
Mynydd Fforch Dwm Wind Farm
Naturalis Energy Developments Ltd

Appendix 9.3: Bats



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1 INTRODUCTION

- 1.1.1 This Technical Appendix has been prepared to accompany **Chapter 9: 'Ecology'** of the Environmental Statement ('ES') for the proposed Mynydd Fforch Dwm Wind Farm (hereafter 'Proposed Development').
- 1.1.2 It presents detailed methodologies, and results of desk studies and field surveys completed to establish baseline conditions with regards bats and should be read with reference to the following figures (presented in Volume 2 of the ES):
- **Figure 9.3** – Phase 1 Habitat Survey Plan.
 - **Figure 9.6** – Bat Survey Plan.
- 1.1.3 Common names are used throughout the report, with scientific names presented in **Annex 1**.

2 METHODOLOGY

2.1 Objectives

- 2.1.1 The objectives of the baseline studies were to:
- Assess the habitats within the Proposed Development to identify:
 - Features that have potential to support maternity roosts and significant hibernation roosts; and
 - The location and extent of commuting and foraging habitat used by bats;
 - Identify the bat species assemblage using the Proposed Development, and the temporal and spatial variations in use; and
 - Assess the level of activity of bats within the Proposed Development.

2.2 Key Guidance

- 2.2.1 Bat survey methodology and subsequent interpretation of results made reference to the following key guidance documents:
- Hundt, L. (2012) *Bat Surveys: Good Practice Guidelines (2nd edition)*. The Bat Conservation Trust, London.
 - Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)*. The Bat Conservation Trust, London.
 - Natural England (2014) Technical Information Note TIN051: Bats and onshore wind turbines interim guidance. Natural England, Peterborough.
 - Russ, J. (2012). *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.
 - NatureScot (2022) *General pre-application and scoping advice for onshore wind farms*.
 - NatureScot (2019) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*.

2.3 Desk Study

- 2.3.1 The desk study has included a review of the following key sources summarised in **Table 2.1**.
- 2.3.2 Additional peer reviewed literature and industry guidance has also been reviewed and is referred to where relevant.

Table 2.1: Desk study key sources and information sought.

Key Source
Aerial imagery and existing habitat mapping of the Proposed Development (Google Maps ¹ , Phase 1 habitat survey plan; Figure 9.3) to complete a habitat appraisal; identify any features of value to foraging, commuting or roosting bats.
The location of statutory designated sites within 10km of the Proposed Development with qualifying bat interests, through a review of Natural Resources Wales 'Protected Areas of Land and Sea' map ² .
A review of local records provided by South East Wales Biodiversity Records Centre (SEWBRC), to identify records of bats and the location of non-statutory designated sites with qualifying bat interest within 1km of the Proposed Development.
A review of post-construction monitoring survey reports for the adjacent Pen y Cymoedd wind farm.
A review of the Proposed Development location in relation to species known ranges in Wales, with reference to the most recent UK Habitats Directive ³ Article 17 Report ⁴ .
The location of other wind energy developments within 5km of the Proposed Development, including the number of turbines and their size.

2.4 Field Surveys

Survey Approach

- 2.4.1 The 'bat survey area' comprised the Proposed Development and is shown on **Figure 9.6**.
- 2.4.2 Bat activity surveys were undertaken in accordance with current NatureScot guidance (2019**Error! Bookmark not defined.**) to establish the bat species assemblage using the Proposed Development, the spatial and temporal distribution of bat activity, the location and extent of commuting or foraging habitat used by bats and the locations of roosts and swarming sites that could potentially be affected by the Proposed Development.
- 2.4.3 Surveys were undertaken in 2019 and 2021 and consisted of the following:
- Habitat Appraisal;
 - Preliminary Roost Assessment; and

¹ <https://www.google.com/maps>

² <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en> (accessed November 2022).

³ Council Directive 92/43/EEC.

⁴ <https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/#regularly-occurring-species-vertebrate-species-mammals-terrestrial> (accessed November 2022).

- Ground-level Activity Surveys.

Habitat Appraisal

- 2.4.4 The habitats present within the bat survey area were appraised for their potential to support bats in terms of foraging and commuting opportunities in accordance with BCT guidance (Collins, 2016) applicable at the time. The bat survey area consisted of the Proposed Development, plus 200m buffer.
- 2.4.5 The habitat appraisal was undertaken through a review of habitats identified during the 2019 extended Phase 1 habitat survey and through the use of aerial imagery and OS mapping of the Proposed Development.

Preliminary Roost Assessment

- 2.4.6 Structures and trees with the potential to support maternity roosts and significant hibernation and/or swarming sites within the bat survey area were identified through a review of aerial imagery and the preliminary habitat appraisal. All potential roosting features were identified within 200m plus blade tip of the Proposed Development turbines, in accordance with NatureScot (2019) guidance.
- 2.4.7 A preliminary roost assessment was undertaken alongside the extended Phase 1 habitat survey in 2015, updated in 2019 to identify any potential bat roosting sites. Full details of the extended Phase 1 habitat survey are provided in **Appendix 9.1**.

Ground-level Activity Surveys

2019

- 2.4.8 Seven automated monitoring stations (Control, MS1 – MS6) were deployed within the bat survey area during each survey period as illustrated in **Figure 9.6** and detailed in **Table 2.2**.
- 2.4.9 In accordance with NatureScot (2019) guidance, the automated monitoring stations were located at each turbine location (the known turbine locations at the time of survey) with an additional monitoring station (Control) also deployed in a location considered to comprise habitats of higher bat suitability within the Proposed Development.
- 2.4.10 Each monitoring station comprised a single Songmeter (SM2 or SM4) bat detector fitted with a single omnidirectional microphone attached to a 1m high wooden stake.

2021

- 2.4.11 Nine automated monitoring stations (MS1 – MS9) were deployed within the bat survey area during each survey period as illustrated in **Figure 9.6** and detailed in **Table 2.2**.
- 2.4.12 MS1 to MS6 were redeployed in the same locations as the 2019 surveys (the Control was not deployed), although some of the turbine locations had changed from the 2019 survey period and so some of the monitoring stations are no longer located at the turbine locations. An additional area of land at Mynydd Blaenafon (MB area) was now part of the Proposed Development and so an additional three automated monitoring stations (MS7 – MS9) were deployed, with two of these located at turbine locations.
- 2.4.13 Each monitoring station comprised a single Songmeter (SM Mini) bat detector attached to a wooden stake, fence post or tree to a height of 1m.
- 2.4.14 During each survey period monitoring was undertaken between the time period spanning approximately 30 minutes before sunset and half an hour after sunrise, with equipment set up to

record simultaneously, to allow comparison of activity recorded at monitoring stations located within different habitats.

Table 2.2: Automated monitoring station locations and recording nights.

 I.D.	Grid Ref (BNG)	No. of Successful Recording Nights ⁵			Nearest Turbine Location	Distance from Turbine (m)	Phase 1 Habitat Classification ⁶	Linear Feature within 50m
		Spring	Summer	Autumn				
Control	SS8299397615	6	16	52	n/a	n/a	Semi-improved acid grassland	Coniferous plantation woodland and ditch network
MS1	SS8325597773	39	65	33	T3	167	Marshy grassland	Ruined stone wall
MS2	SS8288197811	41	70	41	T3	218	Semi-improved acid grassland	Post and wire fence
MS3	SS8267597526	41	75	41	T5	177	Semi-improved neutral grassland	Post and wire fence
MS4	SS8263598026	36	60	28	T4	48	Semi-improved neutral grassland	Coniferous plantation woodland
MS5	SS8221297683	41	79	66	T6	229	Semi-improved acid grassland	Post and wire fence
MS6	SS8232897951	24	71	88	T6	303	Semi-improved neutral grassland	Post and wire fence
MS7	SS8090697261	28	39	34	T2	440	Marshy grassland	Post and wire fence
MS8	SS8107897681	36	52	32	T1	60	Marshy grassland	n/a
MS9	SS8065697598	36	67	37	T2	70	Marshy grassland	Post and wire fence

⁵ Combined survey periods (where applicable), nights deemed unsuitable due to weather conditions removed.

