Technical Appendix 7.3: Bats

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Introduction

Background

This Technical Appendix has been prepared to accompany **Chapter 7: Ecology** of the Appin Wind Farm (hereafter referred to as 'the Proposed Development') Environmental Impact Assessment (EIA) Report.

It presents detailed methodologies, and results of desk studies and field surveys completed to establish baseline conditions with regards bats, in order to inform the design and assessment of the Proposed Development.

The objectives of the baseline studies were to:

- Assess the habitats within the Site to identify:

  – features that have potential to support maternity roosts and significant hibernation roosts; and

  – the location and extent of commuting and foraging habitat which may be used by bats.

- Identify the bat species assemblage using the Site, and the temporal and spatial variations in use.

- Assess the relative level of activity of bats within the Site.

This Technical Appendix also provides a Risk Assessment for bats in accordance with NatureScot guidance (2021) in **Section 4**.

It should be read with reference to the following figures presented in **Volume 2** of the EIA Report:

- **Figure 7.1**: Ecological Statutory Designated Sites;

- **Figure 7.8**: Bat Activity Survey Plan; and

- **Figure 7.9**: Potential Roost Features Plan.

Common names of bat species are used throughout this Technical Appendix, with scientific names presented in **Annex 1**.

The confidential figure **Confidential Figure 7.11**: Bat Desk Study Records (Sensitive) is provided in **Volume 5** of the EIA Report.

Such information will not be made publicly available but will be provided to the Energy Consents Unit, Dumfries and Galloway Council and NatureScot.

Methodology

Desk Study

The desk study was undertaken to identify the proximity of the Site to any statutory or non-statutory designated sites for nature conservation with bats as a qualifying feature, and to obtain any records of bats relative to the Site and the surrounding wider area.

Key desk study sources, search areas and information obtained are summarised in **Table 1**.

Table 1 - Desk study key sources and information sought

Key Source	Information Sought	Search Area
NatureScot Sitelink https://sitelink.nature.scot/home *February 2025*	Proximity to statutory designated sites, with bats as interests.	Within 10 km of the Site boundary (see **Figure 7.1**).
South West Scotland Environmental Information Centre (SWSEIC) *September 2021 and update in March 2025*	Non-statutory designated sites for nature conservation with qualifying bat interests, and existing notable bat species records.	Within 2 km of the Site boundary, and within 1 km of the access track (see **Confidential Figure 7.6**)[1].

Furthermore, the following have also been reviewed:

- Aerial imagery and Ordinance Survey (OS) maps to identify any features of potential value to foraging, commuting or roosting bats;

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[1] It should be noted that the Search Area was based on a previous iteration of the access route which deviated slightly from the final access route. However, given the extent of the Search Area it is considered that records from an appropriate area of relevance to the access route have been considered.

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- A review of the Sites's location in relation to species known ranges in Scotland, with reference to the most recent UK Habitats Directive Article 17 Report (JNCC, 2019); and

- The location of other wind farm developments within 10 km of the Site, including the number of turbines and their size, through a review of the cumulative list provided in **Chapter 5: Landscape and Visual Amenity**, where relevant to the Proposed Development.

Field Surveys

The following field surveys were undertaken in support of the Proposed Development:

- Habitat Suitability Appraisal (HSA);

- Preliminary Roost Assessment (PRA);

- Activity Surveys – Ground Level Automated Monitoring Surveys (2021); and

- Activity Surveys – Ground Level Automated Monitoring Surveys (2024).

Survey methodology and subsequent interpretation of results made reference to the following key guidance documents:

- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd Edition). The Bat Conservation Trust, London.

- Collins, J. (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th Edition). The Bat Conservation Trust, London.

- Russ, J. (2012) *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.

- NatureScot (2023) *General pre-application and scoping advice for onshore wind farms.*

- NatureScot (2021) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*.

Additional peer reviewed literature and industry guidance has also been reviewed and is referred to where relevant.

Habitat Suitability Appraisal

A Habitat Suitability Assessment (HSA) of the Site and access track was informed by several ecological baseline surveys relating to the Proposed Development, which included:

- An extended Phase 1 Habitat survey of the Site (plus 100 m of the Site boundary) conducted on the 30th July 2021 and 2nd and 3rd August 2021, by M. Wood. An additional updated habitat validation survey was conducted on 8th October 2024 by J. Morton.

- An extended Phase 1 Habitat survey of the access track (applicable at the time of survey) conducted on 18th August 2022, by M. Wood.

- Protected mammal surveys of the Site (up to 250 m from the Site boundary), conducted between 24th - 26th May 2021 by P. Higginson, and between 7th-8th September 2021 by M. Wood.

Baseline surveys relating to the Proposed Development utilised BCT guidance relevant at the time of survey, relative to observed bat ecology (Collins, 2016).

However, the HSA presented in this Technical Appendix has utilised baseline data in relation to current BCT guidance (Collins, 2023) in appraising habitats within the Site and access track relative to foraging and commuting opportunities applicable to bats. Likewise, HSA has been utilised in informing the Habitat Risk component of the Initial Risk Assessment (Table 3a; NatureScot, 2021) relative to wind turbines included within the Proposed Development.

Preliminary Roost Appraisal

A ground-level Preliminary Roost Assessment (PRA) of the Site and access route was also incorporated into baseline surveys relative to survey specific areas (as referenced above), adapting BCT guidance applicable at the time of each survey (Collins, 2016), during which structures and trees were appraised for potential roost features (PRFs) and bat roost suitability.

However, particular attention was given to the Site areas relative to turbine constraint buffers (i.e., areas within a 300 m buffer of proposed turbine locations) as understood at time of survey, and addressed in NatureScot (2021) guidance, to identify any maternity roosts and/or substantial hibernation or swarming sites.

PRFs recorded were later appraised relative to updated BCT guidance (Collins, 2023), following PRA assessments being superseded by Ground Level Tree Assessments (GLTA) relative to trees and PRA relative to structures. Results were factored into the Habitat Risk component of the Initial Risk Assessment (Table 3a; NatureScot, 2021) relative to wind turbines included within the Proposed Development.

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Activity Surveys – Automated Monitoring

<u>Automated Monitoring 2021</u>

Bat activity surveys, comprising ground-level static surveys, were undertaken during spring (May), summer (July - early August) and autumn (late September to early October) activity periods, in accordance with NatureScot guidance (2021). A summary of survey effort is outlined in **Table 2**.

Table 2 - Total deployment duration of monitoring stations (MSs) during each recording period

Monitoring Period	Recording Location	Period Start	Period End	Deployment Duration (No. of Nights)
Spring	MS1	11/05/2021	24/05/2021	13
	MS2	11/05/2021	24/05/2021	13
	MS3	11/05/2021	24/05/2021	13
	MS4	11/05/2021	24/05/2021	13
	MS5	Failed	Failed	0
	MS6	11/05/2021	24/05/2021	13
	MS7	11/05/2021	24/05/2021	13
	MS8	11/05/2021	24/05/2021	13
	MS9	11/05/2021	24/05/2021	13
	MS10	11/05/2021	24/05/2021	13
	MS11	11/05/2021	24/05/2021	13
	MS12	11/05/2021	24/05/2021	13
	MS13	11/05/2021	24/05/2021	13
	MS14	11/05/2021	24/05/2021	13
Summer	MS1	11/07/2021	03/08/2021	23
	MS2	11/07/2021	03/08/2021	23
	MS3	11/07/2021	03/08/2021	23
	MS4	11/07/2021	03/08/2021	23
	MS5	11/07/2021	03/08/2021	23
	MS6	11/07/2021	03/08/2021	23
	MS7	11/07/2021	03/08/2021	23
	MS8	11/07/2021	03/08/2021	23
	MS9	11/07/2021	03/08/2021	23
	MS10	11/07/2021	03/08/2021	23
	MS11	11/07/2021	16/07/2021	5
	MS12	11/07/2021	03/08/2021	23
	MS13	11/07/2021	03/08/2021	23
	MS14	11/07/2021	03/08/2021	23
Autumn	MS1	24/09/2021	05/10/2021	11
	MS2	24/09/2021	05/10/2021	11
	MS3	24/09/2021	05/10/2021	11
	MS4	24/09/2021	05/10/2021	11
	MS5	Failed	Failed	0
	MS6	Failed	Failed	0
	MS7	24/09/2021	05/10/2021	11
	MS8	24/09/2021	05/10/2021	11
	MS9	Failed	Failed	0
	MS10	24/09/2021	05/10/2021	11

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Monitoring Period	Recording Location	Period Start	Period End	Deployment Duration (No. of Nights)
	MS11	Failed	Failed	0
	MS12	24/09/2021	05/10/2021	11
	MS13	24/09/2021	05/10/2021	11
	MS14	24/09/2021	05/10/2021	11
	MS1	24/09/2021	05/10/2021	11
	MS2	24/09/2021	05/10/2021	11
	MS3	24/09/2021	05/10/2021	11

The survey methodology employed the use of automated monitoring stations (MSs), each consisting of full spectrum Songmeter Mini (SM Mini), Songmeter 2 (SM2), or Songmeter 4 (SM4) bat detectors fitted with omnidirectional microphones and attached to a 1 m high wooden stake.

In total, fourteen MSs (MS1 – MS11) were deployed within the Site during spring, summer and autumn recording periods; MSs were deployed in close proximity to each proposed turbine location applicable at the time of survey, in accordance NatureScot guidance (2021).

Monitoring was undertaken between time periods spanning approximately 30 minutes before sunset and 30 minutes after sunrise, with equipment set up to record simultaneously, allowing comparison of activity recorded between monitoring stations and habitats present.

A recording summary of MSs deployed is detailed in **Table 3**, whilst deployment locations relative to the Site are presented in **Figure 7.8.**

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Table 3 - Monitoring station (MS) deployment locations and survey effort (recording nights)

MS ID	Grid Reference	No. of Successful Recording Nights[2]			Nearest Turbine	Distance from Turbine	Phase 1 Habitat Classification[3]	Linear Feature (within 50 m of MS)
		Spring	Summer	Autumn				
MS1	NX 73344 98206	9	23	10	T8	1.5 km south	Recently felled woodland (A4)/ Coniferous woodland plantation (A1.2.2)	Plantation edge (0-10 m)
MS2	NX 72859 98372	9	23	10	T1	1.5 km west	Coniferous woodland plantation (A1.2.2)	Plantation edge (0-10 m)
MS3	NX 72057 98418	9	23	10	T1	790 m west	Coniferous woodland plantation (A1.2.2)	Plantation edge (0-10 m)
MS4	NX 71388 98825	9	23	10	T1	115 m south	Unimproved acid grassland (B1.1)	N/A
MS5	NX 70553 99061	0	23	0	T2	280 m south-east	Unimproved acid grassland (B1.1)	N/A
MS6	NX 69968 98996	9	23	0	T2	400 m east	Unimproved acid grassland (B1.1)	N/A
MS7	NX 73533 97142	9	23	10	T9	1.1 km	Coniferous woodland plantation (A1.2.2)	Within plantation.
MS8	NX 73058 96542	9	23	10	T9	330 m south-west	Unimproved acid grassland (B1.1)	Plantation edge (30 m)
MS9	NX 72575 96523	9	23	0	T8	210 m	Unimproved acid grassland (B1.1)	N/A
MS10	NX 72410 96960	9	23	10	T8	280 m	Unimproved acid grassland (B1.1)	N/A
MS11	NX 71930 97130	9	5	0	T7 / T6	180 / 370 m north-west	Coniferous woodland plantation (A1.2.2)	Plantation edge/brook (0-10 m)
MS12	NX 71315 97695	9	23	10	T5	50 m south-west	Unimproved acid grassland (B1.1)	N/A
MS13	NX 70986 97970	9	23	10	T4	90 m north-west	Coniferous woodland plantation (A1.2.2)	Within plantation.
MS14	NX 70734 98266	9	23	10	T3	200 m north-west	Unimproved acid grassland (B1.1)	N/A

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[2] Combined survey periods (where applicable), nights deemed unsuitable due to both poor weather conditions and no bat activity removed.
[3] JNCC (2010) Handbook for Phase 1 Habitat Survey – a technique for environmental audit. JNCC. Peterborough

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Automated Monitoring Surveys 2024

A bat activity survey, comprising a ground-level static survey, was undertaken during the autumn (September) 2024 activity period by FDM Ecology Ltd., in accordance with NatureScot guidance (2021). A summary of survey effort is outlined in **Annex 3.**

The survey methodology employed the use of automated monitoring stations (MSs), each consisting of full spectrum Titley Scientific Anabat Ranger or Anabat Swift bat detectors fitted with omnidirectional microphones and attached to a 1 m high wooden stake.

