



Parc Ynni Calon y Gwynt

ENVIRONMENTAL STATEMENT

Chapter 11: Noise





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CONTENTS

11	NOISE	6
11.1	INTRODUCTION	6
11.2	RELEVANT LEGISLATION, PLANNING POLICY AND TECHNICAL GUIDANCE	7
11.3	CONSULTATION AND ENGAGEMENT	9
11.4	DATA GATHERING METHODOLOGY	11
11.5	OVERALL BASELINE	12
11.6	SCOPE OF THE ASSESSMENT	22
11.7	ASSESSMENT METHODOLOGY	25
11.8	ASSESSMENT OF PARC YNNI CALON Y GWYNT OPERATIONAL WIND TURBINE NOISE LEVELS	29
11.9	ASSESSMENT OF CUMULATIVE OPERATIONAL WIND TURBINE NOISE LEVELS	36
11.10	ASSESSMENT OF OPERATIONAL NOISE LEVELS FROM BESS FACILITY	41
11.11	ASSESSMENT OF CONSTRUCTION/DECOMMISSIONING NOISE LEVELS	42
11.12	CONCLUSIONS	43

TABLES

Table 11-1	- Legislation, policy, and guidance, relevant to the noise assessment	7
Table 11-2	- Summary of EIA Scoping Direction responses for noise and vibration	10
Table 11-3	- Technical Engagement on the Noise Assessment	10
Table 11-4	- Data sources used to inform the noise assessment	11
Table 11-5	- H3 Prevailing Background Noise Level (dB LA90)	16
Table 11-6	- Field nr Lakeside View Prevailing Background Noise Level (dB LA90)	16
Table 11-7	- H7 Prevailing Background Noise Level (dB LA90)	17
Table 11-8	- H47 Prevailing Background Noise Level (dB LA90)	18

Table 11-9 - H53 Prevailing Background Noise Level (dB LA90)	18
Table 11-10 - H56 Prevailing Background Noise Level (dB LA90)	19
Table 11-11 - Average Prevailing Background Noise Level (dB LA90) - Amenity Hours	20
Table 11-12 - Average Prevailing Background Noise Level (dB LA90) - Night-time Hours	20
Table 11-13 - Possible Significant effects on Noise Receptors Scoped in for Further Assessment	23
Table 11-14 - Summary of pathways and effects scoped out of this assessment	24
Table 11-15 - Example threshold of potential significant effect at dwellings	28
Table 11-16 - Summary of predicted compliance of operational wind farm noise levels (of Parc Ynni Calon y Gwynt in isolation), daytime hours	32
Table 11-17 - Summary of predicted compliance of operational wind farm noise levels (of Parc Ynni Calon y Gwynt in isolation), night-time hours	34
Table 11-18 - Summary of Predicted Compliance of Cumulative Operational Wind Farm Noise Levels, Daytime Hours	38
Table 11-19 - Summary of Predicted Compliance of Cumulative Operational Wind Farm Noise Levels, Night-Time Hours	39
Table 11-20 - Summary of Significance of Effects	45

11 NOISE

Noise guidance for assessing operational wind farm noise levels was updated in June 2026 after the preparation of this chapter. Although this chapter has been reviewed and partially updated to ensure that the assessment remains robust and the conclusions are not materially different, the chapter will be updated prior to submission of the DNS application to fully reflect the updated guidance.

11.1 INTRODUCTION

- 11.1.1. This chapter has been drafted by acoustics consultants Hayes McKenzie and presents an assessment of likely significant noise effects of the Proposed Development with respect to those anticipated in the construction and operational stages. The assessment is based on information obtained to date. This chapter should be read in conjunction with the development description provided in **Chapter 4: Description of the Proposed Development** and with respect to relevant parts of **Chapter 12: Traffic and Transport**.
- 11.1.2. This chapter describes:
- The legislation, policy and technical guidance that has informed the assessment (**Section 11.2**);
 - Consultation and engagement that has been undertaken and how comments from consultees relating to noise have been addressed (**Section 11.3**);
 - The methods used for baseline data gathering (**Section 11.4**);
 - Overall baseline (**Section 11.5**);
 - The scope of the assessment for noise (**Section 11.6**);
 - The methods used for the assessment (**Section 11.7**);
 - The assessment of operational wind farm noise levels (of the Proposed Development in isolation) (**Section 11.8**);
 - The assessment of cumulative operational wind farm noise levels (**Section 11.9**);
 - The assessment of noise levels anticipated from the BESS elements (**Section 11.10**);
 - The assessment of construction noise levels (**Section 11.11**);
 - A summary of the conclusions (**Section 11.12**);

LIMITATIONS AND ASSUMPTIONS

- 11.1.3. In terms of operational wind farm noise levels, the assessment is based upon several assumptions. This includes assumptions for the source noise levels (of the Proposed Development and of neighbouring wind farms) when undertaking predictions, and the prevailing background noise levels for locations not measured. Where this is undertaken (e.g. in **Appendices 11J** and **11N**, and **Section 11.5**), details of the assumptions are provided. It is considered that the assumptions follow good practice guidance and are appropriate.

- 11.1.4. The noise assessment is based on a candidate turbine model (a Nordex N163 6.XMW STE wind turbine), If planning permission is obtained, and it is decided to construct the Proposed Development, a tendering process and due diligence process would be undertaken to ensure that the turbine type to be installed, is available, and would meet the required planning conditions including noise limits. This means that the exact turbine type to be ultimately used may be different to that currently modelled, but would fit within the maximum parameters assessed.
- 11.1.5. In terms of prevailing background noise levels, it has not been possible to directly measure background noise levels at the receptor locations known as H4 and H6 because of a lack of access to these properties. These are two of the closest non-financially involved receptor locations in their respective directions. Alternative reasonable proxy locations for these receptors have been utilised, in line with the best practice approach which is used where access to a receptor is not possible. It is a limitation that, in regards the background noise monitoring locations, no feedback from the local environmental health officer has yet been received.
- 11.1.6. In terms of construction related noise levels, the prediction and assessment is based upon source noise levels of typical plant that is likely to be used for the construction activities and traffic movements (see **Appendix 11Q**). In reality, different plant could be used than the ones modelled in this assessment. However, through the use of Best Practicable Means and a Construction Environmental Management Plan, an outline of which is provided within this Environmental Statement, even if different plant is ultimately utilised, noise levels from construction activities can be regulated and managed to be acceptable.
- 11.1.7. Noise guidance for assessing operational wind farm noise levels was updated in June 2026 after the preparation of this chapter. Although this chapter has been reviewed and partially updated to ensure that the assessment remains robust and the conclusions are not materially different, the chapter will be updated prior to submission of the DNS application to fully reflect the updated guidance.

11.2 RELEVANT LEGISLATION, PLANNING POLICY AND TECHNICAL GUIDANCE

- 11.2.1. This section identifies the legislation, planning policy and technical guidance that has informed the assessment of effects with respect to noise.

LEGISLATION, PLANNING POLICY & GUIDANCE

- 11.2.2. A summary of the relevant legislation, planning policy and guidance is provided in **Table 11-1**.

Table 11-1 - Legislation, policy, and guidance, relevant to the noise assessment

Document	Context
Future Wales. The National Plan to 2040 ¹	States that proposals for renewable energy projects qualifying as developments of national significance will be permitted, subject to, amongst other aspects, there being no unacceptable adverse impacts by way of noise.

¹ Welsh Government (2021). "The National Plan 2040". Available at: <https://www.gov.wales/future-wales-national-plan-2040> (Accessed: 4 June 2026).

Document	Context
Planning Policy Wales. Edition 12. February 2024. ²	Direction to consider ETSU-R-97 in the assessment of operational wind farm noise levels
ETSU-R-97. The Assessment and Rating of Noise from Wind Farms. ³	Methodology to assess operational wind farm noise levels
Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. ⁴ (including the supplementary guidance notes)	Good practice guidance in the application of the ETSU-R-97 methodology. Also known as the 'GPG', published by the Institute of Acoustics (IOA)
Assessment and Rating of Wind Turbine Noise. ⁵ (ARWTN)	Updated methodology to assess operational wind farm noise levels. Published in June 2026. Due to the submission time constraints, only a partial update of the operational wind farm noise assessment according to ARWTN has been possible. Hence there remains references to the ETSU-R-97 methodology. Most of the principles that ETSU-R-97 originally set out, that the noise assessment originally follows, is also carried on within the ARWTN guidance. Although there are subtleties to the interpretation and application of the new guidance, for example the end noise criteria and background noise survey methodology remain largely the same.
Noise and Soundscape Plan for Wales ⁶	In regards renewable wind energy proposals, reference is made towards ETSU-R-97 and the GPG. It suggests that a number of issues would benefit from being updated, including how to assess amplitude modulation. This assessment has utilised ETSU-R-97, the GPG and ARWTN, in the assessment of operational wind farm noise levels. In terms of amplitude modulation, it is recommended that the IOA method is incorporated into a planning condition (see Paragraph 1.2.12 of Appendix 11J)

² Welsh Government (2024). Planning Policy Wales. Edition 12. February 2024. Available at: <https://www.gov.wales/planning-policy-wales> (Accessed: 21 April 2026).

³ Department of Trade and Industry (1996). ETSU-R-97: The Assessment and Rating of Noise from Wind Farms. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy_Searchable_.pdf (Accessed: 21 April 2026).

⁴ Institute of Acoustics (2013). Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. Available at: <https://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf> (Accessed: 21 April 2026).

⁵ Department for Energy Security and Net Zero (2026). Assessment and Rating of Wind Turbine Noise. (ARWTN). Available at: <https://www.gov.uk/government/publications/assessment-and-rating-of-noise-from-wind-turbines-guidance> (Accessed: 8 July 2026).

⁶ Welsh Government (2023). Noise and Soundscape Plan for Wales 2023-2028. Our national strategy on soundscapes. Available at: <https://www.gov.wales/noise-and-soundscape-plan-for-wales-2023-2028> (Accessed: 2 June 2026).

Document	Context
Powys Local Development Plan ⁷ and Supplementary Guidance ⁸	In regards renewable energy proposals, there is direction to ensure that amenities enjoyed by occupants shall not be unacceptably affected by levels of noise. It is considered this is achieved by compliance with the ETSU-R-97 / ARWTN, BS4142 and BS5228 criteria, where relevant. There is a replacement local development plan currently being prepared, which is currently timetabled to be adopted in September 2027.
BS 4142 ⁹	Used in the assessment of operational noise levels from the BESS infrastructure
BS 5228 ¹⁰	Used in the assessment of construction noise levels
Control of Pollution Act 1974 ¹¹	Referred to within the assessment of construction noise levels
Environmental Protection Act 1990 ¹²	Referred to within the assessment of construction noise levels

11.3 CONSULTATION AND ENGAGEMENT

OVERVIEW

- 11.3.1. The assessment has been informed by consultation response and ongoing stakeholder engagement. An overview of the approach to consultation is provided in **Section 2.8 of Chapter 2: Approach to EIA**.

SCOPING DIRECTION

- 11.3.2. A Scoping Direction (**Appendix 1B**) was issued by PEDW on behalf of the Welsh Ministers, on 14 May 2025. A summary of the relevant responses received in the Scoping Direction in relation to noise and vibration, and confirmation of how these have been addressed within the assessment to date, is presented in **Table 11-2**.

⁷ Powys County Council (2018). "Powys Local Development Plan 2011 - 2026. 1/4/2011 to 31/3/2026. Written Statement. Adopted April 2018." Available at: <https://en.powys.gov.uk/article/4898/Adopted-LDP-2011---2026> (Accessed: 2 June 2026).

⁸ Powys County Council (2019). "Powys Local Development Plan (2011 - 2026). Supplementary Planning Guidance. Renewable Energy. Adopted April 2019" Available at: <https://en.powys.gov.uk/article/4907/LDP-Supplementary-Planning-Guidance-SPG-and-Supporting-Policy> (Accessed: 2 June 2026).

⁹ BS 4142:2014+A1:2019. "Methods for rating and assessing industrial and commercial sound".

¹⁰ BS 5228-1:2009+A1:2014. "Code of practice for noise and vibration control on construction and open sites - Part 1: Noise"

¹¹ Control of Pollution Act 1974 (Part III), as amended. "An Act to make further provision with respect to waste disposal, water pollution, noise, atmospheric pollution and public health; and for purposes connected with the matters aforesaid". The Stationery Office, London.

¹² Environmental Protection Act 1990. "An Act to make provision for improved control of pollution arising from certain industrial and other processes;...". The Stationery Office, London.

