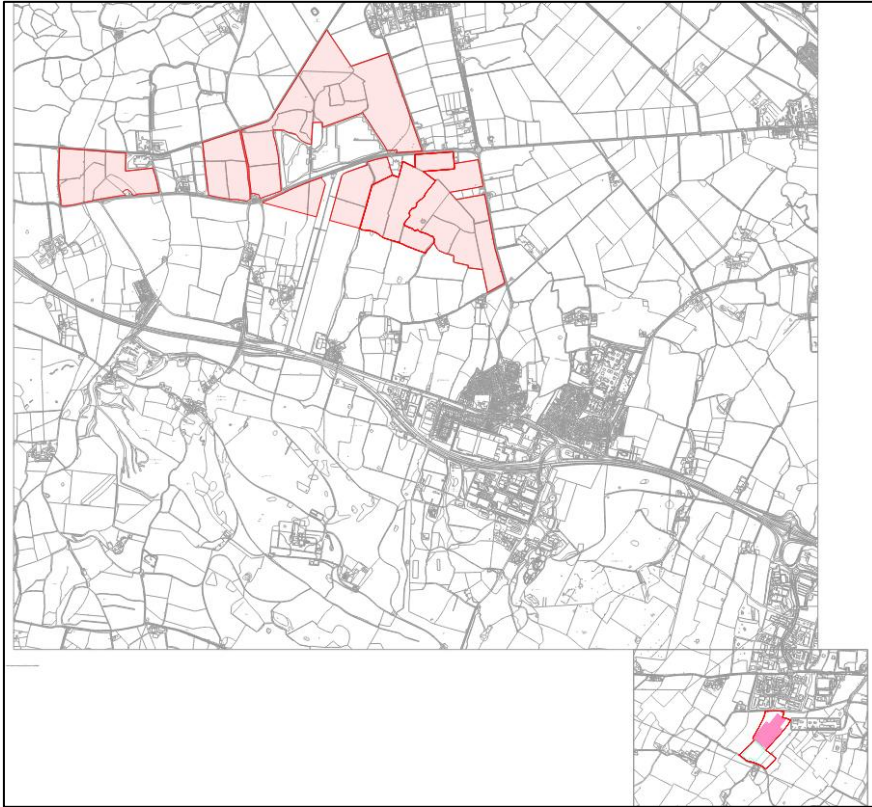


Bodelwyddan Solar and Energy Storage

784-B067970



Noise Impact Assessment

Bodelwyddan Solar and Energy Storage Limited

September 2025



Tetra Tech Limited. Registered in England number: 01959704

Registered Office: 3 Sovereign Square, Sovereign Street, Leeds, United Kingdom, LS1 4ER

Document Control

If you require this document in an alternative format, such as large print or a coloured background, please request this from your Tetra Tech contact.

Document:	Noise Impact Assessment
Project:	Bodelwyddan Solar and Energy Storage
Client:	Bodelwyddan Solar and Energy Storage Limited
Project number:	784-B067970
File origin:	\\lds-dc-vm-101\Data\Projects\784-B067970_Bodelwyddan_Solar_BEES\

Revision:	4	Prepared by:	Alex Clark Senior Environmental Consultant	
Date:	05/09/2025	Checked by:	Kanvin Chen Principal Consultant	pp 
Status:	Fourth Issue	Approved by:	Dawit Abraham Head of Noise and Acoustics	
Description of revision:	Revisions following comments			

Table of contents

Executive Summary	7
1.0 Introduction	8
1.1 Purpose of this Report	8
1.2 Legislative Context	9
1.3 Local & Regional Policy Context	10
1.4 Acoustic Consultants' Qualifications and Professional Memberships	14
2.0 Assessment Criteria	15
3.0 Assessment Methodology	17
3.1 Scoping	17
3.2 Noise Modelling Methodology	17
3.3 Model Input Data	18
3.4 Sensitive Receptors	20
4.0 Noise Survey	22
4.1 Noise Survey Details	22
4.2 Noise Survey Results	23
4.3 Representative Background Noise Levels	26
5.0 Assessment of Construction Effects	28
5.1 Construction Noise	28
6.0 Assessment of Operational Effects	29
6.1 Intrinsic Mitigation	29
6.2 Additional Embedded Mitigation	29
6.3 BS 4142:2014+A1:2019 Operational Phase Noise Assessment	30
6.4 Noise Intrusion Assessment	36
7.0 Uncertainty	42
8.0 Conclusion	44

Appendices	45
-------------------------	-----------

List of tables

Table 1.1: Acoustic Consultants' Qualifications & Experience	14
Table 2.1: Internal Noise Criteria for Dwellings from BS 8233:2014.....	16
Table 3.1: Modelling Parameters Sources and Input Data	17
Table 3.2: Solar Site - Sound Power Level Data.....	18
Table 3.3: Solar Site - Sound Pressure Level Data	18
Table 3.4: Sound Power Level Data	19
Table 4.1: Meteorological Conditions During the Survey	24
Table 4.2: Results of Baseline Noise Monitoring Survey (Average Levels)	24
Table 4.3: Representative Background Noise Levels (All Receptors)	26
Table 6.1: BS4142 Assessment - Solar	34
Table 6.2: BS4142 Assessment - BESS	36
Table 6.3: Daytime Noise Intrusion Levels $L_{Aeq,16hours}$	37
Table 6.4: Night-time Noise Intrusion Levels $L_{Aeq,8hours}$	38
Table 6.5: Daytime Noise Intrusion Levels $L_{Aeq,16hours}$	40
Table 6.6: Night-time Noise Intrusion Levels $L_{Aeq,8hours}$	40

List of figures

Figure 3-1: Sensitive Receptor Locations (Solar Site)	20
Figure 3-2: Sensitive Receptor Locations (BESS Site).....	21
Figure 4-1: Noise Monitoring Locations	23
Figure 6-1: Embedded Mitigation	30
Figure 6-2: Noise Contour Plot of Solar Site $L_{Aeq,1hour}$ – 4.0m Above Ground.....	31
Figure 6-3: Noise Contour Plot of BESS Site $L_{Aeq,1hour}$ – 4.0m Above Ground.....	32
Figure B-1: Time History Graph, LT6	49
Figure B-2: Time History Graph, LT8	50

Appendices

Appendix A – Acoustic Terminology

Appendix B - Time History Graphs

Appendix C – Histograms

Appendix D – References

Acronyms/Abbreviations

Acronyms/Abbreviations	Definition
CADNA	Computer Aided Noise Abatement
DMRB	Design Manual for Roads and Bridges
HGV	Heavy Goods Vehicle
UDP	Unitary Development Plan
UKAS	United Kingdom Accreditation Service

Executive Summary

A noise assessment has been undertaken in support of a Development of National Significance (DNS) planning application for proposed Solar farm and Battery Energy Storage System (BESS) sites in Bodelwyddan, Wales.

A baseline noise survey was undertaken in October 2024 to establish the existing background noise levels (L_{A90}) at the surrounding existing sensitive receptors during the daytime and night-time periods.

With mitigation in place, the majority of BS 4142 noise rating levels associated with the operational phase of the Proposed Development at the nearest sensitive receptors are below the existing background, with worst case noise levels up to +2 and +3 dB above the existing background noise levels at the Solar Site and BESS Site, respectively. For the vast majority of both sites, the noise rating levels will be below the existing background noise level. In accordance with BS 4142:2014+A1:2019, this is likely an indication of either a Low Impact or an impact between Low Impact and Adverse Impact, depending on the context.

A noise intrusion assessment was also undertaken to present further context, particularly to the night-time noise levels. With windows opened, internal noise levels resulting from the proposed development within the sensitive receptors are within the BS 8233:2014 criteria during both the daytime and night-time periods.

Considering the above, the proposed development is not expected to result in a risk of unacceptable harm to health and/or local amenity because of noise and it has been demonstrated that any significant adverse risk to public health, the environment and/or impact upon local amenity due to the proposed development can be overcome.

1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a noise assessment to support a Development of National Significance (DNS) planning application for a proposed Solar and Battery Energy Storage System (BESS) sites in Bodelwyddan, Wales.

The formal description of the Proposed Development is:

‘The construction, operation and maintenance of a proposed solar photovoltaic electricity generating system and battery energy storage system (‘BESS’), associated solar arrays, inverters, transformers, cabling, substations, access tracks, landscaping, ecological enhancement areas and associated ancillary development’.

The Site comprises two separate parcels of land located to the northwest and southeast of Bodelwyddan, which are linked by a cable corridor. The grid connection point will be at Bodelwyddan Substation, directly adjacent to the eastern boundary of the Site.

1.1.1 Solar Site

The larger parcel of land to the northwest of Bodelwyddan extends to approximately 168.95 ha, comprising land to the north and south of Rhuddlan Road (A547), and to the west of St Asaph Avenue, and hereinafter is referred to as the ‘Solar Site’. Towyn and Kinnel Bay are located to the north of the Solar Site and Abergele to the west.

There is an existing 24MW operational solar farm, consented in 2015 (Conwy LPA ref. 0/40999), directly adjacent to the Solar Site. The consented scheme originally included a number of fields within the Solar Site (adjacent to the north and east of the operational solar farm) however these were not built out. Notwithstanding, the precedent for solar development in this specific area and within the Solar Site itself has already been established.

1.1.2 BESS Site

The smaller parcel of land to the south east of Bodelwyddan is approximately 6.52 ha. It is broadly rectangular in shape and is positioned south of St Asaph Business Park, directly adjacent and to the west of Bodelwyddan substation. It is referred to as the ‘BESS Site’.

High voltage overhead lines transect the eastern part of the BESS Site and pylons are located to the east and south of the site. To the east, south and west of the BESS Site lies agricultural land. There are a number of offshore wind farm substations located further to the east.

A list of acoustic terminology used in this report is provided in Appendix A.

1.2 Legislative Context

This report is intended to provide information relevant to the local planning authority and their consultees in support a Development of National Significance (DNS) planning application for the Proposed Development.

Future Wales: The National Plan 2040 (2021) and Planning Policy Wales (PPW) (2024) sets out the land use planning policies of the Welsh Government. They are supplemented by a series of Technical Advice Notes (TANs), Technical Advice Note 11 (1997) which relates to Noise, Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation.

Paragraph 6.7.5 of PPW states:

“In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. Air quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.”

Paragraphs 6.7.6 and 6.7.7 state:

“In proposing new development, planning authorities and developers must, therefore:

- address any implication arising as a result of its association with, or location within, air quality, noise action planning priority areas or areas where there are sensitive receptors;
- not create areas of poor air quality or inappropriate soundscape; and
- seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.

To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer.”

Paragraph. 6.7.24 states:

“The potential impacts of noise pollution arising from existing development, be this commercial, industrial, transport-related or cultural venues (such as music venues, theatres or arts centres), must be fully considered to ensure the effects on new development can be adequately controlled to safeguard amenity and any necessary measures and controls should be incorporated as part of the proposed new development. This will help to prevent the risk of restrictions or possible closure of existing premises or adverse impacts on transport infrastructure due to noise and other complaints from occupiers of new developments. It will be important that the most appropriate level of information is provided, and assessment undertaken.”

TAN 11 further goes on to provide advice on how the planning system can be used to minimise the adverse impacts of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.

1.3 Local & Regional Policy Context

1.3.1 Planning Policy Wales

Future Wales: The National Plan 2040 February 2021 and Planning Policy Wales (PPW) February 2024 sets out the land use planning policies of the Welsh Government. They are supplemented by a series of Technical Advice Notes (TANs), Technical Advice Note 11

which relates to Noise, Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales.

Paragraph 6.7.5 of PPW states:

“In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. Air quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.”

Paragraphs 6.7.6 and 6.7.7 state:

“In proposing new development, planning authorities and developers must, therefore: address any implication arising as a result of its association with, or location within, air quality, noise action planning priority areas or areas where there are sensitive receptors;

- not create areas of poor air quality or inappropriate soundscape; and*
- seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.*

To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer.”

Paragraph. 6.7.24 states:

“The potential impacts of noise pollution arising from existing development, be this commercial, industrial, transport-related or cultural venues (such as music venues, theatres or arts centres), must be fully considered to ensure the effects on new development can be adequately controlled to safeguard amenity and any necessary measures and controls should be incorporated as part of the proposed new development. This will help to prevent the risk of restrictions or possible closure of existing premises or adverse impacts on transport infrastructure due to noise and other complaints from occupiers of new developments. It will be important that the most appropriate level of information is provided, and assessment undertaken.”

TAN 11 further goes on to provide advice on how the planning system can be used to minimise the adverse impacts of noise without placing unreasonable restrictions on development or adding undue costs and administrative burdens of business.

1.3.2 The Denbigshire County Council Local Development Plan (LDP)

The Denbigshire County Council Local Development Plan (LDP) 2006 – 2021 was adopted on the 4th June 2013 and contains local planning policies to develop the spatial strategy and vision for Denbigshire up to 2021. Denbigshire County Council are currently preparing a new LDP but the current adopted LDP 2006 – 2021 continues to guide planning decisions until the replacement LDP is adopted.

The plan considers the following policies applicable to noise and the proposed development:

Policy RD 1 – Sustainable development and good standard design

“Development proposals will be supported within development boundaries provided that all the following criteria are met:

[...]

vi) Does not unacceptably affect the amenity of local residents, other land and property users or characteristics of the locality by virtue of increased activity, disturbance, noise, dust, fumes, litter, drainage, light pollution etc., and provides satisfactory amenity standards itself

[...]”

Policy VOE 10 - Renewable energy technologies

“Development proposals which promote the provision of renewable energy technologies may be supported providing they are located so as to minimise visual, noise and amenity impacts and demonstrate no unacceptable impact upon the interests of nature conservation, wildlife, natural and cultural heritage, landscape, public health and residential amenity. In areas that are visually sensitive, including the AONB, Conservation Areas, World Heritage Site and Buffer Zone and in close proximity to historic buildings, visually intrusive technologies will not be permitted unless it can be demonstrated that there is no negative impact on the designation or there is an overriding public need for the development.”

