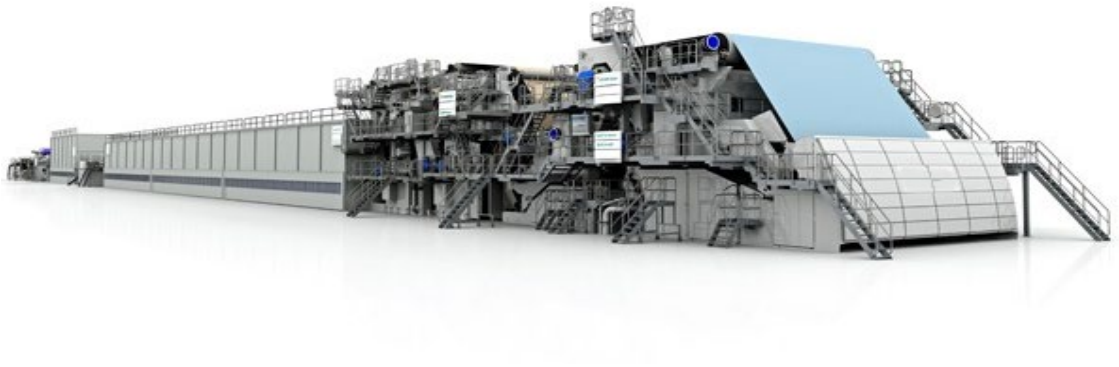
Opal Pty Ltd

Botany Paper Mill – EPL Compliance
November 2023 Quarterly noise monitoring report



26 February 2024

Doc no. 16002-QM-RP-30-0

Opal Pty Ltd
Botany Paper Mill - EPL Compliance

Title	November 2023 quarterly noise monitoring report
Document no.	Doc No. 16002-QM-RP-30-0
Revision	0
Date	26 February 2024
Author	Scott Hughes
Reviewer	John Hutchison
File name	16002-QM-RP-30-0 Quarterly Monitoring Report - November 2023.docx

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Glossary

Acoustic and vibration related terms:

- **Acoustic Spectrum:** A representation of a sound sample (usually short term) of the amount of energy or sound level per frequency.
- **Ambient Noise**: Ambient noise encompasses all sound present in a given environment, being usually a composite of sounds from many sources near and far.
- **dB(A):** A unit of sound measurement which has frequency characteristics weighted so that it approximates the response of the human ear to sound waves
- **Heavy Vehicle**: A truck, transport or other vehicle with a gross vehicle weight above a specified level (for example: over 8 tonnes)
- L_{A90}: Is the noise level that is exceeded 90 per cent of the measurement time. This parameter is commonly referred to as the background noise level
- L_{Aeq}: Noise level that represents the energy average noise from the source during a specified time period, and is the equivalent continuous sound pressure level for a given period
- $L_{Aeq(15hr)}$: The Leq noise level for the period from 7 am to 10 pm.
- $L_{Aeq(9hr)}$: The Leq noise level for the period from 10 pm to 7 am.
- **NCA**: Noise Catchment Area. Grouping dwellings or receivers together in terms of similar noise environment.
- **Noise barrier**: Generally a wall or an earth mound that obstructs or restricts the passage of sounds waves from a noise source
- **Noise Logger**: A data logging (data and audio in some cases) which records noise. Usually used for unattended noise monitoring of background or ambient noise.
- **NML**: Noise Management Level as detailed in the NSW Interim Construction Noise Guideline. The NML is the noise goal for construction activities.
- **Octave Bands**: Sounds that contain energy over a wide range of frequencies are divided into sections called bands. A common standard division is in 10 octave bands identified by their center frequencies 31.5, 63, 250, 500, 1000, 2000, and 4000 Hz
- **RBL**: Rating Background Level is the overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used for determining the appropriate construction noise criteria.
- **RNP**: Road Noise Policy (OEH, 2011)
- **Sound Level Meter**: An instrument consisting of a microphone, amplifier and data analysis package for quantifying and measuring noise.
- **Sound Power Level** (Lw): Sound power level or acoustic power level is a logarithmic measure of the sound power in comparison to a specified reference level.
- **Sound Pressure Level** (SPL or Lp): The level of noise, usually expressed in dB(A), as measured by a standard sound level meter.

1. Introduction

1.1 Background

OPAL operates a paper mill at its Botany site in Sydney, NSW. The paper mill is subject to operational noise conditions set out in the Ministers Conditions of Approval (MCoA) (including subsequent modifications) and the Environment Protection Licence (EPL) No. 1594.

As part of the EPL, a quarterly monitoring survey undertaken at receivers surrounding the site is to be prepared to demonstrate compliance with set noise limits. In addition to the monitoring survey results, Condition U1 of the EPL requires a summary of predicted noise levels from the validation noise model to be included in the quarterly monitoring report.

This report covers the November 2023 – January 2024 quarter. At the time of monitoring, the B9 paper machine was operating at normal production capacity. Validation modelling that covers normal production has been used to predict noise impacts from the Opal site and confirmed in the Noise Model Validation Report (HW October 2022). There are additional updates or changes to the site layout since the validation model was completed.

1.2 Objective

This report addresses operational licence conditions relating to measurements of the quarterly monitoring of the noise environment around the Opal site, i.e. Condition M6.1 and M6.2 of EPL 1594. These require:

- M6.1 The licensee must undertake noise monitoring at least once every three months to check compliance with the noise limits specified in Condition L4.1.
- M6.2 All monitoring required by this licence must be undertaken in accordance with Australian Standard 2659.1 – 1998: Guide to the use of sound measuring equipment – Portable sound level meters, or any revisions of that standard which may be made by Australian Standards Authority, and the compliance monitoring guidance provided in the NSW Industrial Noise Policy.

1.3 Operational noise limits

Operational noise limits for the new Opal Paper Mill are detailed in condition L4.1 of EPL 1594 and Condition 10 of the MCoA. These have been replicated in **Table 1**.

Since the inception of the monitoring program dating back to as early as 2012, the same receiver locations have been used. This last noise monitoring survey only had access to 5 locations with the residence located at R3 (Murrabin Avenue) no longer available for survey access.

Table 1 Operational noise limits

ID	Location	Day $L_{Aeq,15min}$, dB(A)	Evening $L_{Aeq,15min}$, dB(A)	Night $L_{Aeq,15min}$, dB(A)	Night L_{Amax}, dB(A)
R1	Cnr McCauley Street & Australia Avenue	46	45	43	55
R2	Australia Avenue	45	45	43	55
R3*	Murrabin Avenue*	46	45	43	55
R4	Partanna Avenue	42	41	41	55
R5	Corner of Partanna and Moorina Avenues	42	42	39	55
R6	Moorina Avenue	43	43	39	55

*Receiver location no longer accessible

Regular quarterly monitoring surveys have demonstrated that direct measurement of Opal's contribution to the noise environment is not possible because noise emissions from the site are generally lower than the ambient measured L_{Aeq} noise levels, which masks the actual noise from the Opal site.

Ambient noise levels measured at the receiver locations using the L_{Aeq} noise parameter are therefore not a true representation of noise from the Opal site but a combination of influences from all local noise sources.

The influence from Opal on the local noise environment may be better described using the L_{A90} statistical parameter. This additional parameter has been presented in the results summary to be considered in conjunction with the L_{Aeq} noise level when assessing compliance of the Opal site.

During the night periods fewer extraneous noise influences are present providing lower overall noise levels in the area. Under these conditions constant noise sources such as Opal operations are more likely to be apparent in the background noise levels noting that the emission levels from the site remain relatively constant throughout the day, evening, and night.

Maximum noise levels from the site are also captured under the EPL requiring a limit to L_{Amax} noise emissions of 55 dB(A) at all locations during the night period. An L_{Amax} parameter for the monitoring period simply records the loudest noise level measured during the night assessment period and does not distinguish the source of noise.

Maximum noise events are not generally observed from the Opal site unless equipment has broken down or maintenance activities are underway and neither of these scenarios reflect normal operation of the plant.

Maximum noise levels recorded during these surveys are, therefore, more representative of the broader noise environment which makes the distinction between external sources and Opal's emissions difficult. Furthermore, maximum noise levels measured during the monitoring surveys often, if not always, exceed the maximum noise limit from the site hindering the identification of Opal's contribution.

The addition of the L_{A1} noise level statistic is proposed in conjunction with the L_{Amax} parameter to compliment the maximum noise profile and provide a better representation of environmental noise influences.

An L_{A1} noise level above the night criteria would not necessarily indicate an exceedance of the Opal noise goals however, long term measurements of this parameter may be useful in identifying changes to the local noise profile which can then be compared to any changes in functional operation within the Opal site.

2. Existing environment

The site is located on the boundary of an industrial area around Port Botany and is bordered to the north and east of the site by residential properties as illustrated in Figure 2-1. The local noise environment beyond the Opal boundary varies throughout the day depending on the contribution of sources including trucks on Botany Road, aircraft, port noise, local business activities on McCauley Road, and local traffic movements.

Noise emissions from the paper mill do not vary significantly as the operation of the plant has been demonstrated to be consistent and reliable.

The source of maximum noise level events in the area are typically from the local road network and aircraft fly-overs. The nature of the processes within the Opal site means that there are typically no maximum noise level events associated with production activities. The exception to this may occur when equipment is not functioning properly during a breakdown or during maintenance activities, both of which are not common scenarios.

The influence of weather conditions on noise levels are apparent as seasonal variations which are forming data trends in the long-term monitoring for the local area.

2.1 Receiver locations

The EPL specifies six locations for quarterly monitoring. These are illustrated in Figure 2-1 and described further in **Table 2**. The receiver at R3 is not currently being monitored due to access restrictions.

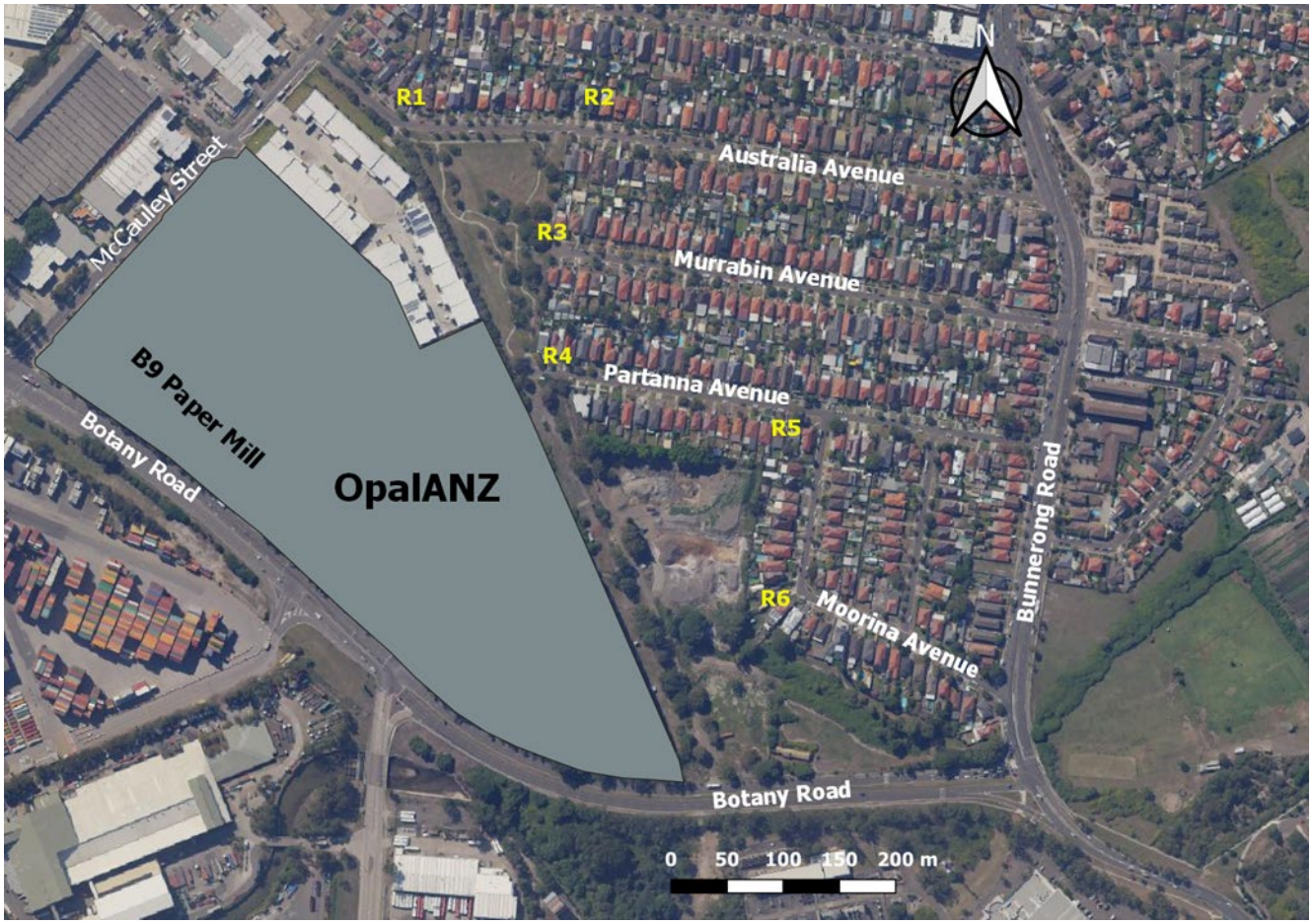


Figure 2-1 Site location and compliance monitoring locations

Table 2 Description of monitoring locations

Monitoring location	Description
R1	This location has a large degree of acoustic shielding from local noise sources due to the development of a warehousing facility on the corner of McCauly Avenue and Australia Avenue. The noise environment at this location is heavily influenced by traffic on McCauley Street, Perry Street and Beauchamp Road. Local industrial noise from Raymond Avenue is also audible during the day and night.
R2	This receiver is located opposite the bottom apex of the Purcell Park on Australia Avenue. At this location the residents have a clear line of sight to the paper mill. Noise walls have less effectiveness for the residences due to the large separation distances. Noise from port activities also has less shielding from the Opal site. Background noise levels are heavily dominated by road traffic noise from all sources.
R3*	This receiver is located adjacent to Purcell Park on Murrabin Avenue. At this location the residents have a partial line of sight to the paper mill although they are located closer to the boundary noise wall than receivers at R2. Noise from port activities are partially shielded by the Opal site. Background noise levels are heavily dominated by road traffic, aircraft and industrial noise from all surrounding sources.
R4	The receivers at Partanna Avenue are physically closest to the Opal site but have the benefit of significant shielding of operational activities from the noise barrier located on the northern boundary. Road traffic noise contributes to background noise for this receiver. Some construction work was in progress at the park adjacent to the property during the monitoring period.
R5	Furthest location from the Opal site, a higher degree of influence from Botany Road, Bunnerong Road and the port. Noise from the Opal site is generally inaudible at this location although significant noise from the Opal site has been observed here during adverse meteorological conditions.
R6	In this location receivers are well shielded from operational noise from the Opal site due to the presence of the noise barrier and No. 8 paper machine building. Noise levels at this location are heavily influenced by local bird colonies, port noise, traffic on Botany road and traffic on Bunnerong Road. Construction of industrial units on the adjacent vacant land (Hanger block) is well underway at the time of writing this report.

*Receiver location currently unavailable

2.2 Monitoring limitations

The local noise environment has been a feature of the area for many years and the total measured noise levels at monitoring locations are only partly due to Opal site operations. Direct monitoring of Opal noise emissions at the nominated receiver locations over time has demonstrated that specific contribution from Opal cannot be provided with any certainty due to the influence of other audible noise sources adjacent to the site.

Using intermediate monitoring locations to determine Opal's contribution is not a practical option for determining compliance. This is primarily due to the influence of the existing local noise environment, the shielding from Opal's boundary noise walls and the proximity of the receiver locations, some of which are already within 40 metres of the site boundary.

To provide more detail on the compliance monitoring, EPL 1594 has been updated to include Condition U1 with the requirement to incorporate modelling outcomes in the quarterly compliance reports. The predicted noise levels from validated noise modelling are used to compare the measured ambient noise levels.

Long term monitoring indicates that there is a strong correlation with the measured RBL and the predicted $L_{Aeq\ 15\ min}$ noise levels for the EPL receiver locations. Information on the current noise model and predicted noise levels at the nearest receiver locations is presented in Section 3.2.

3. Operational noise

3.1 Noise monitoring

Noise monitoring for the November quarterly monitoring period was completed between 10 January and 17 January 2024, using automatic noise loggers deployed at five representative locations.

Monitoring was performed using a combination of SVAN 958 SLM and Acoustic Research Laboratories Ngara Type 1 noise loggers, set to A-weighting, fast-response, and recording noise levels continuously over consecutive periods at each location. This survey period coincided with typical continuous operations of paper mill.

Weather data obtained from the Automatic Weather Station (AWS) maintained by the Bureau of Meteorology at Sydney Airport. Weather conditions for the monitoring period have been plotted showing daily trends in wind direction and speed which are presented in Figure 3-1.

3.2 Noise modelling

A noise model for the Opal site was developed in 2014 to predict noise emissions at receiver locations adjacent to the paper mill. This noise model has been updated in 2022 as the result of changes to the site layout and additional infrastructure projects over the intervening years.

The noise model was calibrated by internal site measurements and external noise monitoring correlation and is to be used as an aid to the quarterly monitoring surveys, specifically to verify the conclusions of the monitoring survey compared to the EPL criteria in Table 1.

Since the validation of the noise model there have been no changes to the site operations or noise sources included in the noise model. Ongoing development within the site will be captured in the noise model to reflect these changes in the noise emission profile of the Opal operations as necessary.

Table 3 Predicted noise levels at monitoring locations

ID	Location	EPL Noise Goals dB(A)		Predicted Noise Levels dB(A)	
		Night		Night	
		LAeq 15 Min	LAmax	LAeq 15 Min	LAmax
R1	Corner of McCauley Street and Australia Avenue	43	55	38	46 - 48
R2	Australia Avenue	43	55	39	47 - 49
R3	Murrabin Avenue	43	55	40	48 -50
R4	Partanna Avenue (Most affected façade)	41	55	40	48 -50
R5	Corner of Partanna Avenue and Moorina Avenue	39	55	37	42 -44
R6	Moorina Avenue	39	55	35	44 - 46

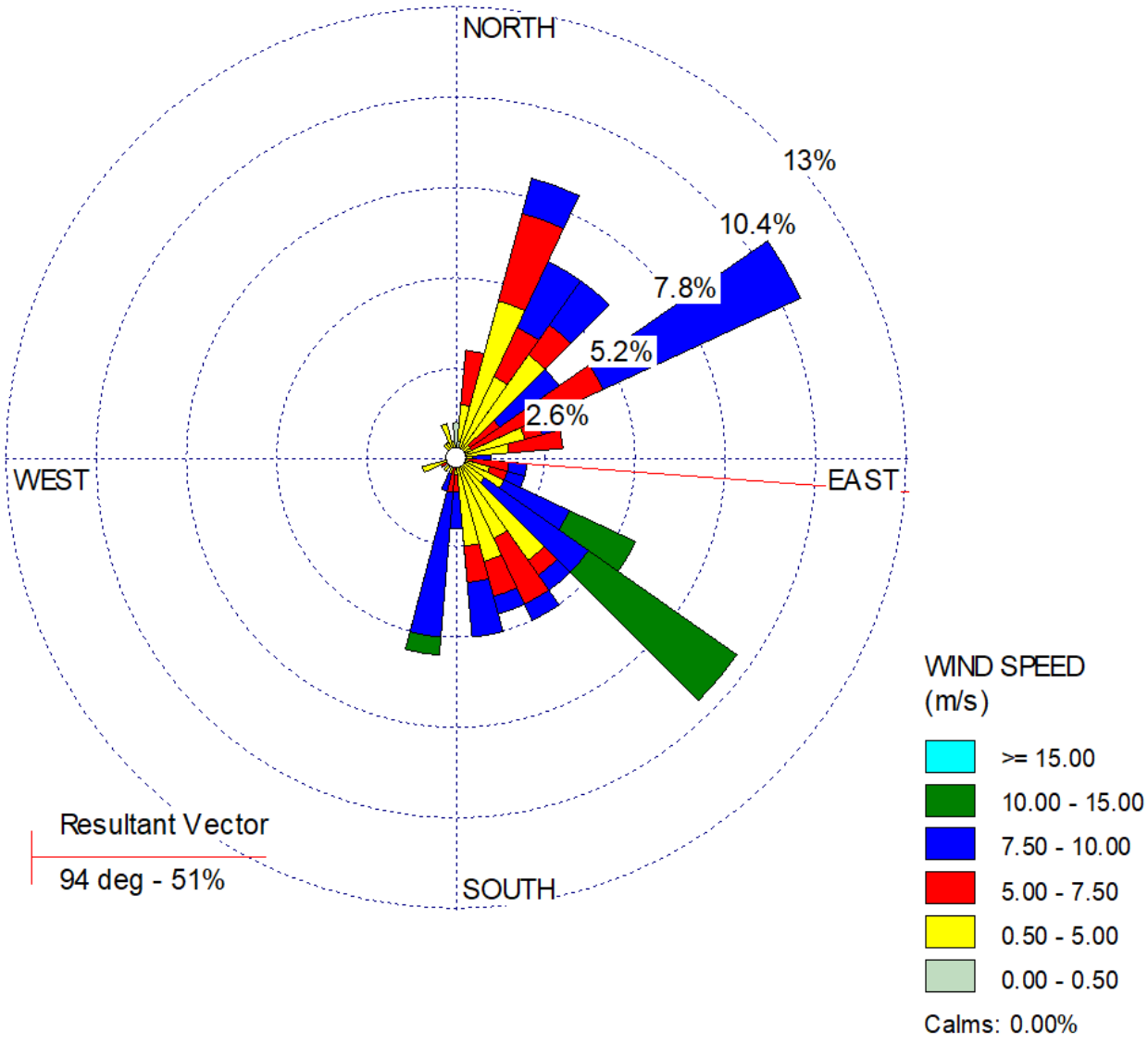


Figure 3-1 Wind speed and direction during monitoring period (10 January – 17 January 2024, source BoM 2024)

The wind rose data indicates that winds up to about 5 m/s were concentrated in the north east and south-east for about equal amounts of time. Wind speeds below 7.5 m/s occurred for around 60% of the time and were evenly distributed throughout these quadrants. A graph of the wind speed frequency during the monitoring period is presented in Figure 3-2

Winds from north-eastly and south-eastly directions are less likely to carry noise from the Opal site towards residential locations to the east and north-east of the site. Similarly, wind from these directions would reduce noise from the Port Botany and the Opal site at residences to the north-east but would generate higher levels of traffic noise from sections of Port Botany Road to the east of the Opal site.

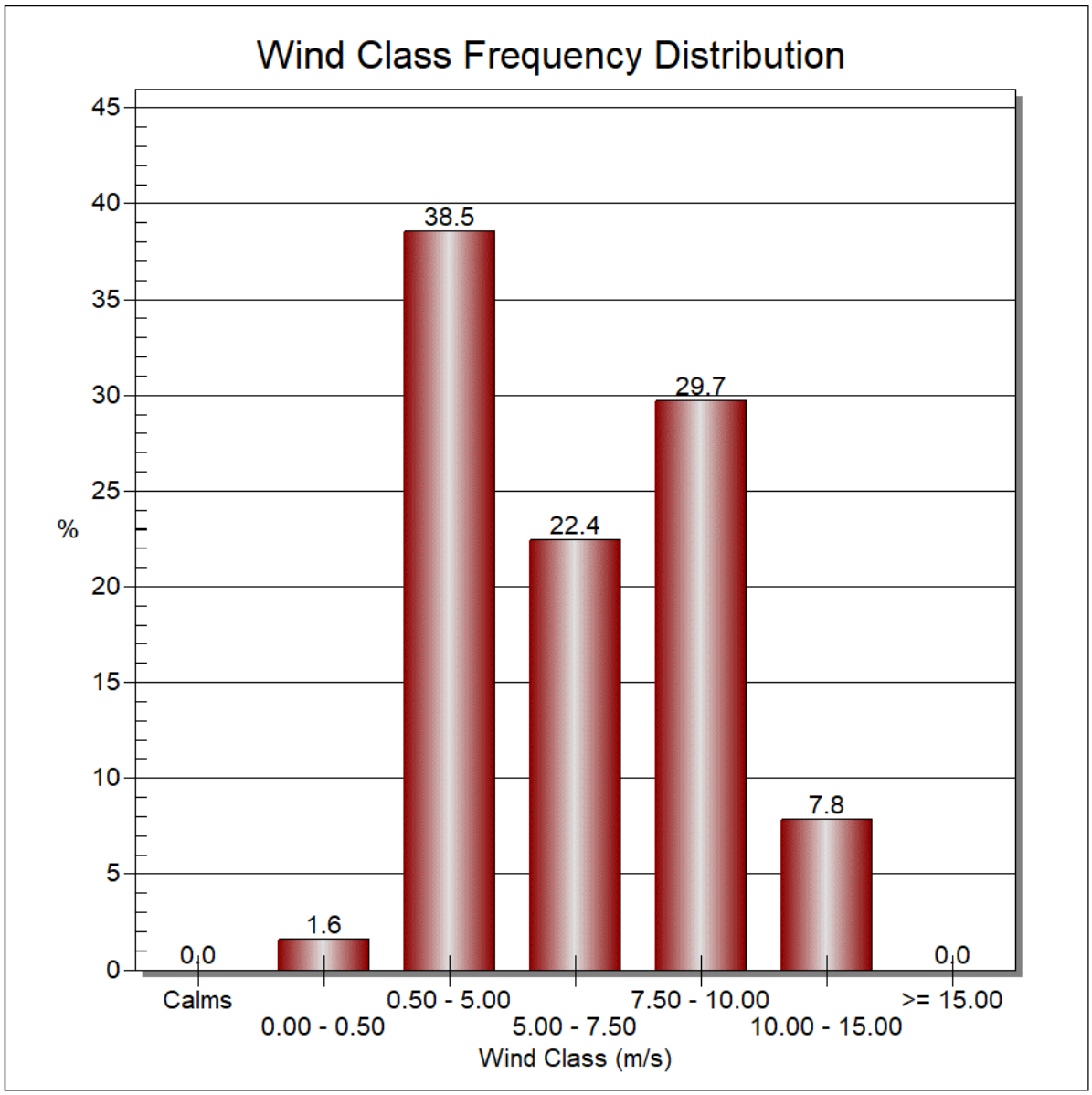


Figure 3-2 Wind speed frequency distribution over monitoring period –January 2024

3.3 Monitoring results

The reported L_{Amax}, L_{A1}, L_{Aeq}, and L_{A90} noise levels are summarised from a 24 hour period of monitoring and the resultant values are representative of all noise sources in the local area such as road traffic, loud short-term noise (birds, people, equipment), aircraft, and local industry and heavy vehicle movements.

During the November 2023 quarterly noise survey, the paper mill operated normally.

Night-time periods were assessed to provide additional information of the paper mill noise contributions using the median L_{A90} noise levels as a benchmark as rating background noise levels provide a good proxy for L_{Aeq} levels from steady state noise emitters.

Measured L_{A90} and L_{Aeq} noise levels for the night-time period during the November 2023 monitoring survey are amongst the lowest measured noise levels when compared to similar times of the year.

Measured L_{A90} night noise levels, used as an indicator of continuous industrial noise sources, were in a tight range for all sites between 35 - 38.5 dB(A) with the highest night L_{A90} median value at R4. The median L_{A90} noise levels at all locations were lower than the EPL criteria.

The most recent round of compliance measurements has been added to the historical data collected during compliance noise surveys, providing about 10 years of seasonal data. This data includes measurements of the noise environment with the Opal site operational over the monitoring period.

The results of monitoring survey for November 2023 have been graphed and are shown in Appendix A. The parameters of L_{Aeq} and L_{A90} presented in Table 4 are used to provide information for comparison against the project criteria and the background noise environment.

The data in Figure 3-3 and Figure 3-4 provides a chronological progression of the measured noise levels during shutdown and normal operations summarised for monitoring from 2012 to present.

Historical background noise levels from Figure 3-3 and Figure 3-4 are not directly related to the L_{Aeq} criteria from the EPL; however, they provide an indication of the increase in background environmental noise levels corresponding to the regular noise surveys undertaken for the Opal site.

Figure 3-5 presents the long term median LA1 noise levels for each of the monitoring locations. The data for shut down and operational periods from previous monitoring surveys are graphed with the most recent monitoring data shown in comparison.

The L_{Amax} noise levels for the November quarter are generally similar to L_{Amax} noise levels from previous surveys with the exception of R1 which is marginally higher than the long term averages for this location. The receiver at R1 is well shielded from the Opal operations, situated directly behind the industrial storage units on McCauley Street therefore this minor increase in maximum levels should not be attributed to the operations of the Opal site.

Measured L_{Amax} and L_{A1} noise levels during the monitoring periods are higher than the project L_{Amax} noise goals by around 10 dB(A) however, these levels do not relate to the operation of the Opal site.

