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ENVIRONMENT

Anesco Ltd

Solar Farm,
St Asaph

Noise Impact Assessment

MCA2211

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Anesco Ltd

Solar Farm, St Asaph

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Noise Impact Assessment

Birmingham
Livery Place, 35 Livery Street, Colmore Business District
Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way
Leeds, LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street
Manchester, M1 3HU
T: 0161 233 4260

Nottingham
5th Floor, Waterfront House, Station Street
Nottingham, NG2 3DQ
T: 0115 924 1100

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04	15/03/2024	S2	Alicia Druce BEng (Hons) AMIOA	Luke Smith BEng (Hons), MIOA / Lucy Elmer BA (Hons) Msc, MIOA	Mike Barrett BSc (Hons) PG Dip MIOA
05	06/03/2025	S2	Alicia Druce BEng (Hons) AMIOA / Megan Gardner MSci (Hons)	Sam Ellwood BSc (Hons) MIOA	Mike Barrett BSc (Hons) PG Dip MIOA
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07	28/04/2025	S2	Alicia Druce BEng (Hons) AMIOA / Megan Gardner MSci (Hons)	Sam Ellwood BSc (Hons) MIOA	Mike Barrett BSc (Hons) PG Dip MIOA

Notice

EXECUTIVE SUMMARY

BWB Consulting was instructed by Anesco Ltd to undertake a Noise Impact Assessment to support a planning application for a proposed solar farm south-west of St Asaph, Denbighshire.

This assessment considers the impact of operational noise and fixed plant associated with the Proposed Development at the Nearest Existing Sensitive Receptors.

A baseline noise survey was undertaken in May 2022, it is considered this survey remains accurate and appropriate, and that there is unlikely to have been any significant change in the noise environment at the Site between 2022 and the time of writing. The subsequent assessment work has been undertaken in accordance with current standards and guidance.

The results of the noise impact assessment indicate that operations associated with the development have the potential to result in a low impact at existing noise sensitive receptors, without mitigation in place.

Based on the results of the assessment, it has been demonstrated that the Site is suitable for the proposed use.

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1. INTRODUCTION

Appointment & Background

1.1 BWB Consulting (BWB) was instructed by Anesco Ltd (The Applicant) to undertake a Noise Impact Assessment for a planning application for a solar farm, at Land at Cefn Meiriadog, St Asaph, Denbighshire (the Site).

1.2 Where appropriate, consideration has been given to noise mitigation measures to demonstrate how an appropriate level of protection could be afforded to existing Noise-Sensitive Receptors (NSRs) within the vicinity of the Site.

1.3 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology can be found in **Appendix A**.

Site Setting

1.4 The Site is located within the administrative boundary of Denbighshire County Council (DCC) and currently comprises open farmland. The Site is situated across two parcels of land. This report considers both parcels as one development Site made up of Parcel A and Parcel B. The location of the Site is shown in **Figure 1**:1.

Parcel A

1.5 To the north, the Site is bordered by an existing dwelling, to the east, south and west the Site is bordered by open farmland with existing dwellings also situated to the east.

Parcel B

1.6 The Site is bordered by open farmland in all directions with existing isolated dwellings also situated in all directions from the Site.