1.4 Acoustic Consultants' Qualifications and Professional Memberships

The lead project Acoustic Consultant is Michaela Moffatt. The report has been updated by Alex Clark, checked by Kanvin Chen and verified by Dawit Abraham. Relevant qualifications, membership and experience are summarised in **Table 1.1**.

Table 1.1: Acoustic Consultants' Qualifications & Experience

Name	Education	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
Michaela Moffatt	BSc 2015 PGDip 2016 MSc 2018	Nov 2015	Jan 2017	Dec 2022
Alex Clark	BEng 2016	Jan 2017	July 2016	March 2020
Kanvin Chen	BEng 2018	Jun 2017	-	-
Dawit Abraham	BSc 2008 MSc 2010	Oct 2010	Jan 2011	Jan 2015

2.0 Assessment Criteria

Noise assessment guidance for the operational phase of the Proposed Development is given in:

- BS4142:2014+A1:2019 'Method for rating industrial and commercial sound'; and
- British Standard BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'.

BS 4142:2014+A1:2019 sets down the following guidelines for assessing the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes, based upon difference between the measured background noise level and the rating level of the source under consideration. In particular, the standard states:

- “a) Typically, the greater the difference, the greater the magnitude of the impact.*
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- d) 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.”*

In addition to noise levels the significance of the impact depends on the individuals affected and to the acoustic features present which may be assessed subjectively or objectively as appropriate. Section 9 of BS 4142:2014 recommends that correction factors be applied to the specific noise level if the noise contains certain acoustic features such as:

- tonality;
- impulsivity;
- intermittency; and
- other sound characteristics which are readily distinctive.

BS4142 also states that:

The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

The current BS4142 does not give any specific guidance on what might constitute a 'low' background noise level or rating level. It is therefore relevant to refer to other standards that provide absolute thresholds for suitable noise levels. BS 8233:2014 specifies 30 dB $L_{Aeq,T}$ as a suitable internal noise level in bedrooms in the night-time, for instance. In addition, the previous BS4142:1997 'Method for Rating industrial noise affecting mixed residential and industrial areas' states:

For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low.

The above levels are reiterated in the Association of Noise Consultants' (ANC) Technical Note on BS 4142:2014+A1:2019, stating:

BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90} , and low rating levels as being less than about 35 dB $L_{Ar,Tr}$. The WG [ANC working group] suggest that similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate.

Additionally, to provide further context to the BS 4142 assessment, the internal noise levels within the assessed dwellings are compared against the internal noise criteria taken from BS 8233:2014. These criteria are reproduced in **Table 2.1**.

Table 2.1: Internal Noise Criteria for Dwellings from BS 8233:2014

Location	Daytime 07:00 – 23:00	Night-time (23:00 – 07:00)
Living Room/Study	35 dB $L_{Aeq,16hours}$	-
Kitchen	40 dB $L_{Aeq,16hours}$	-
Bedroom	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$

3.0 Assessment Methodology

3.1 Scoping

The ES scoping contained a full detailed methodology including details of the noise survey measurement locations. The noise input informing the scoping report discussed assessment criteria in accordance with industry standards. The scoping response welcomed the submission of a standalone technical noise report, and no further recommendations around assessment criteria were specified at the time of this report.

3.2 Noise Modelling Methodology

CADNA 3-D noise modelling software has been used. This model is based on ISO 9613-2 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically. The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in **Table 3.1** have been used.

Table 3.1: Modelling Parameters Sources and Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	OS OpenMap - ST
Ground levels – around site	DataMapWales	Welsh Government LiDAR tile catalogue 2020-2023 2m DTM
Building heights – around site	Tetra Tech Observations	• 4.0m height for one-storey properties • 8.0 m height for two storey properties • 3.0m per additional storey
Receptor positions*	Tetra Tech	• 1.5 m for ground floor properties • 4.0m height for first-floor properties
Modelling Parameters	Tetra Tech	• Ground Absorption: 0.9 • Order of Reflections: 2 • Noise Contour Plot Grid Receiver Spacing: 10x10
Proposed Plans	Island Green Power UK Limited	Drawing Title: Bodelwyddan Solar v.4 10/06/2025 Drawing Title: Bodelwyddan BESS Preliminary Layout v.5 29/05/2025

*All receptors modelled 1.0m from building façade unless otherwise stated.

It is acknowledged that a number of the values of parameters chosen will affect the overall noise levels presented in this report. However, it should be noted that the values used, as identified above, are worst-case and as such, received noise levels are likely to be lower than predicted.

3.3 Model Input Data

The primary sources of noise from the operational development are listed below.

Although the exact units which are to be used for the proposed development may be subject to change, the currently proposed units have been used in the noise model. Manufacturers noise data has been used where available but otherwise sound levels from similar sized sites are used.

3.3.1 Solar Site Noise

The key noise sources associated with the Solar Site include solar inverters and motors for the panels. The sound level data used is reproduced in **Table 3.2** and **Table 3.3**.

Table 3.2: Solar Site - Sound Power Level Data

Item	Data Source	Input Type	Broadband Sound Power Level L_w (dBA)	Octave Band (Hz) Sound Pressure Level (dB)							
				63	125	250	500	1k	2k	4k	8k
Inverter	SMA Conversion Unit	Point Source at 2.5m	90	60	71	78	84	82	80	86	82

Table 3.3: Solar Site - Sound Pressure Level Data

Item	Data Source	Input Type	Broadband Sound Pressure Level L_p (dBA)	Octave Band (Hz) Sound Pressure Level (dB)							
				63	125	250	500	1k	2k	4k	8k
Motor for Panel	Tetra Tech Library	Point Source at 2.5m	50.0 at 1m	No spectrum data available – Modelled at 500Hz band							

3.3.2 BESS site Noise

The key noise sources associated with the BESS Site include a 400/33kV transformer, BESS inverters and BESS units. The sound level data used are reproduced in **Table 3.4**.

The data for the Sungrow PowerTitan 2 Battery Storage Container has been based on manufacturer test data with the unit running at 80% duty, as it is understood that these units typically won't need to operate at higher duty than this. This has been confirmed by the design team.

Table 3.4: Sound Power Level Data

Item	Data Source	Input Type	Broadband Sound Power Level L_w (dBA)	Octave Band (Hz) Sound Pressure Level (dB)							
				63	125	250	500	1k	2k	4k	8k
400/33kV transformer	SWL as advised by IGP	Point Source	85	Spectral data based on TRF_VERTEIL (Distribution-Trafo standard)							
Inverter	SMA inverter (4600 kVA)	Point Source	92	65	72	82	82	82	82	89	81
Battery Storage Container	Sungrow PowerTitan 2	Point Source	79	57	66	69	73	75	72	68	57

*No technical noise data available. However, units are likely to be quieter than traditional units due to liquid cooling vs air cooling.

It is highly unlikely the development would operate continuously, however for the purposes of this noise assessment and in order to present a worst case assessment, it has been assumed that the proposed development is fully operational during the daytime and night-time periods.

3.4 Sensitive Receptors

Receptor locations that have been selected to represent worst-case sensitive receptors with respect to direct noise from the site. Façades of the nearest noise sensitive properties to the development site have been represented. The locations of the receptors are presented within **Figure 3-1** and **Figure 3.2**.

Figure 3-1: Sensitive Receptor Locations (Solar Site)

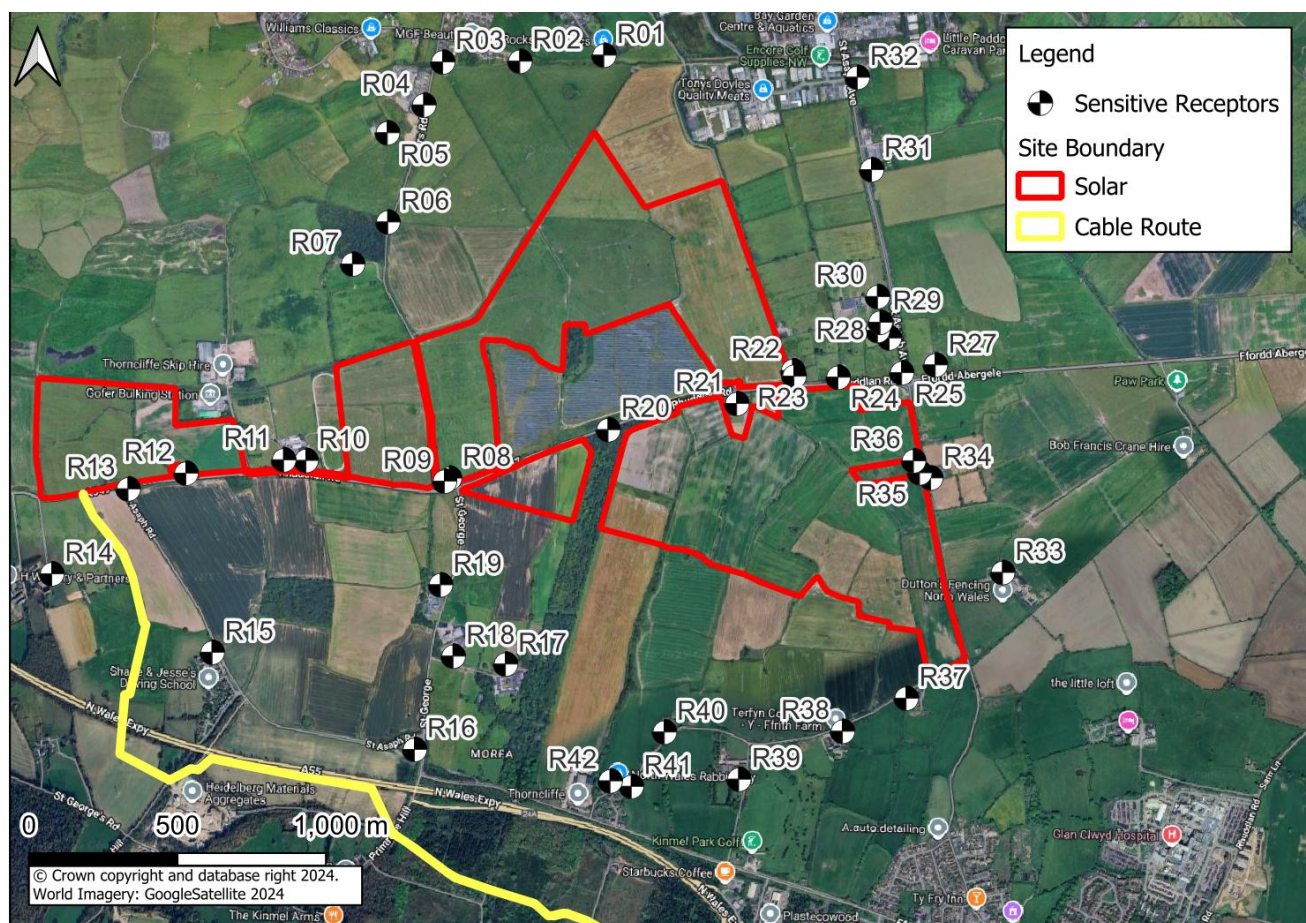
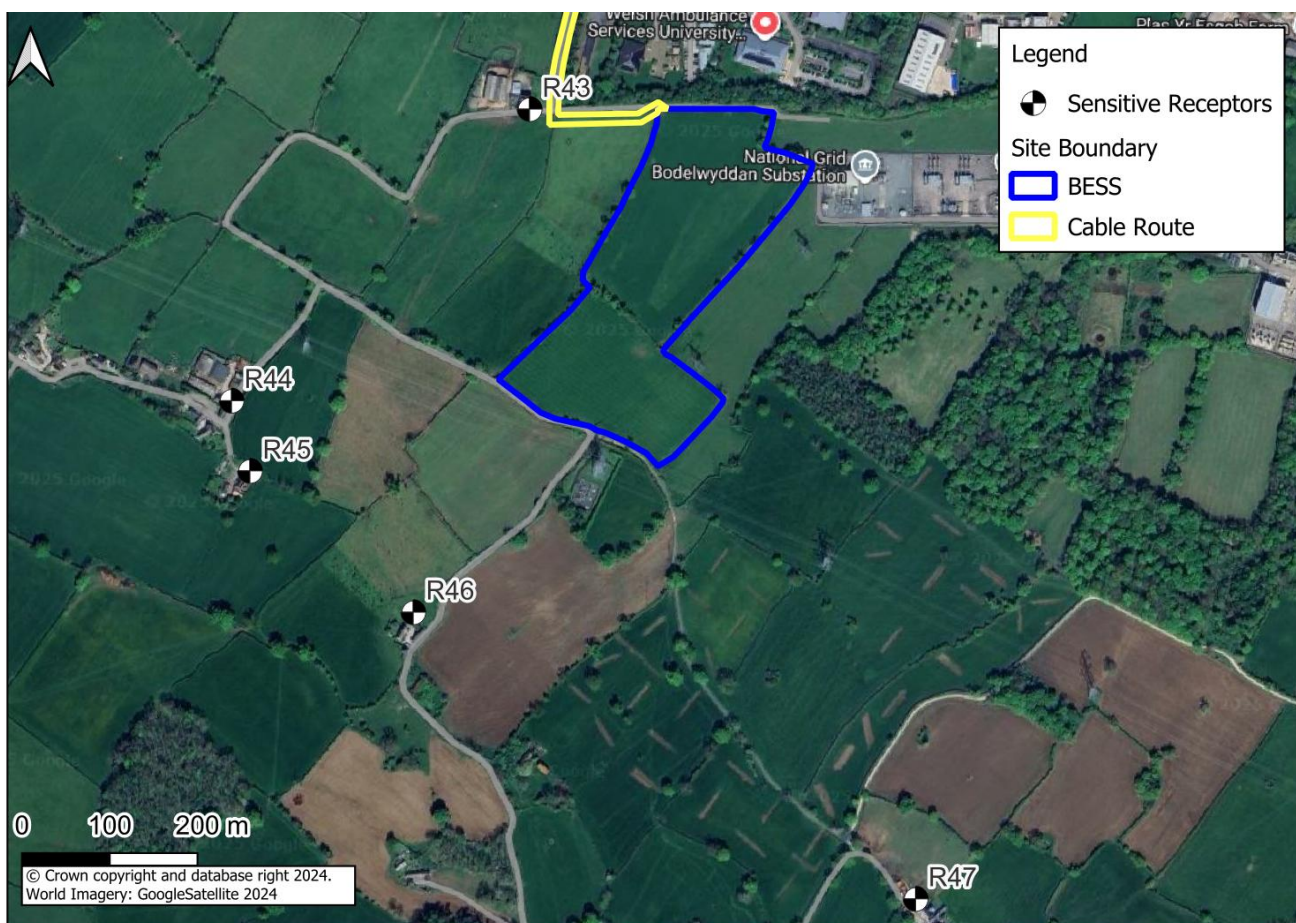


