



Mallard Pass

Solar Farm

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Environmental Statement Volume 2 Appendix 10.4: Noise and Vibration - Baseline Noise Survey

November 2022

PINS Ref: EN010127

Document Ref: EN010127/APP/6.2

Revision P0

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations
2009 - Reg 5 (2) (a)

Appendix 10.4 - Baseline Noise Survey

Introduction

- 1.1.1. Hoare Lea has undertaken a background noise survey at noise sensitive receptors around the Order limits on land near Essendine, Stamford. This technical appendix sets out the existing (baseline) noise climate and summarises the background survey undertaken.
- 1.1.2. Prevailing background noise levels have been determined at the noise sensitive receptors neighbouring the Order limits, in line with the methodology within British Standard (BS) 4142:2014 **[Ref 1]** (see **Appendix 10.1** for further details), to assist with setting suitable plant noise limits.

Context

- 1.1.3. The Order limits comprise mostly agricultural fields and blocks of woodland across two administrative boundaries: Rutland County Council (RCC) and South Kesteven District Council (SKDC). The Order limits extend between the village of Aundby in the north to Greatford Road to the south, Carlby Road to the east and is approximately 600 m north-east of Ryhall with the Grantham-Peterborough (East Coast Main Line) railway dissecting the Order limits on a general north-west – south-east alignment. The Order limits are presented in **Figure 10.1 [EN010127/APP/6.3]** which locates the attended and unattended noise measurement locations, in addition to the nearest potential noise sensitive receptors.

Guidance

1.1.4. The BS 4142 standard does not give a definitive method for determining the background sound level but instead, as a commentary, states that ***“the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”***.

1.1.5. Clause 8.1.4 of the standard, which discusses the monitoring duration, states ***“there is no “single” background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed. As a note to this clause the following commentary is given on obtaining a representative backgrounds sound level:***

To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.”

Background Noise Survey

1.1.6. A series of acoustic measurements have been undertaken within, on and near to the Order limits to quantify the existing background (baseline) noise climate in the vicinity of the Order limits. Locations of the background noise measurements are shown in **Figure 10.1**. Resultant background noise levels are presented in **Table 1** (Unattended logger measurements) and **Table 2** (Attended measurements).

Methodology

- 1.1.7. The acoustic survey included four unattended and nine attended measurements, at locations spatially distributed across the Order limits, representative of the existing noise environment at nearby sensitive (residential) receptors. The unattended measurement locations were chosen to represent relatively quieter areas, away from localised sources of noise such as roads, vegetation and farm activity, and, for unattended locations, on the basis of access and safety restrictions. The attended locations were chosen to further characterise the spatial variation of the noise levels in the area.
- 1.1.8. Initial unattended measurements were undertaken at logger locations 1 and 2 (**Figure 10.1**) from 18/01/2022 to 24/01/2022; however, measurements from Logger 1 stopped on 23/01/2022 due to a power failure. Both locations had varying influence from local roads in the area.
- 1.1.9. Attended measurements (locations 1 to 9, **Figure 10.1**) to were undertaken during the day on the 18/01/2022, 19/01/2022 and 24/01/2022 to supplement the initial unattended measurement data and provide an indication of the variation of noise levels (during day-time hours) around the Solar PV Area.
- 1.1.10. Additional unattended measurements were undertaken at logger locations 3 and 4 from 25/02/2022 to 01/03/2022 (**Figure 10.1**) to complement the initial monitoring and provide a wider spatial coverage.
- 1.1.11. Both sets of unattended measurements captured background noise levels over daytime weekday, daytime weekend, night-time weekday and night-time weekend periods.
- 1.1.12. Measurements were made under free-field conditions, and weather conditions were generally suitable for the purpose of the measurements,

with dry conditions and low to moderate winds for the duration of the initial survey and attended measurements. For the complementary unattended measurements, weather conditions were suitable for majority of the survey period except rainfall on the mornings of 28/02/2022 and 01/03/2022, which were excluded from the analysis using rain gauge data onsite. Dry conditions and low to moderate winds, suitable for these measurements, then persisted for the remainder of the additional unattended survey period.

