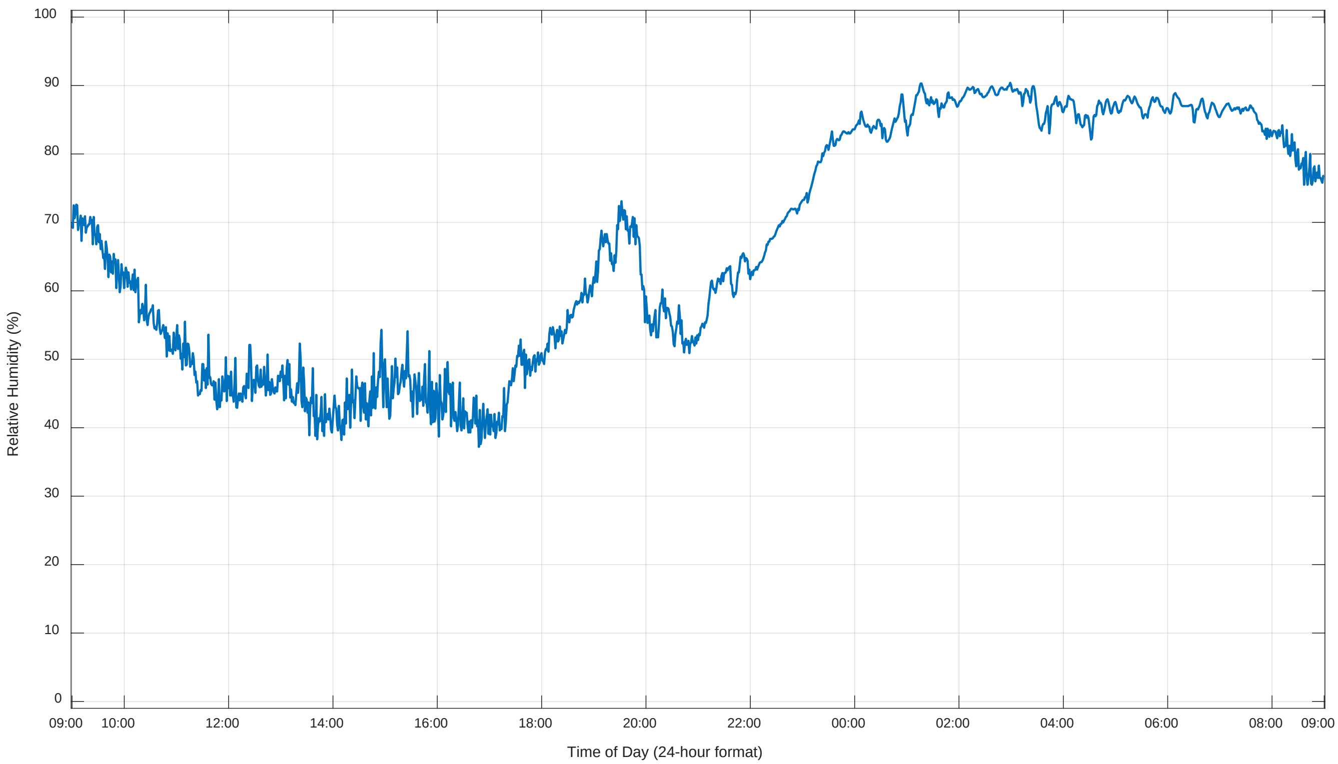
Monitored Wind Speed (July 6 - 7, 2023) at Noise Monitor Location 12



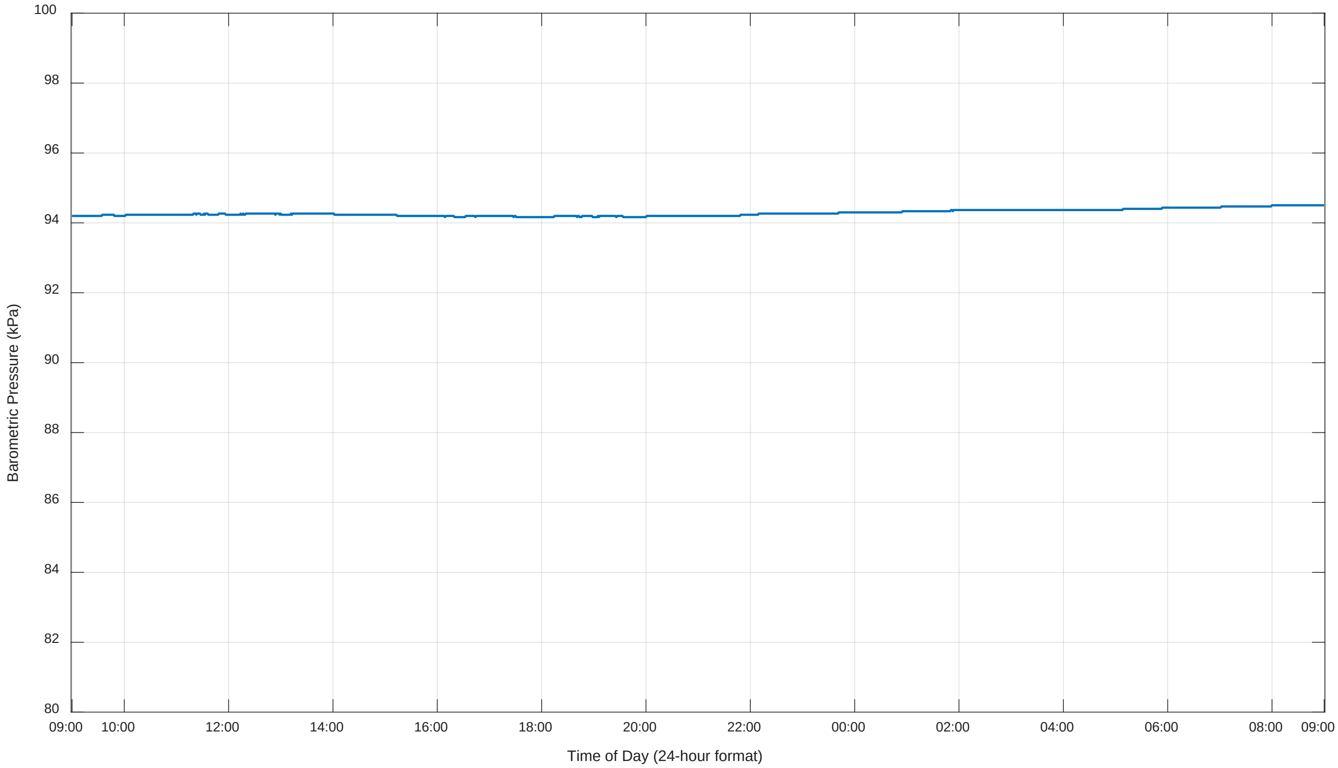
Monitored Wind Direction (July 6 - 7, 2023) at Noise Monitor Location 12



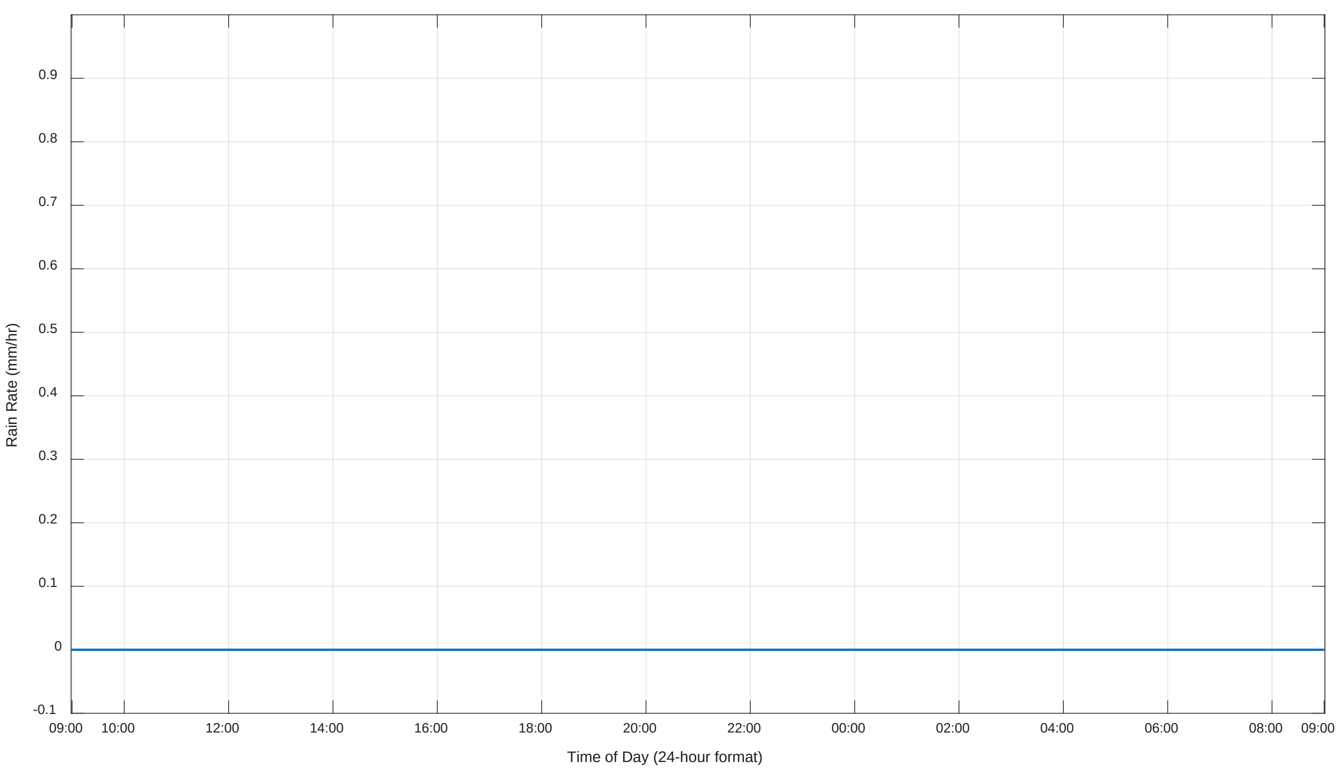
Monitored Temperature (July 6 - 7, 2023) at Noise Monitor Location 12