Table 4 Summary of noise monitoring

Time and date	Profile of Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Daytime: 7:00:00 AM to 6:00:00 PM	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L90 (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**
Wednesday 10 January 2024	42.3	51.2	41.3	49.8	-	-	46.6	55.9	41.2	49.9	43.8	53.3
Thursday 11 January 2024	41.4	51.1	44.7	70.2	-	-	44.1	63.6	42.9	54.4	38.0	49.3
Friday 12 January 2024	41.6	52.7	38.4	53.2	-	-	44.4	71.5	41.4	54.1	39.5	53.5
Saturday 13 January 2024	38.2	53.8	38.8	51.0	-	-	40.6	66.3	40.5	52.9	37.8	52.3
Sunday 14 January 2024	42.4	51.5	44.8	52.4	-	-	46.6	60.6	44.0	53.2	42.0	55.3
Monday 15 January 2024	44.4	52.6	42.8	52.2	-	-	47.0	56.6	45.3	53.0	42.9	54.6
Tuesday 16 January 2024	41.4	56.3	38.2	50.2	-	-	43.0	54.2	40.9	49.3	40.0	50.0
Wednesday 17 January 2024	42.9	54.7	40.7	55.9	-	-	44.0	61.5	41.7	56.0	41.7	51.4
Median	**41.9**	**52.7**	**41.0**	**52.3**	**-**	**-**	**44.3**	**61.0**	**41.6**	**53.1**	**40.9**	**52.8**

Evening: 6:00:00 PM to 10:00:00 PM	**L_{90} (10th Percentile)**	**L_{Aeq}**	L90 (10th Percentile)	LAeq	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**
Wednesday 10 January 2024	37.3	48.1	35.5	46.6	-	-	43.4	58.6	36.9	47.0	35.3	47.9
Thursday 11 January 2024	38.1	49.8	41.6	51.1	-	-	43.3	62.5	39.0	52.2	34.2	45.3
Friday 12 January 2024	37.9	48.7	38.8	47.5	-	-	42.2	64.3	38.7	55.4	36.4	49.2
Saturday 13 January 2024	39.6	49.9	36.6	49.8	-	-	43.7	59.9	41.0	61.8	37.0	55.3
Sunday 14 January 2024	43.7	58.2	43.8	63.1	-	-	45.5	59.8	46.1	55.2	42.2	55.1
Monday 15 January 2024	41.5	51.0	38.5	59.0	-	-	44.1	55.9	41.7	48.2	39.3	48.3
Tuesday 16 January 2024	38.7	48.8	37.6	63.0	-	-	40.4	59.5	39.3	52.8	36.8	49.9
Wednesday 17 January 2024	43.4	55.4	41.9	62.5			46.8	60.4	41.7	53.0	43.6	53.5
Median	**39.2**	**49.8**	**38.6**	**55.0**	**-**	**-**	**43.6**	**59.8**	**40.1**	**52.9**	**36.9**	**49.6**

Time and date	Profile of Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Night 10:00:00 PM to 7:00:00 AM	L_{90} (10th Percentile)	L_{Aeq}	L90 (10th Percentile)	L_{Aeq}	L_{90} (10th Percentile)	L_{Aeq}	L_{90} (10th Percentile)	L_{Aeq}	L_{90} (10th Percentile)	L_{Aeq}	L_{90} (10th Percentile)	L_{Aeq}
Wednesday 10 January 2024	35.2	42.3	35.1	42.5	-	-	35.4	51.9	35.8	43.2	30.7	44.5
Thursday 11 January 2024	35.8	43.3	35.6	43.3	-	-	36.8	47.1	37.2	43.2	29.8	45.1
Friday 12 January 2024	35.4	42.1	37.5	47.8	-	-	35.2	43.3	37.6	42.7	34.7	43.1
Saturday 13 January 2024	44.9	53.3	49.0	52.4	-	-	44.8	53.2	44.9	50.7	41.4	51.2
Sunday 14 January 2024	42.5	51.8	43.7	49.3	-	-	43.6	53.0	42.4	50.3	41.3	53.3
Monday 15 January 2024	37.4	47.1	34.4	44.0	-	-	39.3	47.6	36.3	44.5	31.7	45.9
Tuesday 16 January 2024	37.3	44.7	36.2	44.1	-	-	38.0	47.5	37.2	42.4	35.1	43.8
Wednesday 17 January 2024	37.0	57.7	36.4	51.9	-	-	38.9	55.8	38.1	52.0	36.0	55.0
Median	**37.1**	**45.9**	**36.3**	**45.9**	**-**	**-**	**38.5**	**49.8**	**34.7**	**43.9**	**34.9**	**45.5**

Table 5 Summary of night maximum and LA1 noise levels

Time and date	Maximum Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Date	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}
Wednesday 10 January 2024	73.2	62.7	72.8	62.5	-	-	75.6	70.2	74.9	67.1	82.1	68.7
Thursday 11 January 2024	74.7	65.6	73.3	62.0	-	-	78.1	72.3	77.1	63.0	78.7	70.3
Friday 12 January 2024	74.3	58.7	80.4	73.1	-	-	67.9	58.1	76.7	60.1	74.0	60.7
Saturday 13 January 2024	75.6	73.2	72.8	64.6	-	-	72.2	66.1	71.9	66.9	81.4	65.2
Sunday 14 January 2024	74.2	67.7	71.6	66.7	-	-	69.2	63.8	86.2	65.8	73.2	66.0
Monday 15 January 2024	75.3	72.7	74.1	64.2	-	-	68.8	64.2	72.7	64.4	81.6	65.1
Tuesday 16 January 2024	72.3	64.3	71.9	63.6	-	-	69.7	66.2	75.5	59.7	68.6	62.6
Wednesday 17 January 2024	78.8	76.2	74.0	67.7	-	-	74.2	73.0	71.6	68.4	76.8	72.5
Median	**74.5**	**66.7**	**73.1**	**64.4**	**-**	**-**	**71.0**	**66.2**	**75.2**	**65.1**	**77.8**	**65.6**

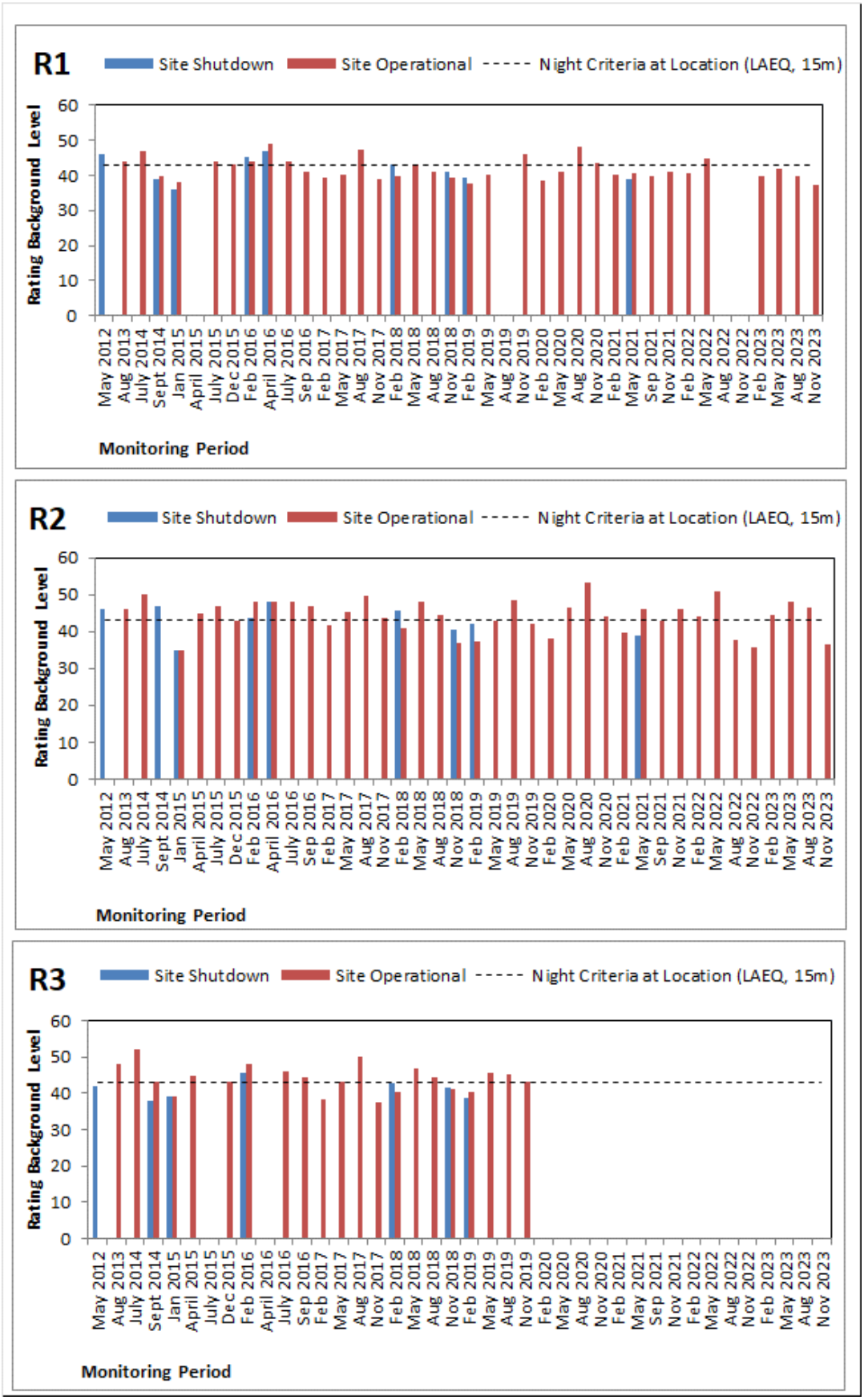


Figure 3-3: Comparison of background noise levels at R1 – R3

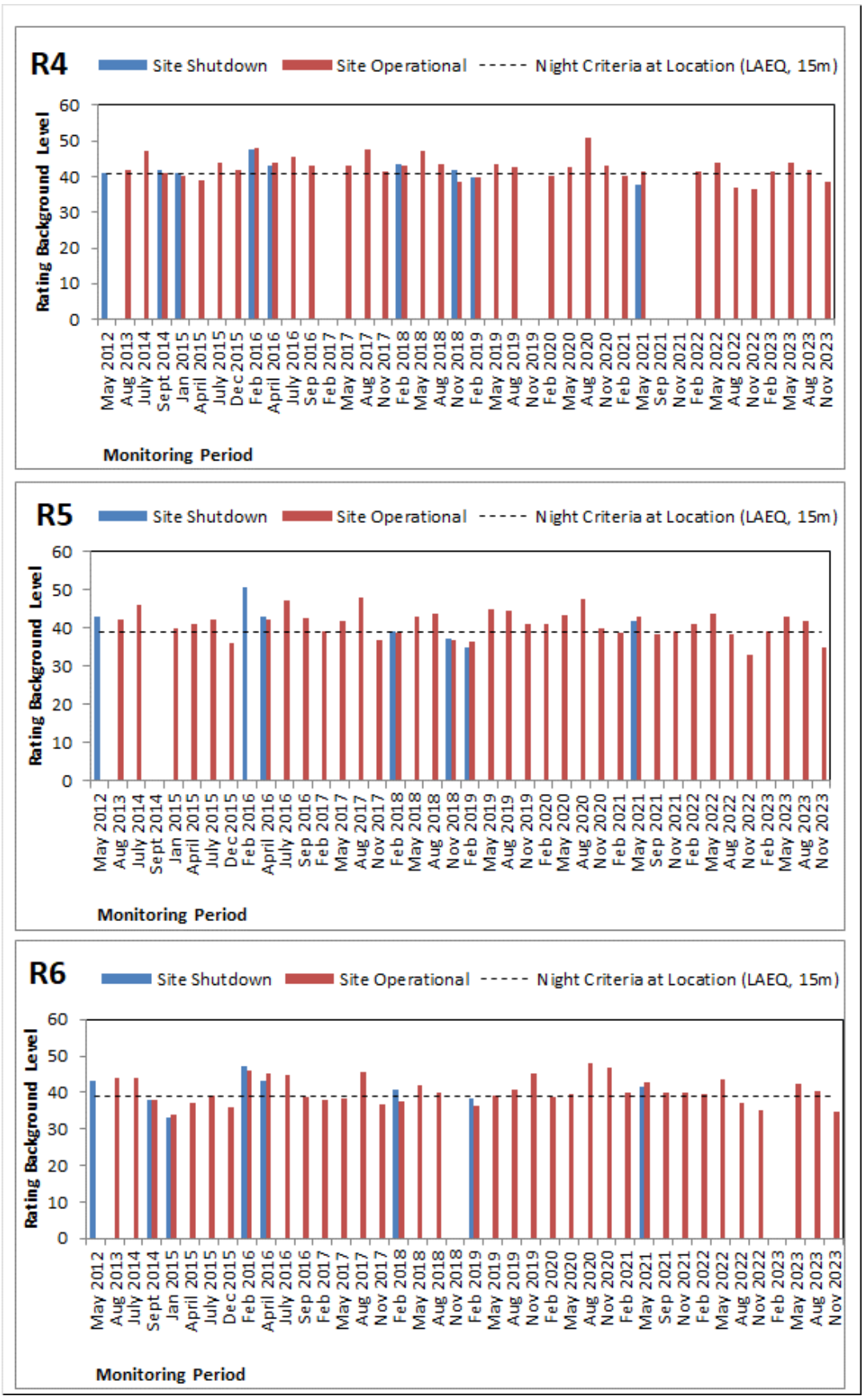


Figure 3-4: Comparison of background noise levels at R4 – R6

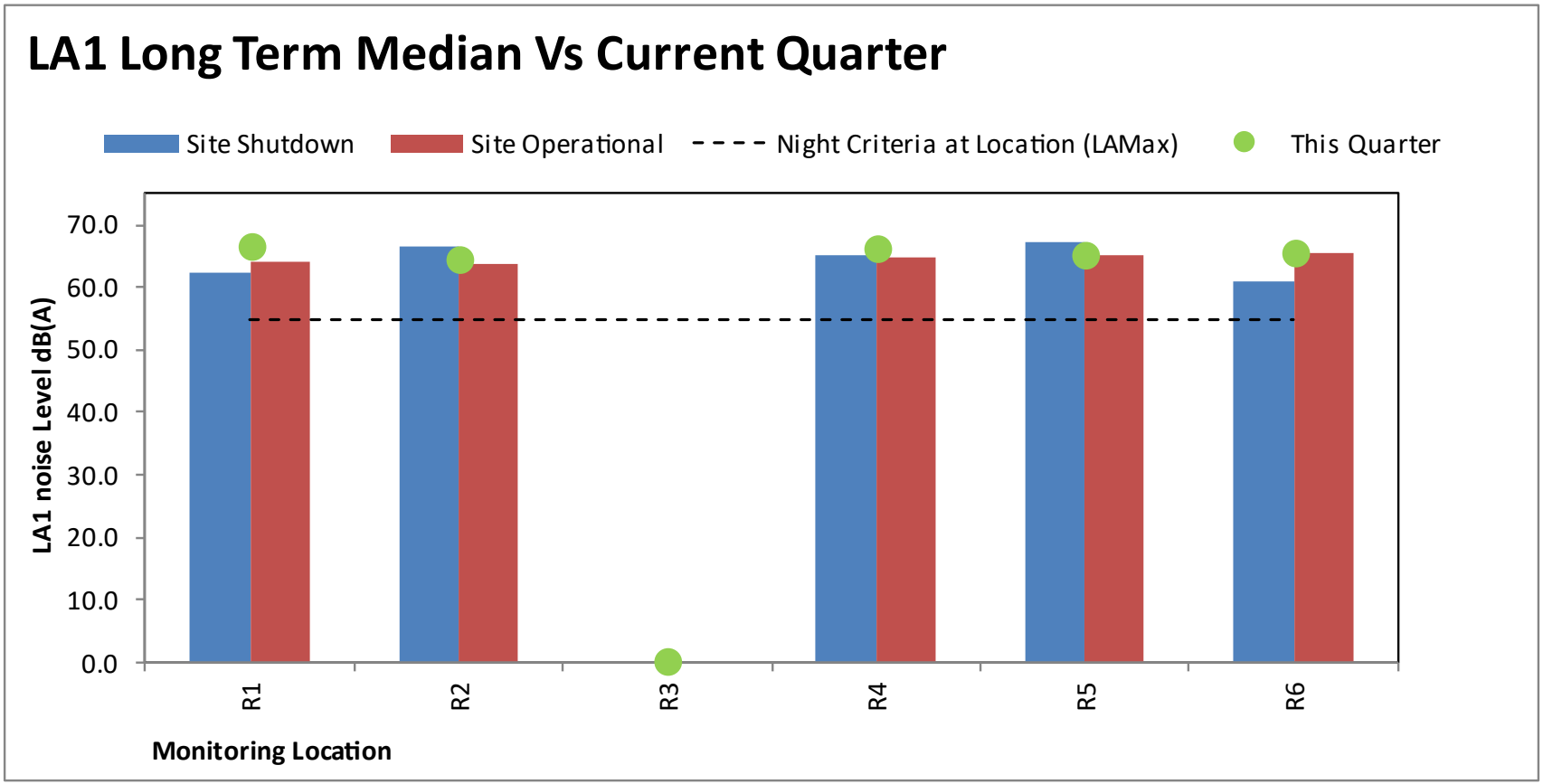


Figure 3-5: Long term LA1 noise levels at R1 – R6

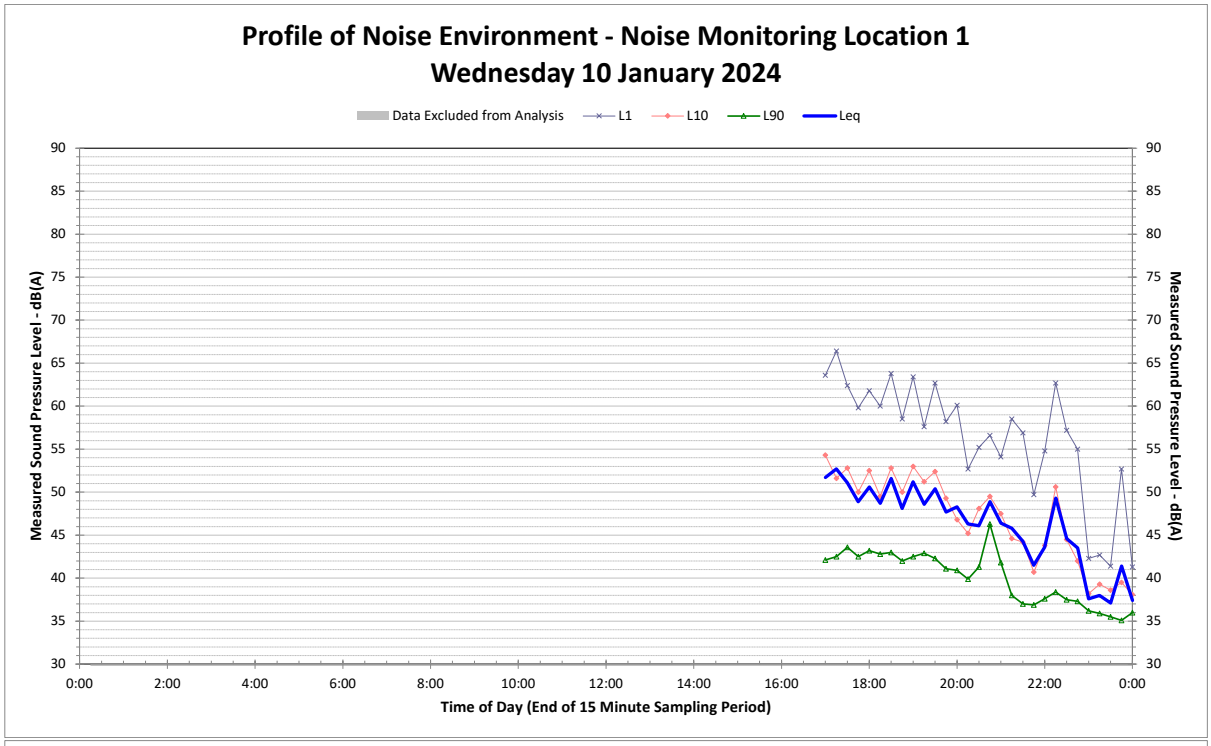
4. Summary

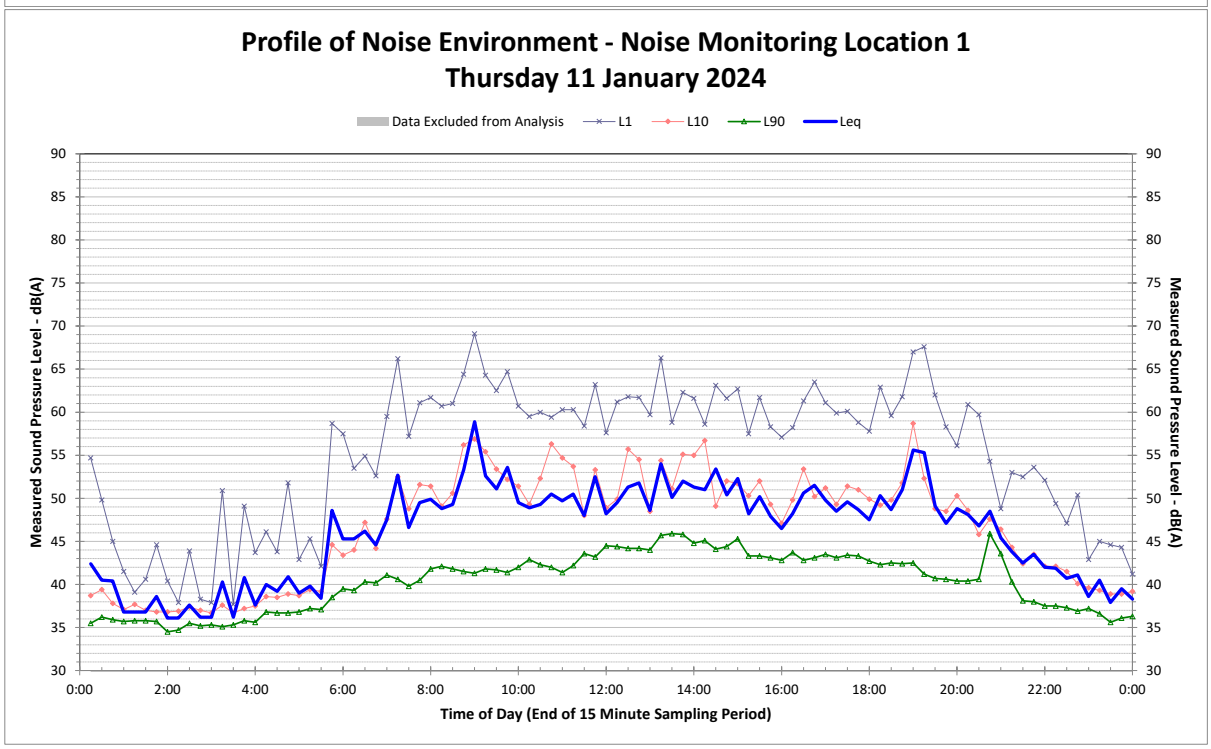
The quarterly noise survey data for the November 2023 – January 2024 period indicates that the L_{Aeq} long term measured noise levels in the vicinity of the paper mill exceeded the EPL criteria for day, evening, and night-time. The maximum (L_{A1}) recorded noise levels at each monitoring location averaged between about 65 to 66.5 dB(A), which also exceeded the EPL criteria of 55 dB(A) L_{Amax} at all receiver locations.

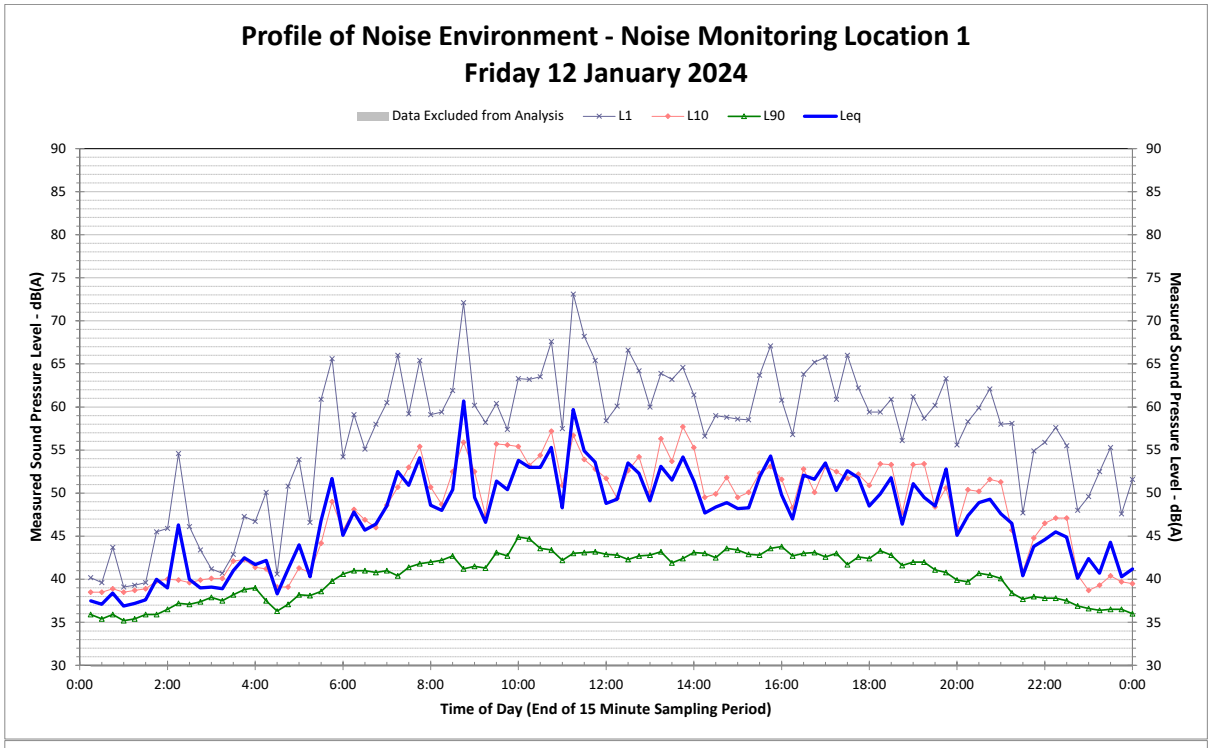
In summary the following conclusions have been drawn from the latest quarterly monitoring data:

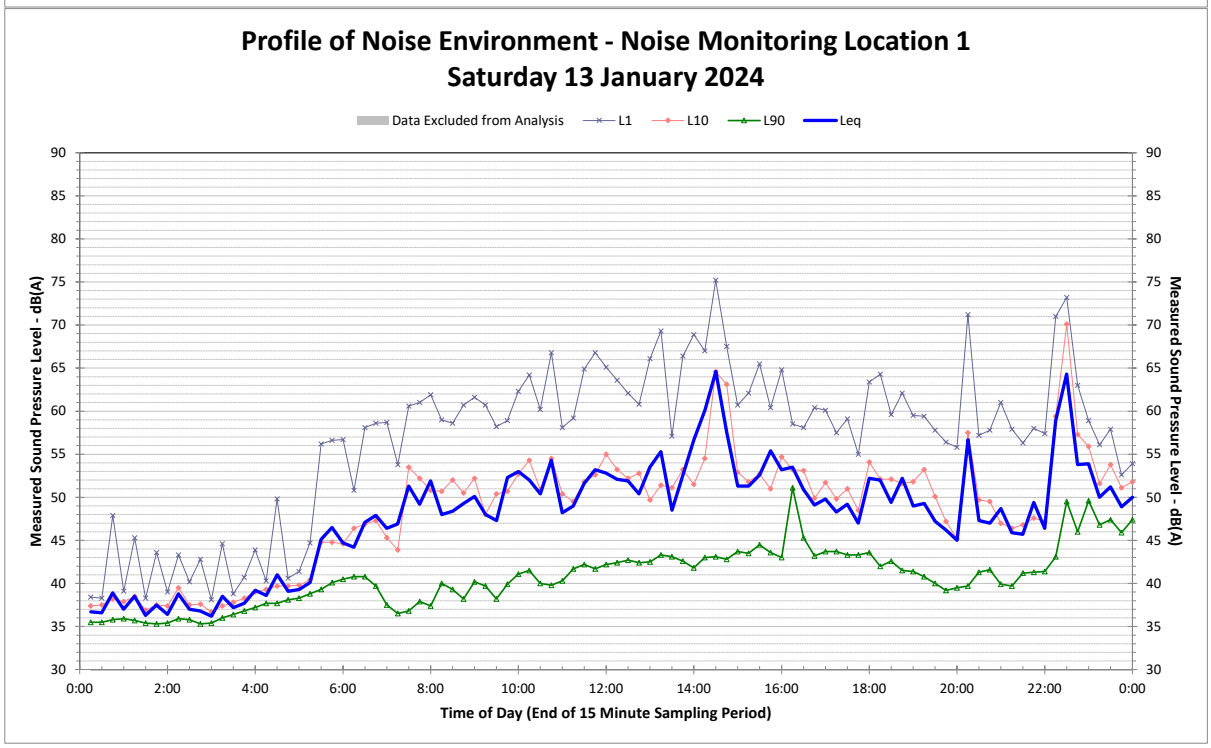
- Several years of monitoring data consistently indicate that the ambient noise environment in the local area is a product of the combined influence of all noise sources within the Port Botany area including the Opal site when operational.
- The resultant wind vector from the east is likely to decrease impacts from the Opal site as well as other nearby industrial sources, to residences located to the north and east of the Opal site and Port Botany container terminal.
- The most recent noise monitoring results indicate that the measured L_{Aeq} noise levels are generally equal to or lower than the median noise levels of the long-term series of data for corresponding seasonal measurement periods.
- At all measured locations the median night L_{A90} noise levels were lower than the EPL criteria for each of the monitoring locations.
- The L_{Amax} noise levels for the November quarterly monitoring period are consistent with L_{Amax} noise levels from previous surveys. The L_{A1} noise levels are also consistent with other monitoring periods.
- The L_{Aeq} and L_{Amax} noise levels recorded during the survey period are higher than the EPL criteria at the monitoring locations but are not related to the operation of the Opal site.
- Median measured L_{A90} noise levels during the night were amongst the lowest measured background noise levels for the data series. The median measured L_{A90} for November were lower than the predicted noise levels from the noise model and therefore are consistent with the predicted noise levels for the site.

