Appendix 25-1: Baseline Noise Monitoring Results

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

A TETRA TECH COMPANY

PARK WIND
JERA GROUP

Energy for generations

ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report
Appendix 25-1: Baseline Noise Monitoring Results

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1 INTRODUCTION

RPS was appointed by Oriel Windfarm Limited (OWL) to undertake baseline noise monitoring surveys to inform the noise impact assessment for the Oriel Wind Farm Project (hereinafter referred to as the Project), which is included in chapter 25: Noise and Vibration in the EIAR.

A comprehensive baseline noise monitoring campaign was carried out for the Project. This included long term noise monitoring at ten onshore locations (see section 1.1), which were chosen following a desktop study to examine the potential for operational wind turbine noise impacts at these locations. A further five locations were chosen for attended noise monitoring (see section 1.2) to examine potential noise impacts during the construction of the onshore cable and onshore substation site and also potential noise impacts from the operation of the onshore substation site.

1.1 Long term noise monitoring

A long-term baseline monitoring campaign was conducted at ten sites (NML1 – NML10) from 10th October 2022 to 25th November 2022. The monitoring sites include three sites on the coastline within 200 m of the high-water mark, six sites within approximately 1 km of the high-water mark, and one elevated site approximately 4 km inland on the Cooley Peninsula. The sites are spatially distributed along the coastline within the Noise and Vibration Study Area, as shown in Figure 1-1, and allow characterisation of the baseline environment for Noise Sensitive Locations (NSLs) which may potentially be impacted by Wind Turbine Noise (WTN) from the Project.

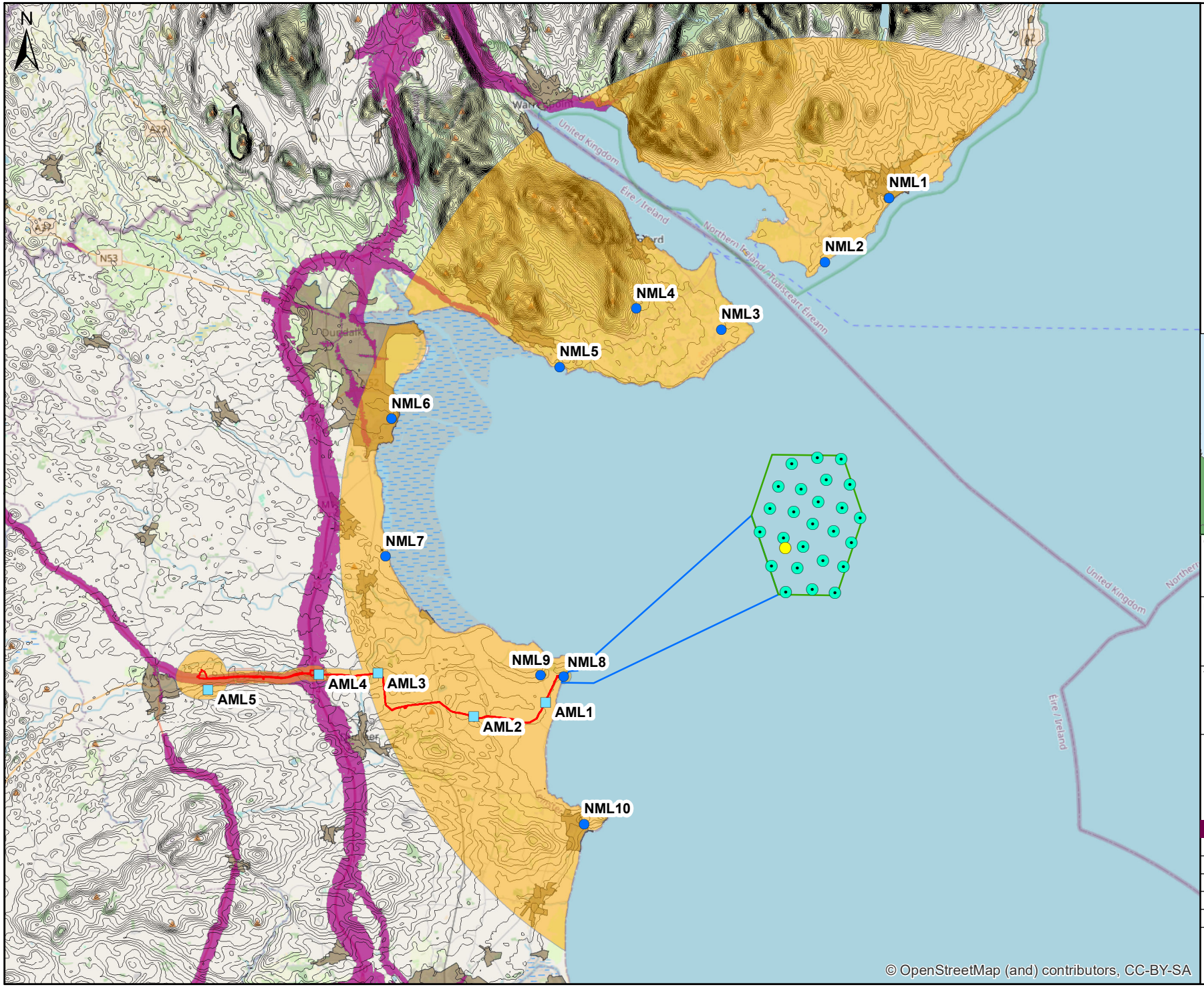
NSLs on the Cooley Peninsula have the shortest separation distance from the proposed Wind Turbine Generators (WTGs) within the Noise and Vibration Study Area (approximately 6 km distance between nearest WTG and nearest NSL). Three monitoring locations were therefore chosen on the Cooley Peninsula; one on the coast (NML5), two approximately 1 km (NML3) and 4 km (NML4) inland respectively. NML4 is at approximately 70 m altitude with direct line of sight to the site of proposed WTGs while being sufficiently inland for coastal noise to be significantly attenuated. Consequently, NML4 is representative of the most sensitive NSLs on the Cooley Peninsula, NML5 representative of the least sensitive NSLs (due to coastal noise) and NML3 between these two extremes, allowing characterisation of changes in the noise environment with distance from the coast.

Following those on the Cooley Peninsula, the next nearest NSLs are located on or near to Dunany Point. Similarly to the Cooley Peninsula noise monitoring strategy, two of the sites are located here, NML8 on the coastline and NML9 (approximately 1 km inland).

The remaining monitoring sites are spatially distributed along the coast within the Noise and Vibration Study Area as follows:

- NML1: approximately 150 m inland in Kilkeel, Co. Down;
- NML2: coastal location in Cranfield, Co. Down;
- NML6: approximately 280 m inland in Blackrock, Co. Louth;
- NML7: approximately 170 m inland in Castlebellingham, Co. Louth; and
- NML10: approximately 350 m inland in Clogherhead, Co. Louth.

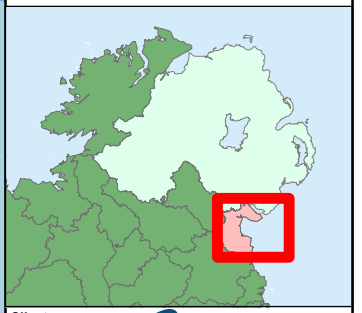
Data from these ten sites forms an extensive and comprehensive dataset allowing assessment of the baseline noise environment for the range of locations within the Noise and Vibration Study Area. Monitoring at these locations was carried out in accordance with the Institute of Acoustics (IoA), Good Practice Guidelines (GPG) procedures to allow use of results to derive prevailing background noise curves for the setting of relative noise limits for WTN.



Legend

- Planning Application Boundary
- Offshore Cable Corridor
- Offshore Wind Farm Area
- Wind Turbine Generator
- Offshore Substation
- Noise (Airborne) and Vibration Study Area
- Long-term Noise Monitoring Locations
- Attended Monitoring Locations
- END Round 3 L_{den} > 55dB
- Cities and Towns NI and ROI
- 10m Elevation Contours

Data Sources: OWL, OSi, EPA, Northern Ireland Department of Agriculture, Environment and Rural Affairs, Northern Ireland Research & Statistics Agency



Client

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

Project

Oriel Wind Farm Project

Title

Figure 1-1: Baseline Noise Monitoring Locations

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Issue Details

Drawn By: NR	**Project No.** MDR1520b
Checked By: BC	**File Ref:** MDR1520bArc3060F02
Approved By: CC	
Scale: 1:240,000 @ A4	**Projection:** ITM (IRENET95) Geographic Co-ordinates: ETRS89
Date: 13/02/2024	

1.2 Attended noise monitoring sites

The attended monitoring sites (AML1 – AML5) are shown in Figure 1-2. The purpose of the attended survey was to characterise existing baseline conditions along the onshore cable route and at the nearest dwellings to the onshore substation site.

AML1 – AML4 are locations along the onshore cable route where it is possible for measurements to be conducted sufficiently distant from the road to be representative of baseline levels at the nearest NSL façades. AML5 was chosen as it provides an accessible location (i.e. similar distance and elevation with respect to the main ambient noise sources such as road traffic on the N33) which is representative of the baseline noise environment at the nearest NSLs to the onshore substation site.

Figure 1-2: Attended monitoring locations.

1.3 Prevailing background noise curves and ETSU-R-97 Limits

Monitoring durations at all long-term monitoring sites were sufficient to meet the data requirements of the IoA GPG and IoA GPG Supplementary Guidance Note 1 which specify recommended minimum numbers of data points within each windspeed bin. The noise monitoring results include a time series of 10-minute L_{A90} measurements at each site which are correlated with 10-minute average standardised 10-metre windspeeds (V10).

The datasets are used to produce scatter plot graphs with $L_{A90,10min}$ values in dB plotted on the Y-axis against V10 windspeeds on the X-axis. The prevailing background noise curve is determined for the data by a least-squares regression formula. The daytime 'amenity' period is classified in the IoA GPG as:

- 18:00 – 23:00 every day;
- 13:00 – 18:00 Saturday; and
- 07:00 – 18:00 Sunday.

The night-time period is classified in ESTU-R-97 and the IoA GPG as:

- 23:00 – 07:00 every day.

Night-time data for analysis was restricted to 23:00 – 06:00 in order to avoid contributions of road traffic noise and the dawn chorus given the time of year.

Linear and polynomial trendlines are fitted to the data in accordance with ETSU-R-97 and with the coefficients of determination (R^2) for each order of polynomial fit line determined for valid data. The "best fit" polynomial is determined as the curve that provides both a higher regression coefficient and a sensible visual match to the data. In accordance with the IoA GPG measurements affected by rain have been excluded. Additional exclusions of measurements showing evidence of extraneous noise have also been made as indicated.

ETSU-R-97 provides guidance regarding determination of the value for the lower fixed limit, stating that this should be done with consideration of the following three criteria:

- Number of dwellings in the neighbourhood of the wind farm.
  - *"The more dwellings that are in the vicinity of a wind farm the tighter the limits should be as the total environmental impact will be greater. Conversely if only a few dwellings are affected, then the environmental impact is less and noise limits towards the upper end of the range may be appropriate."*
- The effect of noise limits on the number of kWh generated.
  - *"Similar arguments can be made when considering the effect of noise limits on uptake of wind energy. A single wind turbine causing noise levels of 40dB(A) at several nearby residences would have less planning merit (noise considerations only) than 30 wind turbines also causing the same amount of noise at several nearby residence."*
- Duration and level of exposure.
  - *"The proportion of the time at which background noise levels are low and how low the background noise level gets are both recognised as factors which could affect the setting of an appropriate lower limit. For example, a property which experienced background noise levels below 30dB(A) for a substantial proportion of the time in which the turbines would be operating could be expected to receive tighter noise limits than a property at which the background noise levels soon increased to levels above 35dB(A). This approach is difficult to formulate precisely and a degree of judgement should be exercised."*

At many of the baseline monitoring locations the background noise levels are largely attributable to natural sources such as coastal noise rather than anthropogenic sources such as road traffic etc. Coastal noise varies with wind speed and direction, and also wave height and these conditions do not follow a diurnal pattern. Consequently, significant differences between daytime amenity and night-time prevailing background noise levels will not necessarily occur. ETSU-R-97 states the following regarding setting daytime and night-time limits:

> *"As the night-time lower fixed limit is greater than the day-time limit, the night-time limit could become superfluous unless background noise levels are less during the night than during the quiet day-time periods. Where the local authority and the developer are in agreement that the background noise levels do not vary significantly between the quiet day-time periods and the night-time, then a single lower fixed limit of 35-40dB(A) can be imposed based upon background noise levels taken during quiet day-time periods and the night analysed together."*

Paragraph 3.2.9 of the IoA GPG states the following regarding the above:

> *"There is no definition of what is considered significant in this context, but where the amenity and night-time derived background noise levels differ by the order of 3 dB or less, over the key wind speed range between cut-in to when the turbines reaches their maximum level of noise emissions, it could then be appropriate to apply this clause of ETSU-R-97."*

Given the above, it is considered appropriate to set a single daytime and night-time lower fixed noise limit where the above conditions have been satisfied in data measured at the monitoring sites. In the case that a single lower fixed limit is imposed, it is important that this limit is "*based upon background noise levels taken during quiet day-time periods and the night analysed together"* as well as consideration of the three criteria referenced above.

2 BASELINE NOISE MONITORING

2.1 Meteorological data

Meteorological data for the survey was supplied from a Lidar unit deployed near to NML8. The hub heights of proposed WTGs range from 145 – 152 m and the Lidar data included measurement of windspeed and direction at 123 m and 163 m. For conservative derivation of prevailing background noise curves, the 152 m hub height is assumed and the average hub height 10-minute windspeeds (VHH) have been calculated from the 123 m and 163 m measurements using equations 2 and 3 from the IoA GPG Supplementary Guidance Note 4. As recommended by the IoA GPG, average wind direction from the nearest measurement height, 163 m, has been used directly. Finally V10 windspeeds have been calculated using a roughness length of 0.05 m as specified by the IoA GPG.

Measurements from the onshore Lidar unit located close to NML8 have been compared with measurements from a floating Lidar which was deployed within the bounds of the site of the proposed WTGs, with excellent correlation shown. The floating Lidar was no longer in position at the time of the baseline monitoring and therefore measurements from the onshore Lidar have been used for baseline analysis.

