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2022 Environmental Noise Survey

For The

Regional Noise Model Annual Field Validation Monitoring

Prepared for:

Northeast Capital Industrial Association

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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.

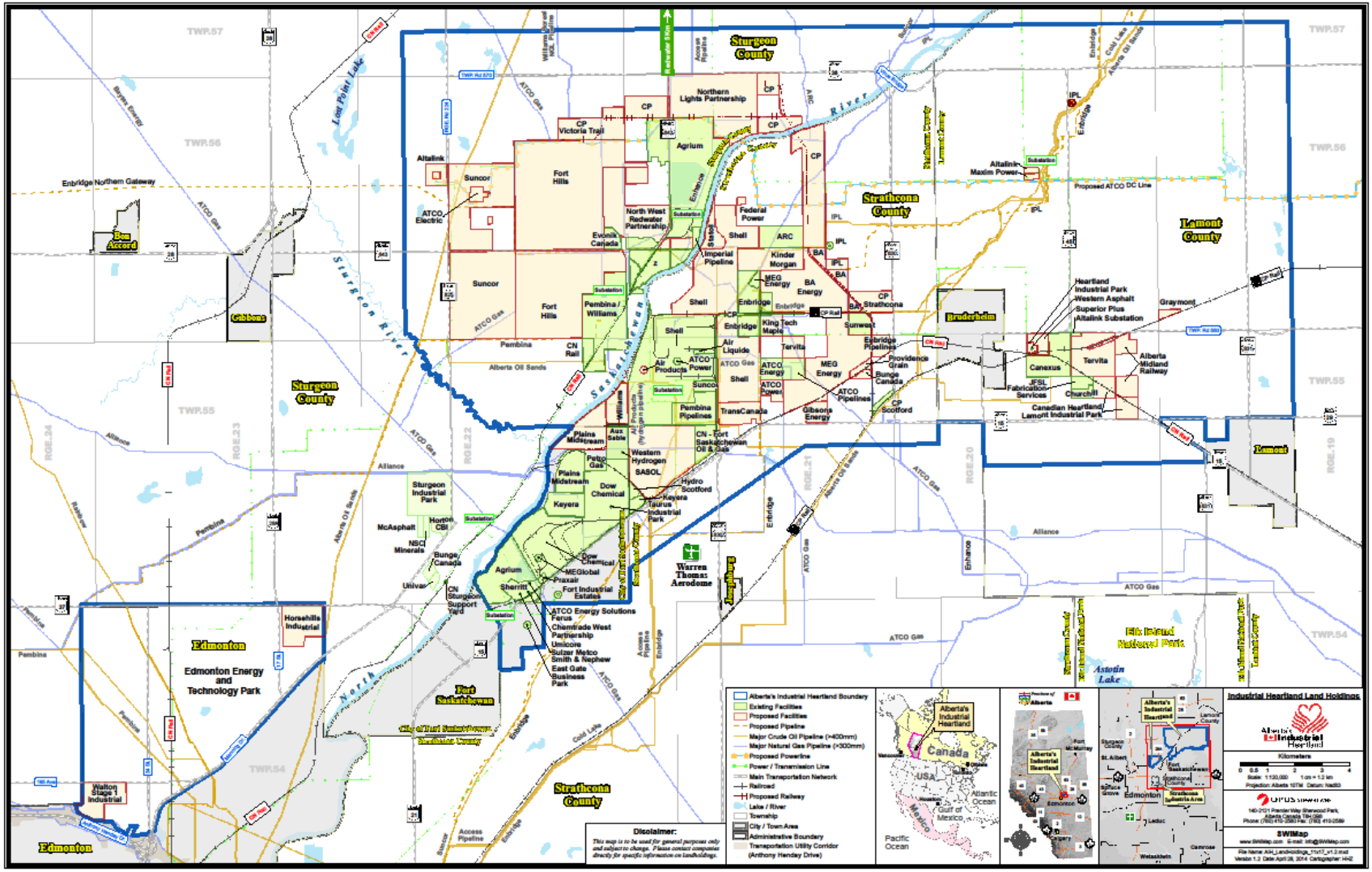


Figure 1. Study Area

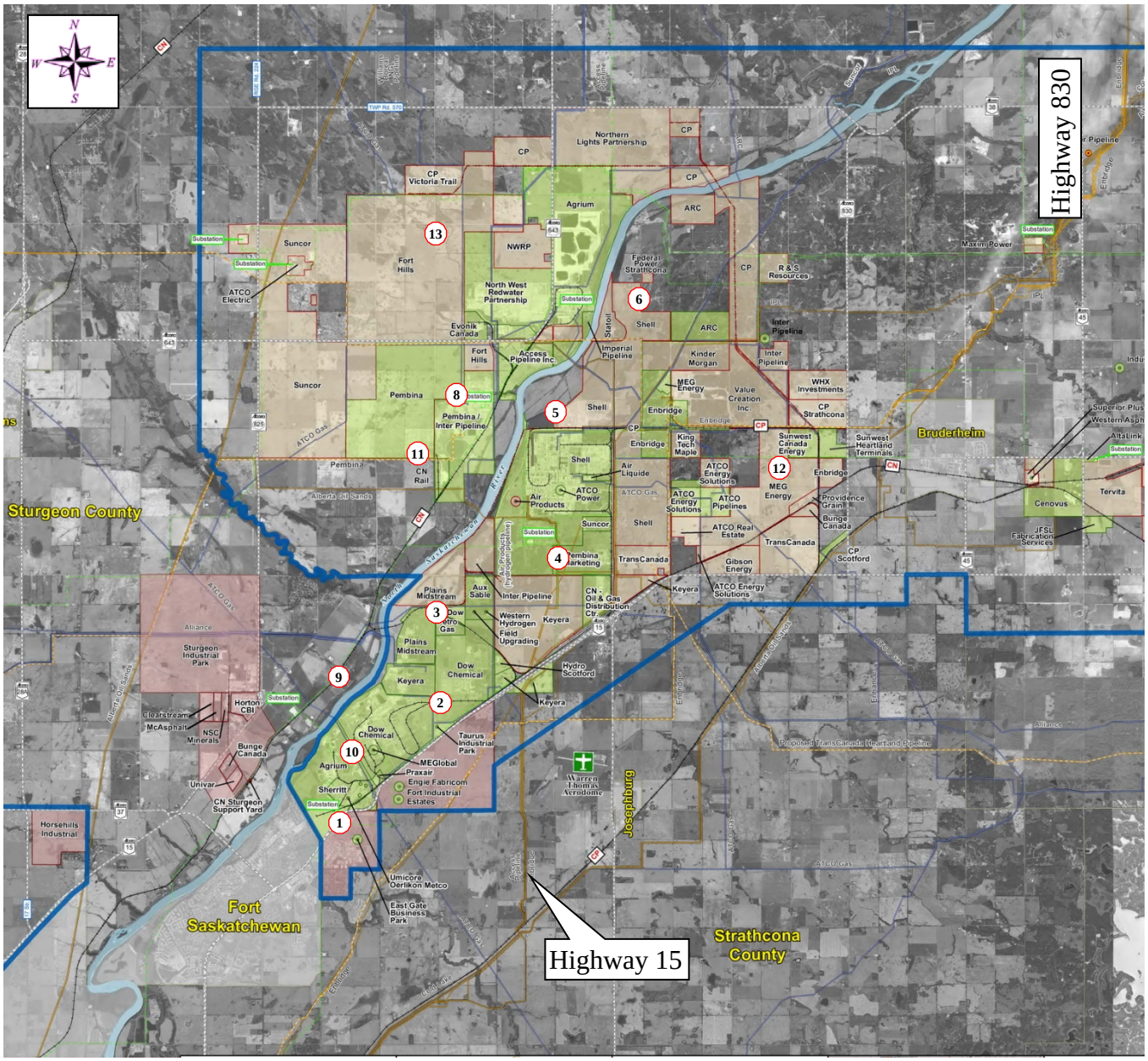


Figure 2. 2022 Study Area (With Noise Monitoring Locations)

Figure 3. Noise Monitor #1

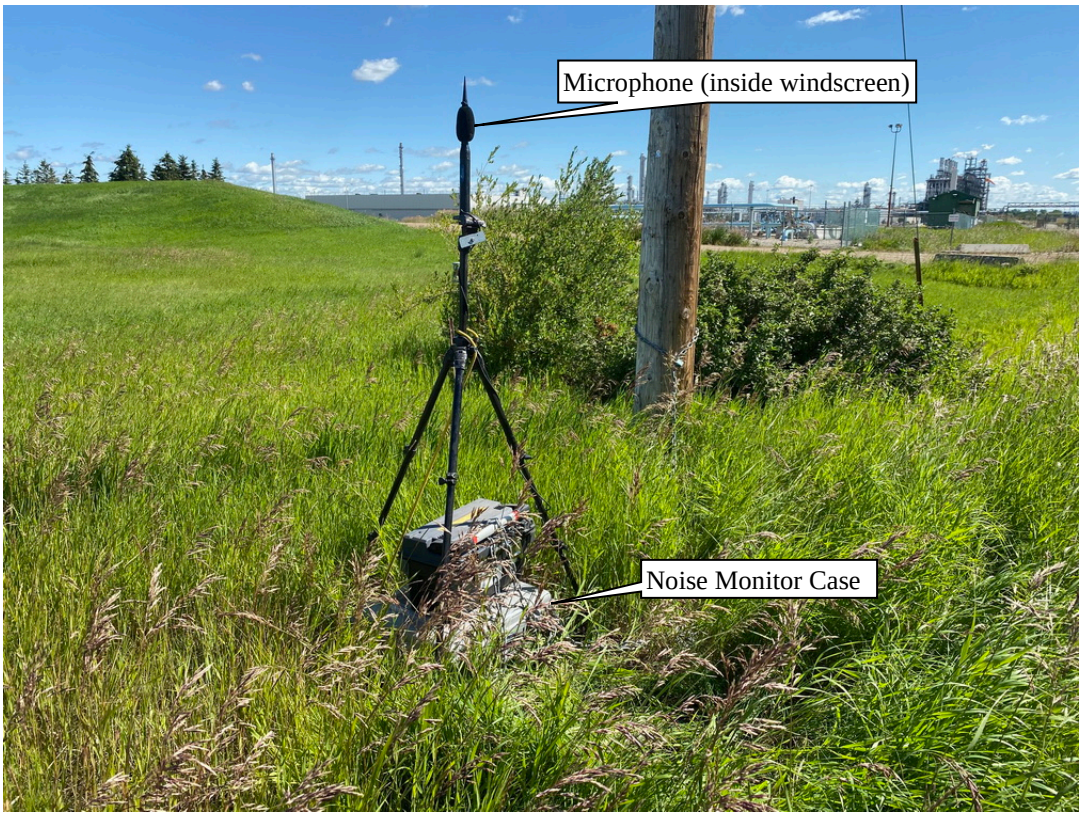


Figure 4. Noise Monitor #2

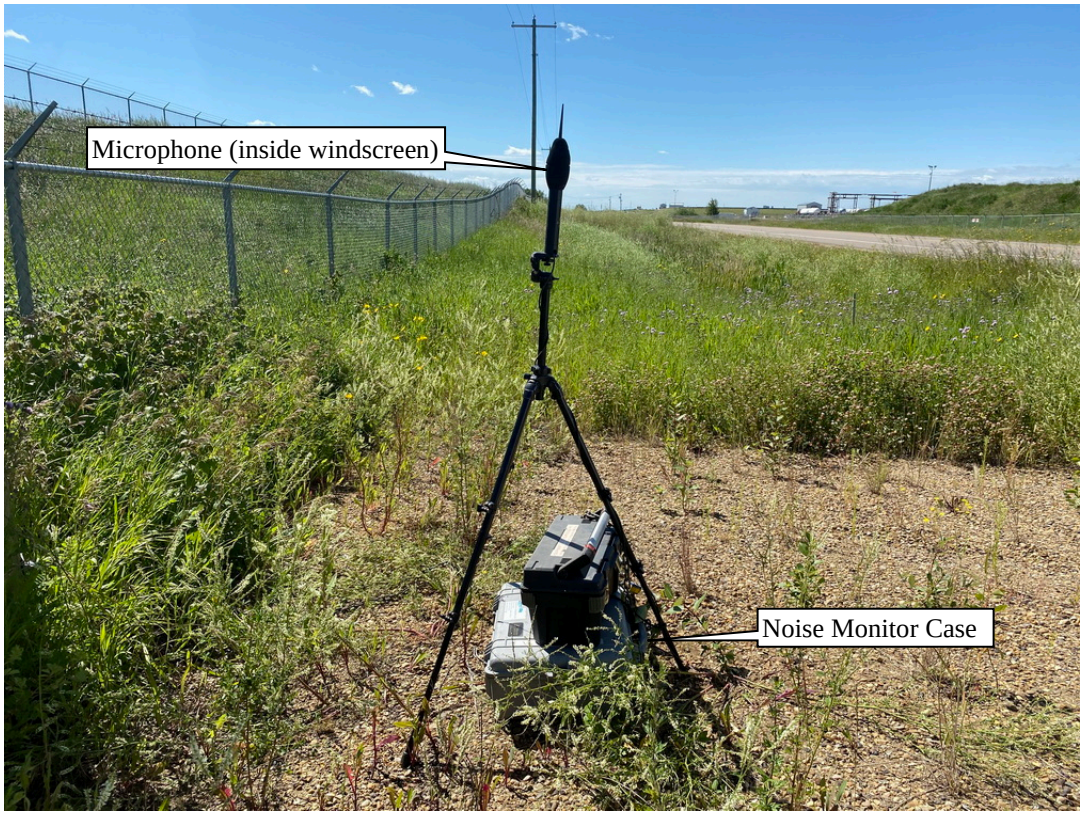


Figure 5. Noise Monitor #3

Figure 6. Noise Monitor #4

Figure 7. Noise Monitor #5

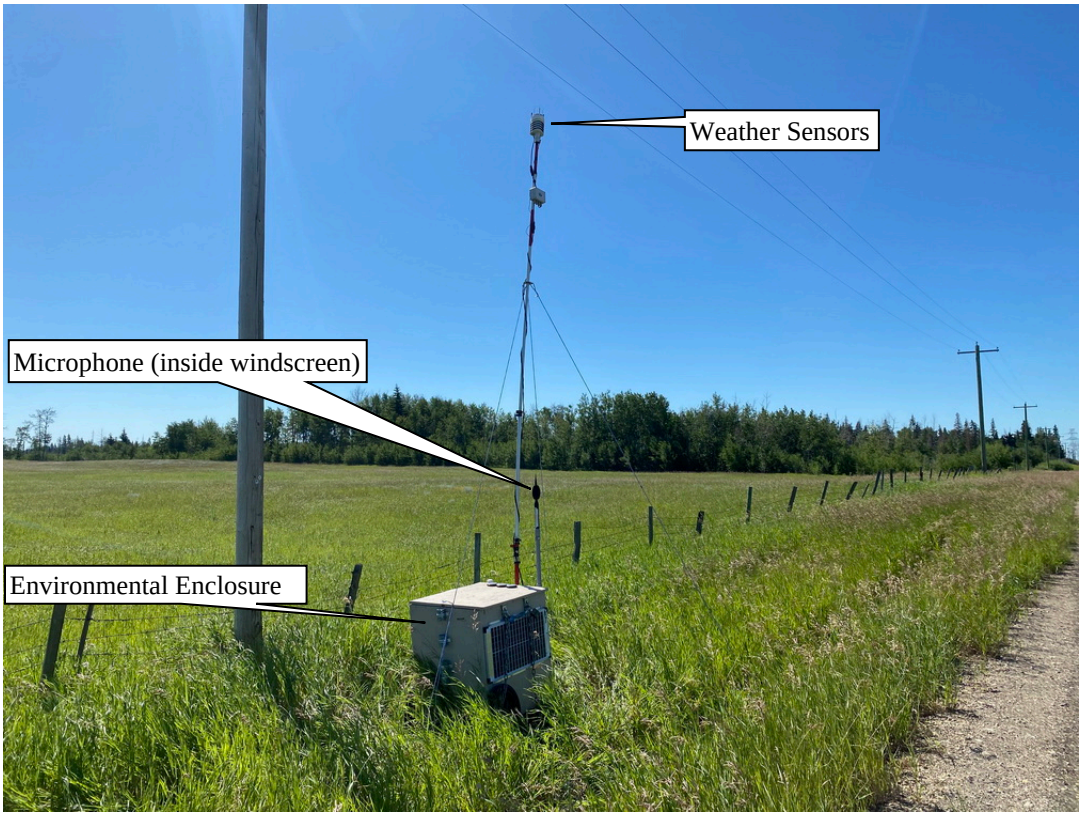


Figure 8. Noise Monitor #6 (With Weather Monitor)

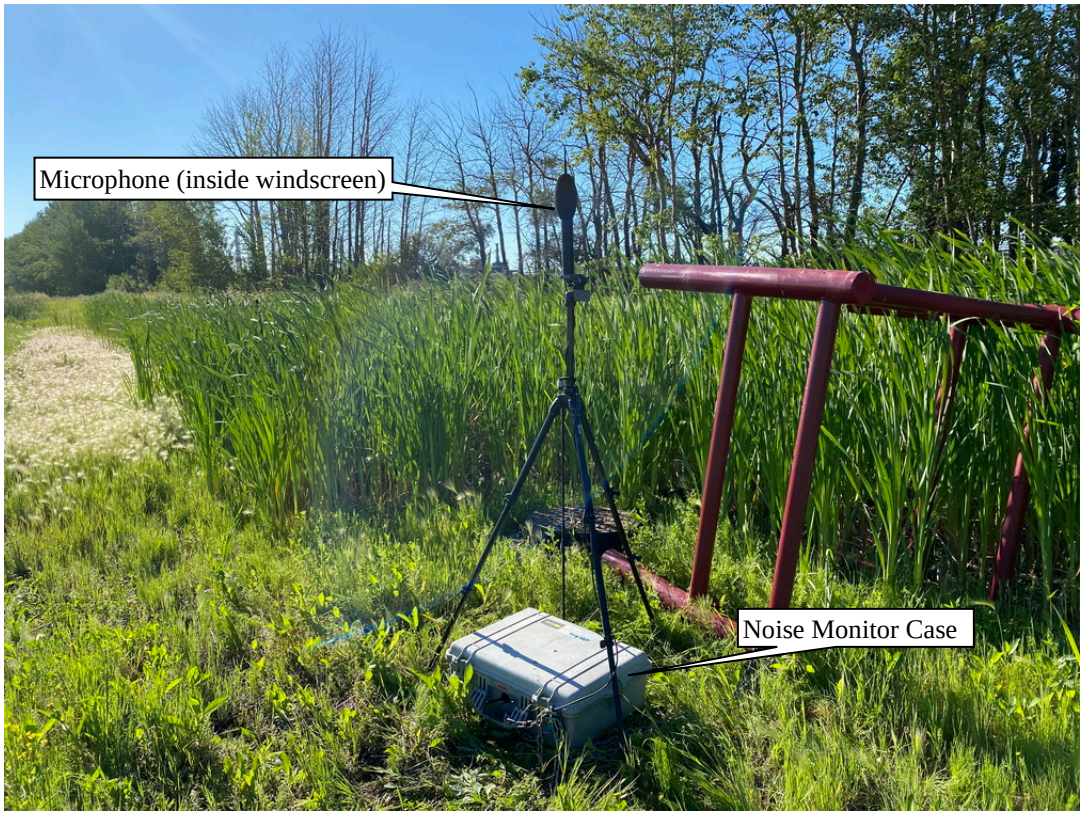


Figure 9. Noise Monitor #8

Figure 10. Noise Monitor #9

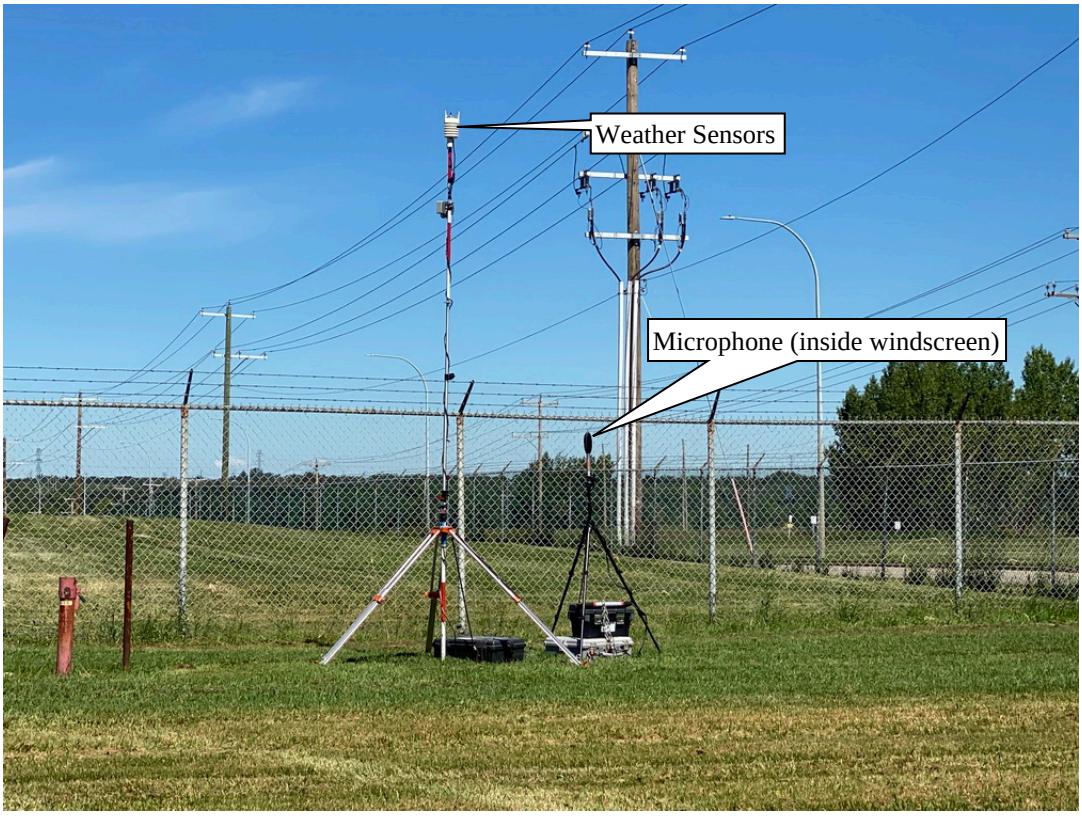


Figure 11. Noise Monitor #10 (With Weather Monitor)

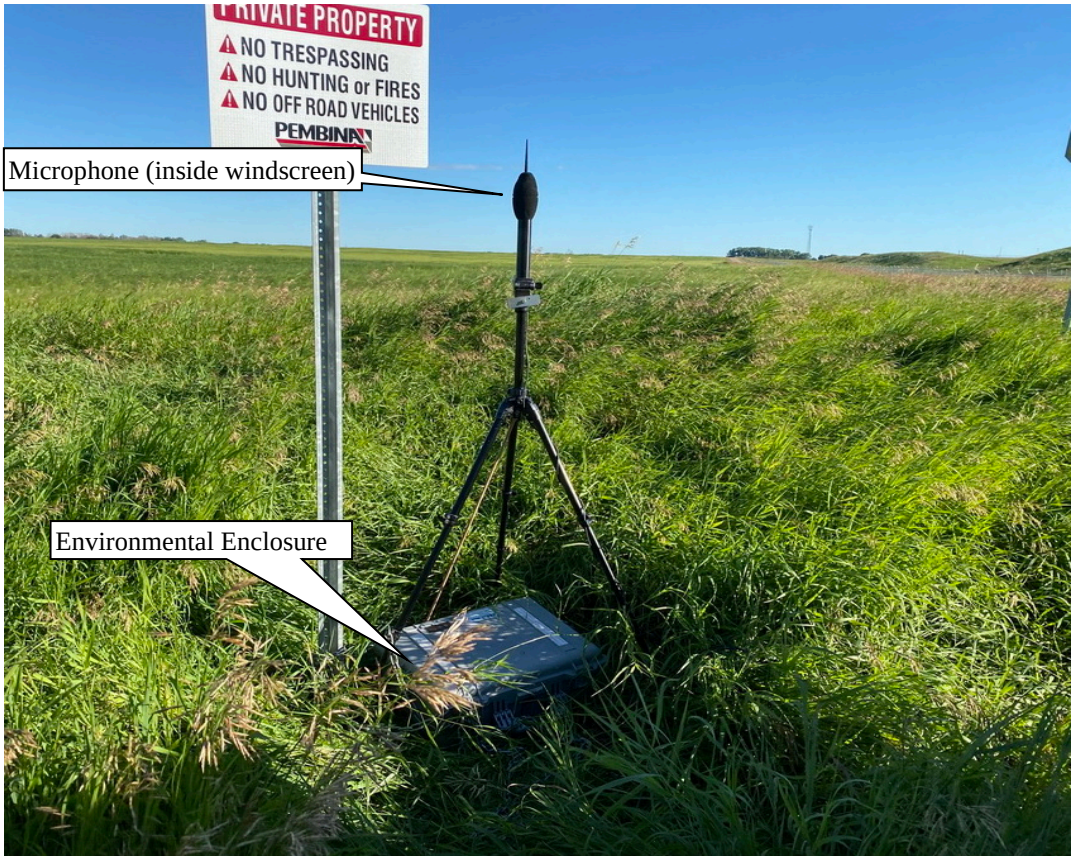


Figure 12. Noise Monitor #11

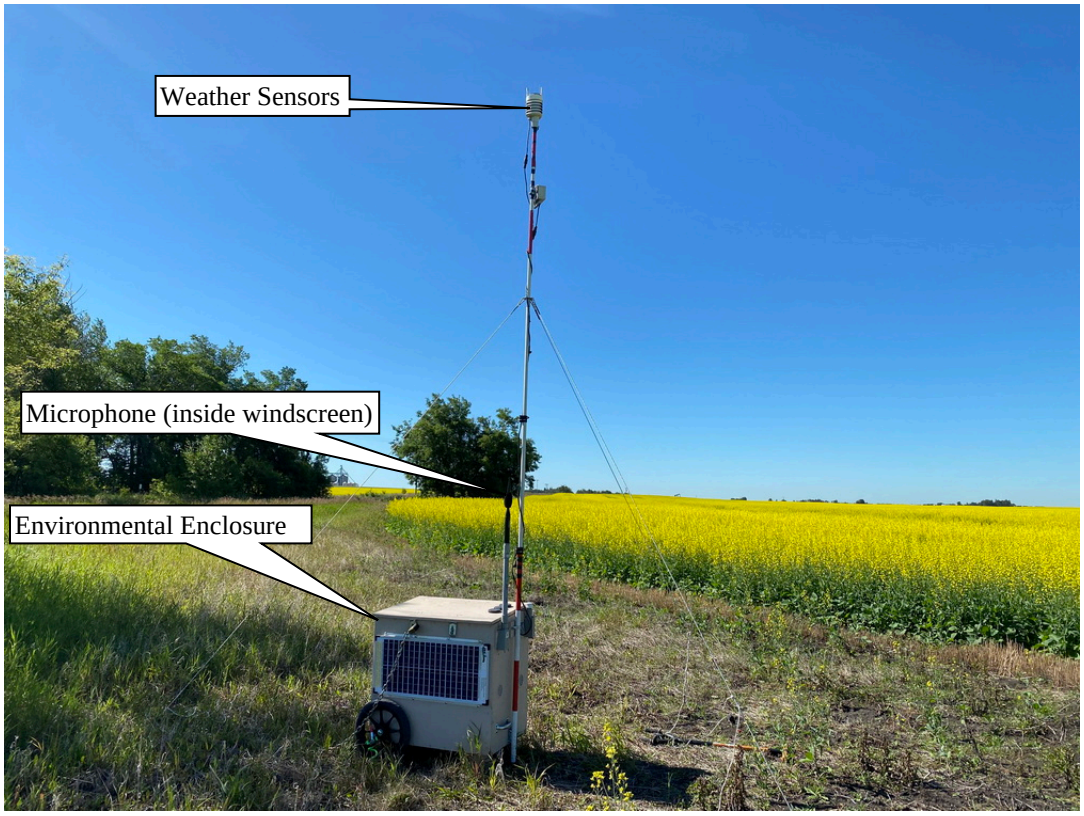


Figure 13. Noise Monitor #12 (Control Site w/ Weather Monitor)

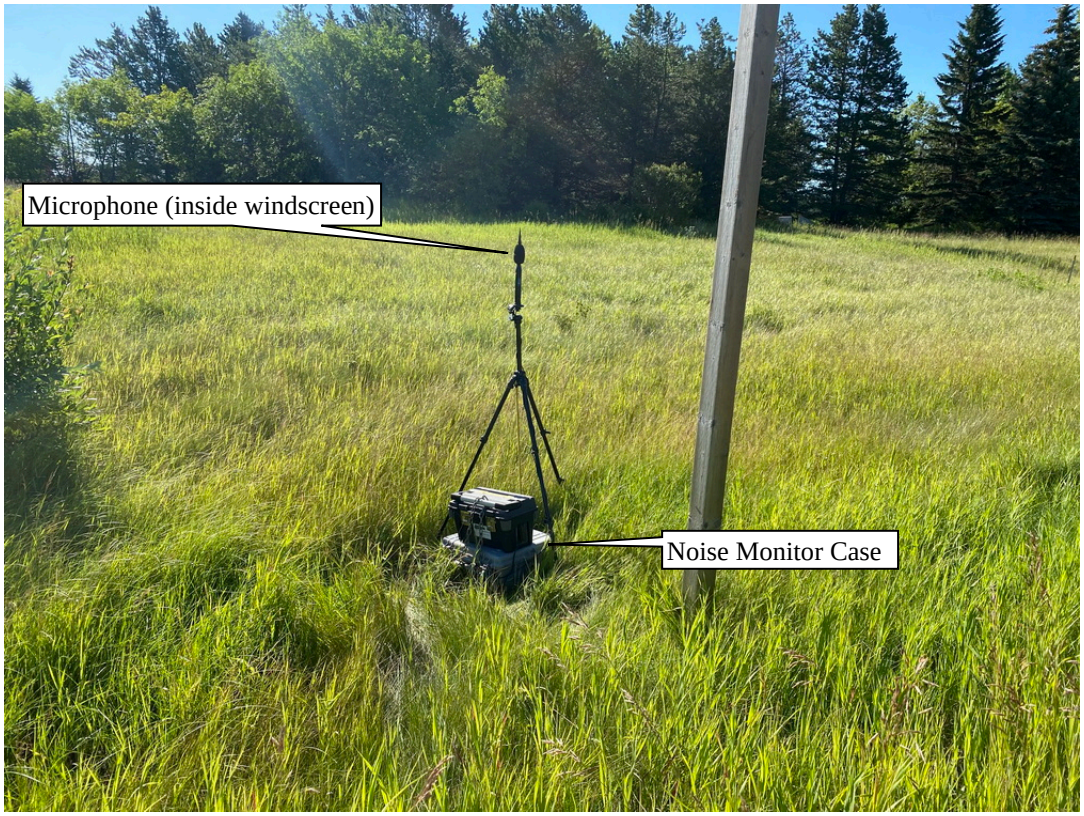


Figure 14. Noise Monitor #13

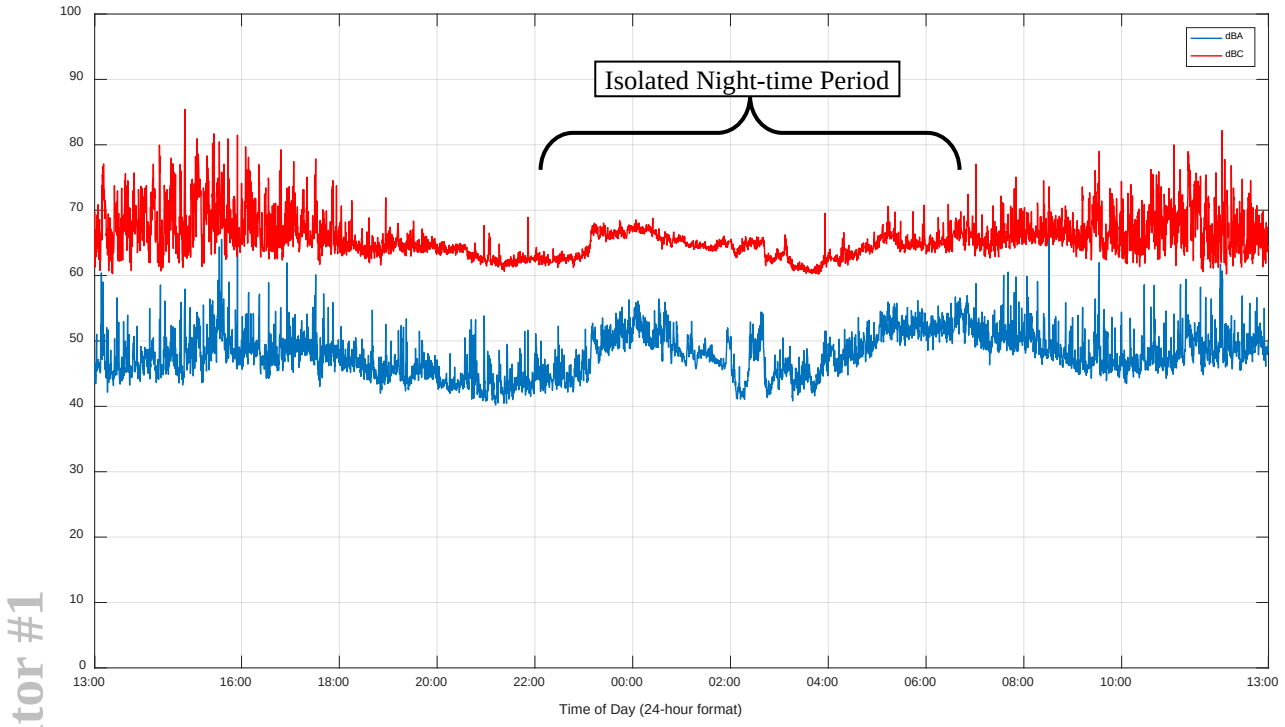


Figure 15. Noise Monitor #1, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

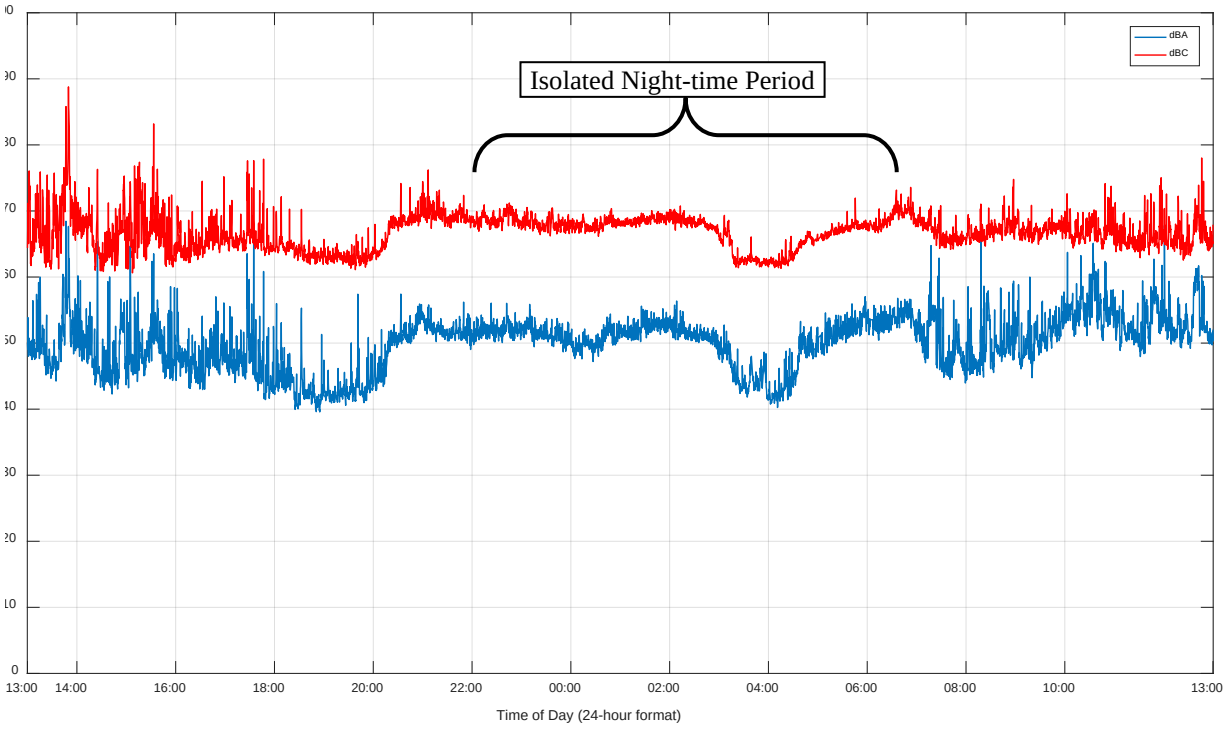


Figure 16. Noise Monitor #1, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

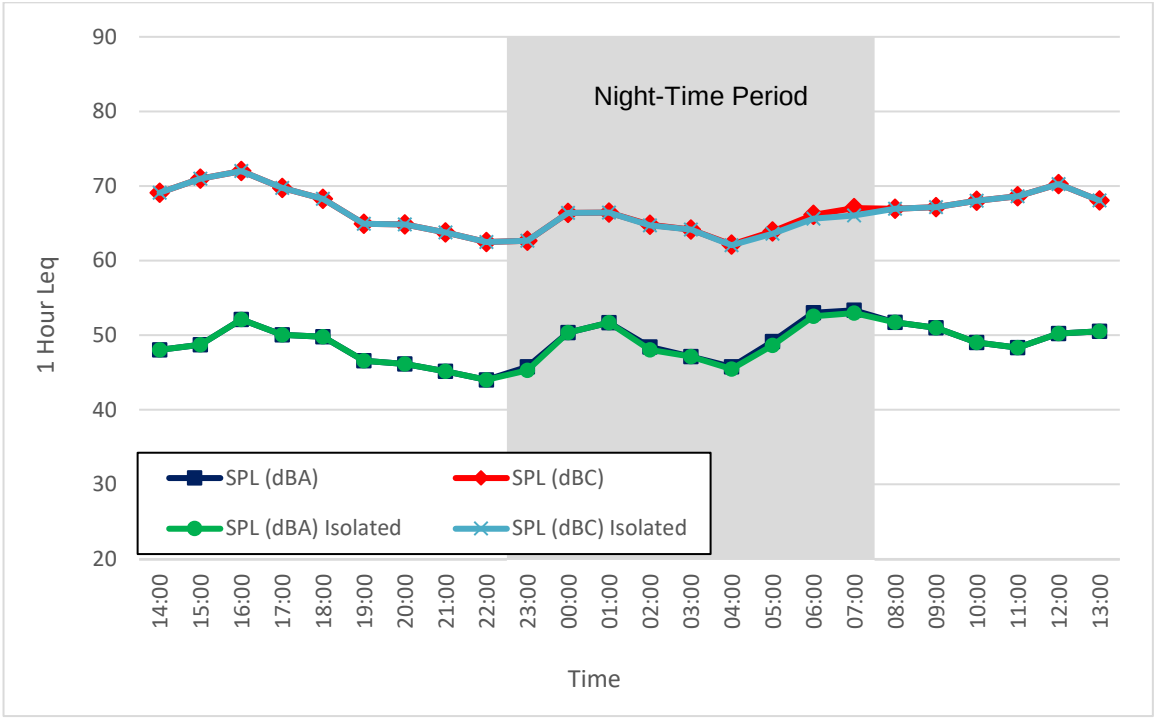


Figure 17. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

Noise Monitor #1

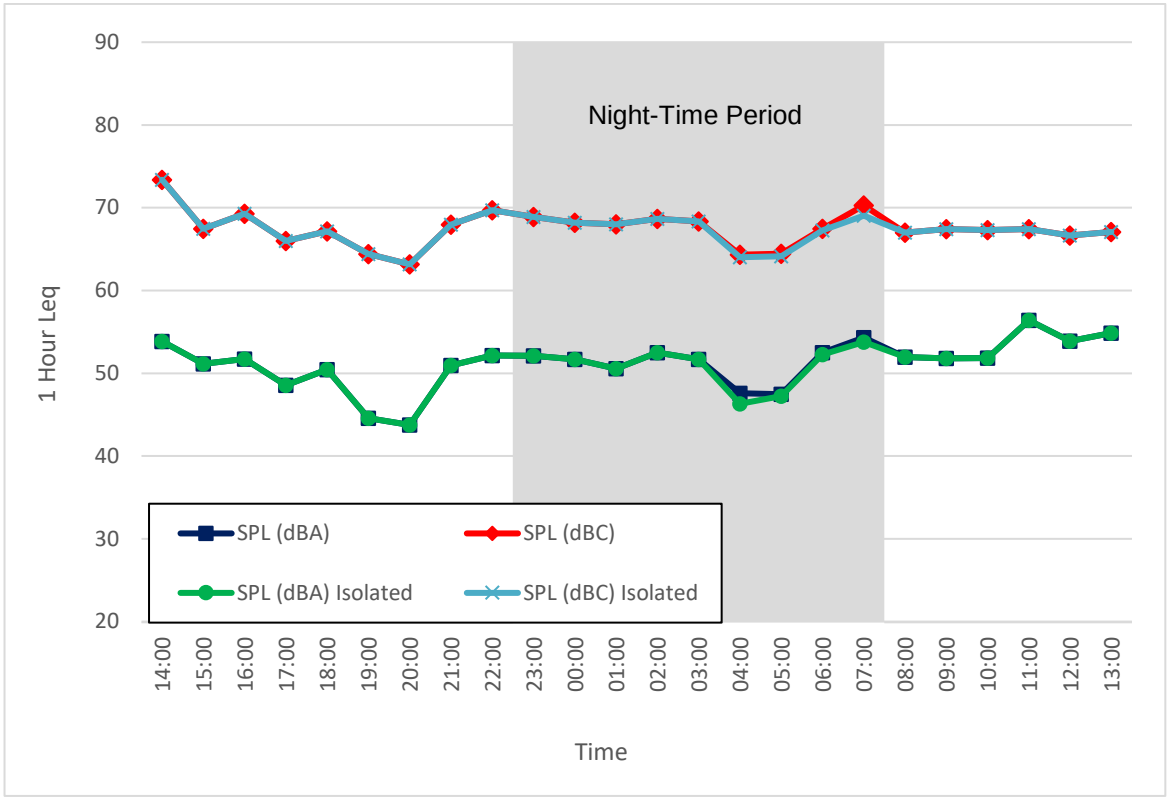


Figure 18. Noise Monitor #1, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

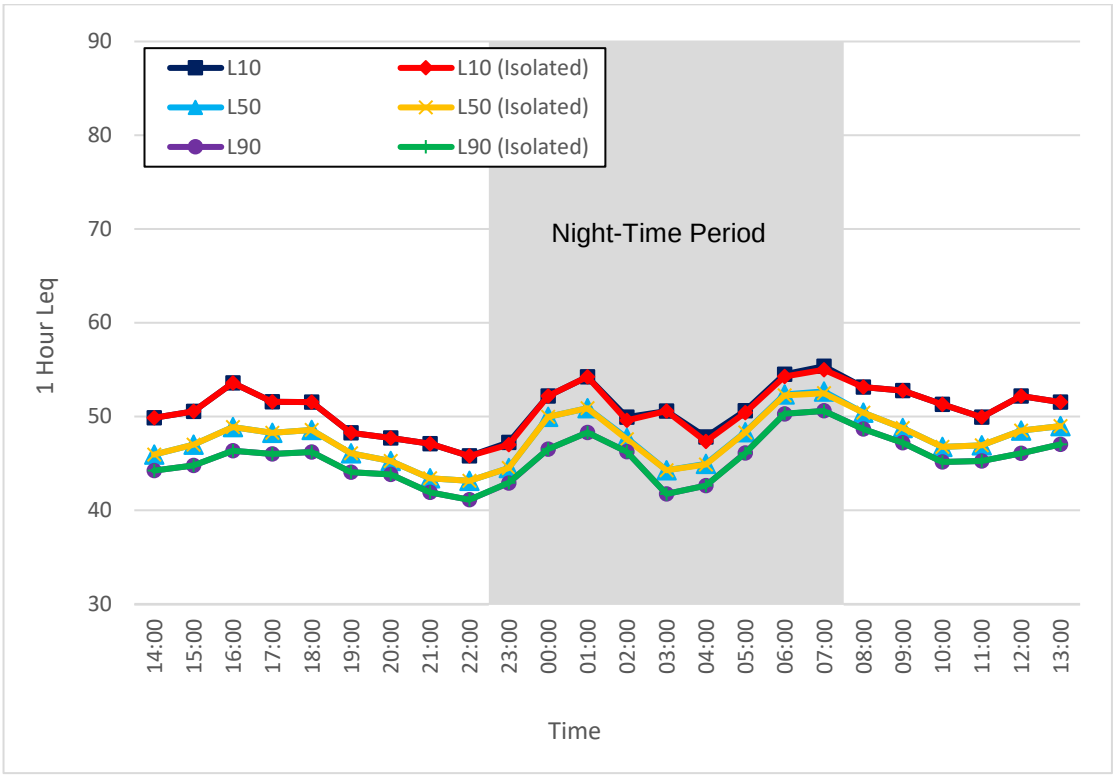


Figure 19. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

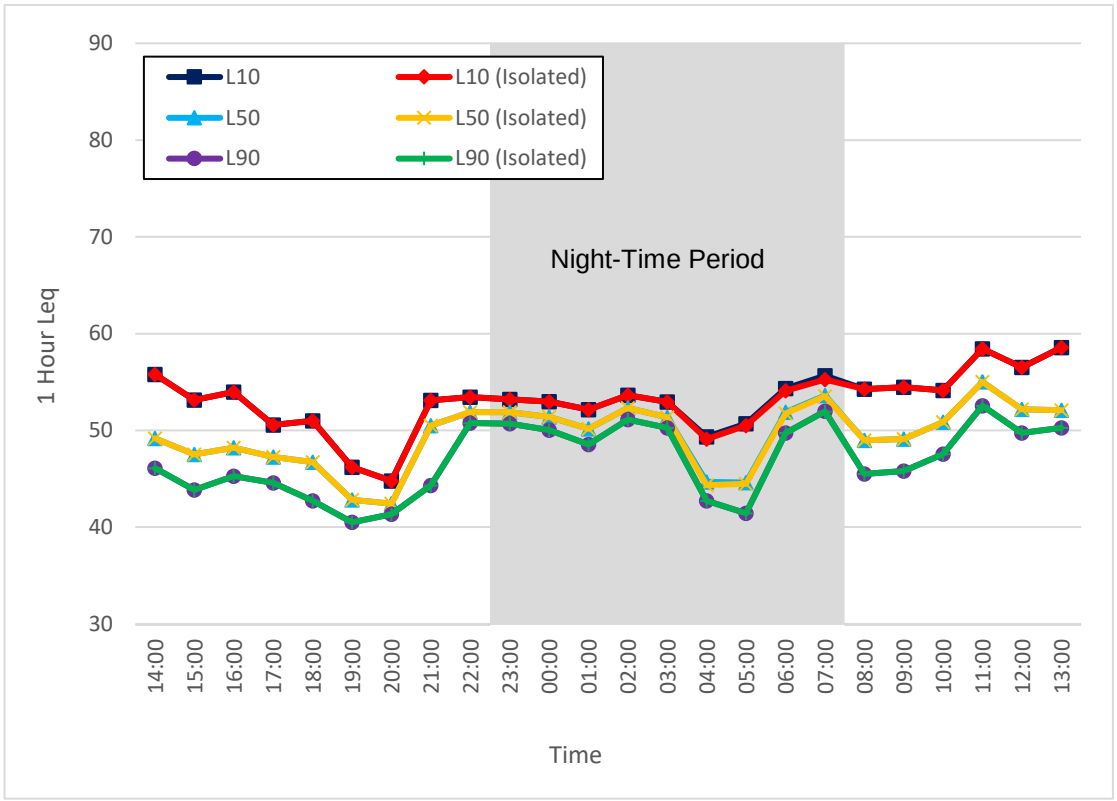


Figure 20. Noise Monitor #1, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

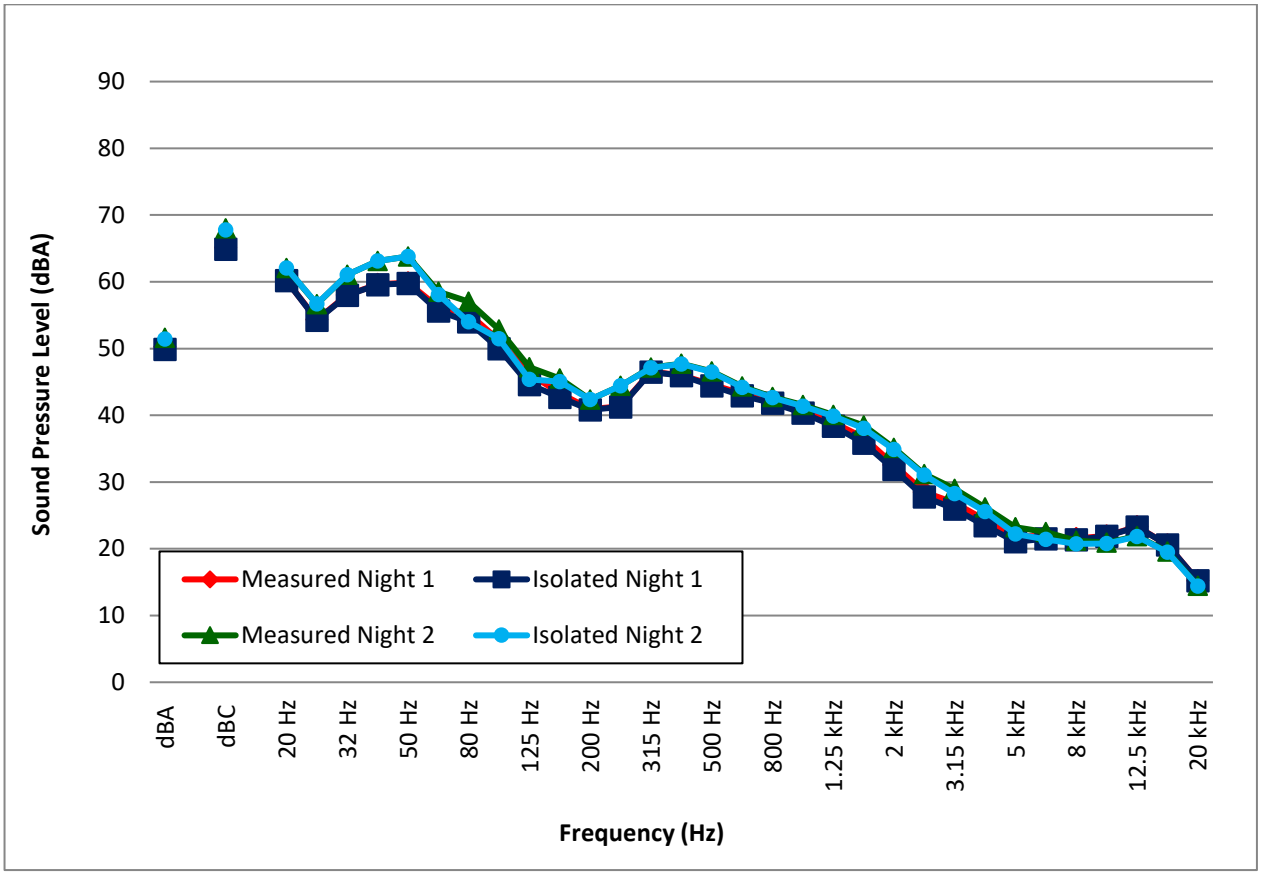


Figure 21. Noise Monitor #1, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

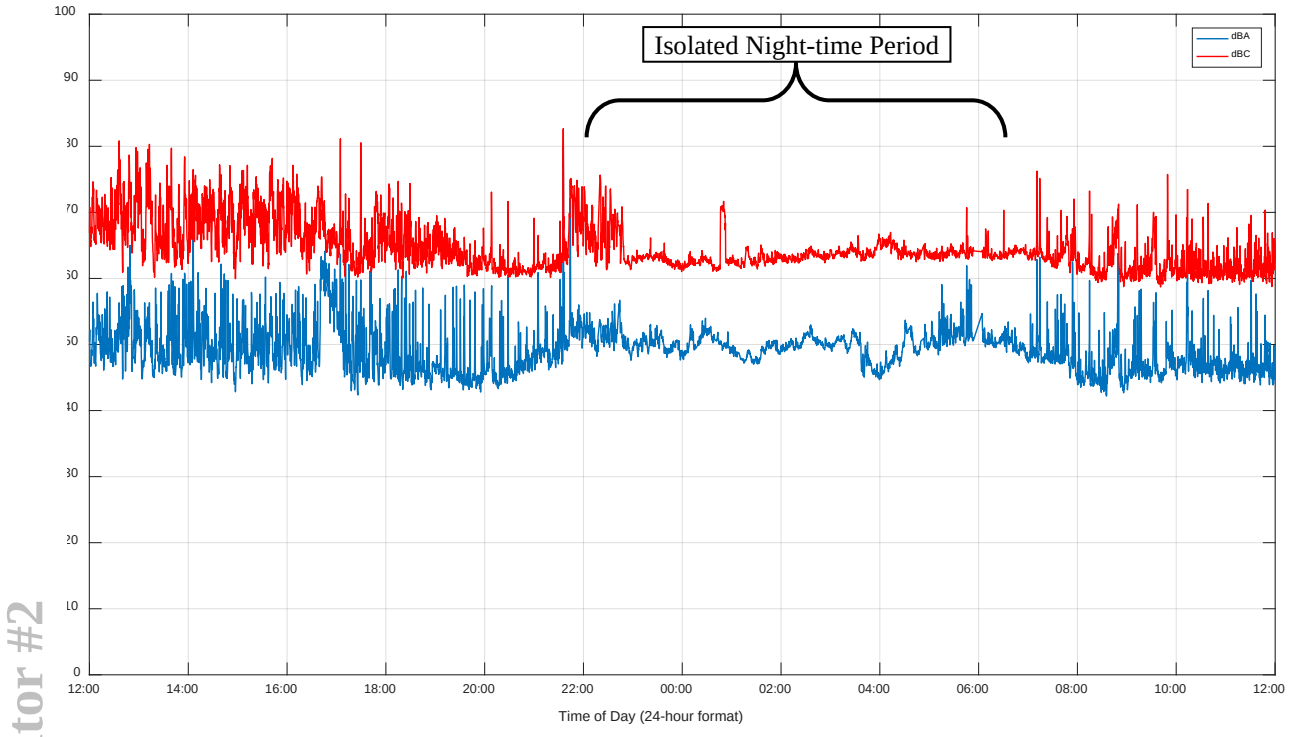


Figure 22. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

Noise Monitor #2

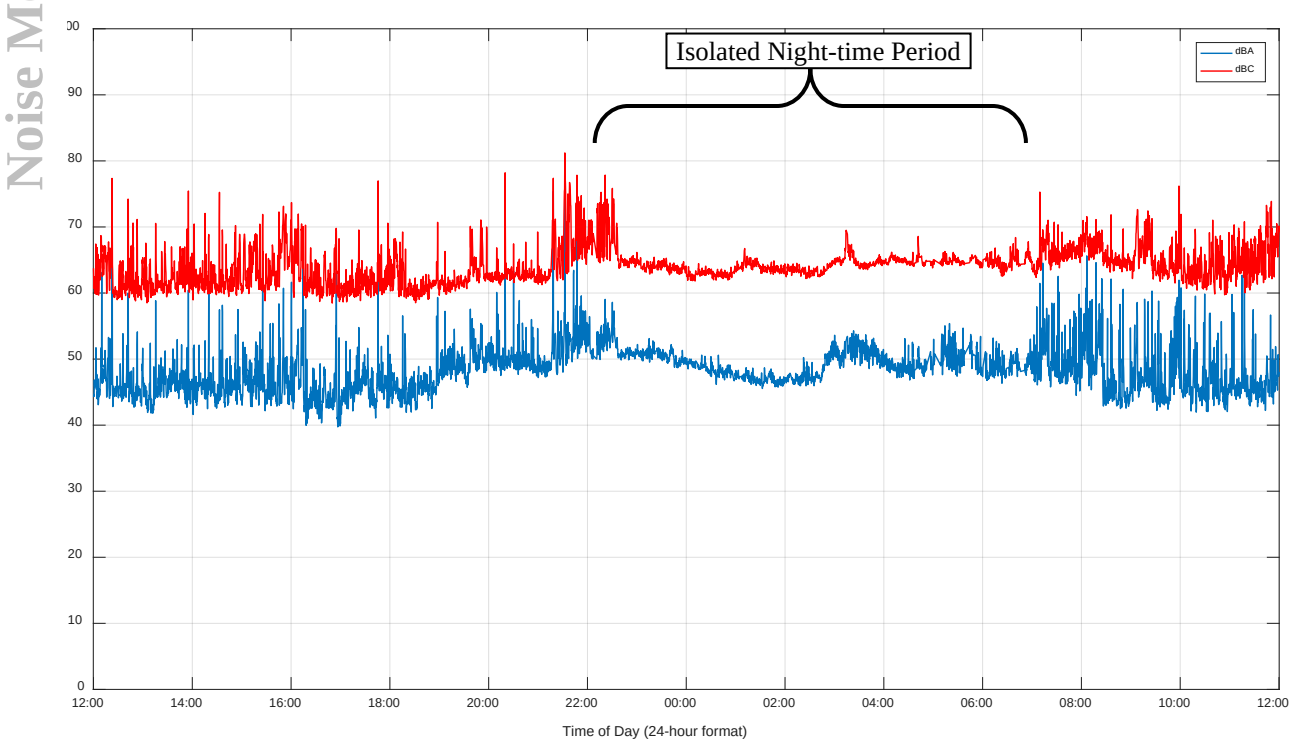


Figure 23. Noise Monitor #2, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #2

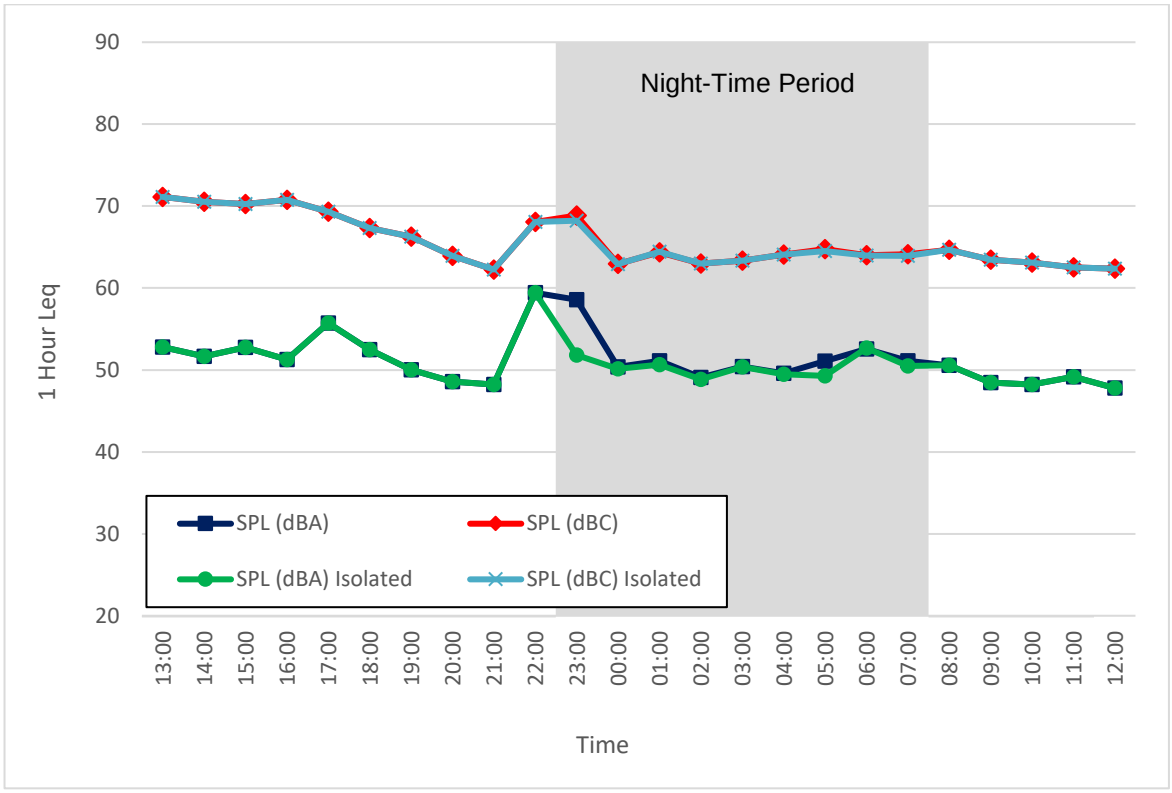


Figure 24. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

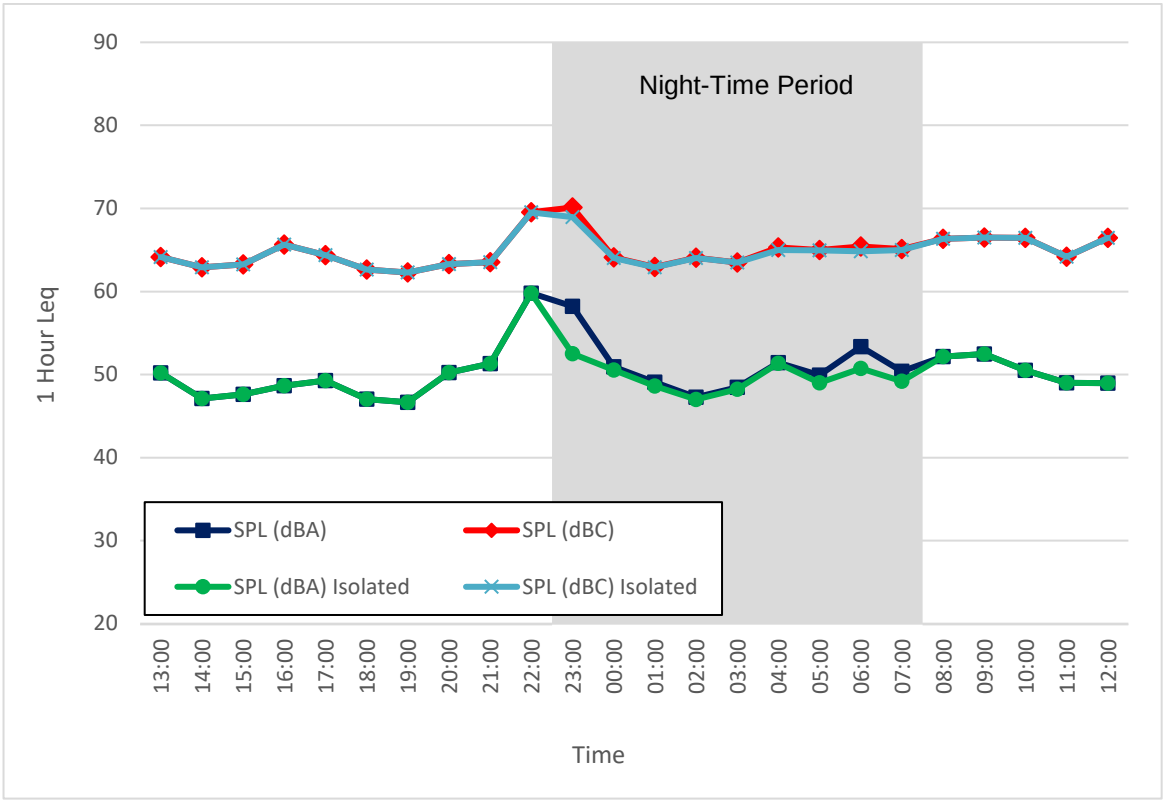


Figure 25. Noise Monitor #2, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