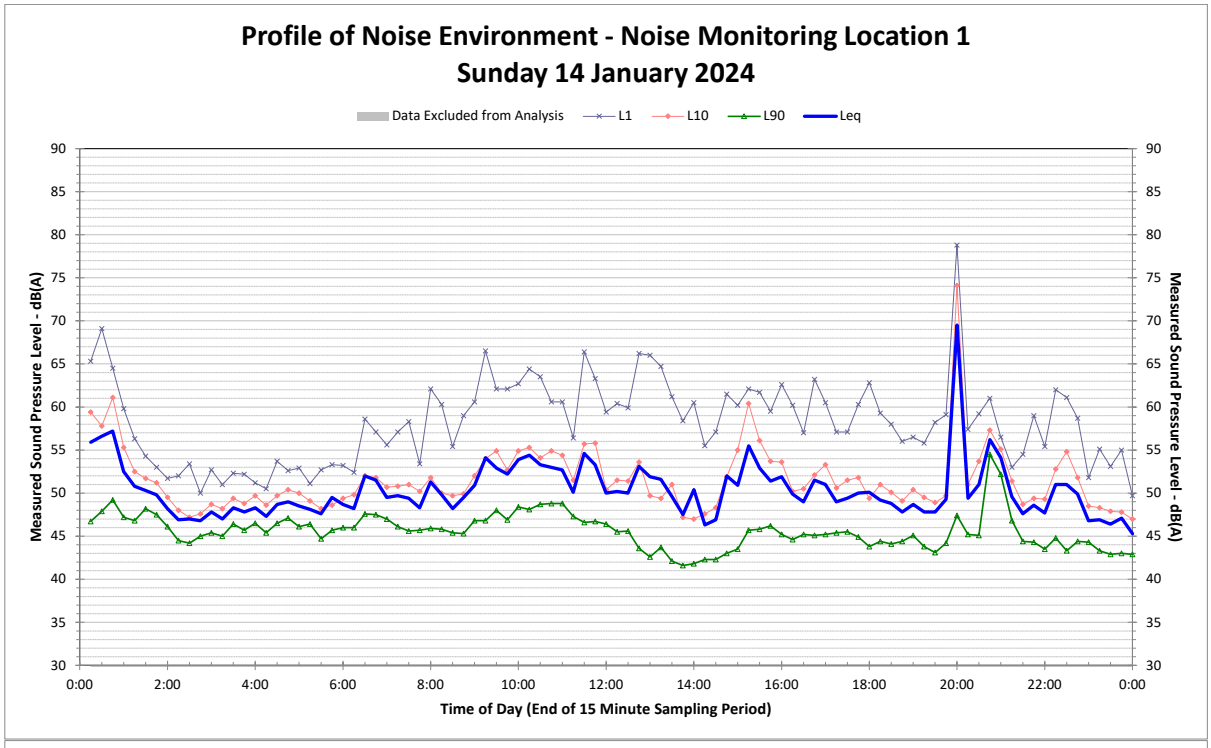
Appendix A. Noise logger graphs

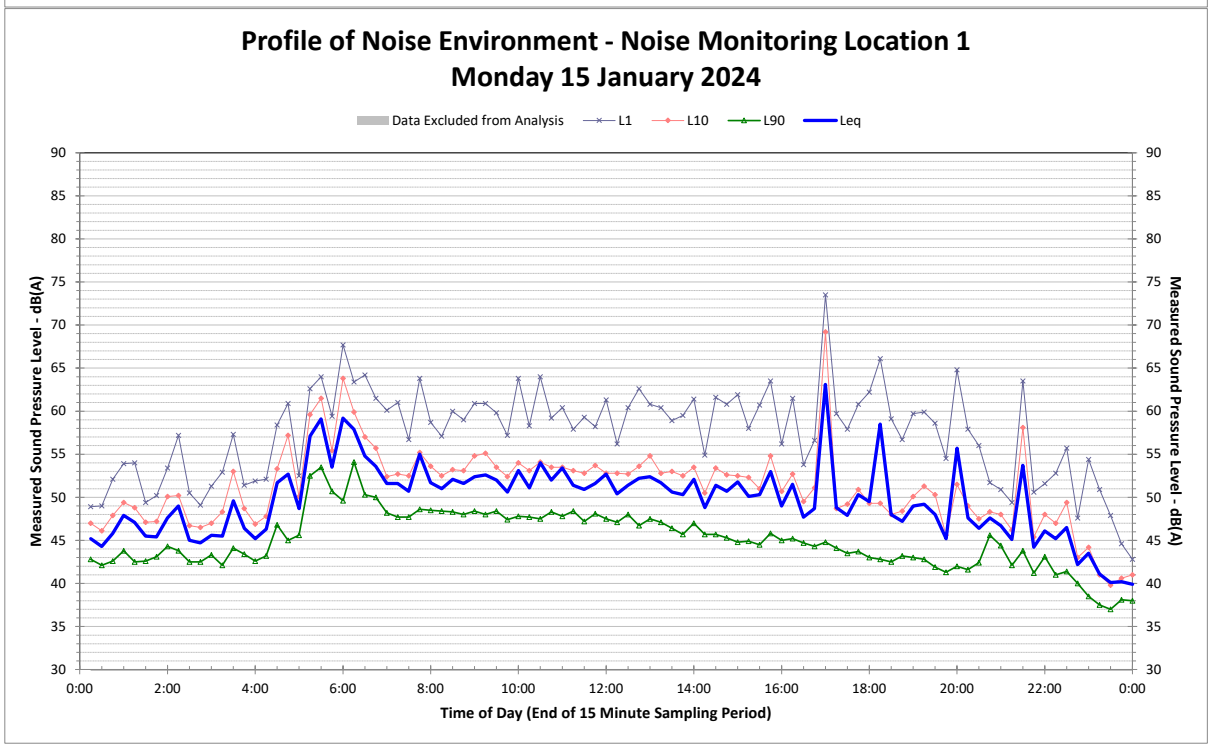


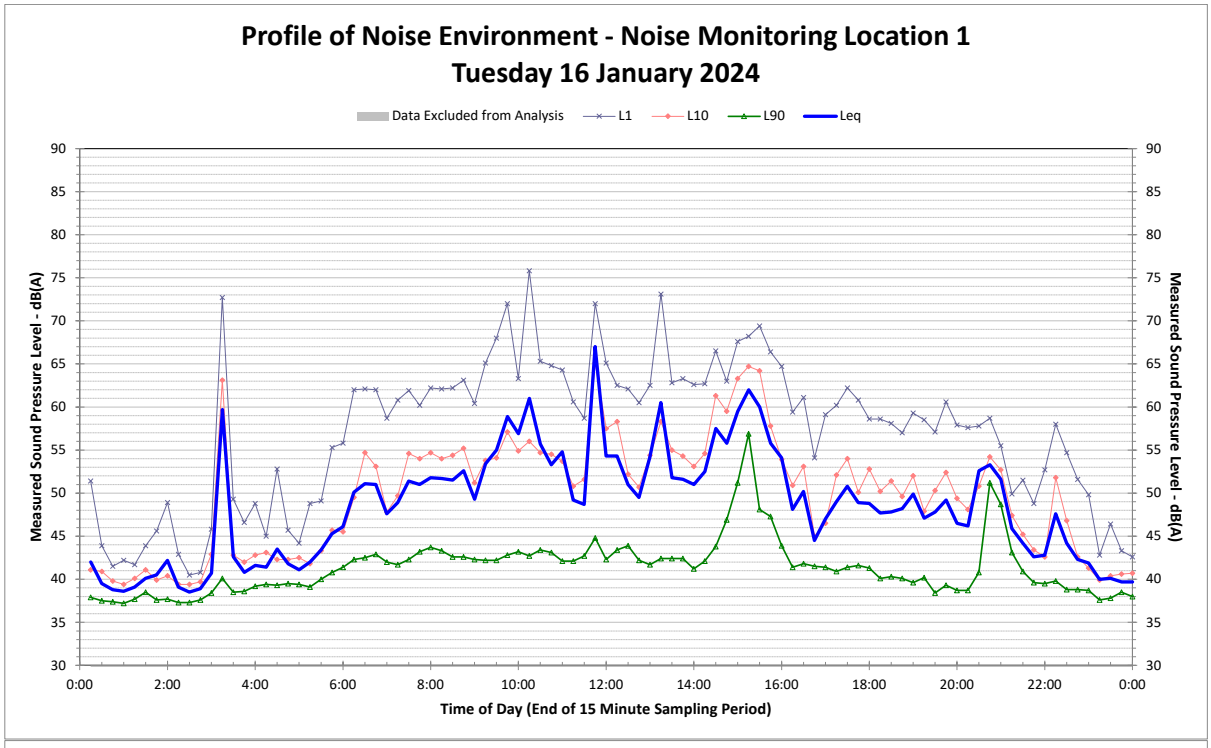


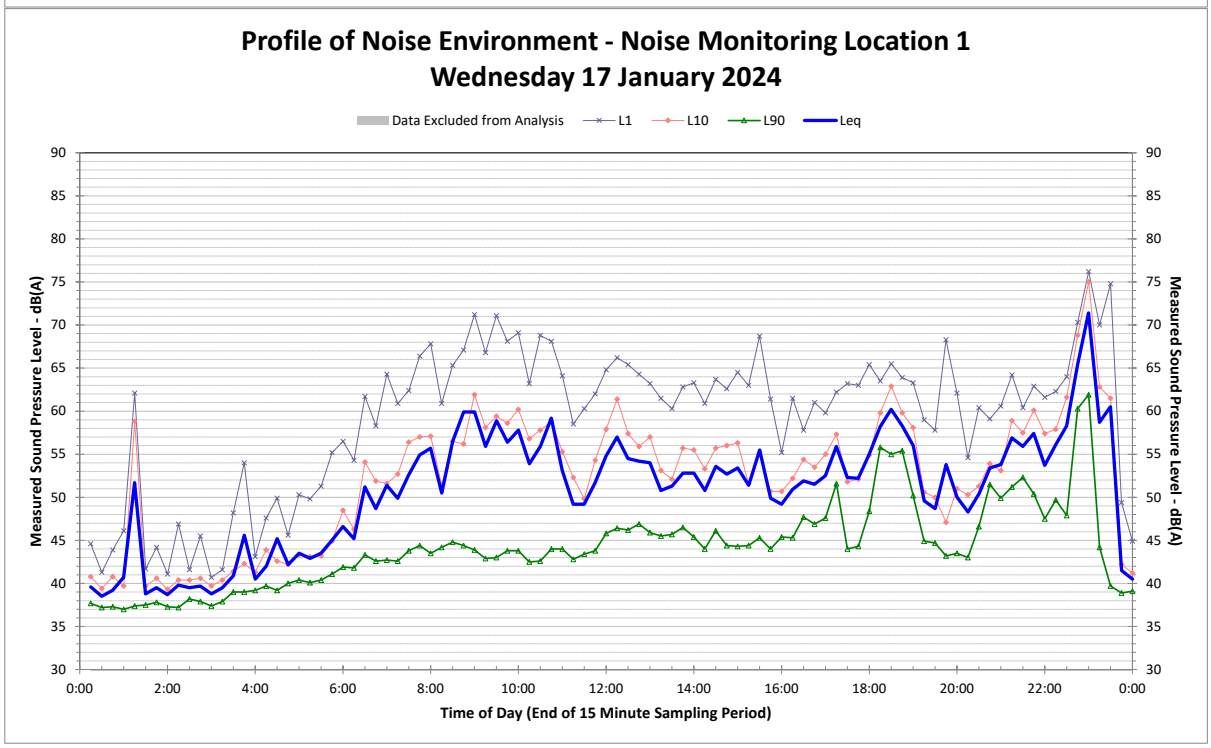

Profile of Noise Environment - Noise Monitoring Location 1
Friday 12 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

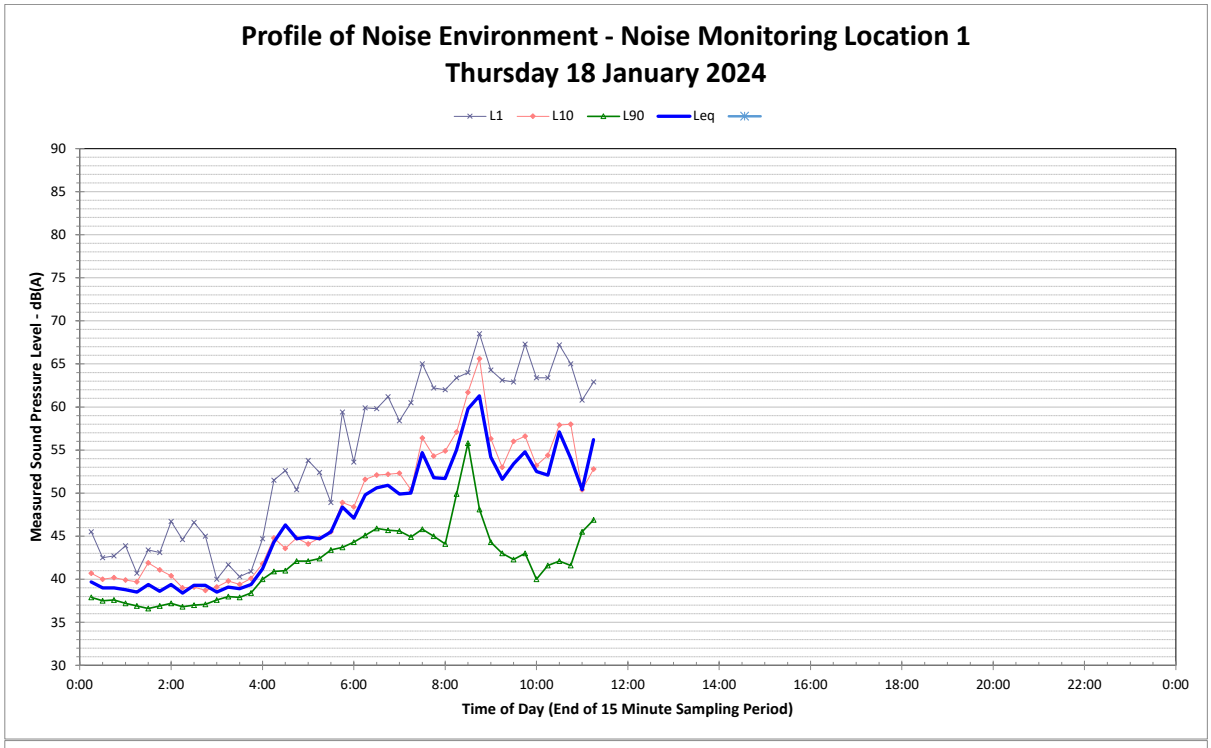

Profile of Noise Environment - Noise Monitoring Location 1
Saturday 13 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

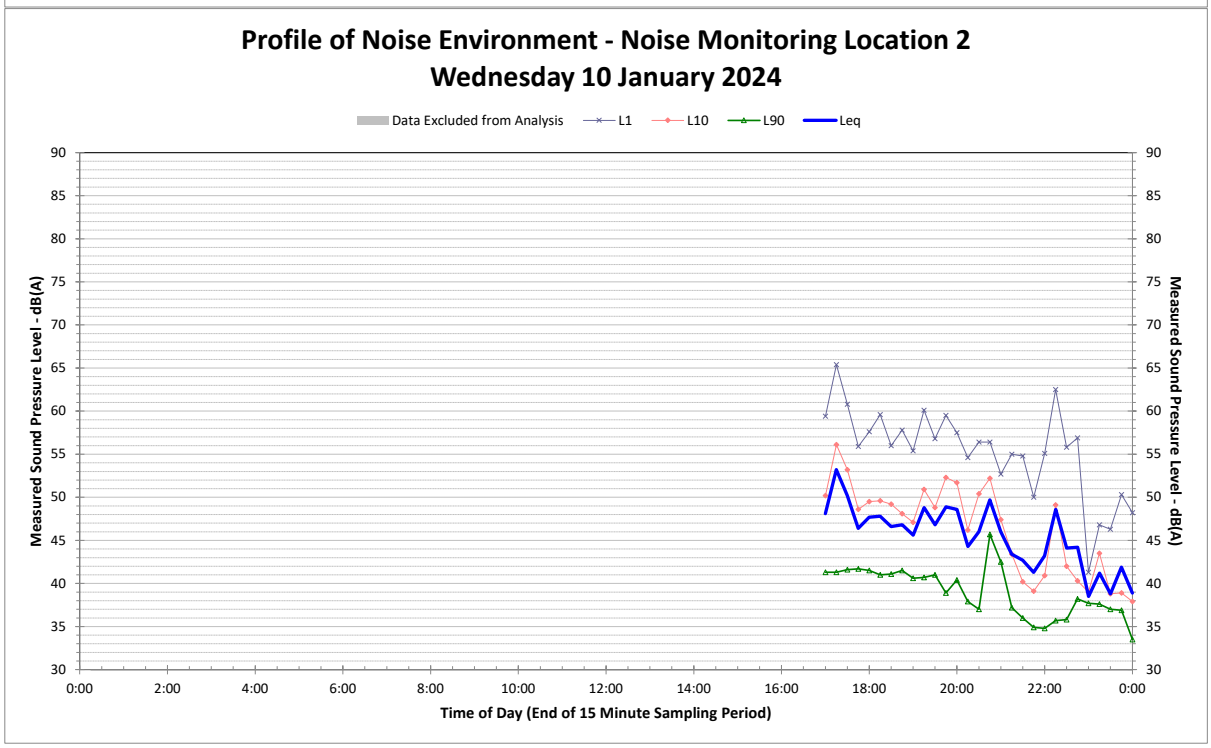

Profile of Noise Environment - Noise Monitoring Location 1
Sunday 14 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

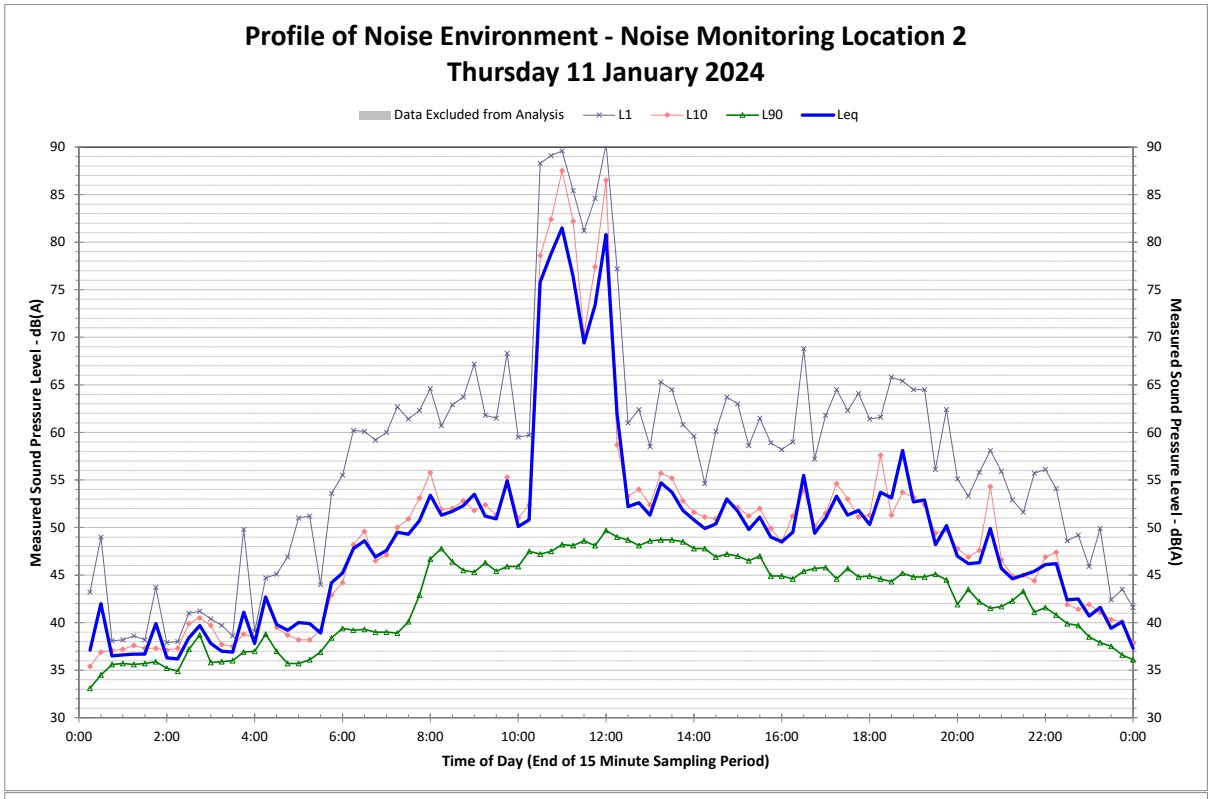

Profile of Noise Environment - Noise Monitoring Location 1
Monday 15 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

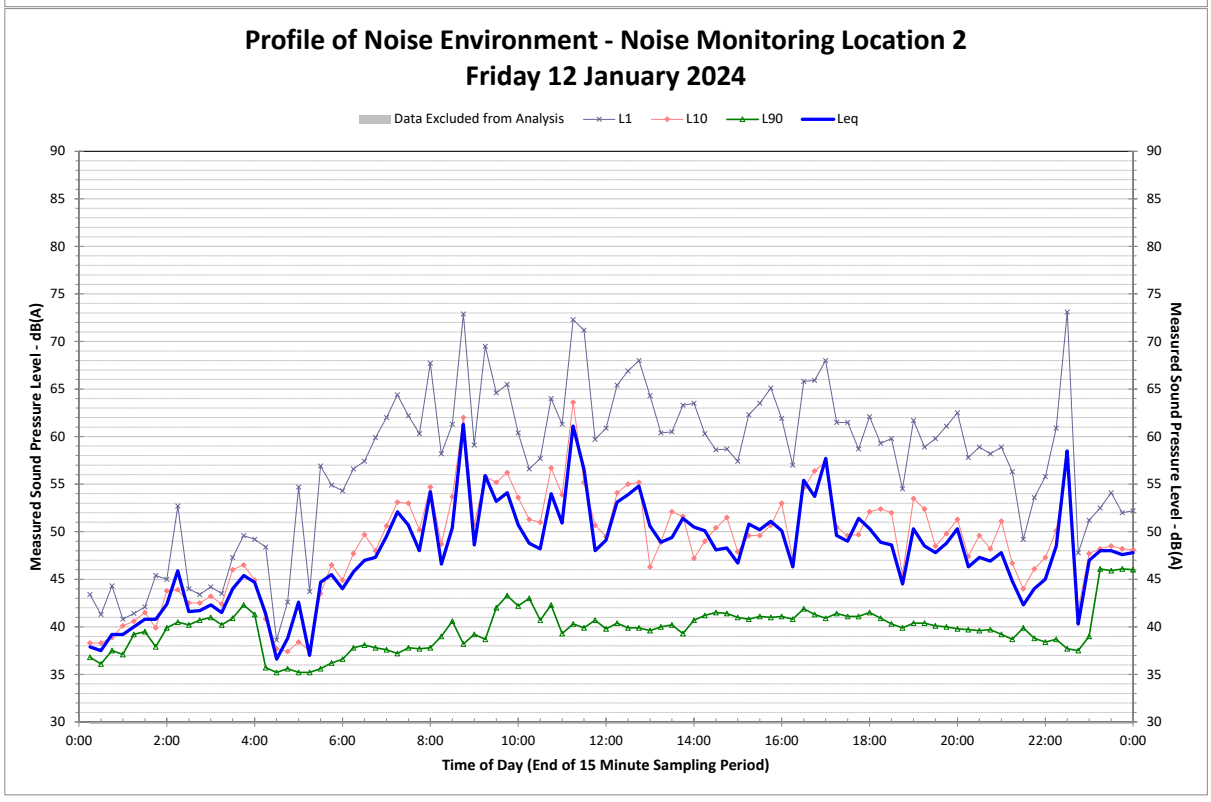

Profile of Noise Environment - Noise Monitoring Location 1
Tuesday 16 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

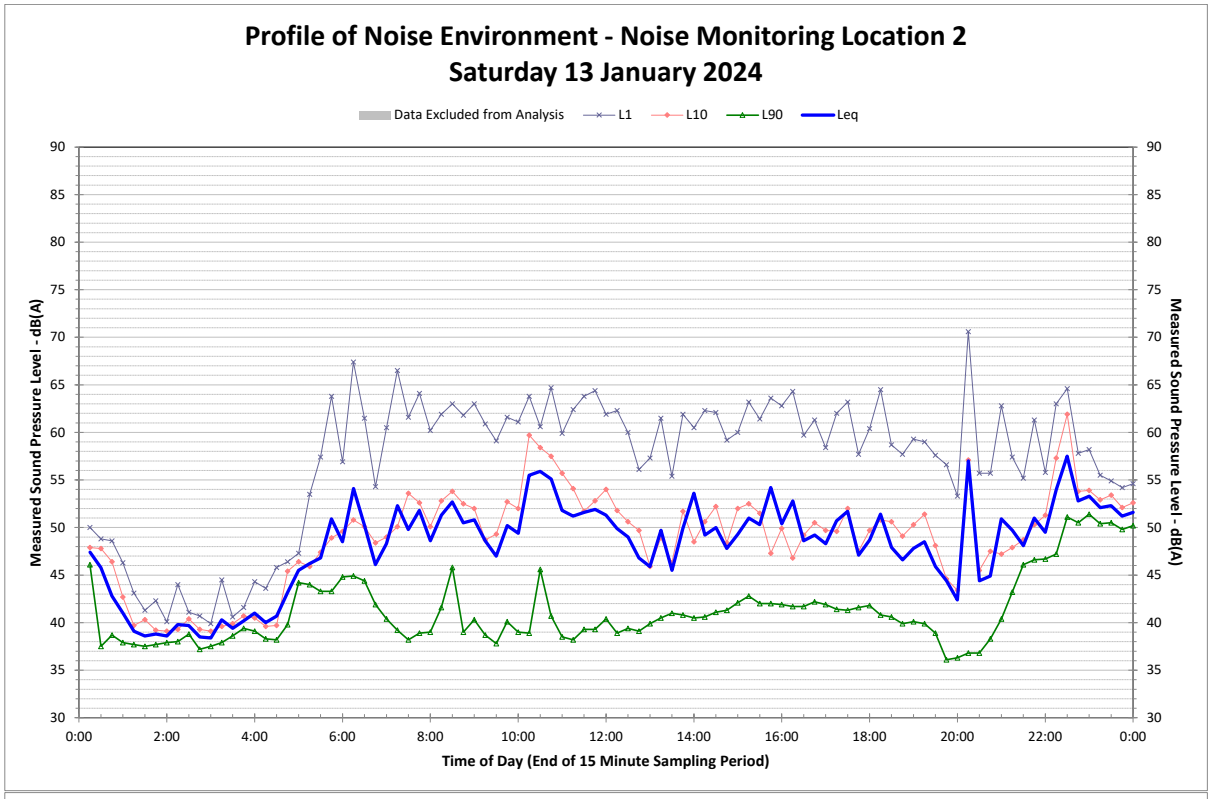

Profile of Noise Environment - Noise Monitoring Location 1
Wednesday 17 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

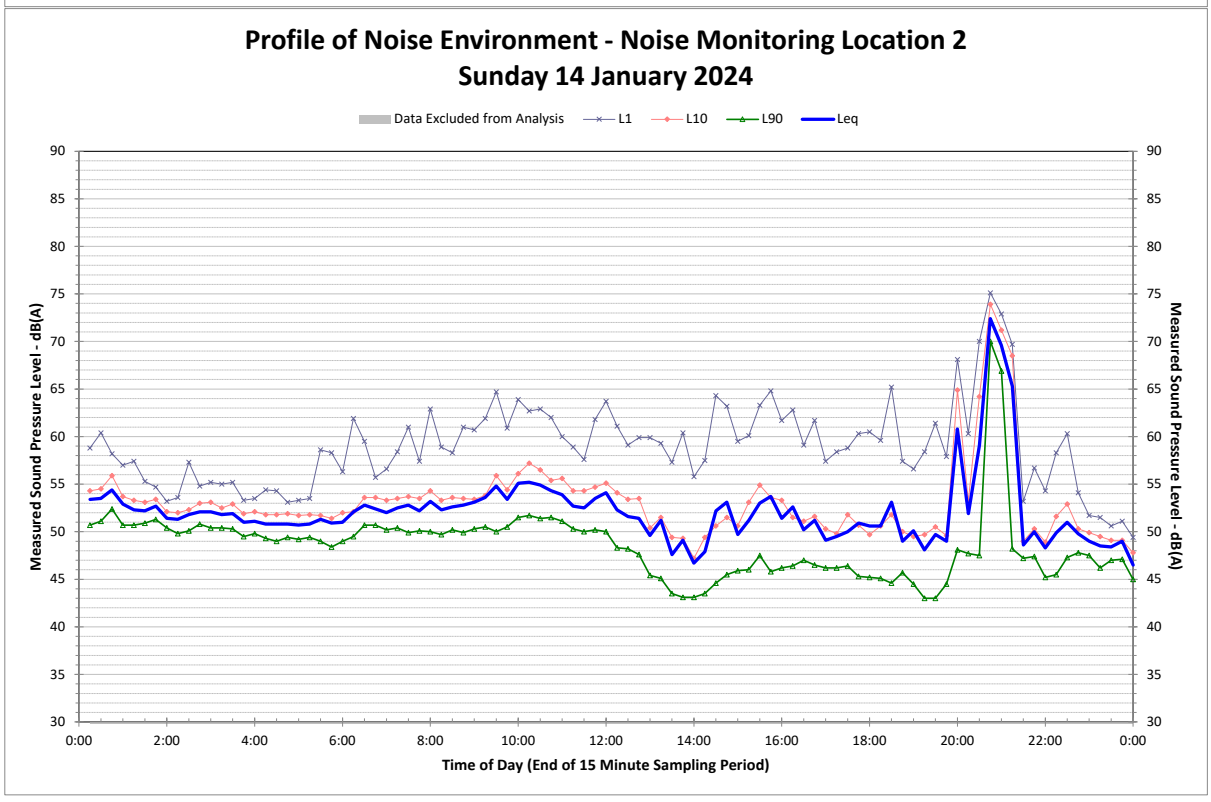

Profile of Noise Environment - Noise Monitoring Location 1
Thursday 18 January 2024
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