Table 11-2 - Summary of EIA Scoping Direction responses for noise and vibration

Consultee	Consideration	How addressed in this ES
PEDW	Welcomed that reference is made to the correct guidance in ETSU-R-97 and the IOA Good Practice Guide to assess operational noise. Powys County Council's Environmental Health Officer concurs with the approach proposed in the scoping report.	Assessment of operational wind farm noise levels undertaken according to ETSU-R-97 and the IOA Good Practice Guide.
PEDW	Welcomed the intention to undertake a cumulative assessment. The applicant should liaise with the relevant LPAs to determine a list of schemes to be included in the assessment.	The applicant and their agent have been seeking to arrange a Planning Performance Agreement (PPA) with Powys County Council since February 2026 to facilitate feedback from the LPA regarding the Proposed Development, including the noise assessment. Despite a positive introductory meeting on 2 February 2026, no further responses have been received from the LPA to allow the PPA discussions to progress. In the absence of a PPA, a direct approach was made to the Powys County Council Environmental Health Officer regarding the wind farm schemes to include in the cumulative assessment on 4 May 2026, and as of July 2026 no response has yet been received.
PEDW	The scoping report proposed to scope out vibration from the ES. No concerns were raised by consultees. PEDW concurred that vibration impacts could be scoped out.	Vibration assessment not undertaken.
Powys County Council Environmental Health	Satisfied in respect of noise that the correct guidance has been identified, in the form of ETSU-R-97 and the IOA Good Practice Guide.	Assessment of operational wind farm noise levels undertaken according to ETSU-R-97 and the IOA Good Practice Guide

TECHNICAL ENGAGEMENT

- 11.3.3. A summary of the technical engagement in relation to noise undertaken to date is outlined in **Table 11-3**.

Table 11-3 - Technical Engagement on the Noise Assessment

Consultee	Consideration	How addressed in this Draft ES
Powys County Council Environmental Health	Email communication (4 May 2026) to confirm methodology of background noise level analysis and wind farm schemes included in cumulative noise assessment.	No response received from EHO at time of writing.

11.4 DATA GATHERING METHODOLOGY

STUDY AREA

- 11.4.1. In terms of the assessment of operational wind turbine noise levels, prediction receptor locations that are located within approximately 2.5 km of the Site have been considered. Receptor locations at greater distances to the north of the site have also been considered due to the potential cumulative noise impact. The approach allows for consideration of whether the Site is predicted to have more than a negligible contribution to the ETSU-R-97 noise criteria. The study area and assessed receptor locations are shown in **Figure 11.1**.
- 11.4.2. In terms of the assessment of operational noise levels from the BESS related elements, the two closest receptor locations have been assessed (see **Figure 11.4**). At further locations, the noise impact from the BESS related elements is predicted to be not significant.
- 11.4.3. In terms of assessment of construction related noise levels, receptor locations that are located within 300 m of the proposed access track, have been considered. The construction of the access track is anticipated to be the stage with the highest level of impact in terms of construction related noise levels. **Figures 11.5 - 11.7** detail the study area and the receptor locations that have been assessed. Due to the large separation distances between receptors and most of the construction areas, and subject to an appropriate adoption of 'Best Practicable Means' as secured by the site-specific Construction Environmental Management Plan, noise levels from construction activities will generally be low. The only activity which is likely to be close enough to receptors to have the potential for noise impacts is construction of the access track.

DESK STUDY

- 11.4.4. Desk-based studies have included undertaking noise predictions of the potential wind farm noise level. Those predictions are based on particular source sound power level information for each wind turbine development modelled. This includes noise predictions of the Proposed Development, and the review of other wind farm developments considered in the cumulative noise assessment. The details of that source information are referenced in each instance, where those predictions are explained (in **Appendix 11J** and **Appendix 11N**).

Table 11-4 - Data sources used to inform the noise assessment

Organisation	Data Source	Data Provided
Various	Manufacturer specifications, noise chapters from EIA reports	Sound power level information

SURVEY WORK

- 11.4.5. A background noise survey was undertaken at six locations neighbouring the Proposed Development. Background noise measurements were undertaken at the following locations: H3 (Llyn Mawr), Field nr Lakeside View, H7 (Ty Hir), H47 (Blaen-y-cwm), H53 (Pantygesail), and H56 (Fir Tree Lodge), the locations of which are shown in **Figure 11.1**. These measurement locations were chosen for the purposes of an ETSU-R-97 noise survey, and were based upon being the closest locations in each direction from the Site. At the time of installation, no access was available at the receptor locations known as H4 and H6, hence alternative locations at the 'Field nr Lakeside View' and H7 were utilised. Further details of the background noise survey work are provided below in **Section 11.5**.

11.5 OVERALL BASELINE

- 11.5.1. This section summarises the existing background noise environment determined through the course of a noise survey undertaken at six locations surrounding the Proposed Development. Further technical details are provided below and in **Appendices 11A - 11I**.

NOISE SURVEY METHODOLOGY

- 11.5.2. Background noise surveys were performed at six locations neighbouring the Site. The noise surveys to determine the existing noise environment at the six measurement locations has followed the guidance within ETSU-R-97 and the IOA GPG. This also aligns with the requirements for noise surveys according to the ARWTN guidance. The noise surveys covered the period from 21 April 2023 to 14 July 2023.
- 11.5.3. Wind speed and noise measurements were performed using a 10-minute measurement period, with 10-minute average wind speeds measured directly at 120 m height above ground level (agl). The wind speed measurements were from a Triton SoDAR (Sonic Detection and Ranging Device) device located within the Site (299246, 297883). Rain gauges were installed at H7 and H47, to monitor rainfall over the duration of the noise monitoring periods.
- 11.5.4. Measured noise levels have been referenced against a standardised 10 m height wind speed, following the methodology suggested by the GPG. The wind speed measured directly at 120 m has been assumed to be the hub height wind speed. Using the reference conditions for a wind turbine sound power level measurement, in accordance with the requirements of IEC 61400-11, the standardised wind speed at 10 m has then been derived based upon the reference ground roughness length of $z_0 = 0.05$. By taking a wind speed measurement directly at the proposed hub height, this follows a method suggested by the GPG.
- 11.5.5. The SoDAR device has a quality factor feature, where for each channel and each 10-minute period, a quality factor value is returned. This value depends upon the quality of the acoustic signal that is returned to the device for that period, and is less if the atmosphere is such that the signal has degraded sufficiently enough to mean the wind speed estimate is unreliable, for example in rainy conditions. For the purposes of this analysis, a quality factor of 90% has been used and periods with a smaller quality factor have been excluded.
- 11.5.6. Type I sound level meters have been used for the noise measurements at neighbouring dwellings. The calibration certificates for the sound level meters and sound level calibrator¹³ used for the surveys are given in **Appendix 11B**. The noise surveys took place between April to July 2023, with the majority occurring in May to June. **Plates 11I.21 - 11I.24** within **Appendix 11I** provide graphical representations of the relative amount of rainfall that occurred within these months, as a percentage of the historical average (as sourced from the Met Office¹⁴). These indicate that, in this area, the majority of the survey period generally experienced lower than average rainfall (e.g. May: 20 - 33 % of the average, June: 50 - 75 % of the average). That is, the weather was untypically dry for an extended period during the survey. This means that the measurements are indicative of the lower

¹³ The sound level calibrator used was a Bruel & Kjaer B&K 4231 model, with Serial Number 3022368.

¹⁴ Met Office (2026). Available at: <https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-actual-and-anomaly-maps> (Accessed: 3 June 2026).

baseline noise levels likely to be experienced at the measurement locations and that the assessment is a likely worst-case.

NOISE SURVEY MEASUREMENT LOCATIONS

- 11.5.7. **Appendix 11A** details the measurement locations and provides photographs of the exact location of the microphone position. A description of each location is given below.

H3 - Llyn Mawr

- 11.5.8. The measurement location known as H3 is positioned approximately 520 m to the south-east of the Proposed Development. The meter was located in the garden area to the south of the main residential building (at approximately 301057, 297298). The general area was where the residents would likely be sat outside, if relaxing in an outdoor amenity space.
- 11.5.9. A Rion NL-52 sound level meter (Serial Number: 00810320) was installed at the location. The equipment was installed from 22 April 2023 to 12 July 2023. The system was calibrated before and after installation, and at the interim visits approximately three weeks apart. It was found that there were 0.0 dB changes in the calibrated level throughout the survey period.
- 11.5.10. During installation and removal of the monitoring equipment, and during the interim visits, it was noted that noise audible at this location consisted of: wind in the nearby foliage, sheep vocalisations, and birdsong.

Field nr Lakeside View

- 11.5.11. The measurement location known as 'Field nr Lakeside View' is similarly positioned to the south-east of the Proposed Development. It is located approximately 740 m from the nearest turbine. At time of installation, no access was available to directly measure background noise levels at the Lakeside View property. Therefore, an alternative was utilised located in the field approximately 20 m directly north of the property (at approximately 301144, 297100). It is considered that given the close proximity and the similar amount of nearby foliage, the measurement location will be representative of the outdoor amenity areas at Lakeside View (H4).
- 11.5.12. A Rion NL-52 sound level meter (Serial Number: 00231706) was installed at the location, from 22 April 2023 to 28 June 2023. To ensure that the equipment utilised remained within a valid 24 month calibration period, another sound level meter (Serial Number: 00921232) was installed from 28 June 2023 to 13 July 2023. The system was calibrated before and after installation, and at the interim visits approximately three weeks apart. It was found that there was no more than a 0.1 dB change in the calibrated level throughout the survey period, which is within normal tolerances.
- 11.5.13. During installation and removal of the monitoring equipment, and during the interim visits, it was noted that noise audible at this location consisted of: wind in the nearby foliage, sheep vocalisations, and birdsong.

H7 - Ty Hir

- 11.5.14. The measurement location known as H7 is located to the north-east of the Proposed Development. It is located approximately 2.1 km from the nearest turbine. With the exception of H6 (where access was not possible), this is the nearest receptor location in that direction. The meter was located in a small garden area to the south-east of the main residential building (at approximately 302545, 300289).

- 11.5.15. A Rion NL-52 sound level meter (Serial Number: 00420658) was installed at the location, from 21 April 2023 to 12 May 2023. Due to an unknown fault, this meter stopped operating during the first day of measurement. The unit was replaced with another sound level meter (Serial Number: 00620893) for the period 12 May 2023 to 14 July 2023. The system was calibrated before and after installation, and at the interim visits approximately three weeks apart. It was found that there was no more than a 0.2 dB change in the calibrated level throughout the survey period, which is within normal tolerances.
- 11.5.16. During installation and removal of the monitoring equipment, and during the interim visits, it was noted that noise audible at this location consisted of: wind in the nearby foliage, birdsong, a faint watercourse, and sheep vocalisations. The Mynydd Clogau wind farm was occasionally audible on two of the five visits to the location.

H47 - Blaen y Cwm

- 11.5.17. The measurement location known as H47 is located to the west of the Proposed Development. It is located approximately 780 m from the nearest turbine. The meter was located on a small unused patch of land approximately 40 m to the north of the main residential building (at approximately 298445, 298690). This location was chosen to be out of sight of the hot tub to the south of the building¹⁵ but still be an appropriate measurement of the outdoor amenity space. The location was sheltered, was slightly more distant from local watercourses, and was at broadly similar distance to nearby foliage, hence it is representative of an outdoor amenity area of the house.
- 11.5.18. A Rion NL-52 sound level meter (Serial Number: 00231708) was installed at the location. The equipment was installed from 21 April 2023 to 14 July 2023. The system was calibrated before and after installation, and at the interim visits approximately three weeks apart. It was found that there were no more than 0.1 dB changes in the calibrated level throughout the survey period, which is within normal tolerances.
- 11.5.19. During installation and removal of the monitoring equipment, and during the interim visits, it was noted that noise audible at this location consisted of: some wind in the nearby foliage, sheep vocalisations, tractor operations, faint watercourse noise, and birdsong.

H53 - Pantygesail

- 11.5.20. The measurement location known as H53 is located to the south-west of the Proposed Development. It is located approximately 740 m from the nearest turbine. The meter was ultimately located on a patch of grassy land, facing the wind farm, approximately 30 m to the north-east of the main residential building (at approximately 298920, 297231).
- 11.5.21. The sound level meter was initially located on a small grassy area immediately outside the front door of the residence. There is a watercourse that runs near and down the side of the house. Upon review of the first three weeks of noise measurements (and with the location having experienced some rainfall), it was concluded that this initial location was overly affected by the watercourse. To provide a more conservative assessment, a second location was used to the rear of the house, that faced the wind farm, and was more distant from the watercourse. The periods of measurements at the initial location (21 April 2023 to 12 May 2023) have been excluded from the analysis.

¹⁵ At request of landowner.

- 11.5.22. A Rion NL-52 sound level meter (Serial Number: 00231710) was installed at the property. The equipment was installed from 12 May 2023 to 13 July 2023 (at the second location). The system was calibrated before and after installation, and at the interim visits approximately three weeks apart. It was found that there were no more than 0.1 dB changes in the calibrated level throughout the survey period, which is within normal tolerances.
- 11.5.23. During installation and removal of the monitoring equipment, and during the interim visits, it was noted that noise audible at this location consisted of: some wind in the nearby foliage, noise from the watercourse, dogs barking, quad bike operations, and birdsong.