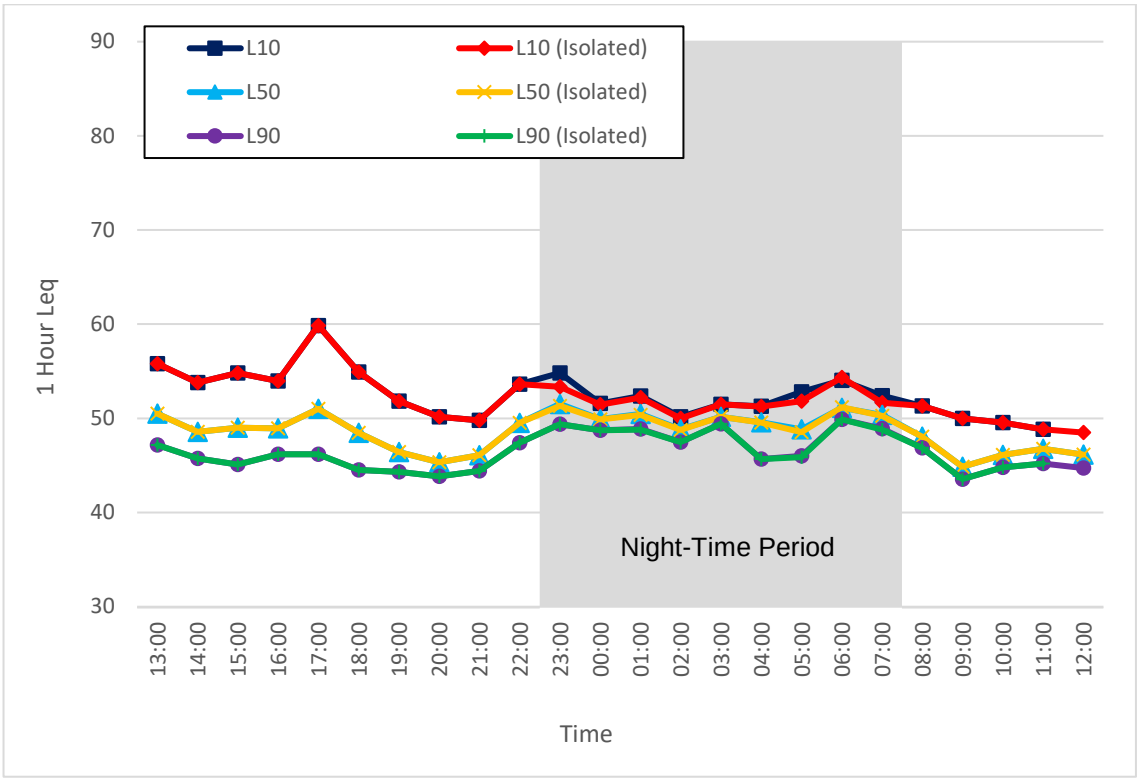


Figure 26. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

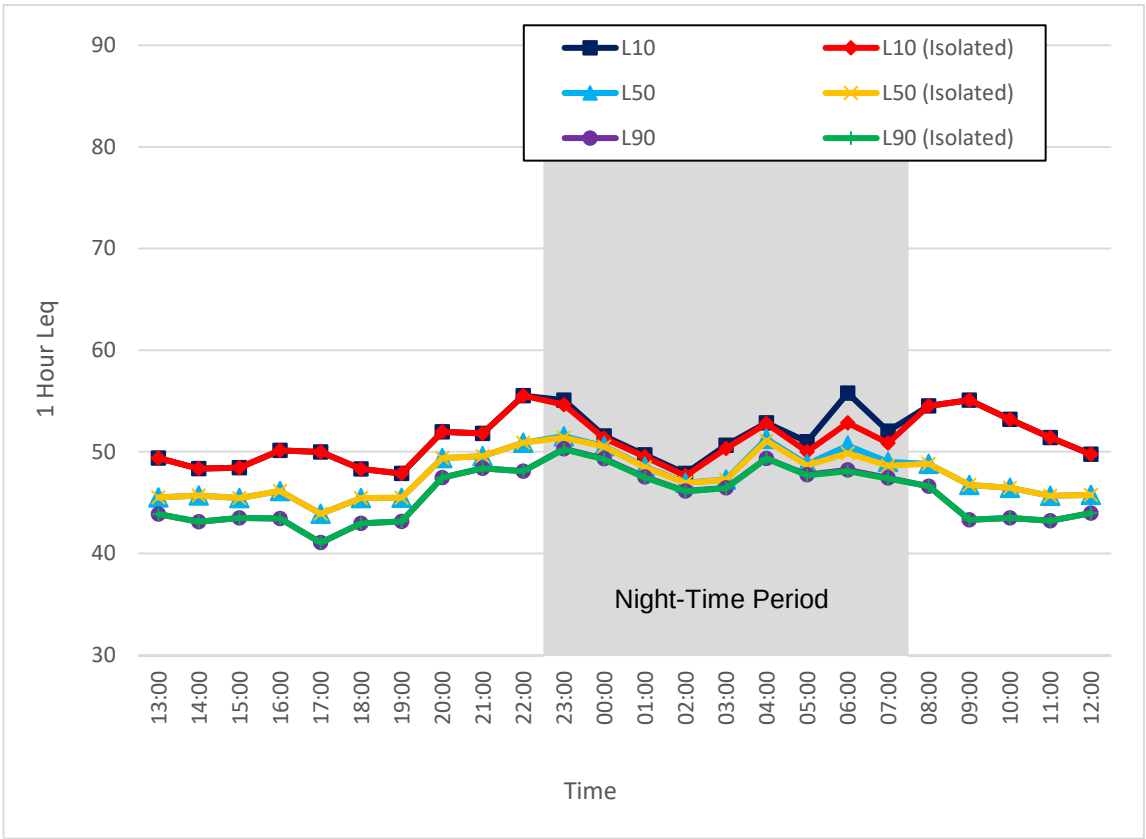


Figure 27. Noise Monitor #2, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #2

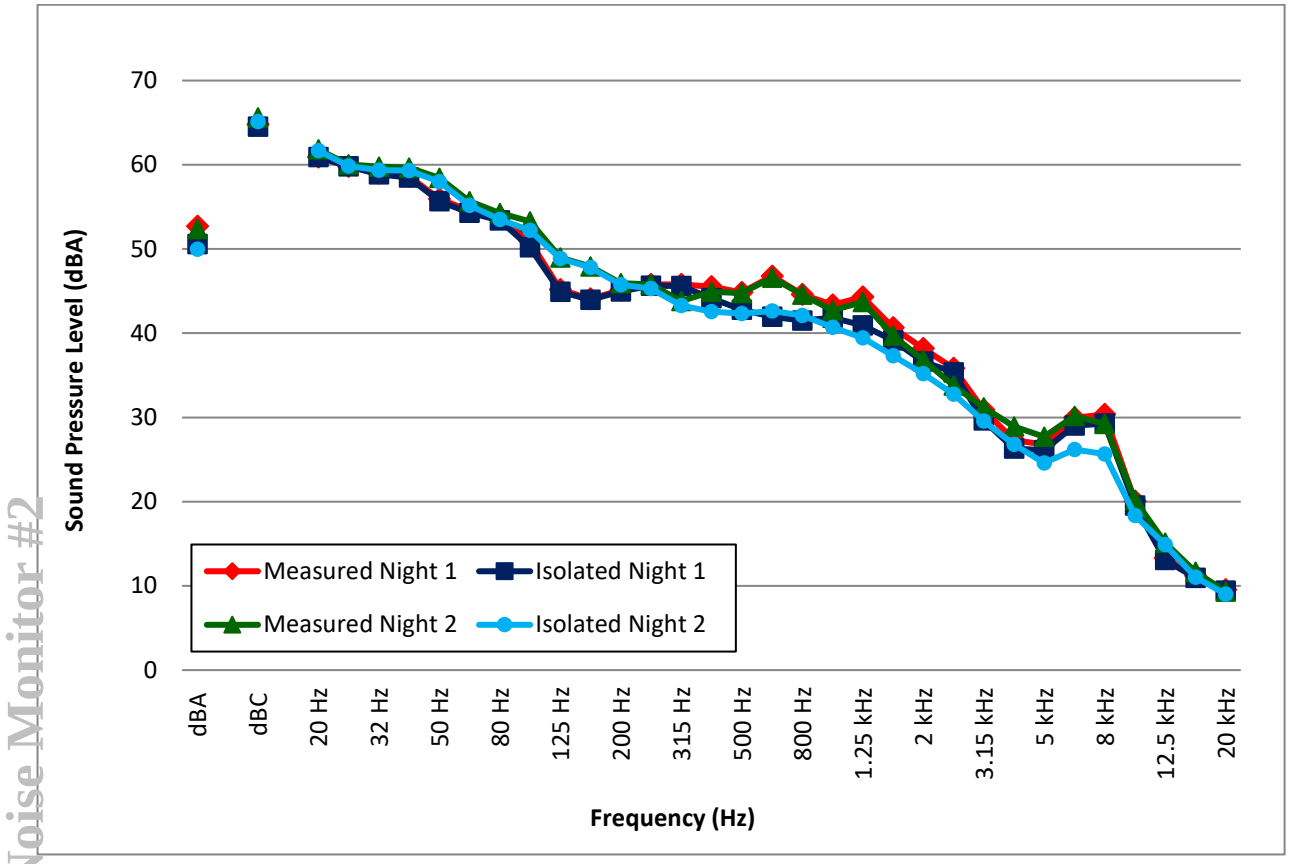
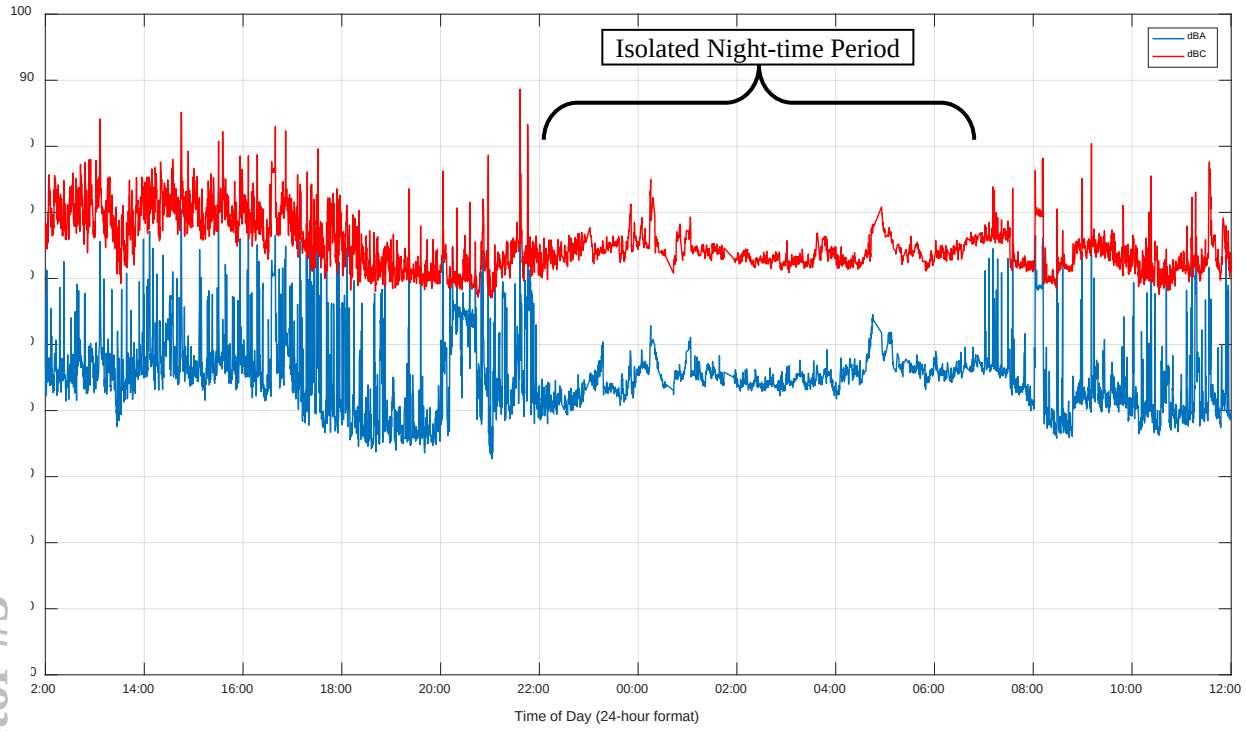


Figure 28. Noise Monitor #2, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)



Noise Monitor #3

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

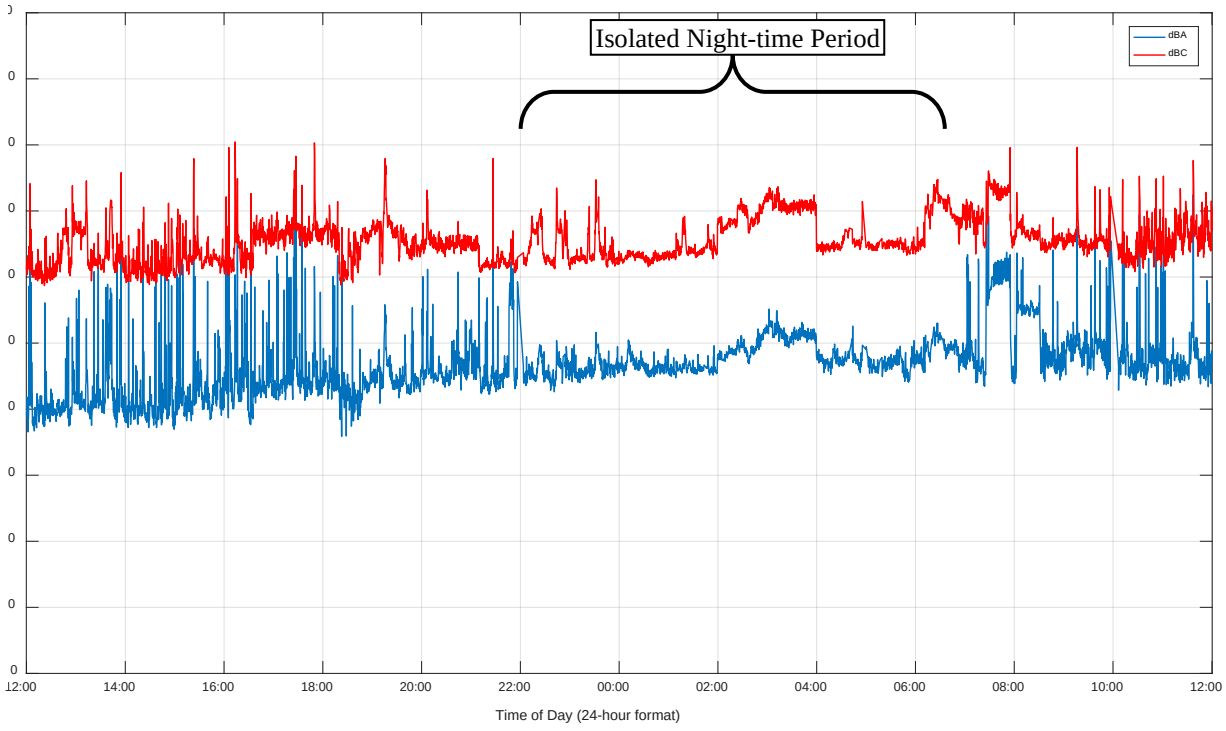


Figure 30. Noise Monitor #3, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

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Noise Monitor #3

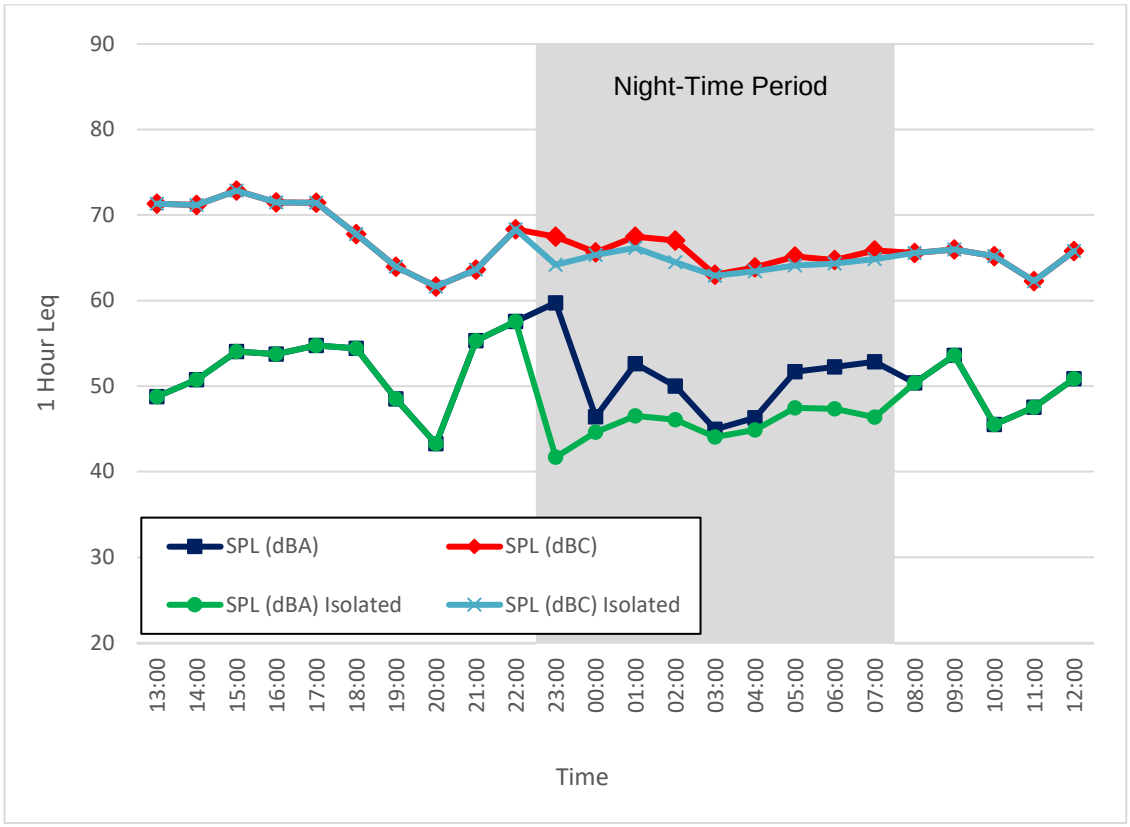


Figure 31. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

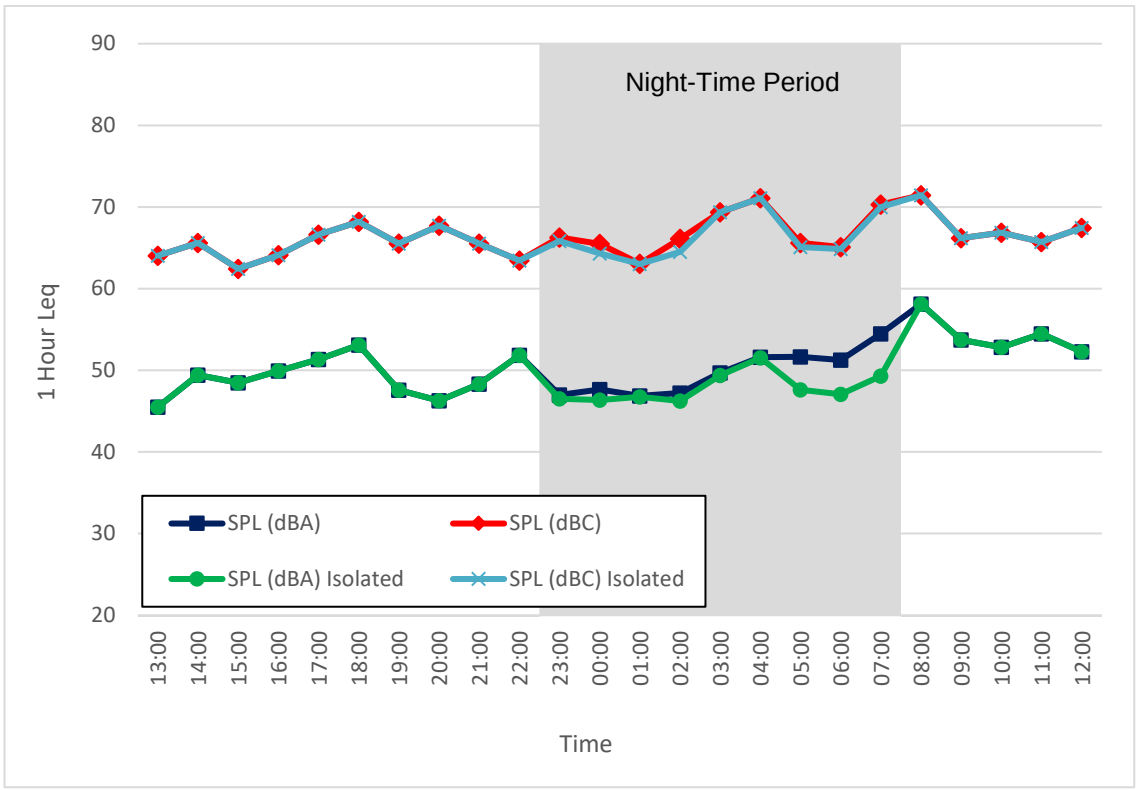


Figure 32. Noise Monitor #3, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

Monitor #3

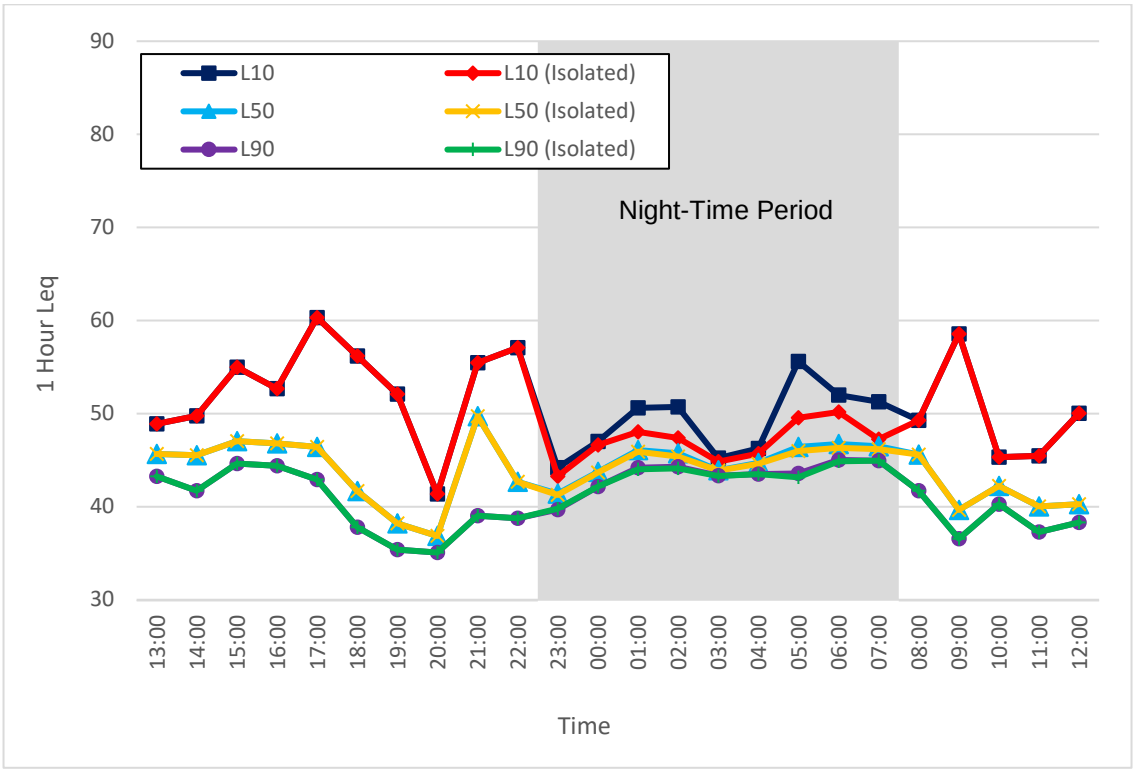


Figure 33. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

Noise

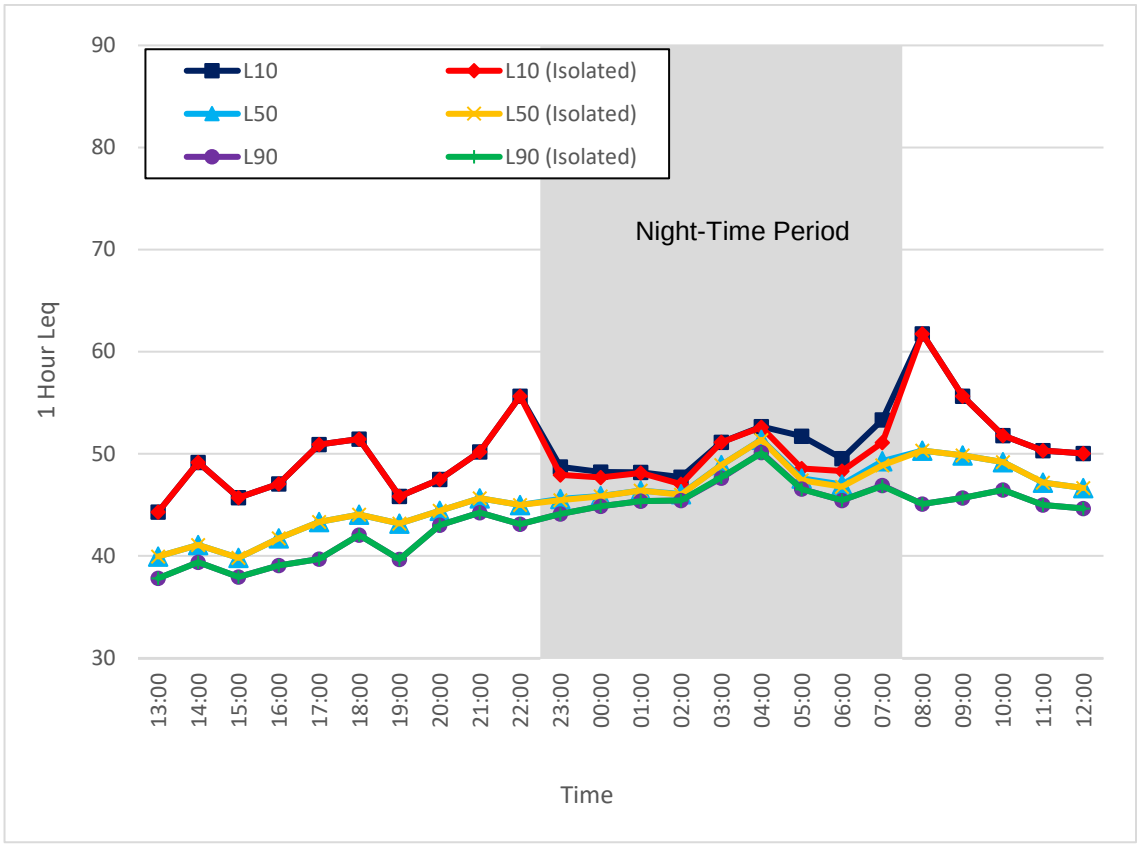


Figure 34. Noise Monitor #3, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #3

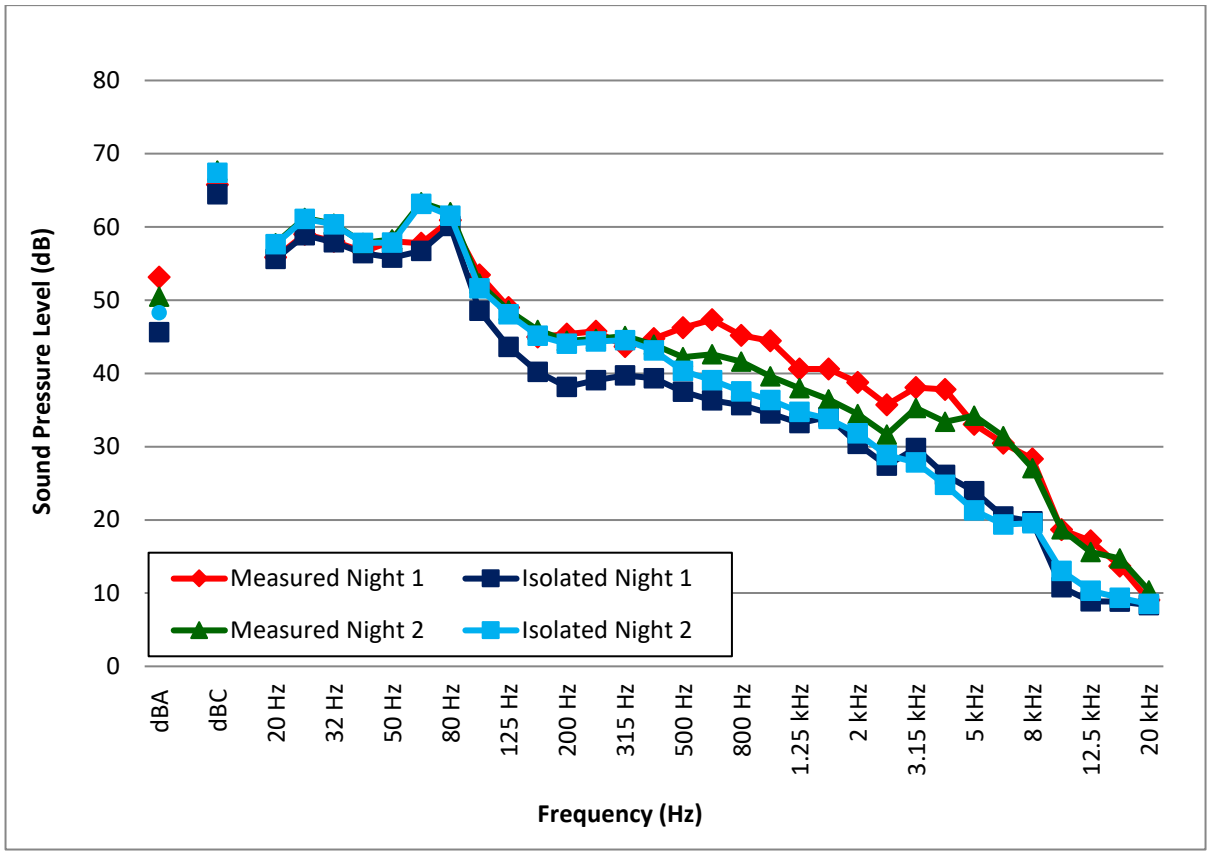
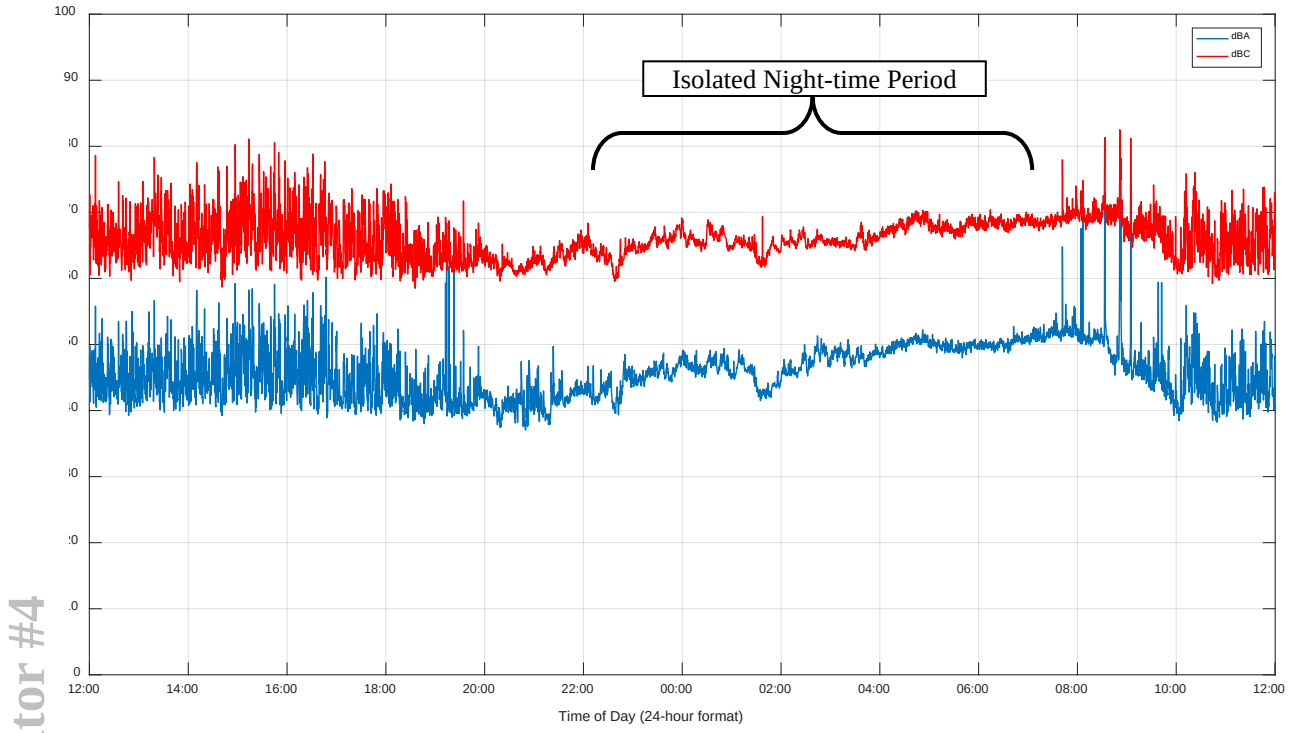


Figure 35. Noise Monitor #3, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)



Noise Monitor #4

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

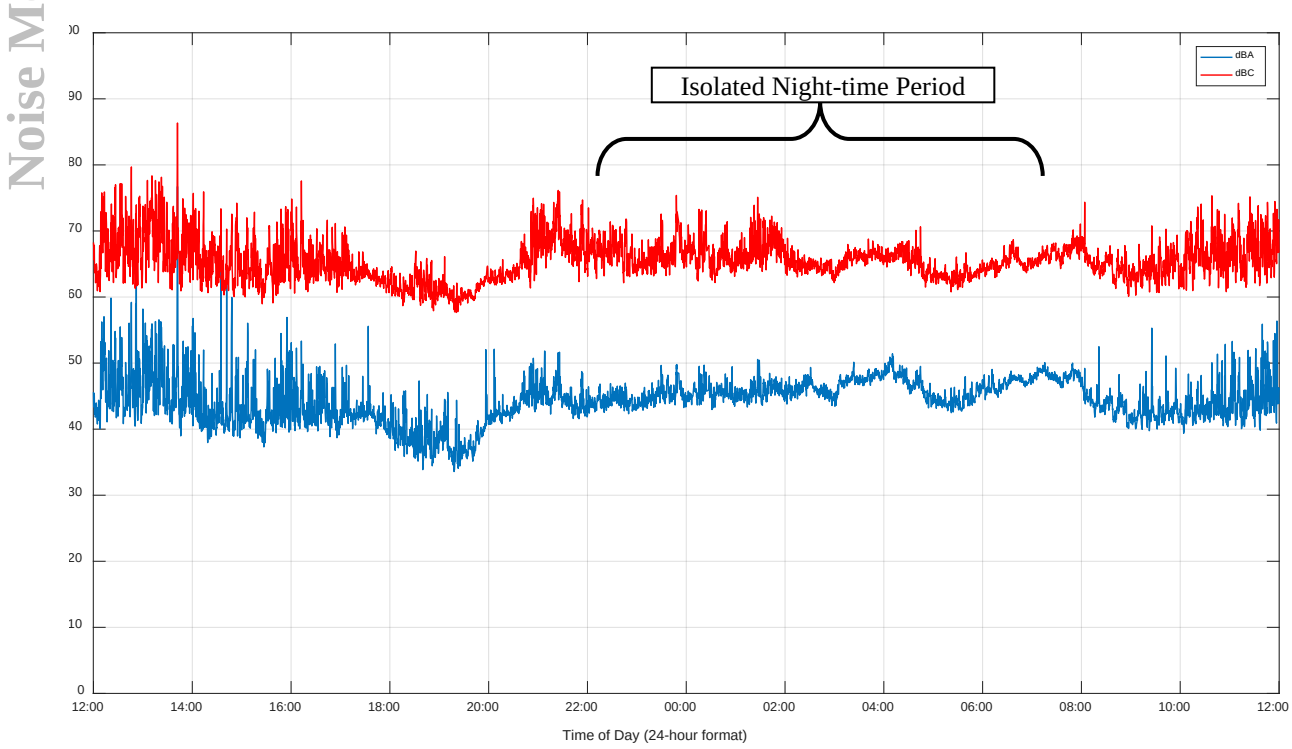


Figure 37. Noise Monitor #4, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

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Noise Monitor #4

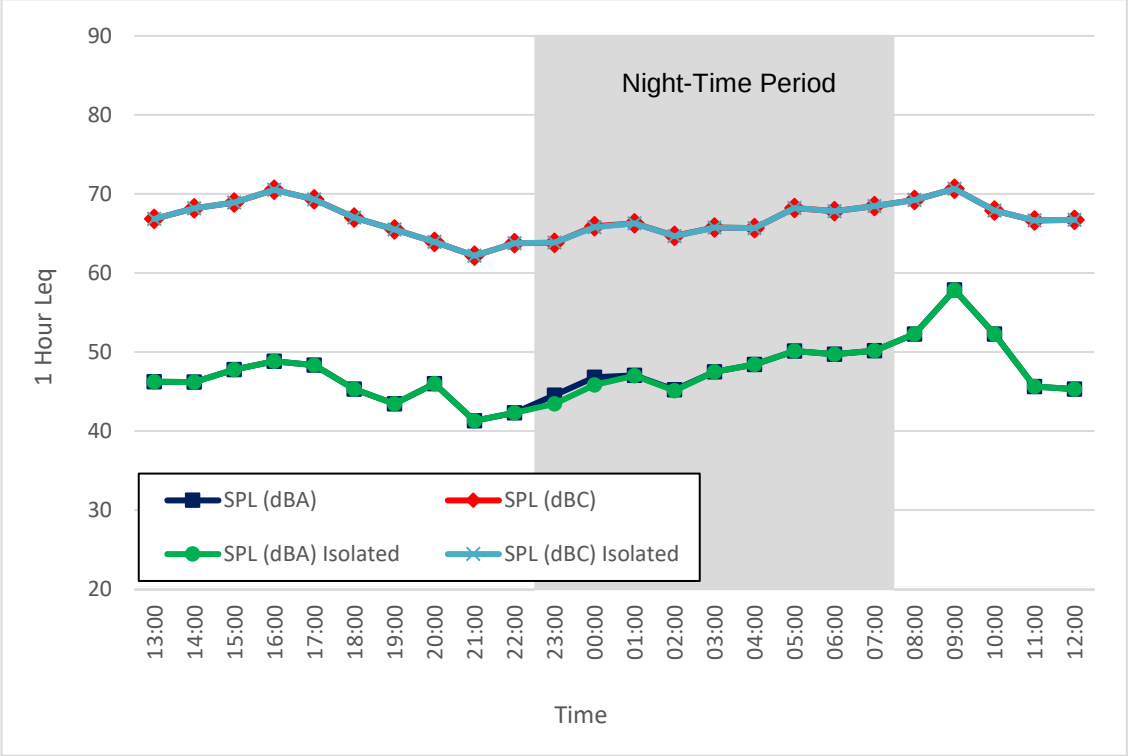


Figure 38. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

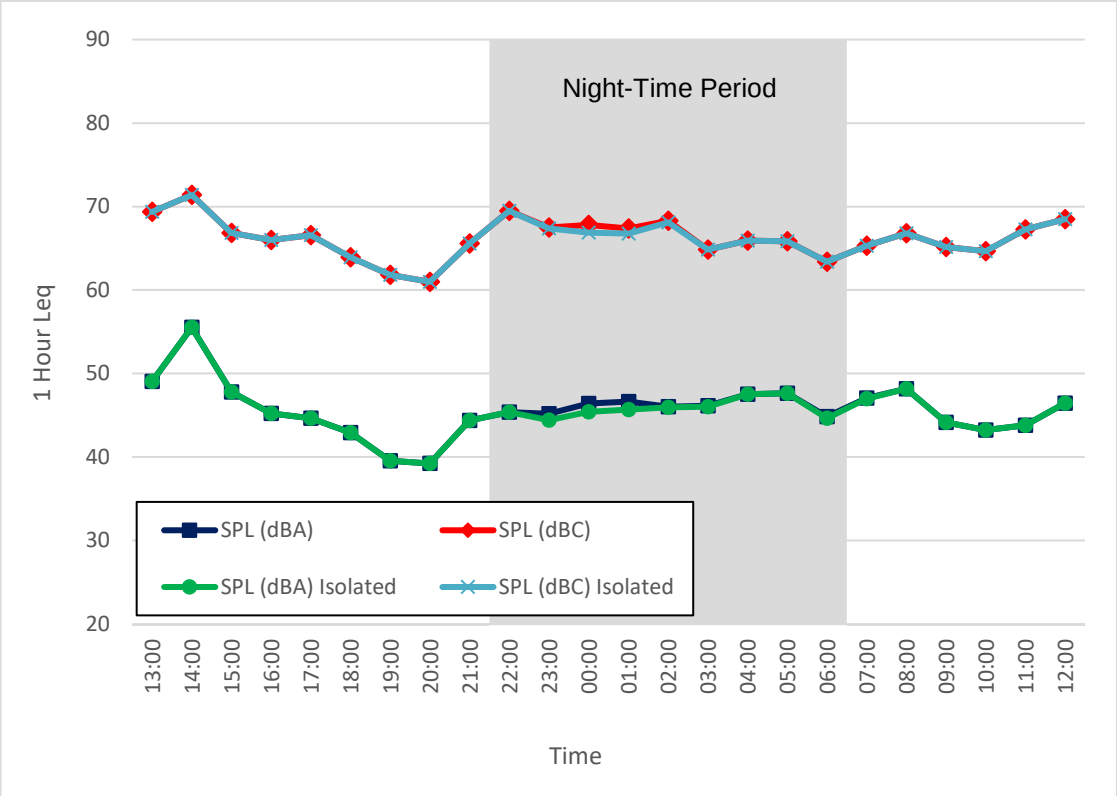


Figure 39. Noise Monitor #4, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

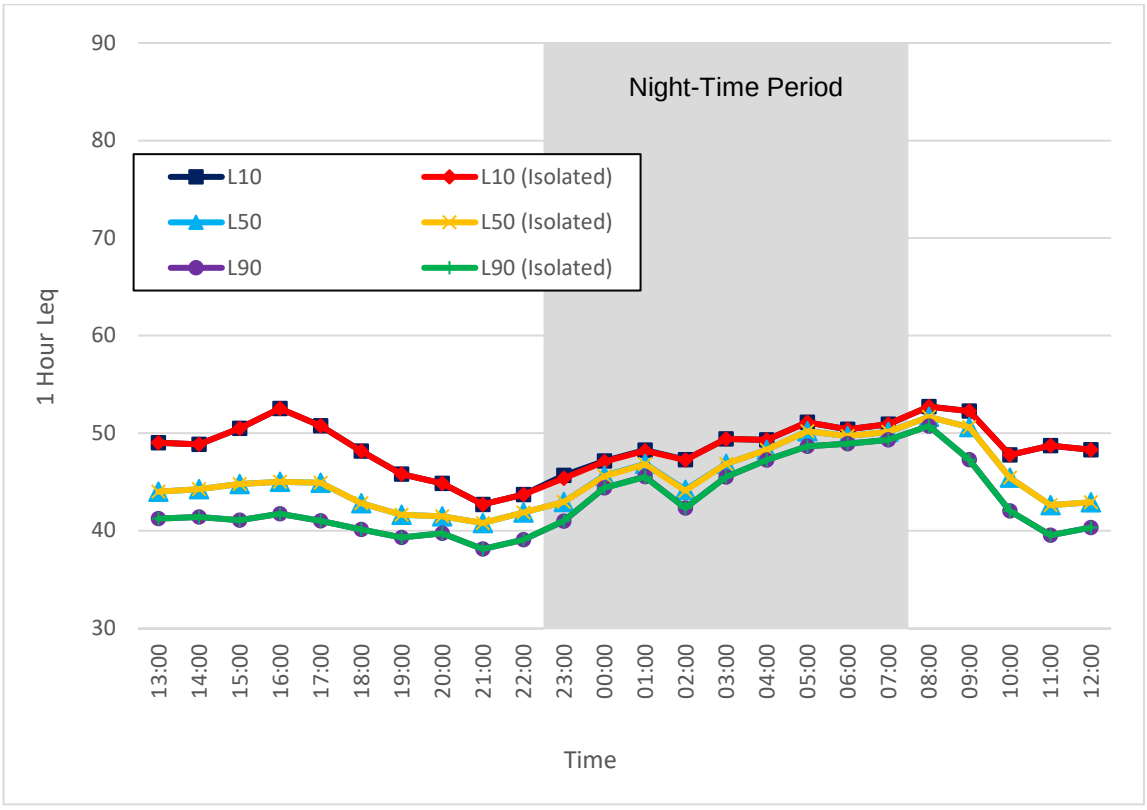


Figure 40. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

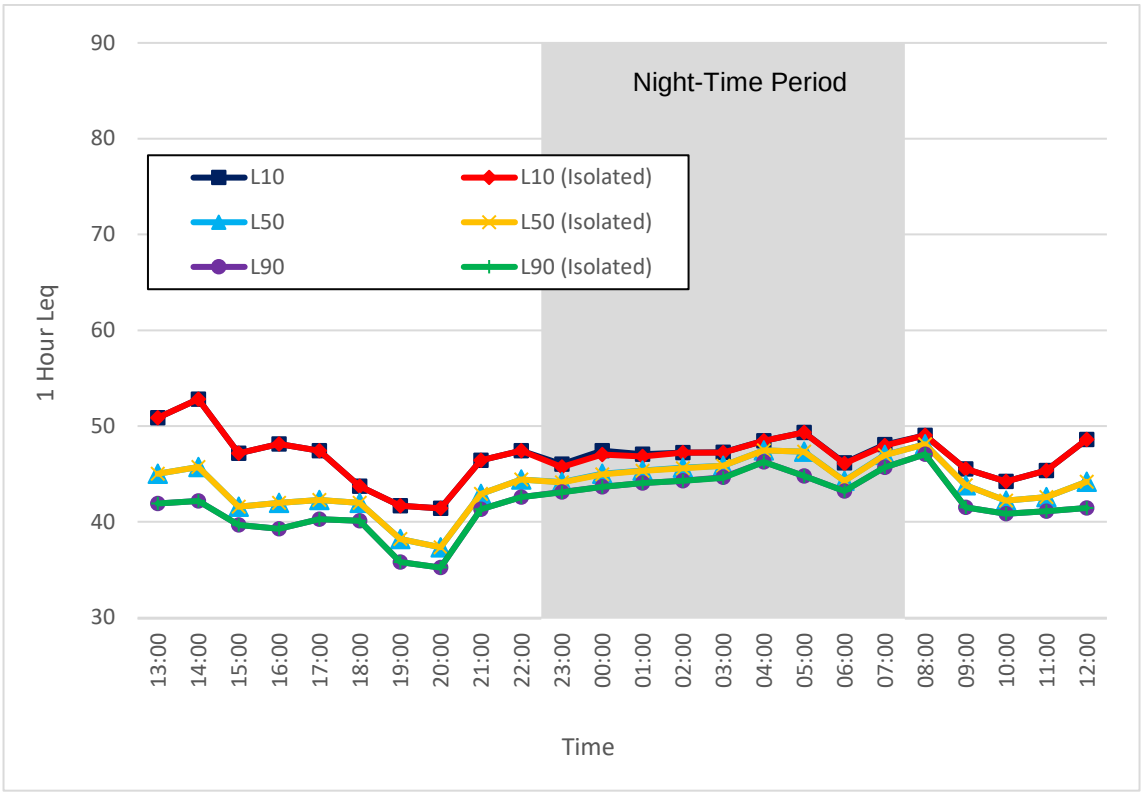
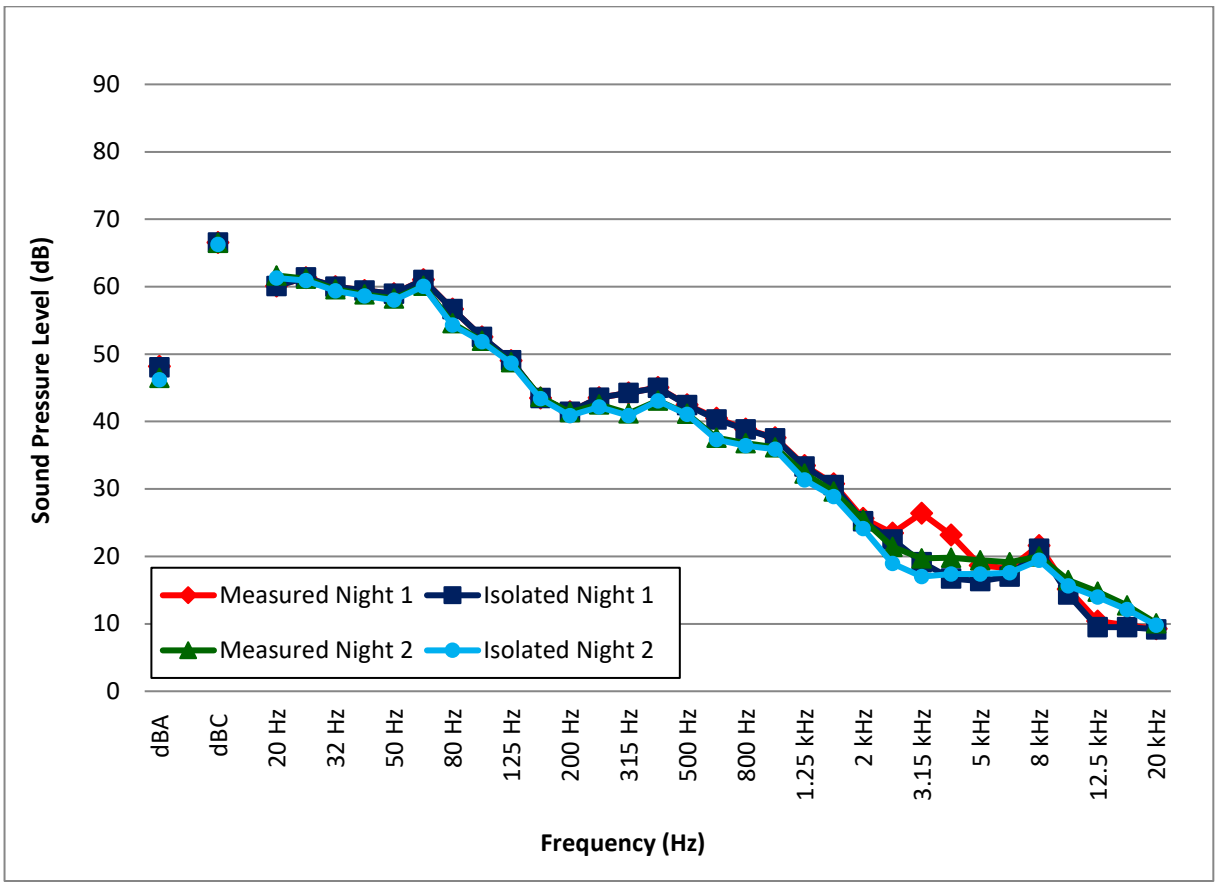
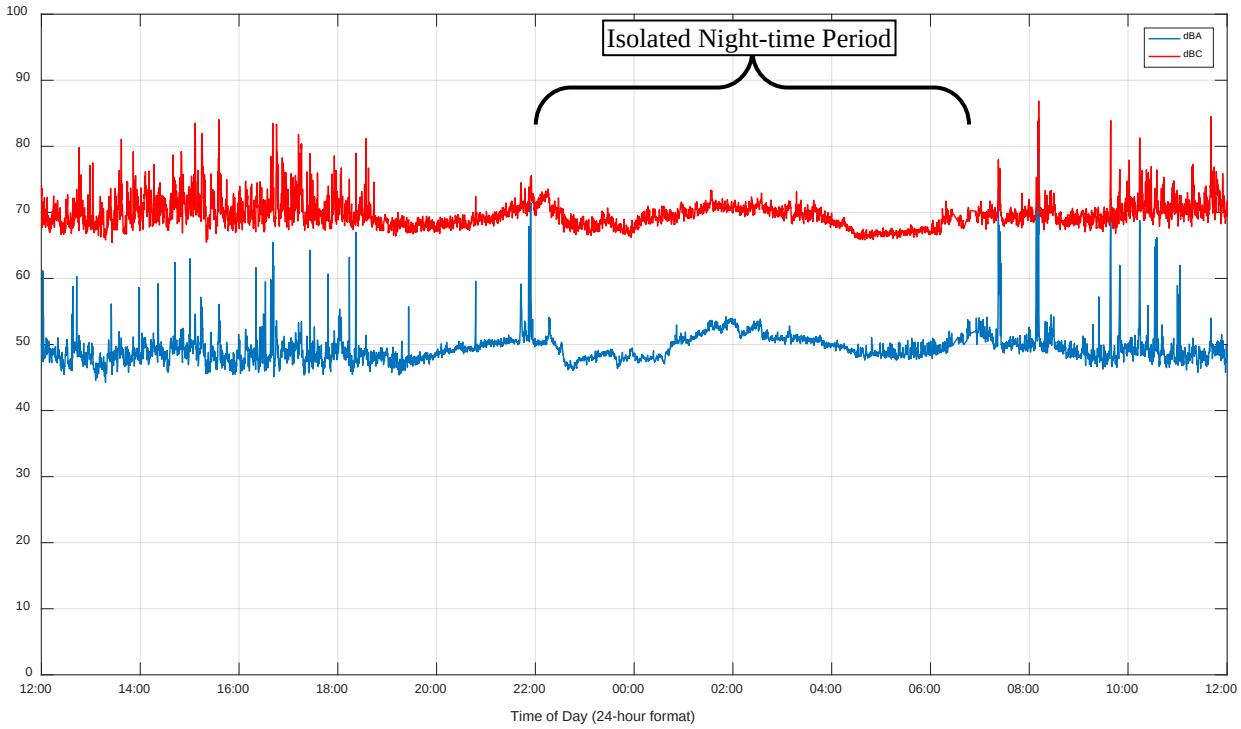


Figure 41. Noise Monitor #4, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)



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)

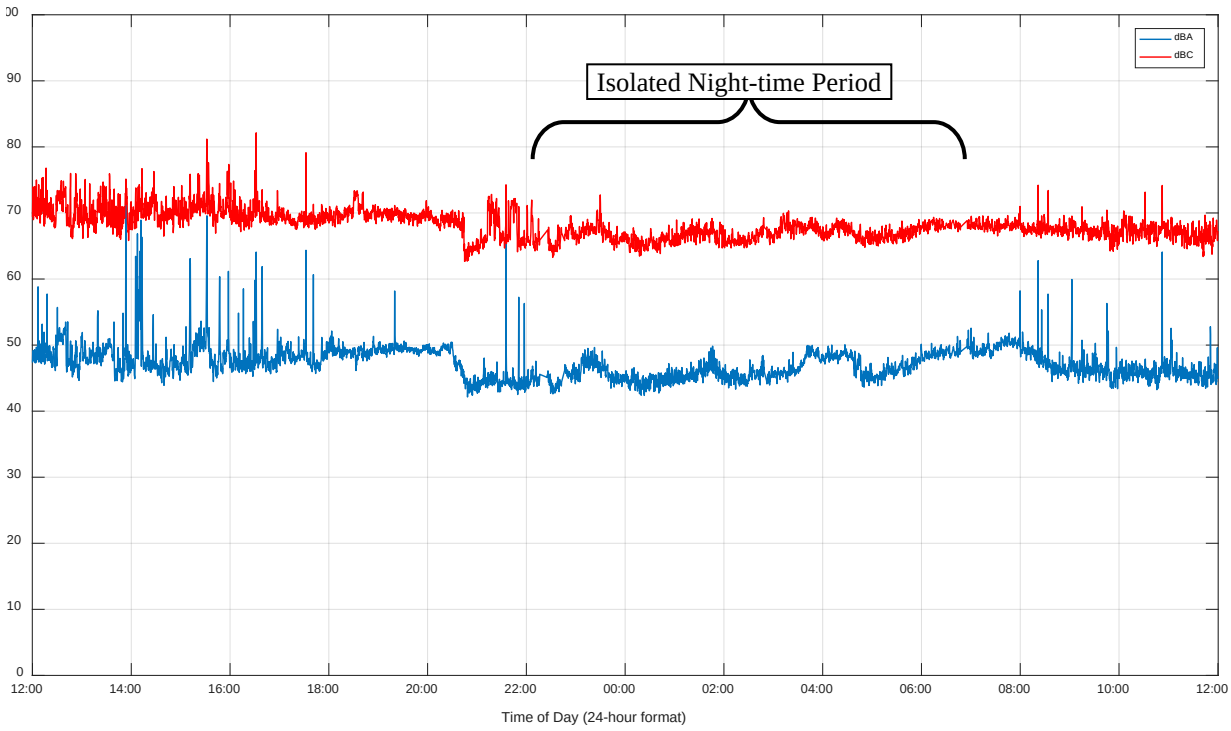


Figure 44. Noise Monitor #5, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #5

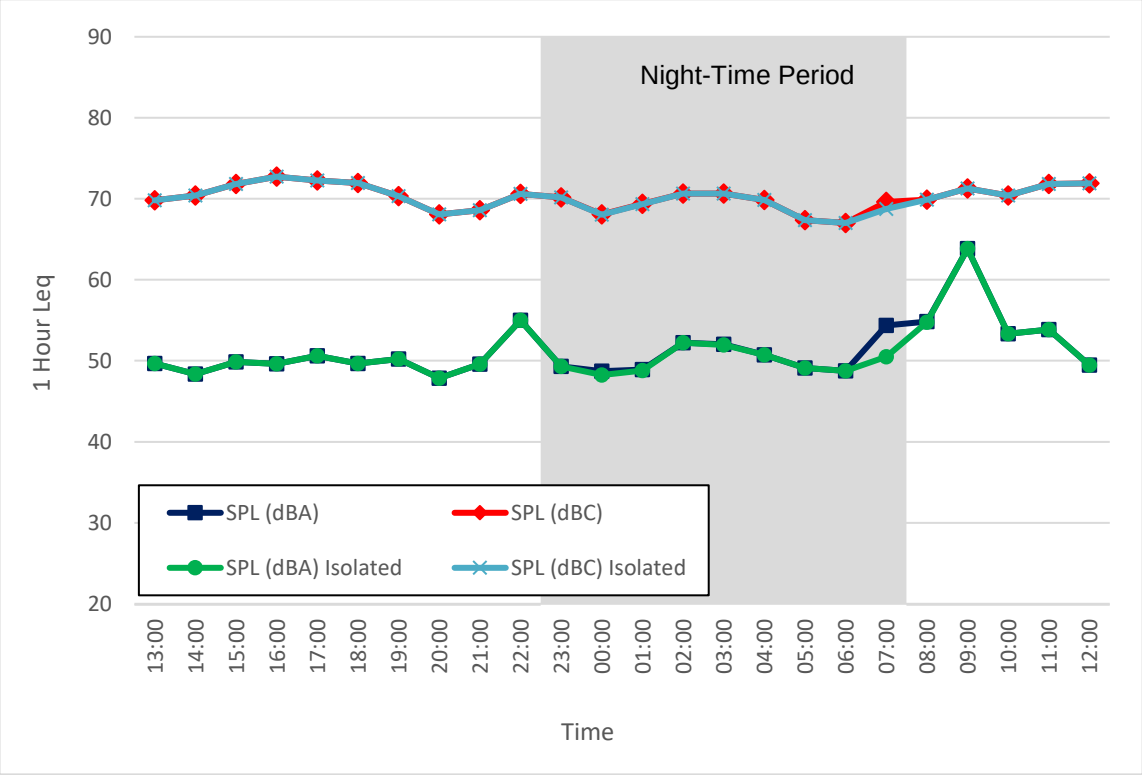


Figure 45. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

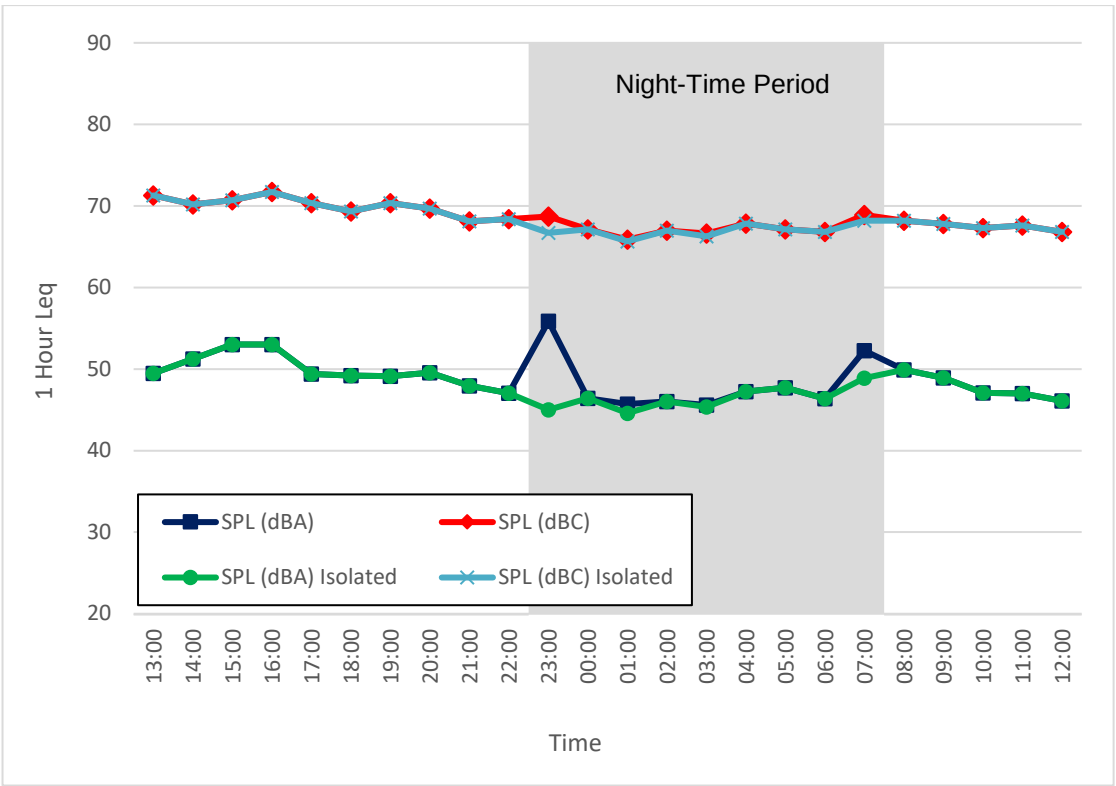


Figure 46. Noise Monitor #5, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

Monitor #5

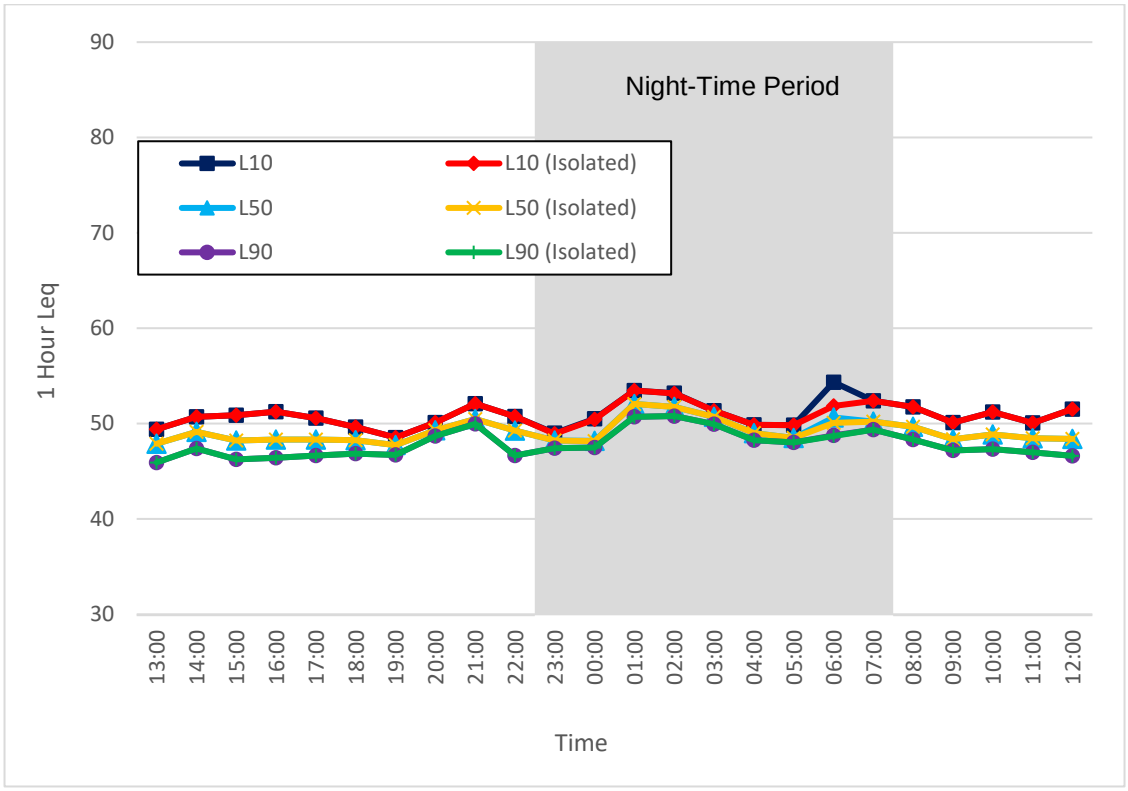


Figure 47. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

Noise

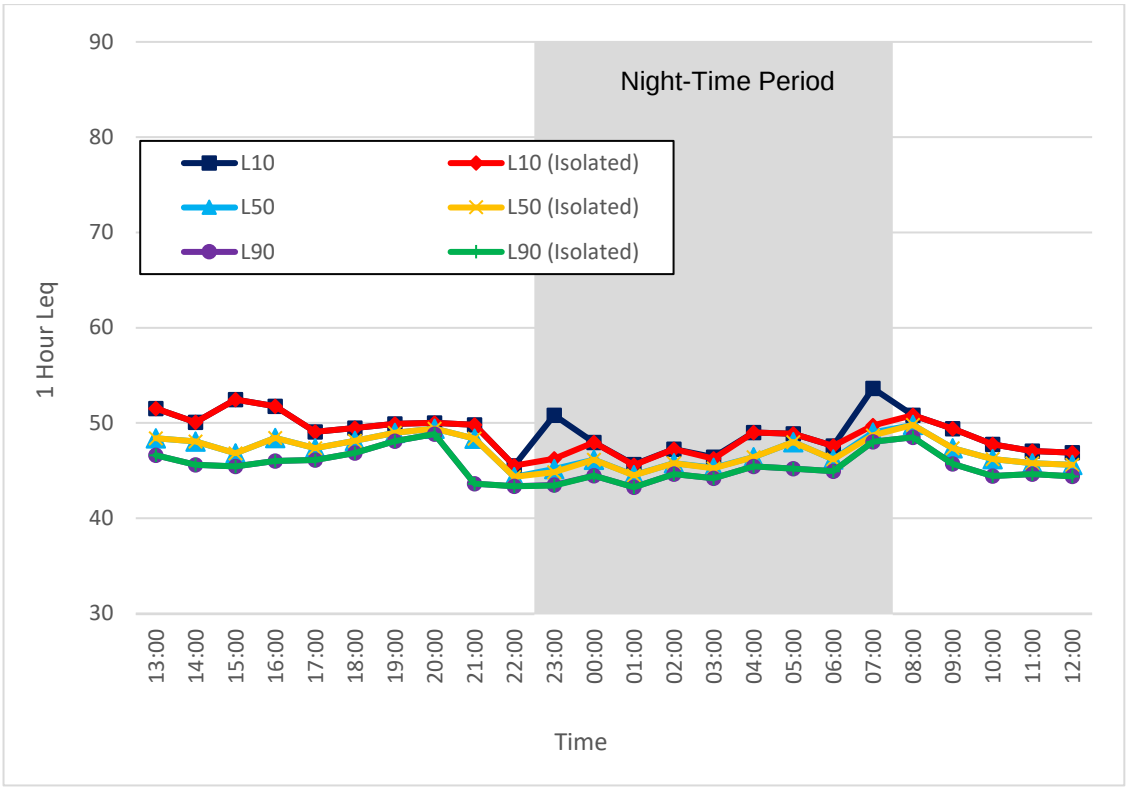


Figure 48. Noise Monitor #5, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