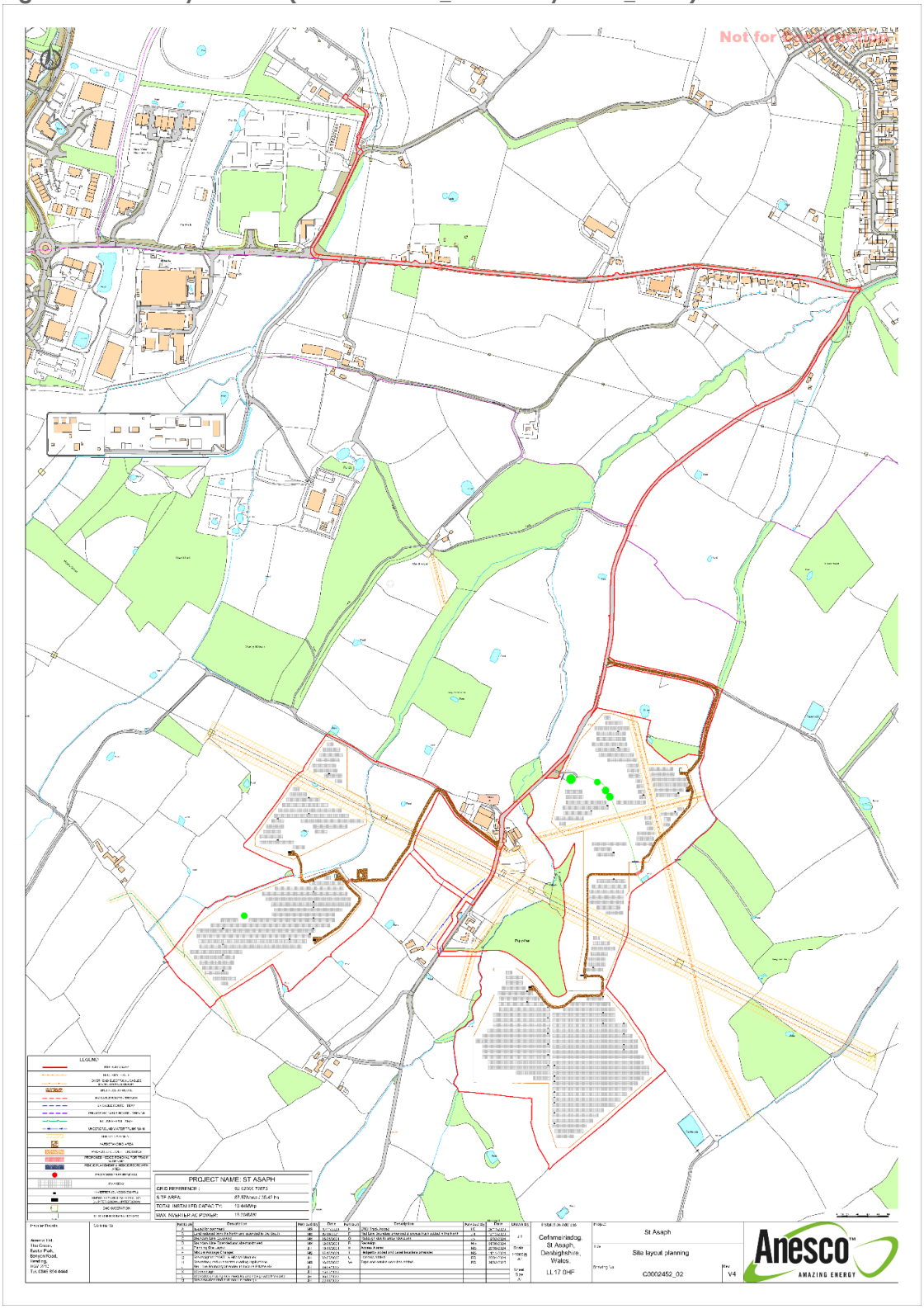
Figure 1:1: Site Location

Proposed Development

1.7 The proposals include for a ground mounted photovoltaic solar farm, together with associated equipment, infrastructure and ancillary works.

1.8 The Site Layout Plan is shown in **Figure 1:2**.

Figure 1:2: Site Layout Plan (ref: C0002452_02 Site Layout PL_RevU)



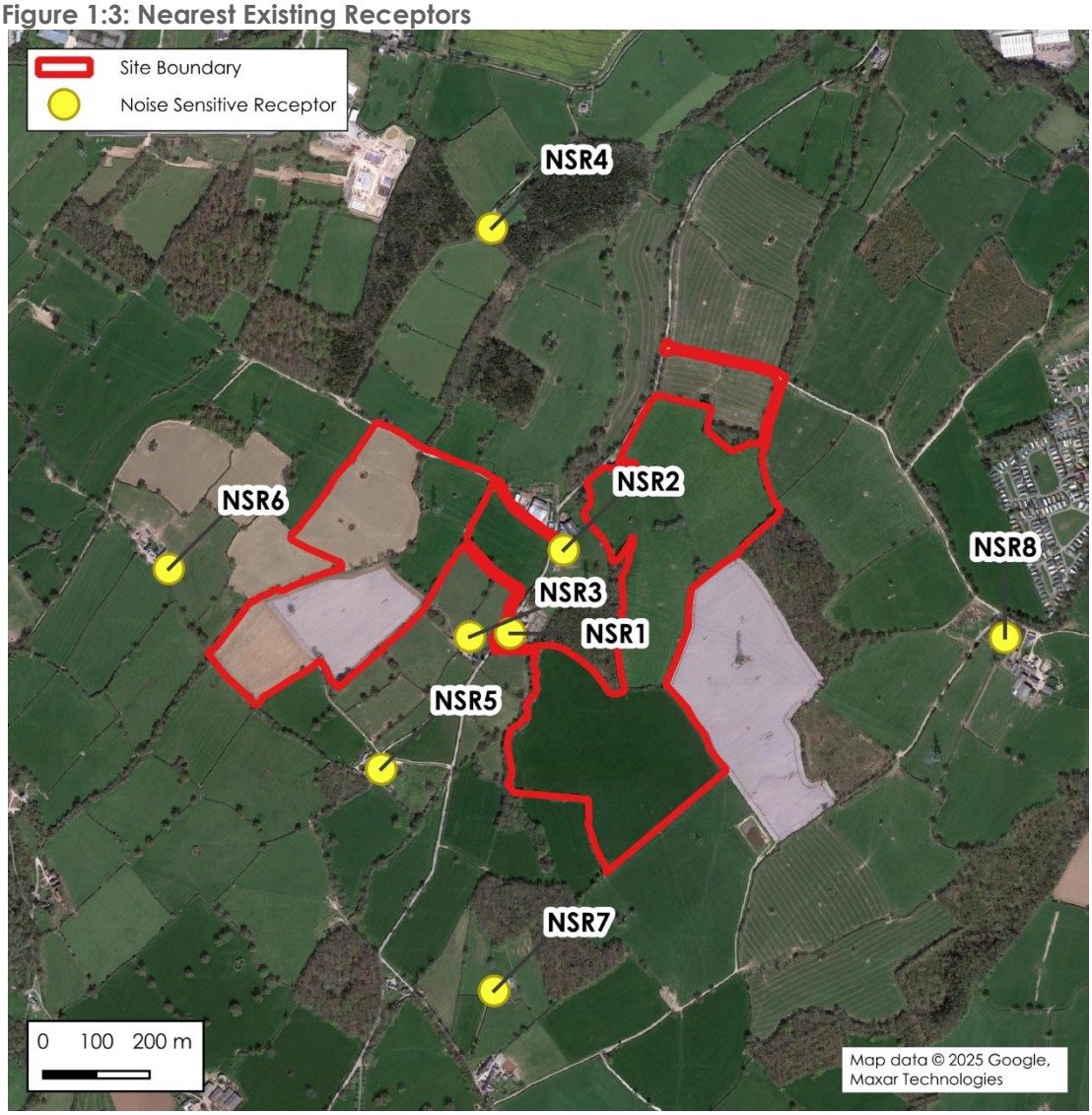
Noise Sensitive Receptors

1.9 The nearest existing Noise Sensitive Receptors (NSRs) are detailed below in **Table 1.1** and are shown in **Figure 1:3.**

Table 1.1: Nearest Noise-Sensitive Receptors

NSR Number	Description	Bearing from Site	Distance from closest Site Boundary
1	Residential Dwelling	Between both Parcels	~15m
2	Residential Dwelling	Between both Parcels	~25m
3	Residential Dwelling	Between both Parcels	~20m
4	Residential Dwelling	North of Parcel A	~380m
5	Residential Dwelling	Between both Parcels	~160m
6	Residential Dwelling	West of Parcel A	~170m
7	Residential Dwelling	South of Parcel B	~290m
8	Residential Dwelling	East of Parcel B	~485m

Figure 1:3: Nearest Existing Receptors



1.10 The remaining NSRs are located further from the Site boundary, and therefore any impact is likely to be less than at those stated above.