- 1.1.13. No severe Covid-19 restrictions were in place during either of the surveys. It was therefore expected that the pandemic would have had either no substantial influence on human activity and road traffic levels and therefore background noise, or that levels would only be marginally lower than normal therefore resulting in a more conservative assessment. The survey did not include school holiday or other atypical periods.
- 1.1.14. The local baseline noise climate is typical of a rural location. The noise sources observed on visits to the area at the various measurement positions were distant road traffic noise, occasional trains passing, occasional non-commercial aircraft noise, vegetation, occasional bird and at attended measurement location 3, low level stream noise. These sources were occasionally present, depending on location; however, varying in dominance of the local baseline noise climate.
- 1.1.15. All survey equipment was field-calibrated at the start and end of each set of measurements with no discernible drift in level observed. The measurement instrumentation used is listed in tables in Annex A below. Annex A also includes photos showing the four installed unattended logger locations as well as some of the attended measurement locations, for illustrative purposes.

Results

- 1.1.16. Time history plots of the four unattended measurements can be found in Annex B attached. The analysis has been made for assessment durations of 15-minutes, as required in BS 4142 for night-time periods. Although BS 4142 requires consideration of a one hour period for day/evening periods, a single $L_{A90,1h}$ measurement would always be higher than the lowest of the four 15-minute duration background sound levels it comprises. Therefore, this represents a precautionary approach and is standard practice.
- 1.1.17. In line with the requirements of BS 4142, in order to “**quantify what is typical during particular time periods**”, a statistical analysis of the measured background sound levels has been undertaken. The periods of interest have been taken as daytime (07:00 to 19:00), evening (19:00 to 23:00) and night-time (23:00 to 07:00). **Figures 10.4.1 to 10.4.4** show the distribution and prevalence of the measured $L_{A90, 15min}$ noise levels during each of these periods.

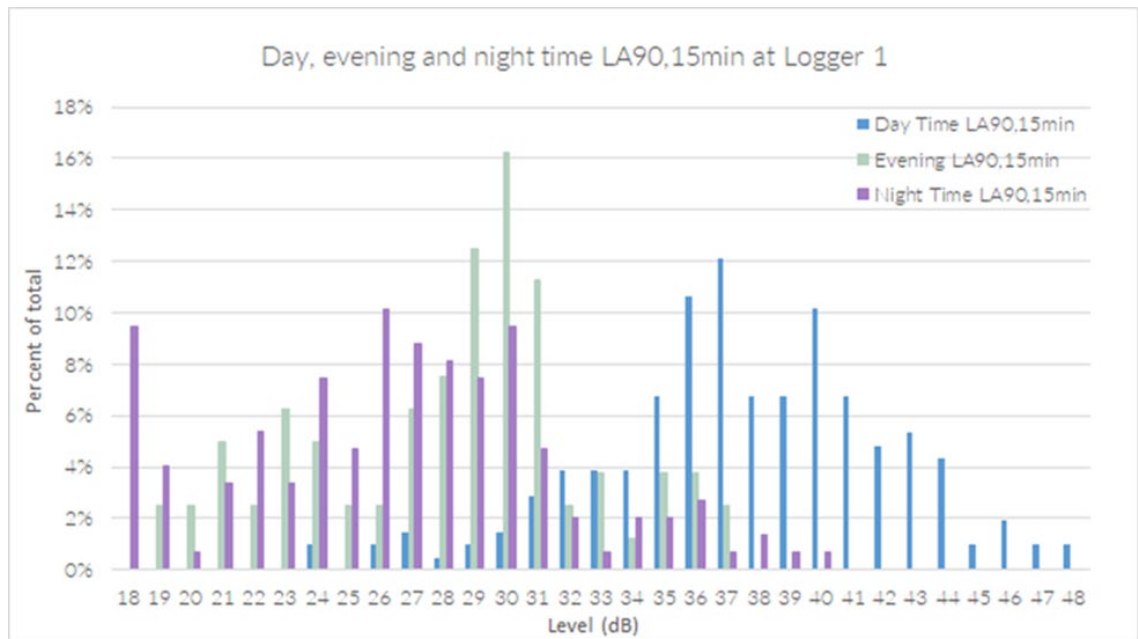


Figure 10.4.1 – Statistical analysis of measured background noise levels at Logger 1 (Unattended position).

