GILLIERON SCOTT
ACOUSTIC DESIGN

Report No:
3 Windmill Hill – Noise Impact Assessment 01102024

Date:
01/10/2024

For:
Infoactive Ltd.

3 WINDMILL HILL
PLANT NOISE IMPACT ASSESSMENT

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REVISION SCHEDULE

Document Revision	Date	Document Title	Details	Prepared by	Approved by
00	13/09/2024	3 Windmill Hill – Noise Impact Assessment 13092024	DRAFT FOR COMMENT	Matias Duarte 	Lucie Zalberg 
01	01/10/2024	3 Windmill Hill – Noise Impact Assessment 01102024	FINAL	Matias Duarte 	Lucie Zalberg 

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Introduction

3 Windmill Hill, NW3 6RU is a residential premise in the London Borough of Camden. It is proposed that a new air source heat pump (ASHP) is to be installed in the rear garden of the property. It is understood that the plant will have the facility to operate 24hrs Monday to Sunday.

A second plant unit (condenser unit) was also previously planned to be installed in the second-floor balcony but was abandoned due the difficulty of achieving the required noise criteria in that location. Assessment for this unit is included within this report.

Gillieron Scott Acoustic Design (GSAD) have been commissioned to undertake a background noise survey at the site and a plant noise impact assessment in accordance with Camden Council's noise policy, in order to ensure the necessary requirements are met for this installation.

GSAD have carried out a long-term background noise survey at two fixed monitoring locations from the 30th of August to the 2nd of September 2024. The microphone locations were chosen to be representative of the closest noise sensitive receptors (NSR).

In this report, it is shown that the stringent requirements for low sound emission have been readily achieved by the choice of plant and mitigation measures taken.

The site location, plant area and nearest residential receptors are indicated in Appendix A.

The results, findings and supporting evidence for this assessment are presented within this report.

1.0 Brief

- Undertake noise measurements at two fixed monitoring locations equivalent to the nearest noise sensitive building over an extended period.
- Identify noise sensitive dwellings located close to the site and assess the topography of the intervening ground.
- Analyse the site-acquired data and determine the appropriate criteria to adopt from Camden Council's noise policy.
- Using measured data from the survey and manufacturer's data for the proposed items of plant where possible, verify the impact of the development to satisfy the Local Authority's noise policy.
- Provide a technical report detailing findings of the noise survey.

2.0 Context

The site is a single-family house on a residential road. The client is proposing to install an ASHP in the south-east corner of the rear garden.

The nearest noise sensitive residential receptors to the unit have been identified as Volta House and 2 Windmill Hill, both approximately 5m away from the proposed installation area.

A party wall to Volta House divides a portion of the rear garden. The rest of the garden is divided by a retaining wall and trellis, which is proposed to be replaced and planted with thick foliage. A first-floor window is located around from the party wall in the rear garden. This window at first floor level is used in this report as the identified nearest noise sensitive receptor.

The rear of 2 Windmill Hill is also separated from the garden by a party wall. The roof at this section of the property includes a sealed double-glazed rooflight window. This rooflight window at ground floor level is used in this report as the identified nearest noise sensitive receptor.

The dominant noise sources noted whilst on site included noise from construction, cars, infrequent planes, railway noise, birds and talking from nearby residents.

3.0 Summary

A background noise survey was undertaken at two fixed monitoring locations from 30th August to 2nd September 2024. The microphone locations were chosen to be representative of the closest residential receptors.

It is understood that the plant will have facility to operate 24hrs daily, therefore the chosen period for this assessment will be based on the lowest representative background noise levels, i.e. during night-time. Manufacturer's noise data is provided in Appendix I.

The Local Authority (Camden Council), requires any installation of new plant machinery to be in accordance with BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'. Appendix 3 of the Camden Local Plan 2017 specifies noise thresholds for fixed plant installations. The 'rating level' must not exceed 10 dB below the background sound level (15 dB if tonal components are present) to achieve LOAEL (Lowest Observed Adverse Effect Level).

Results from the survey show representative background sound levels of 41 dB $L_{A90,15min}$ during the daytime, and 34 dB $L_{A90,15min}$ at night for the second-floor balcony position, and 34 dB $L_{A90,15min}$ during the daytime, and 32 dB $L_{A90,15min}$ at night for the rear garden position.

The site location, measurement position and measured results are presented in the following Sections and Appendices.

4.0 Plant Noise Assessment Criteria

4.1 British Standard 4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound"

Camden Council's noise policy requires new plant machinery installations to be in accordance with BS 4142:2014 + A1:2019. BS 4142 provides methods for rating and assessing industrial and commercial sound. The standard is used to rate sound from fixed installations and sound from the loading and unloading of goods and materials at commercial premises. The standard requires a "Specific Sound Level", in terms of L_{Aeq}, is determined either by measurement or calculation at a receptor location. This Specific Sound Level may then be corrected for the character of sound and is then termed the "Rating Level".

Once the Rating Level has been determined, the background sound level is subtracted from it and the greater the difference, the greater the likelihood of an 'adverse impact'. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact. The standard advocates that each site and situation should take the context of the scenario into consideration and that "not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact".

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The standard provides reference periods over which the assessment should take place which have been reproduced in the table below.

Table 1: Reference Periods

Period	Hours
Typical Daytime	07:00 – 23:00
Typical Night-time	23:00 – 07:00

4.2 Local Authority Noise Policy

The London Borough of Camden's noise policy provides limits for noise from industrial and commercial sources. These are stated in Appendix 3 of the Camden Local Plan 2017 and are reproduced below.

Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

Figure 1: Camden Local Plan noise limits for industrial & commercial sources

In addition to the standard criteria of BS 4142, the London Borough of Camden's policy requires that the rating level of the plant noise is at least 10 dB below the background sound level to achieve LOAEL (Lowest Observed Adverse Effect Level). The guidance goes on to state that, "10 dB should be increased to 15 dB if the noise contains audible tonal elements."

5.0 Survey Details and Results

A background noise survey was undertaken at two fixed monitoring locations between 15:00 on Friday 30th August and 12:00 on Monday 2nd September 2024. The measurement locations were chosen to be representative of the immediate acoustic environment of the nearest noise sensitive receptors. The microphone positions are shown in Appendix B.

The levels were recorded in octave bands as L_{eq}, L_{max} and L_{90} with Fast time-weighting along with their respective A-weighted single-figure values. The clocks on the sound level meters were synchronised to the correct time before deployment. The meters were then set to integrate sound levels over 15-minute periods in synchronisation mode. A list of the measurement equipment is reported in Appendix G.

The equipment was calibrated at the beginning and end of the survey period. The standardised calibrator emits a level 114 dB at 1 kHz and no drift in level was noted on meter 11584 (Position 1) and a 0.1 dB drift was noted in meter 11453 (Position 2).

A weather station was also deployed alongside the sound level meter in Position 1 during the long-term measurement. The wind speed did not exceed 0.4 m/s for the duration of the survey; the temperature varied between 14 and 32°C; no rainfall was recorded. Conditions were considered conducive to acoustic measurement.

Full survey results to one decimal place are presented in Appendix E. Graphical representations of the results are presented in Appendices C and D.

Table 2 – Summary of survey results

	Position 1 - Balcony		**Position 2 - Garden**	
	Daytime	Night-time	Daytime	Night-time
Average Measured Noise Level $L_{Aeq,T}$	54 dB(A)	43 dB(A)	58 dB(A)	40 dB(A)
Lowest Background Noise Level $L_{A90,15min}$	36 dB(A)	30 dB(A)	32 dB(A)	26 dB(A)
Representative Background Noise Level $L_{A90,15min}$	41 dB(A)	34 dB(A)	34 dB(A)	32 dB(A)

The ASHP in the rear garden will have the facility to operate 24hr a day. This assessment of the newly proposed plant item in the following section will be based on the representative background noise levels of 34 dB $L_{A90,15min}$ during daytime and 32 dB $L_{A90,15min}$ during night-time.

6.0 Plant Noise Assessment

6.1 Proposed Unit

It is proposed a Mitsubishi Electric PUZ-WM112VAA(-BS) ASHP unit is installed in the rear garden, in the east side of the property. The proposed plant location and the unit's associated manufacturer supplied noise data is shown in Appendices H and I. The nearest noise sensitive receptors to the ASHP have been identified as Volta House and 2 Windmill Hill, both approximately 5m away.

The plant noise impact assessment for the most affected noise sensitive buildings has been carried out in the following table.

Table 3 – Noise Impact Assessment – Volta House/2 Windmill Hill, rear garden [PUZ-WM112VAA(-BS)]

Element	Level dB(A)	Comments
Sound Power Level (SWL)	60	SWL, is taken from manufacturer's datasheet
Sound Pressure Level (SPL)	49	-11dB from sound power to sound pressure level
Reflections	+6	2 additional acoustically hard reflective surface (floor + 1 wall)
Distance losses	-12	Point source distance attenuation over 4m (1m from nearest identified noise sensitive receptor)
Mitigation Measures	-22	Sound attenuation provided by proposed acoustic enclosure
Specific Sound Level, L_s	21	Specific sound level before acoustic feature corrections
Acoustic Feature Correction	0	Where the specific sound level is reduced to 10dB below the minimum measured background noise, no distinguishing features are likely to be perceptible at the nearest noise-sensitive receptor
Rating Level, $L_{Ar,Tr}$	**21**	**At 1m from the nearest noise-sensitive receptor**
Representative background noise level, $L_{A90,15min}$	32	Representative background noise level, night-time
Difference (Rating Level – Background)	-11	The rating level is calculated at 11 dB below representative measured background noise level during the night, which demonstrates compliance with the Local Authority noise requirements

It is shown that the unit complies with the Local Authority's noise requirements at night-time, with a representative measured background noise level of 32 dB(A). Therefore, the unit would also comply with the daytime noise requirements of a representative measured background noise level of 34 dB(A).

6.2 Second Unit Considered

Plans for a second unit in the second-floor balcony have been abandoned due to the difficulty in achieving the necessary sound reduction. The assessment for this condensing unit, a Samsung AJ100TXJ5KG/EU, is summarised below.

Table 4 – Noise Impact Assessment – 2 Windmill Hill, second-floor balcony (AJ100TXJ5KG/EU)

Element	Level dB(A)	Comments
Sound Power Level (SWL)	70	SWL, is taken from manufacturer's datasheet
Sound Pressure Level (SPL)	59	-11dB from sound power to sound pressure level
Reflections	+9	3 additional acoustically hard reflective surface (floor + corner walls)
Distance losses	-8	Point source distance attenuation over 2.5m (1m from nearest identified noise sensitive receptor)
Specific Sound Level, L_s	60	Specific sound level before acoustic feature corrections
Acoustic Feature Correction	2	2dB correction for tonality
Rating Level, $L_{Ar,Tr}$	**62**	**At 1m from the nearest noise-sensitive receptor**
Representative background noise level, $L_{A90,15min}$	34	Representative background noise level, night-time
Difference (Rating Level – Background)	+28	The rating level is 28dB above the representative background noise level at night which is an indication of an adverse impact in the context of the site and does not comply with the Local Authority noise criteria.

Due to the stringent noise limits and restricted space available in the balcony, no mitigation measures were found to be feasible and therefore the plans to install the unit in this location were abandoned.

7.0 Uncertainties

The sound level meters were checked at the beginning and end of the survey and the field calibration showed no drift on meter 11584 (Position 1) and a 0.1 dB drift on meter 11453 (Position 2). In the context of this environmental noise survey this level of drift it is considered insignificant.

Weather conditions during the survey were recorded. The wind speed did not exceed 0.4 m/s throughout (a maximum of 5 m/s is permissible). No rainfall was recorded. The weather conditions are considered conducive to acoustic measurements.

Overall, the uncertainty within the survey procedure is deemed not to have significant influence on the outcome of the assessment.

8.0 Conclusion

GSAD have been commissioned to undertake a noise impact assessment in accordance with Camden Council's noise policy. GSAD has undertaken a background noise survey at the site and the survey results are presented within this report, together with BS4142:2014+A1:2019 and the Council's policy on plant noise assessment for the proposed unit.

Representative background sound levels of 34 dB $L_{A90,15min}$ during daytime and 32 dB $L_{A90,15min}$ during night-time for the rear garden, between 15:00 on Friday 30th August and 12:00 on Monday 2nd September 2024, have been determined.

The assessment has taken in account the specifications of the proposed plant units and mitigation measures, including acoustic enclosure and considerations taken regarding the location of plant placement to reduce sound contributions from reflective surfaces.

The noise impact assessment has determined that the rating level from the ASHP would be 11 dB(A) below the representative background sound level during night-time, which is a positive indication of a low impact on nearby noise sensitive receptors and demonstrates compliance with the Local Authority's noise requirements.

A second unit was considered for installation in the second-floor balcony. Plans were abandoned due to the stringent noise limits and restricted space available, which limited the options for mitigation measures.

