voltalia

# Technical Appendix 12.1: Baseline Noise

Department: ERM
Project: Bowshiel Farm Solar and BESS
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# INDEX

# 1 BASELINE NOISE SURVEY

## 1.1 Introduction

1.1.1.1 Baseline noise monitoring was carried out between 20/03/25 and 27/03/25, to quantify the noise environment at the noise sensitive receptors (NSRs) identified in the noise and vibration assessment for the Bowshiel Farm Solar and BESS.

1.1.1.2 Noise measurements were undertaken at three monitoring locations. This enabled background noise levels, representative of all assessment locations to be established.

1.1.1.3 This Appendix presents details of the data recorded during the survey and the analysis that has been carried out to derive the representative background sound level (RBSL) according to British Standard (BS) 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound (BS 4142).

1.1.1.4 This appendix also presents measurement data used to inform the construction assessment in accordance with BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites (BS 5228).

1.1.1.5 A summary of the results has been provided in **Table 1.1**.

TABLE 1.1 SUMMARY OF REPRESENTATIVE BACKGROUND SOUND LEVELS

| NOISE MONITORING LOCATION | RBSL, dB ($L_{A90}$) | | RANGE OF FACADE LEVELS USED TO INFORM CONSTRUCTION ASSESSMENT, dB $L_{Aeq}$ | | |
|---|---|---|---|---|---|
| | DAY | NIGHT | DAY | EVENING | NIGHT |
| NML1 | 34 | 30 | 39-47 | 36-44 | 34-46 |
| NML2 | 32 | 27 | 34-42 | 30-42 | 28-42 |
| NML3 | 29 | 22 | 37-45 | 27-41 | 25-39 |

1.1.1.6 This appendix is set out as follows:

- Section 2 presents the survey methodology.
- Section 3 presents an overview of weather conditions.
- Section 4 presents the monitoring results at **NML1**.
- Section 5 presents the monitoring results at **NML2**.
- Section 6 presents the monitoring results at **NML3**.

# 2 METHODOLOGY

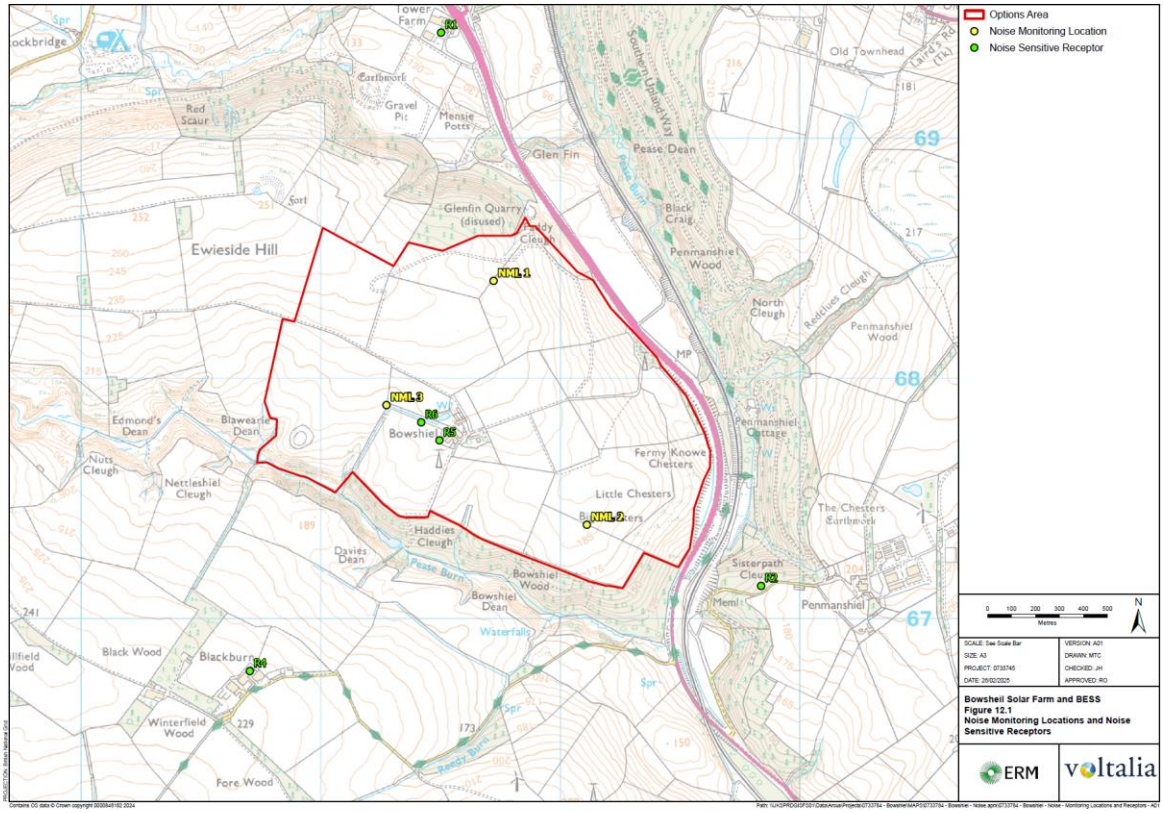
## 2.1 Equipment and Setup

2.1.1.1 The monitoring locations are shown in **Figure 2.1** and also in **Chapter 12** in **Figure 12.1**. Monitoring was carried out using three Class 1 sound level meters (two **Rion NL-52** and one **Brüel & Kjær 2250**) set-up as noise loggers at three monitoring locations, one Class 1 acoustic calibrator (**Rion NC-74**) and one weather station (**Davies Vantage Vue 6250UK**). Noise equipment was calibrated to traceable standards and copies of calibration certificates are available on request. Additional meters were installed for redundancy; however, the data of these meters was not used.

2.1.1.2 The equipment was housed in all-weather cases with long-life batteries. Microphones were set at a height of approximately 1.5 m above the ground, and monitoring was carried out in free-field conditions (i.e., at least 3.5 m from the nearest hard reflective surface). The sound level meters were field calibrated at the start and end of the survey period, with no calibration drift greater than 0.2 dB verified at any location upon collection.