2. STANDARDS AND GUIDANCE

Planning Policy Wales (PPW)

2.1 Planning Policy Wales, last updated in February 2024, details the land use planning policies for Wales, to ultimately contribute to sustainable development through a well-functioning planning system. As part of this, exposure to and mitigation against noise pollution is noted as part of developing healthier places.

2.2 Notable to The Project, it is stated in the context of renewable and low carbon energy that:

"Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:

- *The need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations."*

2.3 Section 6.7 Air Quality and Soundscape discusses the importance of air and noise pollution. It is highlighted that certain sounds contribute to tranquillity and that noise action plans aim to prevent and reduce noise levels where necessary. The importance of using best practice in acoustic design is also noted.

Planning Guidance (Wales), Technical Advice Note 11: Noise

2.4 A Technical Advice Note (TAN) on noise was published in October 1997. This document relates to noise and the planning system and outlines some key considerations that should be taken into account when developing local planning policies and when determining planning applications.

2.5 TAN 11 includes guidance on development control by local planning authorities, and states that noise generating developments should not cause an unacceptable degree of disturbance. It is noted that the noise characteristics and levels from a development should be considered. TAN 11 also highlights possible mitigation measures that could be introduced to control the source of, or limit exposure to, noise.

BS 4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound

2.6 The BS 4142 Standard describes methods for rating and assessing the following:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

2.7 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The Standard advises the purpose of the methodology includes the assessment of sound from any plant and activities associated with existing industrial and/or commercial uses at proposed residential dwellings.

2.8 If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the specific sound and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound.

2.9 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future.

2.10 Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of 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."

Consultation with Denbighshire County Council

2.11 Consultation was undertaken with Christopher Carpenter, Environmental Health Officer at (DCC) via email, to agree the noise assessment methodology. The following approach was proposed:

- A baseline noise survey to determine the existing noise levels at a location representative of the nearest existing noise sensitive receptors;
- Predict the noise levels generated by the development based on source data from manufacturers;
- Assess the impact of from fixed plant, in accordance with BS 4142:2014+A1:2019 where detailed information is available. Where detailed information is not available, we will set limits to be achieved by fixed plant and equipment at the nearest existing and proposed noise sensitive receptors in accordance with BS 4142, based on the results of the baseline noise monitoring; and

- Where appropriate, noise mitigation measures will be considered to reduce noise to within acceptable levels at existing and proposed noise sensitive receptors.

2.12 At the time of writing, no official response has been received.

2.13 There has however been reference made to noise impacts in the pre-app response as below:

"The majority of the proposed development is located in open countryside. However there are a number of residential properties within close proximity to the site, and the proposal would need to demonstrate that the proposal would not adversely impact on residential amenity of these properties. It is advised within the scoping report that a noise impact assessment will be carried out.

It is recommended that the layout is informed by the potential impacts and noise generating equipment is located where possible at a distance from sensitive receptors. At this time limited information regarding noise impacts have been provided. Indeed the applicant indicates that a noise assessment would not be required. The council contest and consider one should be completed."