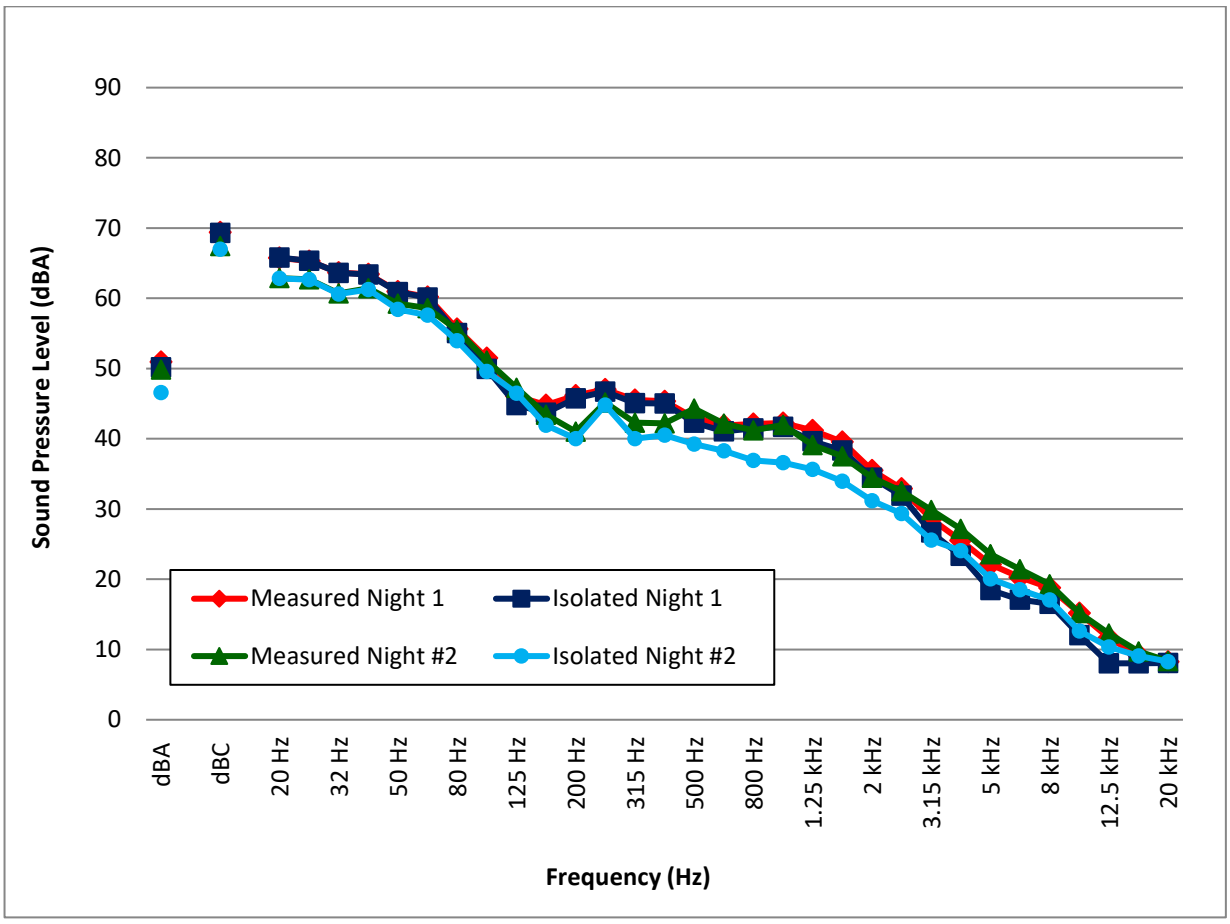


Figure 49. Noise Monitor #5, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

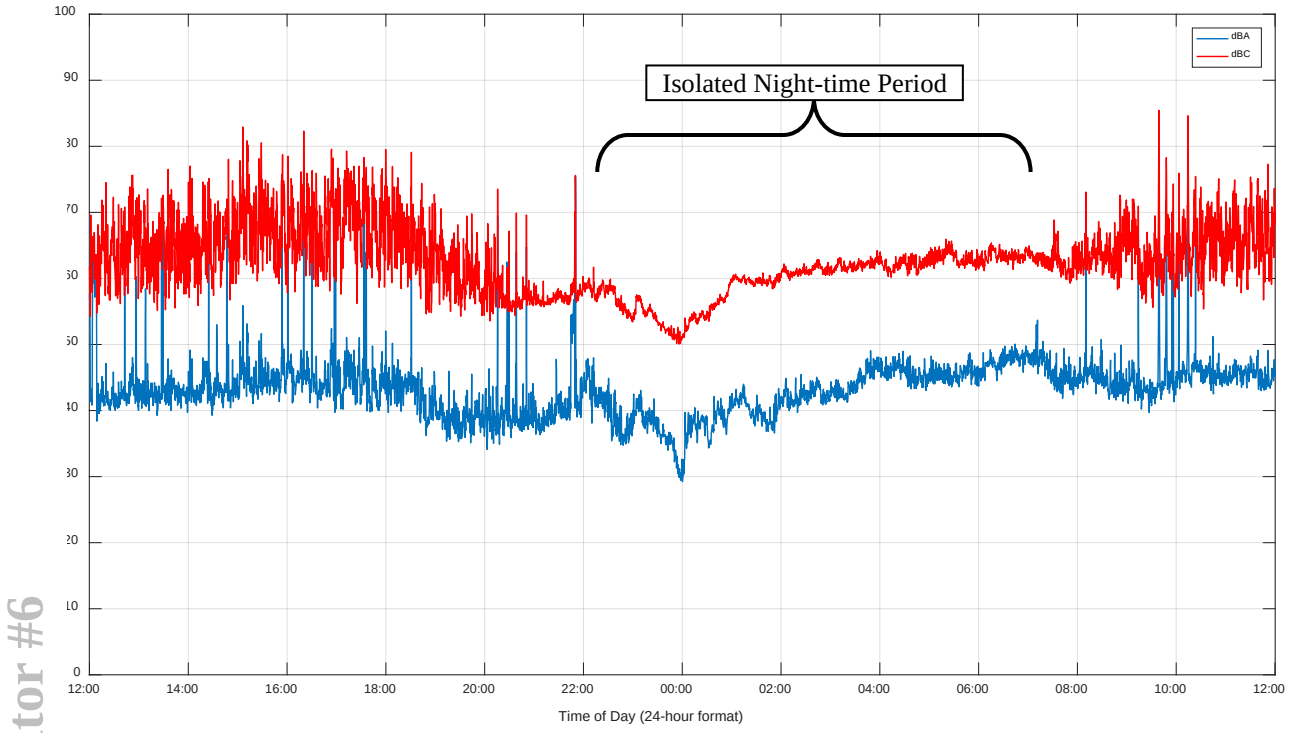


Figure 50. Noise Monitor #6, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

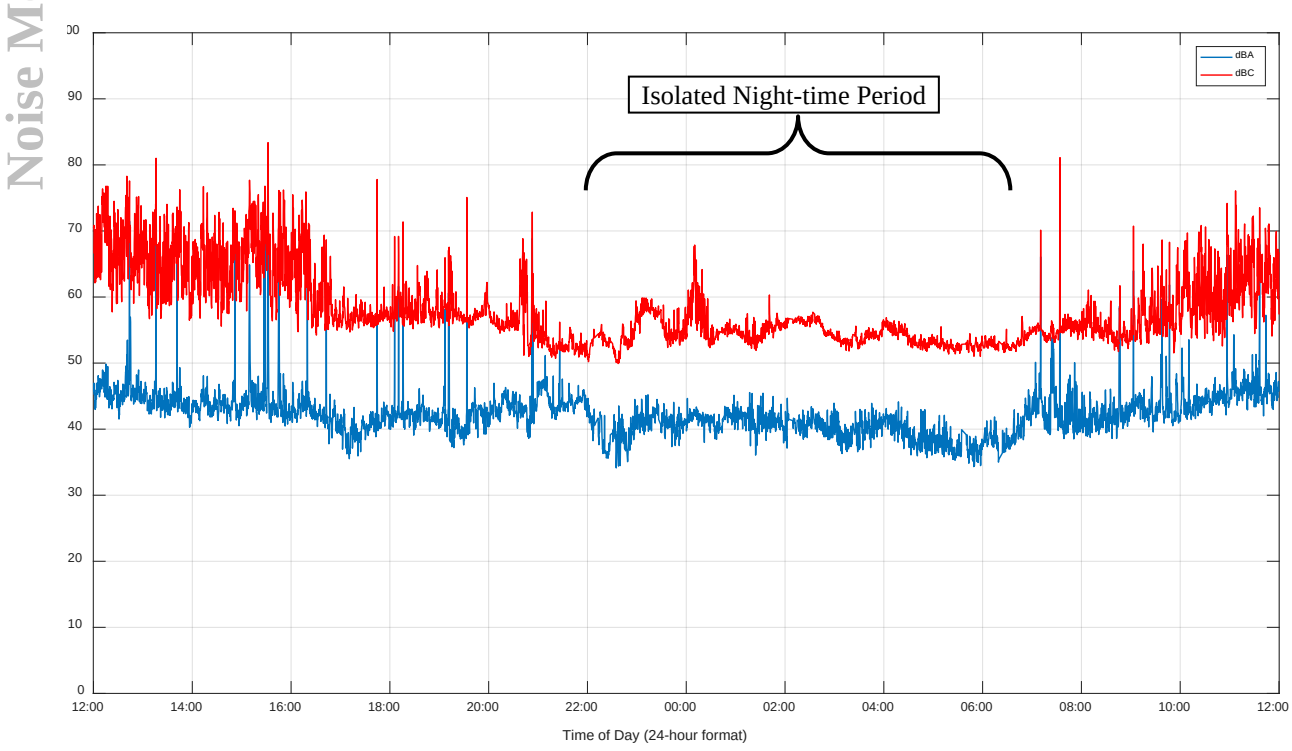


Figure 51. Noise Monitor #6, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #6

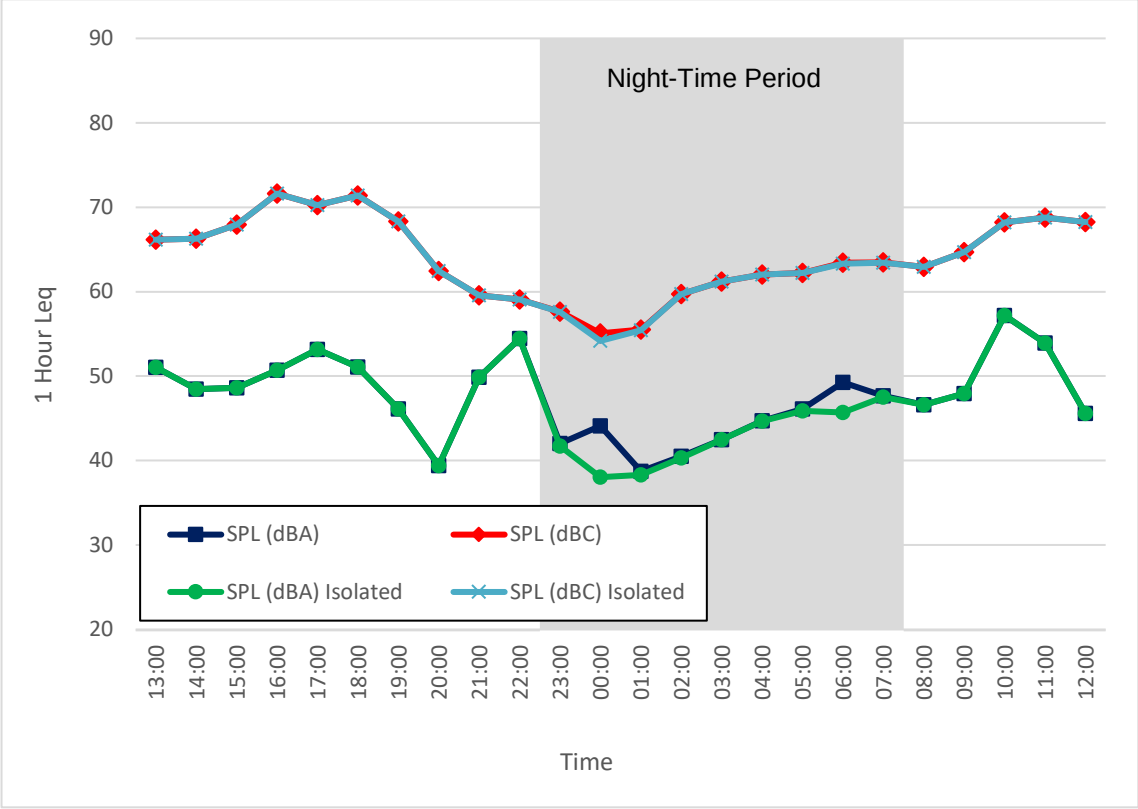


Figure 52. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

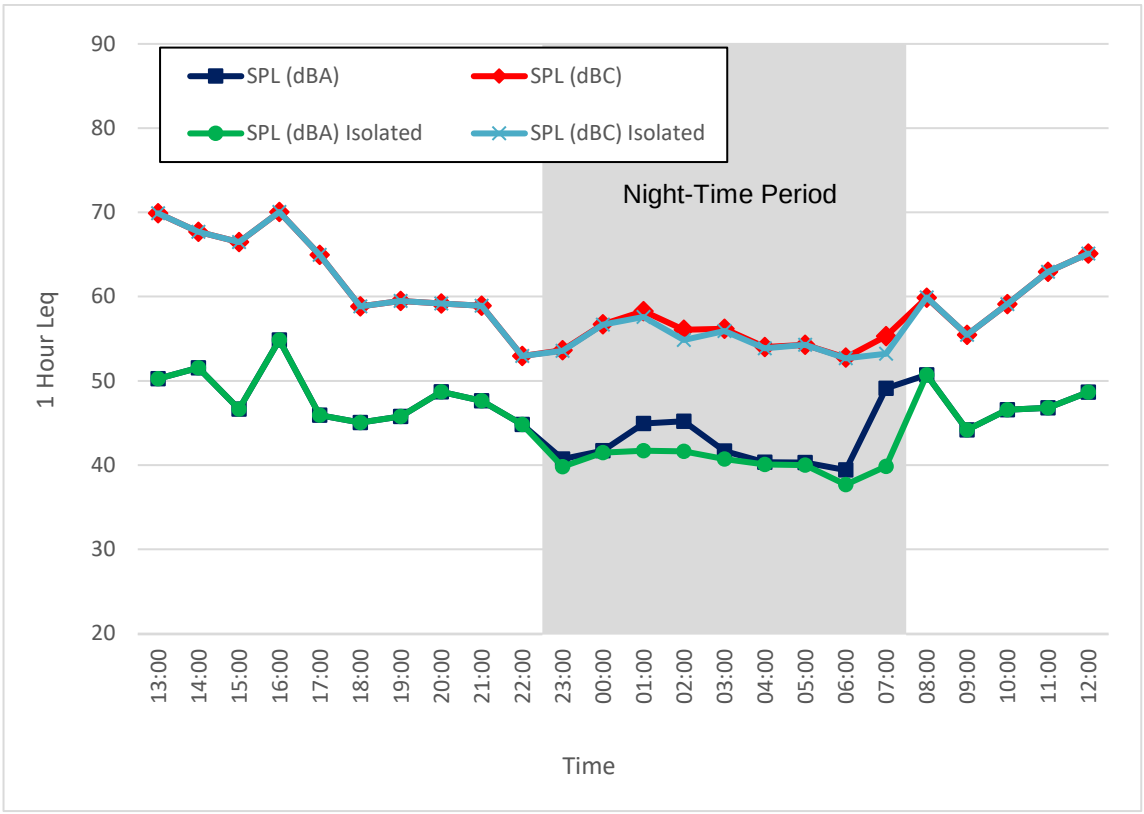


Figure 53. Noise Monitor #6, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

Monitor #6

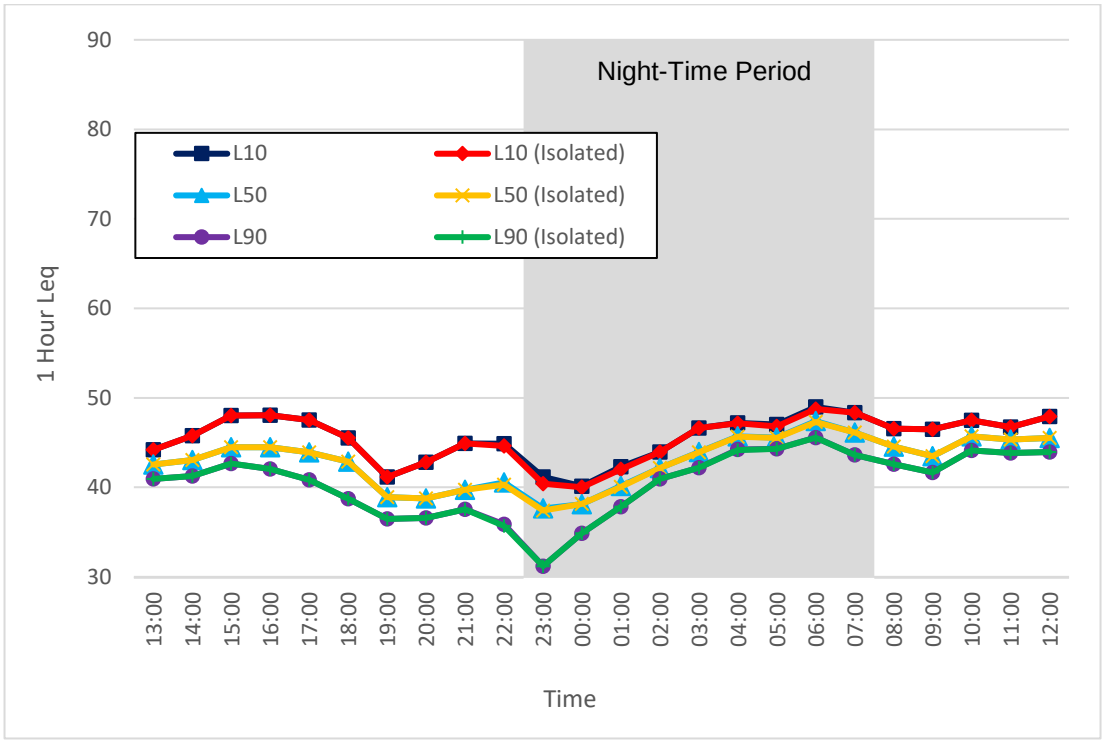


Figure 54. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

Noise

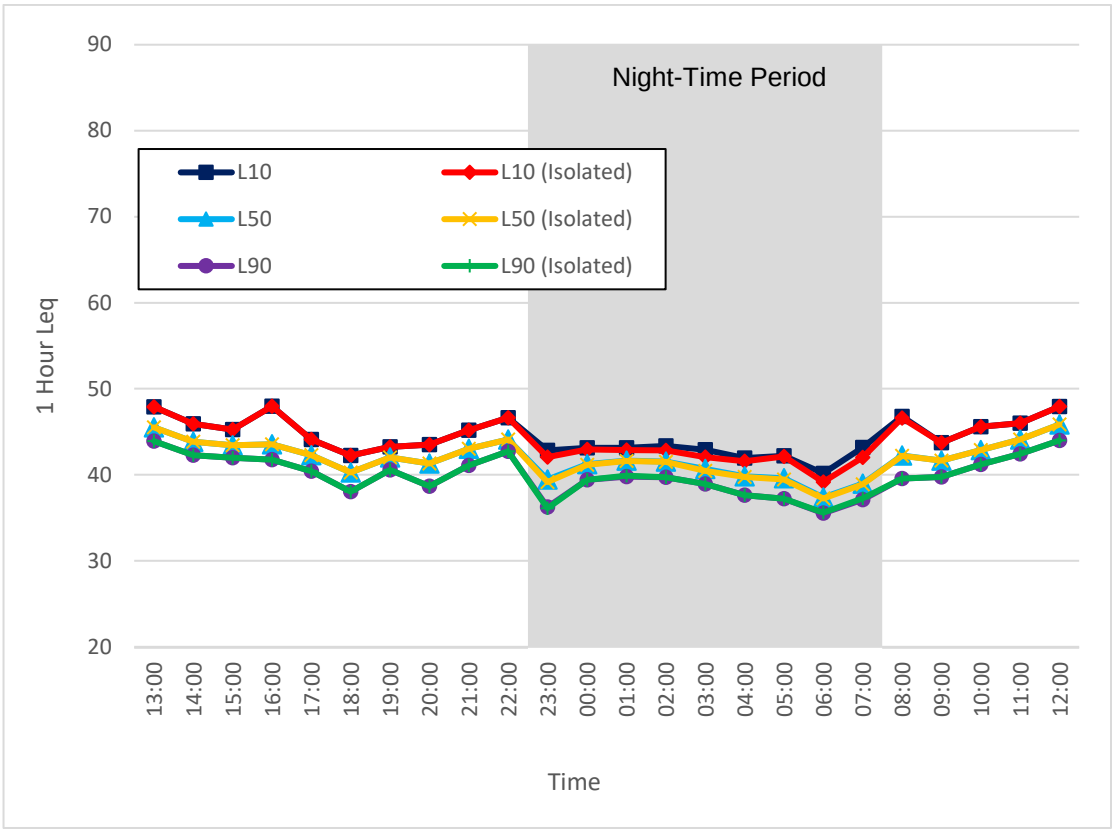


Figure 55. Noise Monitor #6, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

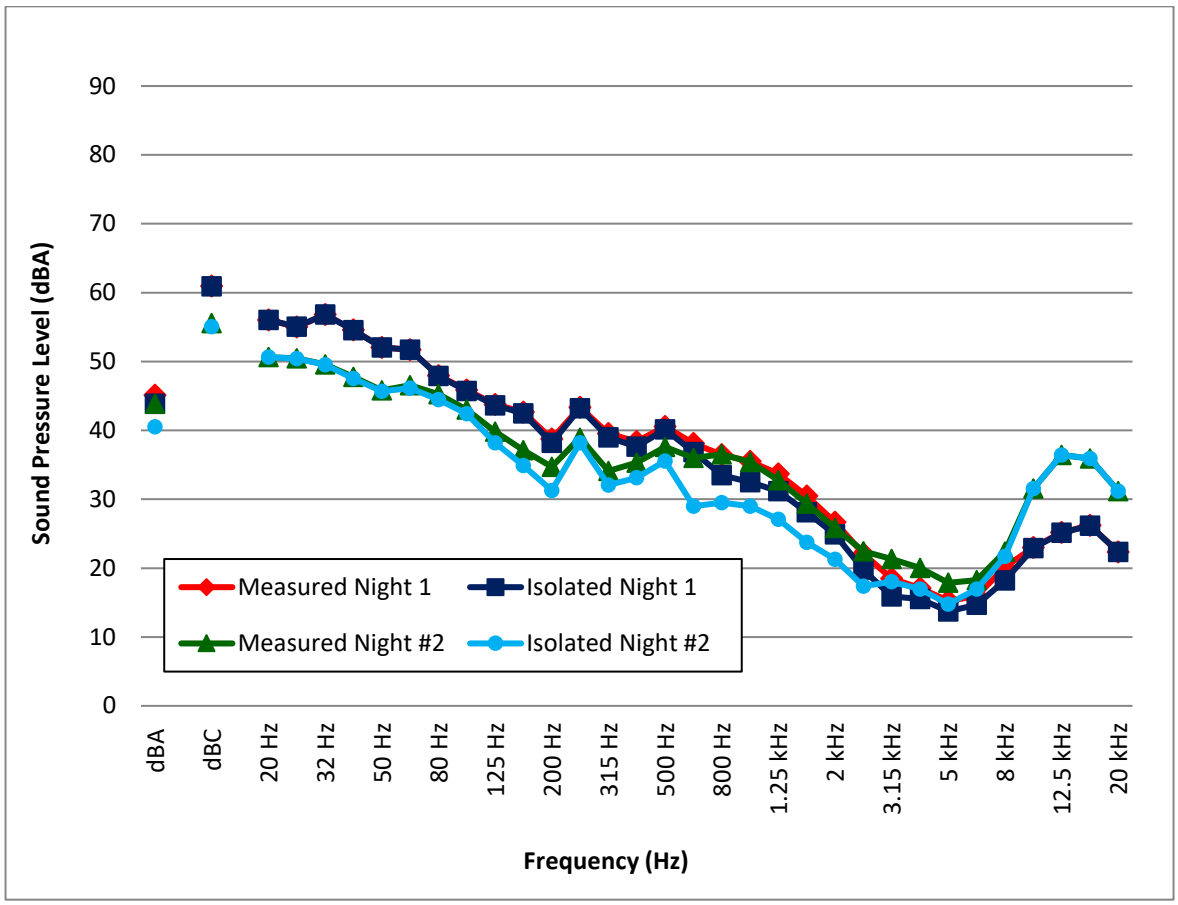


Figure 56. Noise Monitor #6, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #6

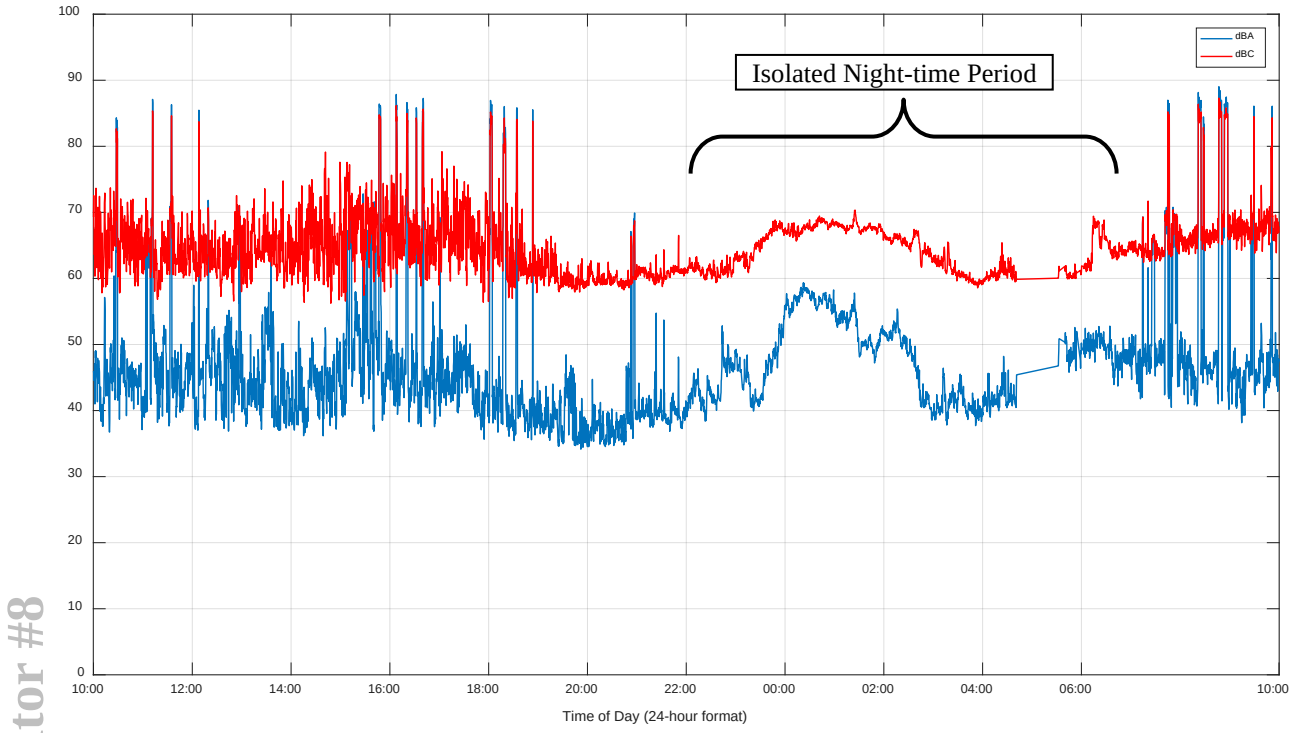


Figure 57. Noise Monitor #8, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

Noise Monitor #8

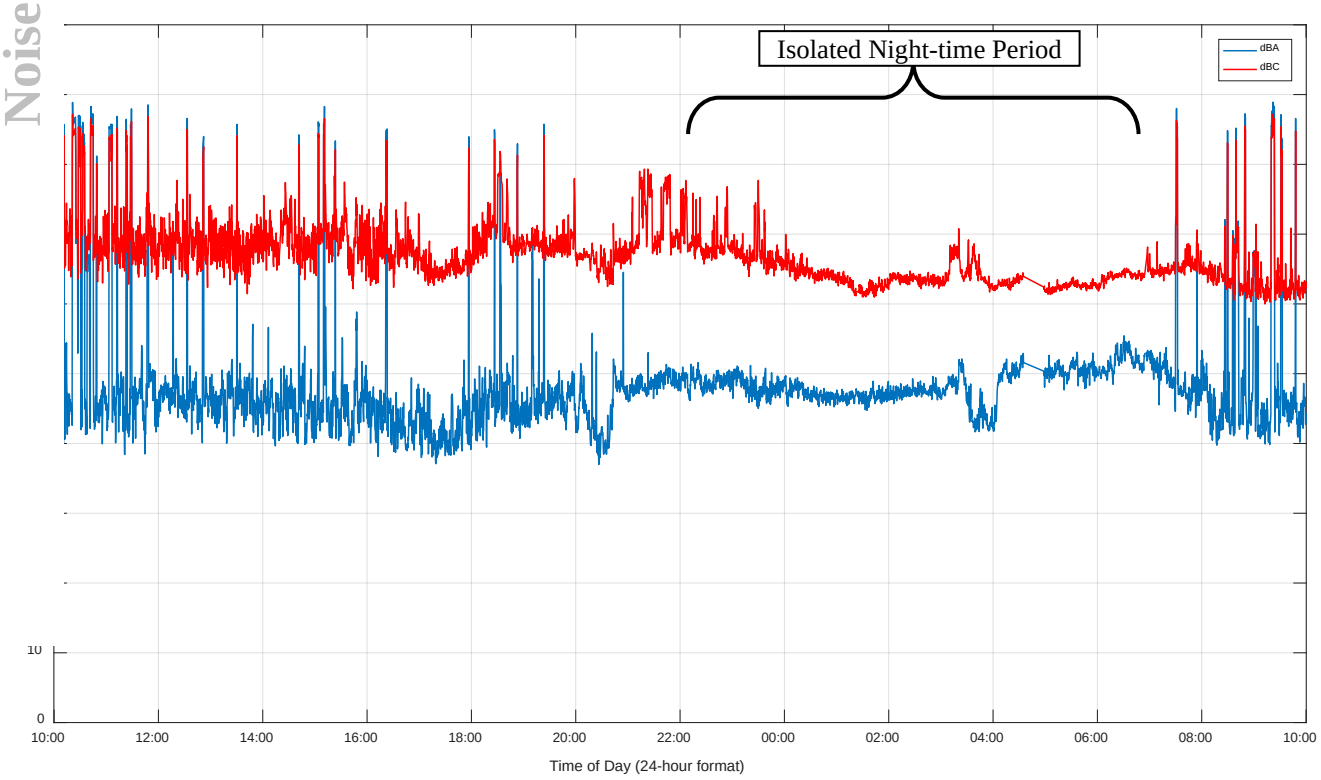


Figure 58. Noise Monitor #8, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

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Noise Monitor #8

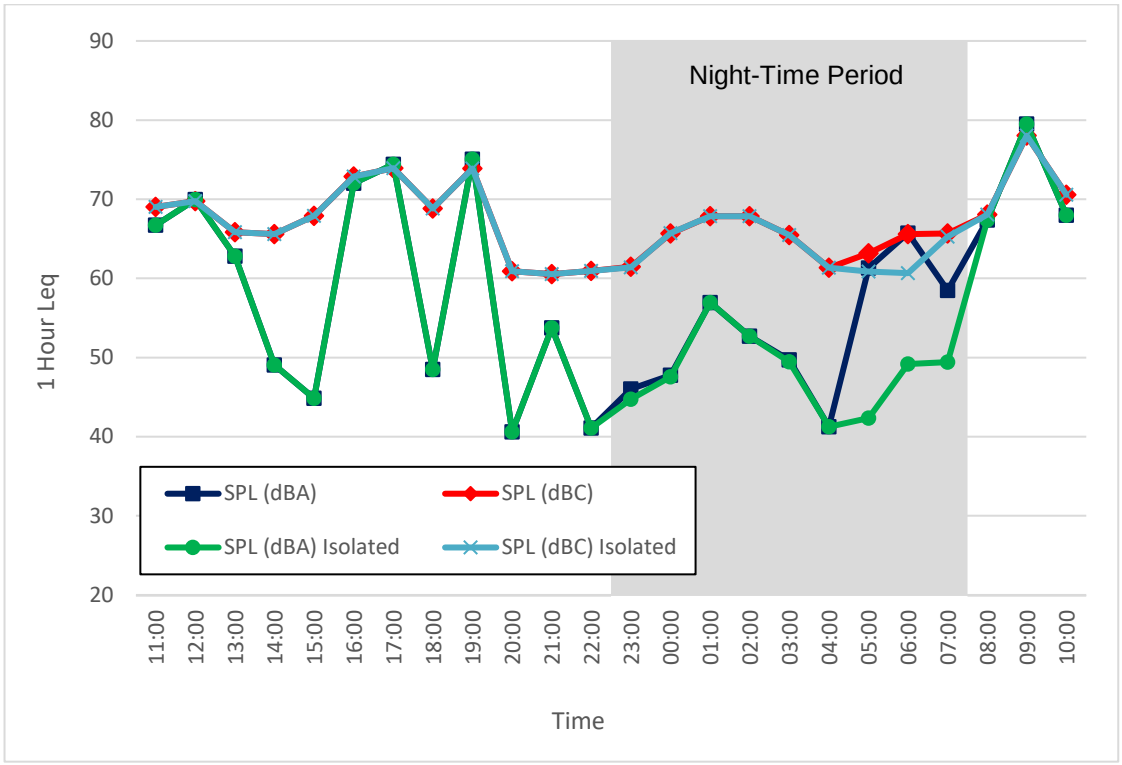


Figure 59. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

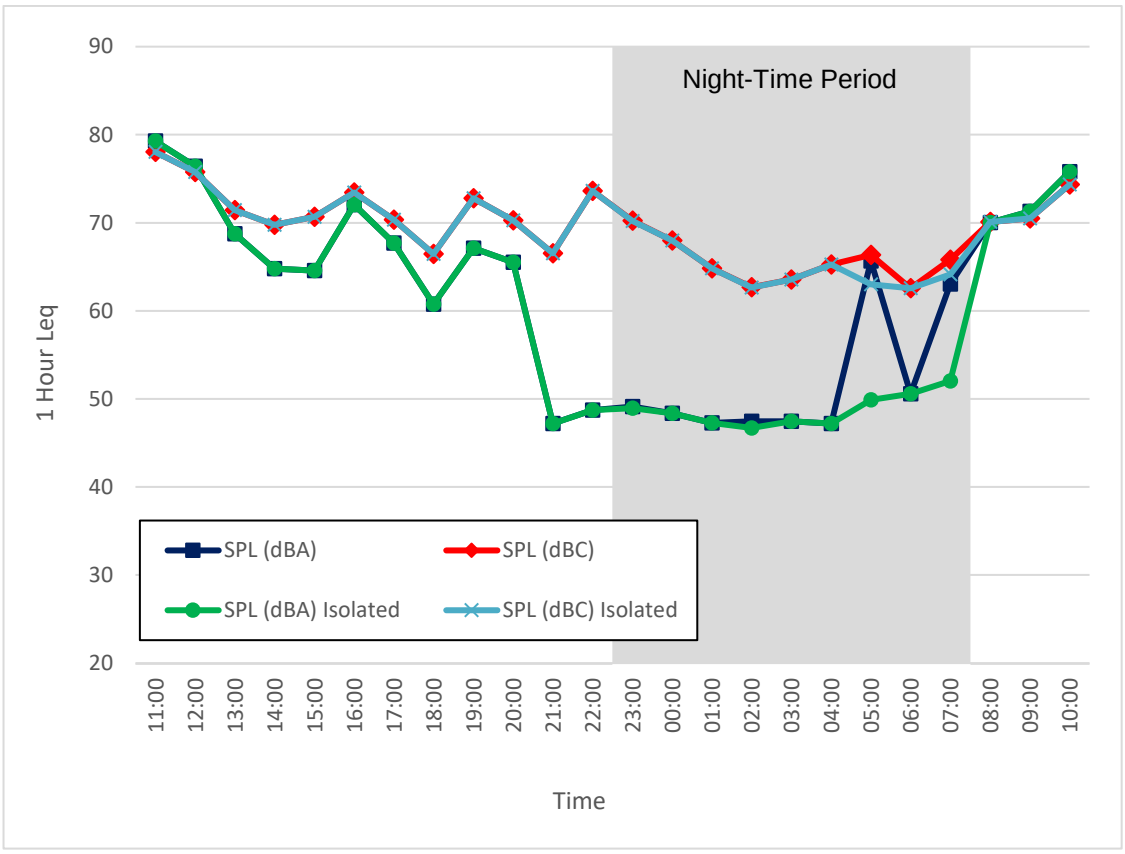


Figure 60. Noise Monitor #8, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

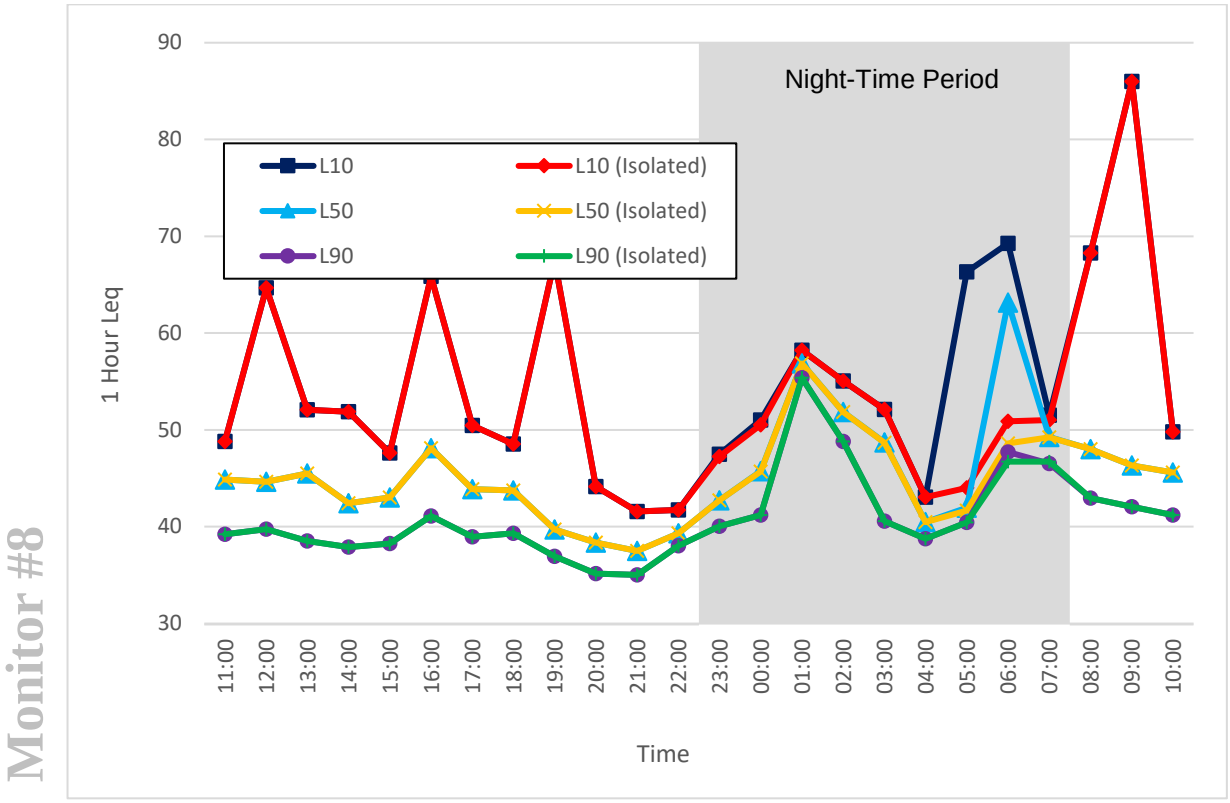


Figure 61. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

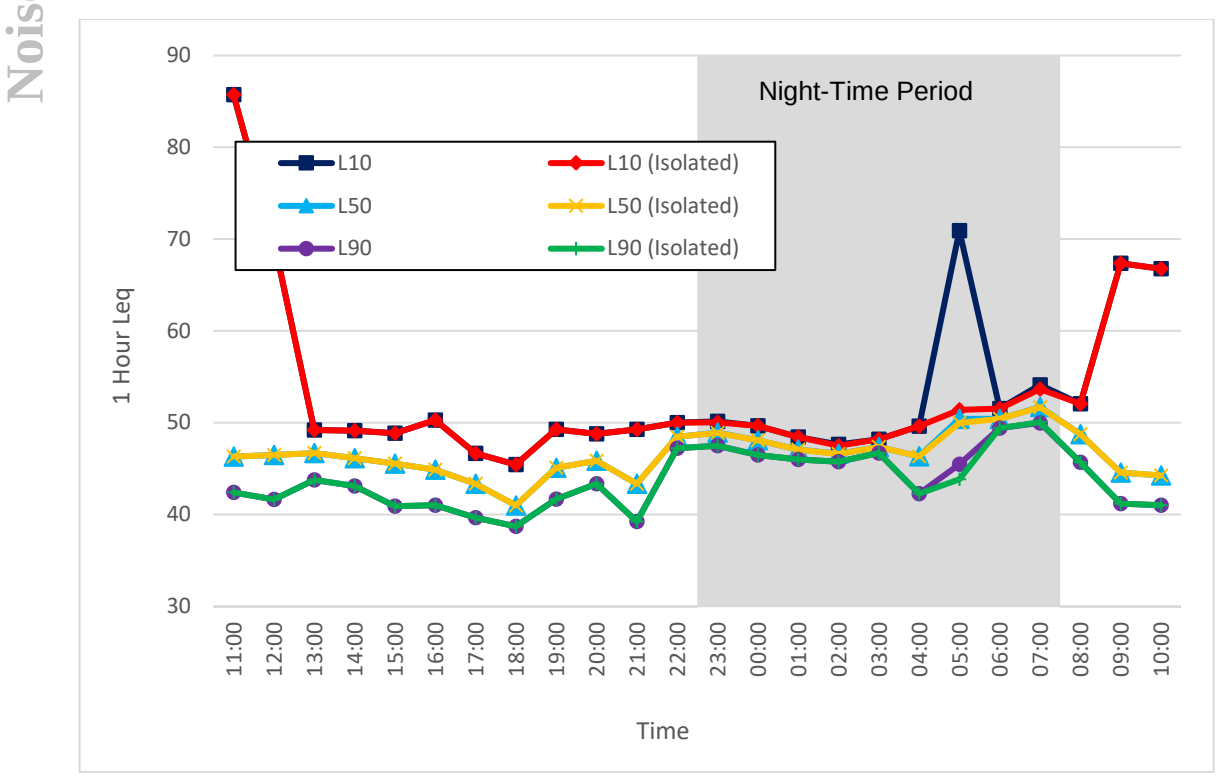


Figure 62. Noise Monitor #8, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #8

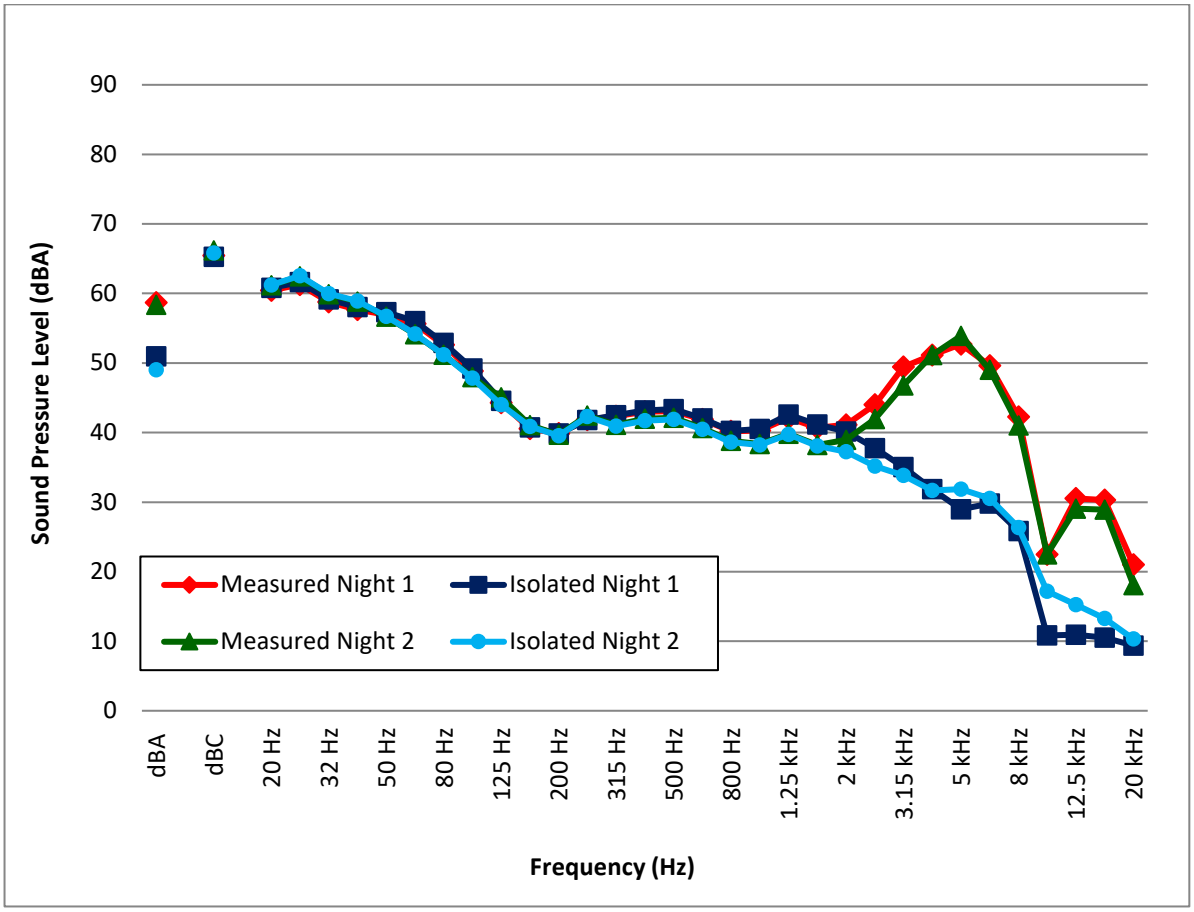


Figure 63. Noise Monitor #8, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #9

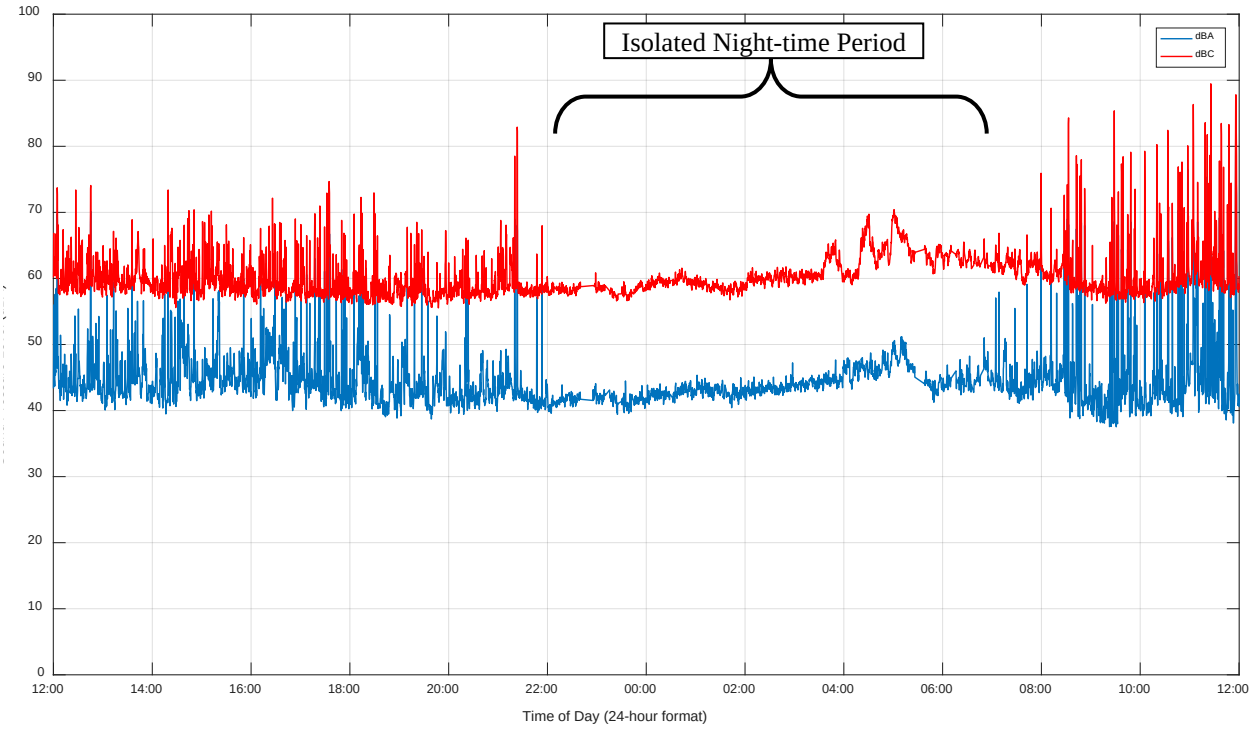


Figure 64. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

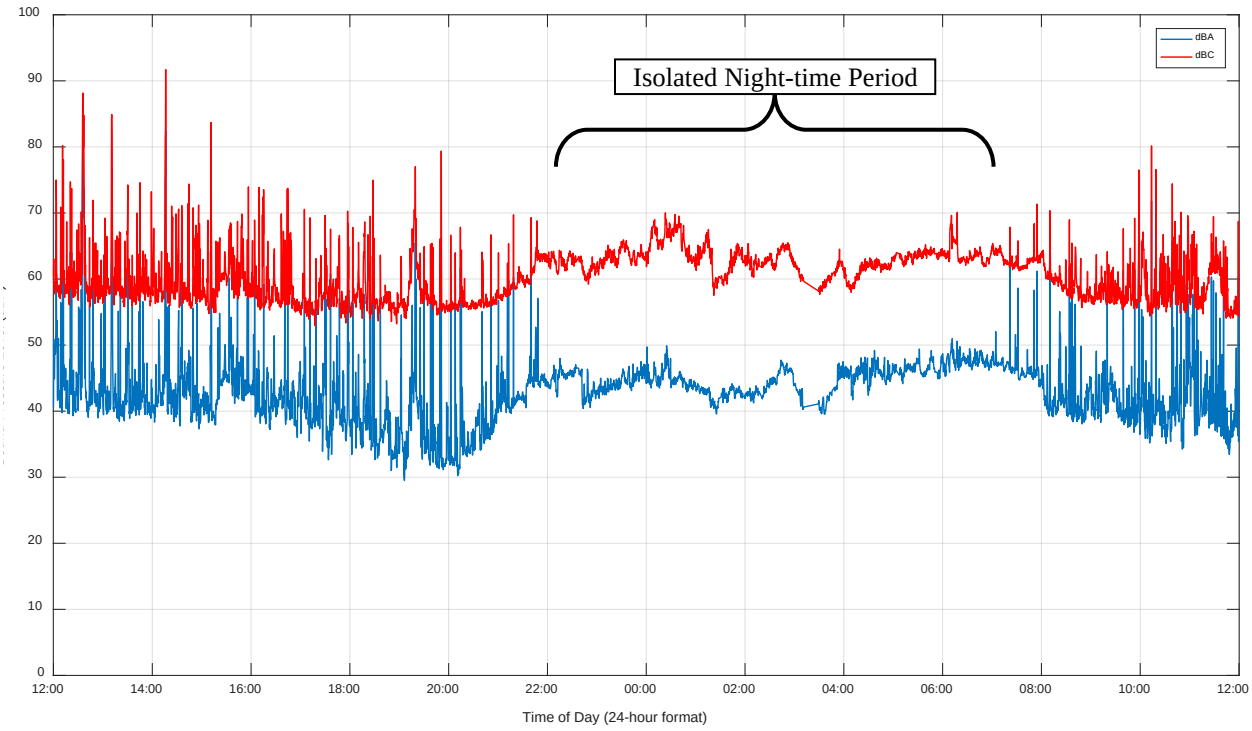


Figure 65. Noise Monitor #9, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

Noise Monitor #9

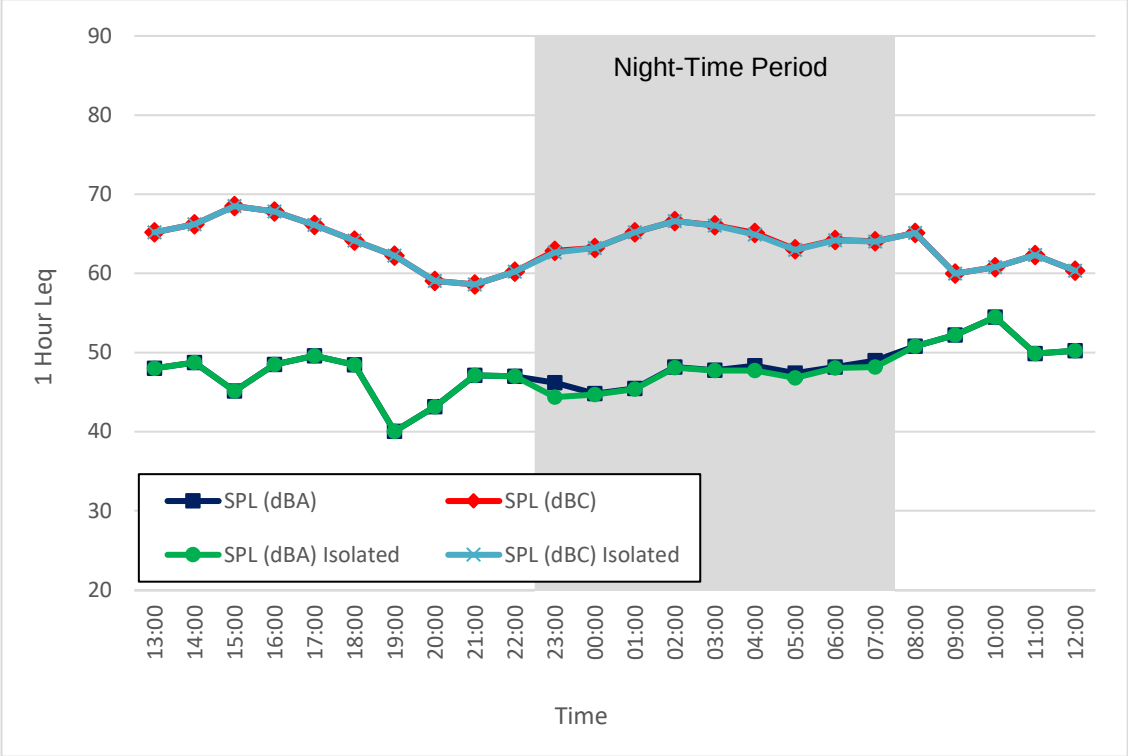


Figure 66. Noise Monitor #9, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

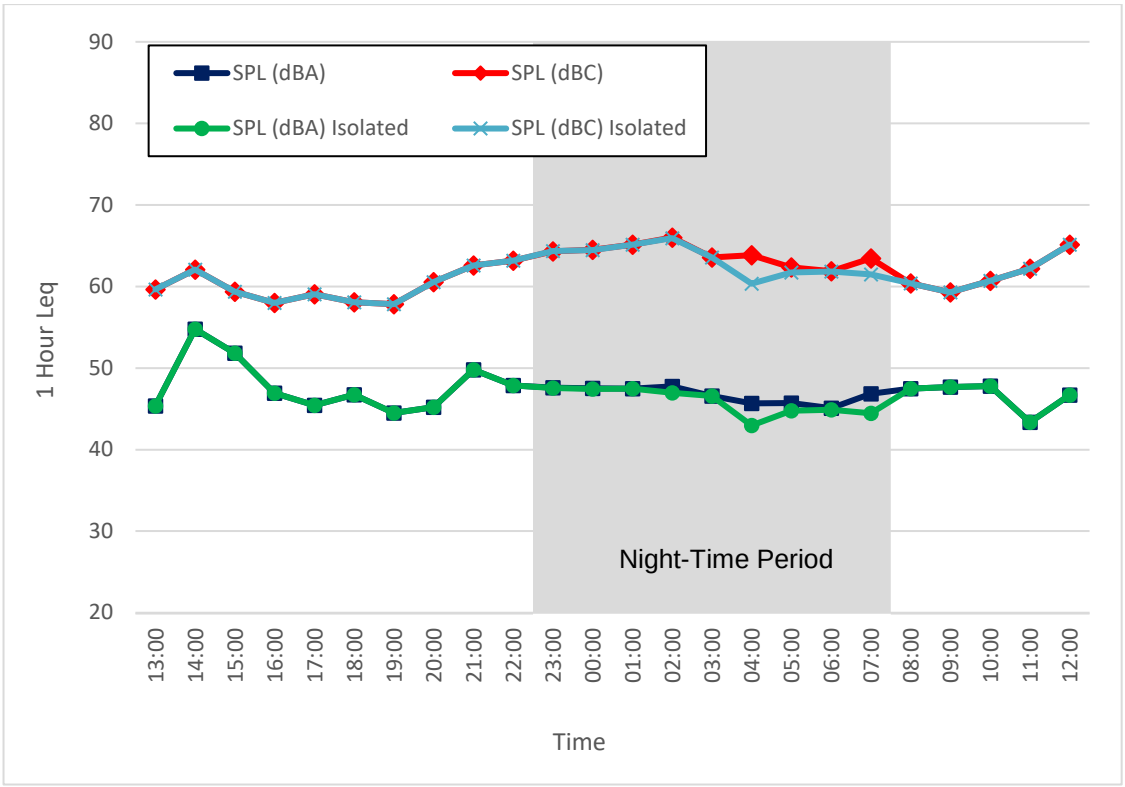


Figure 67. Noise Monitor #9, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

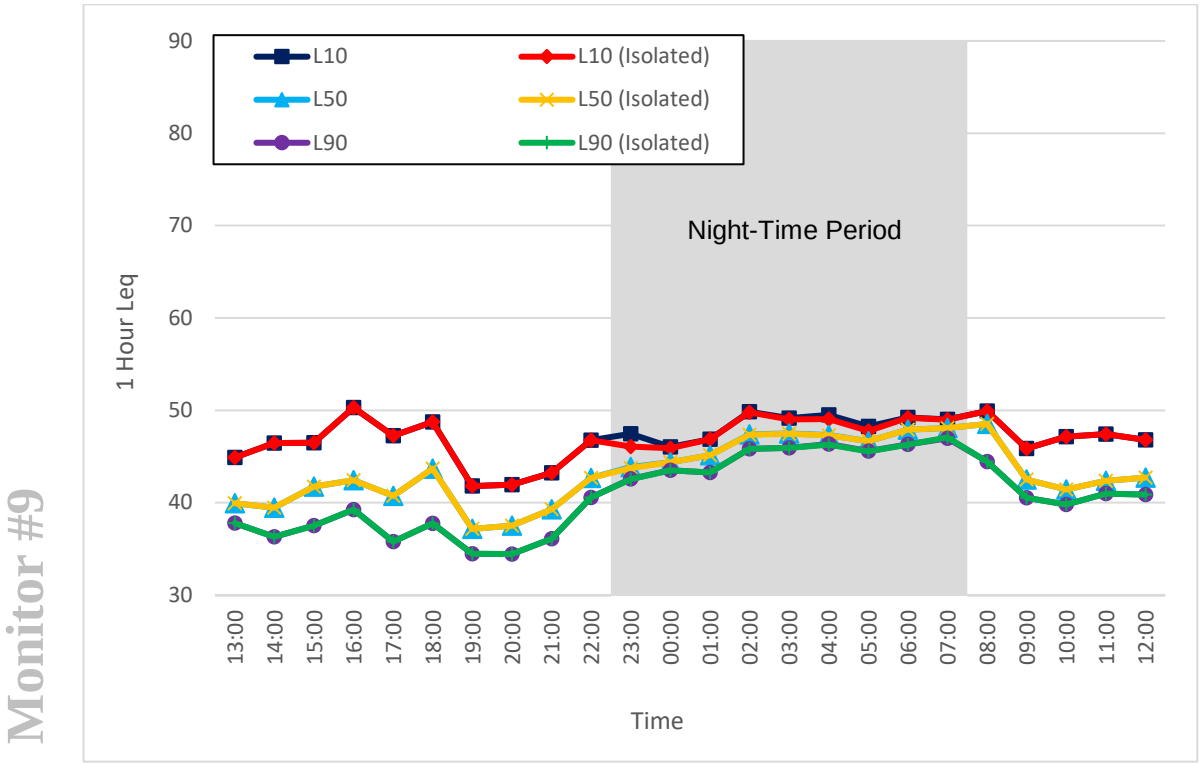


Figure 68. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

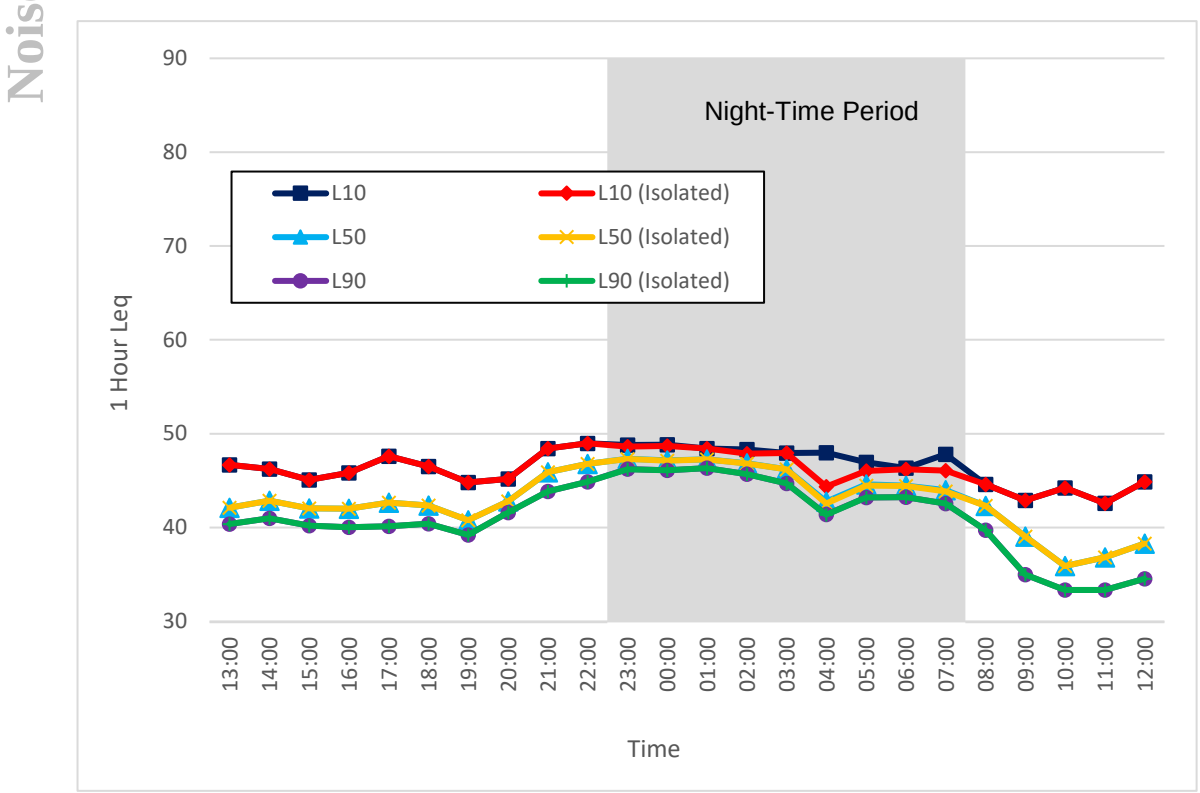


Figure 69. Noise Monitor #9, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