H56 - Fir Tree Lodge

- 11.5.24. The measurement location known as H56 is located to the south of the Proposed Development. It is located approximately 930 m from the nearest turbine. The meter was located in a field, approximately 25 m to the north of the two residential buildings in the area (at approximately 299240, 296795). There is the main residence (H57), with the next door building (H56) being run as a holiday let. In the absence of an available garden space that would not be an inconvenience, the location of the sound level meter was chosen to be as representative as possible of the outdoor amenity space of the two properties. The meter was located approximately 25 m from the garden/patio areas, and likely experiences similar levels of noise from nearby foliage and from traffic noise to the south.
- 11.5.25. A Rion NL-52 sound level meter (Serial Number: 00231709) was installed at the location. The equipment was installed from 1 May 2023 to 13 July 2023. The system was calibrated before and after installation, and at the interim visits approximately three weeks apart. It was found that there were no more than 0.1 dB changes in the calibrated level throughout the survey period, which is within normal tolerances. The end of this survey over-ran (by 4 days) the 24 month valid calibration period, for which the sound level meter remained in calibration. The next calibration certificate is also shown in **Appendix 11B**, indicating that the meter continued to operate normally and within the Class 1/Type1 requirements.
- 11.5.26. During installation and removal of the monitoring equipment, and during the interim visits, it was noted that noise audible at this location consisted of: birdsong, traffic noise from main road to the south, some wind in the nearby foliage, dogs barking, and sheep vocalisations.

NOISE SURVEY MEASUREMENT RESULTS

- 11.5.27. **Appendices 11C - 11H** detail the time histories of all the measured data that has been collected at the six measurement locations. Each figure details the measured $L_{Aeq,10min}$ and $L_{A90,10min}$ levels with the corresponding average 10-minute standardised wind speed calculated at 10 m height based upon measurements undertaken at 120 m.
- 11.5.28. Where periods have been identified (by consideration of the measured overall and spectral noise levels, and listening to the recordings where available) to have been affected by apparent extraneous noise sources, these periods have been manually excluded from the analysis.
- 11.5.29. The measured noise levels have then been plotted against the standardised 10 m height wind speed to develop regression figures, representing the relationship between noise and wind speed. The following derived noise levels are based upon the polynomial equations stated within each regression figure.

H3 (Llyn Mawr) Noise Survey Results

11.5.30. **Appendix 11C** details time history figures of the measured overall noise levels at the location known as H3. Measured noise levels at this location broadly rise and fall with wind speed, with generally higher noise levels measured during the daytime compared to the night-time. Dawn chorus effects that are apparent at the end of the night-time period, have been excluded for the approximate period of 04:30 - 07:00 on all measurement days. Other periods where there is an obvious elevated extraneous noise source have been manually excluded.

11.5.31. **Plates 11I.1 - 11I.2** within **Appendix 11I** detail the regression results for the location known as H3. These show the non-excluded broadband $L_{A90,10min}$ noise measurements plotted against standardised 10 m wind speed, for the amenity and night-time hours, respectively. **Table 11-5** below (derived from **Plates 11I.1 - 11I.2**) detail these prevailing background noise levels for the receptor known as H3.

Table 11-5 - H3 Prevailing Background Noise Level (dB L_{A90})

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
Amenity Hours	26.9	27.0	27.9	29.6	32.2	35.3	38.8	42.1	*45.5	*48.9
Night-time Hours	20.1	20.2	21.0	22.7	25.3	28.8	33.2	38.6	*44.0	*49.4

* NB: the values at 11-12 m/s have been extrapolated, from a linear interpolation of the values at 9-10 m/s

Field nr Lakeside View Noise Survey Results

11.5.32. **Appendix 11D** details time history figures of the measured overall noise levels at the location known as 'Field nr Lakeside View'. In a similar manner to H3, measured noise levels at this location broadly rise and fall with wind speed, with generally higher noise levels measured during the daytime compared to the night-time. Dawn chorus effects that are apparent at the end of the night-time period, have been excluded for the approximate period of 04:30 - 07:00 on all measurement days. Other periods where there is an obvious elevated extraneous noise source have been manually excluded.

11.5.33. **Plates 11I.3 - 11I.4** within **Appendix 11I** detail the regression results for the location known as 'Field nr Lakeside View'. These show the non-excluded broadband $L_{A90,10min}$ noise measurements plotted against standardised 10 m wind speed, for the amenity and night-time hours, respectively. **Table 11-6** below (derived from **Plates 11I.3 - 11I.4**) detail these prevailing background noise levels for the receptor known as H4.

Table 11-6 - Field nr Lakeside View Prevailing Background Noise Level (dB L_{A90})

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
Amenity Hours	23.2	24.4	26.1	28.2	30.7	33.5	36.4	39.5	*42.5	*45.5
Night-time Hours	16.6	17.8	19.5	21.7	24.4	27.5	30.7	33.9	*37.1	*40.3

* NB: the values at 11-12 m/s have been extrapolated, from a linear interpolation of the values at 9-10 m/s

H7 (Ty Hir) Noise Survey Results

- 11.5.34. **Appendix 11E** details time history figures of the measured overall noise levels at the location known as H7. Measured noise levels at this location do broadly rise and fall with wind speed. In a similar manner to several other measurement locations, generally higher noise levels were measured during the daytime compared to the night-time and late evening periods. Dawn chorus effects that are apparent at the end of the night-time period, have been excluded for the approximate period of 04:30 - 07:00 on all measurement days. Other periods where there is an obvious elevated extraneous noise source have been manually excluded.
- 11.5.35. **Plates 11I.5 - 11I.8** within **Appendix 11I** detail the regression results for the location known as H7. These show the non-excluded broadband $L_{A90,10min}$ noise measurements plotted against standardised 10 m wind speed. **Plates 11I.5 - 11I.6** show the results for all wind directions, for the amenity and night-time hours, respectively. It is an ETSU-R-97¹⁶ requirement that background noise levels not be significantly affected by the operation of existing wind turbines. To this end, **Plates 11I.7 - 11I.8** show the results when considering a wind direction sector of 225 - 105°. This is a wind direction where the measurement location was upwind of the Mynydd Clogau turbines.
- 11.5.36. **Table 11-7** below (derived from Sector 1: 225 - 105° **Plates 11I.7 - 11I.8**) detail the prevailing background noise levels for the receptor known as H7.

Table 11-7 - H7 Prevailing Background Noise Level (dB L_{A90})

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
Amenity Hours	30.2	30.5	31.4	32.7	34.4	36.5	39.0	42.1	*45.2	*48.4
Night-time Hours	22.6	22.7	23.5	24.7	26.2	28.1	30.2	32.5	*34.8	*37.0

* NB: the values at 11-12 m/s have been extrapolated, from a linear interpolation of the values at 9-10 m/s

H47 (Blaen y Cwm) Noise Survey Results

- 11.5.37. **Appendix 11F** details time history figures of the measured overall noise levels at the location known as H47. Measured noise levels at this location broadly rise and fall with wind speed, with somewhat higher levels measured during the daytime compared to the night-time. Dawn chorus effects that are apparent at the end of the night-time period, have been excluded for the approximate period of 04:30 - 07:00 on all measurement days. Other periods where there is an obvious elevated extraneous noise source have been manually excluded.
- 11.5.38. **Plates 11I.9 - 11I.10** within **Appendix 11I** detail the regression results for the location known as H47. These show the non-excluded broadband $L_{A90,10min}$ noise measurements plotted against standardised 10 m wind speed, for the amenity and night-time hours, respectively. **Table 11-8** below (derived from **Plates 11I.9 - 11I.10**) detail these prevailing background noise levels for the receptor known as H47.

¹⁶ And ARWTN requirement.

Table 11-8 - H47 Prevailing Background Noise Level (dB L_{A90})

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
Amenity Hours	24.2	24.1	24.4	25.5	27.1	29.3	31.7	33.9	*36.0	*38.1
Night-time Hours	19.0	19.0	19.8	21.5	24.0	27.3	31.4	36.1	*40.9	*45.6

* NB: the values at 11-12 m/s have been extrapolated, from a linear interpolation of the values at 9-10 m/s

H53 (Pantyesail) Noise Survey Results

- 11.5.39. **Appendix 11G** details time history figures of the measured overall noise levels at the location known as H53. Measured noise levels at this location broadly rise and fall with wind speed, again with slightly higher levels measured during the daytime compared to the night-time. The effect of moving to the second sound level meter location can be seen on **Plate 11G.22**, where levels can be seen to reduce by approximately 10 dB. Dawn chorus effects that are apparent at the end of the night-time period, have been excluded for the approximate period of 04:30 - 07:00 on all measurement days. Other periods where there is an obvious elevated extraneous noise source have been manually excluded.
- 11.5.40. **Plates 11I.11 - 11I.14** within **Appendix 11I** detail the regression results for the location known as H53. These show the non-excluded broadband L_{A90,10min} noise measurements plotted against standardised 10 m wind speed. **Plates 11I.11 - 11I.12** show the results for all wind directions, for the amenity and night-time hours, respectively. The effect of distant traffic noise (from the main road) is apparent on some of the southern measurement locations. This is most obvious for when the wind was blowing from the south, which would be the opposite to a downwind direction from the proposed wind farm.
- 11.5.41. To model a downwind direction, that also has less influence from distant traffic noise, **Plates 11I.13 - 11I.14** show the results when considering a wind direction sector of 285 - 120°. This is a wind direction where the measurement location would be downwind of the wind farm but upwind of the main road. It can be seen that the results for 285 - 120° are lower than if considering all directions. For this reason, those are the background noise levels assumed for this assessment.
- 11.5.42. **Table 11-9** below (derived from Sector 1: 285 - 120° **Plates 11I.13 - 11I.14**) detail the prevailing background noise levels for the receptor known as H53.

Table 11-9 - H53 Prevailing Background Noise Level (dB L_{A90})

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
Amenity Hours	27.1	26.8	26.8	27.1	28.1	30.1	33.1	*36.1	*39.1	*42.2
Night-time Hours	19.2	19.4	19.8	20.7	22.2	24.6	28.1	*31.6	*35.1	*38.6

* NB: the values at 10-12 m/s have been extrapolated, from a linear interpolation of the values at 8-9 m/s

H56 (Fir Tree Lodge) Noise Survey Results

- 11.5.43. **Appendix 11D** details time history figures of the measured overall noise levels at the location known as H56. Measured noise levels at this location broadly rise and fall with wind speed, but again with noticeably higher levels measured during the daytime compared to the night-time. Dawn chorus effects that are apparent at the end of the night-time period, have been excluded for the approximate period of 04:30 - 07:00 on all measurement days. Other periods where there is an obvious elevated extraneous noise source have been manually excluded.
- 11.5.44. **Plates 11I.15 - 11I.18** within **Appendix 11I** detail the regression results for the location known as H56. These show the non-excluded broadband $L_{A90,10min}$ noise measurements plotted against standardised 10 m wind speed. **Plates 11I.15 - 11I.16** show the results for all wind directions, for the amenity and night-time hours, respectively. The effect of distant traffic noise from the main road to the south, is apparent at this location. This is again a wind direction which is opposite to being downwind of the wind farm.
- 11.5.45. To model a downwind direction, that also has less influence from distant traffic noise, **Plates 11I.17 - 11I.18** show the results when considering a wind direction sector of 285 - 120°. This is a wind direction where the measurement location would be downwind of the wind farm but upwind of the main road. It can be seen that the results for 285 - 120° are lower than if considering all directions. For this reason, those are the background noise levels assumed for this assessment.
- 11.5.46. **Table 11-10** below (derived from Sector 1: 285 - 120° **Plates 11I.17 - 11I.18**) detail the prevailing background noise levels for the receptor known as H56.

Table 11-10 - H56 Prevailing Background Noise Level (dB L_{A90})

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
Amenity Hours	32.0	31.6	31.1	30.8	31.0	31.7	33.3	*34.9	*36.4	*38.0
Night-time Hours	21.0	21.1	21.7	22.5	23.6	25.3	27.9	*30.5	*33.1	*35.7

* NB: the values at 10-12 m/s have been extrapolated, from a linear interpolation of the values at 8-9 m/s

Other Locations Not Measured

- 11.5.47. For other receptor locations where background noise levels have not been measured, an average background noise level has been assumed within the ETSU-R-97 assessment. This is derived by taking an arithmetic average of the prevailing background noise levels from each of the six measurement locations. Given that the six measurement locations provide a range of levels for the area (including particularly quiet instances), it is likely that the assumption of the average background noise level is reasonably representative of typical background noise levels that are likely to occur for the assessed receptor location. The derivation of the average prevailing background noise level is detailed in **Plates 11I.19 - 11I.20** and **Table 11-11 - Table 11-12** below.
- 11.5.48. The average values at 11-12 m/s have been extrapolated, from a linear interpolation of the average values at 9-10 m/s.

