Glentarken Wind Farm

Bat Survey Report

Technical Appendix 7.3

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1 INTRODUCTION

MacArthur Green was commissioned by the Applicant to carry out bat surveys at the proposed Glentarken Wind Farm located near Lochearnhead, Perth and Kinross, (hereafter referred to as the 'Proposed Development').

Bat surveys included:

- Desk-based assessment;
- A Preliminary Roost Assessment for Bats (PRA) (2023 & 2024); and
- Automated activity surveys (2023).

The aim of the surveys was to quantify the Proposed Development usage by bats and variation in bat activity levels within the Site and to inform the ecological impact assessment for the Glentarken Wind Farm Environmental Impact Assessment Report (EIAR).

2 THE PROPOSED DEVELOPMENT AND SURVEY AREA

The Proposed Development is located approximately 2.8 km east of Lochearnhead. The Site comprises an area of approximately 1,103 hectares (ha). The Proposed Development is set within grazed open moorland, heathland and areas of young commercial forestry from the recent Ardveich planting scheme. There are several minor watercourses on and around the Site and a small number of lochans. The Proposed Development is fully described within **Chapter 2: Project Description** (**EIAR Volume 1**).

The Proposed Development does not overlap with any statutory designated sites containing bat related qualifying features and interests.

The temporal (Anabat) Survey Area covered the wind turbine infrastructure area within the Site and consisted of 12 Anabat deployment locations as shown in **Figure 7.10** (**EIAR Volume 2**). The PRA Survey Area covered a wider extent than the Site, see **Figure 7.10** (**EIAR Volume 2**).

The PRA Survey Area covered during the June 2023 survey for the Proposed Development was the main Site and the access track, with an additional survey in June 2024 due to a gap created from a design iteration, see **Figure 7.10** (**EIAR Volume 2**).

3 BATS AND WIND FARMS

3.1 Policy and Guidance

All bat species are protected under the following legislation:

- The Habitats Directive 92/43/EEC (as amended);
- The Wildlife and Countryside Act 1981 (as amended); and
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Details pertaining to the legal status of bats are included within **Annex A** and in **Table A-1**.

In the UK and Europe, guidelines have been produced with regards to assessing the ecological impact upon bats from wind farm developments. These guidelines help to inform survey and mitigation strategies.

The following guidance documents have been used in the preparation of this report:

- Collins, J. (ed) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines*. 3rd Edition. The Bat Conservation Trust, London[1];
- Collins, J. (ed.) (2023). *Bat Surveys for Professional Ecologists: Good Practice Guidelines*. 4th Edition. The Bat Conservation Trust, London;
- Andrews, H. (2018) *Bat Roosts in Trees: a guide for identification and assessment for tree-care and ecology professionals*. Pelagic Publishing, Exeter;
- Reason, P.F. and Wray, S. (2023). *UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats*. Chartered Institute of Ecology and Environmental Management, Ampfield;
- Russ, J. (2012) *British Bat Calls, A Guide to Species Identification*, Pelagic Publishing, Exeter; and
- NatureScot, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & the Bat Conservation Trust (BCT). (2021). *Bats and Onshore Wind Turbines: Survey Assessment and Mitigation*.

4 METHODS

4.1 Desk-Based Assessment

A desk-based assessment was undertaken with regards to the presence of bat species within the Site and its environs.

A National Biodiversity Network (NBN)[2] Atlas Scotland search was completed to obtain bat records from 2009 to 2024 within 10 km of the Proposed Development.

4.2 Field Survey Methods

4.2.1 Preliminary Bat Roost Assessment

The PRA followed the assessment methodology as set out in Collins (2016)[1] and Collins (2023) to identify any Potential Roost Features (PRFs) in trees, buildings and structures, which could support roosting bats and to search for evidence of roosting bats. Where PRFs were identified in 2023, they were assigned a value of low, moderate or high suitability which indicates the likelihood of bats being present and informs the requirement for further survey work, such as a climbing inspection and/or dusk and dawn bat activity surveys. Collins (2016), state the following descriptions for assessing PRFs:

[1] Methods and analysis followed the 3rd edition of the Bat Conservation Trust survey guidelines as surveys in 2023 were completed before the 4th edition guidelines were published in September 2023.
[2] NBN Atlas occurrence download at https://nbnatlas.org (accessed on 04 January 2024).

- Negligible – Negligible habitat features on site to be used by roosting bats.
- Low – A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[3] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e., unlikely to be suitable for maternity or hibernation[4]).