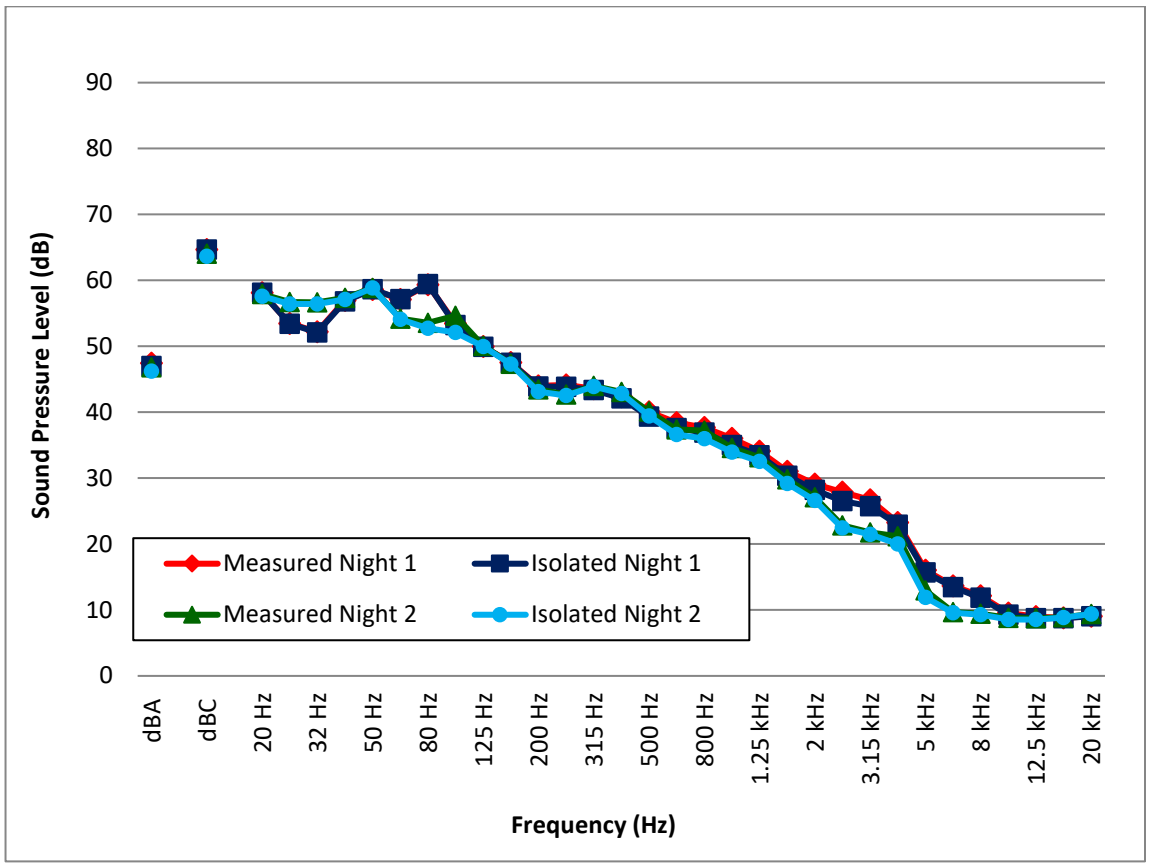


Figure 70. Noise Monitor #9, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)

Noise Monitor #9

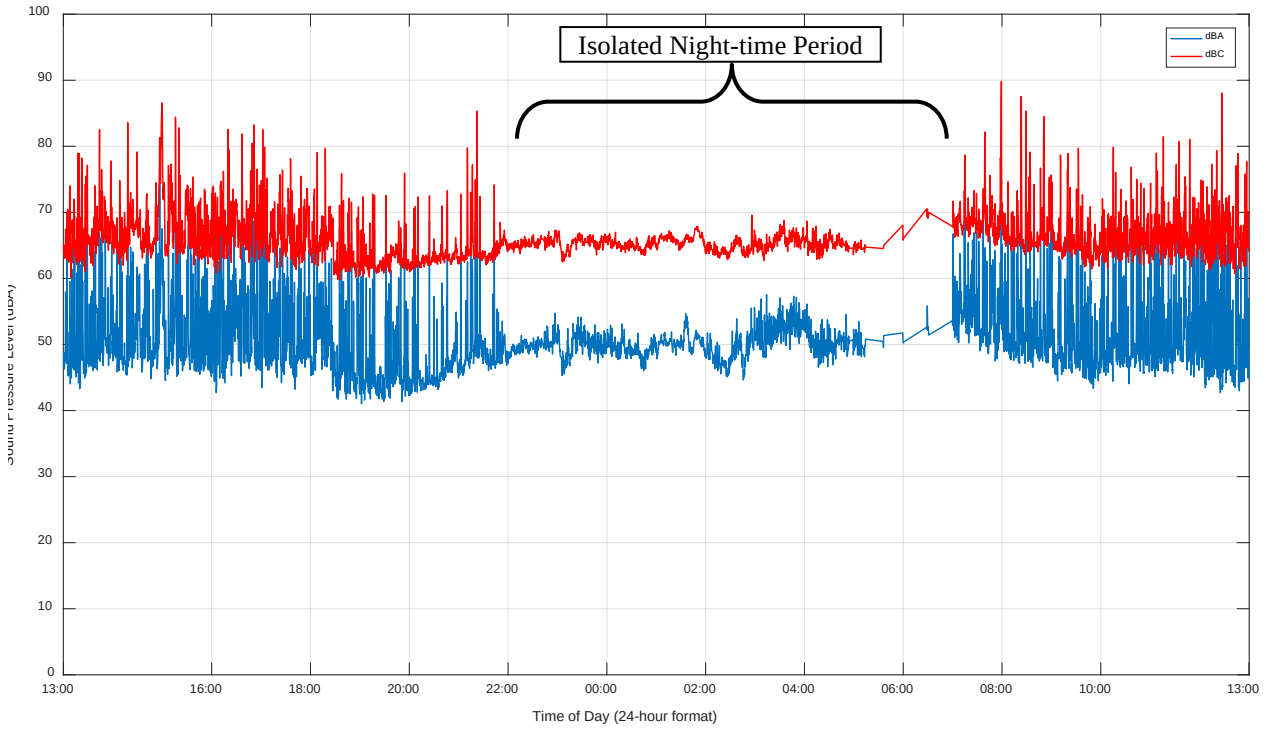


Figure 71. Noise Monitor #10, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

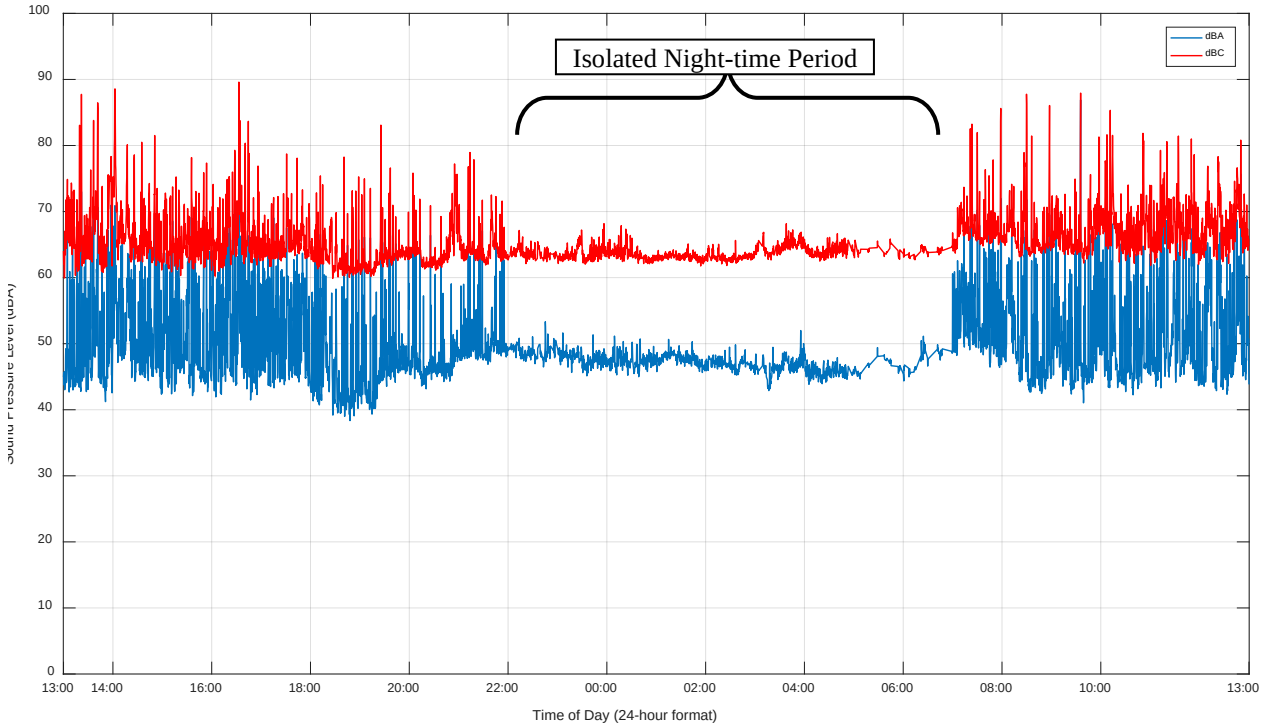


Figure 72. Noise Monitor #10, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #10

Noise Monitor #10

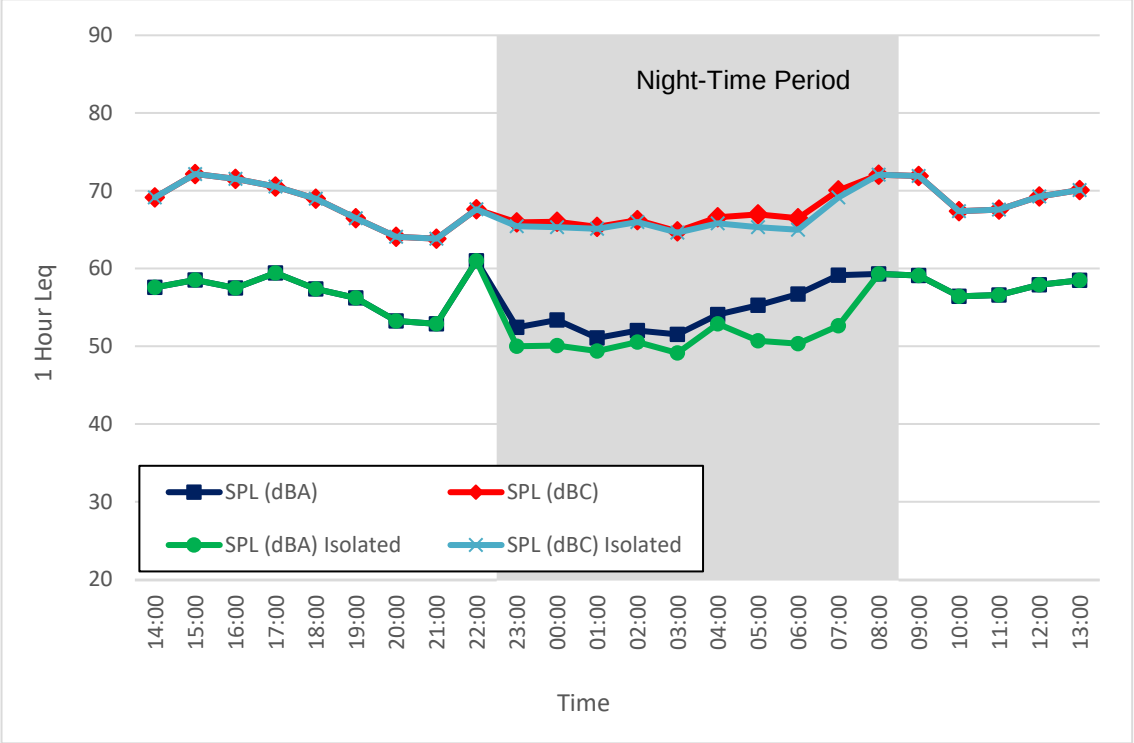


Figure 73. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

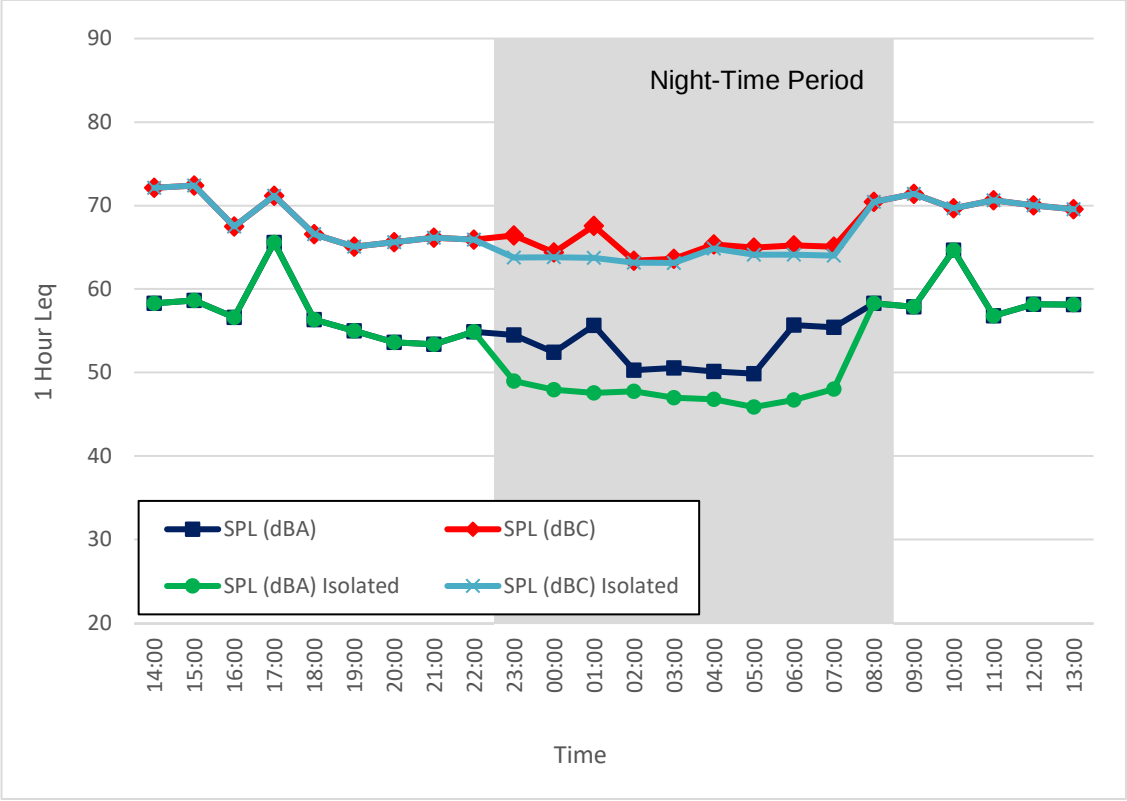


Figure 74. Noise Monitor #10, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

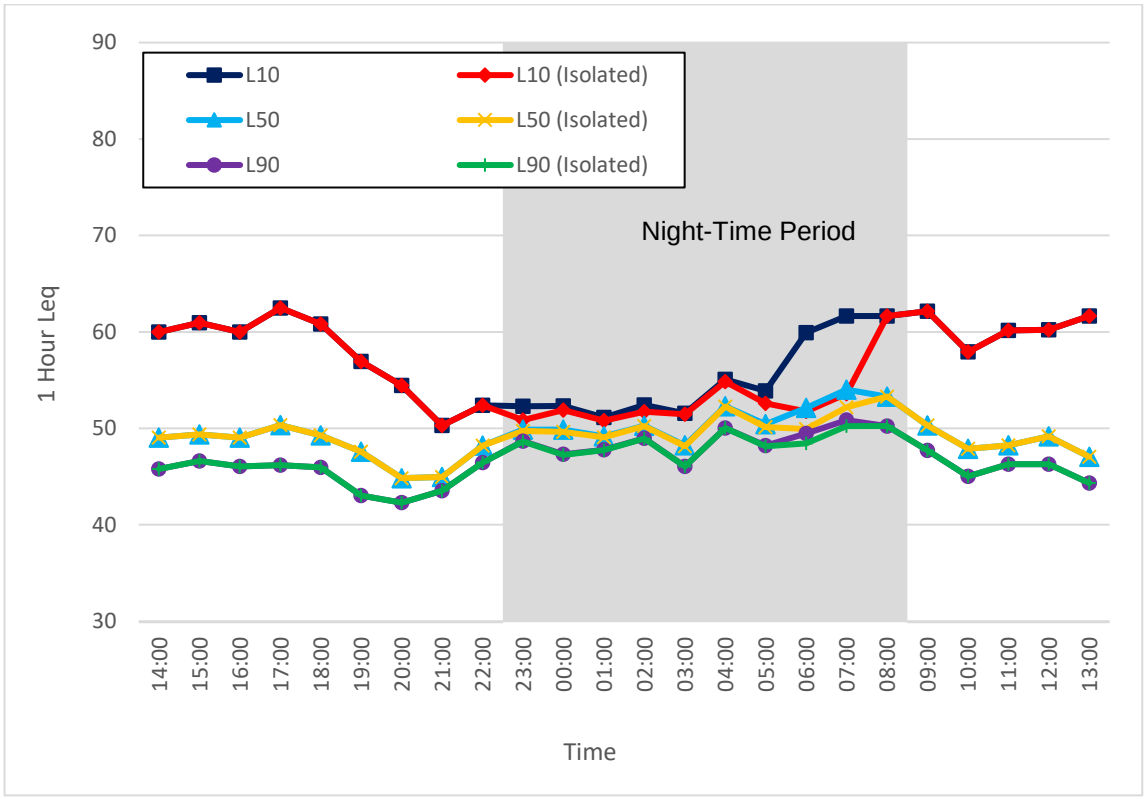


Figure 75. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

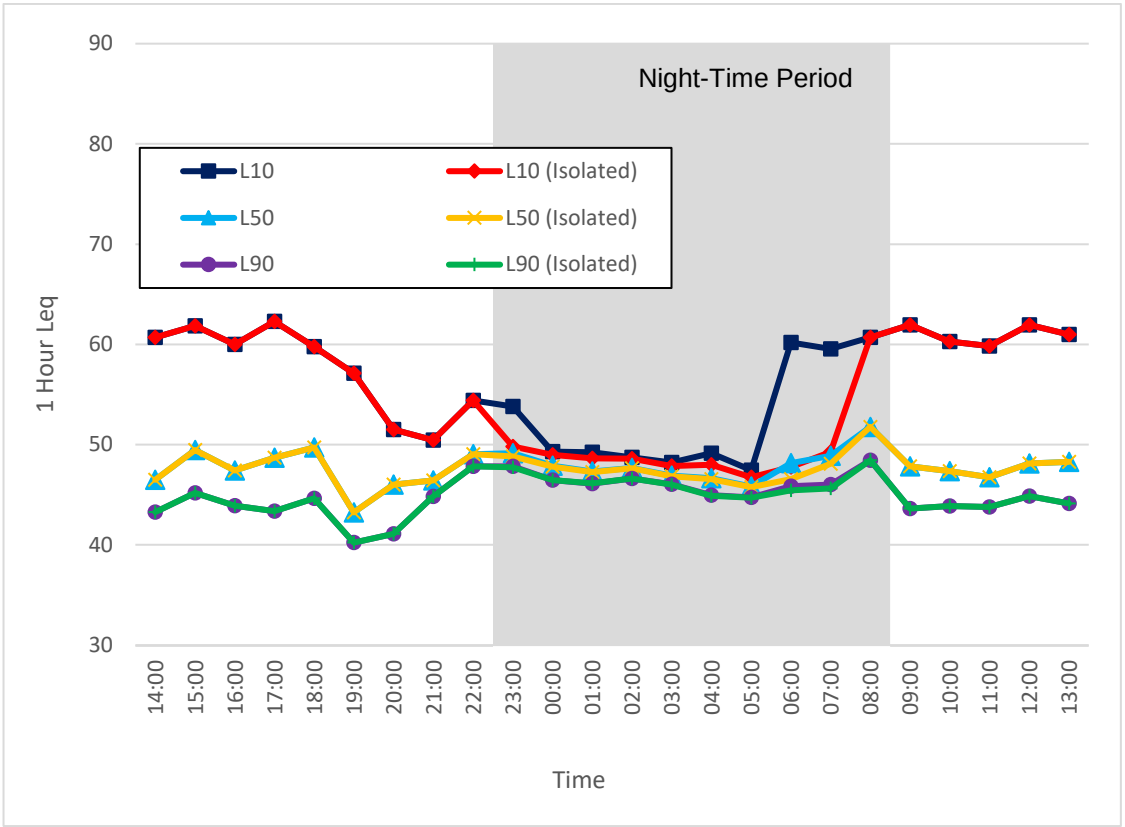


Figure 76. Noise Monitor #10, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

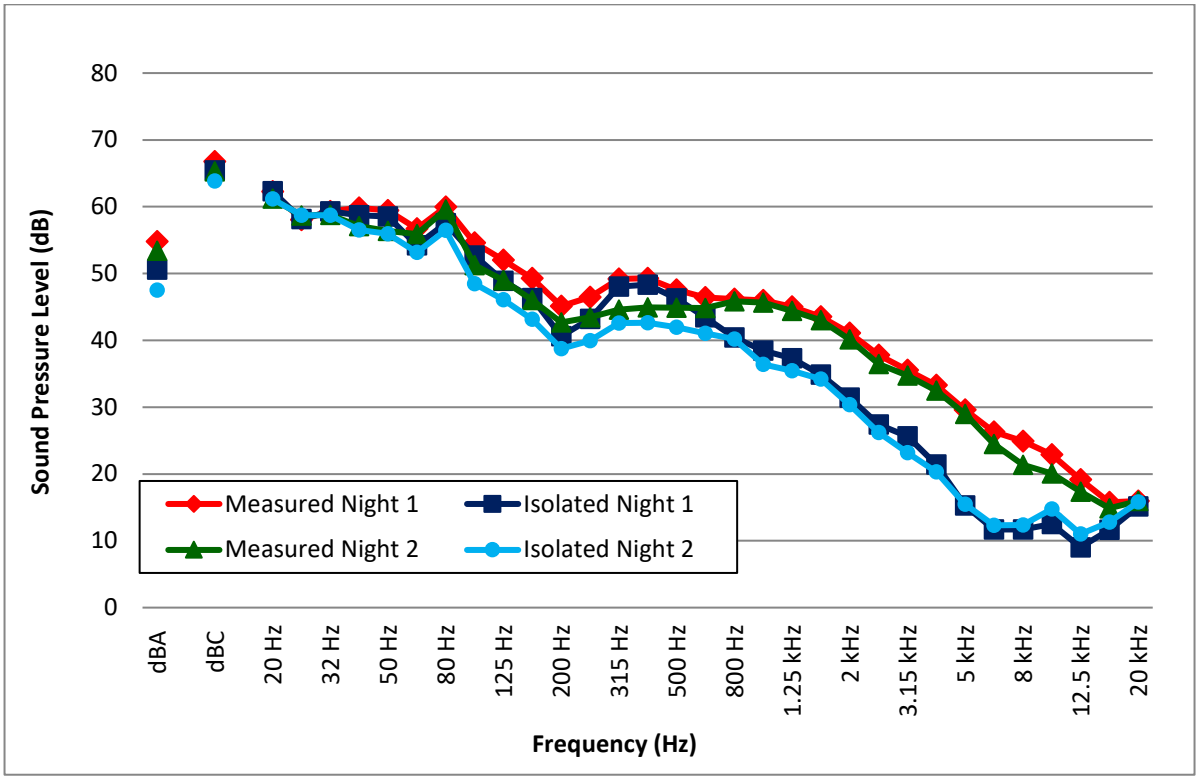


Figure 77. Noise Monitor #10, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #10

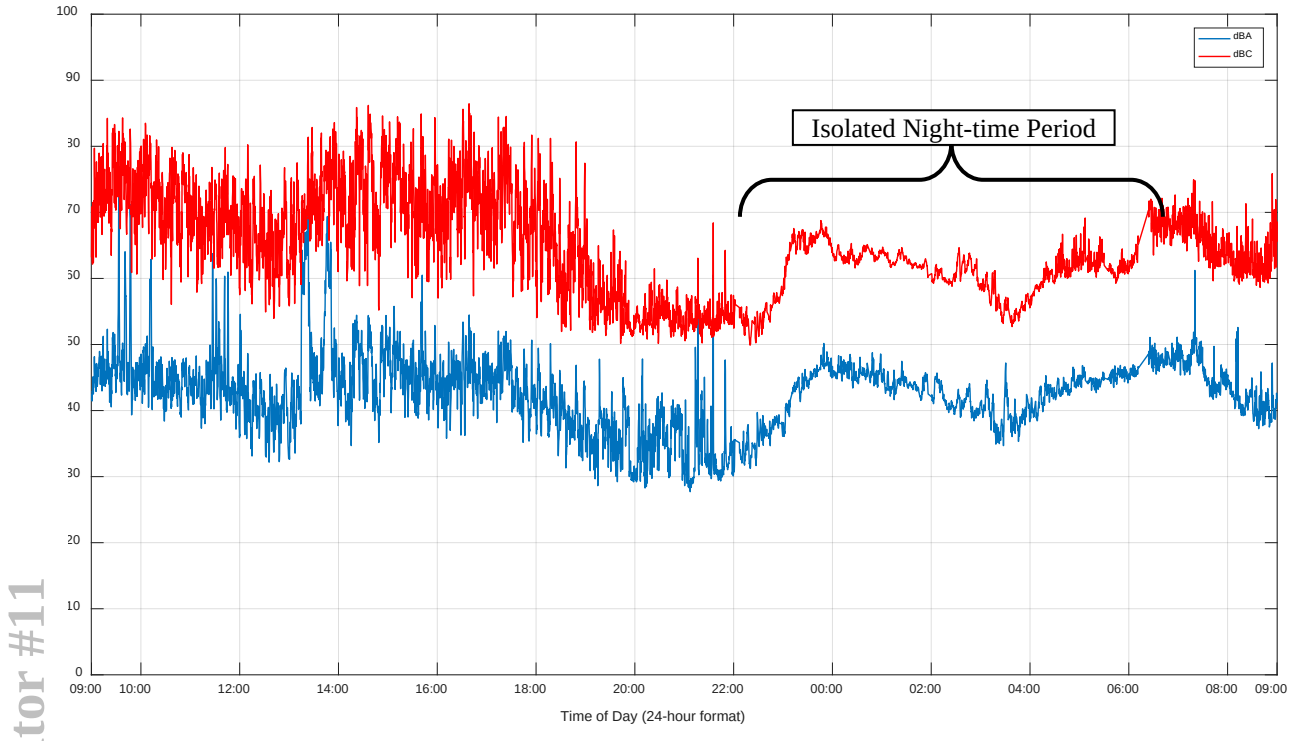


Figure 78. Noise Monitor #11, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

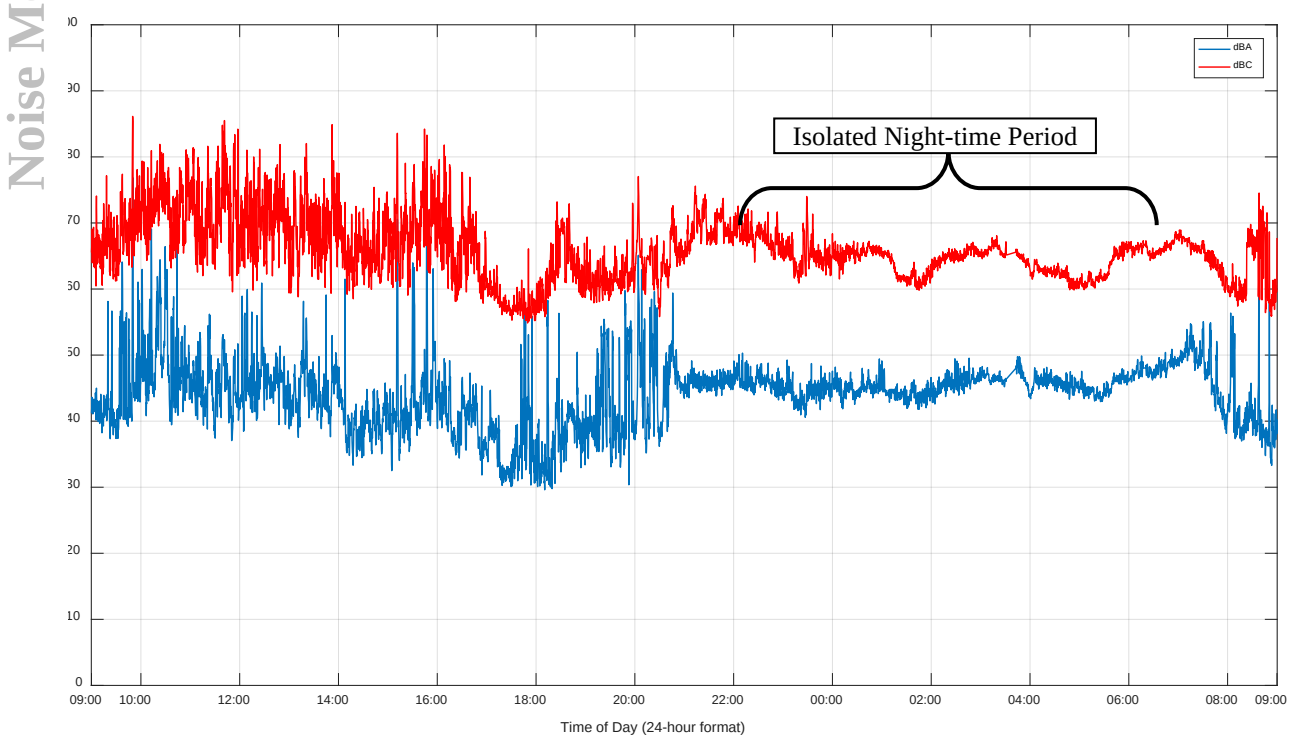


Figure 79. Noise Monitor #11, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #11

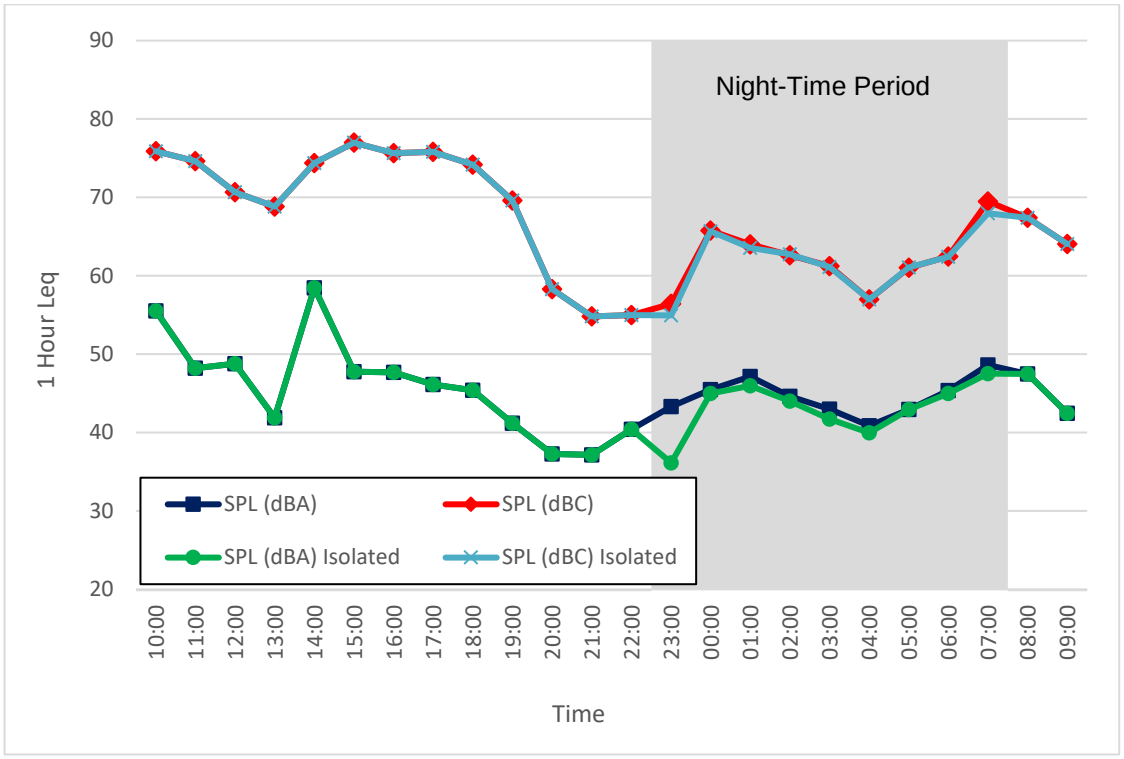


Figure 80. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

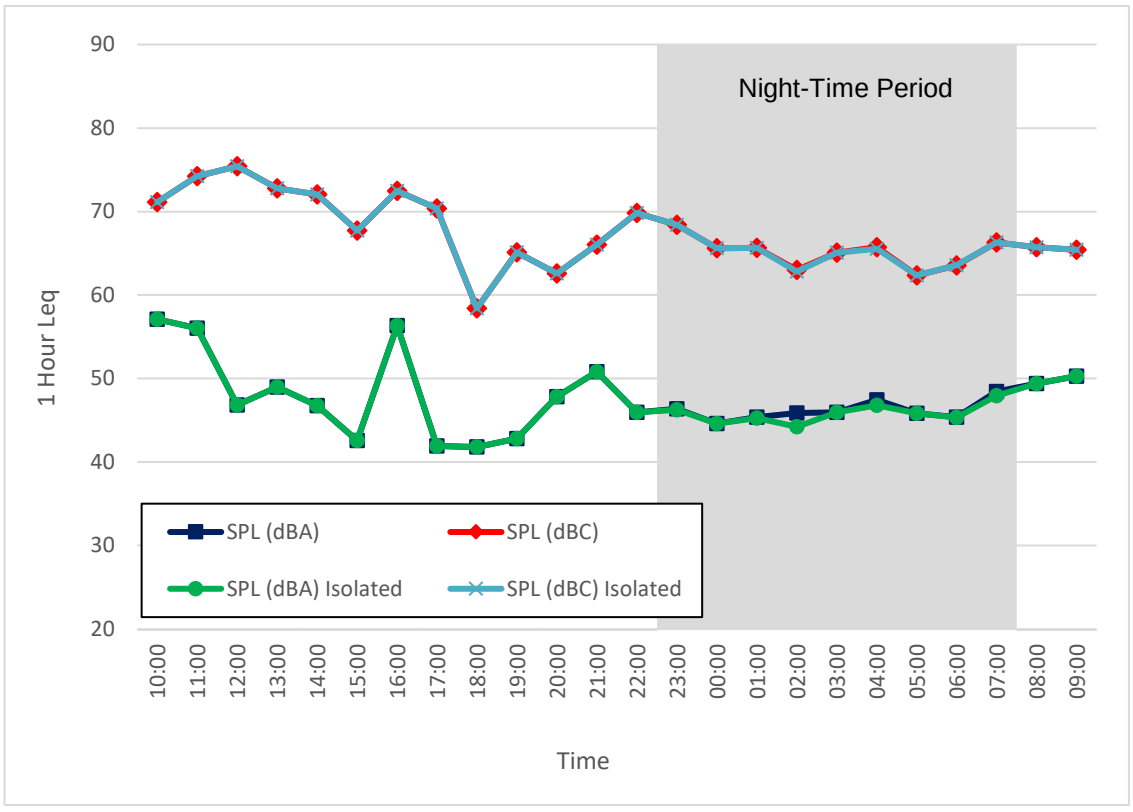


Figure 81. Noise Monitor #11, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

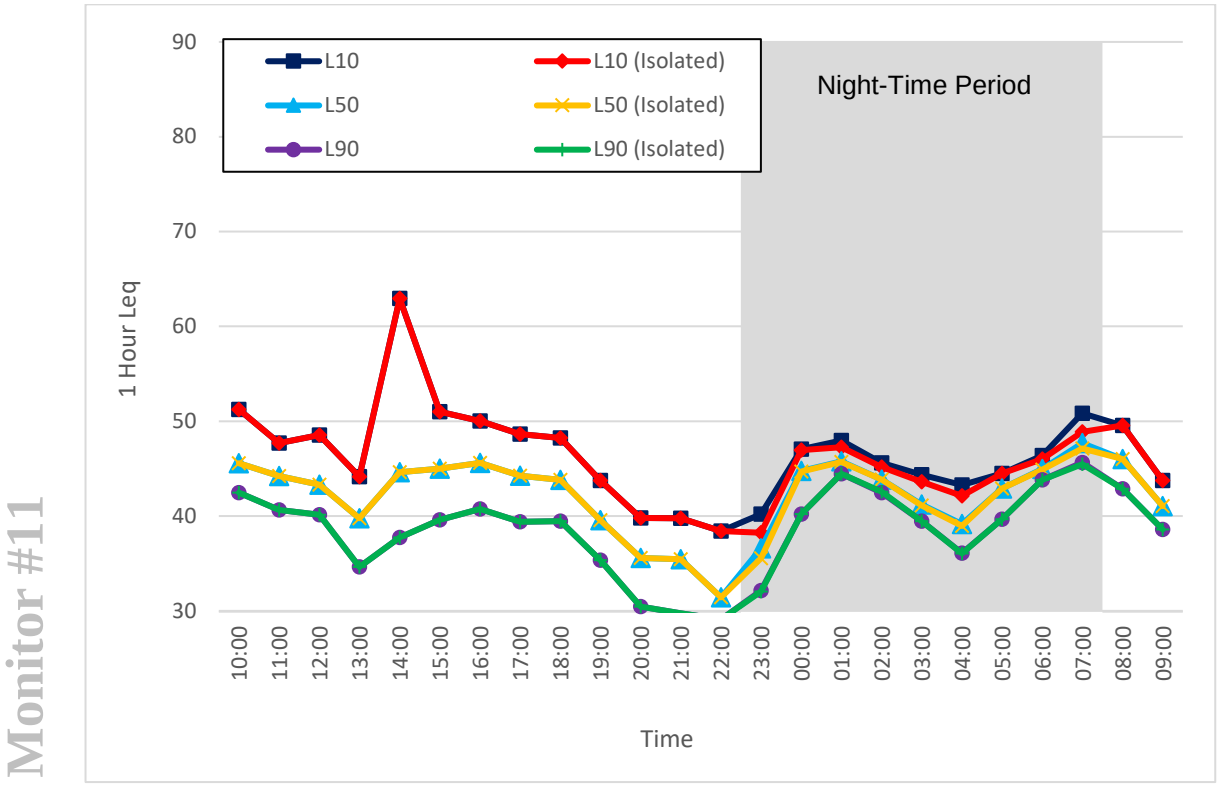


Figure 82. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

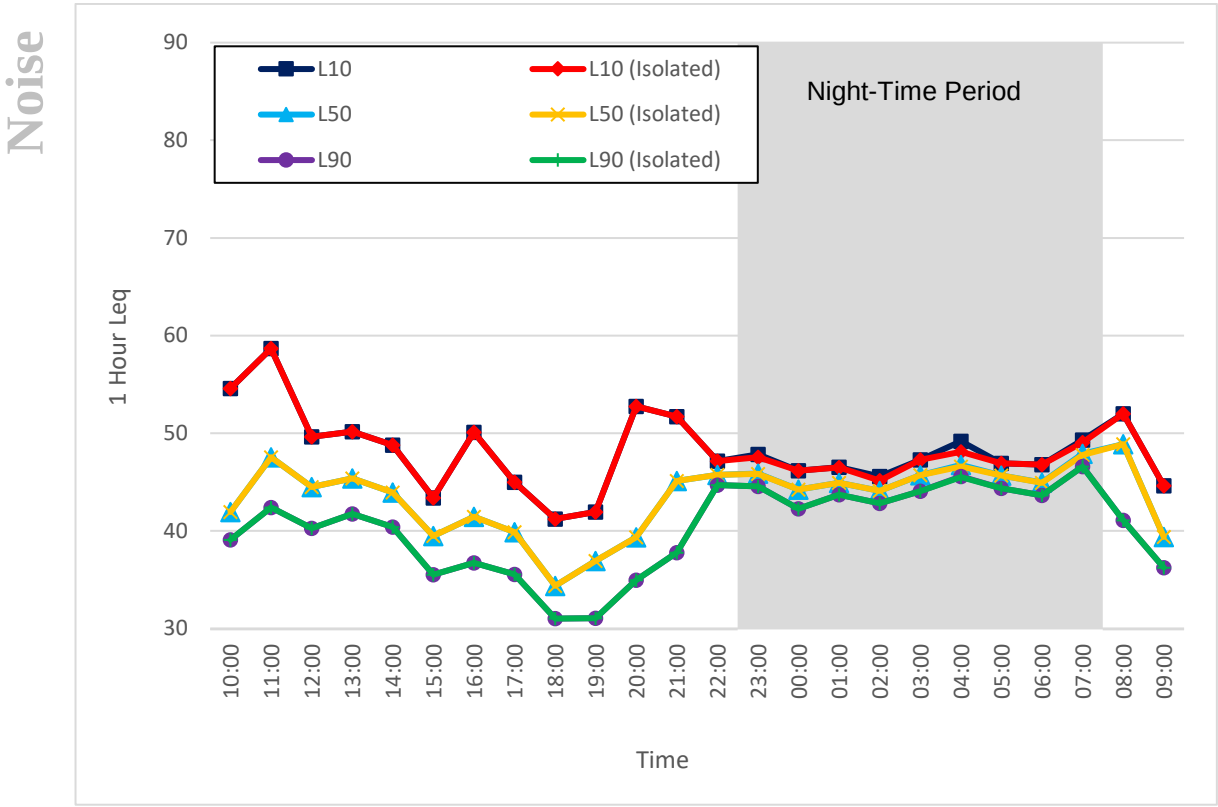
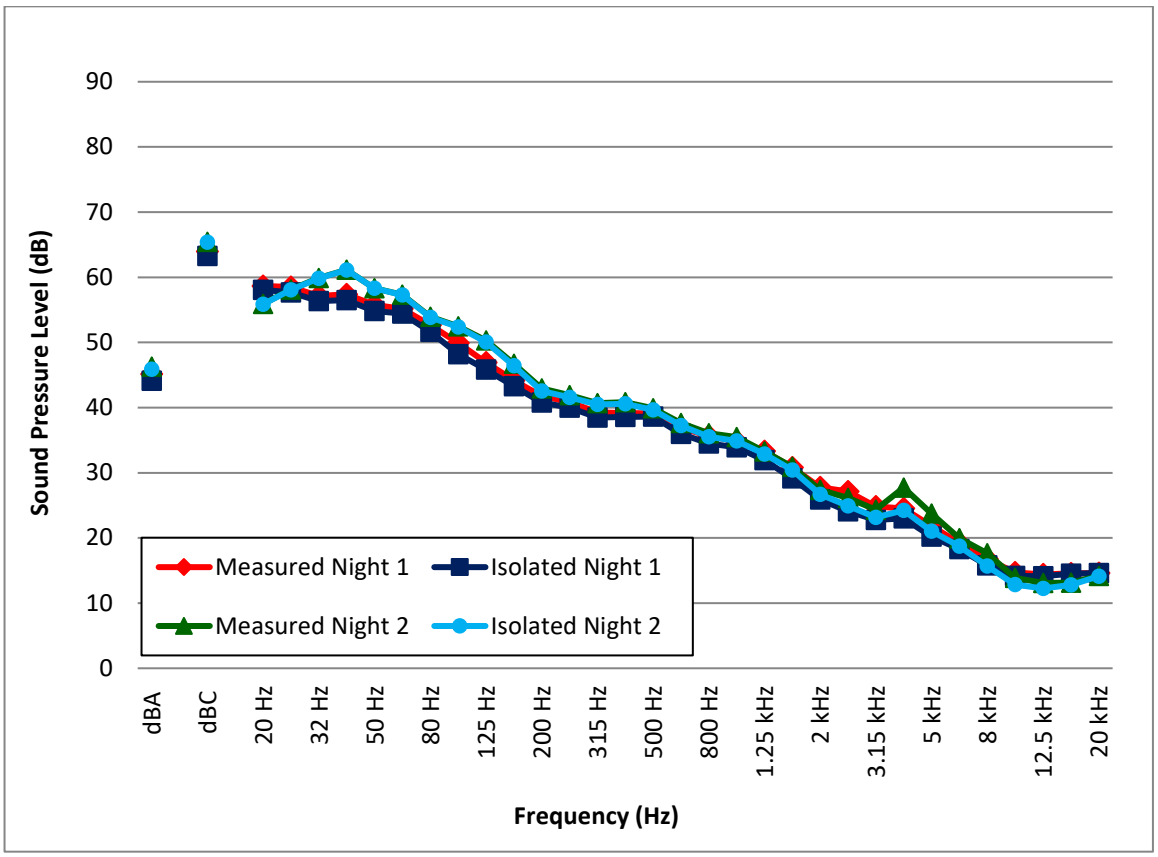


Figure 83. Noise Monitor #11, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)



Noise Monitor #11

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

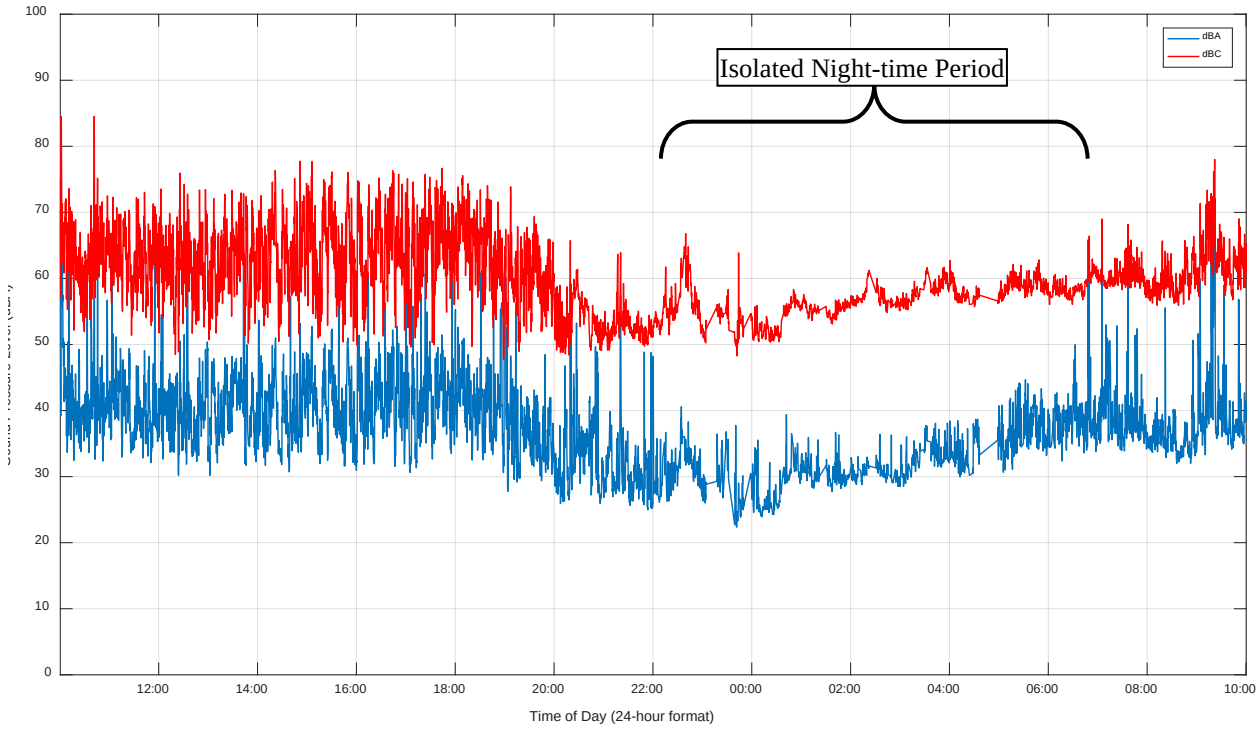


Figure 85. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

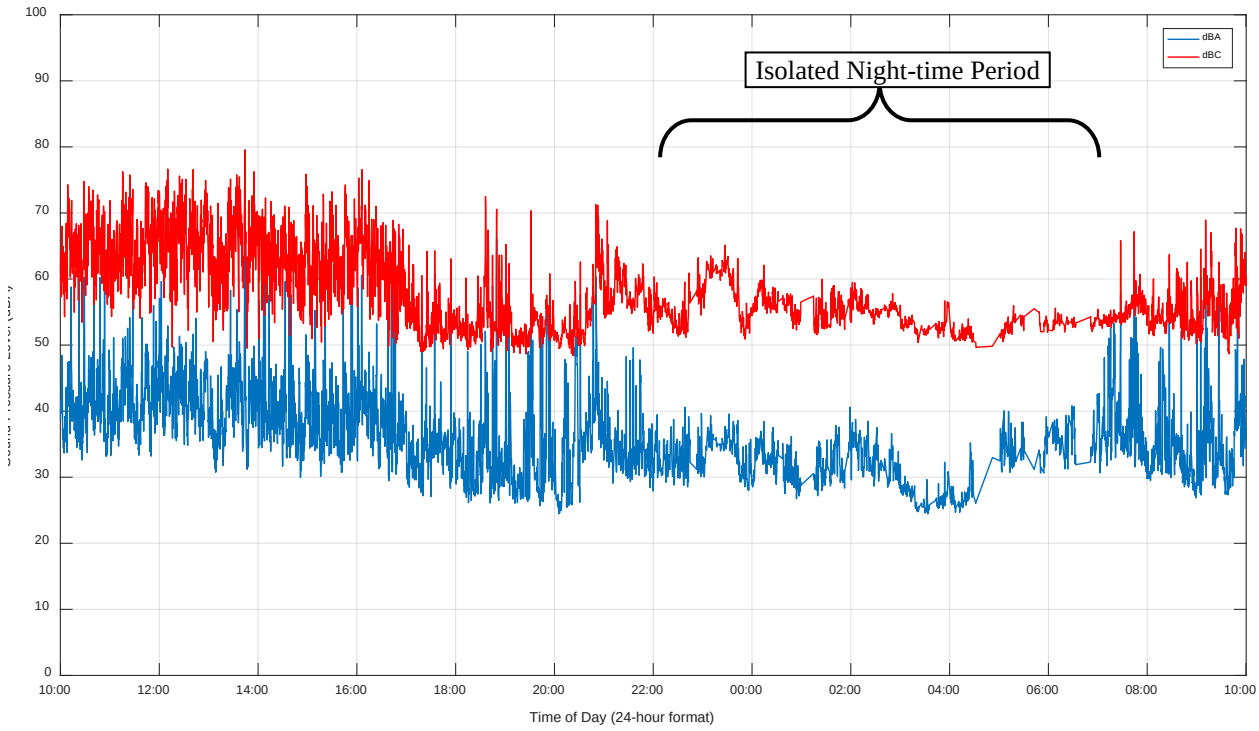


Figure 86. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

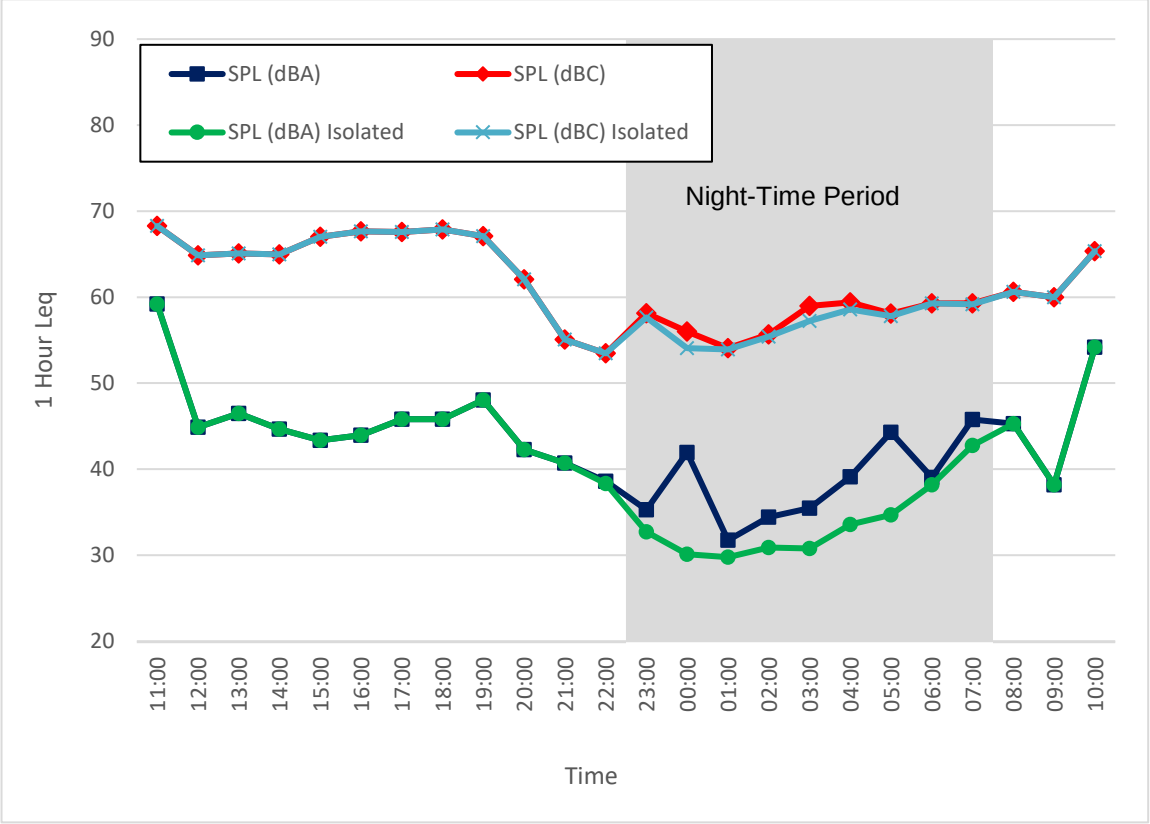


Figure 87. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

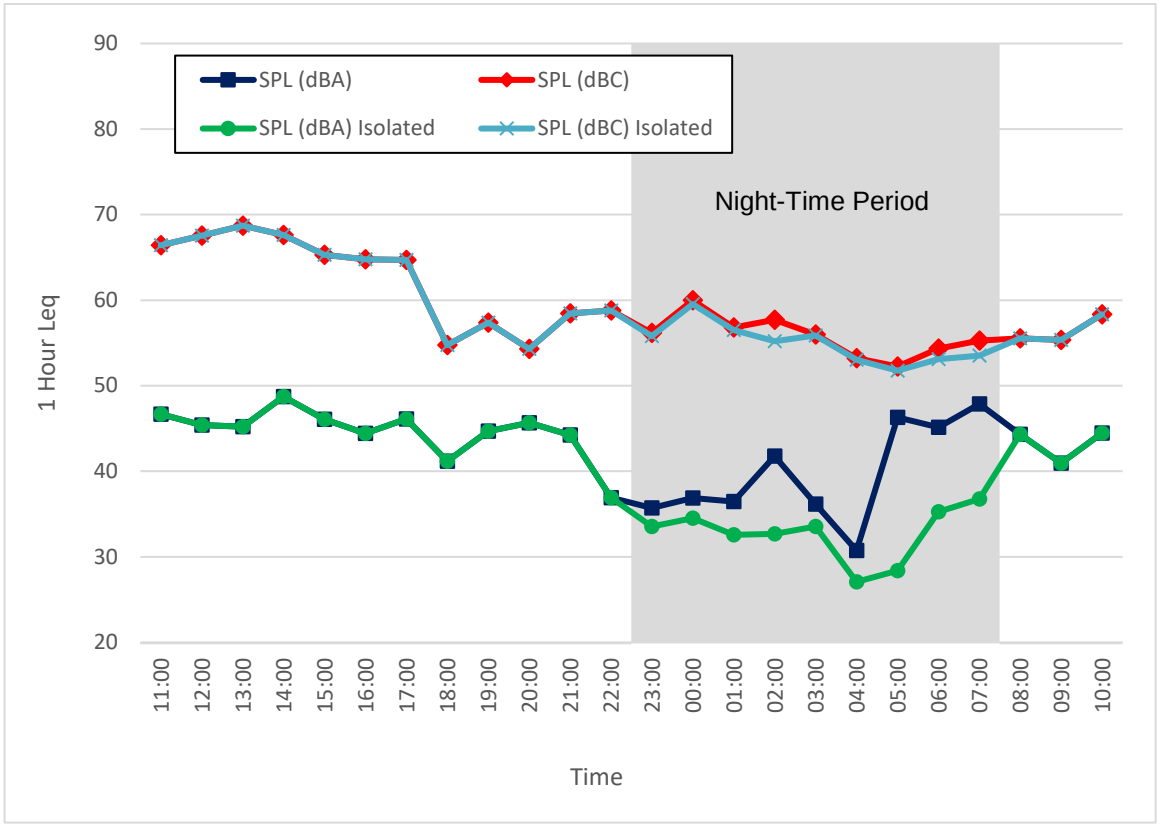


Figure 88. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

#12 - Period 1

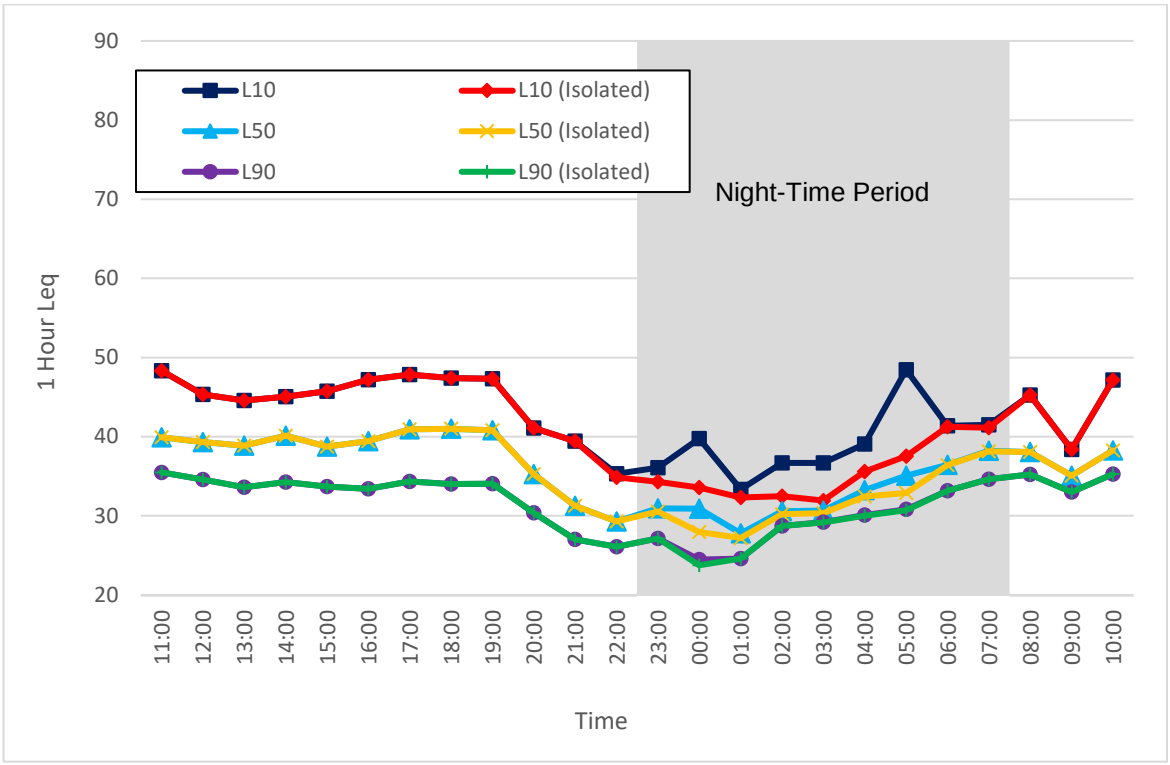


Figure 89. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

Noise Monitor

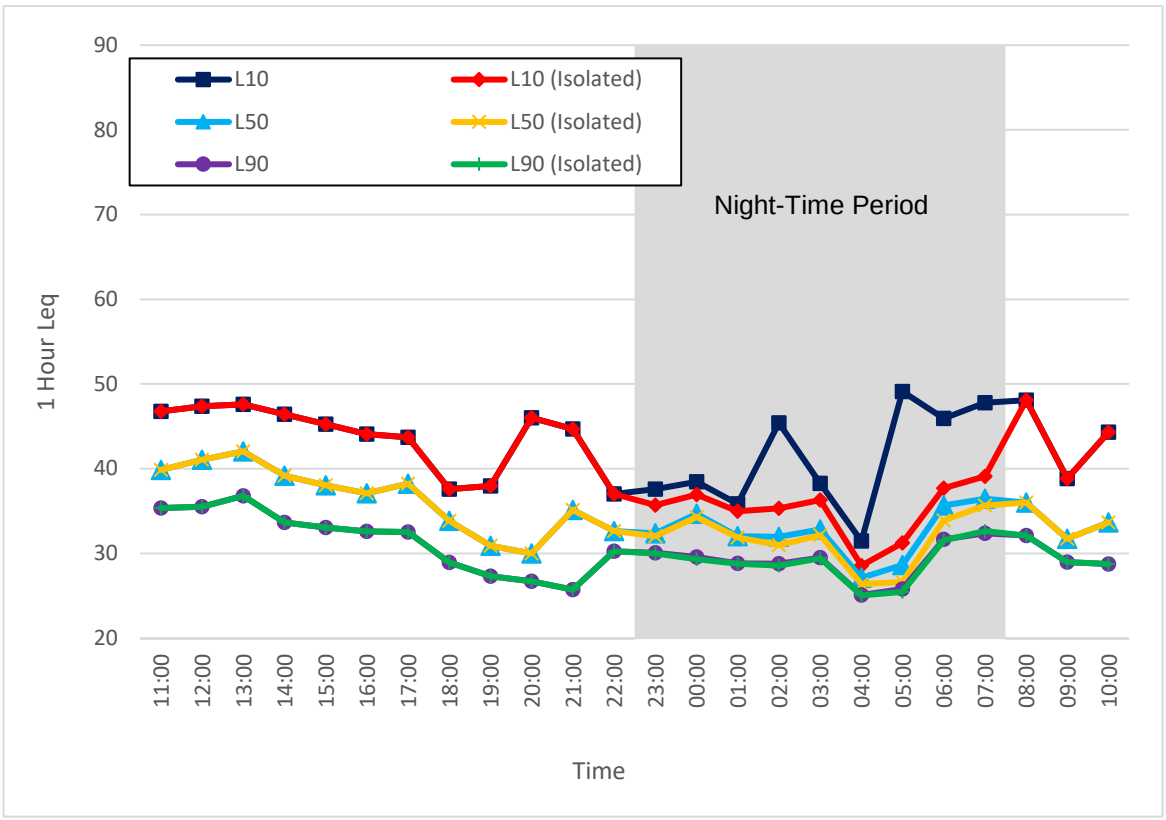


Figure 90. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

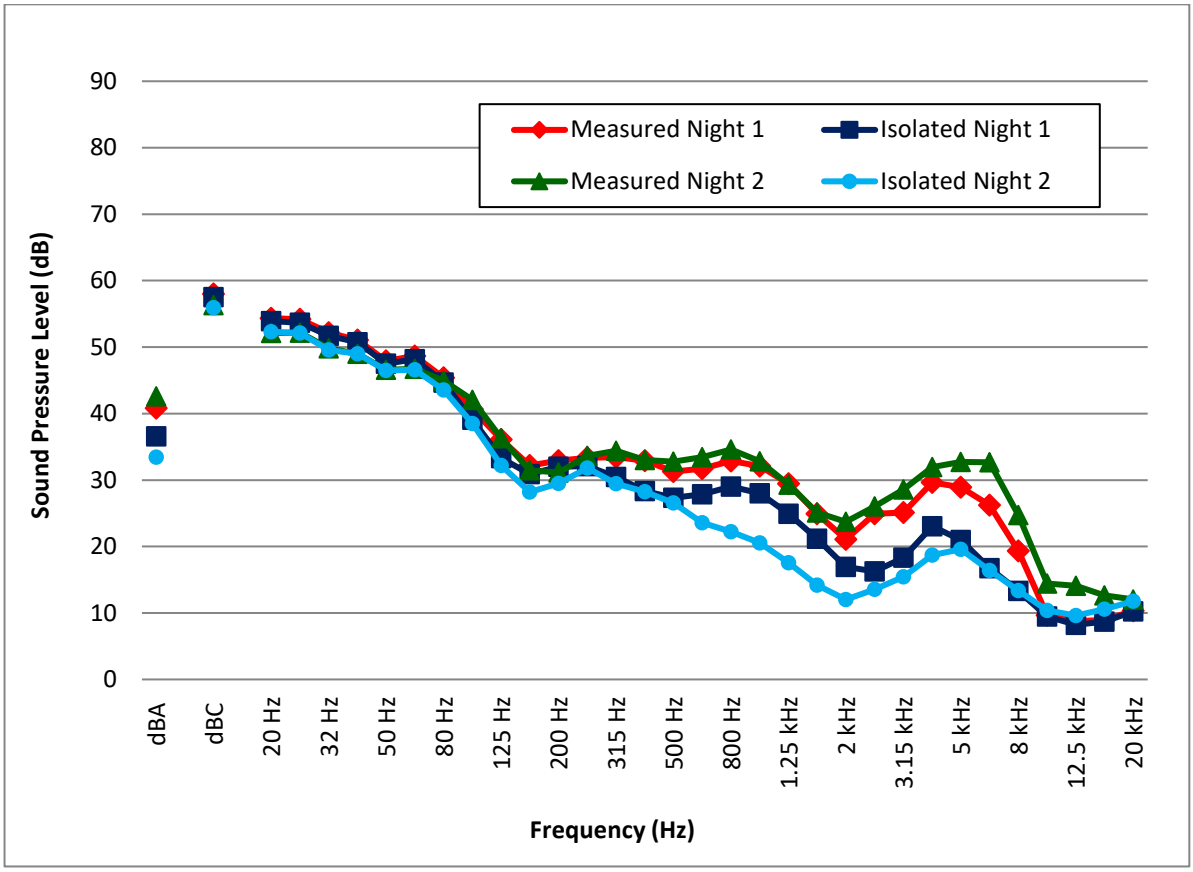


Figure 91. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

Noise Monitor #12 - Period 1

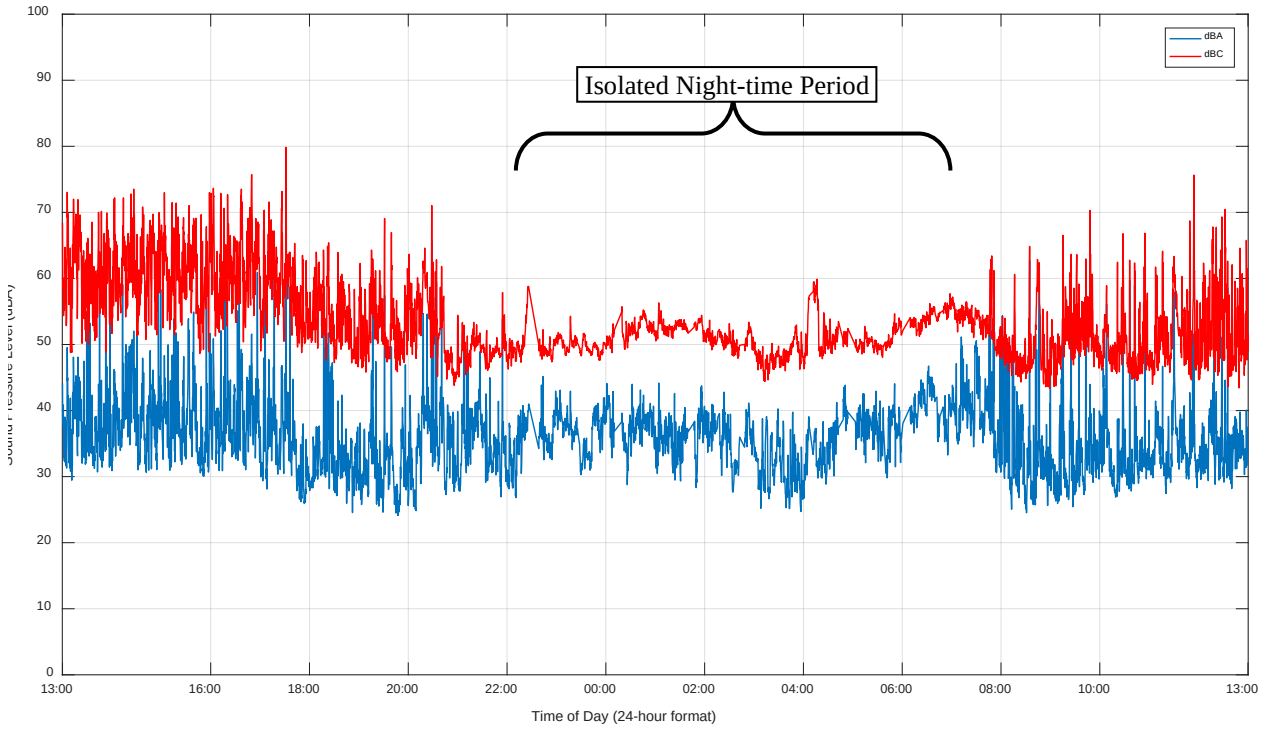


Figure 92. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 22 - 23, 2022)

