Woodleys Estate GSHP

Noise Impact Assessment Report 1543.NIA.02

For

Woodleys Estate Limited

Woodstock

Oxfordshire

OH20 1HJ

07 March 2024

By

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Tables and Figures

Table 1. Author Qualifications

Report		Name and Position	Relevant Qualification
Undertaken and Prepared By	[redacted]	David Fernleigh Principal	MIOA
Checked By	[redacted]	David Fernleigh Principal	MIOA

This report has been prepared with al[redacted]oustics for the Client named. Calculations and estimates made in this report are based on reasonable assumptions and good industry practice that, by their nature, involve uncertainties that could cause future on site results to differ materially from those predicted. dBA Acoustics does not guarantee of warrant any calculation or estimate made. The information contained herein is the property of, and confidential to, the Client. Any third-party information required and/or provided for the completion of this report should not be considered as verified by dBA Acoustics, unless otherwise stated.

1.0 INTRODUCTION

1.1 Along with the main house and cottages, Woodleys Estate incorporates various outbuildings and agricultural barns. It is proposed to utilize one of the existing modern barns for an Energy Centre with the installation of ground source heat pumps.

1.2 The site is in a rural area with residential properties some distance away (>200m).

1.3 dBA Acoustics have been commissioned to undertake a noise impact assessment in accordance with available guidelines in order to demonstrate the noise impact of proposed plant and if/where necessary, provide recommendations for mitigation.

1.4 This report concerns the assessment and/or control of atmospheric noise and/or vibration affecting neighbouring noise sensitive property for the purposes of planning. Detailed mechanical, structural, H, S&E and conservation considerations are beyond the expertise of this practice and should dealt with by the relevant professional service providers.

1.5 Where sound pressure levels are quoted, they are in decibels ref: 2 x 10-5 Pa. Where sound power levels are quoted, they are in decibels ref: 1 x 10-12 W, unless otherwise indicated.

2.0 SUMMARY

2.1 An automated environmental noise survey has been undertaken at the site across a 6day period that included a weekend.

2.2 The prevailing ambient and background sound levels have been established and the representative background sound determined.

2.3 Based on information received concerning the proposed ground source heat pumps noise impa from plant is predicted to be low and commensurate with the proposed criteria of at leas below the prevailing background sound level.

2.4 Based on the proposals, survey data it has been demonstrated that the likely noise from the ground source heat pumps should not lead to an adverse noise impact.

2.5 Based on the assessment undertaken it is expec ted that conditional planning permission sh ould be granted.

2.6 The proposals are subject to final approval of the Local Authority

3.0 SITE

3.1 The map below shows the location of the development site within the context of the general area:

Figure 1. Site Location - Map Data © OpenStreetMap 2023

3.2 The existing site plan excerpt below shows the application site, approximate location of the environmental noise survey monitoring positions 1, 2 and 3; the proposed event area and nearest adjacent residential receptors:

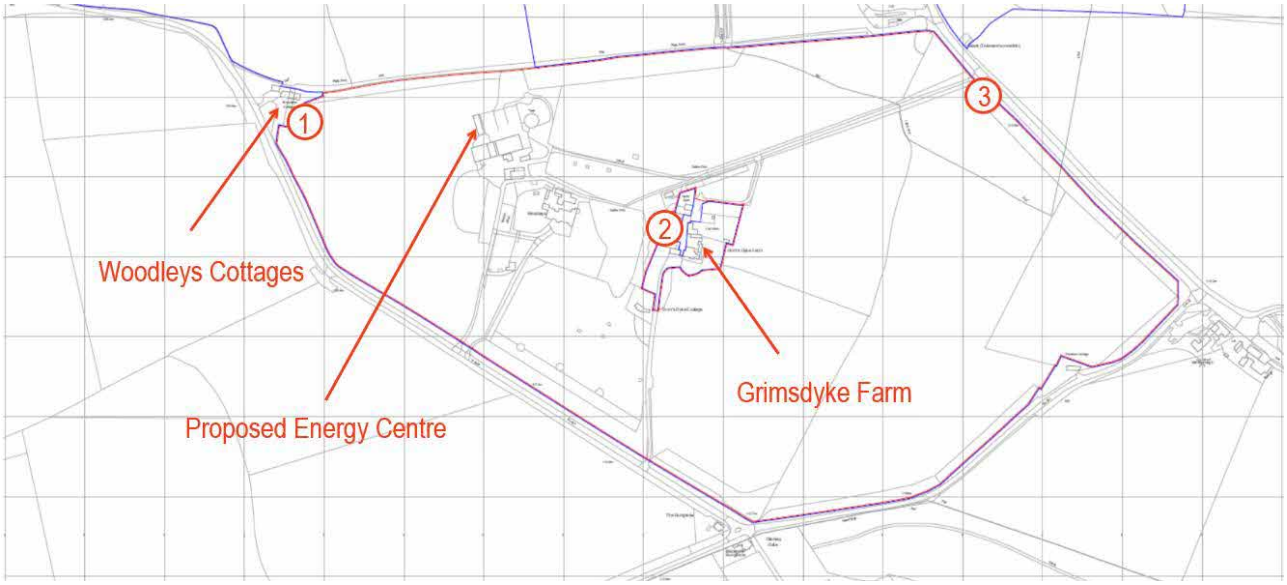


Figure 2. Environmental Noise Monitoring Positions and Nearest Adjacent Residential Receptors

4.0 SURVEY

4.1 An automated environmental noise survey was undertaken over a 6day period at the site that included a weekend.

4.2 The full methodology and results of the environmental noise survey are contained witl appendix.

5.0 RESULTS

5.1 Time history graphs presenting the automated environmental survey mea within Appendix B. A temporary fault caused periods of overload at position 1, these data have been excluded from the analysis. Full raw data is available upon request.

5.2 The following table provides a summary of the range of prevailing L_{A90} background sound levels measured over the survey period:

Table 2. Range of Prevailing Background Sound Level

Time period	Range of Measured $L_{A90,15min}$		
	Position 1	Position 2	Position 3
Day 07:00 – 19:00	29 - 51	31 - 49	35 - 57
Evening 19:00 – 23:00	25 - 52	23 - 47	30 - 57
Night 23:00 – 07:00	18 – 51	20 - 45	20 - 49

5.3 The following table provides a summary of the statistically most common L_{A90} background sound levels measured over the survey period:

Table 3. Statistically Most Common Background Sound Level

Time period	Statistically Most Common Measured $L_{A90,15min}$		
	Position 1	Position 2	Position 3
Day 07:00 – 19:00	41	37	47
Evening 19:00 – 23:00	28	29	40
Night 23:00 – 07:00	27	20	26

5.4 Considering both the range and most commonly occurring L_{A90} levels the following table provides a summary of the background sound levels considered to be representative. For full analysis see figures in Appendix C:

Table 4. Adopted Representative Background Sound Level

Time period	Representative Background Sound $L_{A90,15min}$		
	Position 1	Position 2	Position 3
Day 07:00 – 19:00	40	37	44
Evening 19:00 – 23:00	28	29	34
Night 23:00 – 07:00	19	20	26

5.5 The typical average ambient sound level across the survey duration at each of the measurement positions is given in the following table:

Table 5. Prevailing Ambient Sound Level

Time period	$L_{Aeq,T}$		
	Position 1	Position 2	Position 3
07:00 – 23:00	49	46	66
19:00 – 23:00	46	41	62
23:00 – 07:00	33	32	56

6.0 CRITERIA

BS EN ISO 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

6.1 For noise emissions from items of fixed plant the most appropriate guidance is considered to be that provided by BS4142:2014 and later updates.