2.1.1.3 A weather station was set-up at location **NML2** to record weather data throughout the survey period. As the weather station is in a non-built-up area, weather conditions are likely to be similar in nearby locations due to the proximity of the locations to each other and the open nature of the terrain and therefore, deemed representative of all monitoring locations.

FIGURE 2.1 NOISE MONITORING LOCATIONS AND NOISE SENSITIVE RECEPTORS



### 2.1.2 Data Recording

2.1.2.1 The noise meters were installed and left in-situ to log noise levels continuously for a period of approximately 8 days, where they recorded standard metrics including $L_{Aeq}$, $L_{A90}$ and $L_{Amax}$. In addition, meteorological data such as precipitation, wind speed, and wind direction were also logged.

2.1.2.2 To minimise the influence on the measurements from sources of interference such as wind passing over the diaphragm of the microphone or rain falling on top of the microphone windshield, measurements made during rainfall events and elevated wind speeds were discarded during data analysis in accordance with the guidance given in BS 4142.

# 3 WEATHER CONDITIONS

3.1.1.1 Temperature ranged between 2°C and 16°C degrees, with an average temperature of 8°C degrees, and with small periods of precipitation throughout the survey. **Figure 3.1** details the measurements of wind and rainfall recorded during the survey period, and **Figure 3.2** provides details of wind direction recorded during the survey period.

FIGURE 3.1 WIND AND RAINFALL MEASUREMENTS DURING THE SURVEY

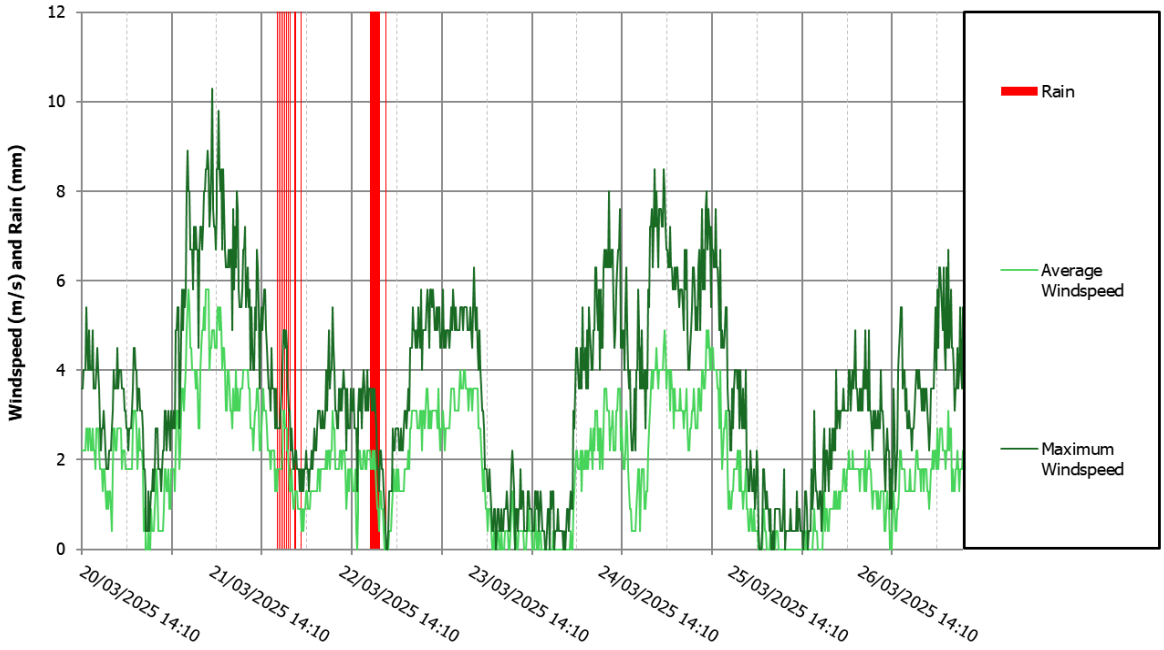



FIGURE 3.2 WIND DIRECTION MEASUREMENTS DURING THE SURVEY PERIOD

# 4 NML1: NORTHEAST OF THE SITE BOUNDARY

4.1.1.1 The noise monitor was installed at 18:20 on the 20/03/2025 and collected at 11:30 on the 27/03/2025. The noise monitoring location can be characterised as agricultural land. The noise environment was dominated by road traffic noise in the distance and wind. Other audible sources include birdsong and livestock. Weather data was derived from on-site monitoring at location **NML2**, approximately 1.1 kilometre from this location. This location was chosen to represent Receptor **NSR1 Tower Farm Holidays**.

**Figures and tables present the following information for NML1:**

- **Figure 4.1** shows the monitoring equipment set-up at NML1.
- **Figure 4.2** presents the 10-minute noise measurements logged over the survey period for the key noise metrics; $L_{Aeq, 10\text{-}min}$, $L_{Amax}$ and $L_{A90, 10\text{-}min}$.
- **Figure 4.3** presents the distribution of daytime background $L_{A90, 10\text{-}min}$ noise levels over the survey period.
- **Figure 4.4** presents the distribution of the total night-time background $L_{A90, 10\text{-}min}$ noise levels over the survey period.
- **Table 4.1** presents the mean, median, mode and representative values for the daytime and night-time background measurements.
- **Table 4.2** presents $L_{Aeq, 10\text{-}min}$ values used to inform the construction assessment.