In total ten MSs (MS4-MS6, MS8-MS14) were deployed within the Site at previously used locations outlined in **Table 3**, which are relevant to currently proposed turbine locations, in accordance with NatureScot guidance (2021).

A recording summary of MSs deployed is also detailed in **Annex 3**, whilst deployment locations relative to the Site are resented in **Figure 7.8**.

Weather Data

Weather data was collected from a weather station located within the study area during the spring, summer and autumn recording periods.

Weather parameters collected included temperature (^{O}C), rainfall (mm) and wind speed at dusk (mps) and data were analysed to account for any periods of poor weather which could have affected bat activity. Weather conditions are summarised in **Annex 2**.

Data Analysis and Assumptions of Bat Activity

Acoustic Analysis

Data analysis and interpretation of results followed the principles presented in the BCT guidance (Collins, 2023). Data analysis was undertaken by A. Hulme *BSc* (Hons.) and L. Quarton *MSc BSc* (Hons.), both experienced bat ecologists who regularly undertake analysis of bat survey data.

Bat detectors recorded data onto digital media and were analysed using Kaleidoscope Pro (Wildlife Acoustics) software. Kaleidoscope Pro automatically identified sonograms, and a manual check was conducted to confirm species identified. Bat species were identified using diagnostic features (e.g., frequency, slope, duration, time between calls, minimum call length etc.).

For the purpose of sonogram analysis, the number of 'bat registered calls' were defined as 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).

Bat Activity Index

An individual bat can pass a particular feature on several occasions while foraging. As such, it is not possible to estimate the number of individual bats or draw a fair comparison where survey times differ. In response, bat activity as presented within this technical appendix is recorded as an index, accounting for bat pass rate per hour or a 'Bat Activity Index (BAI)', as outlined BCT guidance (Collins, 2023), and defined as follows:

BAI (per hour) = Number of bat passes 'registered calls' / number of recording per hours, per night

BAI is presented throughout this Technical Appendix as outputted by Ecobat[4], which includes average summary statistics (i.e., mean and median) relative to MS location and recording period per species, to account for both spatial and temporal activity.

Ecobat recognises that BAI can be highly variable between recording nights, in some cases accounting for few or no passes, compared to subsequent nights of high activity. As such, in reference to Lintott and Mathews (2018), Ecobat adopts the median as its primary measure of average activity, relative to its usefulness in accounting for skew, rarity and small datasets, and over and/or under estimation of average activity based on environmental factors. However, in line with presentation standards also outlined in Lintott & Mathews (2018)[5], mean BAI is also included within this Technical Appendix, so as to disclose additional summary statistics available.

However, Ecobat analyses BAI relative to both presences only, defined as an 'Excludes Absences' variant (i.e., wherein analysis only takes into account the presence, and not the absence, of each bat species), and an inclusion of absences, defined as 'Includes Absences' (i.e., wherein analysis takes into account nights of zero data, during which bats were unrecorded).

Ecobat ultimately makes use of median 'Excludes Absences' in accounting for relative activity percentiles, although the inclusion of 'Includes Absences' variants is relevant as a comparative, and in demonstrating the level of bat interest at a site (e.g., 'no bats' on a recording night where there were no technical issues or weather constraints is a valid BAI result).

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[4] Ecobat (mammal.org.uk) [Accessed February 2025]
[5] Lintott, P.R., Mathews, F. Basic mathematical errors may make ecological assessments unreliable. Biodivers Conserv 27, 265–267 (2018). https://doi.org/10.1007/s10531-017-1418-5 [Accessed 10/02/2025]

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Ecobat Assessment Tool

Relative Activity Levels

In accordance with NatureScot guidance (2021), Ecobat was used to provide an objective interpretation of the relative importance of bat activity levels recorded within the Site.

Ecobat utilises a database of user submitted data (i.e., a reference database), to determine relative bat activity levels within a given site. The reference range consist of the number of bat recording nights (nights that bat passes were recorded) held within the Ecobat reference database per species, relative to selected parameters considered essential for stratifying a given dataset (Lintott *et al.*, 2018[6]). Parameters applicable to the analysis included within this technical appendix include:

- Location: Only records within the region of Scotland West;

- Seasonality: Only records from within +/- 1 month from the survey start date; and

- Detector model: Only records recorded using Wildlife Acoustics full-spectrum detectors.

Additionally, a stratified reference database (i.e., the reference range) requires a minimum sample size of ≥ 200 nights of bat surveying for confidence in the relative activity level provided by Ecobat; reference ranges per species, applicable to the Ecobat outputs included within this Technical Appendix each reached the minimum reference range, as summarised in **Table 4**.

Table 4 - Reference range sample size per species for Ecobat relative activity level outputs

Recorded Species	Reference Range
Common pipistrelle	38942
Soprano pipistrelle	43554
Noctule	456
Leisler's	98
Myotis spp.	1805
Brown long-eared	149

Following parameter selection, Ecobat provides a measure of relative activity via a percentile rank of median and maximum BAI compared against the stratified reference range, in addition to associated confidence intervals. Activity percentiles can subsequently be interpreted in relation to pre-determined activity bands (**Table 5**), as outlined in the NatureScot guidance (2021).

Table 5 - Percentile Scope and Categorised Level of Bat Activity

Recorded Species	Reference Range
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low
81 to 100	High

Automated Monitoring Surveys 2024

Ecobat parameters and available reference ranges relative to the autumn 2024 activity surveys (as undertaken by FDM Ecology Ltd), are presented in **Annex 3**.

Potential Roost Emergence

The Ecobat assessment tool provides a summary of bat passes recorded within the potential emergence time of a given species which might indicate the presence of a nearby roost, (i.e., from 15 minutes before, to 90 minutes after sunset).

Ecobat also highlights recorded passes which fall within a predetermined emergence period (i.e., between 15th June to 30th July) as based on specie specific emergence time ranges.

In both instances, emergence parameters are adapted directly from provided in Russ (2012).

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[6] Lintott, P.R., Davison, S., van Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J., Haddy, E. and Mathews, F. (2018). Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. Ecology and Evolution https://doi.org/10.1002/ece3.3692 [Accessed 10/02/2025].

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Risk Assessment

In accordance with NatureScot guidance (2021), a Risk Assessment has been carried out to identify the potential risk to bat populations from the Proposed Development. Wind farm developments can impact upon bat populations 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).

To ensure that bat species are protected by minimising the risk of collision, NatureScot guidance (2021) advises that an assessment of impact for a proposed wind farm development, requires a detailed appraisal of:

- level of activity of all bat species recorded at the site assessed both spatially and temporally;

- risk of turbine-related mortality for all bat species recorded during bat activity surveys; and

- effect on the species' population status if predicted impacts are not mitigated.

<u>Assessing Potential Risk</u>

NatureScot guidance (2021) presents a two-stage process for assessing the potential risk to bats relative to 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.

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.

Survey Limitations

<u>Field Surveys</u>

Monitoring Station Failure

During static activity surveys, data for MS5 was not obtained during the 2021 spring deployment period, and for MS5, MS6, MS9 and MS11 during the 2021 autumn deployment period following technical failures. As such, the recommended survey effort for the above-mentioned monitoring stations has not been reached, limiting spatial analysis and cumulative seasonal analysis.

However, relative to the current Proposed Development (i.e., nine turbines), survey effort is in excess of the recommended number of MSs, and the recommended minimum survey effort relative to turbine number (i.e., one monitoring station per turbine location) needed to characterise activity across the study area was achieved.

Conversely, failed detectors are located in close association with currently proposed turbine locations (each being most representative of activity per corresponding turbine). In the instance of MS5's spring failure, MS6 is within a comparable distance, and provides baseline activity in lieu of this recording period.

However, autumn failures are still considered a limitation, although the overall character of the turbine constraint area is still well captured by functional MS locations, and consequently not thought to be a substantial limitation given the relative homogeneity of habitats surveyed, and bat activity levels presented.

Additionally, MS6 was noted to have undergone a technical failure during the autumn 2024 survey effort (**Table A3.1** in **Annex 3**). As such, a relative comparison between presence/absence and activity between 2021 and 2024 survey efforts is treated with a degree of caution.

Survey Effort

MS9 did not account for the minimum survey effort outlined in guidance (i.e., 10 nights of consecutive days per detector) during the 2021 autumn recording period, only accounted for 5 nights of recording. Whilst below the recommended survey effort, the use of average BAI in analysis mitigates outliers or low activity. Likewise, both MS8 and MS10 are located in relative proximity within similar habitats, providing baseline data in lieu of non-surveyed dates, relative to local turbine locations. As such, reduced survey effort relative to MS9 is not considered a substantial constraint.

Additionally, during the spring survey effort suboptimal conditions during which no bat activity was recorded reduced the viable sample size of the survey effort to nine nights of recording, falling short of the recommended ten nights by a margin. NatureScot guidance does recognise that in practise, weather conditions in late seasons limit the likelihood of achieving ten nights of suitable conditions. As such, reduced survey effort is not likely to impact the validity of activity assessment.

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Weather Conditions

Weather constraints, including temperatures below 8°C, heavy rain and/ or winds exceeding 5 m/s, were recorded at dusk on ten nights over the survey effort, during which bat activity was undetected over five of these nights, which were subsequently omitted from analysis.

However, dates during which suboptimal weather conditions were recorded, but bat activity was recorded (i.e., five nights) have been retained within analysis. Although it is recognised that poor weather can affect bat activity, excluding these data from the analysis may skew the data, and would remove some high collision risk species from the dataset. Consequently, the inclusion of these nights represents a precautionary approach, in addition to considering weather conditions representative of the Site.

Overall, any limitations to the overall survey effort are not thought to represent a substantive constraint relative to the baseline data collected, which is considered sufficient to achieve the objectives of the study.