Monitored Humidity (July 6 - 7, 2023) at Noise Monitor Location 12

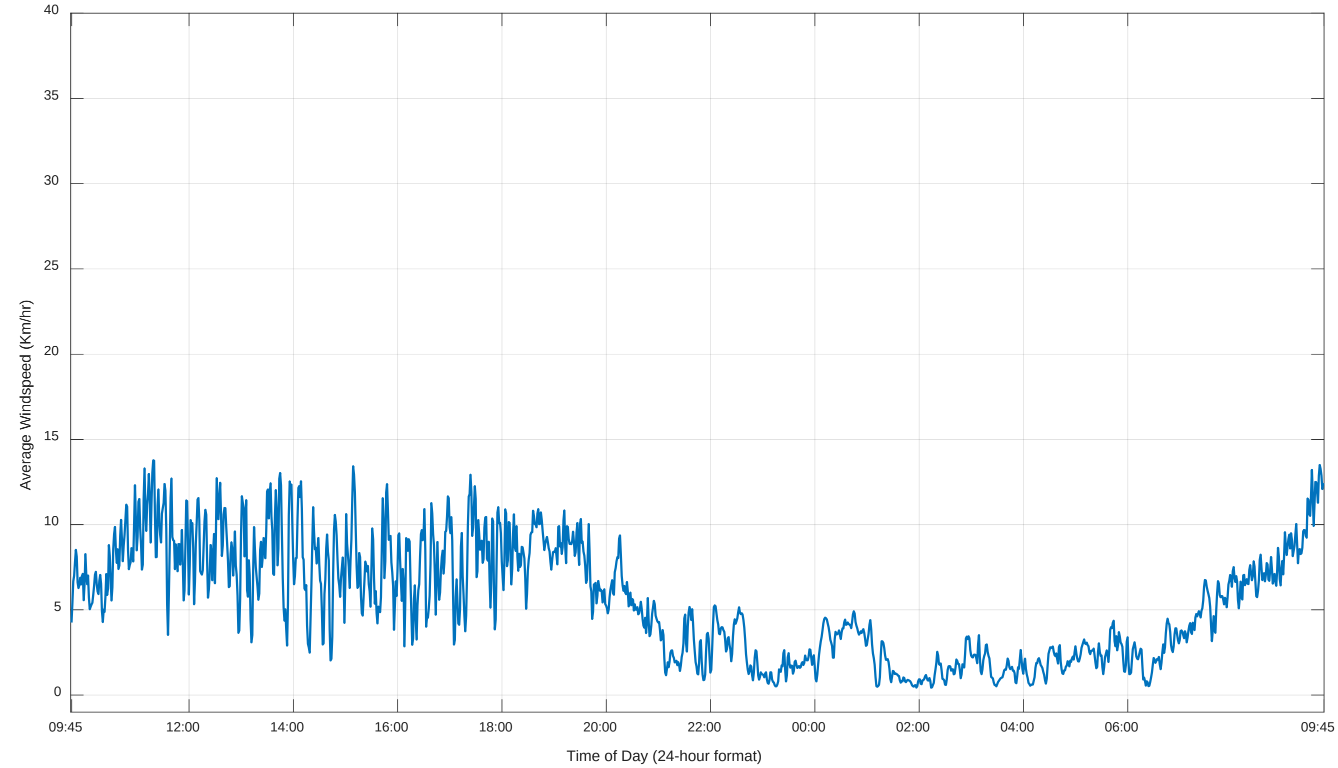


Monitored Barometric Pressure (July 6 - 7, 2023) at Noise Monitor Location 12

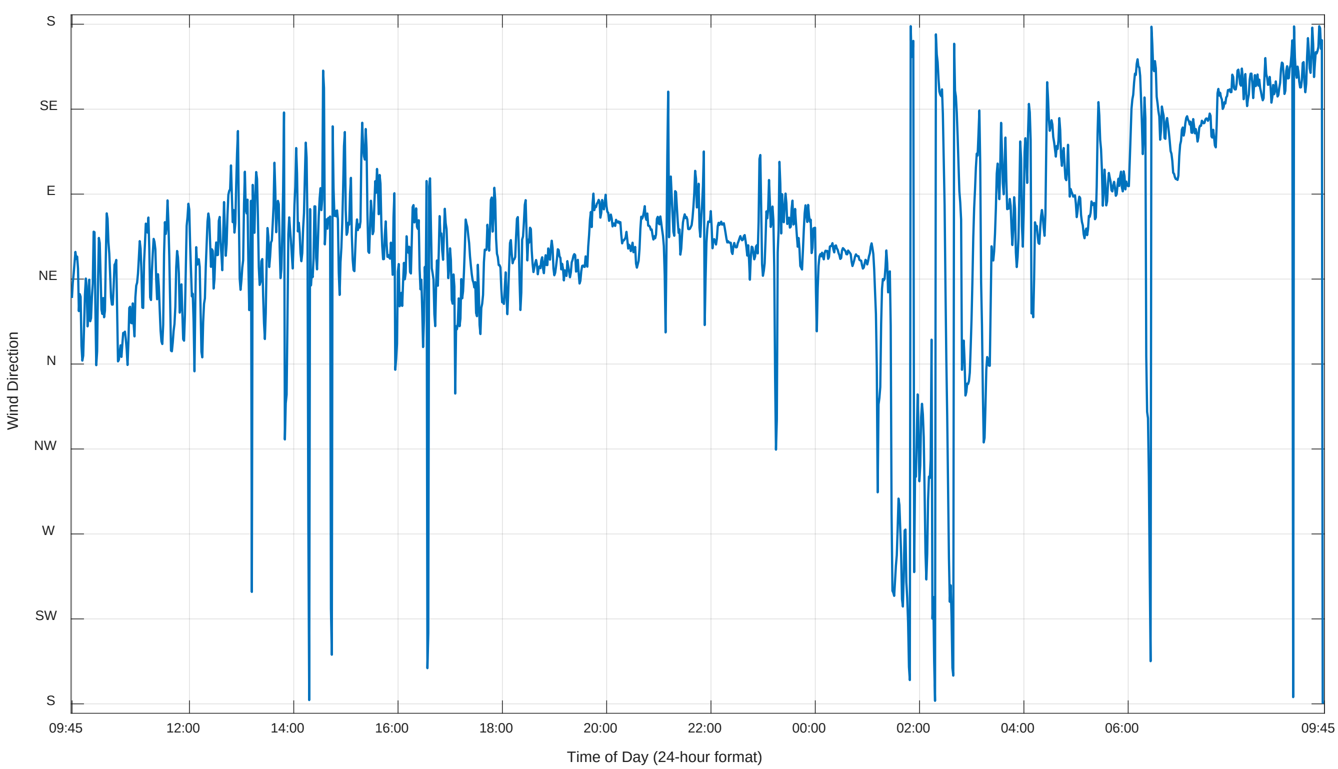


Monitored Rain Rate (July 6 - 7, 2023) at Noise Monitor Location 12

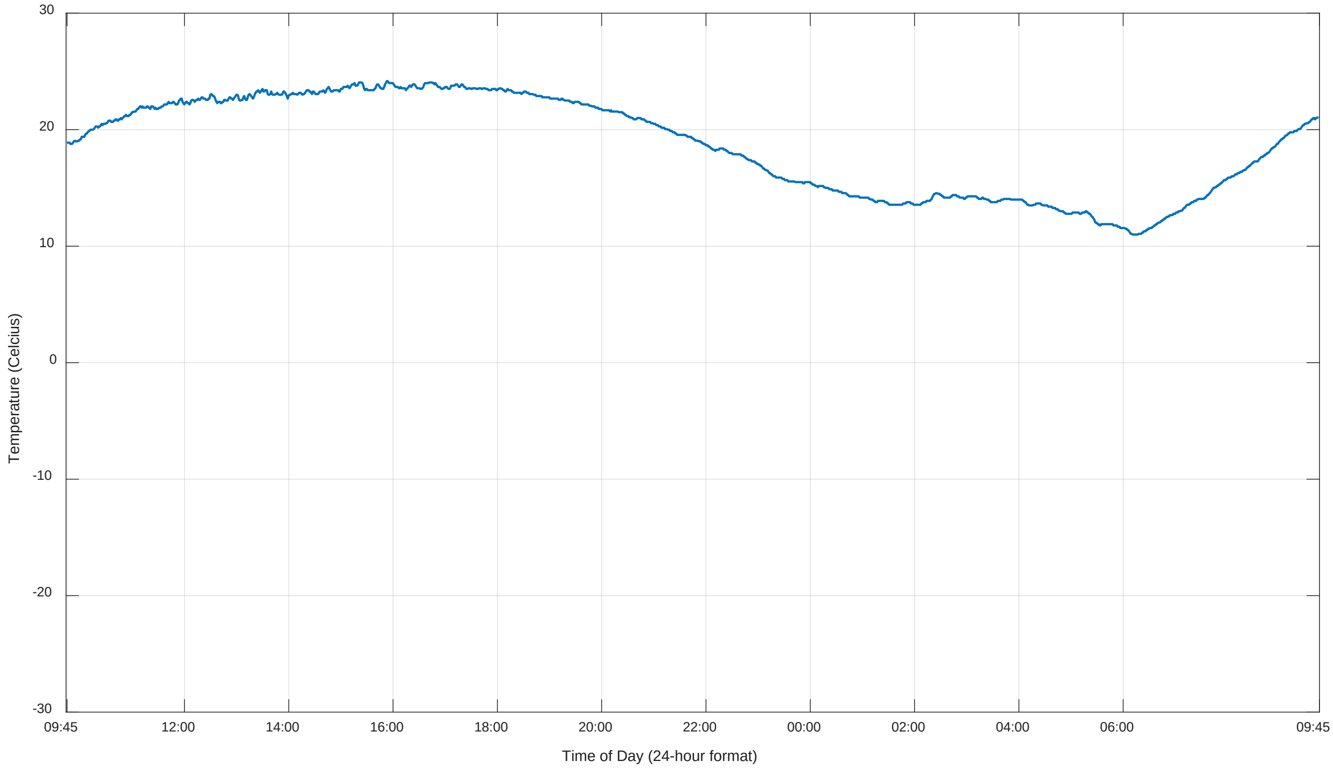
July 7 – 8, 2023 Weather Data



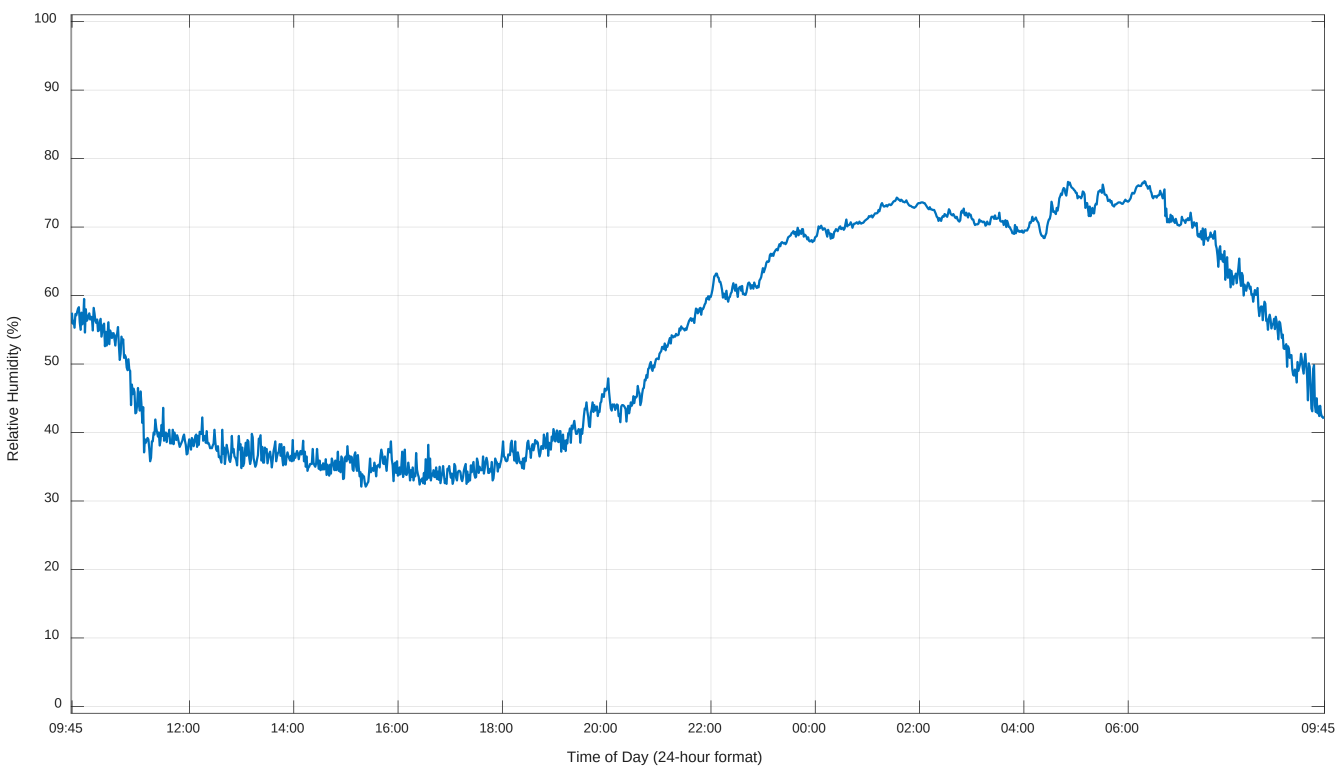
Monitored Wind Speed (July 7 - 8, 2023) at Noise Monitor Location 2



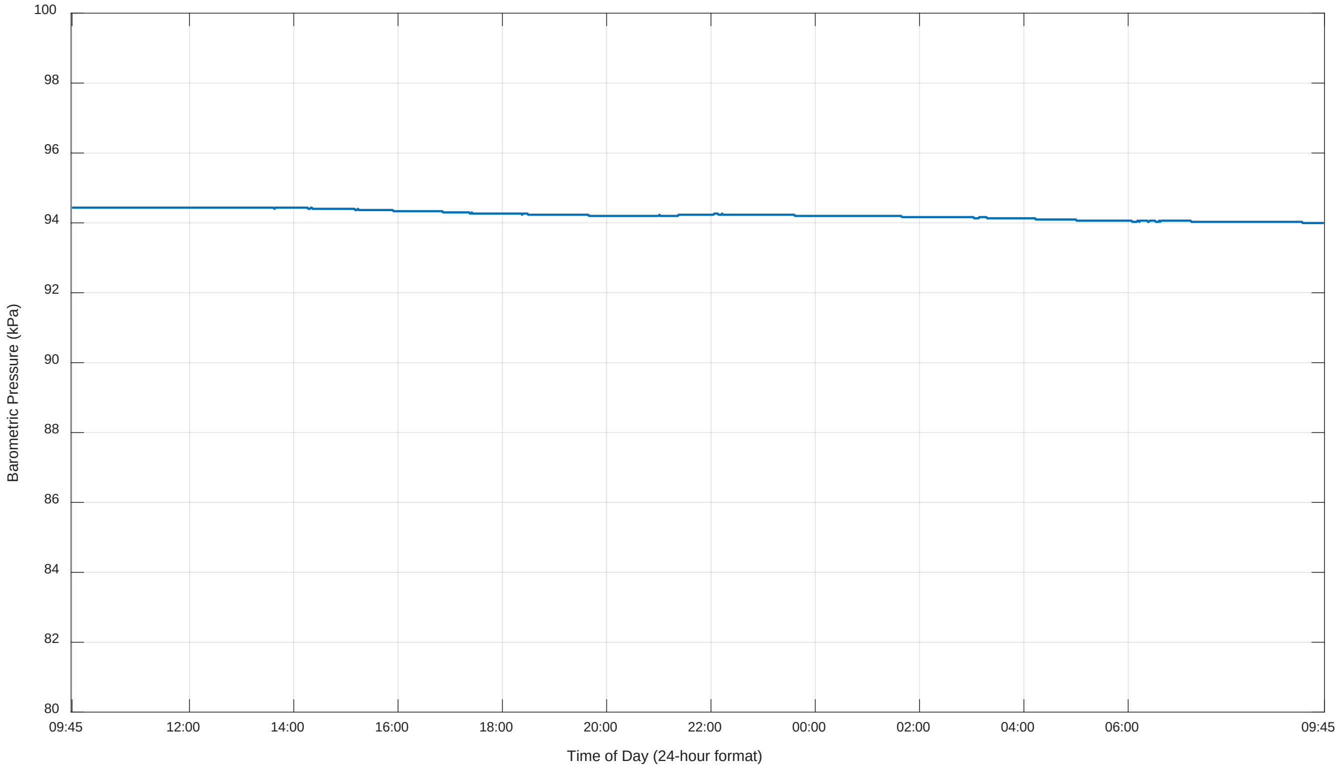
Monitored Wind Direction (July 7 - 8, 2023) at Noise Monitor Location 2



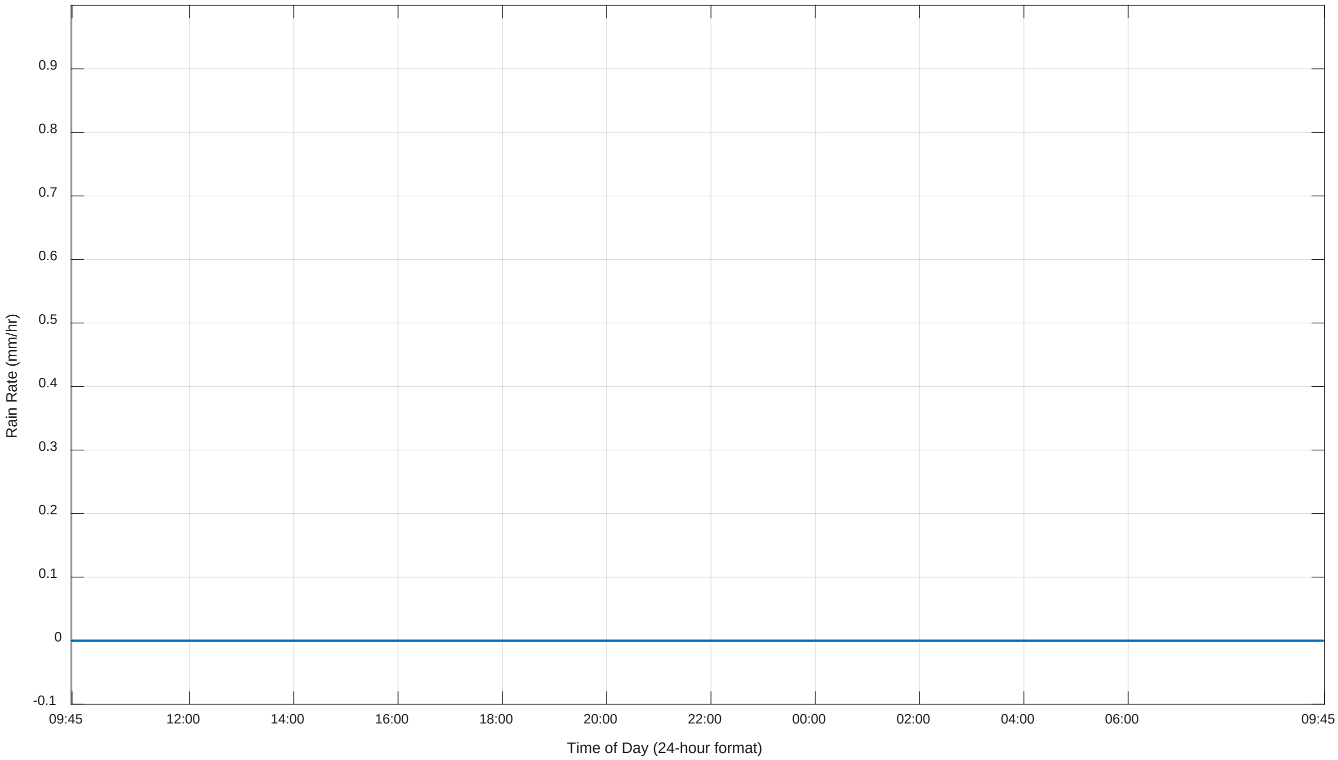
Monitored Temperature (July 7 - 8, 2023) at Noise Monitor Location 2



Monitored Humidity (July 7 - 8, 2023) at Noise Monitor Location 2



Monitored Barometric Pressure (July 7 - 8, 2023) at Noise Monitor Location 2



Monitored Rain Rate (July 7 - 8, 2023) at Noise Monitor Location 2

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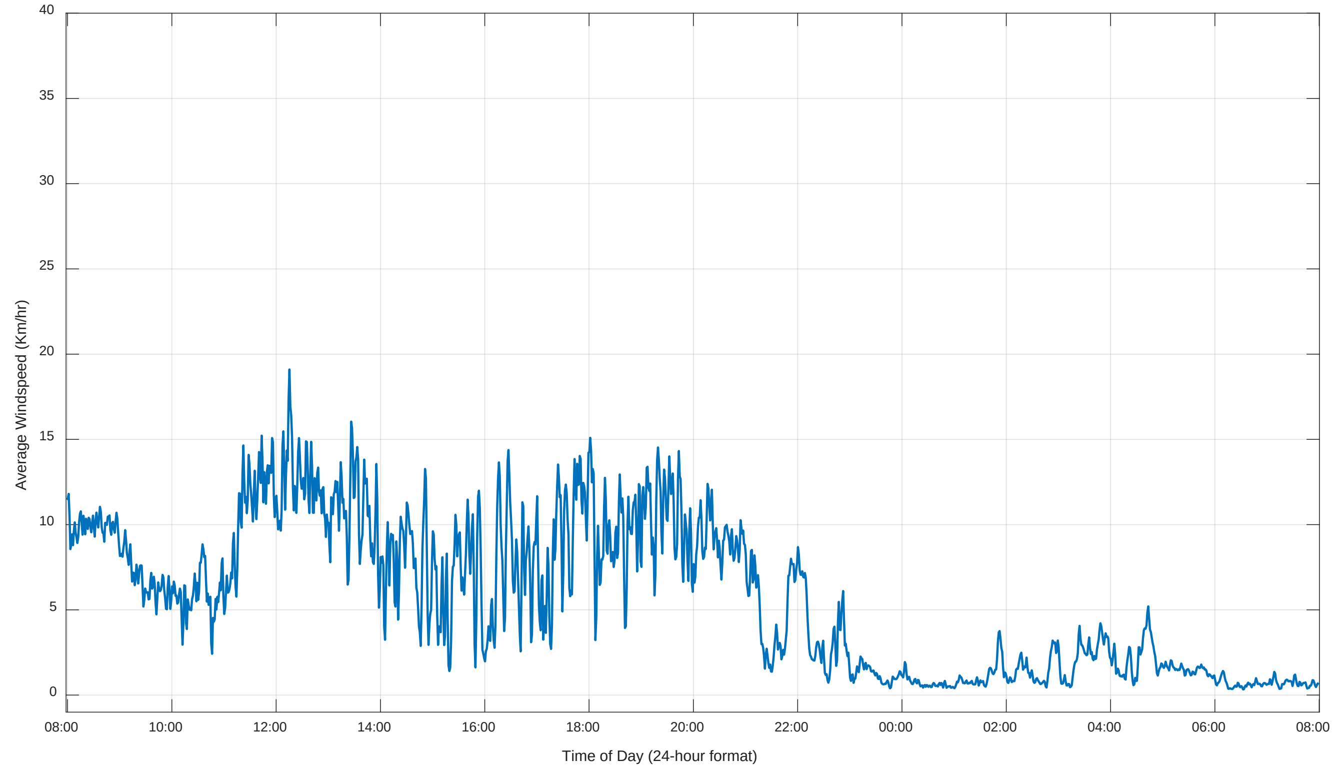
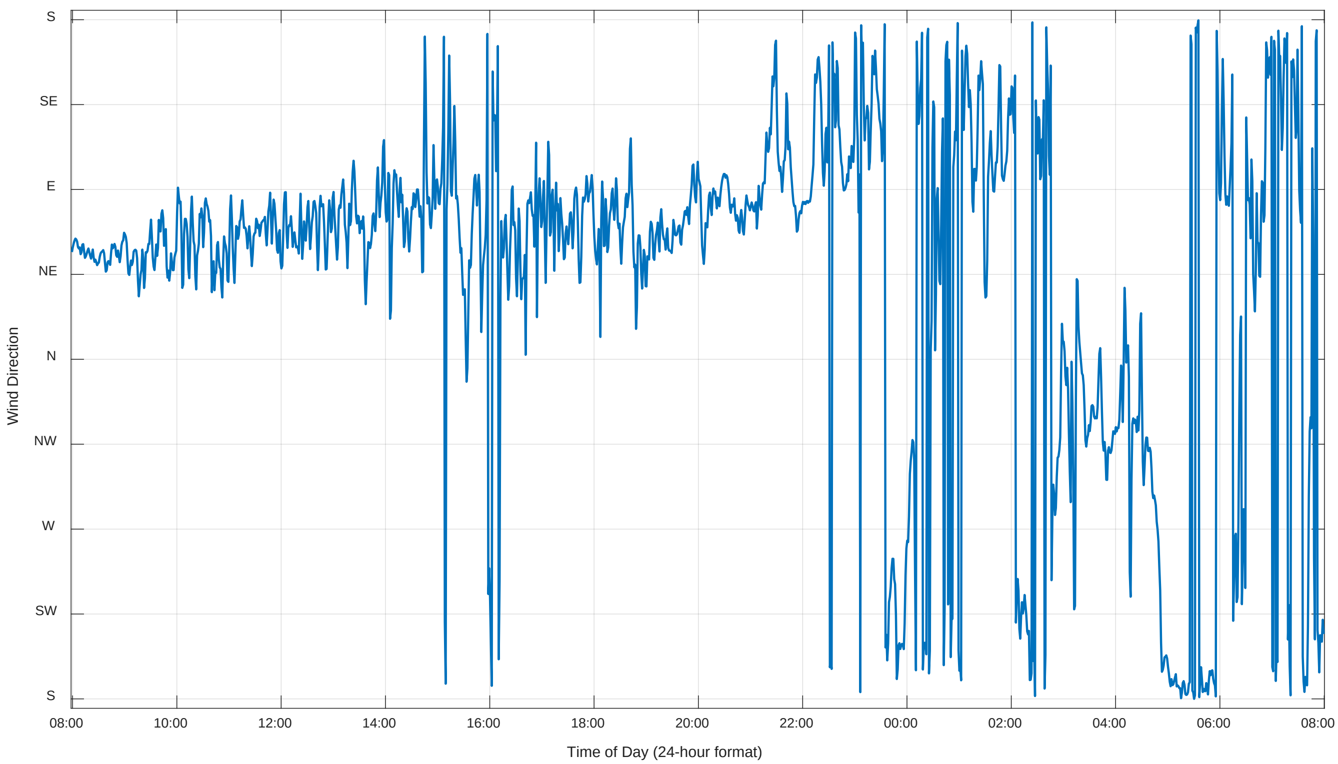
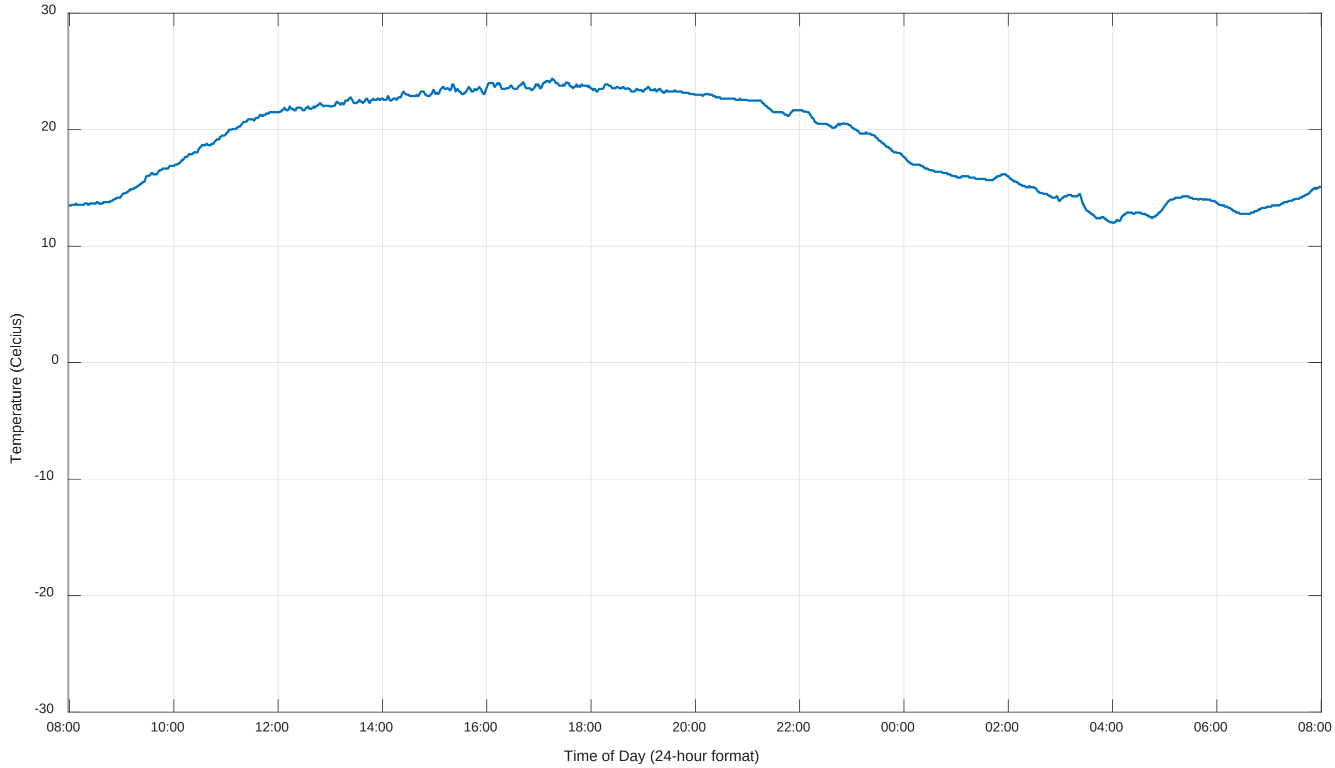