Figure 3-2: Sensitive Receptor Locations (BESS Site)



4.0 Noise Survey

4.1 Noise Survey Details

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

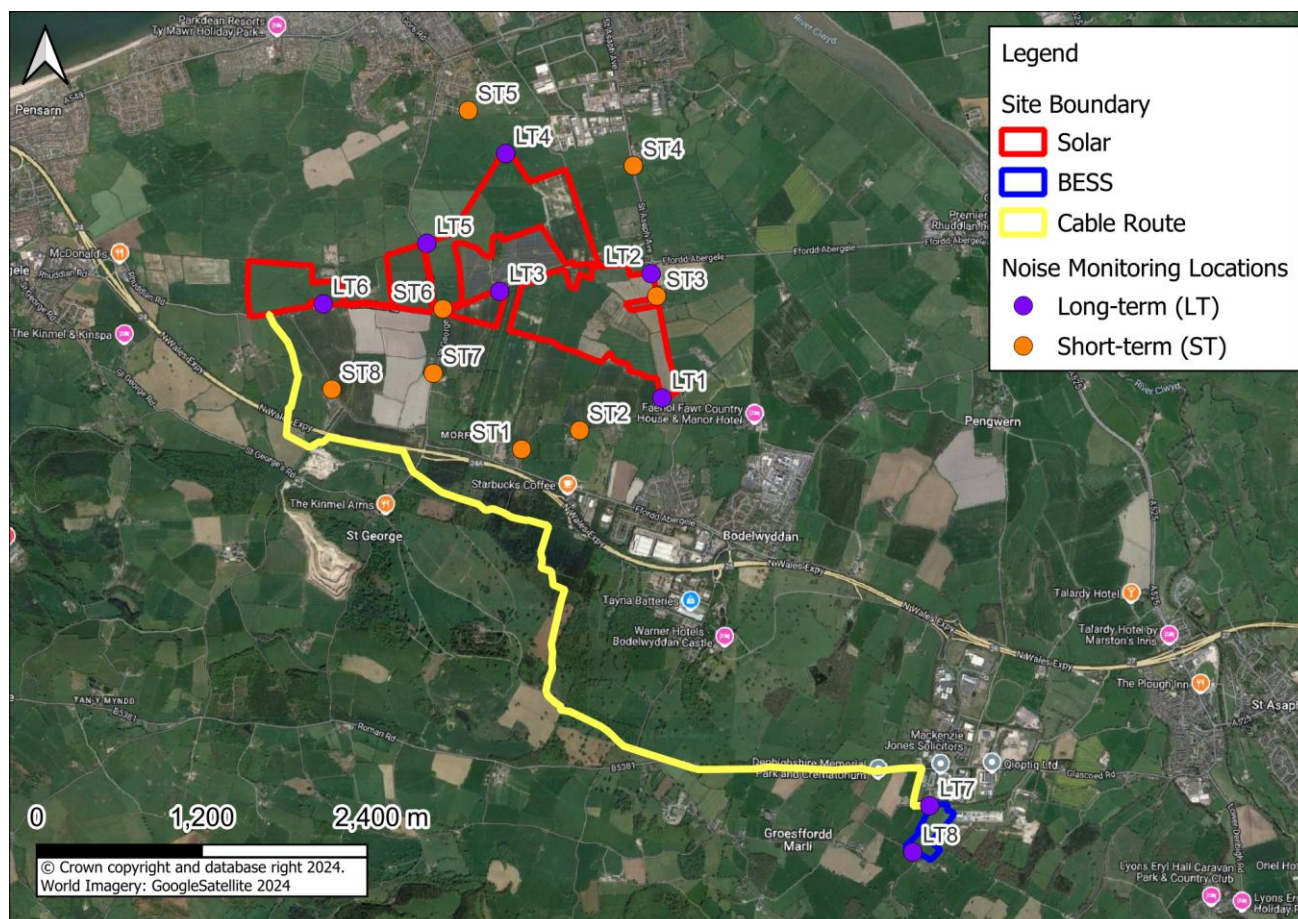
Rion NL-52	Environmental Noise Analyser	s/n 810560	(ST1-ST4)
Rion NL-52	Environmental Noise Analyser	s/n 1043466	(ST5-ST8)
Rion NL-52	Environmental Noise Analyser	s/n 620858	(LT1)
Rion NL-52	Environmental Noise Analyser	s/n 810559	(LT2)
Rion NL-52	Environmental Noise Analyser	s/n 1021257	(LT3)
Rion NL-52	Environmental Noise Analyser	s/n 810558	(LT4)
Rion NL-52	Environmental Noise Analyser	s/n 264490	(LT5)
Rion NL-52	Environmental Noise Analyser	s/n 843173	(LT6)
Rion NL-52	Environmental Noise Analyser	s/n 710448	(LT7)
Rion NL-52	Environmental Noise Analyser	s/n 264488	(LT8)
Rion NC75	Sound Calibrator	s/n 34313029	
Rion NC75	Sound Calibrator	s/n 34145542	
Rion NC75	Sound Calibrator	s/n 35270131	

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

A baseline monitoring survey was undertaken at sixteen locations (as shown in Figure 4.1) from Friday 18th October 2024 to Friday 25th October 2024. Attended Short-Term (ST) locations were measured at 8 locations during the day, evening and night periods, and 8 Long-Term (LT) locations were measured unattended over a 166-hour period. The raw data collected from the long-term monitoring are available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the survey period were observed as being dry. Anemometer readings undertaken on site confirmed that wind speeds were less than 5 ms^{-1} at all times during the survey.

Figure 4-1: Noise Monitoring Locations



4.2 Noise Survey Results

The dominant noise sources found in the area in vicinity to the Solar site include road traffic noise whilst the dominant noise source at the BESS site is from the Gwynt y Môr Offshore Wind Farm Substation.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. For the long-term (LT) locations, the presented $L_{Aeq,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5-minute measurement over the stated survey period.

Table 4.1: Meteorological Conditions During the Survey

Survey Location	Date & Time	Wind Speed (m/s)
ST5	18:00 – 18:15	2.2
	20:20 – 20:35	2.1
	00:00 – 00:15	1.9
ST6	17:35 – 17:50	4.1
	19:55 – 20:10	3.5
	23:40 – 23:55	2.7
ST7	17:05 – 17:20	2.8
	19:25 – 19:40	3.1
	23:20 – 23:35	2.5
ST8	16:35 – 16:50	3.1
	19:00 – 19:15	2.8
	23:00 – 23:15	3.0

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2×10^{-5} Pa).

Table 4.2: Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{A90,T} (dB)
Daytime 07:00 - 23:00	110 Hours	Friday 18/10/2024 12:50 – Friday 25/10/2024 11:00	LT1	51.2	46.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		45.3	37.0
Daytime 07:00 - 23:00	110 Hours	Friday 18/10/2024 13:25 – Friday 25/10/2024 11:25	LT2	60.8	51.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		53.2	36.0
Daytime 07:00 - 23:00	109 Hours	Friday 18/10/2024 13:15 – Friday 25/10/2024 10:20	LT3	68.6	55.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		59.2	37.0

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{A90,T} (dB)
Daytime 07:00 - 23:00	108 Hours	Friday 18/10/2024 15:45 – Friday 25/10/2024 11:50	LT4	55.6	43.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		50.5	37.0
Daytime 07:00 - 23:00	109 Hours	Friday 18/10/2024 14:45 – Friday 25/10/2024 11:20	LT5	60.1	48.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		52.7	36.0
Daytime 07:00 - 23:00	109 Hours	Friday 18/10/2024 14:10 – Friday 25/10/2024 11:00	LT6	62.8	49.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		53.8	35.0
Daytime 07:00 - 23:00	108 Hours	Friday 18/10/2024 14:15 – Friday 25/10/2024 10:05	LT7	56.5	38.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		49.7	38.0
Daytime 07:00 - 23:00	108 Hours	Friday 18/10/2024 14:45 – Friday 25/10/2024 10:35	LT8	52.1	32.0
Night-time 23:00 – 07:00	56 Hours	Friday 18/10/2024 23:00 – Friday 25/10/2024 06:55		44.8	38.0
Daytime 07:00 - 19:00	15 Mins	Thursday 24/10/2024 16:25 – 16:40	ST1	54.2	52.0
	15 Mins	Thursday 24/10/2024 16:50 – 17:05	ST2	49.0	47.0
	15 Mins	Thursday 24/10/2024 17:15 – 17:30	ST3	61.0	48.0
	15 Mins	Thursday 24/10/2024 17:35 – 17:50	ST4	71.6	57.0
	15 Mins	Thursday 24/10/2024 18:00 – 18:15	ST5	44.3	42.0
	15 Mins	Thursday 24/10/2024 17:35 – 17:50	ST6	68.2	57.0
	15 Mins	Thursday 24/10/2024 17:05 – 17:20	ST7	62.5	45.0
	15 Mins	Thursday 24/10/2024 16:35 – 16:50	ST8	56.4	52.0
Evening 19:00 - 23:00	15 Mins	Thursday 24/10/2024 19:00 – 19:15	ST1	52.8	50.0
	15 Mins	Thursday 24/10/2024 19:20 – 19:35	ST2	49.1	47.0
	15 Mins	Thursday 24/10/2024 19:40 – 19:55	ST3	55.2	43.0
	15 Mins	Thursday 24/10/2024 20:00 – 20:15	ST4	67.7	50.0
	15 Mins	Thursday 24/10/2024 20:20 – 20:35	ST5	44.0	38.0
	15 Mins	Thursday 24/10/2024 19:55 – 20:10	ST6	63.5	48.0
	15 Mins	Thursday 24/10/2024 19:25 – 19:40	ST7	54.4	43.0
	15 Mins	Thursday 24/10/2024 19:00 – 19:15	ST8	53.6	50.0
Night-time	15 Mins	Thursday 24/10/2024 23:05 – 23:20	ST1	43.1	37.0

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{A90,T} (dB)
23:00 - 07:00	15 Mins	Thursday 24/10/2024 23:25 – 23:40	ST2	37.9	34.0
	15 Mins	Thursday 24/10/2024 23:45 – Friday 25/10/2024 00:00	ST3	50.7	33.0
	15 Mins	Friday 25/10/2024 00:05 – 00:20	ST4	57.5	38.0
	15 Mins	Friday 25/10/2024 00:00 – 00:15	ST5	40.5	37.0
	15 Mins	Thursday 24/10/2024 23:40 – 23:55	ST6	60.3	35.0
	15 Mins	Thursday 24/10/2024 23:20 – 23:35	ST7	57.5	35.0
	15 Mins	Thursday 24/10/2024 23:00 – 23:15	ST8	48.1	42.0

All values are sound pressure levels in dB re: 2×10^{-5} Pa

4.3 Representative Background Noise Levels

Using the data collected during the baseline survey, representative background noise levels have been derived for all receptor locations presented in **Figure 3-1**. **Table 4.3** presents the representative background noise levels considered appropriate for the existing sensitive receptors within the area.

Table 4.3: Representative Background Noise Levels (All Receptors)

Receptors	Monitoring Location	Time Period	Representative Background Noise Level (L _{A90,T} dB)
R01-R05	LT4	Daytime (07:00 – 23:00)	43
		Night-time (23:00 – 07:00)	37
R06-R07	LT5	Daytime (07:00 – 23:00)	48
		Night-time (23:00 – 07:00)	36
R08-R09, R17-R21	LT3	Daytime (07:00 – 23:00)	55
		Night-time (23:00 – 07:00)	37
R10-R15	LT6	Daytime (07:00 – 23:00)	49
		Night-time (23:00 – 07:00)	35
R22-R36	LT2	Daytime (07:00 – 23:00)	51
		Night-time (23:00 – 07:00)	36
R37-R42	LT1	Daytime (07:00 – 23:00)	46
		Night-time (23:00 – 07:00)	37
R43	LT7	Daytime (07:00 – 23:00)	38
		Night-time (23:00 – 07:00)	38

Receptors	Monitoring Location	Time Period	Representative Background Noise Level (L _{A90,T} dB)
R44-47	LT8	Daytime (07:00 – 23:00)	35*
		Night-time (23:00 – 07:00)	35 ⁺

* Representative background noise level selected based on the BS4142 methodology outlined in Section 2.0 due to the 'very low' background/rating levels.

⁺ Representative background noise level selected based on LA90 Histograms presented in Appendix C. As night-time noise level was higher than the day, the day LA90 has been selected as a 'worst-case'. This is in line with the BS4142 methodology outlined in Section 2.0 for 'very low' background/rating levels.