Acoustic Analysis

Kaleidoscope software can identify certain bat species from sonograms, but some species within the *Myotis* and *Nyctalus* genus can be difficult to distinguish. In some cases, calls may be partially heard or distorted by external factors like passing cars, rain or wind, resulting in unknown or genus-only labels. For example, brown long-eared have lower detectability and may not be detected during activity surveys relative to their hunting strategies in less open habitats. Survey results have been carefully interpreted across species.

Bat Detector Variation

Bat detectors used between the 2021 and 2024 survey effort (i.e., make and model) show variation, with the former consisting of Wildlife Acoustic equipment, and the latter Titley Scientific. Whilst variation in equipment is noted, and caution is recommended in attempting a detailed analysis, a broad comparison is considered possible on the basis of all equipment used applying full spectrum recording. As such, data presented is considered sufficient to account for a comparison of presence/absence, and relative activity within years.

Ecobat Assessment Tool

Ecobat Status

The Ecobat assessment tool has been offline for a period and was, until recently, unavailable. Following its redistribution by the Mammal Society, Ecobat has been advertised as being in suitable condition to inform assessments, as required by NatureScot (2021). However, the Mammal Society recognises that Ecobat remains within the infancy of its redistribution and may be subject to further maintenance. In some instances, outputs are still noted to be anomalous and so caution and professional judgement has been applied in interpreting the results. A discourse with the Mammal Society is ongoing relative to these issues.

Reference Range

Following Ecobat analysis, the recommended reference range (i.e., 200 nights of recorded activity) for both Leisler's and brown long-eared bats was not achievable using a regional filter for West Scotland, and as such confidence in relative activity levels is reduced. However, relative to rarer species, or species whose activity is typically under recorded due to reduced detectability, viable reference ranges at an appropriate scale are difficult to achieve, and as such the reference range provided by Ecobat is still considered relevant to this assessment, in lieu of an alternative resource or recognised form of analysis relative to wind developments.

Likewise, for autumn 2024 activity survey, the minimum reference range recommended by Ecobat is not currently achievable for *Pipistrellus* species, Leisler's bat, Natterer's bat or brown long-eared bat (**Table A3.2** in **Annex 3**). As such, activity percentiles provided by Ecobat (in addition to Overall Risks Assessment results relative to HCR species) included within this report for comparison should be treated with caution.

Results

Desk Study

Statutory Designated Sites for Nature Conservation

This section should be read with reference to **Figure 7.1**.

The Site does not form part of any statutory designated site for nature conservation with qualifying bat species interests, nor is it within 10 km of such a designated site.

Non-statutory Designated Sites for Nature Conservation

Consultation with SWSEIC indicated that the Site does not form part of any non-statutory designated site for nature conservation and no such sites are located within the Search Area.

Existing Bat Records

A total of 18 recent bat records were returned by SWSEIC within the Search Area, accounting for a minimum of six confirmed species overall (i.e., common pipistrelle, soprano pipistrelle, noctule, Leisler's, Natterer's, and Whiskered/Brandt's bats), in addition to unidentified records relating to the *Pipistrellus* and *Myotis* genus.

A summary of the bat records returned by SWSEIC is provided in **Table 6**.

Table 6 - Desk study records relative to the Site boundary

Species / Genus	No. Records	Site Boundary Proximity	Status[7]	Record Notes
Common pipistrelle	4	100 m north	HabReg, HabDir4, LBAP	Records related to a single maternity roost record and bat passes dating from 2016 – 2021.
Soprano pipistrelle	4	100 m north	HabReg, HabDir4, ScotBL, LBAP, UKBAP	Records related to foraging activity and bat passes dating from 2016 – 2021.
Pipistrellus spp.	3	4.3 km south-west	HabReg, HabDir4, ScotBL, UKBAP	Records limited to bat passes dated from 2016.
Noctule	1	4.5 km south-west	HabReg, HabDir4, ScotBL, LBAP. UKBAP	Records limited to social call dated from 2016.
Leisler's	1	4.3 km south-west	HabReg, HabDir4, LBAP, UKBAP	Records limited to bat passes dated from 2016.
Whiskered/Brandt's	1	6.2 km south-west	HabReg, HabDir4	Records limited to bat passes and social calls dated from 2016.
Natterer's	2	100 m north	HabReg, HabDir4, ScotBL, LBAP	Records limited to foraging activity and bat passes dated between 2016 – 2021.
Myotis spp.	2	5.5 km south-west	HabReg, HabDir 2/4, ScotBL, UKBAP	Records limited to bat passes dated from 2016.

UK Bat Species Range

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 Site is located within the known UK distribution range for the following species:

- common pipistrelle;
- soprano pipistrelle;
- Daubenton's;
- Natterer's;
- whiskered;
- noctule;
- Liesler's; and
- brown long-eared bat.

Consequently, the presence of pre-existing and recent records summarised in **Table 6**, in addition to the recorded distribution ranges would suggest these species could be present within the local landscape.

Other Wind Developments

A summary of operational or consented wind farm developments within 10 km of the Site is provided in **Table 7**.

Table 7 - Wind farm Developments within 10 km of the Site

Wind Farm	Distance	Status	No. Wind Turbines	Hub Height (m)	Rotor Diameter (m)	Tip Height (m)
Sanquhar II	1.86	Consented	44	125	150	200
Manquhill	3.42	Consented	8	122.5	155	200
Cornharrow	3.53	Consented	7	122.5	155	200
Wether Hill	3.54	Operational	14	60	62	93
Whiteside Hill	5.75	Operational	10	70	104	121.2
Troston Loch	6.86	Consented	14	83.4	133	149.9
Sanquhar Six	7.54	Consented	6	85	90	130
Afton	7.72	Operational	27	80	80	120

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[7] HabReg: The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), HabDir2/4: Habitats Directive Annex 2/4, SBL: Scottish Biodiversity List, UKBAP United Kingdom Biodiversity Action Plan, LBAP: Local Biodiversity Action Plan.

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Wind Farm	Distance	Status	No. Wind Turbines	Hub Height (m)	Rotor Diameter (m)	Tip Height (m)
Windy Rig	7.82	Operational	12	75	100	125
Sanquhar Community Windfarm	8.20	Operational	9	80	100	130
Twentyshilling Hill	8.34	Operational	9	80	120	140
Windy Standard I	8.42	Operational	36	35	45	53.3
Margree	8.83	Consented	9	118.5	163	200
Hare Hill Phase 2	9.69	Operational	35	65	52	91
Divot Hill	9.86	Consented	9	125	150	200
Glenshimmeroch	10.03	Application (Previously Consented)	10	125	150	200
Windy Standard II	10.09	Operational	30	80	80	120

Habitat Suitability Appraisal

Site Overview

A thorough summary of habitat types located within the Site and extended study areas are included in **Technical Appendix 7.1: Habitats and Vegetation** and presented on **Figures 7.3a** and **7.3b.**

An HSA, as applicable to the Site is summarised below, in reference to both habitat descriptions provided in BCT guidance (Collins, 2023), and NatureScot (2021) relative to wind farm developments.

Foraging, Commuting and Roost Potential

Habitats present within the Site area include open, edge and closed habitat types, which could support a different species guilds present within the local landscape, although suitability is noted to be variable across the Site.

The Site is dominated by closed habitat types, predominantly comprised of coniferous plantation woodland, with localised areas of broad-leaved plantation and semi-natural woodland. Woodland habitats also form the bulk of edge habitat niches present on-Site, relative to woodland edges. Whilst relatively continuous in cover (providing sheltered foraging and commuting opportunities), the majority of closed habitat (i.e. commercial coniferous plantation) is unlikely to form a substantial foraging resource given both its structural composition, species assemblage and land practice management. Likewise, roosting opportunities are likely limited given the age and commercial status of on-site plantation, with no PRF features reported in association during baseline surveys on-site. However, whilst sub-optimal habitat in compared to broad-leaved woodland, plantation areas may be favoured opportunistically by resident species relative to exposed, elevated open habitat found on-site and locally.

Open habitats present are variable distributed and predominantly found in association with southern and western-north-western margins. Suitability is variable, ranging from recently felled woodland areas, grassland (i.e., acid, neutral and marshy grassland, and mosaic variations of each), and minor areas of blanket bog. Much open habitat present is relatively expansive and exposed and subsequently are likely of reduced ecological values (although areas found in association with woodland edge, i.e., edge habitats, are likely more suitable and accessible). As such, open habitats represent a variable foraging resource relative to local bat assemblages.

Several riparian features, which include brooks and streams, are also distributed throughout the Site, which represent areas of increased foraging value, as well as blue corridors within open areas (although largely unsheltered within these locales). Multiple streams are also present across the southern boundary of the Site, within turbine constraint areas.

Proportionally, bat roosting opportunities are limited, with most closed habitat comprising coniferous species managed for commercial practises. However, some structures and free-standing tree opportunities were observed, within the Site boundaries (as detailed within **Preliminary Roost Assessment**). However, the turbine constraint area was noted to lack any substantial roosting opportunities following baseline surveys.

Habitat Suitability and Risk Factor

The general landscape is unlikely to support large numbers of bats due to its elevation, exposure and commercial practices, although the continuous cover of sheltered plantation woodland (both locally and on-site) is of some value as a habitat resource. However, areas of increased ecological value are generally found outside the wind farm development area, beyond the turbine constraints buffers, and what closed habitat does fall within is of reduced suitability (i.e., commercial plantation).

As such, the wind farm development area is most representative of **Low** suitability habitat descriptions outlined in Table 4.1 of BCT guidance (Collins, 2023) and subsequently considered to be of **Low** habitat risk relative to the proposed wind farm development (**4. Assessment of Potential Risk to Bats**), as outlined in Table 3a of NatureScot Guidance (2021).

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Access Track Overview

The access track relating to the Proposed Development is notable for being predominating comprised of sheltered edge habitats, and/or areas of closed woodland. As such, most habitats are comprised of coniferous woodland variants (typically considered to be sub-optimal relative to broader woodland habitats), there is increased potential for foraging, commuting and roosting (e.g., **T4; Preliminary Roost Assessment**), with the access track representing an ecological valuable area relative to the wider Proposed Development.

As such, the access track is most representative of **Moderate** suitability habitat descriptions outlined in Table 4.1 of BCT guidance (Collins, 2023), being continuous and well connected, but dominated by sub-optimal habitat types.

Preliminary Roost Assessment

A summary of potential PRFs recorded during baseline surveys relative to both trees and structures are presented in **Table 8**.

No PRF features were recorded from within bat constraint buffers relative to proposed turbine locations (i.e., within 300 m of any given turbine blade).

Additionally, the nearest confirmed roost record returned by SWSEIC is located approximately 1.4 km from the nearest turbine constraint buffer and considered to fall outside the zone of impact of any given turbine locations.

However, some areas of edge and/or closed habitat (e.g., coniferous plantation) do fall within constraint buffers, although such habitats are typically considered suboptimal for roosting bats, and no PRF features were recorded in association with these areas.

Additionally, a single PRF feature was recorded in direct association with the access track associated with the wider Proposed Development.

Table 8 - PRF features recorded in associations with trees and structures during baseline surveys.