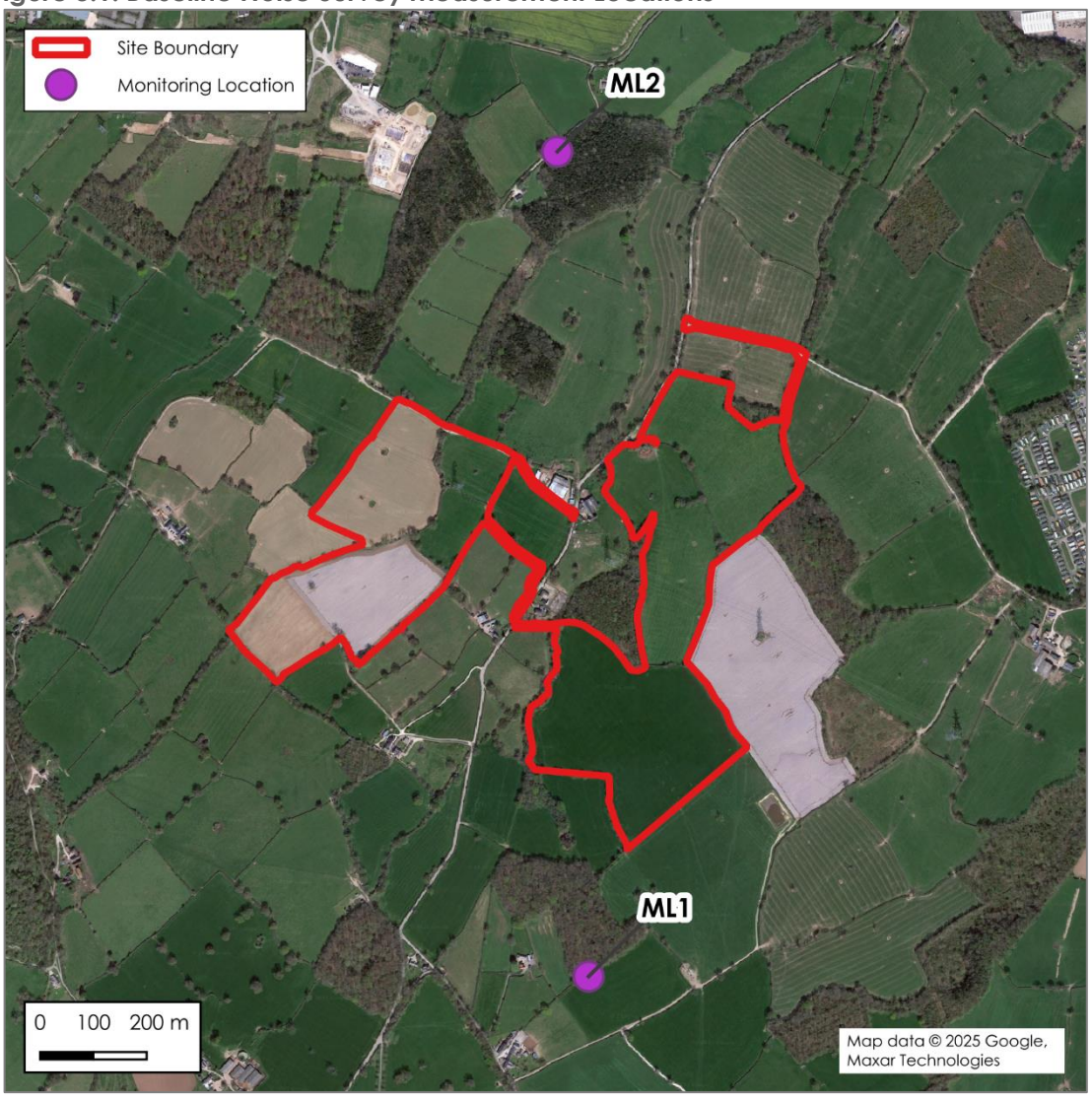
3. BASELINE NOISE SURVEY

Summary

3.1 A baseline noise survey has been undertaken to determine the existing ambient noise levels at NSRs in the vicinity of the Site. The baseline noise survey was completed in 2022, it is considered this survey remains accurate and appropriate, and that there is unlikely to have been any significant change in the noise environment at these locations between 2022 and the time of writing.

3.2 Baseline noise measurements were undertaken at the measurement locations shown in **Figure 3.1.**

Figure 3:1: Baseline Noise Survey Measurement Locations



Survey Methodology

Measurement Location 1 (ML1)

3.3 Noise measurements were undertaken at Measurement Location 1 (ML1) over a 66-hour period commencing at 13:00 on Thursday 12th May 2022. ML1 was adopted to be representative of all NSRs except NSR4. ML1 was at 1.5 m height in free-field conditions.

3.4 The noise climate at ML1, during attended periods at the start and end of the survey, was noted to be dominated by distant road traffic noise from the surrounding road network and occasional noise from farmers in nearby fields.

Measurement Location 2 (ML2)

3.5 Noise measurements were undertaken at Measurement Location 2 (ML2) over a 66-hour period commencing at 14:00 on Thursday 12th May 2022. ML2 was adopted to be representative of all NSRs. ML2 was at 1.5 m height in free-field conditions.

3.6 The noise climate at ML2, during attended periods at the start and end of the survey, was noted to be dominated by distant road traffic noise from the surrounding road network and occasional noise from farmers in nearby fields.

Measurement Equipment

3.7 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment, detailed in **Table 3.1**. The noise measurement equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meters, pre-amplifiers and microphones were calibrated to traceable standards within the 24 months prior to the measurements. The portable calibrators were calibrated within the 12 months preceding the date of the survey.

Table 3.1: Noise Measurement Equipment

Equipment	Make and Model	Serial Number	Calibration Due Date	Measurement Location
Sound Level Meter	01dB Fusion + DMK	11891	17/12/2022	ML1
Microphone	GRAS 40CD	330621		
Sound Level Meter	01dB Fusion + DMK	11893	28/09/2023	ML2
Microphone	GRAS 40CD	332006		
Calibrator	Cirrus CR:515	95401	22/04/2023	ML1 & ML2

Weather Conditions

3.8 The weather was generally conducive to environmental noise measurement during the survey period, it being generally dry with low wind speeds (<5 ms^{-1}).

Measurement Results

3.9 A summary of the measured noise levels is provided below in **Table 3.2** and **Table 3.3**. Full measurement results are included in **Appendix B**.

Table 3.2: Summary of Measured Sound Pressure Levels at ML1, Free-field

Start Date and Time	Period	dB L_{AFmax}[2]	dB $L_{Aeq,T}$	dB $L_{A90,T}$[1]
12/05/2022 14:00	Daytime	-	52	41
12/05/2022 23:00	Night-time	69	50	36
13/05/2022 07:00	Daytime	-	54	40
13/05/2022 23:00	Night-time	76	51	31
14/05/2022 07:00	Daytime	-	53	34
14/05/2022 23:00	Night-time	71	51	28
15/05/2022 07:00	Daytime	-	61	44
15/05/2022 23:00	Night-time	83	56	42

[1] Taken to be the mean of measured $L_{A90,T}$ values.
[2] 90th percentile of measured $L_{AFmax,15min}$ values during night-time

Table 3.3: Summary of Measured Sound Pressure Levels at ML2, Free-field

Start Date and Time	Period	dB L_{AFmax}[2]	dB $L_{Aeq,T}$	dB $L_{A90,T}$[1]
12/05/2022 13:00	Daytime	-	51	43
12/05/2022 23:00	Night-time	69	47	38
13/05/2022 07:00	Daytime	-	51	43
13/05/2022 23:00	Night-time	74	48	36
14/05/2022 07:00	Daytime	-	49	42
14/05/2022 23:00	Night-time	70	47	34
15/05/2022 07:00	Daytime	-	49	39
15/05/2022 23:00	Night-time	74	51	39

[1] Taken to be the mean of measured $L_{A90,T}$ values.
[2] 90th percentile of measured $L_{AFmax,15min}$ values during night-time

4. ASSESSMENT

4.1 The results of the baseline noise survey have been used as a basis for the noise assessment of the Site's suitability for the proposed use. This assessment considers noise from proposed fixed plant at the Site (i.e., transformers), at the NSRs.

Characterisation of Proposed Site Plant

4.2 The times of operation and the power output of the inverters will vary according to the time of year. The longest operational period will be on summer solstice from approximately 06:00 to 20:30 hours. The shortest will be on winter solstice when inverters only operate very briefly. To represent a worst case, all plant is assumed to operate at night, however in reality it will only be the early morning period during the summer.

4.3 The assessment is therefore undertaken based on the following assumptions:

- The Site will operate during the daytime and night-time periods, 7 days a week; and
- There will be a maximum of 50 inverters, 5 transformers and 3 substations.