2.2 Single lower fixed limit for daytime and night-time

Seven of the ten long term monitoring sites analysed meet the condition for setting a single lower fixed limit for both the daytime and the night-time (i.e. the background noise levels do not vary significantly between the quiet day-time periods and the night-time). Therefore, rather than separate lower fixed limits for the daytime amenity and night-time periods, the assessment will be conducted using a single lower fixed limit for the daytime amenity and night-time periods at all sites based on the daytime amenity and night-time background levels analysed together.

The ETSU-R-97 three criteria are described in section 1 and provide guidance for the determination of the lower fixed limit. Additional guidance regarding the three criteria is provided in the IoA GPG. Commentary on the three criteria in relation to the Project is given below:

- Number of dwellings in the neighbourhood of the wind farm:
  - The IoA GPG suggests the predicted 35 dB WTN contour should be used to define the neighbourhood of the wind farm.
  - There are no noise sensitive locations located within the 35 dB WTN contour.
  - The generating capacity of the Project indicates the potential to supply electricity for approximately 300,000 homes.
  - Given there are no NSLs in the neighbourhood of the Project, a 40 dB lower fixed limit would be indicated by the first criterion.
- The effect of noise limits on the number of kWh generated:
  - The generating capacity of the Project is 375MW and the fixed lower limit has no impact on the generating capacity suggesting that a reduced lower limit in the range 35 – 40 dB may be applied.
- Duration and level of exposure:
  - The prevailing wind direction places NSLs upwind of WTGs for most of the year and the predicted noise levels are low compared to the measured background levels, indicating that the likely duration and level of exposure is low indicating that a lower fixed limit toward the upper end of the range of 35 - 40 dB allowed could be justified.

There is no particular detail offered within ETSU-R-97 or the IoA GPG as to how the how the daytime amenity and night-time levels should be analysed together. Given the night-time lower fixed limit would otherwise be 43dB $L_{A90,10min}$, a single lower fixed limit for both daytime and night-time which is lower than

43dB should not result in significantly lower limits during the daytime than would result from the daytime amenity levels analysed alone.

Having given due consideration to the factors listed above, a fixed lower limit of 37.5dB $L_{A90,10min}$ is recommended for both the daytime amenity and night-time periods at all NSLs within the Noise and Vibration Study Area.

2.3 Spread and clustering of data for offshore vs onshore winds

For the coastal monitoring sites, significant differences have been observed between noise levels measured during offshore and onshore wind directions. The plots exhibit clustering of the offshore and onshore data, particularly at higher windspeeds. There is also a very wide spread in data for some windspeeds at certain locations due to low noise levels measured when the winds are directly offshore and sites are sheltered by topography vs the onshore direction with surf and wave noise.

The wind directions placing receivers downwind of WTGs are onshore and therefore exclusion of direct offshore winds could be justified. The effect of including monitoring results during offshore wind conditions is to lower the derived noise limits somewhat. In the context of this assessment, which includes inshore monitoring locations which are more sensitive, the effect of including the offshore results in analysis for coastal sites is considered to be minimal and therefore directional filtering of monitoring results is not applied.

2.4 Observations at long term noise monitoring locations during deployment

2.4.1 NML1

At NML1, the monitoring equipment was installed in the back garden of the property approximately 2 m from the rear wall of the garden due to the limited space available. The primary noise source observed during installation was the rustling of vegetation from surrounding garden plants. Other noise sources included occasional local road traffic noise and distant road traffic noise.

2.4.2 NML2

At NML2, the monitoring equipment was installed in the back garden of the property approximately 3.5 m from the rear wall of the building. This location is in close proximity to the nearby beach and the dominant noise source was waves breaking on the shore. Occasional local road traffic noise was also present.

2.4.3 NML3

At NML3, the monitoring equipment was installed in the back garden of the property approximately 3.5 m from the rear wall of the garden and approximately 7 m from a large shed. The shed is used for storage only and no activity takes place within it. There is a well nearby which fills with rainwater but is otherwise unused. Power lines are present approximately 25 m south of the equipment. It is a quiet location, with light birdsong and distant road traffic noise being the only audible sounds during installation.

2.4.4 NML4

At NML4, the monitoring equipment was installed approximately 6 m in front of the property. This location is situated on a slope, slightly elevating NML4 in comparison to the land immediately in front of the property. There is a large tree approximately 13 m from NML4 in a neighbouring garden which was sparsely leaved at the time of installation. A quiet road runs in front of the property and very occasional local road traffic noise was observed. Across the road from NML4 is a field containing a small number of sheep. Other noise sources included gentle birdsong and the slight rustling of surrounding vegetation.

2.4.5 NML5

At NML5, the monitoring equipment was mounted on a wooden fence below the nearby caravan park. The equipment was in close proximity to the beach below and the dominant noise source observed was waves

breaking on the shore. Other noise sources included birdsong and occasional noise from workers at the caravan park.

2.4.6 NML6

At NML6, the monitoring equipment was installed in the back garden of the property approximately 2 m from the rear wall of the garden. The garden contains a significant amount of vegetation and the dominant noise source observed during installation was vegetation rustle. This property is located within a residential estate and the sounds of children playing, distant dog barking and distant road traffic noise could be heard.

2.4.7 NML7

At NML7, the monitoring equipment was installed in the back garden of the property approximately 3.5 m from the rear wall of the building. The dominant noise source observed was the rustling of a large tree in the corner of the garden. A boiler flue is located towards the opposite side of the garden near the shed but was not in operation at the time of installation. The monitoring equipment was set up approximately 7 m from the large tree, leaving it closer to the tree than the boiler flue. Light birdsong, distant dog barking and distant road traffic noise were also present at this location.

2.4.8 NML8

At NML8, the monitoring equipment was installed at the edge of the landowner's field in the overgrowth with the nearest NSL situated approximately 50 m away. This location was chosen as the landowner intended to plough the field during the following week. The dominant noise source observed was the breaking of waves on the shore below. The location is quite exposed to wind which resulted in the rustling of surrounding vegetation. Birdsong was present and the distant sound of a chainsaw could be heard from a neighbouring property. Occasional road traffic noise from the road below the location was also observed.

2.4.9 NML9

At NML9, the monitoring equipment was installed in the corner of a field within a small cul-de-sac approximately 60 m from the nearest NSL. A small number of sheep were present on the land directly in front of this property. The road running perpendicular to the cul-de-sac is quiet and only distant road traffic noise was observed. Some rustling from a large tree approximately 13 m from the equipment could be heard along with gentle birdsong. During installation, an aircraft passed overhead.

2.4.10 NML10

At NML10, the monitoring equipment was mounted on a wooden fence in the back yard of the property. The field to the rear of this location contains livestock. Due to the absence of vegetation and the presence of hard wall and ground surfaces, the back yard presents an acoustically reflective environment. There is a quiet road in front of the property which gave rise to intermittent road traffic noise. Other noise sources observed were birdsong and distant dog barking. Lawnmowing at a neighbouring property prevented the identification of any other noise sources during installation.

2.5 Survey Durations and Issues Encountered

The dates of surveys and a summary of issues encountered with equipment during the survey period is provided in Table 2-1. Issues encountered included insufficient charge current from solar panels due to shading, SD card failure, damage to one monitor, and a lightning strike to the Lidar meteorological monitoring unit.

Table 2-1: Summary of survey locations, dates and overview of issues encountered.

Site	Location	Start Date	End Date	Overview of Survey / Issues
NML1	Kilkeel	13/10/2022	18/11/2022	Tight back garden solar charge difficulties. Additional solar capacity added. Offline from 19/10/22 to 21/10/22
NML2	Cranfield	13/10/2022	18/11/2022	Continuous noise monitoring – no issues
NML3	Ballagan	10/10/2022	18/11/2022	Continuous noise monitoring – no issues

Site	Location	Start Date	End Date	Overview of Survey / Issues
	Rain Gauge	10/10/2022	18/11/2022	Continuous rain monitoring – no issues
NML4	The Grange	10/10/2022	18/11/2022	Continuous noise monitoring – no issues
NML5	Gyles Quay	14/10/2022	18/11/2022	Continuous noise monitoring – no issues
NML6	Blackrock	13/10/2022	18/11/2022	SD card failure. Data from 21/10/22 to 28/10/22 missing. Replaced card on 28/10/22
NML7	Castlebellingham	10/10/2022	18/11/2022	Continuous noise monitoring – no issues
	Rain Gauge	10/10/2022	18/11/2022	Continuous rain monitoring – no issues
NML8	Dunany (Landfall)	10/10/2022	25/11/2022	Solar panel issues. Offline from 15/10/22 to 24/10/22 Worked following replacement on 24/10/22
	Lidar	10/10/2022	25/11/2022	Monitoring of wind speed and direction. Lidar unit was offline from 10/10/22 to 25/10/22 following lightning strike.
NML9	Dunany (~1 km inland)	28/10/2022	25/11/2022	Equipment damaged, removed on 21/10/22. Reinstalled on 28/10/22
	Rain Gauge	18/11/2022	25/11/2022	Continuous rain monitoring – no issues
NML10	Clogherhead	10/10/2022	18/11/2022	Continuous noise monitoring – no issues
	Rain Gauge	10/10/2022	18/11/2022	Continuous rain monitoring – no issues

2.6 Monitoring results at long term noise monitoring locations and derived noise limits

Scatter plots, derivation of prevailing background trendlines, and derivation of ETSU-R-97 noise limits have been conducted for each of the long term noise monitoring sites. Graphs for daytime and night-time at each site are shown in the following subsections. While the graphs show monitoring results up to a wind speed of 12 m/s, the regression analysis has included all valid measured data up to approximately 18 m/s.

2.6.1 NML1

Figure 2-1 and Figure 2-2 show the data measured at NML1 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