⁶ JNCC (2010) Handbook for Phase 1 Habitat Survey – a technique for environmental audit. JNCC. Peterborough
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2.5 Weather Data

- 2.5.1 Weather data were collected from a weather station located within the bat survey area at SS 82757 97514 and, during periods the weather station failed to record, the AccWeather⁷ website (2019 survey period) and the World Weather Online⁸ website (2021 survey period) were used to fill in missing data. Temperature, rainfall and wind speed at dusk were collected. Weather conditions are summarised in **Annex 2**.
- 2.5.2 Weather data were also analysed to check for any periods of poor weather which could have affected bat activity. Nights of unsuitable weather that recorded no bats were removed from the dataset.

2.6 Data Analysis and Assumptions of Bat Activity

- 2.6.1 Data analysis and interpretation of results followed the principles presented in the BCT guidance (Collins, 2016).
- 2.6.2 Bat detectors recorded data onto digital media for subsequent analysis using 'Analog' (Titley Electronics) and Kaleidoscope Pro (Wildlife Acoustics) software. All data was processed through Kaleidoscope Pro to separate out noise files. The remaining sonograms are then automatically identified by the software. A selection of sonograms from each species or species group was manually checked with particular attention given to non-pipistrelle species.
- 2.6.3 Bat species were identified using characteristic features associated with species echolocation calls. Diagnostic features used in this analysis include characteristic frequency, slope, call duration, time between calls, minimum length of the body of the call and smoothness.
- 2.6.4 Bat detectors record the passage of echolocating bats during surveys, enabling an estimation of relative bat activity levels for assessment. It is recognised, however, that there are limitations to the use of this method for determining bat activity levels.
- 2.6.5 For the purpose of sonogram analysis, bat activity was taken as the number of 'bat registered calls' i.e., a sequence of echolocation calls consisting of two or more call notes (pulse of frequency), not separated by more than one second (White and Gehrt, 2001 and Gannon *et al.*, 2003), with a minimum call note length of two milliseconds (Weller *et al.*, 2009).
- 2.6.6 An individual bat can pass a particular feature on several occasions while foraging and therefore it was not possible to estimate the number of individual bats or draw a fair comparison where survey time differs.

Ecobat Tool

- 2.6.7 In accordance with NatureScot guidance (2019), the Ecobat tool (Box 1) was used to provide an objective interpretation of the relative importance of bat activity levels recorded within the Site.

⁷ <https://www.accuweather.com/en/gb/neath/sa11-1/weather-forecast/324992> (accessed September 2020)

⁸ <https://www.worldweatheronline.com/neath-weather/neath-port-talbot/gb.aspx> (accessed November 2022).

Box 1: Ecobat tool

Ecobat⁹ is a secure online tool initially designed by the University of Exeter and now hosted and developed by the Mammal Society (Lintott *et al.*, 2018).

The *Ecobat* tool compares baseline bat activity data collected for a site, with bat survey information collected from similar areas (i.e., the 'reference range') at the same time of year. It then provides a percentile rank for each species and a numerical representation of activity levels recorded at a site, relative to the surrounding landscape for each night of surveying.

Percentiles can then be assigned to activity categories (low, moderate, high) to provide a quantifiable and objective measure of bat activity (Table 7.3.3), rather than relying on professional judgment alone.

It should be noted that the online tool remains limited by the amount of data in the database on a locational basis; and therefore, the results should be regarded as indicative rather than conclusive evidence of the importance of a site for bats.

2.6.8 Relative levels of activity are determined by Ecobat by comparison to a reference data set, the 'reference range'. When uploading data into the Ecobat tool, the reference range was stratified to only include the following records from the reference data set:

- Only records +/- one month from the survey periods start and end dates; and
- Only records from within the region of survey location; Neath Port Talbot.

2.6.9 Records of each species included within the reference range for comparison included:

- Common pipistrelle – 296,636 records;
- Soprano pipistrelle – 53,073 records;
- Noctule – 17,070 records;
- Myotis species – 11,524 records;
- Leisler's bat – 6,071 records; and
- Brown long-eared – 519 records.

2.6.10 For each night where bat activity was recorded, the Ecobat tool reports the percentile and associated confidence limits of the night of data against the reference range. **Table 2.3** presents the percentile and associated bat activity category, replicated from NatureScot guidance (2019).

Table 2.3: Percentile Scope and Categorised Level of Bat Activity

Percentile	Bat Activity Category
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

⁹ <http://www.ecobat.org.uk/about-ecobat> (Accessed November 2022)

Risk Assessment

2.6.11 In accordance with NatureScot guidance (2019), a risk assessment has been carried out to identify the potential risk to bat populations. Wind farm developments can impact upon bat species as a result of:

- collision mortality and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality);
- loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);
- loss of, or damage to, roosts; and
- displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

2.6.12 To ensure that bat species are protected by minimising the risk of collision, NatureScot guidance (2019) advises that an assessment of impact for a proposed wind farm development, requires a detailed appraisal of:

- the level of activity of all bat species recorded at the Site assessed both spatially and temporally;
- the risk of turbine-related mortality for all bat species recorded at the Site during bat activity surveys; and
- the effect on the species' population status if predicted impacts are not mitigated.

Assessing Potential Risk

2.6.13 NatureScot guidance (2019) presents a two-stage process for assessing the potential risk to bats as a result of onshore wind turbine developments:

- Stage 1 - gives an indication of the potential risk level of a site, based on a consideration of habitat and development-related features; and
- Stage 2 – uses the output of Stage 1 (i.e., the potential risk level of a site) to provide an overall risk assessment based on the activity level of high collision risk species.

2.6.14 The assessment is intended to assist in the identification of those developments which are of greatest concern in terms of potential collision risks at the population level and inform the potential requirements for mitigation.

2.7 Survey Limitations

Field Surveys

2.7.1 NatureScot guidance (2019) requires a minimum of ten consecutive monitoring nights for each of the spring, summer and autumn activity periods. This results in a minimum of 30 survey nights throughout the survey period.

2.7.2 During the 2019 surveys all monitoring stations during spring failed to record for the minimum ten nights after unsuitable nights (nights of unsuitable weather that recorded no bats) were removed. Additionally, due to an unforeseen detector malfunction, bat activity data captured at MS3 during summer and MS1, MS2, MS3 and MS4 during autumn could not be retrieved. As a result, four of the monitoring stations (MS1, MS2, MS3 and MS4) failed to record for the minimum 30-night total when

the seasons for each monitoring station were combined. In order to compensate, monitoring stations during 2021 were deployed for extended periods. As a result the minimum ten night periods were exceeded at all monitoring stations, with each recording for over 100 nights.

- 2.7.3 NatureScot guidance (2019) requires that monitoring stations be placed at or close to turbine locations. Due to the presence of livestock within the fields of the proposed turbine locations, monitoring stations were attached to field boundary features (predominantly post and wire fencing) so as to reduce the possibility of livestock damage to the equipment (from trampling or nibbling).
- 2.7.4 The turbine locations changed between the 2019 survey period and 2021 survey period. As a result, some of the monitoring stations were located a considerable distance from the final proposed turbine locations. This is not considered to be a significant constraint limitation to the data as the number of turbines reduced and thus the number of monitoring locations exceeded the recommended requirements of NatureScot (2019) guidance. Further, monitoring stations covered a range of habitats which is considered representative of the Site and final proposed turbine locations.
- 2.7.5 Weather constraints including temperatures below 10°C, heavy rain and/ or winds exceeding 5 m/s were recorded at dusk on 16 nights during spring, one night during summer and 15 nights during autumn of the 2019 survey period and five nights during spring, ten nights during summer and ten nights during autumn of the 2021 survey period. However, bat activity was still recorded on 34 of these nights (16 in 2019, 18 in 2021) and so have been included within the analysis. Although it is recognised that poor weather can affect bat activity, excluding these data from the analysis skews the dataset and would remove some high collision risk species from the dataset. Subsequently inclusion of these nights represents a precautionary approach.
- 2.7.6 Weather data were collected from a weather station located within the bat survey area. However, due to tampering by livestock and unforeseen malfunction the weather station failed to record for the entirety of the 2019 survey period and throughout the autumn 2021 survey period. For missing periods the weather data was instead obtained from the AccuWeather¹⁰ website (2019 survey period) and the World Weather Online¹¹ website (2021 survey period), from the weather mast in Neath, Port Talbot approximately 7km south-west. As a result, the weather data may not be totally accurate for the bat survey area during these periods; however, considering that bats were recorded on the majority of nights (201 of 222), including during nights deemed as having unsuitable weather, this is not considered to represent a significant limitation to the data.