Table 11-11 - Average Prevailing Background Noise Level (dB L_{A90}) - Amenity Hours

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
H3 (Llyn Mawr)	26.9	27.0	27.9	29.6	32.2	35.3	38.8	42.1	45.5	48.9
Field nr Lakeside View	23.2	24.4	26.1	28.2	30.7	33.5	36.4	39.5	42.5	45.5
H7 (Ty Hir)	30.2	30.5	31.4	32.7	34.4	36.5	39.0	42.1	45.2	48.4
H47 (Blaen-y-cwm)	24.2	24.1	24.4	25.5	27.1	29.3	31.7	33.9	36.0	38.1
H53 (Pantygesail)	27.1	26.8	26.8	27.1	28.1	30.1	33.1	36.1	39.1	42.2
H56 (Fir Tree Lodge)	32.0	31.6	31.1	30.8	31.0	31.7	33.3	34.9	36.4	38.0
Average	27.3	27.4	27.9	29.0	30.6	32.7	35.4	38.1	*40.8	*43.5

Table 11-12 - Average Prevailing Background Noise Level (dB L_{A90}) - Night-time Hours

Standardised 10m Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
H3 (Llyn Mawr)	20.1	20.2	21.0	22.7	25.3	28.8	33.2	38.6	44.0	49.4
Field nr Lakeside View	16.6	17.8	19.5	21.7	24.4	27.5	30.7	33.9	37.1	40.3
H7 (Ty Hir)	22.6	22.7	23.5	24.7	26.2	28.1	30.2	32.5	34.8	37.0
H47 (Blaen-y-cwm)	19.0	19.0	19.8	21.5	24.0	27.3	31.4	36.1	40.9	45.6
H53 (Pantygesail)	19.2	19.4	19.8	20.7	22.2	24.6	28.1	31.6	35.1	38.6
H56 (Fir Tree Lodge)	21.0	21.1	21.7	22.5	23.6	25.3	27.9	30.5	33.1	35.7
Average	19.7	20.0	20.9	22.3	24.3	26.9	30.3	33.9	*37.5	*41.1

BS4142 Representative Background Sound Levels

11.5.49. For the purposes of a BS4142 assessment of the noise from the BESS and substation, it is necessary to process baseline data slightly differently. Statistical analyses of the background sound level results measured at H3 and H4 are detailed within **Appendix 11C** and **Appendix 11D** respectively. It should be noted that Llyn Mawr and Lakeside View are the two closest residential properties to the BESS facility. As no significant effects are predicted at these two closest receptors it is not necessary to consider any receptors further away¹⁷.

¹⁷ The noise predictions detailed later suggest that at more distant receptor locations, the noise levels from the BESS related elements are not likely to be significant.

- 11.5.50. The baseline data for these locations has been split into daytime (07:00 - 23:00) and night-time (23:00 - 07:00) datasets. The same filtering of the data to remove non-representative data (including periods of rainfall etc., as adopted for the ETSU-R-97 baseline data processing) has been applied to the daytime and night-time datasets. In addition, any periods where standardised 10 m height wind speeds exceed 5 m/s have been removed from the analysis. Representative values for the background sound levels to be used in the BS4142 assessment have then been derived by considering frequency distribution plots of the relevant datasets.
- 11.5.51. Review of the distribution plots (**Plates 11C.84 - 11C.85** in **Appendix 11C**) indicates that at H3, the most commonly occurring background sound levels are 29 dB L_{A90} and 17 dB L_{A90} , for the daytime and night-time respectively. For the location known as H4 (**Plates 11D.84 - 11D.85** in **Appendix 11D**), the most commonly occurring background sound levels are 25 dB L_{A90} and 16 dB L_{A90} , for the daytime and night-time respectively.
- 11.5.52. It should also be noted that very similar results can be obtained by taking an arithmetic average of the daytime background sound levels at both locations. The arithmetic average for night-time is higher than the modal value at both locations but the lower values are considered to be representative of the quietest parts of the night and therefore more conservative. These values have been adopted as the appropriate representative background sound levels for the BS4142 assessment.

11.6 SCOPE OF THE ASSESSMENT

OVERVIEW

11.6.1. The scope of the assessments considered in this chapter is as follows:

- Assessment of operational wind farm noise levels, including the cumulative impact alongside other wind farm schemes
- Assessment of noise levels related to the operation of the BESS related elements
- Assessment of noise levels related to construction/decommissioning related activities, including that from construction related traffic movements

SPATIAL SCOPE

- 11.6.2. Receptor locations within approximately 2.5 km of the Site have been considered¹⁸. This effectively considers receptor locations where operational wind turbine noise levels from the Site are predicted to be more than approximately 25 - 30 dB. This allows consideration of whether the Site is predicted to be within 10 dB of the ETSU-R-97 noise criteria¹⁹. Any further locations where noise levels are not within 10 dB can be discounted as the contribution of the Site would be insignificant to any potential cumulative compliance/exceedance of the ETSU-R-97 noise criteria.
- 11.6.3. In terms of operational wind turbine noise levels, the receptor locations that have been considered, are detailed in **Figure 11.1**, and **Table 11M.1** within **Appendix 11M**, alongside their co-ordinates, and maximum predicted wind farm noise level.
- 11.6.4. In terms of operational noise levels from the BESS related elements, **Figure 11.4** details the receptor locations that have been assessed.
- 11.6.5. In terms of construction related noise levels, **Figures 11.5 - 11.7** detail the receptor locations that have been assessed.

TEMPORAL SCOPE

- 11.6.6. Background noise measurements were undertaken over several months during spring/summer of 2023. This follows accepted practice, with the amount of data captured exceeding the minimum that good practice guidance stipulates. It is considered these measurements are representative of the baseline noise environment going forward. Given the rural setting, there is not expected to be significant changes to the baseline noise conditions (without the presence of any wind farm²⁰ or any other noise generating development) in the future. It is expected that the construction stage will last for 24 months, and the operation of the wind farm will be 40 years. The noise impact of the decommissioning phase is considered to be similar to the construction phase in using similar plant but with fewer activities required. On this basis the noise impact of future decommissioning works are considered to be short-term, and likely to be of lower impact than the worst case construction stage.

¹⁸ With the addition of some to the north of the Site, for potential cumulative effects.

¹⁹ A 10 dB difference is conventionally thought of as the point where a lower noise source can be considered negligible compared to a higher noise level. This is also what the new ARWTN guidance suggests, in that where the noise level from the proposed development is 10 dB or more below the Total Noise Assessment Criteria, it is stated that a cumulative noise assessment is not necessary at that noise-sensitive receptor.

²⁰ The Mynydd Clogau wind farm is approaching the end of its planning permission. Hence there is expected to be some changes to the wind farm noise levels from this site, because the site is likely to either be de-commissioned or re-powered.

POTENTIAL RECEPTORS

- 11.6.7. In the context of operational noise levels from the wind turbines, receptor locations nearer the Site have been considered. Co-ordinates and a site plan figure has been provided (see **Figure 11.1**, and **Table 11M.1** within **Appendix 11M**) that detail the locations of the receptors considered.
- 11.6.8. In the context of operational noise levels from the BESS facility, the two closest receptor locations have primarily been considered (e.g. see **Figure 11.4**). At more distant receptor locations there will be a lower noise impact from the BESS facility, and will not be subject to likely significant effects.
- 11.6.9. In the context of constructed related activities and construction traffic noise levels, receptor locations within 300 m of the proposed access route leading off the main road, have been considered (e.g. see **Figures 11.5 - 11.7**). Given the distances involved between most construction activities and receptor locations, it is considered this provides a conservative assessment of construction related noise levels, as the construction of the access track is likely to be the worst stage of construction that most impacts any nearby receptors. Due to the distances involved, and subject to an appropriate adoption of 'Best Practicable Means' as secured by the site-specific Construction Environmental Management Plan, noise levels from construction activities will generally be low. The only activity which is likely to be close enough to receptors to have the potential for noise impacts is construction of the access track.

POSSIBLE SIGNIFICANT EFFECTS

- 11.6.10. The effects on noise receptors which have the potential to be significant and have been taken forward for detailed assessment are summarised in **Table 11-13**.

Table 11-13 - Possible Significant effects on Noise Receptors Scoped in for Further Assessment

Receptor Type	Possible Significant Effects
Construction / Decommissioning	
Receptors near the Site	Noise from construction/decommissioning activities may be above construction noise criteria
Receptors along the access route	Noise from construction related traffic movements may be above the construction noise criteria
Operation	
Receptors near the Site	Noise levels from the operation of the wind turbines may be above ETSU-R-97 noise criteria
Receptors near the Site	Noise levels from the BESS elements may be above BS4142 noise criteria

- 11.6.11. The effects detailed in **Table 11-14** have been scoped out from being subject to further assessment because the potential effects are not considered likely to be significant.

Table 11-14 - Summary of pathways and effects scoped out of this assessment

Potential effects	Justification
Vibration	Vibration has been scoped out of the operational and construction assessments, as levels of vibrations will not be significant. Ground-borne vibration during the operational phase will not be perceptible at receptor locations. Levels of vibration during the construction stage will meet the criteria for human tolerance and for cosmetic damage, as set out in BS:5228-2. Levels of vibration during construction are generally unlikely to be perceptible, however specific operations (e.g. blasting, piling, or vibrating compactors on nearby tracks) may result in short-term vibration being experienced, especially if in the near vicinity of receptor locations. For such activities, even though levels will not cause any damage, it will be worthwhile forewarning residents that such operations are taking place (if that is the case), and for this to be part of the CEMP.
Infrasound	Several peer-reviewed studies (e.g.^{21 22 23 24}) have been conducted in regard to the levels of infrasound that wind turbines emit. All reliable evidence suggests that at typical residential distances, the levels of infrasound from a wind farm are significantly below accepted thresholds of perception. Even when measured in close proximity to a wind turbine, the measured levels of infra-sound are still below accepted thresholds of perception. This suggests that infrasound is not an issue for neighbours in the vicinity of wind turbines and has not been considered further within this assessment.
Low frequency noise	A government funded study²⁵ investigated low frequency noise from wind turbines. This study concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines. Subsequently, further international research efforts have included a large study from Health Canada²⁶ that concluded that there were no health effects from low frequency noise or infrasound. Other more recent studies (e.g.²⁷) have come to similar conclusions. The IOA also published a position statement²⁸ stating:

- ²¹ Styles et al (2005). "Microseismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Windfarms." Keele University. Dated 18 July 2005.
- ²² Turnbull et al (2012). "Measurement and Level of Infrasound from Wind Farms and Other Sources". Acoustics Australia. Vol. 40, No.1, April 2012.
- ²³ Majjala, P. et al (2020). "Infrasound Does Not Explain Symptoms Related to Wind Turbines". Publications of the Government's analysis, assessment and research activities. Prime Minister's Office, Helsinki 2020. Available at: <https://julkaisut.valtioneuvosto.fi/server/api/core/bitstreams/785868aa-79dc-4425-bf2a-45b57a23ec86/content> (Accessed: 3 June 2026).
- ²⁴ Marshall, N.S., et al (2023) "The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study in Noise-Sensitive, Healthy Adults" Environmental Health Perspectives, 131(3) March 2023.
- ²⁵ Department of Trade and Industry (2006). "The Measurement of Low Frequency Noise at Three UK Wind Farms". Contract No.: W/45/00656/00/00.
- ²⁶ Health Canada (2014). Wind Turbine Noise and Health Study: Summary of Results. Available at: <https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/everyday-things-emit-radiation/wind-turbine-noise/wind-turbine-noise-health-study-summary-results.html> (Accessed: 21 May 2026).
- ²⁷ van Kamp, I. and van den Berg (2020). "Health effects related to wind turbine sound: an update." National Institute for Public Health and the Environment. RIVM report 2020-0150. Available at: <https://www.rivm.nl/bibliotheek/rapporten/2020-0150.pdf> (Accessed: 3 June 2026).
- ²⁸ Institute of Acoustics (2024). Available at: <https://www.ioa.org.uk/sites/default/files/IOA%20Statement%20-%20Wind%20Farm%20Noise%20Assessment%20Dec%202024.pdf> (Accessed: 3 June 2026).

Potential effects	Justification
	<i>“The IOA is aware that there is some information presented at planning inquiries suggesting the potential for physiological health effects from low frequency noise from wind turbines. It is current advice to members that there is no need to assess low frequency noise as part of the noise impact assessment process, as the absolute levels, whilst potentially audible at typical receptor distances, are well below those reported to trigger physiological health effects based on peer reviewed research to date.”</i> The current evidence suggests that it is not necessary to carry out specific assessments of low frequency noise and this has not been considered further within this assessment.

11.7 ASSESSMENT METHODOLOGY

OVERVIEW

11.7.1. The noise assessments undertaken here have considered the methodologies set out in ETSU-R-97 / ARWTN (operational noise from the wind turbines), BS4142 (operational noise from the BESS units), and BS5228 (construction noise).