Study Area	Grid Ref.	Habitat Feature	Suitability	Surveyor Comments
Site	NX 74337 98250	Mature trees	PRF[89]	Located on the Site boundary, a stand of mature ash trees approximately 20 m high, with several cavity and crevice features found in association (although no signs of bat presence where noted).
Site Buffer	NX 74669 97270	Residential building	BRP	Residential cottage noted within Site buffer.
Site Buffer	NX 75284 97408	Residential building	BRP	Residential cottage noted within Site buffer.
Site	NX 73139 97772	Mature trees	PRF	Mature beech trees noted for large cavity features found in association.
Site	NX 74386 97192	Bridge	BRP	Stone bridge, which appears suitable for bats.
Site	NX 74267 98278	Mature tree	PRF	Mature tree featuring large cavity feature suitable for roosting bats.
Access Track	NX 69086 97966	Mature trees	PRF	Small area of semi-natural Scots Pine approximately 15 m high, which include some standing deadwood. Includes cavity features forming possible roost features.

Activity Surveys – Automated Monitoring

This section discusses the results of the 2021 bat activity surveys; however, reference is made to the findings of the autumn 2024 survey, to provide context (analysis of the autumn 2024 survey is presented in **Annex 3**).

Bats were detected on 38 nights over the course of the survey effort, which covered May (spring), July – early August (summer) and late September - October (autumn) 2021 recording periods.

A minimum of six species were recorded on-Site during the 2021 surveys; species identified are presented in **Table 9** along with potential collision risk and population vulnerability as described in Table 2 of NatureScot guidance (2021).

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[8] PRF: A tree with at least one PRF present.

[9] BRP: Bat Roost Potential noted – provisional assessment.

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Table 9 - Bat species recorded, collision risk and population vulnerability as applicable to Scotland

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

A similar bat assemblage was recorded during the 2024 autumn period survey (common pipistrelle, soprano pipistrelle, Leisler's, Daubenton's, Natterer's and brown long-eared bat) (**Table A3.3** in **Annex 3**), of which common pipistrelle, soprano pipistrelle and Leisler's are attributed as high collision risk (HCR) species.

Over the courses of the 2021 survey, a total of 5,125 bat passes were recorded over a period of 521 suitable nights across all MS locations combined.

Soprano pipistrelle was noted to be most abundantly recorded species, with a total of 3,095 passes recorded (i.e., 60.4% of total bat calls recorded) over the duration of the survey effort.

Likewise, soprano pipistrelle was noted to be the most frequently recorded species over the survey effort, registering across 223 cumulative nights (i.e., 42.8% of sampled nights).

A summary of the total number and percentage of bat passes, in addition to the number of nights presence was recorded relative to the overall sampling effort per species is presented in **Table 10**.

Table 10 - Total number/percentage of bat passes and recording frequency per species

Species	No. Nights Bats Recorded	Percentage Nights Bats Recorded[10]	Passes (No.)	Percentage (%)
Common pipistrelle	195	37.4	1372	26.8
Soprano pipistrelle	223	42.8	3,095	60.4
Noctule	157	30.1	456	8.9
Leisler's	55	10.6	98	1.9
Myotis species	50	9.6	70	1.4
Brown long-eared	30	5.8	34	0.7
		Total	**5,125**	**100.0**

Regarding the spatial distribution of bat recordings, a summary of bat activity per MS is presented in **Table 11**.

Bats were recorded on 51.25% of cumulative survey nights (i.e., suitable nights of bat recordings at each MS location combined).

MS10 was noted to have recorded the most bat passes (i.e., 839 passes), as well as the highest percentage of passes for cumulative recordings (16.4%) total number of passes for MSs combined.

However, MS3 featured the highest frequency of bat passes relative to the number of nights sampled over the survey effort (i.e., 69.05% of recorded nights).

Table 11 - Bat activity survey results per monitoring station (MS)[11]

MS ID	No. Nights Sampled	No. Nights Bats Recorded	Percentage Nights Bats Recorded	Total No. Passes Recorded	Percentage Distribution Passes Recorded (%)
MS1	42	23	54.76	186	3.6
MS2	42	24	57.14	497	9.7
MS3	42	29	69.05	312	6.1
MS4	42	17	40.48	241	4.7
MS5	23	7	30.43	219	4.3
MS6	32	17	53.13	454	8.9
MS7	42	28	66.67	520	10.1
MS8	42	20	47.62	287	5.6
MS9	32	25	78.13	483	9.4
MS10	42	20	47.62	839	16.4
MS11	14	9	64.29	327	6.4

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[10] Percentage of nights bats were recorded within out of a possible 521 cumulate nights between MS locations.
[11] The number of dates sampled is the number of nights each detector was operational for throughout the survey period, taking account of detector failures and unsuitable weather conditions.

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MS ID	No. Nights Sampled	No. Nights Bats Recorded	Percentage Nights Bats Recorded	Total No. Passes Recorded	Percentage Distribution Passes Recorded (%)
MS12	42	9	21.43	48	0.9
MS13	42	28	66.67	544	10.6
MS14	42	11	26.19	168	3.3
Total	**521**	**267**	**51.25**	**5125**	100.0

An additional summary of bat recordings per recording period is presented in **Table 12**.

Cumulatively, the summer recording period accounted for the highest number of recorded bat passes (5,029 passes), accounting for 98.1% of total recorded passes across the survey effort.

Likewise, the summer recording period accounted for the highest number of bat passes relative to the number of suitable nights sampled over the survey effort (i.e., 58.4% of nights sampled).

Table 12 - Bat activity survey results per season, monitoring stations (MS) combined

Recording Period	Recording Month	No. Nights Sampled	No. Nights Bats Recorded	Percentage Nights Bats Recorded	Total No. Passes Recorded	Percentage Distribution Passes Recorded (%)
Spring	May	117	13	22.5	37	0.7
Summer	July	278	219	53.4	4824	94.1
	August	26	18	5.0	205	4.0
Autumn	September	70	11	13.4	23	0.4
	October	30	6	5.8	36	0.7
Total		521	267	100.0	5125	100.0

Nightly Activity Analysis (per Species)

Table 13 presents the total number of nights bat activity was categorised under each relative activity band (i.e., **Low** to **Exceptionally High** activity) per species, in reference to activity categories outlined in **Table 5.**

High Collision Risk (HCR) Species

Nightly activity was limited to **Low** activity for common pipistrelle and ranged from **Low** to **Low-Moderate** for soprano pipistrelle (accounting for Low nightly activity most frequently).

Nightly activity for both *Nyctalus* species recorded ranged from **Low** to **Exceptionally High** activity, most frequently accounting for **Low** activity relative to noctule, and **Low-Moderate** activity relative to Leisler's bat.

Other Species

Nightly activity ranged from **Low** to **Low-Moderate** activity for *Myotis* species, with **Low** nightly activity being most frequently recorded.

Nightly activity for brown long-eared bat was variable, and included **Moderate** to **Moderate-High** activity, and a single night of **Exceptionally High** nightly activity. However, **Moderate** nightly activity was most frequently recorded.

Table 13 - Number of nights recorded bat activity fell into each activity band per species

Species / Genus	Exceptionally High Activity	High Activity	Moderate/ High Activity	Moderate Activity	Low/Moderate Activity	Low Activity
Common pipistrelle	0	0	0	0	0	195
Soprano pipistrelle	0	0	0	0	4	219
Noctule	2	12	35	27	34	47
Leisler's	2	5	7	15	26	0
Myotis spp.	0	0	0	0	5	45
Brown long-eared	1	0	2	27	0	0

Site Activity Analysis (per Species)

Table 14 presents median and maximum activity percentiles per species for the Site (i.e., MS locations combined, across the overall survey effort).

High Collision Risk (HCR) Species

Common and soprano pipistrelle accounted for **Low** activity at both the 1st and 3rd median percentile, respectively. Activity was also noted to be **Low** at 12th maximum percentile for common pipistrelle, but **Low-Moderate** at 21st maximum percentile for soprano pipistrelle.

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Noctule accounted for **Low-Moderate** activity at the 28th median percentile, whilst Leisler's bat accounted for **Moderate** activity at the 57th median percentile. However, both *Nyctalus* species accounted for **High** activity at the 100th maximum percentile, respectively.

Other Species

Myotis species accounted for **Low** activity at 4th median percentile, but **Low-Moderate** activity at the 35th maximum percentile.

Brown long-eared bat accounted for **Moderate** activity at 57th median percentile, and **High** activity at 100th maximum percentile.

Table 14 - Key activity metrics species recorded on-Site over the total survey effort

Species	Median Percentile[12]	95% CIs[13]	Max Percentile[14]	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	1st	5-11	12th	Low	Low
Soprano pipistrelle	3rd	9-15	21st	Low	Low-Moderate
Noctule	28th	47-68	100th	Low-Moderate	High
Leisler's	57th	57-94	100th	Moderate	High
Myotis spp.	4th	4-4	35th	Low	Low-Moderate
Brown long-eared	57th	57-67	100th	Moderate	High

Activity Analysis per Monitoring Station (MS)

Table 15 presents the median and mean pass rates (BAI) for each species recorded per MS.

BAI outputs presented include both an Excludes Absences variant (i.e., including only nights bat presence was detected) and Includes Absences variant (i.e., including nights of absences).

Table 15 - Median and mean bat pass rate (BAI) per species, per monitoring station (MS)

Species / Genus	MS 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	MS1	59	0.4	0.5	0.4	0.6
	MS2	180	1.0	1.1	1.2	1.3
	MS3	72	0.2	0.5	0.4	0.6
	MS4	72	0.1	0.6	1.0	1.8
	MS5	84	1.1	1.1	1.7	2.0
	MS6	43	0.3	0.5	0.4	0.5
	MS7	145	0.6	0.9	0.9	1.2
	MS8	125	0.6	0.7	1.0	1.1
	MS9	111	0.6	0.7	0.8	1.0
	MS10	172	1.2	1.7	1.7	2.0
	MS11	114	0.1	3.1	1.6	3.0
	MS12	12	0.1	0.3	0.1	0.3
	MS13	112	0.4	0.9	0.7	1.3
	MS14	71	0.1	0.4	0.9	1.3
Soprano pipistrelle	MS1	96	0.8	1.1	0.7	0.8
	MS2	256	1.6	1.6	1.7	1.9
	MS3	160	0.3	1.0	0.9	1.2
	MS4	154	0.3	0.6	1.2	1.7
	MS5	121	3.6	3.6	3.5	3.5
	MS6	391	0.8	1.2	4.7	5.3
	MS7	304	1.5	1.9	1.8	2.1
	MS8	140	0.8	0.9	1.2	1.4
	MS9	271	1.3	1.6	1.8	2.2
	MS10	628	3.8	3.8	5.1	5.1
	MS11	192	1.8	3.4	2.5	3.2
	MS12	36	0.3	0.8	0.8	1.0
	MS13	252	1.3	1.5	1.6	2.0
	MS14	94	0.5	0.6	1.1	1.6
Noctule	MS1	24	0.1	0.2	0.1	0.3

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[12] A numerical representation of average activity levels relative to the Ecobat reference range summarised in Table 2.4.
[13] An indication of the confidence in the median percentile (Excludes Absences).
[14] A numerical representation of maximum activity levels relative to the Ecobat reference range summarised in Table 2.4.