  A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential[5].
- Moderate – A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[3] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
- High – A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions[3] and surrounding habitat.

For the 2024 surveys, Collins (2023), state the following descriptions for assessing PRFs recorded in trees:

- PRF-I – PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats.
- PRF-M – PRF is suitable for multiple bats and may therefore be used by a maternity colony.

The PRA was carried out within the survey areas in 2023 and 2024, as shown in **Figure 7.10** (**EIAR Volume 2**).

4.2.2 Automated Activity Surveys

NatureScot *et al.* (2021) recommends that, "*Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments.*"

The Proposed Development layout at the time of survey in 2023 comprised 18 proposed turbines. An 18-turbine Site would therefore require 12 locations to be sampled. The Proposed Development now consists of a reduced 12 turbine layout, and as such the required number of sampling locations to meet minimum guidance standards would be ten survey locations. The 12 detectors were located at potential turbine locations across the Site, deployed seasonally (three deployment

[3] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

[4] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.

[5] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

periods) from May to September. NatureScot *et al.* (2021) also recommends a minimum of ten consecutive nights of sampling per seasonal deployment. Detector locations are shown in **Figure 7.10** (**EIAR Volume 2**).

Anabat Swift detectors recording full-spectrum files were deployed for a minimum period of 14 consecutive nights across the Site (i.e., exceeding minimum survey requirements of ten days per season; spring April - May, summer June - mid-August; autumn mid-August - October) and were positioned at a height of 2 m above ground level. Each detector recorded bats from dusk to dawn with detectors starting 30 minutes before dusk and finishing 30 minutes after dawn. Detector operating times and a description of the habitat type at each location is shown in **Table B-1** of **Annex B**.

Full spectrum detectors were deployed with the following settings:

- Sensitively value of 14;
- Minimum frequency of 15 kHz;
- Maximum frequency of 250 kHz;
- Maximum file length of 15 s;
- Minimum event of -2 ms; and
- Sampling rate of 320 kHz.

Data was analysed using Kaleidoscope Pro Auto ID classifier which assigns a species label to a sound file (Reason *et al.* 2016). To ensure that all bat calls (with the exception of common and soprano pipistrelle which were excluded) were identified correctly by the software, they were manually reviewed by an appropriately trained ecologist using Kaleidoscope software (Pro and Viewer). This method of analysis is in line with current guidelines for data analysis which recommends the manual checking of all non-*Pipistrellus* calls (excluding Nathusius' pipistrelle) when using automated methods (Collins, 2023). Sound files labelled as noise were also reviewed. Guidance on call parameters was taken from Russ (2012).

At the time of preparing this report (September 2024), the secure online tool Ecobat (Mammal Society, 2017) was not available and therefore alternative quantitative methods were used to assess bat activity levels (described below).

4.3 Methods for Analysing Bat Activity Levels and Risks

NatureScot *et al.* (2021) details the methodology for analysing bat activity levels. This method is summarised below and involves the following modified steps (due to Ecobat being offline at the time of reporting):

1. Calculating bat passes per hour (bpph) for Bat Activity Level;
2. Categorising collision risk of the relevant species;
3. Identifying population relevant abundance (size of the populations);

4. Categorising the potential vulnerability of bat populations by combining collision risk with population abundance;
5. Categorising the Site risk level; and
6. An assessment of significance and mitigation.

The following sections outline the methods used in each step.

4.3.1 Step 1: Calculating Bat Passes Per Hour

To generate a bat activity index value and allow a comparison between locations, species and seasons, the number of bpph was calculated. This method refers to the number of bat passes as opposed to the number of individual bats recorded, as it is not possible to definitively identify individual bats and the total number of individual bats present. The data analysis did not include any noise files. The bpph is used to provide a quantitative measure of bat activity across the Site.

4.3.2 Step 2: Vulnerability to Collision

Appendix 3 of NatureScot *et al.* (2021) presents a generic assessment of vulnerability to collision for UK species, based on species behaviour, flight characteristics and casualties in the UK and Europe. **Table 4-1** provides a summary of the vulnerability of each bat species to collision.

Table 4-1: Vulnerability of Bat Species to Turbine Impact in the UK

Risk of Turbine Impact (Collision Risk)		
Low Risk	**Medium Risk**	**High Risk**
Myotis spp.	Serotine	Common pipistrelle
Long-eared bats	Barbastelle	Soprano pipistrelle
Horseshoe bats		Noctule
		Leisler's bat
		Nathusius' pipistrelle

Habitat characteristics at the location of turbines can have an important influence on the vulnerability of bat species to collision. For example, proximity to key feeding sites and commuting routes such as water features and woodland edge habitats is known to increase the likelihood of bat collision (NatureScot *et al.* (2021)).