4.4 Inverter and transformer sound power levels been provided by the manufacturer. Substation sound power levels have been taken from other similar projects. These are presented in **Table 4.1**.

Table 4.1: Sound Power Levels

Fixed Plant	Sound Power Level L_W (dB) Octave Band Centre Frequency (Hz)								L_W dB(A)
	63	125	250	500	1k	2k	4k	8k	
Inverter	57	64	69	72	71	64	63	56	74
Transformer	94	94	84	72	61	56	52	52	81
Substation	50	39	33	30	0*	0*	0*	0*	36
*Substation produces negligible noise from 500 Hz octave band and above									

Noise Model

4.5 A detailed noise model has been generated in order to calculate the daytime and noise propagation from the proposed development at NSRs. The following prediction methodologies were adopted for the modelling exercise:

- For noise sources, the noise model was set to apply the noise prediction methodology set out in ISO 9613-2:2024 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*';
- Mapping of the Site and the surrounding area was calibrated into the noise model based on known Ordinance Survey grid reference points;
- Indicative ground topography was approximated using the LIDAR Composite 2m DTM information freely available from the data.gov website;

- Off-site buildings which would provide screening to the Site have been incorporated as reflective façades;
- To reflect the local ground cover, ground absorption was set to G = 0.5 (50% acoustically absorptive ground);
- The model was set to include second order reflected noise from solid structures; and
- Proposed fixed plant has been included in the noise model as point sources with a height of 1.5 m.

4.6 The predicted noise levels have been calculated at the NSRs, as identified in **Table 1.1** without any mitigation in place.

4.7 Noise contour maps have been generated at a height of 1.5 m for the daytime period and at first floor height of 4 m for the night-time period.

4.8 The resultant daytime and night-time noise contours at the NSRs are shown in **Figure 4:1** and **Figure 4.2**.

Figure 4:1: Daytime Noise Contours of Specific Noise Levels, 1.5 m Above Ground, dB $L_{Aeq,1h}$

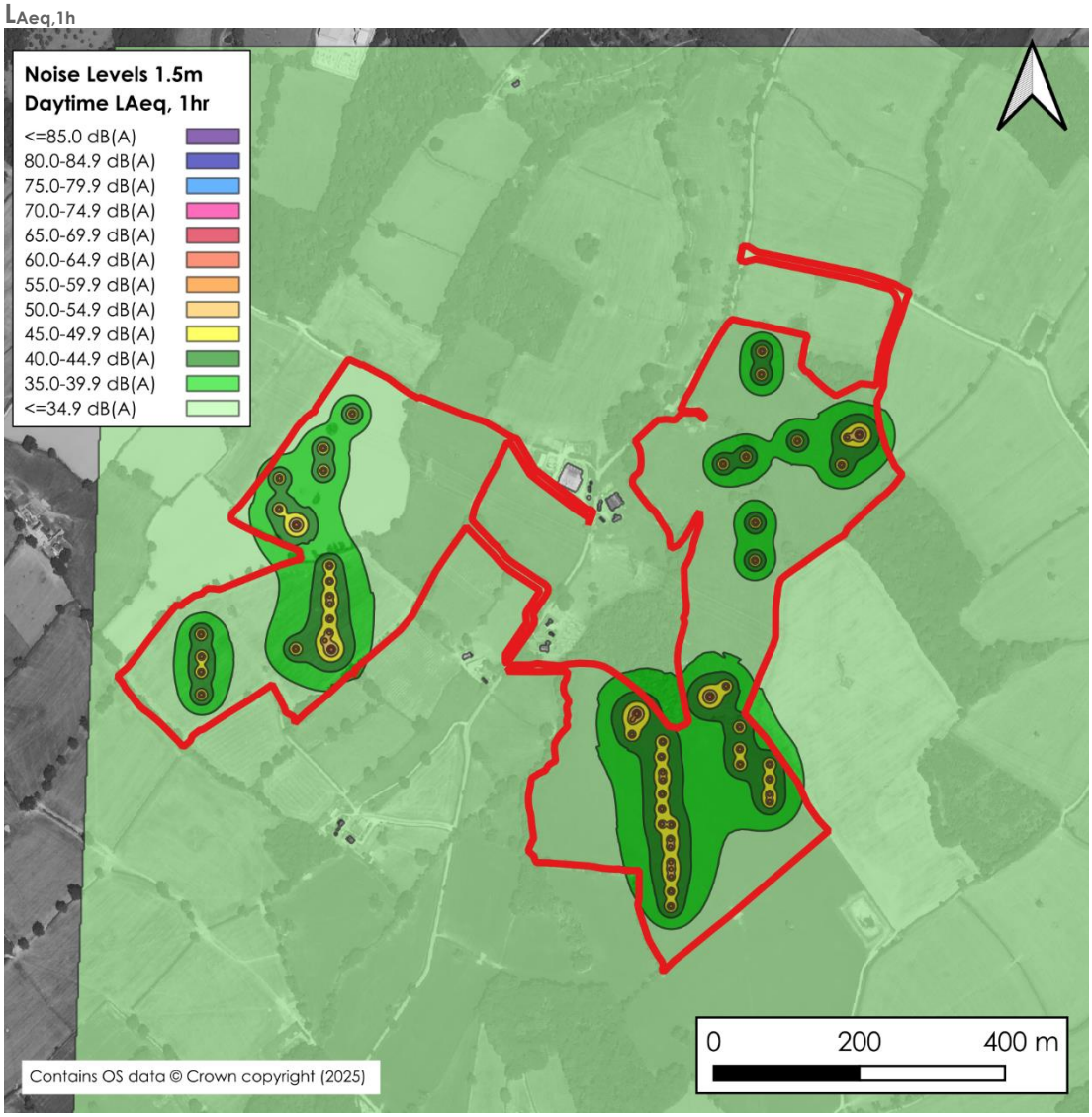
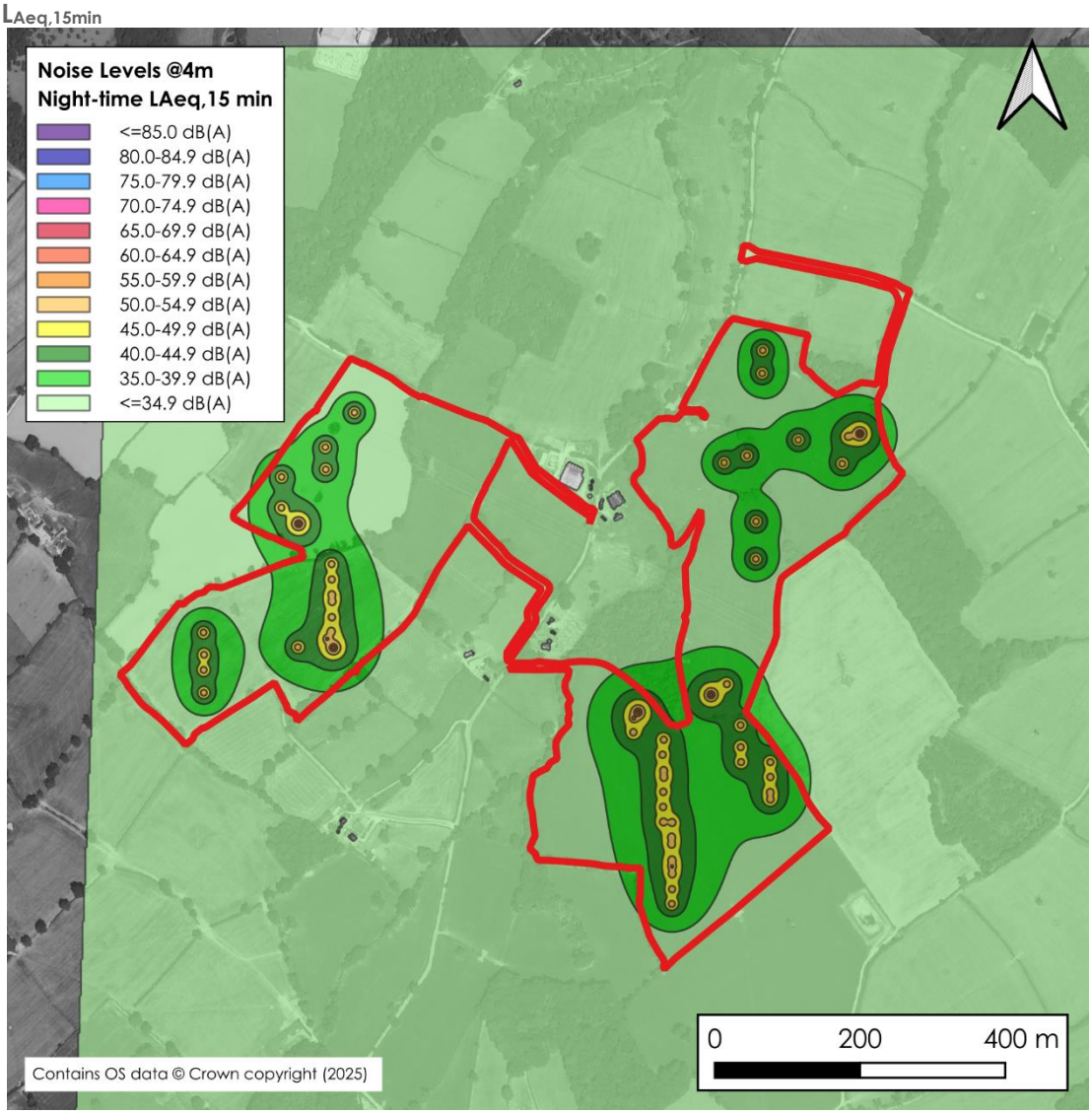