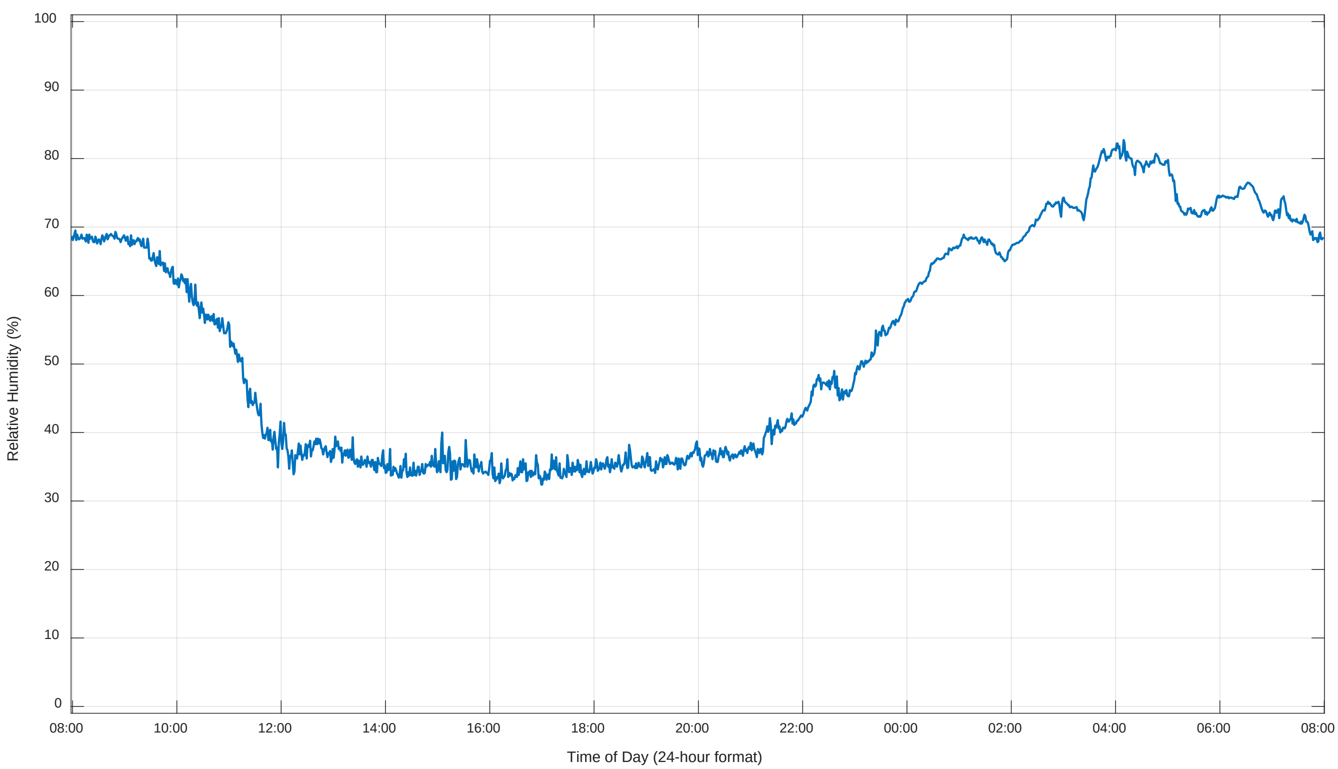
Monitored Wind Speed (July 7 - 8, 2023) at Noise Monitor Location 11



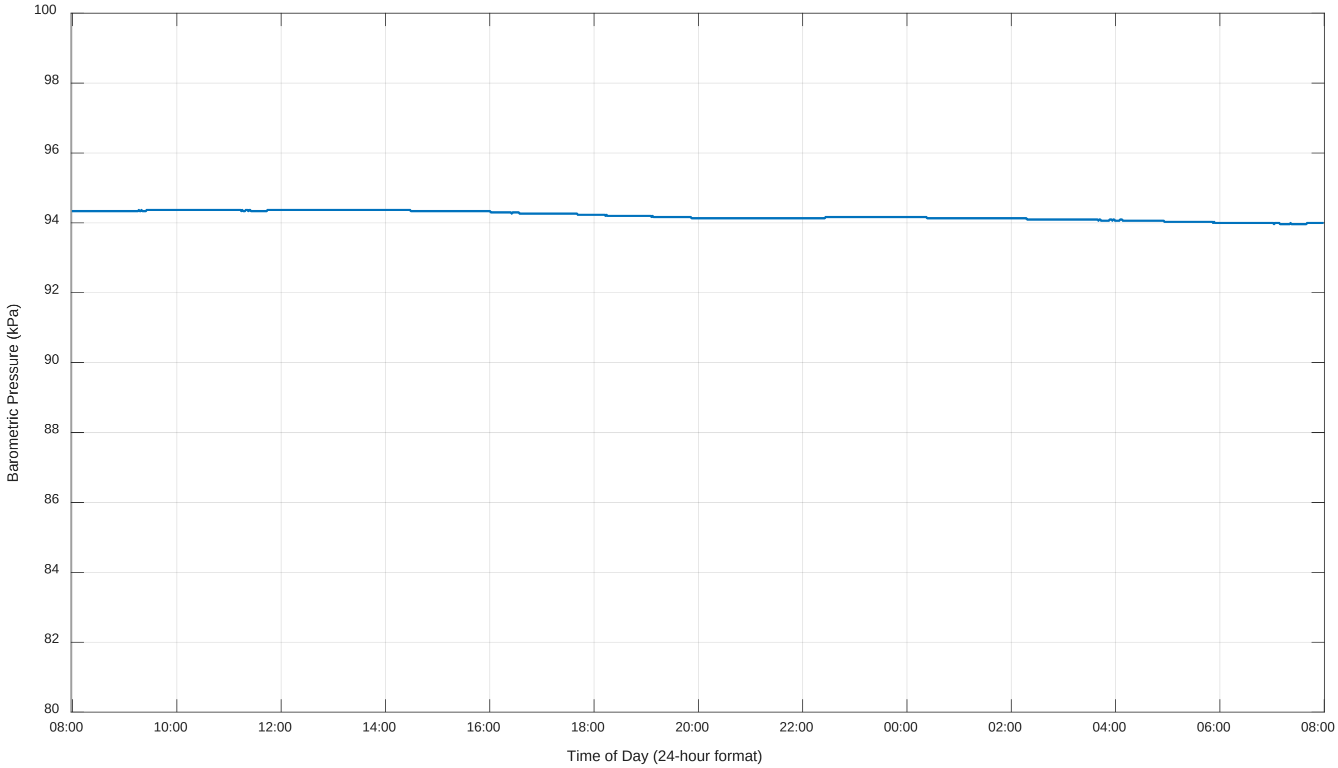
Monitored Wind Direction (July 7 - 8, 2023) at Noise Monitor Location 11



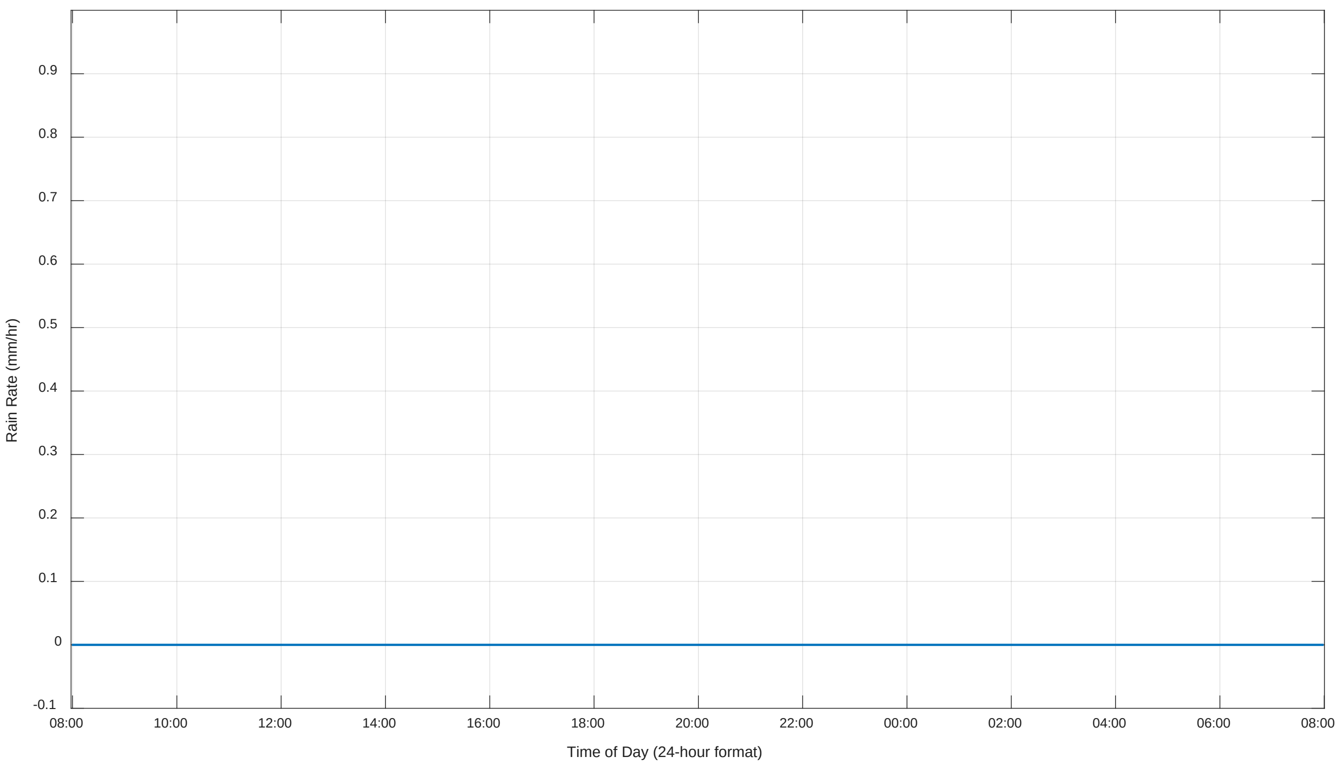
Monitored Temperature (July 7 - 8, 2023) at Noise Monitor Location 11



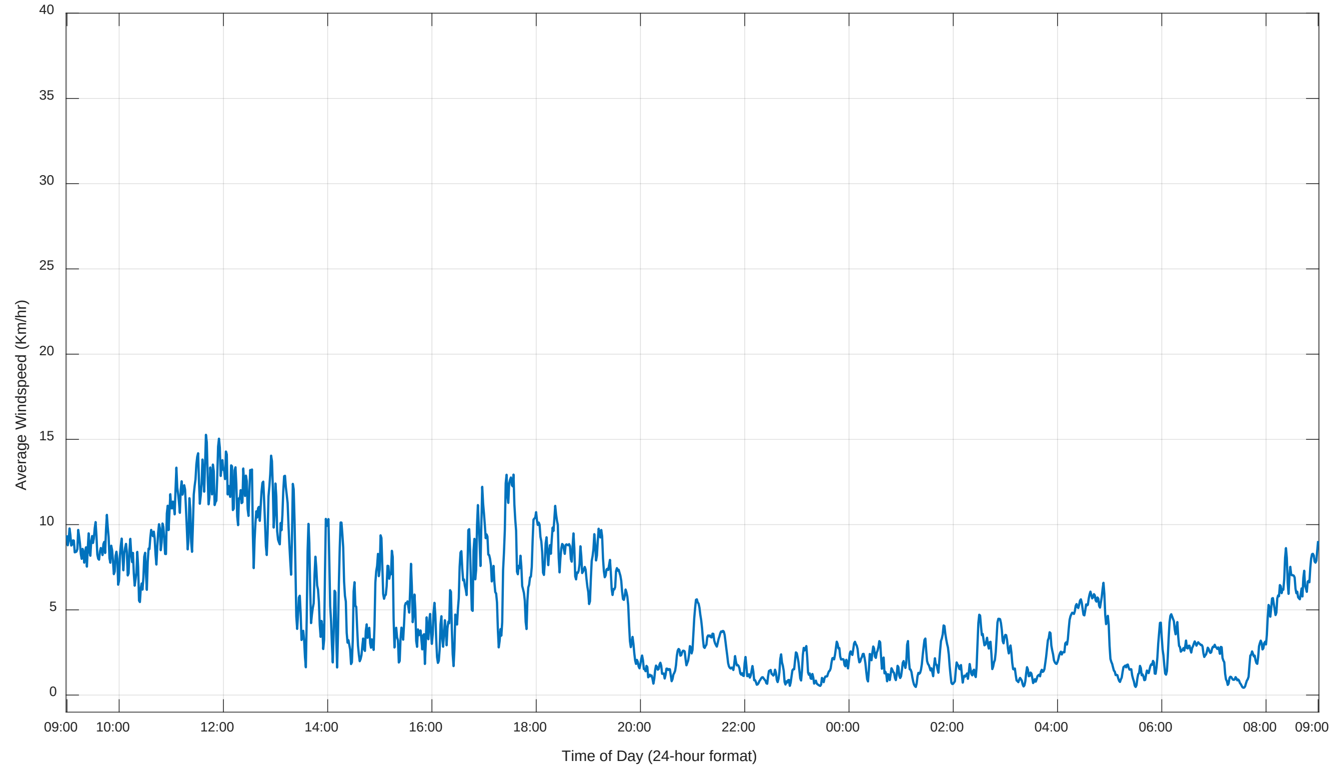
Monitored Humidity (July 7 - 8, 2023) at Noise Monitor Location 11