4.3.3 Step 3: Population Relative Abundance

NatureScot *et al.* (2021) details the sensitivity of a bat species to impact based on their population's relative abundance in Scotland as detailed in **Table 4-2**. Species with the rarest relative abundance are more susceptible to significant effects.

Table 4-2: Population Relative Abundance of Bats in Scotland

Relative Abundance	Species
Common	Common pipistrelle (*Pipistrellus pipistrellus*)
	Soprano pipistrelle (*Pipistrellus pygmaeus*)

Relative Abundance	Species
Rarer	Brown long-eared bat (*Plecotus auritus*)
	Daubenton's bat (*Myotis daubentonii*)
	Natterer's bat (*Myotis nattereri*)
Rarest	Whiskered bat (*Myotis mystacinus*)
	Brandt's bat (*Myotis brandtii*)
	Nathusius' pipistrelle (*Pipistrellus nathusii*)
	Noctule bat (*Nyctalus noctule*)
	Leisler's bat (*Nyctalus leisleri*)

4.3.4 Step 4: Potential Vulnerability of Bat Populations

Table 4-3 below, sourced from NatureScot *et al.* (2021), uses the measure of collision risk, in combination with population relative abundance, to indicate the potential vulnerability of populations of British bat species. The overall potential vulnerability of bat populations is identified as: low (yellow), medium (orange), high (red).

Table 4-3: Level of Potential Vulnerability of Populations of British Bat Species

Relative Abundance of Bats in Scotland	Collision Risk		
	Low collision risk	Medium collision risk	High collision risk
Common species			Common pipistrelle Soprano pipistrelle
Rarer species	Brown long-eared bat Daubenton's bat Natterer's bat		
Rarest species	Whiskered bat Brandt's bat		Nathusius' pipistrelle Noctule bat Leisler's bat

4.3.5 Step 5: Categorise the Site Risk Level

The Site risk level is categorised through a combination of habitat risk and project size which is then entered into the table matrix as shown below in

Table 4-4 to calculate the overall Site risk level. The full matrix table, as provided within NatureScot *et al.* (2021), is shown in **Annex C** of this report which includes descriptions on how to determine the habitat risk and project size for the Proposed Development.

Table 4-4: Initial Site Risk Level (1-5) Assessment

Habitat Risk	Project Size		
	Small	Medium	Large
Low	1	2	3
Moderate	2	3	4
High	3	4	5

Key: Green (1-2) – low/lowest site risk; Amber (3) – medium site risk; Red (4-5) – high/highest site risk[6]

4.3.6 Step 6: Assessment of Significance and Mitigation

The outputs of the bpph detailed in Step 1 above are then used to assess the significance of effect within the EIAR. At this stage, other Site-specific factors should be considered such as habitat characteristics (and how they may change), behaviour of species at the Proposed Development, and location of the Proposed Development regarding the natural range of the species and how this could affect favourable conservation status.

Mitigation measures as detailed within section 7.1 of NatureScot *et al.* (2021) are then considered where appropriate.

5 BAT SURVEY LIMITATIONS

NatureScot *et al.* (2021) guidance recommends the minimum level of pre-application survey required for ground level static detectors to be ten nights of recordings in each of spring (April - May), summer (June to mid-August) and autumn (mid-August - October). In Scotland, due to unfavourable weather conditions and low activity levels for bats in April, ground-level automated activity surveys commenced in May and were completed in September by MacArthur Green.

Automated activity surveys should capture a sufficient number of nights (minimum of ten nights) with appropriate weather conditions for bat activity (i.e., temperatures at or above of 8 °C in Scotland at dusk, maximum ground level wind speed of 5 m/s and no, or only very light, rainfall) (NatureScot *et al*, 2021). To account for the potential limitations of weather on the number of suitable nights recorded, surveys were carried out over longer deployment periods, with a minimum of 14 nights recorded.