Sonograms Analysis

- 2.7.7 Analysing bat sonograms using Kaleidoscope can clearly identify certain species. However, some genus groups (such as *Myotis* and *Nyctalus*) can be difficult to determine the specific species due to their similar styles of calls. In addition, it can be difficult to determine species or even genus in some circumstances, due to partial calls being heard or due to distortion from, for example passing cars, rain or wind. In cases where it is not possible to identify a bat call to genus, it is labelled as an unknown bat. If the genus can be identified but not the species, the call is labelled by the genus group only.
- 2.7.8 The detectability of some bat species, such as brown long-eared and barbastelle, is lower than that of, for example, *Nyctalus* and *Pipistrellus*. The echolocation calls of brown long-eared and barbastelle are comparatively more difficult to detect with bat detectors, and their particular hunting strategies take them into less open habitats, where transect routes may not venture. Careful interpretation has been applied when comparing survey results across species.

¹⁰ <https://www.accuweather.com/en/gb/neath/sa11-1/weather-forecast/324992> (accessed September 2020)

¹¹ <https://www.worldweatheronline.com/neath-weather/neath-port-talbot/gb.aspx> (accessed November 2022).

Ecobat Tool

- 2.7.9 The Ecobat tool remains in its relative infancy, and naturally there is the possibility of having limited data in the reference range, reducing the confidence in the assigned category. The tool does, however, provide a guide for discussion along with Site-specific circumstances (e.g., habitats present, desk study information) and its use is advised in accordance with NatureScot guidance (2019).
- 2.7.10 The data within the reference range used to compare activity levels between the Proposed Development data and other records within the region of Neath Port Talbot is likely to have been obtained from surveys undertaken at proposed or operational wind farm sites. Thus, most of the records are likely to be from low value habitats (upland, exposed commercial forestry and farmland) compared to habitats of greater value (such as those detailed in Table 3a of NatureScot guidance (2019) and listed under 'High').
- 2.7.11 When data are entered into Ecobat for analysis, there is no allowance for entering recording nights where no bat passes were recorded, and so the analysis is carried out only on presence data. For example, the detector may have recorded 200 bat passes over a seven-day period; all of these passes were recorded on two nights but the Ecobat medians and means only consider those two nights in their analysis, not the full seven days. This can act to skew the results and elevate the risk levels of percentile ranks calculated.
- 2.7.12 Ecobat output is therefore regarded as an indicative assessment and to be considered alongside desk study information and professional judgement, rather than conclusive evidence of the importance of a site for bats.

3 RESULTS

3.1 Desk Study

Statutory Designated Sites for Nature Conservation

- 3.1.1 In review of the Natural Resources Wales website¹², the Proposed Development is not located within 10km of any national or internationally designated site for nature conservation, with bat qualifying interests.

Non-statutory Designated Sites for Nature Conservation

- 3.1.2 In review of records provided by SEWBReC the Proposed Development is located within 1km of three local Sites of Importance for Nature Conservation (SINC); however none of these sites have bats as a qualifying feature.

Existing Bat Records

- 3.1.3 The data provided by SEWBRC returned no bat records within 1km of the Proposed Development.
- 3.1.4 A review of post-construction monitoring reports of the adjacent Pen y Cymoedd wind farm (BSG Ecology, 2017; RPS Group, 2019; and MPS Ecology, 2021), confirms the presence of the following species within close proximity of the Proposed Development:

¹² <https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/find-protected-areas-of-land-and-sea/?lang=en> (accessed November 2022).
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- Greater horseshoe bat;
- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle;
- Myotis species;
- Noctule;
- Leisler's bat;
- Serotine;
- Plecotus species; and
- Barbastelle.

UK Bat Species Range

3.1.5 In review of the UK Habitats Directive Article 17 Report 'Habitats Directive Report 2019: Species Conservation Status Assessments 2019' based on Mathews *et al.* (2018), the Proposed Development is located within the known UK distribution range for:

- Lesser horseshoe bat;
- Greater horseshoe bat;
- Common pipistrelle;
- Soprano pipistrelle;
- Noctule;
- Daubenton's bat;
- Brandt's bat;
- Natterer's bat;
- Whiskered bat; and
- Brown long-eared bat.

3.1.6 The Proposed Development is not within the published usual range of Leisler's bat and Nathusius' pipistrelle; however both species were recorded during the bat activity surveys and during the post-construction surveys carried out at the adjacent Pen y Cymoedd wind farm, therefore it is considered that these species are present within the wider area.

Other Wind Developments

3.1.7 The Proposed Development is located within 5km of five wind farm developments; three of which are operational, as summarised in **Table 3.1**.

Table 3.1: Wind farm developments within 5km of the Site.

Wind Farm	Location	Description
Pen y Cymoedd	c. 0.4km north-east	76 turbines with a tip height of 145m. Operational.
Fynnon Oer	c. 1.3km north-east	16 turbines with an unspecified tip height. Operational.
Lynfi Afan	c. 5km south-east	9 turbines with a tip height of 118m. Operational.
Melin Court	c. 2.6km north-east	5 turbines with a tip height of 145m. Approved (May 2018).
Y Bryn Wind Farm	c. 2.6km south	Up to 26 turbines with an unspecified tip height. Pre-application.

3.2 Field Surveys

Habitat Appraisal

3.2.1 The habitats within the bat survey area are dominated by semi-improved acid and neutral grassland and marshy grassland managed as grazing pasture. The Mynydd Fforch-Dwm area of the survey area also comprised extensive scattered scrub, patches of coniferous, mixed and broad-leaved woodland,

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watercourses and stonewalls. The Mynydd Blaenafon area of the survey area also comprised areas of continuous bracken, some of which also comprised scattered scrub. Both areas are bordered by extensive coniferous plantation woodland.

- 3.2.2 In terms of interest for bats, the majority of the bat survey area comprises open grassland which provides limited suitable foraging and commuting opportunities. The patches of woodland, bracken and scrub areas, linear features of watercourses, and stonewalls, and bordering woodland edges offer more suitable foraging and commuting opportunities.
- 3.2.3 The linear features within and bordering the survey area also provide connectivity to other favourable habitats in the wider surrounding area.
- 3.2.4 Overall, the bat survey area (the Proposed Development) is considered to offer low value habitats for bats although habitats of increased value are present and offer localised foraging opportunities.

Preliminary Roost Inspection

- 3.2.5 No trees or structures were noted which were likely to have bat roost potential within 200m plus blade length of the proposed turbines.

Ground-level Activity Surveys

- 3.2.6 Bats were detected on 201 dates out of a possible 222 sampled dates (nights of unsuitable weather that recorded no bats removed) over the full survey period between April and October 2019 and April and October 2021.
- 3.2.7 Species identified are presented in **Table 3.2** along with potential collision risk and population vulnerability as described in Table 2 of NatureScot guidance (2019).

Table 3.2: Bat species recorded, collision risk and population vulnerability.

Species	Collision Risk	Population Vulnerability
Common pipistrelle	High	Low/Medium
Soprano pipistrelle	High	Low
Nathusius pipistrelle	High	High
Noctule	High	High
Leisler's bat	High	High
Brown long-eared	Low	Medium
Myotis species	Low	Medium/High

- 3.2.8 A total of 26,482 bat passes were recorded over a total of 1372 nights (all detectors combined, excluding nights of unsuitable weather that recorded no bats and including nights that no bats were recorded) as summarised in **Table 3.3**.

Table 3.3: Total number of bat passes.

Species	Passes (No.)	Percentage of total (%)
Common pipistrelle	21,987	83
Soprano pipistrelle	884	3.3
Nathusius' pipistrelle	68	0.3

Species	Passes (No.)	Percentage of total (%)
Noctule	1,114	4.2
Leisler's bat	15	0.1
Brown long-eared	29	0.1
Myotis species	2,385	9.0
Total	26,482	100

3.2.9 The full Ecobat tool output report is included as **Annex 3**.

3.2.10 **Table 3.4** presents the total numbers of nights bat activity fell under each band of high to low activity and **Table 3.5** presents the percentiles, confidence intervals (CI) and key metrics of the Ecobat output for each species.

Table 3.4: Number of nights recorded bat activity fell into each activity band per species.