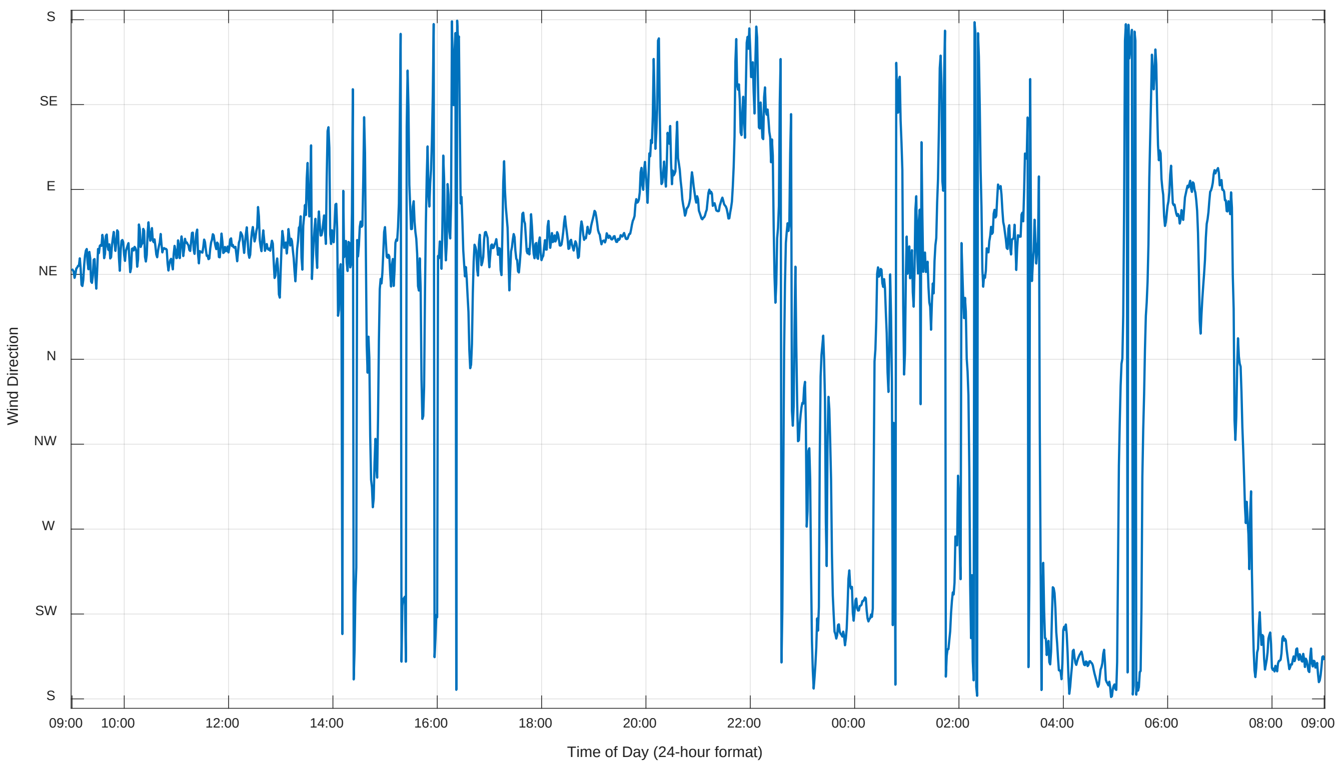
Monitored Barometric Pressure (July 7 - 8, 2023) at Noise Monitor Location 11



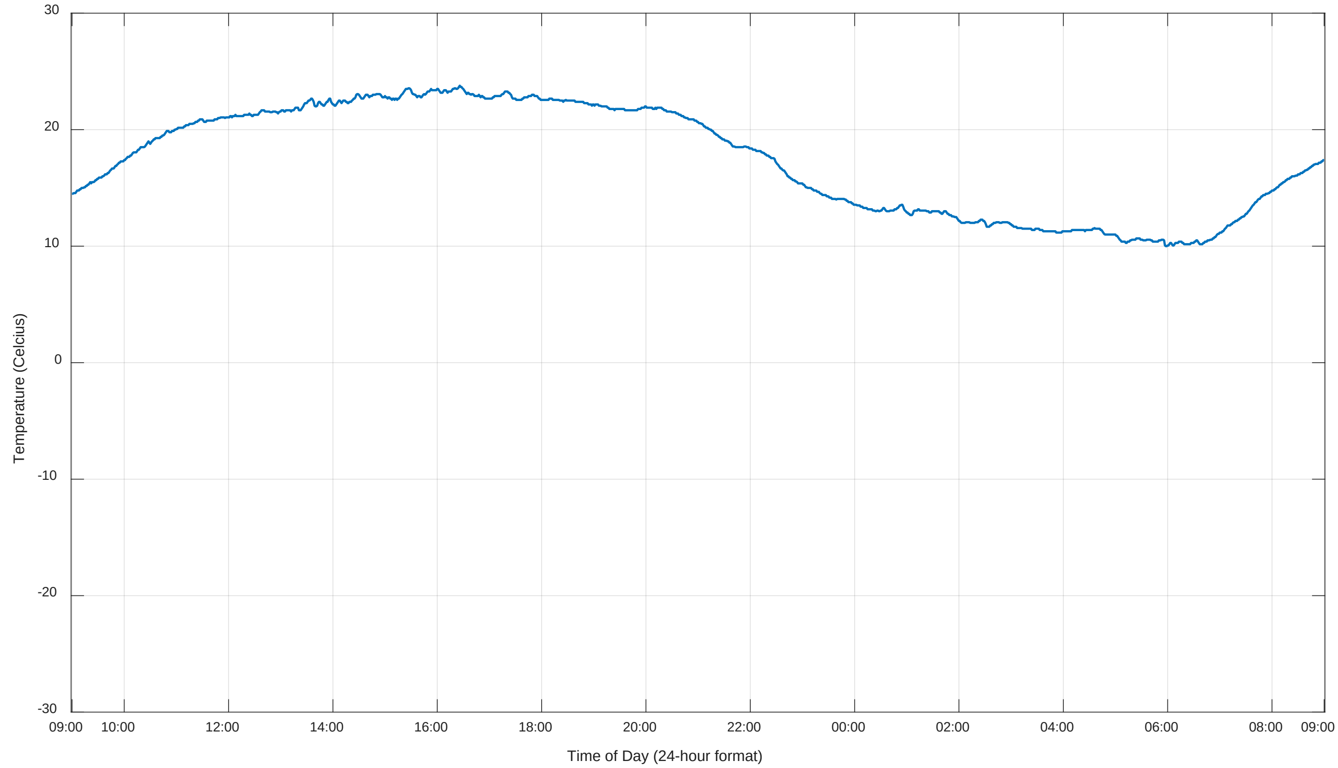
Monitored Rain Rate (July 7 - 8, 2023) at Noise Monitor Location 11



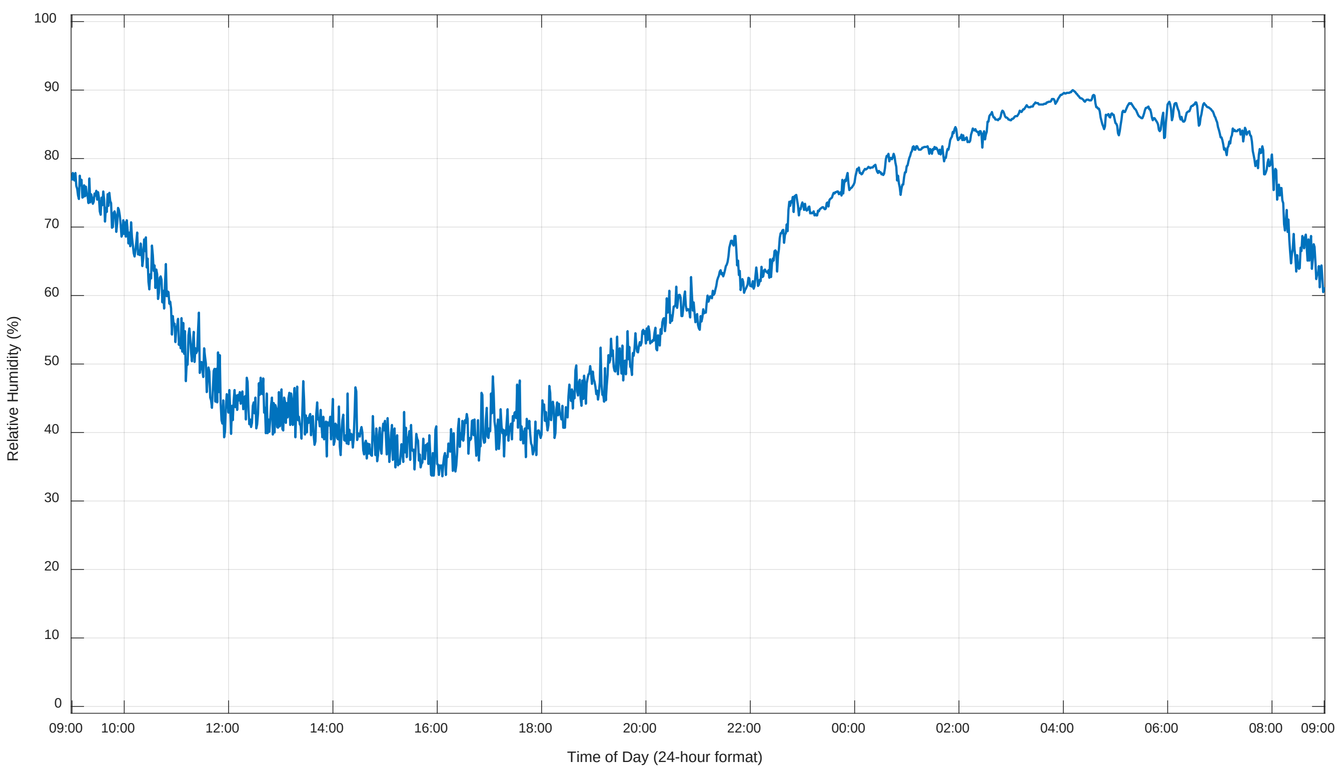
Monitored Wind Speed (July 7 - 8, 2023) at Noise Monitor Location 12



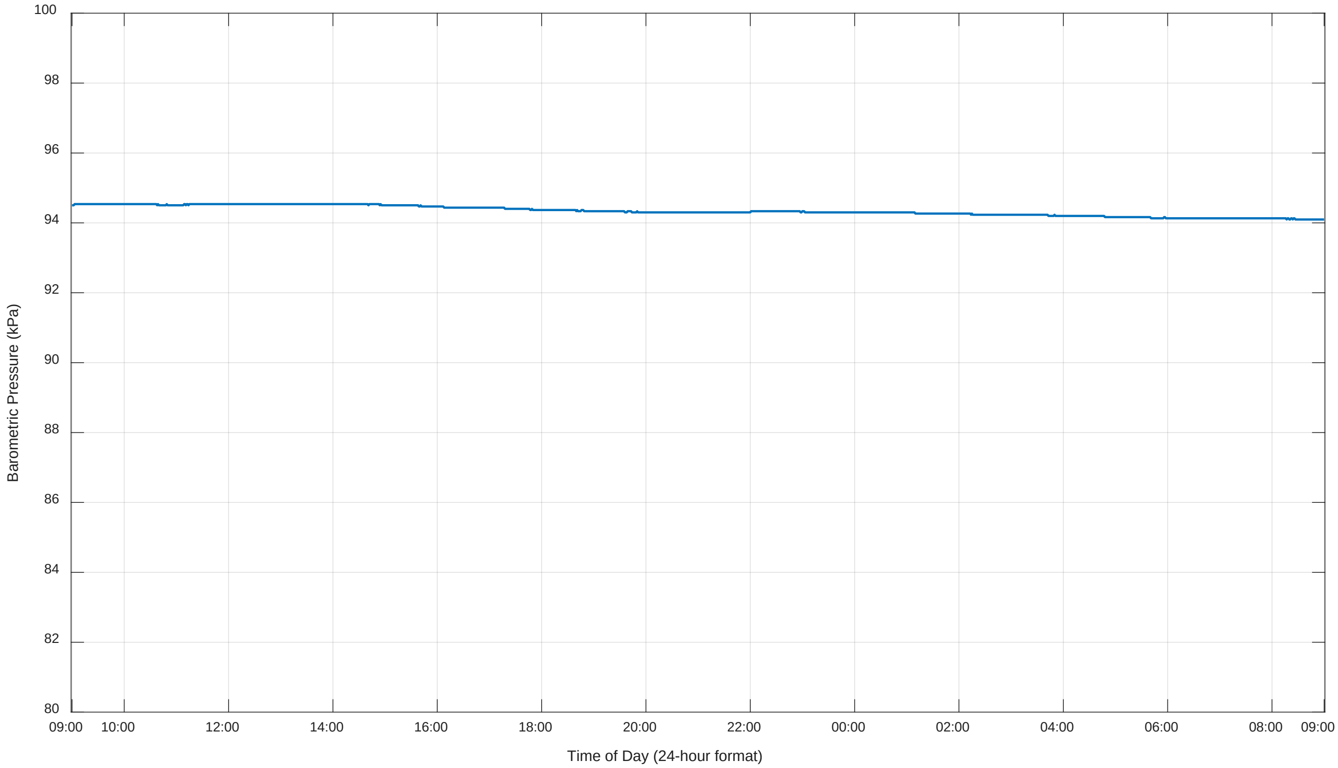
Monitored Wind Direction (July 7 - 8, 2023) at Noise Monitor Location 12



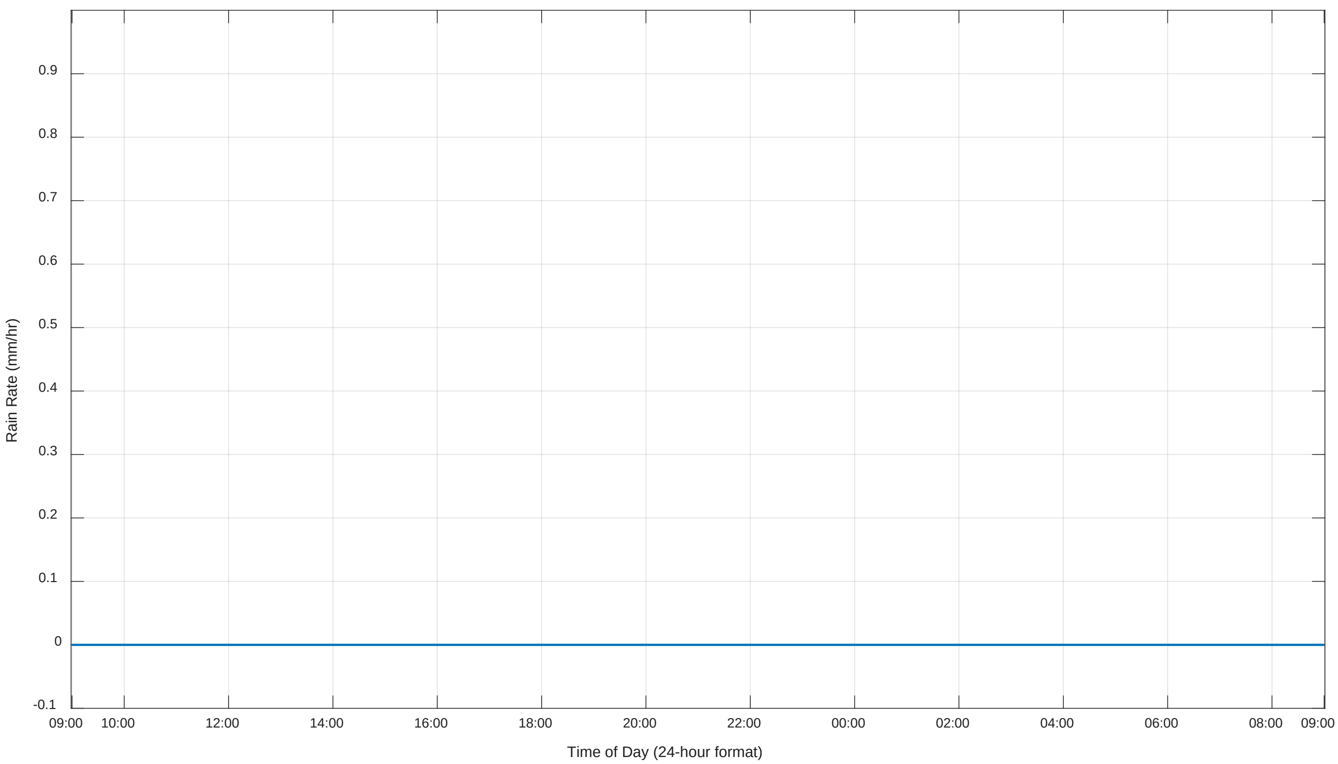
Monitored Temperature (July 7 - 8, 2023) at Noise Monitor Location 12