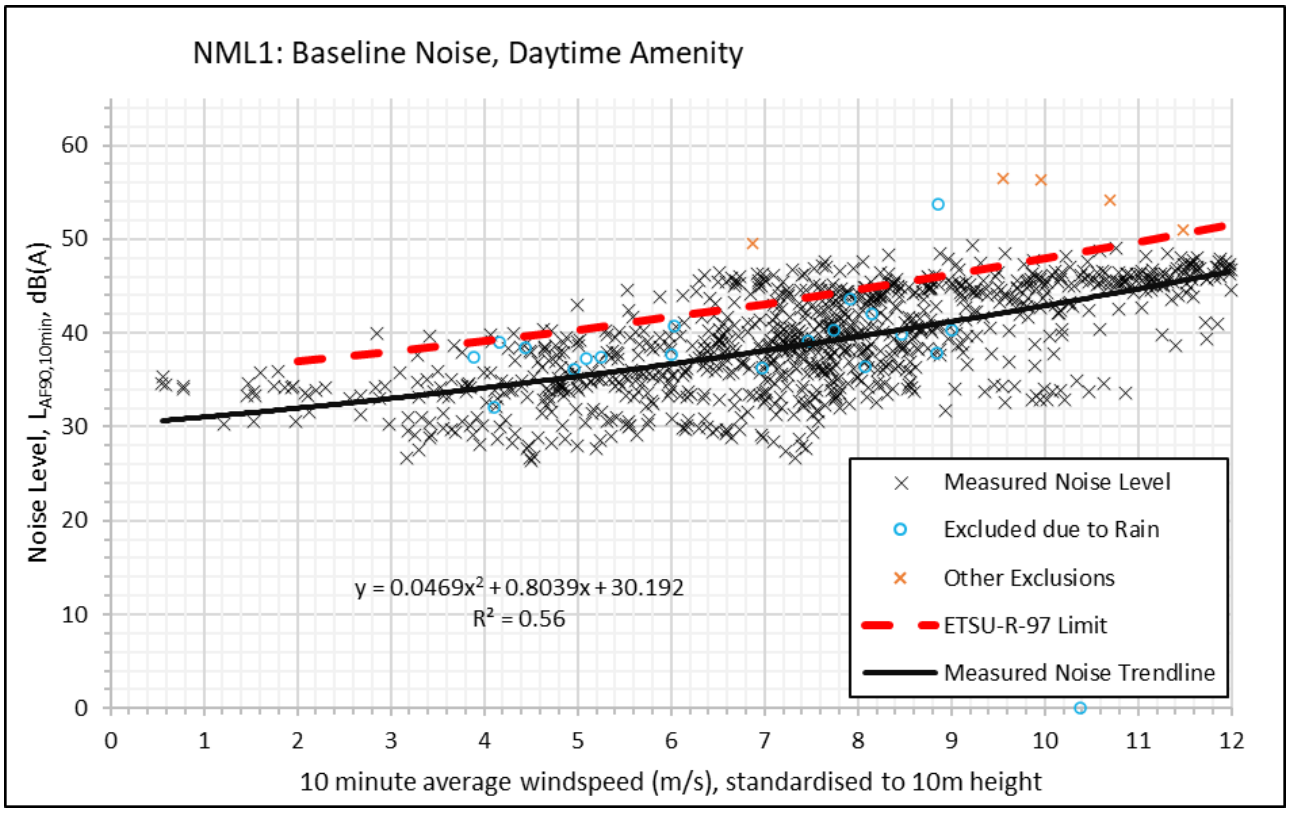

Figure 2-1: **Baseline Noise Levels – Daytime Amenity - NML1.**

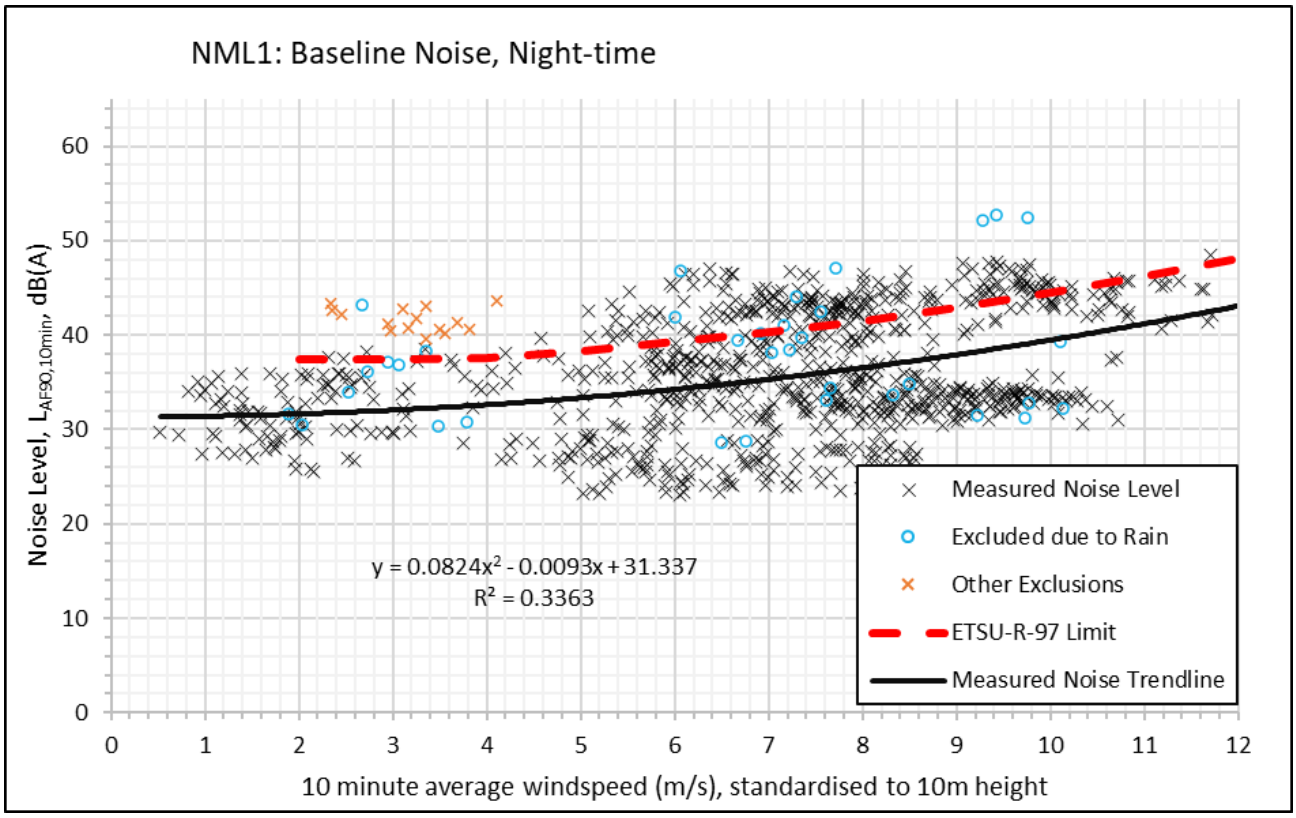

Figure 2-2: **Baseline Noise Levels – Night-time - NML1.**

2.6.2 NML2

Figure 2-3 and Figure 2-4 show the data measured at NML2 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

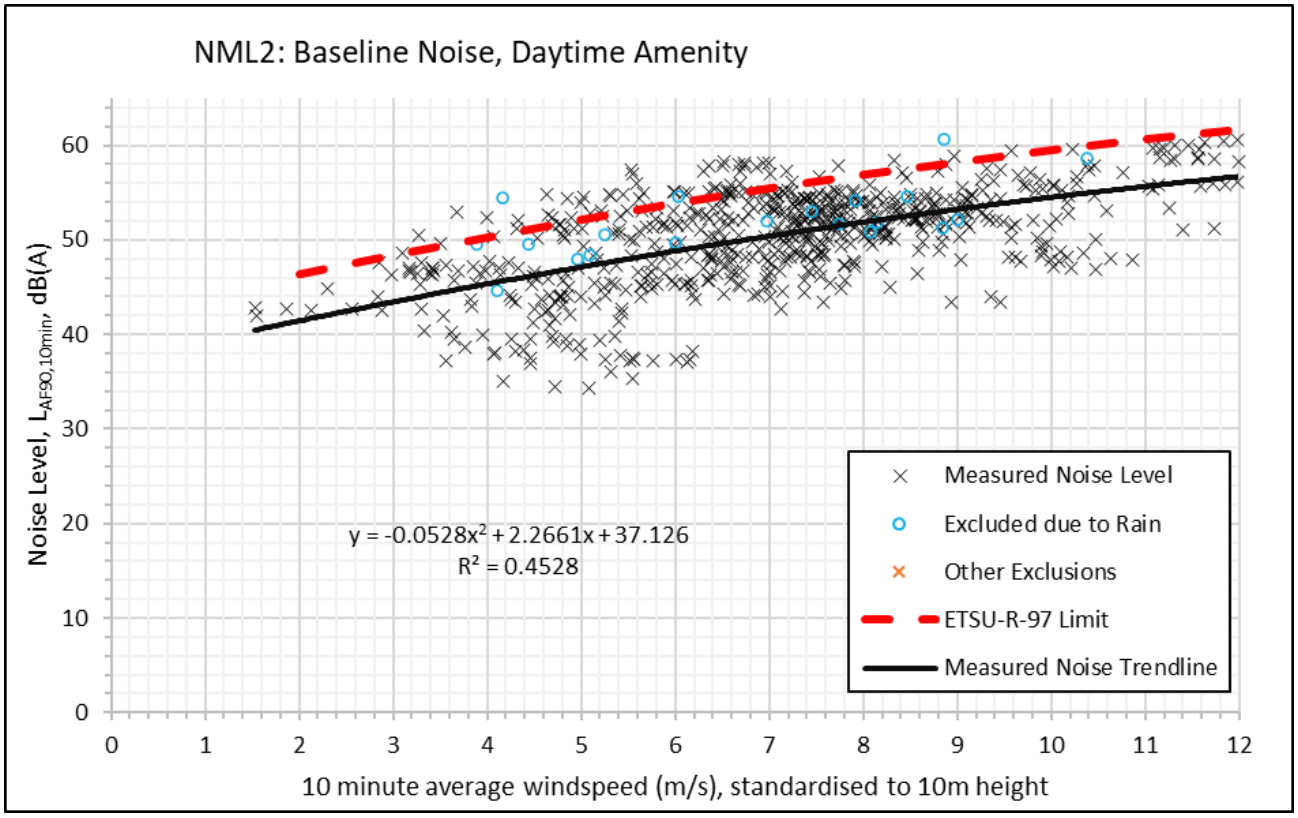

Figure 2-3: **Baseline Noise Levels – Daytime Amenity – NML2.**

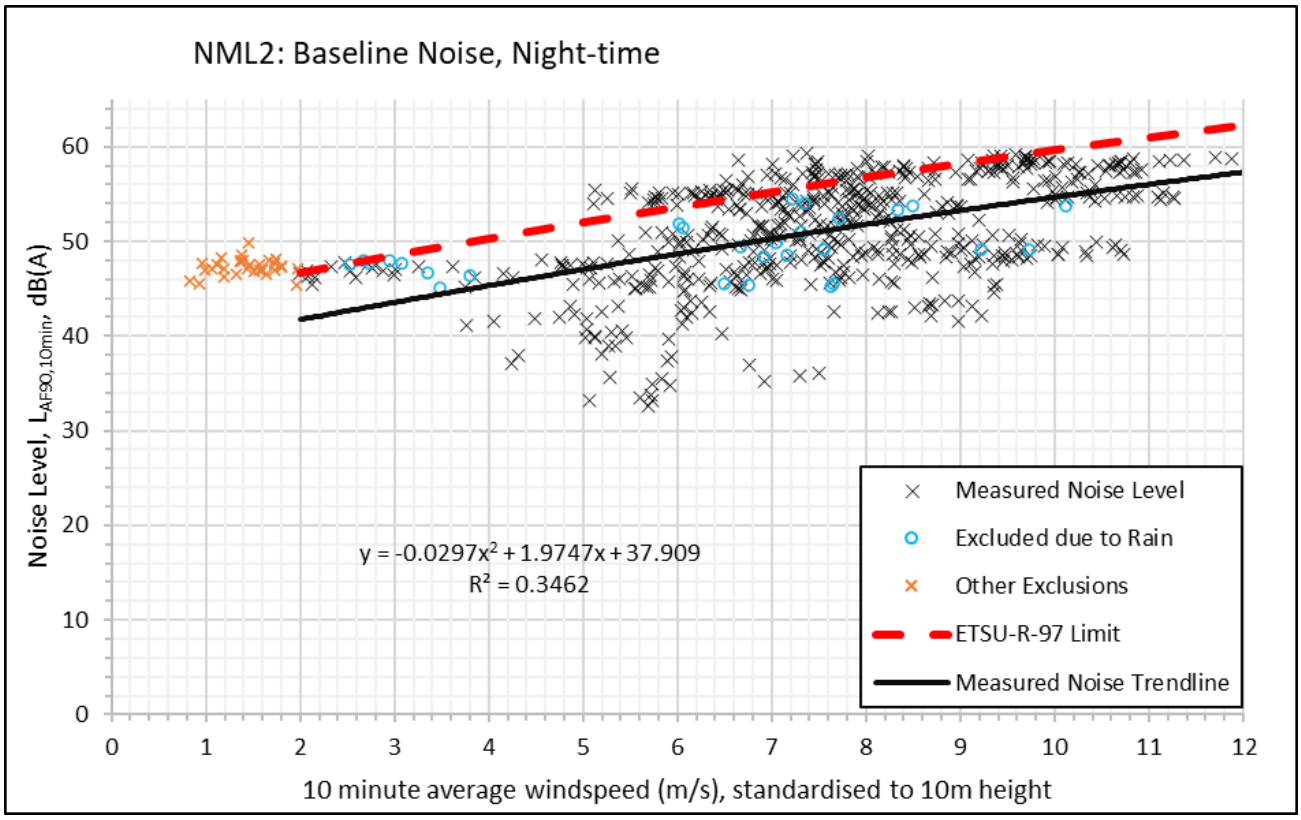

Figure 2-4: **Baseline Noise Levels – Night-time – NML2.**

2.6.3 NML3

Figure 2-5 and Figure 2-6 show the data measured at NML3 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