The representative noise levels presented in **Table 4.3** have been used to inform the assessment presented in Section 5.0.

5.0 Assessment of Construction Effects

5.1 Construction Noise

Construction noise is generally not regarded as being a key issue in the planning process other than where it is likely to be high in level and likely to continue for very long periods.

For the Proposed Development, although the construction phase would likely extend over several months in respect to the whole Site, the nature of the construction works will be dispersed which would mean that the impact on individual existing sensitive receptors (residential properties) would be for much shorter periods.

The construction works for the Solar and BESS Sites would primarily consist of installation of solar panels, battery energy storage units, substations and other ancillary units along with access routes. It is considered that these works would be relatively small in scale and as such would be unlikely to result in noise or vibration levels that are significant over a long period.

For the cable corridor, 'Best Practicable Means' and best practice advice provided in BS 5228-1:2009+A1:2014 will be employed to ensure any existing sensitive receptors in the vicinity of the cable corridor will not be exposed to significant levels of noise or vibration over long periods.

6.0 Assessment of Operational Effects

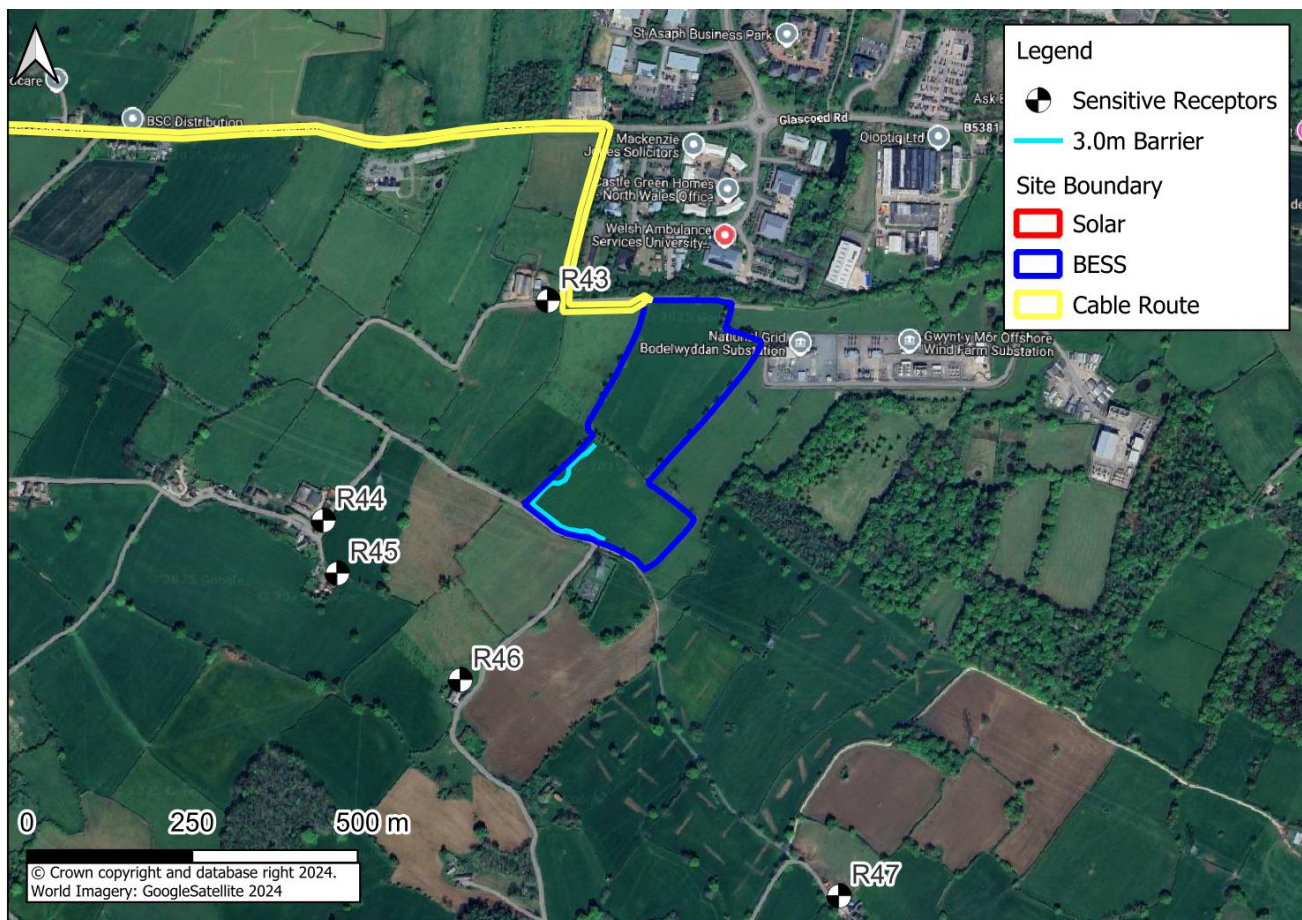
6.1 Intrinsic Mitigation

Potential impacts due to noise have been considered throughout the design process, and as such the scheme benefits from a number of intrinsic mitigation measures. A summary of the intrinsic noise mitigation measures included within the scheme are provided below:

- Buffer areas between the development and noise-sensitive receptors.
- Locating the noise-generating equipment away from noise-sensitive receptors, where practical e.g. proposed inverters re-sited away from nearby residential receptors as informed by results of the noise survey during design development before the layout was finalised.

6.2 Additional Embedded Mitigation

Additional mitigation has been considered throughout the design process including embedded noise mitigation in the form of an acoustic fence at the BESS site illustrated in **Figure 6-1**. These fences will be constructed using close board fencing with a minimum surface mass density of 15 kg/m². This mitigation measure has been included in the noise model.

Figure 6-1: Embedded Mitigation

6.3 BS 4142:2014+A1:2019 Operational Phase Noise Assessment

Noise Contours from the Solar Site and BESS Site illustrate the predicted noise levels across the site.

Figure 6-2: Noise Contour Plot of Solar Site $L_{Aeq,1hour}$ – 4.0m Above Ground

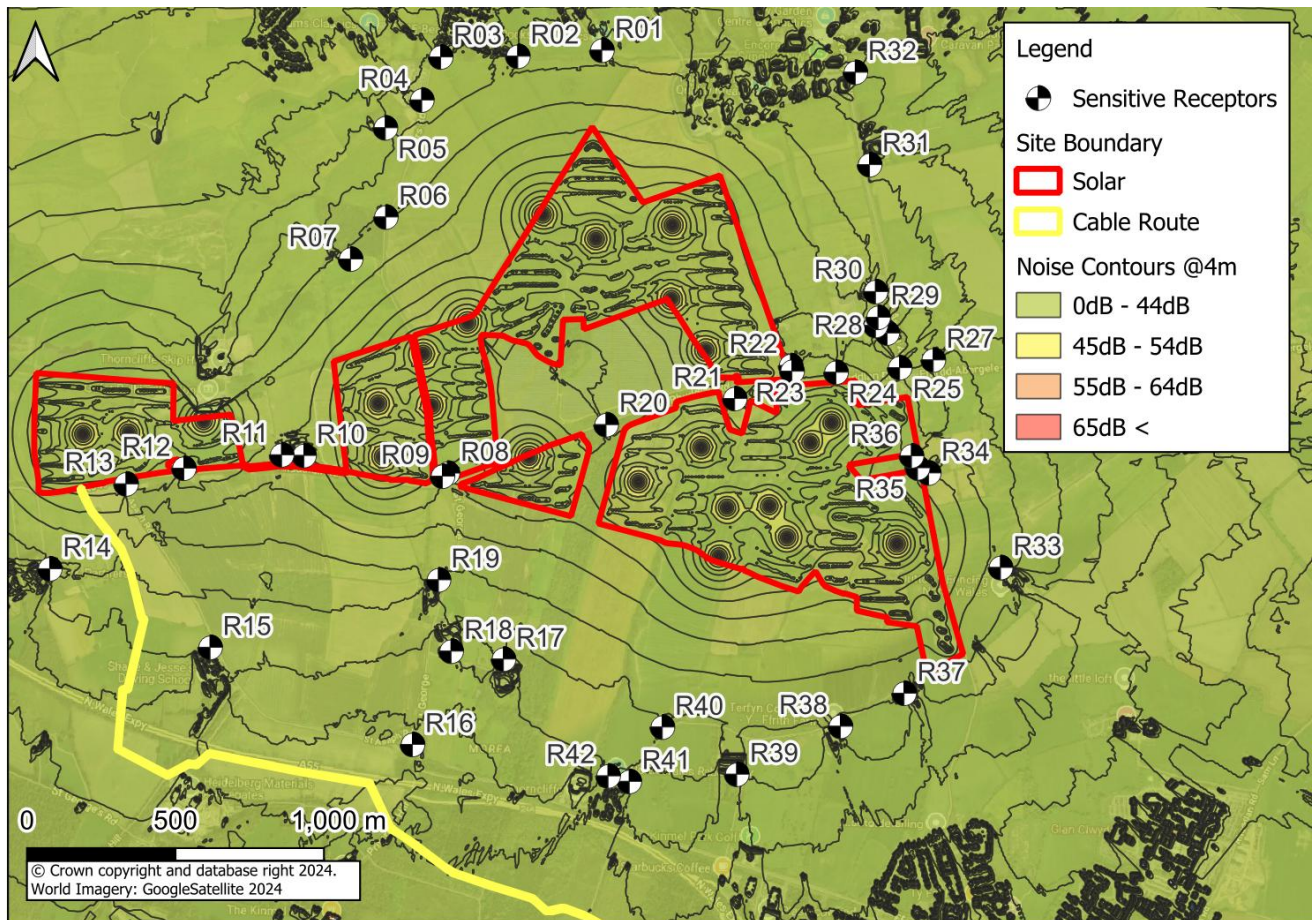
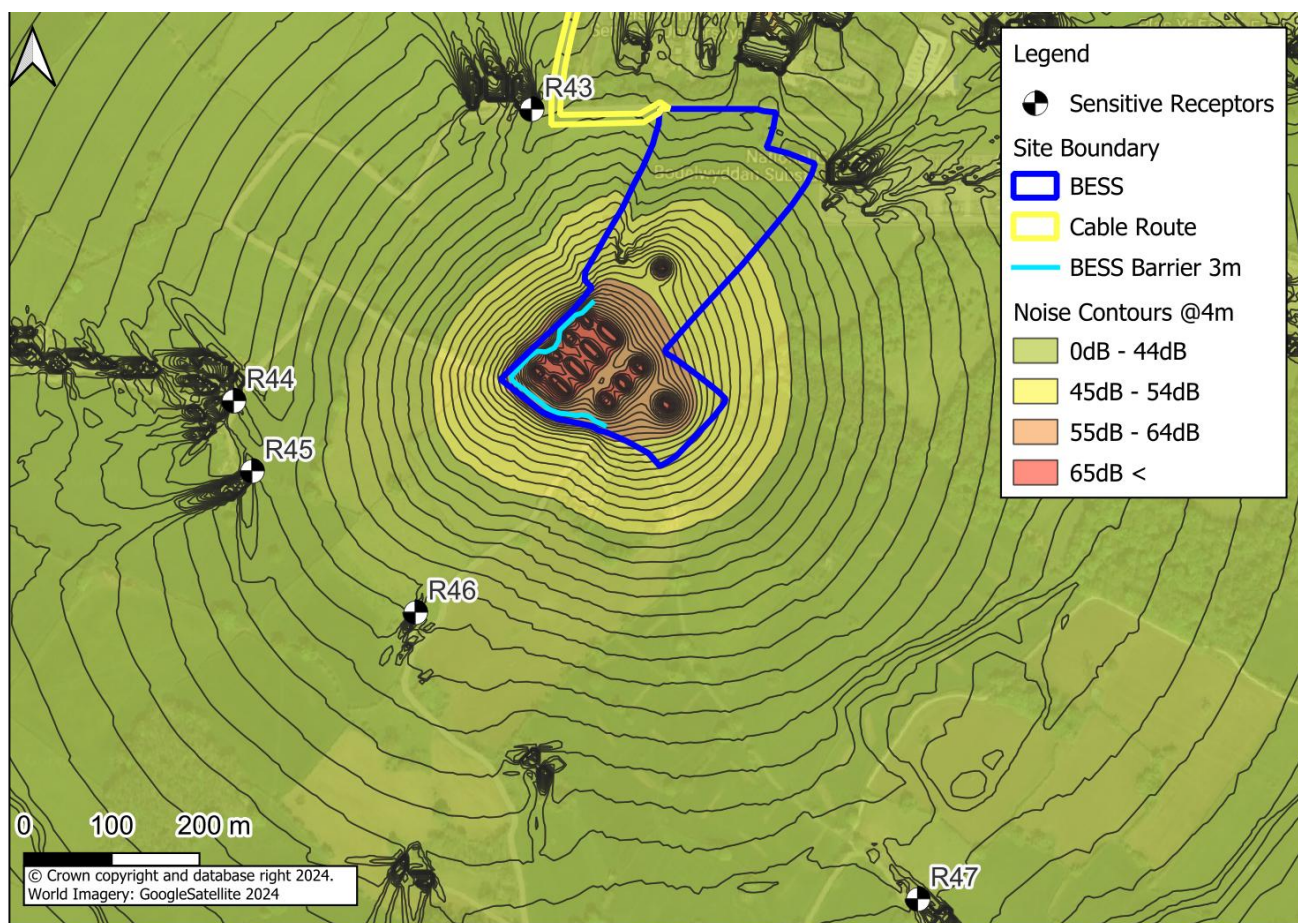


Figure 6-3: Noise Contour Plot of BESS Site $L_{Aeq,1hour}$ – 4.0m Above Ground

The assessment below compares the noise rating levels from the operational phase of the proposed development with the existing background noise level (L_{A90}) at the surrounding noise sensitive receptors.