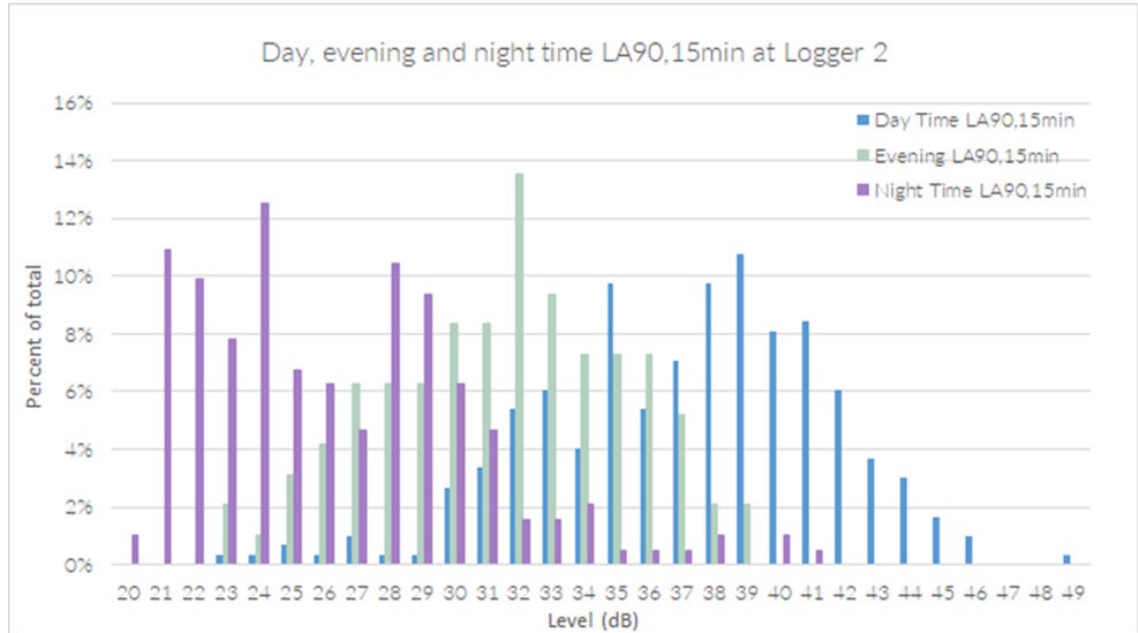


Figure 10.4.2 – Statistical analysis of measured background noise levels at Logger 2 (Unattended position).

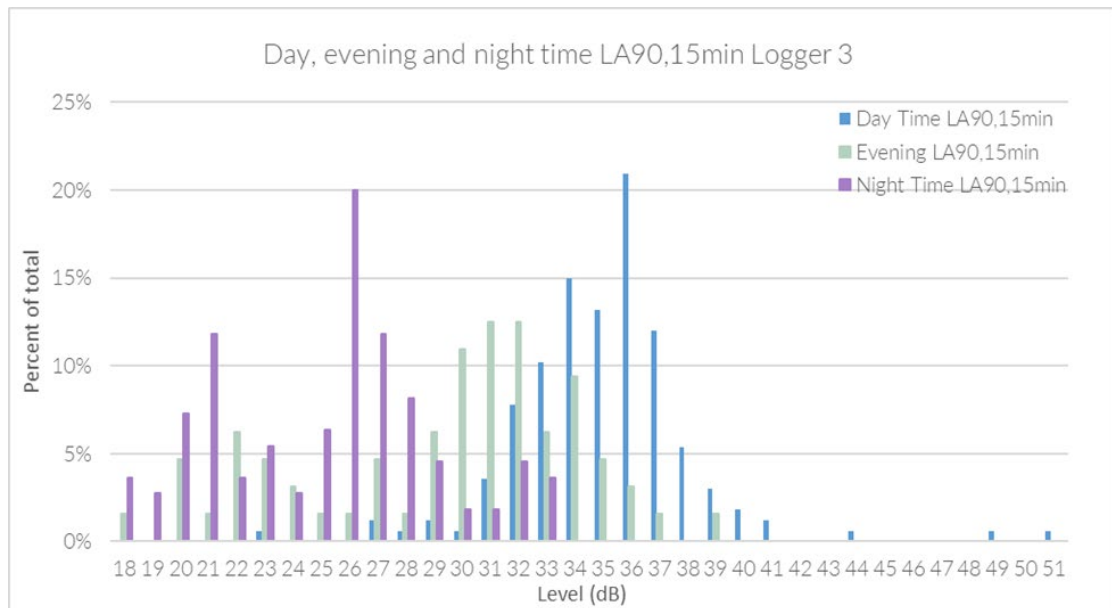


Figure 10.4.3 – Statistical analysis of measured background noise levels at Logger 3 (Additional unattended position).