FIGURE 4.1 NOISE MONITORING SETUP AT **NML1**

FIGURE 4.2 RESULTS OF THE NOISE MONITORING AT **NML2**

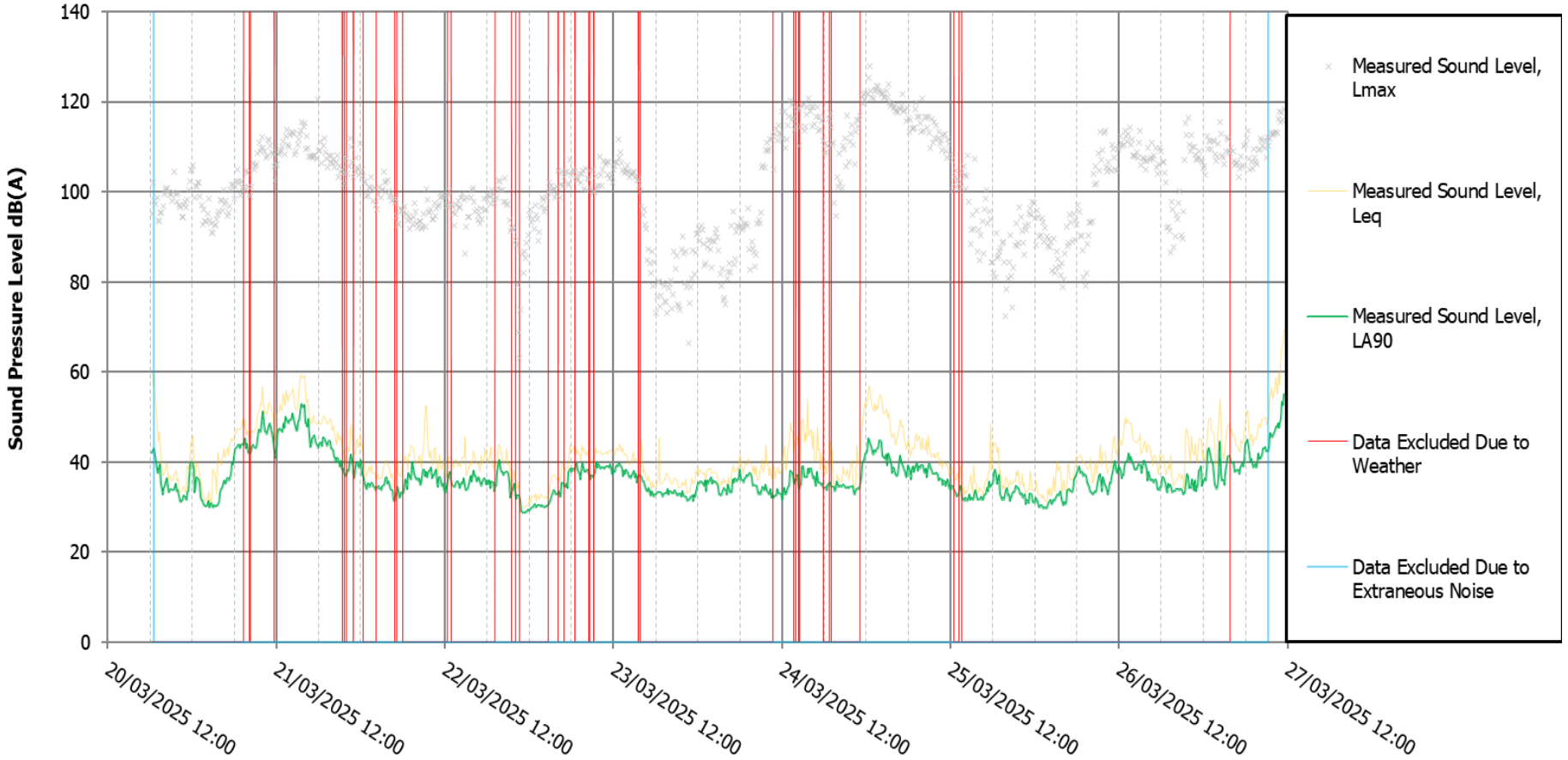


FIGURE 4.3 DISTRIBUTION OF DAYTIME RBSL AT **NML1** $L_{A90,10\text{-MIN}}$

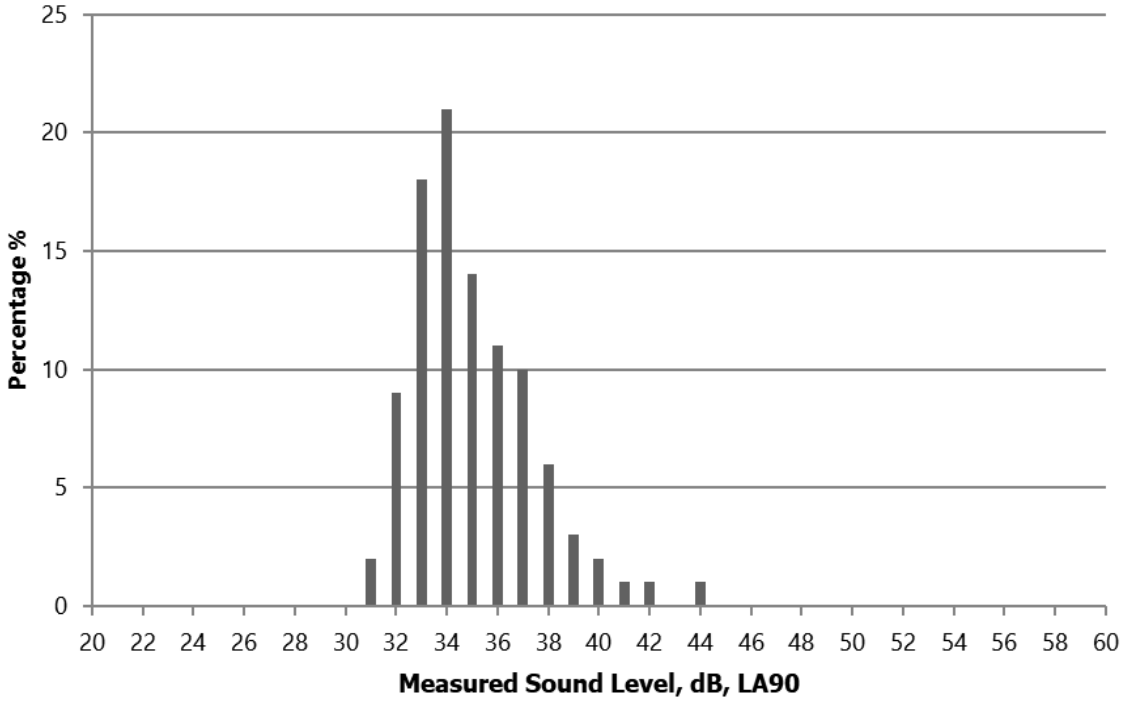



FIGURE 4.4 DISTRIBUTION OF NIGHT-TIME RBSL AT **NML1** $L_{A90,10\text{-MIN}}$

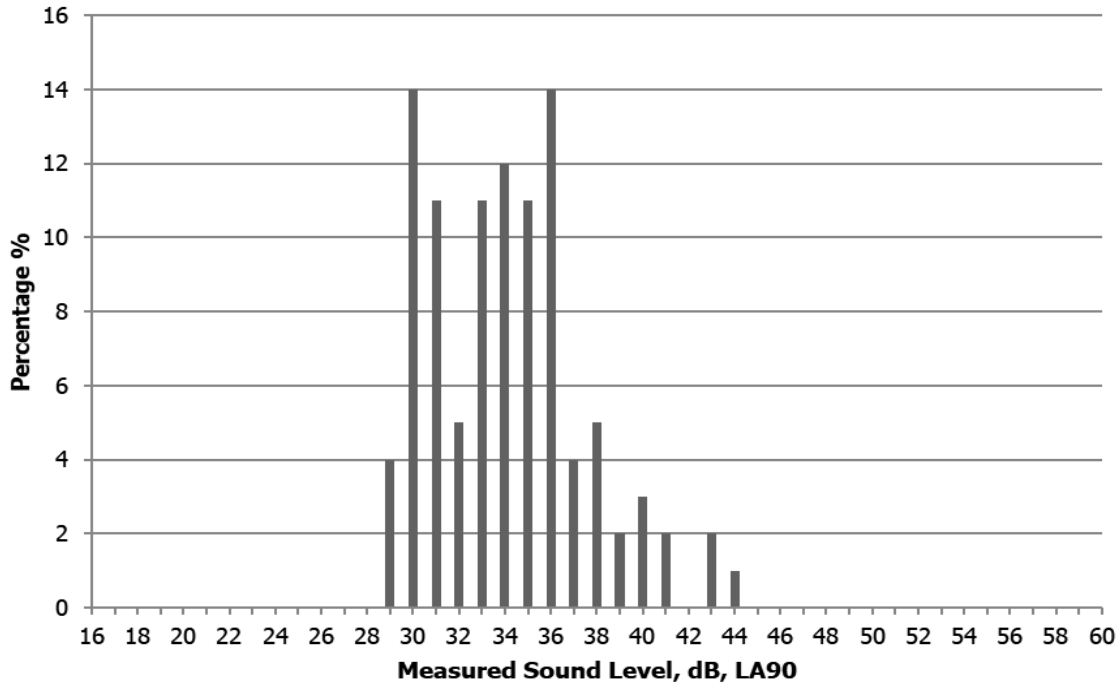


TABLE 4.1 BACKGROUND DATA ANALYSIS NML1

| PERIOD | MODE | MEDIAN | MEAN | REPRESENTATIVE |
|---|---|---|---|---|
| Daytime (0700-2300) $L_{A90,\ 10\text{-}min}$ | 34 dB | 35 dB | 35 dB | 34 dB |
| Night-Time (2300-0700) $L_{A90,\ 10\text{-}min}$ | 30 dB | 34 dB | 34 dB | 30 dB |

**4.1.1.2** Based upon the results presented in **Table 4.1**, along with the spread of data presented in **Figure 4.3** and **Figure 4.4** a daytime background sound level of 34 dB, $L_{A90,\ 10\text{-}min}$ and a night-time background sound level of 30 dB, $L_{A90,\ 10\text{-}min}$ are considered appropriate for the purposes of this assessment.

4.1.1.3 **Table 4.2** presents the $L_{Aeq}$ noise levels measured in the survey period at NML1.

TABLE 4.2 PERIOD AVERAGE FAÇADE NOISE LEVELS TO INFORM THE CONSTRUCTION ASSESSMENT

| SURVEY PERIOD | | FAÇADE NOISE LEVEL, $L_{Aeq}$ | | |
|---|---|---|---|---|
| Date | Weekday | Day(1) | Evening(1) | Night(1) |
| 20/03/2025 | Thu | -(2) | 44 dB | 42 dB |
| 21/03/2025 | Fri | 47 dB | 42 dB | 39 dB |
| 22/03/2025 | Sat | 42 dB | 40 dB | 34 dB |
| 23/03/2025 | Sun | 39 dB | 37 dB | 38 dB |
| 24/03/2025 | Mon | 40 dB | 38 dB | 40 dB |
| 25/03/2025 | Tue | 39 dB | 36 dB | 37 dB |
| 26/03/2025 | Wed | 44 dB | 41 dB | 46 dB |
| 27/03/2025 | Thu | -(2) | -(3) | -(3) |