It should be noted that BS 4142:1997 recognises that its method of assessment is not suitable when background and rating noise levels are both very low. Background noise levels below about 30 dB(A) and rating levels below about 35 dB(A) are considered to be very low. In such circumstances, it is recommended that a criteria of 35 dB $L_{A_{r,Tr}}$ is set where the prevailing background noise levels are below this value. Such a limiting criterion falls well below credited absolute noise level amenity standards that are based on scientifically derived health-based guideline values to prevent harmful effects of noise (e.g. on rest/sleep with windows open), whilst importantly ensuring unreasonable restrictions on development and/or undue costs on business are not borne where residual noise levels cannot be cost effectively or practically prevented.

As such, where the measured background noise levels are below 35 dB during the daytime or the night-time period, an adopted criteria of 35 dB has been used instead.

BS 4142:2014+A1:2019 states that corrections should be applied to account for certain acoustic features which have the potential to increase the level of effect at nearby properties. In this instance, no corrections have been applied considering the existing noise climate includes substation, introduction of BESS and substation will not change the characteristics of the noise climate.

6.3.1 Solar Site

Table 6.1 presents the difference between the background noise level and the noise rating level associated with the proposed development at the nearest sensitive receptors.

Table 6.1: BS4142 Assessment - Solar

Location	Existing Measured Background L_{A90}		Predicted Noise Level L_{Aeq}		Noise rating level from plant		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R01	43	37	24	24	24	24	-19	-13
R02	43	37	26	26	26	26	-17	-11
R03	43	37	23	23	23	23	-20	-14
R04	43	37	24	24	24	24	-19	-13
R05	43	37	24	24	24	24	-19	-13
R06	48	36	29	29	29	29	-19	-7
R07	48	36	28	28	28	28	-20	-8
R08	55	37	35	35	35	35	-20	-2
R09	55	37	34	34	34	34	-21	-3
R10	49	35	31	31	31	31	-18	-4
R11	49	35	31	31	31	31	-18	-4
R12	49	35	36	36	36	36	-13	+1
R13	49	35	37	37	37	37	-12	+2
R14	49	35	27	27	27	27	-22	-8
R15	49	35	23	23	23	23	-26	-12
R16	55	37	20	20	20	20	-35	-17
R17	55	37	26	26	26	26	-29	-11
R18	55	37	21	21	21	21	-34	-16
R19	55	37	28	28	28	28	-27	-9
R20	55	37	30	30	30	30	-25	-7
R21	55	37	31	31	31	31	-24	-6
R22	51	36	33	33	33	33	-19	-4
R23	51	36	35	35	35	35	-16	-1
R24	51	36	36	36	36	36	-16	-1
R25	51	36	30	30	30	30	-21	-6
R26	51	36	25	25	25	25	-26	-11
R27	51	36	29	29	29	29	-22	-7

Location	Existing Measured Background L_{A90}		Predicted Noise Level L_{Aeq}		Noise rating level from plant		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R28	51	36	31	31	31	31	-20	-5
R29	51	36	28	28	28	28	-24	-9
R30	51	36	24	24	24	24	-27	-12
R31	51	36	23	23	23	23	-28	-13
R32	51	36	18	18	18	18	-33	-18
R33	51	36	27	27	27	27	-24	-9
R34	51	36	34	34	34	34	-17	-2
R35	51	36	31	31	31	31	-20	-5
R36	51	36	32	32	32	32	-20	-5
R37	46	37	29	29	29	29	-18	-9
R38	46	37	24	24	24	24	-22	-13
R39	46	37	20	20	20	20	-26	-17
R40	46	37	22	22	22	22	-24	-15
R41	46	37	22	22	22	22	-25	-16
R42	46	37	22	22	22	22	-24	-15

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.

All calculations used to derive the above table (including averaging of background noise levels and predicted source noise levels) have been undertaken to 1 decimal place to avoid perpetuation of rounding errors. However, in accordance with BS4142 para 8.6 the levels are expressed as integers (with 0.5 dB being rounded up). This may mean that the arithmetic in the above table may appear to be up to 1 dB incorrect due to this rounding.

As demonstrated within **Table 6.1**, the results of the assessment indicate that the BS4142 Noise Rating Levels at sensitive façades of the existing noise sensitive properties are well below the existing daytime background noise levels. Similarly, Noise Rating Levels at sensitive façades of the existing noise sensitive properties are below the existing nighttime background noise levels with the exception of two properties which were just +1 and +2 dB above the night-time background noise levels (at R12-R13).

In accordance with BS 4142:2014+A1:2019, this is likely an indication of an impact below 'adverse impact' at R12-R13. For the remaining receptors, this is an indication of 'low impact', depending on the context.

BS4142 requires that consideration is given to context before arriving at a final impact. As such, further consideration to context is provided in the Section 6.5.

6.3.2 BESS Site

Table 6.2 presents the difference between the background noise level and the noise rating level associated with the proposed development at the nearest sensitive receptors.

Table 6.2: BS4142 Assessment - BESS

Location	Existing Measured Background L_{A90}		Predicted Noise Level L_{Aeq}		Noise rating level from plant		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R43	38	38	39	39	39	39	+1	+1
R44	35	35	35	35	35	35	0	0
R45	35	35	36	36	36	36	+1	+1
R46	35	35	38	38	38	38	+3	+3
R47	35	35	34	34	34	34	-1	-1

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.

All calculations used to derive the above table (including averaging of background noise levels and predicted source noise levels) have been undertaken to 1 decimal place to avoid perpetuation of rounding errors. However, in accordance with BS4142 para 8.6 the levels are expressed as integers (with 0.5 dB being rounded up). This may mean that the arithmetic in the above table may appear to be up to 1 dB incorrect due to this rounding.

As demonstrated within **Table 6.2**, the results of the assessment indicate that the BS4142 Noise Rating Levels at sensitive façades of the existing noise sensitive properties are up to +3 dB above the daytime and night-time background noise levels at R46. In accordance with BS 4142:2014+A1:2019, this is likely an indication of an impact below adverse impact at R46. For the remaining receptors, this is an indication of low impact, depending on the context.

BS4142 requires that consideration is given to context before arriving at a final impact. As such, further consideration to context is provided in the Section 6.5.

6.4 Noise Intrusion Assessment

To provide further context to the assessment presented within Section 5.0, internal noise levels predicted at the façade of sensitive receptor locations are assessed with windows open where a reduction to the external noise levels of 13 dB from a partially open window has been used.

6.4.1 Solar Site Noise Intrusion

The results are shown in **Table 6.3** and **Table 6.4**, and compared against the BS 8233:2014 internal noise criteria for bedrooms and living rooms in dwellings.

Table 6.3: Daytime Noise Intrusion Levels $L_{Aeq,16hours}$

Location	External $L_{Aeq,16hours}$	Internal $L_{Aeq,16hours}$ with Windows Open	Criteria $L_{Aeq,16hours}$
R01	24	11	35
R02	26	13	35
R03	23	10	35
R04	24	11	35
R05	24	11	35
R06	29	16	35
R07	28	15	35
R08	35	22	35
R09	34	21	35
R10	31	18	35
R11	31	18	35
R12	36	23	35
R13	37	24	35
R14	27	14	35
R15	23	10	35
R16	20	7	35
R17	26	13	35
R18	21	8	35
R19	28	15	35
R20	30	17	35
R21	31	18	35
R22	33	20	35
R23	35	22	35
R24	36	23	35
R25	30	17	35

Location	External $L_{Aeq,16hours}$	Internal $L_{Aeq,16hours}$ with Windows Open	Criteria $L_{Aeq,16hours}$
R26	25	12	35
R27	29	16	35
R28	31	18	35
R29	28	15	35
R30	24	11	35
R31	23	10	35
R32	18	5	35
R33	27	14	35
R34	34	21	35
R35	31	18	35
R36	32	19	35
R37	29	16	35
R38	24	11	35
R39	20	7	35
R40	22	9	35
R41	22	9	35
R42	22	9	35

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.

Table 6.4: Night-time Noise Intrusion Levels $L_{Aeq,8hours}$

Location	External $L_{Aeq,8hours}$	Internal $L_{Aeq,8hours}$ with Windows Open	Criteria $L_{Aeq,8hours}$
R01	24	11	30
R02	26	13	30
R03	23	10	30
R04	24	11	30
R05	24	11	30
R06	29	16	30
R07	28	15	30
R08	35	22	30

Location	External $L_{Aeq,8hours}$	Internal $L_{Aeq,8hours}$ with Windows Open	Criteria $L_{Aeq,8hours}$
R09	34	21	30
R10	31	18	30
R11	31	18	30
R12	36	23	30
R13	37	24	30
R14	27	14	30
R15	23	10	30
R16	20	7	30
R17	26	13	30
R18	21	8	30
R19	28	15	30
R20	30	17	30
R21	31	18	30
R22	33	20	30
R23	35	22	30
R24	36	23	30
R25	30	17	30
R26	25	12	30
R27	29	16	30
R28	31	18	30
R29	28	15	30
R30	24	11	30
R31	23	10	30
R32	18	5	30
R33	27	14	30
R34	34	21	30
R35	31	18	30
R36	32	19	30
R37	29	16	30
R38	24	11	30

Location	External $L_{Aeq,8hours}$	Internal $L_{Aeq,8hours}$ with Windows Open	Criteria $L_{Aeq,8hours}$
R39	20	7	30
R40	22	9	30
R41	22	9	30
R42	22	9	30

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.

As demonstrated in the tables above, with windows open, the resultant internal noise levels within the sensitive receptors during the daytime and night-time periods are predicted to be compliant with the BS 8233:2014 internal noise level criteria.

As such, the proposed Solar development is considered to have a low noise impact on the existing sensitive receptors.

6.4.2 BESS Site Noise Intrusion

The results are shown in **Table 6.5** and **Table 6.6**, and compared against the BS 8233:2014 internal noise criteria for bedrooms and living rooms dwellings.

Table 6.5: Daytime Noise Intrusion Levels $L_{Aeq,16hours}$

Location	External $L_{Aeq,16hours}$	Internal $L_{Aeq,16hours}$ with Windows Open	Criteria $L_{Aeq,16hours}$
R43	39	26	35
R44	35	22	35
R45	36	23	35
R46	38	25	35
R47	34	21	35

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.

Table 6.6: Night-time Noise Intrusion Levels $L_{Aeq,8hours}$

Location	External $L_{Aeq,8hours}$	Internal $L_{Aeq,8hours}$ with Windows Open	Criteria $L_{Aeq,8hours}$
R43	39	26	30
R44	35	22	30
R45	36	23	30
R46	38	25	30
R47	34	21	30

All values are sound pressure levels in dBA re: 2×10^{-5} Pa.

As demonstrated in the tables above, with windows open, the resultant internal noise levels within the sensitive receptors during the daytime and night-time periods are predicted to be compliant the BS 8233:2014 internal noise level criteria.

As such, the proposed BESS development is considered to have a low noise impact on the existing sensitive receptors.

6.5 Cumulative Noise Assessment

6.5.1 Construction Cumulative Impacts

While site-specific construction phase effects are unlikely to be significant, there is potential for cumulative effects of on-site construction and construction traffic noise impacts from other developments in the vicinity of the Proposed Development should the phases overlap.

However, the implementation of Best Practicable Means' and best practice advice provided in BS 5228-1:2009+A1:2014 will minimise any cumulative effects at the Proposed Site.

6.5.2 Operation Cumulative Impacts

Due to the proximity of the BESS Site to the National Grid Proposed Substation Extension, it is considered that there may be potential for cumulative effects at R46 when the sites operation simultaneously. Given the context of the site, which is already characterised by noise from the existing National Grid Substation, it is not considered that the cumulative effects would change the character of the existing noise climate.

At the time of this assessment, it is understood that National Grid have not submitted a planning application for proposals. Therefore, a cumulative assessment cannot be undertaken at this stage.

7.0 Uncertainty

Despite sound measurement system precision of 0.1dB, all measurements of environmental sound or specific components identified within this report are subject to uncertainty. All noise measurements include elements of intrinsic uncertainty in the measured value, the magnitude and significance of which usually depends upon many factors.

The most obvious factor for measurements undertaken for this assessment is due to instrumentation, but this is minimised by a range of controls set out in Craven & Kerry's '*A Good Practice Guide on the Sources and Magnitude of Uncertainty Arising in the Practical Measurement of Environmental Noise*' (as referenced in BS4142) including:

- Use of Type 1 sound level analysers
- Bi-annual calibration of sound level analysers and annual calibration of calibrators
- Periodic cross-calibration with other calibrated analysers and monitoring of system's calibration characteristics
- On site calibration checks before and after measurements are taken
- Avoidance and control of interference due to electromagnetic sources, weather, or other factors.

It is considered that any empirical uncertainty within noise measurements and assessments presented within these reports has been suitably mitigated by the following of the practices outlined above.

The level of uncertainty from the calculation is considered low. The resultant levels have been derived using acoustic modelling software, which uses industry recognized standard IOS 9613-2 calculation method. Where measurements of similar noise sources were not used for the model input data, sound power levels stated on manufacturers/suppliers' datasheets were used which ought to be representative of both the source and the conditions under which the source is expected to operate. 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 for non-compliance.

BS 4142 rating penalties include corrections for sound that is tonal, impulsive, intermittent, or has other characteristics that will tend to attract a listener's attention. The significance of these

characteristics has been assessed by comparison of the specific and residual sound at the noise sensitive location(s).

It is considered that any uncertainty within the subjective assessment of noise character has been suitably mitigated within this assessment using suitably qualified surveyors and assessors.