Due to unforeseen errors with the detectors, microphones or batteries, it was not always possible to achieve 14 consecutive nights of recordings. However, only one detector failed to record data for the minimum ten nights during a deployment period (Location 2 in May), with this location recording zero nights. Two detectors had fallen (Location 6 in May and Location 1 in July) but had still recorded for the full 14 nights. As the majority of locations recorded for more than ten nights, and with more detectors deployed than required (12 deployed versus the ten required by the guidance for a development of this size), and with a total of 490 complete nights recorded, this is significantly more than the minimum number of nights required (i.e., 10 Anabats*10 nights*3

[6] Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

seasonal deployments = 300 nights of data) required for the Proposed Development. The survey timings can be seen in **Annex B, Table B-1.**

Anabat detectors are a commonly used bat detector for acoustic monitoring at wind farm sites, however all bat detectors have limitations and will only monitor bat activity within a limited area, which for Anabats is usually around 30 m, depending on a variety of environmental factors. Furthermore, due to passive monitoring methodologies depending on sound reaching the microphone, the detection rate of bat calls varies with a bias towards loud bat calls with quieter calls, namely brown long-eared bats (low collision risk species), potentially being under-recorded.

6 SURVEY RESULTS & ANALYSIS

6.1 Desk-Based Assessment

The NBN Atlas data search[2] returned records of the following bat species within 10 km of the Proposed Development between 2009 - 2024 inclusive:

- Daubenton's;
- Common pipistrelle;
- Soprano pipistrelle; and
- Brown long-eared bat.

Details regarding licences and data providers for these records are included in **Table 6-1** below.

Table 6-1 Data Providers for NBN Atlas Scotland Records Used

Species	Data Provider (Recorder)	Licence
Daubenton's	Bat Conservation Trust (BCT)	OGL[7]
Common pipistrelle	Wild Surveys Ltd & Nocturne Environmental Surveyors Ltd NatureScot (Emilie Wadsworth)	CC-BY[8] OGL[7]
Soprano pipistrelle	Wild Surveys Ltd	CC-BY[8]
Pipistrelle spp.	National Trust for Scotland (Helen Cole & Lindsay McKerral)	CC-BY[8]
Brown long-eared bat	Wild Surveys Ltd & Nocturne Environmental Surveyors Ltd	CC-BY[8]

6.2 Preliminary Bat Roost Assessment

The PRA survey for the Proposed Development was undertaken by MacArthur Green in June 2023. Additional surveys in June 2024 were conducted in the access track area around Ardveich. Associated Moderate PRF records are shown in **Figure 7.10** (EIAR Volume 2) with the detailed results (target notes) listed in **Annex D, Table D-1.**

[7] Open Government Licence (OGL) https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/. [Accessed September 2024].

[8] Creative Commons with Attribution 4.0 (CC-BY) https://creativecommons.org/licenses/by/4.0/. [Accessed September 2024]

There was a total of ten features recorded with low to moderate potential suitability for roosting bats in 2023. All these features were located along the track (six moderate and four low potential), the moderate potential features are located beyond 30 m of planned infrastructure or access track, except one moderate feature that is within 20 m of the access track (alder (*Alnus glutinosa*) tree).

No features with moderate suitability for roosting bats were recorded within 200 m plus rotor radius of a proposed wind turbine location and as such no further surveys were required.

6.3 Automated Activity Surveys

MacArthur Green deployed detectors at 12 locations at the Site from May to September in 2023 over a total period of 42 days and collecting 490 complete recording nights of data, see **Table B-1** of **Annex B** and **Figure 7.10** (EIAR Volume 2).

A total of seven bat species were recorded at these locations. The total number of bat passes recorded for each species across all the detectors within the Site are shown below in **Table 6-2.**

Table 6-2 Total Number of Bat Passes for Each Species Across all Locations

Species/Species Group	No. of Registrations	Percentage of total (%)
Soprano pipistrelle	515	52.77
Common pipistrelle	338	34.63
Noctule	22	2.25
Leisler's	6	0.61
Daubenton's	64	6.56
Natterer's	10	1.02
Brown long-eared	21	2.15
Total	**976**	**99.99**[9]

The summarised results and analysis are presented in Steps 1 – 6 below.

6.3.1 Step 1: Bat Activity Levels (using bpph)

Bat Activity Levels Across the Site and Through the Seasons

Data on the activity levels for all species across the Site and through the seasons is provided in **Table E-1** of **Annex E.** Professional judgement was used to assess the Site risk.

The bpph for each bat species found at each location across the three Visits are shown in **Table 6-3**[10]**;** see also **Figures 7.11 - 7.13** (EIAR Volume 2) in relation to high collision risk species. There are several bat species that were not recorded over the deployment period at several of the locations.