ETSU-R-97 Methodology

11.7.2. The approach to assessing operational wind turbine noise effects has been carried out in line with the recommendations of ETSU-R-97 and the IOA GPG, as referred to in national planning policy identified above (**Section 11.2**). Deriving the appropriate ETSU-R-97 noise limits includes the following stages:

- Baseline noise survey conducted at noise sensitive receptors around the Proposed Development and correlated with standardised 10 m height wind speeds measured concurrently on site.
- Plots of baseline L_{A90} sound levels against standardised 10 m height wind speed are used to derive prevailing amenity²⁹ and night-time³⁰ background sound curves for a range of wind speeds up to 12 m/s.
- Derived prevailing background sound curves are used to define daytime and night-time noise limits calculated in accordance with ETSU-R-97. During the day the ETSU-R-97 limits is the greater of either 5 dB above prevailing background sound levels or a lower limiting value set somewhere between 35 - 40 dB. During the night the ETSU-R-97 limit is the greater of either 43 dB or 5 dB above prevailing background sound levels.
- In terms of the lower limiting value for the daytime limit, ETSU-R-97 suggests that this should be chosen based upon three factors: the generating capacity, the duration and level of exposure, and the number of dwellings.
- If a resident is financially involved³¹ with the Proposed Development, the ETSU-R-97 limit is the greater of either 45 dB or 5 dB above prevailing background sound levels. In this case, the receptor locations known as H3 (Llyn Mawr), H47 (Blaen-y-cwm), and H53 (Pantygesail) are understood to be financially involved with the Parc Ynni Calon y Gwynt development.

²⁹ Also known as 'Quiet Daytime Hours'. 'Amenity Hours', or 'Quiet Daytime Hours', is defined as evenings from 18:00-23:00, plus Saturday afternoons from 13:00-18:00 and Sundays from 07:00-18:00.

³⁰ The 'Night-time Hours' is defined as the hours between 23:00 - 07:00 every day.

³¹ Also known as 'associated'.

ARWTN Methodology

11.7.3. New guidance in assessing operational wind turbine noise levels was published in June 2026, in the form of 'Assessment and Rating Wind Turbine Noise Levels' (ARWTN). This is replacing ETSU-R-97. Due to submission timescales, only a partial update of the noise assessment according to ARWTN has been undertaken here. Therefore there remains references to ETSU-R-97 within this noise chapter. Deriving the appropriate ARWTN noise limits includes the following (similar) stages:

- Background noise survey conducted at noise sensitive receptors around the Proposed Development and correlated with standardised 10 m height wind speeds measured concurrently on site.
- Plots of baseline L_{A90} noise levels against standardised 10 m height wind speed, are used to derive prevailing quiet daytime and night-time background noise curves for a range of wind speeds up to 10 m/s. This uses the same time periods as ETSU-R-97.
- Derived prevailing background noise curves are used to define daytime and night-time noise limits according to ARWTN. The noise criteria, which would still apply cumulatively, is now called the Total Noise Assessment Criteria (TNAC), but is at the same noise levels as the ETSU-R-97 noise limits stated above in Paragraph 11.7.2.

11.7.4. Notable updates to the guidance include:

- In terms of setting the daytime Lower Limiting Value (LLV), greater emphasis has now been put on generating capacity, but the 'number of properties' and 'duration and level of exposure' are still considerations.
- The daytime LLV now applies to the project overall, i.e. to all receptors and not determined on a receptor-by-receptor basis as was previously the case.
- Clarification of how cumulative noise from multiple wind developments should be considered. This includes the suggestion to discount any wind farms that are predicted to not be within 10 dB of the TNAC.
- Emphasis on site-specific noise limits, accounting for the available remaining noise budget within the TNAC.
- Guidance on operational noise monitoring and compliance assessment.
- Updated consideration of noise characteristics such as tonal noise and amplitude modulation.
- Inclusion of an example planning condition intended to form the basis for planning conditions for consented developments.

BS4142 Methodology

11.7.5. BS4142 is generally aimed at mechanical plant noise and is therefore entirely appropriate for assessing noise immissions relating to industrial noise sources such as the BESS facility included within the Proposed Development. Specific sound levels, due to proposed items of plant operating under downwind propagation conditions, arriving at neighbouring residential properties, have been calculated through noise predictions according to ISO 9613-2, as referred to in BS4142.

11.7.6. Hayes McKenzie Partnership Ltd (HMPL) consider that background sound levels below 35 dB L_{A90} are low and that for background sound levels below 30 dB L_{A90} , the initial BS4142 comparison between background sound and rating level becomes less important. In the context of low background sound levels, Section 11 of BS4142 states that '*absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background*' which is relevant to receptors close to the proposed BESS facility.

- 11.7.7. For representative daytime background sound levels between 25 - 45 dB L_{A90} , HMPL consider that a threshold criterion of a rating level no higher than 5 dB above background sound level is suitably conservative for identifying potential adverse impacts. Background sound levels are discussed above (at **Section 11.5**) which confirms that 29 dB L_{A90} and 25 dB L_{A90} are suitable representative daytime background sound level for H3 and H4 respectively. It is therefore considered that adverse effects could start to occur for rating levels above 34 dB and 30 dB at H3 and H4 respectively.
- 11.7.8. For representative night-time background sound levels below 30 dB L_{A90} , HMPL consider that comparison of external rating levels against background sound levels is no longer appropriate and absolute predicted sound levels within bedrooms are more relevant. Background sound levels are discussed above (at **Section 11.5**) which confirms that 17 dB L_{A90} and 16 dB L_{A90} are suitable representative night-time background sound levels for H3 and H4 respectively. It is therefore considered that an internal rating level criterion of no higher than 30 dB within bedrooms is a suitable threshold for determining the onset of potential adverse impact at this site during the night. The adopted internal 30 dB criterion is based upon the 30 dB $L_{Aeq,8hr}$ desirable target set out by BS 8233:2014³² for sleeping in a bedroom.

BS5228 Methodology

- 11.7.9. Part 1 of BS5228 provides guidance on the methods that can be used to predict and measure noise from construction activities and how to assess the impact on those exposed to it. In particular, Annex F sets out the methods of estimating noise from construction sites which take into account distance, ground effects, reflections from surfaces, and screening by obstacles.
- 11.7.10. Annexes C and D of Part 1 of BS5228 provide generic source noise data for various items of plant used on open sites which can be used in the absence of measured data or manufacturer specifications.
- 11.7.11. Part 1, Annex E '*Significance of noise effects*' of BS5228 presents various methods of determining the significance of noise effects due to construction works. Example method 1, the ABC method, is a widely adopted set of criteria for establishing the acceptability of noise levels. This is reproduced below in **Table 11-15**.

³² BS 8233:2014. "Guidance on sound insulation and noise reduction for buildings".

Table 11-15 - Example threshold of potential significant effect at dwellings

Assessment category and threshold value period	Threshold value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23:00-07:00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3 Applied to residential receptors only			
^{A)} Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. ^{B)} Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. ^{C)} Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. ^{D)} 19:00–23:00 weekdays, 13:00–23:00 Saturdays and 07:00–23:00 Sundays.			

11.7.12. Ambient sound levels are discussed above at **Section 11.5** Error! Reference source not found. which indicates that levels are typically well below the thresholds used to define category A. Construction activities are expected to take place between 07:00 to 19:00 hours on weekdays and 07:00 to 13:00 on Saturdays. It is therefore considered that adverse effects could start to occur for construction noise levels above 65 dB L_{Aeq} (during the day only).

DETERMINATION OF SIGNIFICANCE

- 11.7.13. Operational wind farm noise effects are considered to not be significant where the ETSU-R-97 criteria are predicted to be met. The daytime hours ETSU-R-97 noise criterion is the greater of: 35 - 40 dB L_{A90} / Background + 5 dB. The night-time hours ETSU-R-97 noise criterion is the greater of: 43 dB L_{A90} / Background + 5 dB. The noise criteria set out by the new ARWTN guidance follow the same noise levels. This also applies in a cumulative sense, in that this criteria needs to be met when considering the Proposed Development in combination with the noise impact of all other wind farm developments in the area.
- 11.7.14. Operational noise effects from the BESS related elements are considered to not be significant adverse, where the external rating levels are below 34 and 30 dB L_{Aeq} (for H3 and H4 respectively) and internal rating levels (during the night) are below 30 dB L_{Aeq} .
- 11.7.15. Construction related noise effects are considered to not be significant adverse where the predicted noise levels are below 65 dB L_{Aeq} .

SIGNIFICANCE EVALUATION METHODOLOGY

- 11.7.16. Wind turbine sound can be audible at nearby properties, depending on the turbine type and locations. Background noise at high wind speeds can mask the sound from wind turbines, however at low to medium wind speeds, there may be very little masking provided by background noise, and the wind turbine sound may be audible, even if the noise limit is met. Noise limits are often included in planning consents to protect amenity and prevent sleep disturbance. Appropriate noise limits can

be derived using ETSU-R-97 and the GPG. These limits are based on a set margin above the background noise level for daytime and night-time periods, with a lower limiting value that should depend on certain factors that reflect the overall planning merit of the development.

- 11.7.17. Where predicted operational wind farm noise levels have been found to exceed the derived noise limits, an appropriate operational scheme has been developed, to ensure the Proposed Development (in isolation and cumulatively) will meet the ETSU-R-97 noise criteria. Operational wind farm noise levels are considered to not be significant if the ETSU-R-97 / ARWTN noise criteria are met.
- 11.7.18. Given the generating capacity (of the Proposed Development, and of the total of all the wind farms in the area), a cumulative noise limit towards the upper end of the daytime ETSU-R-97 range is appropriate, i.e. the greater of: 40 dB L_{A90} or Background + 5 dB³³. For night-time, a limit of, the greater of: 43 dB L_{A90} or Background + 5 dB³⁴, is appropriate.
- 11.7.19. Given the large signal-noise ratio exhibited at H4, and the ‘duration and level of exposure’ aspect³⁵, a noise limit towards the lower end of the daytime ETSU-R-97 range may be appropriate for this receptor location. Although an operational scheme for such compliance has not been detailed here, the candidate turbine model, and other similar models, are capable of achieving that if deemed appropriate.

11.8 ASSESSMENT OF PARC YNNI CALON Y GWYNT OPERATIONAL WIND TURBINE NOISE LEVELS

PREDICTION OF OPERATIONAL WIND FARM NOISE LEVELS & EMBEDDED MEASURES

- 11.8.1. **Appendix 11J** describes the calculation method and assumptions for undertaking noise predictions of operational wind farm noise levels of the Proposed Development. This also summarises the embedded measures (in the form of serrated trailing edges and restricted modes of operation) that ultimately will ensure wind farm noise levels³⁶ can meet the relevant noise criteria.
- 11.8.2. For information purposes, **Appendix 11K** details noise prediction results of operational cumulative noise levels³⁷, if considering unrestricted operation of the Proposed Development, considering the candidate N163 turbine model. It can be seen that cumulative wind farm noise levels may exceed the ETSU-R-97 noise criteria, under particular wind conditions at some receptor locations, if unrestricted operation is fully implemented.

³³ Also known as the ‘Upper Daytime Hours Noise Criterion’.

³⁴ Also known as the ‘Night-time Hours Noise Criterion’.

³⁵ In terms of this aspect, ETSU-R-97 states: “*The proportion of the time at which background noise levels are low and how low the background noise level gets are both recognised as factors which could affect the setting of an appropriate lower limit. For example, a property which experienced background noise levels below 30dB(A) for a substantial proportion of the time in which the turbines would be operating could be expected to receive tighter noise limits than a property at which the background noise levels soon increased to levels above 35dB(A)*”.

³⁶ That is, assuming the N163 candidate turbine model. If a quieter turbine model was ultimately implemented, these measures may not be required.

³⁷ The cumulative scenario that is being considered is described later in Appendix 11N. This assumes that all proposed wind farms such as Esgair Cwmowen and Llyn Lort achieve planning permission, and that existing wind farms such as Mynydd Clogau continue to operate.

- 11.8.3. For the receptor locations known as H3, H4, and H6, there are predicted exceedances within the medium wind speed range of 6 - 9 m/s. These are caused, or partially caused, by the Proposed Development, and hence restricted modes of operation are suggested to give a reduced noise level that gives predicted compliance for all wind speeds and wind directions at these receptor locations.
- 11.8.4. For the receptor locations known as H19, H20, H44, and H46, cumulative wind farm noise levels are theoretically predicted to exceed the upper ETSU-R-97 noise criteria. However, for these locations other wind farms dominate and are the primary cause of the theoretical exceedance. Restricted modes of operation for the Proposed Development are suggested that mean its contribution is at least 10 dB below the ETSU-R-97 upper noise criteria, and therefore insignificant at these receptor locations. Being at least 10 dB below the limit, this means that the Proposed Development is immaterial to any cumulative compliance/exceedance of the ETSU-R-97 upper criterion at these receptor locations.
- 11.8.5. **Appendix 11L** details the suggested restricted modes of operation. Noise predictions of this scheme (as detailed subsequently) indicate cumulative wind farm noise levels will be compliant with the ETSU-R-97 Upper Daytime Hours and Night-time Hours Noise Criteria at all receptor locations³⁸. The scheme that is proposed details restricted modes of operation for each turbine, that is predicted to give cumulative compliance for each wind direction. All of the following noise predictions in this assessment assume that scheme of operation.