8.0 Conclusion

A noise assessment has been undertaken in support of a Development of National Significance (DNS) planning application for proposed Solar and Battery Energy Storage System (BESS) sites in Bodelwyddan, Wales.

A baseline noise survey was undertaken in October 2024 to establish the existing background noise levels (L_{A90}) at the surrounding existing sensitive receptors during the daytime and night-time periods.

With mitigation in place, the majority of BS 4142 noise rating levels associated with the operational phase of the Proposed Development at the nearest sensitive receptors are below the existing background, with worst case noise levels up to +2 and +3 dB above the existing background noise levels at the Solar Site and BESS Site, respectively. For the vast majority of both sites, the noise rating levels will be below the existing background noise level. In accordance with BS 4142:2014+A1:2019, this is likely an indication of either Low impact or an impact between Low Impact and Adverse Impact, depending on the context.

A noise intrusion assessment was also undertaken to present further context, particularly to the night-time noise levels. With windows opened, the internal noise levels at the sensitive receptors resulting from both the Solar and BESS sites were predicted to be compliant the BS 8233:2014 criteria during both the daytime and night-time periods.

Considering the above, the proposed development is not expected to result in a risk of unacceptable harm to health and/or local amenity because of noise and it has been demonstrated that any significant adverse risk to public health, the environment and/or impact upon local amenity due to the proposed development can be mitigated.

Appendices

Appendix A – Acoustic Terminology

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result, the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The L_{Aeq, 07:00 – 23:00} for example, describes the equivalent continuous noise level over the 16-hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the L_{Aeq, 07:00 – 23:00}.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say, 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the L_{A10, 1 hr} = x dB.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

Appendix B - Time History Graphs

Figure B-1: Time History Graph, LT1

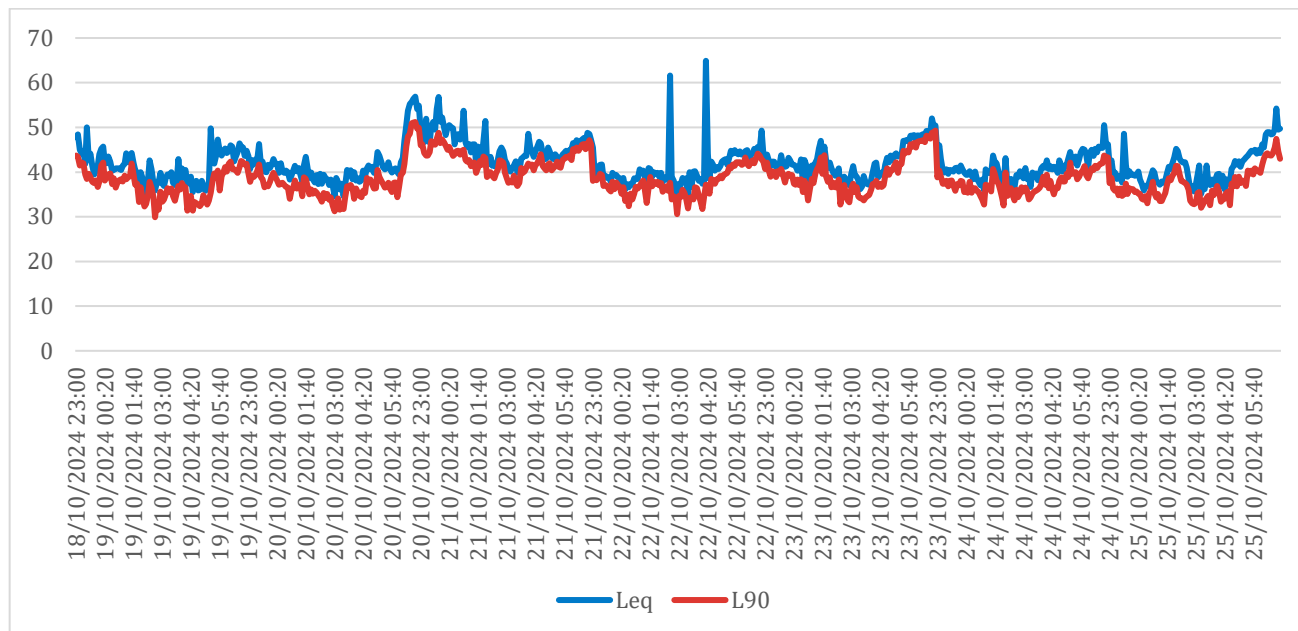


Figure B-2: Time History Graph, LT2

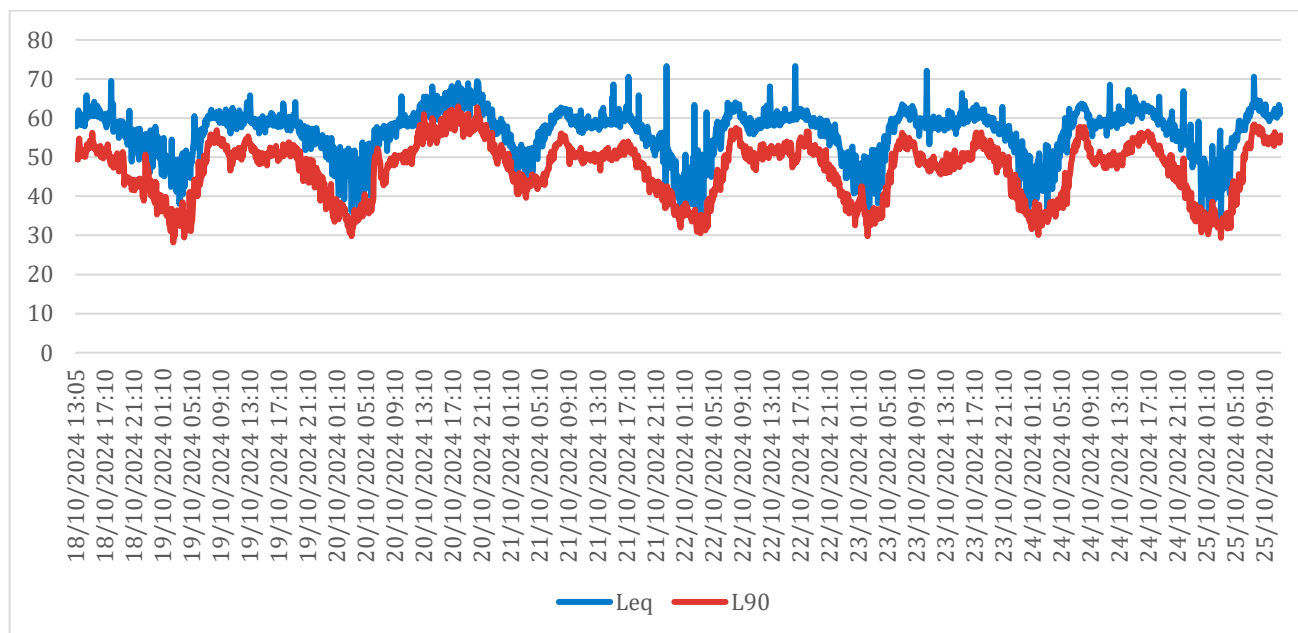


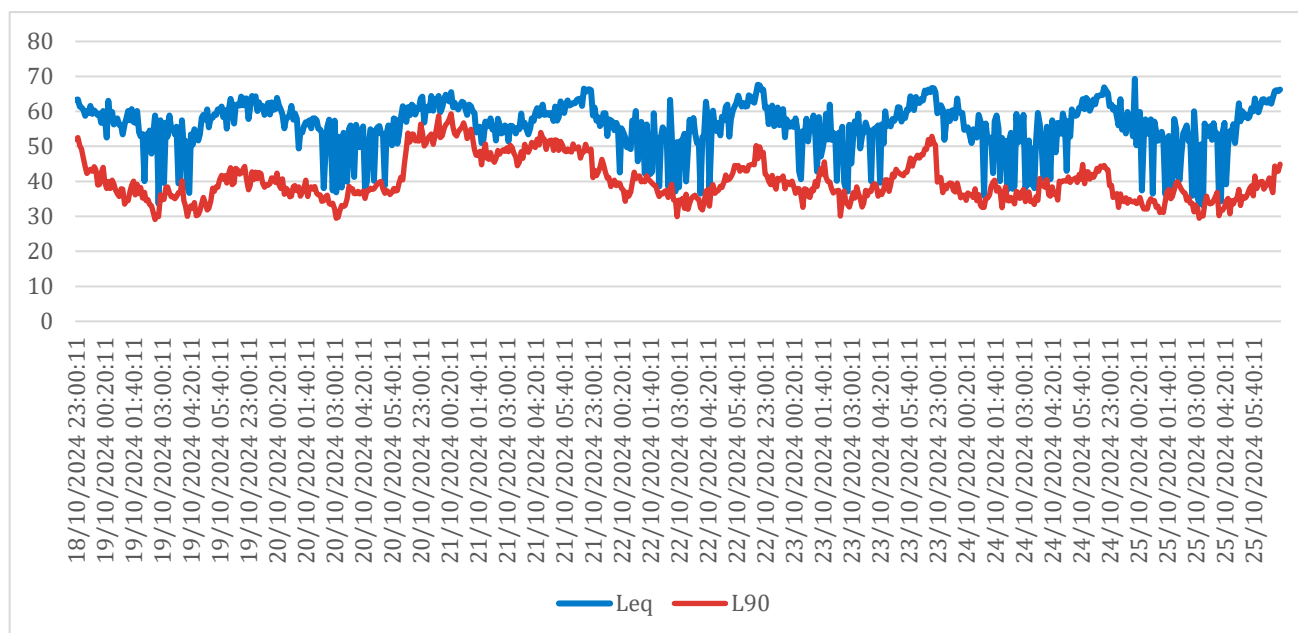
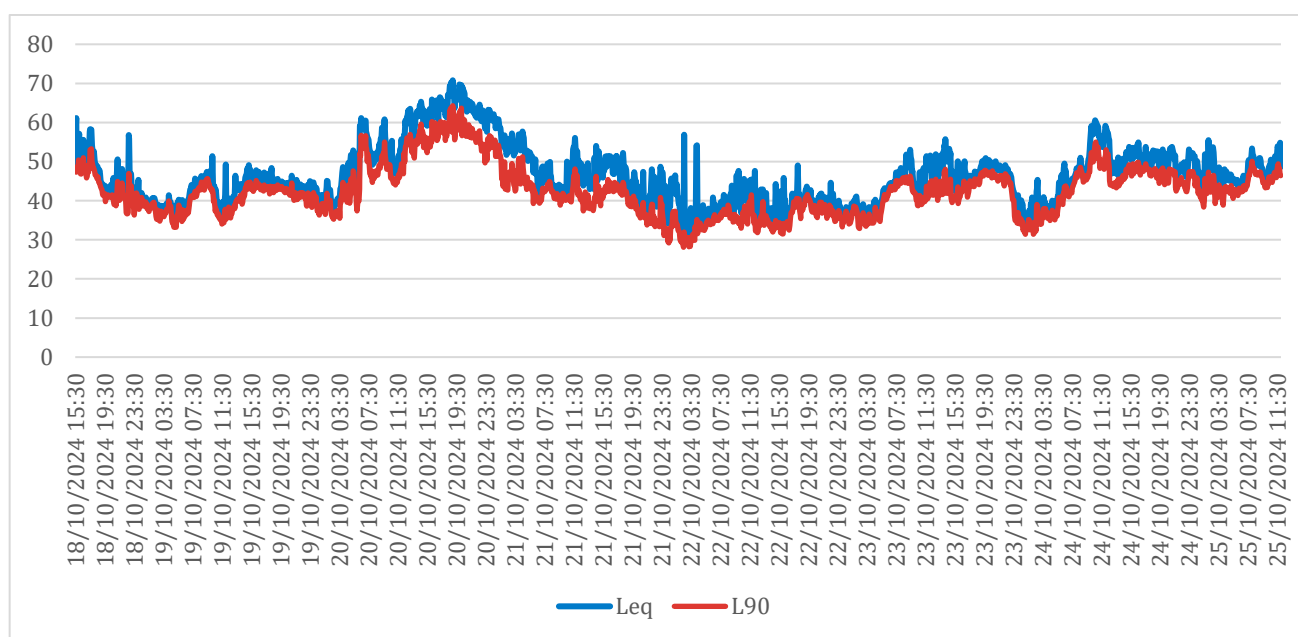
Figure B-3: Time History Graph, LT3**Figure B-4: Time History Graph, LT4**