Species/Species Group	High Activity	Moderate/ High Activity	Moderate Activity	Low/ Moderate Activity	Low Activity
Common pipistrelle	0	0	4	7	606
Soprano pipistrelle	0	0	0	0	240
Nathusius' pipistrelle	0	0	0	0	41
Noctule	0	0	0	3	315
Leisler's bat	0	0	0	0	8
Brown long-eared	0	0	0	6	17
Myotis species	0	1	14	48	425

Table 3.5: Percentiles and passes per night for each species.

Species/Species Group	Total Passes	Passes per Night		Median Percentile ¹³	95% Cis ¹⁴	Max Percentile ¹⁵	Nights Recorded
		Recorded ¹⁶	Included in Ecobat ¹⁷				
Common pipistrelle	21,987	16.03	27.52	0	5 – 16	47	617
Soprano pipistrelle	884	0.64	1.11	0	2 – 5	15	240
Nathusius' pipistrelle	68	0.05	0.09	5	6 – 15	15	41
Noctule	1,114	0.81	1.39	2	2 – 3	26	318
Leisler's bat	15	0.01	0.02	0	0 – 0	2	8

¹³ A numerical representation of average activity levels relative to the surrounding landscape (within the region of England South West & South Wales) for each night of surveying.

¹⁴ An indication of the confidence in the median percentile.

¹⁵ A numerical representation of maximum activity levels on any one night relative to the surrounding landscape (within the region of England South West & South Wales) for each night of surveying.

¹⁶ Total recorded nights for the survey period is 1372.

¹⁷ A total of 799 nights were included in Ecobats analysis. Nights when no bats are recorded are excluded.

Species/Species Group	Total Passes	Passes per Night		Median Percentile ¹³	95% Cis ¹⁴	Max Percentile ¹⁵	Nights Recorded
		Recorded ¹⁶	Included in Ecobat ¹⁷				
Brown long-eared	29	0.02	0.04	12	27 – 27	27	23
Myotis species	2385	1.74	2.98	5	9.5 – 16	63	488

3.2.11 The Ecobat output median and mean nightly pass rate (passes per hour, per night) of each species, at each detector for all months is presented in **Table 3.6**. The use of the median value is recognised to provide the more accurate representation of activity, as bat activity levels between nights can be highly variable, and thus the median provides a more reliable value than the mean or maximum (Lintott *et al.*, 2018). In addition, the dataset is unlikely to be normally distributed, therefore the median is the most appropriate metric to report.

3.2.12 Data for 'Includes Absences' and 'Excludes Absences' are included in **Table 3.6**. Includes absences takes into account nights when no bats were recorded and therefore lowers the overall medians and means (note this does not include any nights when no bats of any species were recorded as these are filtered out by Ecobat in the initial data upload to the Ecobat tool, see Limitations). Including absences are key to demonstrating the level of bat interest at a site as 'no bats' on a recording night where there were no technical issues or weather constraints is a valid result.

Table 3.6: Median and Mean bat pass rate per species, per detector.

Species	Detector ID	Total Bat Passes	Median Pass Rate (passes per hour/night)		Mean Pass Rate (passes per hour/night)	
			Incl. Absences	Excl. Absences	Incl. Absences	Excl. Absences
Common pipistrelle	Control	7,939	2.1	3.5	13.8	15
	MS1	1,035	0.3	0.6	1.3	1.9
	MS2	2,778	0.3	0.4	3.4	4.3
	MS3	2,973	0.7	0.9	2.8	3.4
	MS4	36	0.1	0.1	0.2	0.2
	MS5	855	0.7	0.9	1.2	1.4
	MS6	1,243	0.8	1.4	2.2	2.9
	MS7	1,032	0.3	0.9	1.9	2.9
	MS8	1,015	0.5	1.1	1.7	2.2
	MS9	3,081	0.5	1.4	3.6	4.8
Soprano pipistrelle	Control	129	0	0.2	0.2	0.5
	MS1	103	0	0.2	0.1	0.6
	MS2	215	0	0.2	0.3	1.1
	MS3	101	0	0.2	0.1	0.3
	MS4	0	0	0	0	0
	MS5	80	0	0.2	0.1	0.3
	MS6	73	0	0.2	0.1	0.3
	MS7	53	0	0.2	0.1	0.3
	MS8	36	0	0.2	0.1	0.2
	MS9	94	0	0.3	0.1	0.3
Nathusius' pipistrelle	Control	0	0	0	0	0
	MS1	4	0	0.1	0	0.1
	MS2	7	0	0.1	0	0.1
	MS3	5	0	0.1	0	0.1
	MS4	0	0	0	0	0

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Species	Detector ID	Total Bat Passes	Median Pass Rate (passes per hour/night)		Mean Pass Rate (passes per hour/night)	
			Incl. Absences	Excl. Absences	Incl. Absences	Excl. Absences
	MS5	22	0	0.4	0	0.4
	MS6	22	0	0.3	0	0.3
	MS7	2	0	0.1	0	0.1
	MS8	4	0	0.1	0	0.1
	MS9	2	0	0.1	0	0.1
Noctule	Control	98	0	0.2	0.2	0.3
	MS1	143	0	0.2	0.2	0.6
	MS2	112	0	0.2	0.1	0.3
	MS3	211	0	0.2	0.2	0.5
	MS4	9	0	0.1	0	0.2
	MS5	77	0	0.1	0.1	0.3
	MS6	39	0	0.1	0.1	0.2
	MS7	247	0.1	0.3	0.4	0.7
	MS8	46	0	0.1	0.1	0.2
	MS9	132	0	0.2	0.1	0.3
Leisler's bat	Control	0	0	0	0	0
	MS1	11	0	0.1	0	0.3
	MS2	1	0	0.1	0	0.1
	MS3	0	0	0	0	0
	MS4	0	0	0	0	0
	MS5	0	0	0	0	0
	MS6	0	0	0	0	0
	MS7	2	0	0.1	0	0.1
	MS8	1	0	0.1	0	0.1
	MS9	0	0	0	0	0
Brown long-eared	Control	0	0	0	0	0
	MS1	4	0	0.1	0	0.1
	MS2	2	0	0.1	0	0.1
	MS3	5	0	0.1	0	0.1
	MS4	2	0	0.1	0	0.1
	MS5	7	0	0.1	0	0.2
	MS6	1	0	0.1	0	0.1
	MS7	0	0	0	0	0
	MS8	5	0	0.1	0	0.1
	MS9	3	0	0.1	0	0.1
Myotis species	Control	214	0.1	0.4	0.4	0.6
	MS1	486	0.3	0.7	0.6	0.8
	MS2	156	0	0.2	0.2	0.4
	MS3	341	0.2	0.4	0.3	0.6
	MS4	18	0	0.2	0.1	0.3
	MS5	246	0.1	0.4	0.3	0.5
	MS6	126	0.1	0.2	0.2	0.3
	MS7	244	0.1	0.2	0.3	0.5
	MS8	65	0	0.1	0.1	0.2
	MS9	489	0.3	0.5	0.5	0.5

3.2.13 **Table 3.7** presents the relative bat activity levels (percentiles) per detector, per species. **Table 3.8** presents the percentage distribution of no. bats per detector.

Table 3.7: Percentiles for each species per detector location for the whole survey period.

Species / Genus	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	Control	1	5 – 16	45	56	Low	Moderate
	MS1	0	1 – 5	9	63	Low	Low
	MS2	0	1 – 24	47	53	Low	Moderate
	MS3	0	1 – 3	16	94	Low	Low
	MS4	0	0 – 0	0	17	Low	Low
	MS5	0	1 – 1.5	2	72	Low	Low
	MS6	0	1 – 2.5	6	55	Low	Low
	MS7	0	1 – 3.5	6	45	Low	Low
	MS8	0	1 – 2	4	59	Low	Low
	MS9	0	2 – 4	12	83	Low	Low
Soprano pipistrelle	Control	0	1 – 4	7	24	Low	Low
	MS1	0	2 – 5	5	20	Low	Low
	MS2	0	1 – 15	15	22	Low	Low to Moderate
	MS3	0	0 – 0	1	38	Low	Low
	MS5	0	0 – 0	3	30	Low	Low
	MS6	0	1 – 2	2	31	Low	Low
	MS7	0	0 – 0	1	22	Low	Low
	MS8	0	0 – 0	1	19	Low	Low
	MS9	0	1 – 1	2	34	Low	Low
Nathusius' pipistrelle	MS1	5	5 – 5	5	4	Low	Low
	MS2	5	5 – 5	5	7	Low	Low
	MS3	5	5 – 5	5	5	Low	Low
	MS5	10	6 – 15	15	7	Low	Low
	MS6	9	6 – 10	10	10	Low	Low
	MS7	5	5 – 5	5	2	Low	Low
	MS8	5	5 – 5	5	4	Low	Low
	MS9	5	5 – 5	5	2	Low	Low
Noctule	Control	2	2 – 3	8	31	Low	Low
	MS1	2	1.5 – 3.5	26	29	Low	Low to Moderate
	MS2	2	1.5 – 2.5	10	38	Low	Low
	MS3	2	1.5 – 3	15	46	Low	Low
	MS4	2	2 – 2	2	5	Low	Low
	MS5	1	1.5 – 2	8	33	Low	Low
	MS6	1	1 – 2.5	4	18	Low	Low
	MS7	2	1.5 – 3.5	20	44	Low	Low
	MS8	2	1.5 – 2	5	22	Low	Low
	MS9	2	1.5 – 2.5	6	52	Low	Low
Leisler's bat	MS1	0	0 – 0	2	4	Low	Low
	MS2	0	0	0	1	Low	Low
	MS7	0	0 – 0	0	2	Low	Low
	MS8	0	0	0	1	Low	Low