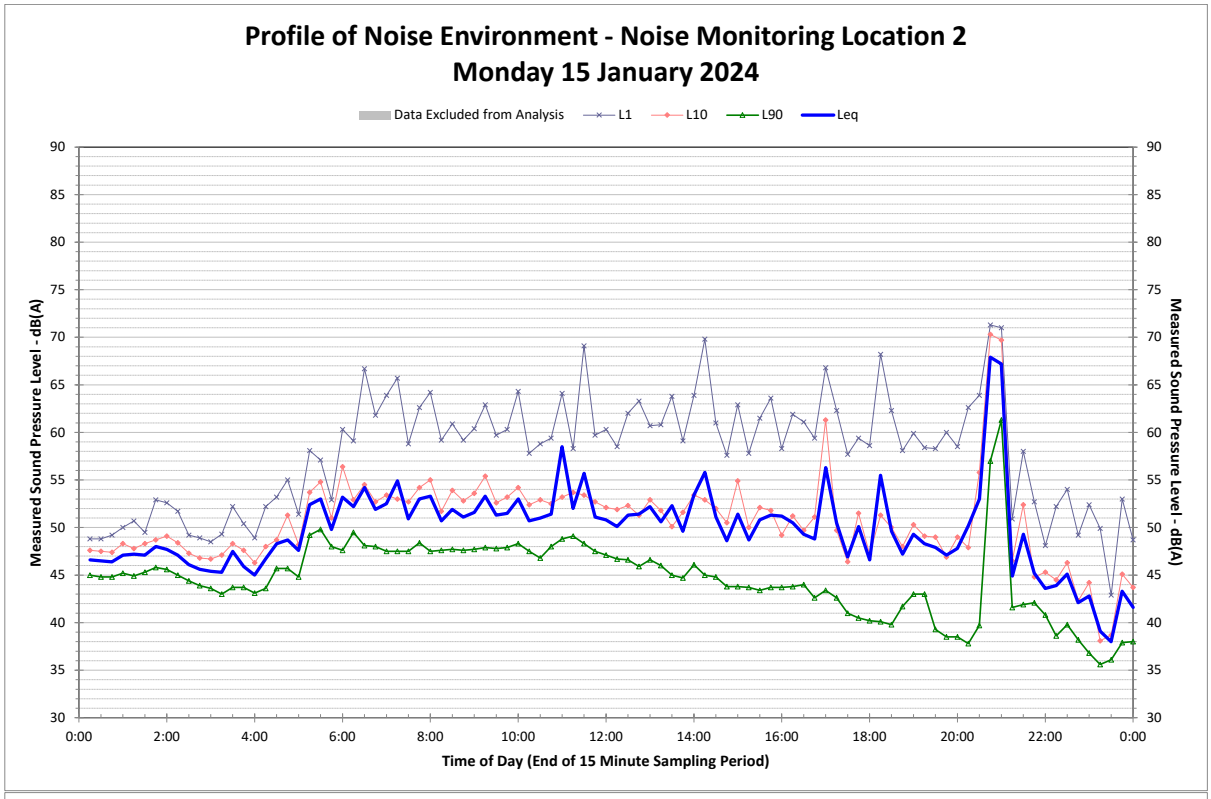

Profile of Noise Environment - Noise Monitoring Location 2
Wednesday 10 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

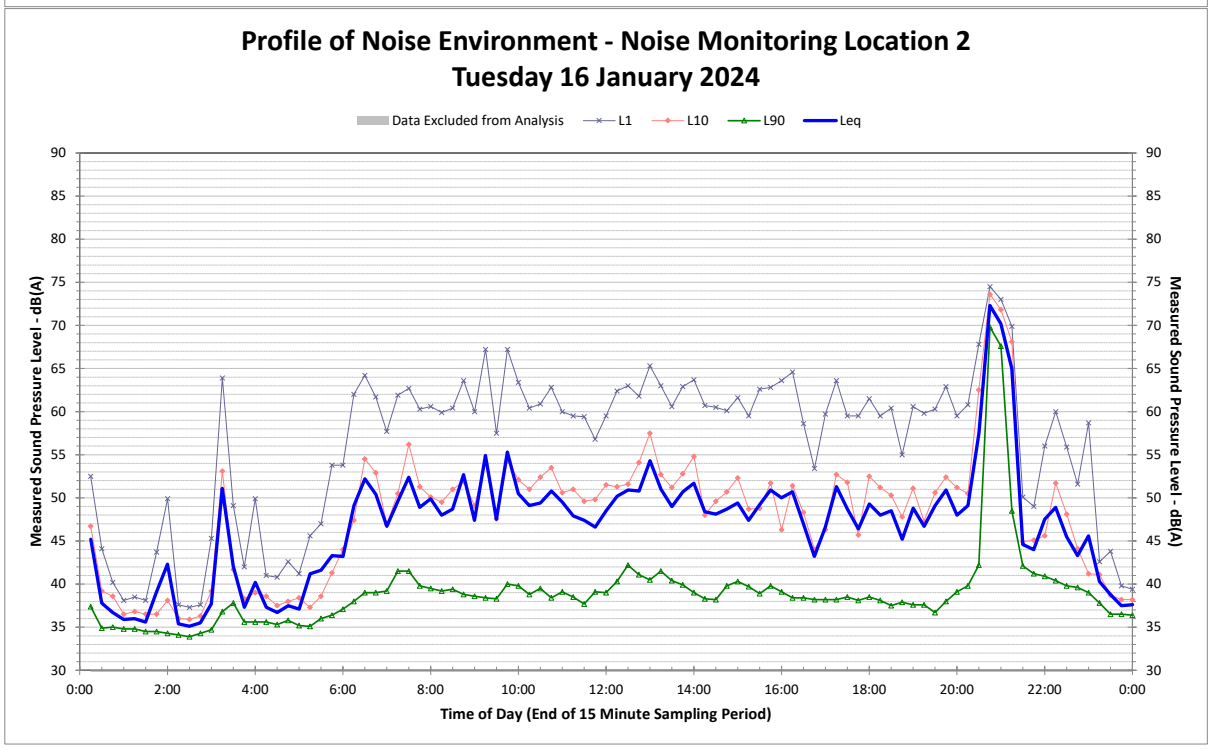

Profile of Noise Environment - Noise Monitoring Location 2
Thursday 11 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

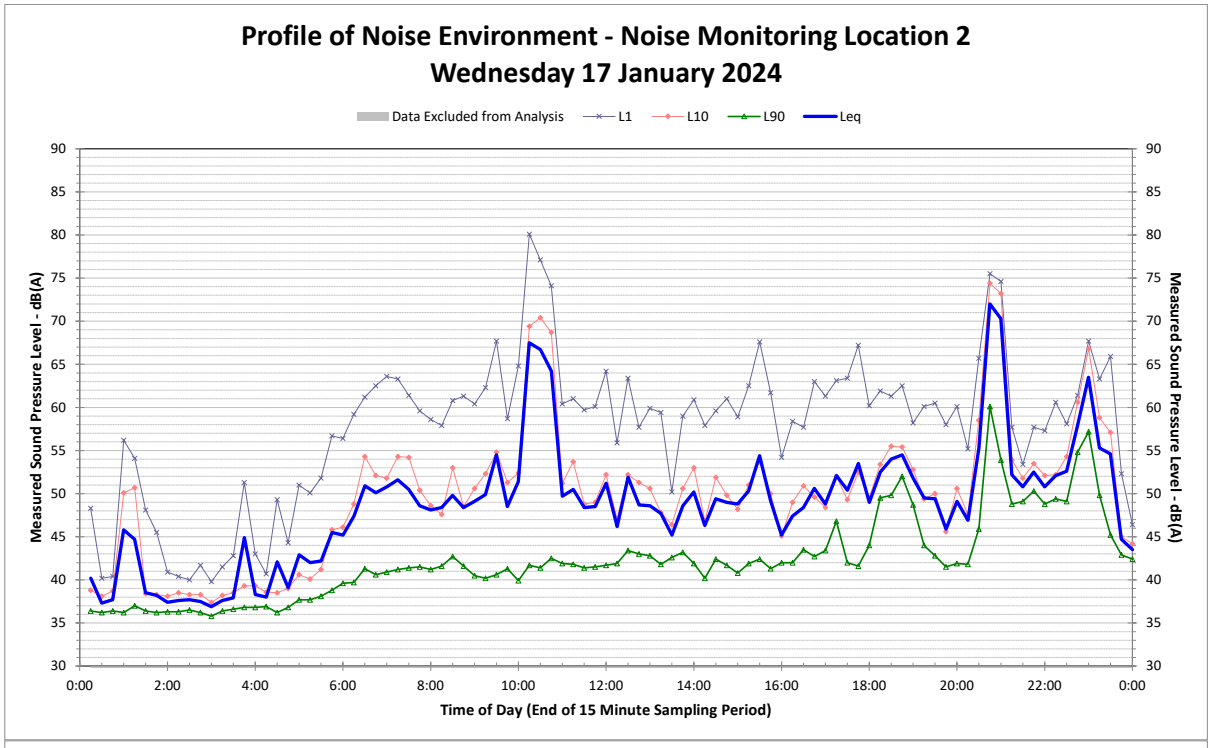

Profile of Noise Environment - Noise Monitoring Location 2
Friday 12 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

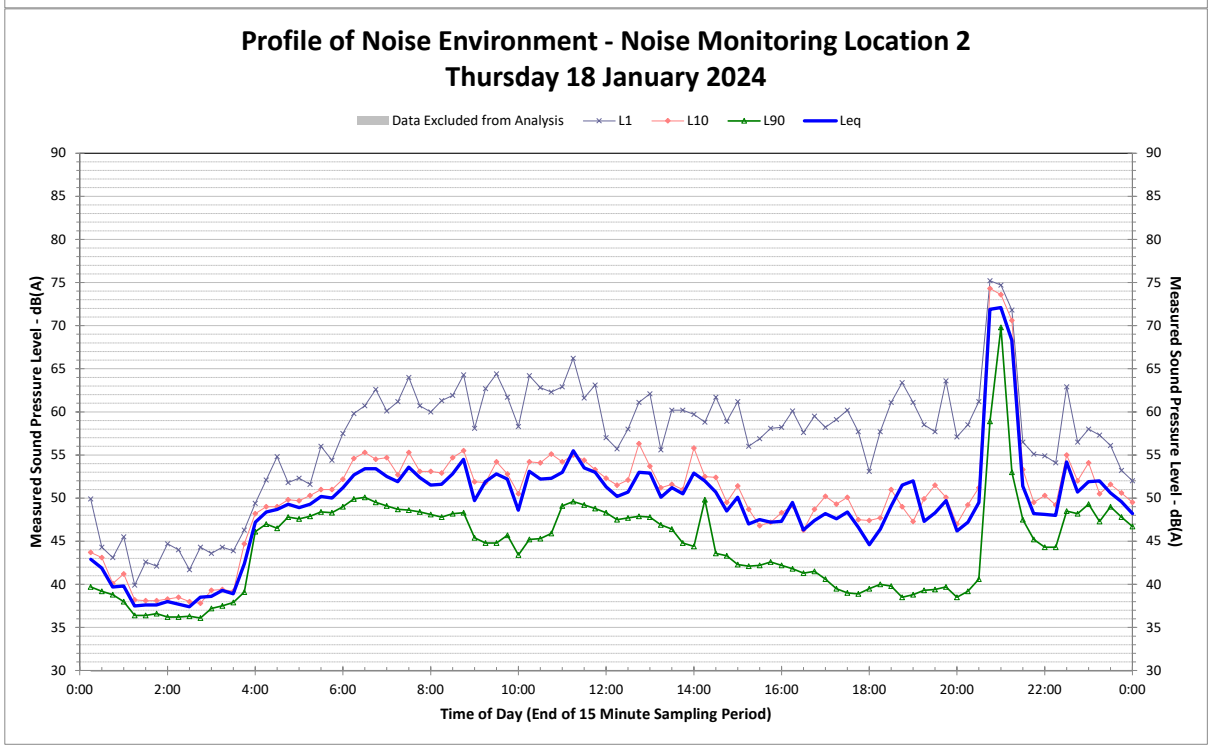

Profile of Noise Environment - Noise Monitoring Location 2
Saturday 13 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

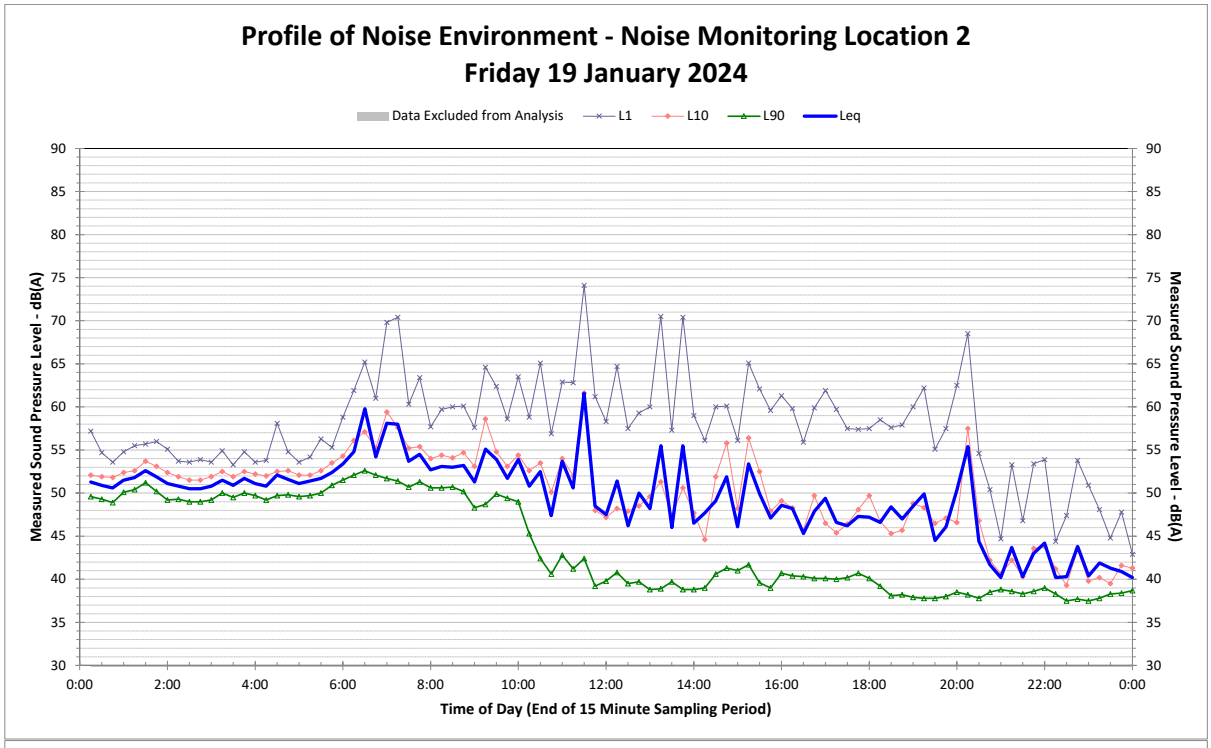

Profile of Noise Environment - Noise Monitoring Location 2
Sunday 14 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

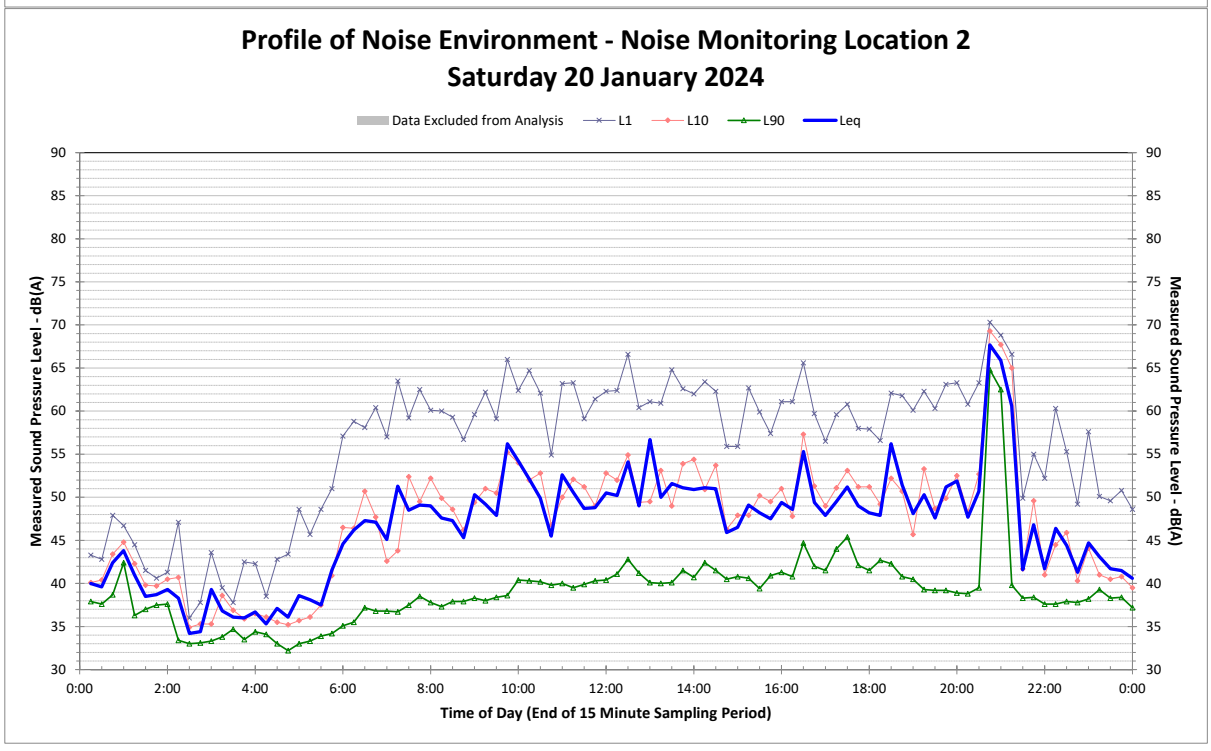

Profile of Noise Environment - Noise Monitoring Location 2
Monday 15 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

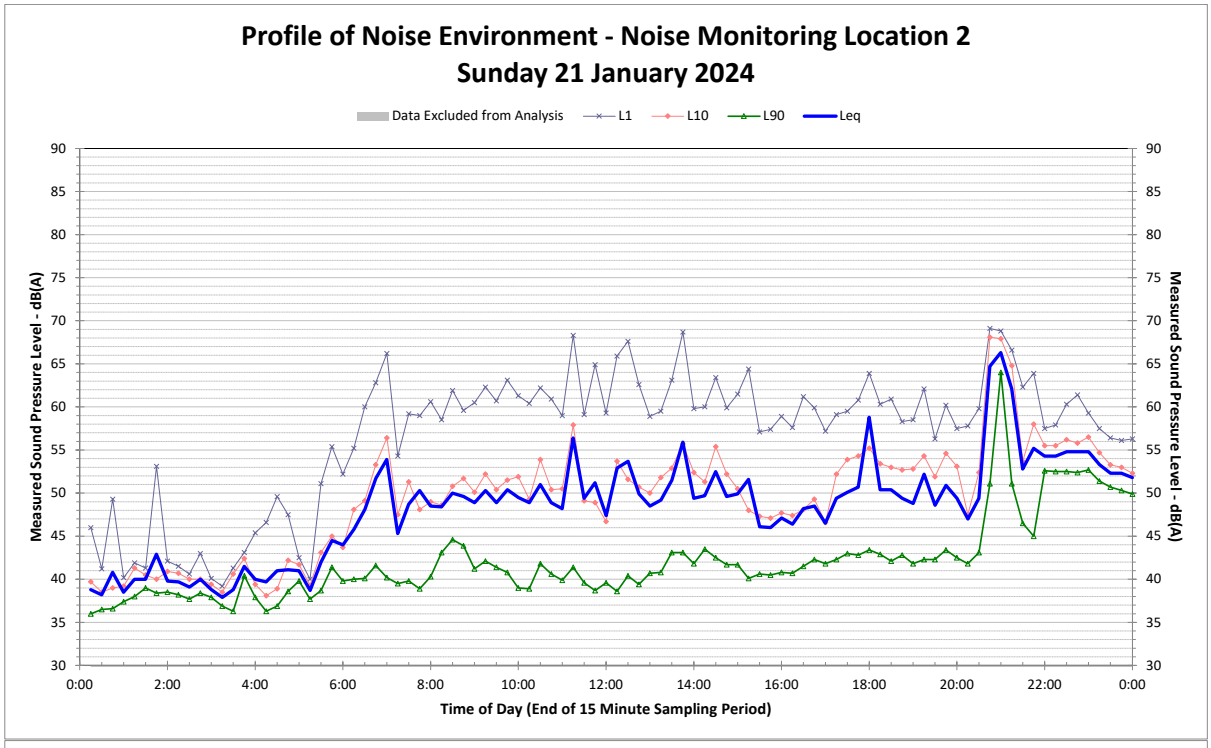

Profile of Noise Environment - Noise Monitoring Location 2
Tuesday 16 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

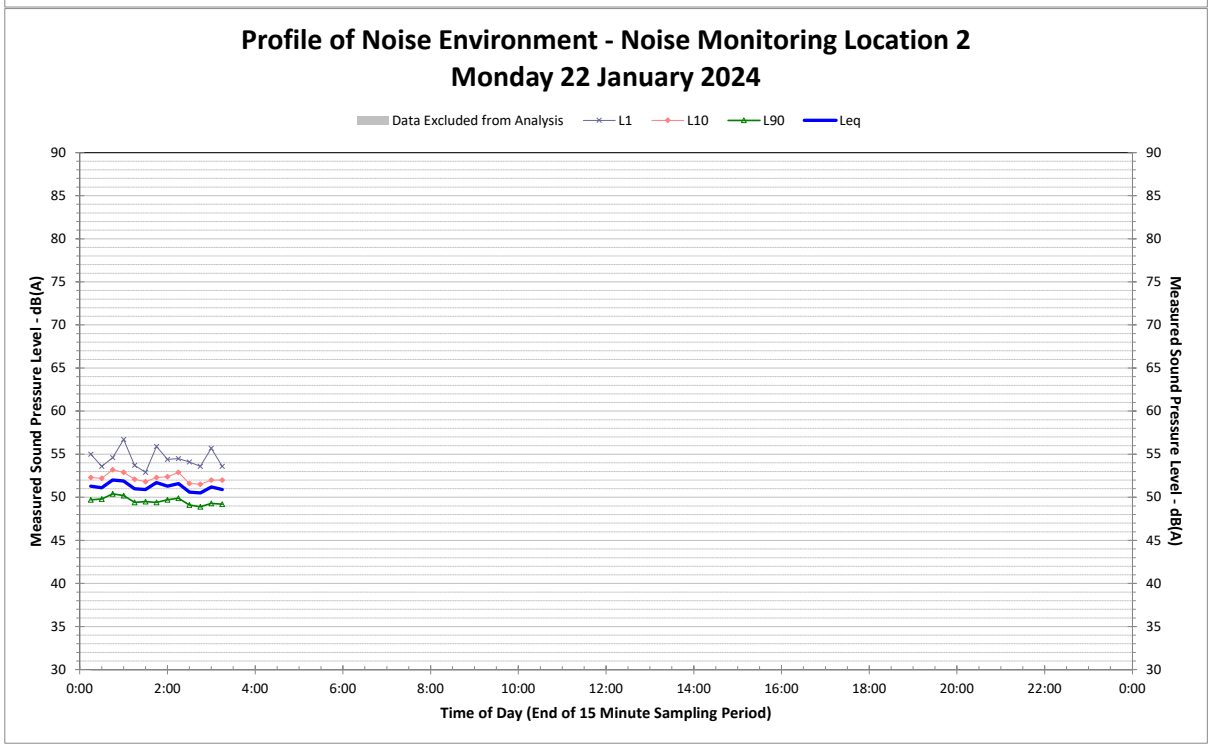

Profile of Noise Environment - Noise Monitoring Location 2
Wednesday 17 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

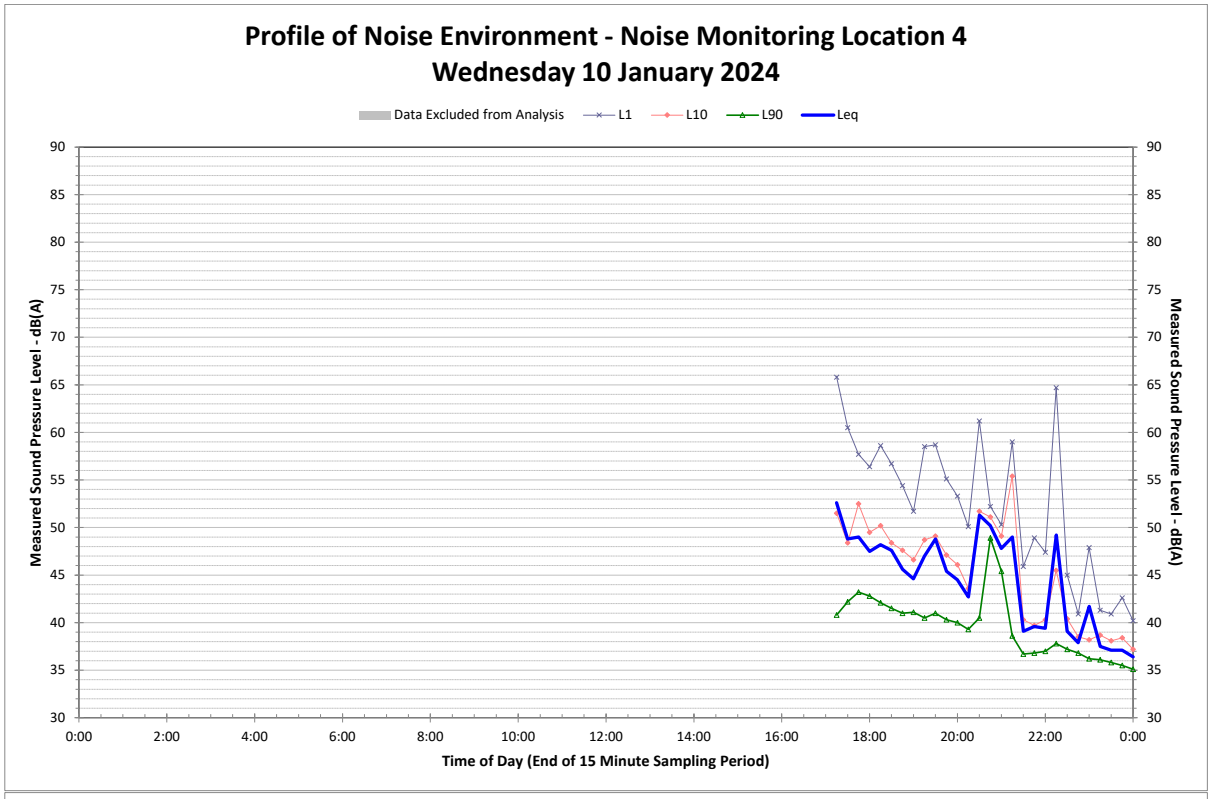

Profile of Noise Environment - Noise Monitoring Location 2
Thursday 18 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

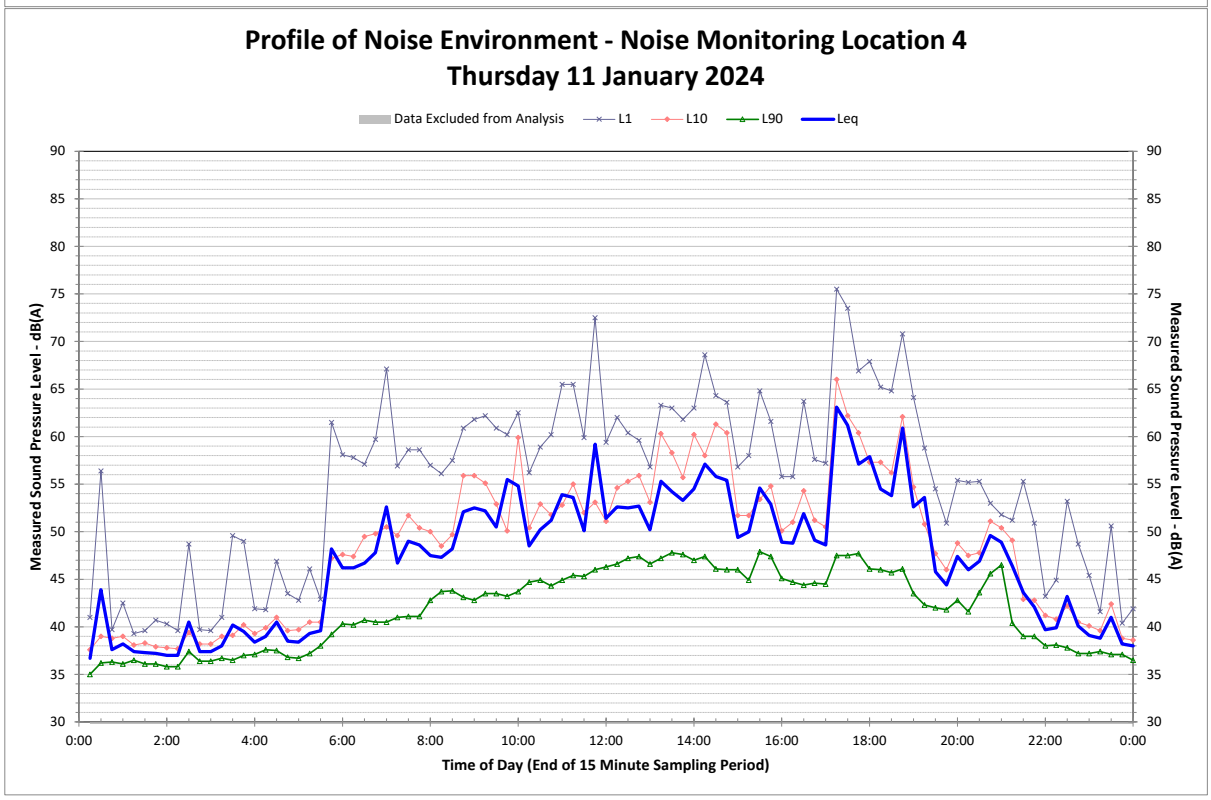

Profile of Noise Environment - Noise Monitoring Location 2
Friday 19 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