Table 6-3 Bat Passes per Hour for Each Species Across all Locations and Visits

[9] Due to rounding of the percentages per species, the 'Total' percentage may not be exactly 100%.
[10] N.B. In **Table 6-3** *Myotis* species have been combined as they are considered low collision risk species.

Common pipistrelle			
	Visit 1 bpph	Visit 2 bpph	Visit 3 bpph
Location 1	0.00	0.02	0.17
Location 2	-	0.02	0.14
Location 3	0.00	0.03	0.23
Location 4	0.78	0.04	0.25
Location 5	0.00	0.00	0.07
Location 6	0.00	0.00	0.07
Location 7	0.00	0.04	0.05
Location 8	0.00	0.02	0.01
Location 9	0.00	0.01	0.01
Location 10	0.01	0.00	0.16
Location 11	0.00	0.02	0.20
Location 12	0.00	0.01	0.03
Soprano pipistrelle			
	Visit 1 bpph	**Visit 2 bpph**	**Visit 3 bpph**
Location 1	0.01	0.01	0.25
Location 2	-	0.00	0.28
Location 3	0.00	0.05	0.23
Location 4	1.42	0.02	0.51
Location 5	0.00	0.01	0.20
Location 6	0.00	0.02	0.07
Location 7	0.01	0.00	0.12
Location 8	0.00	0.00	0.06
Location 9	0.00	0.00	0.01
Location 10	0.00	0.00	0.17
Location 11	0.00	0.02	0.12
Location 12	0.00	0.00	0.04
***Nyctalus* spp.**			
	Visit 1 bpph	**Visit 2 bpph**	**Visit 3 bpph**
Location 1	0.00	0.00	0.00
Location 2	-	0.00	0.00
Location 3	0.00	0.00	0.00
Location 4	0.19	0.01	0.00
Location 5	0.00	0.00	0.01
Location 6	0.00	0.00	0.00

Common pipistrelle			
Location 7	0.00	0.00	0.01
Location 8	0.00	0.00	0.01
Location 9	0.00	0.00	0.00
Location 10	0.00	0.00	0.00
Location 11	0.00	0.00	0.00
Location 12	0.00	0.00	0.00
Brown long-eared			
	Visit 1 bpph	**Visit 2 bpph**	**Visit 3 bpph**
Location 1	0.00	0.00	0.01
Location 2	-	0.00	0.01
Location 3	0.00	0.00	0.01
Location 4	0.09	0.00	0.01
Location 5	0.00	0.00	0.01
Location 6	0.00	0.00	0.00
Location 7	0.00	0.00	0.00
Location 8	0.00	0.00	0.00
Location 9	0.00	0.00	0.01
Location 10	0.00	0.00	0.01
Location 11	0.00	0.00	0.00
Location 12	0.00	0.00	0.00
***Myotis* spp.**			
	Visit 1 bpph	**Visit 2 bpph**	**Visit 3 bpph**
Location 1	0.00	0.00	0.10
Location 2	-	0.00	0.01
Location 3	0.00	0.00	0.02
Location 4	0.21	0.01	0.04
Location 5	0.00	0.00	0.02
Location 6	0.00	0.00	0.01
Location 7	0.00	0.00	0.01
Location 8	0.00	0.00	0.00
Location 9	0.00	0.01	0.01
Location 10	0.00	0.00	0.04
Location 11	0.00	0.00	0.01
Location 12	0.00	0.00	0.01

Site Activity Levels

Throughout the survey period, for all species, the 31/08/2023, 26/05/2023 and 02/09/2023 recorded the highest total bat passes across all 12 detectors: 195, 95 and 86 respectively.

Overall, the highest total bpph (1.42 bpph) was recorded during Visit 1 at Location 4 for soprano pipistrelle.

During Visit 1, the maximum bpph for all species was at Location 4 with 2.68 bpph, followed by very low activity at Locations 1, 7 and 10 with 0.01 bpph (**Chart 6-1**). However, Locations 3, 5, 6, 8, 9, 11 and 12 recorded no bat species and Location 2 had detector issues so did not recorded during this Visit. All locations were within open moorland, with Location 9 being located within 65 m of Locahn na Creige Ruaidhe and Location 6 being located within 130 m of Loch Eas Domhain. Bats are known to use watercourse/bodies for foraging opportunities. Over all Locations during Visit 1, the bat species with the maximum bpph was soprano pipistrelle with 1.42 bpph, at Location 4. There was a total of 317 bat passes during Visit 1.