Figure B-5: Time History Graph, LT5

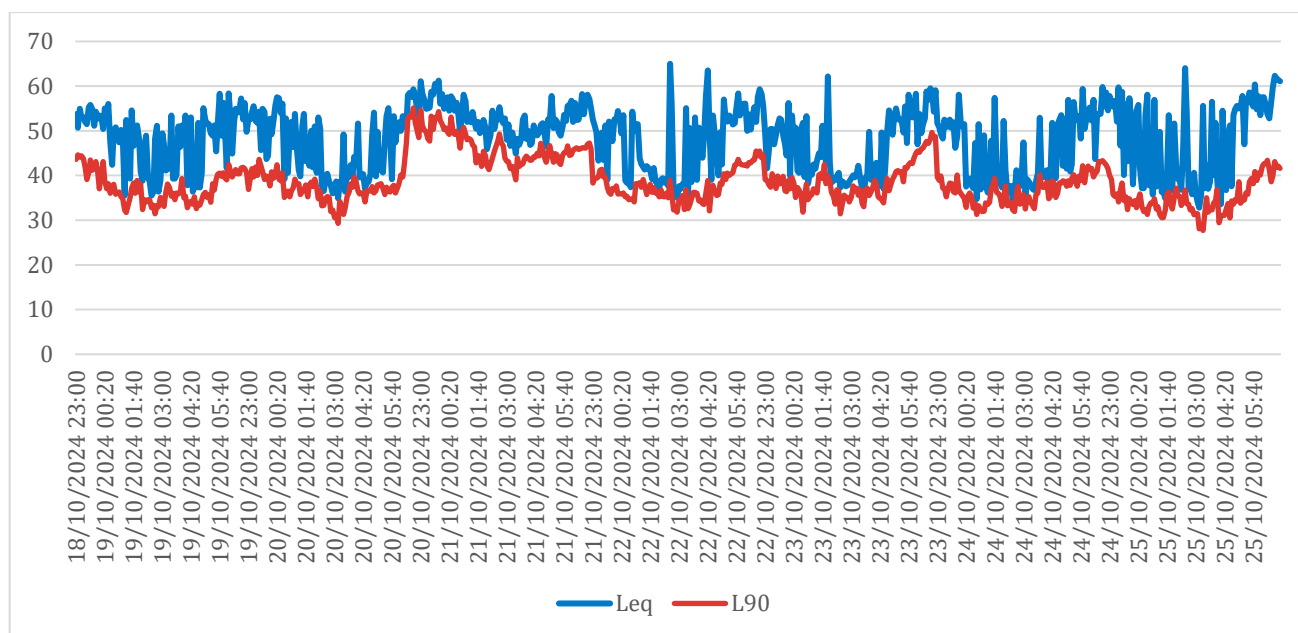


Figure B-1: Time History Graph, LT6

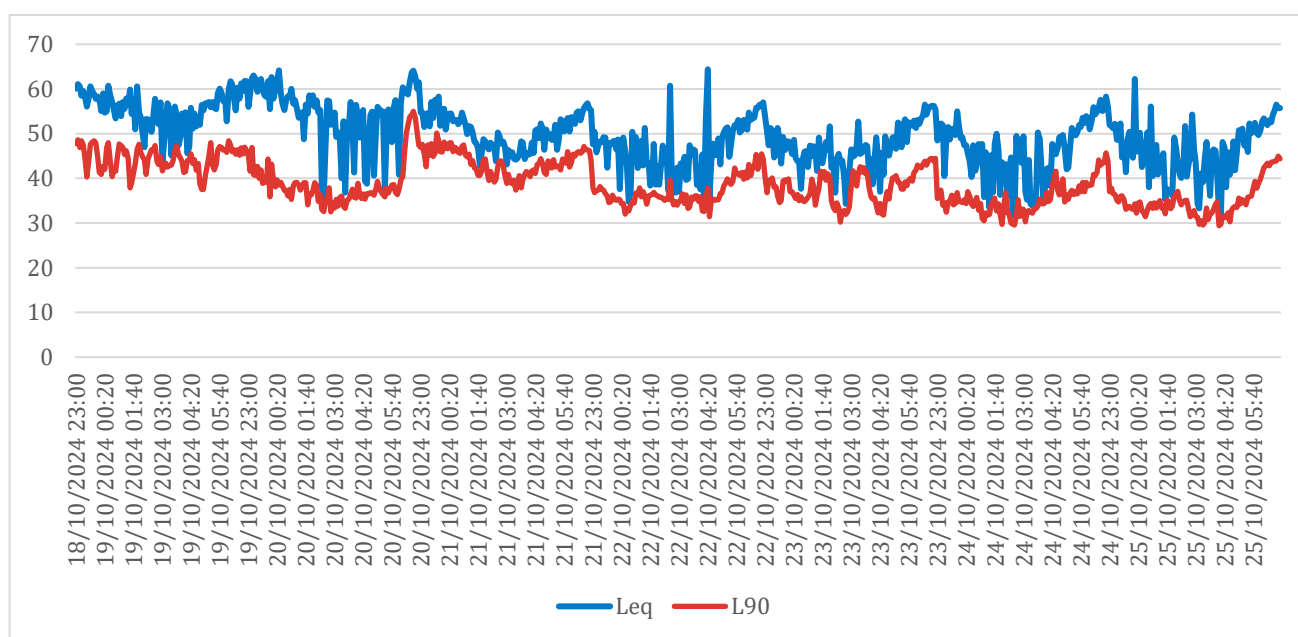


Figure B-7: Time History Graph, LT7

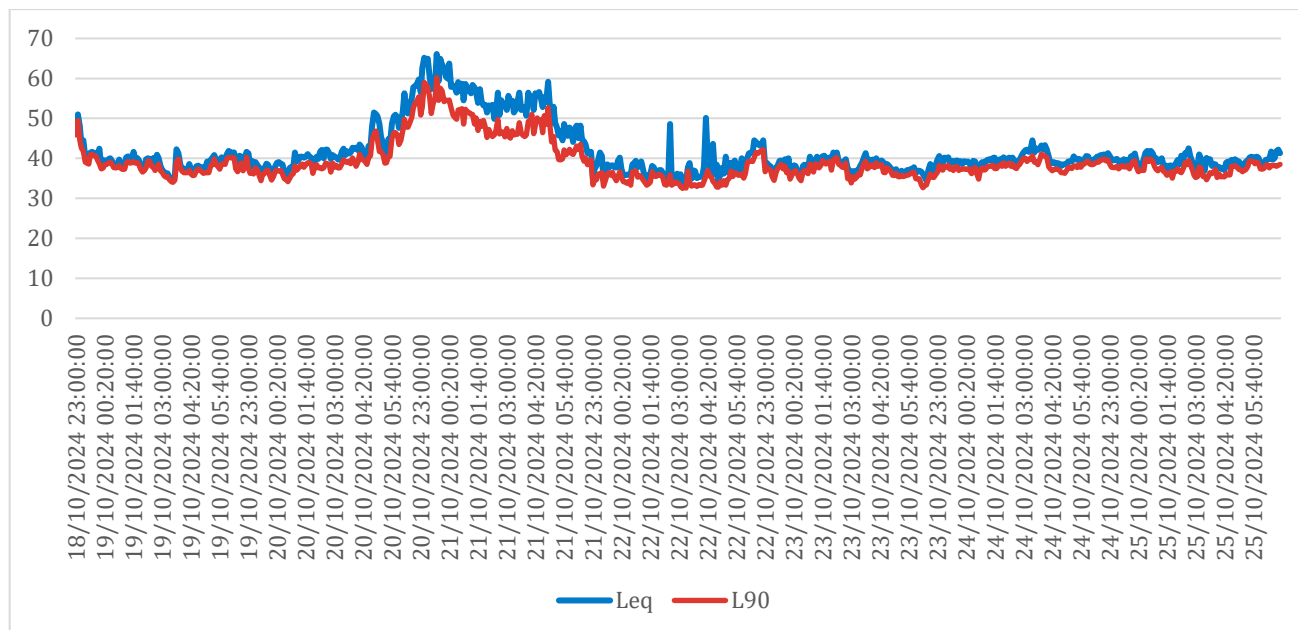
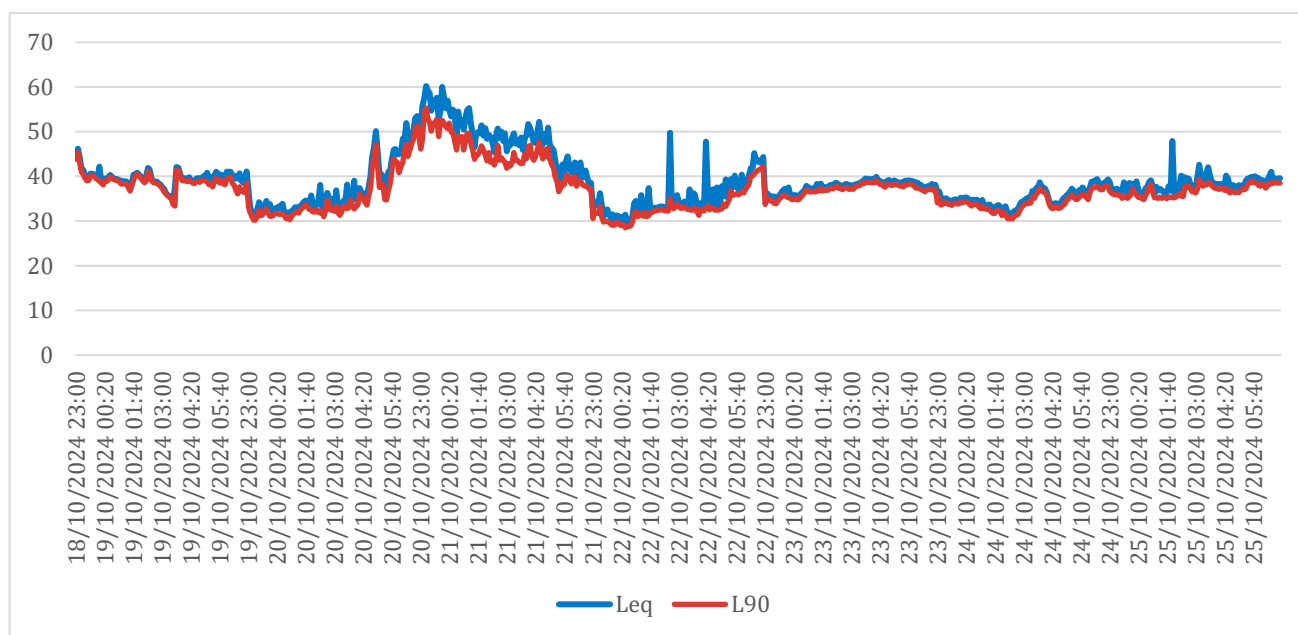
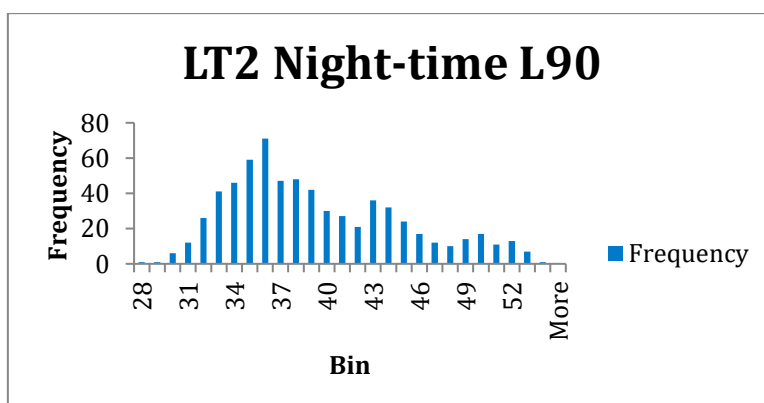
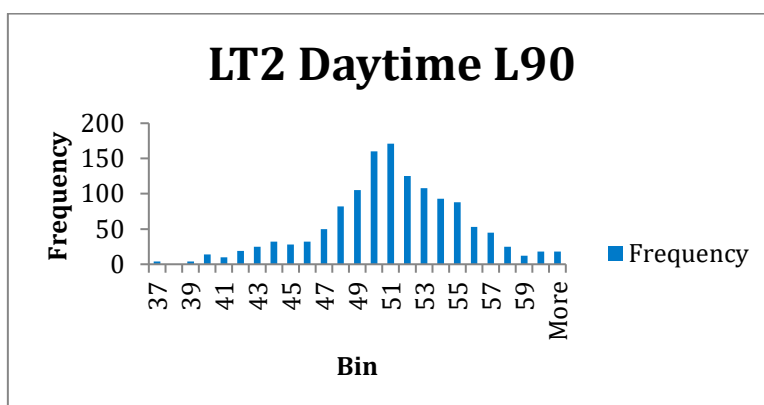
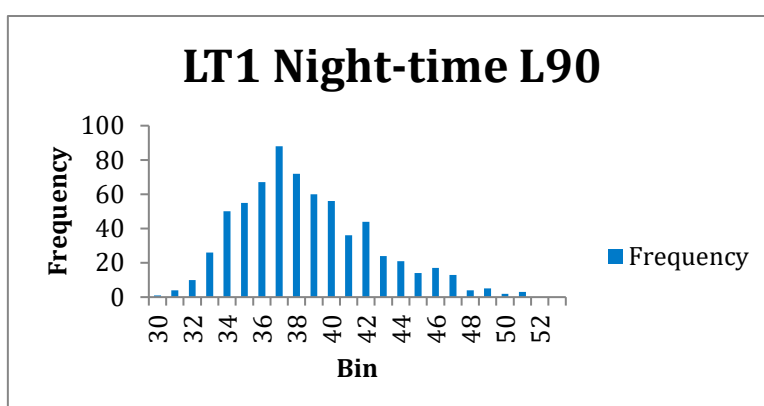
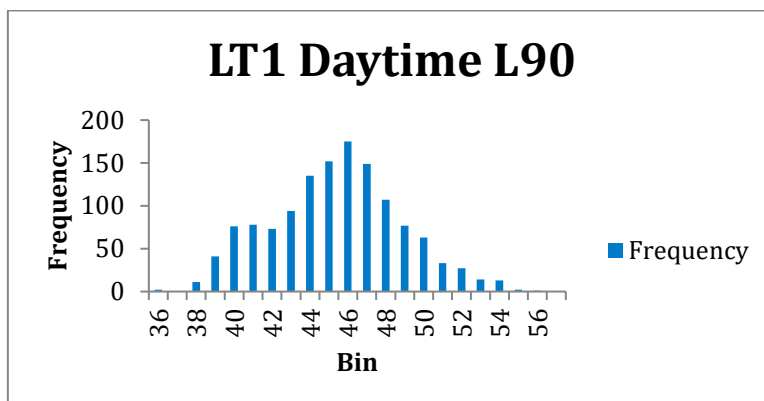
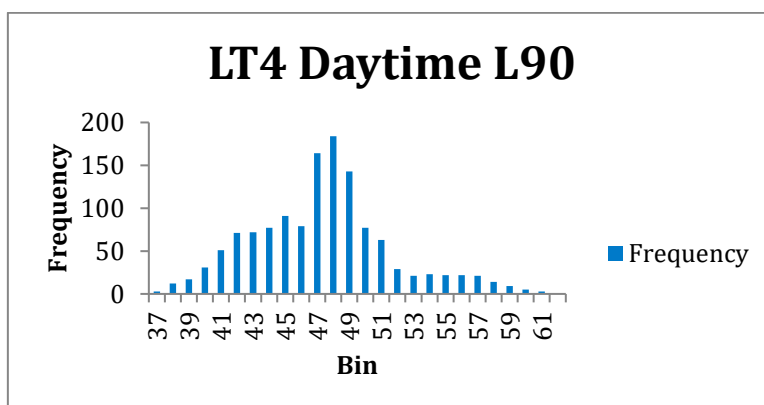
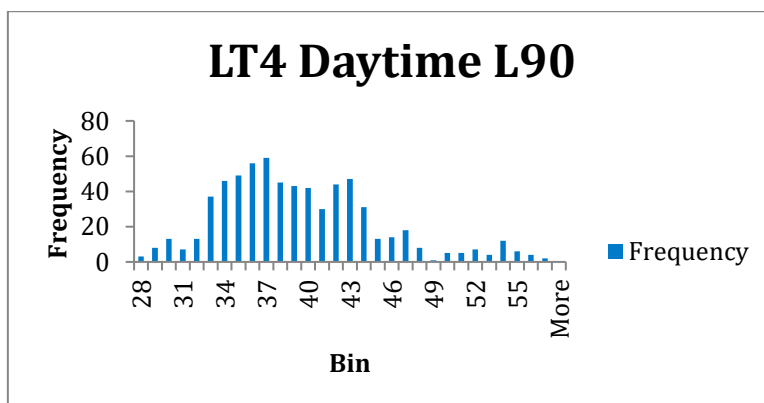
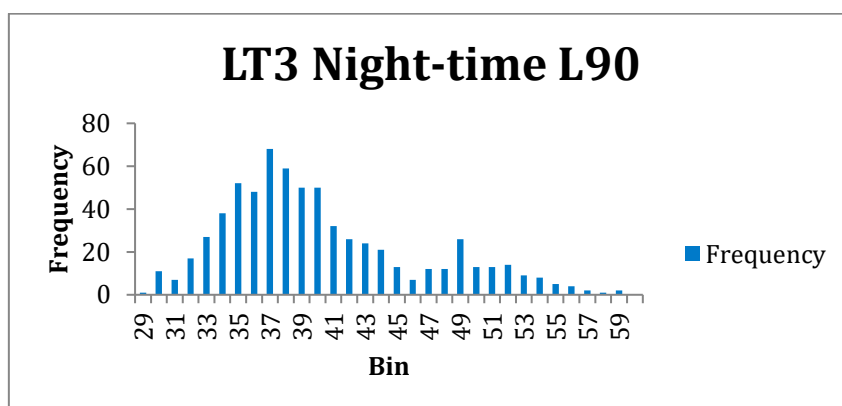
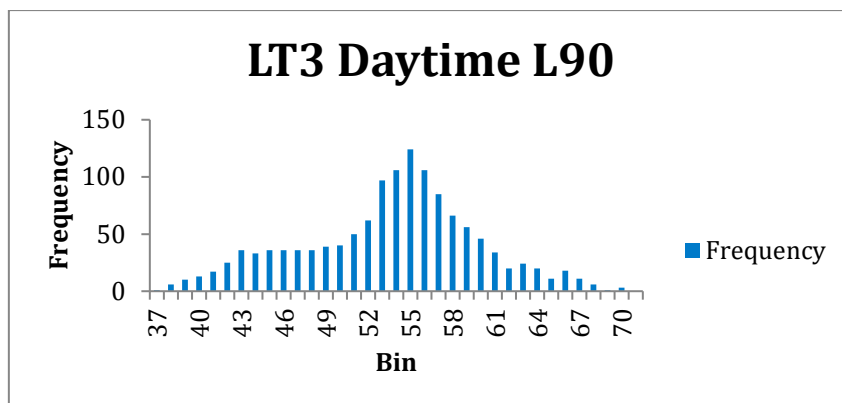