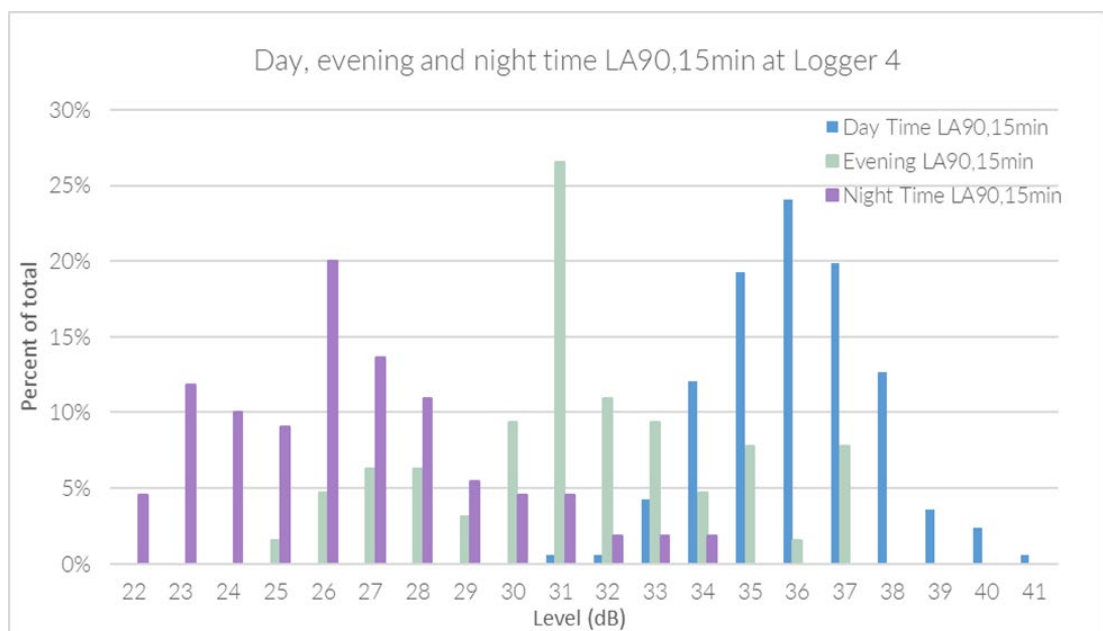


Figure 10.4.4 – Statistical analysis of measured background noise levels at Logger 4 (Additional unattended position).

1.1.18. As advised in BS 4142, consideration of the most frequently occurring noise level in the above statistical distribution provides only a starting point for determining typical noise levels, and the above distributions

were considered together with the time history charts included in Annex B, using professional judgement and based on the context of the area around the Order limits. The typical lowest common background noise levels have been determined to represent each of the periods of interest.

1.1.19. Specifically, **Figures 10.4.1 to 10.4.4** show that the measurements at locations 1 and 2 included some higher noise periods of 40-46 dB L_{A90}, sometimes experienced during the day-time, which were not apparent at locations 3 and 4. This is likely due to an increased contribution from local road traffic. However, results at positions 1 and 2 also included quieter periods of 36-39 dB, similar to levels experienced at locations 3 and 4, as the influence of local traffic reduced, and these were referenced as more typical (on a precautionary basis). In all cases, during quieter evening periods, levels reduced further to around 31 dB.

Table 1: Unattended measurement – derived representative background noise levels

Unattended Monitoring Location	L _{A90} representative background noise level (dB)		
	Day	Evening	Night
Logger 1	37	30	26
Logger 2	39	32	24
Logger 3	36	31	26
Logger 4	36	31	26

1.1.20. The results of a precautionary analysis of these background levels are set out in **Table 1** above for the unattended measurement positions. This shows that similar noise levels were derived at all locations on this basis.