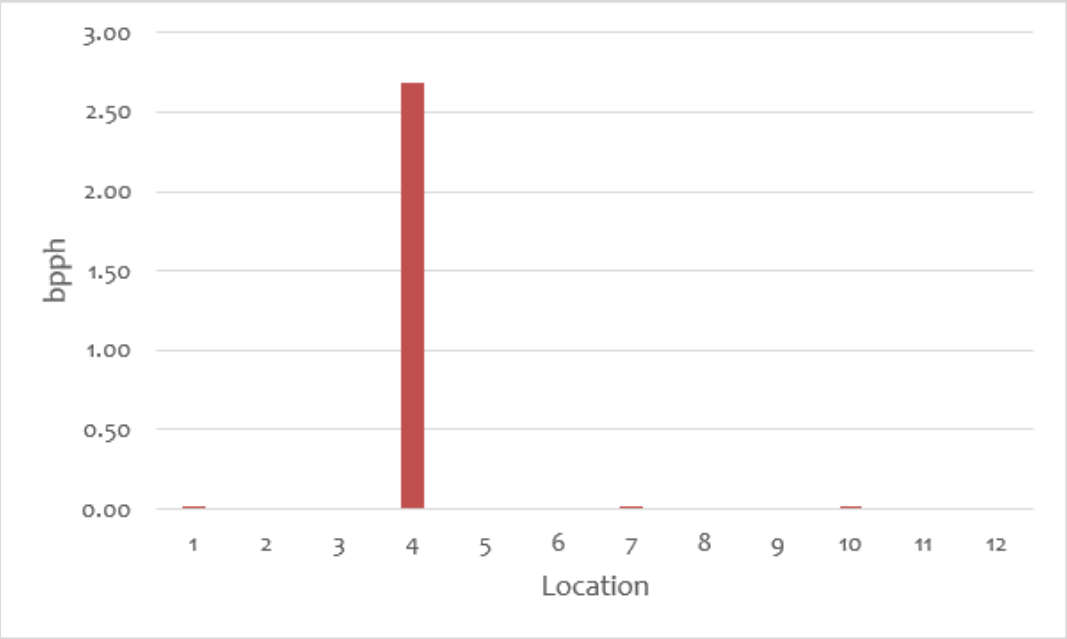

Chart 6-1: Visit 1 Bat Passes Per Hour at each Location

During Visit 2, the maximum bpph for all species was at Locations 3 and 4 with 0.07 bpph, followed by very low activity at Locations 5 and 12 with 0.07 bpph (**Chart 6-2**). However, Location 10 recorded no bat species. Over all Locations during Visit 2, the bat species with the maximum bpph was soprano pipistrelle with 0.05 bpph, at Location 3 (**Table 6-3**). There was a total of 37 bat passes during Visit 2.