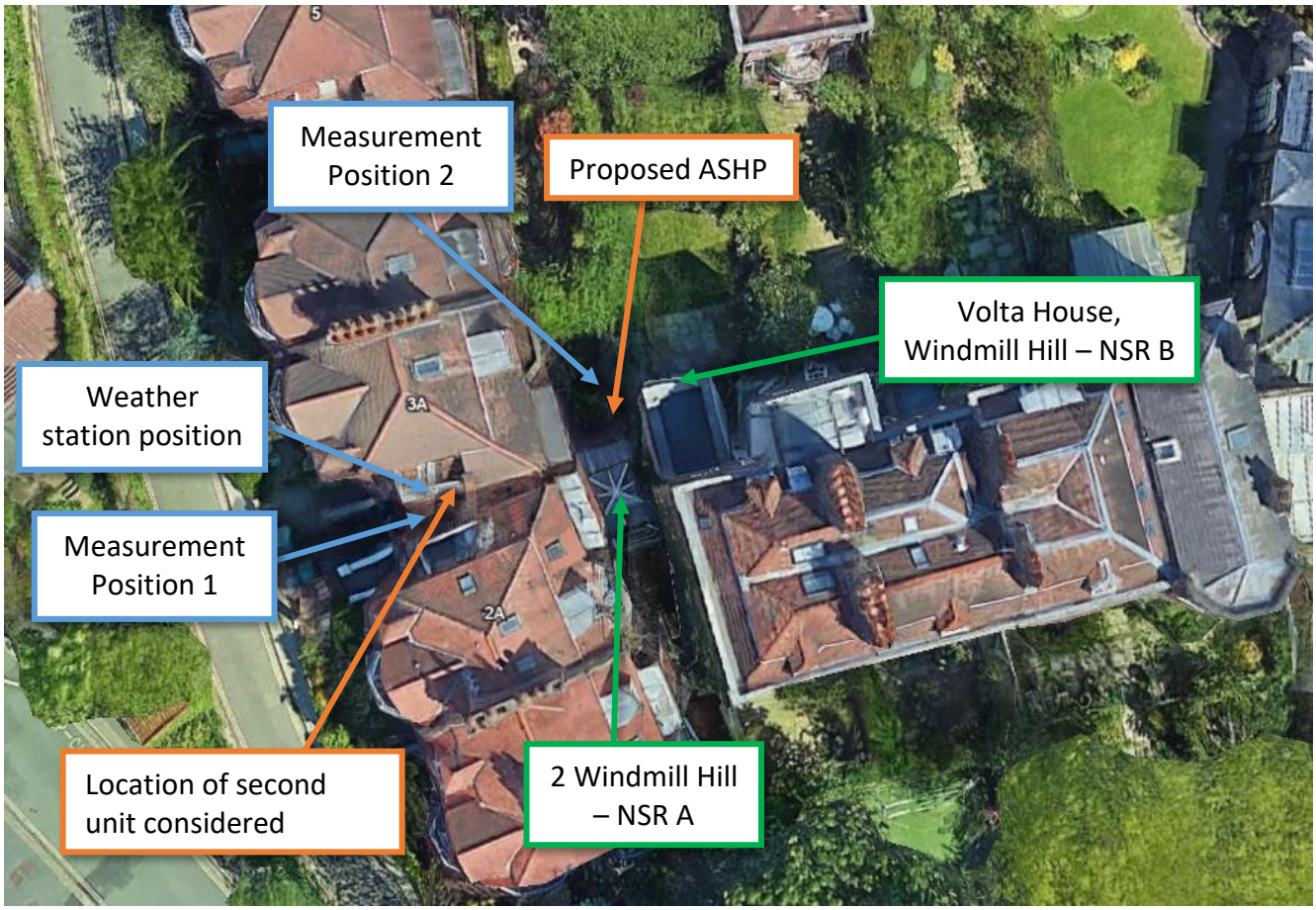
9.0 Statement of Competence

The assessment has been undertaken by the author of this report: Matias Duarte, BSc (Music Technology) MSc (Environmental and Architectural Acoustics). The author is an Acoustic Consultant at Gillieron Scott Acoustic Design. Matias has undertaken several noise surveys according to the BS 4142:2014 standard.

The assessment has been checked by: Lucie Zalberg, BSc (Physics) MSc (Architectural Acoustics) MIOA. The author is a Director of Gillieron Scott Acoustic Design with 15+ years' experience since completing a degree at Pierre et Marie University in Paris and Bath University. Lucie has undertaken numerous noise assessments according to the 1997 revision of the British Standard and the most recent 2014 revision of the standard.