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Species / Genus	MS 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
	MS2	42	0.1	0.3	0.3	0.4
	MS3	53	0.2	0.3	0.2	0.3
	MS4	15	0.0	0.3	0.1	0.3
	MS5	11	0.0	0.4	0.2	0.5
	MS6	20	0.0	0.3	0.2	0.5
	MS7	63	0.3	0.4	0.4	0.5
	MS8	18	0.1	0.1	0.2	0.4
	MS9	72	0.4	0.4	0.5	0.7
	MS10	32	0.1	0.4	0.2	0.4
	MS11	6	0.0	0.1	0.1	0.1
	MS12	0	0.0	N/A	0.0	N/A
	MS13	98	0.4	0.5	0.6	0.7
	MS14	2	0.0	0.1	0.0	0.1
Leisler's	MS1	5	0.0	0.1	0.0	0.2
	MS2	14	0.0	0.2	0.1	0.2
	MS3	19	0.0	0.1	0.1	0.2
	MS4	0	0.0	N/A	0.0	N/A
	MS5	2	0.0	0.1	0.0	0.1
	MS6	0	0.0	N/A	0.0	N/A
	MS7	0	0.0	N./A	0.0	N/A
	MS8	0	0.0	N/A	0.0	N/A
	MS9	18	0.0	0.2	0.1	0.3
	MS10	0	0.0	0.3	0.0	0.2
	MS11	4	0.0	0.1	0.1	0.2
	MS12	0	0.0	N/A	0.0	N/A
	MS13	33	0.0	0.5	0.2	0.5
	MS14	0	0.0	N/A	0.0	N/A
Myotis spp.	MS1	1	0.0	0.1	0.0	0.1
	MS2	1	0.0	0.1	0.0	0.1
	MS3	4	0.0	0.1	0.0	0.1
	MS4	0	0.0	N/A	0.0	N/A
	MS5	1	0.0	0.1	0.0	0.1
	MS6	0	0.0	N/A	0.0	N/A
	MS7	6	0.0	0.1	0.0	0.1
	MS8	1	0.0	0.1	0.0	0.1
	MS9	6	0.0	0.1	0.1	0.1
	MS10	4	0.0	0.1	0.0	0.2
	MS11	11	0.1	0.1	0.1	0.2
	MS12	0	0.0	N/A	0.0	N/A
	MS13	34	0.1	0.1	0.2	0.3
	MS14	1	0.0	0.1	0.0	0.1
Brown long-eared	MS1	1	0.0	0.1	0.0	0.1
	MS2	4	0.0	0.1	0.0	0.1
	MS3	4	0.0	0.1	0.0	0.1
	MS4	0	0.0	N/A	0.0	N/A
	MS5	0	0.0	N/A	0.0	N/A
	MS6	0	0.0	N/A	0.0	N/A
	MS7	2	0.0	0.1	0.0	0.1
	MS8	3	0.0	0.1	0.0	0.1
	MS9	5	0.0	0.1	0.0	0.1
	MS10	0	0.0	N/A	0.0	N/A
	MS11	0	0.0	N/A	0.0	N/A
	MS12	0	0.0	N/A	0.0	N/A
	MS13	15	0.0	0.1	0.1	0.2
	MS14	0	0.0	N/A	0.0	N/A

Table 16 presents the corresponding median and maximum bat activity percentiles for each species recorded per MS, relative to BAI (Excludes Absences).

Table 16 - Median and maximum activity percentiles per species, per monitoring station (MS)

Species	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	MS1	1st	1-1.5	2nd	16	Low	Low
	MS2	2nd	2-5	6th	23	Low	Low
	MS3	1st	1.5-2	2nd	18	Low	Low
	MS4	1st	1-11	11th	10	Low	Low

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Species	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
	MS5	2nd	2-7	12th	6	Low	Low
	MS6	1st	1-1.5	2nd	13	Low	Low
	MS7	2nd	1.5-3	11th	22	Low	Low
	MS8	1st	1.5-6.5	10th	18	Low	Low
	MS9	1st	1-5	9th	19	Low	Low
	MS10	4th	3.5-8.5	11th	17	Low	Low
	MS11	6th	5-11	11th	5	Low	Low
	MS12	0th	0-0	0th	5	Low	Low
	MS13	2nd	1.5-5.5	10th	16	Low	Low
	MS14	0th	4-11	11th	7	Low	Low
Soprano pipistrelle	MS1	2nd	1.5-2.5	3rd	19	Low	Low
	MS2	4th	4-7	10th	22	Low	Low
	MS3	2nd	2-6.5	10th	22	Low	Low
	MS4	1st	1-8.5	16th	12	Low	Low
	MS5	9th	8-11	12th	7	Low	Low
	MS6	3rd	7-21	21st	15	Low	Low-Moderate
	MS7	5th	4-7.5	15th	24	Low	Low
	MS8	1st	1-8	13th	17	Low	Low
	MS9	4th	5-9.5	12th	21	Low	Low
	MS10	10th	9-15	18th	20	Low	Low
	MS11	9th	9-12.5	14th	7	Low	Low
	MS12	1st	1-7	7th	7	Low	Low
	MS13	4th	3.5-7	11th	22	Low	Low
	MS14	1st	1-13	13th	8	Low	Low
Noctule	MS1	21st	13-36.5	75th	12	Low-Moderate	Moderate-High
	MS2	37th	20.5-48	83rd	18	Low-Moderate	High
	MS3	28th	28-45	83rd	21	Low-Moderate	High
	MS4	28th	13-47	66th	7	Low-Moderate	Moderate-High
	MS5	45th	13-71	71st	3	Moderate	Moderate-High
	MS6	28th	13-55.5	83rd	7	Low-Moderate	High
	MS7	45th	36.5-59.5	91st	21	Moderate	High
	MS8	13th	13-44	75th	10	Low	Moderate-High
	MS9	45th	36.5-56.5	100th	20	Moderate	High
	MS10	45th	29-60	83rd	11	Moderate	High
	MS11	13th	13-13	28th	4	Low	Low-Moderate
	MS12	N/A	N/A	N/A	N/A	N/A	N/A
	MS13	60th	47-68	94th	21	Moderate	High
	MS14	13th	13-13	13th	2	Low	Low
Leisler's	MS1	30th	30-30	57th	4	Low-Moderate	Moderate
	MS2	57th	30-64.5	72nd	8	Moderate	Moderate-High
	MS3	30th	30-57	88th	13	Low-Moderate	High
	MS4	N/A	N/A	N/A	N/A	N/A	N/A
	MS5	30th	30-30	30th	2	Low-Moderate	Low-Moderate
	MS6	N/A	N/A	N/A	N/A	N/A	N/A
	MS7	N/A	N/A	N/A	N/A	N/A	N/A
	MS8	N/A	N/A	N/A	N/A	N/A	N/A
	MS9	44th	30-72	72nd	12	Moderate	Moderate-High
	MS10	57th	57-57	57th	3	Moderate	Moderate
	MS11	30th	30-30	57th	3	Low-Moderate	Moderate
	MS12	N/A	N/A	N/A	N/A	N/A	N/A
	MS13	88th	57-94	100th	10	High	High
	MS14	N/A	N/A	N/A	N/A	N/A	N/A
Myotis spp.	MS1	4th	0	4th	1	Low	Low
	MS2	4th	0	4th	1	Low	Low
	MS3	4th	4-4	4th	4	Low	Low
	MS4	N/A	N/A	N/A	N/A	N/A	N/A
	MS5	4th	0	4th	1	Low	Low
	MS6	N/A	N/A	N/A	N/A	N/A	N/A
	MS7	4th	4-4	4th	6	Low	Low
	MS8	4th	0	4th	1	Low	Low
	MS9	4th	4-4	4	6	Low	Low
	MS10	4th	4-4	11th	3	Low	Low
	MS11	4th	4-11	22nd	6	Low	Low-Moderate
	MS12	N/A	N/A	N/A	N/A	N/A	N/A
	MS13	4th	4-17	35th	20	Low	Low-Moderate
	MS14	4th	0	4th	1	Low	Low
Brown long-eared	MS1	57	0	57	1	Moderate	Moderate
	MS2	57th	57-57	57th	4	Moderate	Moderate
	MS3	57th	57-57	57th	4	Moderate	Moderate
	MS4	N/A	N/A	N/A	N/A	N/A	N/A

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Species	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
	MS5	N/A	N/A	N/A	N/A	N/A	N/A
	MS6	N/A	N/A	N/A	N/A	N/A	N/A
	MS7	57th	57-57	57th	2	Moderate	Moderate
	MS8	57th	57-57	57th	3	Moderate	Moderate
	MS9	57th	57-57	57th	5	Moderate	Moderate
	MS10	N/A	N/A	N/A	N/A	N/A	N/A
	MS11	N/A	N/A	N/A	N/A	N/A	N/A
	MS12	N/A	N/A	N/A	N/A	N/A	N/A
	MS13	57	57-67	100	11	Moderate	High
	MS14	N/A	N/A	N/A	N/A	N/A	N/A

<u>High Collision Risk (HCR) Species</u>

Common pipistrelle

Common pipistrelle activity was recorded at each MS location on-site.

Median pass rates (Excludes Absences) for common pipistrelle ranged from 0.3 to 3.1 passes per hour, being relatively higher at MS11 (**Table 15**).

Median activity levels uniformly equated to **Low** activity, ranging between the $0^{th} – 6^{th}$ median percentile across each MS (being highest at MS11) (**Table 16**). Likewise, maximum activity levels also uniformly equated to **Low** activity, ranging from $0^{th} – 12^{th}$ maximum percentile (being highest at MS5).

In comparison the autumn 2024 survey[15] recorded activity at both median and maximum activity percentiles uniformly which equated to **Low activity**, per corresponding MS location (**Table A3.4** in **Annex 3**).

Soprano pipistrelle

Soprano pipistrelle activity was recorded at each MS location on-site.

Median pass rates (Excludes Absences) for soprano pipistrelle ranged from 0.6 to 3.6 passes per hour, being relatively higher at MS10 (**Table 15**).

Median activity levels uniformly equated to **Low** activity, ranging from the $1^{st} – 10^{th}$ median percentile across each MS location (**Table 16**).

Maximum activity levels mostly equated to **Low** activity across MS locations, ranging from the $3^{rd} – 18^{th}$ maximum percentile, but **Low-Moderate** at the 21st percentile relative to MS6 (**Table 16**).

In comparison, the autumn 2024 activity survey, recorded activity at both median and maximum activity percentiles uniformly which equated to **Low activity**, per corresponding MS location (**Table A3.5** in **Annex 3**).

Noctule

Noctule bat activity was recorded at most MS locations on-site but was undetected at MS12.

Median pass rates (Excludes Absences) for noctule ranged from 0.1 to 0.5 passes per hour, being relatively higher at MS13 (**Table 15**).

Median activity levels were variable, accounting for **Low** (MS8, MS11, MS14), **Low-Moderate** (MS1-MS4, MS6) and **Moderate** (MS5, MS7, MS9-MS10, MS13) activity across MS locations, ranging from the 13th to 60th median percentiles, but most frequently accounting for **Low** and **Moderate** activity between MS locations (**Table 16**).