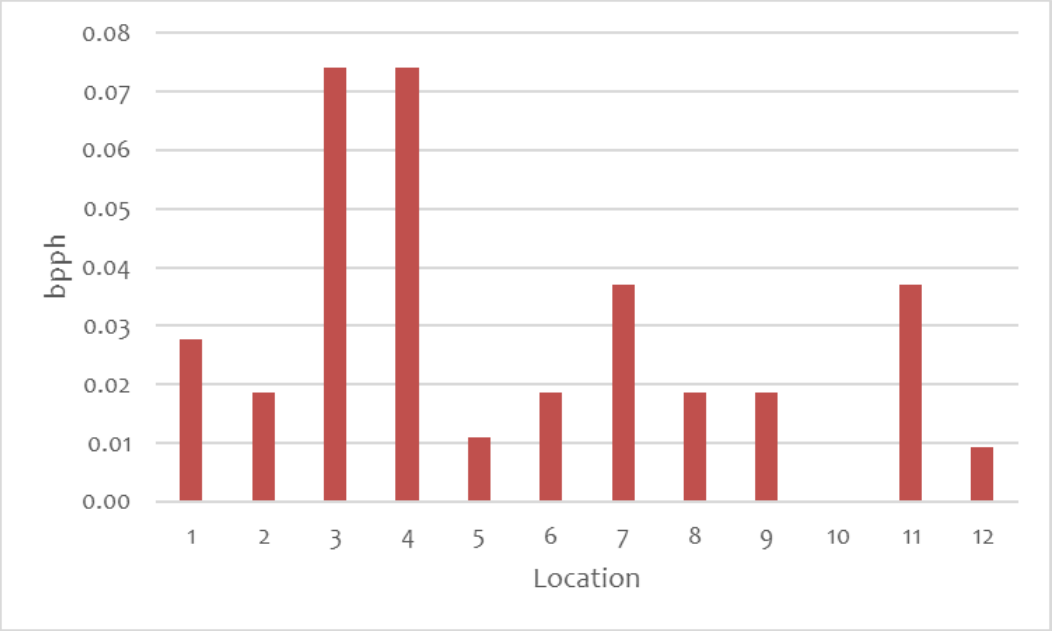

Chart 6-2: Visit 2 Bat Passes Per Hour at each Location

During Visit 3, the maximum bpph for all species was at Location 4 with 0.80 bpph, followed by very low activity at Location 9 with 0.04 bpph (**Chart 6-3**). Over all Locations during Visit 3, the bat species with the maximum bpph was soprano pipistrelle with 0.51 bpph, at Location 4. There was a total of 622 bat passes during Visit 3.

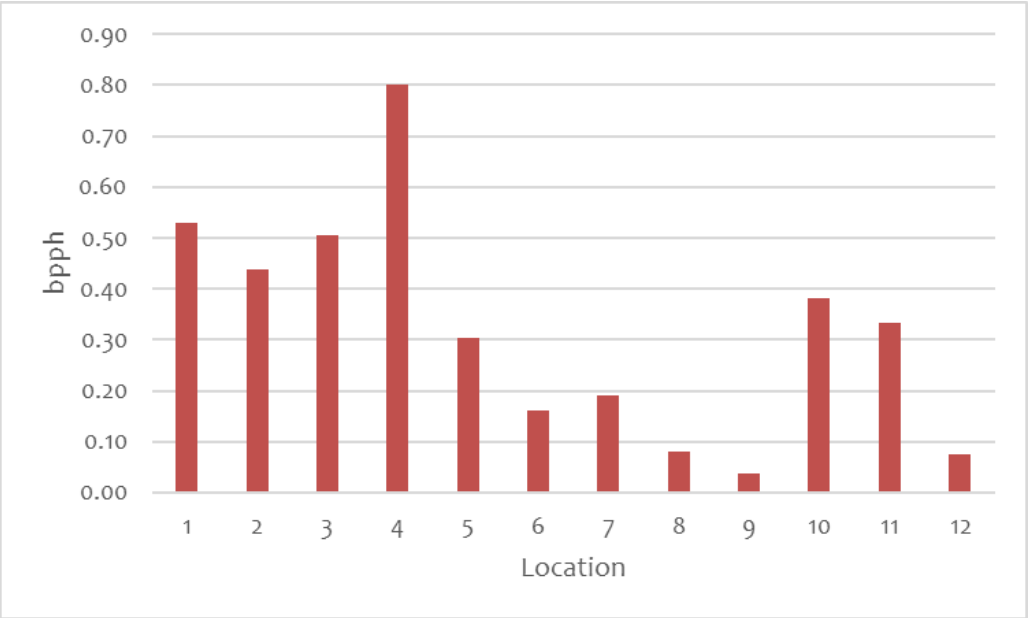

Chart 6-3: Visit 3 Bat Passes Per Hour at each Location

6.3.2 Step 2, 3 and 4: Collision Risk, Population Relative Abundance and Potential Vulnerability

Table 6-4 details the collision risk, population relative abundance and potential vulnerability of the bat species recorded at the Proposed Development.

Table 6-4: Collision Risk, Population Relative Abundance and Potential Vulnerability

Bat Species	Collision Risk	Population Relative Abundance	Potential Vulnerability
Soprano pipistrelle	High	Common	Medium
Common pipistrelle	High	Common	Medium
Noctule	High	Rarest	High
Leisler's	High	Rarest	High
Daubenton's	Low	Rarer	Low
Natterer's	Low	Rarer	Low
Brown long-eared	Low	Rarer	Low

6.3.3 Step 5: Categorising Site Risk Level

The Site risk level is determined by project size and habitat risk (see **Table 4-4**). The Proposed Development consists of 12 turbines that are over 50 m in height, and so falls within the 'Medium' project size, as shown in **Table 4-4** and **Table C-1** of **Annex C**.

In terms of habitat risk for bats, the Site is not connected to the wider landscape by linear features such as woodland edges. Foraging habitat quality and connectivity within this buffer area is low-quality with small open burns and a fairly homogenous area of open grazed moorland habitat present, resulting in a habitat risk classification of '**Low**' as shown in **Table 4-4** and **Table C-1** of **Annex C**.