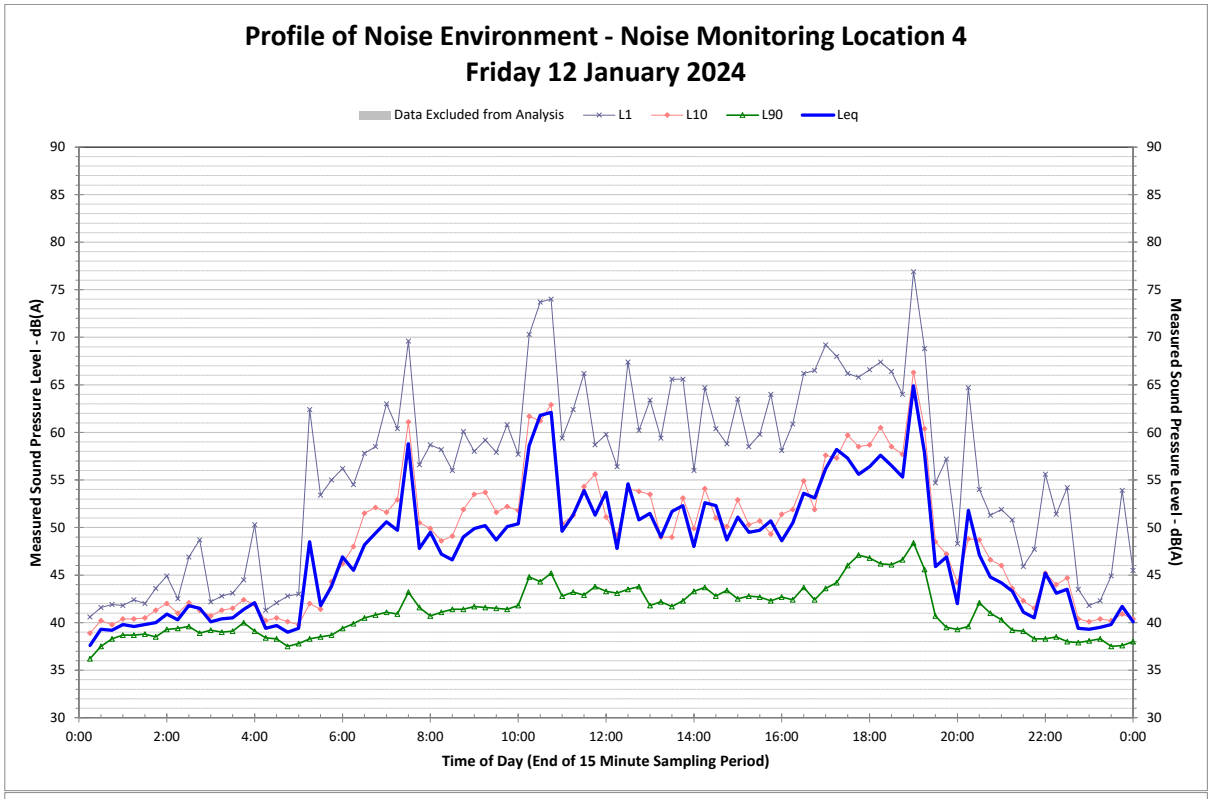

Profile of Noise Environment - Noise Monitoring Location 2
Saturday 20 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 2
Sunday 21 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 2
Monday 22 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 4
Wednesday 10 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 4
Thursday 11 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 4
Friday 12 January 2024
Data Excluded from Analysis
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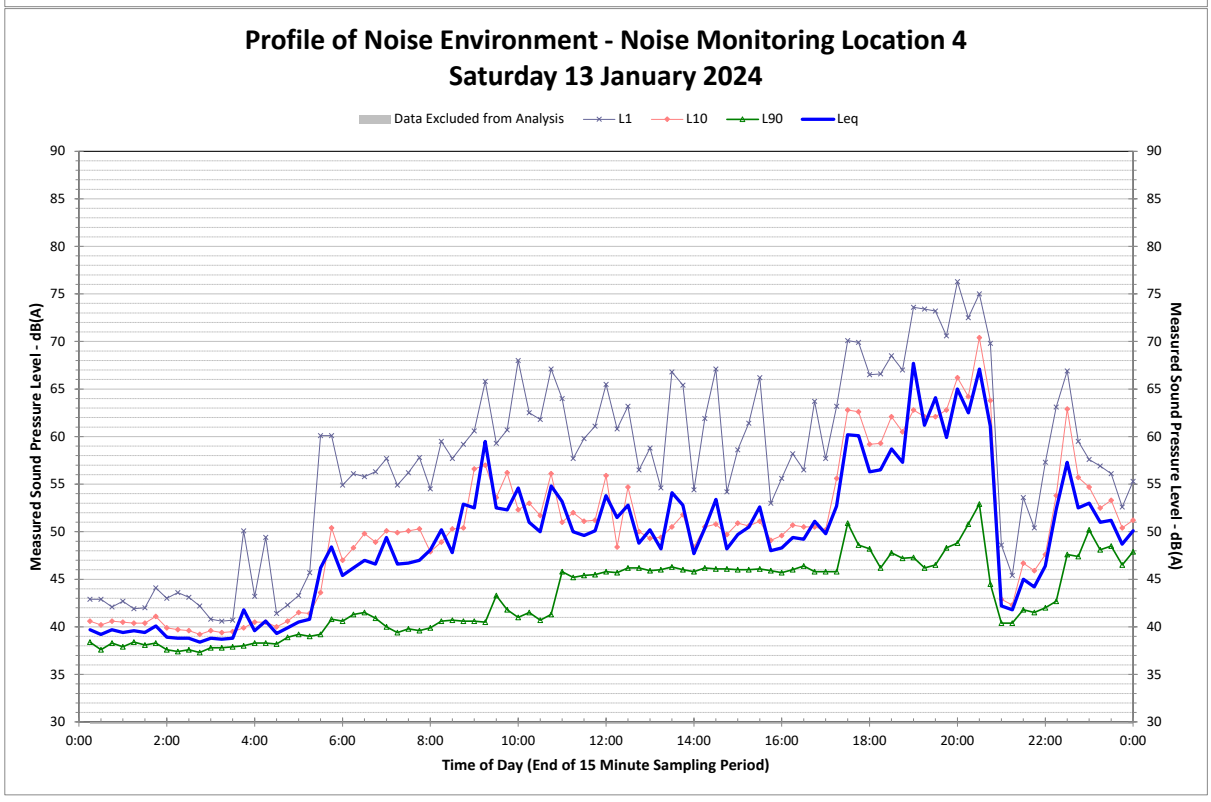
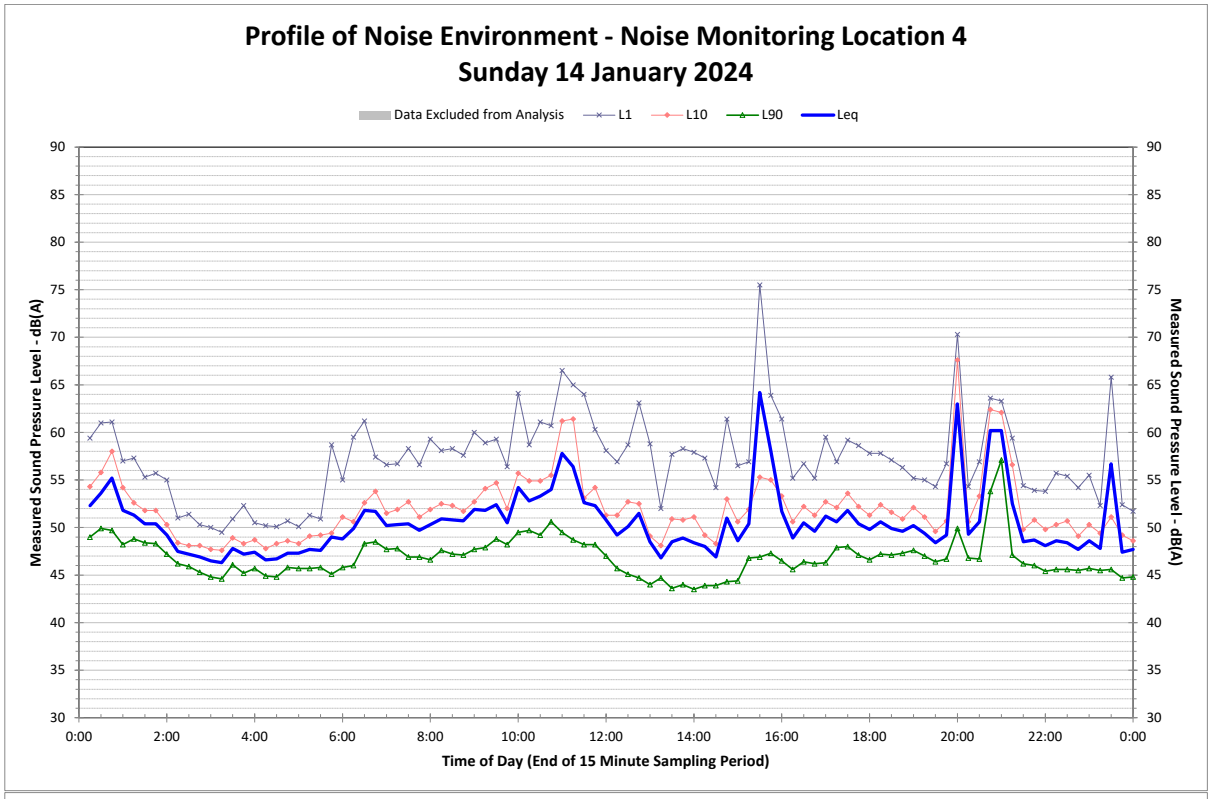
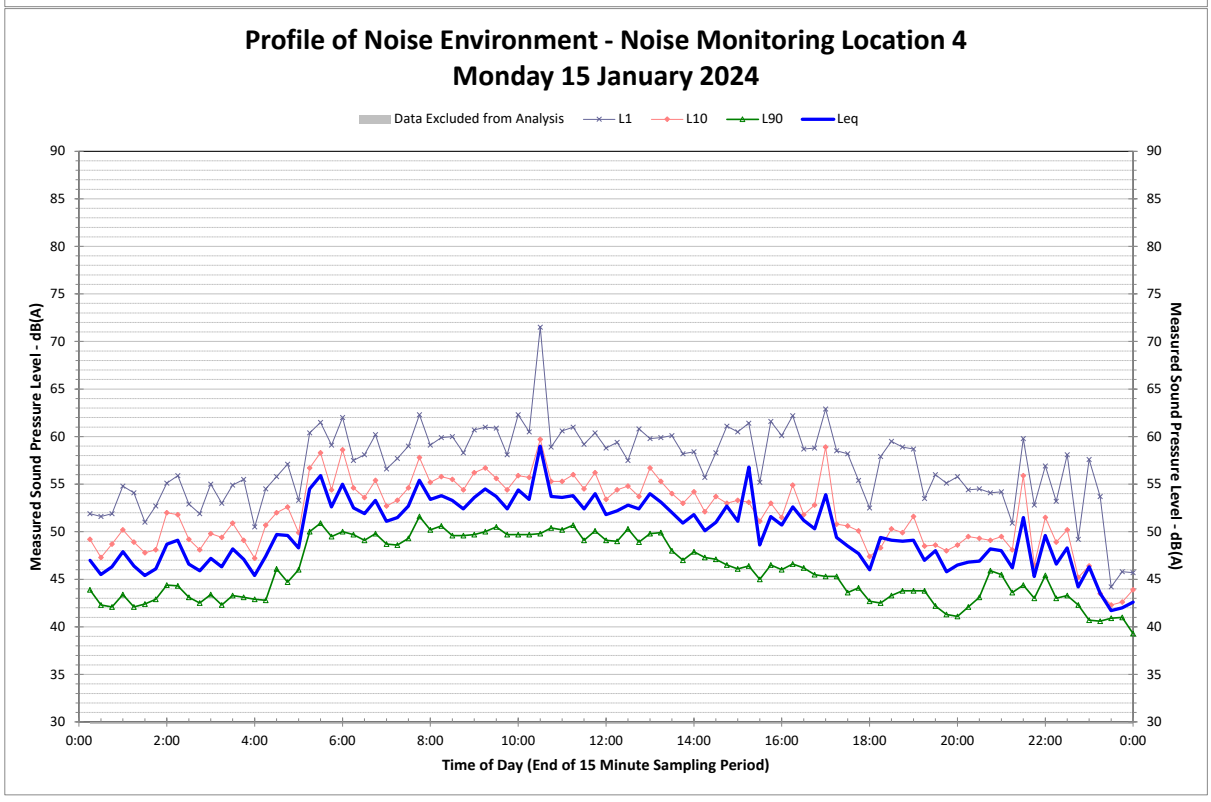
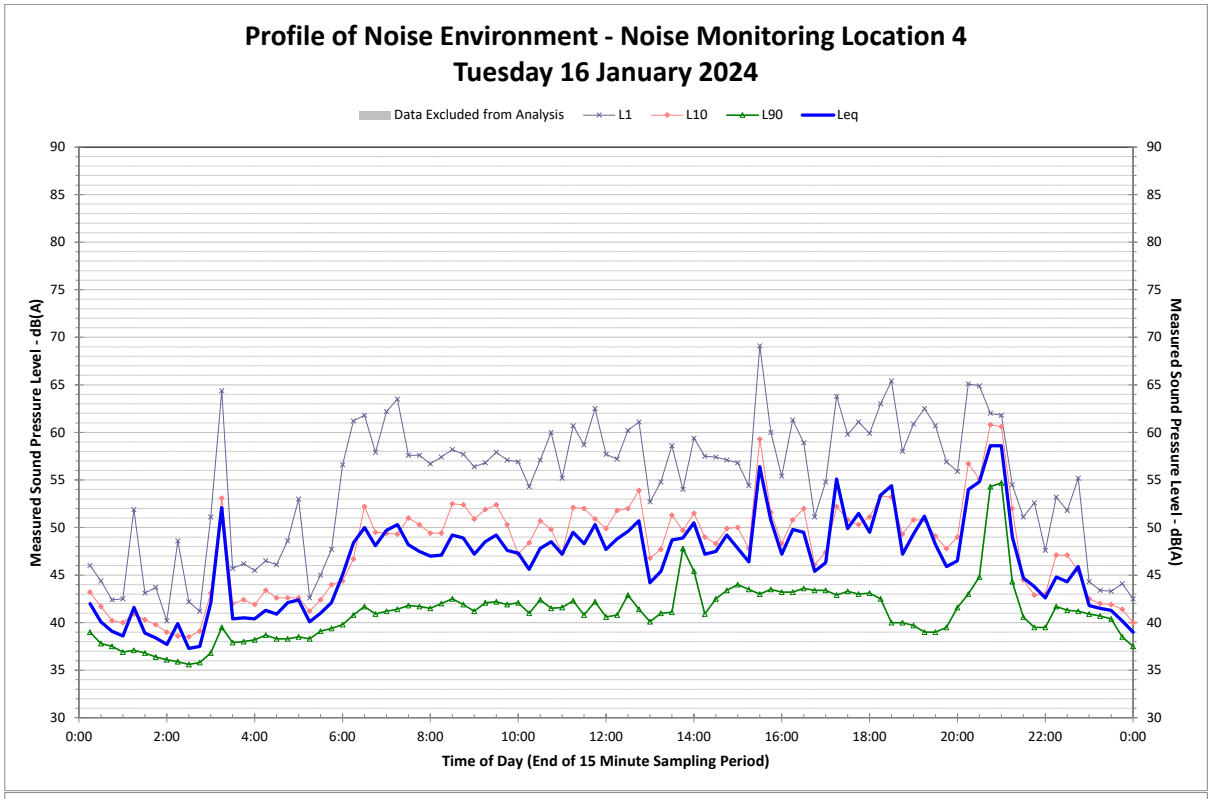
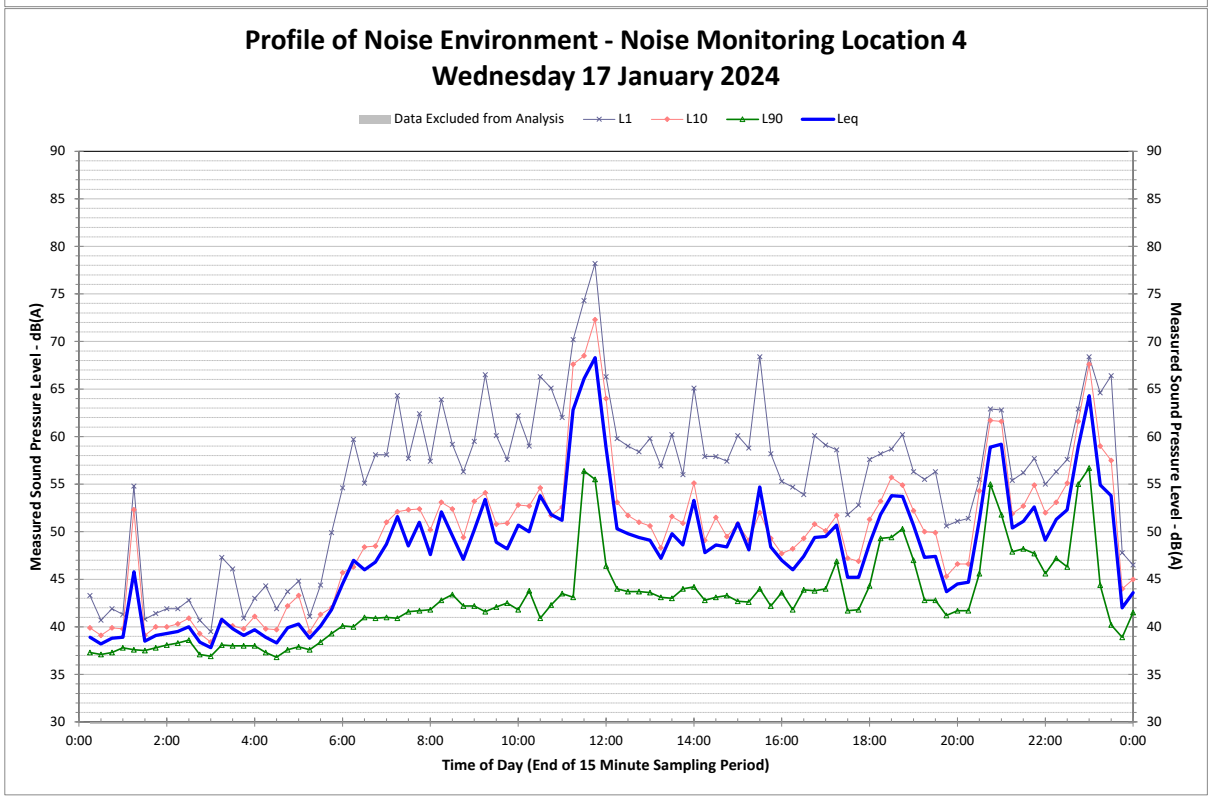
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

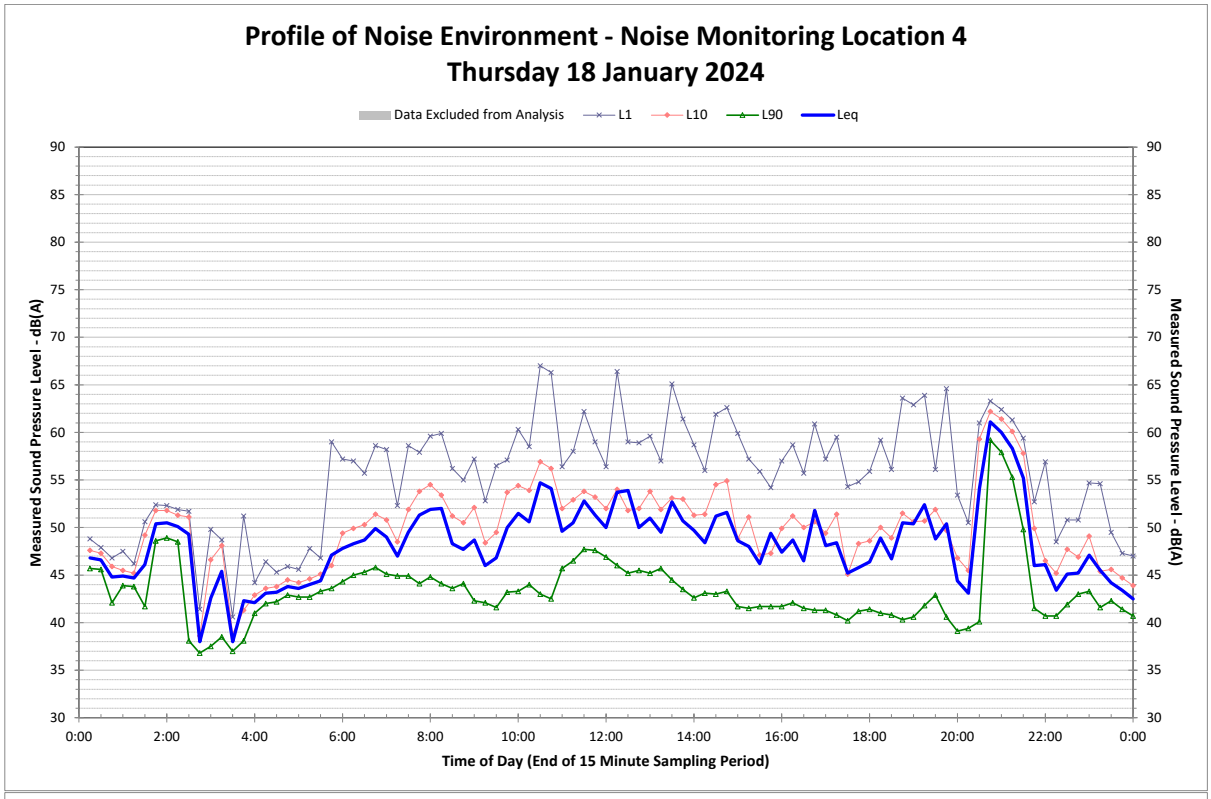

Profile of Noise Environment - Noise Monitoring Location 4
Saturday 13 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

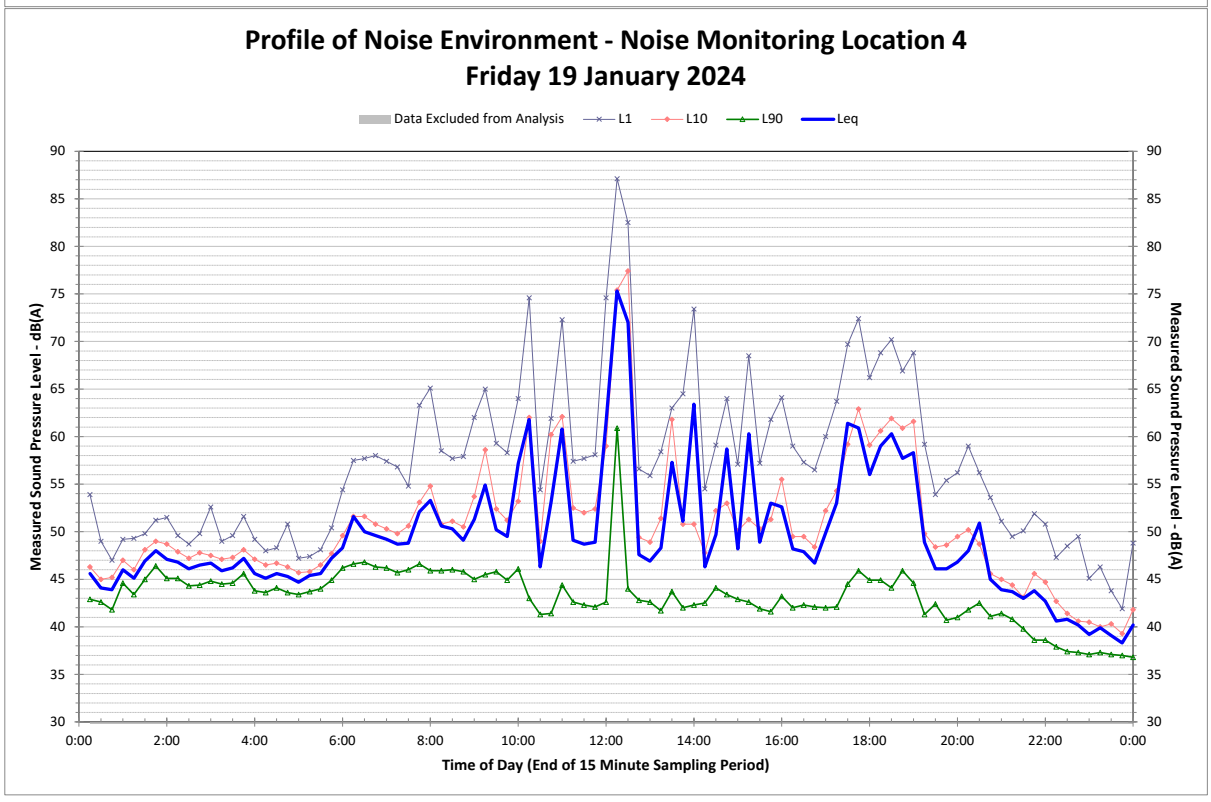

Profile of Noise Environment - Noise Monitoring Location 4
Sunday 14 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

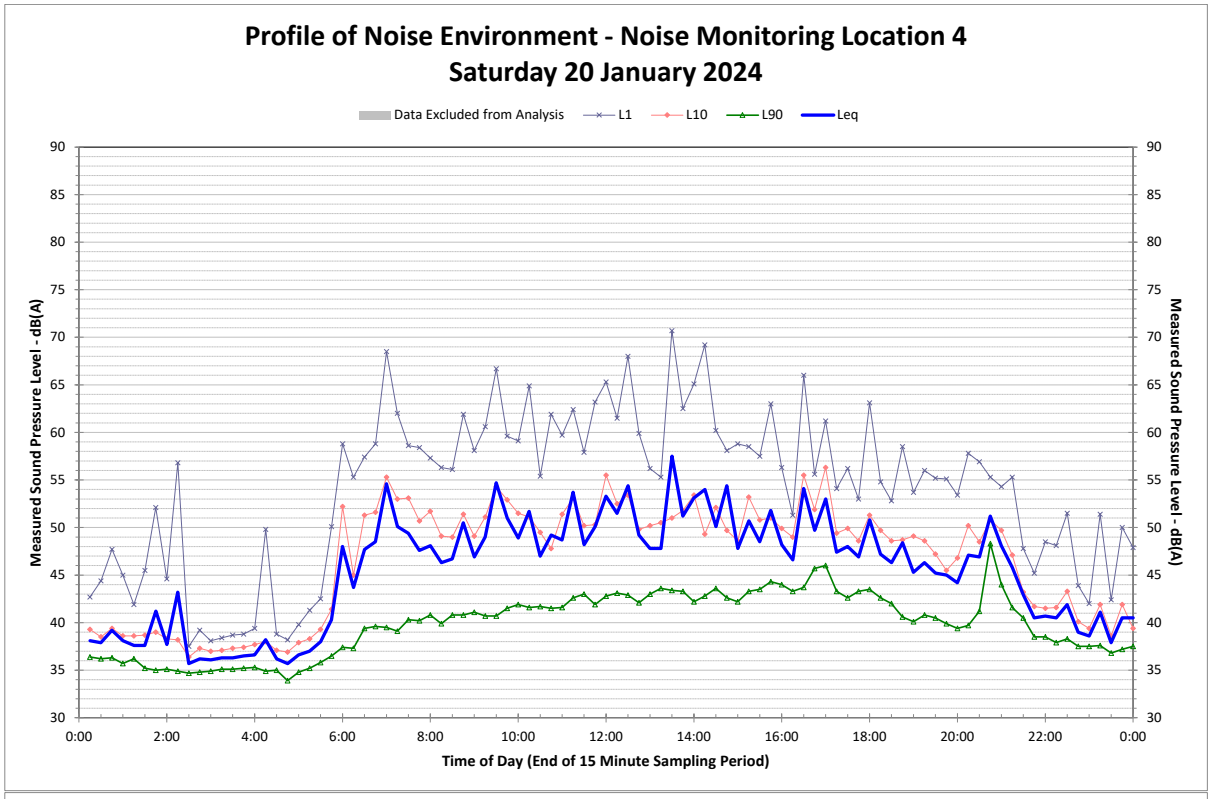

Profile of Noise Environment - Noise Monitoring Location 4
Monday 15 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