Maximum activity levels were also variable, accounting for **Low** (MS14), **Low-Moderate** (MS11), **Moderate-High** (MS1, MS4-MS5, MS8) and **High** (MS2-MS3, MS6-MS7, MS9-MS10, MS13) activity across MS locations, but most frequently accounting for **High** activity between MS locations (**Table 16**).

Noctule activity was not recorded on-Site during autumn 2024 (**Table A3.3** in **Annex 3**).

Leisler's

Leisler's bat activity was variable across MS locations, going undetected at MS4, MS6-MS8, MS12 and MS14.

Median pass rates (Excludes Absences) for Leisler's ranged from 0.1 to 0.5 passes per hour, being relatively higher at MS13 (**Table 15**).

Median activity levels were variable, accounting for **Low-Moderate** (MS1, MS3, MS5, MS11), **Moderate** (MS2, MS9, MS10), and **High** (MS13) activity across MS locations, ranging from the 30th to 88th median percentile, but most frequently accounting for **Low-Moderate** activity between MS locations (**Table 16**).

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[15] Note: current 2024 activity survey data is only indicative of the autumn recording period.

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Maximum activity levels were also variable, accounting for **Low-Moderate** (MS5), **Moderate** (MS1, MS10-MS11), **Moderate-High** (MS2, MS9) and **High** (MS3, MS13) activity across MS locations, ranging from 30th – 100th maximum percentile, but most frequently accounting for **Moderate-High** activity between MS locations (**Table 16**).

In comparison, at comparable MS locations during the autumn 2024 activity survey, Leisler's activity was limited to MS9-MS11. However, both median and maximum activity percentiles ranged from **Moderate** to **High** activity, most frequently accounting for **Moderate** activity. However, caution is advised in interpreting autumn 2024 activity to date due to a deficient reference range (**Table A3.2** in **Annex 3**).

<u>Other Species</u>

Myotis species

Myotis bat activity was recorded at most MS location on-Site, but went undetected at MS4, MS6 and MS12.

Median pass rates (Excludes Absences) for *Myotis* species uniformly accounted for 0.1 passes per hour, per MS location recorded.

Median activity levels uniformly equated to **Low** activity across MS locations at the 4th median percentile.

Maximum activity levels between MS locations ranged from **Low** to **Low-Moderate** activity, ranging from the 4th – 35th percentile, *but* accounting for **Low** activity most frequently.

In comparison, at comparable MS locations during the autumn 2024 activity survey, unidentified *Myotis* species activity was limited to MS9-MS11 and MS14. Activity was recorded at both median and maximum activity percentiles mostly equated to **Low** activity, with the exception of **Low-Moderate** maximum activity at MS13.

However, both Daubenton's and Natterer's *Myotis* species were also identified during autumn 2024. Daubenton's activity was *recorded* at MS5, MS9-MS10 and MS13, and uniformly accounted for **Low** activity at both median and maximum activity percentiles.

Natterer's activity was limited to MS11 and MS13, accounting for **Low** activity at both median and maximum percentiles at MS11, but **Moderate-High** and **High** activity at MS13 respectively. However, caution in advised in interpreting autumn 2024 activity for Natterer's due to a deficient reference range (**Table A3.2** in **Annex 3**).

Brown long-eared

Brown long-eared bat activity was variable across MS locations, going undetected at MS4-MS6, MS10-MS12, and MS14.

Where recorded, median pass rates (Excludes Absences) for brown long-eared bat uniformly accounted for 0.1 passes per hour, per MS location recorded.

Median activity levels uniformly equated to **Moderate** activity across MS locations at the 57th median percentile.

Maximum activity levels between MS locations ranged from **Moderate** to **High** activity, ranging from the 57th – 100th maximum percentile, but most frequently accounted for **Moderate** activity.

In comparison, during the autumn the 2024 activity survey, brown long-eared activity was limited to MS8 and MS12-MS13. Activity recorded at both median and maximum activity percentiles equated to **Moderate** activity for MS8 and MS12, but **Moderate-High** activity relative to MS13. However, caution in advised in interpreting autumn 2024 activity for brown long-eared activity due to a deficient reference range (**Table A3.2** in **Annex 3**).

Analysis per Recording Period

Table 17 presents relative bat activity levels (percentiles) for each species recorded, per individual month comprising seasonal recording periods.

Table 17 - Median and maximum activity percentiles per species, per recording period

Species	Season	Month	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	Spring	May	0	1.5-3	0	1	Low	Low
	Summer	Jul	1	5-11	12	181	Low	Low
		Aug	0	3.5-8.5	1	11	Low	Low
	Autumn	Sep	0	2-5	0	1	Low	Low
		Oct	0	1.5-3	0	1	Low	Low
Soprano pipistrelle	Spring	May	N/A	N/A	N/A	N/A	N/A	N/A
	Summer	Jul	4	9-15	21	198	Low	Low-Moderate
		Aug	0	9-15	7	17	Low	Low
	Autumn	Sep	0	9-12.5	0	4	Low	Low
		Oct	0	9-12.5	8	4	Low	Low
Noctule	Spring	May	37	47-68	75	10	Low-Moderate	Moderate-High
	Summer	Jul	45	47-68	100	129	Moderate	High
		Aug	28	47-68	91	13	Low-Moderate	High
	Autumn	Sep	13	36.5-59.5	28	4	Low	Low-Moderate

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Species	Season	Month	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
		Oct	13	28-45	13	1	Low	Low
Leisler's	Spring	May	N/A	N/A	N/A	N/A	N/A	N/A
	Summer	Jul	57	57-94	100	51	Moderate	High
		Aug	51	57-94	88	4	Moderate	High
	Autumn	Sep	N/A	N/A	N/A	N/A	N/A	N/A
		Oct	N/A	N/A	N/A	N/A	N/A	N/A
Myotis spp.	Spring	May	4	4-4	4	3	Low	Low
	Summer	Jul	4	4-4	35	32	Low	Low-Moderate
		Aug	4	4-4	4	6	Low	Low
	Autumn	Sep	4	4-4	4	6	Low	Low
		Oct	4	4-4	22	3	Low	Low-Moderate
Brown long-eared	Spring	May	N/A	N/A	N/A	N/A	N/A	N/A
	Summer	Jul	57	57-67	100	25	Moderate	High
		Aug	57	57-67	57	4	Moderate	Moderate
	Autumn	Sep	57	57-67	57	1	Moderate	Moderate
		Oct	N/A	N/A	N/A	N/A	N/A	N/A

High Collision Risk Species

Common pipistrelle

Common pipistrelle was recorded on-Site during each recording period.

Relative activity levels between individual months (comprising each seasonal recording period) at the median percentile uniformly *accounted* for **Low** activity at the 0th (May, August-October) or 1st median percentile (July).

Relative activity levels between individual months at the maximum percentile also uniformly accounted for **Low** activity at the 0th (May, September-October), 1st (August) or 12th median percentile (July).

Comparably, relative activity during the autumn (September) 2024 recording period uniformly accounted for **Low** activity at both the median and maximum percentiles (**Table A3.5** in **Annex 3**).

Soprano pipistrelle

Soprano pipistrelle was recorded on-Site during most recording periods but went undetected during May (spring).

Median activity levels between individual months (comprising each seasonal recording period) uniformly accounted for **Low** activity at the 0th (August-October) or 4th median percentile (July).

Maximum activity levels (comprising each seasonal recording period) ranged from **Low** activity (August-October) between the 0th -8th maximum percentiles, and **Low-Moderate** activity (July) at the 21st maximum percentile.

Comparably, relative activity during the autumn (September) 2024 recording period uniformly accounted for **Low** activity at both the median and maximum percentiles (**Table A3.5** in **Annex 3**).

Noctule

Noctule bat was recorded on-Site during each recording period.

Median activity levels between individual months (comprising each seasonal recording period) were variable, ranging from **Low** activity at the 13th percentile (September-October), **Low-Moderate** activity at 37th and 28th percentile (May and August, respectively), and Moderate at the 45th percentile (July).

Maximum activity levels (comprising each seasonal recording period) were also variable, ranging from **Low** (October), **Low-Moderate** (September), **Moderate-High** (May) and High (July-August).

Noctule activity was not recorded on-Site during autumn 2024 activity survey (**Table A3.3** in **Annex 3**).

Leisler's

Leisler's bat activity on-Site was limited to the summer recording period (July-August).

Median activity levels during the summer recording period uniformly accounted for **Moderate** activity at the 57th (July) and 51st (August) median percentile.

Likewise, maximum activity levels during the summer recording period uniformly accounted for **High** activity at the 100th (July) and 88th (August) maximum percentile.

Comparably, relative activity during the autumn (September) 2024 recording period accounted for **Moderate** activity at the median activity percentile, and **High** activity at the maximum percentile (**Table A3.5** in **Annex 3**). However, caution in advised in interpreting autumn 2024 activity due to a deficient reference range (**Table A3.2** in **Annex 3**).

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Other Species

Myotis species

Myotis bat was recorded on-site during each recording period.

Median activity levels between individual months (comprising each seasonal recording period) uniformly accounted for Low activity at the 4th median percentile.

Maximum activity levels (comprising each seasonal recording period) ranged from **Low** activity (May, August-September) at the 4th maximum percentile, and **Low-Moderate** activity (July, October) at the 35th and 22nd maximum percentile, respectively.

Comparably, relative activity during the autumn (September) 2024 recording period for unidentified Myotis species accounted for **Low** activity at the median activity percentile, and **Low-Moderate** activity at the maximum percentile.

Relative activity during the autumn (September) 2024 recording period for Daubenton's bat uniformly accounted for **Low** activity at both the median and maximum percentiles.

Relative activity during the autumn (September) 2024 recording period for Natterer's bat accounted for **Moderate-High** activity at the median activity percentile, and **High** activity at the maximum percentile. However, caution in advised in interpreting autumn 2024 activity due to a deficient reference range (**Table A3.2** in **Annex 3**).

Brown long-eared

Brown long-eared bat was recorded on-site during most recording periods but went undetected during May (spring), and during the month of October.

Median activity levels between individual months detected uniformly accounted for **Moderate** activity at the 57th median percentile

Maximum activity levels between individual months detected was variable, with activity ranging from **Moderate** activity at the 57th percentile (August, September), and **High** activity at the 100th percentile (July).

Comparably, relative activity during the autumn (September) 2024 recording period for brown long-eared bat accounted for **Moderate** activity at the median activity percentile, and **Moderate-High** activity at the maximum percentile. However, caution in advised in interpreting autumn 2024 activity due to a deficient reference range (**Table A3.2** in **Annex 3**).

Emergence Activity

Bat passes recorded throughout the survey effort were assessed via the Ecobat tool, relative to species specific emergence time ranges[16] which might indicate the potential presence of roosts in proximity to each MS location on-site.

Ecobat returned recorded activity within the species-specific emergence times for seven MS locations, collectively relating to a minimum three species (common pipistrelle, soprano pipistrelle and noctule), as detailed in **Table 18.**

Additionally, bat passes indicative of potential emergence activity with the maternity period were recorded at five MS locations relative to common pipistrelle[17].