6.2 In the assessment of commercial sound, BS4142: 2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound is a key guidance document. The standard methodology that considers the likely impact of a commercial or industrial noise source measured and/or predicted against the acoustic environment. Corrections are given for times, duration and the presence of acoustic feature characteristics that could make the sound intrusive

6.3 The magnitude of the corrections that can be applied to the noise in question are dependent upo its severity/prominence. A penalty of between 0dB to +3dB may be applied for soun intermittent; 0dB to +6dB for sound that is tonal and 0dB to +9dB for sound that is impulsive. The maximum levels are applied where the acoustic feature is highly perceptible. The corrections a additive with the maximum correction being +15dB in any given case.

6.4 The standard states that generally, the greater the margin by which the specific sound emer above the background sound level, the greater the magnitude of impact.

6.5 Guidance is given on the assessment of impact as follows:

A difference of around +10dB or more is likely to be an indication of a significant adve impact, depending on the context.

A difference of around +5dB or more 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 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.

6.6 For this project it is recommended that the rating level of the combined noise emissions from items of fixed plant do not exceed a level that is more than 5dB below the representative background sound level, as shown in the following table:

Table 6. Proposed Rating Level Noise Emission Limit

Time period	Rating Level Noise Emission Limit $L_{Aeq,T}$		
	Position 1	Position 2	Position 3
Day 07:00 – 19:00	27	32	39
Evening 19:00 – 23:00	23	24	29
Night 23:00 – 07:00	14	15	21

7.0 ASSESSMENT - GSHP

7.1 It is understood that ground source heat pumps are proposed for location within an energy centre. The energy centre is proposed within an existing single storey modern barn building that can be enhanced as necessary to control noise egress. The location of the proposed energy centre is indicated on the site plan excerpt below:

Figure 3. Energy Centre Location

7.2 It is understood that the main noise producing items for location within the energy centre are as follows:

2 x 60 kW ground source heat pumps with a maximum sound power level output of 71dB
1 x 86kW ground source heat pump with a maximum sound power level output of 72dB

7.3 Preliminary calculations have been undertaken to determine the internal reverberant noise level within and likely noise egress from the energy centre. The following table summarizes the predicted noise impact at the nearest receptors assuming a nominal lightweight timber structure (i.e. no less than 18mm plywood and assuming no untreated openings). Full calculations can be found within the Appendix.

Table 7. Preliminary Plant Noise Assessment

Plant Noise Assessment – Ground Source Heat Pumps (rounded)					
Receptor	Distance (m)	Predicted Plant Rating Level (dBA)	Prevailing Background Sound Level (dBA)	Difference (dB)	Noise Impact
Woodleys Cottages	220	11.0	19.0	-8	Low
Grims's Dyke Farm	250	6.0	20.0	-14	Low

7.4 The results in the above table demonstrate that the maximum duty noise emissions from the proposed ground source heat pumps are likely to have low noise impact at the nearest receptors and are expected to achieve the proposed criteria of no more than 5 dB below the prevailing background sound level. Full details of the construction of the energy centre are not known at this time but the above assessment is considered sufficient to demonstrate the feasibility of the proposed ground source heat pumps, even provided with minimal mitigation.

8.0 CONCLUSION

8.1 An automated environmental noise survey has been undertaken at the site across a 6day peri that included a weekend.

8.2 The prevailing ambient and background sound levels have been established and the representative background sound determined.

8.3 Based on information received concerning the proposed ground source heat pumps noise impa from plant is predicted to be low and commensurate with the proposed criteria of at leas below the prevailing background sound level.

8.4 Based on the proposals, survey data it has been demonstrated that the likely noise from the ground source heat pumps should not lead to an adverse noise impact.

8.5 Based on the assessment undertaken it is expected that conditional planning permission should be granted.

8.6 The proposals are subject to final approval of the Local Authority

Report end
dBA Acoustics

APPENDIX A – ENVIRONMENTAL NOISE SURVEY METHODOLOGY

Environmental noise monitoring was undertaken for approximately 7days commencing 12:00 on Wednesday 27 September 2023. The prevailing L_{Aeq}, L_{Amax} and L_{A90} levels were logged at 15minute intervals throughout the survey period. The following sound level meters and calibrator were deployed:

Table 8. External Noise Monitoring Equipment Position 1

Northern Boundary	SLM	Preamplifier	Microphone	Calibrator
Manufacturer	Norsonic AS	Norsonic AS	Gras	Norsonic AS
Type	140	1209	40AF	1255
Serial No.	1403413	12821	207390	125525261
Latest Calibration	14/03/2023			25/11/2022
Certificate No.	43668			U42618

Table 9. External Noise Monitoring Equipment Position 2

Southern Boundary	SLM	Preamplifier	Microphone	Calibrator
Manufacturer	Norsonic AS	Norsonic AS	Norsonic AS	Norsonic AS
Type	140	1209	1225	1255
Serial No.	1405948	15806	212903	125525261
Latest Calibration	08/07/2022			25/11/2022
Certificate No.	41444			U42618

Table 10. External Noise Monitoring Equipment Position 3

Inside Unit	SLM	Preamplifier	Microphone	Calibrator
Manufacturer	Norsonic AS	Norsonic AS	Norsonic AS	Norsonic AS
Type	140	1209	1225	1255
Serial No.	1405947	15793	355507	125525261
Latest Calibration	08/07/2022			25/11/2022
Certificate No.	41442			U42618

The calibration of the sound level meters used complies with IEC 61672-3:2006 class 1.

At position 1 the sound level meter was installed at the boundary with Woodleys Cottage residential property to the northwest. The microphone was pole mounted at a height of approximately 2.0m and positioned in freefield conditions. Position 1 was selected to determine the ambient and background noise levels at the nearest residential receptor to the northwest.