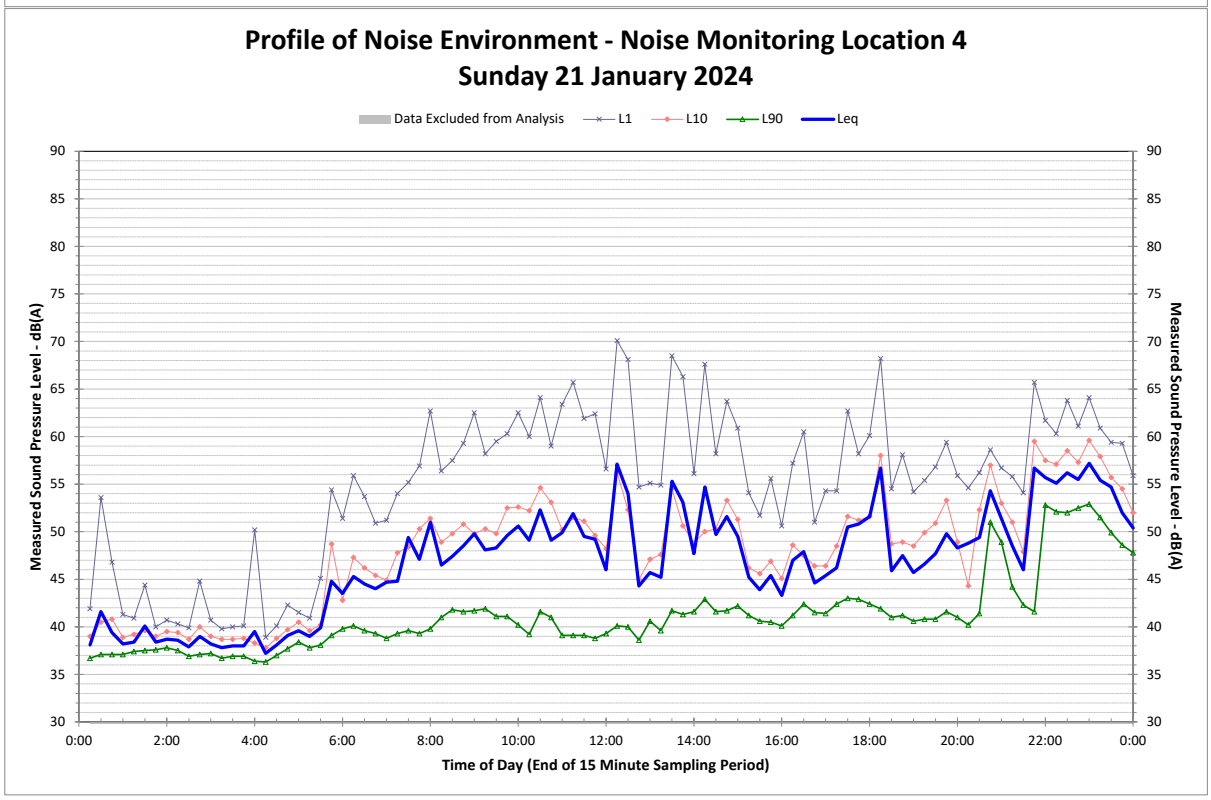

Profile of Noise Environment - Noise Monitoring Location 4
Tuesday 16 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

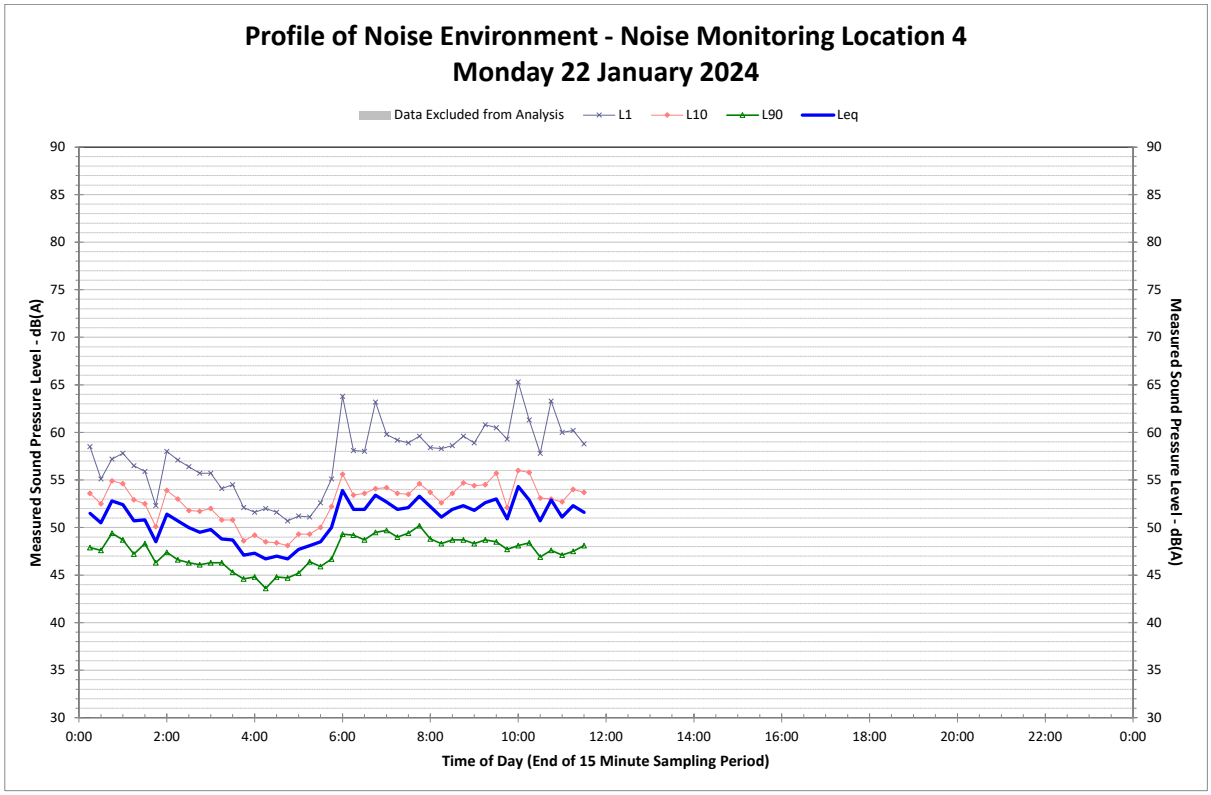

Profile of Noise Environment - Noise Monitoring Location 4
Wednesday 17 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

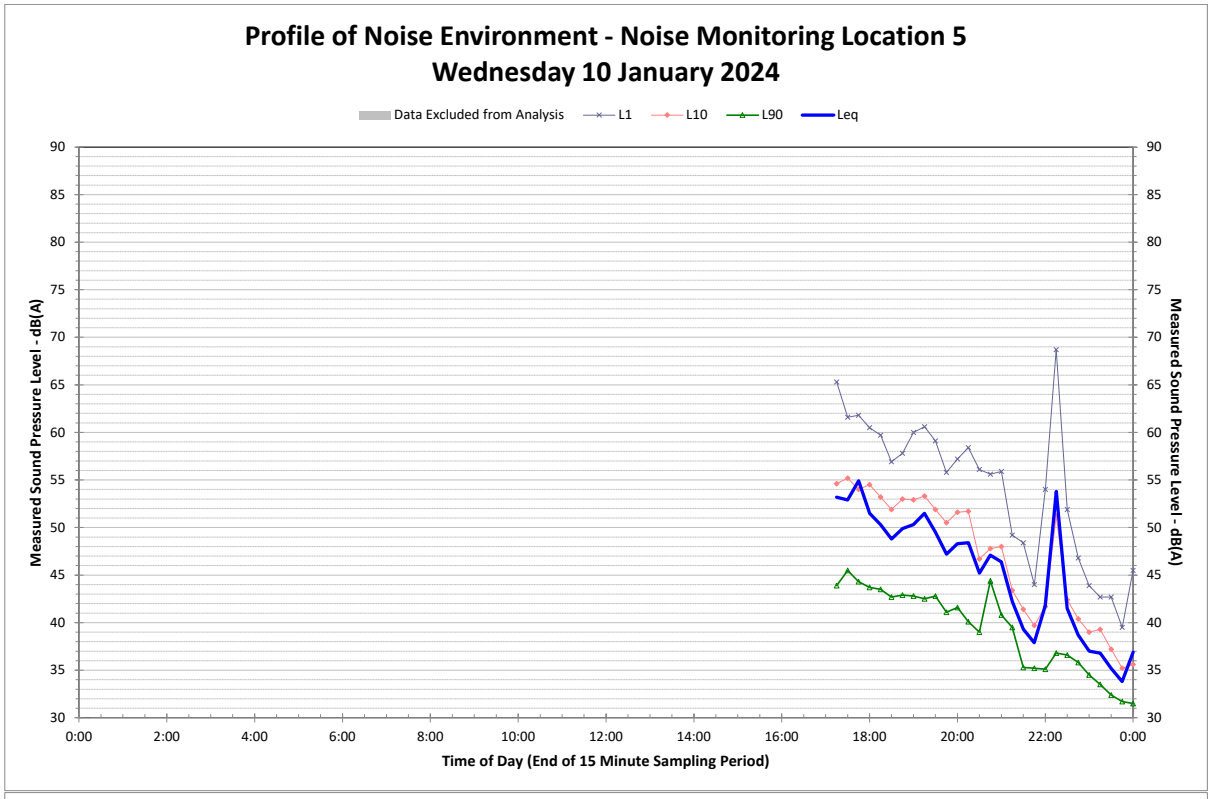

Profile of Noise Environment - Noise Monitoring Location 4
Thursday 18 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

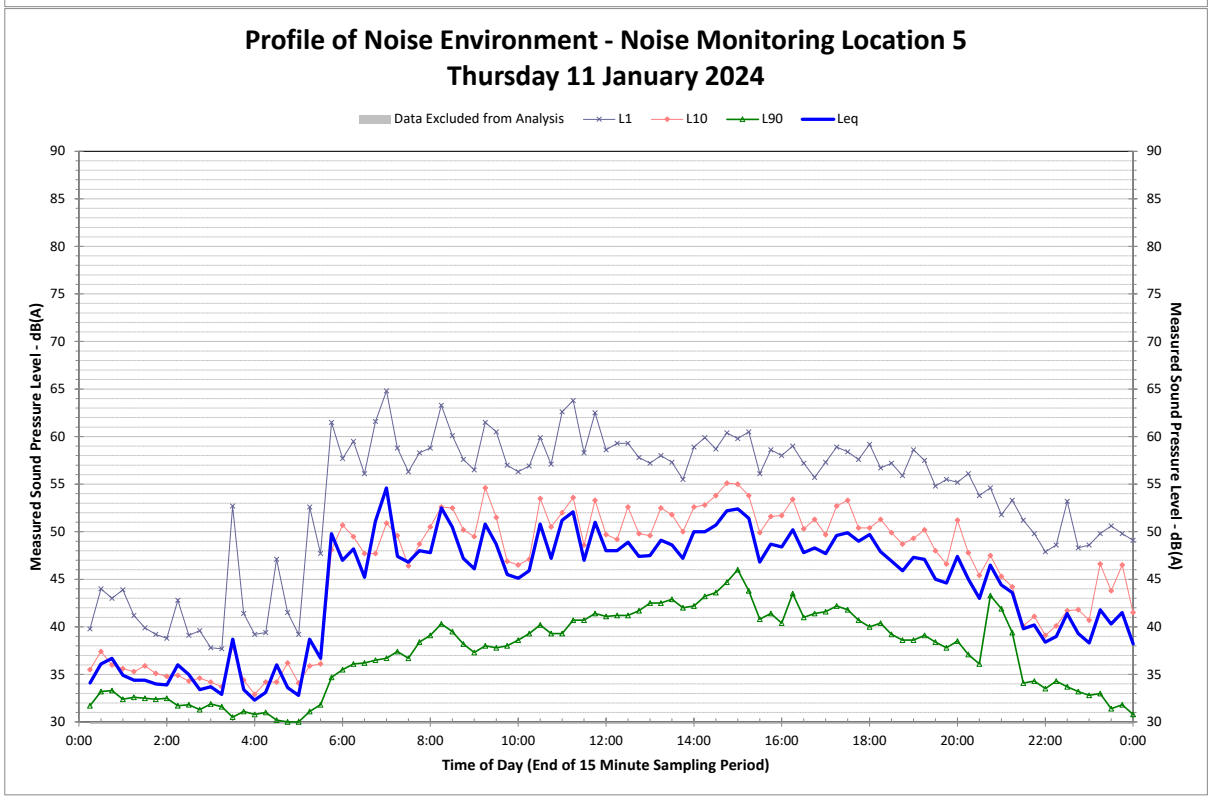

Profile of Noise Environment - Noise Monitoring Location 4
Friday 19 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

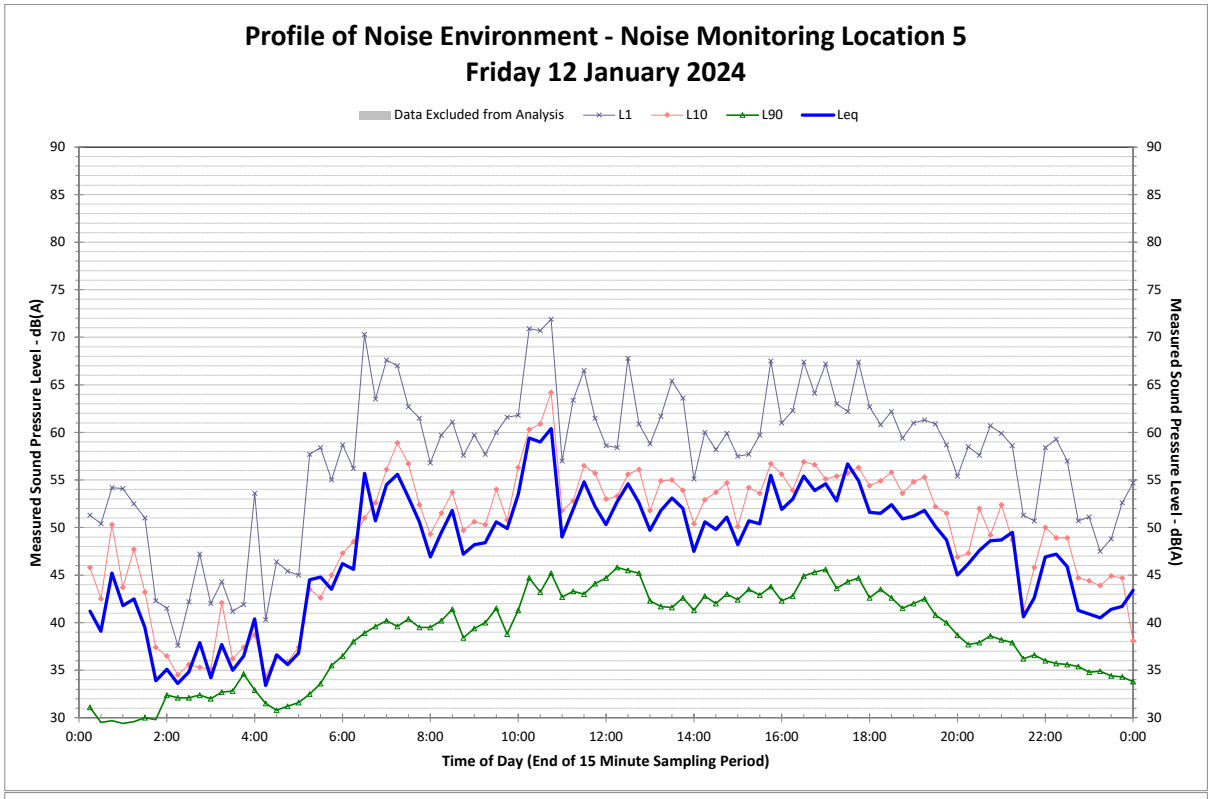

Profile of Noise Environment - Noise Monitoring Location 4
Saturday 20 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

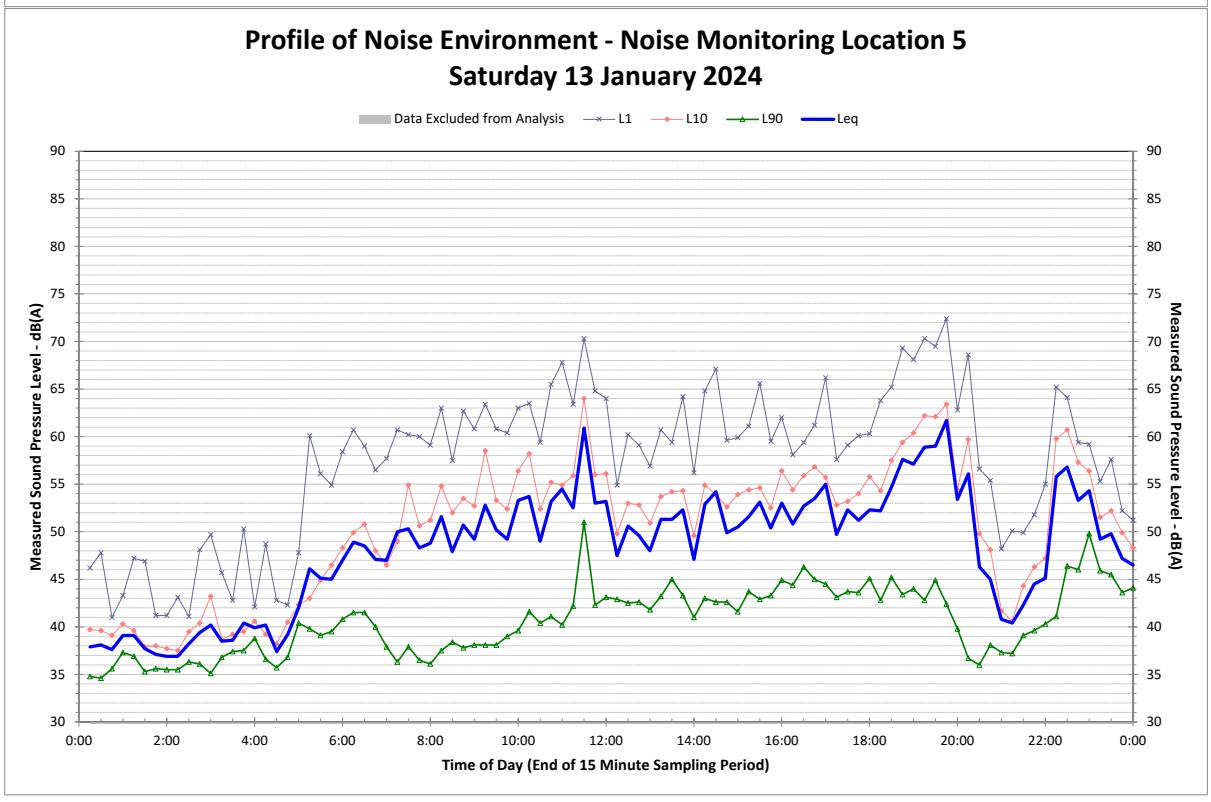

Profile of Noise Environment - Noise Monitoring Location 4
Sunday 21 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

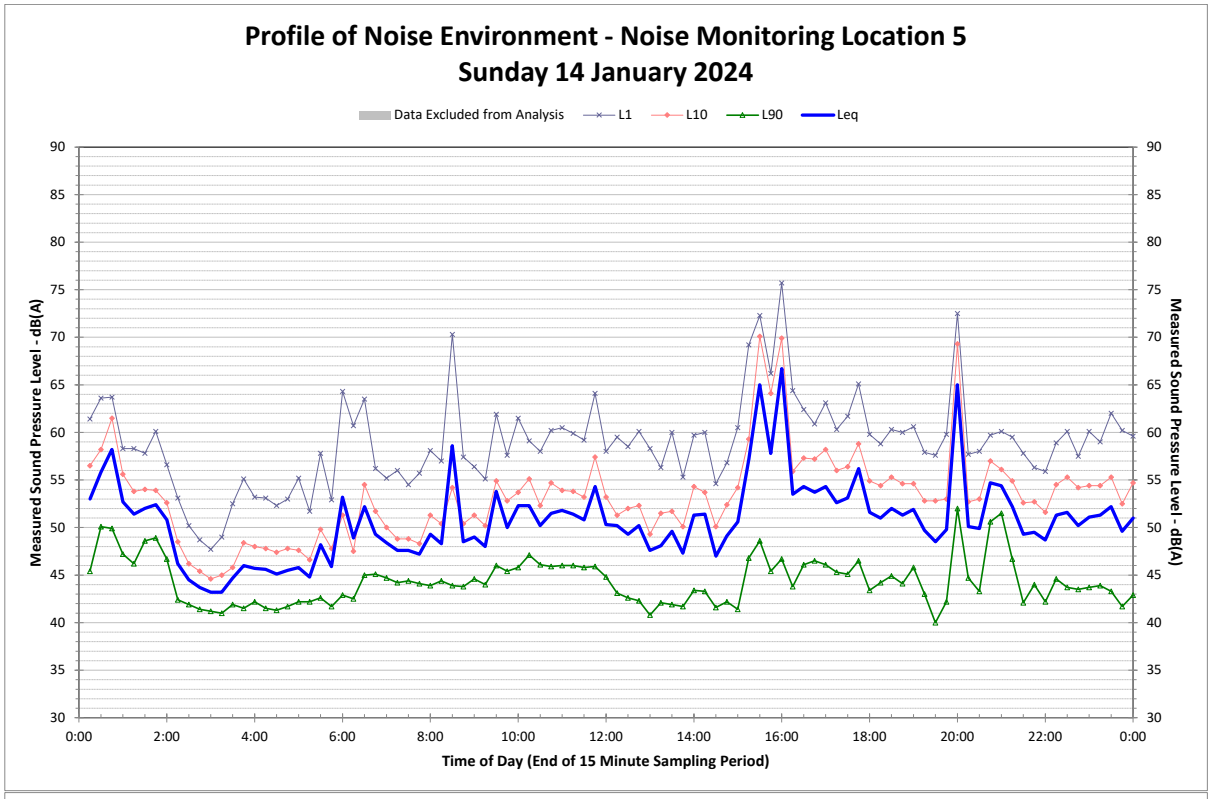

Profile of Noise Environment - Noise Monitoring Location 4
Monday 22 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
90
85
80
75
70
65
60
55
50
45
40
35
30

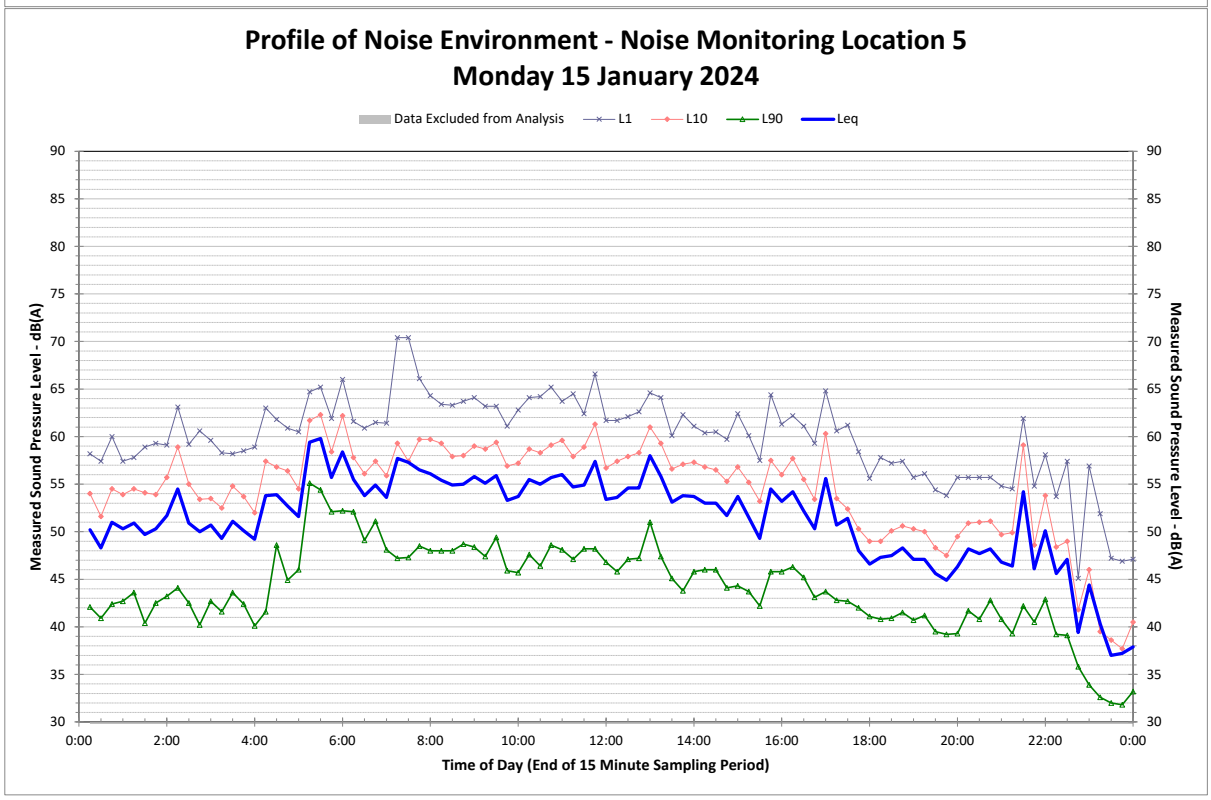

Profile of Noise Environment - Noise Monitoring Location 5
Wednesday 10 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

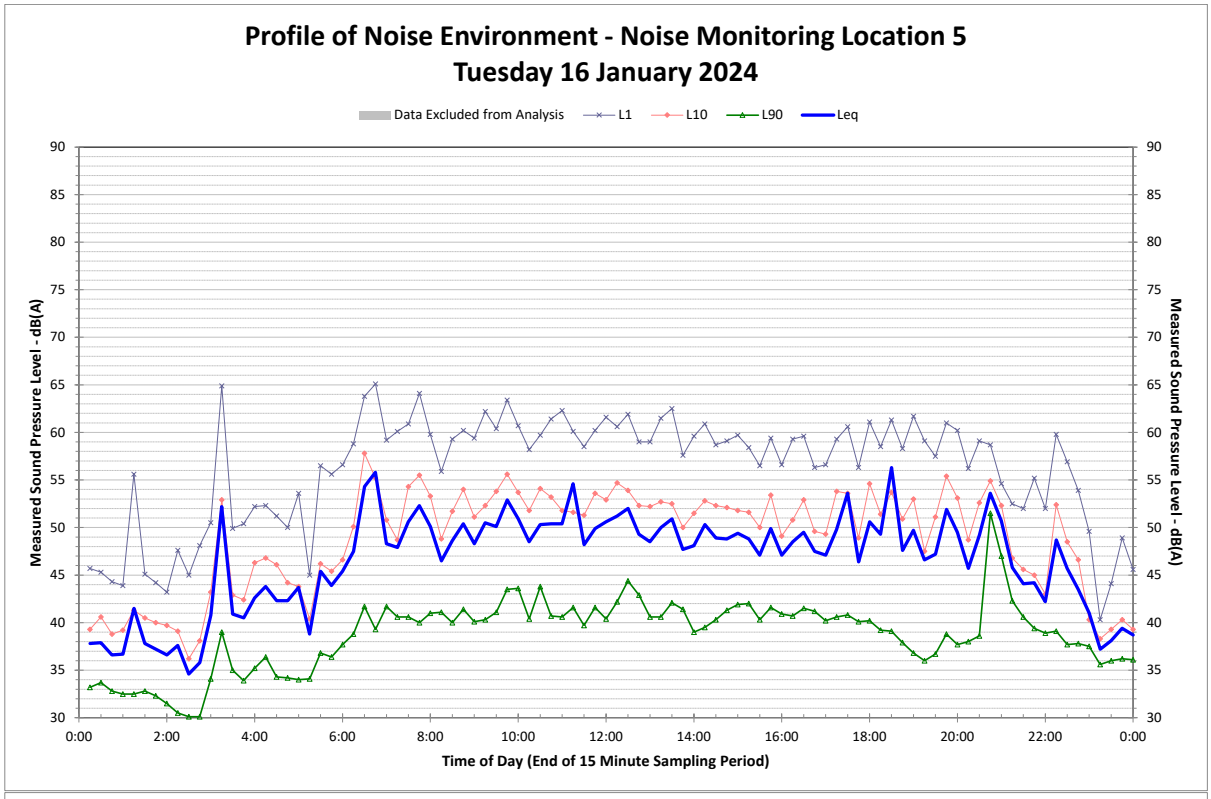

Profile of Noise Environment - Noise Monitoring Location 5
Thursday 11 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