*1) 'Day' encompasses 07:00 to 19:00, 'Evening' encompasses 19:00 to 23:00 and 'Night' encompasses 23:00 to 07:00.*
*2) Period values have not been calculated where less than half of the data were available (e.g. due to poor weather).*
*3) Monitoring had been terminated.*

# 5 NML2: SOUTHEAST OF THE SITE BOUNDARY

5.1.1.1 The monitor at this location was installed at 14:30 on the 20/03/2025 and collected at 08:20 on the 27/03/2025. The following monitoring location can be characterised as agricultural land. The noise environment was dominated by road traffic noise in the distance and wind. Other audible sources include birdsong and occasional farm equipment in the distance. Weather data was obtained from a weather station at this location. This location was chosen to represent **NSR2 Penmanshiel Farm Cottages** and **NSR3 Blackburn Rig Farmhouse**.

**Figures and tables present the following information for NML2:**

- **Figure 5.1** shows the monitoring equipment set-up at **NML2**.
- **Figure 5.2** presents the 10-minute noise measurements logged over the survey period for the key noise metrics; $L_{Aeq,\ 10\text{-}min}$, $L_{Amax}$ and $L_{A90,\ 10\text{-}min}$.
- **Figure 5.3** presents the distribution of daytime background $L_{A90,\ 10\text{-}min}$ noise levels over the survey period.
- **Figure 5.4** presents the distribution of the total night-time background $L_{A90,\ 10\text{-}min}$ noise levels over the survey period.
- **Table 5.1** presents the mean, median, mode and representative values for the daytime and night-time background measurements.
- **Table 5.2** presents $L_{Aeq,\ 10\text{-}min}$ values used to inform the construction assessment.