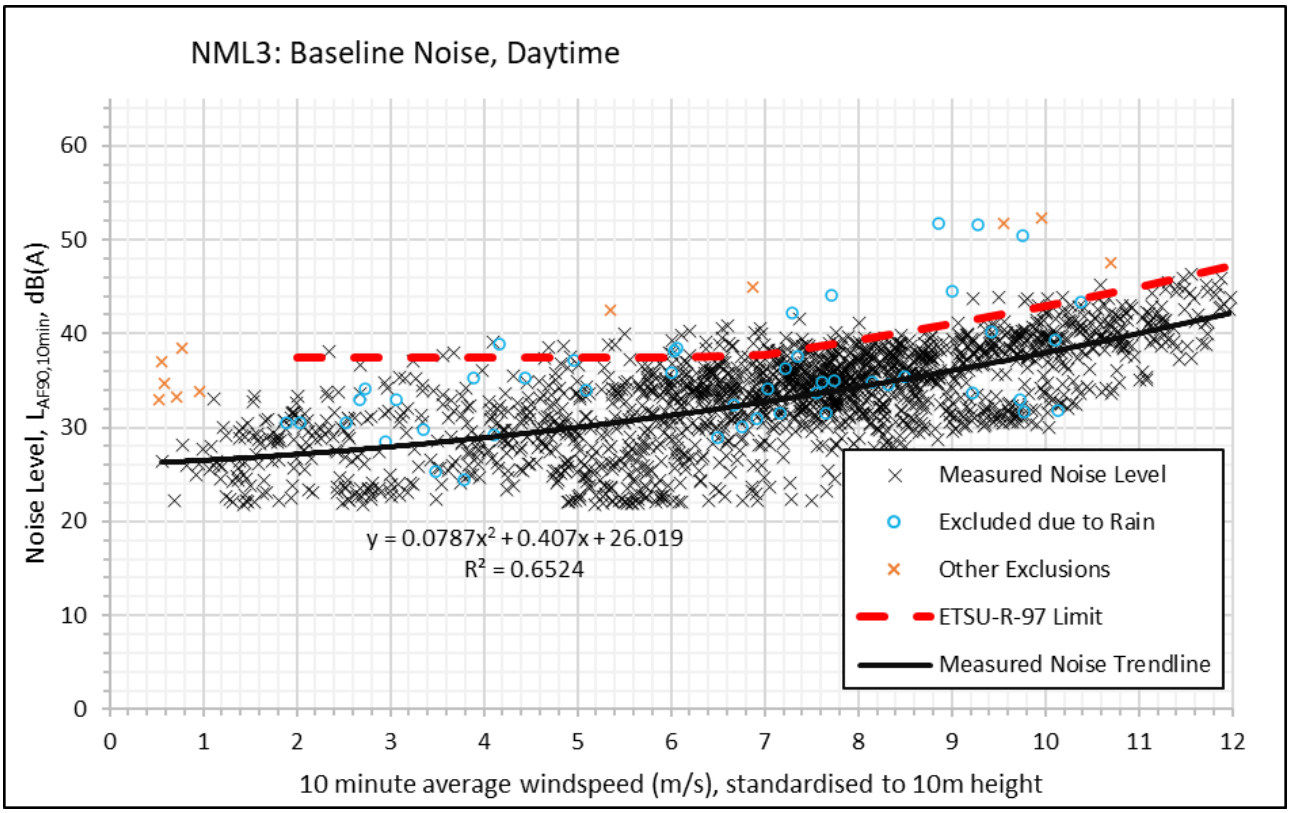

Figure 2-5: **Baseline Noise Levels – Daytime Amenity – NML3.**

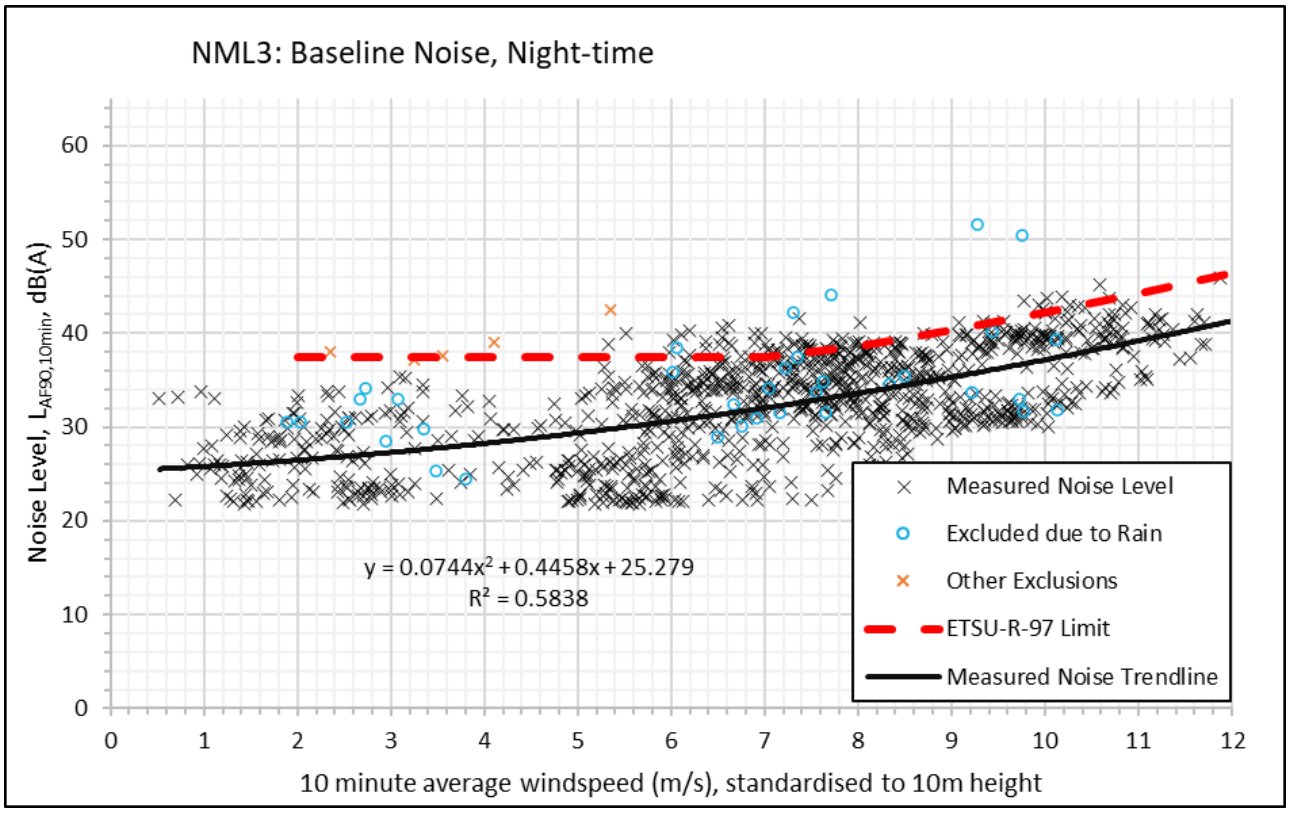

Figure 2-6: **Baseline Noise Levels – Night-time – NML3.**

2.6.4 NML4

Figure 2-7 and Figure 2-8 show the data measured at NML4 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

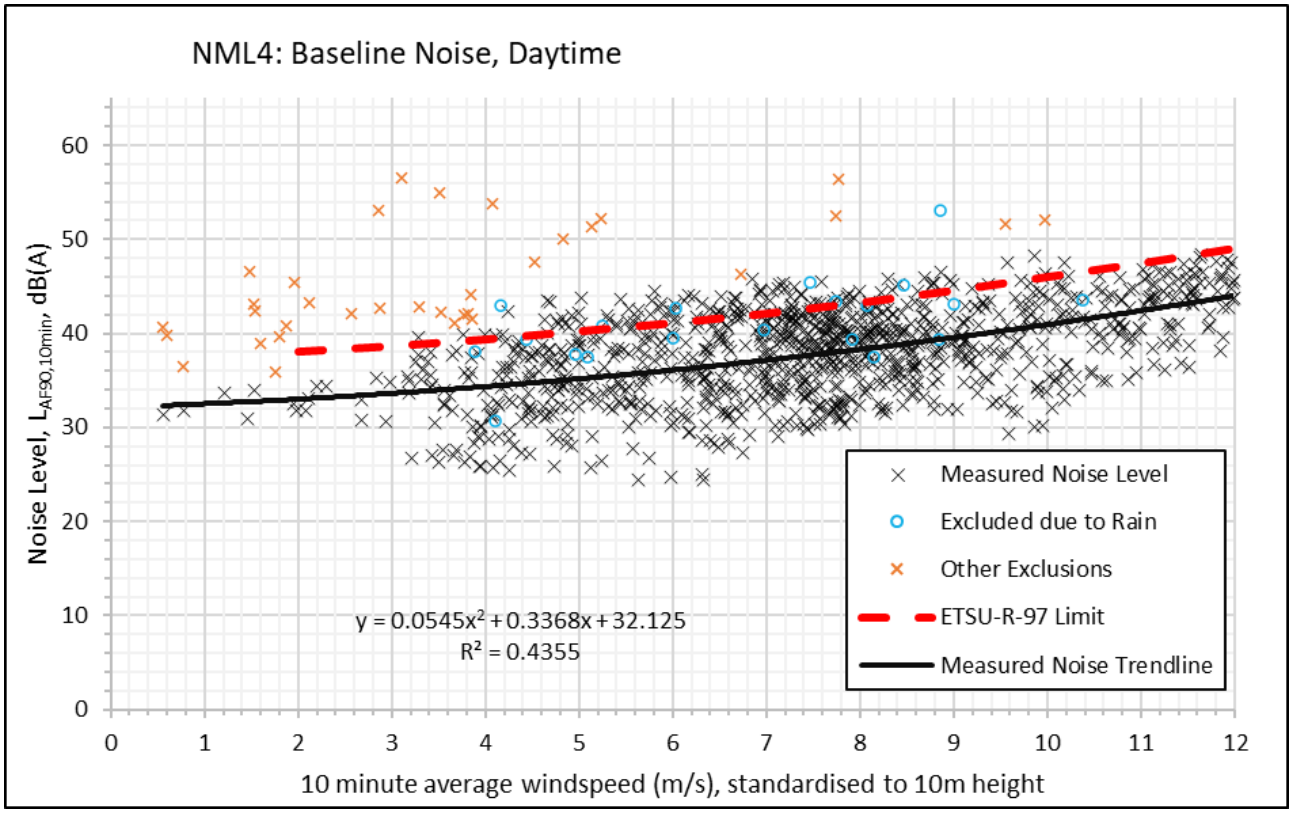

Figure 2-7: **Baseline Noise Levels – Daytime Amenity – NML4.**

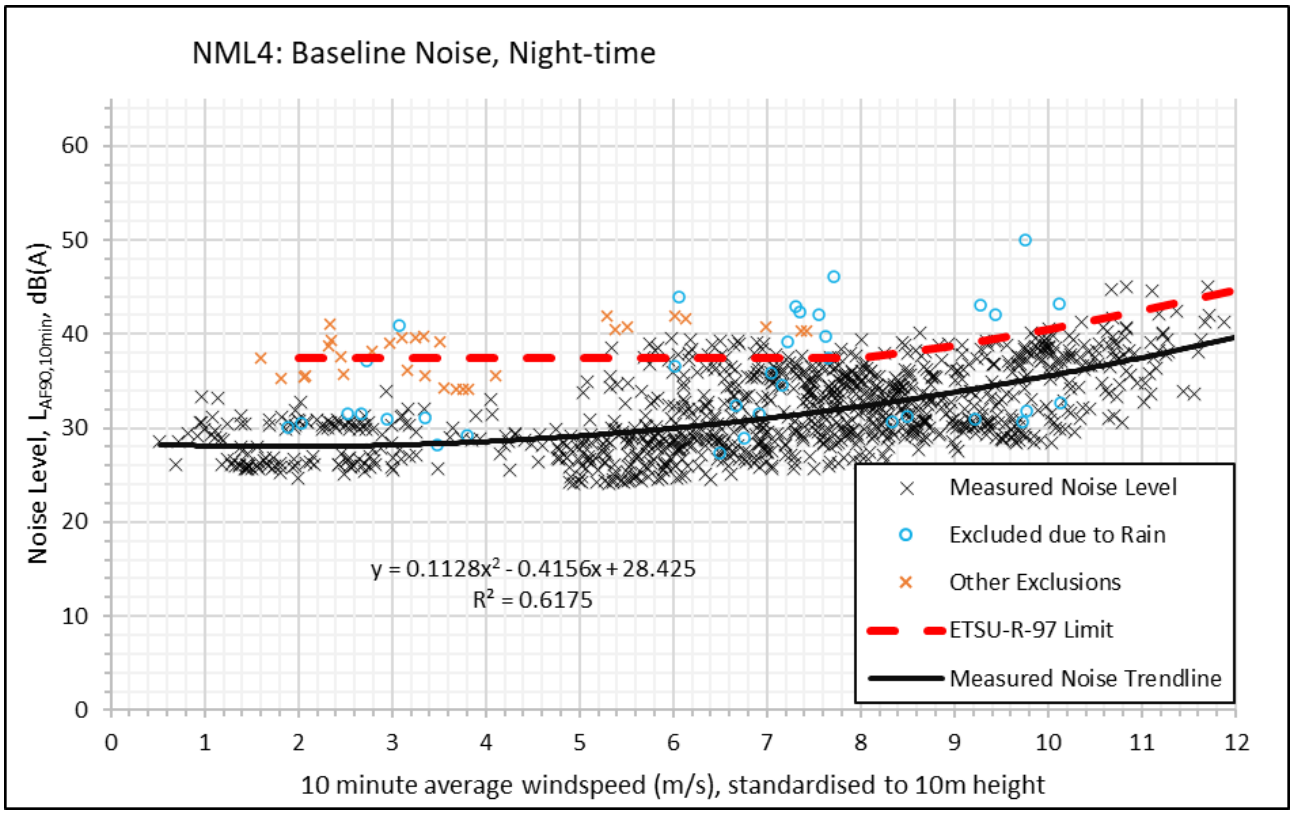

Figure 2-8: **Baseline Noise Levels – Night-time – NML4.**

2.6.5 NML5

Figure 2-9 and Figure 2-10 show the data measured at NML5 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