Comparably, during the autumn 2024 activity survey three call registrations from within a species-specific emergence time were recorded at three separate MS locations (i.e., MS4, MS5 and MS9), relating to common pipistrelle.

Table 18 - Bat activity recorded within species-specific emergence times, per monitoring station (MS)

MS ID	Species / Genus	Nights Recorded	Peak Count	Month of Peak Count
MS2	Common pipistrelle	5	5	July
MS3	Common pipistrelle	1	1	July
MS4	Noctule	2	2	May
MS7	Common pipistrelle	4	1	July/August
MS9	Noctule	2	1	July
MS11	Common pipistrelle	1	2	July
	Soprano pipistrelle	1	20	October
MS13	Noctule	1	2	May

Assessment of the Potential Risks to Bats

Stage 1 – Initial Site Risk Assessment

In accordance with NatureScot guidance (2021), an assessment of the potential risk level of the Proposed Development has been undertaken based on a consideration of both habitat and development-related features detailed in Table 3a of the NatureScot guidance (2021).

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[16] Species-specific emergence time ranges were adapted from *British Bat Calls: A Guide to Species Identification* (Ross, 2012).
[17] Calls indicative of potential emergence within the maternity period as defined by Ecobat, between 15th June – 30th July).

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The values and classification criteria provided within Table 3a of NatureScot guidance (2021) 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 to conclude on the overall risk level for the site. The Site has been assessed as having an 'Initial Site Risk' of **2** representing a **Low** Site Risk:

- the Site 'Habitat Risk' is classified as **'Low'**; and

- the Site 'Project Size' is classified as being **Medium**, comprising a development of **nine** turbines of up to **200** m tip height, with **four** other wind farm developments (three consented and one operational (as presented in **Table 7**) located within 5 km of the Site.

Stage 2 – Overall Risk Assessment

In accordance with NatureScot guidance (2021), Stage 2 should be carried out separately for all HCR species recorded, which includes the following species recorded during bat activity surveys for the Proposed Development:

- common pipistrelle;

- soprano pipistrelle;

- noctule; and

- Leisler's bat.

To derive an 'Overall Risk Assessment' the determined Bat Activity Category derived from the Ecobat assessment tool, is compared against the Site Risk Level (Stage 1) using the matrix presented in Table 3b in NatureScot (2021) to determine the level of Overall Risk.

As calculated using NatureScot (2021) guidance, 'Overall Risk Assessments' for each species recorded on-Site, both spatially and temporally (i.e., where/when recorded)[18], are presented in **Table 19** and **Table 20**.

Common pipistrelle

Overall Risk Assessments per MS location equated to 'Low Risk' when considering both median and maximum activity percentiles.

Overall Risk Assessments per recording period equated to 'Low Risk' when considering both median and maximum activity percentiles.

Likewise, Overall Risk Assessments per MS and for the overall autumn recording period during autumn 2024 activity surveys uniformly equated to 'Low Risk' at both median and maximum activity percentiles (**Table A3.4**; **Table A3.5** in **Annex 3**).

Comparably, where presence was detected in 2024 (excluding MS8 and MS12)[19] activity percentiles were uniformly similar per MS location in accounting for 'Low Risk' relative to activity recorded across the 2021 survey effort.

Likewise, median and maximum activity percentiles for the overall autumn recording periods were comparable between 2021 and 2024, uniformly accounting for 'Low Risk'.

Soprano pipistrelle

Overall Risk Assessments per MS location equated to 'Low Risk' when considering both median and maximum activity percentiles.

Overall Risk Assessments per recording period also equated to 'Low Risk' when considering both median and maximum activity percentiles where recorded (i.e., during summer and autumn months).

Likewise, Overall Risk Assessments per MS and for the overall autumn recording period during autumn 2024 activity surveys uniformly equated to 'Low Risk' at both median and maximum activity percentiles (**Table A3.**4; **Table A3.5** in **Annex 3**).

Comparably, median and maximum activity percentiles were uniformly similar per MS location in accounting for 'Low Risk' relative to activity recorded across the 2021 survey effort, and 2024 survey effort.

Likewise, median and maximum activity percentiles for the overall autumn recording periods were comparable between 2021 and 2024, uniformly accounting for 'Low Risk'.

Noctule

Overall Risk Assessments per MS location ranged from 'Low Risk' to 'Medium Risk' when considering median activity percentiles, but more frequently accounted for 'Low Risk' between MS locations.

Overall Risk Assessments per MS location ranged from 'Low Risk' to 'Medium Risk' when considering maximum activity percentiles, but more frequently accounted for 'Medium Risk' between MS locations.

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[18] Where/when species presence was not recorded, Overall Assessment tables denote 'N/A' where applicable.
[19] Note: presence/absence per MS location for the 2024 survey effort may be subject to change following spring and summer activity surveys; as such, a broad comparison of presence/absence per MS location is not currently possible until the completion of outstanding surveys.

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Overall Risk Assessments per recording period ranged from 'Low Risk' to 'Medium Risk' when considering both median activity percentiles, with months comprising both the spring and autumn recoding periods uniformly accounting for 'Low Risk'. However, months comprising the summer recording period varied, when median activity in July accounting for 'Medium Risk', and August 'Low Risk'.

Overall Risk Assessments per recording period ranged from 'Low Risk' to 'Medium Risk' when considering maximum activity percentiles, with months comprising both the spring and summer recoding periods uniformly accounting for 'Medium Risk'. However, maximum activity during months comprising the autumn recording period varied uniformly accounted for 'Low Risk'.

Noctule activity was not recorded on-Site during autumn 2024 activity surveys (**Table A3.3** in **Annex 3**).

Leisler's

Overall Risk Assessments per MS location ranged from 'Low Risk' to 'Medium Risk' when considering median activity percentiles, being evenly matched between active MS locations.

Overall Risk Assessments per MS location ranged from 'Low Risk' to 'Medium Risk' when considering maximum activity percentiles, but more frequently accounted for 'Medium Risk' between MS locations.

Leisler's activity was limited to months during the summer recording period; Overall Risk Assessments per month were limited to 'Medium Risk' at both median and maximum activity percentiles.

Likewise, Overall Risk Assessments per MS and for the overall autumn recording period during autumn 2024 activity surveys uniformly equated to 'Medium Risk' at both median and maximum activity percentiles (**Table A3.4**; **Table A3.5** in **Annex 23**).

Comparably, where presence was detected in 2024 (i.e., MS9-MS11), activity percentiles were mostly similar per MS location, with the exception of median activity at MS11 accounting for 'Low Risk' based on activity recorded across the 2021 survey effort.

Per recording period, Leisler's bat was not previously recorded during autumn during the 2021 survey effort, in contrast to confirmed presence during the 2024 autumn recording period

Table 19 - Overall Risk Assessment per MS location for both the median and maximum percentiles (Table 3b from NatureScot (2021) guidance). Key: green = Low, Amber = Medium, Red = High

Species	MS ID	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species	MS ID	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	MS1	1st	Low	Low (2)		Common pipistrelle	MS1	2nd	Low	Low (2)
	MS2	2nd	Low	Low (2)			MS2	6th	Low	Low (2)
	MS3	1st	Low	Low (2)			MS3	2nd	Low	Low (2)
	MS4	1st	Low	Low (2)			MS4	11th	Low	Low (2)
	MS5	2nd	Low	Low (2)			MS5	12th	Low	Low (2)
	MS6	1st	Low	Low (2)			MS6	2nd	Low	Low (2)
	MS7	2nd	Low	Low (2)			MS7	11th	Low	Low (2)
	MS8	1st	Low	Low (2)			MS8	10th	Low	Low (2)
	MS9	1st	Low	Low (2)			MS9	9th	Low	Low (2)
	MS10	4th	Low	Low (2)			MS10	11th	Low	Low (2)
	MS11	6th	Low	Low (2)			MS11	11th	Low	Low (2)
	MS12	0th	Low	Low (2)			MS12	0th	Low	Low (2)
	MS13	2nd	Low	Low (2)			MS13	10th	Low	Low (2)
	MS14	0th	Low	Low (2)			MS14	11th	Low	Low (2)
Soprano pipistrelle	MS1	2nd	Low	Low (2)		Soprano pipistrelle	MS1	3rd	Low	Low (2)
	MS2	4th	Low	Low (2)			MS2	10th	Low	Low (2)
	MS3	2nd	Low	Low (2)			MS3	10th	Low	Low (2)
	MS4	1st	Low	Low (2)			MS4	16th	Low	Low (2)
	MS5	9th	Low	Low (2)			MS5	12th	Low	Low (2)
	MS6	3rd	Low	Low (2)			MS6	21st	Low-Moderate	Low (4)
	MS7	5th	Low	Low (2)			MS7	15th	Low	Low (2)
	MS8	1st	Low	Low (2)			MS8	13th	Low	Low (2)
	MS9	4th	Low	Low (2)			MS9	12th	Low	Low (2)
	MS10	10th	Low	Low (2)			MS10	18th	Low	Low (2)
	MS11	9th	Low	Low (2)			MS11	14th	Low	Low (2)
	MS12	1st	Low	Low (2)			MS12	7th	Low	Low (2)
	MS13	4th	Low	Low (2)			MS13	11th	Low	Low (2)
	MS14	1st	Low	Low (2)			MS14	13th	Low	Low (2)
Noctule	MS1	21st	Low-Moderate	Low (4)		Noctule	MS1	75th	Moderate-High	Medium (8)
	MS2	37th	Low-Moderate	Low (4)			MS2	83rd	High	Medium (10)
	MS3	28th	Low-Moderate	Low (4)			MS3	83rd	High	Medium (10)
	MS4	28th	Low-Moderate	Low (4)			MS4	66th	Moderate-High	Medium (8)
	MS5	45th	Moderate	Medium (6)			MS5	71st	Moderate-High	Medium (8)
	MS6	28th	Low-Moderate	Low (4)			MS6	83rd	High	Medium (10)
	MS7	45th	Moderate	Medium (6)			MS7	91st	High	Medium (10)
	MS8	13th	Low	Low (2)			MS8	75th	Moderate-High	Medium (8)
	MS9	45th	Moderate	Medium (6)			MS9	100th	High	Medium (10)
	MS10	45th	Moderate	Medium (6)			MS10	83rd	High	Medium (10)
	MS11	13th	Low	Low (2)			MS11	28th	Low-Moderate	Low (4)
	MS12	N/A	N/A	N/A			Ms12	N/A	N/A	N/A
	MS13	60th	Moderate	Medium (6)			MS13	94th	High	Medium (10)

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Species	MS ID	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species	MS ID	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
	MS14	13th	Low	Low (2)			MS14	13th	Low	Low (2)
Leisler's[20]	MS1	30th	Low-Moderate	Low (4)		Leisler's	MS1	57th	Moderate	Medium (6)
	MS2	57th	Moderate	Medium (6)			MS2	72nd	Moderate-High	Medium (8)
	MS3	30th	Low-Moderate	Low (4)			MS3	88th	High	Medium (10)
	MS4	N/A	N/A	N/A			MS4	N/A	N/A	N/A
	MS5	30th	Low-Moderate	Low (4)			MS5	30th	Low-Moderate	Low (4)
	MS6	N/A	N/A	N/A			MS6	N/A	N/A	N/A
	MS7	N/A	N/A	N/A			MS7	N/A	N/A	N/A
	MS8	N/A	N/A	N/A			MS8	N/A	N/A	N/A
	MS9	44th	Moderate	Medium (8)			MS9	72nd	Moderate-High	Medium (8)
	MS10	57th	Moderate	Medium (8)			MS10	57th	Moderate	Medium (6)
	MS11	30th	Low-Moderate	Low (4)			MS11	57th	Moderate	Medium (6)
	MS12	N/A	N/A	N/A			MS12	N/A	N/A	N/A
	MS13	88th	High	Medium (10)			MS13	100th	High	Medium (10)
	MS14	N/A	N/A	N/A			MS14	N/A	N/A	N/A

[20] Note: the minimum reference range recommended by Ecobat (200 nights of activity) was not reached for Leisler's bat. As such, activity percentiles provided by Ecobat should be treated with caution.