Figure 4:2: Night-time Noise Contours of Specific Noise Levels, 4 m Above Ground, dB $L_{Aeq,15min}$



4.9 As the proposed fixed plant is at a distance from the receptors and specific sound levels are considerably below the background sound levels it is considered unlikely any acoustic features will be perceptible. Therefore, no correction has been applied, in accordance with BS 4142.

4.10 The background sound level used within the following assessment has been derived following statistical analysis of the L_{A90} values.

4.11 The measured levels at ML1 are considered representative of NSR4, whilst the measured levels at ML2 are considered to be representative of all other NSRs as a worst-case.

4.12 The predicted noise levels at the NSRs have been assessed in accordance with BS 4142 for weekday and weekend periods which is shown in **Table 4.1** to **Table 4.4**.

Table 4.1: BS 4142 Assessment of Operational Noise at NSRs, Weekday Daytime Period

Description	Sound Levels (dB)								Relevant BS 4142 Clause
	NSR1	NSR2	NSR3	NSR4	NSR5	NSR6	NSR7	NSR8	
Specific sound level $L_{Aeq,1\text{-}hr}$	30	27	28	20	27	26	21	10	7.3.5
Acoustic feature correction	0								9.2
Rating level $L_{Ar,1\text{-}hr}$	30	27	28	20	27	26	21	10	9.2
Background sound level $L_{A90,1\text{-}hr}$	43	43	43	40	43	43	43	43	8
Excess over background	-13	-16	-15	-20	-16	-16	-22	-33	-
BS 4142 impact	**Low Impact**								
Commentary	[2] based on representative $L_{A90,1hr}$ levels during the daytime and $L_{A90,15min}$ during the night-time period								

Table 4.2: BS 4142 Assessment of Operational Noise at NSRs, Weekday Night-time Period