FIGURE 5.1 NOISE MONITORING SETUP AT **NML2**

FIGURE 5.2 RESULTS OF THE NOISE MONITORING AT **NML2**

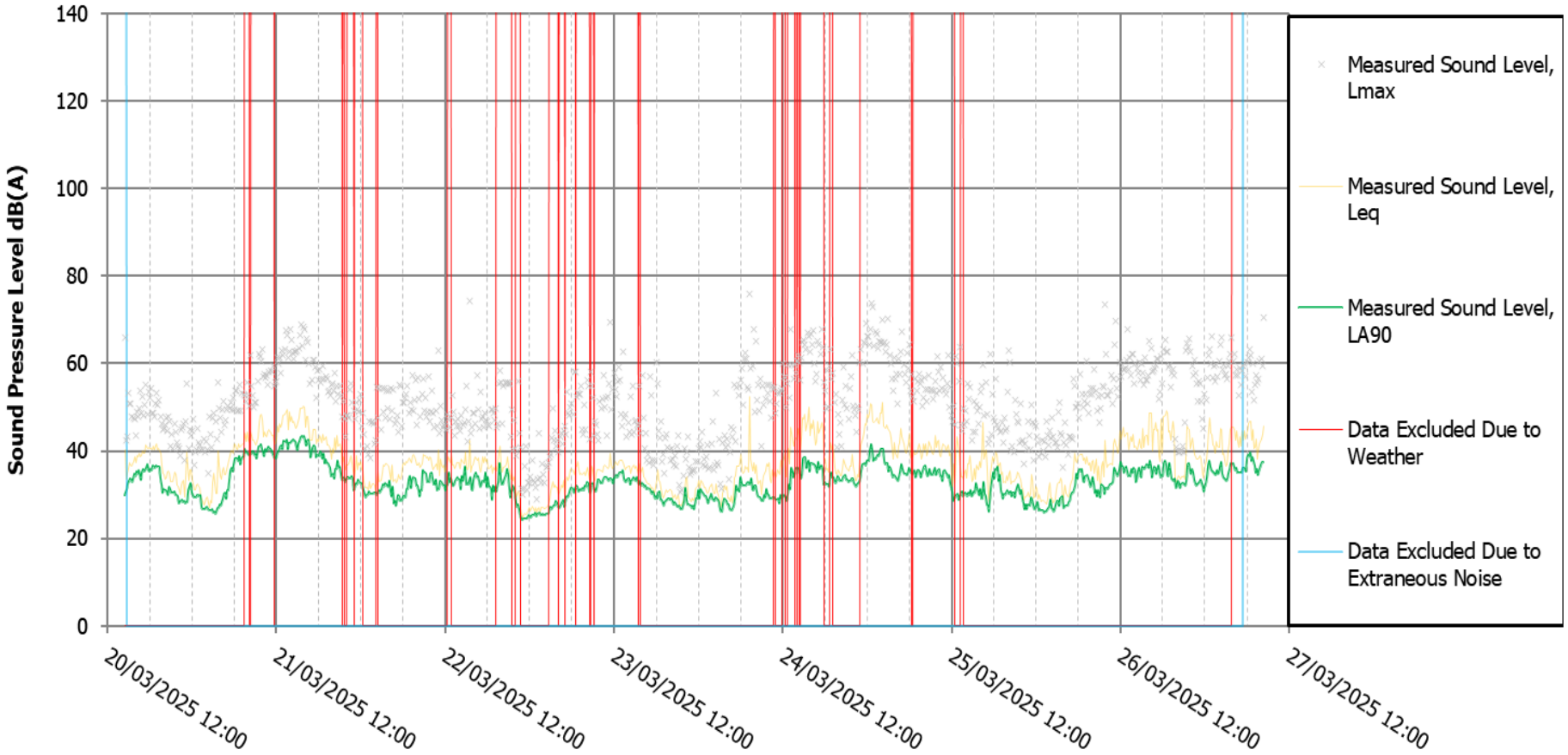


FIGURE 5.3 DISTRIBUTION OF DAYTIME RBSL AT **NML2** $L_{A90,10\text{-MIN}}$

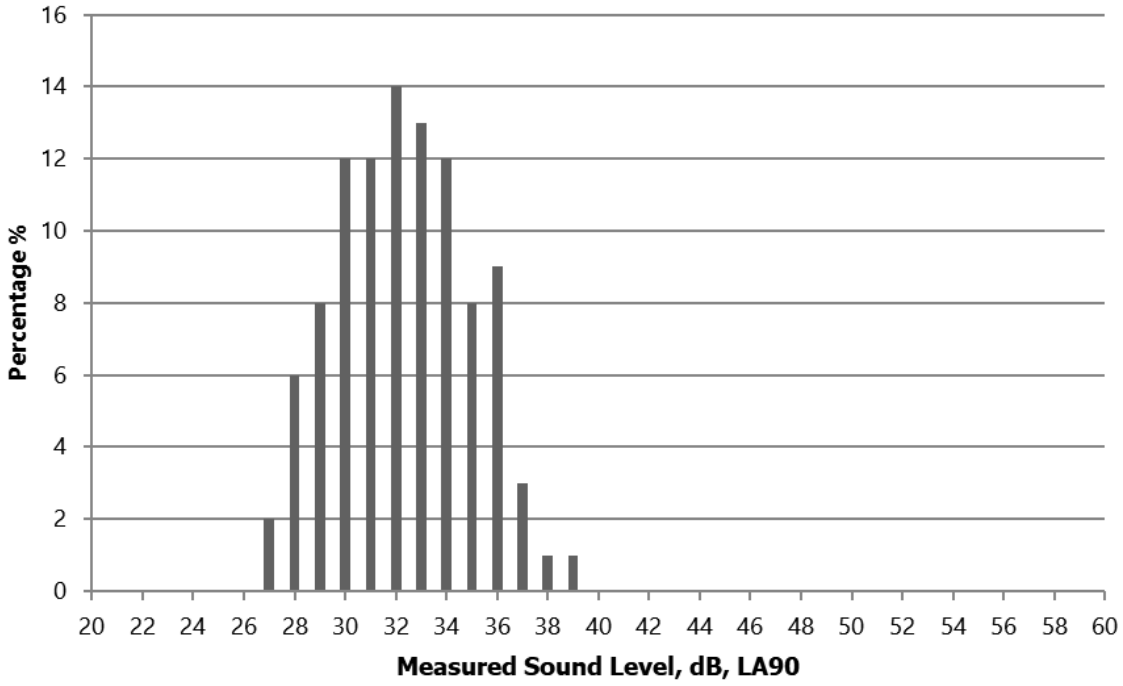



FIGURE 5.4 DISTRIBUTION OF NIGHT-TIME RBSL AT **NML2** $L_{A90,10\text{-MIN}}$

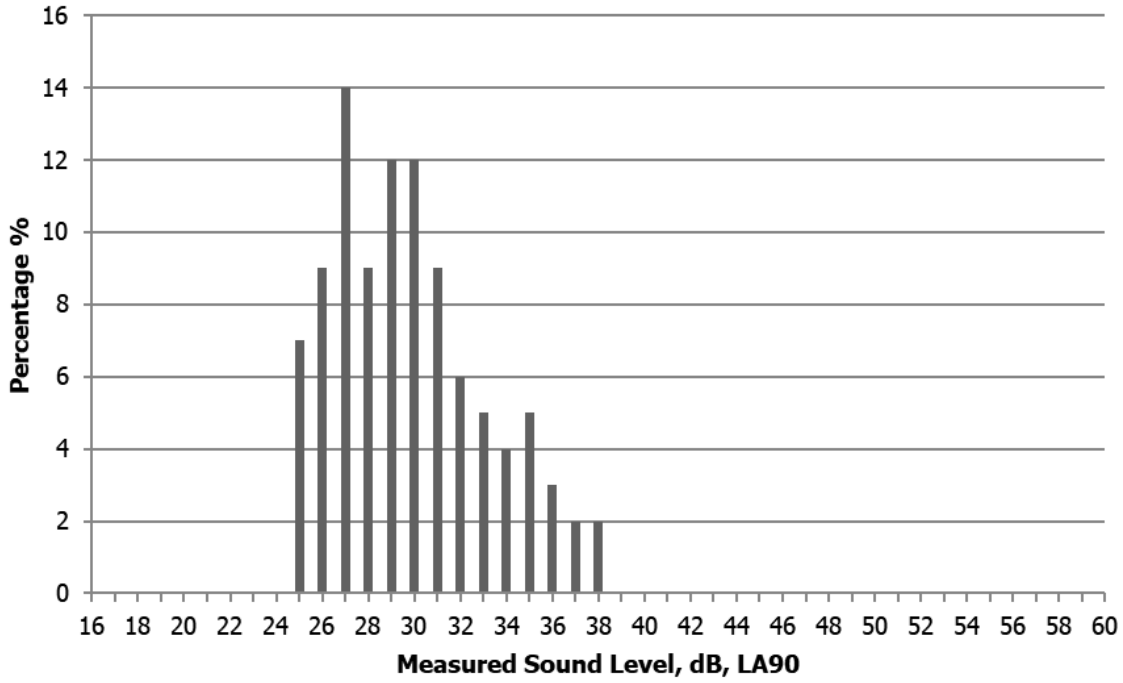


TABLE 5.1 BACKGROUND DATA ANALYSIS NML2

| PERIOD | MODE | MEDIAN | MEAN | REPRESENTATIVE |
|---|---|---|---|---|
| Daytime (0700-2300) $L_{A90, 10\text{-}min}$ | 32 dB | 32 dB | 32 dB | 32 dB |
| Night-Time (2300-0700) $L_{A90, 10\text{-}min}$ | 27 dB | 29 dB | 30 dB | 27 dB |

5.1.1.2 Based upon the results presented in **Table 5.1**, along with the spread of data presented in **Figure A 5-3** and **Figure A 5-4 a** daytime background sound level of 34 dB, $L_{A90, 10\text{-}min}$ and a night-time background sound level of 30 dB, $L_{A90, 10\text{-}min}$ are considered appropriate for the purposes of this assessment.

5.1.1.3 **Table 5.2** presents the $L_{Aeq}$ noise levels measured in the survey period at NML2.

TABLE 5.2 PERIOD AVERAGE FAÇADE NOISE LEVELS TO INFORM THE CONSTRUCTION ASSESSMENT

| SURVEY PERIOD | | FAÇADE NOISE LEVEL, $L_{Aeq}$ | | |
|---|---|---|---|---|
| Date | Weekday | Day(1) | Evening(1) | Night(1) |