At position 2 the sound level meter was installed at the boundary with Grimsdyke Farm residential property to the east. The microphone was pole mounted at a height of approximately 2.0m and positioned in freefield conditions. Position 2 was selected to determine the ambient and background noise levels at the nearest residential receptor to the east.

At position 3 the sound level meter was installed at the boundary with the A44 to the east. The microphone was pole mounted at a height of approximately 2.0m and positioned in conditions. Position 3 was selected to determine the ambient and background noise le locations adjacent to the A44.

Monitoring positions 1, 2 and 3 were approximately as shown in the site plan below:

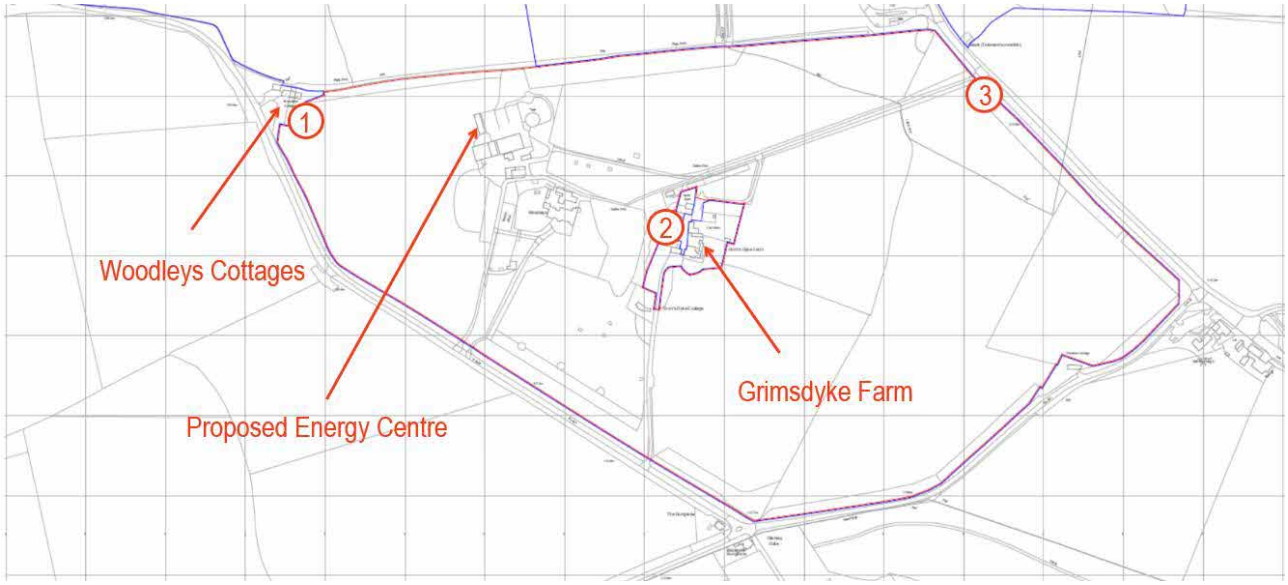


Figure 4. Noise Monitoring Positions– Site Plan

Proprietary windshields and extension cables were deployed. The entire signal path was checked for calibration pre and post survey. The calibrated meter readings pre and post survey indicated no calibration shift greater than 0.2dB.

The following table details the weather conditions at the beginning and end of the survey period:

Table 11. Weather Conditions

Condition	Start	End
Wind Speed ms^{-1}	<3.4	<1.8
Wind Direction (from)	southeast	south
Precipitation or Fog	no	no
Wet Ground	no	no
Frozen Ground or Snow	no	no
Temperature °C	17	16
Cloud Cover %	80	90

The weather conditions over the survey period were varied and included some periods of heavy rainfall. However, in general it is understood that the conditions were predominantly dry with no high winds.

During the manned periods at the beginning and end of the automated survey the prevailing ambient sound was noted to be occasional local and distant road traffic noise and with occasional aircraft fly overs and birdsong.

The measurements at position 1 were affected by an intermittent fault understood to be water vapour affecting the microphone diaphragm that caused the meter to register an overload. These periods can be clearly seen in the time history graphs and have been excluded from the general analysis. The meter is and was in calibration and the readings outside of the overload periods are considered to be accurate. Comparing the results from position 1 with those from position 2 supports this assumption.

The conditions measured or noted above were deemed acceptable for obtaining suitably representative measurements.