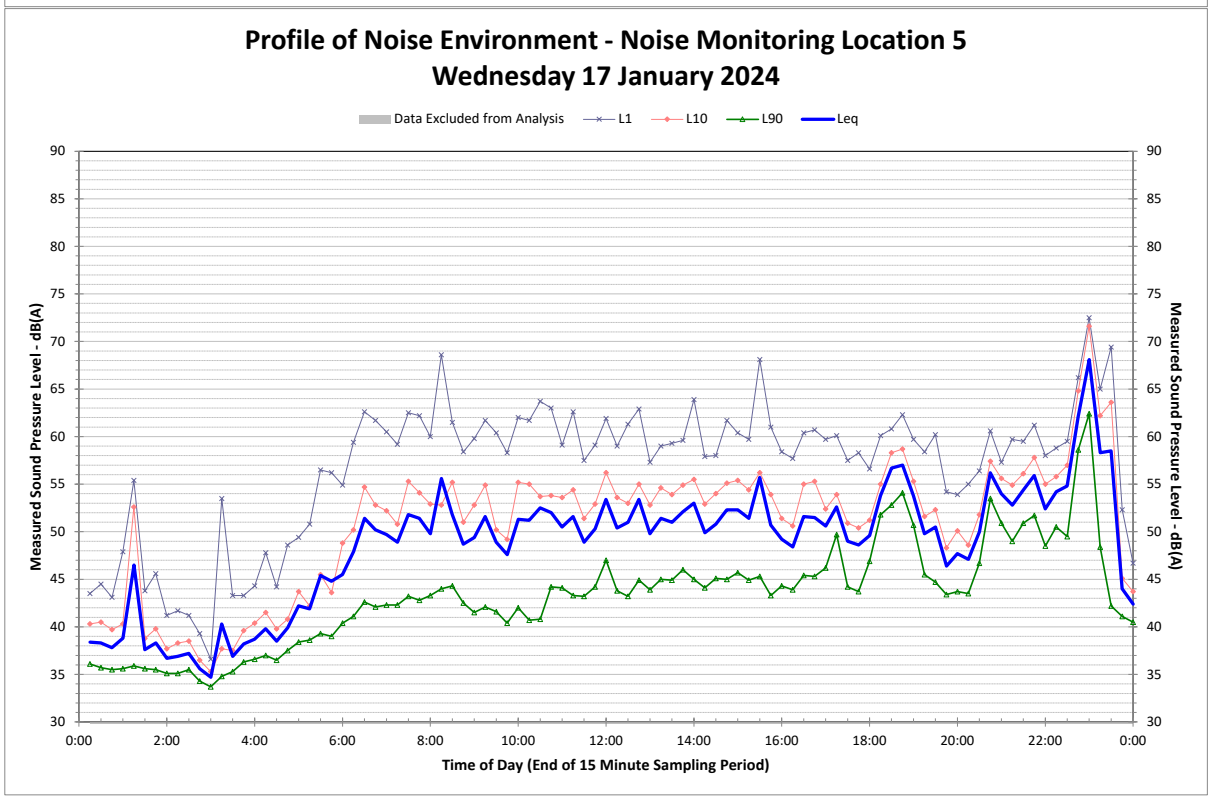

Profile of Noise Environment - Noise Monitoring Location 5
Friday 12 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

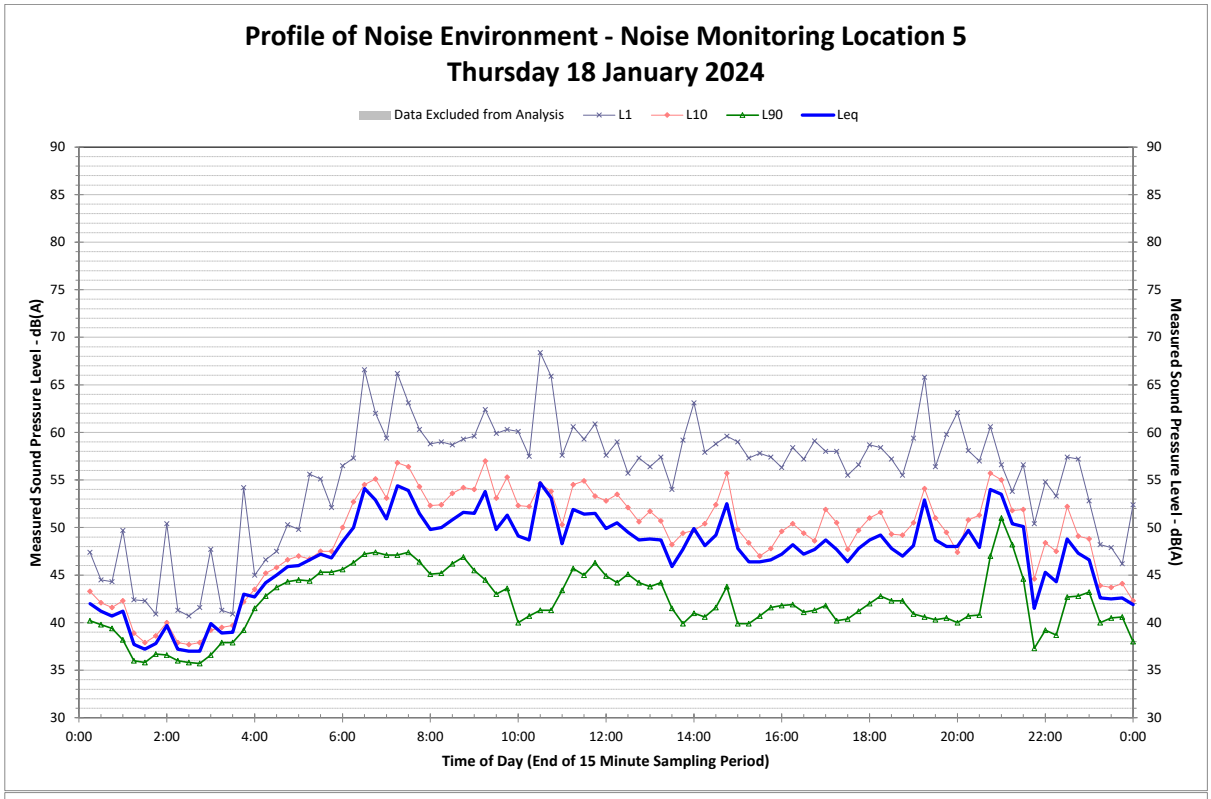

Profile of Noise Environment - Noise Monitoring Location 5
Saturday 13 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

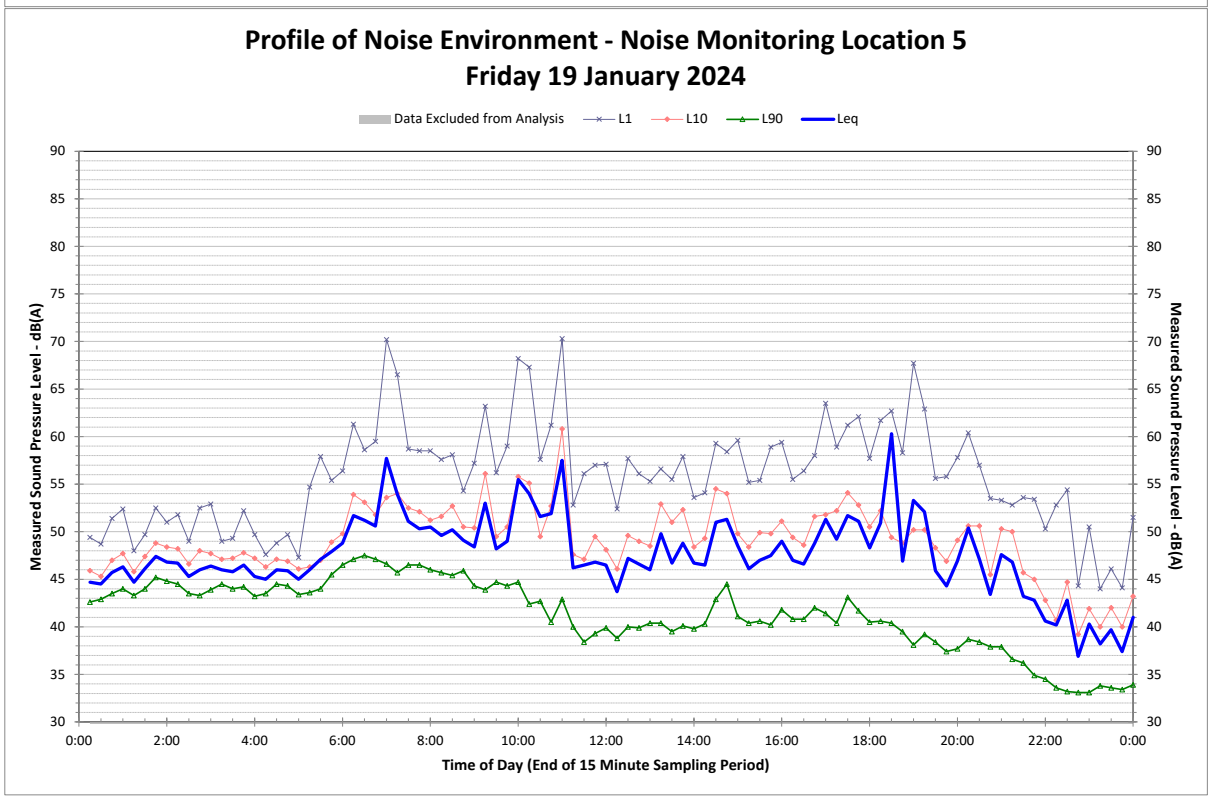

Profile of Noise Environment - Noise Monitoring Location 5
Sunday 14 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

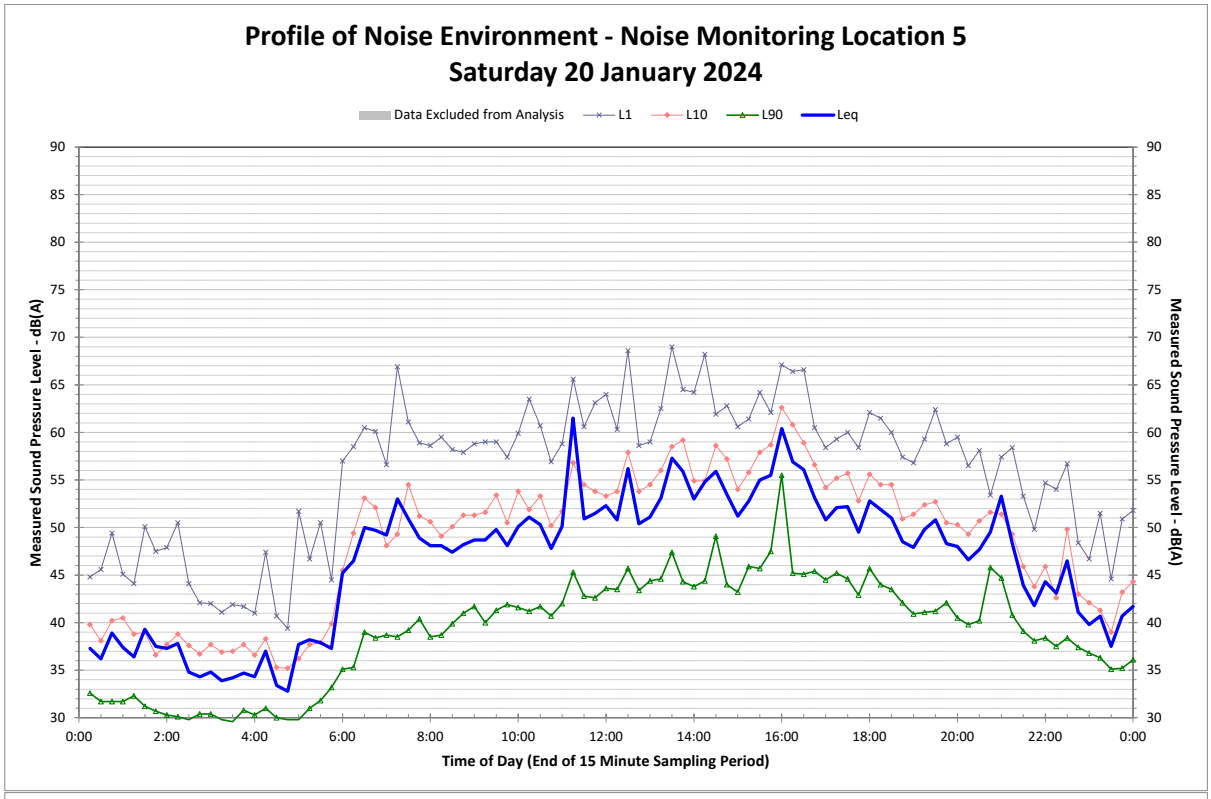

Profile of Noise Environment - Noise Monitoring Location 5
Monday 15 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

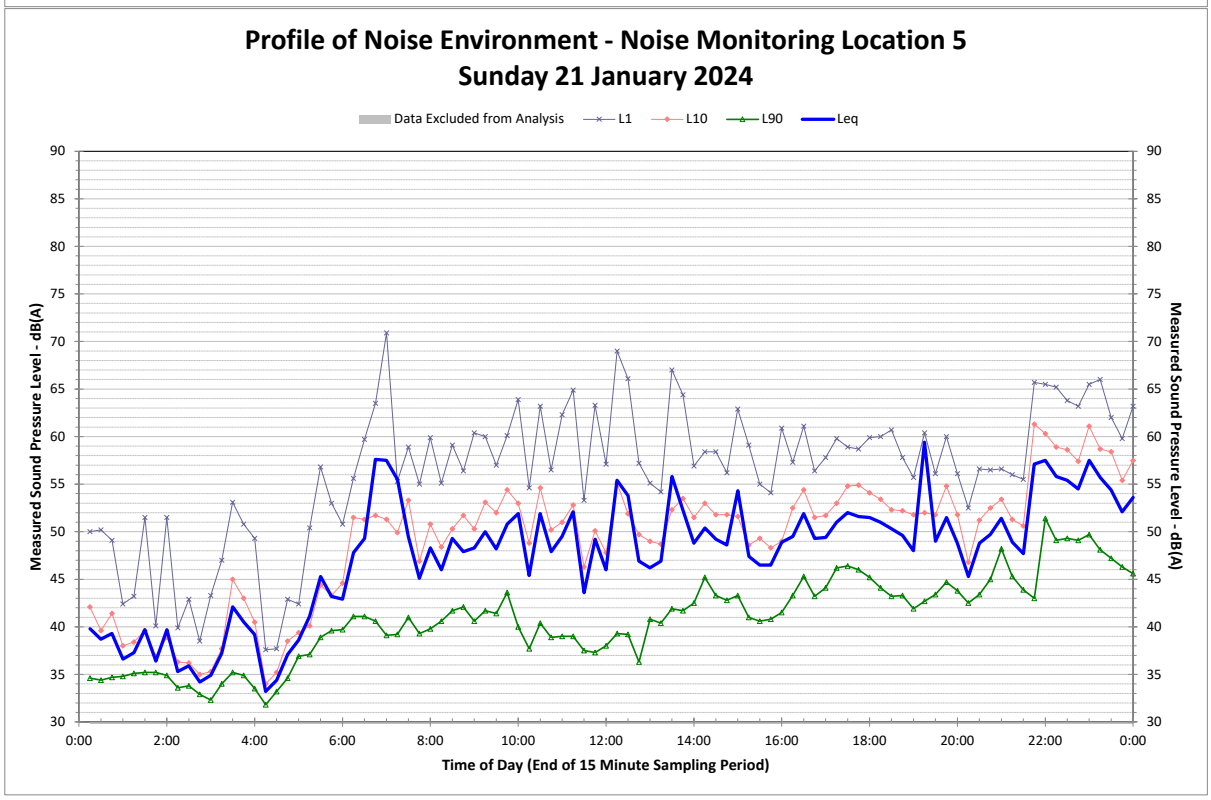

Profile of Noise Environment - Noise Monitoring Location 5
Tuesday 16 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

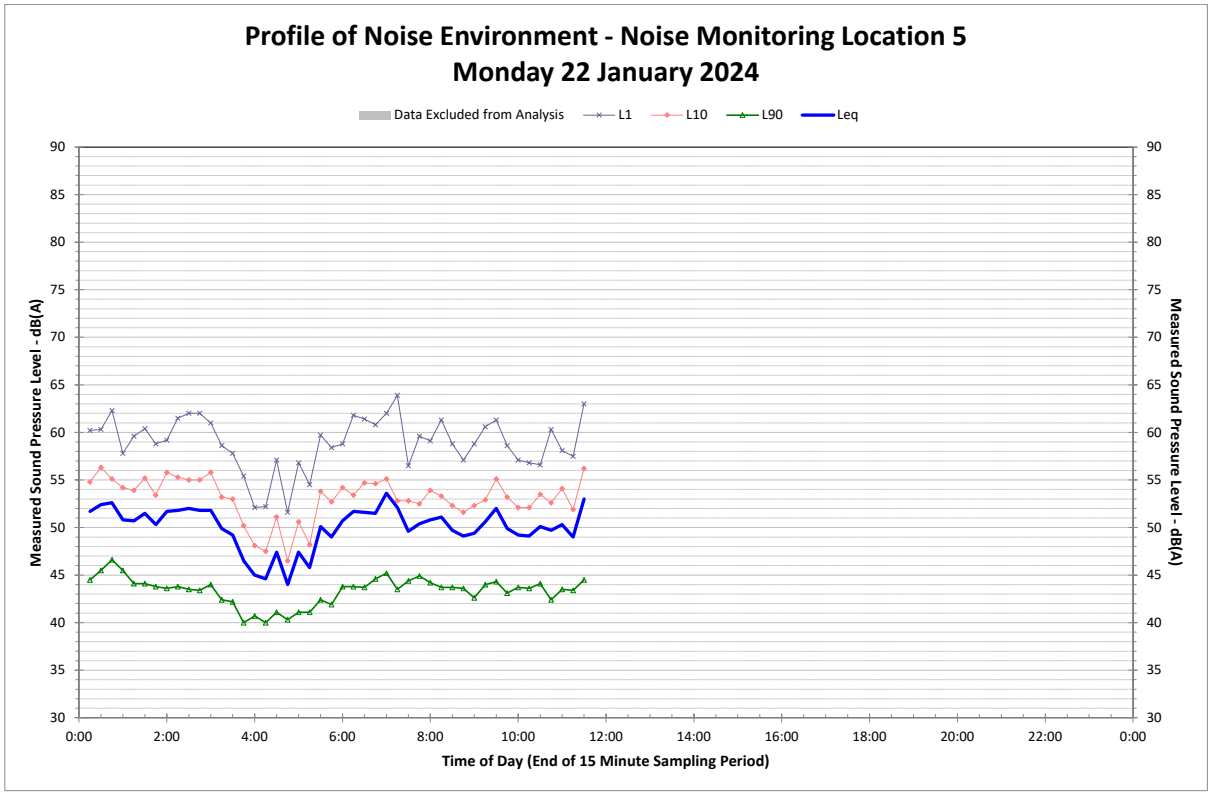

Profile of Noise Environment - Noise Monitoring Location 5
Wednesday 17 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

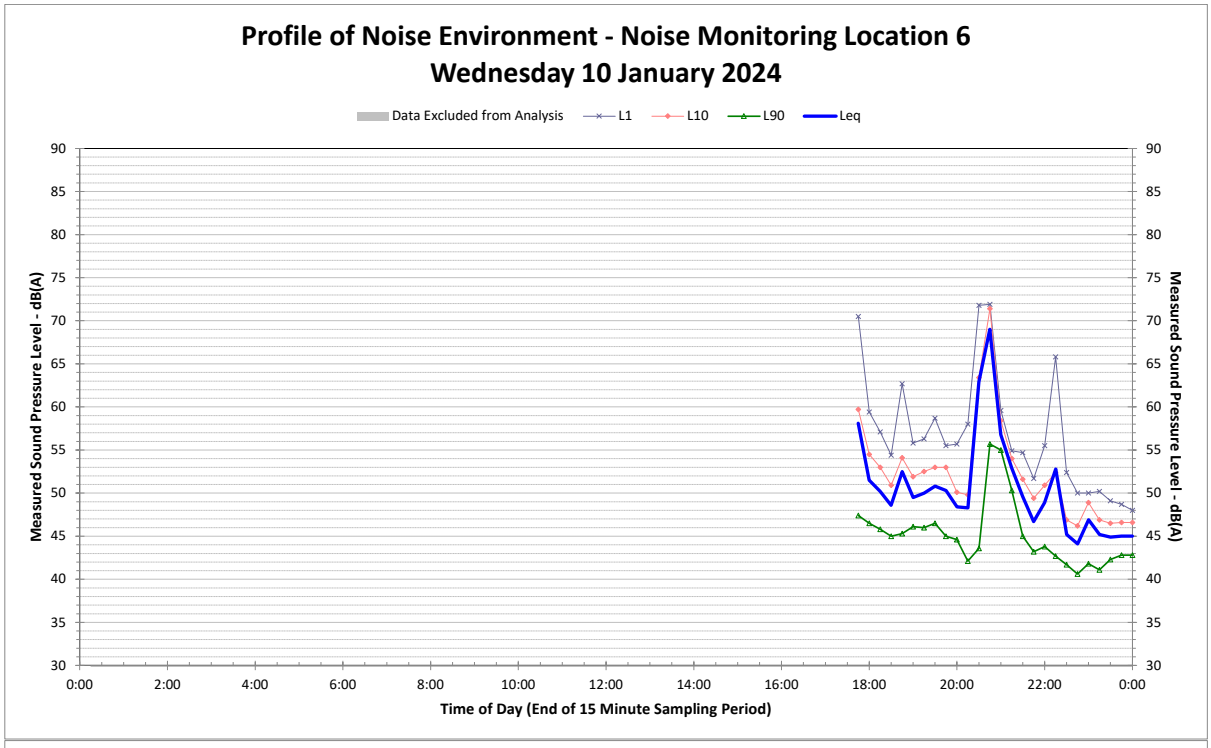

Profile of Noise Environment - Noise Monitoring Location 5
Thursday 18 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

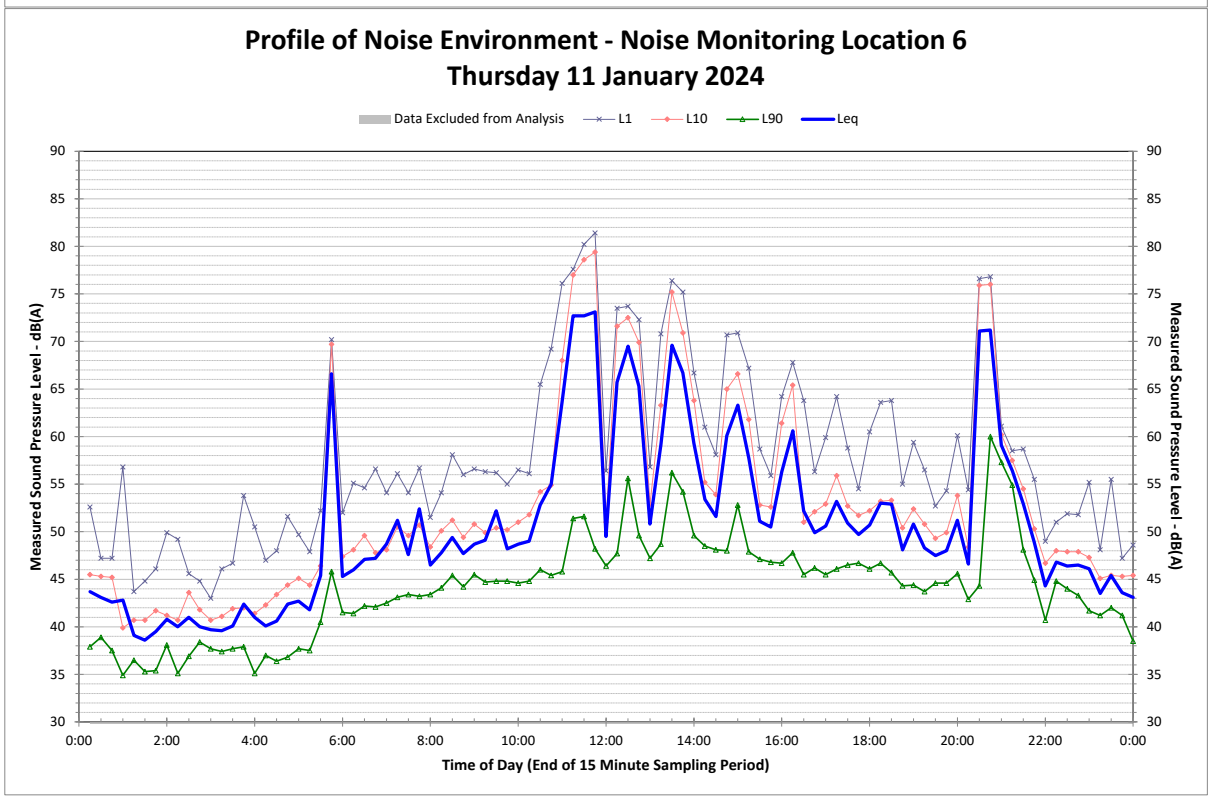

Profile of Noise Environment - Noise Monitoring Location 5
Friday 19 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

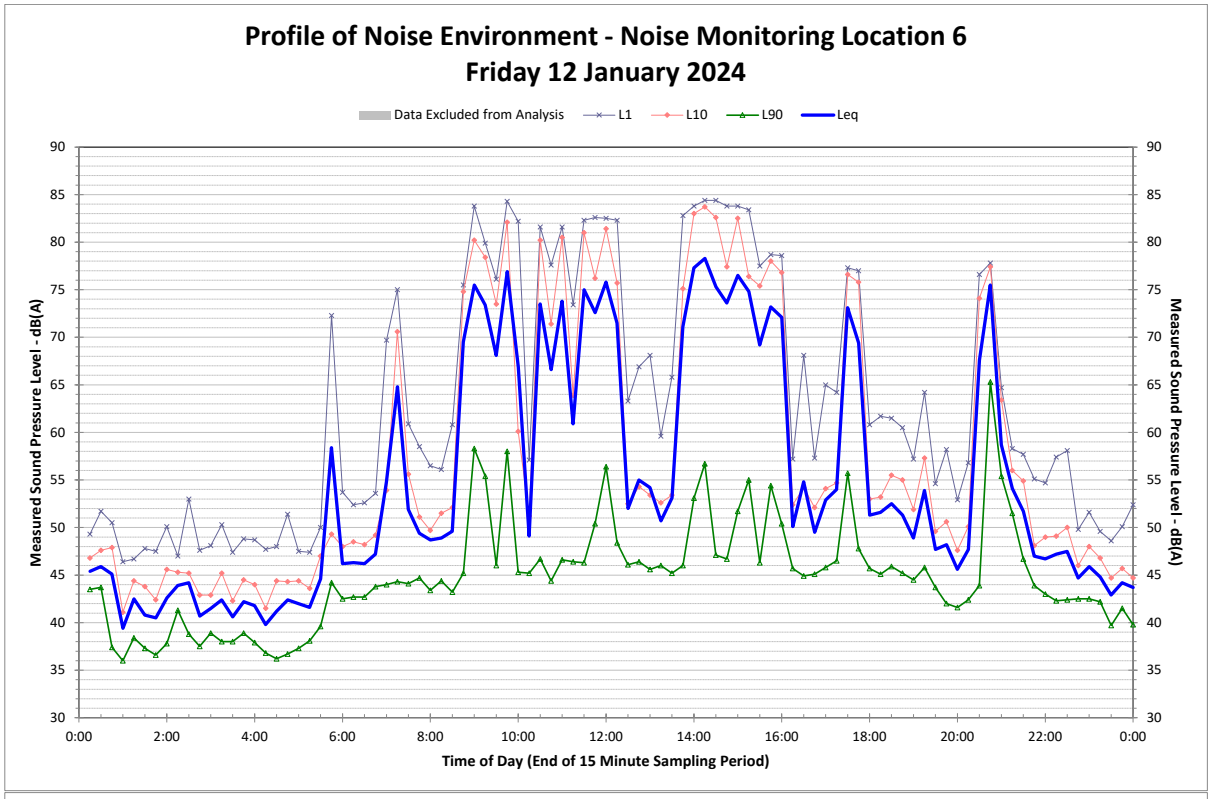

Profile of Noise Environment - Noise Monitoring Location 5
Saturday 20 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

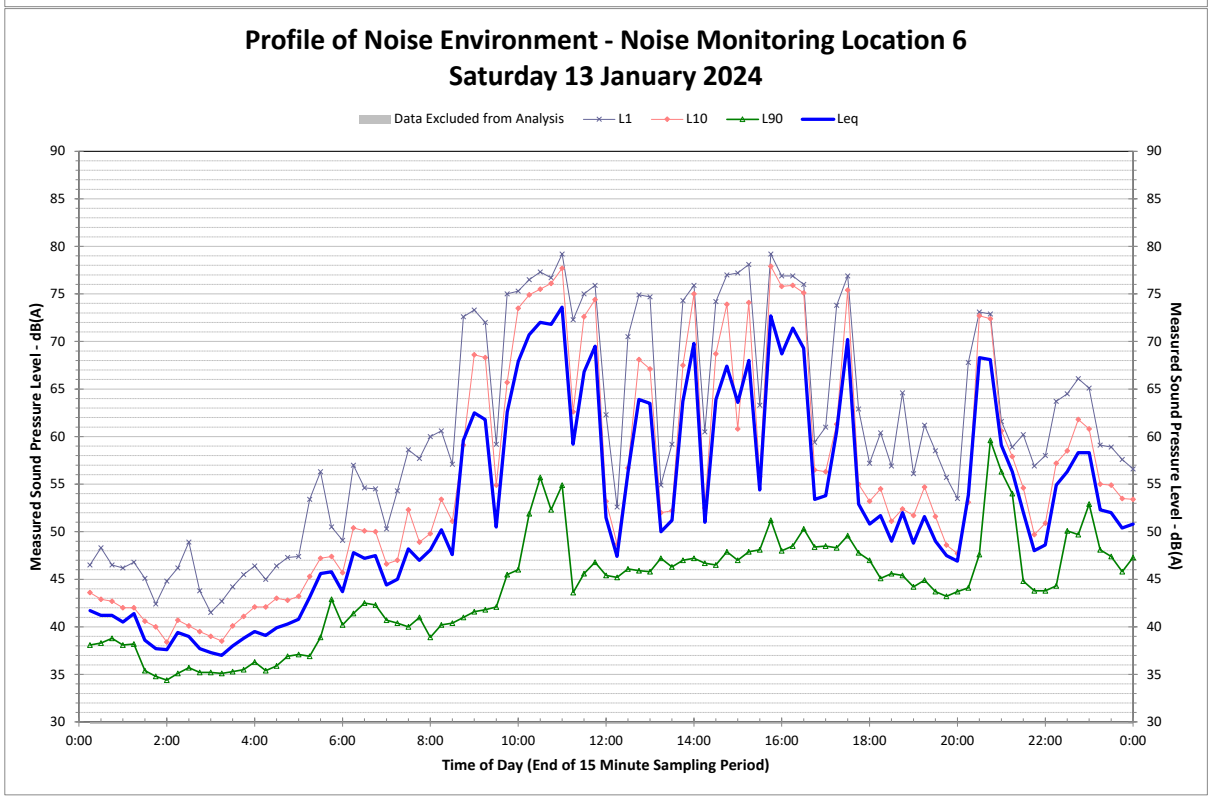

Profile of Noise Environment - Noise Monitoring Location 5
Sunday 21 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