Attended measurements

- 1.1.21. Attended noise measurements were carried out at nine positions, over a period of more than 3 hours, in 15-minute or 30-minute intervals per position on 18/01/2022, 19/01/2022 and 24/01/2022 during day-time hours. **Table 2** sets out details of the time, location and duration of all measurements, as well as the results. In each case, the measurement was considered representative of the background noise levels and not unduly influenced by localised, short-term sources of noise.
- 1.1.22. The aim of the measurements was to supplement the unattended measurements (which described the typical variation of background noise with time of day) and evaluate the potential spatial variation of noise in the area. The attended measurements carried out were synchronised with the start time of measurements by unattended loggers at positions 1 and 2, which were those operating during the attended measurements. **Table 2** therefore sets out the corresponding result (based on the 15-minute measurement with the closest start time) shown for comparison with the results of the attended survey.

Table 2: Resultant unattended measurement L_{A90} background noise levels

Attended measurement position ID	Measurement periods start time	Measurement duration (T) (minutes)	Noise level at Attended measurement position L _{A90,T} (dB)	Corresponding unattended background noise level L _{A90, 15min} (dB)	
				Noise level at Logger position 1	Noise level at Logger position 2
1	18/01/2022 16:00	15	33	44	41
2	18/01/2022 15:30		38	44	41
3	18/01/2022 16:30		43	43	39
4	19/01/2022 11:30		49	43	41
5	24/01/2022 15:30	30	24	*	33
6	24/01/2022 14:45	15	30	*	32
7	19/01/2022 12:00	30	41	42	41
8	19/01/2022 13:00	15	38	46	44
9	19/01/2022 13:30		40	44	43

* Unavailable due to the power failure described above.

1.1.23. The comparison shows that:

- Attended locations 3, 6 and 7 experienced similar levels as the unattended logger positions;
- Attended location 4, on the A6121, experienced levels at least 6 dB higher than at the logger positions, likely due to the increased influence of road traffic;

- Locations 1, 2 and 8 experienced levels typical of those experienced at the unattended logger positions during quieter day-time and evening periods, consistent with a reduced influence of road traffic noise;
- Location 5, north-east of the site, experienced lower levels (below 30 dB) than at the unattended position during a quieter period of the day. However, the closest properties located north-east of the Order limits such as Grange Farm Cottage are located closer to the road to Greatford.

Conclusions

1.1.24. The analysis of the unattended loggers in line with BS 4142 guidance, was based on a precautionary approach in which the influence of traffic noise was reduced. The attended measurements showed that this was representative of the quieter noise environments found around the site, except for dwellings along the A6121 (with levels at least 6 dB higher).

Table 3 therefore derives typical lowest background noise levels for the basis of the operational noise analysis in line with BS 4142.

Table 3: Derived representative background noise levels

Assessment Locations	L _{A90} representative background noise level (dB)	
	Day-time (quiet/evening periods)	Night
Properties located along the A6121	37	32
Other properties	31	26

References

Ref 1 British Standard (BS) 4142 - Methods for Rating and Assessing Industrial and Commercial Sound (2014).

Annex A: Acoustic survey equipment and photos

Table 10.4.A1: Logger 1 – Unattended survey

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	00632047	30/09/2021
Pre-amplifier	Rion NH-25	32075	30/09/2021
Microphone	Rion UC-59	05214	30/09/2021

Table 10.4.A2: Loggers 2 & 3 – Unattended survey – same equipment used for the survey at both locations

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	00632047	30/09/2021
Pre-amplifier	Rion NH-25	32075	30/09/2021
Microphone	Rion UC-59	05214	30/09/2021

Table 10.4.A3: Logger 4 – Unattended survey

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	331819	11/01/2022
Pre-amplifier	Rion NH-25	21770	11/01/2022
Microphone	Rion UC-59	10813	11/01/2022

Table 10.4.A4: Sound level meter – Attended surveys

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	00632045	23/11/2021
Pre-amplifier	Rion NH-25	32073	23/11/2021
Microphone	Rion UC-59	11317	23/11/2021

A field calibration was carried out at the start and end of the measurements, as identified in table 10.1.A5.