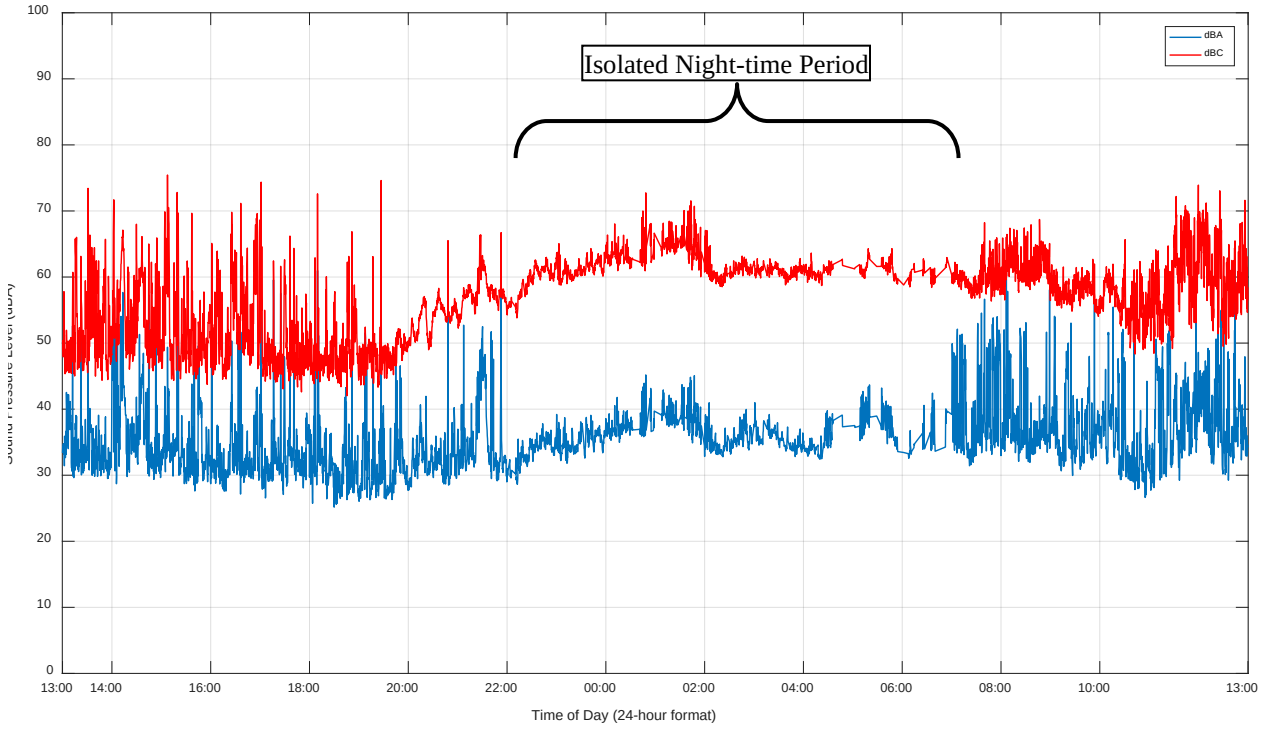


Figure 93. Noise Monitor #12, 15-Second L_{eq} Sound Levels (July 23 - 24, 2022)

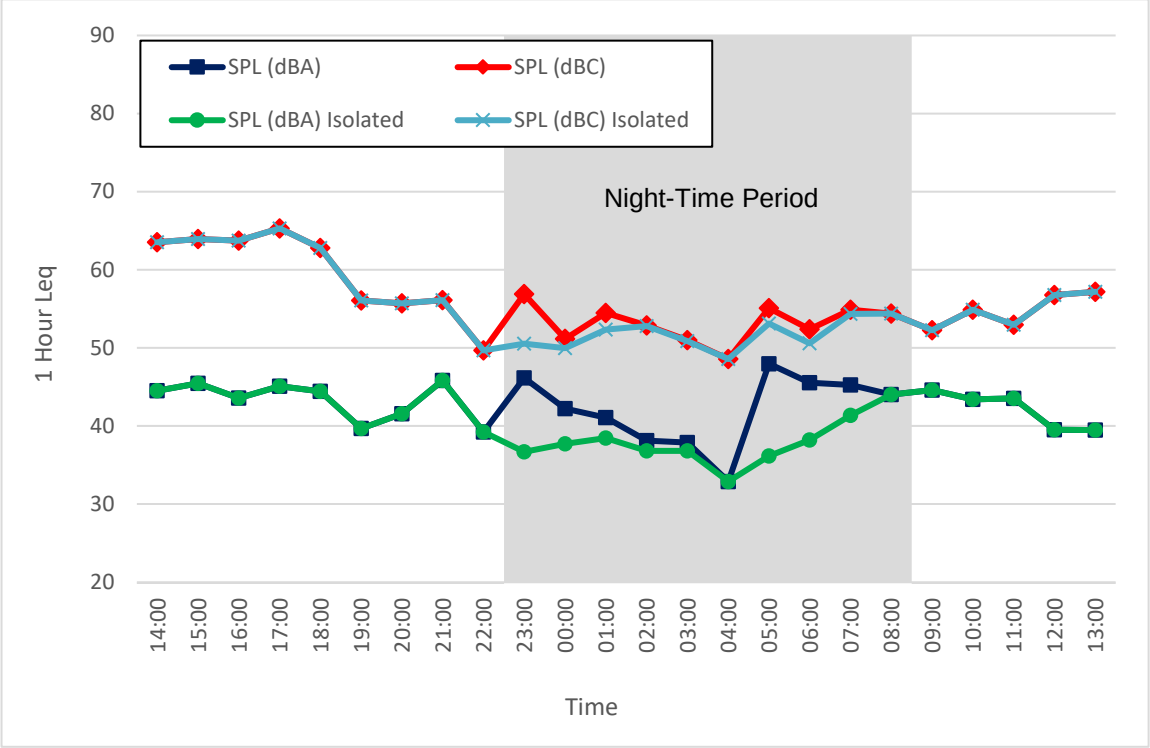


Figure 94. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 22 - 23, 2022)

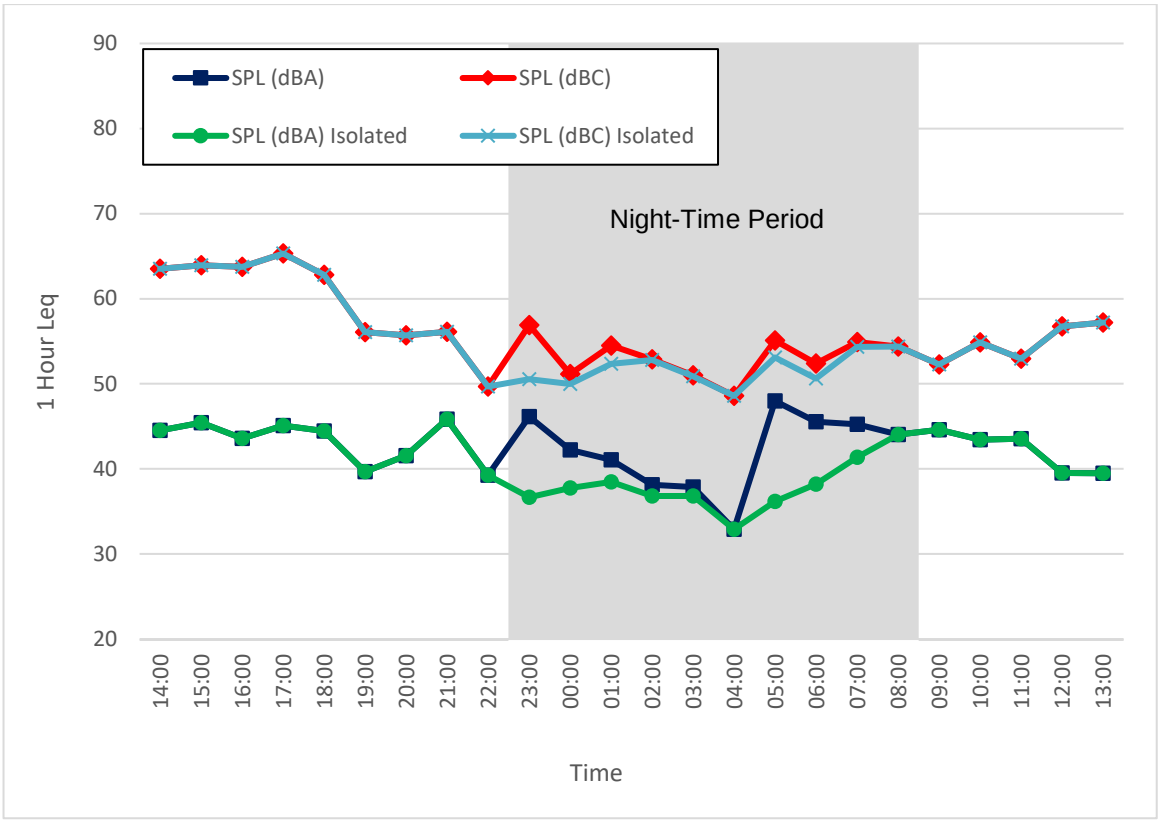


Figure 95. Noise Monitor #12, 1-Hour L_{eq} Sound Levels (July 23 - 24, 2022)

#12 - Period 2

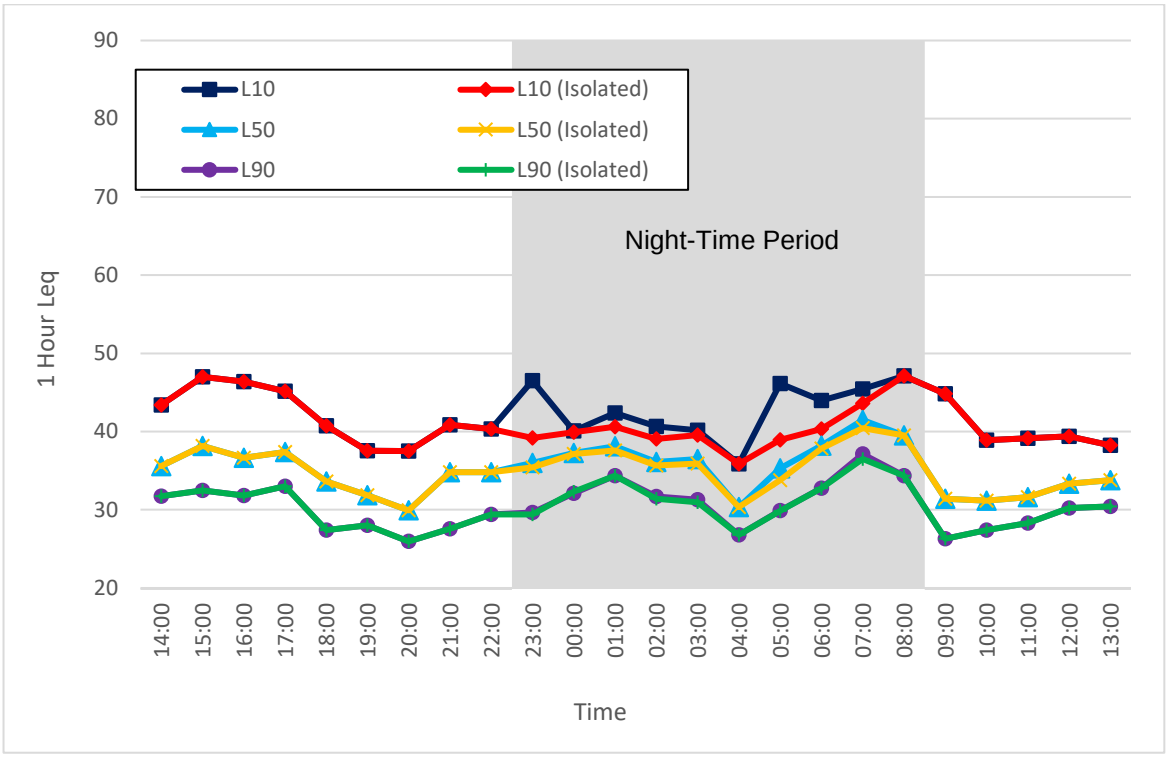


Figure 96. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 22 - 23, 2022)

Noise Monitor

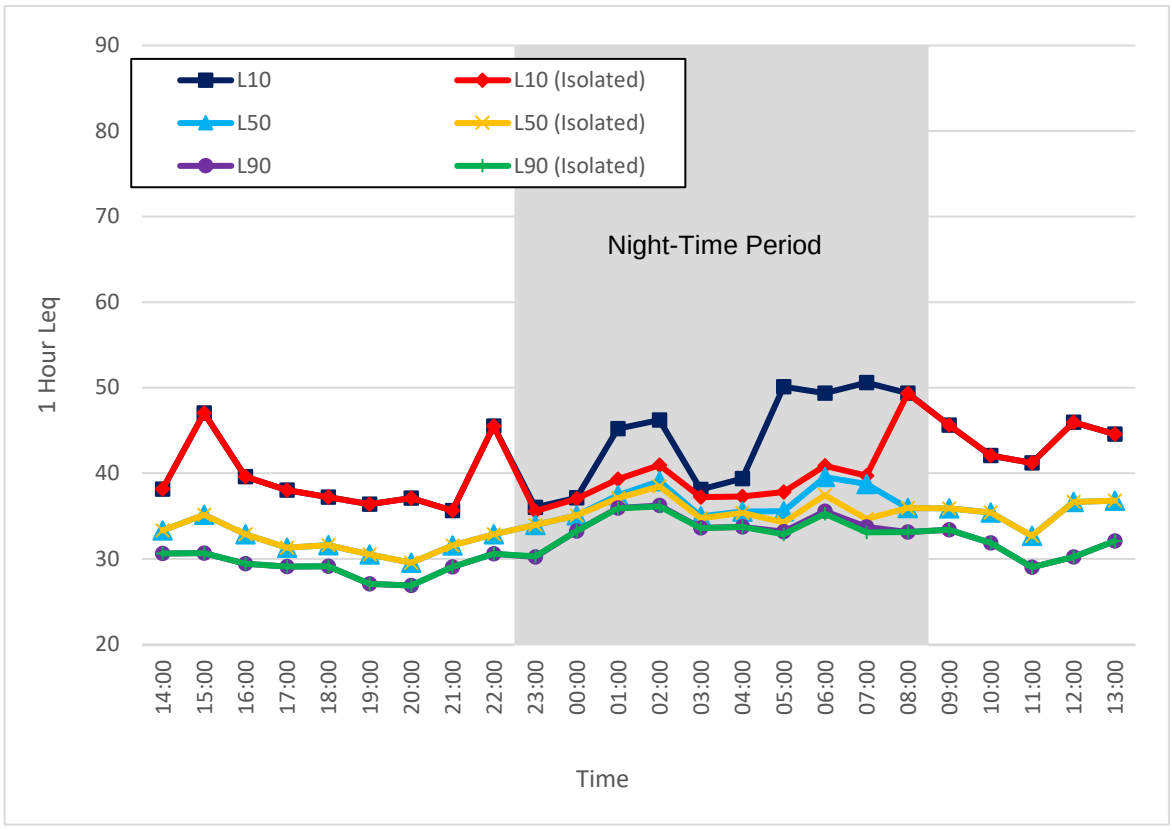


Figure 97. Noise Monitor #12, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 23 - 24, 2022)

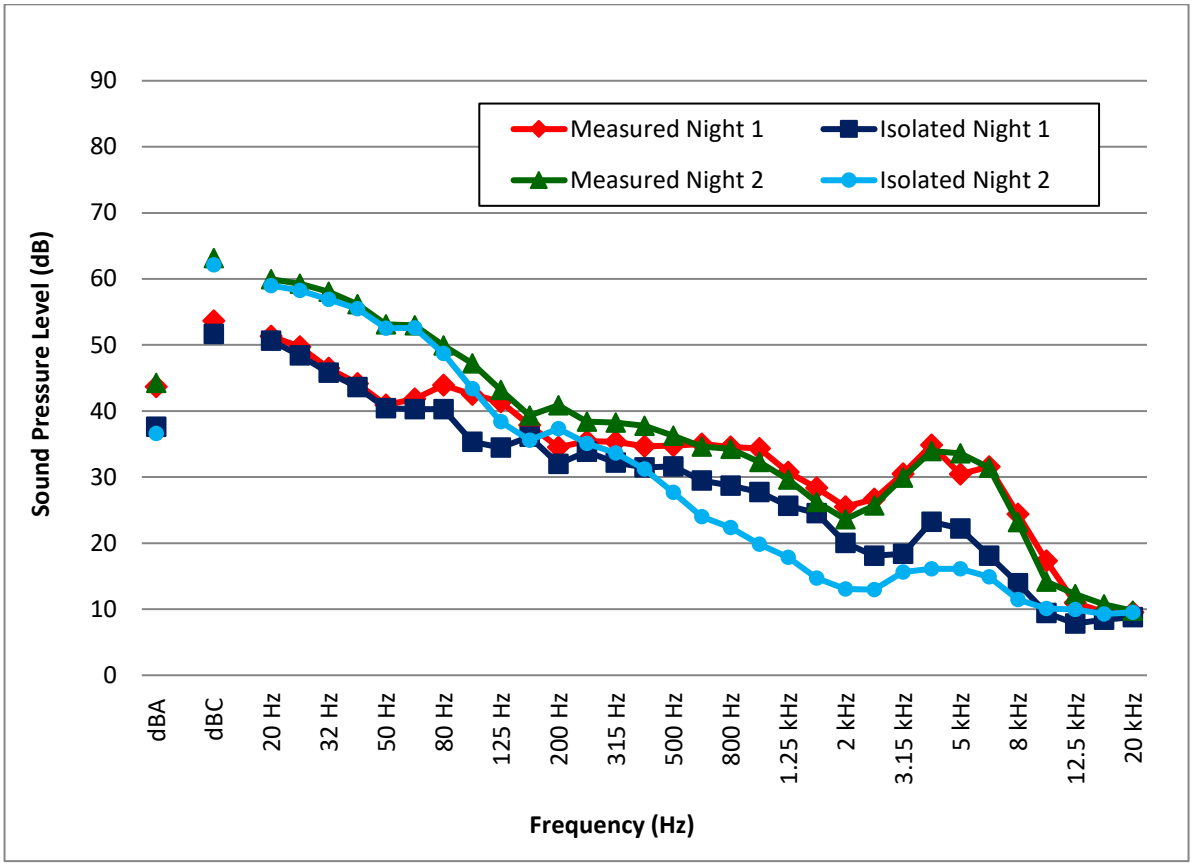


Figure 98. Noise Monitor #12, 1/3 Octave L_{eq} Sound Levels (July 22 - 24, 2022)

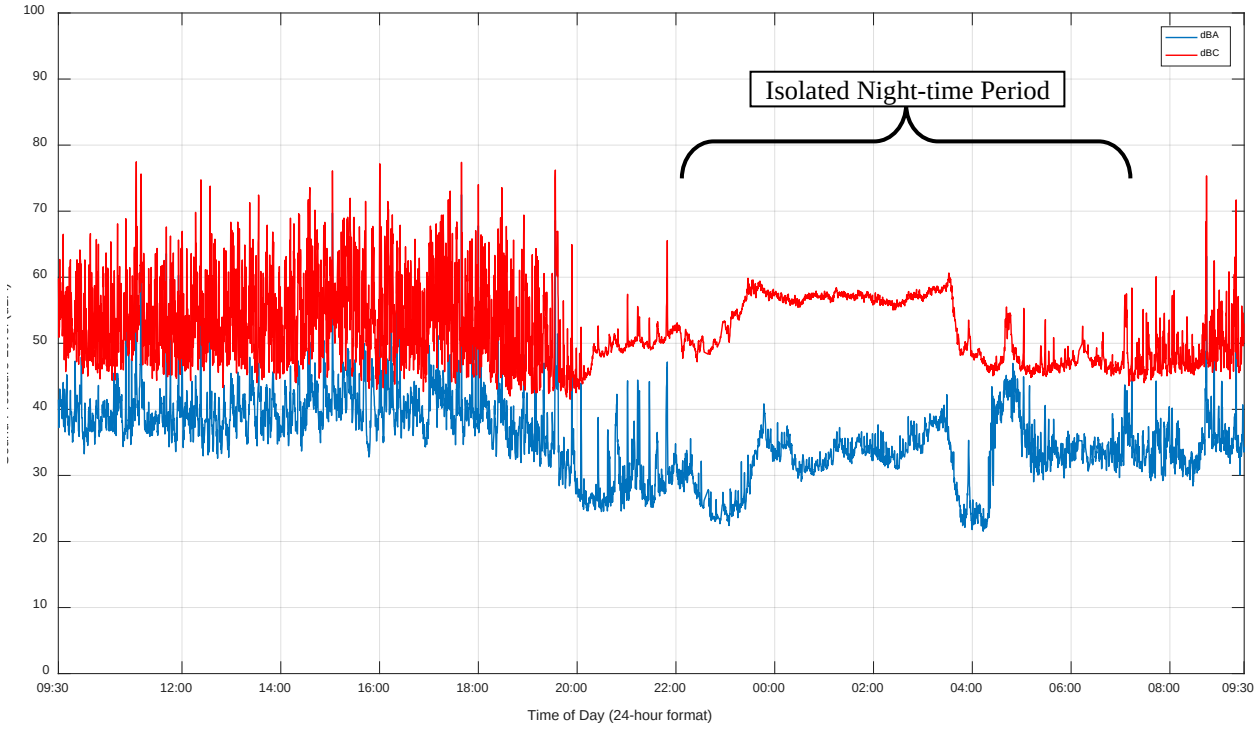


Figure 99. Noise Monitor #13, 15-Second L_{eq} Sound Levels (July 20 - 21, 2022)

Noise Monitor #13

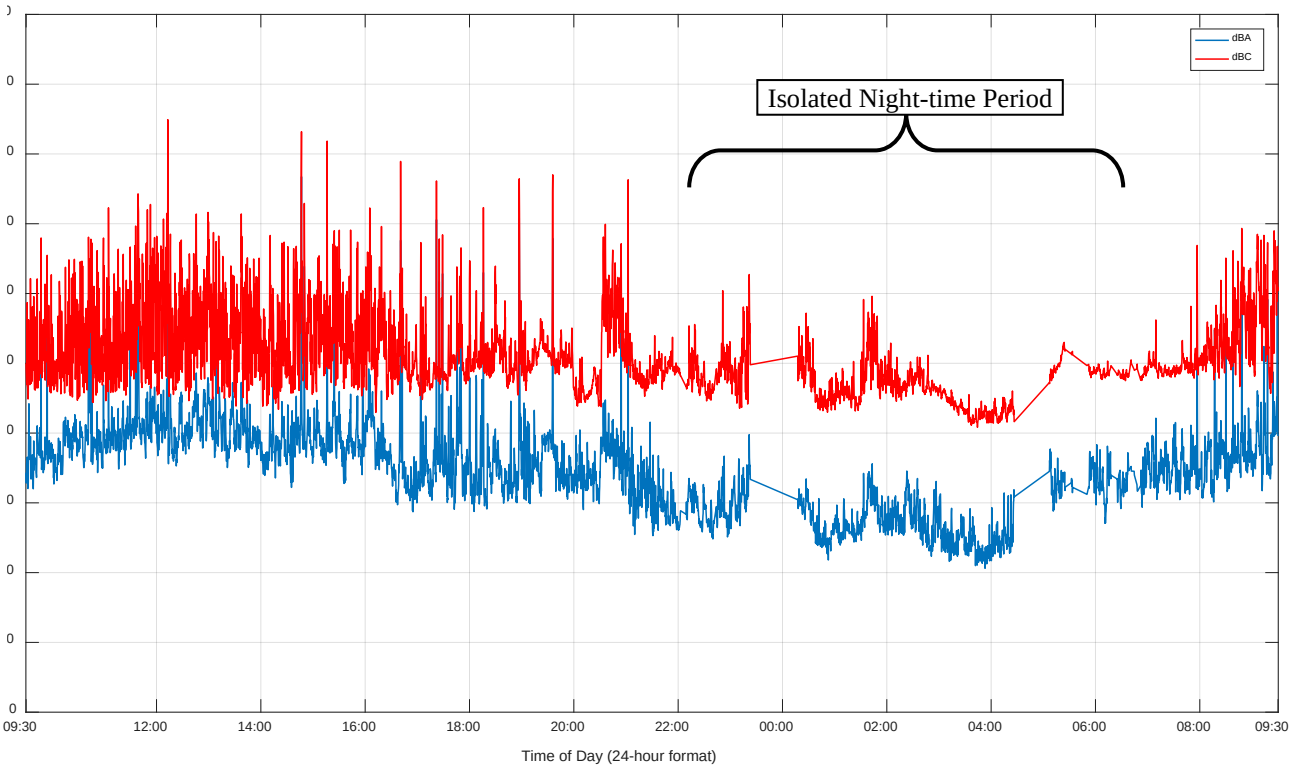


Figure 100. Noise Monitor #13, 15-Second L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #13

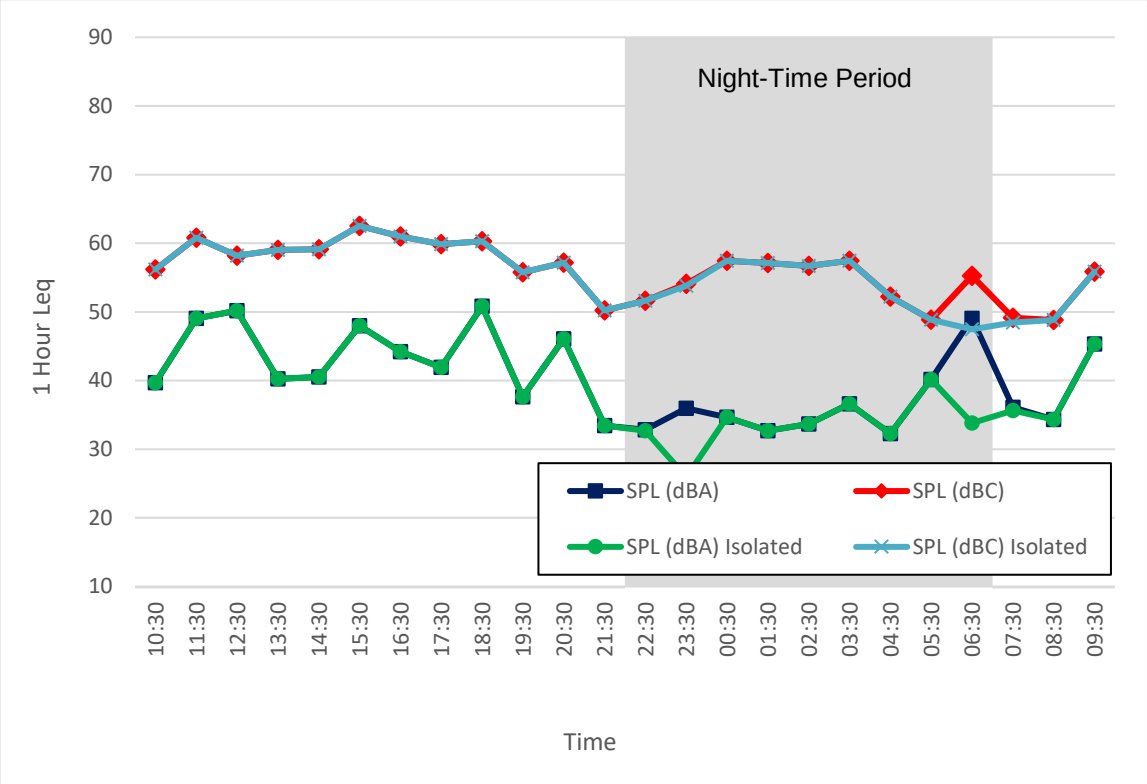


Figure 101. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (July 20 - 21, 2022)

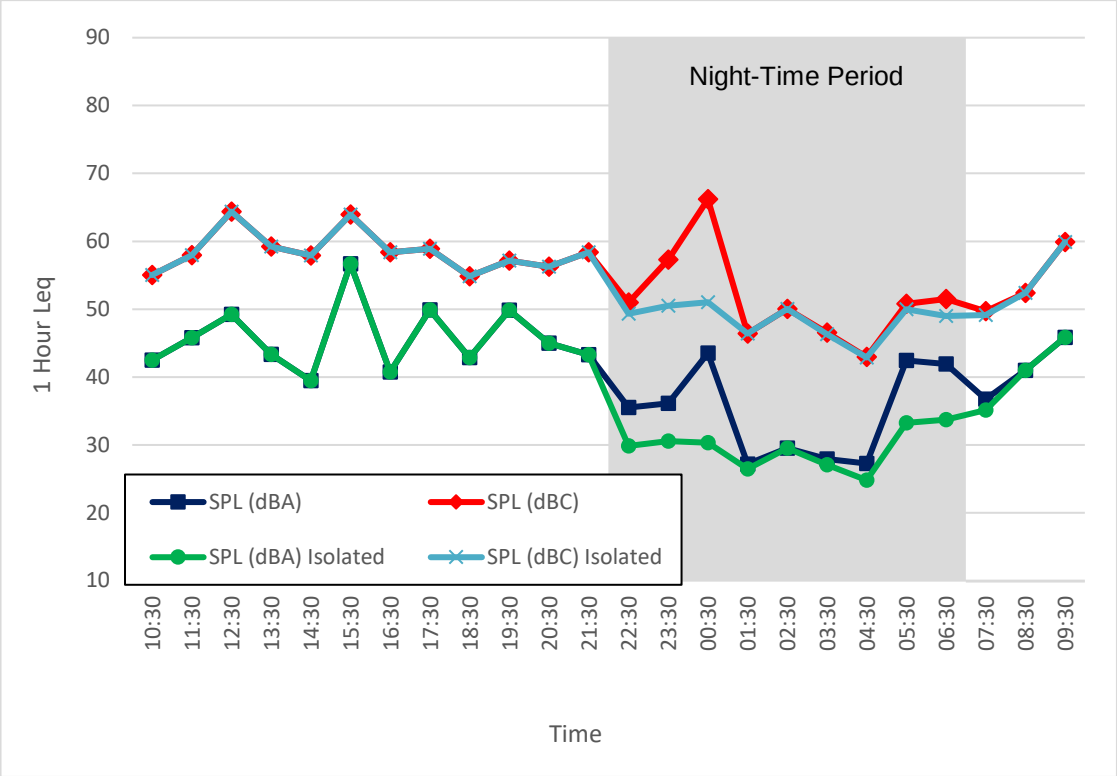


Figure 102. Noise Monitor #13, 1-Hour L_{eq} Sound Levels (July 21 - 22, 2022)

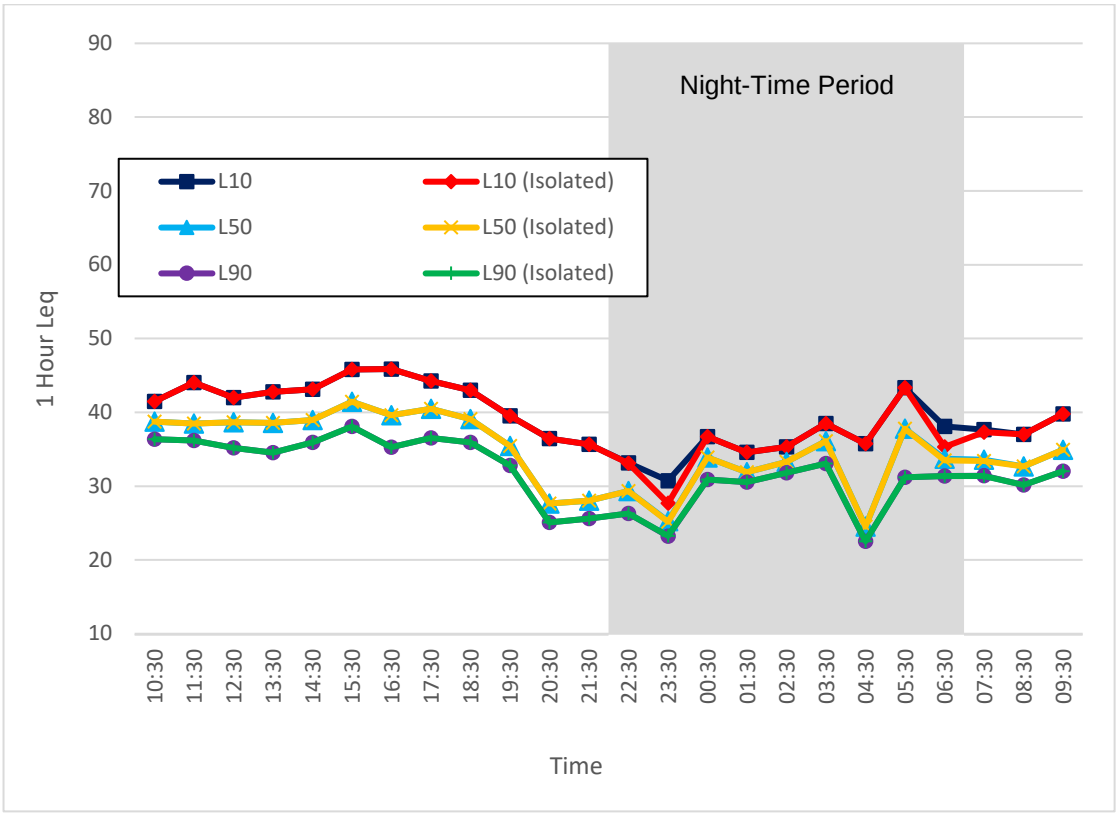


Figure 103. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 20 - 21, 2022)

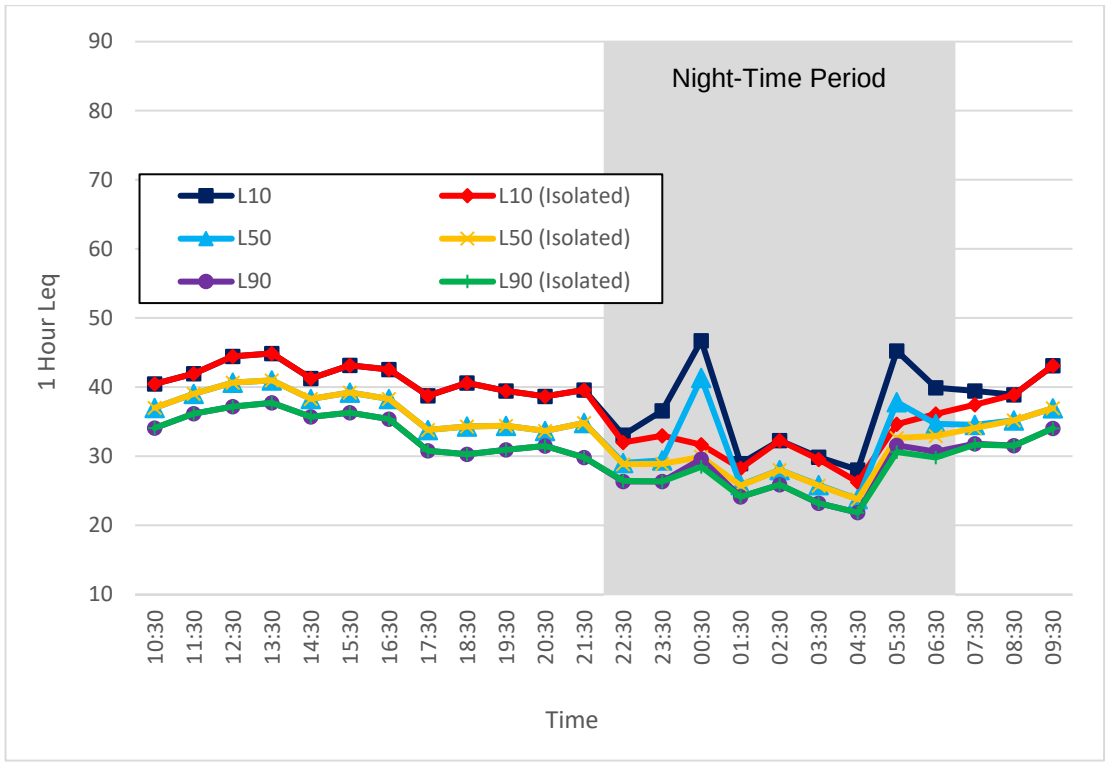


Figure 104. Noise Monitor #13, 1-Hour L_{10}, L_{50}, L_{90} L_{eq} Sound Levels (July 21 - 22, 2022)

Noise Monitor #13

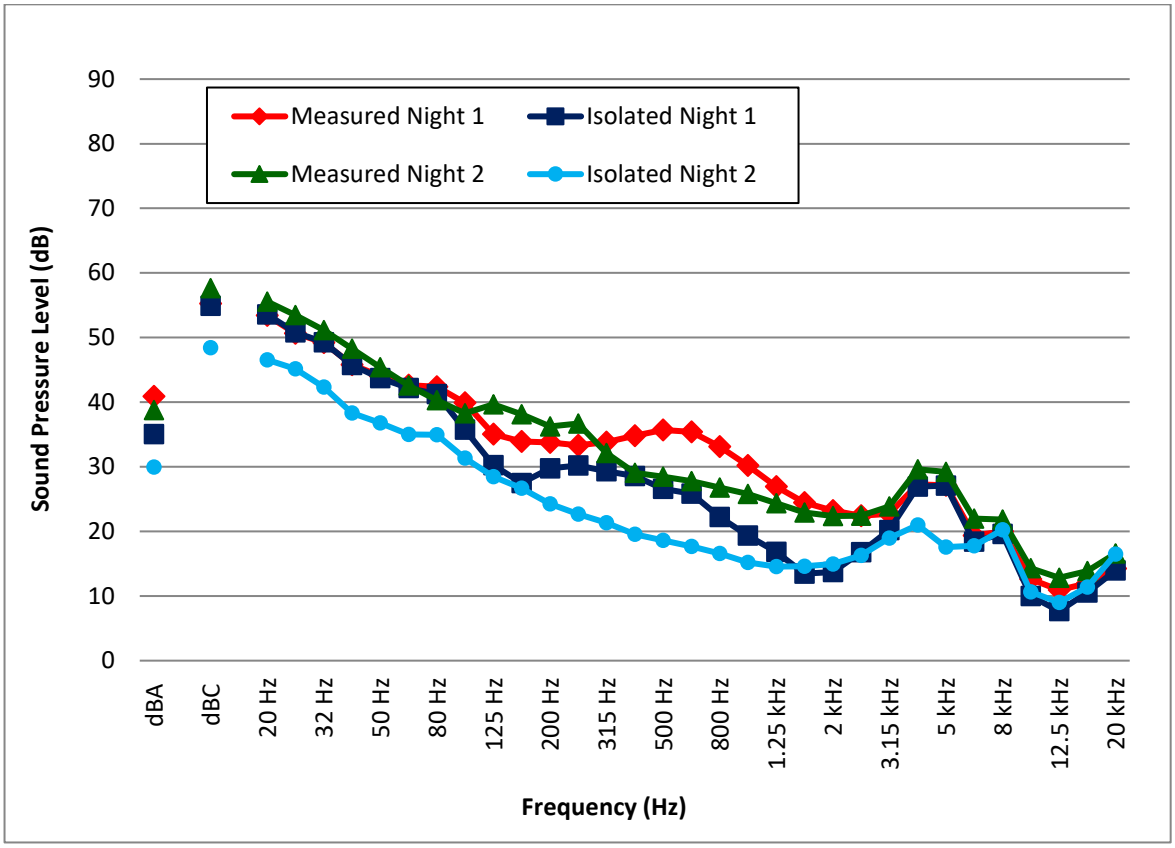


Figure 105. Noise Monitor #13, 1/3 Octave L_{eq} Sound Levels (July 20 - 22, 2022)

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

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

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

PO Number: BILAWCHUK

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**
Model: **4231**
Manufacturer: **Brüel and Kjær**
Serial number: **2575493**
Class (IEC 60942): **1**
Barometer type:
Barometer s/n:
Customer: **ACI Acoustical Consultants Inc.**
Tel/Fax: **780-414-6373 / 780-414-6376**

Date Calibrated: **1/24/2022** *Cal Due:*

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

Contains non-accredited tests: __Yes _X_ No

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

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

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

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	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

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

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B&K 2270 Unit #4 Microphone Calibration Certificate

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

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.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

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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

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Page 1 of 2

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	9/24/2021

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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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Page 1 of 2

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

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

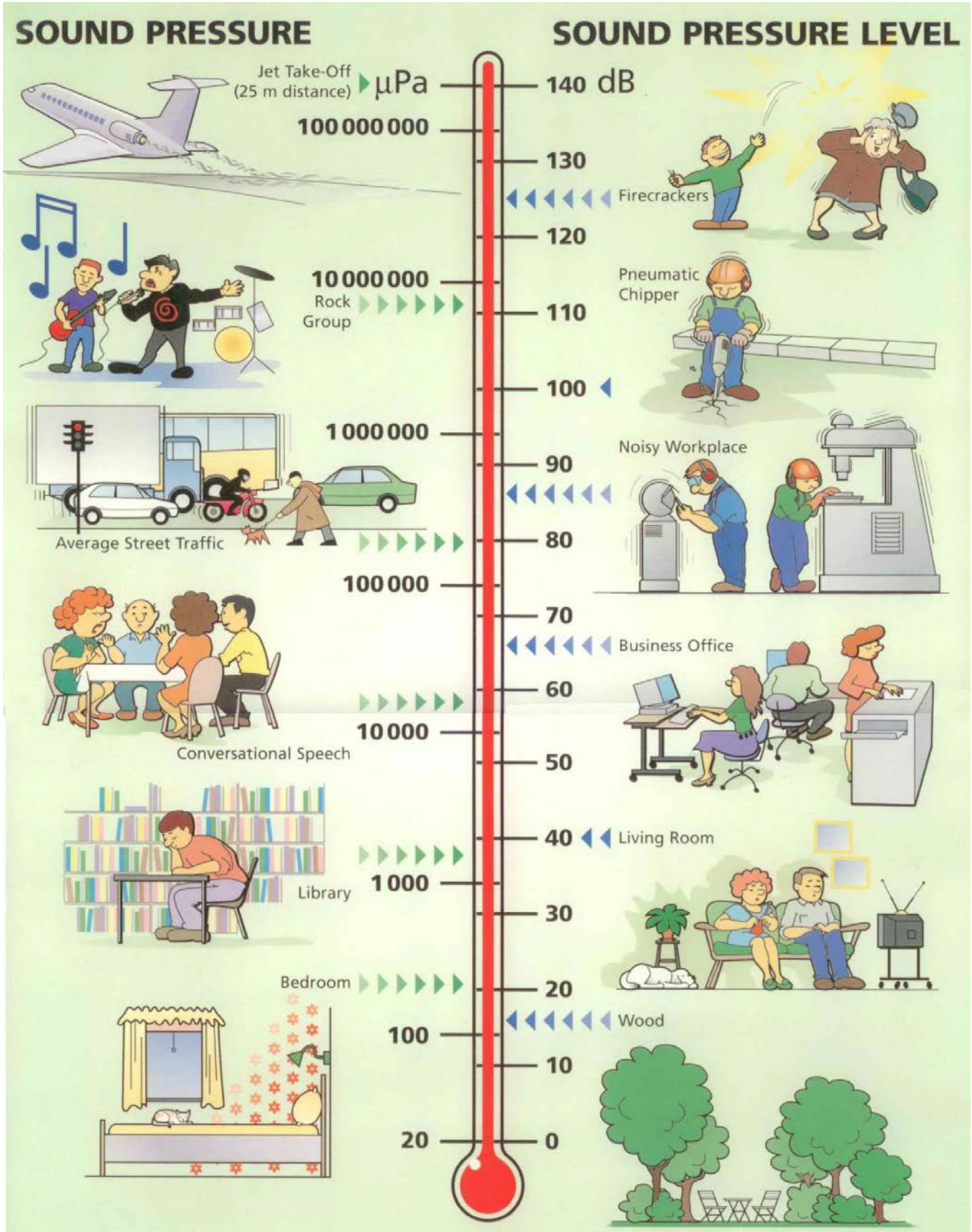
Sound pressure is initially measured in Pascal's (Pa). Humans can hear several orders of magnitude in sound pressure levels, so a more convenient scale is used. This scale is known as the decibel (dB) scale, named after Alexander Graham Bell (telephone guy). It is a base 10 logarithmic scale. When we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

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

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
dB
100 000 000
140
130
Firecrackers
120
10 000 000
Rock
Group
110
Pneumatic
Chipper
100
1 000 000
90
Noisy Workplace
80
Average Street Traffic
100 000
70
Business Office
60
10 000
Conversational Speech
50
40
Living Room
1 000
Library
30
Bedroom
20
100
Wood
10
20
0

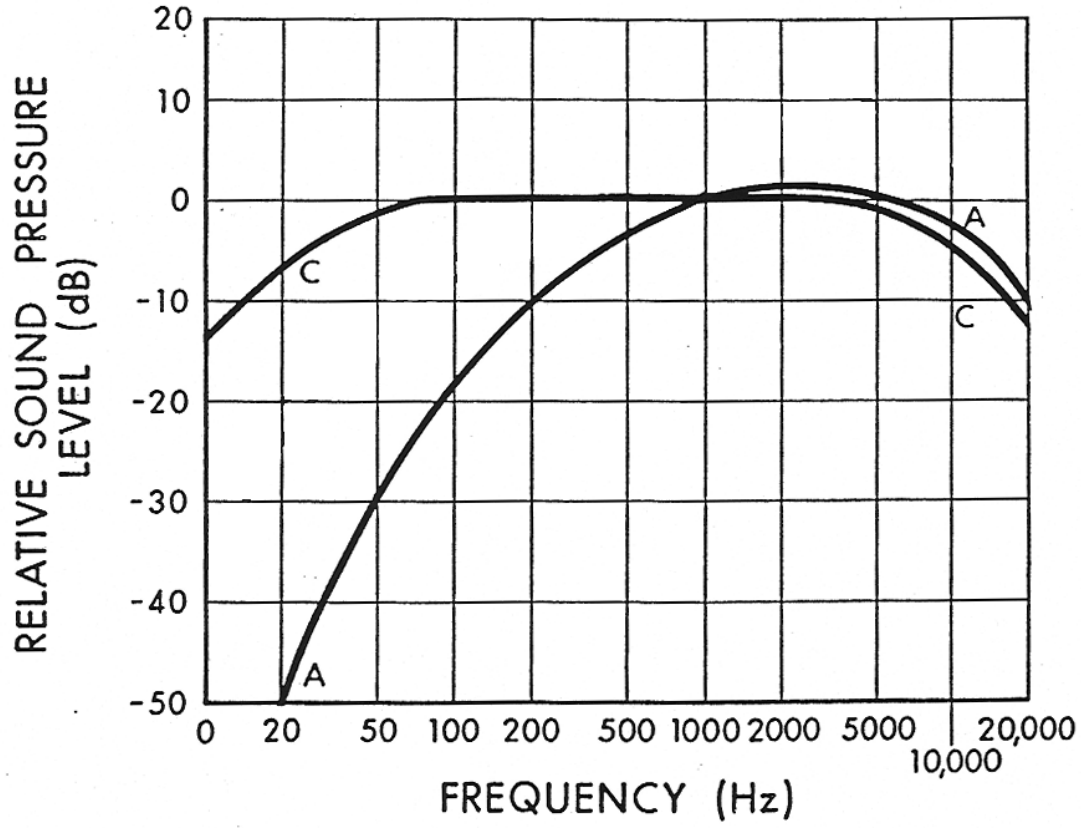
Frequency

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

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

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

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



Combination of Sounds

When combining multiple sound sources the general equation is:

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

Examples:

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

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

Sound Level Measurements

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

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

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

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

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

Statistical Descriptor

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

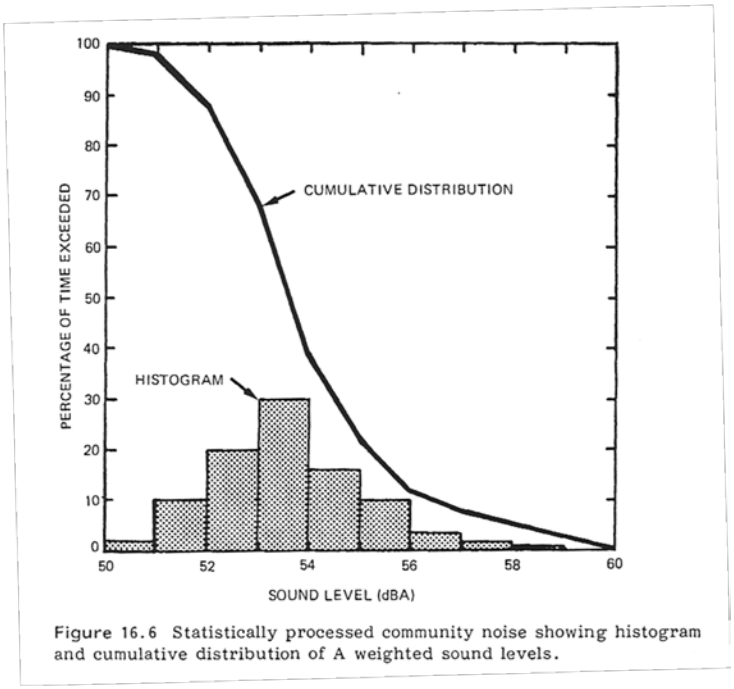


Figure 16.6 Statistically processed community noise showing histogram and cumulative distribution of A weighted sound levels.

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

The most common statistical descriptors are:

L_{min} - minimum sound level measured
L_{01} - sound level that was exceeded only 1% of the time
L_{10} - sound level that was exceeded only 10% of the time.
- Good measure of intermittent or intrusive noise
- Good measure of Traffic Noise

L_{50} - sound level that was exceeded 50% of the time (arithmetic average)
- Good to compare to L_{eq} to determine steadiness of noise

L_{90} - sound level that was exceeded 90% of the time
- Good indicator of typical "ambient" noise levels

L_{99} - sound level that was exceeded 99% of the time
L_{max} - maximum sound level measured

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

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

Sound Propagation

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

Point Source

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

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

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

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

Examples (note no atmospheric absorption):

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

Line Source

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

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

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

Examples (note no atmospheric absorption):

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

Atmospheric Absorption

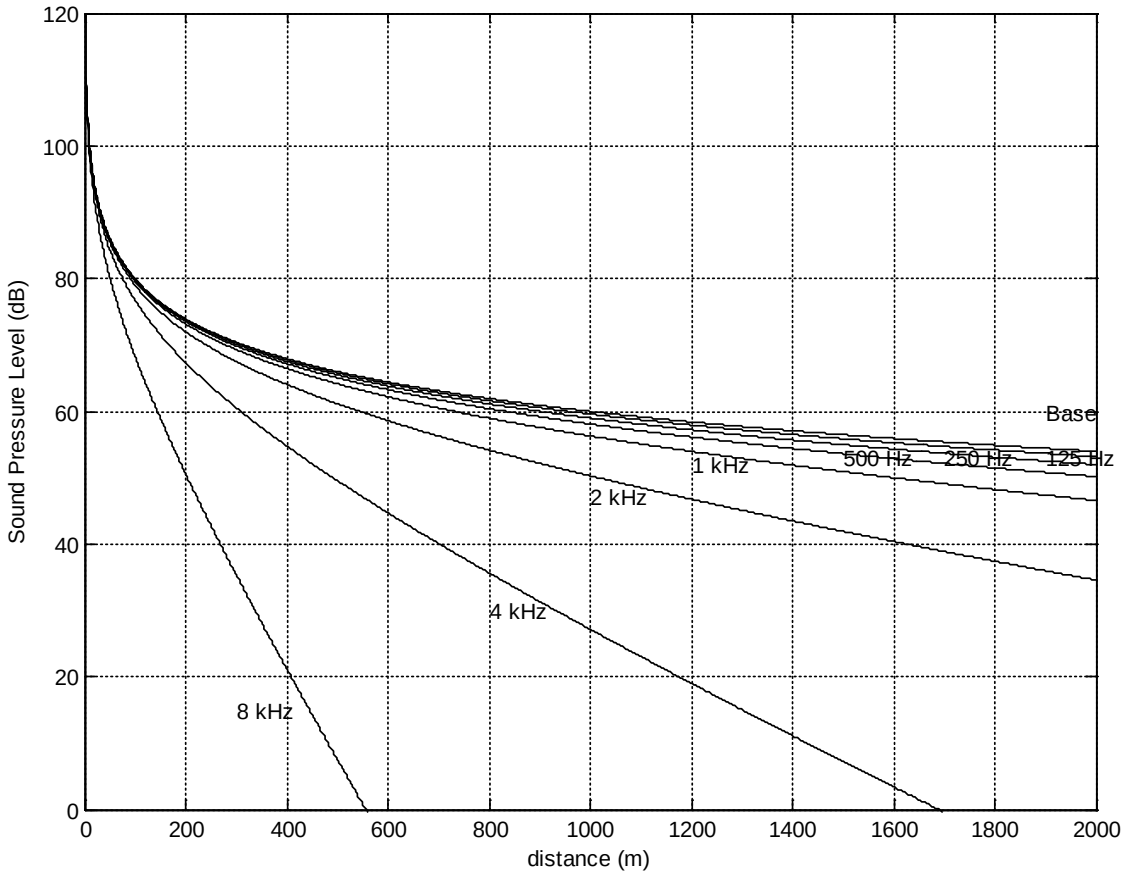
As sound transmits through a medium, there is an attenuation (or dissipation of acoustic energy) which can be attributed to three mechanisms:

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

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

Temperature	Relative Humidity	Frequency (Hz)					
°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

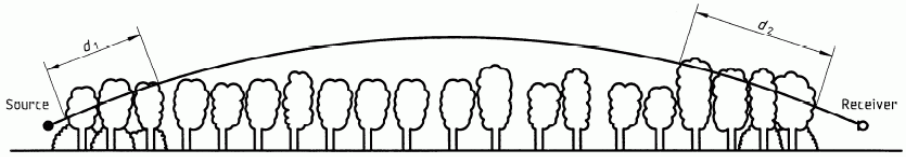
- Can be an effective absorber due to large area covered
- Only effective at low height above ground. Does not affect sound transmitted direct from source to receiver if there is line of sight.
- Typically less absorption than atmospheric absorption when there is line of sight.
- Approximate rule of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

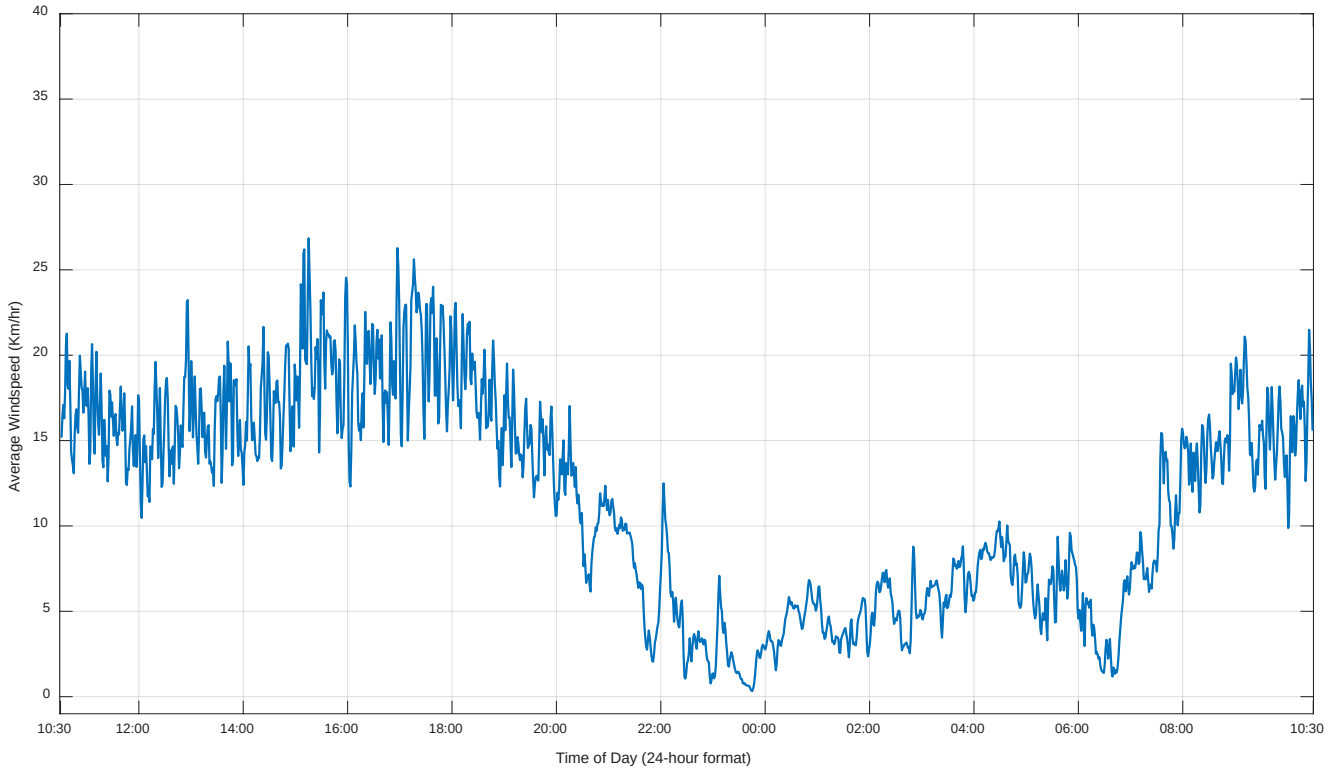
Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/24/22 03:12	7/24/22 03:16	52.8	4.0	Train Passby
7/24/22 03:23	7/24/22 03:24	51.0	1.3	Train Passby
7/24/22 03:32	7/24/22 03:33	40.3	1.3	Train Passby
7/24/22 03:35	7/24/22 03:35	39.2	0.5	Loud Vehicle Passby
7/24/22 03:36	7/24/22 03:37	37.9	1.0	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