Monitored Humidity (July 7 - 8, 2023) at Noise Monitor Location 12

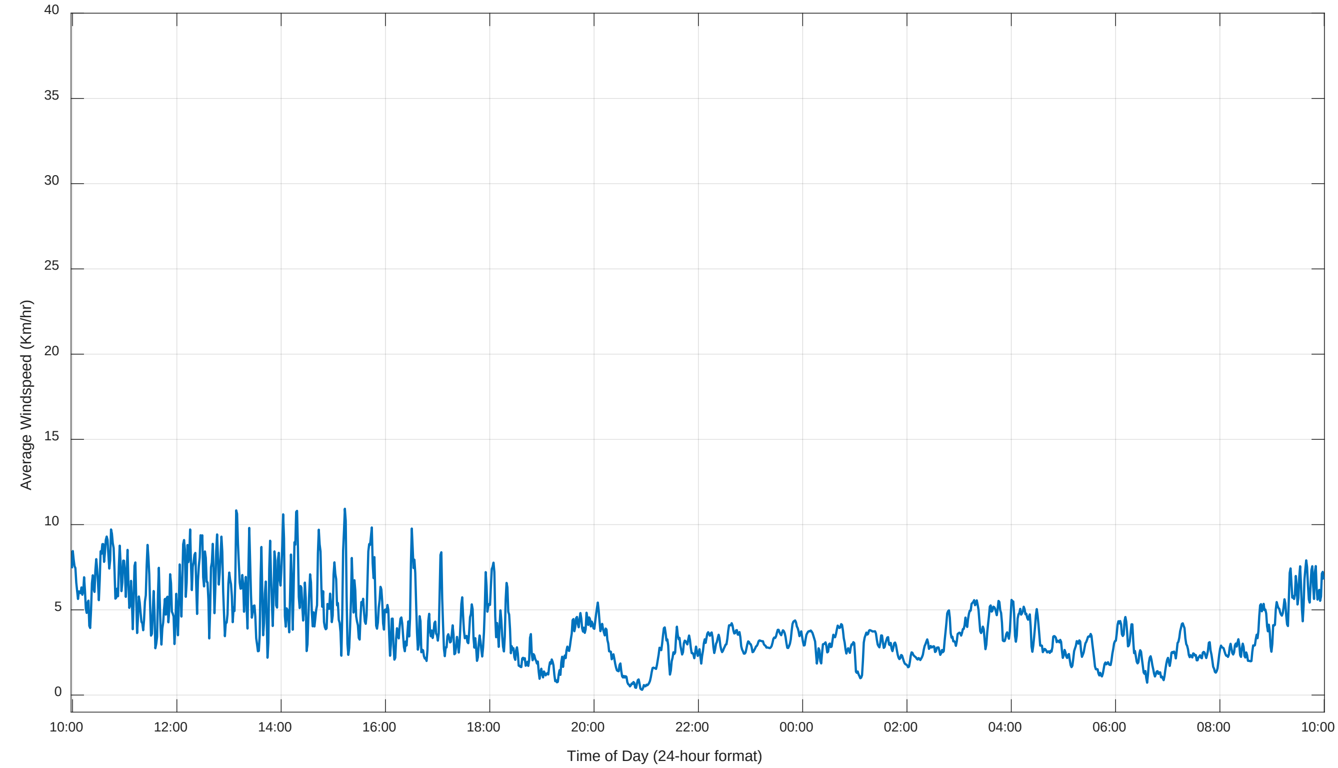


Monitored Barometric Pressure (July 7 - 8, 2023) at Noise Monitor Location 12

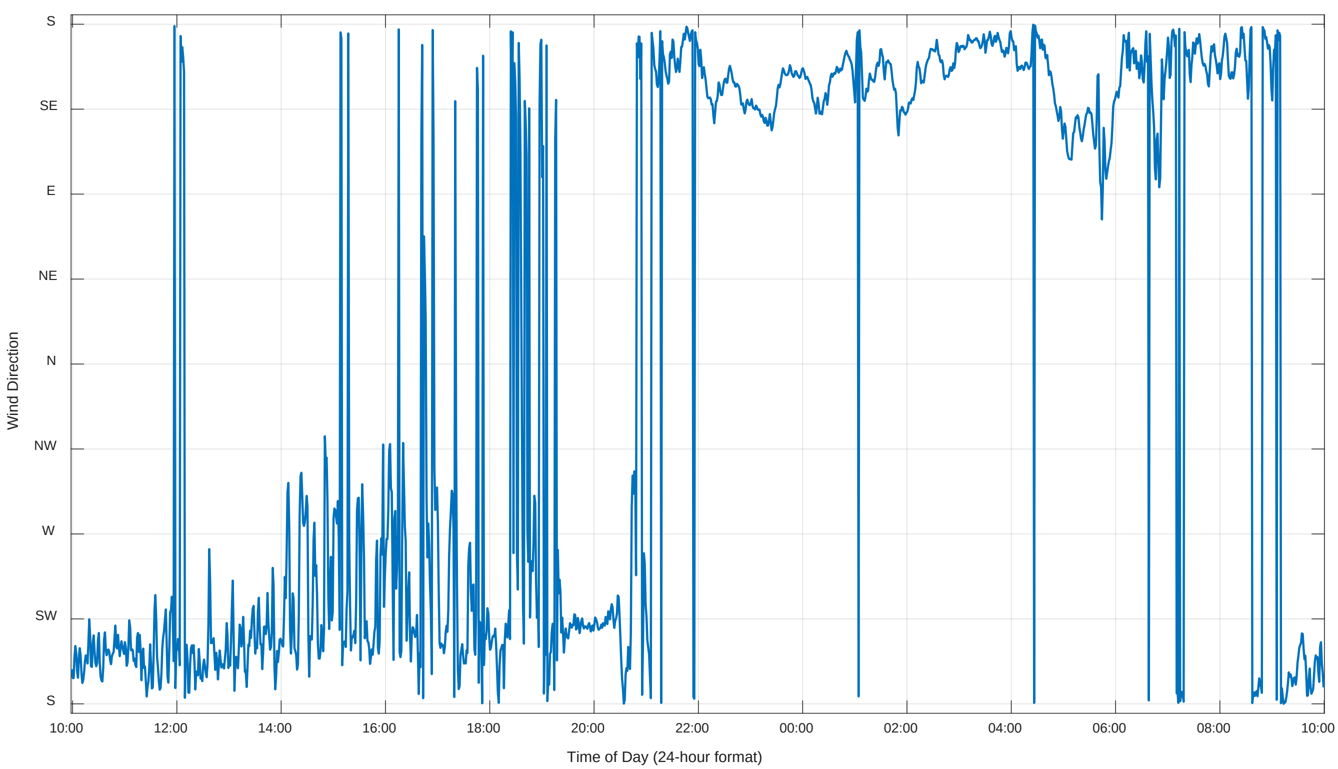


Monitored Rain Rate (July 7 - 8, 2023) at Noise Monitor Location 12

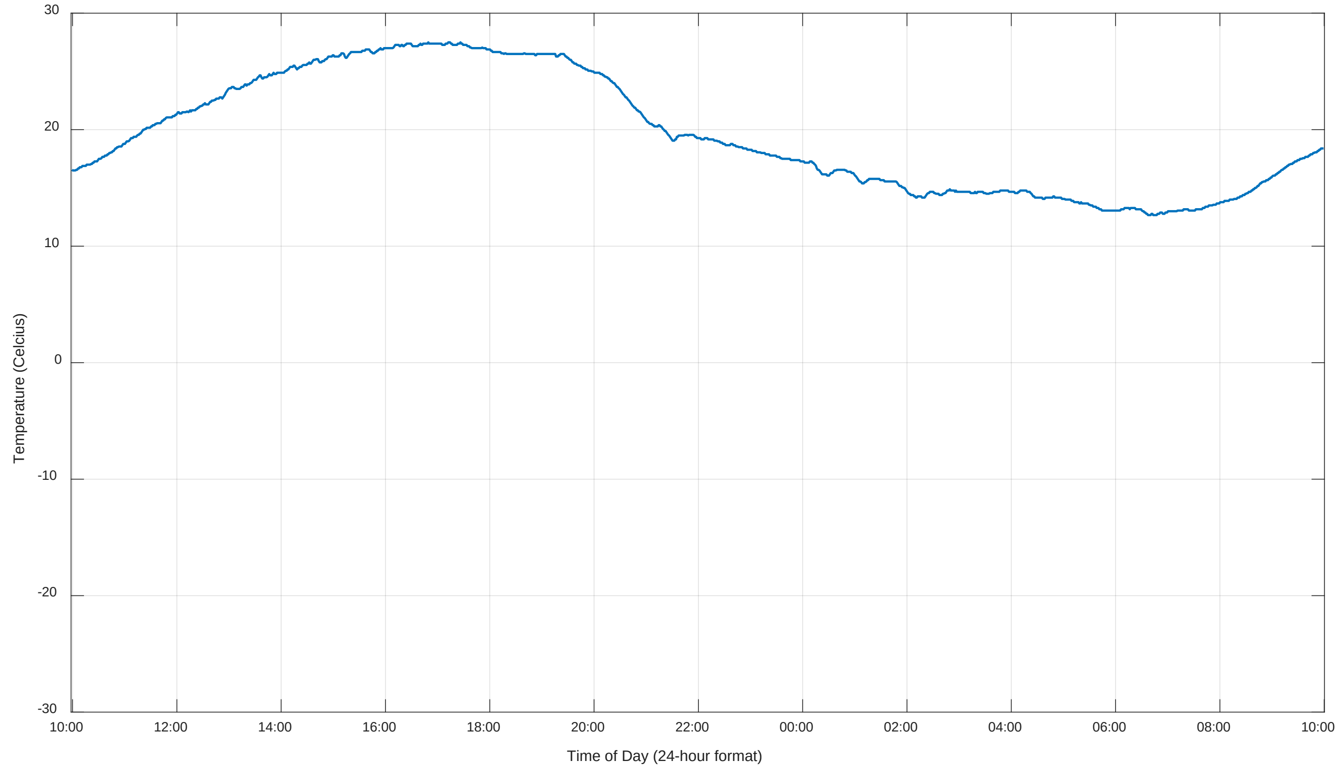
August 27 – 28, 2023 Weather Data



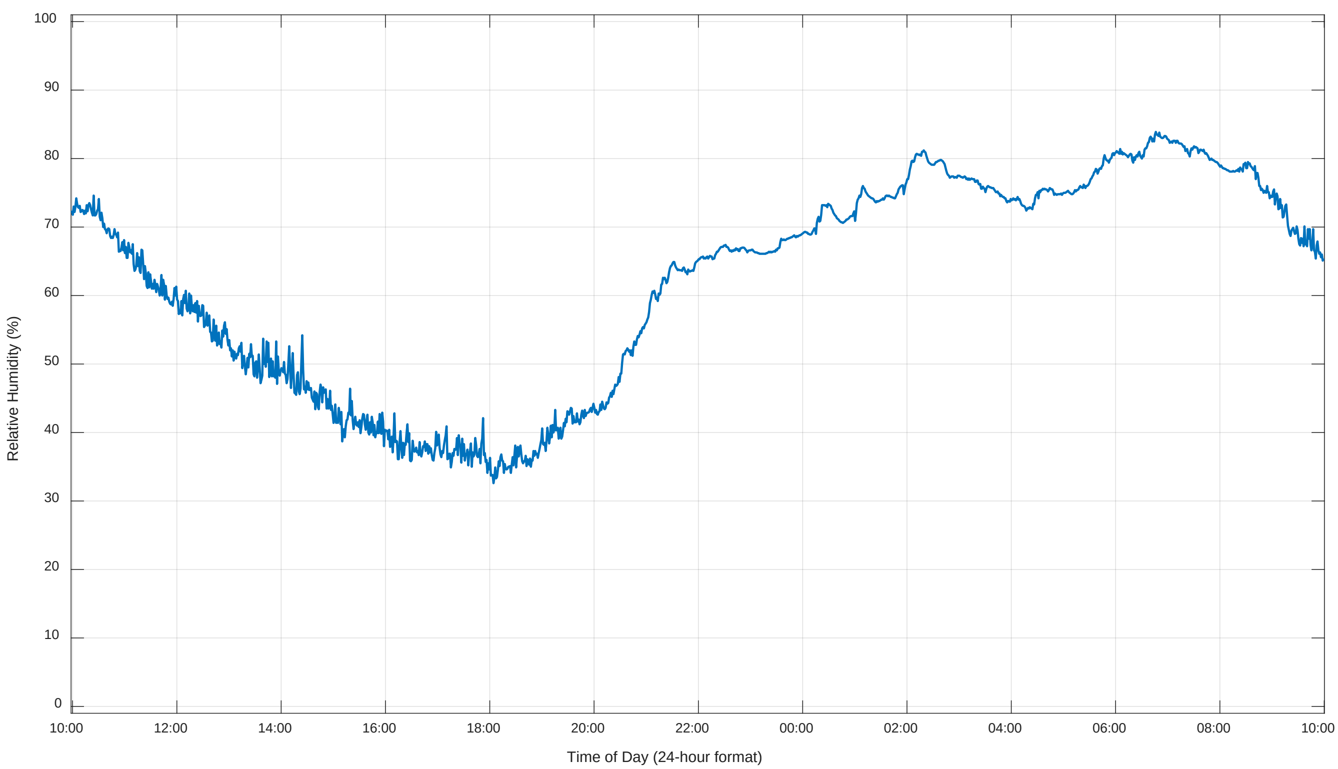
Monitored Wind Speed (August 27 - 28, 2023) at Noise Monitor Location 1



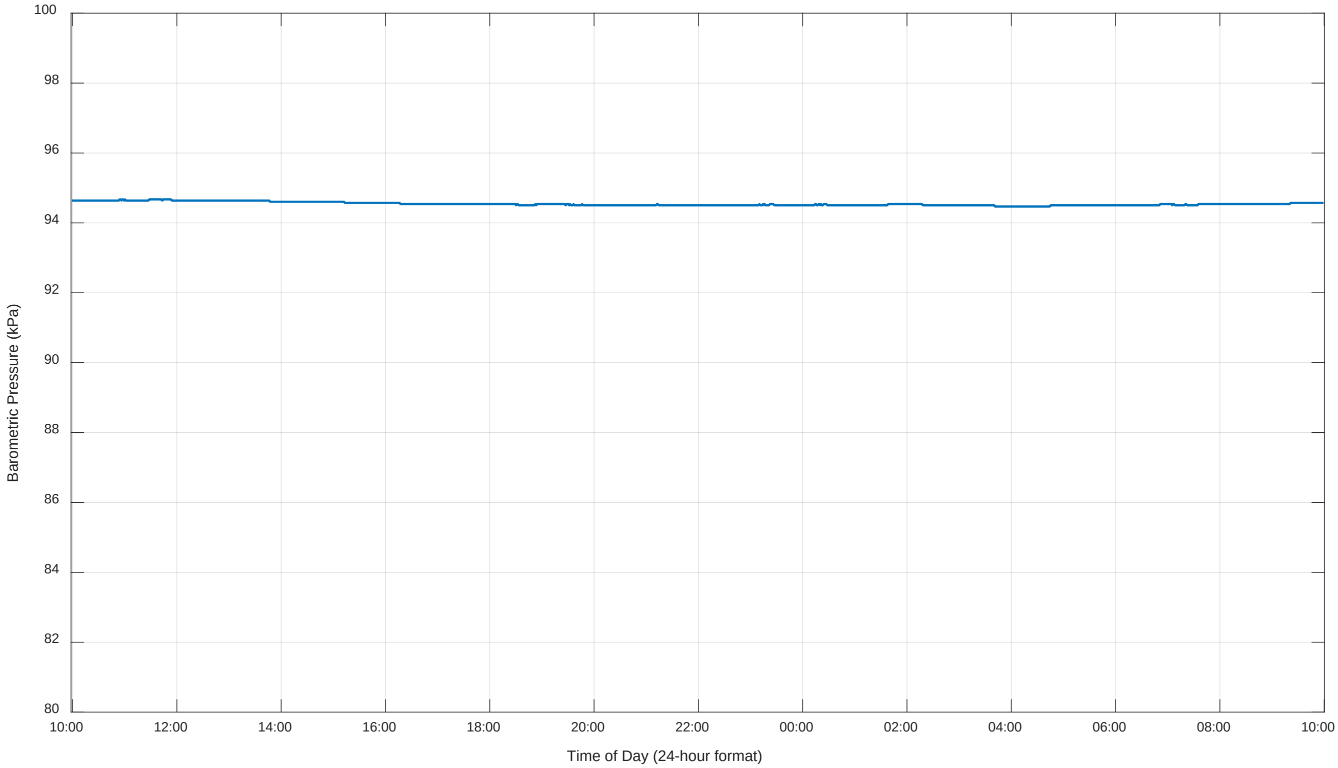
Monitored Wind Direction (August 27 - 28, 2023) at Noise Monitor Location 1



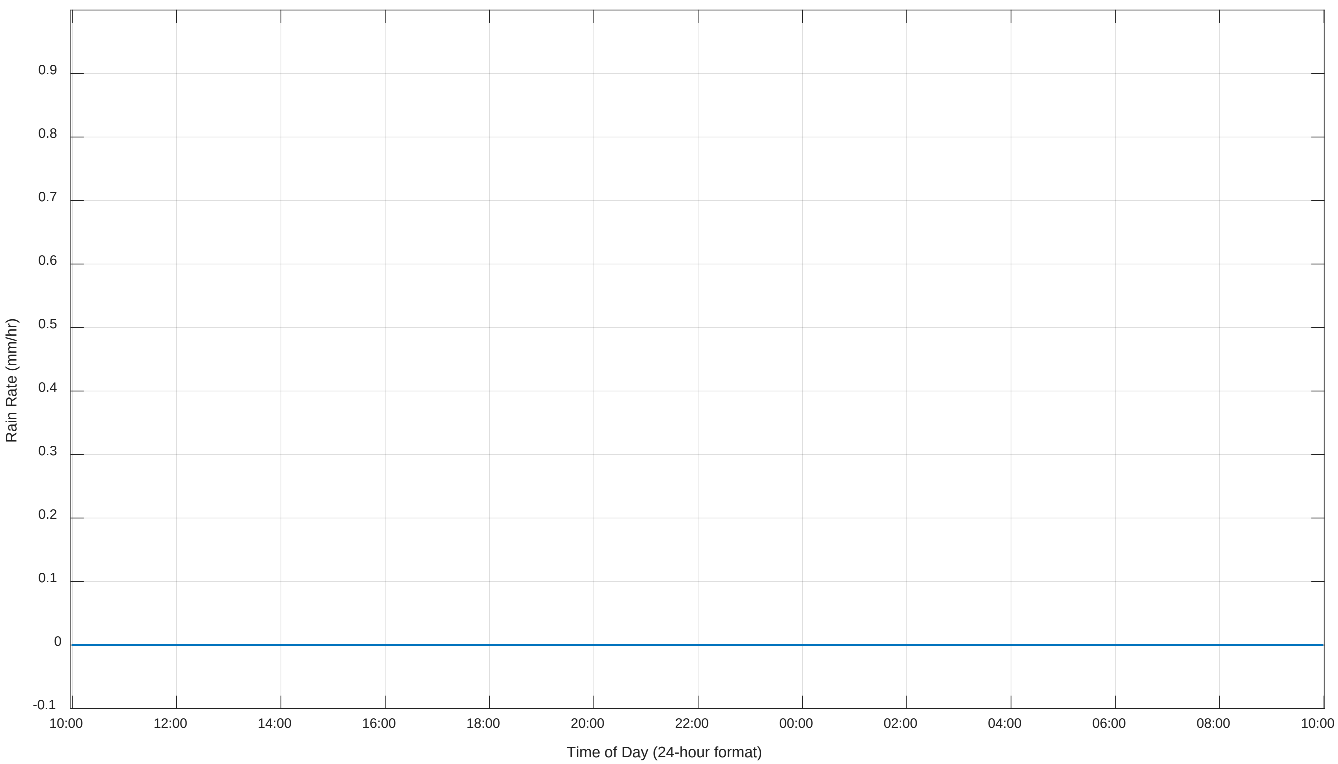
Monitored Temperature (August 27 - 28, 2023) at Noise Monitor Location 1