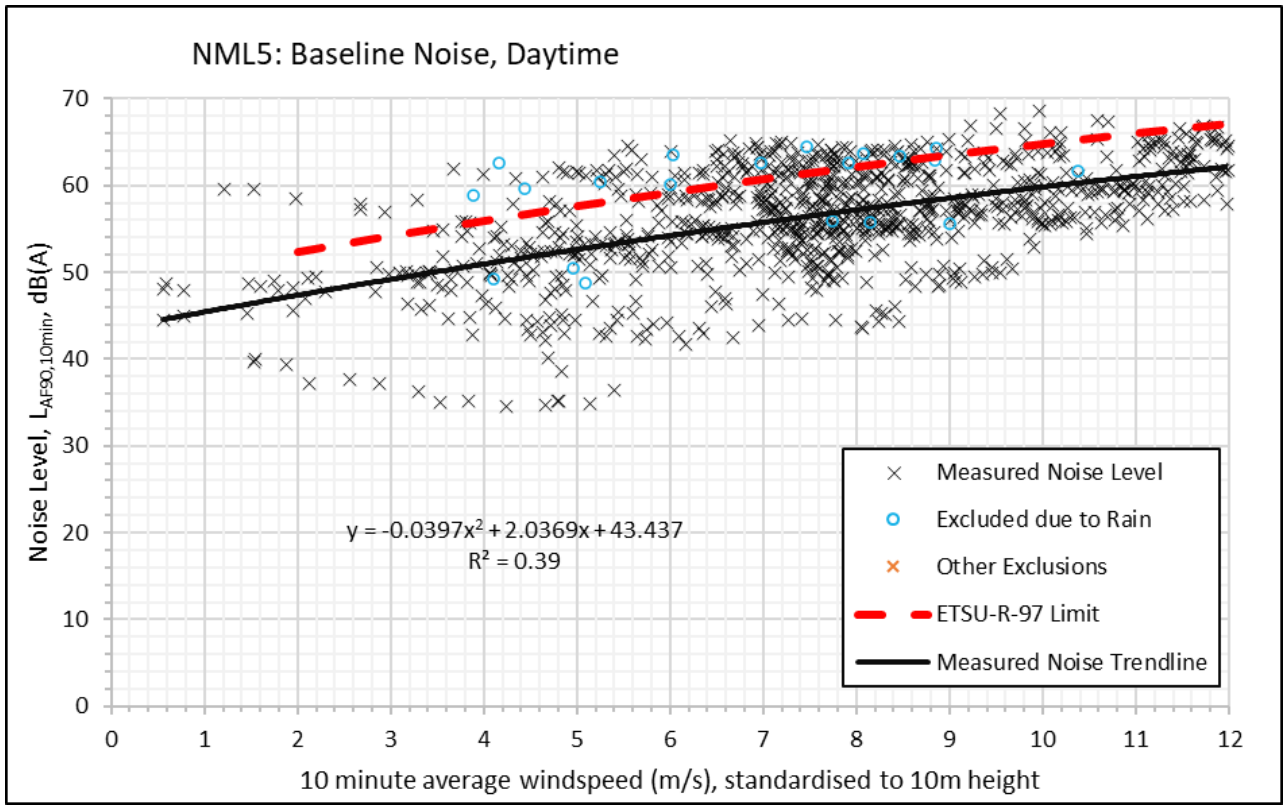

Figure 2-9: **Baseline Noise Levels – Daytime Amenity – NML5.**

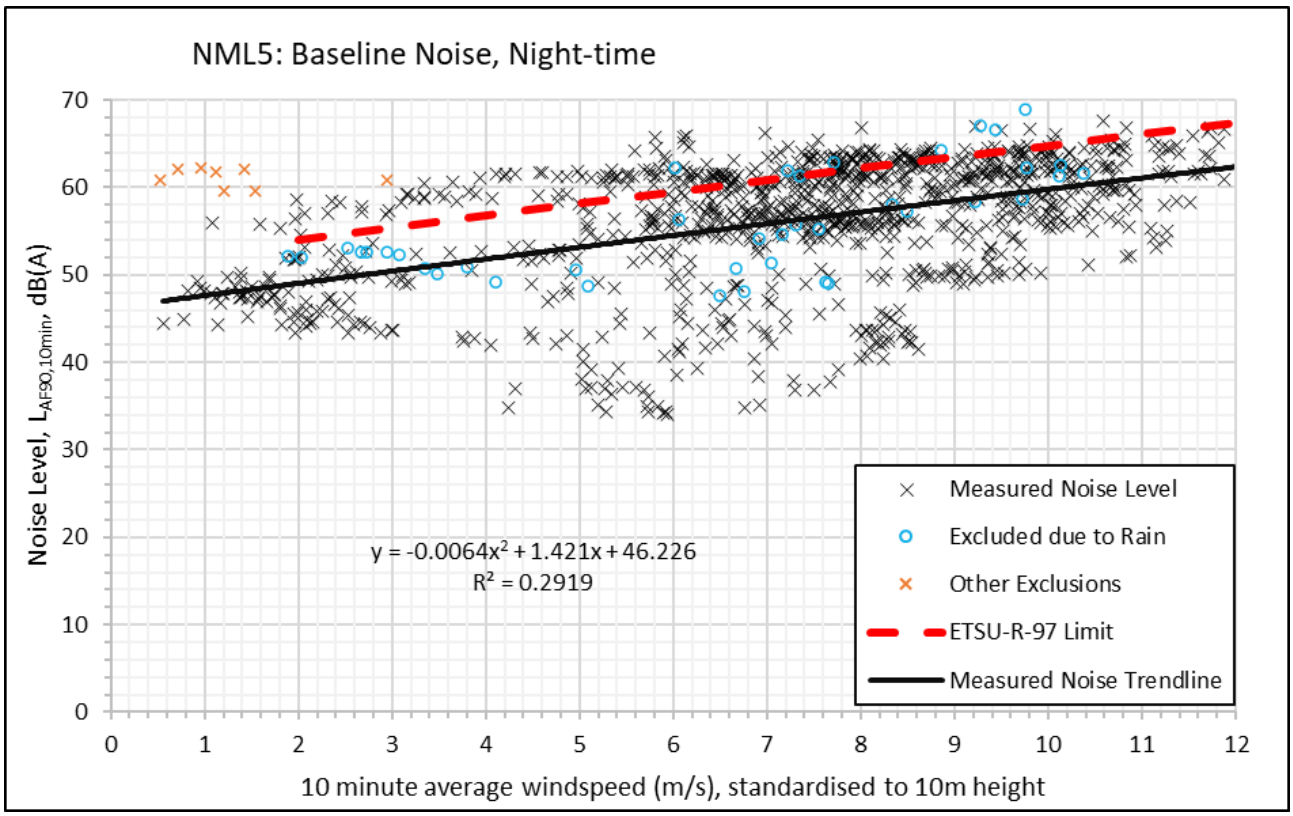

Figure 2-10: **Baseline Noise Levels – Night-time – NML5.**

2.6.6 NML6

Figure 2-11 and Figure 2-12 show the data measured at NML6 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

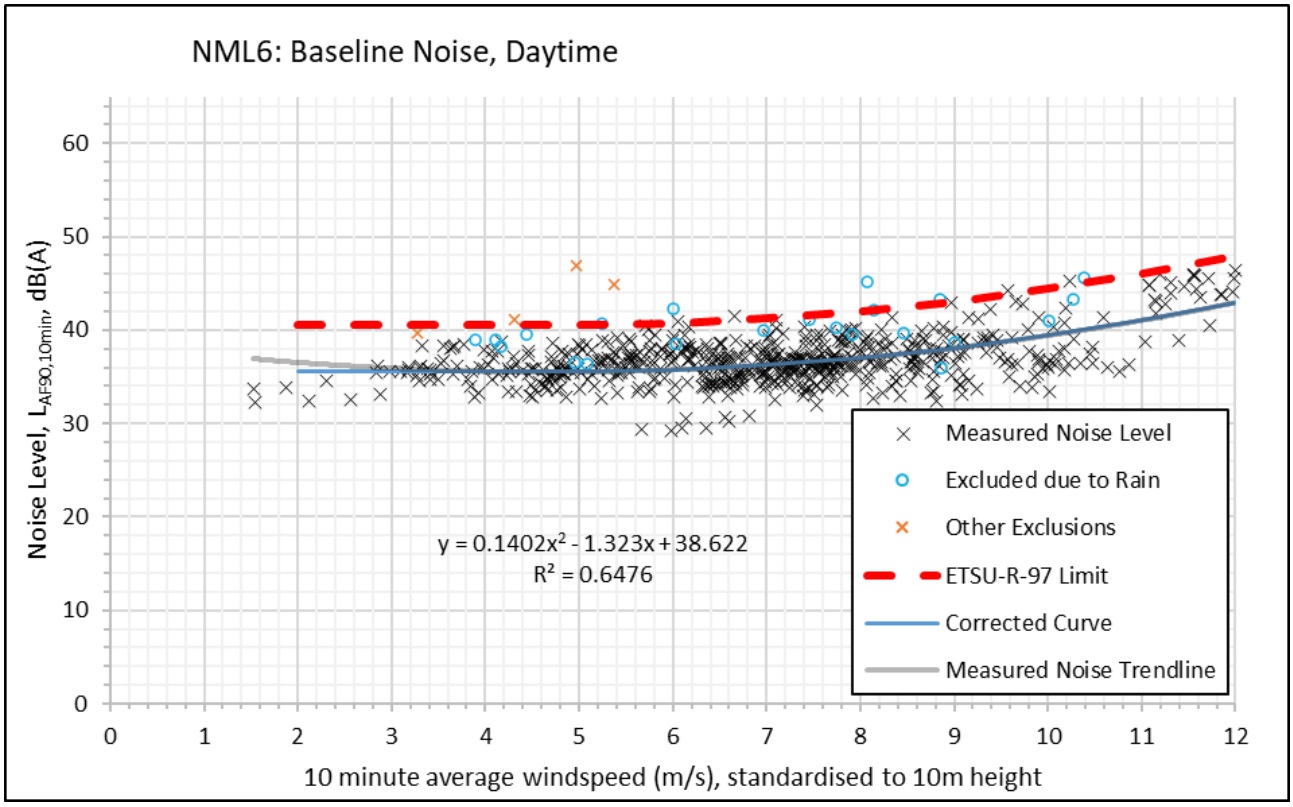

Figure 2-11: **Baseline Noise Levels – Daytime Amenity – NML6.**

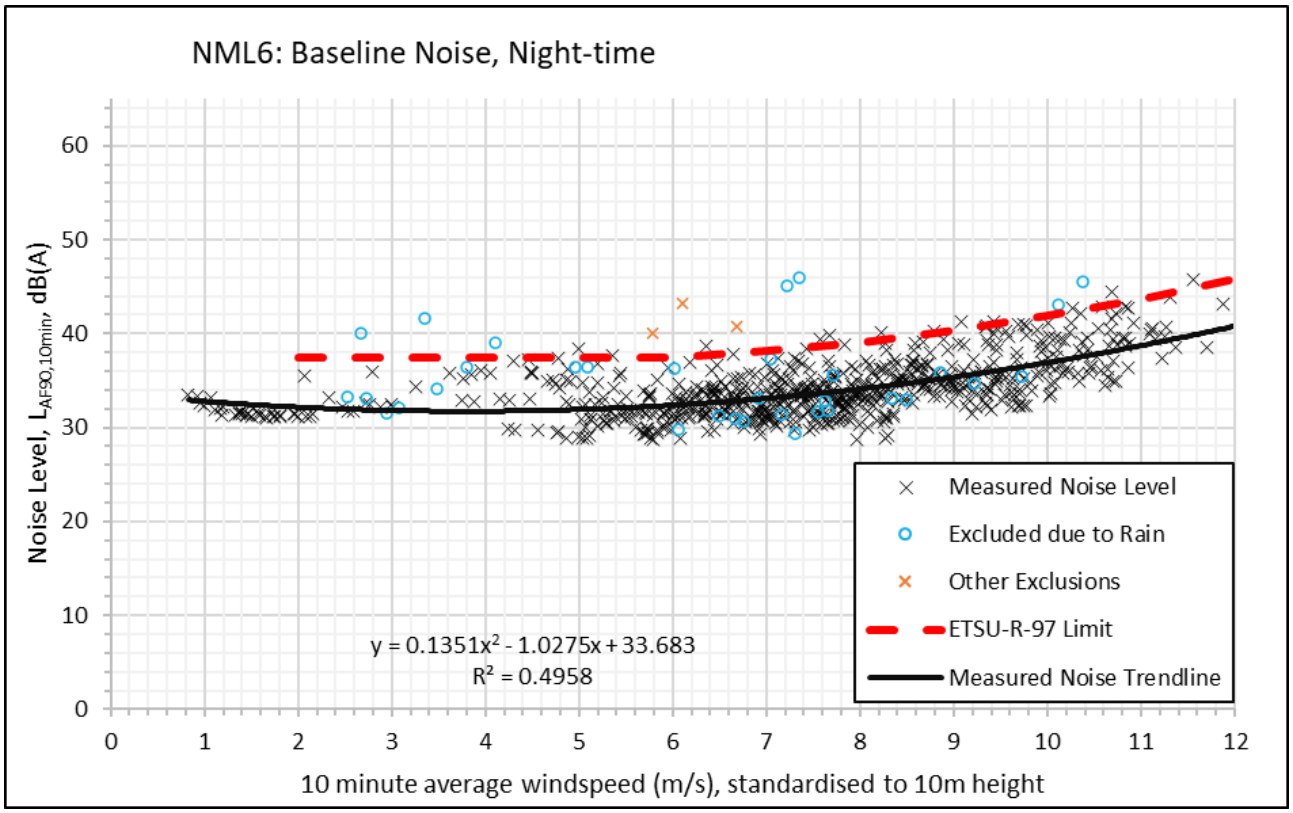

Figure 2-12: **Baseline Noise Levels – Night-time – NML6.**

2.6.7 NML7

Figure 2-13 and Figure 2-14 show the data measured at NML7 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