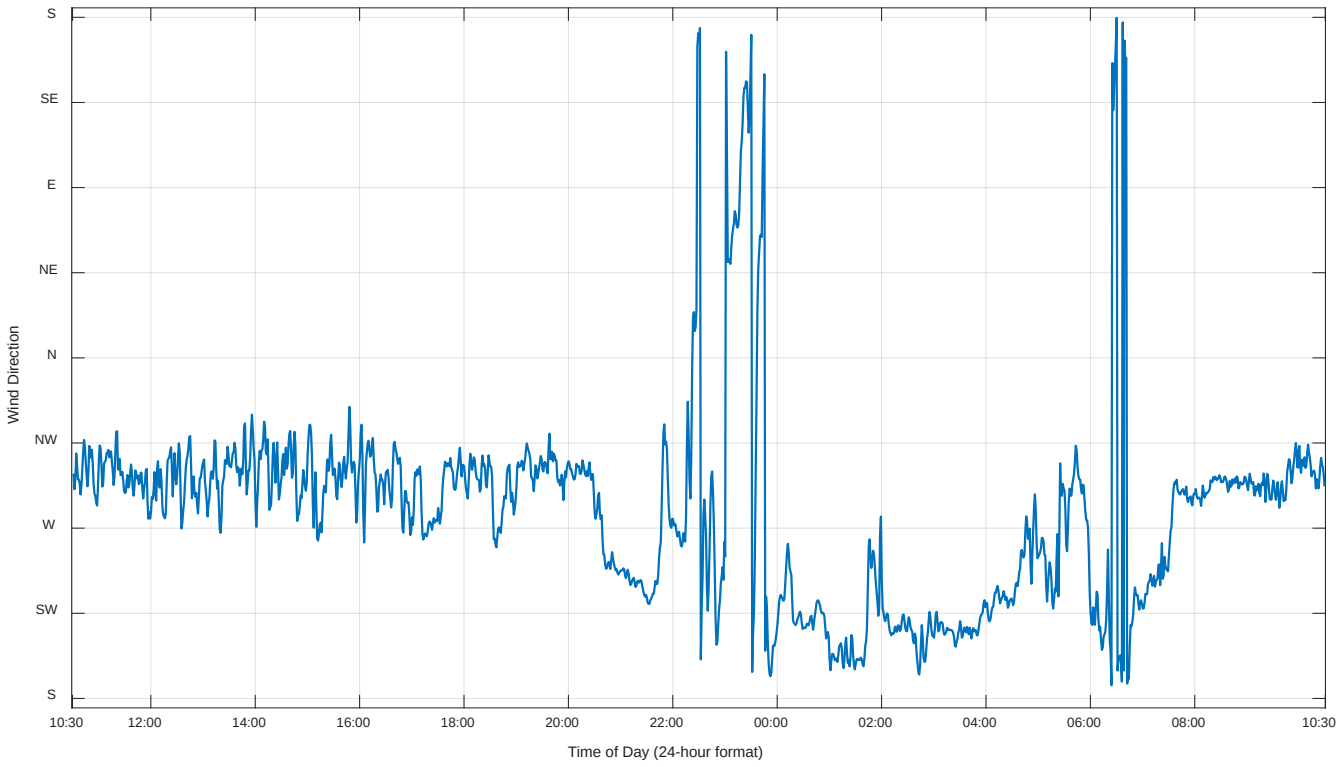
Start Time	End Time	Noise Level (dBA)	Duration (min)	Reason
7/20/22 22:14	7/20/22 22:15	37.9	0.75	Excessive Bird Noise
7/20/22 22:21	7/20/22 22:22	33.2	0.75	Excessive Bird Noise
7/20/22 22:34	7/20/22 22:39	37.0	4.75	Animal Noise
7/20/22 22:50	7/20/22 22:53	47.7	2.75	Loud Vehicle Passby
7/20/22 22:54	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

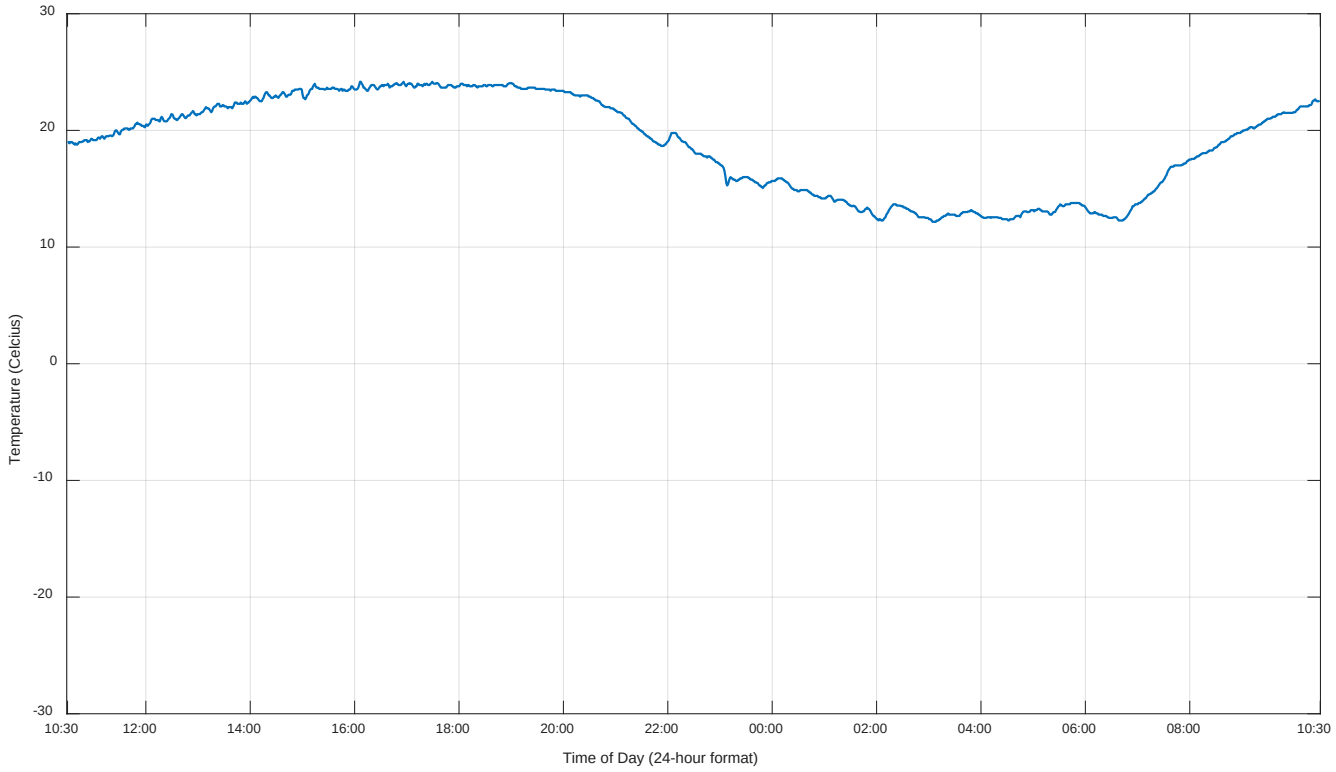
July 20 - 21, 2022 Weather Data



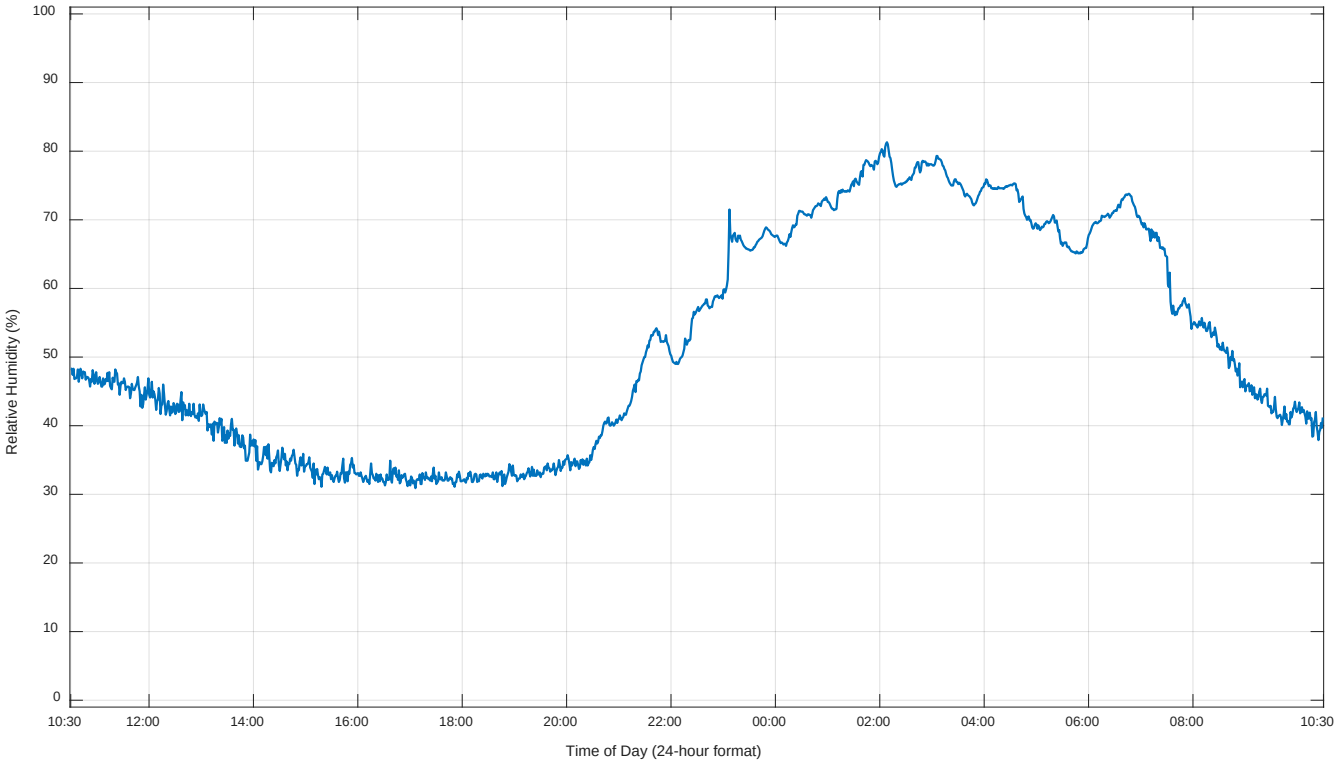
Monitored Wind Speed (July 20 - 21, 2022) at Noise Monitor Location 6



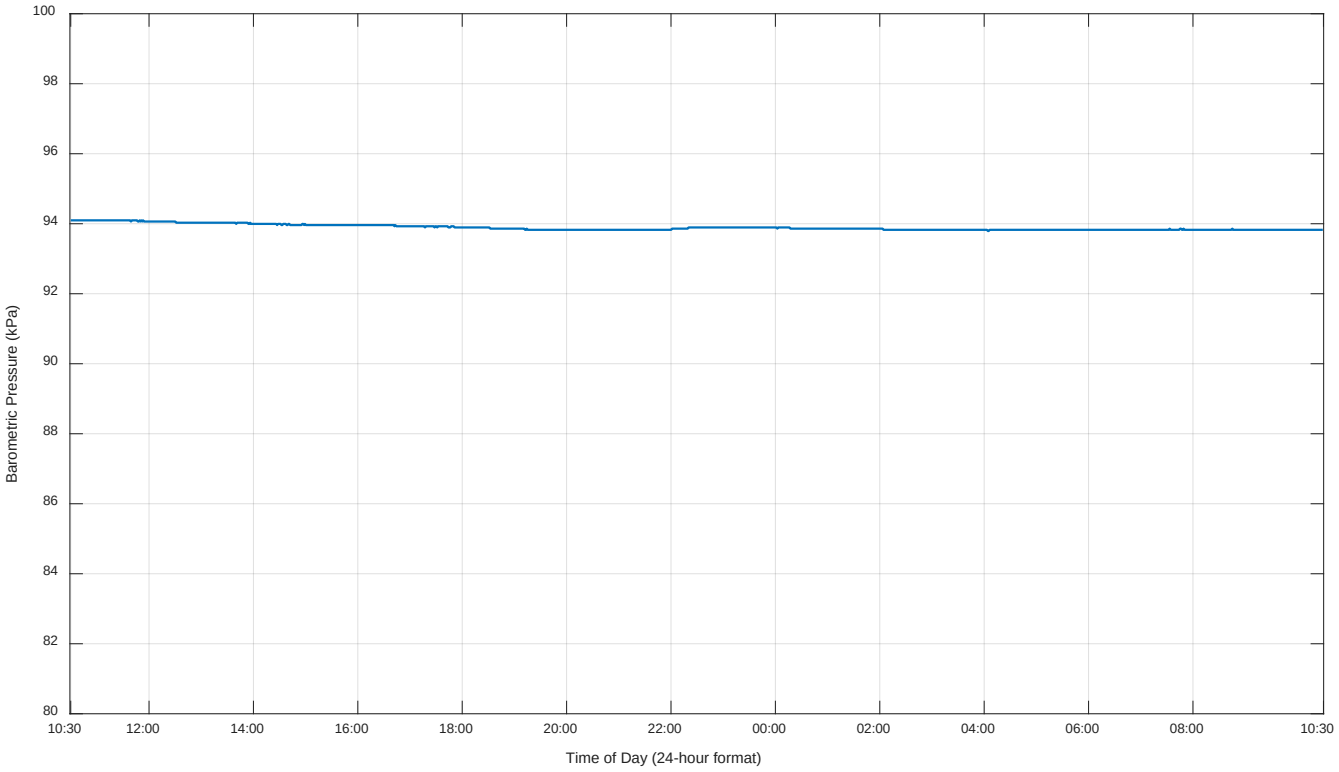
Monitored Wind Direction (July 20 - 21, 2022) at Noise Monitor Location 6



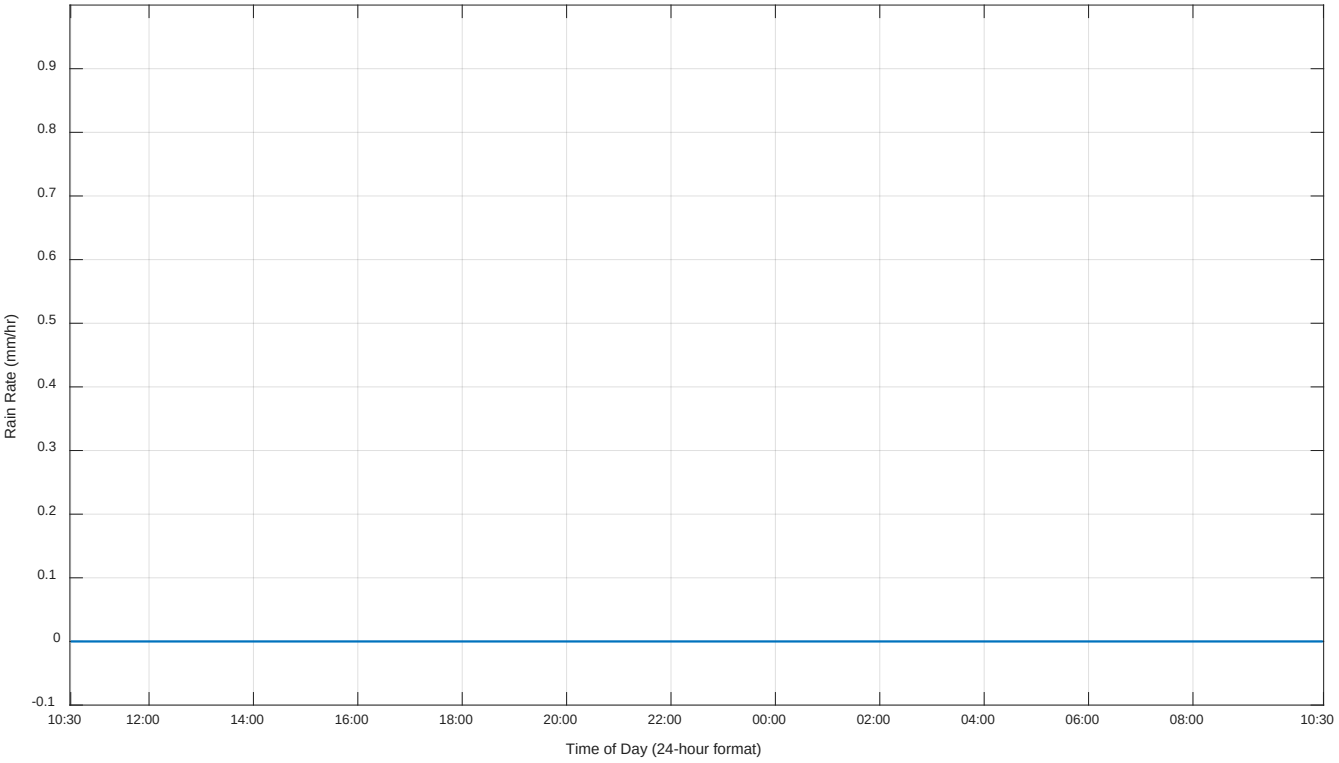
Monitored Temperature (July 20 - 21, 2022) at Noise Monitor Location 6



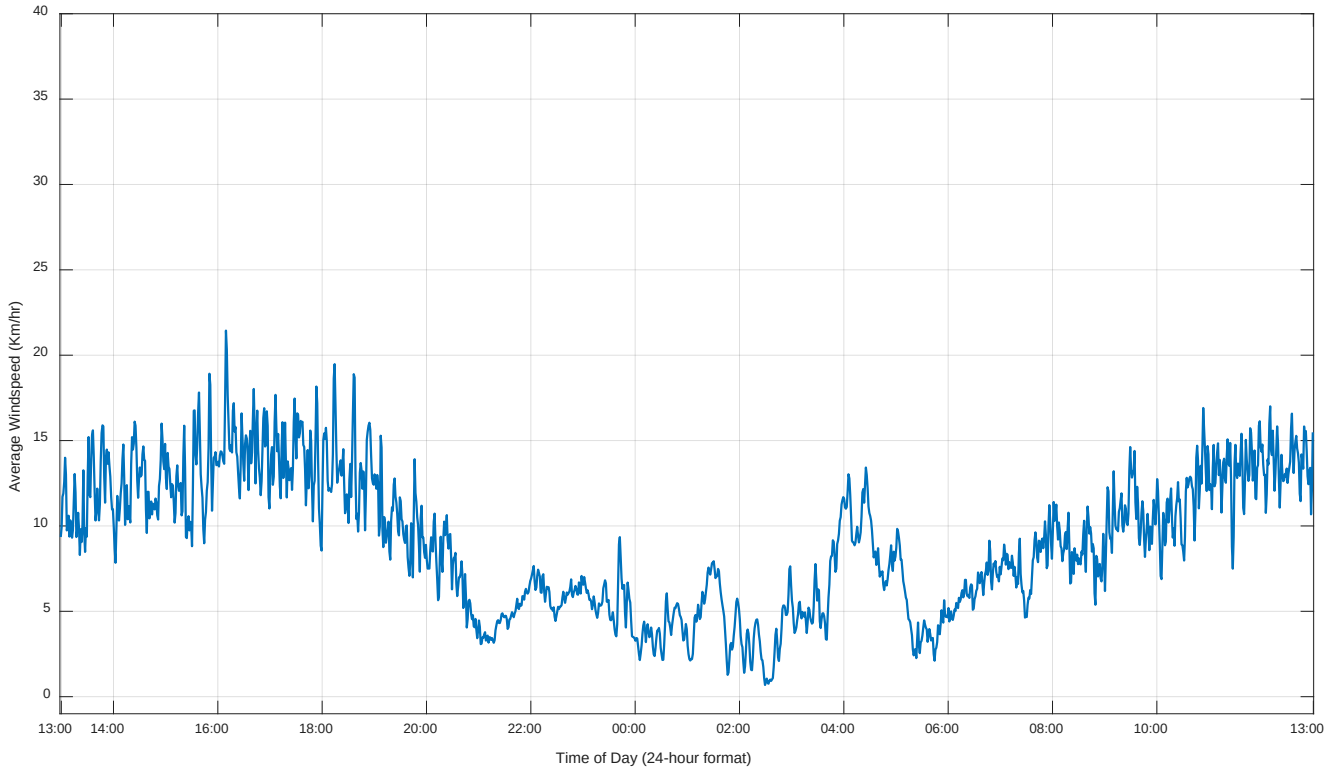
Monitored Humidity (July 20 - 21, 2022) at Noise Monitor Location 6



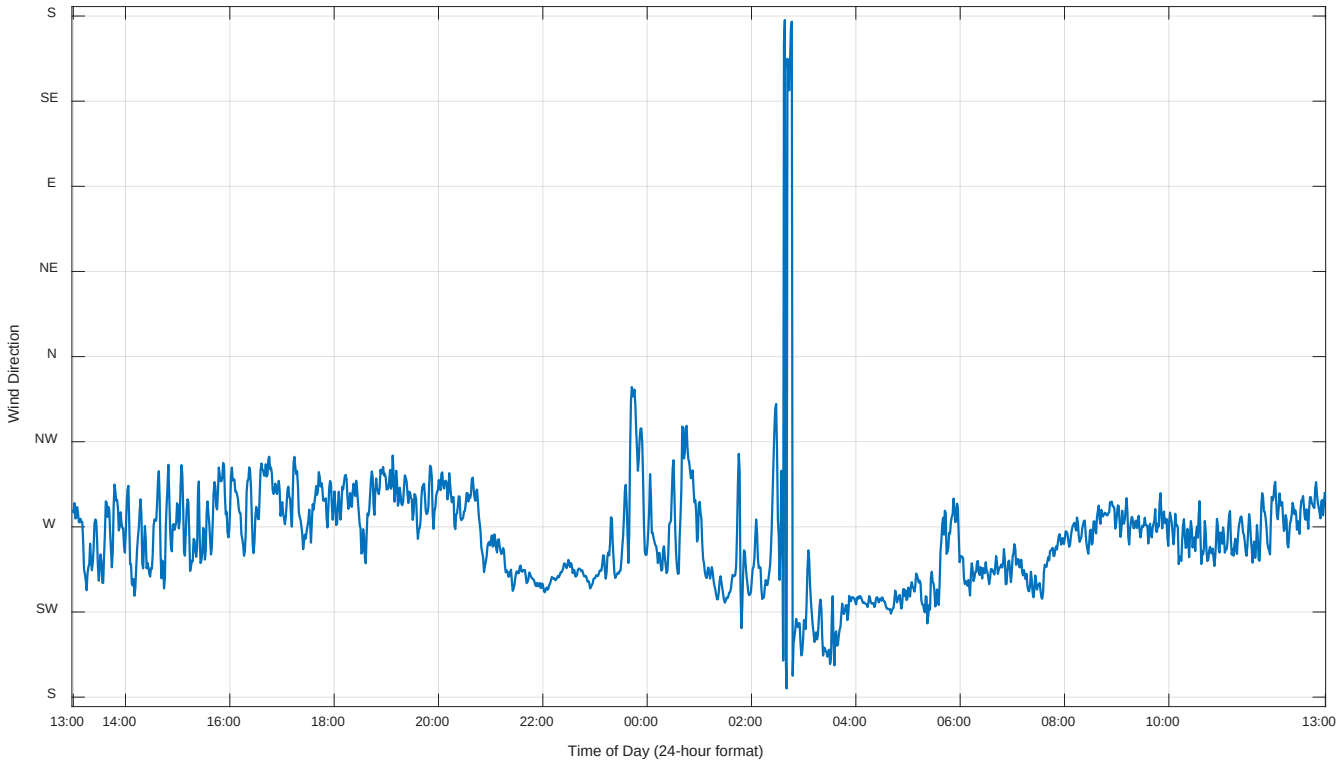
Monitored Barometric Pressure (July 20 - 21, 2022) at Noise Monitor Location 6



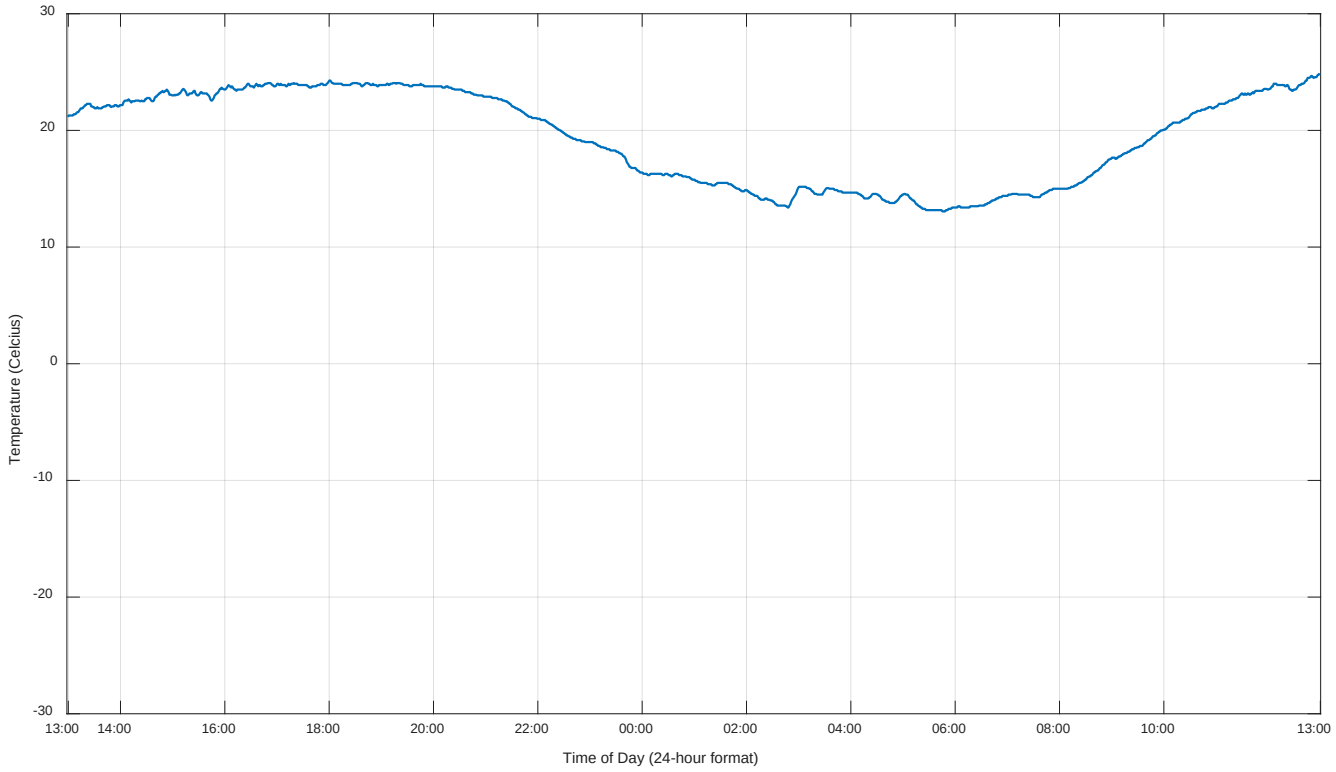
Monitored Rain Rate (July 20 - 21, 2022) at Noise Monitor Location 6



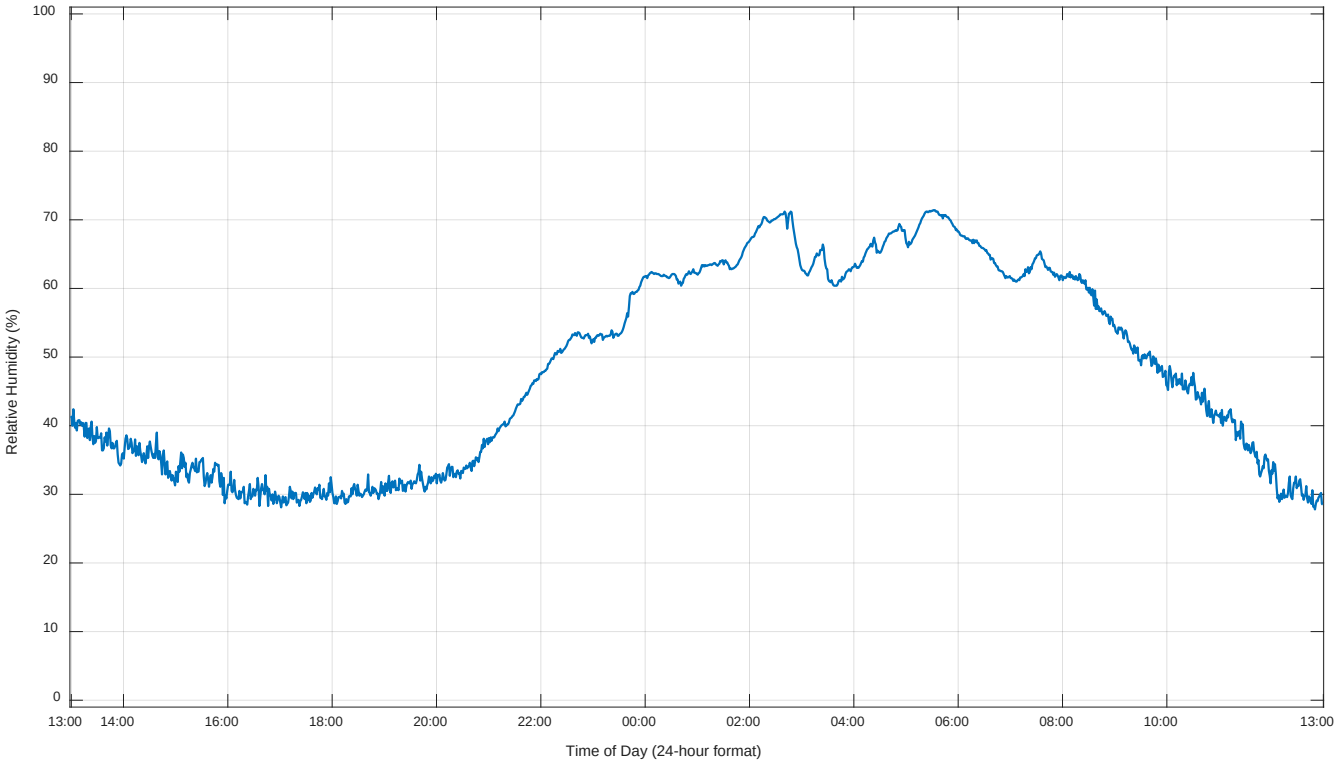
Monitored Wind Speed (July 20 - 21, 2022) at Noise Monitor Location 10



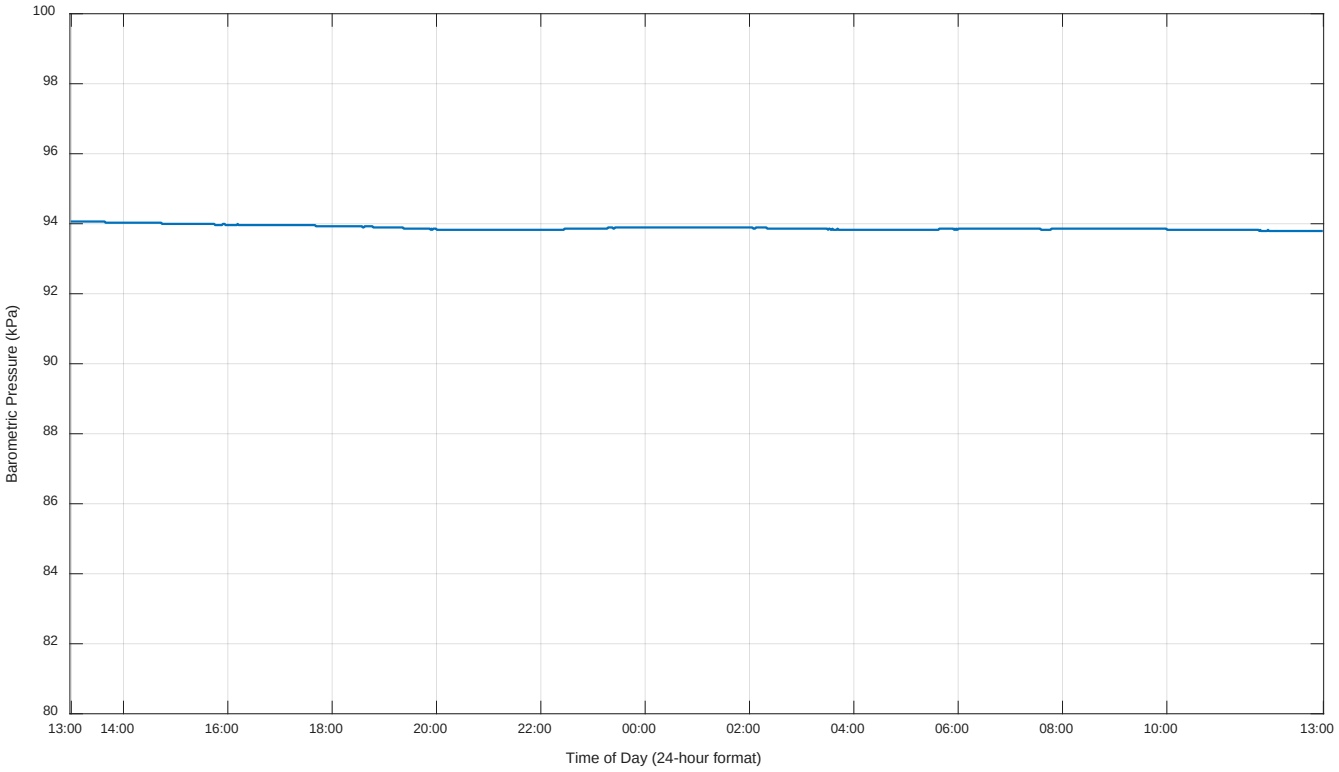
Monitored Wind Direction (July 20 - 21, 2022) at Noise Monitor Location 10



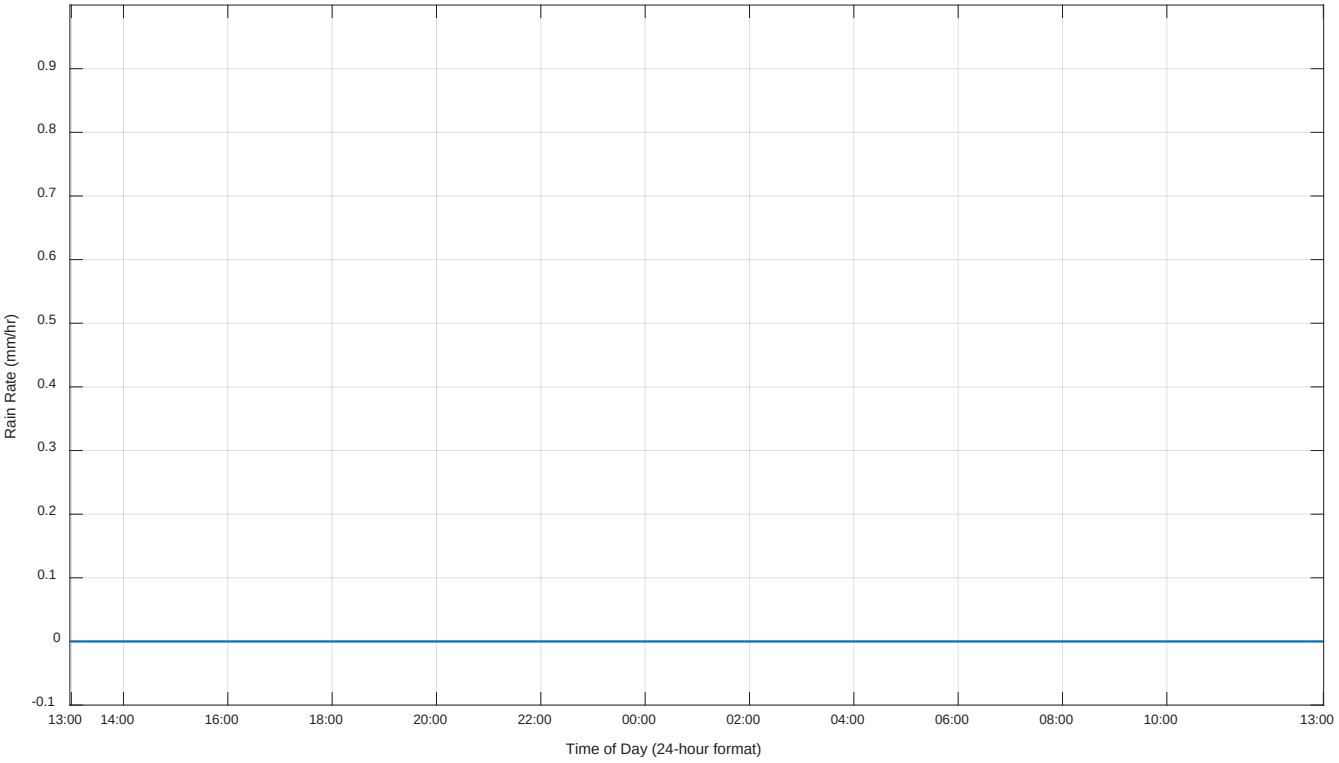
Monitored Temperature (July 20 - 21, 2022) at Noise Monitor Location 10



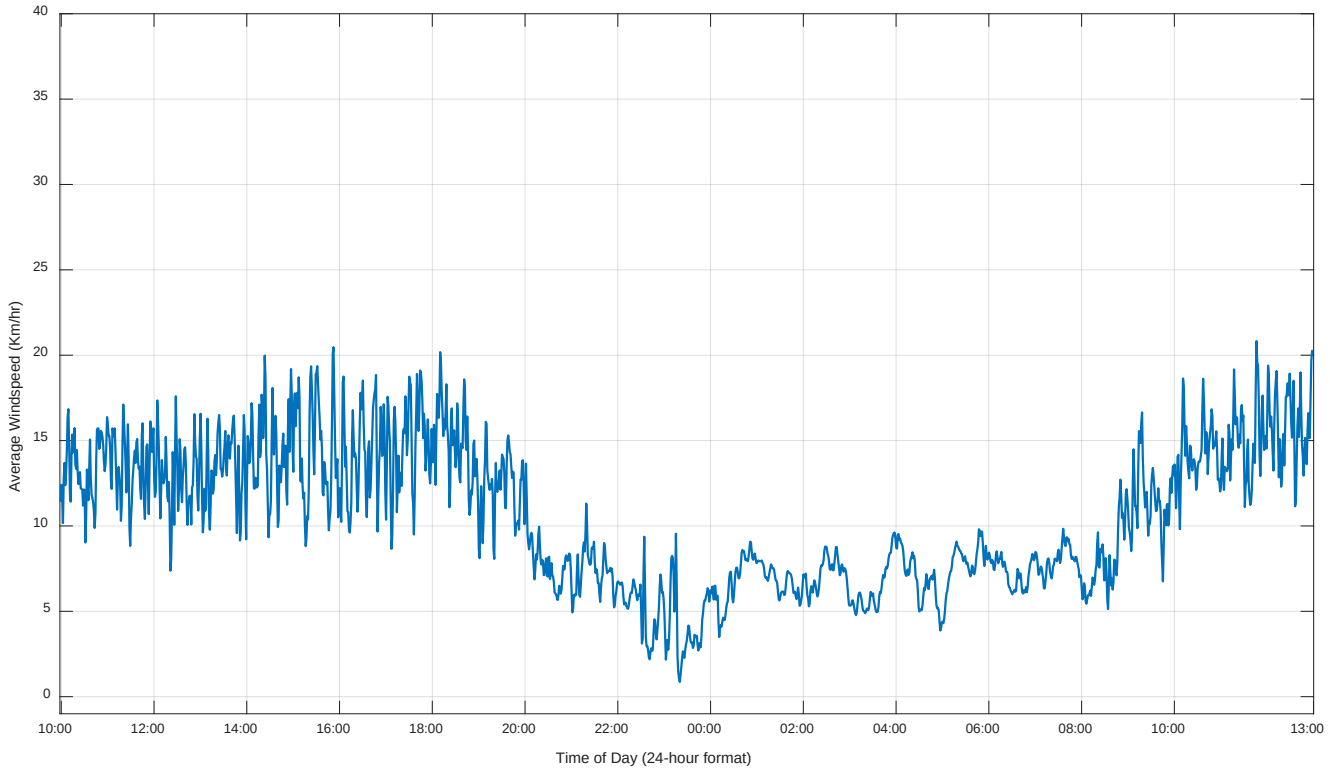
Monitored Humidity (July 20 - 21, 2022) at Noise Monitor Location 10



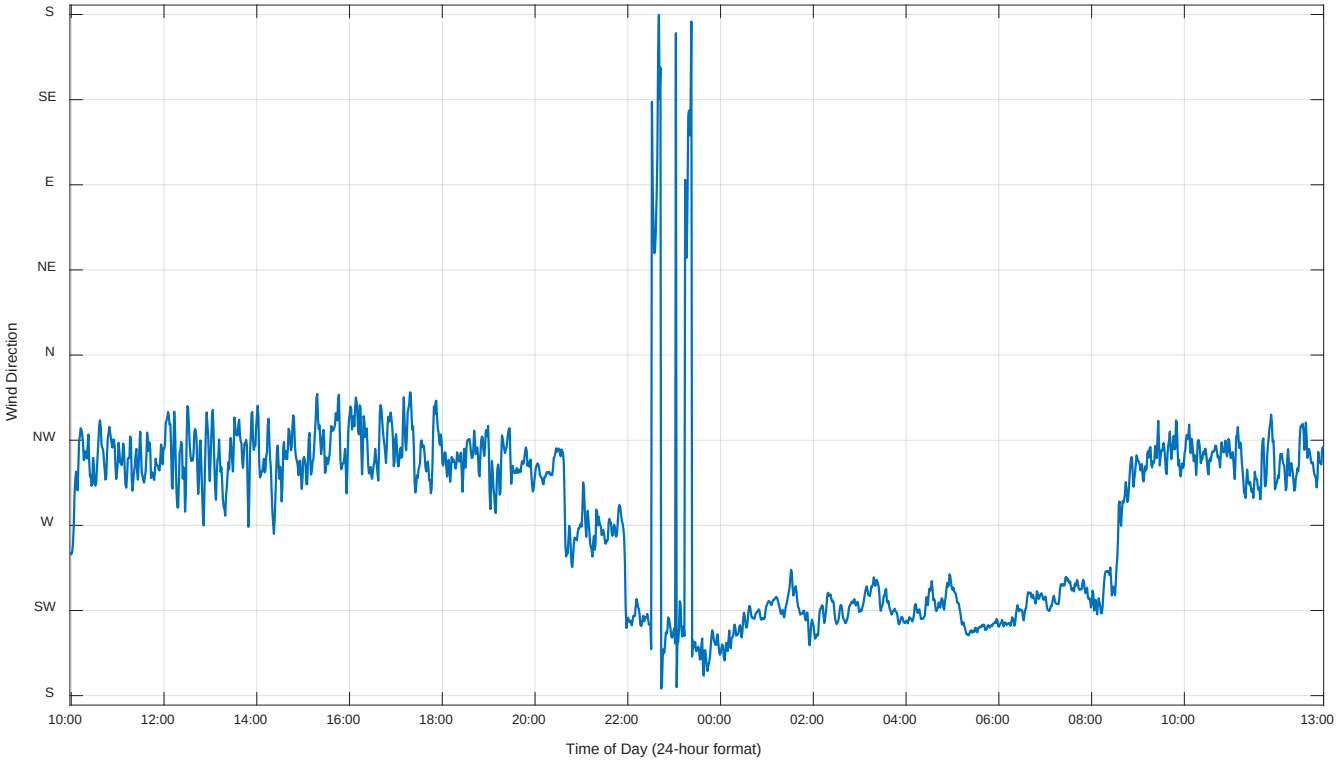
Monitored Barometric Pressure (July 20 - 21, 2022) at Noise Monitor Location 10



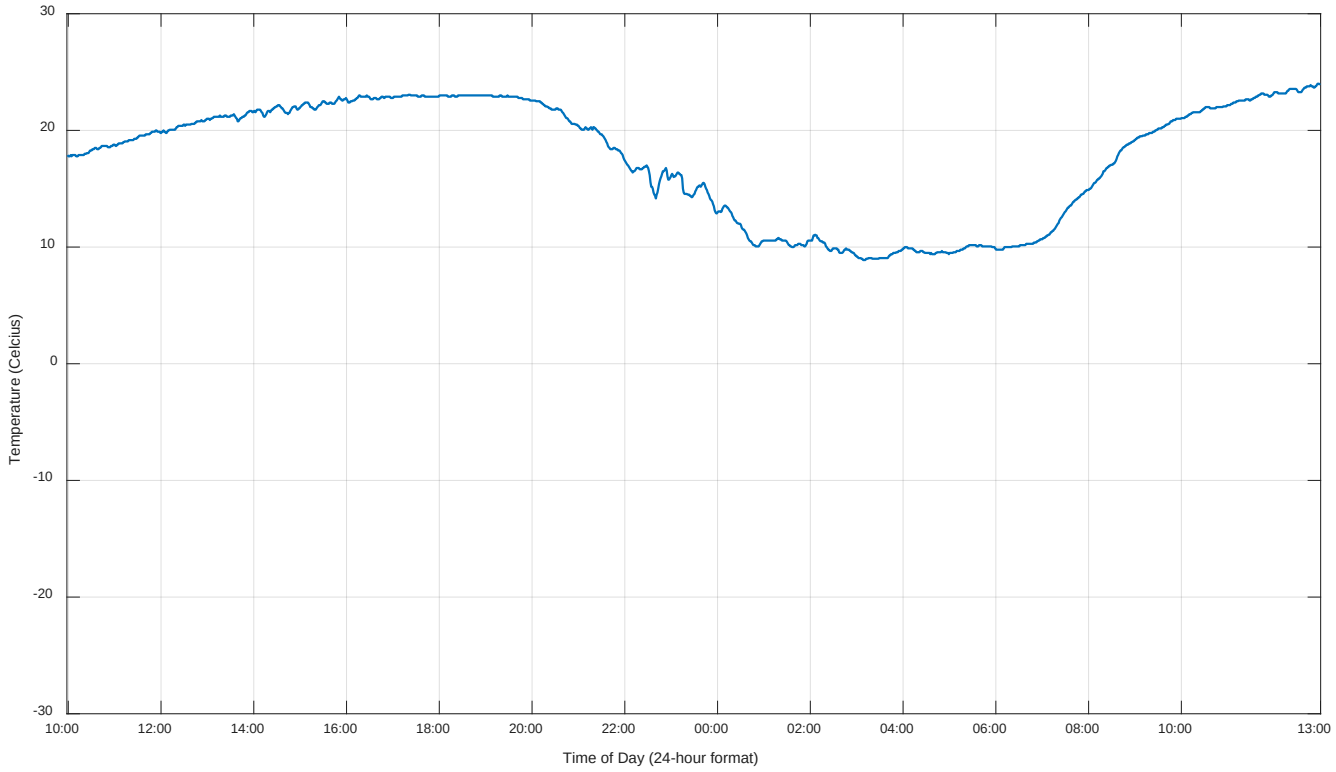
Monitored Rain Rate (July 20 - 21, 2022) at Noise Monitor Location 10



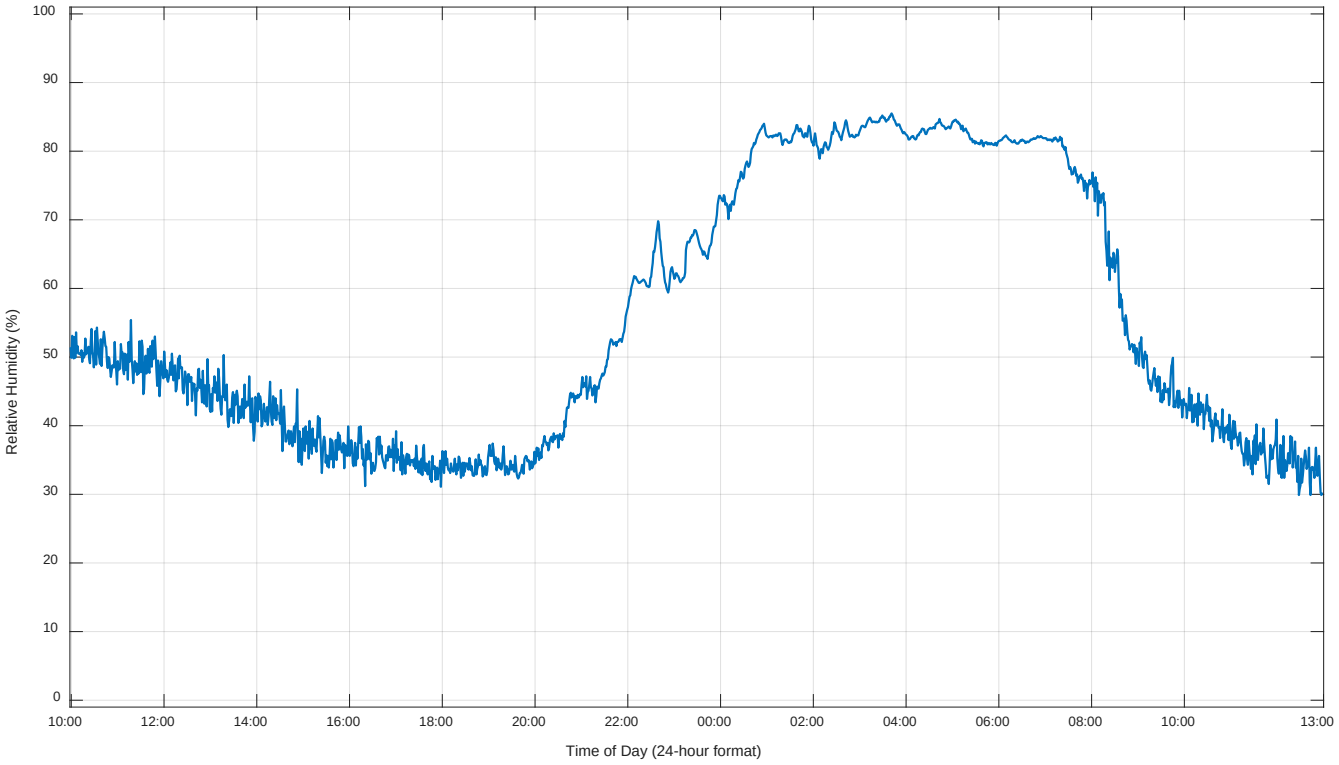
Monitored Wind Speed (July 20 - 21, 2022) at Noise Monitor Location 12



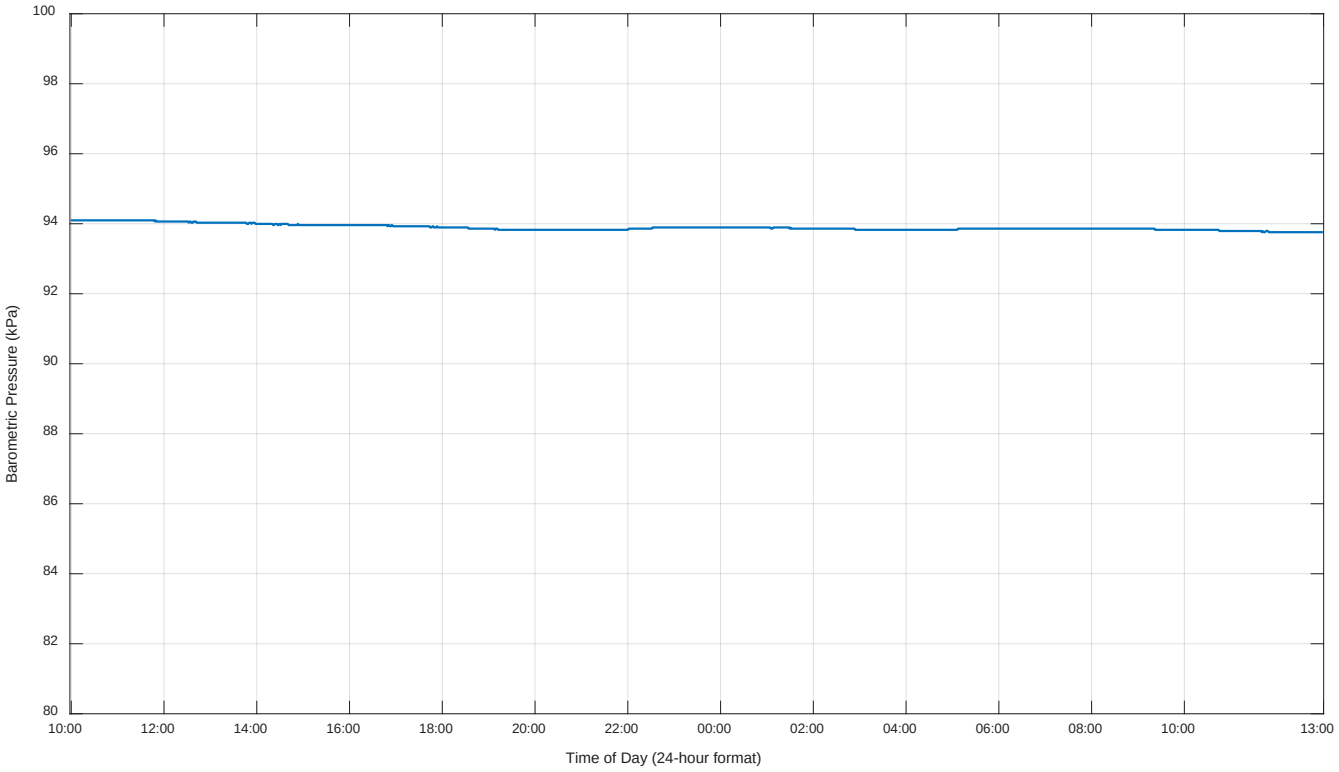
Monitored Wind Direction (July 20 - 21, 2022) at Noise Monitor Location 12



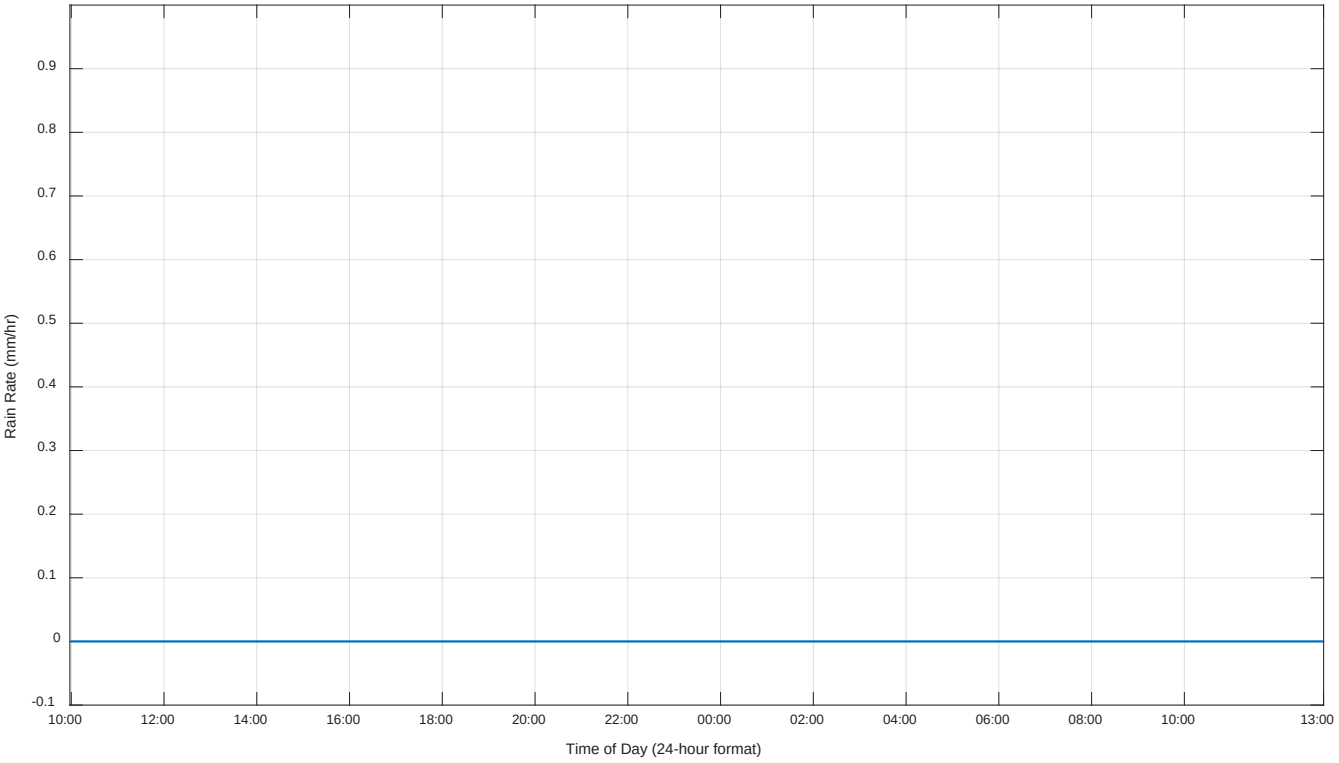
Monitored Temperature (July 20 - 21, 2022) at Noise Monitor Location 12



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

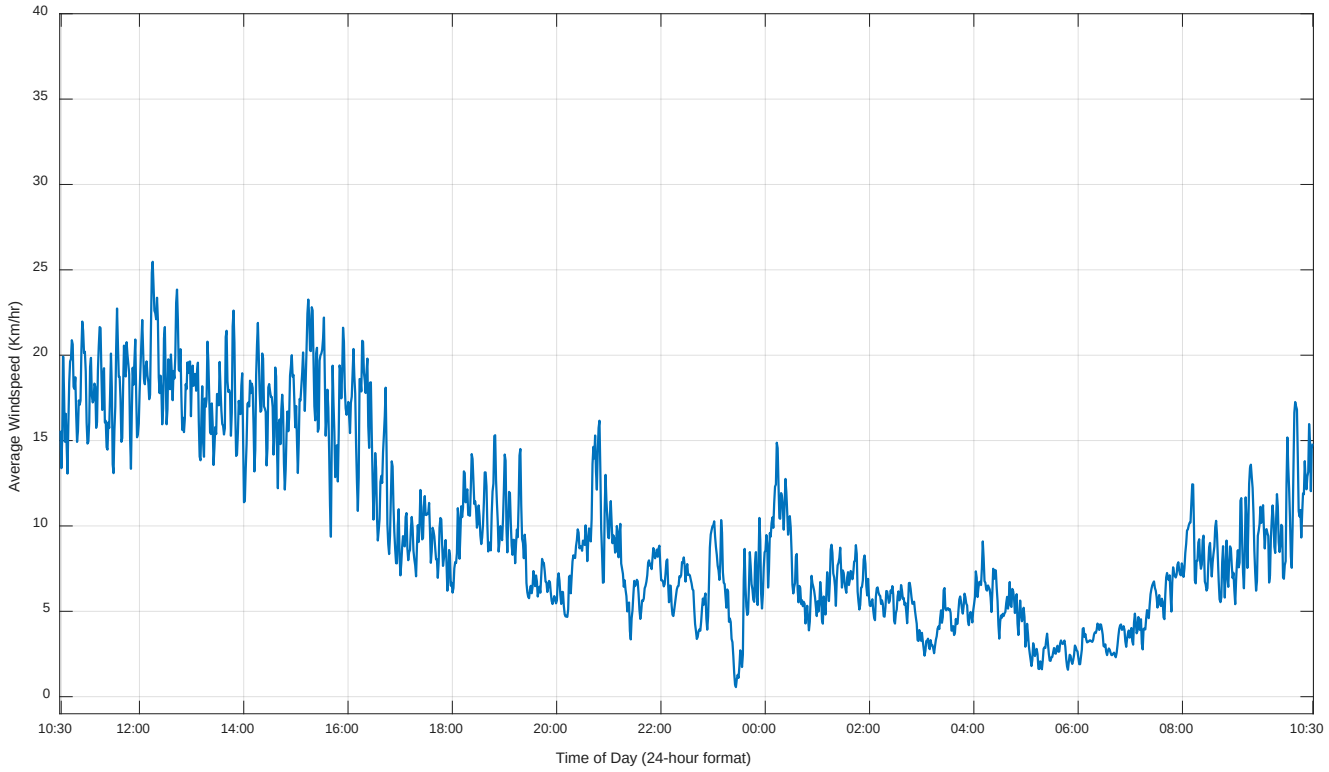


Monitored Barometric Pressure (July 20 - 21, 2022) at Noise Monitor Location 12

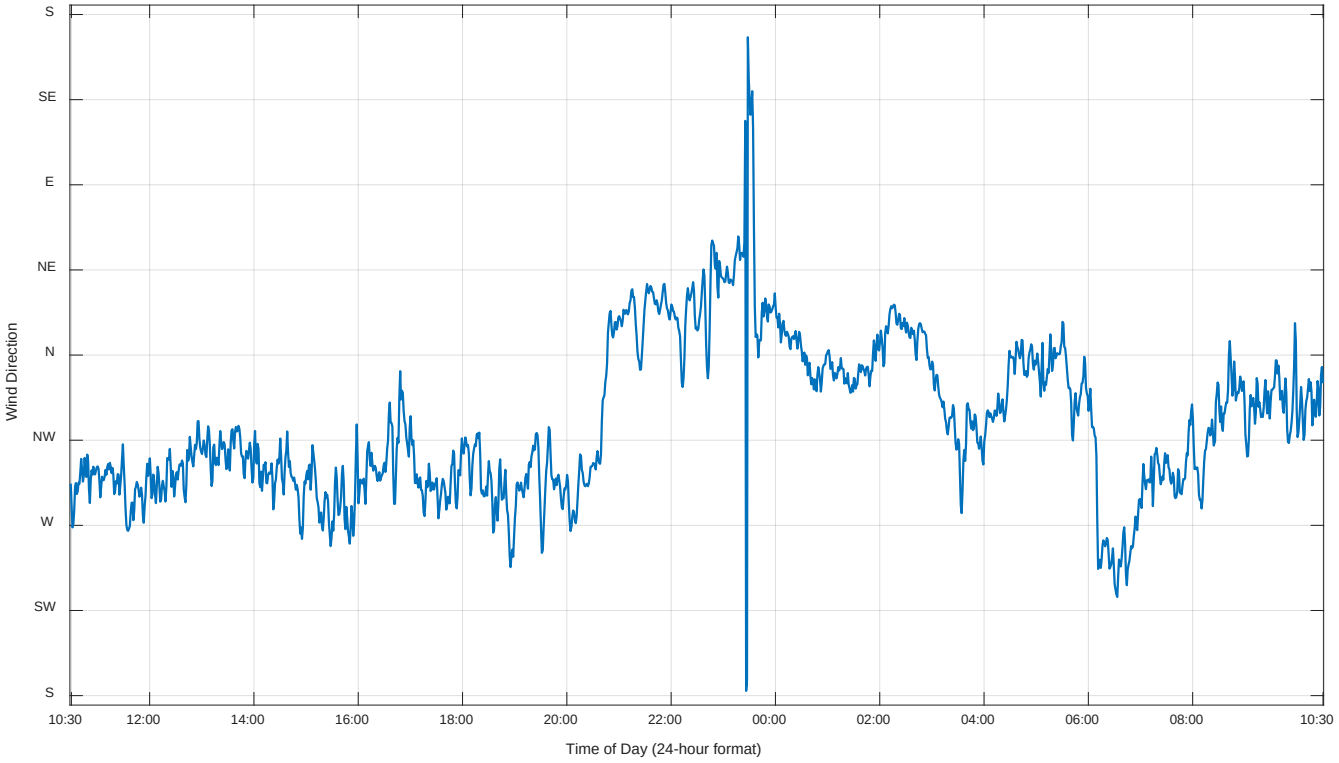


Monitored Rain Rate (July 20 - 21, 2022) at Noise Monitor Location 12

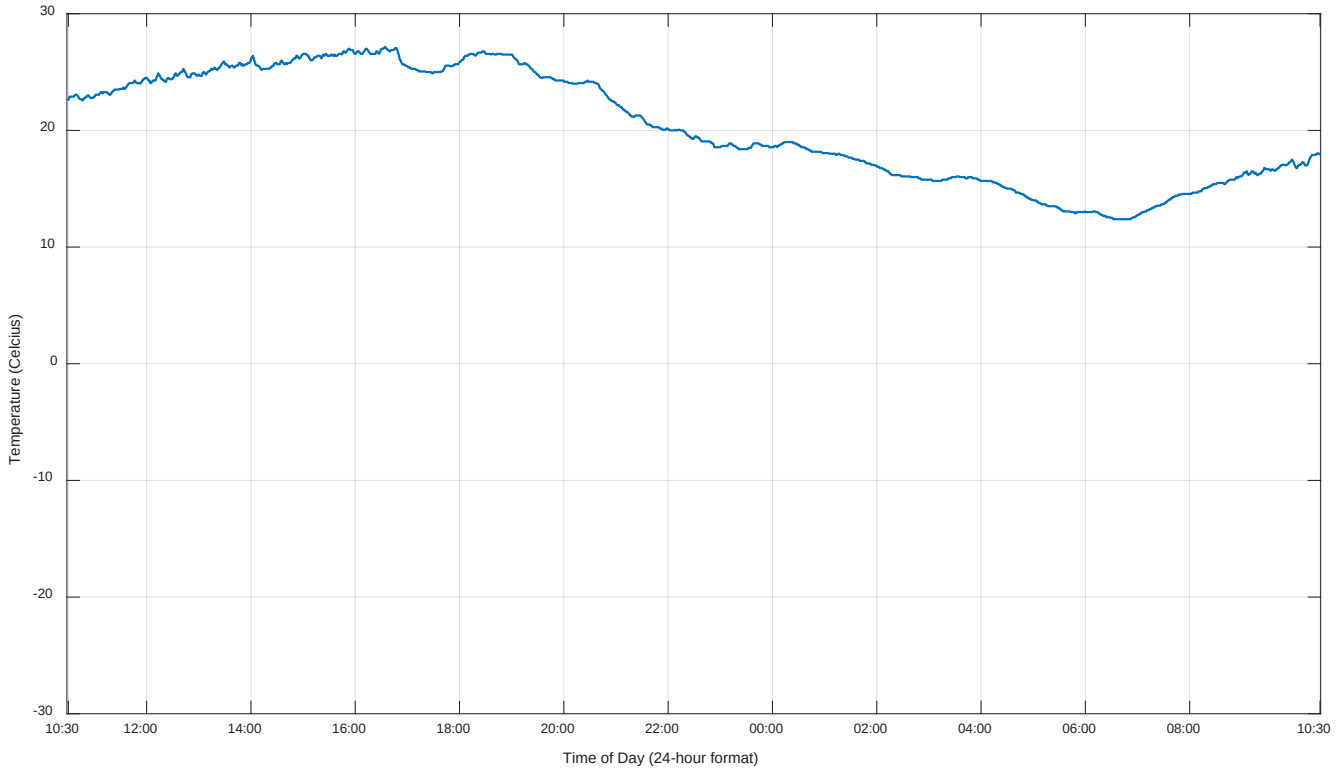
July 21 - 22, 2022 Weather Data



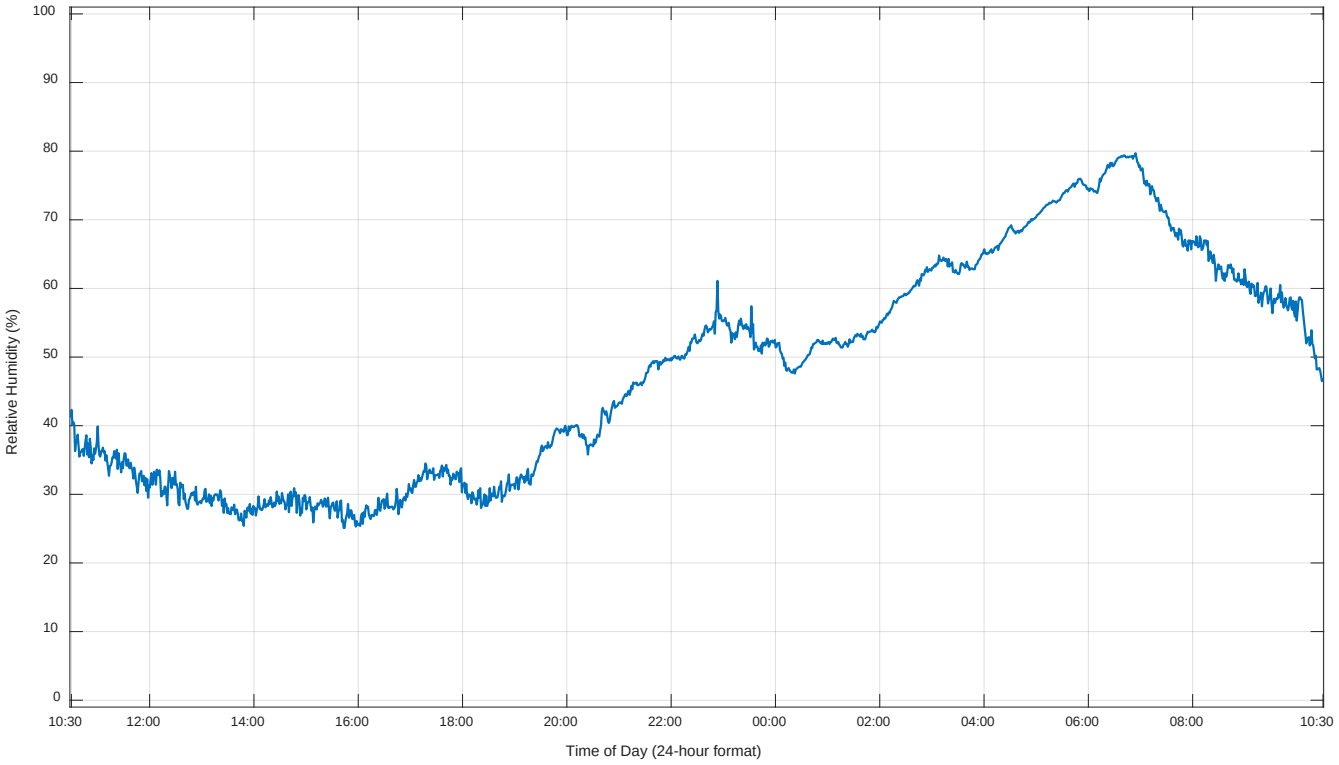
Monitored Wind Speed (July 21 - 22, 2022) at Noise Monitor Location 6