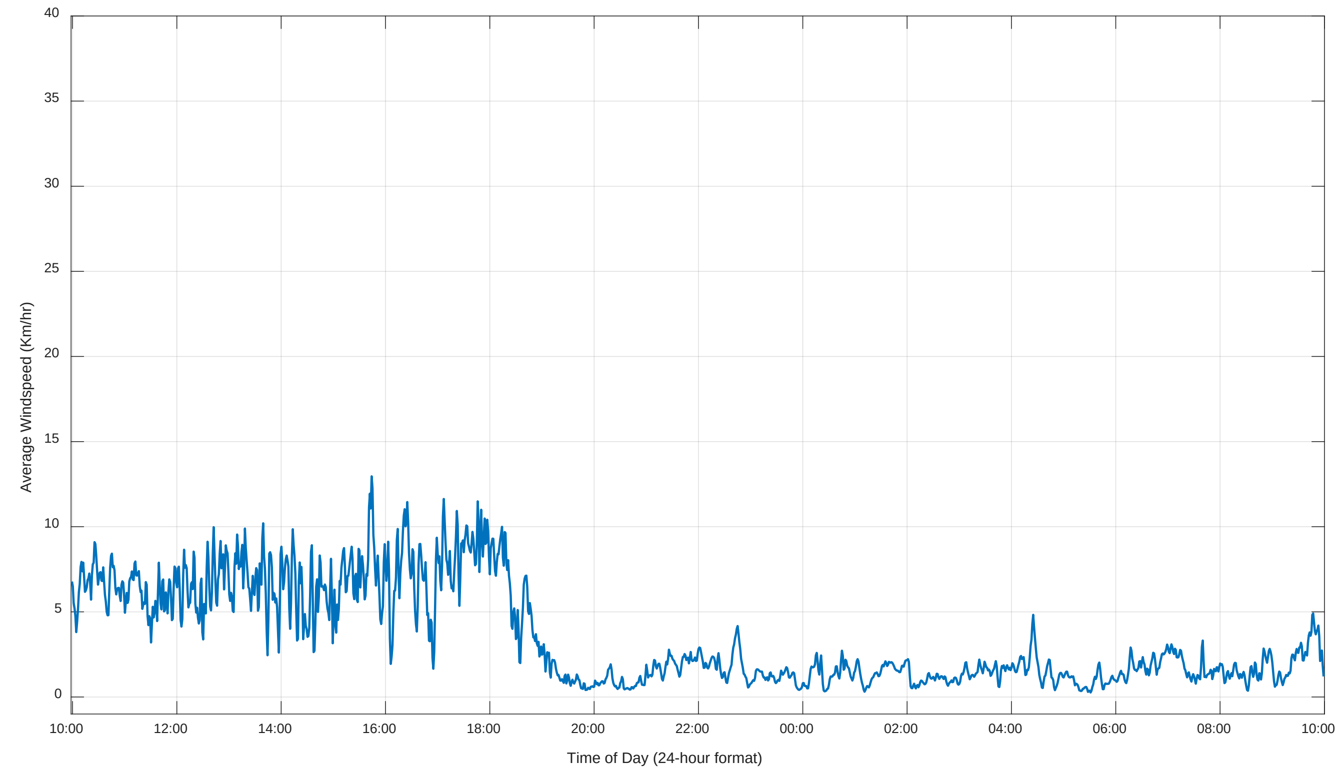
Monitored Humidity (August 27 - 28, 2023) at Noise Monitor Location 1



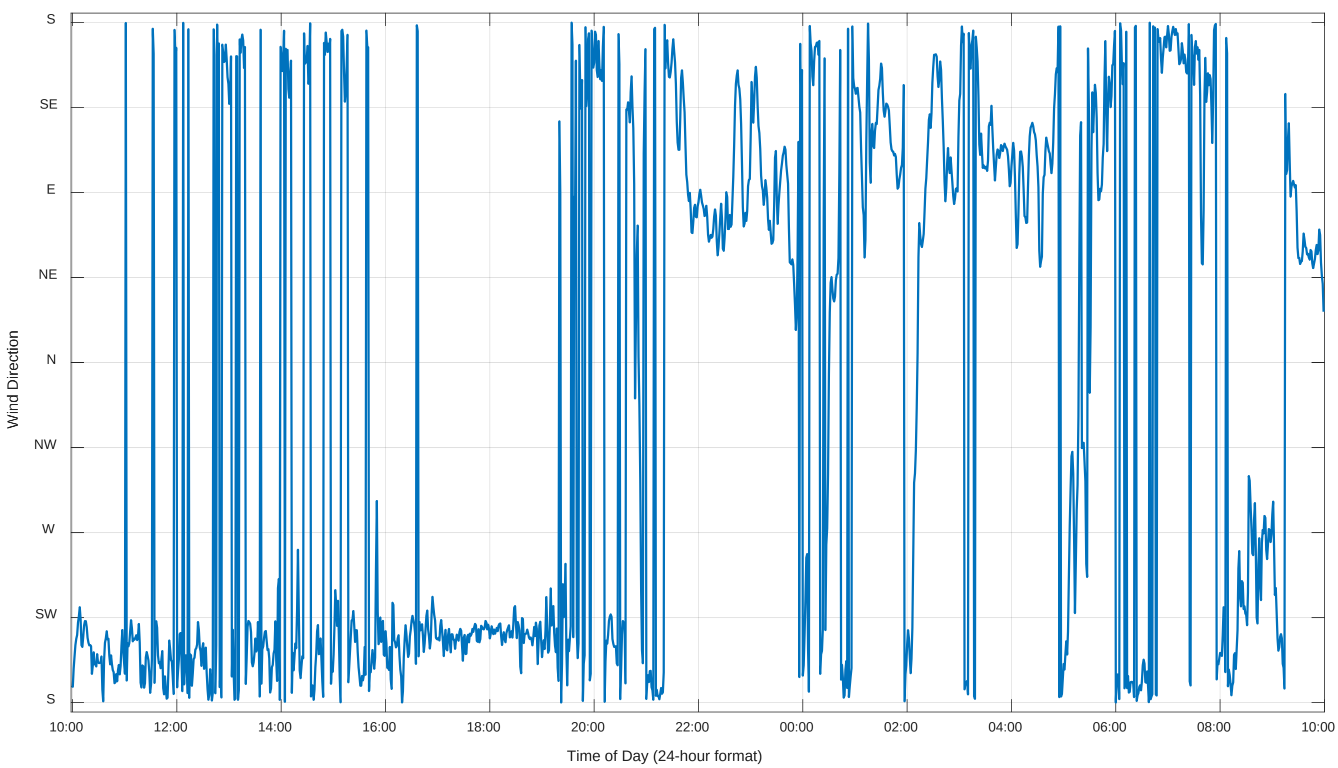
Monitored Barometric Pressure (August 27 - 28, 2023) at Noise Monitor Location 1



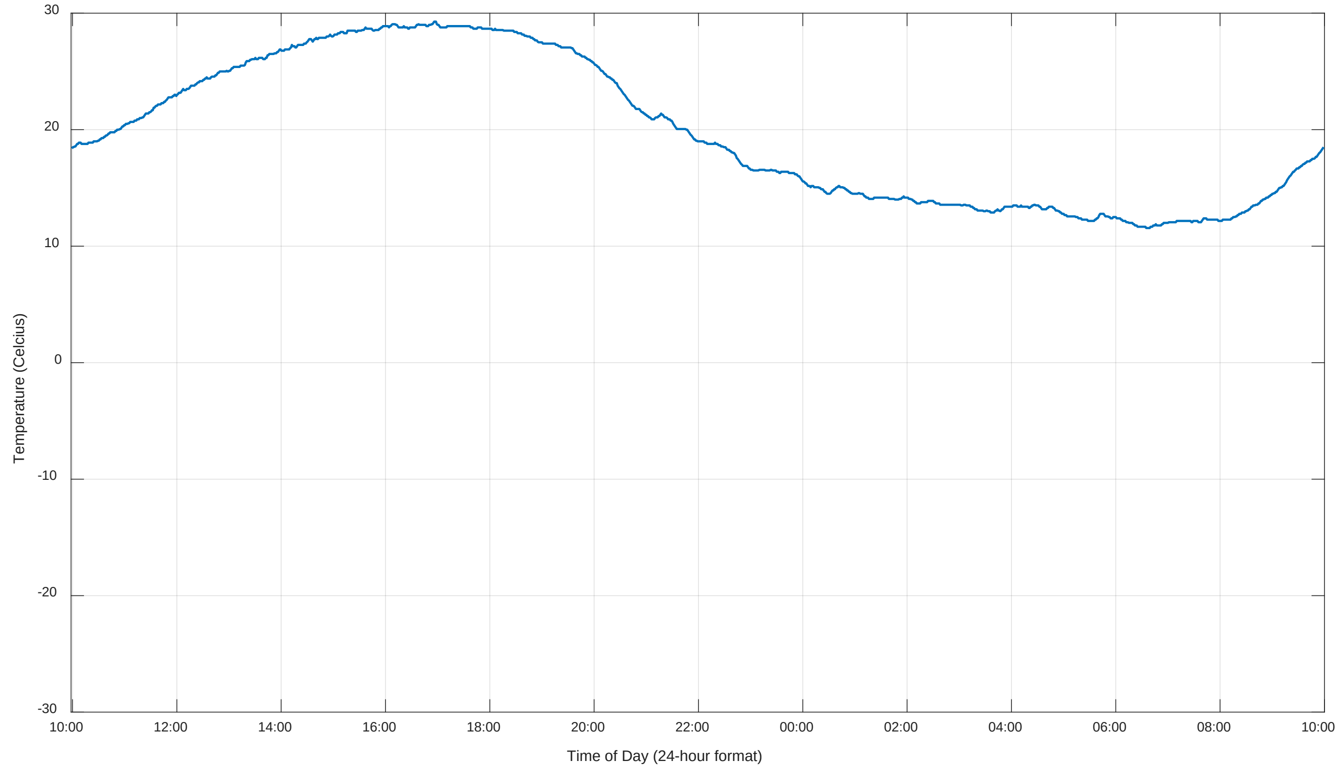
Monitored Rain Rate (August 27 - 28, 2023) at Noise Monitor Location 1



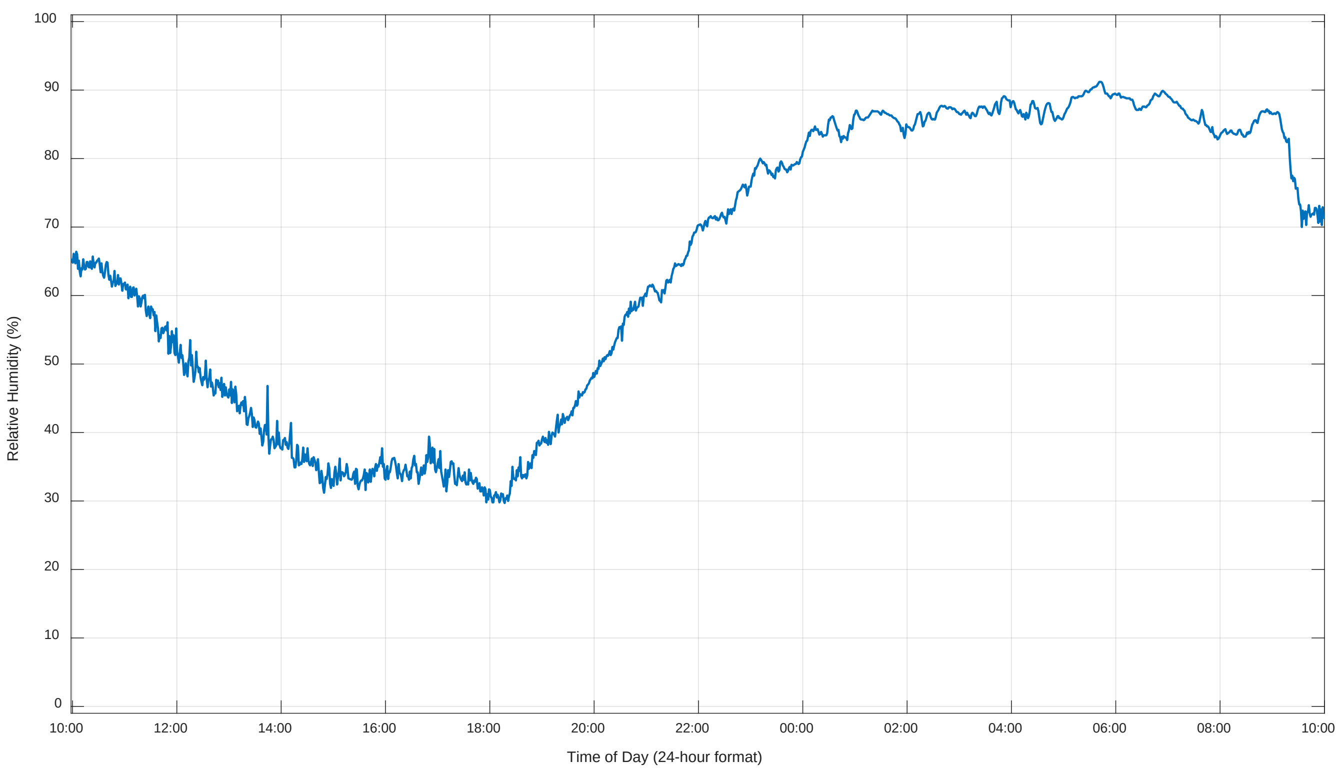
Monitored Wind Speed (August 27 - 28, 2023) at Noise Monitor Location 12



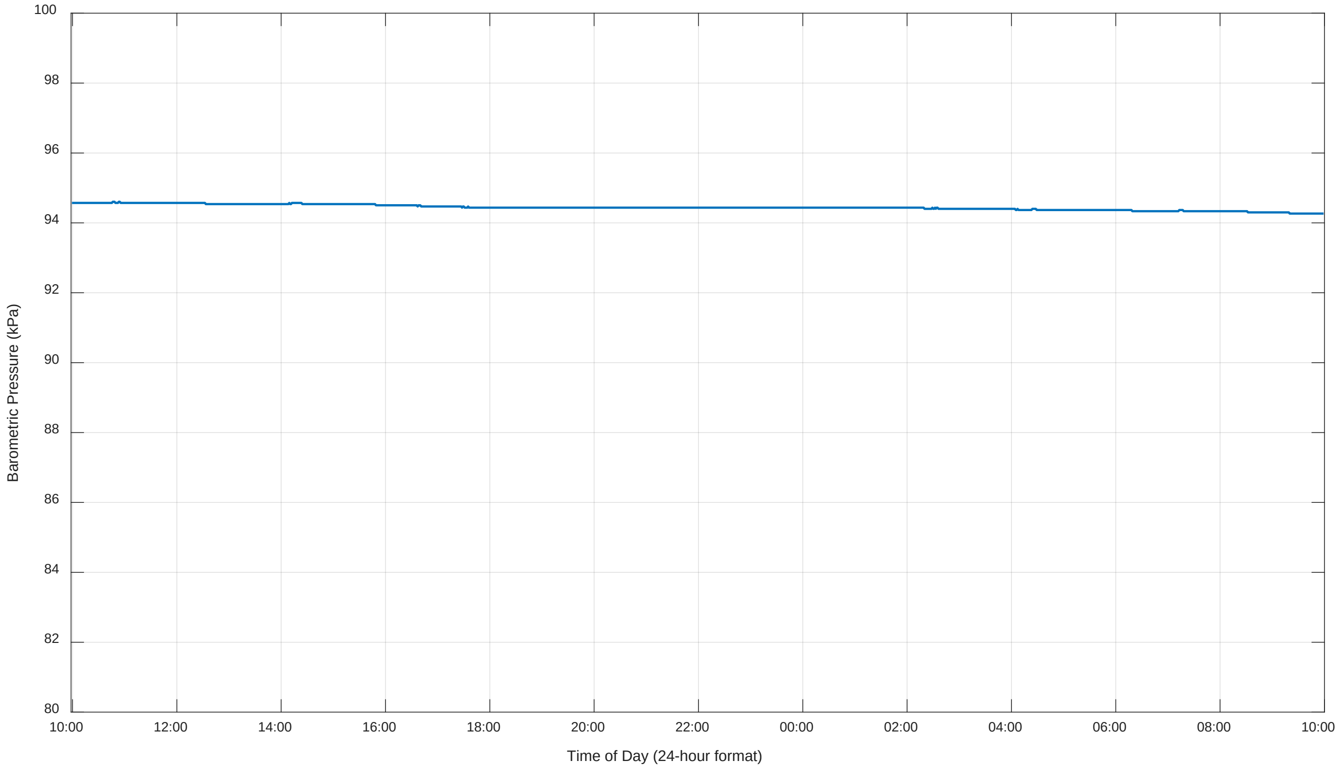
Monitored Wind Direction (August 27 - 28, 2023) at Noise Monitor Location 12



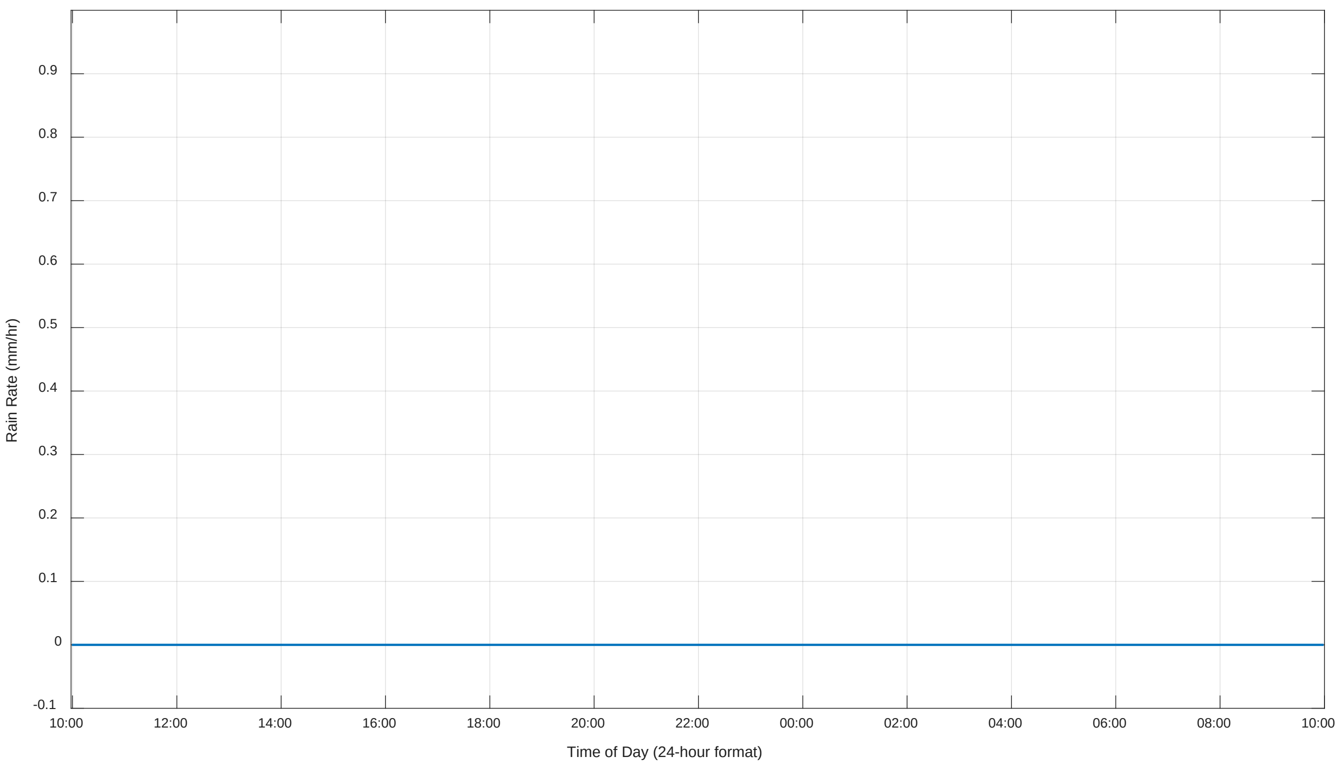
Monitored Temperature (August 27 - 28, 2023) at Noise Monitor Location 12