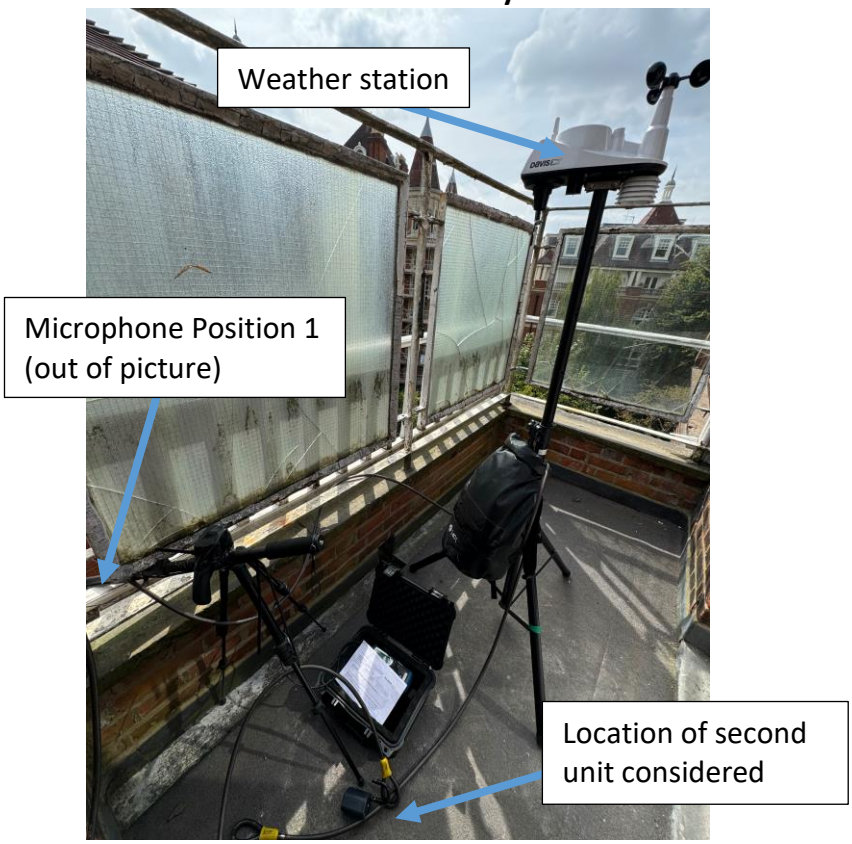
APPENDICES

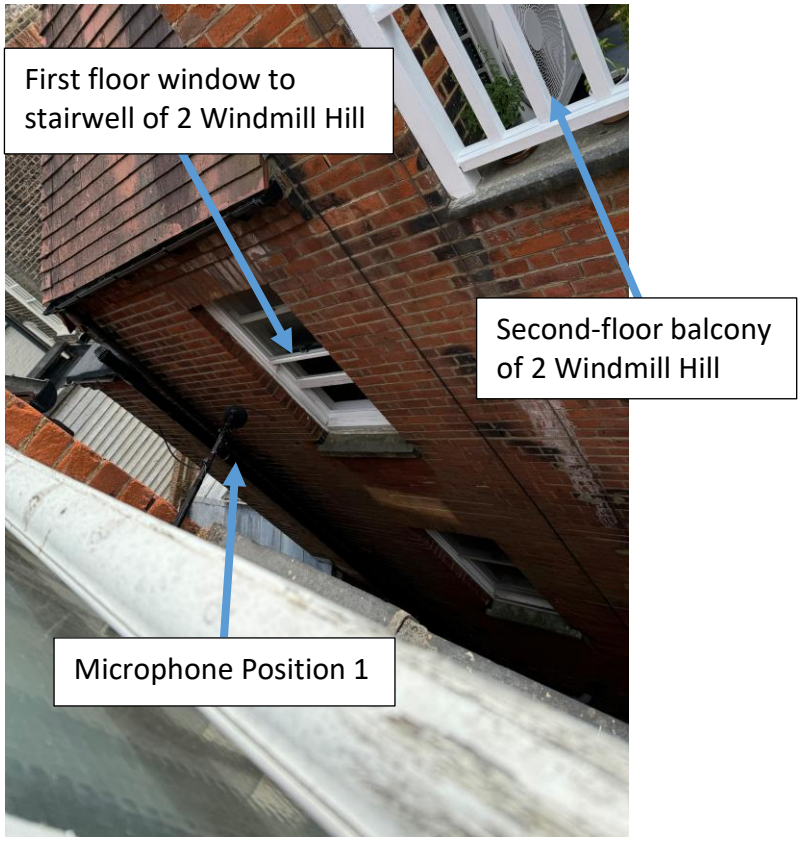
APPENDIX A: Site Overview



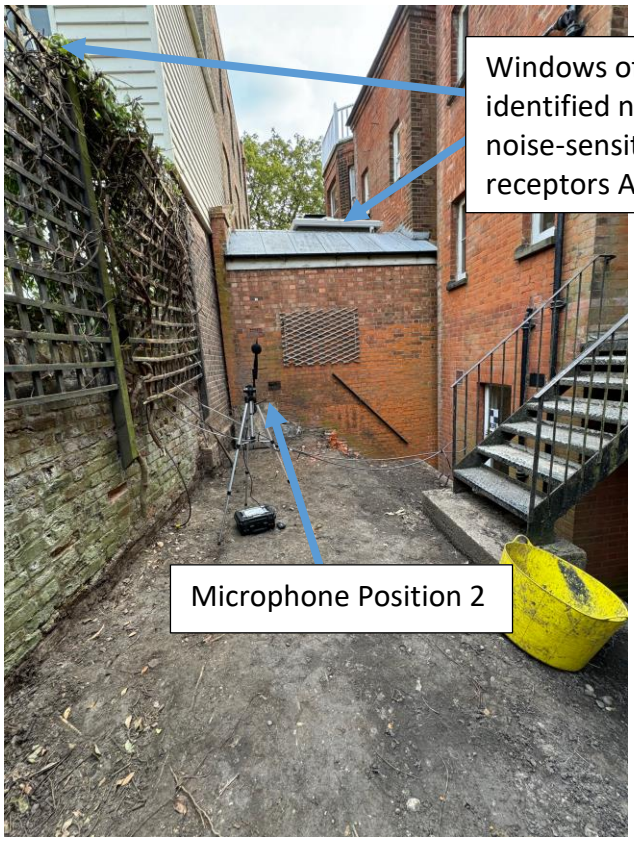
APPENDIX B: Survey Arrangement

Position 1- Second-floor balcony



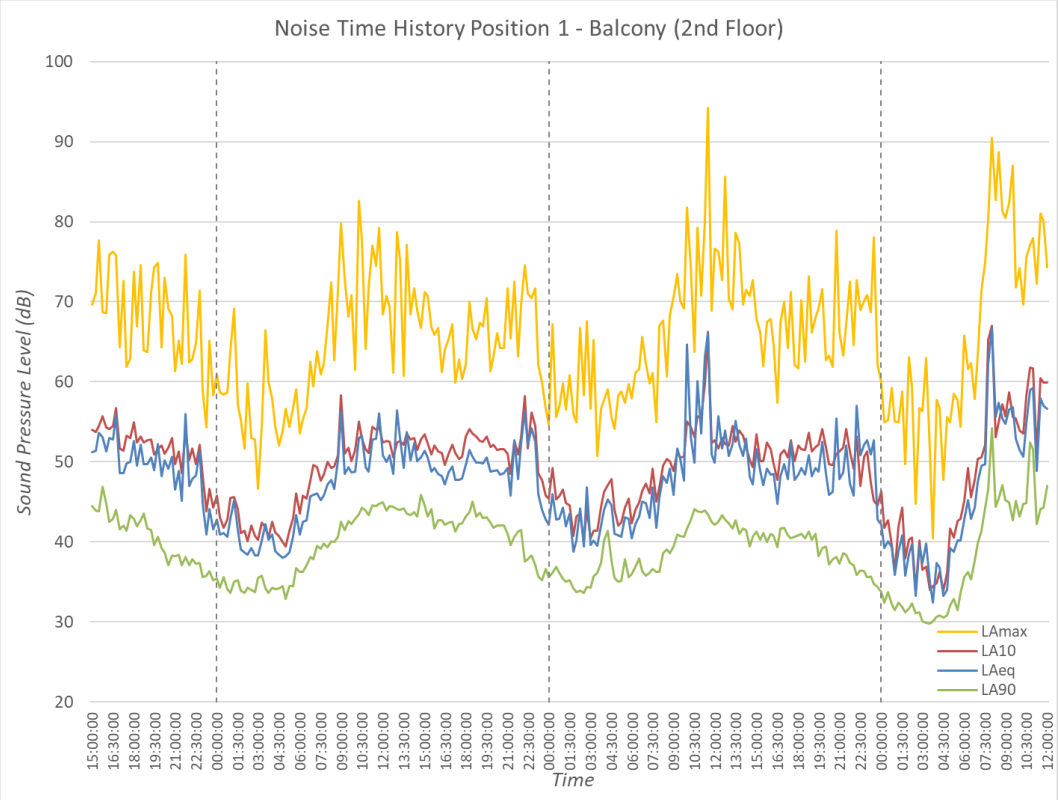


Position 2 – Rear Garden

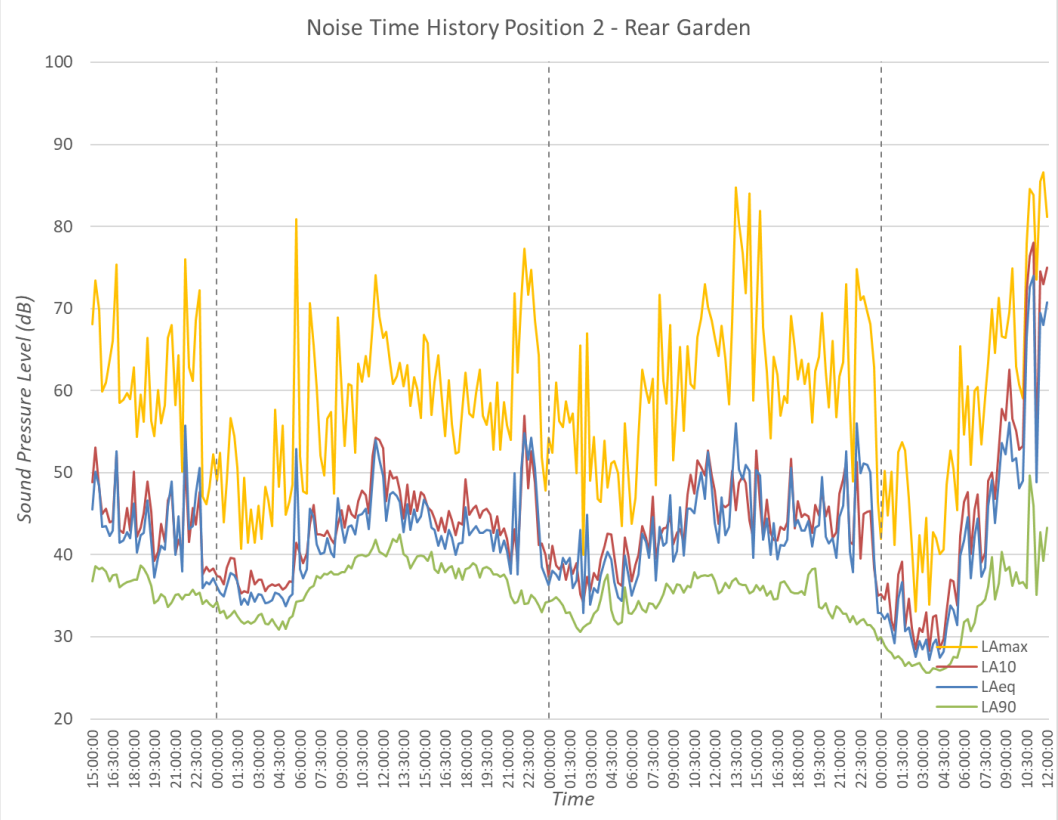


APPENDIX C: Time Series Graph

Position 1- Second-floor balcony



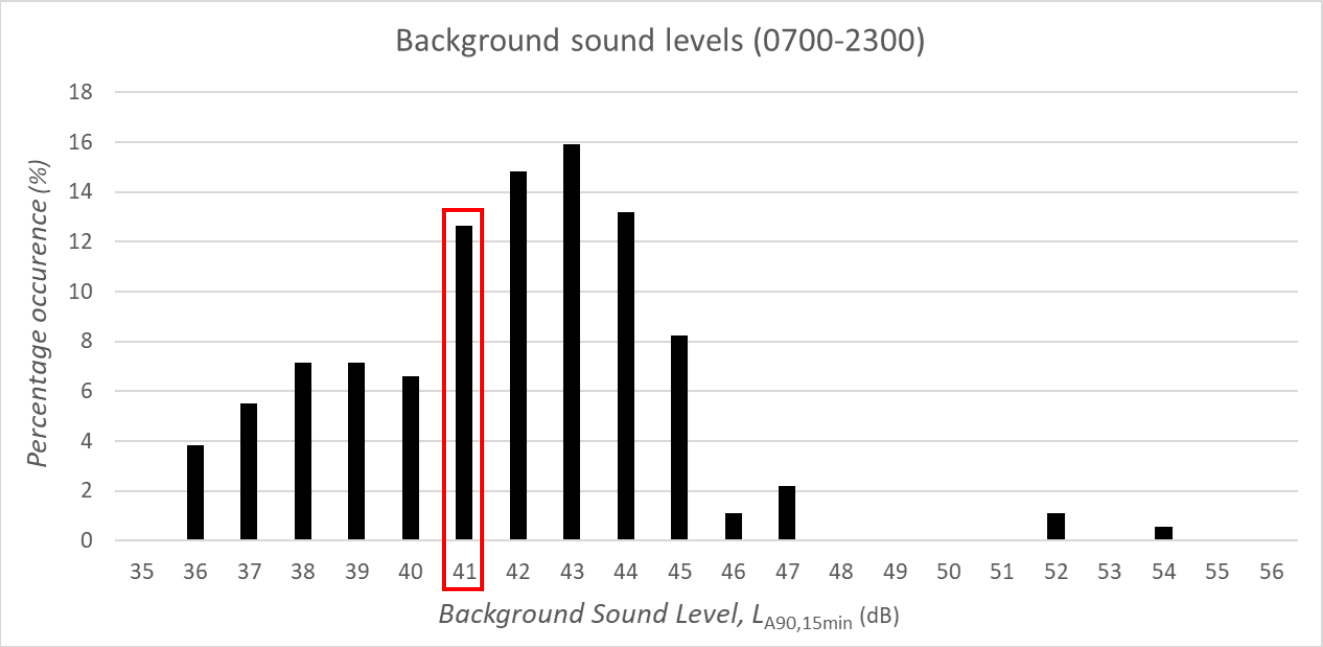
Position 2 – Rear Garden



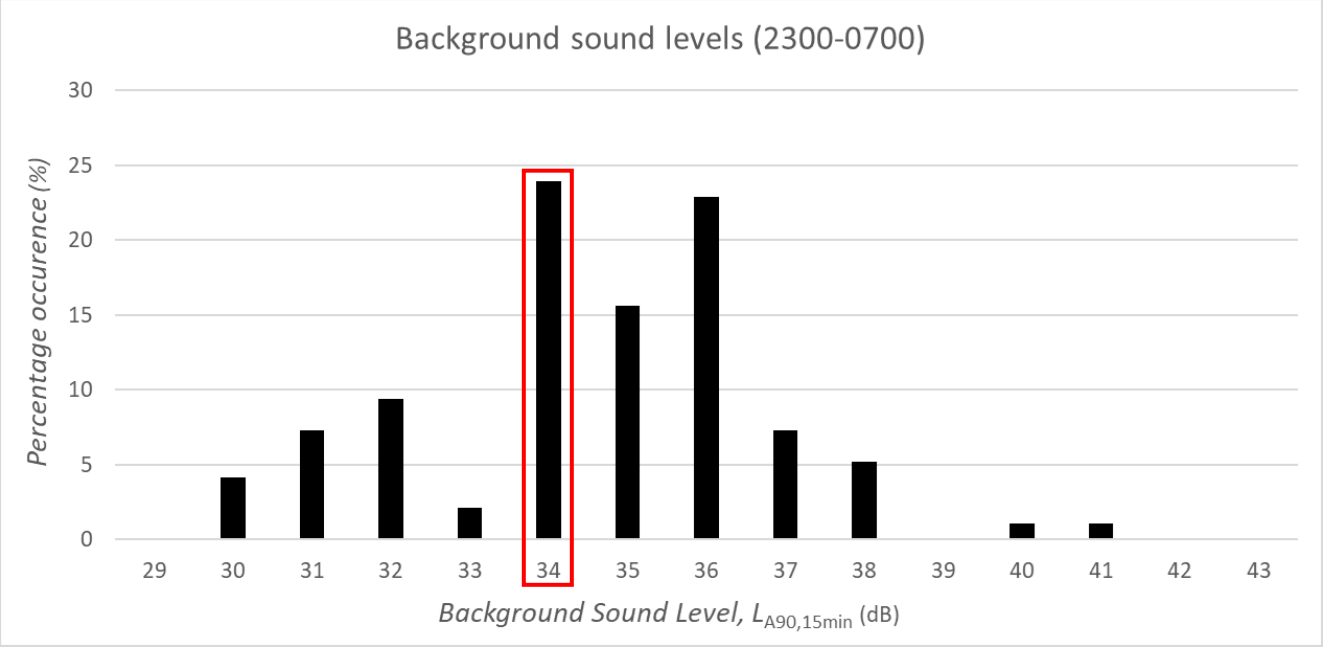
APPENDIX D: Histogram Plots

The following histograms shows the distribution of background sound levels during daytime (07.00-23.00) and night-time (23.00-07.00) periods over the survey duration.

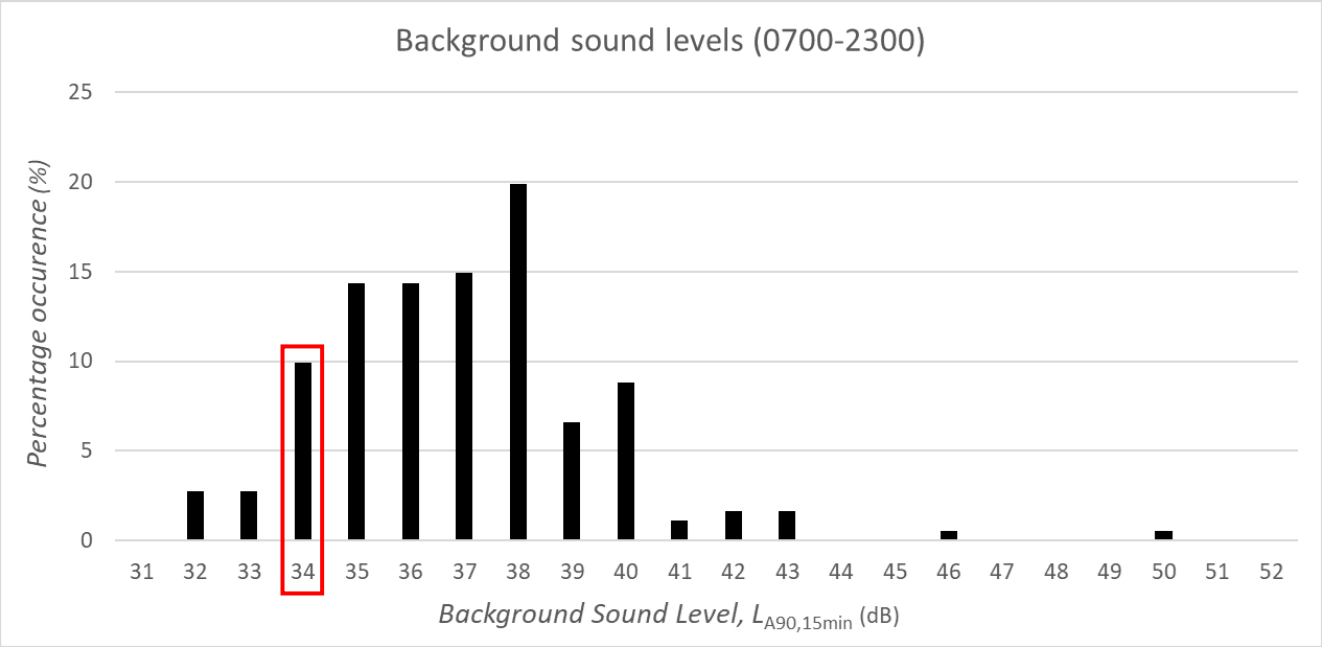
Representative Background Noise Level – Daytime (07:00-23:00hrs) – Position 1



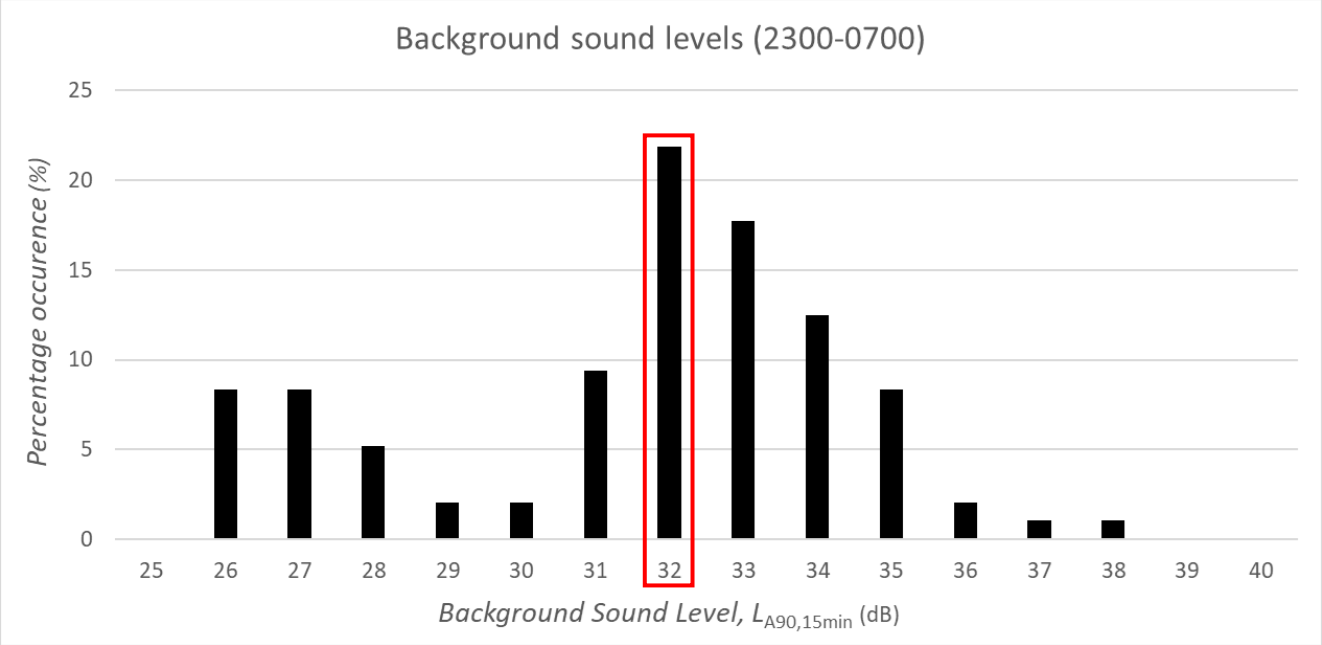
Representative Background Noise Level – Night-time (23:00-07:00hrs) – Position 1