Table 10.4.A5: Calibrators

Equipment	Type	Serial Number	Last Calibrated
Calibrator	Rion NC-74	34172705	28/09/2020
Calibrator	Rion NC-74	34172706	14/06/2021



Figure 10.4.A1 – Logger 1 (1 of 4) - Unattended



Figure 10.4.A2 – Logger 2 (2 of 4) – Unattended



Figure 10.4.A3 – Logger 3 (3 of 4) – Unattended



Figure 10.4.A4 – Logger 4 (4 of 4) – Unattended



Figure 10.4.A5 – SLM 3 – Attended position 7



Figure 10.4.A6 – SLM 3 – Attended position 3



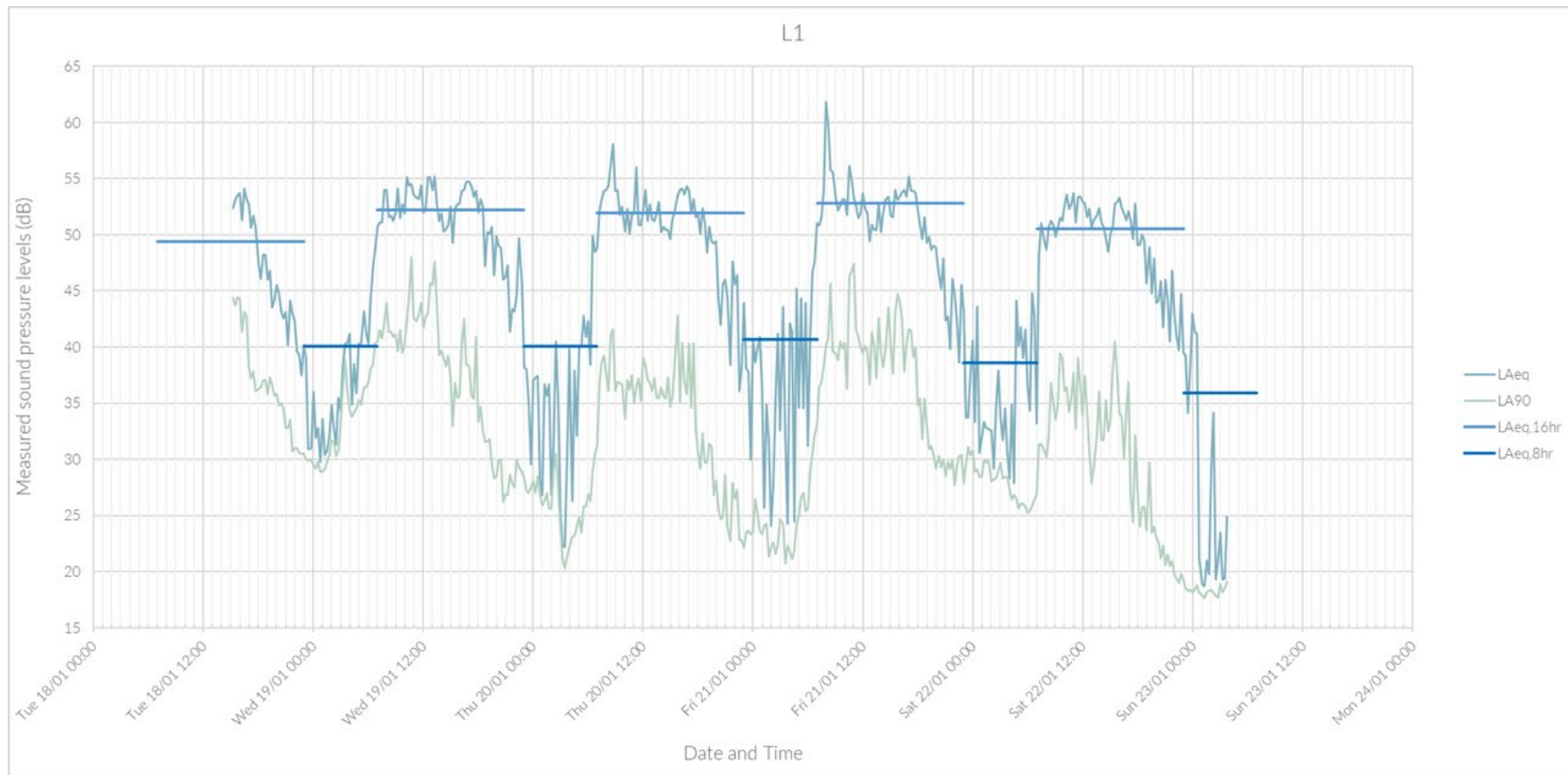
Figure 10.4.A7 – SLM 3 – Attended position 4