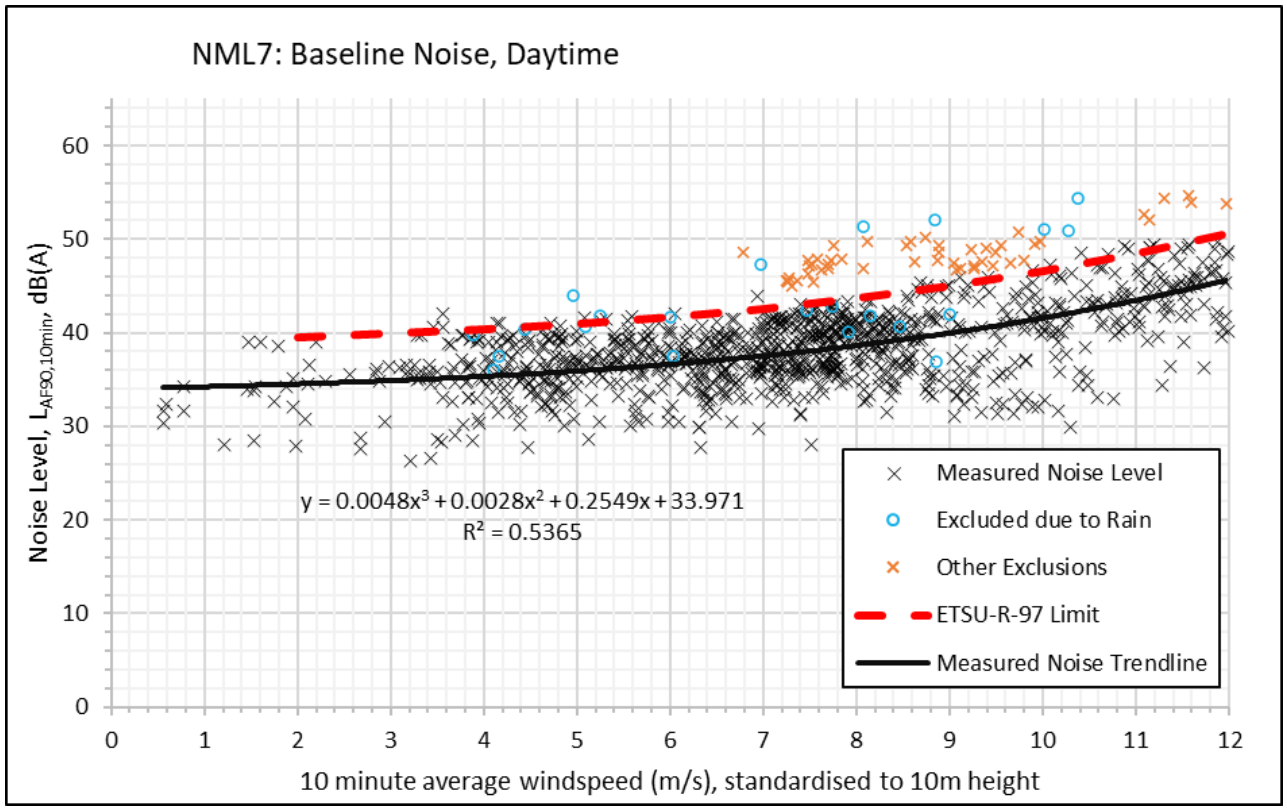

Figure 2-13: **Baseline Noise Levels – Daytime Amenity – NML7.**

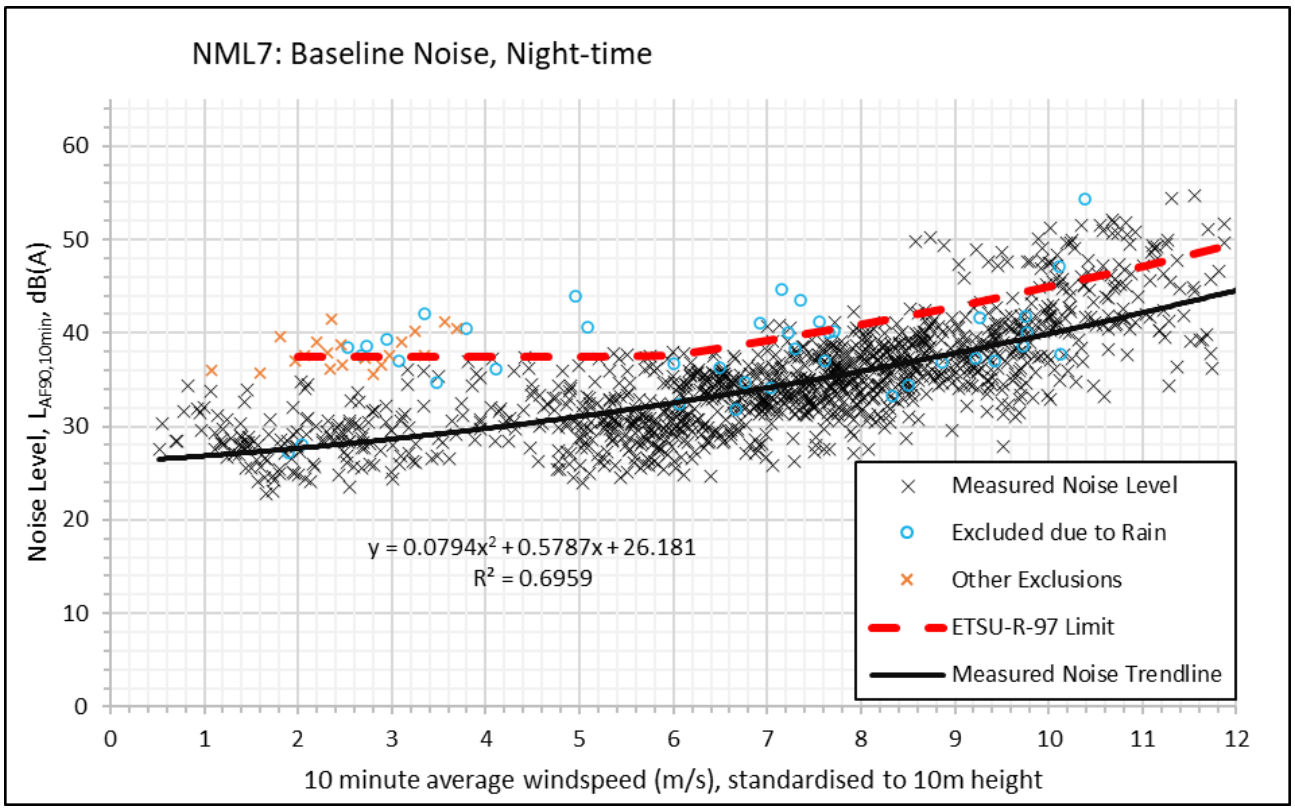

Figure 2-14: **Baseline Noise Levels – Night-time – NML7.**

2.6.8 NML8

Figure 2-15 and Figure 2-16 show the data measured at NML8 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

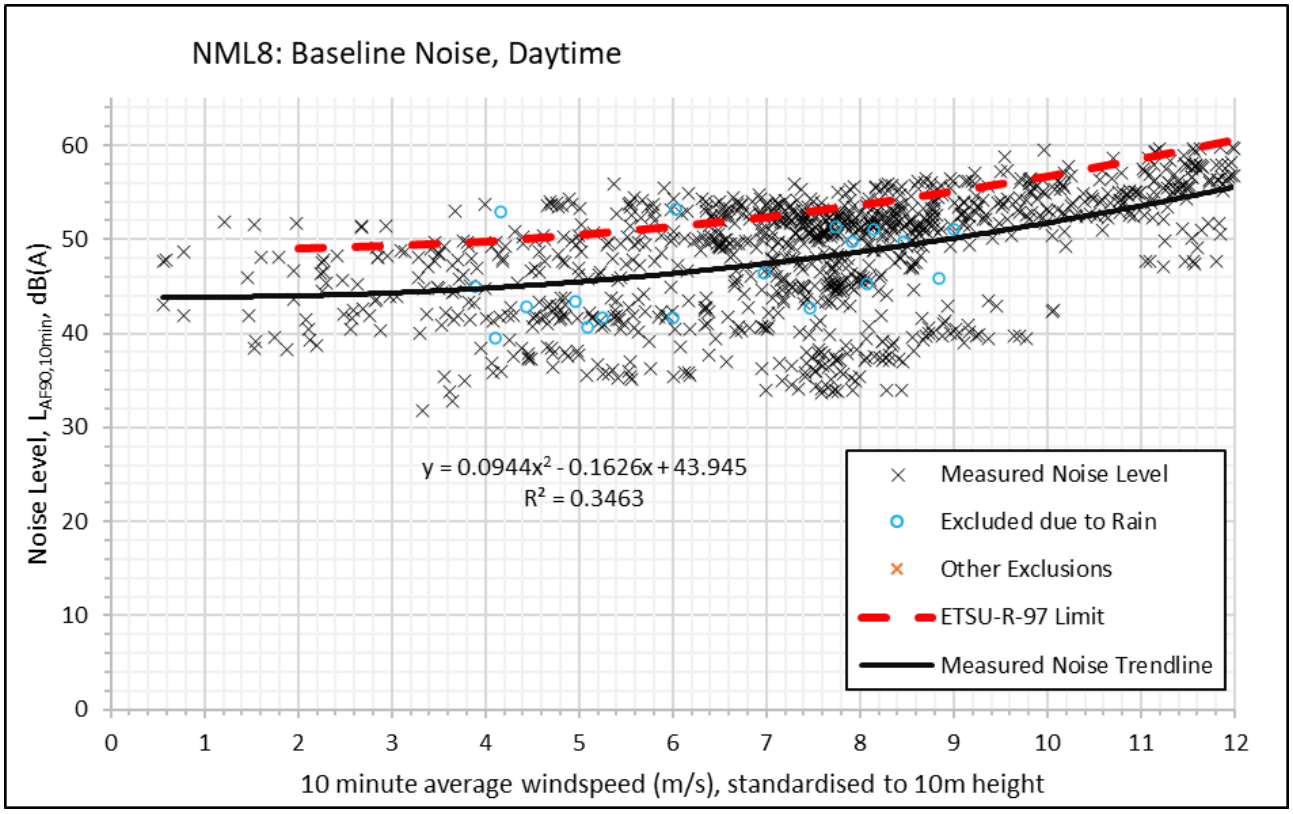

Figure 2-15: **Baseline Noise Levels – Daytime Amenity – NML8.**

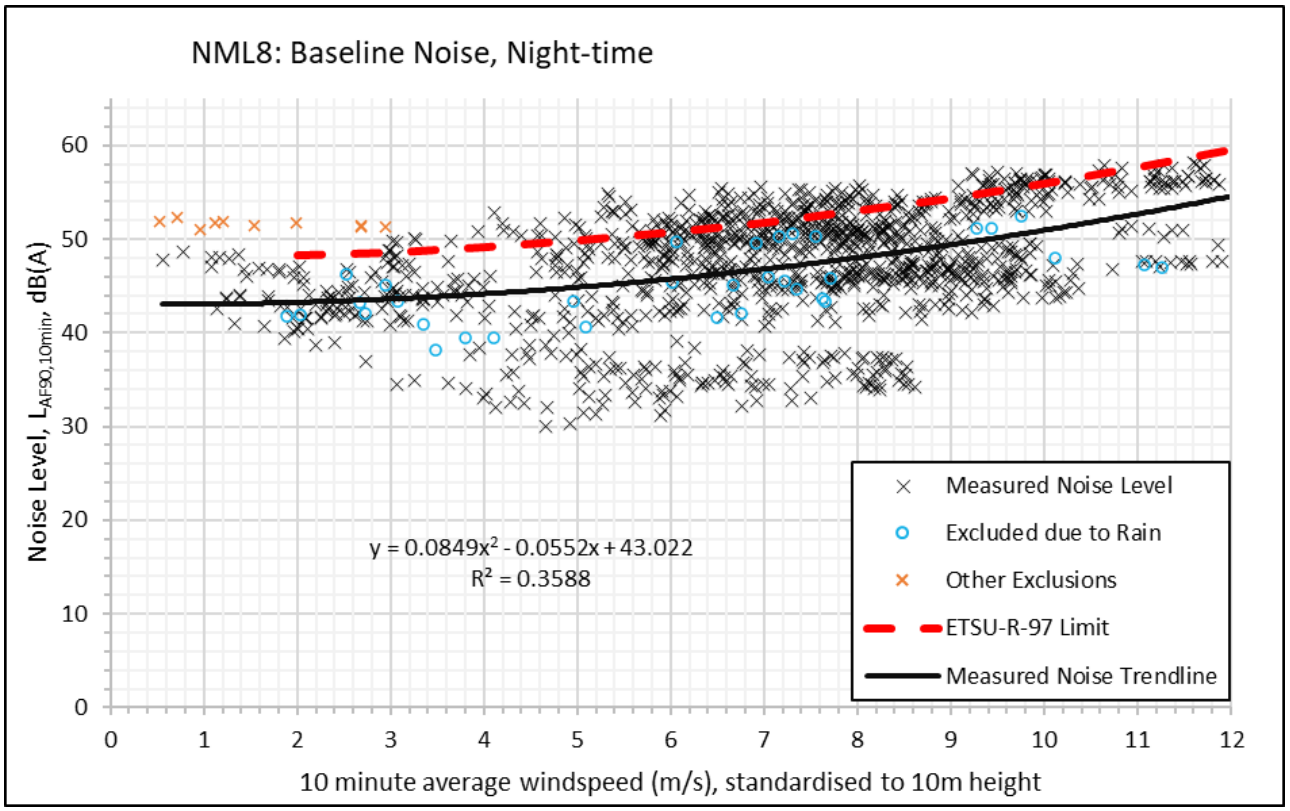

Figure 2-16: **Baseline Noise Levels – Night-time – NML8.**

2.6.9 NML9

Figure 2-17 and Figure 2-18 show the data measured at NML9 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