Representative Background Noise Level – Daytime (07:00-23:00hrs) – Position 2



Representative Background Noise Level – Night-time (23:00-07:00hrs) – Position 2



APPENDIX E: Survey Results

Position 1 - Balcony

Date	Time	LA_{eq}	LA_{max}	LA_{10}	LA_{90}
30/08/2024	15:00:00	51.2	69.6	54	44.5
30/08/2024	15:15:00	51.4	71.1	53.7	43.9
30/08/2024	15:30:00	53.6	77.7	54.5	43.8
30/08/2024	15:45:00	53.1	68.7	55.7	46.9
30/08/2024	16:00:00	51.3	68.6	54.3	44.7
30/08/2024	16:15:00	53	75.9	54.1	42.5
30/08/2024	16:30:00	52.8	76.3	54.5	42.9
30/08/2024	16:45:00	56	75.8	56.7	44
30/08/2024	17:00:00	48.6	64.3	51.7	41.6
30/08/2024	17:15:00	48.6	72.6	51.4	42
30/08/2024	17:30:00	49.8	61.9	53.3	41.4
30/08/2024	17:45:00	50	62.9	53	43.3
30/08/2024	18:00:00	52.6	73.7	54.9	42.9
30/08/2024	18:15:00	49.5	66.9	52.4	41.9
30/08/2024	18:30:00	52.1	74.6	53.2	42.7
30/08/2024	18:45:00	49.7	63.9	52.4	43.5
30/08/2024	19:00:00	49.7	63.7	52.7	41.7
30/08/2024	19:15:00	50.5	71.2	52.8	41.5
30/08/2024	19:30:00	49	74.3	50.9	39.6
30/08/2024	19:45:00	52.2	74.9	51.6	40.6
30/08/2024	20:00:00	48.2	64.3	52	39.2
30/08/2024	20:15:00	50.2	73	51	38.7
30/08/2024	20:30:00	49.1	69.2	51.8	37.1
30/08/2024	20:45:00	50.6	68.2	53	38.3
30/08/2024	21:00:00	46.5	61.3	49.7	38.2
30/08/2024	21:15:00	48.9	65.1	51.3	38.4
30/08/2024	21:30:00	45.1	62.2	48.6	37.1
30/08/2024	21:45:00	56	75.9	53.7	38.1
30/08/2024	22:00:00	47	62.4	50.3	37.1
30/08/2024	22:15:00	47.8	62.8	51.7	37.8
30/08/2024	22:30:00	48.3	64.9	49.7	37.3
30/08/2024	22:45:00	51.4	71.4	52.1	37.4
30/08/2024	23:00:00	44.7	58.8	48.2	35.6
30/08/2024	23:15:00	40.9	54.3	43.8	35.8
30/08/2024	23:30:00	44.1	65.1	46.6	36.3
30/08/2024	23:45:00	41.6	58.3	44.3	35.2
31/08/2024	00:00:00	42.8	60.9	45.8	35.4
31/08/2024	00:15:00	40.9	58.7	43.1	34.3
31/08/2024	00:30:00	41.1	58.4	41.8	35.6
31/08/2024	00:45:00	40.6	58.7	42.8	34.1
31/08/2024	01:00:00	42.9	63.8	45.5	33.6
31/08/2024	01:15:00	45.2	69.2	45.6	35
31/08/2024	01:30:00	41.5	57.2	44.1	35.2
31/08/2024	01:45:00	39	55.2	41.1	33.9
31/08/2024	02:00:00	38.7	51.7	41.4	33.6
31/08/2024	02:15:00	38.4	59.8	40.1	34.3
31/08/2024	02:30:00	39.2	53	42	34
31/08/2024	02:45:00	38.3	52.8	40.7	33.7
31/08/2024	03:00:00	38.3	46.6	40.3	35.5
31/08/2024	03:15:00	40.2	54.4	42.4	35.8
31/08/2024	03:30:00	42.2	66.4	41.8	34.2
31/08/2024	03:45:00	40.3	60	40.5	33.6
31/08/2024	04:00:00	40.9	57.8	42.5	34.3
31/08/2024	04:15:00	38.9	54.5	41.2	34.1
31/08/2024	04:30:00	38.4	52	40.7	34.2
31/08/2024	04:45:00	38	53.8	40	34.5
31/08/2024	05:00:00	38.2	56.6	39.4	32.9
31/08/2024	05:15:00	38.7	54.4	41.4	34.5
31/08/2024	05:30:00	40.7	56.8	43	34.5
31/08/2024	05:45:00	43.3	59.1	46.1	36.7
31/08/2024	06:00:00	40.9	53.5	43.5	36.2
31/08/2024	06:15:00	42.5	55.3	45.8	36.2
31/08/2024	06:30:00	42.7	56.7	45.4	37.1
31/08/2024	06:45:00	45.7	62.5	47.6	38.1
31/08/2024	07:00:00	45.9	59.4	49.6	37.8
31/08/2024	07:15:00	46.1	63.8	49.3	39.5
31/08/2024	07:30:00	45.2	60.9	47.6	39.1
31/08/2024	07:45:00	45.8	62.2	48.4	39.8
31/08/2024	08:00:00	47.2	67.1	50	39.3
31/08/2024	08:15:00	47.7	72.4	49.2	40.1
31/08/2024	08:30:00	46.6	62.7	49.4	40
31/08/2024	08:45:00	50.2	71.5	50.8	40.6
31/08/2024	09:00:00	56.3	79.8	58.3	42.5
31/08/2024	09:15:00	48.5	72.8	51	41.5
31/08/2024	09:30:00	49.3	68.1	51.8	42.6
31/08/2024	09:45:00	48.7	70.8	50.1	42.2
31/08/2024	10:00:00	48.8	61.5	51.5	42.9
31/08/2024	10:15:00	53	82.6	55	43.4
31/08/2024	10:30:00	53.3	77.7	52.9	44.3
31/08/2024	10:45:00	49.3	64.1	51.6	43.9
31/08/2024	11:00:00	48.8	71.7	51.1	43.3
31/08/2024	11:15:00	52.8	77	54.4	44.6
31/08/2024	11:30:00	52.9	74.5	54	44.5

31/08/2024	11:45:00	56.1	79.3	54.4	44.7
31/08/2024	12:00:00	50.8	68.4	52.4	44.9
31/08/2024	12:15:00	50	70.7	52.6	43.9
31/08/2024	12:30:00	50.8	69.3	52.5	44.5
31/08/2024	12:45:00	48.5	61.1	50.5	44.4
31/08/2024	13:00:00	56.4	78.7	52.4	44.1
31/08/2024	13:15:00	53	75.2	52.6	44
31/08/2024	13:30:00	49.2	60.7	52.1	44.2
31/08/2024	13:45:00	53.7	77.1	53.5	43.5
31/08/2024	14:00:00	50.2	68.4	52.8	43.3
31/08/2024	14:15:00	52.3	71.7	53	43.7
31/08/2024	14:30:00	50.1	69	51.5	43.2
31/08/2024	14:45:00	50.5	66.7	52.8	45.9
31/08/2024	15:00:00	51.4	71.2	53.4	44.6
31/08/2024	15:15:00	50.5	70.7	52.3	43.2
31/08/2024	15:30:00	48.8	66.8	50.9	44.1
31/08/2024	15:45:00	49.2	65.9	52	41.7
31/08/2024	16:00:00	48.5	66.7	51.3	42.7
31/08/2024	16:15:00	48.2	61.2	51.1	42.7
31/08/2024	16:30:00	47.2	64	49.6	42.1
31/08/2024	16:45:00	48.7	65.3	51	42.4
31/08/2024	17:00:00	49.4	67.2	52.1	42.5
31/08/2024	17:15:00	47.7	59.9	51.1	41.3
31/08/2024	17:30:00	47.7	62.8	50.4	42.2
31/08/2024	17:45:00	47.9	60.4	50.6	42.3
31/08/2024	18:00:00	49.6	62.1	53.2	43.2
31/08/2024	18:15:00	51.5	70	54.1	43.7
31/08/2024	18:30:00	50.6	66.6	53.5	45
31/08/2024	18:45:00	49.9	65.3	53.2	43.2
31/08/2024	19:00:00	49.9	67.4	52.6	43.6
31/08/2024	19:15:00	49.8	66.9	52.5	43
31/08/2024	19:30:00	50.5	70.5	53.2	43.1
31/08/2024	19:45:00	48.8	61.3	51.9	42.4
31/08/2024	20:00:00	48.9	63.2	52.1	41.8
31/08/2024	20:15:00	49	66.1	51.5	42
31/08/2024	20:30:00	48.4	64.2	51.6	42
31/08/2024	20:45:00	48.6	64.2	51.6	42
31/08/2024	21:00:00	49.2	71.7	51	41
31/08/2024	21:15:00	45.8	65.4	48.5	39.6
31/08/2024	21:30:00	52.7	72.5	52.6	40.6
31/08/2024	21:45:00	47.8	63.2	50.9	41.3
31/08/2024	22:00:00	52.3	69.6	53.1	41.5
31/08/2024	22:15:00	56.3	74.6	58.2	37.5
31/08/2024	22:30:00	52.1	71	51.7	37.8
31/08/2024	22:45:00	54.2	70.5	56.2	38.3
31/08/2024	23:00:00	52.5	71.7	54.5	37.1
31/08/2024	23:15:00	46	62.1	48.6	35.7
31/08/2024	23:30:00	44	59.9	47.7	35.2
31/08/2024	23:45:00	42.8	56.6	45.8	36.6
01/09/2024	00:00:00	42.1	54.7	45.4	35.6
01/09/2024	00:15:00	46	67.2	49.2	36.1
01/09/2024	00:30:00	42.8	55.6	45.3	36.9
01/09/2024	00:45:00	42.9	56.8	45.7	36.1
01/09/2024	01:00:00	44.3	59.8	46.5	35.4
01/09/2024	01:15:00	41.9	56.5	44.8	35
01/09/2024	01:30:00	43.5	60.8	44.6	35.2
01/09/2024	01:45:00	38.8	56	40.7	34.2
01/09/2024	02:00:00	40.2	54.9	43.2	33.7
01/09/2024	02:15:00	44.2	66.7	43.5	33.9
01/09/2024	02:30:00	39.4	58.3	40.1	33.6
01/09/2024	02:45:00	46.8	67.6	44.1	34.4
01/09/2024	03:00:00	39.6	56.6	40.4	34.3
01/09/2024	03:15:00	40.2	65.2	41.4	35.7
01/09/2024	03:30:00	39.5	50.7	41.4	36.1
01/09/2024	03:45:00	42	56.6	44.4	37.4
01/09/2024	04:00:00	44	57.7	46.2	40.2
01/09/2024	04:15:00	45.3	59.1	47.1	41.4
01/09/2024	04:30:00	44.6	55.6	47.8	37.6
01/09/2024	04:45:00	41	54.1	44	35.5
01/09/2024	05:00:00	40.8	58.3	42	35
01/09/2024	05:15:00	40.6	58.8	42.4	35.1
01/09/2024	05:30:00	43.1	57.4	44.3	37.8
01/09/2024	05:45:00	42.9	59.7	45.4	35.6
01/09/2024	06:00:00	40.4	57.9	42.3	36
01/09/2024	06:15:00	42.2	61.1	44	36.9
01/09/2024	06:30:00	43.2	61.6	44.9	37.9
01/09/2024	06:45:00	45	65.6	46.3	36.3
01/09/2024	07:00:00	44.8	62.2	47.3	35.8
01/09/2024	07:15:00	43	59.8	46.1	36.1
01/09/2024	07:30:00	46.8	61.1	49.1	36.6
01/09/2024	07:45:00	41.8	54.9	45	36.2
01/09/2024	08:00:00	45.5	67	46.8	36.2
01/09/2024	08:15:00	48.2	67.7	49.5	38.6
01/09/2024	08:30:00	47.4	60.6	50.4	39
01/09/2024	08:45:00	49.1	68.3	50.1	38.6
01/09/2024	09:00:00	45.9	70.6	48.9	39.4
01/09/2024	09:15:00	51.7	73.5	51.2	40.9
01/09/2024	09:30:00	50.4	70.1	50.5	40.7
01/09/2024	09:45:00	47.6	69.2	50.6	40.6
01/09/2024	10:00:00	64.7	81.8	55	41.7