NOISE IMPACT ASSESSMENT RESULTS

- 11.8.6. The noise assessment of the proposed wind farm operating in isolation is contained within **Appendix 11M** which details an assessment of the wind farm in accordance with the requirements of ETSU-R-97. This considers the scheme of restricted operation as detailed in **Appendix 11L**.
- 11.8.7. **Figure 11.2** provides an indicative noise contour figure of the approximate³⁹ predicted L_{A90} noise level for a standardised 10m wind speed of 12 m/s. This wind speed occurs for the rated power of the candidate turbine and is where the maximum noise level is generated. This is also a wind speed where no restricted operation is proposed. Hence, for other wind speeds the predicted wind turbine noise level will be less. It should also be noted that the noise prediction contour is applicable for a downwind scenario for all receptors, and as such does not take into account wind direction effects. It can be seen that for the majority of receptor locations predicted noise levels from the development in isolation are predicted to be less than 35 dB L_{A90} .
- 11.8.8. **Table 11M.1** within **Appendix 11M** details the grid co-ordinates of the assessed receptor locations and the maximum predicted noise level from the Parc Ynni Calon y Gwynt development at each one. **Appendix 11M** then provides assessment figures for the receptor locations where noise levels from the Parc Ynni Calon y Gwynt development are predicted to be more than 30 dB L_{A90} .
- 11.8.9. Within each noise assessment figure, the background noise assumption for each location is detailed within brackets in the sub-title on each figure. For all locations (except H4 and H57) that did not have monitoring, an assumption of the 'Average Background Noise Level' has been undertaken.

³⁸ Or, the Proposed Development is at least 10 dB below the upper noise limit.

³⁹ The predicted noise levels shown in Figure 11.2 do not take account of any concave valley corrections, that are otherwise included in the noise assessment figures. However, such effects are limited to no more than 1.1 dB at any assessed receptor, when considering noise from the development in isolation.

- 11.8.10. Due to its immediate vicinity, for the receptor location known as H4, the background noise levels measured at the nearby 'Field Nr Lakeside View' location has been assumed.
- 11.8.11. Due to its immediate vicinity, for the receptor location known as H57, the background noise levels measured at the nearby H56 (Fir Tree Lodge) location has been assumed.
- 11.8.12. The predictions detailed in **Appendix 11M** assume a proposed scheme of operational power modes, that is dependent on wind speed and wind direction. The modes of operation are detailed in **Tables 11L.1 - 11L.11** in **Appendix 11L**. It is proposed that this scheme of operation would run in both day and night-time periods. The provided table of results on each page of **Appendix 11M** detail the predicted noise levels for each wind direction, of the Proposed Development in isolation. The assessment figures for each receptor, detail one of the worst wind directions, when the receptor in question would be downwind of the wind farm.
- 11.8.13. At all non-financially involved receptor locations, predicted noise levels indicate that operational wind turbine noise from the proposed Parc Ynni Calon y Gwynt development will not exceed the Upper Daytime Hours Noise Criterion suggested by ETSU-R-97 (i.e. the greater of 40 dB L_{A90} / Background + 5 dB).
- 11.8.14. At all non-financially involved receptor locations, predicted noise levels indicate that operational wind turbine noise from the proposed Parc Ynni Calon y Gwynt development will not exceed the 43 dB L_{A90} Night-time Hours Noise Criterion suggested by ETSU-R-97.
- 11.8.15. It is understood that the residents who reside at the dwellings known as H3 (Llyn Mawr), H47 (Blaen-y-cwm) and H53 (Pantyclesail), are landowners or are otherwise financially involved with the Parc Ynni Calon y Gwynt development. For all financially involved receptor locations, predicted noise levels indicate that operational wind turbine noise from the proposed development will not exceed the Daytime and Night-time Hours Noise Criteria suggested by ETSU-R-97 for financially involved dwellings (i.e. the greater of 45 dB L_{A90} / Background + 5 dB).
- 11.8.16. **Table 11M.96** in **Appendix 11M** details the predicted worst-case wind farm noise levels from the Parc Ynni Calon Y Gwynt development, for the closer dwellings. This is the prediction from the worst wind direction⁴⁰, for each wind speed, for each receptor. The worst wind direction is generally a downwind wind direction in each instance.
- 11.8.17. **Table 11-18 - Table 11-19** below summarise the predicted compliance of the predicted worst-case wind farm noise levels for each receptor, for daytime and night-time respectively. This indicates that at all receptor locations, wind farm noise levels (of Parc Ynni Calon y Gwynt in isolation) are predicted to not exceed the Upper Daytime Hours and Night-time Hours ETSU-R-97 noise criteria⁴¹. The figures in these tables indicate the noise levels relative to the limits, for example (-11.2) indicates that the operational noise level will be 11.2 dB below the limit.

⁴⁰ Which is highlighted in red, in the tables for each receptor location.

⁴¹ Or financially involved criteria where associated.

Table 11-16 - Summary of predicted compliance of operational wind farm noise levels (of Parc Ynni Calon y Gwynt in isolation), daytime hours

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H1	-11.2	-6.4	-4.3	-4.3	-4.3	-3.3	-5.0	-7.2	-9.9
H2	-12.7	-7.9	-5.1	-5.4	-5.6	-4.3	-6.5	-8.7	-11.4
H3	-8.9	-4.1	-0.7	-1.1	-1.1	-0.4	-2.4	-4.6	-8.0
H4	-7.4	-2.6	-0.5	-0.9	-0.9	-0.7	-2.8	-5.1	-8.1
H6	-11.8	-7.0	-3.2	-3.1	-3.1	-3.1	-5.3	-7.8	-10.5
H7	-19.4	-14.6	-11.0	-11.0	-12.5	-14.4	-16.8	-19.8	-23.0
H8	-19.1	-14.3	-10.7	-10.7	-10.7	-10.6	-12.5	-15.1	-17.8
H17	-19.5	-14.7	-11.2	-11.3	-11.3	-11.2	-12.9	-15.5	-18.2
H18	-19.4	-14.6	-11.1	-11.2	-11.2	-11.1	-12.8	-15.4	-18.1
H19	-18.6	-13.8	-10.2	-10.4	-10.5	-10.2	-11.9	-14.6	-17.3
H20	-18.4	-13.6	-10.1	-10.3	-10.3	-10.1	-11.8	-14.4	-17.1
H44	-19.6	-14.8	-11.0	-11.0	-11.0	-11.0	-12.9	-15.6	-18.3
H46	-18.7	-13.9	-10.1	-10.1	-10.1	-10.1	-12.0	-14.7	-17.4
H47	-15.1	-10.3	-6.1	-5.7	-5.7	-5.5	-5.3	-5.3	-5.3
H51	-17.2	-12.4	-8.4	-8.0	-8.0	-8.1	-10.5	-13.2	-15.9
H52	-19.7	-14.9	-10.7	-10.3	-10.4	-10.4	-13.0	-15.7	-18.4
H53	-15.1	-10.3	-6.0	-5.6	-5.7	-5.4	-5.3	-5.3	-7.5
H54	-11.2	-6.4	-2.1	-1.7	-1.8	-1.9	-4.5	-7.2	-9.9
H55	-12.2	-7.4	-3.1	-2.7	-2.7	-2.9	-5.5	-8.2	-10.9
H56	-12.7	-7.9	-3.7	-3.4	-3.5	-3.0	-3.0	-4.3	-5.9
H57	-12.7	-7.9	-3.7	-3.5	-3.5	-3.0	-3.0	-4.3	-5.9
H58	-16.1	-11.3	-7.1	-6.8	-6.9	-6.8	-9.4	-12.1	-14.8
H59	-16.3	-11.5	-7.3	-7.0	-7.1	-7.0	-9.6	-12.3	-15.0
H60	-16.8	-12.0	-7.8	-7.5	-7.5	-7.5	-10.1	-12.8	-15.5

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H61	-17.4	-12.6	-8.5	-8.1	-8.2	-8.2	-10.7	-13.4	-16.1
H62	-17.9	-13.1	-8.9	-8.6	-8.6	-8.6	-11.2	-13.9	-16.6
H63	-13.3	-8.5	-4.7	-4.7	-4.9	-4.3	-6.8	-9.3	-12.0
H64	-13.5	-8.7	-4.9	-4.9	-5.1	-4.5	-7.0	-9.5	-12.2
H65	-14.3	-9.5	-5.8	-5.8	-6.0	-5.3	-7.9	-10.3	-13.0
H66	-16.2	-11.4	-8.5	-8.6	-8.8	-7.8	-10.0	-12.2	-14.9
H67	-17.6	-12.8	-9.9	-10.0	-10.2	-9.2	-11.3	-13.6	-16.3
H68	-15.1	-10.3	-7.7	-7.9	-8.0	-6.9	-9.0	-11.1	-13.8
H69	-14.3	-9.5	-6.9	-7.0	-7.2	-6.0	-8.2	-10.3	-13.0
H70	-14.9	-10.1	-8.4	-8.5	-8.5	-7.4	-8.8	-10.9	-13.6
H71	-15.8	-11.0	-8.8	-8.8	-8.8	-7.8	-9.6	-11.8	-14.5
H72	-15.9	-11.1	-8.5	-8.7	-8.8	-7.7	-9.7	-11.9	-14.6
H73	-16.3	-11.5	-8.7	-8.8	-9.0	-7.9	-10.0	-12.3	-15.0
H74	-17.3	-12.5	-10.3	-10.4	-10.4	-9.4	-11.1	-13.3	-16.0
H75	-12.7	-7.9	-6.1	-6.3	-6.3	-5.0	-6.5	-8.7	-11.4
H76	-16.7	-11.9	-8.0	-7.8	-7.9	-7.6	-10.2	-12.7	-15.4
H77	-16.9	-12.1	-8.1	-7.9	-8.0	-7.7	-10.3	-12.9	-15.6
H78	-17.6	-12.8	-8.8	-8.7	-8.8	-8.5	-11.1	-13.6	-16.3
H79	-18.7	-13.9	-10.1	-10.1	-10.2	-9.7	-12.2	-14.7	-17.4
H80	-18.9	-14.1	-10.4	-10.4	-10.6	-9.9	-12.5	-14.9	-17.6
H81	-19.2	-14.4	-11.0	-11.0	-11.2	-10.4	-12.9	-15.2	-17.9
H101	-14.4	-9.6	-5.4	-5.0	-5.1	-5.1	-7.7	-10.4	-13.1
H102	-14.7	-9.9	-5.7	-5.3	-5.4	-5.4	-8.1	-10.7	-13.4

Table 11-17 - Summary of predicted compliance of operational wind farm noise levels (of Parc Ynni Calon y Gwynt in isolation), night-time hours

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H1	-14.2	-9.4	-7.3	-7.3	-7.3	-5.9	-4.9	-4.4	-7.5
H2	-15.7	-10.9	-8.1	-8.4	-8.6	-6.9	-6.4	-5.9	-9.0
H3	-8.9	-4.1	-0.7	-1.1	-1.1	-0.4	-0.3	-3.1	-8.5
H4	-10.4	-5.6	-3.5	-3.9	-3.9	-2.3	-1.3	-0.6	-2.9
H6	-14.8	-10.0	-6.2	-6.1	-6.1	-5.7	-5.2	-5.0	-8.1
H7	-22.4	-17.6	-14.0	-14.0	-14.0	-13.4	-12.7	-12.6	-12.6
H8	-22.1	-17.3	-13.7	-13.7	-13.7	-13.2	-12.4	-12.3	-15.4
H17	-22.5	-17.7	-14.2	-14.3	-14.3	-13.8	-12.8	-12.7	-15.8
H18	-22.4	-17.6	-14.1	-14.2	-14.2	-13.7	-12.7	-12.6	-15.7
H19	-21.6	-16.8	-13.2	-13.4	-13.5	-12.8	-11.8	-11.8	-14.9
H20	-21.4	-16.6	-13.1	-13.3	-13.3	-12.7	-11.7	-11.6	-14.7
H44	-22.6	-17.8	-14.0	-14.0	-14.0	-13.6	-12.8	-12.8	-15.9
H46	-21.7	-16.9	-13.1	-13.1	-13.1	-12.7	-11.9	-11.9	-15.0
H47	-15.1	-10.3	-6.1	-5.7	-5.7	-5.5	-5.3	-6.2	-10.9
H51	-20.2	-15.4	-11.4	-11.0	-11.0	-10.7	-10.4	-10.4	-13.5
H52	-22.7	-17.9	-13.7	-13.3	-13.4	-13.0	-12.9	-12.9	-16.0
H53	-15.1	-10.3	-6.0	-5.6	-5.7	-5.4	-5.3	-5.3	-5.3
H54	-14.2	-9.4	-5.1	-4.7	-4.8	-4.5	-4.4	-4.4	-7.5
H55	-15.2	-10.4	-6.1	-5.7	-5.7	-5.5	-5.4	-5.4	-8.5
H56	-15.7	-10.9	-6.7	-6.4	-6.5	-6.0	-6.0	-5.9	-5.9
H57	-15.7	-10.9	-6.7	-6.5	-6.5	-6.0	-6.0	-5.9	-5.9
H58	-19.1	-14.3	-10.1	-9.8	-9.9	-9.4	-9.3	-9.3	-12.4
H59	-19.3	-14.5	-10.3	-10.0	-10.1	-9.6	-9.5	-9.5	-12.6
H60	-19.8	-15.0	-10.8	-10.5	-10.5	-10.1	-10.0	-10.0	-13.1