APPENDIX B – TIME HISTORY GRAPHS

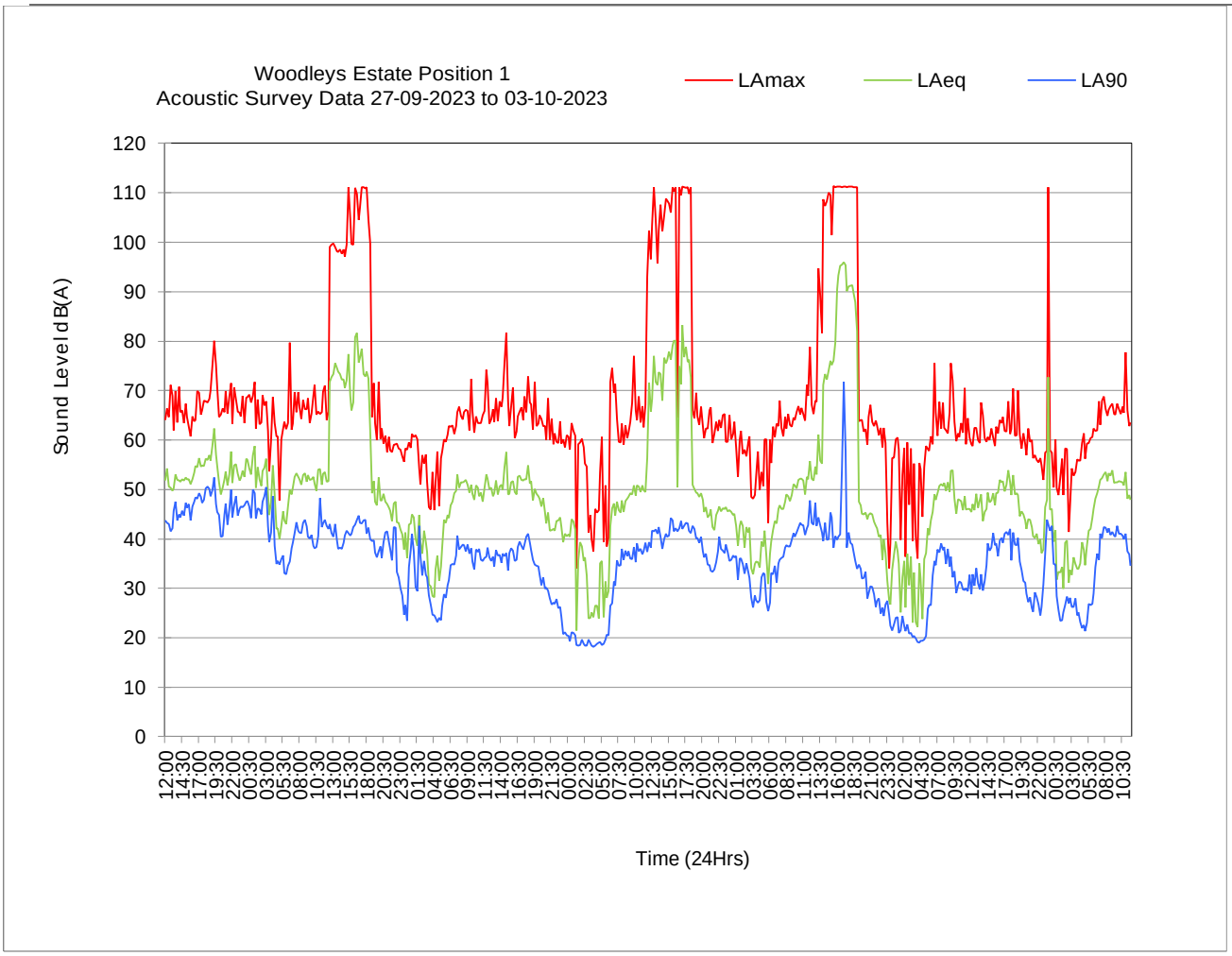


Figure 5. Time History Graph Position 1

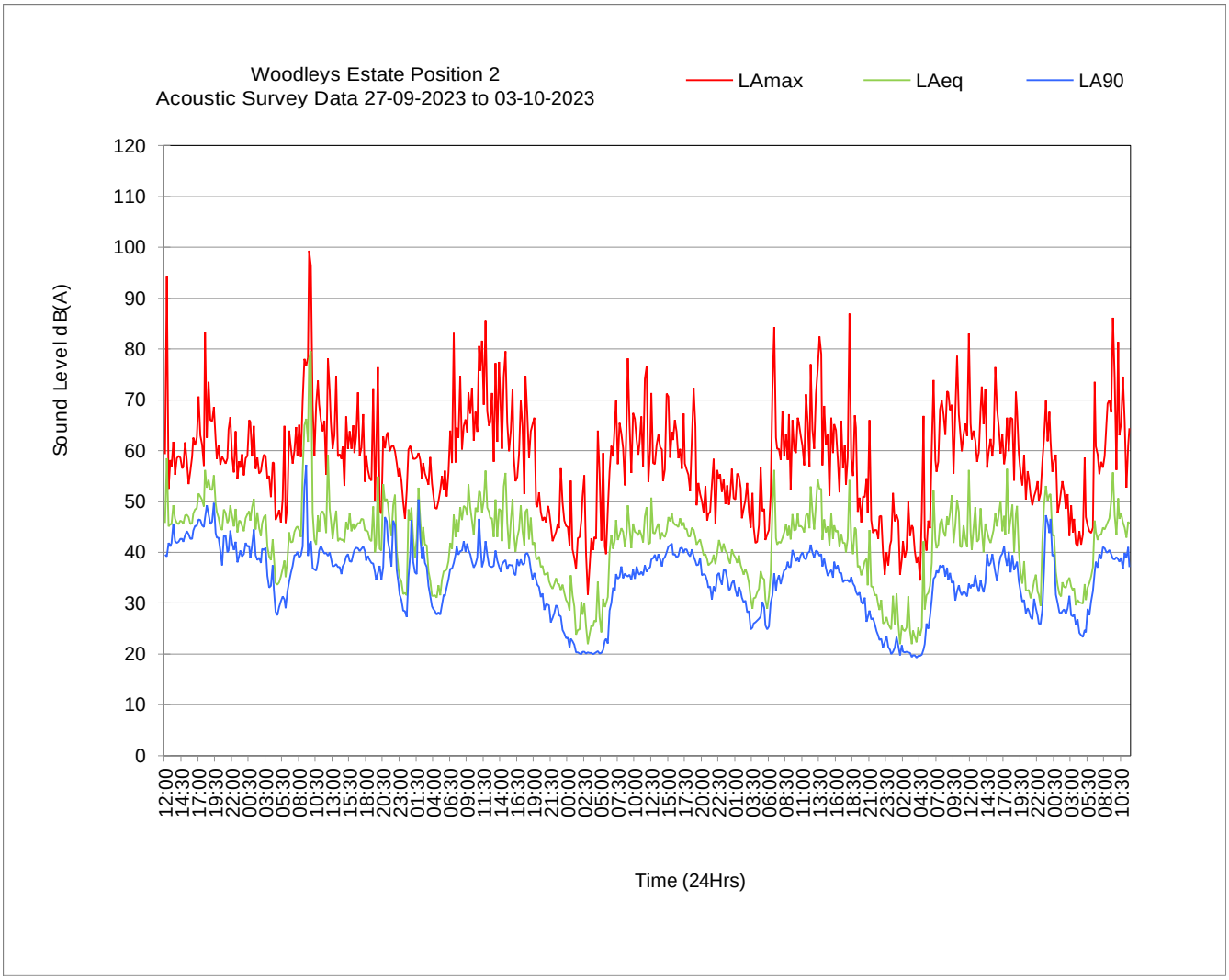