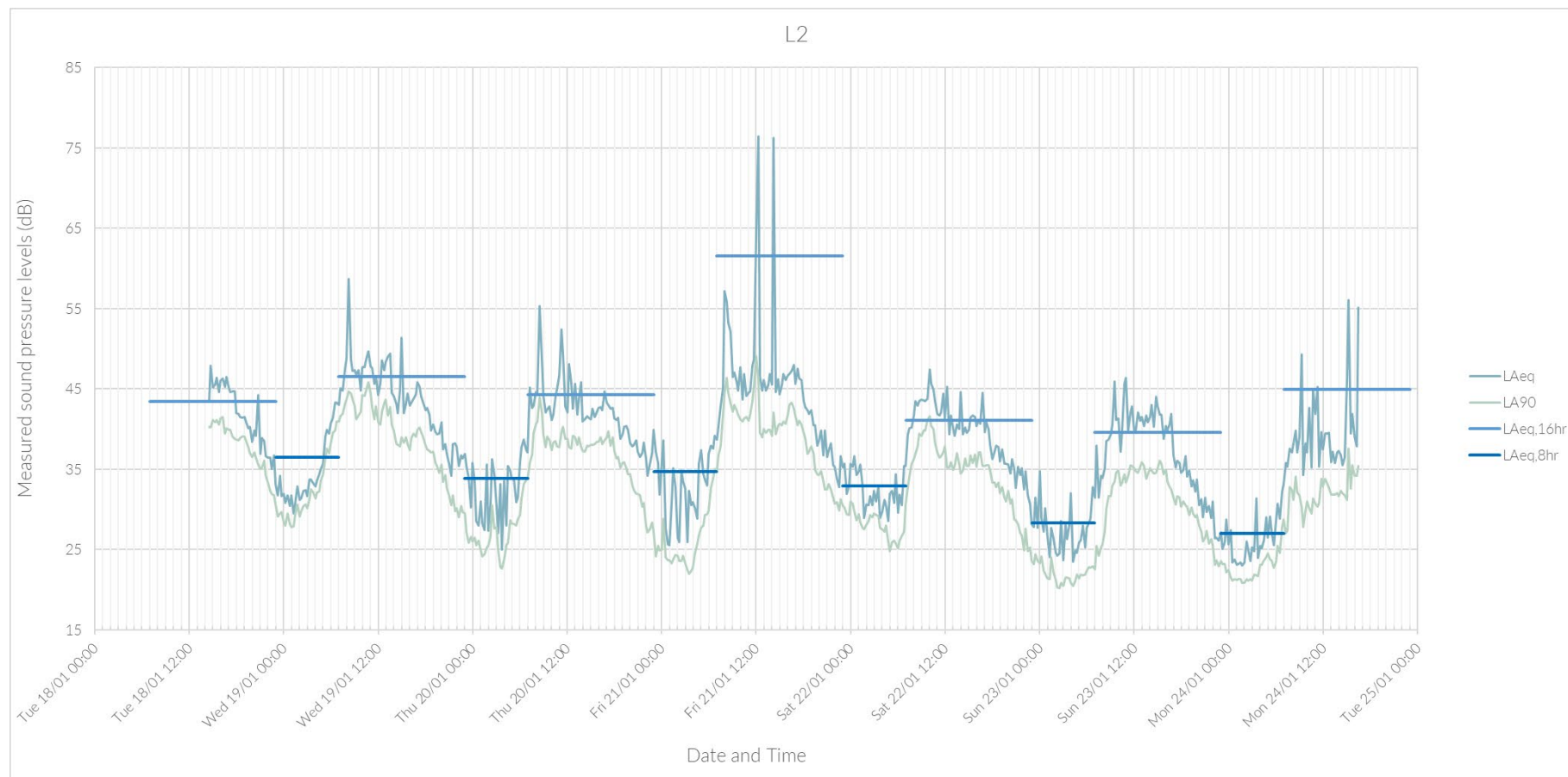
Figure 10.4.A8 – SLM 3 – Attended position 2