01/09/2024	10:15:00	53.2	74.5	54.4	42.7
01/09/2024	10:30:00	49.9	63.7	53.1	44.1
01/09/2024	10:45:00	60.1	79.3	55.7	43.8
01/09/2024	11:00:00	53.5	70.7	55.5	43.7
01/09/2024	11:15:00	63.2	80.2	59.8	43.9
01/09/2024	11:30:00	66.1	94.2	66.3	43.4
01/09/2024	11:45:00	50.9	68.9	52.3	42.5
01/09/2024	12:00:00	49.9	76.6	52.7	42.1
01/09/2024	12:15:00	55.7	76.3	51.7	42.5
01/09/2024	12:30:00	51.7	72.7	53	43.3
01/09/2024	12:45:00	53.9	85.6	52.2	42.8
01/09/2024	13:00:00	50.7	70.4	52	42.3
01/09/2024	13:15:00	52.2	69.1	54.5	41.7
01/09/2024	13:30:00	55.1	78.6	52.5	42.7
01/09/2024	13:45:00	52.1	77.3	53.9	41
01/09/2024	14:00:00	50.7	69.6	53.3	41.7
01/09/2024	14:15:00	52.9	71.5	51.9	41.5
01/09/2024	14:30:00	48.1	70.7	50.3	39.4
01/09/2024	14:45:00	47.2	72.7	49.3	40.6
01/09/2024	15:00:00	51.6	67.8	53.4	41.3
01/09/2024	15:15:00	48.9	66.2	50.1	40.3
01/09/2024	15:30:00	47.1	62	50.1	41.1
01/09/2024	15:45:00	49.1	67.5	52.4	40
01/09/2024	16:00:00	48.4	67.8	51.6	41
01/09/2024	16:15:00	48.5	64.5	49.7	40.7
01/09/2024	16:30:00	44.7	57.4	47.7	39.3
01/09/2024	16:45:00	48.2	67.4	50.9	41.7
01/09/2024	17:00:00	49.7	70	51.5	41.8
01/09/2024	17:15:00	47.8	64.2	50.5	40.8
01/09/2024	17:30:00	52.4	71.2	52.7	40.4
01/09/2024	17:45:00	47.7	62.1	50.1	40.6
01/09/2024	18:00:00	48.4	61.7	52	40.8
01/09/2024	18:15:00	49.2	70.2	51.6	41
01/09/2024	18:30:00	48.4	62.5	51.5	40.4
01/09/2024	18:45:00	50.8	73.2	53.6	41.3
01/09/2024	19:00:00	48.2	66.2	51.3	40.3
01/09/2024	19:15:00	49.2	68	51.9	41
01/09/2024	19:30:00	48.8	69.2	52.1	38.2
01/09/2024	19:45:00	52.5	71.6	54.1	39.2
01/09/2024	20:00:00	48.5	62.7	51.8	39.4
01/09/2024	20:15:00	45.9	63.3	49.7	37.2
01/09/2024	20:30:00	46.2	61.9	49.6	37.8
01/09/2024	20:45:00	55.4	78.9	51	38.1
01/09/2024	21:00:00	47.8	66.2	51.3	37.3
01/09/2024	21:15:00	48.7	63.3	51.8	38.6
01/09/2024	21:30:00	52	67.2	54.1	38.4
01/09/2024	21:45:00	47.3	72.5	51.3	37.4
01/09/2024	22:00:00	45.8	64.6	49.1	37.1
01/09/2024	22:15:00	57	72.7	53.2	35.9
01/09/2024	22:30:00	50.8	69	47	36.4
01/09/2024	22:45:00	52.1	70.1	50.6	36.3
01/09/2024	23:00:00	52.7	70.8	51.3	35.6
01/09/2024	23:15:00	50.9	68.7	47.4	35.7
01/09/2024	23:30:00	52.7	78	45.1	34.7
01/09/2024	23:45:00	42.8	62.1	44.6	34.4
02/09/2024	00:00:00	42.1	59.9	46.3	33.7
02/09/2024	00:15:00	39.2	54.9	41.8	32.4
02/09/2024	00:30:00	40.1	55.2	42.7	33.7
02/09/2024	00:45:00	39.3	59.2	39.6	32.2
02/09/2024	01:00:00	35.9	55	36.3	31.5
02/09/2024	01:15:00	38.9	54.9	41.9	32.4
02/09/2024	01:30:00	40.8	58.8	44.3	31.8
02/09/2024	01:45:00	35.8	49.7	37.9	31.2
02/09/2024	02:00:00	38.5	63.1	40.3	31.7
02/09/2024	02:15:00	39.7	59.3	40.5	32.3
02/09/2024	02:30:00	33.2	44.7	33.9	31.1
02/09/2024	02:45:00	39.5	56.7	40.2	31.2
02/09/2024	03:00:00	37.4	56.3	36.5	30.1
02/09/2024	03:15:00	39.8	63	36.9	29.9
02/09/2024	03:30:00	34.9	51.4	34	29.8
02/09/2024	03:45:00	32.4	40.4	34.5	30.1
02/09/2024	04:00:00	37.4	57.7	34.8	30.6
02/09/2024	04:15:00	36.8	56.7	36.2	30.8
02/09/2024	04:30:00	33.2	47.7	33.9	30.5
02/09/2024	04:45:00	34	55.6	36.1	30.8
02/09/2024	05:00:00	39.2	54.9	41.7	32
02/09/2024	05:15:00	38.8	58.5	40.5	32.9
02/09/2024	05:30:00	40.2	57.7	42.6	31.5
02/09/2024	05:45:00	40.2	54.4	42.9	33.6
02/09/2024	06:00:00	42.8	65.8	45.1	35.6
02/09/2024	06:15:00	45.2	61.6	49.2	36.2
02/09/2024	06:30:00	42.9	62.3	45.6	35.3
02/09/2024	06:45:00	44.3	57.8	47.7	37.6
02/09/2024	07:00:00	47.5	63.3	50.4	39.8
02/09/2024	07:15:00	49.5	71.5	50.5	41.4
02/09/2024	07:30:00	49.7	75	52.1	44.3
02/09/2024	07:45:00	62.3	80.4	65.2	46.5
02/09/2024	08:00:00	66.6	90.5	67	54.2
02/09/2024	08:15:00	55.6	82.7	53.1	44.4
02/09/2024	08:30:00	57.4	88.7	54.9	45.4

02/09/2024	08:45:00	55.4	81.3	57.2	47.1
02/09/2024	09:00:00	54.8	80.5	55.7	45.2
02/09/2024	09:15:00	56.5	82.3	58.7	44.9
02/09/2024	09:30:00	56.8	87	55.6	42.7
02/09/2024	09:45:00	52.9	71.8	55.4	45.1
02/09/2024	10:00:00	51.5	74.2	53.9	43.2
02/09/2024	10:15:00	50.6	69.6	53.5	44.7
02/09/2024	10:30:00	54.8	75.5	58.2	44.8
02/09/2024	10:45:00	59	77.1	61.8	52.4
02/09/2024	11:00:00	59.2	77.9	61.7	51.6
02/09/2024	11:15:00	48.9	72.2	51	42.2
02/09/2024	11:30:00	57.9	81	60.5	44.1
02/09/2024	11:45:00	57	80.1	59.9	44.3
02/09/2024	12:00:00	56.6	74.3	59.9	47
02/09/2024	12:15:00	51.6	77.9	52.5	45.6

Position 2 – Rear Garden

Date	Time	LA_{eq}	LA_{max}	LA_{10}	LA_{90}
30/08/2024	15:00:00	45.5	68.1	48.8	36.8
30/08/2024	15:15:00	50.1	73.4	53.1	38.6
30/08/2024	15:30:00	48.4	69.8	48.2	38.2
30/08/2024	15:45:00	43.4	59.9	45	38.4
30/08/2024	16:00:00	43.5	61	45.6	38
30/08/2024	16:15:00	42.3	63.8	44	36.8
30/08/2024	16:30:00	42.9	66.1	44.1	37.5
30/08/2024	16:45:00	52.6	75.4	52.4	37.6
30/08/2024	17:00:00	41.5	58.5	43	36
30/08/2024	17:15:00	41.7	58.9	42.7	36.4
30/08/2024	17:30:00	42.8	59.7	45.7	36.7
30/08/2024	17:45:00	42	59	42.9	36.8
30/08/2024	18:00:00	46.3	62.8	50.1	37
30/08/2024	18:15:00	40.3	54.4	42.2	37
30/08/2024	18:30:00	42.4	59.5	43.3	38.7
30/08/2024	18:45:00	42.7	56.2	45.1	38.3
30/08/2024	19:00:00	46.6	66.4	48.9	37.5
30/08/2024	19:15:00	41.6	56.3	45.2	36.2
30/08/2024	19:30:00	37.2	54.5	39.3	34.1
30/08/2024	19:45:00	39.7	60.1	40.4	34.5
30/08/2024	20:00:00	41.1	56	43.8	35.2
30/08/2024	20:15:00	40.6	58.2	41.6	34.8
30/08/2024	20:30:00	45.9	66.4	46.6	33.6
30/08/2024	20:45:00	48.9	68	47.8	34.2
30/08/2024	21:00:00	40	58.2	40.1	35.1
30/08/2024	21:15:00	44.7	64.3	41.8	35.2
30/08/2024	21:30:00	38	50.1	40.4	34.6
30/08/2024	21:45:00	55.7	76	51.7	35.1
30/08/2024	22:00:00	43.1	62.8	41.6	35.1
30/08/2024	22:15:00	43.5	61.2	45.7	35.8
30/08/2024	22:30:00	47.5	68.5	43.7	35.1
30/08/2024	22:45:00	50.6	72.2	47.6	35.4
30/08/2024	23:00:00	35.9	47.1	37.6	34
30/08/2024	23:15:00	36.7	46.2	38.5	34.5
30/08/2024	23:30:00	36.4	48.2	38	34
30/08/2024	23:45:00	37.1	52.2	38.3	33.6
31/08/2024	00:00:00	36.1	49	37.4	34.3
31/08/2024	00:15:00	35.4	52.4	37.3	32.9
31/08/2024	00:30:00	34.9	44	36.4	33.2
31/08/2024	00:45:00	36.2	49	38.4	32.3
31/08/2024	01:00:00	37.8	56.7	39.6	32.6
31/08/2024	01:15:00	37.5	54.5	39.5	33.2
31/08/2024	01:30:00	36.8	50.6	36.6	32.5
31/08/2024	01:45:00	33.9	40.7	35.3	31.9
31/08/2024	02:00:00	34.7	49.4	35.6	31.6
31/08/2024	02:15:00	33.9	41.5	35.4	31.9
31/08/2024	02:30:00	35.4	45.5	38.1	31.6
31/08/2024	02:45:00	34.3	41.5	36.4	31.9
31/08/2024	03:00:00	35.2	46	37	32.6
31/08/2024	03:15:00	35.1	41.9	37	32.8
31/08/2024	03:30:00	34.1	48.3	35.6	31.6
31/08/2024	03:45:00	34.2	46.6	36.1	31.5
31/08/2024	04:00:00	34.5	43.5	36.4	32.2
31/08/2024	04:15:00	35.4	57.7	36.2	31.5
31/08/2024	04:30:00	35.2	48.3	36.4	30.9
31/08/2024	04:45:00	34.7	55.7	35.8	31.9
31/08/2024	05:00:00	33.7	44.9	36	31
31/08/2024	05:15:00	34.8	46.5	36.8	32.3
31/08/2024	05:30:00	35.2	48.6	36.7	32.5
31/08/2024	05:45:00	52.9	80.9	41.5	34.3
31/08/2024	06:00:00	38.2	52	40.1	34.4
31/08/2024	06:15:00	37.1	47.7	39	34.5
31/08/2024	06:30:00	38.2	47.5	40.2	35.4
31/08/2024	06:45:00	45.6	70.7	43.7	35.9
31/08/2024	07:00:00	44.6	65.5	46.1	36.2
31/08/2024	07:15:00	41.3	60.4	42.5	37.4
31/08/2024	07:30:00	40.1	52.1	42.5	37.1
31/08/2024	07:45:00	40.3	49.7	42.3	37.7
31/08/2024	08:00:00	42	56.6	42.9	37.6