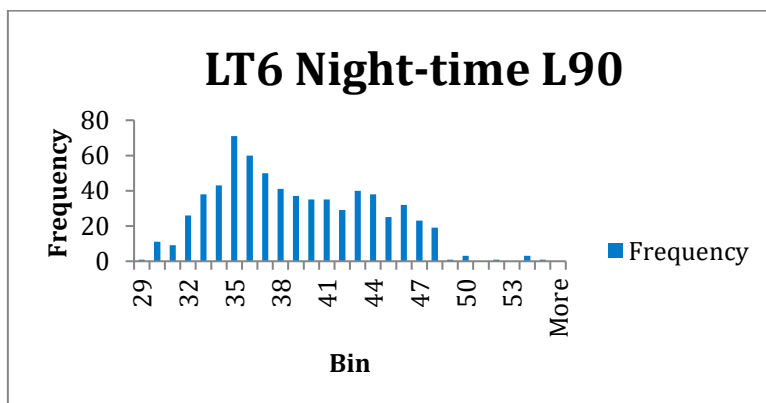
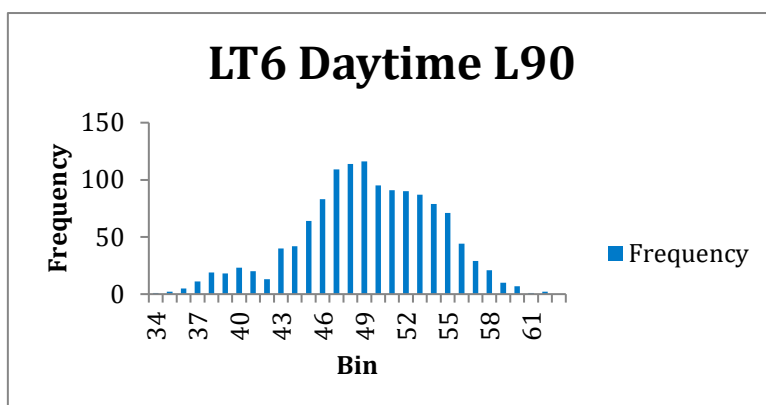
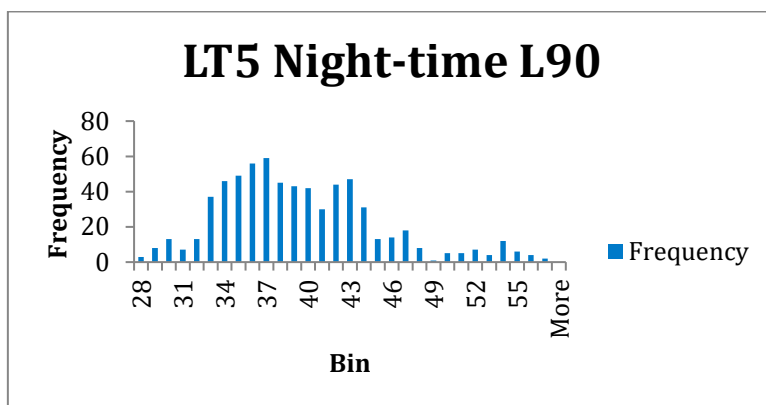
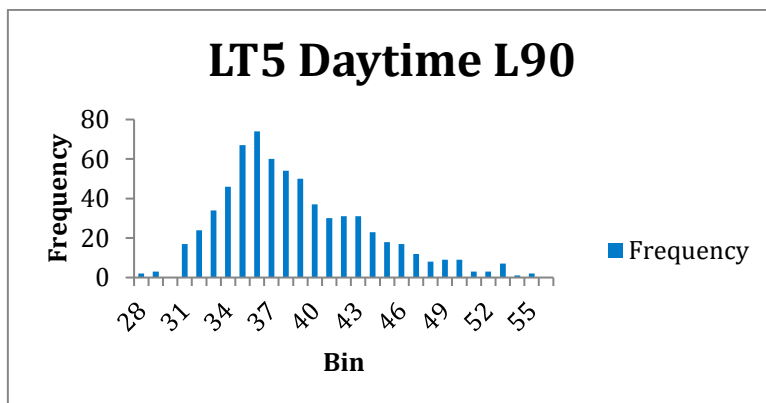
Figure B-2: Time History Graph, LT8

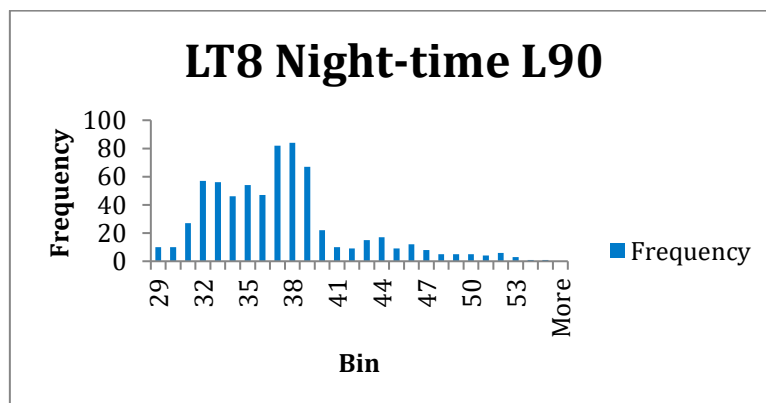
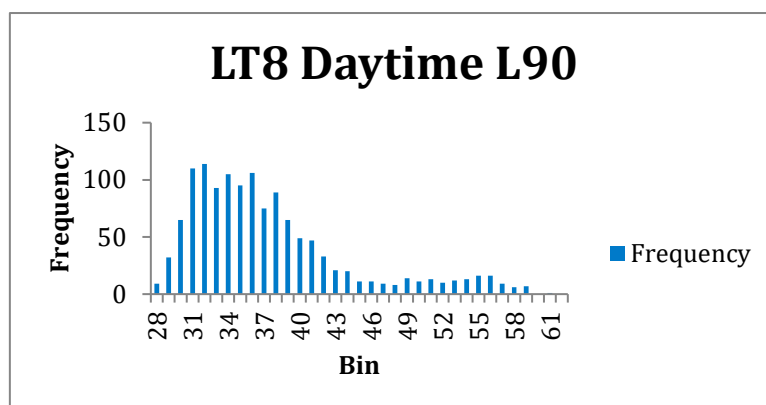
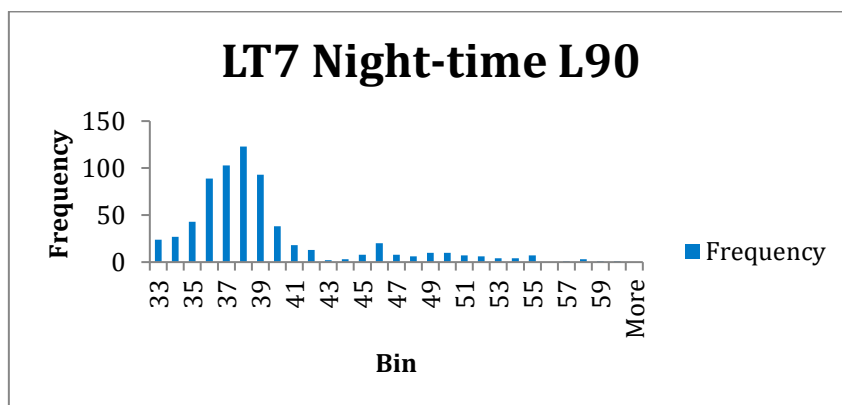
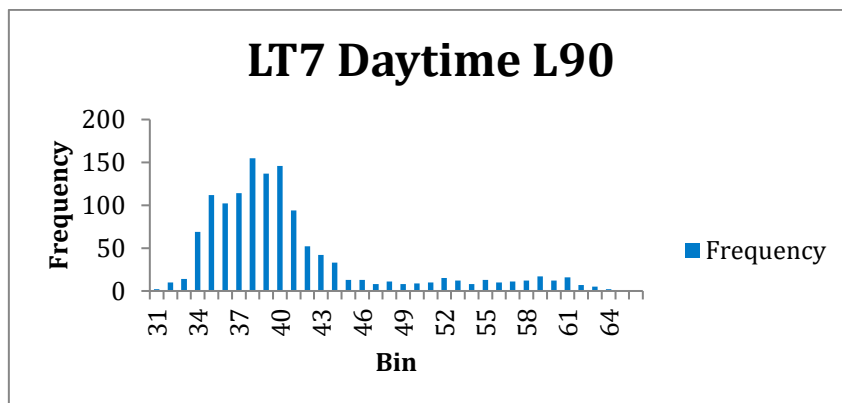


Appendix C – Histograms









Appendix D – References

British Standards Institute (BSI). (1997). BS 4142:1997. *Method for rating industrial noise affecting mixed residential and industrial areas*. United Kingdom.

British Standards Institute (BSI). (2003). BS 7445-1:2003. *Description and Measurement of Environmental Noise - Part 1: Guide to Quantities and Procedures*. United Kingdom.

British Standards Institute (BSI). (2014). BS 4142:2014+A1:2019. *Method for Rating Industrial and Commercial Sound*. United Kingdom.

British Standards Institute (BSI). (2014). BS 8233:2014. *Guidance on Sound Insulation and Noise Reduction for Buildings*. United Kingdom.

Energy Networks Association. (2024). TS 35-3. *Continuous Maximum Rated (CMR) system transformers (for use on systems up to 132 kV)*. United Kingdom.

Welsh Government. (1997). *Technical Advice Note (TAN) 11: Noise*. United Kingdom.

Welsh Government. (2021). *Future Wales: The National Plan 2040*. United Kingdom.

Welsh Government. (2024). *Planning Policy Wales*. United Kingdom.