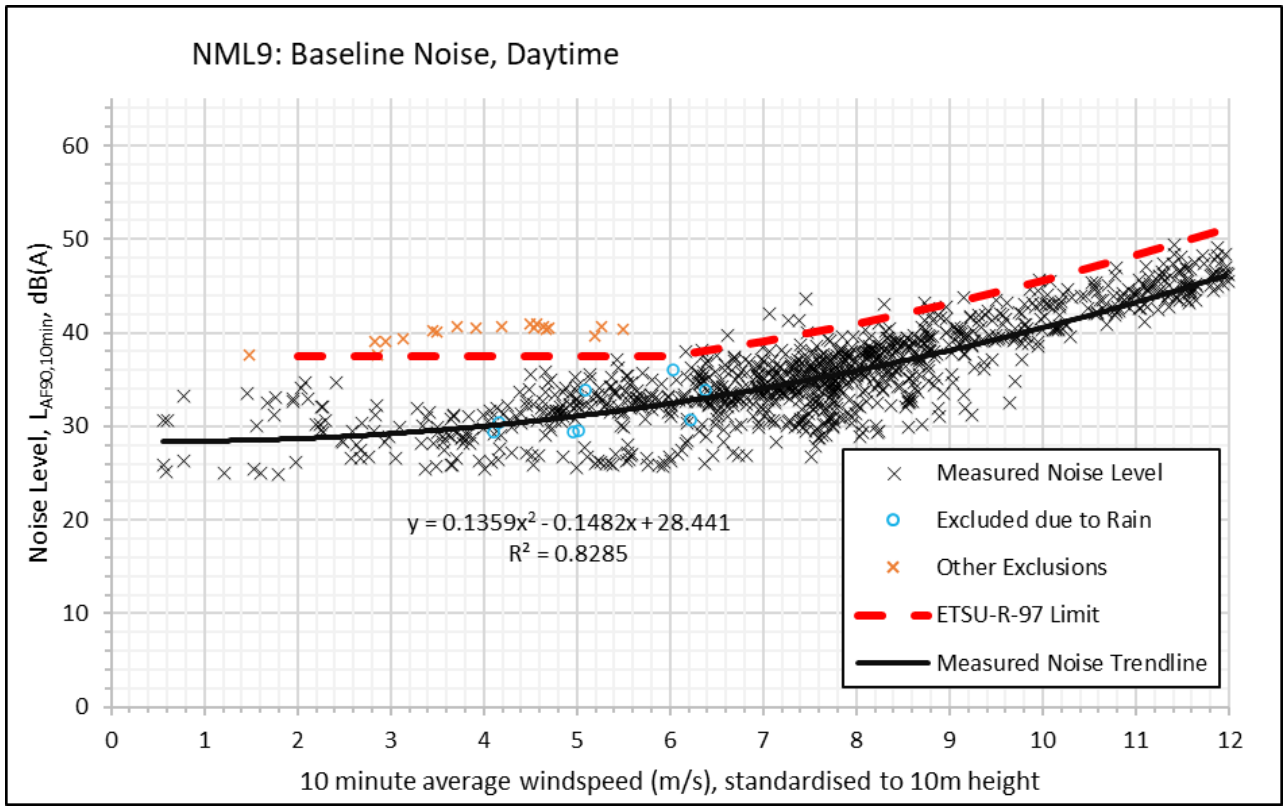

Figure 2-17: **Baseline Noise Levels – Daytime Amenity – NML9.**

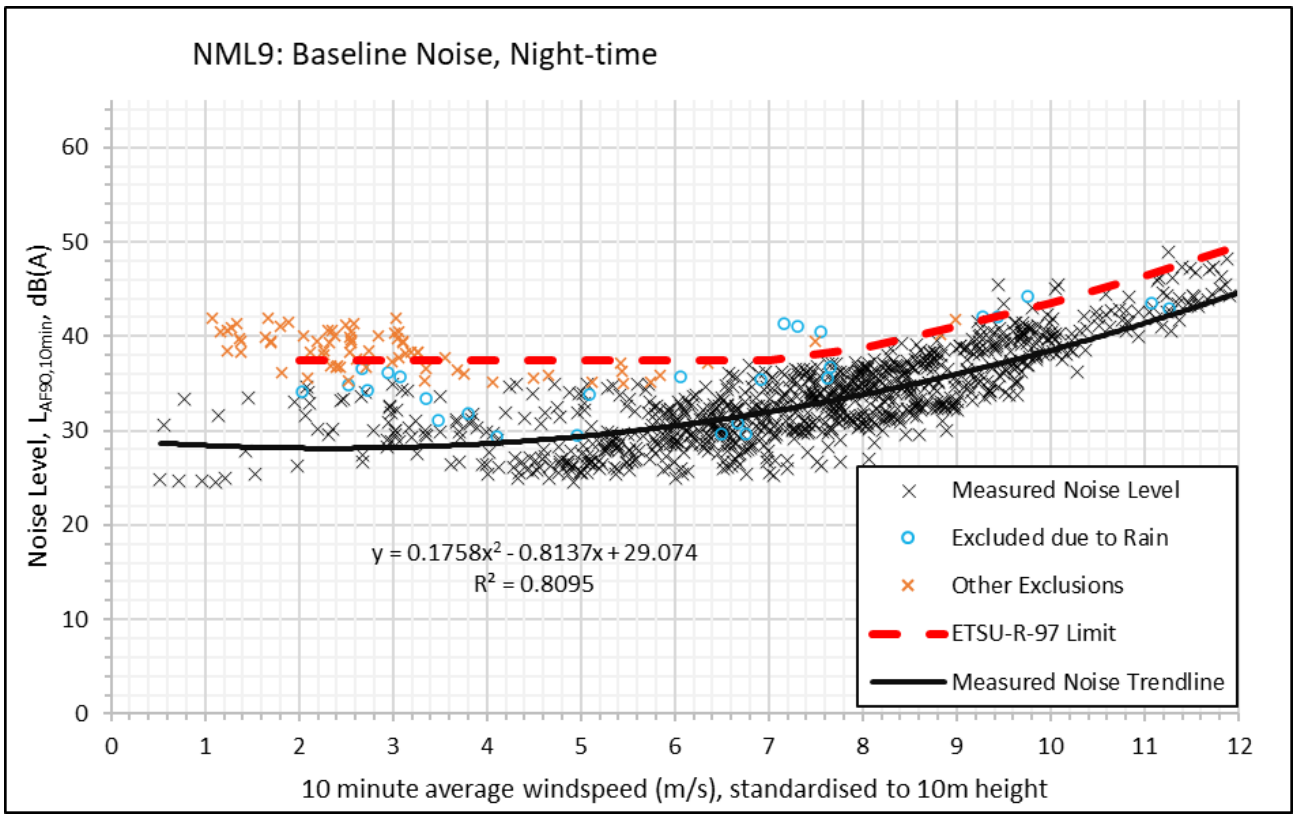

Figure 2-18: **Baseline Noise Levels – Night-time – NML9.**

2.6.10 NML10

Figure 2-19 and Figure 2-20 show the data measured at NML10 during the baseline noise monitoring for the daytime amenity and night-time periods respectively.

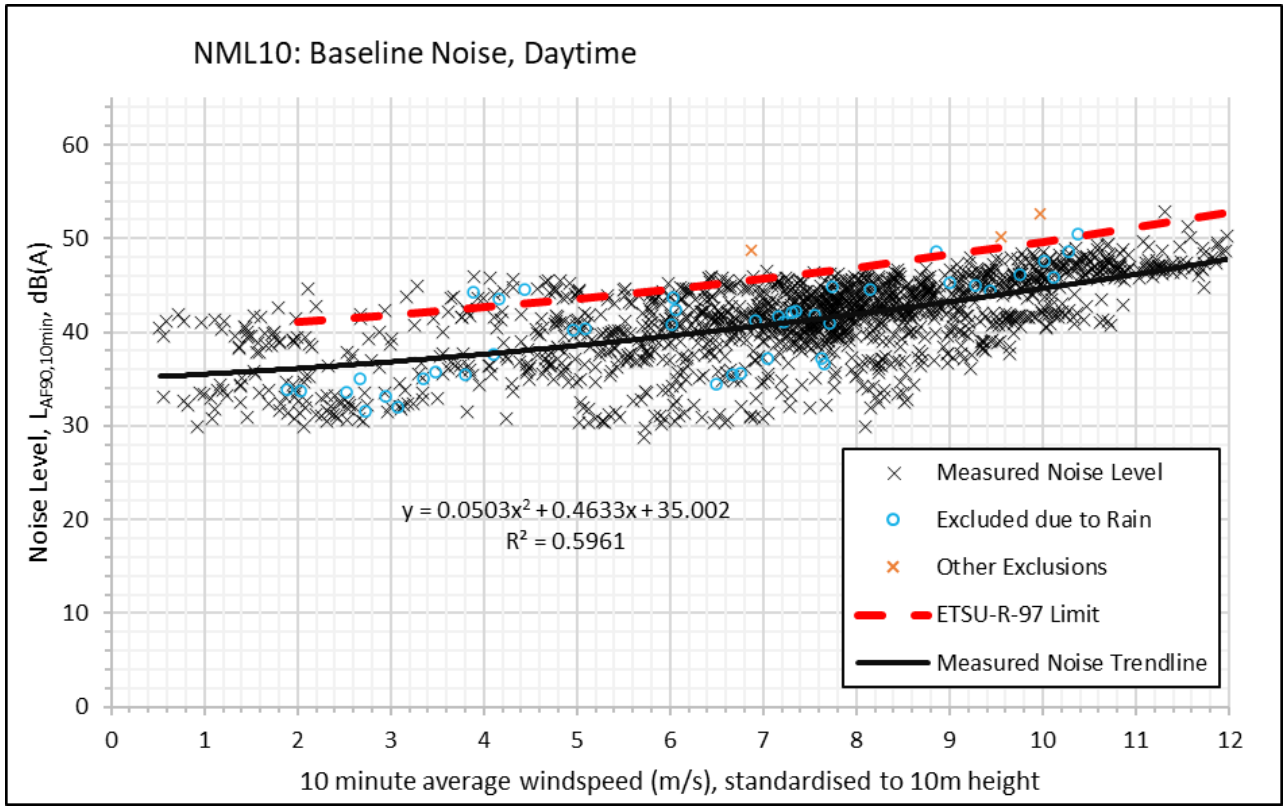

Figure 2-19: **Baseline Noise Levels – Daytime Amenity – NML10.**

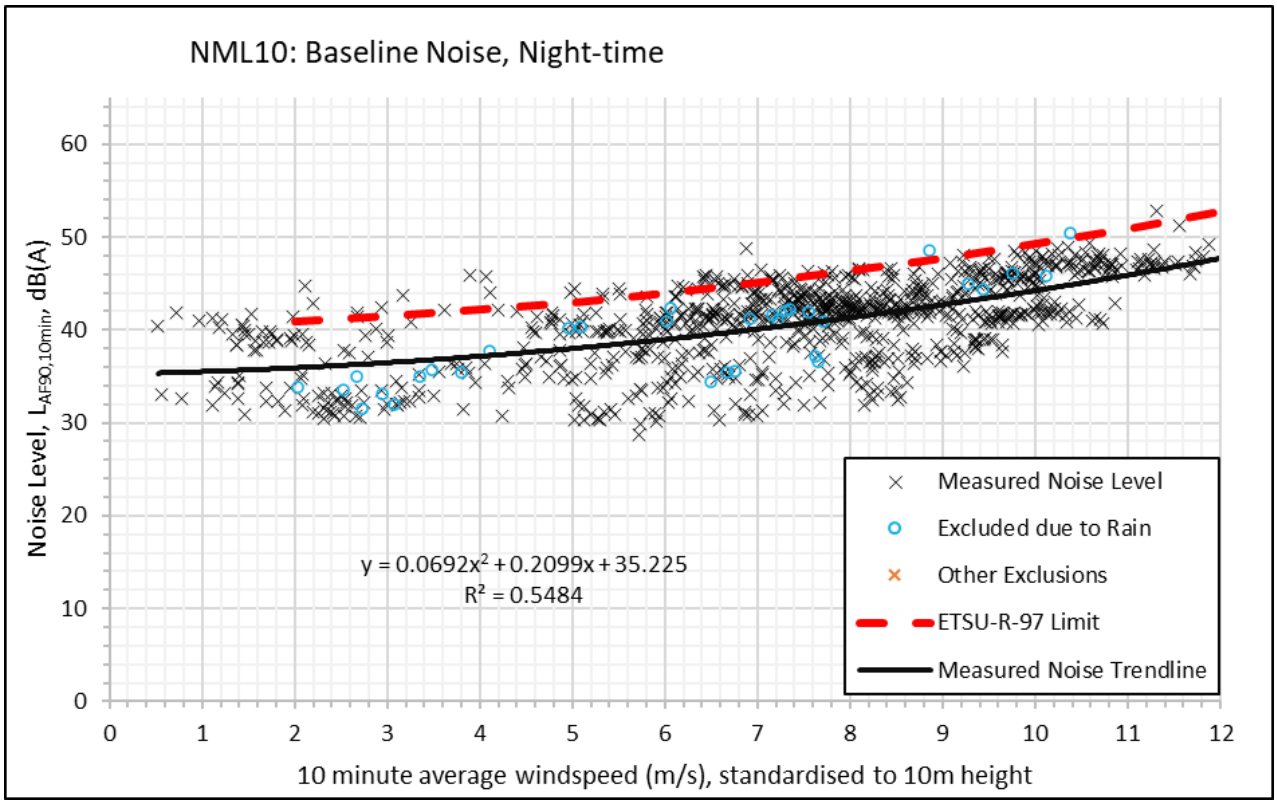

Figure 2-20: **Baseline Noise Levels – Night-time – NML10.**

2.7 Attended noise monitoring results

The attended noise survey was conducted from 15:00 on 28 February 2023 to 01:00 on 1 March 2023. Three 15-minute daytime measurements were conducted at AML1 to AML4 to inform the BS 5228 construction noise assessment. Two 15-minute night-time measurements were conducted at AML5 to inform the onshore substation operational noise assessment.

Table 2-2 summarises the daytime and evening measurements conducted at the five attended monitoring locations.

Table 2-2: Daytime/evening attended baseline noise measurements.

Site	Start date/time	Duration	Measured baseline noise levels (dB)			BS 5228 ABC Category
			L_{Aeq} (energy average)	L_{AFmax} (max)	L_{A90} (average)	
AML1	28/02/2023 15:21	3 x 15min	52	76	40	A
AML2	28/02/2023 16:34	3 x 15min	50	72	39	A
AML3	28/02/2023 17:43	3 x 15min	51	68	42	A
AML4	28/02/2023 18:59	3 x 15min	69	89	51	B

Table 2-3 summarises the night-time measurements conducted at AML5.

Table 2-3: Attended night-time baseline noise measurements at AML5.

Start date/time	Duration	Measured broadband levels (dB)			1/3 octave L_{Aeq} (dB) for centre frequency (Hz)		
		L_{Aeq}	L_{AFmax}	L_{A90}	100 Hz	200 Hz	315 Hz
01/03/2023 00:06	00:15:00	45	57	31	12	15	22
01/03/2023 00:22	00:15:00	45	61	31	12	17	23

3 SUMMARY OF BASELINE CURVES AND ETSU-R-97 LIMITS

As expected, the monitoring results show a large difference in baseline levels measured at coastal vs inland sites. Table 3-1 shows results and limits for the following two monitoring sites in Co. Down, Northern Ireland with the influence of coastal noise shown in results from both sites:

- NML1 – approximately 150 m inland, sheltered rear garden; and
- NML2 – Coastal, exposed garden location.

Table 3-1: Baseline and ETSU-R-97 Limit curves for NML1 and NML2 (Co. Down, NI).

Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
NML1	Daytime Amenity Curve (dB L_{A90})	32.6	33.2	34.0	35.1	36.5	38.0	39.6	41.4	43.2
	Daytime Limit (dB L_{A90})	37.6	38.2	39.0	40.1	41.5	43.0	44.6	46.4	48.2
	Night-time Curve (dB L_{A90})	31.6	32.1	32.6	33.4	34.2	35.3	36.5	37.9	39.5
	Night-time Limit (dB L_{A90})	37.5	37.5	37.6	38.4	39.2	40.3	41.5	42.9	44.5
Site	**V10 (m/s)**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
NML2	Daytime Amenity Curve (dB L_{A90})	42.1	43.7	45.4	47.1	48.7	50.3	51.9	53.3	54.7
	Daytime Limit (dB L_{A90})	47.1	48.7	50.4	52.1	53.7	55.3	56.9	58.3	59.7
	Night-time Curve (dB L_{A90})	41.7	43.6	45.3	47.0	48.7	50.3	51.8	53.3	54.7
	Night-time Limit (dB L_{A90})	46.7	48.6	50.3	52.0	53.7	55.3	56.8	58.3	59.7

Relatively high baseline levels were recorded for NML5 on the coast. The lowest baseline levels were measured at NML3 which is located approximately 1 km inland. Table 3-2 shows results for the following three sites located on the Cooley Peninsula.

- NML3 – approximately 1 km inland, exposed garden location;
- NML4 – approximately 4 km inland, exposed garden location; and
- NML5 – coastal, exposed deck location overlooking beach.

Table 3-2: Baseline and ETSU-R-97 Limit curves for NML3, NML4 and NML5 (Cooley Peninsula).

Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
NML3	Daytime Amenity Curve (dB L_{A90})	27.5	27.9	28.7	29.8	31.1	32.6	34.3	36.2	38.2
	Daytime Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	37.6	39.3	41.2	43.2
	Night-time Curve (dB L_{A90})	26.5	27.3	28.3	29.4	30.6	32.0	33.6	35.3	37.2
	Night-time Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	37.5	38.6	40.3	42.2
Site	**V10 (m/s)**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
NML4	Daytime Amenity Curve (dB L_{A90})	31.8	33.1	34.3	35.4	36.3	37.3	38.3	39.4	40.6

Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
	Daytime Limit (dB L_{A90})	37.5	38.1	39.3	40.4	41.3	42.3	43.3	44.4	45.6
	Night-time Curve (dB L_{A90})	28.0	28.2	28.6	29.2	30.0	31.0	32.3	33.8	35.5
	Night-time Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	37.5	37.5	38.8	40.5
Site	**V10 (m/s)**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
NML5	Daytime Amenity Curve (dB L_{A90})	47.4	49.2	50.9	52.6	54.2	55.7	57.2	58.6	59.9
	Daytime Limit (dB L_{A90})	52.4	54.2	55.9	57.6	59.2	60.7	62.2	63.6	64.9
	Night-time Curve (dB L_{A90})	49.0	50.4	51.8	53.2	54.5	55.9	57.2	58.5	59.8
	Night-time Limit (dB L_{A90})	54.0	55.4	56.8	58.2	59.5	60.9	62.2	63.5	64.8

Table 3-3 shows results for the following sites closest to Dundalk town:

- NML6 – approximately 300m inland, sheltered garden location; and
- NML7 – approximately 170m inland, somewhat sheltered location.

Table 3-3: Baseline and ETSU-R-97 Limit curves for NML6 and NML7 (Blackrock and Castlebellingham, Co. Louth).

Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
NML6	Daytime Amenity Curve (dB L_{A90})	35.6	35.6	35.6	35.5	35.7	36.2	37.0	38.1	39.4
	Daytime Limit (dB L_{A90})	40.6	40.6	40.6	40.5	40.7	41.2	42.0	43.1	44.4
	Night-time Curve (dB L_{A90})	32.2	31.8	31.7	31.9	32.4	33.1	34.1	35.4	36.9
	Night-time Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	38.1	39.1	40.4	41.9
Site	**V10 (m/s)**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
NML7	Daytime Amenity Curve (dB L_{A90})	34.5	34.9	35.3	35.9	36.6	37.5	38.6	40.0	41.6
	Daytime Limit (dB L_{A90})	39.5	39.9	40.3	40.9	41.6	42.5	43.6	45.0	46.6
	Night-time Curve (dB L_{A90})	27.7	28.6	29.8	31.1	32.5	34.1	35.9	37.8	39.9
	Night-time Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	39.1	40.9	42.8	44.9

Table 3-4 shows results for the following three southern-most monitoring sites:

- NML8 – coastal, exposed location in field;
- NML9 – approximately 1 km inland, exposed location in field; and
- NML10 – approximately 350 m inland, exposed location.

Table 3-4: Baseline and ETSU-R-97 Limit curves for NML8, NML9 and NML10 (Dunany Point and Clogher Head, Co. Louth).

Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
NML8	Daytime Amenity Curve (dB L_{A90})	44.0	44.3	44.8	45.5	46.4	47.4	48.7	50.1	51.8
	Daytime Limit (dB L_{A90})	49.0	49.3	49.8	50.5	51.4	52.4	53.7	55.1	56.8
	Night-time Curve (dB L_{A90})	43.3	43.6	44.2	44.9	45.7	46.8	48.0	49.4	51.0
	Night-time Limit (dB L_{A90})	48.3	48.6	49.2	49.9	50.7	51.8	53.0	54.4	56.0

Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
NML9	Daytime Amenity Curve (dB L_{A90})	28.7	29.2	30.0	31.1	32.4	34.1	36.0	38.1	40.5
	Daytime Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	39.1	41.0	43.1	45.5
	Night-time Curve (dB L_{A90})	28.2	28.2	28.6	29.4	30.5	32.0	33.8	36.0	38.5
	Night-time Limit (dB L_{A90})	37.5	37.5	37.5	37.5	37.5	37.5	38.8	41.0	43.5
Site	V10 (m/s)	2	3	4	5	6	7	8	9	10
NML10	Daytime Amenity Curve (dB L_{A90})	36.1	36.8	37.7	38.6	39.6	40.7	41.9	43.2	44.7
	Daytime Limit (dB L_{A90})	41.1	41.8	42.7	43.6	44.6	45.7	46.9	48.2	49.7
	Night-time Curve (dB L_{A90})	35.9	36.5	37.2	38.0	39.0	40.1	41.3	42.7	44.2
	Night-time Limit (dB L_{A90})	40.9	41.5	42.2	43.0	44.0	45.1	46.3	47.7	49.2

4 PHOTOGRAPHS OF MONITORING SITES

Photographs of the noise monitoring equipment deployed at each of the ten monitoring sites are displayed in below.

NML1

NML2

NML3

NML4

NML5

NML6

NML7

NML8

NML9

NML10

5 COORDINATES OF MONITORING SITES

Table 5-1 details the Irish Transverse Mercator (ITM) coordinates for each of the ten long-term monitoring sites.

Table 5-1: ITM coordinates of long term noise monitoring sites.

Site	Easting (ITM)	Northing (ITM)
NML1	730793	813714
NML2	727744	810678
NML3	722828	807463
NML4	718796	808469
NML5	715140	805688
NML6	707158	803216
NML7	706869	796684
NML8	715326	790971
NML9	714237	791033
NML10	716303	783961

Table 5-2 details the Irish Transverse Mercator (ITM) coordinates for each of the five attended monitoring sites.

Table 5-2: ITM coordinates of attended noise monitoring sites.

Site	Easting (ITM)	Northing (ITM)
AML1	714473	789759
AML2	711069	789061
AML3	706516	791132
AML4	703699	791078
AML5	698444	790362

6 EQUIPMENT CALIBRATION CERTIFICATES

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2208920 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2654662	Id: - 2654662
Microphone:	Brüel & Kjær Type 4950	No: 2730389	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 6822	
Supplied Calibrator:	Brüel & Kjær Type 4231	No: 2626210	
Software version:	BZ7222 Version 4.7.5	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2022-02-24

Date of issue: 2022-02-24

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 3 7, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2205023 Page 1 of 10

CALIBRATION OF

Calibrator	Brüel & Kjær Type 4231	No: 2292707
1/2 inch adaptor	Brüel & Kjær Type UC0210	
Pattern Approval:	PTB-1.61-4057176	

CUSTOMER

Enfonic Ltd
Unit 2A
Century Business Park
D11 T0HV Dublin
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Calibrator Bruel & Kjaer Type 4231 has been calibrated in accordance with the requirements as specified in IEC60942:2003 Annex B Class 1. The accreditation assures the traceability to the international unit system SI.

PROCEDURE

The measurements have been performed with the assistance of Bruel & Kjaer acoustic calibrator calibration application software Type 7794 (version 2.4) by using procedure P 4231 D04.

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2022-08-18

Date of issue: 2022-08-18

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

DANAK
CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2104736 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3001350	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3022867	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 23775	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.5.2	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2021-08-21

Date of issue: 2021-08-21

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Brüel & Kjær

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Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2202900 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3002365	Id: - 3002365
Microphone:	Brüel & Kjær Type 4950	No: 2807020	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 15085	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.5	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2022-06-06

Date of issue: 2022-06-06

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Page 1 of 3

APPROVED SIGNATORIES

Claire Lomax [x] Sean Furlong [ ]
Gary Phillips [ ] Danny McCaul [ ]

acoustic calibration laboratory
The University of Salford, Salford, Greater Manchester, M5 4WT, UK
http://www.acoustics.salford.ac.uk
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UKAS CALIBRATION 0801

University of Salford MANCHESTER

Certificate Number: 05659/2 **Date of Issue: 25 March 2022**

PERIODIC TEST OF A SOUND LEVEL METER to IEC 61672-3:2006

FOR:	Enfonic Ltd Unit 2A Century Business Park Dublin D11 T0HV
FOR THE ATTENTION OF:	Bruna Barros
DATE RECEIVED:	16 March 2022
PERIODIC TEST DATE:	18th and 21st March 2022
LOCATION OF CALIBRATION:	Acoustic Calibration Laboratory, Newton G31, University of Salford
TEST PROCEDURE:	CTP12 (Laboratory Manual)

Sound Level Meter Details-

Manufacturer	B&K
Model	2250 L
Serial number	3002367
Class	1
Hardware version: 4.0	Software BZ7133 Version 4.7.5

Associated Items:-

Type	Manufacturer	Model	Serial Number	Adaptor
Microphone	B&K	4950	2745852	
Preamplifier	B&K	ZC 0032	16743	
Calibrator	B&K	4231	2343370	UC 0210

Test Engineer (initial):	GP	Name:	Gary Phillips

Results in this certificate relate only to instruments tested.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 05659/2 Date of Issue: 25 March 2022

Procedures from IEC 61672-3: 2006 and TPS 49 Edition 2 June 2009 were used to perform the periodic tests.

The manufacturer's instruction manual was marked as follows: B&K 2250-L with mic 4950 BE 1774-11 June 2007 From hardware version 2.0.

Adjustment data used to adjust the sound levels indicated in response to the application of a multi-frequency sound calibrator to sound levels equivalent to those that would be indicated in response to plane, progressive sound waves were obtained from the manufacturer's instruction manual referred to in this certificate.

The sound level meter calibration check frequency is 1000 Hz, the reference sound pressure level is 94 dB. As this instrument only has a single range, this range is the reference level range.

The environmental conditions in the laboratory at the start of the test were:
Static pressure 103.777 kPa ± 0.013 kPa; air temperature 22.5 °C ± 0.4 °C; relative humidity 42.7 % ± 2.1 %.

The initial response of the instrument to application of the associated sound calibrator was 93.9 dB (C). No adjustment of the instrument was required. This indication was obtained from the calibration certificate of the calibrator, 05659/1 and information in the manufacturer's instruction manual specified in this certificate, when the instrument is configured as follows; Transducer: 4950(2745852), Sound Field Correction: Free-field, Windscreen Correction: None. The instrument was calibrated without a windscreen. Consult manufacturer's instructions if using a windscreen.

With the microphone installed the level of self-generated noise was:

A: 16.1 dB*
* Under-range indicated on instrument display.

With the microphone replaced by an electrical input device with a similar capacitance to the supplied microphone, the levels of self-generated noise were:

A: 11.8 dB*
B: 11.1 dB*
C: 12.5 dB*
Z: 18.1 dB*
* Under-range indicated on instrument display.

The environmental conditions in the laboratory at the end of the test were:
Static pressure 103.738 kPa ± 0.013 kPa; air temperature 23.2 °C ± 0.4 °C; relative humidity 42.8 % ± 2.1 %.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 05659/2 Date of Issue: 25 March 2022

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

The microphone corrections applied as specified in 12.6 of IEC 61672-3:2006 were obtained from a frequency response measured by this Laboratory using the electrostatic actuator method. This response in isolation is not covered by our UKAS accreditation.

Instruments used in the verification procedure were traceable to *National Standards*. The multi-frequency calibrator method was employed in the acoustical tests of a frequency weighting.

The uncertainty evaluation has been carried out in accordance with UKAS requirements. All measurement results are retained at the acoustic calibration laboratory for at least four years.

-----END OF CERTIFICATE-----

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2106286 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250-Light	No: 3008423	Id: -
Microphone:	Brüel & Kjær Type 4950	No: 2697054	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 18175	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.5.2	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2021-05-21

Date of issue: 2021-05-21

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2103021 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2567756	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 2470482	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 3418	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.5	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A
Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2021-03-29

M. Önder

Mikail Önder
Calibration Technician

Date of issue: 2021-03-29

Susanne Jørgensen

Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2106836 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 3007000	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 3022866	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 23929	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.5.2	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2021-09-14

Date of issue: 2021-09-14

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

DANAK
CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2203821 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2818081	Id: - 2820751
Microphone:	Brüel & Kjær Type 4189	No: 2785433	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 24941	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.5	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2022-02-18

Date of issue: 2022-02-18

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2108523 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2611593	Id: -
Microphone:	Brüel & Kjær Type 4231	No: 2730389	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 12941	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.7.5	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2021-08-18

Date of issue: 2021-08-18

M. Önder

Mikail Önder
Calibration Technician

Susanne Jørgensen

Susanne Jørgensen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2208920 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2654662	Id: - 2654662
Microphone:	Brüel & Kjær Type 4950	No: 2730389	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 6822	
Supplied Calibrator:	Brüel & Kjær Type 4231	No: 2626210	
Software version:	BZ7222 Version 4.7.5	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2022-02-24

Date of issue: 2022-02-24

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

HBK HOTTINGER BRÜEL & KJÆR

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.No. 307 Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2102651 Page 1 of 12

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2690265	Id: -
Microphone:	Brüel & Kjær Type 4189	No: 2748694	
PreAmplifier:	Brüel & Kjær Type ZC-0032	No: 15279	
Supplied Calibrator:	Brüel & Kjær Type 4231	No: 2389038	
Software version:	BZ7224 Version 4.7.5	Pattern Approval:	PTB1.63-4093056 / 1.63-4093058
Instruction manual:	BE1712-22		

CUSTOMER

RPS Group Ltd.
Mervue
G1 Galway
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC 61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 8.2 - DB: 8.20) by using procedure B&K proc 2250, 4189 (IEC 61672:2013).

RESULTS

Calibration Mode: **Calibration as received.**

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

Date of calibration: 2021-04-12

Date of issue: 2021-04-13

Lene Petersen
Calibration Technician

Erik Bruus
Approved Signatory

HBK HOTTINGER BRÜEL & KJÆR

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.No. 307 Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2102594 Page 1 of 4

CALIBRATION OF

Supplied Calibrator:	Brüel & Kjær Type 4231	No: 2389038 Id: -
½ Inch adaptor:	Brüel & Kjær Type UC-0210	
Pattern Approval:	PTB-1.61-4057176	

CUSTOMER

RPS Group Ltd.
Mervue
G1 Galway
Ireland

CALIBRATION CONDITIONS

Preconditioning:	4 hours at 23°C ± 3°C
Environment conditions:	Pressure: 100.07 kPa. Humidity: 41 % RH. Temperature: 22.9 °C.

SPECIFICATIONS

The Supplied Calibrator Brüel & Kjær Type 4231 has been calibrated in accordance with the requirements as specified in IEC60942:2003 Annex B Class 1. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær acoustic calibrator calibration application software Type 7794 (version 2.5) by using procedure P_4231_D07.

RESULTS

Calibration Mode: **Calibration after repair/adjustment.**

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

Date of calibration: 2021-04-09

Rikke Hansen
Calibration Technician

Date of issue: 2021-04-09

Erik Bruus
Approved Signatory