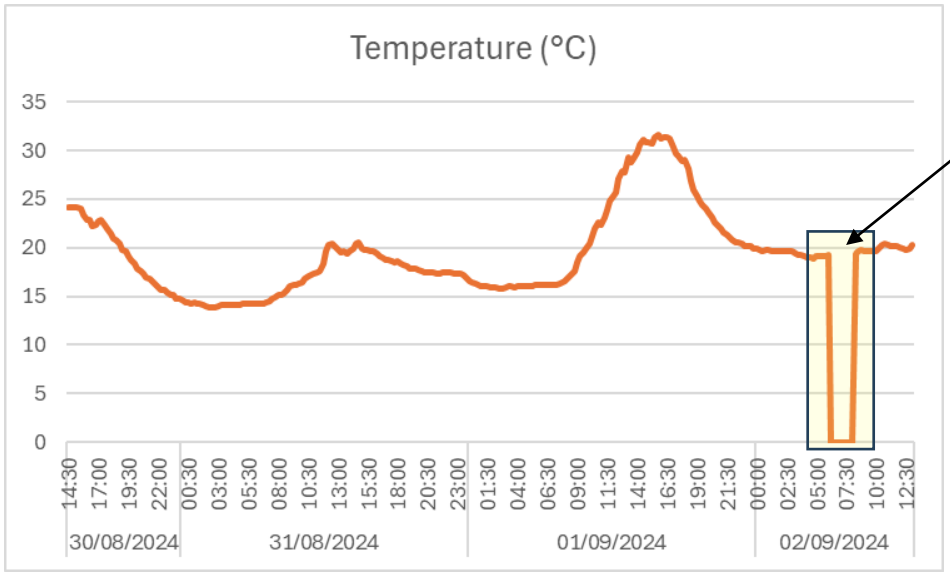
31/08/2024	08:15:00	40.3	57.4	41.9	38
31/08/2024	08:30:00	39.7	47.5	41.4	37.6
31/08/2024	08:45:00	46.9	68.9	43.7	37.6
31/08/2024	09:00:00	43.5	60.3	45.4	37.9
31/08/2024	09:15:00	41.5	53.3	43.3	37.9
31/08/2024	09:30:00	43.4	60.8	46	38.7
31/08/2024	09:45:00	43.6	60.6	45	38.3
31/08/2024	10:00:00	42.5	52.4	44.5	39.6
31/08/2024	10:15:00	44.8	63.3	46.5	39.9
31/08/2024	10:30:00	45	61.1	47.8	40
31/08/2024	10:45:00	45.6	64.2	47.3	39.8
31/08/2024	11:00:00	43.1	61.7	45.1	40
31/08/2024	11:15:00	49.1	67.9	52.1	40.8
31/08/2024	11:30:00	54	74.1	54.3	41.8
31/08/2024	11:45:00	51.6	69	54	40.4
31/08/2024	12:00:00	49.6	66.4	53	40.1
31/08/2024	12:15:00	44.1	67.2	46.5	39.8
31/08/2024	12:30:00	47.4	63.5	50.2	40.9
31/08/2024	12:45:00	47.6	60.8	49.3	41.9
31/08/2024	13:00:00	47.2	61.7	49.5	41.6
31/08/2024	13:15:00	46.4	63.4	47.8	42.5
31/08/2024	13:30:00	42.8	60.5	44.4	40.1
31/08/2024	13:45:00	46.2	63.1	48.6	39.7
31/08/2024	14:00:00	43	58.1	45	38.3
31/08/2024	14:15:00	45.5	61.6	47.7	39.2
31/08/2024	14:30:00	44	60.3	45.3	39.8
31/08/2024	14:45:00	44.7	56.7	47.6	39.9
31/08/2024	15:00:00	46.7	66.8	47.3	39.8
31/08/2024	15:15:00	45.9	65.8	45.8	39.3
31/08/2024	15:30:00	43.3	57	45.3	40.4
31/08/2024	15:45:00	43	61.1	44.4	38.2
31/08/2024	16:00:00	41.1	64.3	42.9	37.8
31/08/2024	16:15:00	42.3	59.8	44.5	39
31/08/2024	16:30:00	40.7	54.5	42.8	37.9
31/08/2024	16:45:00	43	61.3	45.3	38.4
31/08/2024	17:00:00	42.1	55.9	44.2	38.6
31/08/2024	17:15:00	40	52.3	42.4	37.1
31/08/2024	17:30:00	41.4	52.5	44	38.3
31/08/2024	17:45:00	41.5	58	43.7	37
31/08/2024	18:00:00	45.8	62.2	49.2	38.2
31/08/2024	18:15:00	42.4	57.2	44.9	38.4
31/08/2024	18:30:00	43	56.8	45.6	39
31/08/2024	18:45:00	43.5	59.7	46	38.7
31/08/2024	19:00:00	42.7	62.6	44.5	37.2
31/08/2024	19:15:00	42.7	56.9	45.3	38.3
31/08/2024	19:30:00	43	55.8	45.6	38.5
31/08/2024	19:45:00	42.9	58.5	44.9	38.2
31/08/2024	20:00:00	40.5	52.8	42.7	37.6
31/08/2024	20:15:00	43	61	44.7	37.6
31/08/2024	20:30:00	40.3	52.8	42.4	37.3
31/08/2024	20:45:00	41.7	58.6	43.2	37.6
31/08/2024	21:00:00	40.5	55.7	41.9	37
31/08/2024	21:15:00	37.7	54	38.8	34.9
31/08/2024	21:30:00	49.9	71.9	43.1	34.1
31/08/2024	21:45:00	37.6	62.2	39	34.3
31/08/2024	22:00:00	50.6	71.3	48.7	35.7
31/08/2024	22:15:00	54.8	77.3	56.9	34
31/08/2024	22:30:00	51.6	71.7	48.1	34.1
31/08/2024	22:45:00	54.3	74.7	52.6	35.1
31/08/2024	23:00:00	50.5	68.5	48.7	34.7
31/08/2024	23:15:00	43.8	64.3	41.2	33.8
31/08/2024	23:30:00	38.5	51.9	41.4	33
31/08/2024	23:45:00	37.3	47.8	40	34.2
01/09/2024	00:00:00	36.3	54.3	37.3	34.3
01/09/2024	00:15:00	38.1	52.4	41.1	34.5
01/09/2024	00:30:00	37.6	61	38.7	34.8
01/09/2024	00:45:00	37	56.3	38.2	34.5
01/09/2024	01:00:00	39.6	55.6	38.9	33.8
01/09/2024	01:15:00	38.9	58.7	37	32.9
01/09/2024	01:30:00	39.6	56.1	38.9	33
01/09/2024	01:45:00	35.9	57.2	37.7	32.2
01/09/2024	02:00:00	36.9	49.9	39	31.2
01/09/2024	02:15:00	43	65.5	35.2	30.6
01/09/2024	02:30:00	32.9	40	34.2	31.2
01/09/2024	02:45:00	44.9	67	37.3	31.5
01/09/2024	03:00:00	33.9	49	35.6	31.7
01/09/2024	03:15:00	35.9	54.4	37.8	32.8
01/09/2024	03:30:00	35.4	46.8	37	33.3
01/09/2024	03:45:00	37.5	46.4	39.4	34.6
01/09/2024	04:00:00	39.2	53.9	41	36.8
01/09/2024	04:15:00	40.4	48.2	42.6	37.6
01/09/2024	04:30:00	39.4	51.1	42.5	33.3
01/09/2024	04:45:00	36.7	51.4	39.8	32.1
01/09/2024	05:00:00	34.8	49.9	36.6	31.5
01/09/2024	05:15:00	34.4	43.5	36.2	31.8
01/09/2024	05:30:00	39.9	56	42.1	36
01/09/2024	05:45:00	37.3	49.2	39.7	32.9
01/09/2024	06:00:00	35	43.8	36.8	32.8
01/09/2024	06:15:00	36.5	46.9	38.8	33.5
01/09/2024	06:30:00	37.6	54.5	40	34.4

01/09/2024	06:45:00	42.6	62.6	43.5	33.4
01/09/2024	07:00:00	41.6	60.1	42.1	33
01/09/2024	07:15:00	39.6	58.5	40.4	34.1
01/09/2024	07:30:00	44.6	61.5	47.1	34
01/09/2024	07:45:00	36.9	48.5	39.5	33.5
01/09/2024	08:00:00	43.4	71.7	42.1	34.2
01/09/2024	08:15:00	41.1	61.2	43.2	35.2
01/09/2024	08:30:00	41.5	58.4	43.3	36.5
01/09/2024	08:45:00	47.3	68	44.7	35.9
01/09/2024	09:00:00	39.2	51.5	41.3	35.3
01/09/2024	09:15:00	40.5	59	42.7	36.4
01/09/2024	09:30:00	45.8	65.3	43.1	36.3
01/09/2024	09:45:00	39.9	55.1	41.6	35.4
01/09/2024	10:00:00	45.6	65.4	47.4	36.2
01/09/2024	10:15:00	45.6	60.8	49.8	36
01/09/2024	10:30:00	45.1	60.3	47.5	37.9
01/09/2024	10:45:00	47.7	66.5	51.5	37.1
01/09/2024	11:00:00	50	68.8	50.7	37.4
01/09/2024	11:15:00	46.8	73	49.7	37.5
01/09/2024	11:30:00	52.5	70.2	52.7	37.4
01/09/2024	11:45:00	48.2	68.5	49.7	37.6
01/09/2024	12:00:00	43.9	66.5	47.8	36.9
01/09/2024	12:15:00	41.5	64.2	43.8	35.3
01/09/2024	12:30:00	47	67.9	46.2	35.6
01/09/2024	12:45:00	42.4	63.9	45.8	36.6
01/09/2024	13:00:00	43.4	58.3	46.2	35.9
01/09/2024	13:15:00	49.4	68.3	50.2	36.8
01/09/2024	13:30:00	56	84.8	45.4	37.1
01/09/2024	13:45:00	50.4	80.4	48.7	36.5
01/09/2024	14:00:00	49.2	76.7	49.6	36.3
01/09/2024	14:15:00	51	71.9	48.7	36.3
01/09/2024	14:30:00	50.2	84	44.1	35.3
01/09/2024	14:45:00	39.6	58.8	42	35.6
01/09/2024	15:00:00	50.3	68.6	52.7	36.3
01/09/2024	15:15:00	49.7	81.9	46.1	35.7
01/09/2024	15:30:00	41.8	67.7	42.2	36.2
01/09/2024	15:45:00	44.4	62.3	46.7	35
01/09/2024	16:00:00	40	54.2	42.7	35.6
01/09/2024	16:15:00	43.9	64.1	41.8	34.6
01/09/2024	16:30:00	39.4	61.9	41.7	34.7
01/09/2024	16:45:00	41.2	56.9	43.4	36.6
01/09/2024	17:00:00	41.1	59.3	43	36.8
01/09/2024	17:15:00	41.8	58.5	44	36.2
01/09/2024	17:30:00	50.6	69.1	51.7	35.5
01/09/2024	17:45:00	43.5	65.1	43.2	35.3
01/09/2024	18:00:00	44.2	61.4	46.5	35.3
01/09/2024	18:15:00	42.9	63.8	44.6	35.6
01/09/2024	18:30:00	42.9	60.8	45	35.1
01/09/2024	18:45:00	44.1	63.3	44.7	37.6
01/09/2024	19:00:00	41	56.1	42.7	38.2
01/09/2024	19:15:00	43.3	62.4	46.1	38.3
01/09/2024	19:30:00	43.6	64.1	44.8	33.6
01/09/2024	19:45:00	49.5	69.5	47.9	33.5
01/09/2024	20:00:00	42.2	62.3	44.7	34.1
01/09/2024	20:15:00	41.4	58	45.9	33
01/09/2024	20:30:00	42	66.1	42	32.3
01/09/2024	20:45:00	39.6	56.8	42.8	33.7
01/09/2024	21:00:00	44.6	61.7	47.5	33.5
01/09/2024	21:15:00	46	63.5	49.2	32.8
01/09/2024	21:30:00	52.6	73	51.3	32.8
01/09/2024	21:45:00	40.4	57.9	41.6	31.8
01/09/2024	22:00:00	37.9	48.9	41.3	32.5
01/09/2024	22:15:00	56	74.8	51.3	31.5
01/09/2024	22:30:00	49.9	71	39.5	32
01/09/2024	22:45:00	51.1	71.5	45	32.2
01/09/2024	23:00:00	51	69.6	45.2	31.4
01/09/2024	23:15:00	50	68.1	45.3	31.4
01/09/2024	23:30:00	39.4	62.8	38.3	30.9
01/09/2024	23:45:00	32.9	46.4	35	29.6
02/09/2024	00:00:00	32.9	41.9	35.2	30
02/09/2024	00:15:00	32.2	50.2	34.6	28.9
02/09/2024	00:30:00	32.8	44.8	36.5	28.4
02/09/2024	00:45:00	31	50.1	32	28
02/09/2024	01:00:00	29.2	41.2	30.8	27.4
02/09/2024	01:15:00	34.7	52.5	37.6	27.7
02/09/2024	01:30:00	36.7	53.7	39.2	27.2
02/09/2024	01:45:00	30.7	52.7	31.2	26.5
02/09/2024	02:00:00	31.2	46.8	34.7	26.9
02/09/2024	02:15:00	29.5	40.9	31.1	26.5
02/09/2024	02:30:00	27.6	33.1	28.5	26.6
02/09/2024	02:45:00	29.5	42.4	31.1	26.8
02/09/2024	03:00:00	28.5	37.9	30.6	26.2
02/09/2024	03:15:00	29.7	44.5	33	25.6
02/09/2024	03:30:00	27.2	33.9	28.3	25.6
02/09/2024	03:45:00	29.1	42.8	32.4	26.2
02/09/2024	04:00:00	29.7	42	32.6	26.1
02/09/2024	04:15:00	27.5	40.1	28.6	25.9
02/09/2024	04:30:00	28.2	40.6	29.8	26.1
02/09/2024	04:45:00	31.2	48.6	33.2	26.3
02/09/2024	05:00:00	33.8	52.7	37	26.7

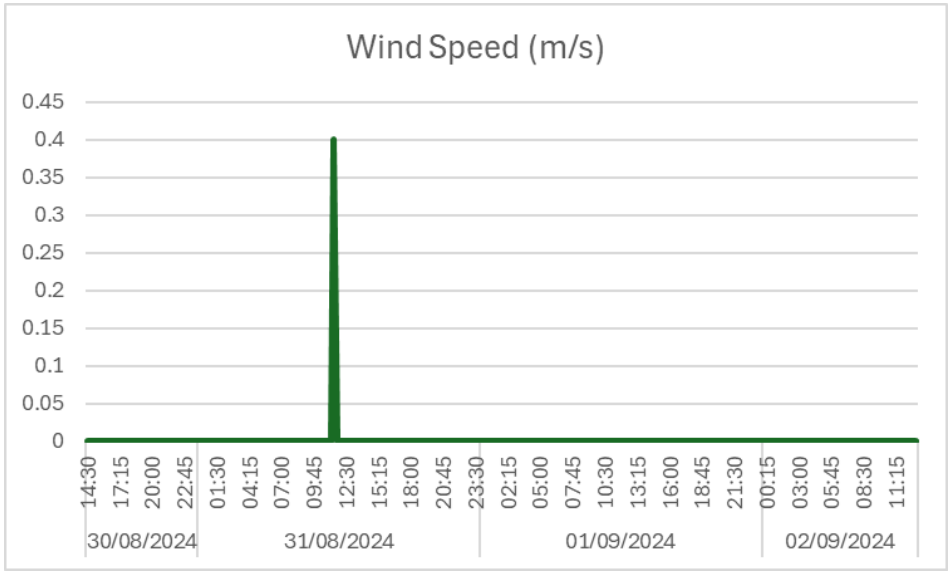
02/09/2024	05:15:00	33.3	50.5	36.8	27.6
02/09/2024	05:30:00	31.4	45.4	33.8	27.5
02/09/2024	05:45:00	39.9	65.4	42.3	28.8
02/09/2024	06:00:00	41.7	54.6	46.4	31.8
02/09/2024	06:15:00	44.6	60.5	47.6	32.2
02/09/2024	06:30:00	37.1	51	40.1	30.7
02/09/2024	06:45:00	42.2	60	45.5	31.7
02/09/2024	07:00:00	44.4	60.4	47.4	33.7
02/09/2024	07:15:00	37.3	53.4	39.1	34
02/09/2024	07:30:00	38.4	59.2	40.3	34.6
02/09/2024	07:45:00	46	63.5	49	36.1
02/09/2024	08:00:00	49.1	69.9	50	39.7
02/09/2024	08:15:00	43.9	64.6	46.8	34.6
02/09/2024	08:30:00	49	71.3	52.8	36.5