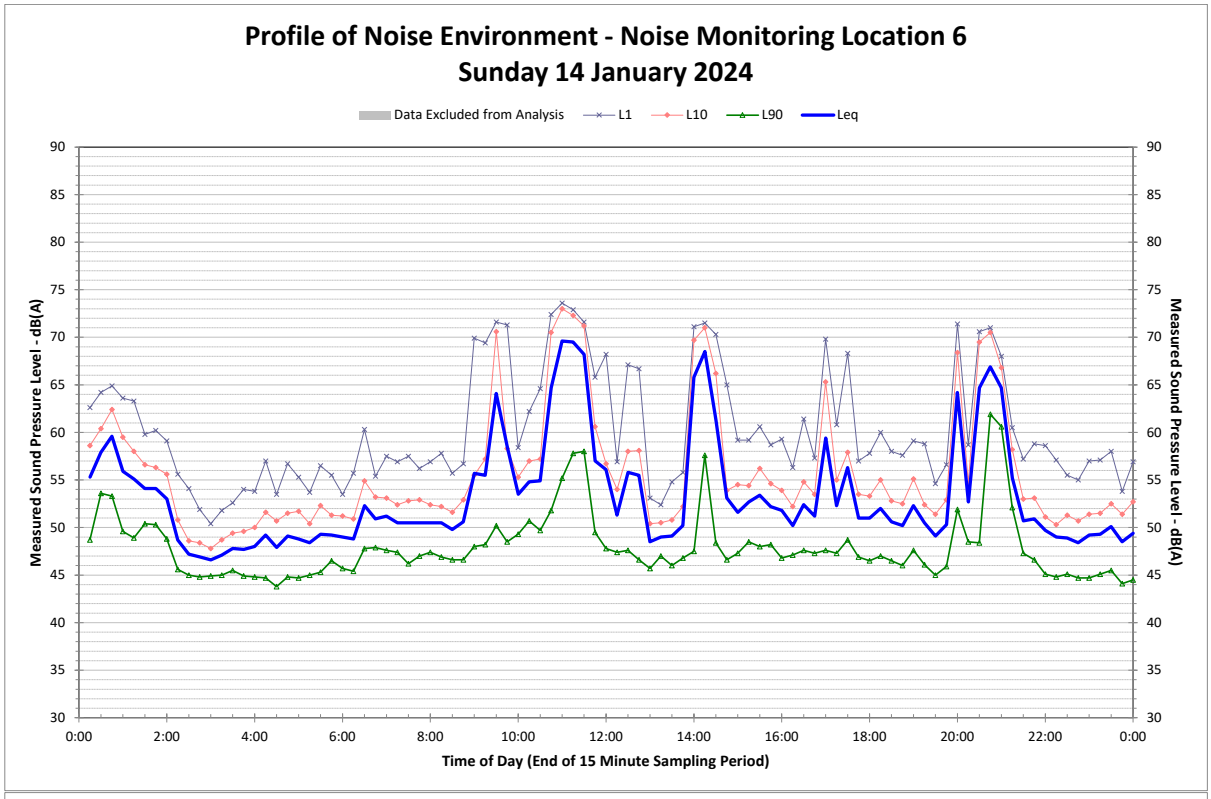

Profile of Noise Environment - Noise Monitoring Location 5
Monday 22 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
30
35
40
45
50
55
60
65
70
75
80
85
90

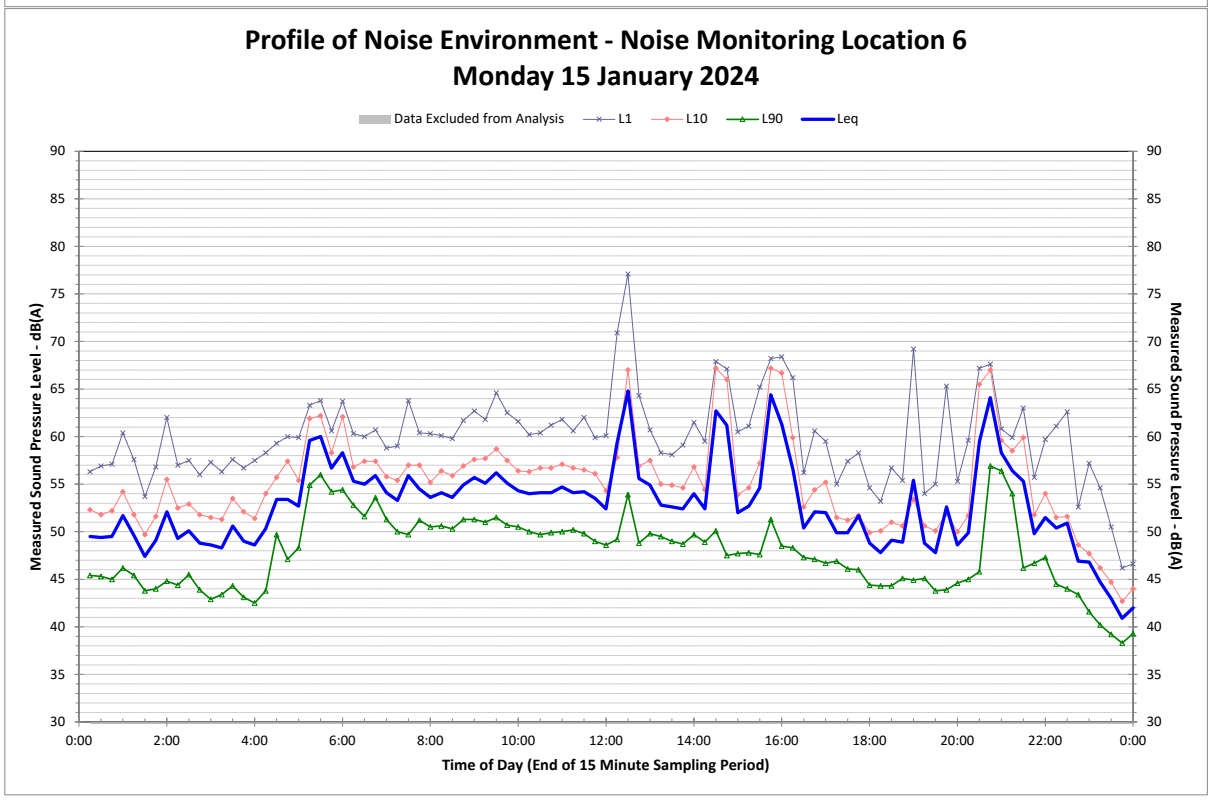

Profile of Noise Environment - Noise Monitoring Location 6
Wednesday 10 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

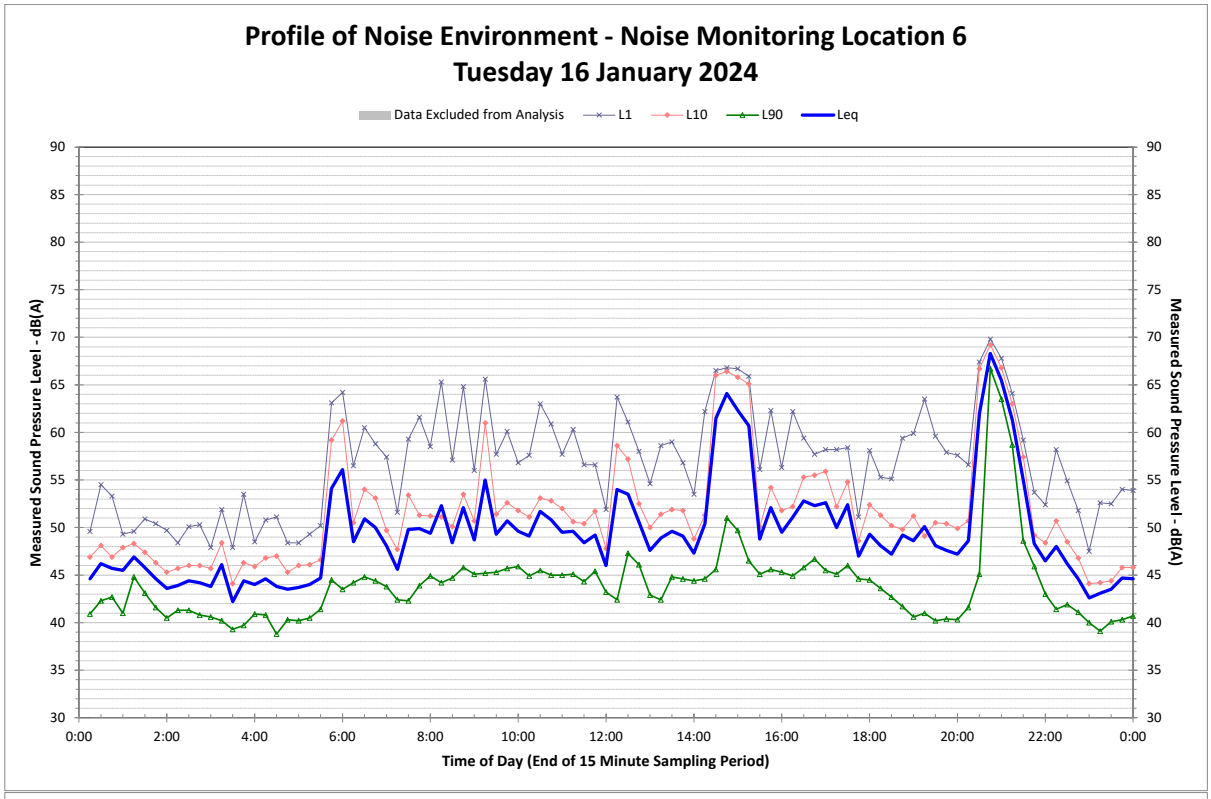

Profile of Noise Environment - Noise Monitoring Location 6
Thursday 11 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

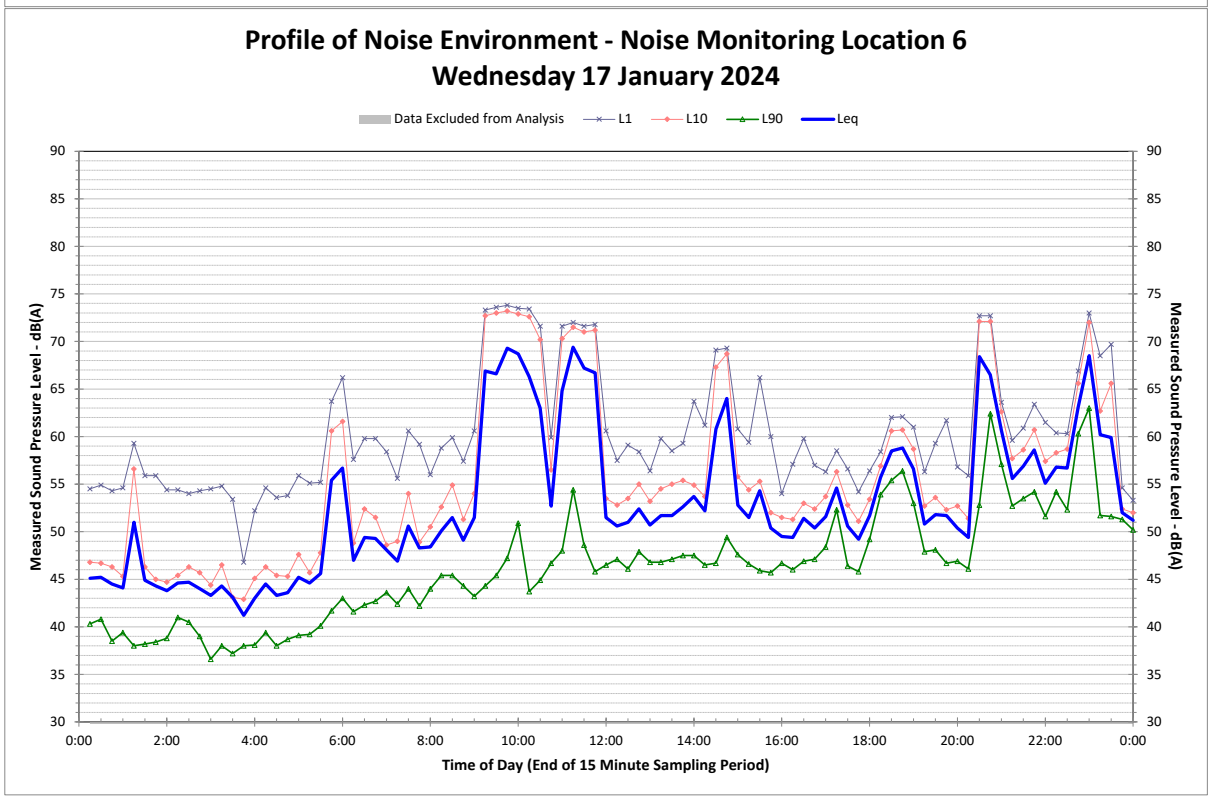

Profile of Noise Environment - Noise Monitoring Location 6
Friday 12 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

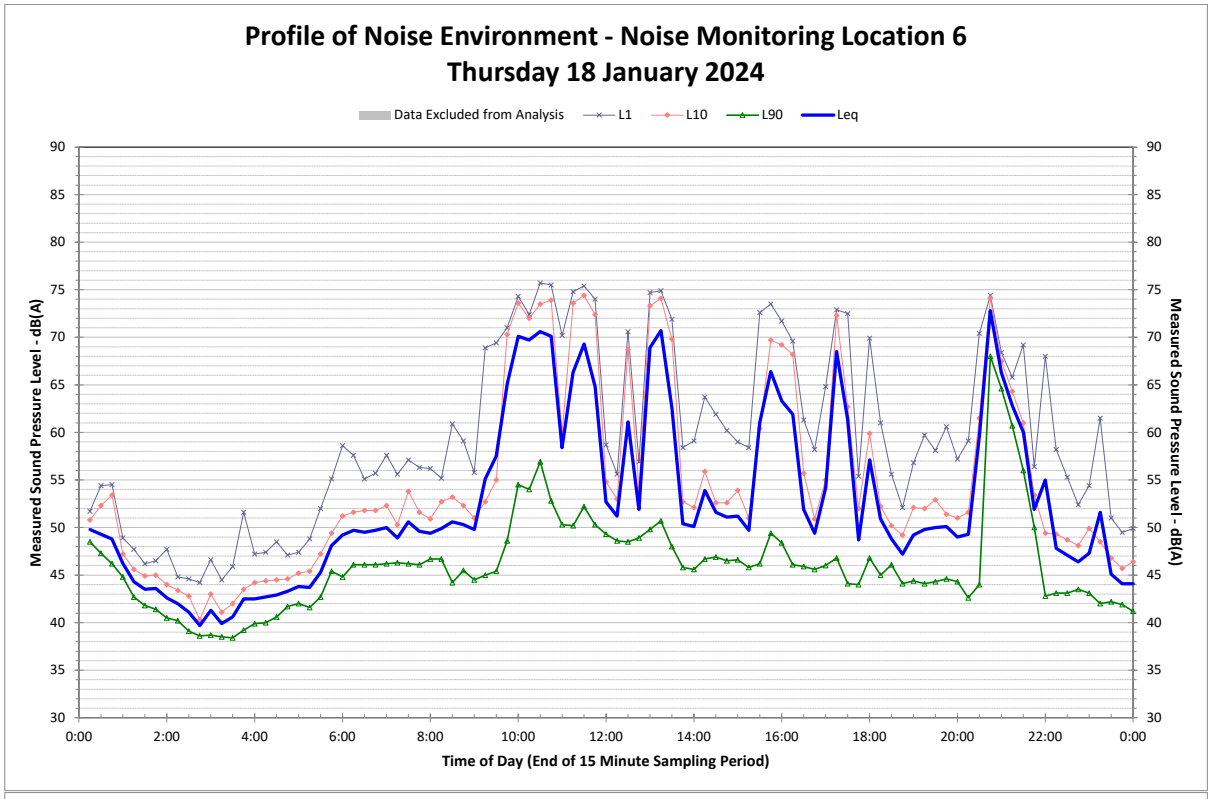

Profile of Noise Environment - Noise Monitoring Location 6
Saturday 13 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

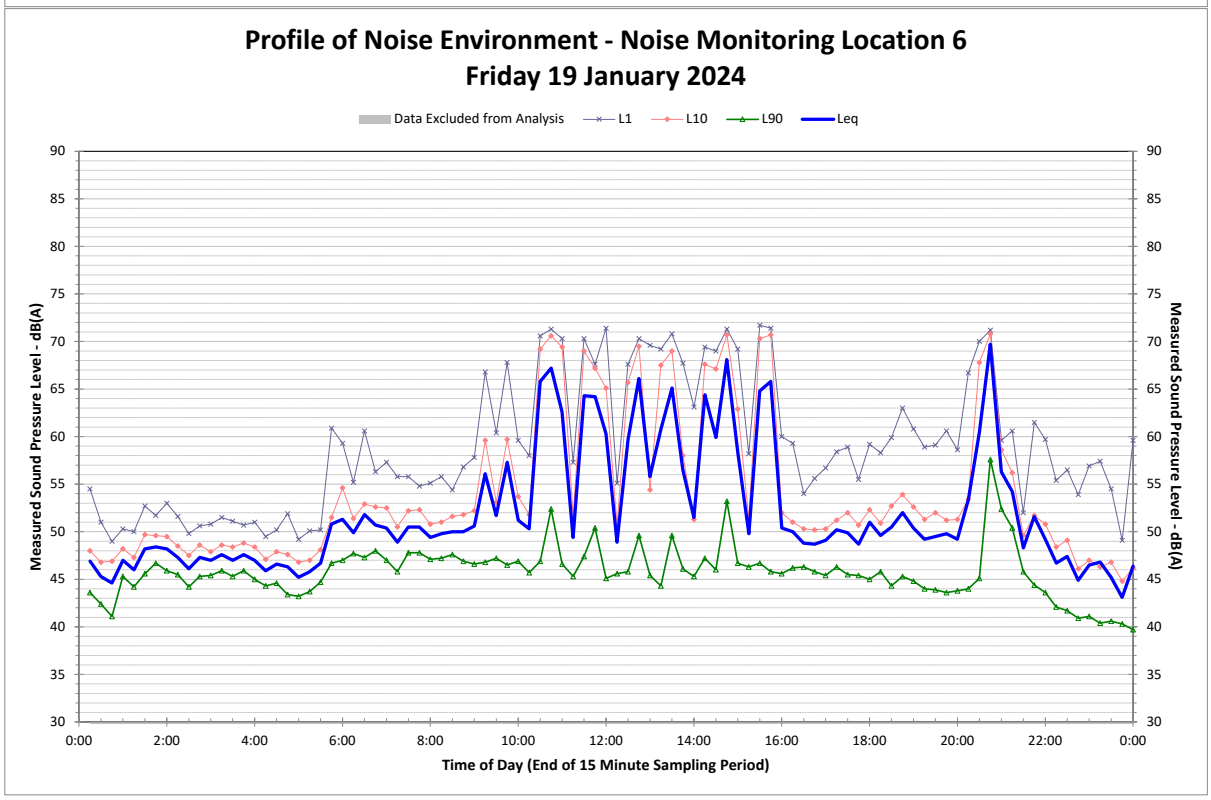

Profile of Noise Environment - Noise Monitoring Location 6
Sunday 14 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

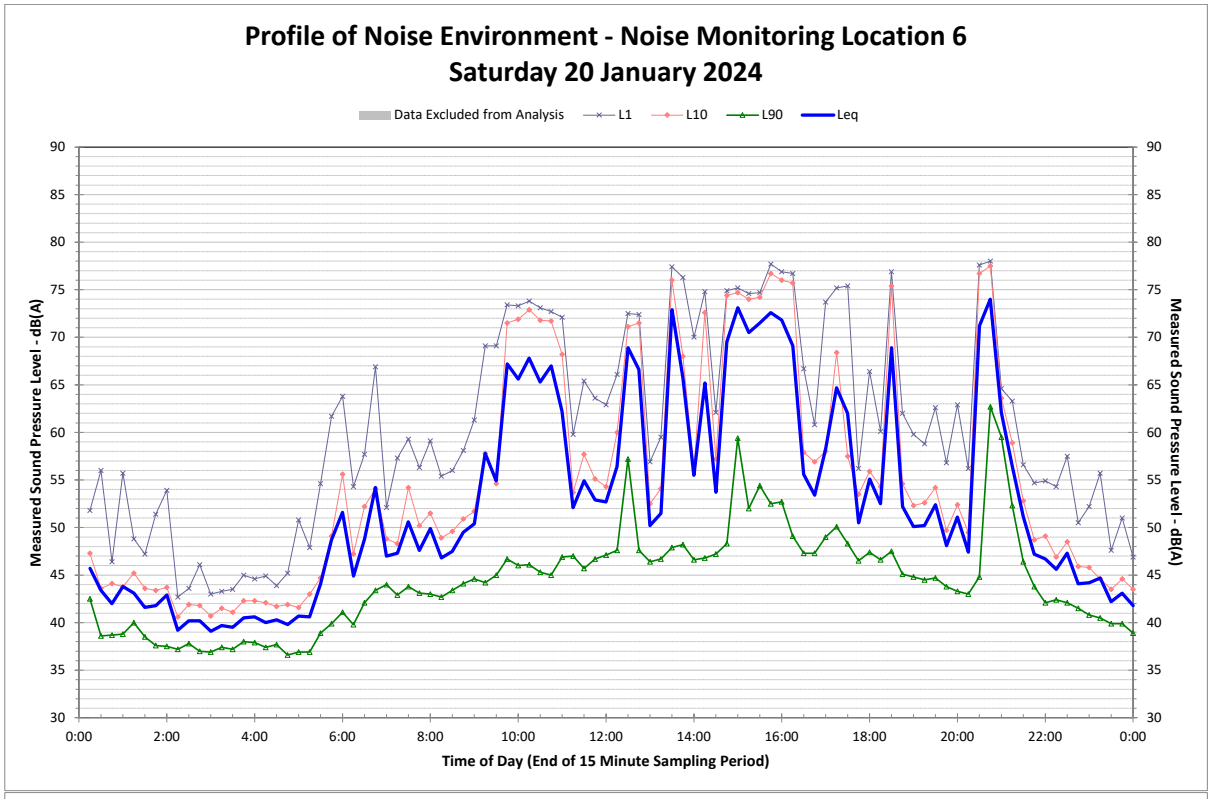

Profile of Noise Environment - Noise Monitoring Location 6
Monday 15 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

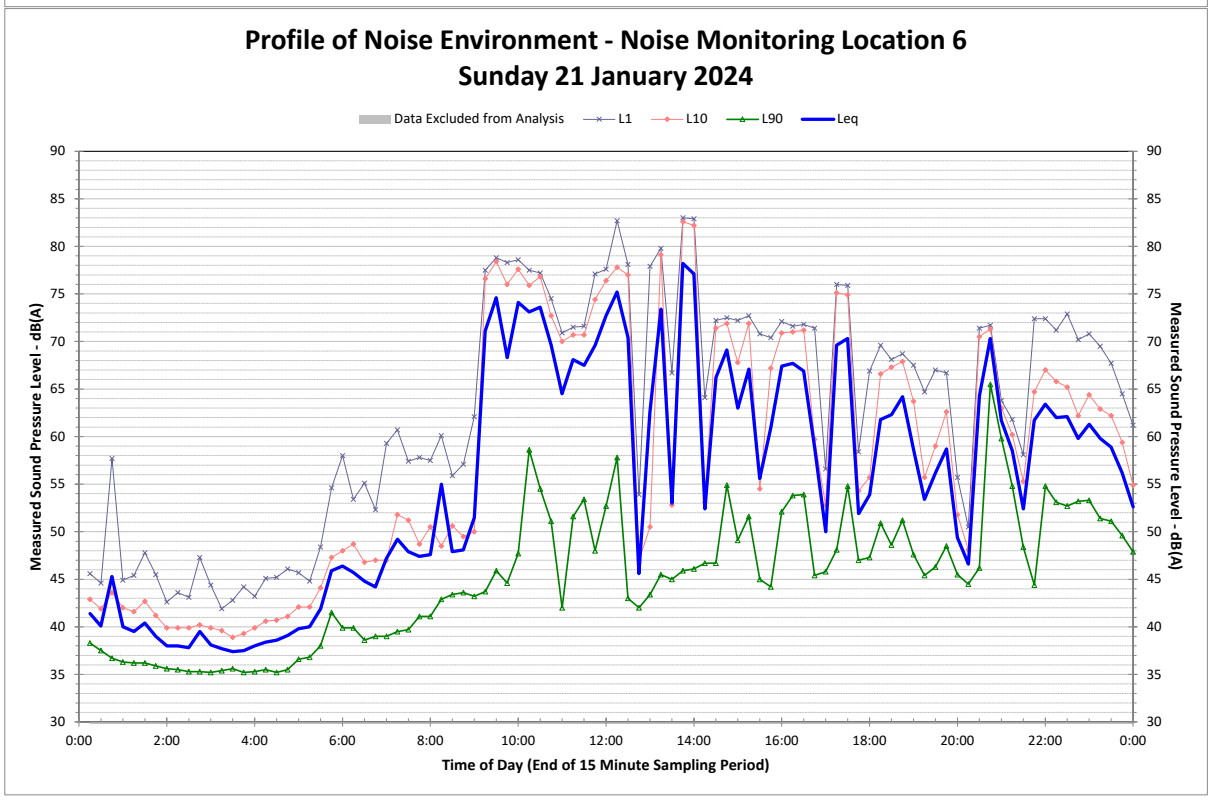

Profile of Noise Environment - Noise Monitoring Location 6
Tuesday 16 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)

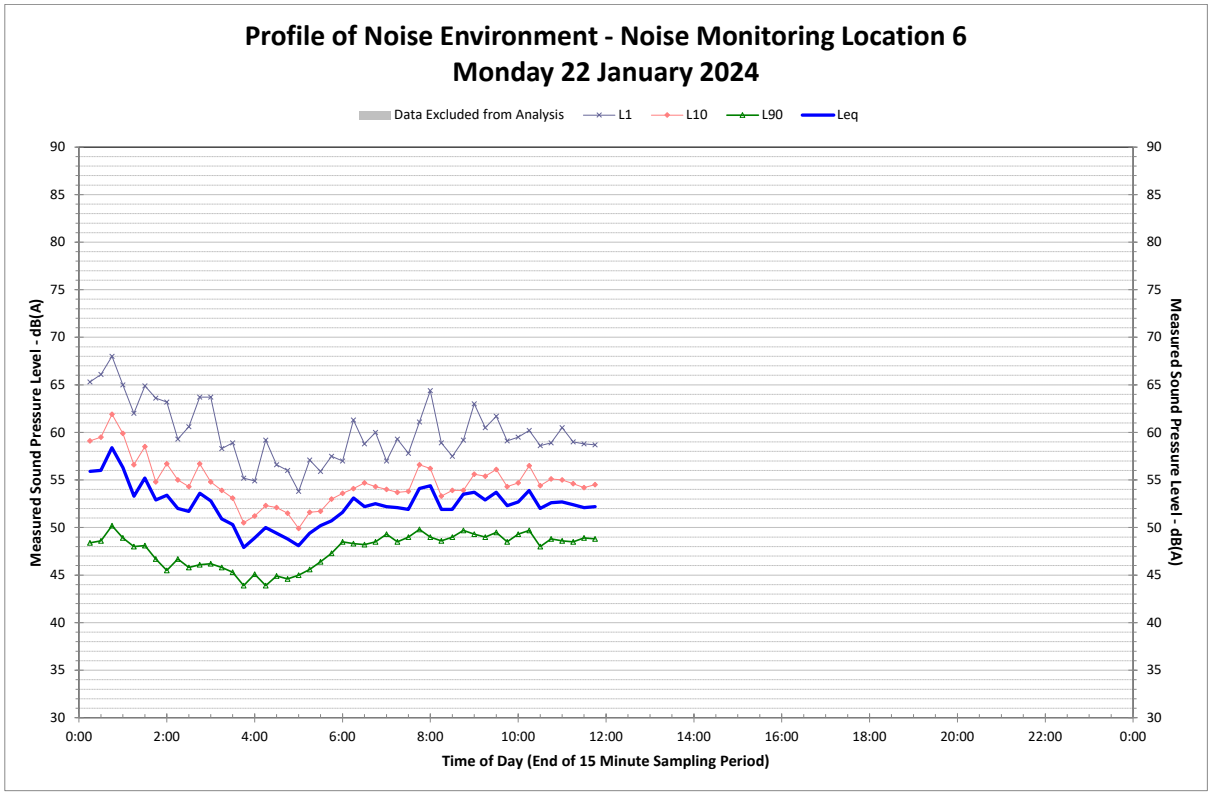

Profile of Noise Environment - Noise Monitoring Location 6
Wednesday 17 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 6
Thursday 18 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 6
Friday 19 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 6
Saturday 20 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 6
Sunday 21 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)


Profile of Noise Environment - Noise Monitoring Location 6
Monday 22 January 2024
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Time of Day (End of 15 Minute Sampling Period)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

hutchison weller

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