Description	Sound Levels (dB)								Relevant BS 4142 Clause
	NSR1	NSR2	NSR3	NSR4	NSR5	NSR6	NSR7	NSR 8	
Specific sound level $L_{Aeq,15min}$	30	27	28	20	27	26	21	10	7.3.5
Acoustic feature correction	0								
Rating level $L_{Ar,15min}$	30	27	28	20	27	26	21	10	9.2
Background sound level $L_{A90,15min}$	36	36	36	31	36	36	36	36	8
Excess over background	-6	-9	-8	-11	-9	-10	-15	-26	-
BS 4142 impact	**Low Impact**								
Commentary	[2] based on representative $L_{A90,1hr}$ levels during the daytime and $L_{A90,15min}$ during the night-time period								

Table 4.3: BS 4142 Assessment of Operational Noise at NSRs, Weekend Daytime Period

Description	Sound Levels (dB)								Relevant BS 4142 Clause
	NSR1	NSR2	NSR3	NSR4	NSR5	NSR6	NSR7	NSR8	
Specific sound level $L_{Aeq,1\text{-}hr}$	30	27	28	20	27	26	21	10	7.3.5
Acoustic feature correction	0								
Rating level $L_{Ar,1\text{-}hr}$	30	27	28	20	27	26	21	10	9.2
Background sound level $L_{A90,1\text{-}hr}$	42	42	42	34	42	42	42	42	8
Excess over background	-12	-15	-14	-14	-15	-16	-21	-32	-
BS 4142 impact	**Low Impact**								
Commentary	[2] based on representative $L_{A90,1hr}$ levels during the daytime and $L_{A90,15min}$ during the night-time period								

Table 4.4: BS 4142 Assessment of Operational Noise at NSRs, Weekend Night-time Period

Description	Sound Levels (dB)								Relevant BS 4142 Clause
	NSR1	NSR2	NSR3	NSR4	NSR5	NSR6	NSR7	NSR8	
Specific sound level $L_{Aeq,15min}$	30	27	28	20	27	26	21	10	7.3.5
Acoustic feature correction	0								
Rating level $L_{Ar,15min}$	30	27	28	20	27	26	21	10	9.2
Background sound level $L_{A90,15min}$	34	34	34	28	34	34	34	34	8
Excess over background	-4	-7	-6	-8	-7	-8	-13	-24	-
BS 4142 impact	**Low Impact**								
Commentary	[2] based on representative $L_{A90,1hr}$ levels during the daytime and $L_{A90,15min}$ during the night-time period								

4.13 When assessed in accordance with BS 4142+A1:2019, this would demonstrate a low impact during both the weekday and weekend daytime and night-time periods at all

NSRs, with no mitigation in place. Therefore, no consideration to mitigation has been given.

Uncertainty

4.14 Reasonably practicable steps have been taken to reduce the level of uncertainty with respect to the measurements and assessment calculation methodology. The level of uncertainty of the measurement is considered low given the length of the measurement period and intervals, and the it is considered this survey remains accurate and appropriate, and that there is unlikely to have been any significant change in the noise environment at these locations between 2022 and the time of writing. It should be noted that the specific noise source is significantly lower in the context of the existing noise climate, therefore the risk of uncertainty causing adverse impact is considered very unlikely.

4.15 The level of uncertainty from the calculation is considered low. The resultant levels have been derived using acoustic modelling software, which uses industry recognised standard IOS 9613-2 calculation method. Notwithstanding this, uncertainty in the operation or sound emission characteristics of the specific source remains, albeit a low risk for this particular assessment given the greater margin between the predicted levels and the thresholds for non-compliance.

5. CONCLUSION AND RECOMMENDATIONS

5.1 BWB Consulting was instructed by Anesco Ltd to undertake a Noise Impact Assessment to support a planning application for proposed solar farm, south-west of St Asaph, Denbighshire.

5.2 This assessment considers the impact of operational noise and fixed plant associated with the Proposed Development on nearby existing sensitive receptors.

5.3 A baseline noise survey was undertaken in May 2022 and the subsequent assessment work has been undertaken in accordance with current standards and guidance.

5.4 The results of the noise impact assessment indicate that operations associated with the development have the potential to result in a low impact at existing noise sensitive receptors, without mitigation in place.

5.5 Based on the results of the assessment, it has been demonstrated that the Site is suitable for the proposed use.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears can respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by several other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX B: Full Survey Results