Figure 6. Time History Graph Position 2

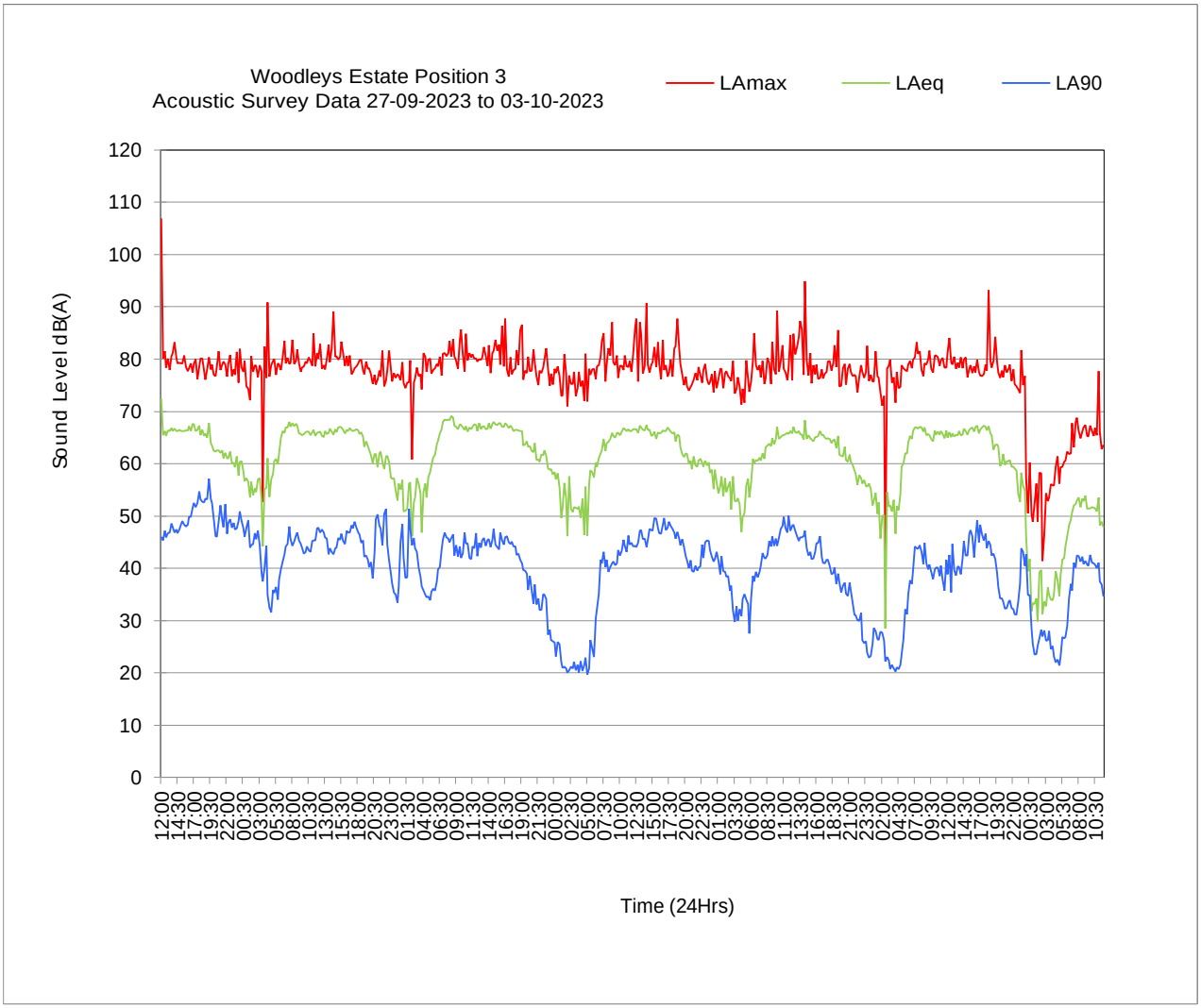
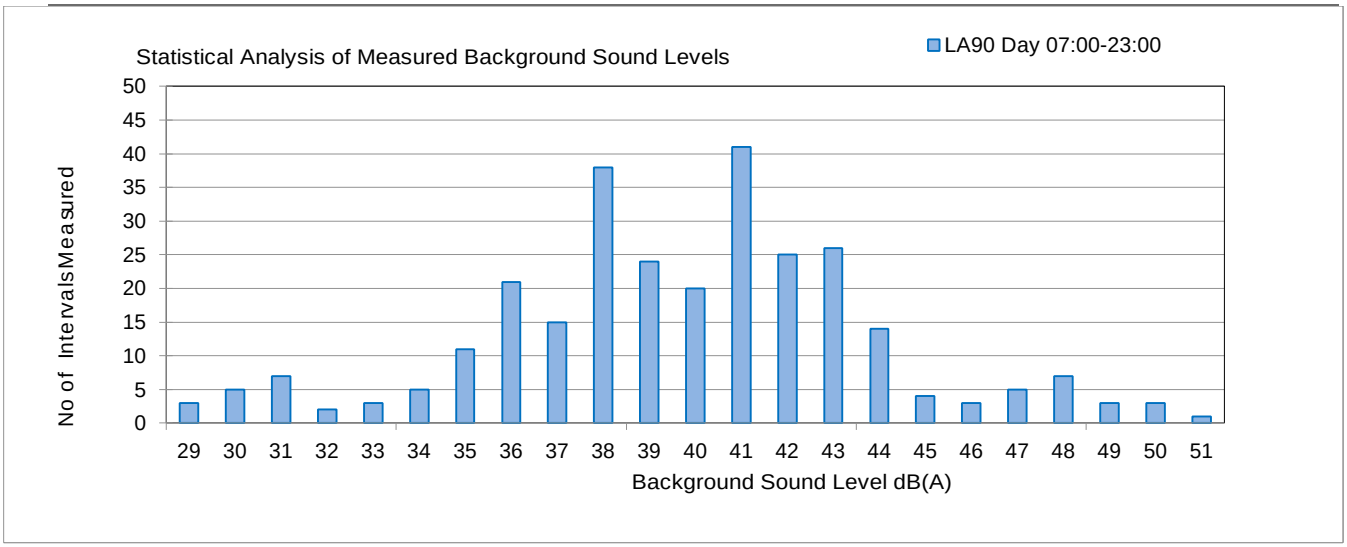
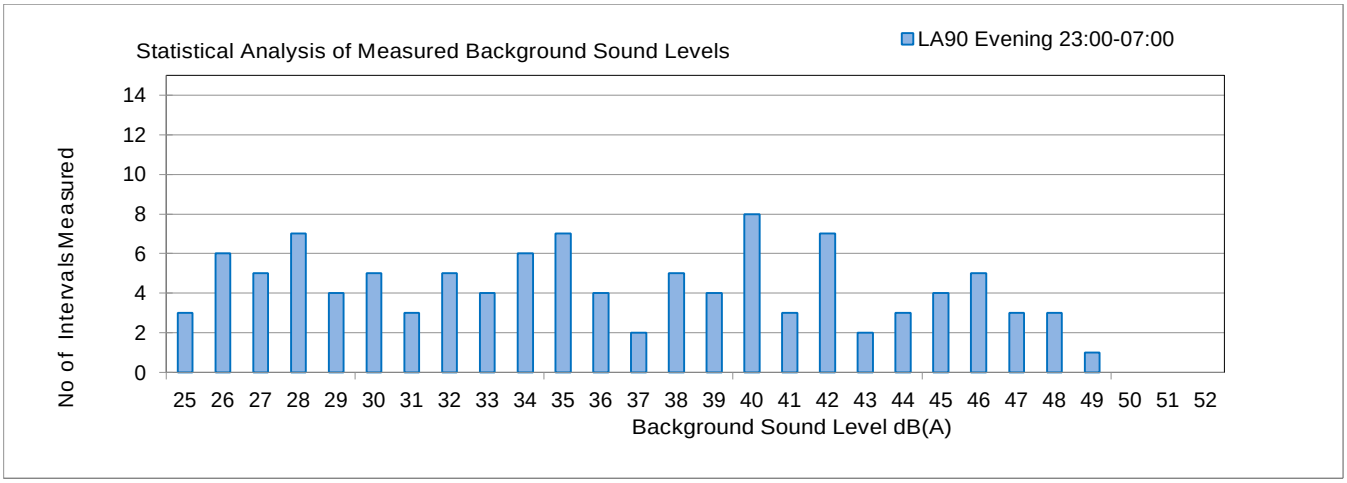