Monitored Humidity (August 27 - 28, 2023) at Noise Monitor Location 12



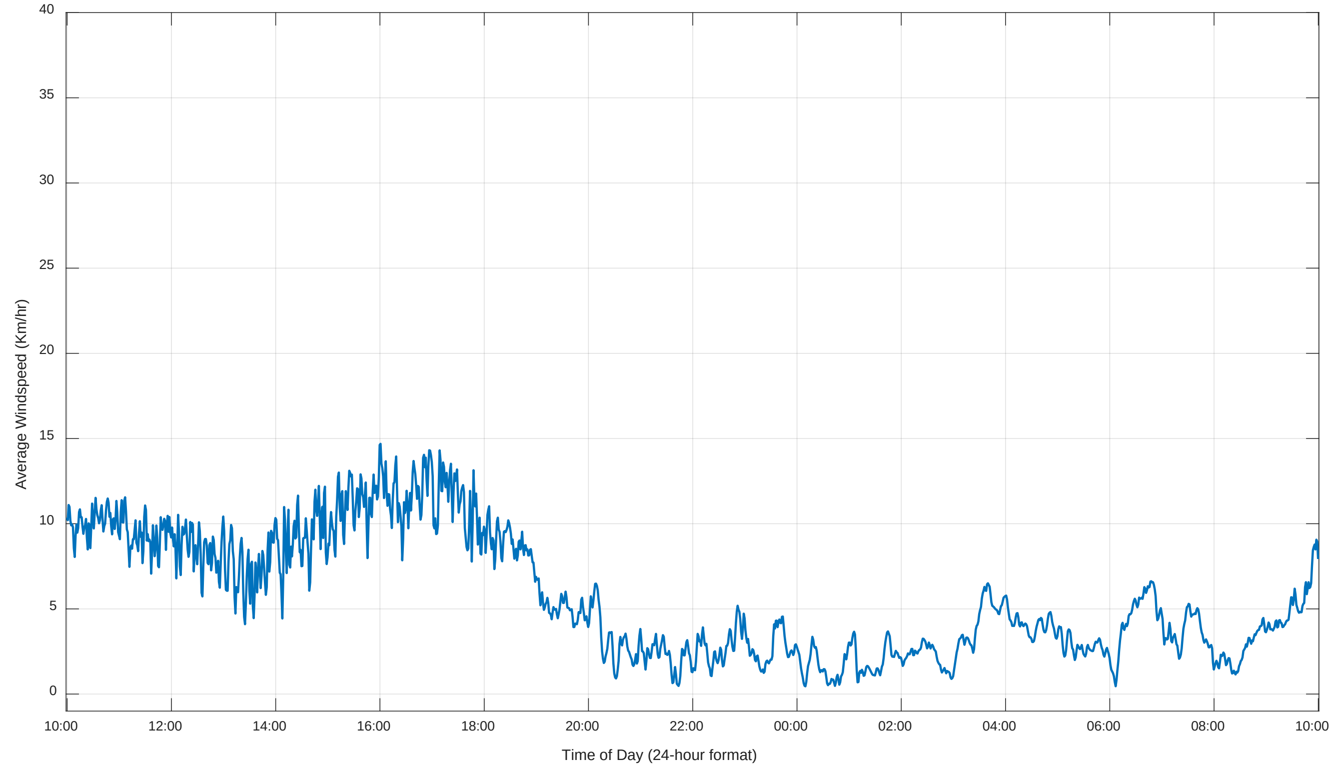
Monitored Barometric Pressure (August 27 - 28, 2023) at Noise Monitor Location 12



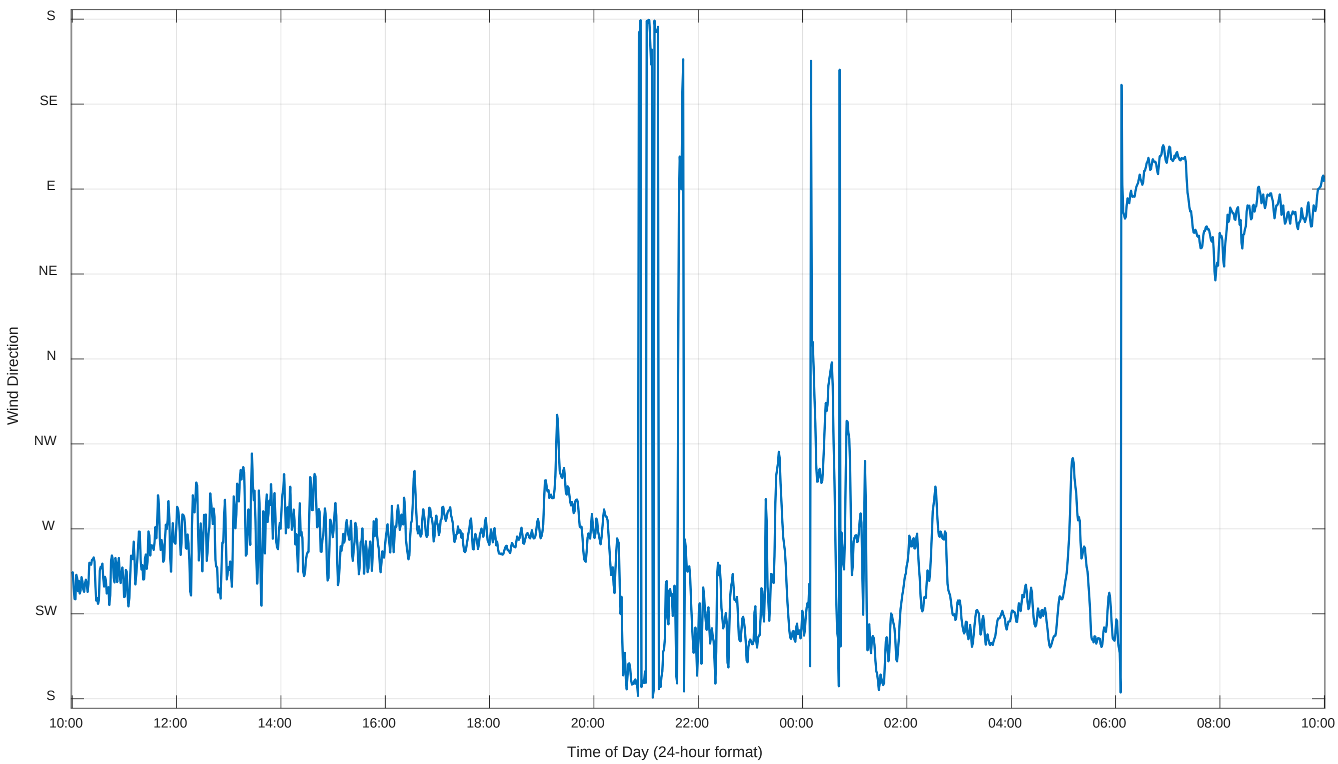
Monitored Rain Rate (August 27 - 28, 2023) at Noise Monitor Location 12

acoustical consultants inc

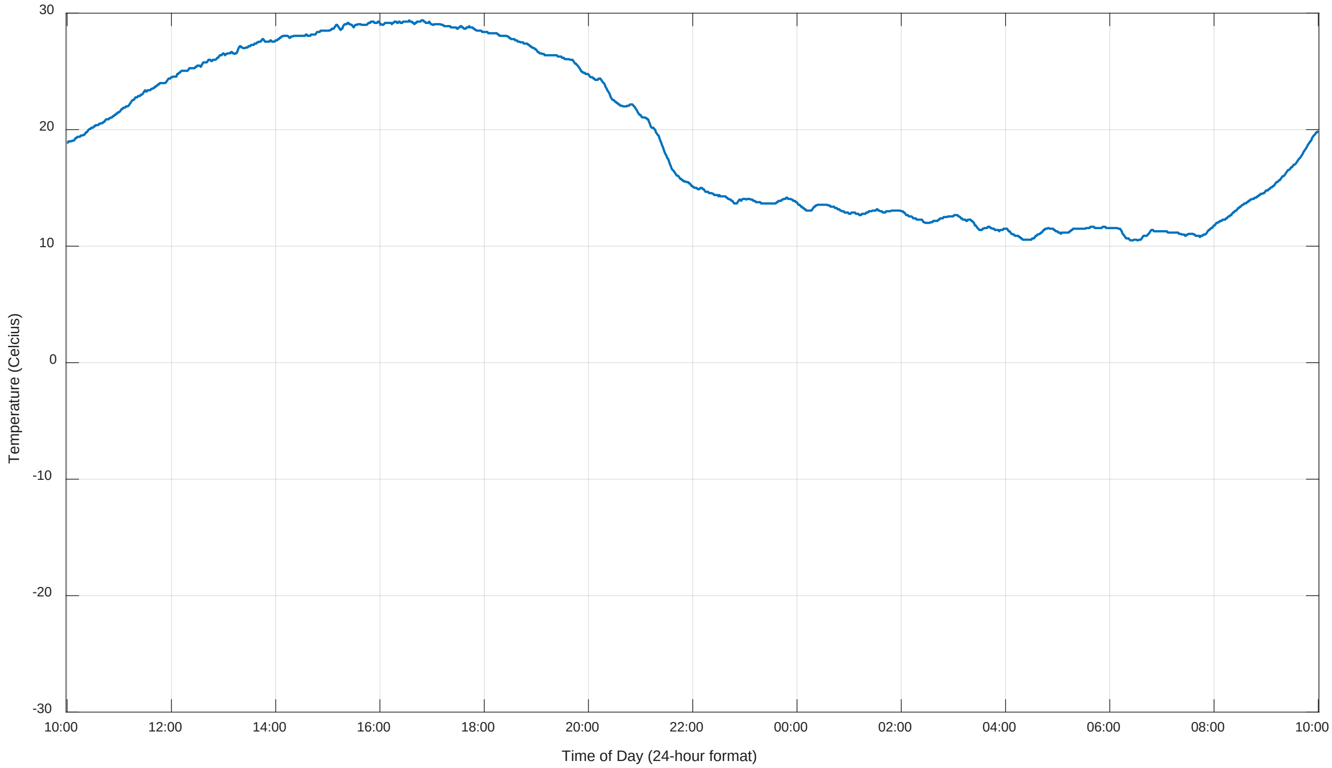
August 28 - 29, 2023 Weather Data



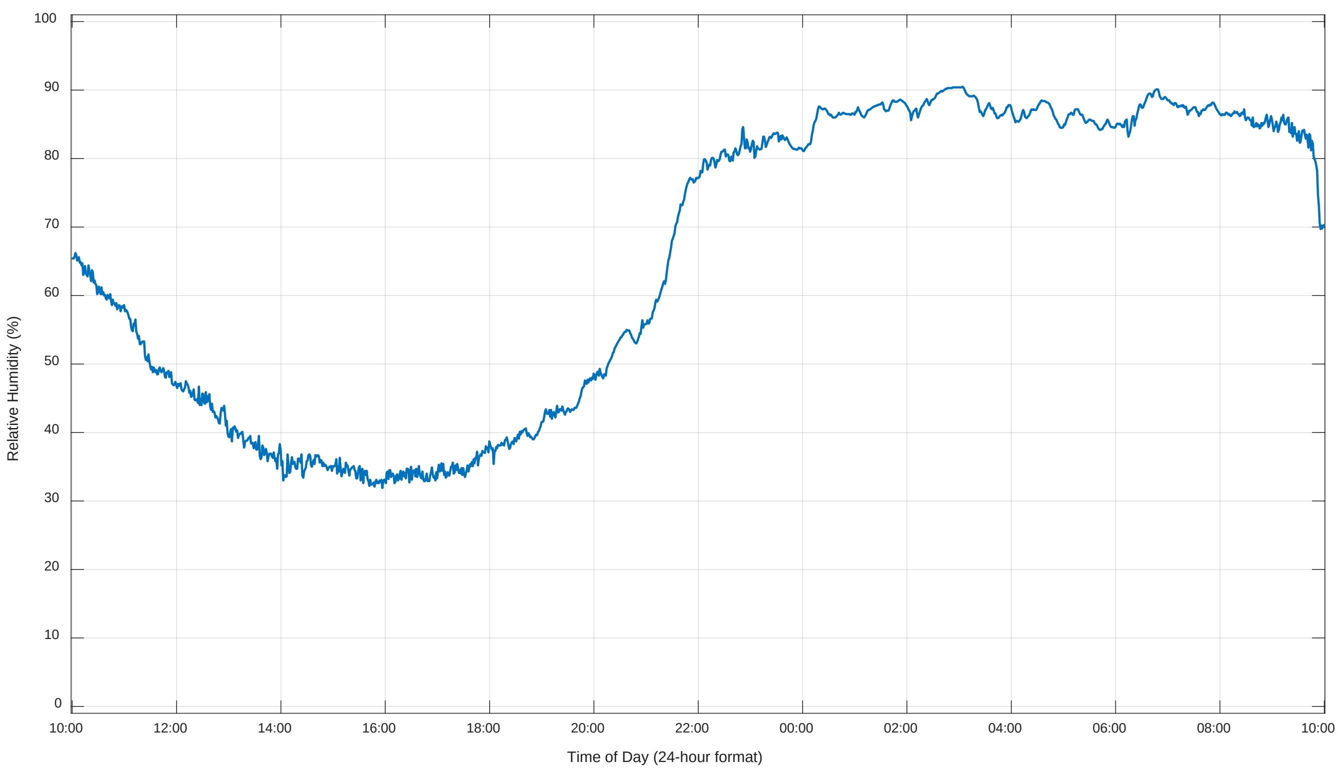
Monitored Wind Speed (August 28 - 29, 2023) at Noise Monitor Location 12



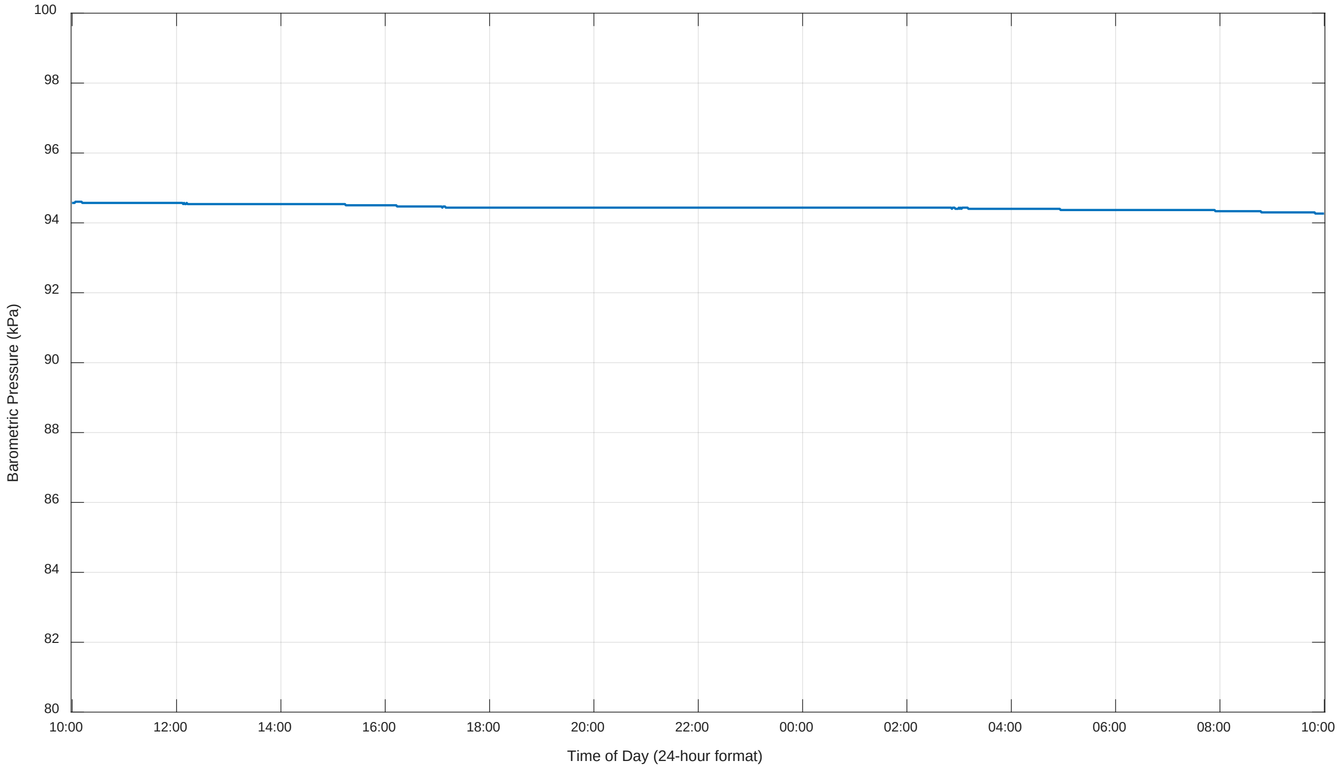
Monitored Wind Direction (August 28 - 29, 2023) at Noise Monitor Location 12