Annex B: Time history charts

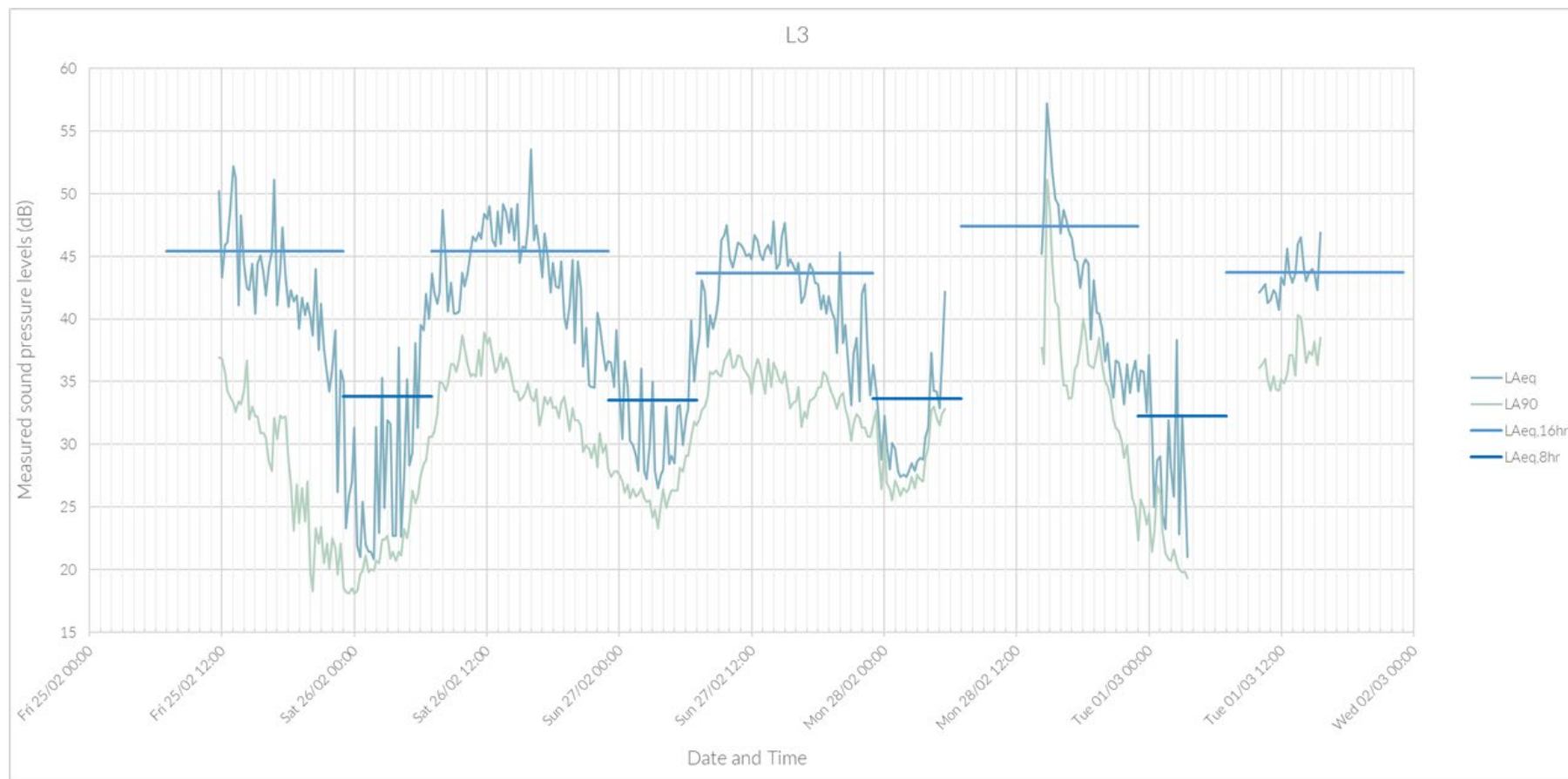
B.1 Unattended measurement position Logger 1



B.2 Unattended measurement position Logger 2



B.3 Unattended measurement position Logger 3



B.4 Unattended measurement position Logger 4