Figure B-1: Measured Noise Levels at ML1 12th May to 16th May

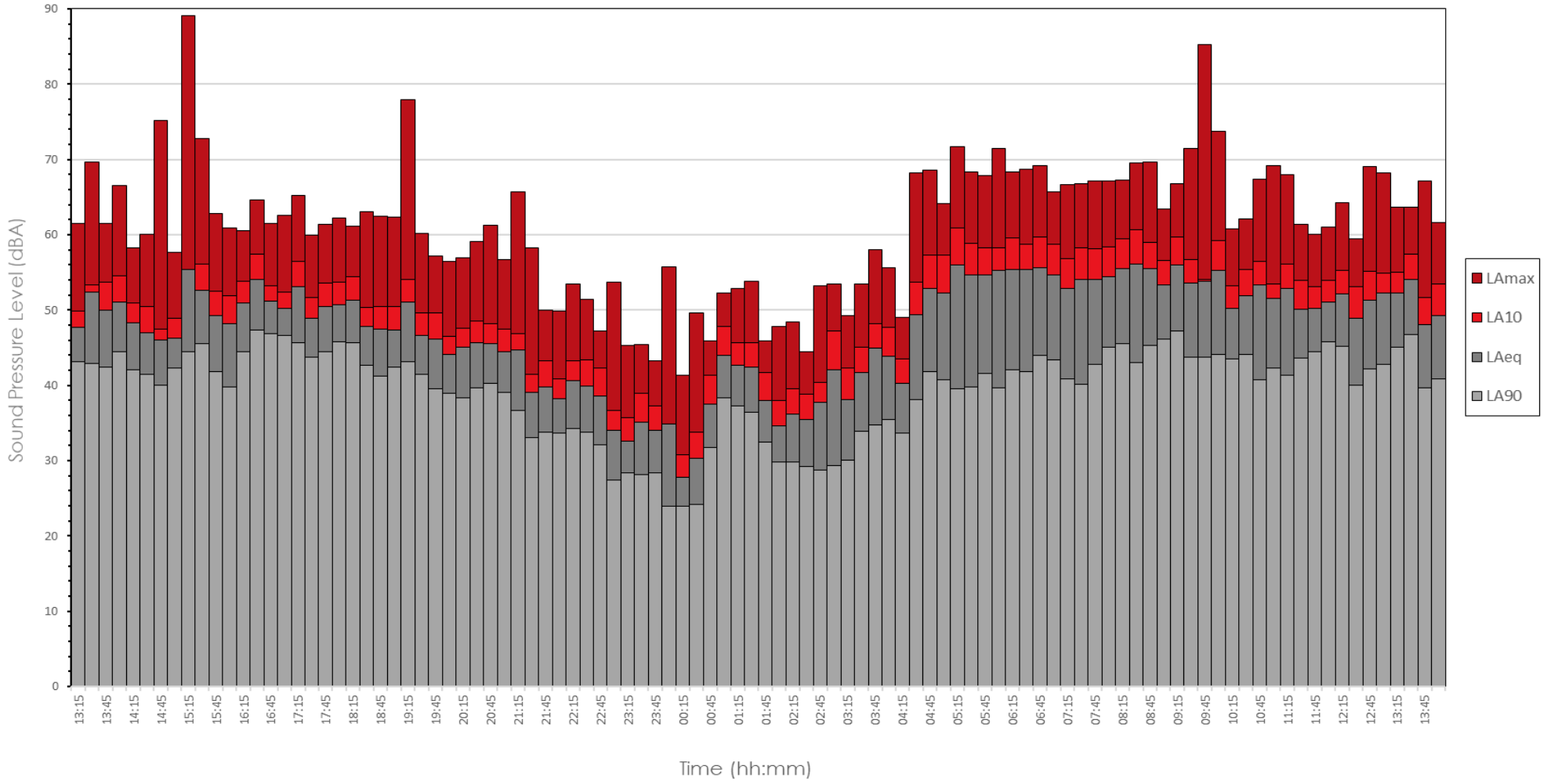
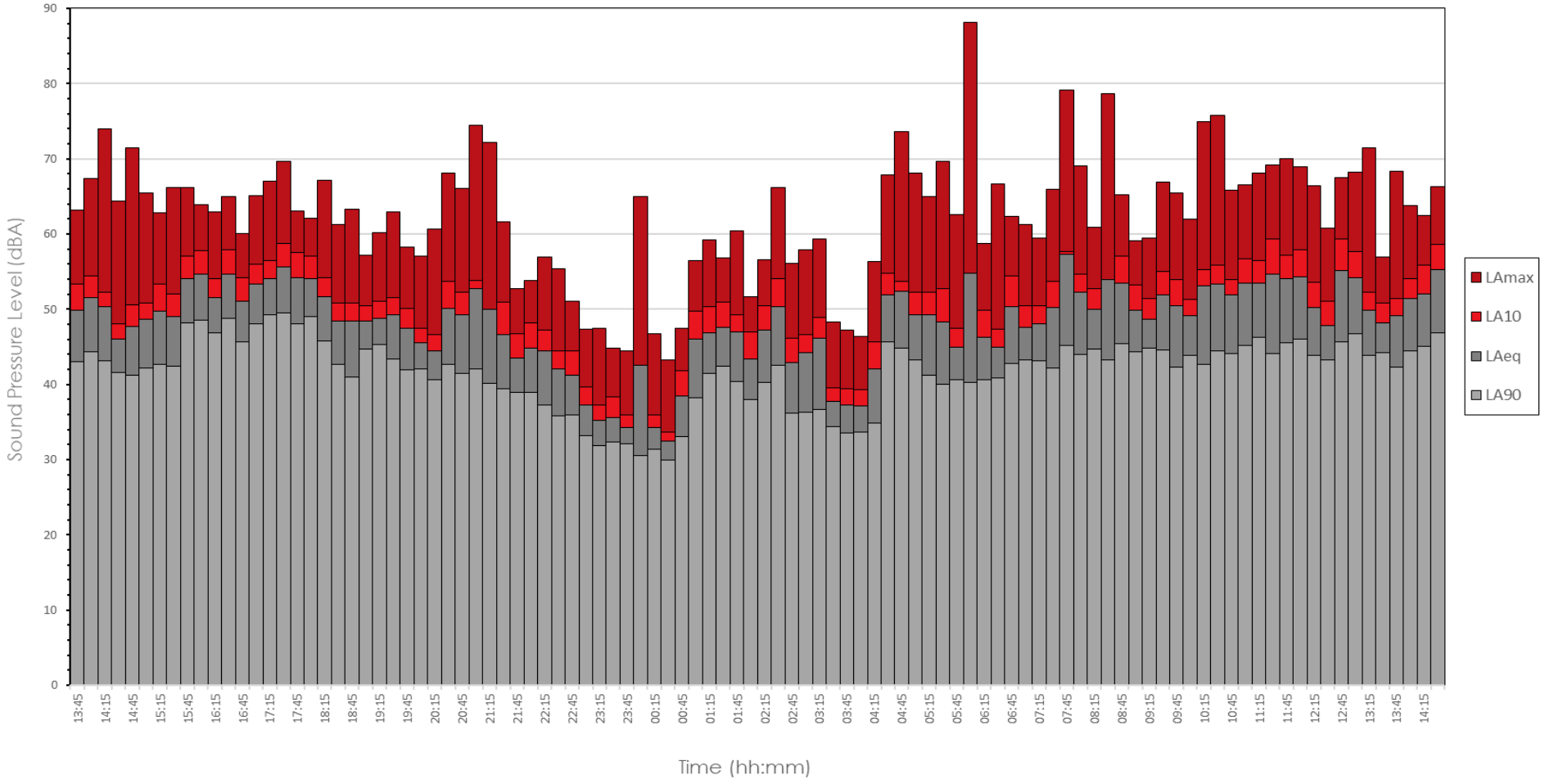


Figure B-2: Measured Noise Levels at ML2 12th May to 16th May



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