Species / Genus	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Brown long-eared	MS1	12	12 – 12	27	3	Low	Low to Moderate
	MS2	12	12 – 12	12	2	Low	Low
	MS3	12	12 – 12	12	5	Low	Low
	MS4	27	0	27	1	Low to Moderate	Low to Moderate
	MS5	12	12 – 19.5	27	5	Low	Low to Moderate
	MS6	12	0	12	1	Low	Low
	MS8	27	27 – 27	27	3	Low to Moderate	Low to Moderate
	MS9	12	12 – 12	12	3	Low	Low
Myotis species	Control	8	6.5 – 12.5	52	37	Low	Moderate
	MS1	12	9.5 – 16	63	62	Low	Moderate to High
	MS2	4	2.5 – 6.5	40	45	Low	Low to Moderate
	MS3	8	6.5 – 10.5	33	74	Low	Low to Moderate
	MS4	5	1 – 8.5	12	7	Low	Low
	MS5	8	6 – 9.5	36	53	Low	Low to Moderate
	MS6	4	3 – 7.5	19	42	Low	Low
	MS7	5	4.5 – 9	54	44	Low	Moderate
	MS8	1	1 – 3	11	36	Low	Low
	MS9	8	7.5 – 12	44	88	Low	Moderate

Table 3.8: Bat activity survey results per monitoring station (MS)¹⁸

Detector ID	No. Nights Sampled	No. of nights Bats were Recorded	Percentage of Nights Bats were Recorded	Total No. Bats recorded	Percentage Distribution of No. Bats
Control	75	61	81.3%	8,380	31.64%
MS1	137	89	65.0%	1,786	6.74%
MS2	152	94	61.8%	3,271	12.35%
MS3	157	117	74.5%	3,636	13.73%
MS4	124	21	16.9%	65	0.25%
MS5	182	90	49.5%	1,287	4.86%
MS6	184	71	38.6%	1,504	5.68%
MS7	101	70	69.3%	1,580	5.97%
MS8	120	74	61.7%	1,172	4.43%
MS9	140	112	80.0%	3,801	14.35%

¹⁸ The number of nights sampled is the number of nights each detector was operational for, taking account of detector failures.

3.2.14 A summary of results per season is provided in **Table 3.9**.

3.2.15 Activity levels were calculated by Ecobat per species (or species group) per month to allow for temporal variations in bat activity. Median and maximum percentiles and corresponding activity levels are presented.

Table 3.9: Percentiles for each species per month for the whole monitoring period.

Species / Genus	Month	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	Apr	0	5 – 16	1	14	Low	Low
	May	0	5 – 16	4	47	Low	Low
	Jun	0	2 – 4	12	146	Low	Low
	Jul	0	5 – 16	29	96	Low	Low to Moderate
	Aug	0	5 – 16	47	215	Low	Moderate
	Sep	0	5 – 16	25	38	Low	Low to Moderate
	Oct	0	5 – 16	1	61	Low	Low
Soprano pipistrelle	Apr	0	1 – 2	0	2	Low	Low
	May	0	1 – 15	1	9	Low	Low
	Jun	0	2 – 5	1	46	Low	Low
	Jul	0	2 – 5	2	37	Low	Low
	Aug	0	2 – 5	15	119	Low	Low
	Sep	0	1 – 4	2	14	Low	Low
	Oct	0	1 – 4	0	13	Low	Low
Nathusius' pipistrelle	Jun	5	6 – 15	15	27	Low	Low
	Jul	5	6 – 15	5	10	Low	Low
	Aug	5	6 – 10	5	4	Low	Low
Noctule	Apr	2	1.5 – 3.5	6	9	Low	Low
	May	1	2 – 2	19	34	Low	Low
	Jun	2	1.5 – 3.5	26	54	Low	Low to Moderate
	Jul	1	2 – 3	10	38	Low	Low
	Aug	2	2 – 3	15	136	Low	Low
	Sep	2	2 – 3	3	16	Low	Low
	Oct	1	2 – 3	2	31	Low	Low
Leisler's bat	May	1	0 – 0	2	2	Low	Low
	Jun	0	0	0	1	Low	Low
	Aug	0	0 – 0	0	4	Low	Low
	Oct	0	0 – 0	0	1	Low	Low
Brown long-eared	Jun	12	12 – 19.5	12	1	Low	Low
	Jul	20	12 – 19.5	27	4	Low	Low to Moderate
	Aug	12	12 – 19.5	27	9	Low	Low to Moderate
	Oct	12	27 – 27	27	9	Low	Low to Moderate
Myotis species	Apr	1	7.5 – 12	4	9	Low	Low
	May	1	9.5 – 16	11	28	Low	Low
	Jun	5	9.5 – 16	63	69	Low	Moderate to High
	Jul	8	9.5 – 16	52	93	Low	Moderate

Mynydd Fforch-dwn Wind Farm

Species / Genus	Month	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
	Aug	8	9.5 – 16	52	186	Low	Moderate
	Sep	10	6.5 – 12.5	19	20	Low	Low
	Oct	4	9.5 – 16	54	83	Low	Moderate

3.2.16 Ecobat analysis showed that activity was recorded within the species-specific emergence time for all ten monitoring locations. This is detailed in **Table 3.10**.

3.2.17 Based on the Ecobat analysis, it is possible that roosts for common pipistrelle, soprano pipistrelle, noctule, Leisler's bat and Myotis species may be present within close proximity to the Proposed Development.

Table 3.10: Bat activity recorded within the species-specific emergence time

Detector ID	Species / Genus	Passes Recorded
Control	Common pipistrelle	53
	Myotis species	2
MS1	Common pipistrelle	2
	Noctule	14
	Leisler's bat	3
	Myotis species	7
MS2	Common pipistrelle	5
	Noctule	2
	Myotis species	3
MS3	Common pipistrelle	33
	Noctule	6
	Myotis	6
MS4	Common pipistrelle	4
	Noctule	3
MS5	Common pipistrelle	16
	Soprano pipistrelle	1
	Noctule	9
	Myotis species	4
MS6	Common pipistrelle	2
	Noctule	5
	Myotis species	4
MS7	Common pipistrelle	5
	Soprano pipistrelle	2
	Noctule	8
	Myotis species	2
MS8	Common pipistrelle	5
	Noctule	2
	Myotis species	4
MS9	Common pipistrelle	6

Mynydd Fforch-dwn Wind Farm

Detector ID	Species / Genus	Passes Recorded
	Noctule	13
	Myotis species	25

4 DISCUSSION AND CONCLUSIONS

4.1 Desk Study

- 4.1.1 No statutory or non- statutory designated sites were identified within 10km of the Proposed Development with bats as a qualifying interest.

4.2 Field Surveys

Habitat Assessment

- 4.2.1 The habitats within the Proposed Development are considered to be of low habitat risk for bats, in accordance with criteria presented in the BCT guidelines (Collins, 2016).

Roosts

- 4.2.2 No structures or trees with the potential to support maternity or hibernation roosts were identified within at least 200m plus the rotor radius distance (75m) of proposed turbine locations.
- 4.2.3 The Ecobat tool identified the possible presence of roosts of common pipistrelle, soprano pipistrelle, noctule, Leisler's bat and Myotis species within proximity of the survey area based on recording of activity within the survey area within their species-specific emergence times.
- 4.2.4 Activity within the species-specific emergence times peaked at the Control with 55 passes, followed by MS3 and MS9 with 45 and 44 passes respectively.