Figure 7. Time History Graph Position 3

APPENDIX C - STATISTICAL ANALYSIS OF BACKGROUND SOUND LEVEL





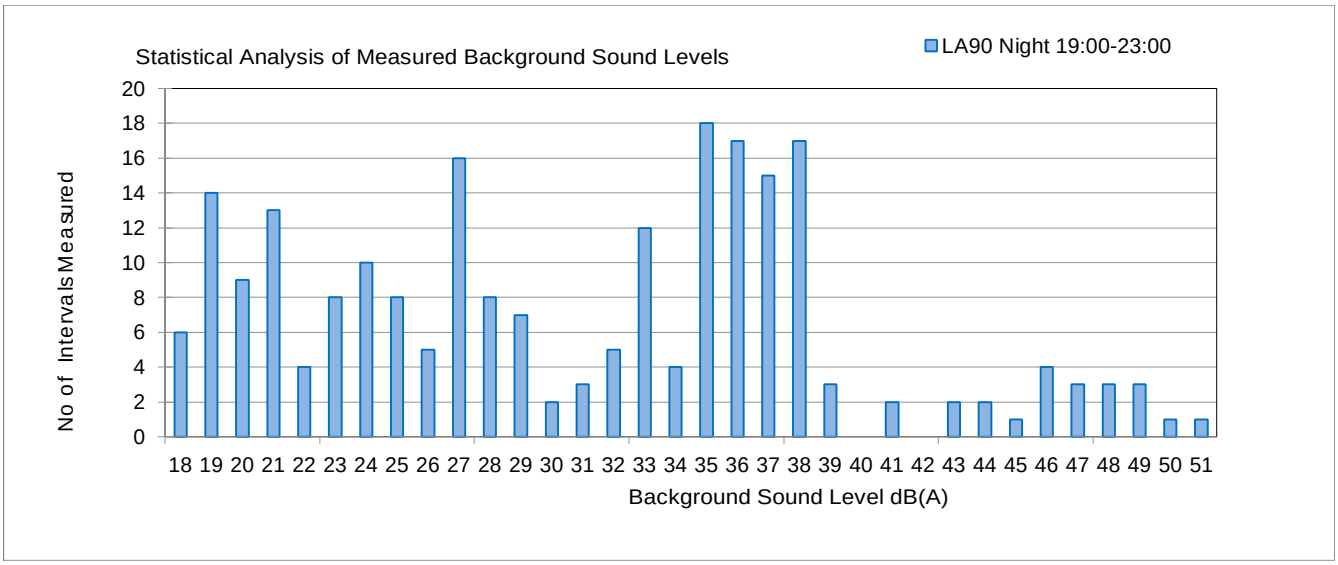
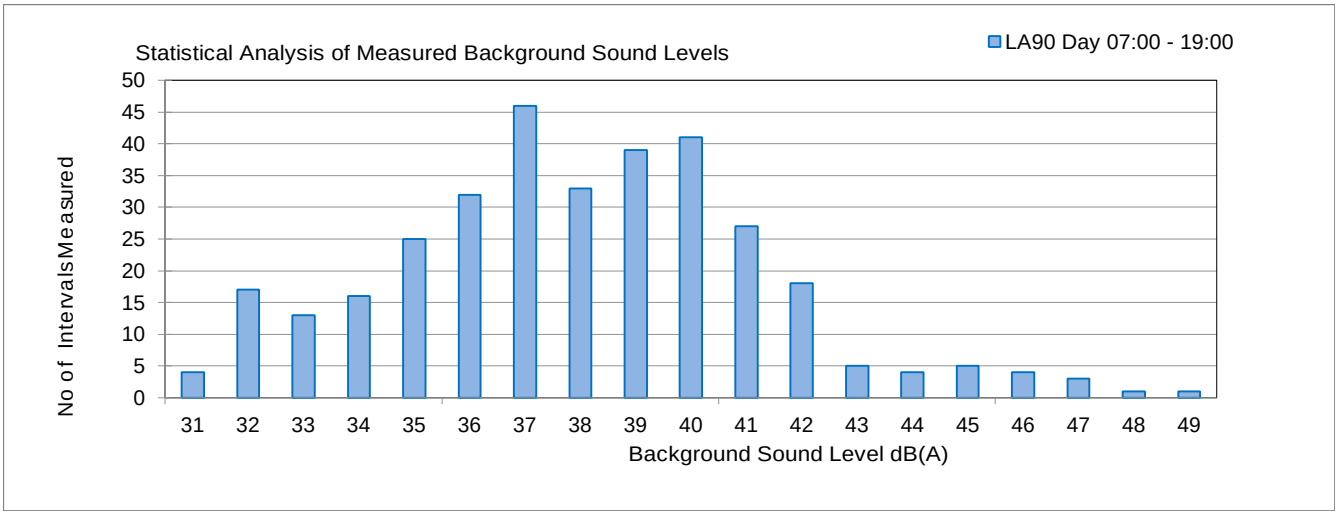
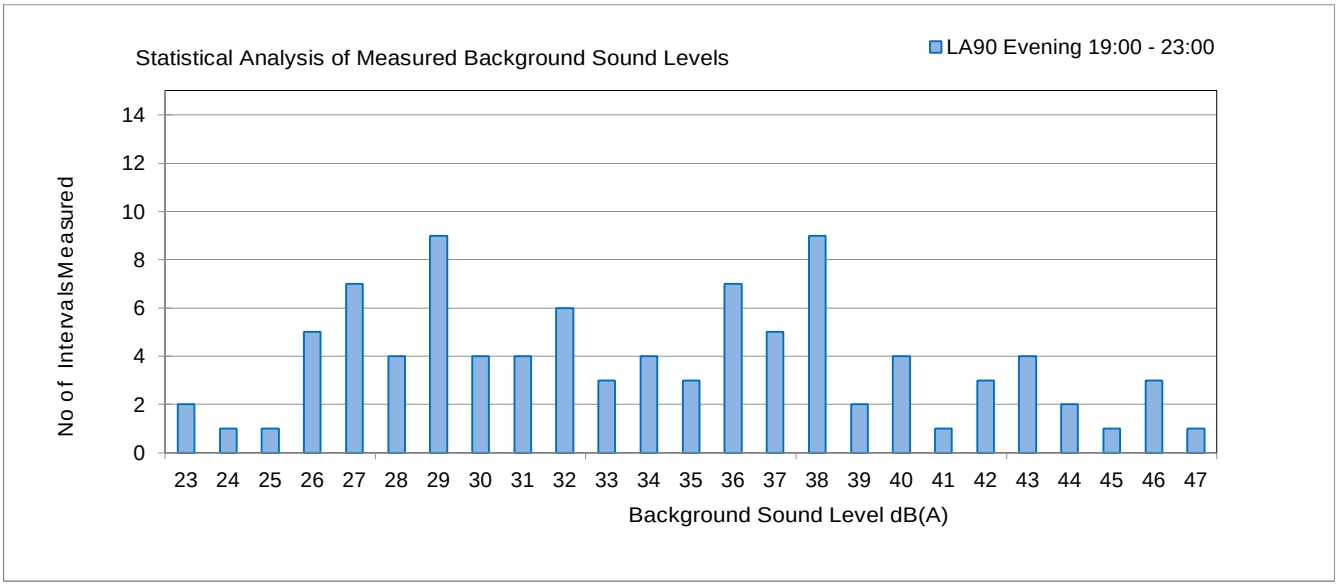