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Table 20 - Overall Risk Assessment per month for both the median and maximum percentiles (Table 3b from SNH (2021) guidance). Key: green = Low, Amber = Medium, Red = High

Species	Season	Month	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species	Season	Month	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	Spring	May	0th	Low	Low (4)		Common pipistrelle	Spring	May	0th	Low	Low (4)
	Summer	July	1st	Low	Low (4)			Summer	July	12th	Low	Low (4)
		Aug	0th	Low	Low (4)				Aug	1st	Low	Low (4)
	Autumn	Sep	0th	Low	Low (4)			Autumn	Sep	0th	Low	Low (4)
		Oct	0th	Low	Low (4)				Oct	0th	Low	Low (4)
Soprano pipistrelle	Spring	May	N/A	N/A	N/A		Soprano pipistrelle	Spring	May	N/A	N/A	N/A
	Summer	July	4th	Low	Low (2)			Summer	July	21st	Low-Moderate	Low (4)
		Aug	0th	Low	Low (2)				Aug	7th	Low	Low (2)
	Autumn	Sep	0th	Low	Low (2)			Autumn	Sep	0th	Low	Low (2)
		Oct	0th	Low	Low (2)				Oct	8th	Low	Low (2)
Noctule	Spring	May	37th	Low-Moderate	Low (4)		Noctule	Spring	May	75th	Moderate-High	Medium (8)
	Summer	July	45th	Moderate	Medium (6)			Summer	July	100th	High	Medium (10)
		Aug	28th	Low-Moderate	Low (4)				Aug	91st	High	Medium (10)
	Autumn	Sep	13th	Low	Low (2)			Autumn	Sep	28th	Low-Moderate	Low (4)
		Oct	13th	Low	Low (2)				Oct	13th	Low	Low (2)
Leisler's	Spring	May	N/A	N/A	N/A		Leisler's	Spring	May	N/A	N/A	N/A
	Summer	July	57th	Moderate	Medium (6)			Summer	July	100th	High	Medium (10)
		Aug	51st	Moderate	Medium (6)				Aug	88th	High	Medium (10)
	Autumn	Sep	N/A	N/A	N/A			Autumn	Sep	N/A	N/A	N/A
		Oct	N/A	N/A	N/A				Oct	N/A	N/A	N/A

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Annex 1 - Scientific Names

Table A1-1 provides common and scientific names of bat species included in this Technical Appendix, and within **Chapter 7: Ecology**.

Table A1-1 – Bat Names

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

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Annex 2 - Survey Weather Conditions

Table A2-1 - Weather conditions for bat activity survey periods. Those values in red font represent less suitable weather conditions for bats

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
11/05/2021	**6.1**	0	0.0
12/05/2021	**7.3**	0	0.8
13/05/2021	9	0	0.0
14/05/2021	20.9	0	0.0
15/05/2021	20.3	0	0.0
16/05/2021	22.6	0	0.0
17/05/2021	**4.8**	0	0.0
18/05/2021	**7.2**	0	0.1
19/05/2021	8.2	0	0.0
20/05/2021	**7.6**	0.25	0.3
21/05/2021	**4.6**	0	0.4
22/05/2021	**2.9**	0	0.0
23/05/2021	**4.7**	0	0.0
11/07/2021	13.9	0	0.4
12/07/2021	12.8	0	0.4
13/07/2021	13.4	0	1.1
14/07/2021	14.3	0	0.5
15/07/2021	14.8	0	0.8
16/07/2021	16.4	0	0.8
17/07/2021	16.5	0	0.3
18/07/2021	14.3	0	0.5
19/07/2021	14.4	0	0.8
20/07/2021	14.1	0	0.4
21/07/2021	16.3	0	0.4
22/07/2021	14.5	0	0.0
23/07/2021	25.5	0	0.0
24/07/2021	26.9	0	0.0
25/07/2021	27.4	0	0.0
26/07/2021	26.4	0	0.0
27/07/2021	24.9	0	0.0
28/07/2021	11.4	0	0.0
29/07/2021	12.5	0	0.0
30/07/2021	13.6	0	0.0
31/07/2021	10.2	0	0.0
01/08/2021	10.9	0	0.9
02/08/2021	8.8	0	0.0
24/09/2021	14.3	0	0.1
25/09/2021	14.8	0.51	0.1
26/09/2021	14.1	1.27	0.0
27/09/2021	8.3	0	0.1
28/09/2021	8.8	0	0.1

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Date	Temp at Dusk (ºC)	Rainfall (mm)	Maximum Wind Speed (m/s)
29/09/2021	**7.2**	0	0.1
30/09/2021	11.2	0	0.0
01/10/2021	7.2	0	0.1
02/10/2021	8.2	0	0.0
03/10/2021	8.9	0	0.9
04/10/2021	**7.1**	0	0.0

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Annex 3 - Automated Activity Surveys (Autumn 2024)

A3-1 - Deployment duration of monitoring stations (MSs) during the autumn 2024 period

Recording Period	Recording Location	Period Start	Period End	Deployment Duration (No. of Nights)
Autumn	MS4	14/09/2024	28/09/2024	14
	MS5	14/09/2024	28/09/2024	14
	MS6[21]	Failed	Failed	0
	MS8	14/09/2024	28/09/2024	14
	MS9	14/09/2024	28/09/2024	14
	MS10	14/09/2024	28/09/2024	14
	MS11	14/09/2024	28/09/2024	14
	MS12	14/09/2024	28/09/2024	14
	MS13	14/09/2024	28/09/2024	14
	MS14	14/09/2024	28/09/2024	14

A3-2 - Reference range sample size per species for Ecobat relative activity level outputs (autumn 2024)

Recorded Species	Reference Range[22]
Common pipistrelle	24481
Soprano pipistrelle	27077
Pipistrellus spp.	2
Leisler's	4
Daubenton's	550
Natterer's	124
Myotis spp.	1127
Brown long-eared	114

A3-3 - Total number/percentage of bat passes and recording frequency per species (autumn 2024)

Species / Genus	No. Nights Bats Recorded	Percentage Nights Bats Recorded[23]	Passes (No.)	Percentage (%)
Common pipistrelle	21	16.7	35	15.3
Soprano pipistrelle	45	35.7	128	55.9
Pipistrellus spp.	1	0.8	2	0.9
Leisler's	3	2.4	4	1.7
Daubenton's	4	3.2	4	1.7
Natterer's	11	8.7	21	13.5
Myotis species	12	9.5	17	7.4
Brown long-eared	6	4.8	8	3.5
		Total	229	100.0

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[21]MS6 failed to record during the autumn 2024 activity survey due to technical error.

[22]Note: the minimum reference range recommended by Ecobat (200 nights of activity) is not currently achievable for Pipistrellus species, Leisler's bat, Natterer's bat and brown long-eared bat. As such, activity percentiles provided by Ecobat should be treated with caution.

[23]Percentage of nights bats were recorded within out of a possible 126 cumulate nights between MS locations.

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Table A3-4 - Overall Risk Assessment per MS location for both the median and maximum percentiles during autumn 2024 (Table 3b from NatureScot (2021) guidance). Key: green = Low, Amber = Medium, Red = High

Species	MS ID	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)	Species	MS ID	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	MS4	0th	Low	Low (2)	Common pipistrelle	MS4	0th	Low	Low (2)
	MS5	0th	Low	Low (2)		MS5	0th	Low	Low (2)
	MS8	N/A	N/A	N/A		MS8	N/A	N/A	N/A
	MS9	0th	Low	Low (2)		MS9	0th	Low	Low (2)
	MS10	0th	Low	Low (2)		MS10	0th	Low	Low (2)
	MS11	0th	Low	Low (2)		MS11	0th	Low	Low (2)
	MS12	N/A	N/A	N/A		MS12	N/A	N/A	N/A
	MS13	0th	Low	Low (2)		MS13	0th	Low	Low (2)
	MS14	0th	Low	Low (2)		MS14	0th	Low	Low (2)
Soprano pipistrelle	MS4	0th	Low	Low (2)	Soprano pipistrelle	MS4	0th	Low	Low (2)
	MS5	0th	Low	Low (2)		MS5	2nd	Low	Low (2)
	MS8	0th	Low	Low (2)		MS8	2nd	Low	Low (2)
	MS9	0th	Low	Low (2)		MS9	1st	Low	Low (2)
	MS10	0th	Low	Low (2)		MS10	0th	Low	Low (2)
	MS11	1st	Low	Low (2)		MS11	3rd	Low	Low (2)
	MS12	0th	Low	Low (2)		MS12	0th	Low	Low (2)
	MS13	0th	Low	Low (2)		MS13	0th	Low	Low (2)
	MS14	0th	Low	Low (2)		MS14	0th	Low	Low (2)
Leisler's[24]	MS4	N/A	N/A	N/A	Leisler's	MS4	N/A	N/A	N/A
	MS5	N/A	N/A	N/A		MS5	N/A	N/A	N/A
	MS8	N/A	N/A	N/A		MS8	N/A	N/A	N/A
	MS9	50th	Moderate	Medium (6)		MS9	50th	Moderate	Medium (6)
	MS10	50th	Moderate	Medium (6)		MS10	50th	Moderate	Medium (6)
	MS11	100th	High	Medium (10)		MS11	100th	High	Medium (10)
	MS12	N/A	N/A	N/A		MS12	N/A	N/A	N/A
	MS13	N/A	N/A	N/A		MS13	N/A	N/A	N/A
	MS14	N/A	N/A	N/A		MS14	N/A	N/A	N/A

[24] Reference range substantially below required number (200 nights of activity); as such, activity percentiles and overall risk assessment results should be treated with caution. 2024 activity survey data is only indicative of the autumn recording period.

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**Table A3-5 - Overall Risk Assessment for the overall autumn 2024 survey period, for both the median and maximum percentiles (Table 3b from SNH (2021) guidance).
Key: green = Low, Amber = Medium, Red = High**

Season	Species	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Season	Species	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Autumm	Common pipistrelle	0th	Low	Low (2)		Autumn	Common pipistrelle	0th	Low	Low (2)
	Soprano pipistrelle	0th	Low	Low (2)			Soprano pipistrelle	3rd	Low	Low (2)
	Leisler's	50th	Moderate	Medium (6)			Leisler's	100th	High	Medium (10)

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Annex 4 – Ecobat Output

Available electronically - hard copy available on request

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