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H61	-20.4	-15.6	-11.5	-11.1	-11.2	-10.8	-10.6	-10.6	-13.7
H62	-20.9	-16.1	-11.9	-11.6	-11.6	-11.2	-11.1	-11.1	-14.2
H63	-16.3	-11.5	-7.7	-7.7	-7.9	-6.9	-6.7	-6.5	-9.6
H64	-16.5	-11.7	-7.9	-7.9	-8.1	-7.1	-6.9	-6.7	-9.8
H65	-17.3	-12.5	-8.8	-8.8	-9.0	-7.9	-7.8	-7.5	-10.6
H66	-19.2	-14.4	-11.5	-11.6	-11.8	-10.4	-9.9	-9.4	-12.5
H67	-20.6	-15.8	-12.9	-13.0	-13.2	-11.8	-11.2	-10.8	-13.9
H68	-18.1	-13.3	-10.7	-10.9	-11.0	-9.5	-8.9	-8.3	-11.4
H69	-17.3	-12.5	-9.9	-10.0	-10.2	-8.6	-8.1	-7.5	-10.6
H70	-17.9	-13.1	-11.4	-11.5	-11.5	-10.0	-8.7	-8.1	-11.2
H71	-18.8	-14.0	-11.8	-11.8	-11.8	-10.4	-9.5	-9.0	-12.1
H72	-18.9	-14.1	-11.5	-11.7	-11.8	-10.3	-9.6	-9.1	-12.2
H73	-19.3	-14.5	-11.7	-11.8	-12.0	-10.5	-9.9	-9.5	-12.6
H74	-20.3	-15.5	-13.3	-13.4	-13.4	-12.0	-11.0	-10.5	-13.6
H75	-15.7	-10.9	-9.1	-9.3	-9.3	-7.6	-6.4	-5.9	-9.0
H76	-19.7	-14.9	-11.0	-10.8	-10.9	-10.2	-10.1	-9.9	-13.0
H77	-19.9	-15.1	-11.1	-10.9	-11.0	-10.3	-10.2	-10.1	-13.2
H78	-20.6	-15.8	-11.8	-11.7	-11.8	-11.1	-11.0	-10.8	-13.9
H79	-21.7	-16.9	-13.1	-13.1	-13.2	-12.3	-12.1	-11.9	-15.0
H80	-21.9	-17.1	-13.4	-13.4	-13.6	-12.5	-12.4	-12.1	-15.2
H81	-22.2	-17.4	-14.0	-14.0	-14.2	-13.0	-12.8	-12.4	-15.5
H101	-17.4	-12.6	-8.4	-8.0	-8.1	-7.7	-7.6	-7.6	-10.7
H102	-17.7	-12.9	-8.7	-8.3	-8.4	-8.0	-8.0	-7.9	-11.0

11.9 ASSESSMENT OF CUMULATIVE OPERATIONAL WIND TURBINE NOISE LEVELS

- 11.9.1. There are several other proposed/consented/operational wind farms in the broad vicinity of Parc Ynni Calon y Gwynt. This cumulative noise assessment has considered the current operational and current consented wind farms, and any proposed wind farm developments that predate the Proposed Development. Consequently, the following wind turbine developments have been considered:
- Mynydd Clogau - operational
 - Esgair Cwmowen - in planning
 - Tirgwynt - operational
 - Llyn Lort - in planning
 - Single Turbine A - consented/operational
 - Mynydd Lluest y Graig - in scoping
- 11.9.2. **Figure 11.1** and **Figure 11.3** show the cumulative study area and detail the locations of the wind farms considered. Also highlighted in **Figure 11.3** are the receptor locations assessed within the cumulative noise assessment. For more distant receptor locations, the contribution of the Parc Ynni Calon y Gwynt turbines is predicted to be more than 10 dB lower than the cumulative noise limit, hence these are not assessed further.
- 11.9.3. Other wind farm developments that are also on the 'short-list' for consideration⁴² are located at too large a distance to be relevant for the cumulative noise assessment.

CUMULATIVE NOISE PREDICTION ASSUMPTIONS

- 11.9.4. In terms of the source noise levels and co-ordinates of the various other wind turbine developments considered, **Appendix 11N** details the assumptions made within this cumulative noise assessment. It has been assumed that all wind farms currently in planning will receive consent and that wind turbine types, locations and source noise levels as set out in within their respective EIAs or Scoping Reports will be implemented. In terms of Mynydd Clogau, it is assumed that this wind farm continues in a similar manner to its current operation, although it is possible it may be decommissioned before the Proposed Development becomes operational.

CUMULATIVE NOISE IMPACT ASSESSMENT RESULTS

- 11.9.5. **Appendix 11O** provides the results of noise predictions of the various wind farm developments. The predictions consider the contribution of the Proposed Development operating alongside the other wind turbine developments. The predicted total cumulative wind farm noise level is then compared with the upper ETSU-R-97 noise criteria. It is considered that given the generating capacity (of the Proposed Development, and of the total of all the wind farms in the area), a cumulative noise limit towards the upper end of the ETSU-R-97 range is appropriate.

⁴² That is: Carno A&B (~7.5 km away), Carno III (~7.9 km away), Llanbrynmair 1 (~7.6 km away), Llanbrynmair 2 (~7.6 km away).

- 11.9.6. In the context of the new ARWTN guidance, given the generating capacity, a Total Noise Assessment Criterion (TNAC) towards the upper end may also be appropriate. For the purposes of this assessment the daytime TNAC has been assumed to be the same as the upper ETSU-R-97 noise criteria (i.e. 40 dB L_{A90} / Background + 5 dB).
- 11.9.7. Receptor locations where the contribution of Parc Ynni Calon y Gwynt is predicted to be within 10 dB of the upper ETSU-R-97 noise criterion (40 dB L_{A90} / Background + 5 dB) have been considered. For other receptor locations that are further away, because they are more than 10 dB below the limit, the contribution of the Proposed Development is immaterial to any cumulative compliance⁴³.
- 11.9.8. The operational scheme for Parc Ynni Calon y Gwynt (as detailed in **Appendix 11L**), has been considered. It is proposed to operate these operational modes for both daytime and night-time periods. For each receptor location, cumulative noise prediction results are presented for each wind direction. This includes considering the operational schemes of the other proposed wind farm developments, for each relevant wind direction.
- 11.9.9. The noise predictions detailed in **Appendix 11O** indicate that at all non-financially involved receptor locations, for all wind directions, cumulative wind farm noise levels will meet the Upper Daytime Hours Noise Criterion suggested by ETSU-R-97. Similarly the noise predictions suggest that cumulative wind farm noise levels will meet the daytime TNAC according to the ARWTN guidance.
- 11.9.10. The noise predictions also indicate that at all non-financially involved receptor locations, cumulative wind farm noise levels of the same operational scheme, will meet the Night-time Hours Noise Criterion suggested by ETSU-R-97 / ARWTN.
- 11.9.11. It is understood that the residents who reside at the dwellings known as H3, H47 and H53, are financially involved with the Parc Ynni Calon y Gwynt development. Predicted cumulative noise levels indicate that operational wind turbine noise from the Proposed Development will meet the Daytime and Night-time Hours Noise Criteria suggested by ETSU-R-97 / ARWTN for financially involved dwellings.
- 11.9.12. **Table 11-18 - Table 11-19** below summarise the predicted compliance of the predicted worst-case cumulative wind farm noise levels for each receptor, for daytime and night-time respectively. This indicates that at all receptor locations, wind farm noise levels are predicted to not exceed the daytime and night-time ETSU-R-97 / ARWTN noise criteria⁴⁴.

⁴³ This also aligns with the new ARWTN guidance, in that where the noise level from the proposed development is 10 dB or more below the Total Noise Assessment Criteria, it is stated that a cumulative noise assessment is not necessary at that noise-sensitive receptor.

⁴⁴ Or financially involved criteria where associated.

Table 11-18 - Summary of Predicted Compliance of Cumulative Operational Wind Farm Noise Levels, Daytime Hours

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H1	-10.0	-5.5	-3.1	-2.9	-2.8	-2.1	-4.1	-6.4	-9.1
H2	-11.2	-6.7	-3.7	-3.6	-3.6	-2.9	-5.5	-7.7	-10.4
H3	-8.5	-3.7	-0.6	-0.9	-1.0	-0.3	-2.1	-4.3	-7.7
H4	-6.7	-2.0	-0.1	-0.1	-0.1	0.0	-2.2	-4.6	-7.6
H6	-6.5	-3.0	-0.3	0.0	0.0	-0.1	-1.9	-3.7	-6.5
H47	-13.4	-8.6	-4.7	-4.4	-4.5	-4.3	-4.1	-4.2	-4.2
H51	-12.0	-7.1	-3.8	-3.6	-3.6	-3.8	-6.5	-9.2	-11.9
H53	-14.3	-9.6	-5.5	-5.1	-5.1	-4.9	-4.8	-4.8	-7.0
H54	-10.3	-5.6	-1.5	-1.1	-1.1	-1.3	-3.9	-6.6	-9.3
H55	-11.1	-6.3	-2.3	-1.9	-1.9	-2.1	-4.8	-7.4	-10.1
H56	-11.6	-6.9	-2.9	-2.6	-2.6	-2.2	-2.2	-3.5	-5.2
H57	-11.6	-6.9	-2.9	-2.6	-2.6	-2.2	-2.2	-3.5	-5.1
H58	-14.4	-9.7	-5.8	-5.5	-5.5	-5.6	-8.3	-10.9	-13.6
H59	-14.6	-9.9	-6.0	-5.7	-5.7	-5.8	-8.4	-11.1	-13.8
H60	-14.9	-10.2	-6.3	-6.0	-6.0	-6.1	-8.8	-11.5	-14.2
H61	-15.4	-10.7	-6.8	-6.6	-6.6	-6.7	-9.3	-12.0	-14.7
H62	-15.7	-11.0	-7.2	-6.9	-6.9	-7.0	-9.7	-12.4	-15.1
H63	-12.1	-7.5	-3.7	-3.6	-3.7	-3.3	-5.9	-8.5	-11.2
H64	-12.3	-7.6	-3.9	-3.7	-3.8	-3.5	-6.1	-8.7	-11.4
H65	-12.9	-8.3	-4.7	-4.5	-4.6	-4.2	-6.9	-9.4	-12.1
H66	-14.3	-9.8	-6.7	-6.4	-6.4	-6.0	-8.6	-10.9	-13.6
H67	-15.3	-10.9	-7.8	-7.4	-7.3	-7.0	-9.5	-12.0	-14.7
H68	-13.4	-8.9	-5.9	-5.6	-5.6	-5.1	-7.6	-9.9	-12.7
H69	-12.7	-8.2	-5.3	-5.0	-5.0	-4.4	-6.9	-9.2	-11.9

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H70	-12.9	-8.5	-6.2	-5.7	-5.5	-5.1	-7.2	-9.5	-12.2
H71	-13.8	-9.4	-6.6	-6.1	-6.0	-5.7	-7.9	-10.4	-13.1
H72	-14.0	-9.5	-6.6	-6.1	-6.1	-5.7	-8.1	-10.5	-13.3
H73	-14.3	-9.9	-6.8	-6.4	-6.3	-5.9	-8.4	-10.9	-13.6
H74	-14.0	-9.9	-7.1	-6.2	-5.9	-5.9	-8.3	-10.9	-13.7
H75	-11.1	-6.7	-4.6	-4.1	-4.0	-3.3	-5.2	-7.6	-10.3
H76	-15.0	-10.4	-6.6	-6.3	-6.3	-6.2	-8.9	-11.5	-14.2
H77	-15.2	-10.5	-6.7	-6.4	-6.5	-6.4	-9.1	-11.7	-14.4
H78	-15.8	-11.1	-7.3	-7.1	-7.1	-7.0	-9.7	-12.3	-15.0
H79	-16.6	-12.0	-8.4	-8.1	-8.1	-7.9	-10.6	-13.2	-15.9
H80	-16.7	-12.2	-8.6	-8.2	-8.2	-8.0	-10.7	-13.3	-16.0
H101	-12.9	-8.2	-4.3	-3.9	-3.9	-4.1	-6.7	-9.4	-12.1
H102	-13.2	-8.5	-4.5	-4.2	-4.2	-4.3	-7.0	-9.7	-12.4

Table 11-19 - Summary of Predicted Compliance of Cumulative Operational Wind Farm Noise Levels, Night-Time Hours