| 20/03/2025 | Thu | -(2) | 36 dB | 36 dB |
| 21/03/2025 | Fri | 42 dB | 37 dB | 34 dB |
| 22/03/2025 | Sat | 38 dB | 34 dB | 28 dB |
| 23/03/2025 | Sun | 34 dB | 30 dB | 33 dB |
| 24/03/2025 | Mon | 40 dB | 36 dB | 39 dB |
| 25/03/2025 | Tue | 40 dB | 33 dB | 34 dB |
| 26/03/2025 | Wed | 40 dB | 42 dB | 42 dB |
| 27/03/2025 | Thu | -(2) | -(3) | -(3) |

*1) 'Day' encompasses 07:00 to 19:00, 'Evening' encompasses 19:00 to 23:00 and 'Night' encompasses 23:00 to 07:00.*
*2) Period values have not been calculated where less than half of the data were available (e.g. due to poor weather).*
*3) Monitoring had been terminated.*

# 6 NML3: SOUTHWEST OF THE SITE BOUNDARY

6.1.1.1 The monitor at this location was installed at 17:00 on the 20/03/2025 and collected at 10:20 on the 27/03/2025. The following noise monitoring location can be characterised as agricultural land. The noise environment was dominated by road traffic noise in the distance and wind. Other audible sources include birdsong and farming equipment in the distance. Weather data was derived from weather monitoring at location **NML2**, approximately 1 kilometre from this location. This location was chosen to represent **NSR4 Blackburn Farm Cottages**, **NSR5 Bowshiel Farm Cottages** and **NSR6 Bowshiel Farmhouse**.