Figure 8 Position 1 - Background Sound Analysis





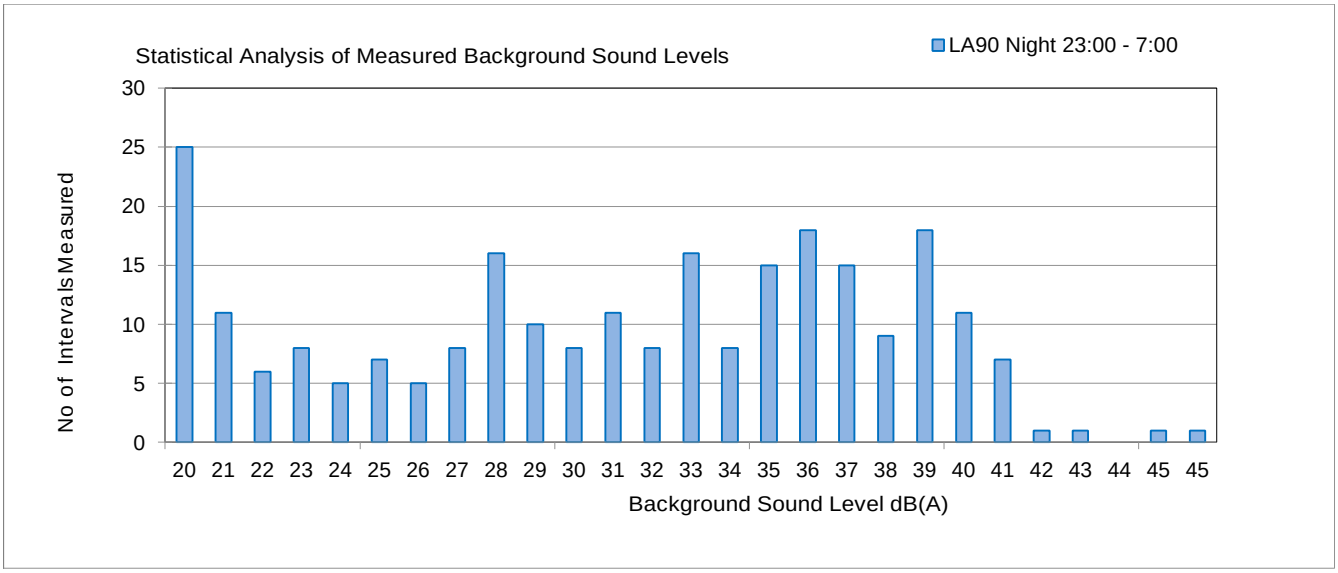
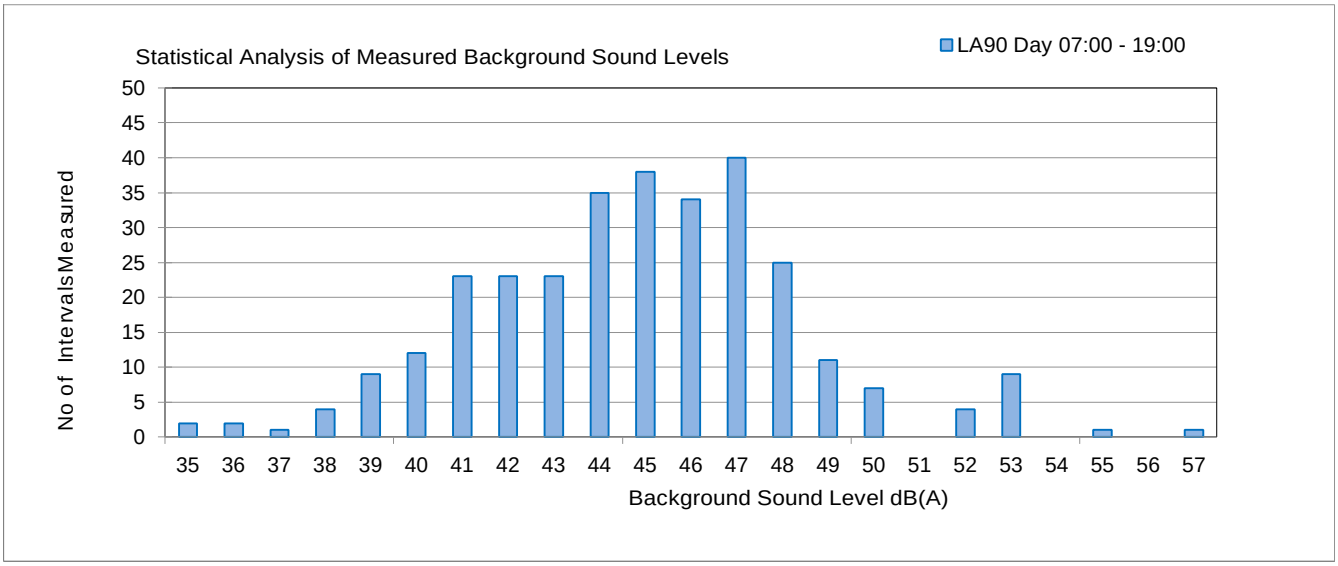
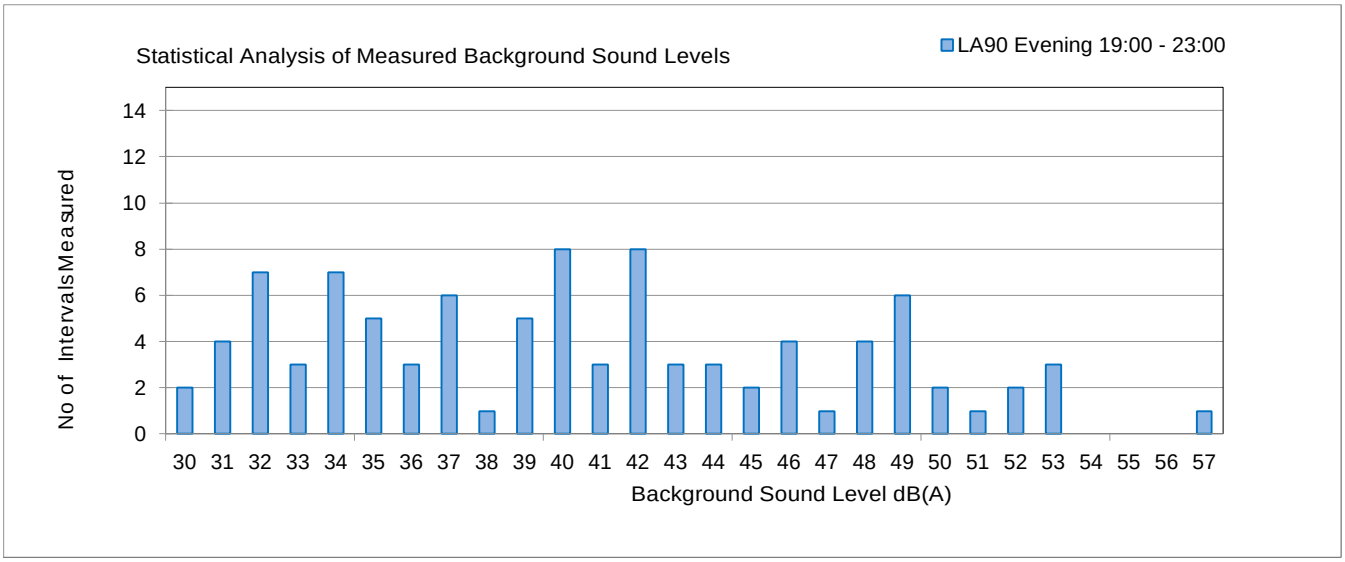