4.3 Ground-level Static Surveys

- 4.3.1 Surveys identified the following species:

- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle;
- Noctule;
- Myotis species;
- Leisler's bat; and
- Brown long-eared bat.

- 4.3.2 Common pipistrelle was the most frequently recorded species representing 83% of all recordings. Activity overall was considered to be moderate, with the species being recorded on 617 nights out of 1372 nights (all detectors combined and including nights that no bats were recorded) and representing 16.03 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles) common pipistrelle activity was concluded to be low at the 0th median percentile and moderate at the 47th max percentile.
- 4.3.3 Myotis species represented 9% of all recordings. Activity overall was considered to be low, with the species being recorded on 488 nights out of 1372 nights and representing 1.74 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles) Myotis species activity was concluded to be low at the 5th median percentile and moderate to high at the 63rd max percentile.
- 4.3.4 Noctule represented 4.2% of all recordings. Activity overall was considered to be low, with the species being recorded on 318 nights out of 1327 nights and representing 0.81 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles), noctule activity was concluded to be low at the 2nd median percentile and low to moderate at the 26th max percentile.
- 4.3.5 Soprano pipistrelle represented 3.3% of all recordings. Activity overall was considered to be low, with the species being recorded on 240 nights out of 1327 nights and representing 0.64 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles) soprano pipistrelle activity was concluded to be low at the 0th median percentile and low at the 15th max percentile.
- 4.3.6 Nathusius' pipistrelle represented 0.3% of all recordings. Activity overall was considered to be very low, with the species being recorded on 41 nights out of 1327 nights and representing 0.05 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles), Nathusius' pipistrelle activity was concluded to be low at the 5th median percentile and low at the 15th max percentile.
- 4.3.7 Brown long-eared represent 0.1% of all recordings. Activity was considered to be very low, with the species being recorded on 23 nights out of 1327 nights and representing 0.02 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles), brown long-eared bat activity was concluded to be low at the 12th median percentile and low to moderate at 27th max percentile.
- 4.3.8 Leisler's bat represented 0.1% of all recordings. Activity overall was considered to be very low, with the species being recorded on 8 nights out of 1327 nights and representing 0.01 passes per night for the survey period. When compared with activity at other sites (Ecobat reference range and percentiles), Leisler's bat activity was concluded to be low at the 0th median percentile and low at the 2nd max percentile.

Spatial Distribution of Bat Activity

- 4.3.9 Common pipistrelle activity was recorded at all the detectors. Highest activity was at Control and MS2, with moderate activity. The remaining detectors recorded low activity. The median pass rate (passes per hour, per night) for common pipistrelle peaked at 3.5 for the Control with MS6, MS9 and MS8 peaking at 1.4, 1.4 and 1.1 respectively. All remaining detectors had activity levels <1 passes.
- 4.3.10 Myotis species activity was recorded at all the detectors. Highest activity was at MS1, with moderate to high activity, followed by Control, MS2, MS7 and MS9 with moderate activity. The remaining detectors recorded low to moderate or low activity. The median pass rate for Myotis species was <1 at all detectors, peaking at 0.7 at MS1.

- 4.3.11 Noctule activity was recorded at all the detectors. Highest activity was at MS1 and MS7, with low to moderate activity. The remaining detectors recorded low activity levels. The median pass rate for noctule was <1 at all detectors, peaking at 0.3 at MS7.
- 4.3.12 Soprano pipistrelle activity was recorded at nine of the detectors, with no activity recorded at MS4. Low activity was recorded at all detectors. The median pass rate for *Myotis* species was <1 at all detectors, peaking at 0.7 at MS1.
- 4.3.13 Nathusius' pipistrelle activity was recorded at eight of the detectors, with no activity recorded at Control and MS4. Low activity was recorded at all detectors. The median pass rate for Nathusius' pipistrelle was <1 at all detectors, peaking at 0.4 at MS5.
- 4.3.14 Brown long-eared bat activity was recorded at eight of the detectors, with no activity at Control and MS7. Highest activity was at MS1, MS4 and MS8, with low to moderate activity. The remaining detectors recorded low activity levels. The median pass rate for brown long-eared bat was <1 at all detectors, peaking at 0.1.
- 4.3.15 Leisler's bat activity was recorded at four of the detectors, with no activity at Control, MS3, MS4, MS5, MS6 and MS9. Low activity was recorded at all detectors. The median pass rate for Leisler's bat was <1 at all detectors, peaking at 0.1.
- 4.3.16 Overall, the Control recorded the most bat passes, with 31.64% of the total. This was to be expected as the Control was stationed in a location of higher bat suitability to have as a comparison to the monitoring stations positioned at/close to the turbine locations. The Control was placed at the edge of coniferous woodland within semi-improved acid grassland, adjacent to a wet ditch. The high number of bat passes is due to the linear features of woodland edge and ditch likely provided improved foraging and commuting resources.
- 4.3.17 With the exception of MS4 all monitoring stations recorded in excess of 1000 bat passes. The activity was concentrated at MS2, MS3 and MS9; each recording over 3000 bat passes. MS2 and MS3 were located along post and wire fencing that connected to the linear route where the Control was positioned, suggesting that activity was higher here due to bats using the connected post and wire fencing as additional foraging and commuting routes as they travel along the higher suitable route where the Control was positioned. MS9 was also located along post and wire fencing on the boundary of marshy grassland and semi-improved acid grassland, within proximity to bracken and scrub and the bordering coniferous plantation woodland, suggesting that bats travel along the post and wire fence to access the bracken and scrub habitat, which is of higher foraging suitability, and to connect with the extensive linear feature of the coniferous plantation woodland that borders the survey area.

Temporal Distribution of Bat Activity

- 4.3.18 Common pipistrelle was recorded every month in both 2019 and 2021. Overall activity was low or low to moderate throughout, with the exception of August which had nights of moderate activity.
- 4.3.19 *Myotis* species activity was recorded every month in both 2019 and 2021. Overall activity was low or low to moderate throughout, with the exception of August and October which had nights of moderate activity.
- 4.3.20 Noctule was recorded every month in both 2019 and 2021, with the exception of September in 2019. Overall activity was low throughout, with the exception of June which had nights of low to moderate activity.
- 4.3.21 Soprano pipistrelle was recorded every month in both 2019 and 2021. Overall activity was low throughout.

- 4.3.22 Nathusius' pipistrelle was only recorded in June, July and August 2021. Overall activity was low throughout.
- 4.3.23 Brown long-eared bat was only recorded in June, July and August 2021. Overall activity was low or low to moderate throughout.
- 4.3.24 Leisler's bat was only recorded in May, July and August 2021. Overall activity was low throughout.
- 4.3.25 Overall, activity was low for all species with peaks of higher activity for some species occurring in the summer and autumn months with low activity consistently recorded in spring.

Bat Activity Relative to Other Sites

- 4.3.26 On nights where bats were recorded, the level of activity for all species most frequently represented low activity when compared against records from a similar date in a similar geographical location in Ecobat.

5 ASSESSMENT OF THE POTENTIAL RISKS TO BATS

5.1 Stage 1 – Initial Site Risk Assessment

- 5.1.1 In accordance with NatureScot guidance (2019) an assessment of the potential risk level of the Proposed Development, has been undertaken based on a consideration of habitat and development-related features detailed in Table 3a of NatureScot guidance (2019).
- 5.1.2 The values and classification criteria provided within Table 3a of NatureScot guidance (2019) are intended to be taken as a guide, with habitat and development-related features at proposed wind farm sites rarely matching rigid descriptions. Professional judgement has therefore been applied to interpret and assign risk categories and conclude on the overall risk level for the Site.
- 5.1.3 The Proposed Development has been assessed as having an overall 'Site Risk' of **2**, represent a **Low Site Risk**:
- The Site 'Habitat Risk' is classified as **Low** (see Section 3.2).
 - The Site 'Project Size' is classified as being **Medium**, comprising a development of 6 turbines of up to 200m tip height, with three other operational wind farm developments (Pen y Cymoedd (x76 turbines), Fynnon Oer (x16 turbines) and Lynfi Afan (x9 turbines), one approved wind farm development (Melin Court (x5 turbines) and one pre-application wind farm development (Y Bryn Wind Farm (up to x26 turbines) located within 5km of the Site (distances measures between the nearest turbines).