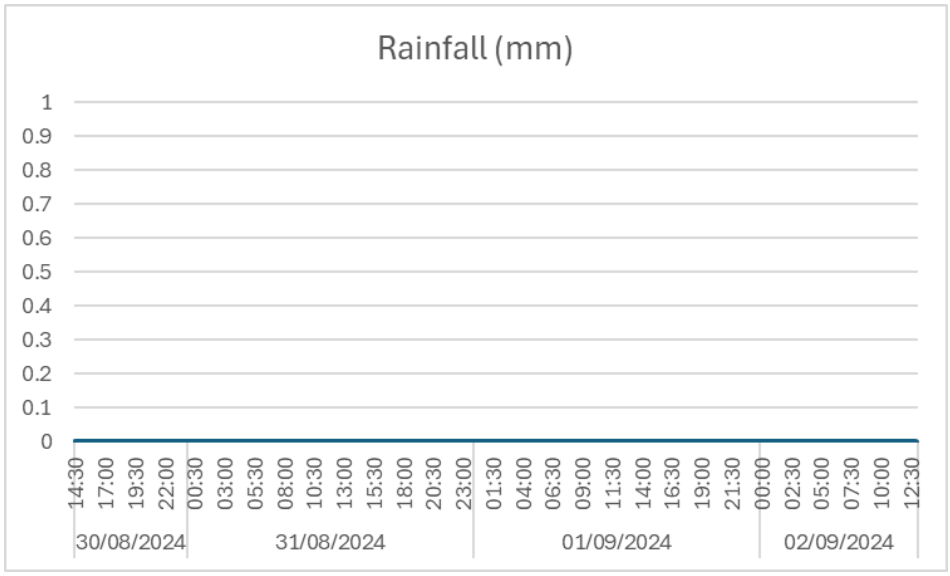
02/09/2024	08:45:00	53.6	66.6	57.8	40.4
02/09/2024	09:00:00	52.2	66.4	56.4	38.1
02/09/2024	09:15:00	56.1	69.6	62.6	38.5
02/09/2024	09:30:00	51.4	74.9	56.6	36.2
02/09/2024	09:45:00	51.8	62.9	55.1	37.9
02/09/2024	10:00:00	48.1	60.7	52.8	36.5
02/09/2024	10:15:00	49	59.1	53.3	36.7
02/09/2024	10:30:00	66.5	77.9	72.1	35.9
02/09/2024	10:45:00	72.6	84.6	76.4	49.7
02/09/2024	11:00:00	74	83.8	78	46
02/09/2024	11:15:00	48.8	73.5	52.1	35.1
02/09/2024	11:30:00	69.5	85.5	74.5	42.8
02/09/2024	11:45:00	68	86.6	73	39.3
02/09/2024	12:00:00	70.8	81.2	75	43.3

APPENDIX F: Weather Data



No data recorded – possible equipment malfunction or low battery due to lack of sunlight.





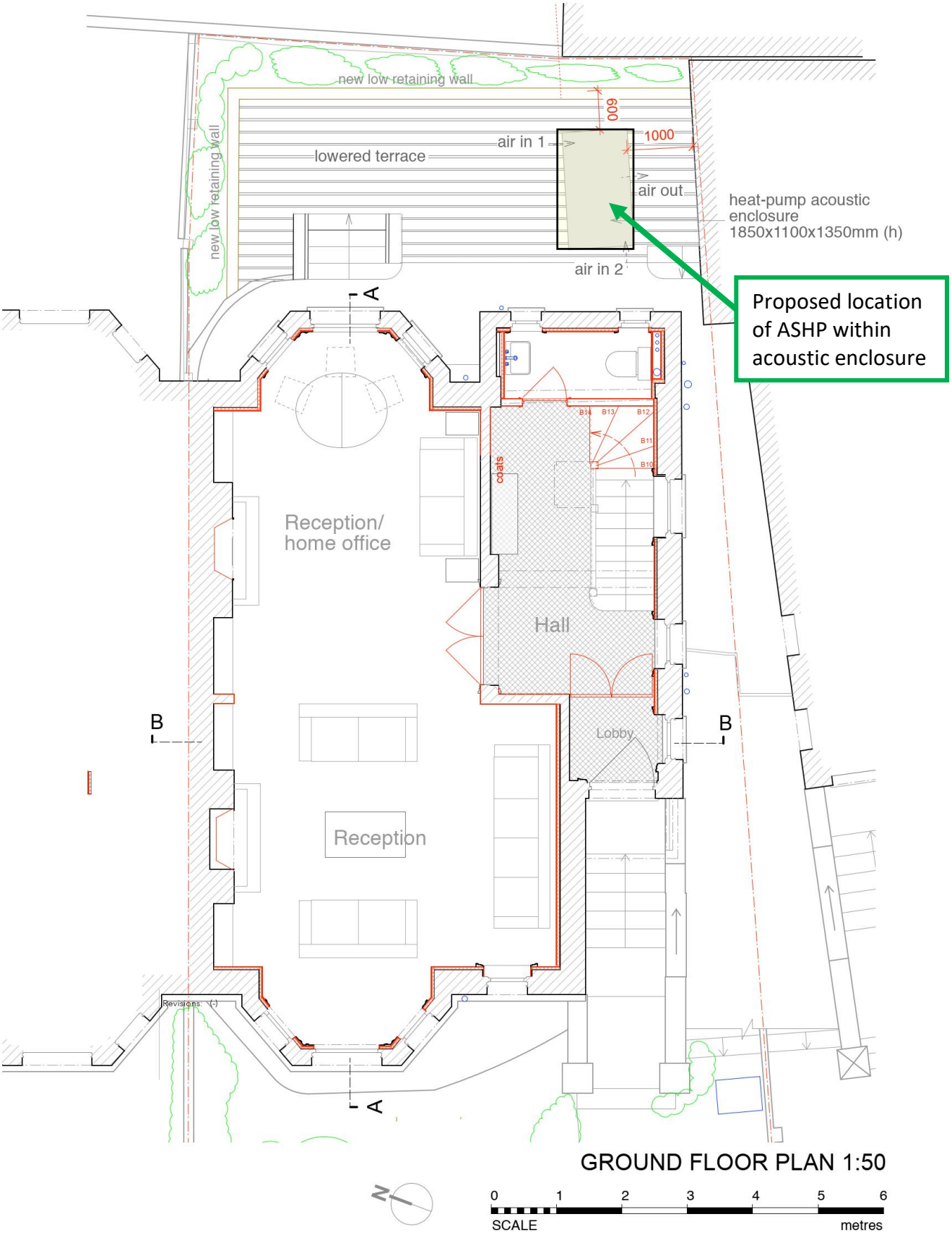
APPENDIX G: Equipment

- 2x No. NTi XL2 Real Time Analysers
- Bruel & Kjaer 4231 Calibrator
- 2x No. NTi outdoor kits
- Tripods
- Davis Weather Station

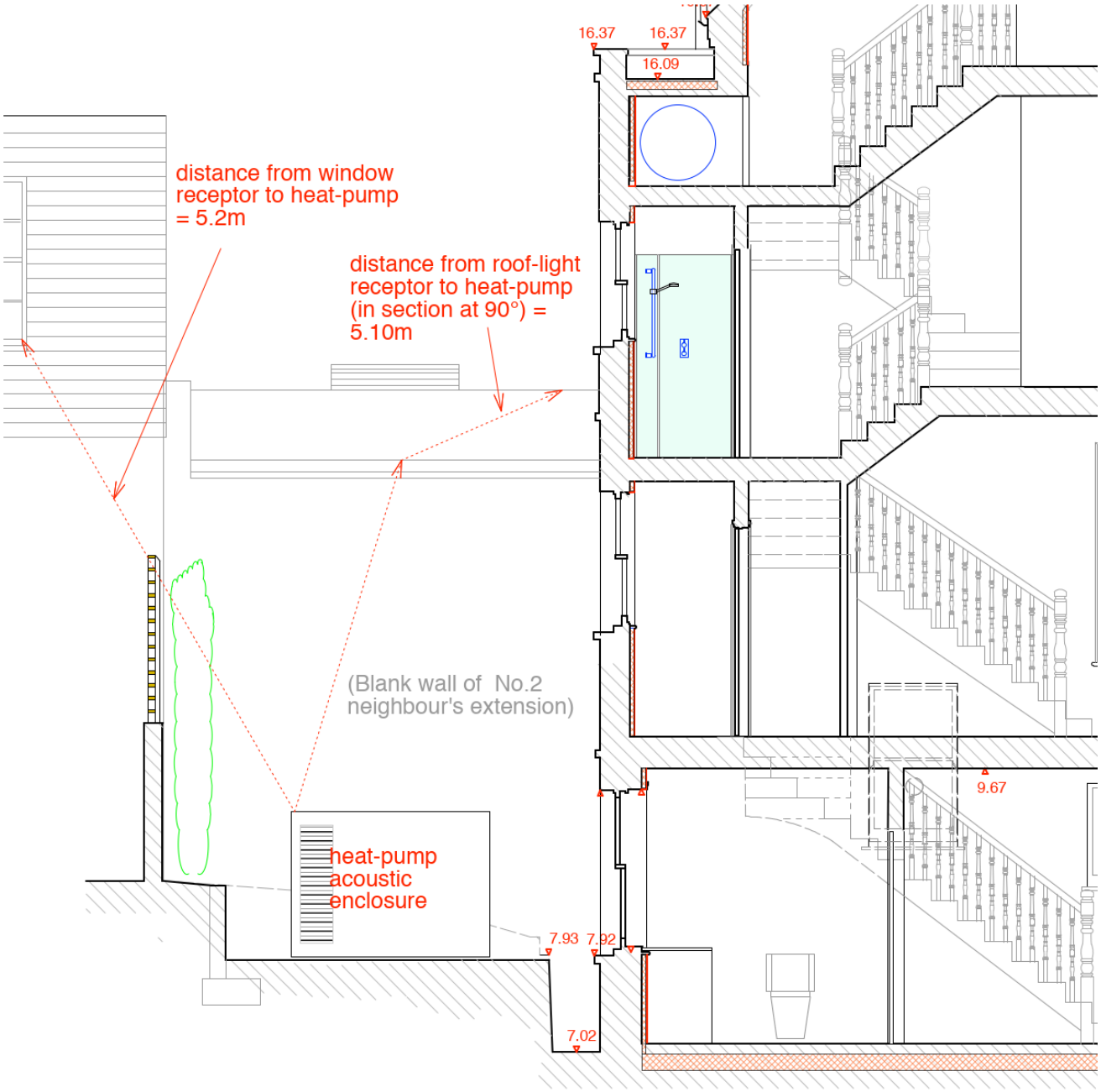
All sound level meters are Class 1 and within 2 years of their most recent laboratory calibration. Calibration certificates are available on request.