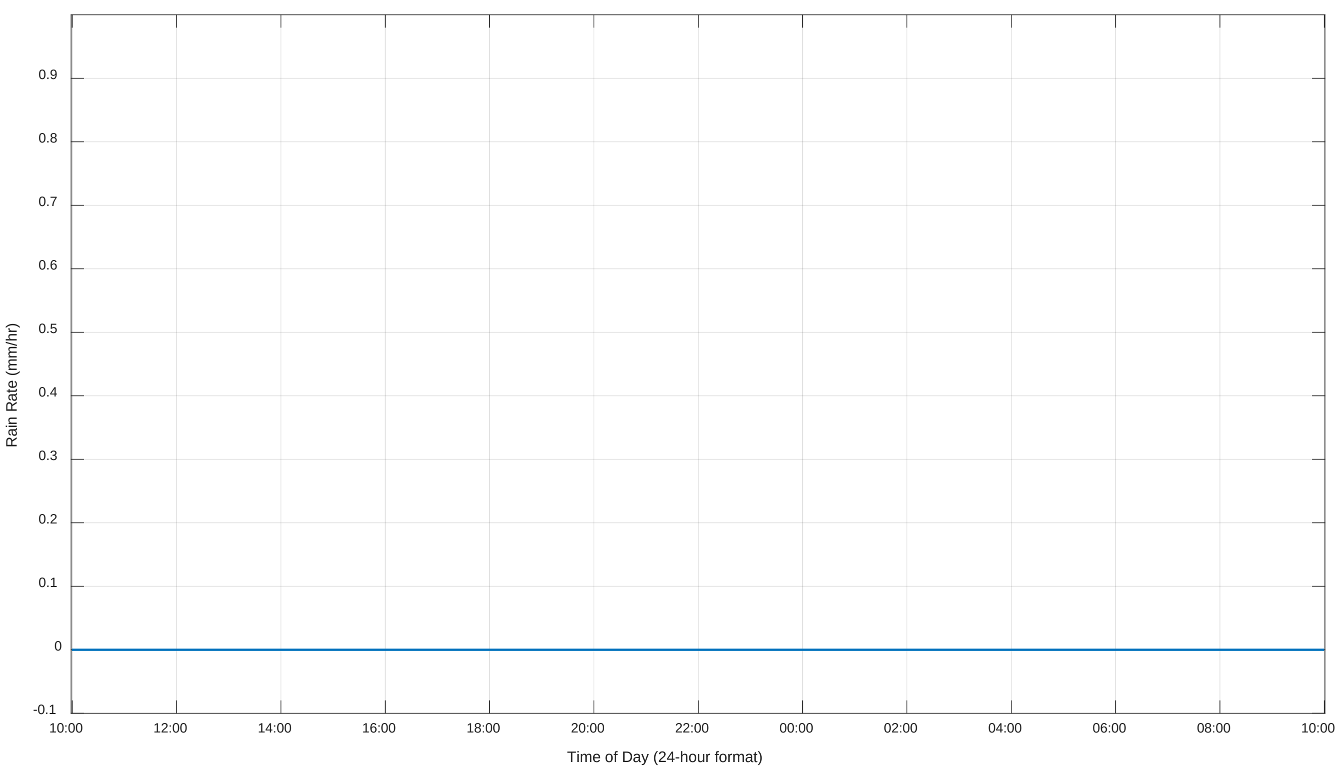
Monitored Temperature (August 28 - 29, 2023) at Noise Monitor Location 12



Monitored Humidity (August 28 - 29, 2023) at Noise Monitor Location 12



Monitored Barometric Pressure (August 28 - 29, 2023) at Noise Monitor Location 12



Monitored Rain Rate (August 28 - 29, 2023) at Noise Monitor Location 12

APPENDIX 4

NCIA Member Company Noise Management Plan Updates for 2022

Insert your Company Name here: Chemtrade

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 2022.**

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.	A Noise Management program has been implanted at the Fort Saskatchewan sites and a copy has ben submitted to NCIA.
Provide a summary of any monitoring (fence line outward completed in 2022. Note, you are not required to conduct any off-site monitoring.	No noise monitoring completed in 2022, all equipment is inside a building and there is very minimal noise created outside.
Disclose any improvements/corrective actions implemented in 2022 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 were implemented in 2022.

Disclose any improvements/projects that are approved for 2023 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 no projects slated for 2023 that will permanently impact the noise level, all noise will be temporary during project execution.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2022.	Annual internal audits are completed for site programs, no qualitative assessments done.
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	No noise complaints received in 20232.

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**

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 2022.**

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 2021. Note, you are not required to conduct any off-site monitoring.	No offsite monitoring was conducted in 2022.
Disclose any improvements/corrective actions implemented in 2021 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 2022 that would impact the noise level output.

Disclose any improvements/projects that are approved for 2022 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?	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 2021.	No audit/self-assessment evaluation was completed in 2022.
Provide a Noise Complaint summary for all noise complaints received in 2021 including any actions taken to address them.	No noise complaints were received in 2022.

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

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 2022.**

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 2022. Note, you are not required to conduct any off-site monitoring.	No monitoring or assessment required or carried out in 2022.
Disclose any improvements/corrective actions implemented in 2022 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.

Disclose any improvements/projects that are approved for 2023 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 2022.	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 2022 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**

Insert your Company Name here: **Keyera Energy Ltd.**

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 2021.**

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 previously provided an electronic copy of the site plan to NCIA.
Provide a summary of any monitoring (fence line outward completed in 2022. Note, you are not required to conduct any off-site monitoring.	No monitoring was completed outside the fence line 2022
Disclose any improvements/corrective actions implemented in 2022 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 corrective actions or changes occurred in 2022 that would change the results of the most recent noise model.

Disclose any improvements/projects that are approved for 2023 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 approved improvements or projects are currently sanctioned for 2023 that will impact site noise models.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2022.	None completed in 2022.
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	There were no noise complaints received in 2022.

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.

Nutrien Redwater:

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 2022.**

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 2022. Note, you are not required to conduct any off-site monitoring.	There was no offsite monitoring completed in 2022 for the Redwater facility.
Disclose any improvements/corrective actions implemented in 2022 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 or corrective actions were implemented in 2022. Redwater facility updated the site noise model in 2022. SLR Consulting will be incorporating it into the NCIA Regional Noise Model at the end of the 2023.

Disclose any improvements/projects that are approved for 2023 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 or projects planned for 2023.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2022.	The Noise Management Plan, program and associated documents were not reviewed in 2022.
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	There were four external noise complaints for the Redwater facility in 2022 (see attached summary).

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.

Redwater Noise Summary

Noise Incident Detail # INC-2022-RNO-00451

A neighbor phoned in a noise complaint. The cause was determined to be a timer malfunction on a propane cannon.

Actions Taken

The propane cannon timer was reset. Followed up with complainant.

Noise Incident Detail # INC-2022-RNO-00452

A neighbor phoned in a noise complaint. The cause of the noise was determined to be coming from an adjacent industrial site.

Actions Taken

Investigation revealed no issues with the noise system on site. Followed up with complainant.

Noise Incident Detail # INC-2022-RNO-00507

A neighbor phoned in a noise complaint. The cause was determined to be a malfunctioning cannon.

Actions Taken

The cannon was decommissioned. Followed up with complainant.

Noise Incident Detail # INC-2022-RNO-00543

A neighbor phoned in a noise complaint. The cause of the noise was determined to be coming from an adjacent industrial site.

Actions Taken

Investigation revealed no issues with the noise system on site. Followed up with complainant.

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 2022.**

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 2022. Note, you are not required to conduct any off-site monitoring.	No fence line outward monitoring conducted in 2022.
Disclose any improvements/corrective actions implemented in 2022 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?	Measurements in RFS II/III were completed in 2022 by SLR to finalize the noise model from theoretical to actual.

Disclose any improvements/projects that are approved for 2023 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 scheduled for 2023.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2022.	None completed.
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	No 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.

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

<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 2022.</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 2022.
Provide a summary of any monitoring (fence line outward completed in 2022. Note, you are not required to conduct any off-site monitoring.	None
Disclose any improvements/corrective actions implemented in 2022 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 2022. The Site noise model does not require updating at this time.

Disclose any improvements/projects that are approved for 2023 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 2023. 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 2022.	None
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	No Complaints received in 2022.

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

Access Pipeline o/a Wolf Midstream (Stonefell Terminal – Operating on Behalf of MEG Energy)

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 2022.**

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.	Access abides by AER's Directive 38. We participate in industrial noise monitoring.
Provide a summary of any monitoring (fence line outward completed in 2022. Note, you are not required to conduct any off-site monitoring.	A noise monitoring was not conducted in 2022.
Disclose any improvements/corrective actions implemented in 2022 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 2023 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 2023 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 2022.	None.
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	We did not receive any noise complaints for the 2022 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 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

Access Pipeline o/a Wolf Midstream (Sturgeon 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 2022.**

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.	Access abides by AER's Directive 38. We participate in industrial noise monitoring.
Provide a summary of any monitoring (fence line outward completed in 2022. Note, you are not required to conduct any off-site monitoring.	A noise monitoring was not conducted in 2022.
Disclose any improvements/corrective actions implemented in 2022 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 2023 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 2023 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 2022.	None.
Provide a Noise Complaint summary for all noise complaints received in 2022 including any actions taken to address them.	We did not receive any noise complaints for the 2022 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.

APPENDIX 5

NCIA Member Company Noise Management Plan Updates for 2023

Bunge Canada:

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 2023.**

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.	Yes
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	N/A
Disclose any improvements/corrective actions implemented in 2023 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

Disclose any improvements/projects that are approved for 2024 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
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	N/A
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	None 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.

Insert your Company Name here: Chemtrade (Fort Saskatchewan CSC and Sulfide Site)

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 2023.**

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.	A Noise Management program has been implanted at the Fort Saskatchewan sites and a copy has been submitted to NCIA.
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	No noise monitoring completed in 2023, all equipment is inside a building and there is very minimal noise created outside.
Disclose any improvements/corrective actions implemented in 2023 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 were implemented in 2023.

Disclose any improvements/projects that are approved for 2024 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 no projects slated for 2024 that will permanently impact the noise level, all noise will be temporary during project execution.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	Annual internal audits are completed for site programs, no qualitative assessments done.
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	No noise complaints received in 2023.

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.

April 26, 2024

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

Dear Dr. Danielson,

Subject: 2023 Regional 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 Stephanie Kozey at 780 - 992 - 4408 or me at 780 - 992 - 2835 if you require any further information or clarification.

Yours sincerely,

Stacey Heidbrink

Stacey Heidbrink
Responsible Care Director
Dow Alberta Operations

Copy: Abdulqader Al-Qubandi, Responsible Care Leader MEGlobal Canada ULC

Dow Fort Saskatchewan Site
2023 Regional Noise Management Annual Report
Prepared for Northeast Capital Industrial Association (NCIA)

This report provides Dow and MEGlobal's 2023 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	**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.	A Noise Management Plan was developed by Dow and MEGlobal for submission to NCIA for inclusion in the 2023 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.
Provide a summary of any monitoring (fence line outward completed in 2023.) Note, you are not required to conduct any off-site monitoring.	There was no noise monitoring (fenceline outward) completed in 2023. The site noise model was updated in 2014 for all sources (other than onsite 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 2023 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/corrective actions implemented in 2023 at the MEGlobal plant. Dow started up a new ethylene cracking furnace, H-091, on April 13, 2021. This new cracking furnace will be included in our next site noise model update. The Hydrocarbons Plant noise assessment was updated in 2022 to include H-091. It shows that the noise from the new cracking furnace is similar to that from the other 11 cracking furnaces. As such, Dow does not believe that the expansion is having any offsite impact and therefore does not need to be included in the regional noise model at this time. Environmental Operations noise assessment was updated in 2023. There were no other improvement/corrective action implemented in 2023 at Dow plants.

Disclose any improvements/projects that are approved for 2024 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 improvements/corrective actions approved for 2024 at either Dow or MEGlobal plants.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	The Noise Management Plan falls within the Pollution Prevention section of Dow and MEGlobal's Operating Discipline Management System (ODMS). A hearing conservation self-assessment was completed in 2023 and a site Management System Review was conducted in December 2023 by the Site Leader. No actions or gaps were identified related to the Noise Management Plan.
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	There were no noise complaints related to Dow or MEGlobal operations at the site in 2023.

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 conduct noise surveys at least every five years, or when equipment is added, modified, or removed. The onsite noise monitoring program is managed as per 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 4 or 5 year frequencies for all site units/departments and include ODMS elements related to noise and hearing conservation. Hearing conservation self-assessments are conducted every 3 years as per Alberta Operations master self-assessment plan and are approved by the Facility Work Group Leaders. Completeness of unit/department and site self-assessments are reviewed by the Site Leader at the annual site Management System Review. 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 every 3 years. 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
June 2022	Stacey Heidbrink	Dow Responsible Care Director
September 2023	Stacey Heidbrink	Dow Responsible Care Director
April 2024	Stacey Heidbrink	Dow Responsible Care Director

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
October 2018	Marcella deJong	Updated Broken Links
July 2020	Marcella deJong	Updated Broken Links
September 2023	Stephanie Kozey	Updated 06.07 L1 link
April 2024	Stephanie Kozey	Updated to reflect change to self-assessments from mandatory and annual to every 3 years. Also, SA are approved by the FWGL now rather than results being reviewed during annual MSRs. Hearing conservation program is now reviewed every 3 years rather than annually.

Enbridge Pipelines Athabasca Inc. (Stonefell 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 2023.**

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 abides by AER's Directive 38:Noise Control. We participate in industrial noise monitoring.
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	Noise monitoring was not conducted by Enbridge in 2023.
Disclose any improvements/corrective actions implemented in 2023 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 have been made at Stonefell terminal.

Disclose any improvements/projects that are approved for 2024 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 no projects or improvements for 2023 that may impact 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 2023.	None.
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	Enbridge Stonefell did not receive any noise complaints for the 2023 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.

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 2023.**

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 2023. Note, you are not required to conduct any off-site monitoring.	No monitoring or assessment required or carried out in 2023.
Disclose any improvements/corrective actions implemented in 2023 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.

Disclose any improvements/projects that are approved for 2024 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 2023.	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 2023 including any actions taken to address them.	No complaints.

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

NWR:

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 2023.**

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 (per NWR document 10-00-EMS-20-0027-001 Environmental Noise Management Plan previously submitted)
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	NWR completed the site noise survey in May 2023 for the purpose of updating the NCIA regional noise model. Data was provided to SLR and the regional noise model should be updated accordingly.
Disclose any improvements/corrective actions implemented in 2023 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?	NWR's noise levels showed improvements related to the late fall 2022 maintenance turnaround improvements. A failed silencer was replaced and improve the refinery reliability resulted in less shutdown/start-up events that result in increased noise levels during these transitions.

Disclose any improvements/projects that are approved for 2024 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 no improvement projects planned for 2024. A major maintenance turnaround activity is planned for 2025.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	No formal audit's or self-assessment completed in 2023.
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	NWR rec'd one noise complaint in April 2023 related to our bird cannons. Bird cannons are required to be on 24/7 from spring to fall to prevent birds from accessing our POWs pond. NWR did a site audit near the source of the complaint and verified that the NWR cannons were audible. Cannons were repositioned, propane volumes reduced and follow-up communication with the neighbour was completed.

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

Nutrien Fort Saskatchewan

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 2023.**

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 2023. Note, you are not required to conduct any off-site monitoring.	There was no offsite monitoring completed in 2023 for the Fort Saskatchewan facility.
Disclose any improvements/corrective actions implemented in 2023 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 2023 for the Fort Saskatchewan facility

Disclose any improvements/projects that are approved for 2024 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 improvement projects are planned for 2024.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	The Noise Management Plan, program and associated documents were not reviewed in 2023
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	No complaints were received in 2023.

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.

Nutrien Redwater:

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 2023.**

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 2023. Note, you are not required to conduct any off-site monitoring.	There was no offsite monitoring completed in 2023 for the Redwater facility.
Disclose any improvements/corrective actions implemented in 2023 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 or corrective actions were implemented in 2023. Redwater facility updated the site noise model in 2022. SLR Consulting will be incorporating it into the NCIA Regional Noise Model.

Disclose any improvements/projects that are approved for 2024 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 or projects planned for 2024.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	The Noise Management Plan, program and associated documents were not reviewed in 2023.
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	There were no external noise complaints for the Redwater facility in 2023.

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.

Oerlikon Metco (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 2023.**

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.	Yes
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	No monitoring conducted from the fence line outward in 2023
Disclose any improvements/corrective actions implemented in 2023 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 implemented. No N/R

Disclose any improvements/projects that are approved for 2024 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 at this time. 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 2023.	Third party completed occupational noise exposure monitoring in 2023
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	No noise complaints received in 2023.

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

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 2023.**

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 2023. Note, you are not required to conduct any off-site monitoring.	NCIA Regional Noise Monitoring was completed by ACI for the purpose of field validation for the regional noise model.
Disclose any improvements/corrective actions implemented in 2023 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/corrective actions implemented in 2023.

Disclose any improvements/projects that are approved for 2024 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 scheduled for 2024.
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	None completed.
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	No 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.

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

Insert your Company Name here: Shell Scotford 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 2023.**

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.	Shell Scotford Facility has implemented a Noise Management Plan.
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	No external noise monitoring during the year.
Disclose any improvements/corrective actions implemented in 2023 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?	Turnaround activities occurred onsite in 2023 however no changes to site noise model required.

Disclose any improvements/projects that are approved for 2024 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 planned that would impact noise level. No update to model required at this time. Anticipated changes to the noise model expected following initiation of project Polaris
Disclose any audit/self-assessment evaluation (qualitative evaluation only, with senior site leader sign-off) completed for your site noise management plan in 2023.	N/A
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	No noise complaints noted during the 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.

Sherritt International Corporation:

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 2023.**

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 2023.
Provide a summary of any monitoring (fence line outward completed in 2023. Note, you are not required to conduct any off-site monitoring.	None
Disclose any improvements/corrective actions implemented in 2023 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 2023. The Site noise model does not require updating at this time

Disclose any improvements/projects that are approved for 2024 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 for 2024. 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 2023.	None
Provide a Noise Complaint summary for all noise complaints received in 2023 including any actions taken to address them.	No complaints received in 2023.

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.