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H1	-13.0	-8.5	-6.1	-5.9	-5.8	-4.7	-4.0	-3.6	-6.7
H2	-14.2	-9.7	-6.7	-6.6	-6.6	-5.5	-5.4	-4.9	-8.0
H3	-8.5	-3.7	-0.6	-0.9	-1.0	-0.3	0.0	-2.8	-8.2
H4	-9.7	-5.0	-3.1	-3.1	-3.1	-1.6	-0.7	-0.1	-2.4
H6	-9.5	-6.0	-3.3	-3.0	-3.0	-2.7	-1.8	-0.9	-4.1
H47	-13.4	-8.6	-4.7	-4.4	-4.5	-4.3	-4.1	-5.1	-9.8
H51	-15.0	-10.1	-6.8	-6.6	-6.6	-6.4	-6.4	-6.4	-9.5
H53	-14.3	-9.6	-5.5	-5.1	-5.1	-4.9	-4.8	-4.8	-4.8

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H54	-13.3	-8.6	-4.5	-4.1	-4.1	-3.9	-3.8	-3.8	-6.9
H55	-14.1	-9.3	-5.3	-4.9	-4.9	-4.7	-4.7	-4.6	-7.7
H56	-14.6	-9.9	-5.9	-5.6	-5.6	-5.2	-5.2	-5.1	-5.2
H57	-14.6	-9.9	-5.9	-5.6	-5.6	-5.2	-5.2	-5.1	-5.1
H58	-17.4	-12.7	-8.8	-8.5	-8.5	-8.2	-8.2	-8.1	-11.2
H59	-17.6	-12.9	-9.0	-8.7	-8.7	-8.4	-8.3	-8.3	-11.4
H60	-17.9	-13.2	-9.3	-9.0	-9.0	-8.7	-8.7	-8.7	-11.8
H61	-18.4	-13.7	-9.8	-9.6	-9.6	-9.3	-9.2	-9.2	-12.3
H62	-18.7	-14.0	-10.2	-9.9	-9.9	-9.6	-9.6	-9.6	-12.7
H63	-15.1	-10.5	-6.7	-6.6	-6.7	-5.9	-5.8	-5.7	-8.8
H64	-15.3	-10.6	-6.9	-6.7	-6.8	-6.1	-6.0	-5.9	-9.0
H65	-15.9	-11.3	-7.7	-7.5	-7.6	-6.8	-6.8	-6.6	-9.7
H66	-17.3	-12.8	-9.7	-9.4	-9.4	-8.6	-8.5	-8.1	-11.2
H67	-18.3	-13.9	-10.8	-10.4	-10.3	-9.6	-9.4	-9.2	-12.3
H68	-16.4	-11.9	-8.9	-8.6	-8.6	-7.7	-7.5	-7.1	-10.3
H69	-15.7	-11.2	-8.3	-8.0	-8.0	-7.0	-6.8	-6.4	-9.5
H70	-15.9	-11.5	-9.2	-8.7	-8.5	-7.7	-7.1	-6.7	-9.8
H71	-16.8	-12.4	-9.6	-9.1	-9.0	-8.3	-7.8	-7.6	-10.7
H72	-17.0	-12.5	-9.6	-9.1	-9.1	-8.3	-8.0	-7.7	-10.9
H73	-17.3	-12.9	-9.8	-9.4	-9.3	-8.5	-8.3	-8.1	-11.2
H74	-17.0	-12.9	-10.1	-9.2	-8.9	-8.5	-8.2	-8.1	-11.3
H75	-14.1	-9.7	-7.6	-7.1	-7.0	-5.9	-5.1	-4.8	-7.9
H76	-18.0	-13.4	-9.6	-9.3	-9.3	-8.8	-8.8	-8.7	-11.8
H77	-18.2	-13.5	-9.7	-9.4	-9.5	-9.0	-9.0	-8.9	-12.0
H78	-18.8	-14.1	-10.3	-10.1	-10.1	-9.6	-9.6	-9.5	-12.6
H79	-19.6	-15.0	-11.4	-11.1	-11.1	-10.5	-10.5	-10.4	-13.5

Receptor	Standardised 10m Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
H80	-19.7	-15.2	-11.6	-11.2	-11.2	-10.6	-10.6	-10.5	-13.6
H101	-15.9	-11.2	-7.3	-6.9	-6.9	-6.7	-6.6	-6.6	-9.7
H102	-16.2	-11.5	-7.5	-7.2	-7.2	-6.9	-6.9	-6.9	-10.0

11.10 ASSESSMENT OF OPERATIONAL NOISE LEVELS FROM BESS FACILITY

- 11.10.1. The noise prediction and assessment of the proposed BESS facility is contained within **Appendix 11P** which details an assessment of the electrical plant in accordance with the requirements of BS4142.
- 11.10.2. To assess the level of noise from the proposed BESS facility, the predicted rating level has been compared with the adopted daytime and night-time criteria (for example as set out in Paragraphs 11.7.7 - 11.7.8 above). This is undertaken at the closest receptor locations H3 and H4.
- 11.10.3. Measured noise levels at these locations suggest representative background sound levels during the day of 29 dB L_{A90} and 25 dB L_{A90} , at H3 and H4 respectively. Therefore the adopted significance criterion is 5 dB above this value. Due to low background sound levels at night, the adopted significance criterion is an internal rating level no higher than 30 dB.
- 11.10.4. Noise predictions were undertaken based upon the specifications of electrical plant expected to be installed. **Figure 11.4** provides an indicative noise contour figure of the predicted L_{Aeq} specific noise level for the BESS facility. The contours are presented for a height of 4 m to represent a worst case.
- 11.10.5. The noise predictions suggest external rated noise levels from the BESS facility to be 33 dB and 29 dB, at H3 and H4 respectively. This suggests a rated noise level no more than 4 dB above daytime background sound levels during the day. This is an indication of a low impact. The noise predictions suggest a night-time internal rated noise level of no more than 24 dB, which is below the adopted criterion of 30 dB. Consequently noise effects from the BESS facility are considered to be not significant.
- 11.10.6. **Tables 11P.1 - 11.P.2** within **Appendix 11P** provide summary assessment tables for the two closest receptor locations. The predicted rating levels are below the criteria for both assessment locations. The predicted noise levels and associated impact would be lower at all other more distant assessment locations⁴⁵.

⁴⁵ For example, the next nearest receptor would be approximately 390 m further away, and receives a predicted external rated noise level of approximately 26 dB, and hence would be well below the criteria, and therefore the noise effects considered to be not significant.

11.11 ASSESSMENT OF CONSTRUCTION/DECOMMISSIONING NOISE LEVELS

- 11.11.1. The noise prediction and assessment of construction noise for the Proposed Development is contained within **Appendix 11Q**, which details an assessment of the noise generated by construction plant and delivery vehicles in accordance with the requirements of BS5228. Due to the large separation distances between receptors and most of the construction areas, and subject to an appropriate adoption of 'Best Practicable Means' as secured by the site-specific Construction Environmental Management Plan, noise levels from construction activities will generally be low. The only activity which is likely to be close enough to receptors to have the potential for noise impacts is construction of the access track.
- 11.11.2. The noise impact of the decommissioning phase is considered to be similar to the construction phase in using similar plant but with fewer activities required. On this basis the noise impact of future decommissioning works are considered to be short-term, and likely to be of lower impact than the worst case construction stage.

TRACK CONSTRUCTION

- 11.11.3. Construction of the access track is likely to be the stage with the highest level of impact in terms of construction related noise levels. **Figures 11.4 - 11.6** provide indicative noise contours of the predicted L_{Aeq} noise level for the plant used in track construction. The contours are presented for a height of 1.5 m and show predicted noise levels for the closest receptor locations.
- 11.11.4. **Table 11Q.2** within **Appendix 11Q** details the grid co-ordinates of the closest locations assumed for the items of plant associated with track construction. **Table 11Q.3** then details predicted L_{Aeq} noise levels for receptor locations within 300 m of the access track. The predicted noise levels are above the daytime 65 dB noise criterion for at least six receptor locations.
- 11.11.5. Whilst noise levels during the construction phase would exceed the assumed 65 dB $L_{Aeq,12hr}$ daytime criterion, this would only be expected to occur for a maximum of two days⁴⁶ and this is not considered to be significant. Nonetheless, mitigation would be employed to minimise impacts at any property within 150 m of areas where track construction will be taking place, as set out in **Appendix 11Q**. Given the duration of the works, it is recommended that appropriate mitigation is discussed with the residents of the properties nearer the time of construction.
- 11.11.6. The exact nature of the mitigation employed would be determined via the use of Best Practicable Means and the site specific Construction Environmental Management Plan, which would involve a more informed noise assessment being undertaken, and discussion with the residents and local authority. This could theoretically involve, for example the construction of noise barriers, however given the negatives of that in itself, and the temporary nature of the potential exceedances of the track construction, a more practical solution may be achieved.
- 11.11.7. The mitigation could also involve noise monitoring and auditing of plant use and timings, to ensure the daily dose of construction noise levels does not exceed the 65 dB $L_{Aeq,12hr}$ criterion, whether it be for track construction, or any of the other construction activities.

⁴⁶ Based on an estimation of how long each particular section of access track is expected to be constructed.

CONSTRUCTION TRAFFIC

- 11.11.8. In relation to the assessment of construction related traffic noise, indicative noise predictions have been undertaken using the haul road method outlined in BS5228 (see **Appendix 11Q**).
- 11.11.9. The noise predictions have been carried out based upon the number of vehicles movements expected for one of the worst anticipated months for construction related vehicle movements⁴⁷, and the receptor distances to the access route. Predictions are provided for the receptors located within 300 m of the access route leading up from the junction between the B5468 and the main A road⁴⁸. These are the same receptors as shown in **Figures 11.5 - 11.7**.
- 11.11.10. The resultant predicted noise levels are below the daytime 65 dB noise criterion for all assessment locations (this is summarised in **Table 11Q.4** within **Appendix 11Q**). As the predicted noise levels are below the criterion, noise effects from construction related traffic are considered to be not significant.

11.12 CONCLUSIONS

- 11.12.1. Information has been provided regarding the potential noise impact from the proposed Parc Ynni Calon y Gwynt, including analysis of the potential cumulative noise impact.
- 11.12.2. Predictions of wind farm noise have been made, based upon likely warranted sound power levels for a Nordex N163 STE wind turbine and a calculation procedure which is considered to give conservative estimates of noise immission levels. An operational scheme has been considered that applies specific noise optimised modes for different wind conditions.
- 11.12.3. When considering only the proposed Parc Ynni Calon y Gwynt development, predicted levels and measured background noise levels indicate that, for all non-financially involved dwellings neighbouring the Proposed Development, wind turbine noise will meet the Upper Daytime Hours and Night-time Hours Noise Criteria proposed by ETSU-R-97.
- 11.12.4. Cumulative noise predictions indicate that, for all non-financially involved dwellings, cumulative wind turbine noise will meet the Upper Daytime Hours and Night-time Hours Noise Criteria specified in ETSU-R-97. The predictions indicate that for all non-financially involved dwellings, cumulative wind turbine noise will meet the Total Noise Assessment Criteria suggested in ARWTN.
- 11.12.5. The noise predictions indicate that for all financially involved dwellings, wind farm noise levels (of Parc Ynni Calon y Gwynt in isolation, and cumulatively) will meet the Daytime and Night-time Hours Noise Criteria specified by ETSU-R-97/ARWTN for residents with financial involvement.
- 11.12.6. Operational noise levels relating to the BESS facility under worst case conditions have been assessed with reference to BS4142. External rating levels from electrical equipment are expected to be no more than 4 dB above background sound levels during the day which could be expected to result in a low impact. At night, internal rating levels are expected to be below 30 dB which has been adopted as a criterion for potential significant effects. Noise effects from the BESS facility are considered to be not significant.
- 11.12.7. Indicative predictions have been undertaken based on conservative assumptions for construction operations in relation to construction of the Proposed Development. Predicted noise levels have

⁴⁷ Month 4, where road stone deliveries are expected to take place.

⁴⁸ In regards the main A roads leading up to the site, it is considered that changes in traffic flow relating to construction traffic along such roads is likely to represent less than a 50% increase and would not result in any significant increases in traffic noise.

been shown to exceed a proposed significance criterion derived from guidance in BS 5228-1 at a number of properties. However, the criterion is not expected to be exceeded for any more than two days and mitigation will be employed to minimise the impact at affected properties. On the basis of the short duration and proposed mitigation, residual effects from all construction activities are considered to be not significant.

11.12.8. A summary of the results of the noise assessment is provided in **Table 11-20** below.

Table 11-20 - Summary of Significance of Effects

Receptor And Summary Of Predicted Effects	Significance	Summary Rationale
Receptors near the Site	Not significant	Predicted operational wind farm noise levels meet the ETSU-R-97/ARWTN noise criteria
Receptors close to the BESS facility	Not significant	BESS operational noise levels are expected to be below adopted significance criteria following BS4142 methodology
Receptors within 300 m of access track	Not significant	Construction related noise is predicted to exceed the adopted threshold for potential significant effects. Due to the limited duration , residual effects are considered to be not significant, however mitigation would be proposed to further reduce the residual effects.



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