**Figures and tables present the following information for NML3:**

- **Figure 6.1** shows the monitoring equipment set-up at **NML3**.
- **Figure 6.2** presents the 10-minute noise measurements logged over the survey period for the key noise metrics; $L_{Aeq, 10\text{-}min}$, $L_{Amax}$ and $L_{A90, 10\text{-}min}$.
- **Figure 6.3** presents the distribution of daytime background $L_{A90, 10\text{-}min}$ noise levels over the survey period.
- **Figure 6.4** presents the distribution of the total night-time background $L_{A90, 10\text{-}min}$ noise levels over the survey period.
- **Table 6.1** presents the mean, median, mode and representative values for the daytime and night-time background measurements.
- **Table 6.2** presents $L_{Aeq, 10\text{-}min}$ values used to inform the construction assessment.

FIGURE 6.1 NOISE MONITORING AT **NML3**

FIGURE 6.2 RESULTS OF THE NOISE MONITORING AT **NML3**

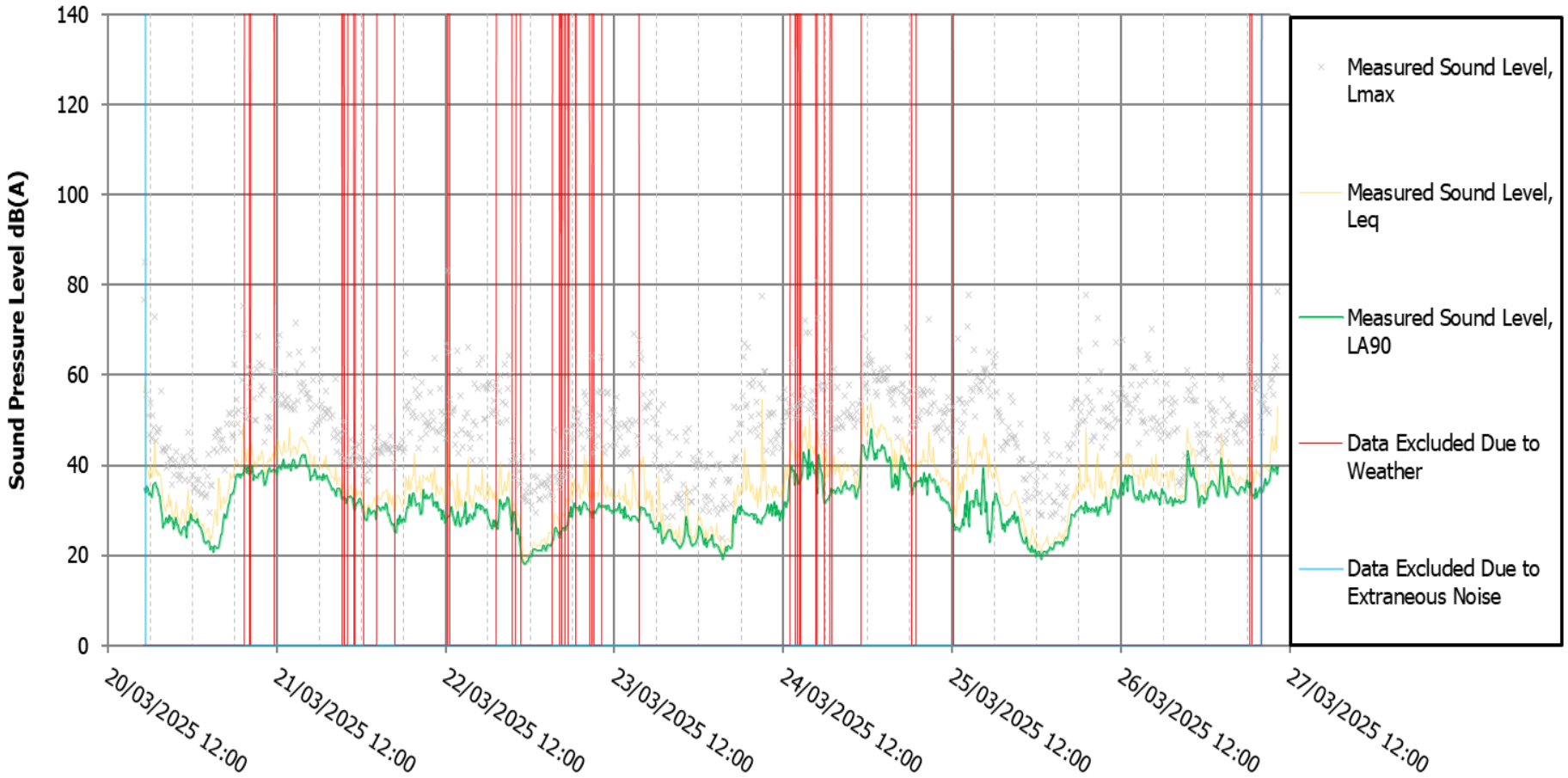


FIGURE 6.3 DISTRIBUTION OF DAYTIME RBSL $L_{A90,10\text{-}MIN}$

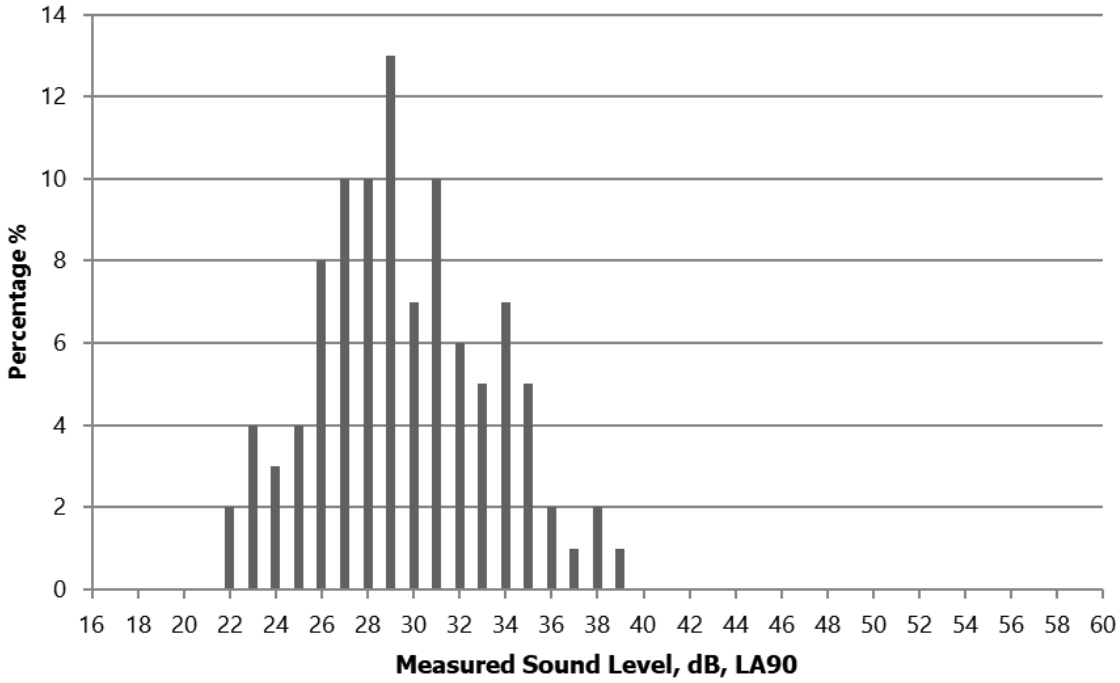



FIGURE 6.4 DISTRIBUTION OF NIGHT-TIME RBSL $L_{A90,10\text{-}MIN}$

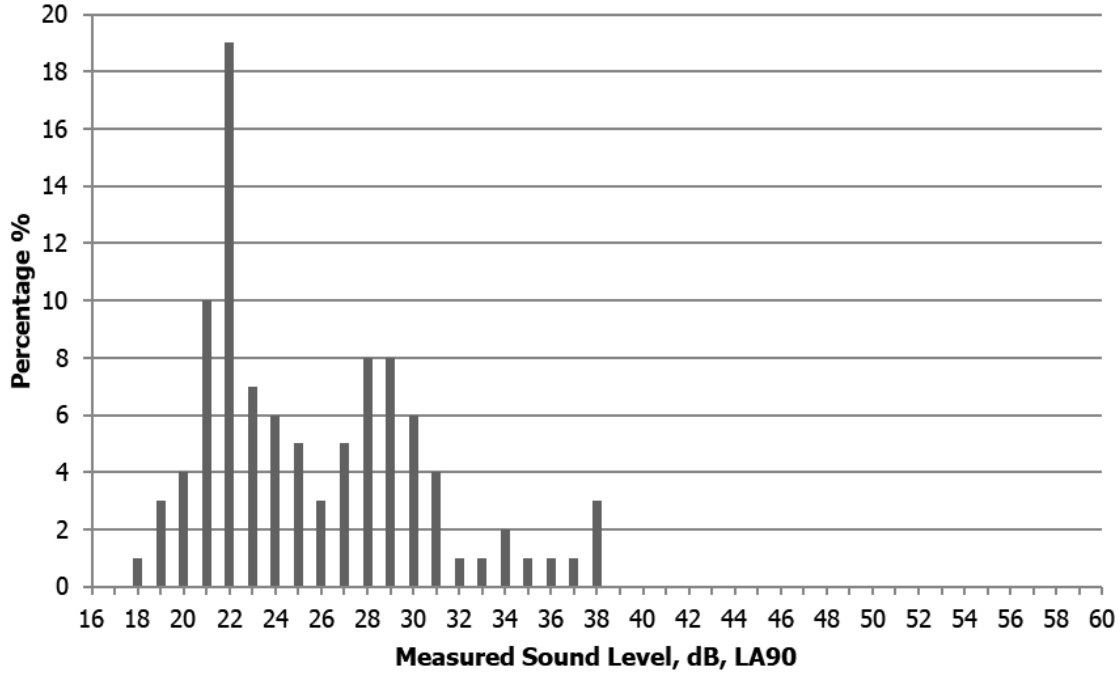


TABLE 6.1 BACKGROUND DATA ANALYSIS **NML3**

| PERIOD | MODE | MEDIAN | MEAN | REPRESENTATIVE |
|---|---|---|---|---|
| Daytime (0700-2300) $L_{A90,\ 10\text{-}min}$ | 29 dB | 31 dB | 30 dB | 29 dB |