APPENDIX H: Proposed Mechanical Layout

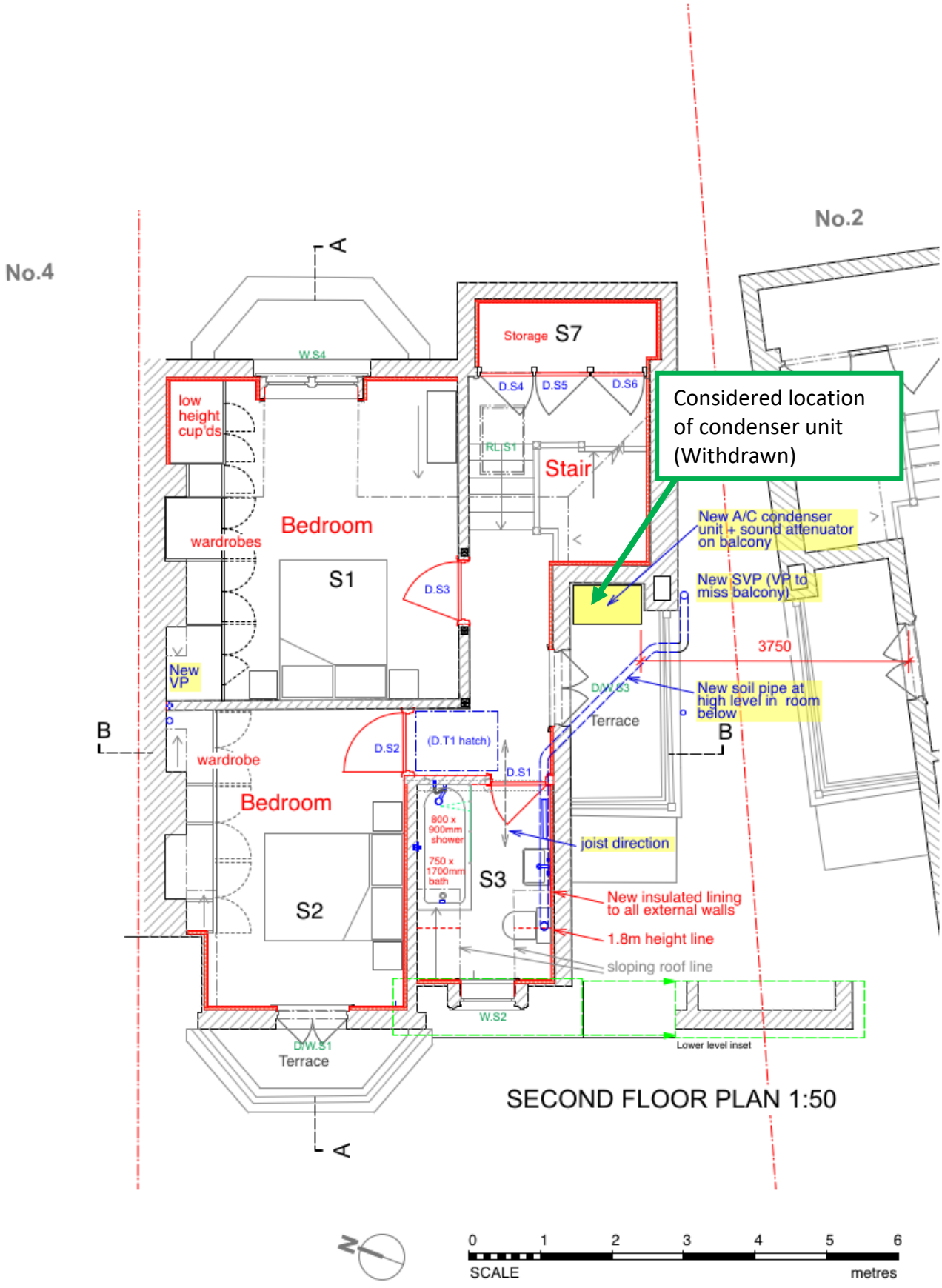
Proposed ASHP Unit: Mitsubishi Electric PUZ-WM112VAA(-BS)



Proposed ASHP Unit: Mitsubishi Electric PUZ-WM112VAA(-BS) (continued)



Second Unit Considered: Samsung AJ100TXJ5KG/EU



APPENDIX I: Manufacturer's Data

Proposed ASHP Unit: Mitsubishi Electric PUZ-WM112VAA(-BS)

OUTDOOR UNIT		PUZ-WM112VAA(-BS)
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++
	η_s	134%
	SCOP (MCS)	3.34
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A+++
	η_s	191%
	SCOP (MCS)	4.74
HEAT PUMP COMBINATION HEATER - Large Profile*1	ErP Rating	A+
	η_{wh}	148%
HEATING*2 (A-7/W35)	Capacity (kW)	11.2
	Power Input (kW)	3.73
	COP	3.00
OPERATING AMBIENT TEMPERATURE (°C DB)		-25 ~ +35
SOUND DATA*3	Pressure Level at 1m (dBA)	45
	Power Level (dBA)*4	60
WATER DATA	Pipework Size (mm)	28
	Flow Rate (l/min)	32
	Water Pressure Drop (kPa)	24.0
DIMENSIONS (mm)	Width	1050
	Depth	480
	Height	1020
WEIGHT (kg)		119
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz
	Phase	Single
	Nominal Running Current [MAX] (A)*5	10.9 [28]
	Fuse Rating - MCB Sizes (A)*6	32
REFRIGERANT CHARGE (kg) / CO_2 EQUIVALENT (t)	R32 (GWP 675)	3.0 / 2.03

Notes:
*1 Combination with E*PT20X Cylinder
*2 Under normal heating conditions at outdoor temp: -7°CDB / -8°CWB, outlet water temp 35°C, inlet water temp 30°C.
*3 Under normal heating conditions at outdoor temp: 7°CDB / 6°CWB, outlet water temp 55°C, inlet water temp 47°C as te
*4 Sound power level tested to BS EN12102.
*5 Under nominal heating conditions at outdoor temp: 7ºC, outlet water temp: 35ºC.
*6 MCB Sizes BS EN60898-2 & BS EN60947-2.
η_s is the seasonal space heating energy efficiency (SSHEE) η_{wh} is the water heating energy efficiency

Second Unit Considered: Samsung AJ100TXJ5KG/EU

8. Sound Data

Sound Power level

8-3. Outdoor unit

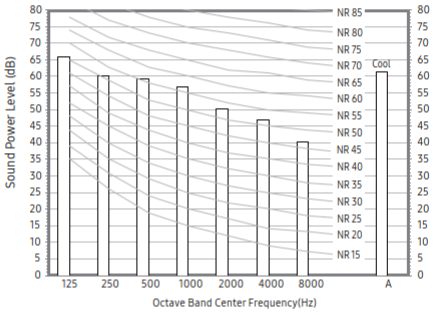
Unit: dB(A)

Model	Cooling
AJ068TXJ3KG/EU	64
AJ080TXJ4KG/EU	64
AJ100TXJ5KG/EU	70

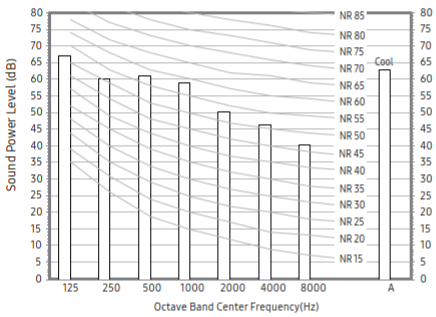
NOTE

- Specifications may be subject to change without prior notice
  - Sound power level is an absolute value that a sound source generates.
  - dBA = A-weighted sound power level.
  - Reference power : 1pW.
  - Measured according to ISO 3741.

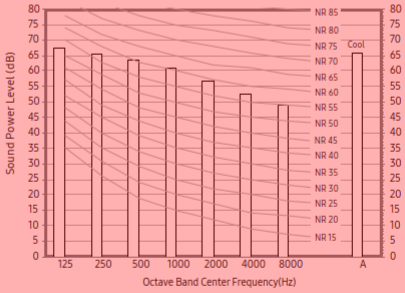
4) AJ068TXJ3KG/EU



5) AJ080TXJ4KG/EU



6) AJ100TXJ5KG/EU



Example of Acoustic Enclosure for ASHP unit e.g. Environlite T3-1350

environ™

Tel: 0870 383 3344
www.environ.co.uk

SELECTION MATRIX

environlite T3-1350

Acoustic enclosures for Split AC Unit Applications

CUSTOMER:	SITE / LOCATION / REFERENCE

ORIGINAL EQUIPMENT MANUFACTURERS PUBLISHED DATA

MAKE, MODEL, DIMENSIONS, AIR FLOW & SOUND PRESSURE LEVEL @1.0M FREE FIELD

MAKE:	MODEL:	AIR IN	AIR OUT
Mitsubishi Electric	PUZ-WM112VAA	Front & 1 Side	Rear

WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	AIRFLOW (M^3S^{-1})	Sound Power dB(A)	DISTANCE (M)
1050	460	1020	1.28	60	1

INNER CUBE DIMENSIONS		
1100	600	1235
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.28	1.0	45
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

ENCLOSURE DETAIL		
1850	1100	1350
WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
1.28	1.0	42-45
AIRFLOW (M^3S^{-1})	DISTANCE (M)	SPL dB(A)

INLET AIRWAYS		
1235	300	1
WIDTH (MM)	HEIGHT (MM)	NO.

DESIGN CRITERIA		
OK	OK	OK
UNIT SIZE	OUTLET	INLET

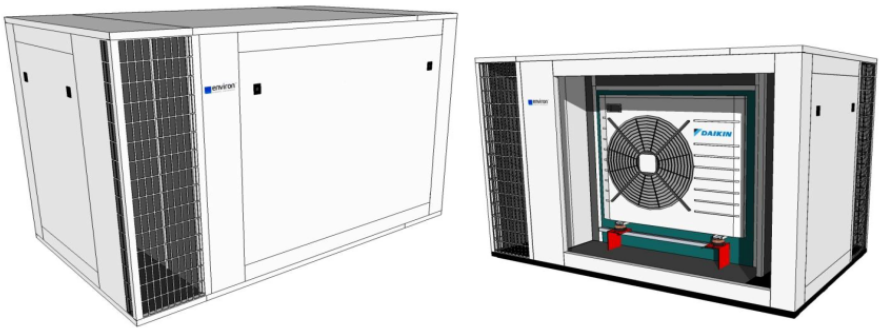
OUTLET AIRWAYS		
300	1235	1
WIDTH (MM)	HEIGHT (MM)	NO.

AIRFLOW INFORMATION		
14	3.5	3.5
PD (NM^{-2})	OUTLET (MS^{-1})	INLET (MS^{-1})

Select Inlet & Outlet Airway Sizes to Ensure Airflows are kept Below 6.0m/s

ENCLOSURE INFORMATION	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)
INLET AIRWAY	300		1235
OUTLET AIRWAY	300		1235
INDICATIVE EXTERNAL SIZE	1850	1100	1350
INDICATIVE SOUND LEVEL RANGE @ 1.0m (FREE FIELD)	42-45	SPL dB(A) SOUND PRESSURE	

NOTES CONCERNING ENCLOSURE DESIGN
Enclosure weight 140kg
Estimated airflow



Environ acoustic designs are protected under patent

The information contained in this Selection Matrix is Confidential and shall not be disclosed or used for any unauthorised purposes

environ

SPECIFICATION OF COMPONENTS

ENVIRON ELV ACOUSTIC ENCLOSURE – Air Conditioning & Heat Pumps

Environ ELV is a proprietary high performance acoustic housing specifically designed to DIN ISO 8015 standards.

Acoustic housing consists of the following components.

1) Intake & Discharge Airways
2) Ventilation Grilles
3) Acoustic Foam
4) Plenum Panels
5) Anti-Vibration Mounts
6) Drain Tray
7) Standard RAL7015 (can be specified)

Enclosure Construction

Acoustic enclosure panels are fabricated in Zintec Cold Rolled sheet steel to DIN ISO 9001 manufacturing standards. All exterior panels have a Polyester Powder Coat finish. All relevant internal faces have 25mm FT-70 high performance acoustic foam applied.

Structure Walls/Panels

All external & Internal panelling is fabricated using 1.8mm galvanised steel sheet applied with 40mm FT-70 high performance acoustic foam.

Anti-Vibration Base Assembly

M8 30x20 Anti-vibration mounts integrated into base design.

ELV Enclosure System – Acoustic Performance

Octave Band Centre Frequency Hz	63	125	250	500	1k	2k	4k	8k
Insertion Loss dB	10	12	18	27	34	36	36	37

In-situ sound reduction performance 18-22dBA (free field)

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APPENDIX J: Acoustic Feature Correction

Tonality
For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity
A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

I**ntermittency**
When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Other sound characteristics
Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

A rating penalty has been established based on a subjective assessment of characteristics. Penalties have been applied based on GSAD's previous experience of similar plant units.

APPENDIX K: Glossary of Acoustic Terms

DECIBEL (dB) - A unit of sound pressure measurement
Sound Pressure Level in dB (*L*p) = 20 log (Measured sound pressure/Reference sound pressure = 20 µPa)

dB(A) - The A -weighted sound pressure level, the weighting network reduces low frequency sound in a similar way to the human ear.

REVERBERATION TIME (RT or *T*) – decay of sound in rooms
The time taken for a sound, once terminated, to fall through 60dB i.e. to one millionth of its original sound intensity. *T*30 – RT for first 30dB of decay. RT_{500} - Mid frequency RT.

HERTZ (Hz) - a unit of frequency measurement. The normal range of hearing is from 20Hz to about 15kHz.

ABSORPTION COEFFICIENT – degree to which a material absorbs sound.
The ratio of absorbed to incident sound energy (perfect absorber = 1)

SOUND REDUCTION INDEX *R* – quantity which describes a material's ability to reduce the sound pressure level across it (e.g. a wall or floor)

$R = L1 - L2 + 10\log (S/A)$

*L*1 - Average sound pressure level in source room (averaged from 100 Hz – 3150 Hz)
*L*2 - Average sound pressure level in receiving room (averaged from 100 Hz – 3150 Hz)
S – Wall Area (m^2)
A – Total absorption in receiving room (m^2 units)

***R*w** – weighted sound reduction index

AVERAGE ROOM TO ROOM LEVEL DIFFERENCE – *D*, dB = *L*1 – *L*2, averaged 1/3 octave bands from 100Hz – 3150kHz.

***D*w** – weighted value of D (usually 2 - 3dB higher)

***D*nT, w** – *D*w corrected for reverberation time of receiving room

NOISE RATING CURVES (NR CURVES) – set of curves used to describe optimum background noise levels for different tasks.

***L*10/90 LEVEL (dB)** - The level in dB of a time varying sound pressured level (e.g. traffic) exceeded for 10%/90% of the time of measurement.
*L*90 is usually called the BACKGROUND NOISE LEVEL.

***L*eq AVERAGE SOUND PRESSURE LEVEL** – level dB of a time varying sound pressure level with equal amounts of energy above and below it, for the time of measurement.

TONAL NOISE – noise of a single frequency (or a narrow band of frequencies that can be perceived as a tone), audible above the broad band noise background. Noise which is at least 5dB above the average of the 1/3 octave band sound pressure levels immediately on either side of it.