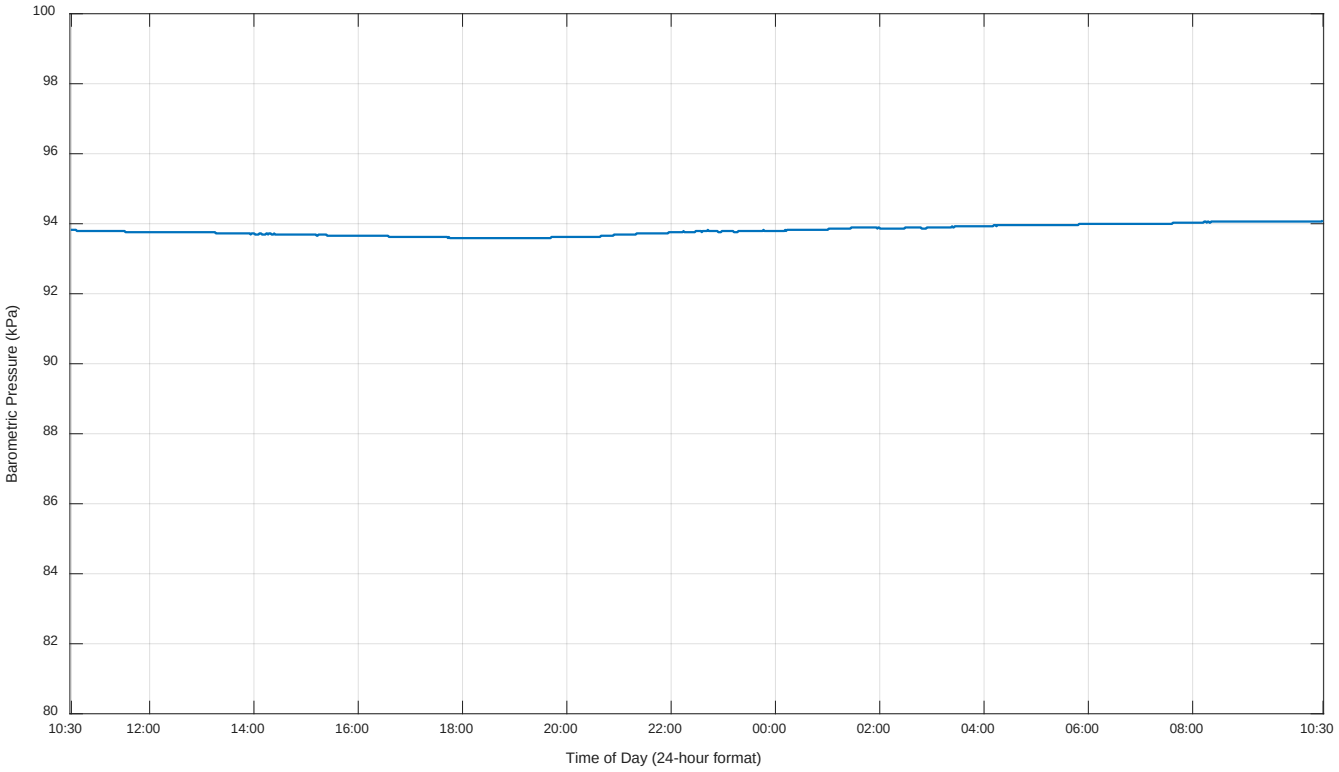
Monitored Wind Direction (July 21 - 22, 2022) at Noise Monitor Location 6



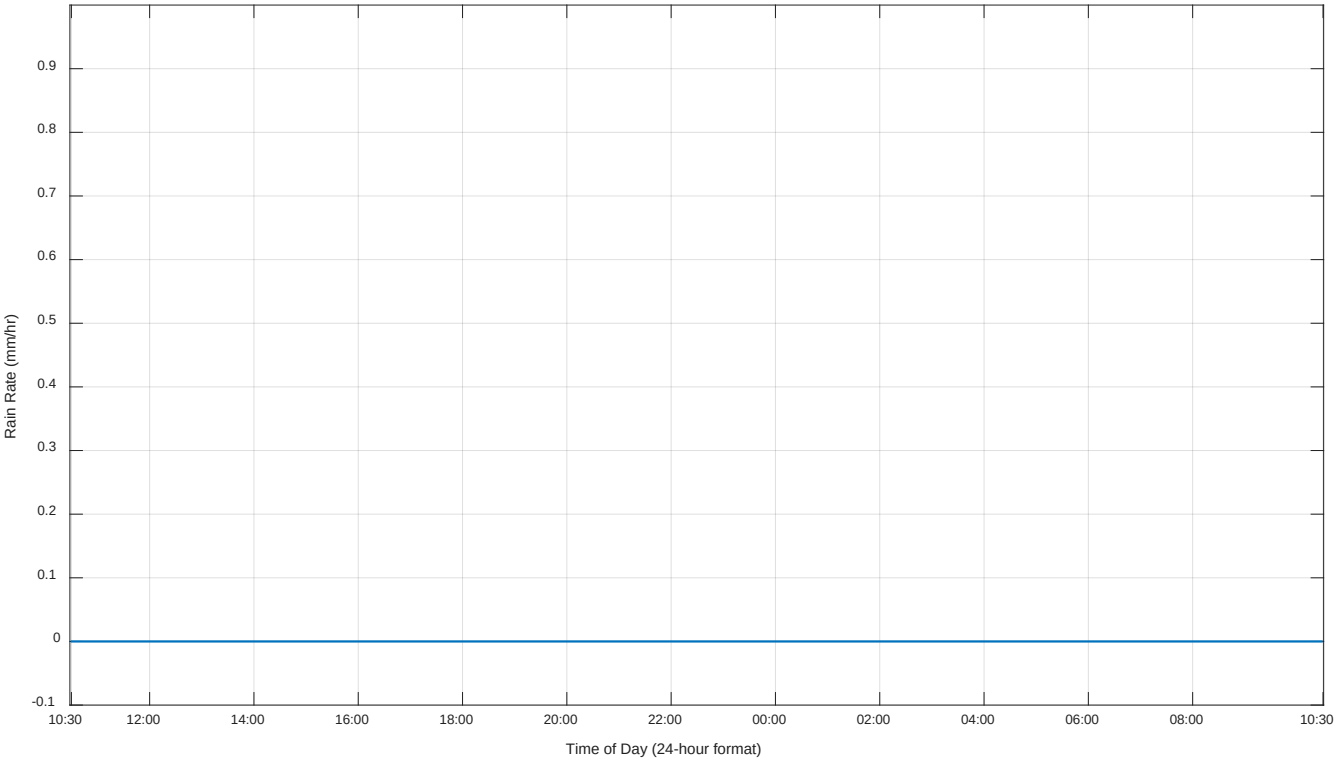
Monitored Temperature (July 21 - 22, 2022) at Noise Monitor Location 6



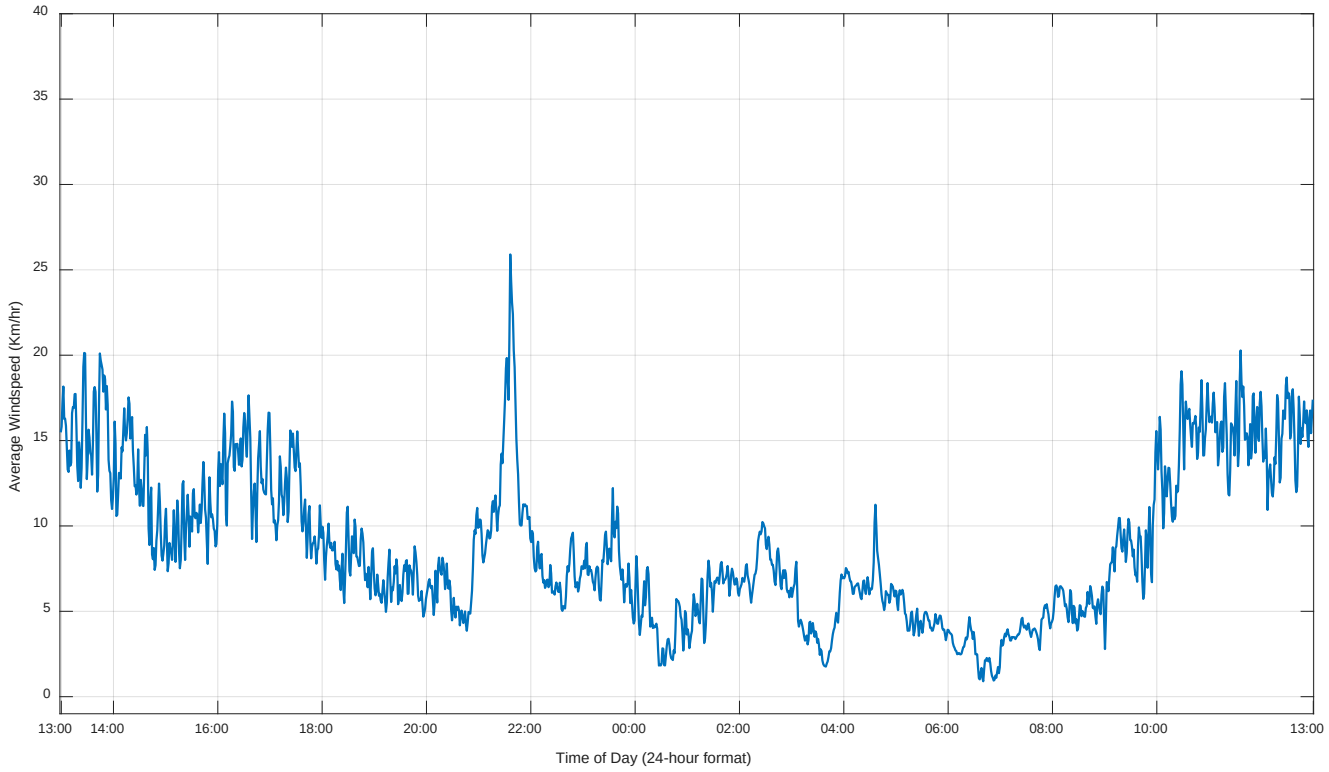
Monitored Humidity (July 21 - 22, 2022) at Noise Monitor Location 6



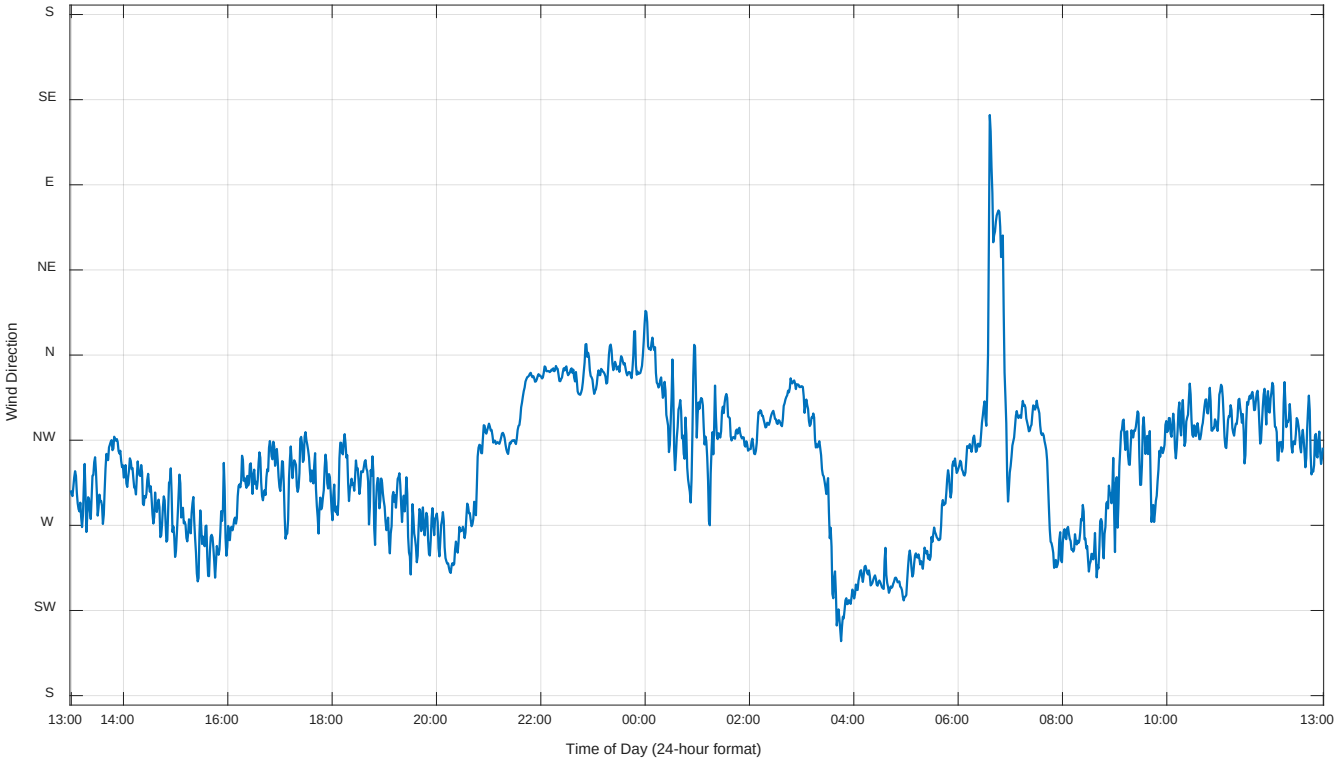
Monitored Barometric Pressure (July 21 - 22, 2022) at Noise Monitor Location 6



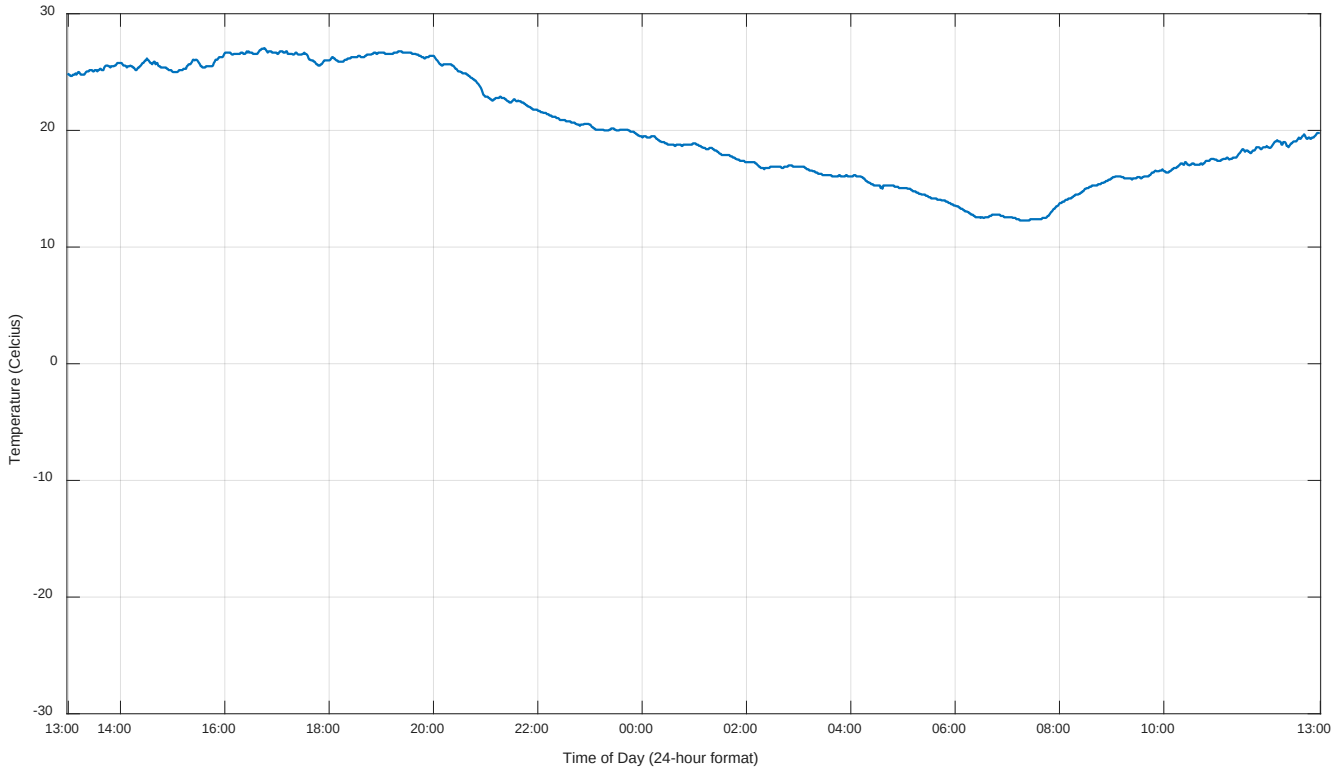
Monitored Rain Rate (July 21 - 22, 2022) at Noise Monitor Location 6



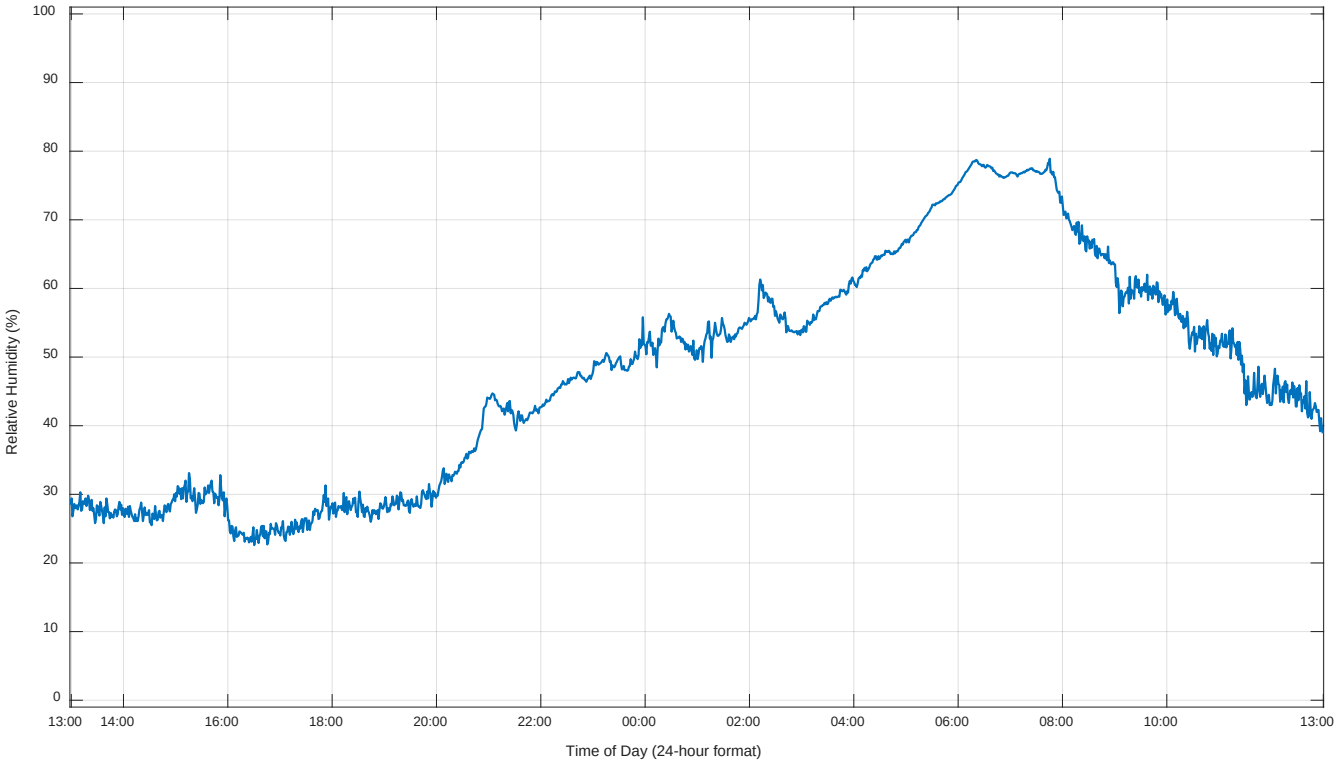
Monitored Wind Speed (July 21 - 22, 2022) at Noise Monitor Location 10



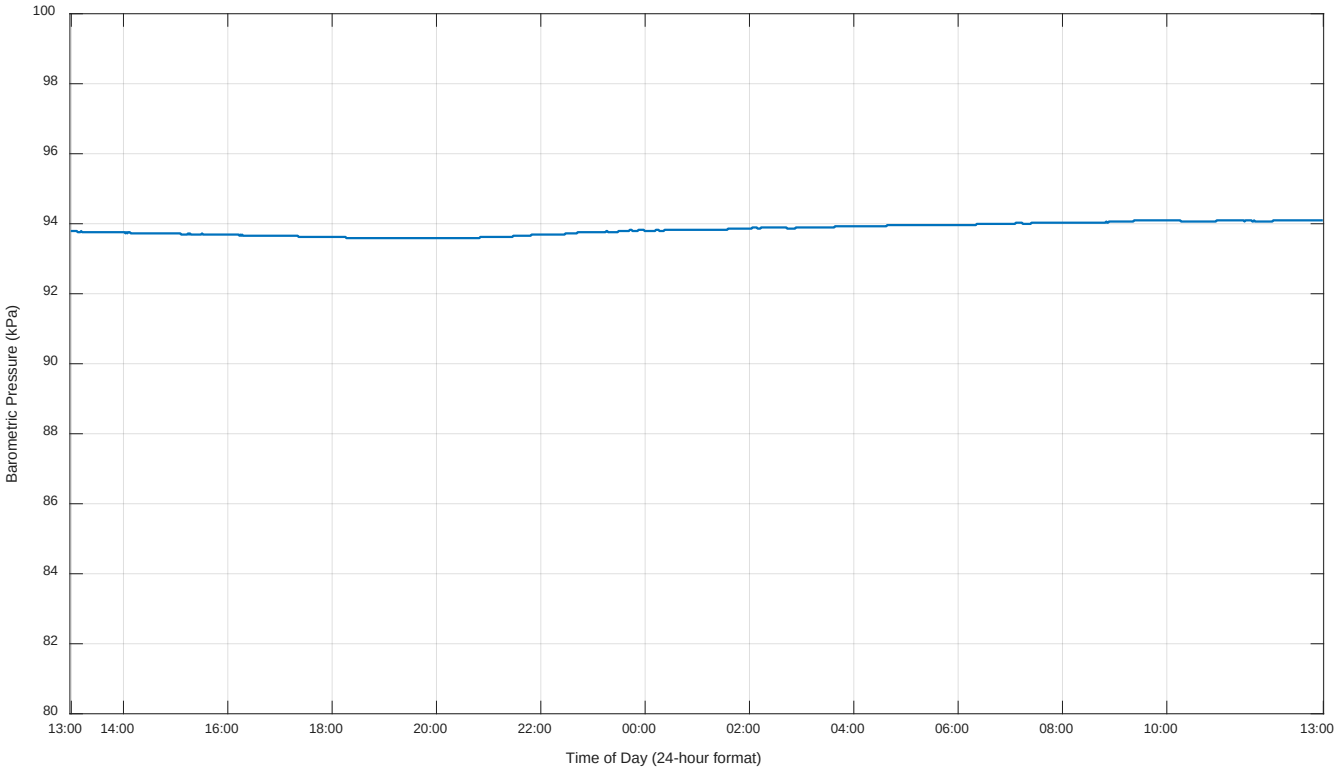
Monitored Wind Direction (July 21 - 22, 2022) at Noise Monitor Location 10



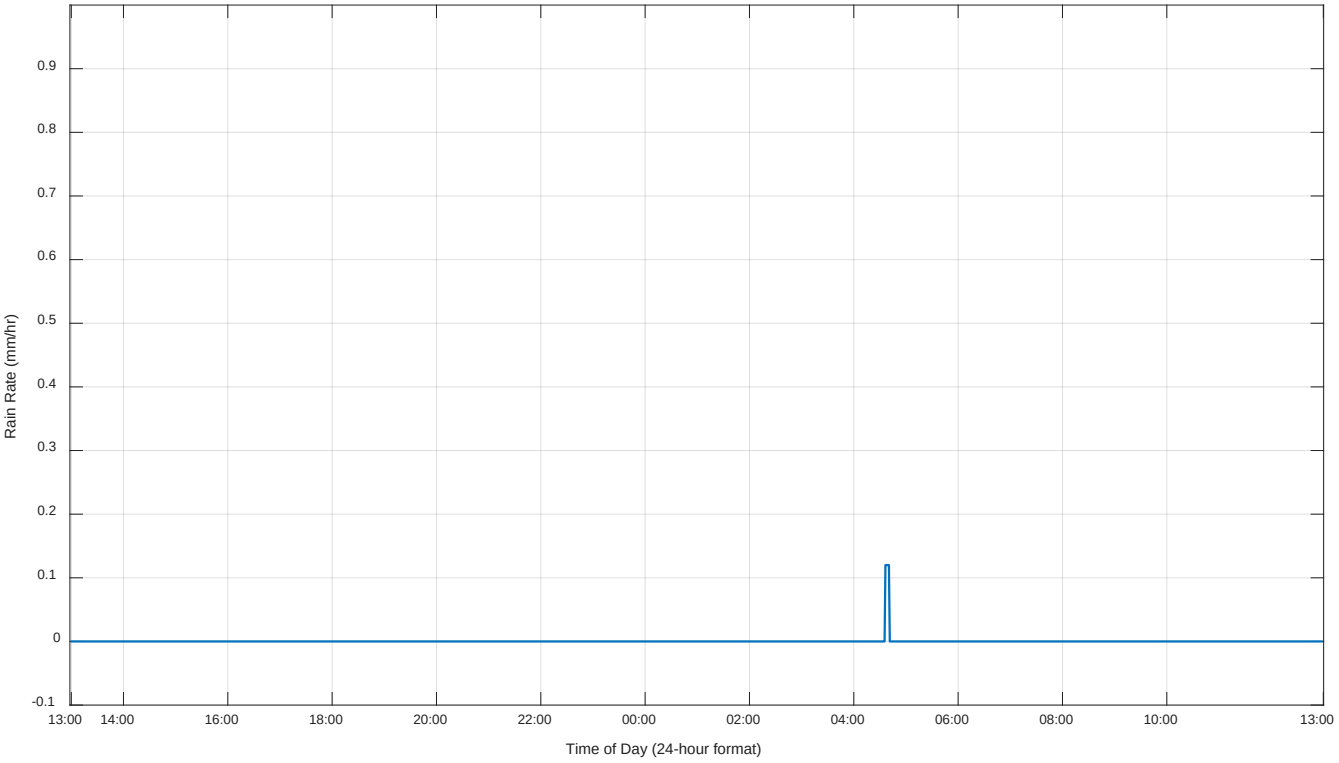
Monitored Temperature (July 21 - 22, 2022) at Noise Monitor Location 10



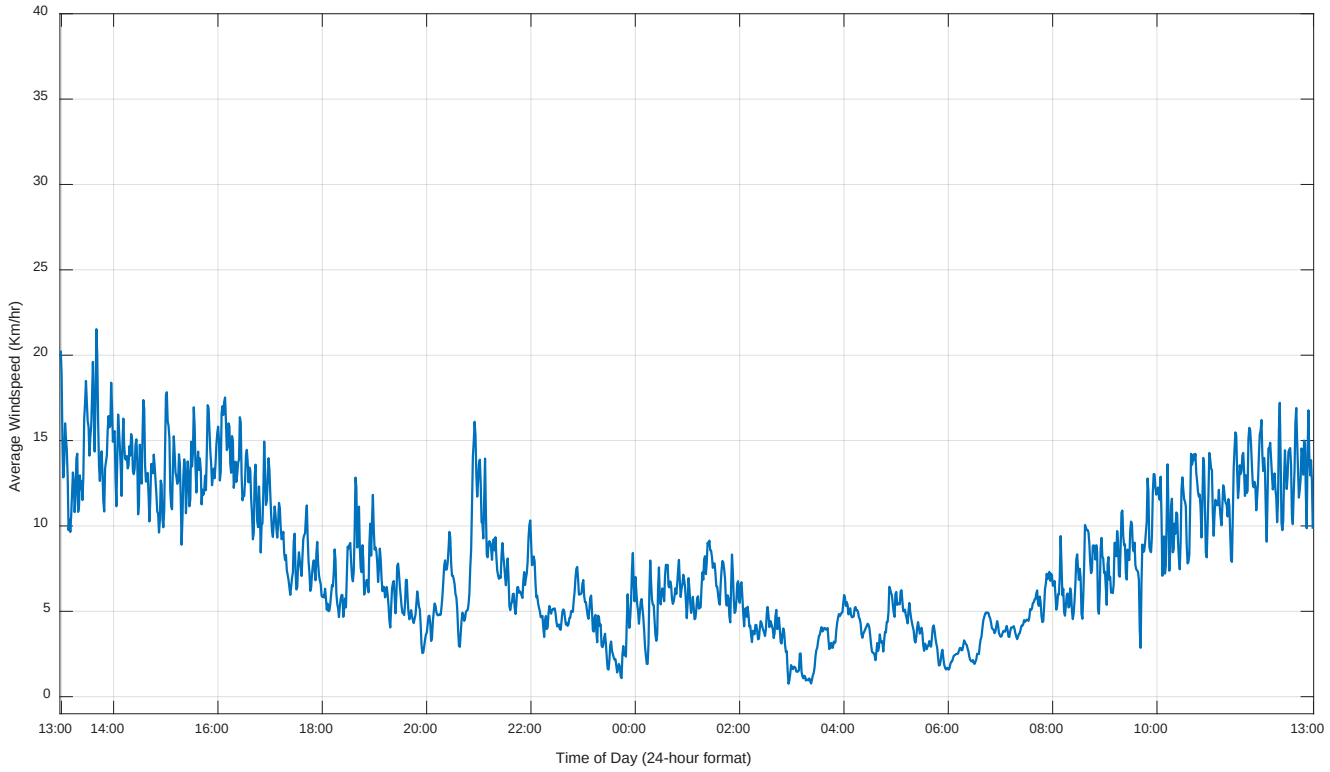
Monitored Humidity (July 21 - 22, 2022) at Noise Monitor Location 10



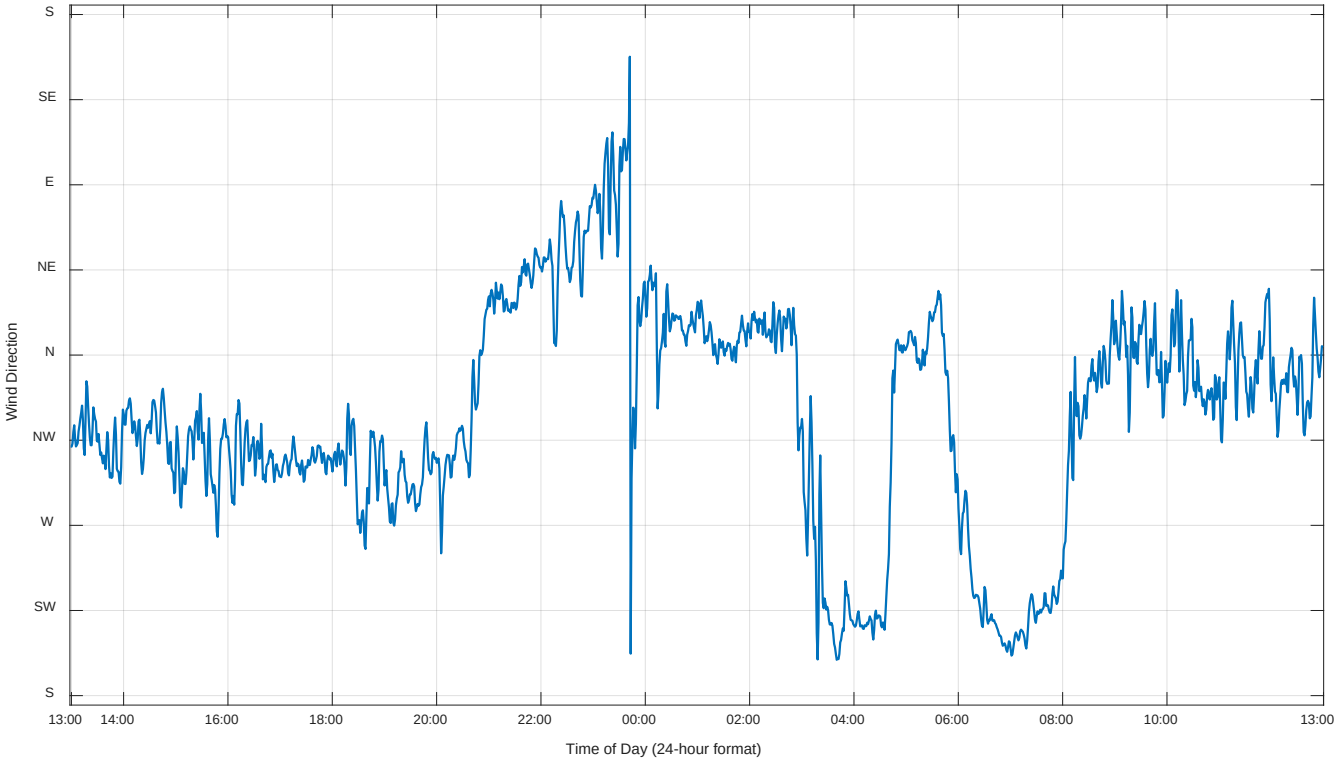
Monitored Barometric Pressure (July 21 - 22, 2022) at Noise Monitor Location 10



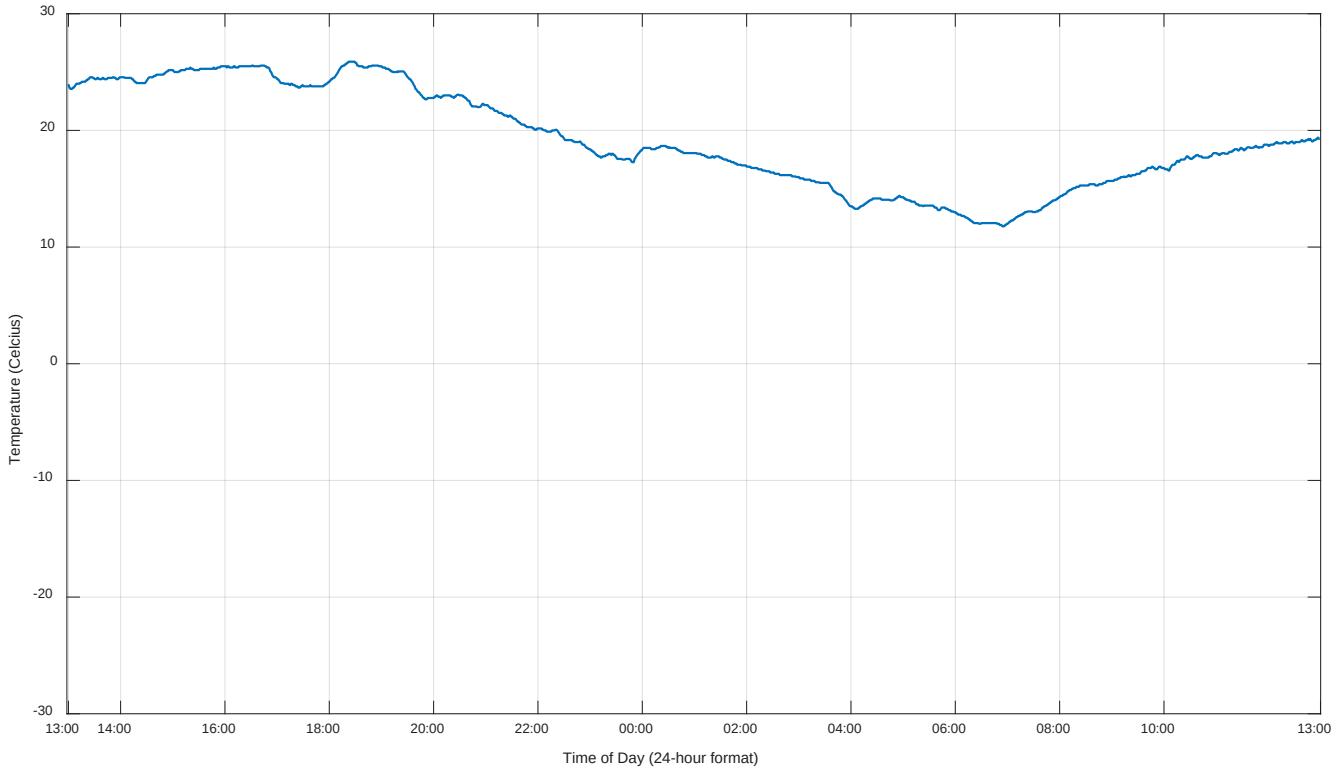
Monitored Rain Rate (July 21 - 22, 2022) at Noise Monitor Location 10



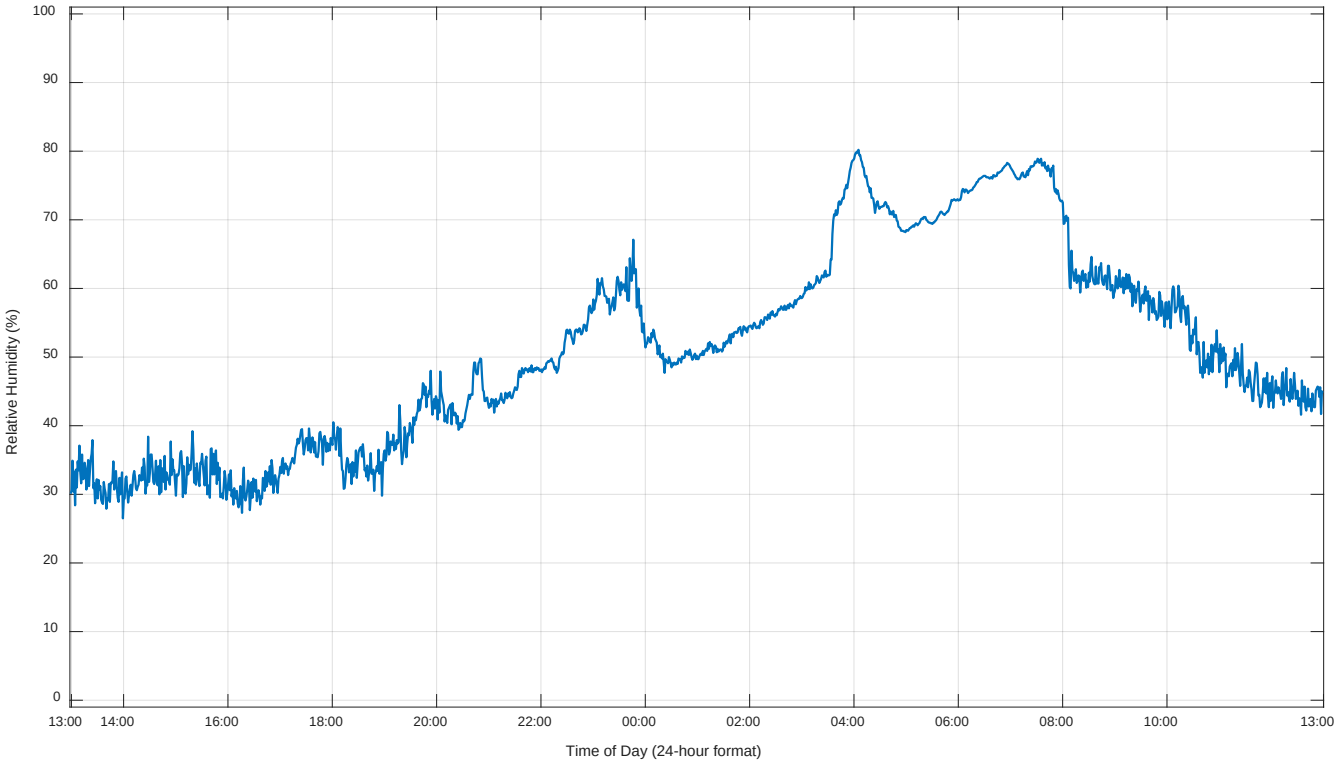
Monitored Wind Speed (July 21 - 22, 2022) at Noise Monitor Location 12



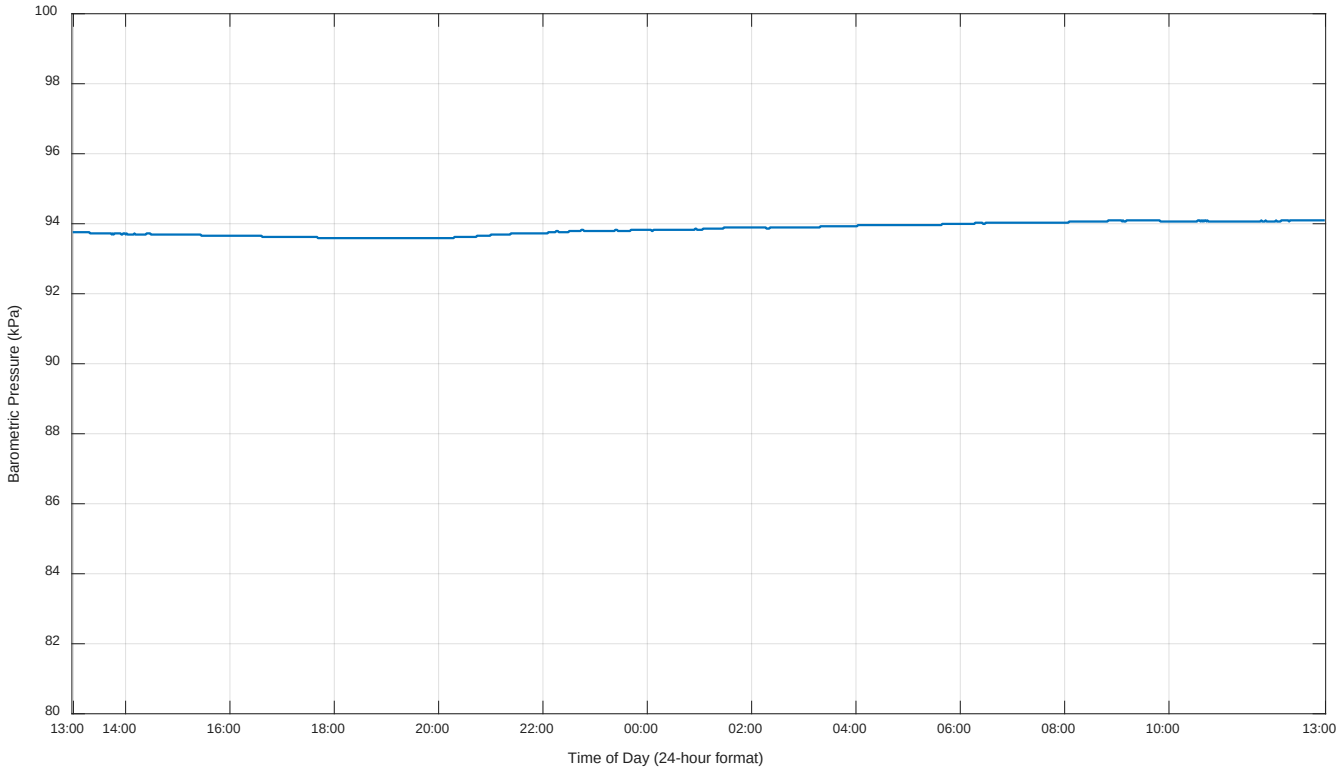
Monitored Wind Direction (July 21 - 22, 2022) at Noise Monitor Location 12



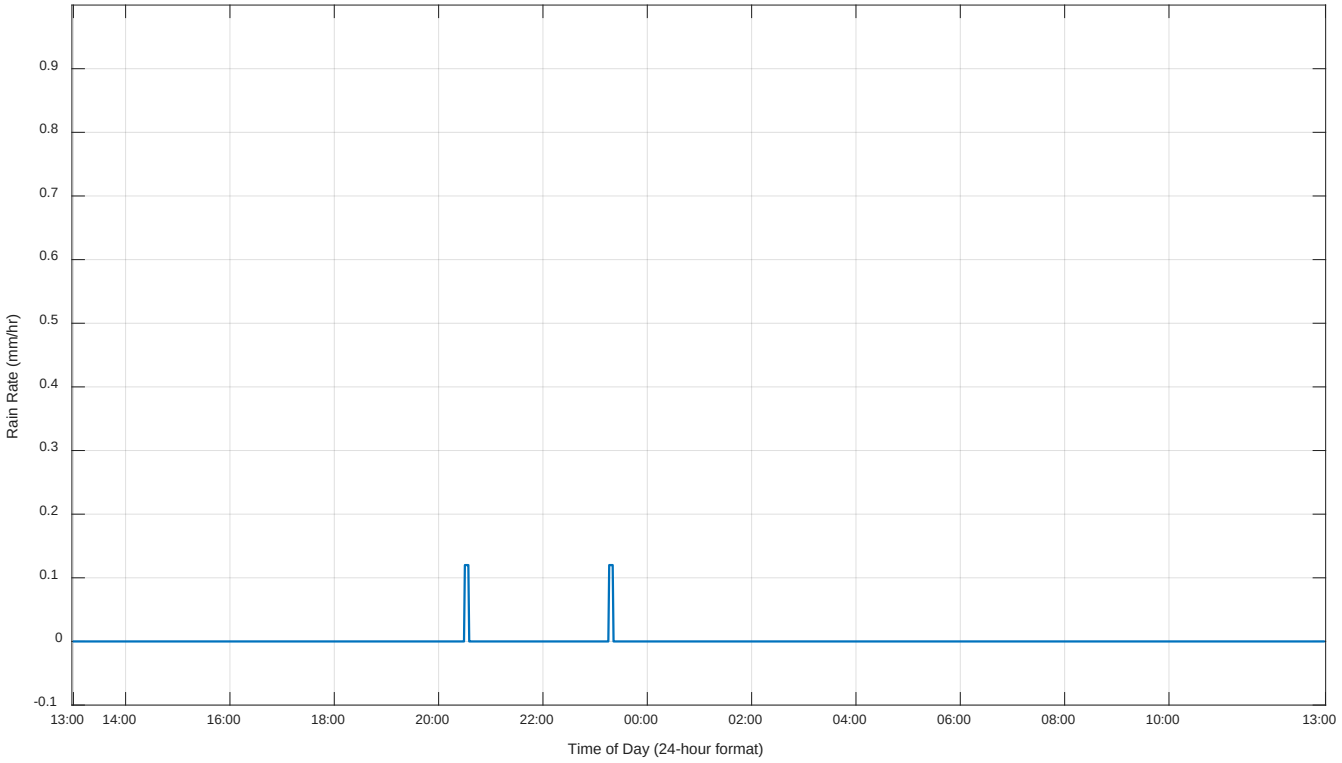
Monitored Temperature (July 21 - 22, 2022) at Noise Monitor Location 12



Monitored Humidity (July 21 - 22, 2022) at Noise Monitor Location 12

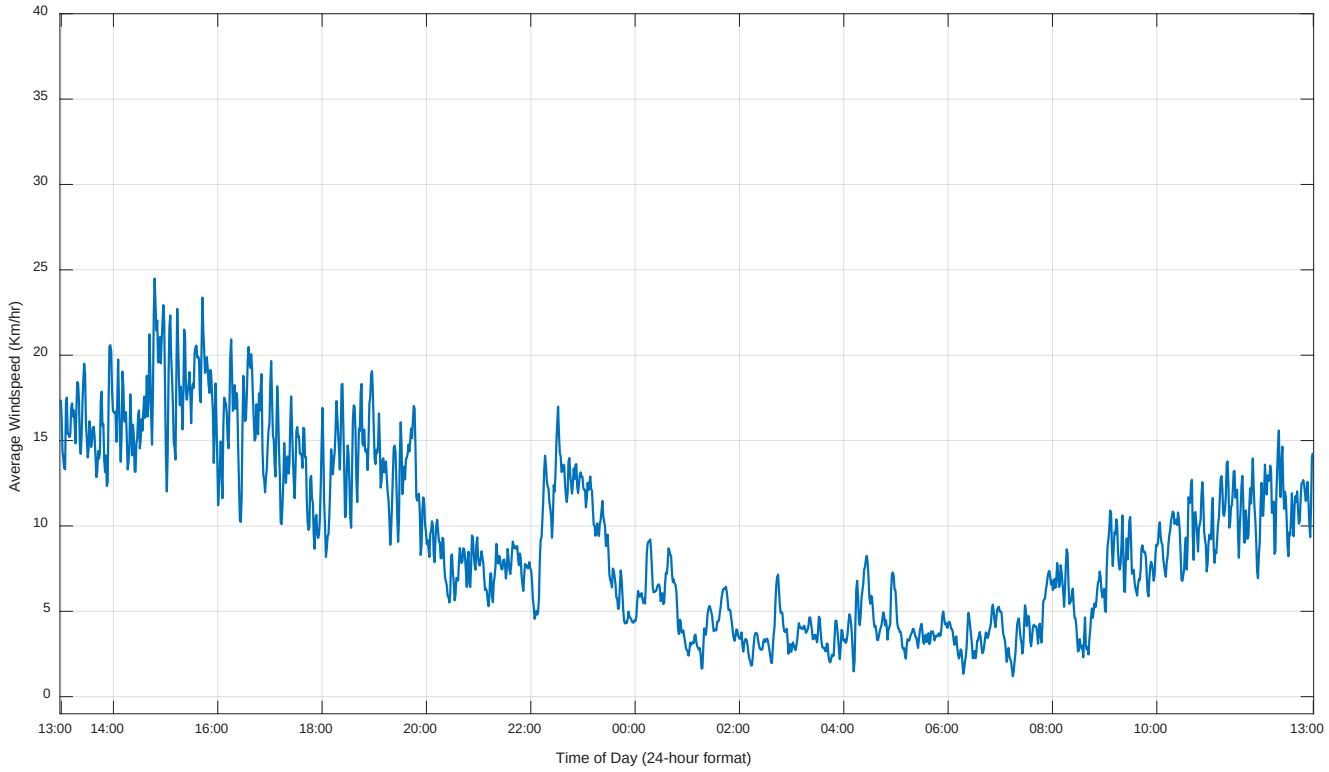


Monitored Barometric Pressure (July 21 - 22, 2022) at Noise Monitor Location 12

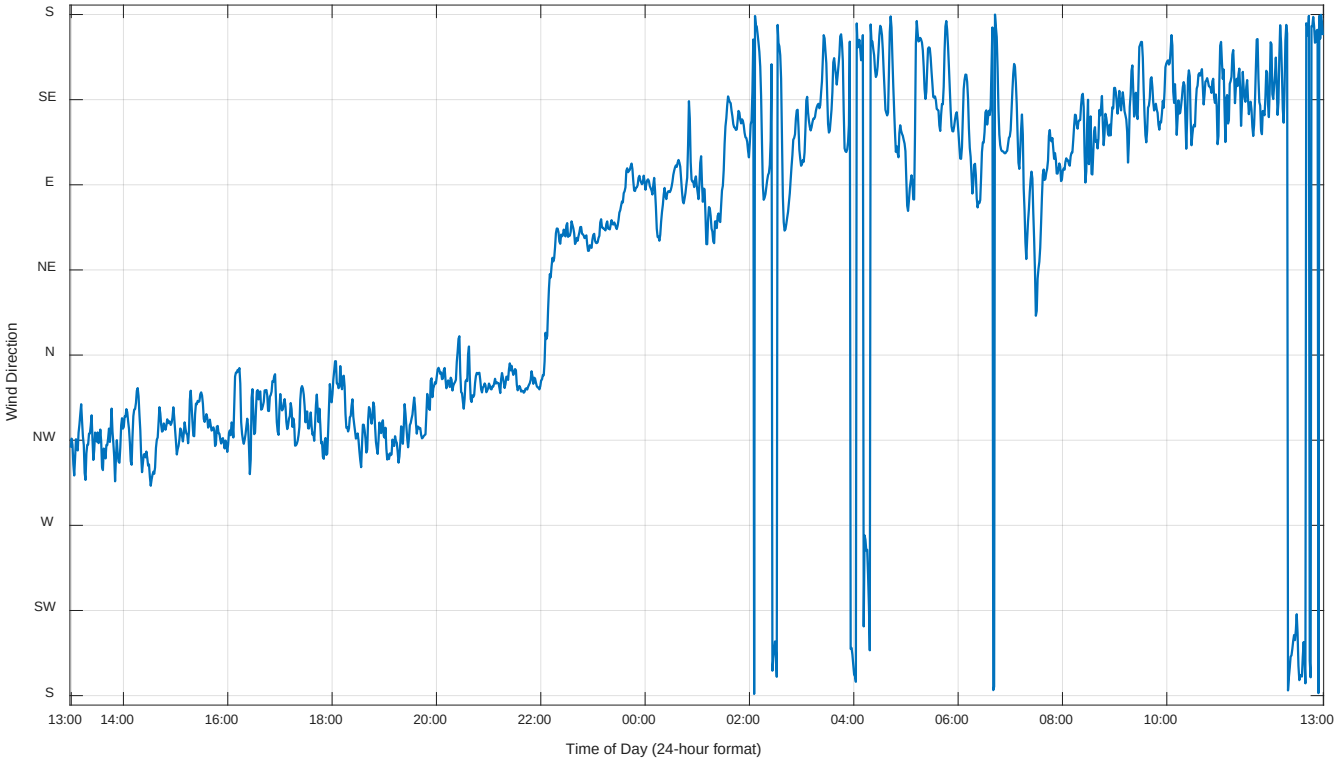


Monitored Rain Rate (July 21 - 22, 2022) at Noise Monitor Location 12

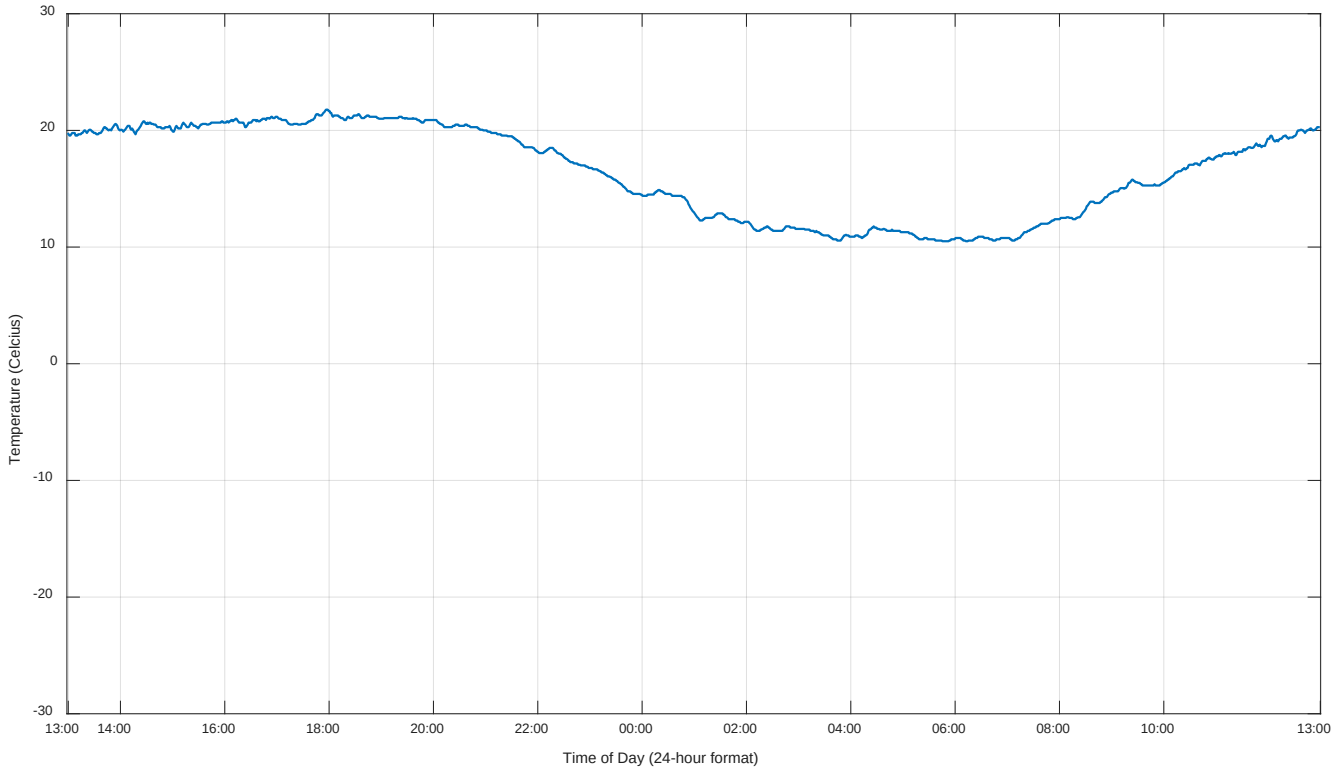
July 22 – 23, 2022 Weather Data



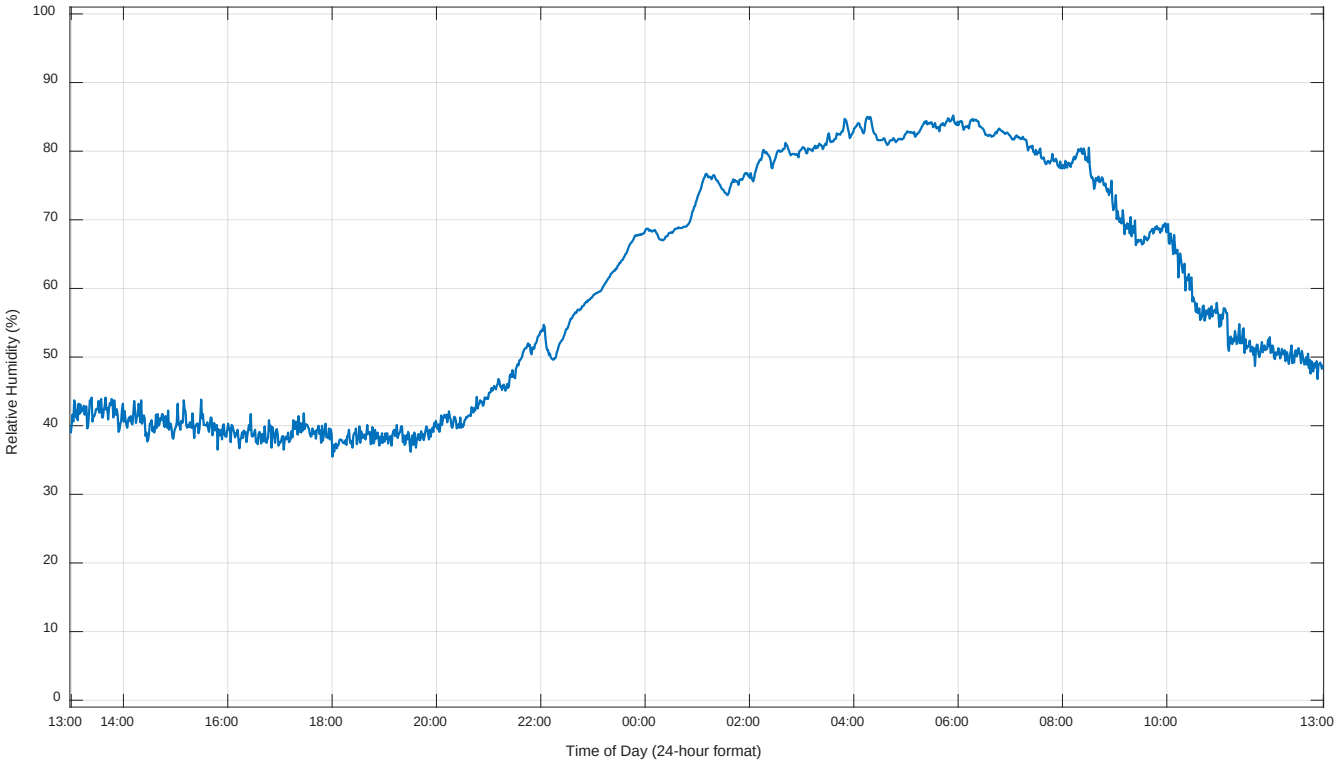
Monitored Wind Speed (July 22 - 23, 2022) at Noise Monitor Location 10