| Night-Time (2300-0700) $L_{A90,\ 10\text{-}min}$ | 22 dB | 27 dB | 27 dB | 22 dB |

6.1.1.2 Based upon the results presented in **Table 6.1**, along with the spread of data presented in **Figure 6.3** and **Figure 6.4**, a daytime background sound level of 29 dB, $L_{A90,\ 10\text{-}min}$ and a night-time background sound level of 22 dB, $L_{A90,\ 10\text{-}min}$ are considered appropriate for the purposes of this assessment.

6.1.1.3 **Table 6.2** presents the $L_{Aeq}$ noise levels measured in the survey period at NML3.

TABLE 6.2 PERIOD AVERAGE FAÇADE NOISE LEVELS TO INFORM THE CONSTRUCTION ASSESSMENT

| SURVEY PERIOD | | FAÇADE NOISE LEVEL, $L_{Aeq}$ | | |
|---|---|---|---|---|
| Date | Weekday | Day(1) | Evening(1) | Night(1) |
| 20/03/2025 | Thu | -(2) | 33 dB | 34 dB |
| 21/03/2025 | Fri | 45 dB | 34 dB | 32 dB |
| 22/03/2025 | Sat | 39 dB | 31 dB | 25 dB |
| 23/03/2025 | Sun | 37 dB | 27 dB | 32 dB |
| 24/03/2025 | Mon | 41 dB | 39 dB | 40 dB |
| 25/03/2025 | Tue | 41 dB | 31 dB | 40 dB |
| 26/03/2025 | Wed | 39 dB | 41 dB | 39 dB |
| 27/03/2025 | Thu | -(2) | -(3) | -(3) |

*1) 'Day' encompasses 07:00 to 19:00, 'Evening' encompasses 19:00 to 23:00 and 'Night' encompasses 23:00 to 07:00.*
*2) Period values have not been calculated where less than half of the data were available (e.g. due to poor weather).*
*3) Monitoring had been terminated.*