5.2 Stage 2 – Overall Risk Assessment

- 5.2.1 In accordance with NatureScot guidance (2019), Stage 2 should be carried out separately for all high collision risk species recorded, which includes the following species recorded during bat activity surveys for the Proposed Development:
- Soprano pipistrelle;
 - Common pipistrelle;
 - Natusius' pipistrelle;
 - Noctule; and,
 - Leisler's bat.

- 5.2.2 In order to derive an 'Overall Risk Assessment' the determined Bat Activity Category derived from the Ecobat Tool Output Report is compared against the Site Risk Level (Stage 1) using the matrix presented in Table 3b in NatureScot (2019) to determine the level of overall risk.
- 5.2.3 The calculated 'Overall Risk Assessment' per species, both temporally and spatially is presented in **Table 5.1** and **Table 5.2**.
- 5.2.4 In summary, the Overall Risk Assessment is considered to fall under:
- “Low Site Risk” when using the median percentile and “Low/Medium Site Risk” when using the max percentile for common pipistrelle, noctule and Leisler’s bat; and,
 - “Low Site Risk” when using the median and max percentiles for soprano pipistrelle and Nathusius pipistrelle.

Table 5.1: Overall Risk Assessment per MS location for both the Median and Max Percentiles (Table 3b from NatureScot(2019) guidance). Key: green = Low, Amber = Medium, Red = High

Species / Genus	MS	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species / Genus	MS	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	Control	1	Low	2		Common pipistrelle	Control	1	Low	2
	MS1	0	Low	2			MS1	4	Low	2
	MS2	0	Low	2			MS2	12	Low	2
	MS3	0	Low	2			MS3	29	Low to Moderate	4
	MS4	0	Low	2			MS4	47	Moderate	6
	MS5	0	Low	2			MS5	25	Low to Moderate	4
	MS6	0	Low	2			MS6	1	Low	2
	MS7	0	Low	2			MS7	0	Low	2
	MS8	0	Low	2			MS8	1	Low	2
	MS9	0	Low	2			MS9	1	Low	2
Soprano pipistrelle	Control	0	Low	2		Soprano pipistrelle	Control	2	Low	2
	MS1	0	Low	2			MS1	15	Low	2
	MS2	0	Low	2			MS2	2	Low	2
	MS3	0	Low	2			MS3	0	Low	2
	MS5	0	Low	2			MS5	15	Low	2
	MS6	0	Low	2			MS6	5	Low	2
	MS7	0	Low	2			MS7	5	Low	2
	MS8	0	Low	2			MS8	6	Low	2
	MS9	0	Low	2			MS9	19	Low	2
Nathusius' pipistrelle	MS1	5	Low	2		Nathusius' pipistrelle	MS1	26	Low to Moderate	4
	MS2	5	Low	2			MS2	10	Low	2
	MS3	5	Low	2			MS3	15	Low	2
	MS5	10	Low	2			MS5	3	Low	2
	MS6	9	Low	2			MS6	2	Low	2
	MS7	5	Low	2			MS7	2	Low	2
	MS8	5	Low	2			MS8	0	Low	2
	MS9	5	Low	2			MS9	0	Low	2
Noctule	Control	2	Low	2		Noctule	Control	0	Low	2

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	MS1	2	Low	2			MS1	1	Low	2
	MS2	2	Low	2			MS2	4	Low to Moderate	4
	MS3	2	Low	2			MS3	12	Low to Moderate	4
	MS4	2	Low	2			MS4	29	Low to Moderate	4
	MS5	1	Low	2			MS5	47	Low	2
	MS6	1	Low	2			MS6	25	Low	2
	MS7	2	Low	2			MS7	1	Moderate to High	8
	MS8	2	Low	2			MS8	0	Moderate	6
	MS9	2	Low	2			MS9	1	Moderate	6
Leisler's bat	MS1	0	Low	2		Leisler's bat	MS1	1	Low	2
	MS2	0	Low	2			MS2	2	Moderate	6
	MS7	0	Low	2			MS7	15	Low	2
	MS8	0	Low	2			MS8	2	Low	2

Table 5.2: Overall Risk Assessment per month for both the Median and max Percentiles (Table 3b from NatureScot (2019) guidance). Key: green = Low, Amber = Medium, Red = High

Species / Genus	Month	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species / Genus	Month	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	Apr	0	Low	2		Common pipistrelle	Apr	1	Low	2
	May	0	Low	2			May	4	Low	2
	Jun	0	Low	2			Jun	12	Low	2
	Jul	0	Low	2			Jul	29	Low to Moderate	4
	Aug	0	Low	2			Aug	47	Moderate	6
	Sep	0	Low	2			Sep	25	Low to Moderate	8
	Oct	0	Low	2			Oct	1	Low	2
Soprano pipistrelle	Apr	0	Low	2		Soprano pipistrelle	Apr	0	Low	2
	May	0	Low	2			May	1	Low	2
	Jun	0	Low	2			Jun	1	Low	2
	Jul	0	Low	2			Jul	2	Low	2
	Aug	0	Low	2			Aug	15	Low	2
	Sep	0	Low	2			Sep	2	Low	2
	Oct	0	Low	2			Oct	0	Low	2
Nathusius' pipistrelle	Jun	5	Low	2		Nathusius' pipistrelle	Jun	15	Low	2
	Jul	5	Low	2			Jul	5	Low	2
	Aug	5	Low	2			Aug	5	Low	2
Noctule	Apr	2	Low	2		Noctule	Apr	6	Low	2
	May	1	Low	2			May	19	Low	2
	Jun	2	Low	2			Jun	26	Low to Moderate	4
	Jul	1	Low	2			Jul	10	Low	2
	Aug	2	Low	2			Aug	15	Low	2
	Sep	2	Low	2			Sep	3	Low	2
	Oct	1	Low	2			Oct	2	Low	2
Leisler's bat	May	1	Low	2		Leisler's bat	May	2	Low	2
	Jun	0	Low	2			Jun	0	Low	2
	Aug	0	Low	2			Aug	0	Low	2
	Oct	0	Low	2			Oct	0	Low	2

Mynydd Fforch-dwn Wind Farm

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ANNEX 1: SCIENTIFIC NAMES

Table A1.1 provides common and scientific names of bat species included in this Technical Appendix.

Common Name	Scientific Name
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>
Common pipistrelle	<i>Pipistrellus pipistrellus</i>
Myotis species	<i>Myotis</i> spp.
Whiskered bat	<i>Myotis mystacinus</i>
Natterer's bat	<i>Myotis nattereri</i>
Daubenton's bat	<i>Myotis daubentonii</i>
Brandt's bat	<i>Myotis brandtii</i>
Nyctalus species	<i>Nyctalus</i> spp.
Noctule	<i>Nyctalus noctula</i>
Leisler's bat	<i>Nyctalus leisleri</i>
Serotine	<i>Eptesicus serotinus</i>
Brown long-eared	<i>Plecotus auritus</i>
Plecotus species	<i>Plecotus</i> spp.
Barbastelle	<i>Barbastella barbastellus</i>

ANNEX 2: SURVEY WEATHER CONDITIONS

Table A2.1 below provides weather conditions for Bat Activity Survey periods. Those values in red font represent less suitable weather conditions for bats (above average for the category).