Figure 9. Position 2 – Background Sound Analysis





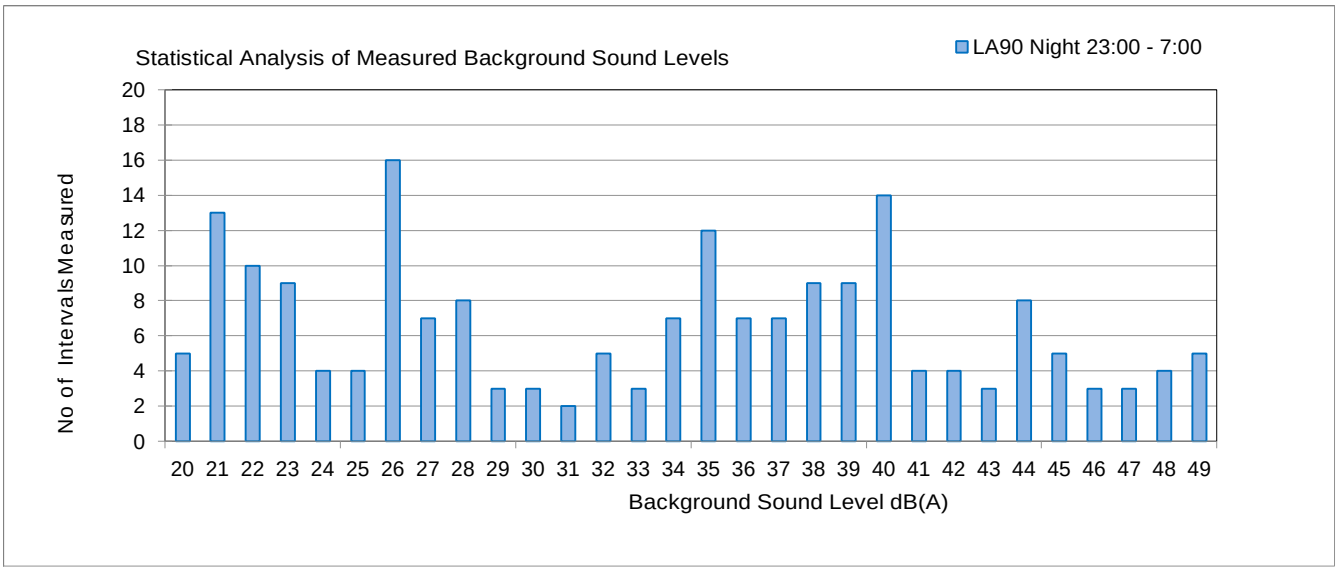


Figure 10. Position 3 - Background Sound Analysis

APPENDIX D - CALCULATIONS

Table 12. GSHP – Worst Affected Receptor (Woodleys Cottages)

	63	125	250	500	1k	2k	4k	8k		
Rev + Direct Lp	65.8	63.4	66.3	68.2	68.0	69.1	71.0	71.0		76.7
Timber Comp SRI	-12	-16	-20	-24	-22	-23	-32	-32		
Surface Area	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0		
Distance	-46.8	-46.8	-46.8	-46.8	-46.8	-46.8	-46.8	-46.8		
Screening	0	0	0	0	0	0	0	0		
Specific Level	13.9	7.5	6.5	4.3	6.1	6.2	-0.9	-0.8		11.2
Acousitc Character										0
Rating Level										11.0
Background										19
Exceedance of Background										-8.0

APPENDIX E – DEFINITION OF TERMS

$L_{Aeq,T}$ is the equivalent continuous A-weighted sound pressure level defined IN BS4142:2014 as the value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.

L_{A90} is the background sound level as defined in BS4142:2014 as the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

L_{Amax} Defined in WHO as the maximum outdoor sound pressure level associated with an individual noise event.

Background Sound Level is the L_{A90}, see above.

BB93 is Building Bulletin 93 "Acoustic Design of Schools: Performance standards" and sets out the minimum performance standards for the acoustics of school buildings.

IANL as defined in BB93 is the indoor ambient noise level within teaching accommodation and is comprised of 30minute LAeq.

Ambient Sound as defined by BS4142:2014 is the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.

Specific Sound as defined by BS4142:2014 is the sound source being assessed.

Residual Sound as defined by BS4142:2014 is the ambient sound remaining at the assessment location when the specific sound is suppressed to such a degree that it does not contribute to the ambient sound.

Rating Level as defined by BS4142:2014 is the specific sound level plus any adjustment for the characteristic features of the sound.

Tonal Characteristic as defined by BS4142:2014 Annex C: For a prominent, discrete tone to be identified as present, the time-averaged $L_{Zeq,T}$ sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged $L_{Zeq,T}$ sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

The level differences between adjacent one-third-octave bands that identify a tone are:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz).

WHO refers to the World Health Organisation.