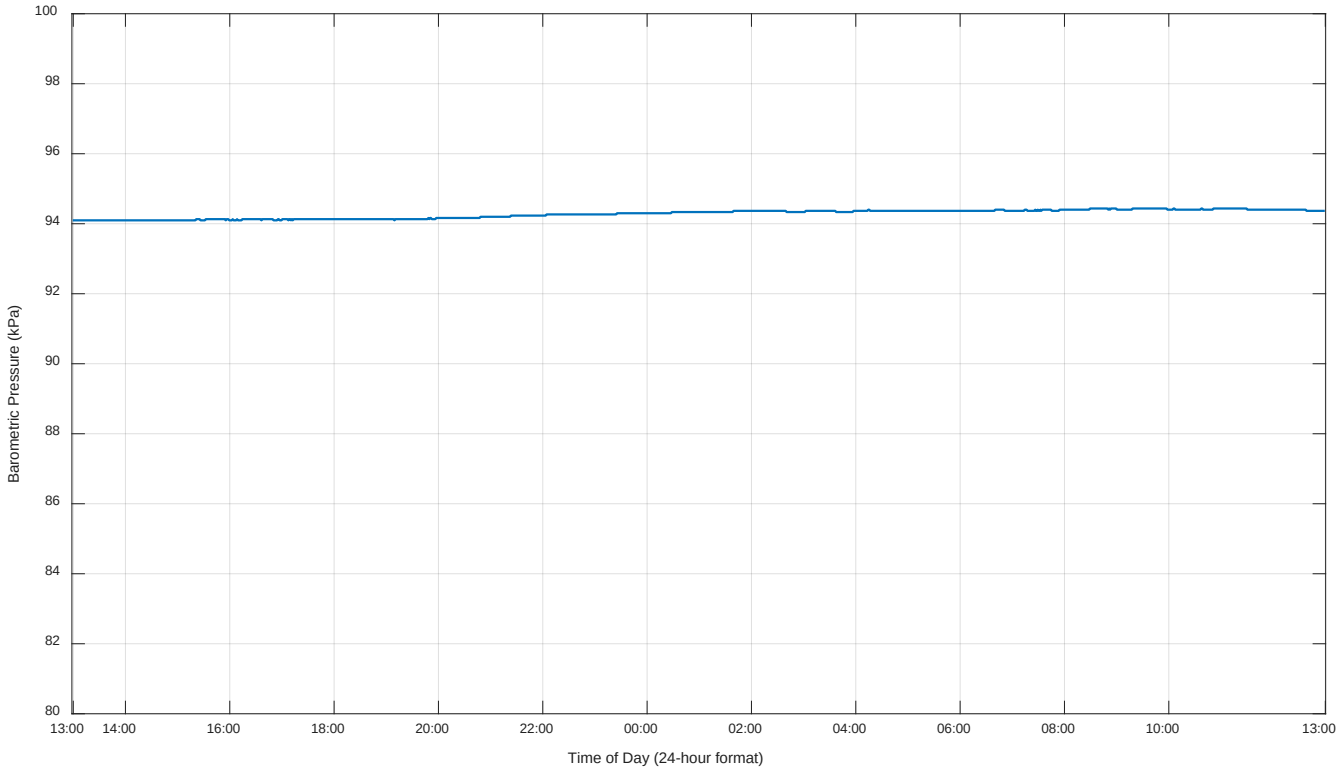
Monitored Wind Direction (July 22 - 23, 2022) at Noise Monitor Location 10



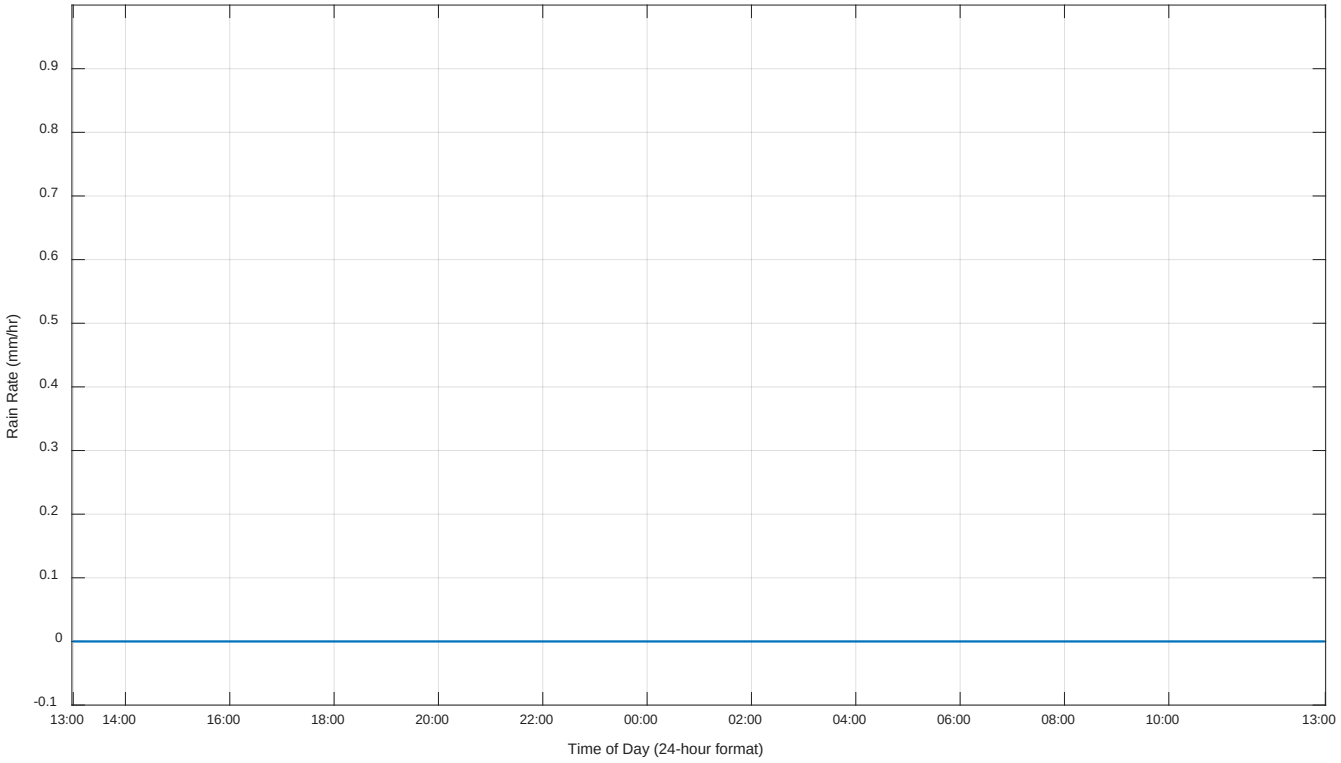
Monitored Temperature (July 22 - 23, 2022) at Noise Monitor Location 10



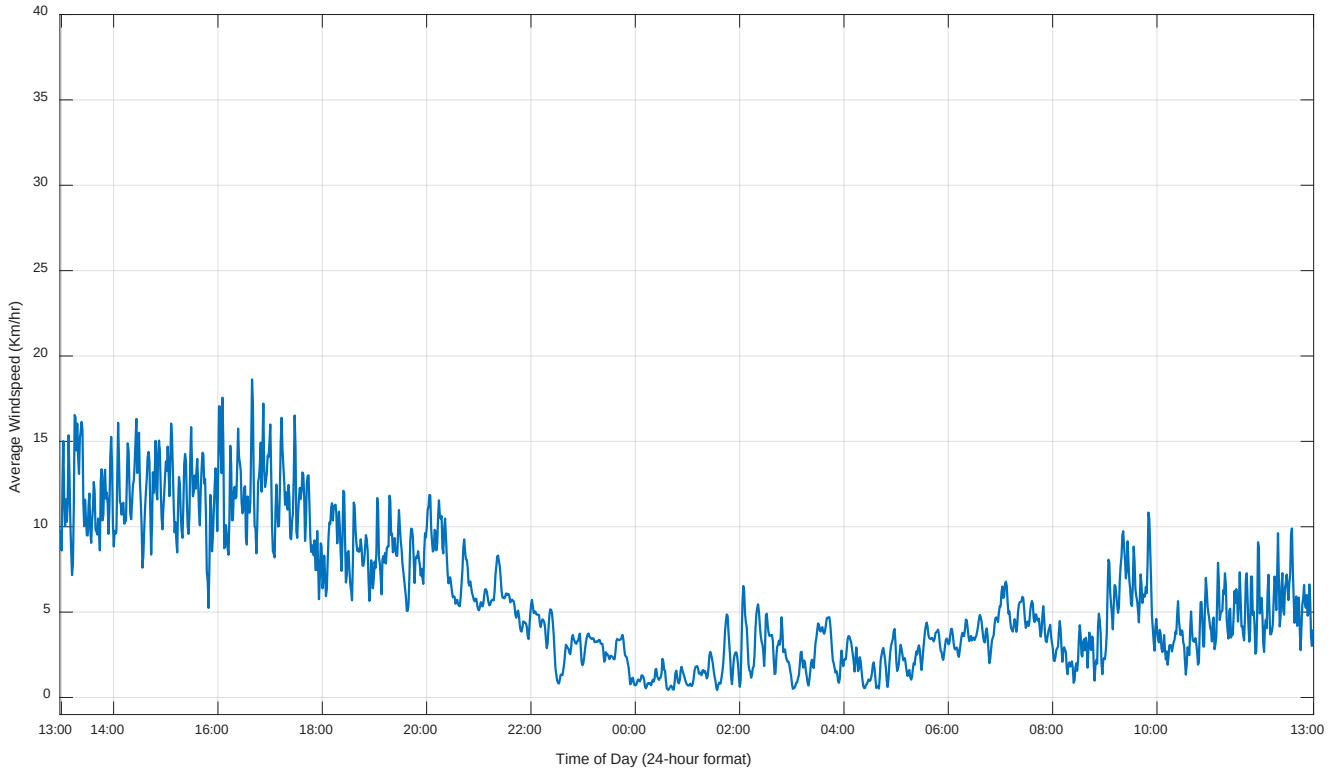
Monitored Humidity (July 22 - 23, 2022) at Noise Monitor Location 10



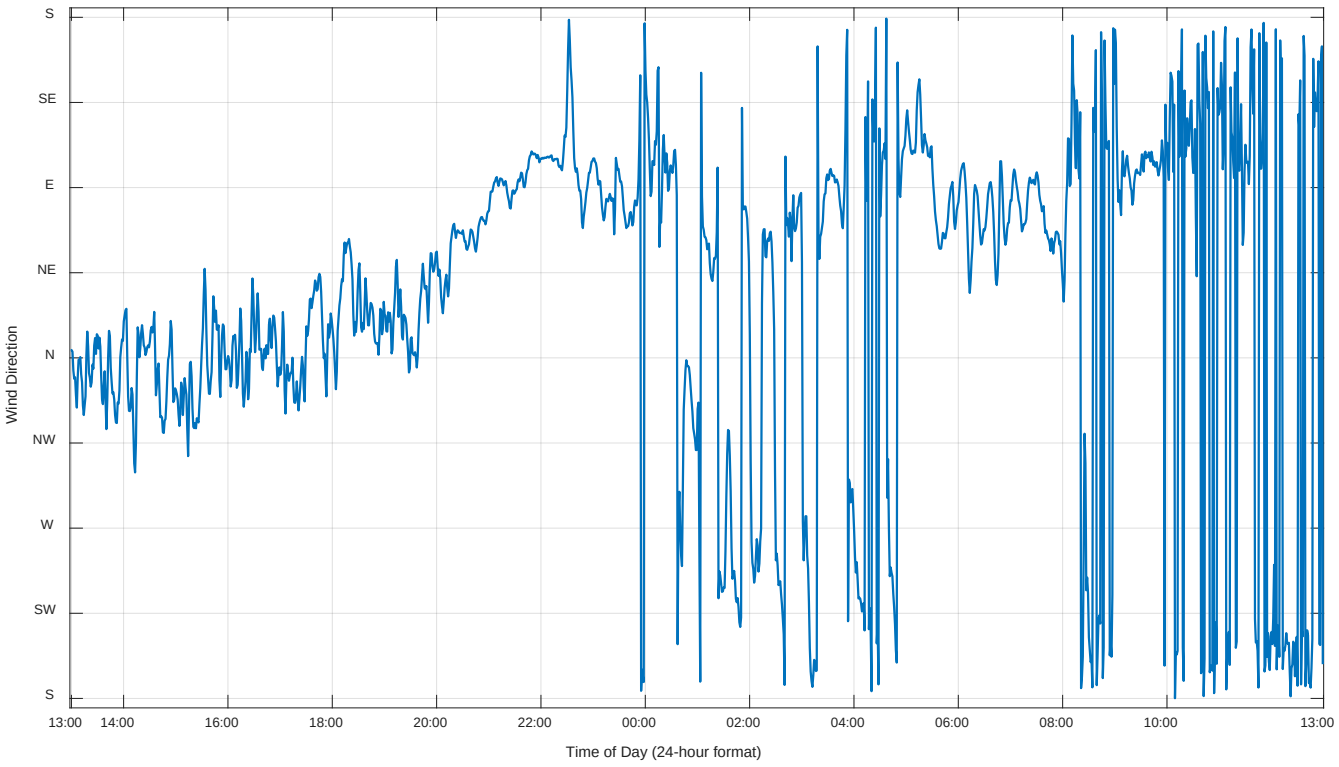
Monitored Barometric Pressure (July 22 - 23, 2022) at Noise Monitor Location 10



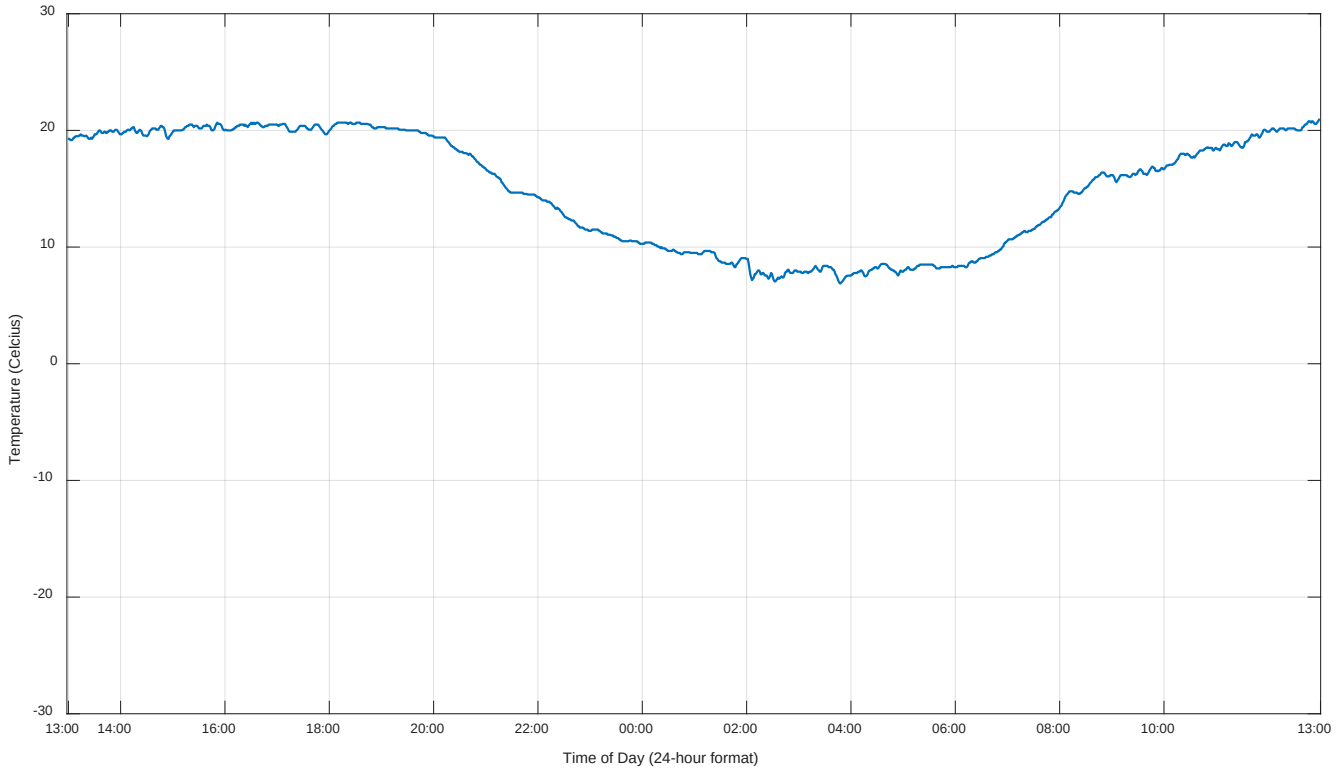
Monitored Rain Rate (July 22 - 23, 2022) at Noise Monitor Location 10



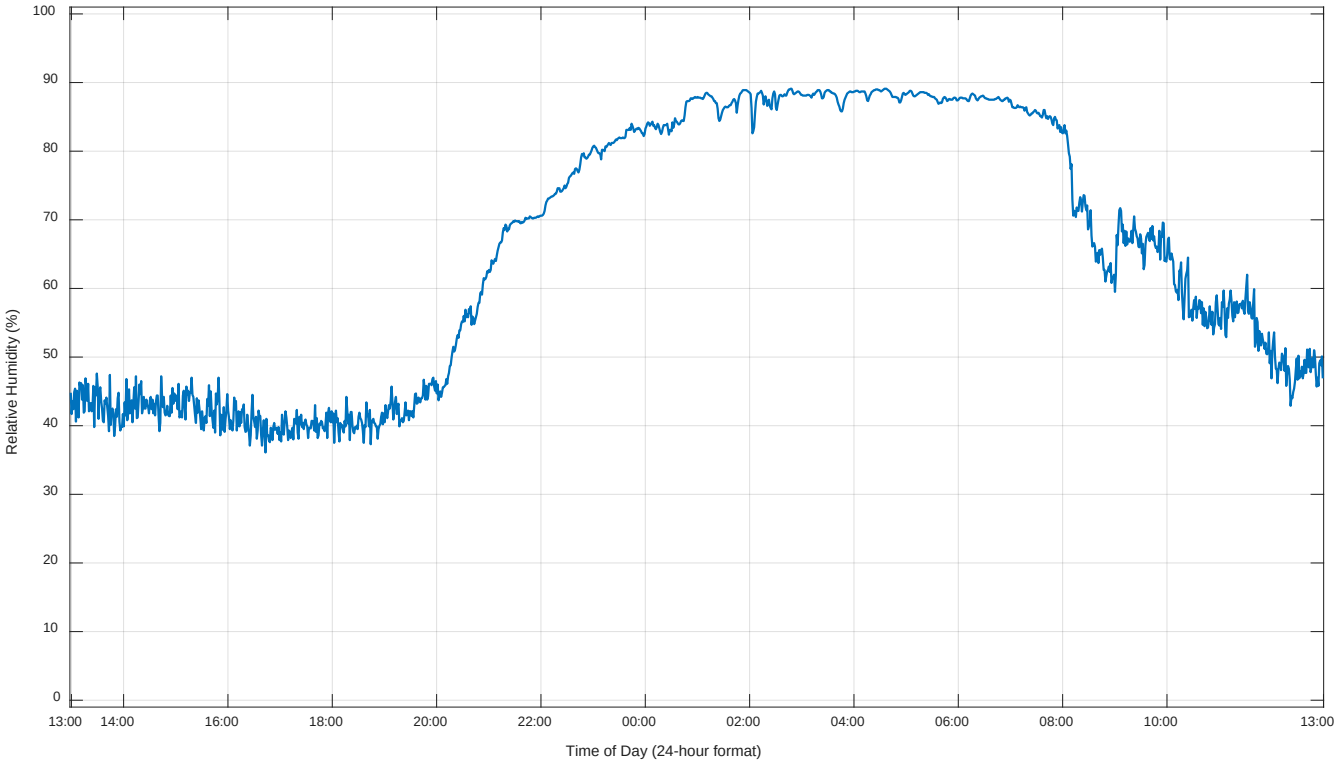
Monitored Wind Speed (July 22 - 23, 2022) at Noise Monitor Location 12



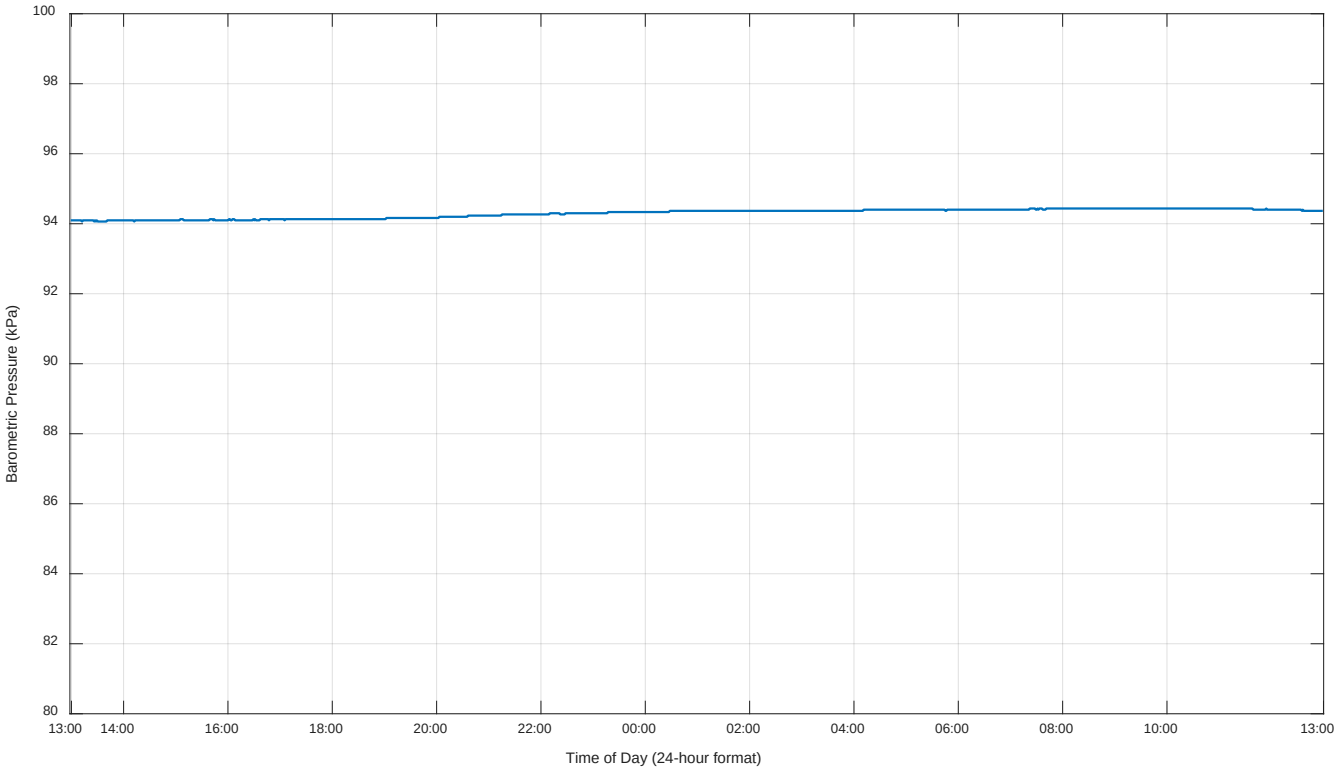
Monitored Wind Direction (July 22 - 23, 2022) at Noise Monitor Location 12



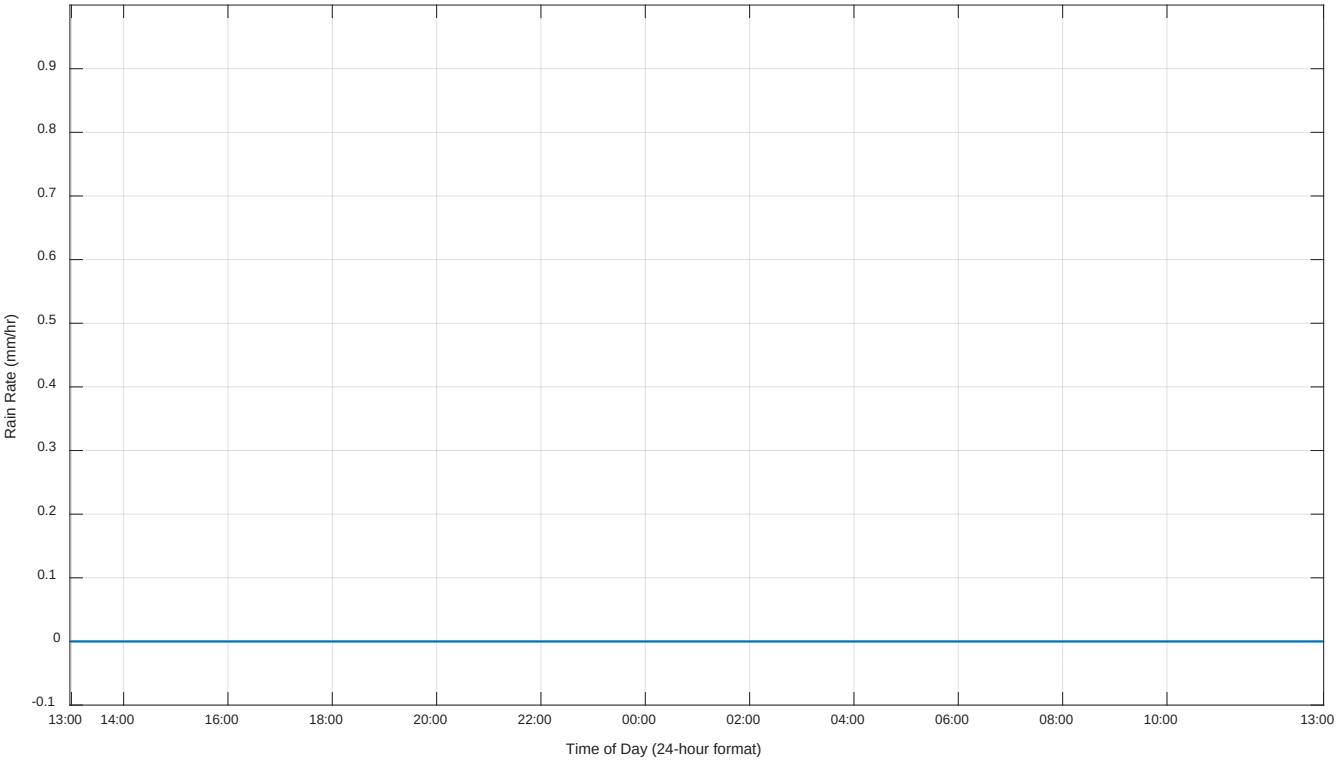
Monitored Temperature (July 22 - 23, 2022) at Noise Monitor Location 12



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

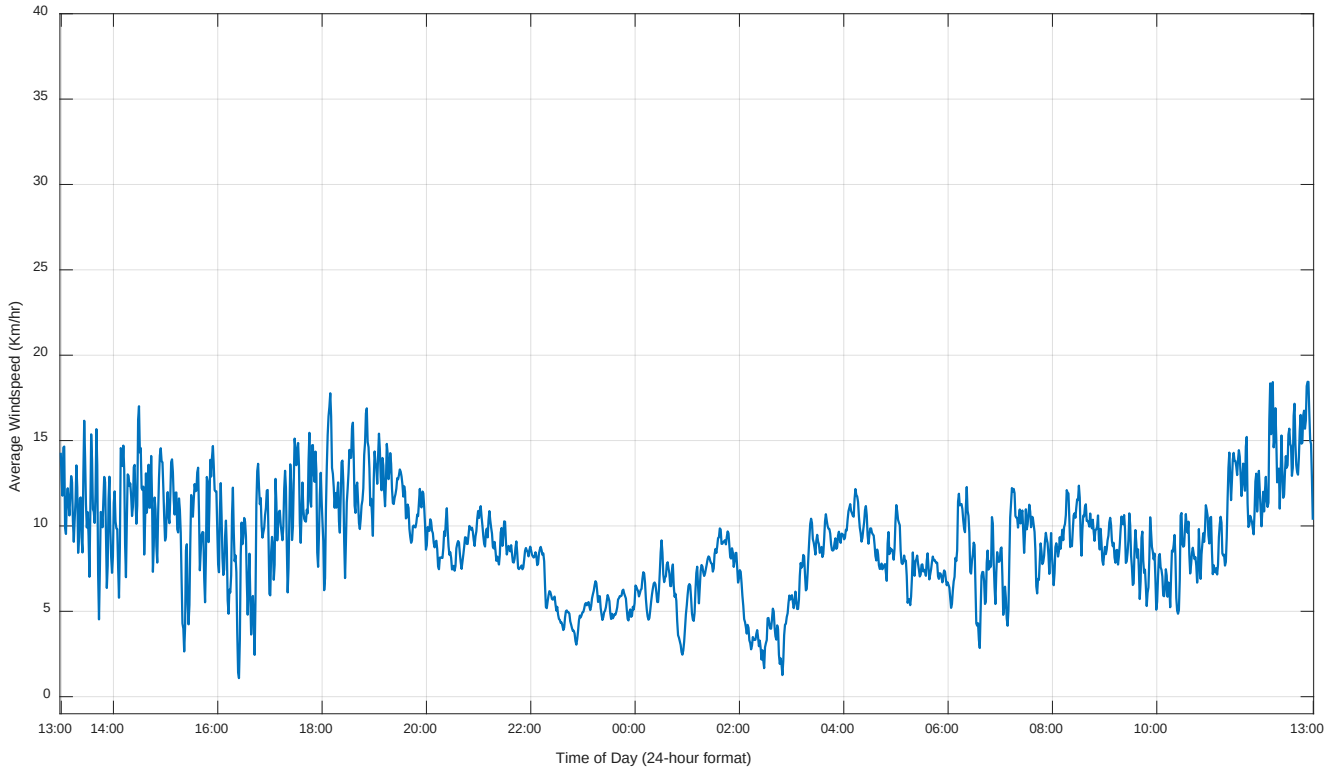


Monitored Barometric Pressure (July 22 - 23, 2022) at Noise Monitor Location 12

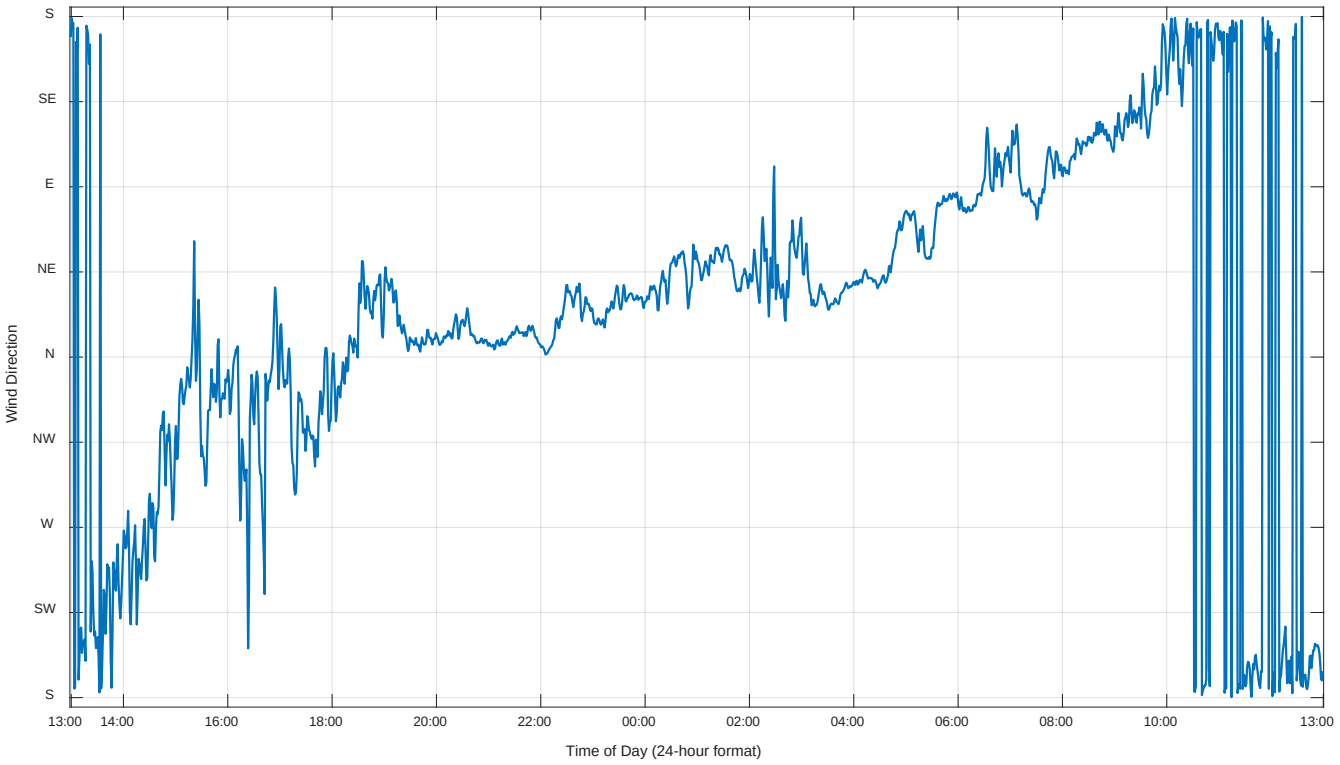


Monitored Rain Rate (July 22 - 23, 2022) at Noise Monitor Location 12

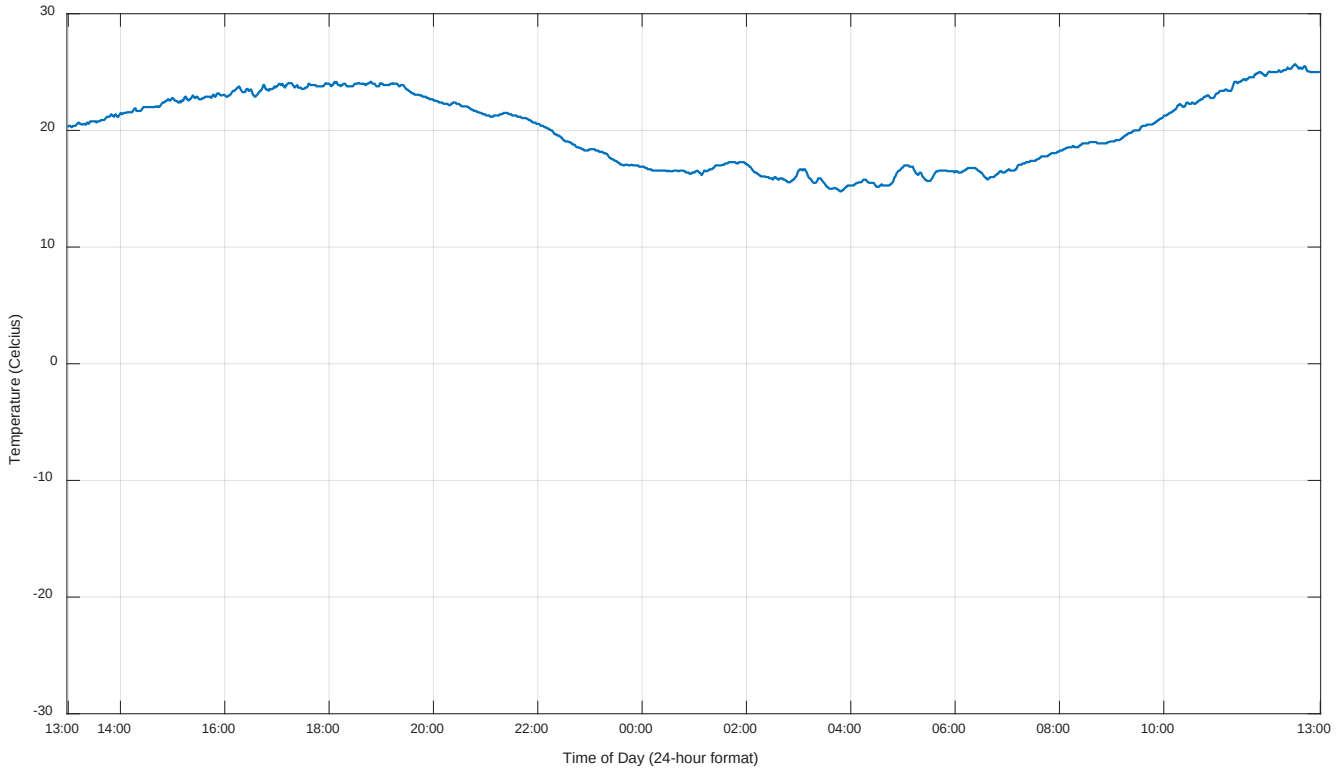
July 23 - 24, 2022 Weather Data



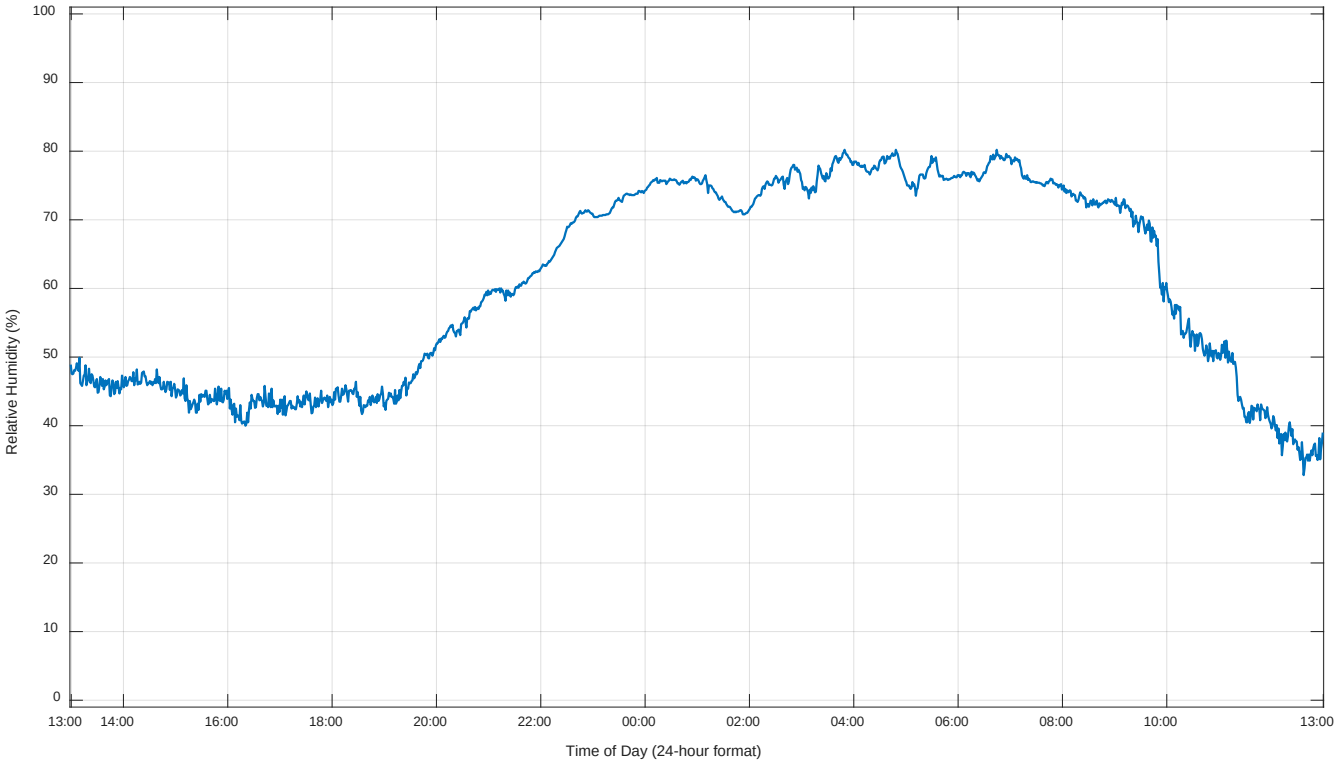
Monitored Wind Speed (July 23 - 24, 2022) at Noise Monitor Location 10



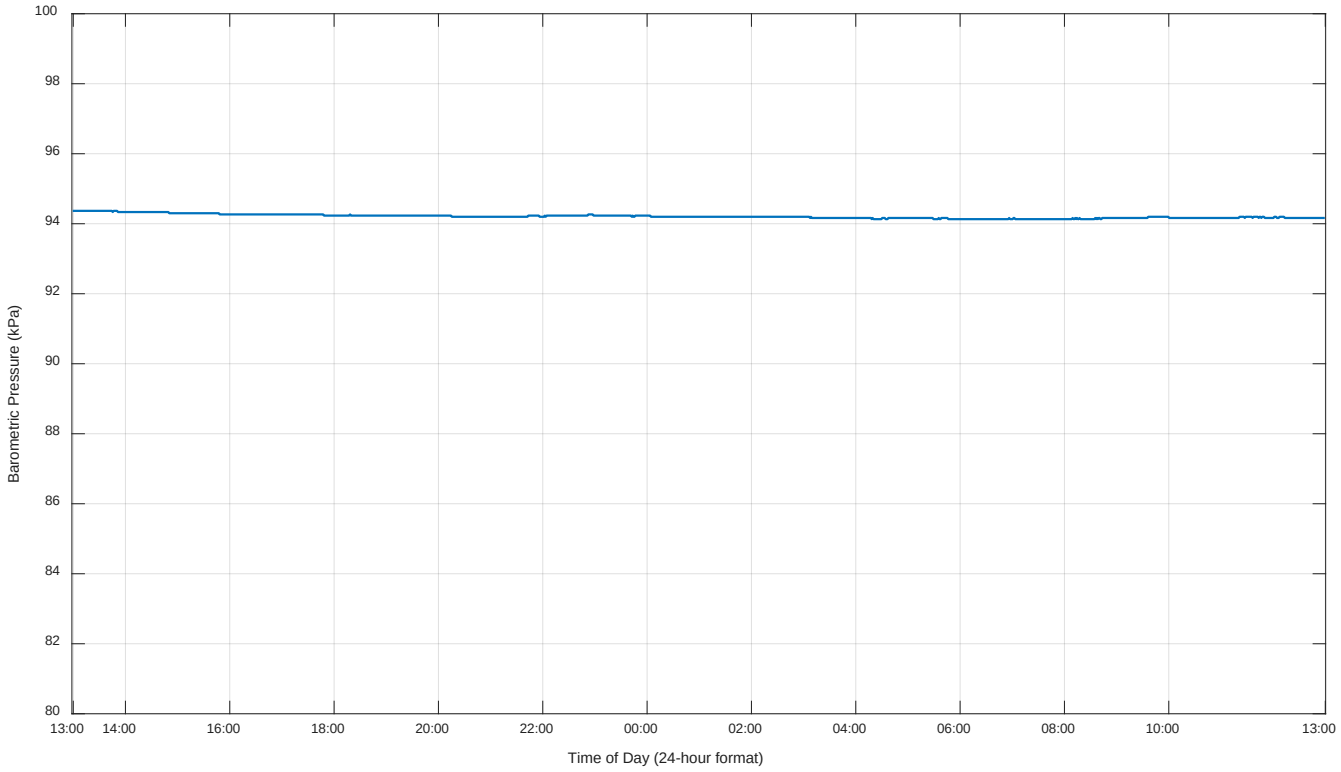
Monitored Wind Direction (July 23 - 24, 2022) at Noise Monitor Location 10



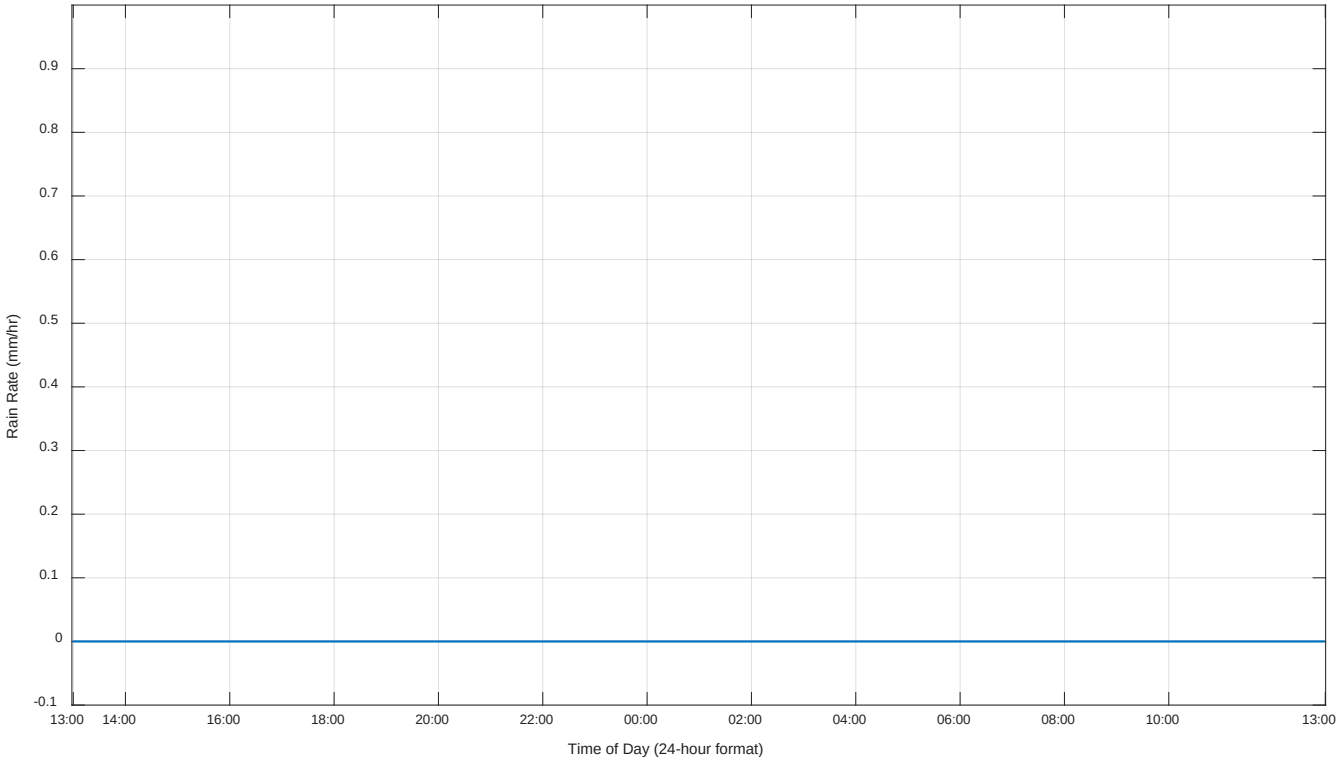
Monitored Temperature (July 23 - 24, 2022) at Noise Monitor Location 10



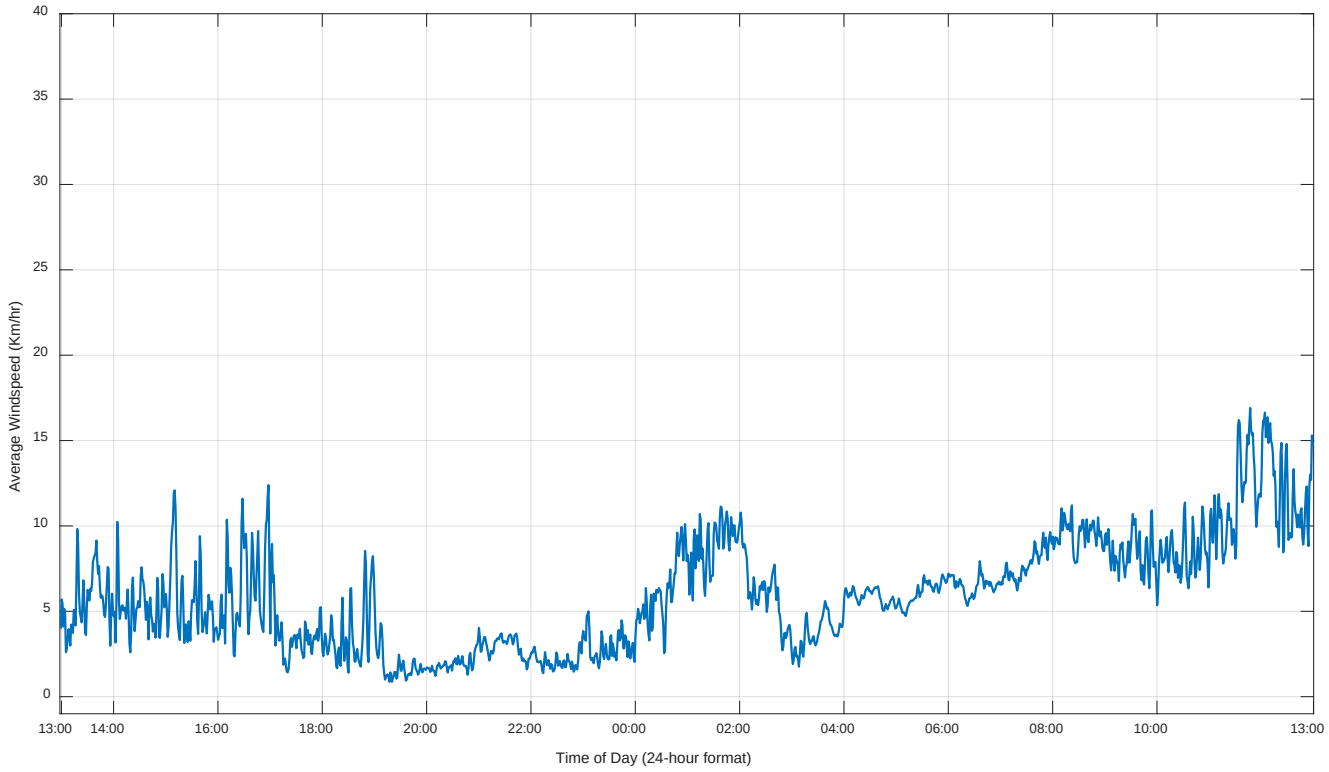
Monitored Humidity (July 23 - 24, 2022) at Noise Monitor Location 10



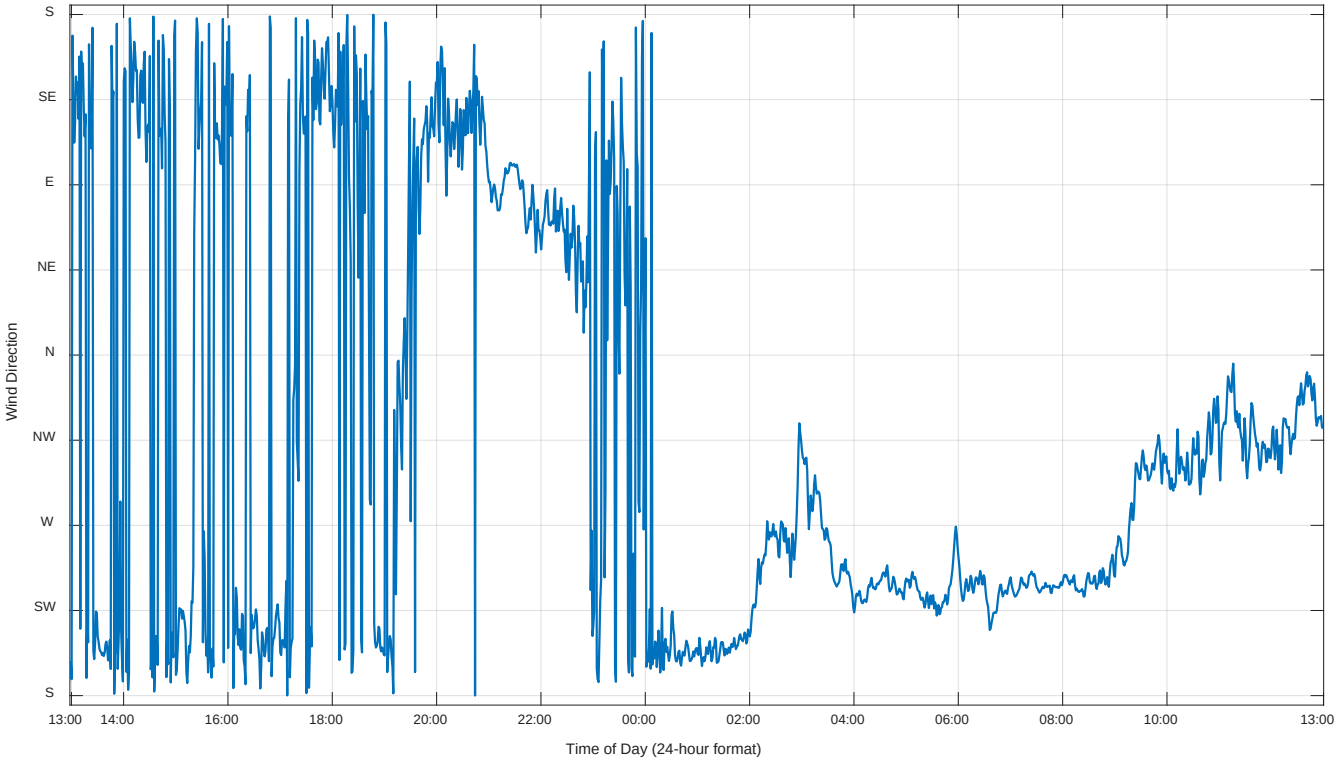
Monitored Barometric Pressure (July 23 - 24, 2022) at Noise Monitor Location 10



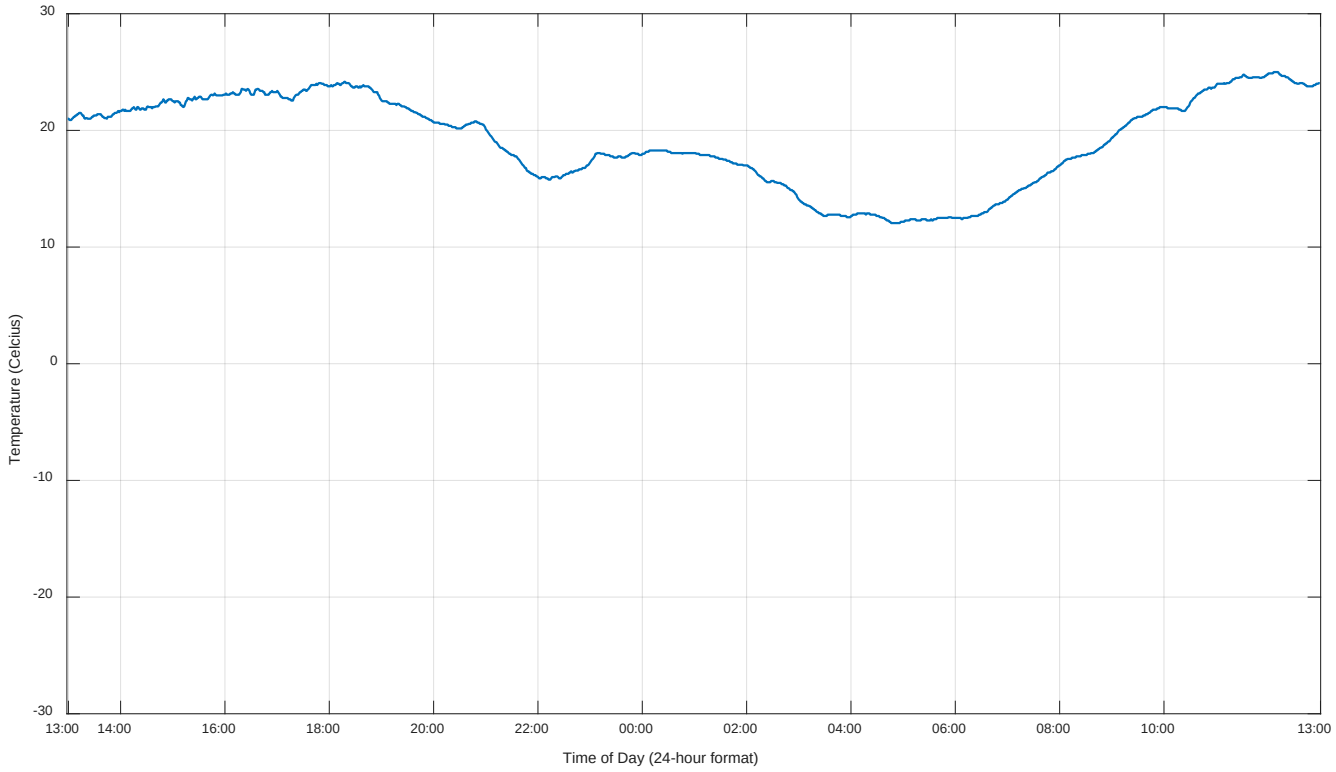
Monitored Rain Rate (July 23 - 24, 2022) at Noise Monitor Location 10



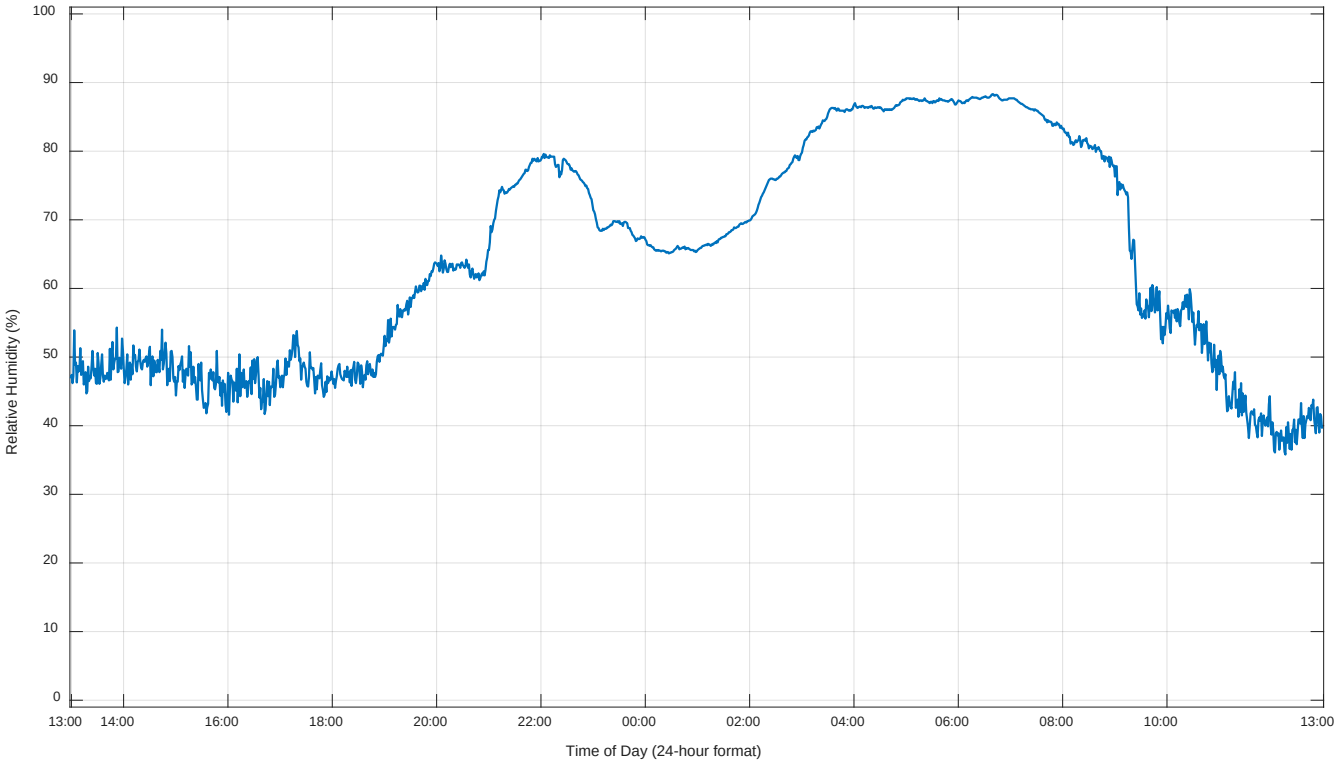
Monitored Wind Speed (July 23 - 24, 2022) at Noise Monitor Location 12



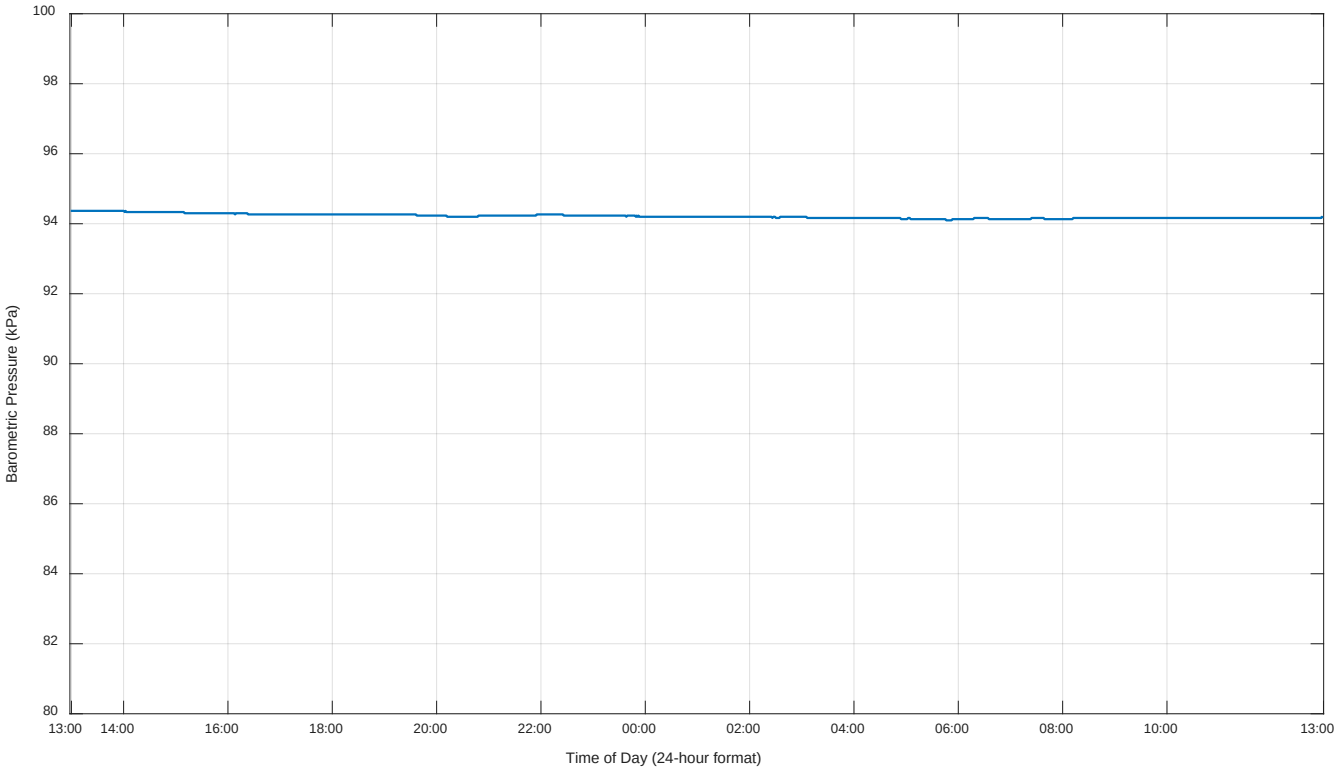
Monitored Wind Direction (July 23 - 24, 2022) at Noise Monitor Location 12



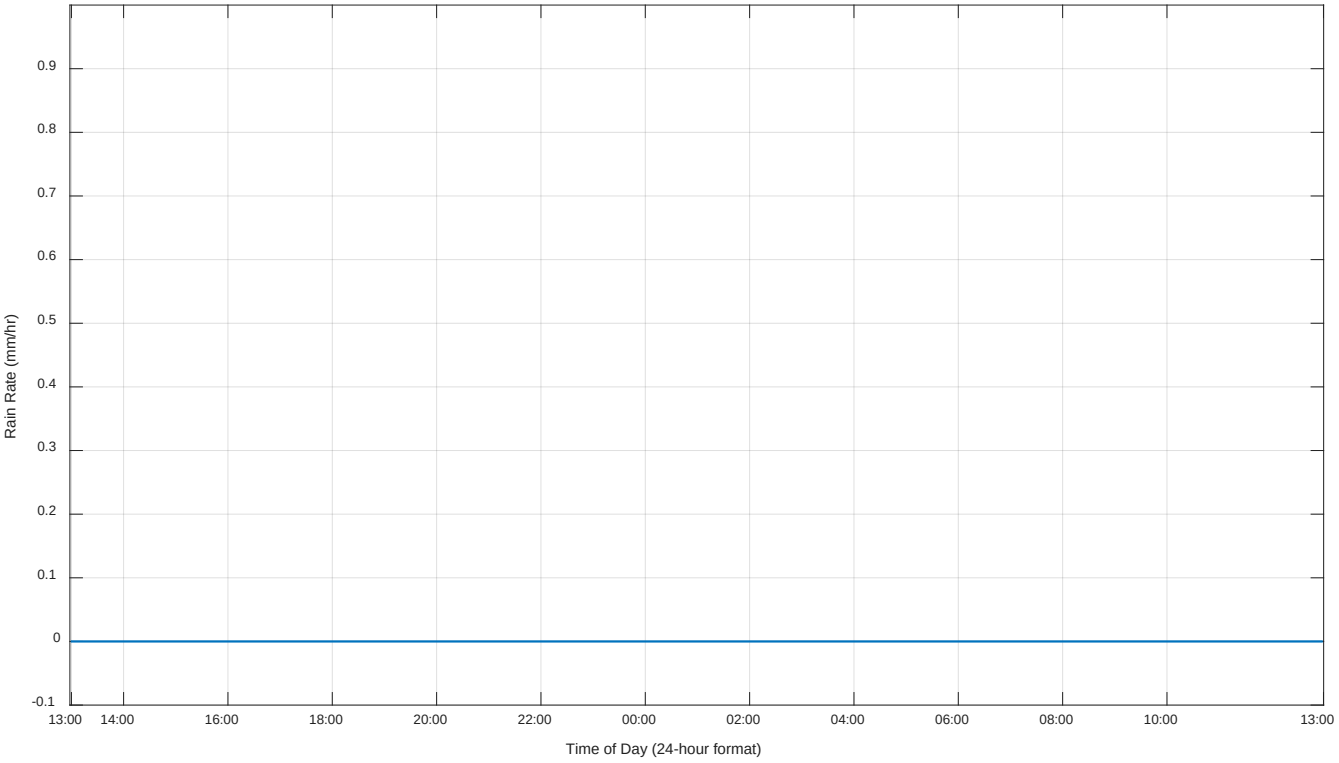
Monitored Temperature (July 23 - 24, 2022) at Noise Monitor Location 12



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



Monitored Barometric Pressure (July 23 - 24, 2022) at Noise Monitor Location 12



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