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
25/04/2019	7	0.6	-
26/04/2019	6	0.5	-
27/04/2019	7	0.4	-
28/04/2019	7	0	-
29/04/2019	9	0.4	-
30/04/2019	4	0	-
01/05/2019	8	0	-
02/05/2019	6	0	-
03/05/2019	5	0	-
04/05/2019	4	0	-
05/05/2019	3	0	-
06/05/2019	2	0	-
07/05/2019	5	0.1	-
08/05/2019	8	0	-
09/05/2019	6	0	-
10/05/2019	7	0	-
30/07/2019	13.5	0	0
31/07/2019	15	0	1.9
01/08/2019	16.1	0	0
02/08/2019	15.6	0	0
03/08/2019	16.6	0.5	0
04/08/2019	13.6	0	0
05/08/2019	14.3	0.03	0.1
06/08/2019	12.3	0.3	0
07/08/2019	12.5	1.2	0.1
08/08/2019	12.7	1.1	0
09/08/2019	15.6	1.6	0.9
10/08/2019	13.6	0.8	0.4
11/08/2019	10.8	1.7	1.8
12/08/2019	10.4	0.1	0.1
13/08/2019	9.3	0.8	0
14/08/2019	14.3	1.6	0.2
15/08/2019	12.2	1.2	0

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
16/08/2019	14.8	1.3	0
17/08/2019	11	0.28	0.2
18/08/2019	11.4	1.09	0
19/08/2019	10.5	1.12	0
20/08/2019	11.7	0.15	0
21/08/2019	13.1	0	1.4
22/08/2019	14.8	0	0.1
23/08/2019	15	0.03	0
24/08/2019	15	0	0
25/08/2019	13	0	0
26/08/2019	17	0	0
27/08/2019	16	0	0
28/08/2019	16	0.51	0
29/08/2019	11	0	0
30/08/2019	16	0	0
31/08/2019	13	0.2	0
01/09/2019	11	0	-
02/09/2019	10	0.05	-
03/09/2019	14	0.66	-
04/09/2019	12	0.43	-
05/09/2019	10	0	-
06/09/2019	12	0.41	-
07/09/2019	10	0	-
08/09/2019	8	0	-
09/09/2019	12	1.37	-
10/09/2019	12	0.03	-
11/09/2019	14	0.43	-
12/09/2019	15	0.36	-
13/09/2019	10	0	-
14/09/2019	9	0	-
15/09/2019	12	0	-
16/09/2019	14	0.03	-
17/09/2019	11	0	-
18/09/2019	9	0	-
19/09/2019	8	0	-
20/09/2019	11	0	-
21/09/2019	12	0	-

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
22/09/2019	14	0.61	-
23/09/2019	14	0.69	-
24/09/2019	15	2.13	-
25/09/2019	15	1.04	-
26/09/2019	14	0.89	-
27/09/2019	14	0.76	-
28/09/2019	14	2.84	-
29/09/2019	11	0.51	-
30/09/2019	9	1.12	-
01/10/2019	11.8	0.69	8.4
02/10/2019	8.8	0	0.7
03/10/2019	11.1	0.51	2.5
04/10/2019	12.1	0.74	0
05/10/2019	12	1.07	0.7
06/10/2019	9.1	0	4.4
07/10/2019	12.4	0.28	7.1
08/10/2019	8.9	0.61	9
09/10/2019	8.4	2.36	7.4
10/10/2019	12.9	0.76	11.2
11/10/2019	10	0.99	5.9
12/10/2019	9.8	0.3	0.5
13/10/2019	8.3	0.86	1.8
26/04/2021	12	0	0.0
27/04/2021	13	7.7	0.0
28/04/2021	13	0	0.0
29/04/2021	14	0	0.0
30/04/2021	13	0	0.0
01/05/2021	13	0	0.0
02/05/2021	11	2.8	0.0
03/05/2021	20	1.4	0.0
04/05/2021	16	0	0.0
05/05/2021	15	0.8	0.0
06/05/2021	17	0	0.0
07/05/2021	19	0	0.0
08/05/2021	17	0	0.4
09/05/2021	15	0	0.0
10/05/2021	15	2.1	0.0

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
11/05/2021	13	13.4	1.5
12/05/2021	11	16.9	0.0
13/05/2021	13	19	0.0
14/05/2021	14	5.7	0.0
15/05/2021	14	0	0.0
16/05/2021	13	0	0.0
17/05/2021	13	0	0.0
18/05/2021	12	7	0.1
19/05/2021	13	4.3	0.0
20/05/2021	15	0	0.1
21/05/2021	15	0	0.0
22/05/2021	18	0	0.0
23/05/2021	18	0	0.0
24/05/2021	19	0	0.0
25/05/2021	18	0	0.0
26/05/2021	19	0	0.0
27/05/2021	18	0	0.0
28/05/2021	18	0	0.0
29/05/2021	19	0	0.0
30/05/2021	18	0	0.8
31/05/2021	16	0	0.0
01/06/2021	14	0	0.0
02/06/2021	16	0	0.0
03/06/2021	14	2.8	0.0
04/06/2021	12	12.7	0.0
05/06/2021	13	0	0.1
06/06/2021	13	37.4	0.0
07/06/2021	13	0	0.0
08/06/2021	10	0	0.0
09/06/2021	12	6.3	0.0
10/06/2021	12	0	0.0
11/06/2021	12	0	0.0
12/06/2021	14	11.3	0.0
13/06/2021	12	0	0.0
14/06/2021	13	0	0.0
15/06/2021	13	0	0.0
16/06/2021	13	0	0.0

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
17/06/2021	12	0	0.0
18/06/2021	12	0	0.0
19/06/2021	14	0	0.0
20/06/2021	14	0	0.0
21/06/2021	15	0	0.0
22/06/2021	14	0	0.0
23/06/2021	12	0	0.0
24/06/2021	14	0	0.0
25/06/2021	12	0	0.1
26/06/2021	14	0	0.0
27/06/2021	15	0	0.0
28/06/2021	14	0	0.0
29/06/2021	10	0	0.0
30/06/2021	12	0	0.0
01/07/2021	13	0	0.0
02/07/2021	12	0	0.0
03/07/2021	14	0	0.0
04/07/2021	11	0	0.0
05/07/2021	9	0	0.0
06/07/2021	11	0	0.0
07/07/2021	13	0	0.1
08/07/2021	13	0	0.0
09/07/2021	13	0	0.1
10/07/2021	13	0	0.0
11/07/2021	10	0	0.0
12/07/2021	13	0	0.0
13/07/2021	18	0	0.0
14/07/2021	15	0	0.0
15/07/2021	20	0	0.1
16/07/2021	17	0	0.0
17/07/2021	16	0	0.0
18/07/2021	15	0	0.0
19/07/2021	13	0	0.0
20/07/2021	13	0	0.0
21/07/2021	14	0	0.0
22/07/2021	13	0	0.0
23/07/2021	15	0	0.0

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
24/07/2021	10	0.7	0.0
25/07/2021	14	0	0.0
26/07/2021	14	2.1	0.0
27/07/2021	8	0	0.0
28/07/2021	10	0	0.0
29/07/2021	10	0	0.0
30/07/2021	12	0	0.1
31/07/2021	12	2.2	0.0
01/08/2021	15	0	0.0
02/08/2021	16	0.7	0.0
03/08/2021	14	1.4	0.0
04/08/2021	9	16.2	0.0
05/08/2021	6	24.7	0.0
06/08/2021	10	0	0.0
07/08/2021	12	12.7	0.0
08/08/2021	7	9.1	0.0
09/08/2021	10	5	0.0
10/08/2021	10	0.7	0.0
11/08/2021	10	0.7	0.0
12/08/2021	10	0	0.0
13/08/2021	12	0	0.0
14/08/2021	14	0	0.0
15/08/2021	13	0	0.0
16/08/2021	12	0	0.0
17/08/2021	7	0	0.0
18/08/2021	5	0	0.0
19/08/2021	10	0	0.0
20/08/2021	12	0	0.0
21/08/2021	15	0	0.0
22/08/2021	13	0	0.0
23/08/2021	15	0	0.0
24/08/2021	16	0	0.0
25/08/2021	15	0	0.0
26/08/2021	18	1.4	3.3
27/08/2021	12	0	3.1
28/08/2021	15	0	2.8
29/08/2021	16	0	3.9

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
30/08/2021	14	0	3.6
31/08/2021	16	0	3.9
01/09/2021	18	0	5.8
02/09/2021	18	0	3.6
05/10/2021	12	0	9.2
06/10/2021	12	0	2.2
07/10/2021	13	0	1.1
08/10/2021	15	0	1.7
09/10/2021	15	0.1	1.1
10/10/2021	12	0.1	3.6
11/10/2021	11	0	3.1
12/10/2021	11	0	3.3
13/10/2021	14	0	1.7
14/10/2021	12	0	3.3
15/10/2021	13	0.9	1.7
16/10/2021	12	0.1	2.2
17/10/2021	14	0	3.1
18/10/2021	15	5.1	3.3
19/10/2021	16	2.1	6.1
20/10/2021	11	3	4.7
21/10/2021	7	0	3.6
22/10/2021	10	0	3.3
23/10/2021	12	0.2	8.3
24/10/2021	12	1	3.6
25/10/2021	11	0	3.9
26/10/2021	14	0	6.1
27/10/2021	15	0	7.8
28/10/2021	15	1.2	7.5

ANNEX 3: ECOBAT REPORT