According to **Table 4-4** above, the '**Medium**' project size combined with a '**Low**' habitat risk level results in an overall site risk assessment of **'Low/Lowest' (2).**

6.3.4 Step 6: Risk Assessment – High Collision Risk Species Only

In analysing bat activity levels, professional judgement has been used previously in the absence of any recognised standard measure to define levels as being high, medium or low. This took into consideration the geographical and Site location and habitats present as well as professional experience. NatureScot *et al.* (2021) recommends the use of Ecobat as a measure of activity levels. Ecobat analyses activity levels during nights where bat activity was recorded and assigns a value to the activity levels (low, low/moderate, moderate, moderate/high or high) for each location on each night. These values are based on a comparison with other surveys within the local area. While this provides an objective assessment of activity levels in a given area, the reliability of the results can be impacted by how many previous surveys within the comparison radius have been submitted to Ecobat. As noted above, at the time of preparation of this Technical Appendix the Ecobat tool was still offline and unavailable.

Therefore, Site specific details, knowledge of bat species behaviour, professional judgement and experience from other and similar projects has been used to assess the bat activity levels at the Proposed Development as high, medium or low. While the appraisal of activity levels was ascertained using professional judgement, the risk assessment has taken due consideration of the NatureScot *et al.* (2021) guidance, as shown in the preceding sections above to provide an assessment of risk.

The overall risk assessment is undertaken for high collision risk species which were identified at the Site. Low-risk species have a low risk of collision with a turbine blade, so the impact of the Proposed Development on the local bat population would likely be negligible, particularly also considering the low bpph recorded for these species at the site (**Section 6.3.1** and **Table 6-3**).

6.3.4.1 *Common Pipistrelle*

For common pipistrelle, bpph and distribution of activity is presented in **Figure 7.11** (EIAR Volume 2), see also **Table 6-3**. Only Locations 4 and 10 recorded any bat activity (less than 1 bpph) during spring, with the rest of the Locations recording no activity. In summer, Locations 5, 6 and 10 recorded no activity, with the remaining Locations recording less than 0.5 bpph. All locations in the autumn survey Visit recorded less than 0.5 bpph, and the overall risk at these locations is considered Low.

Location 2 in spring recorded no data due to a detector failure.

Overall, for common pipistrelle the risk is assessed as Low for the Site across all seasons.

6.3.4.2 *Soprano Pipistrelle*

For soprano pipistrelle, bpph and distribution of activity is presented in **Figure 7.12** (EIAR Volume 2), see also **Table 6-3**. In spring, Locations 1, 4 and 7 recorded less than 1.5 bpph, with the rest of the Locations recording no activity. Locations 1, 3-6 and 11 recorded less than 0.05 bpph in summer, and the other Locations recorded no activity. All Locations in autumn recorded bat activity but the bpph were below 0.55.

Location 2 in spring recorded no data due to a detector failure.

Overall, for Soprano pipistrelle the risk is assessed as Low for the Site across all seasons.

6.3.4.3 *Nyctalus spp.*

For *Nyctalus* spp., bpph and distribution of activity is presented in **Figure 7.13** (EIAR Volume 2), see also **Table 6-3**. Location 4 had less than 0.2 bpph in spring and summer, with autumn recording no activity. Locations 5, 7 and 8 recorded 0.01 bpph in autumn. No *Nyctalus* spp. were recorded at Location 1-3, 5-12 in spring and summer or Locations 1-4, 6 and 9-12 during autumn.

Location 2 in spring recorded no data due to a detector failure.

The overall risk for this genus across all Locations and seasons is considered Low.

6.3.4.4 *Summary*

For the three high collision risk species recorded at the Site, all Locations were considered Low risk across all seasons. Several Locations also recorded no activity during the season. This data is also presented in **Table E-1** of **Annex E** which includes the bpph, bat passes per night and maximum bat activity (bat passes per night).

7 MITIGATION

Good practice and standard embedded mitigation will be included as high collision risk species indicated above were recorded across the Site.

The Proposed Development includes mitigation by design and embedded mitigation to reduce the potential collision risk to bats, for instance via:

- In line with NatureScot *et al.* (2021) guidance a 50 m buffer will be maintained from blade tip to feature height to reduce potential risk to bats, along woodland edges;
- A 50 m buffer for any infrastructure or construction activity around all watercourses where possible, except where a minimum number of watercourse crossings are required. This will minimise effects along potential commuting and foraging corridors associated with watercourses; and
- A Site Carcass Search Protocol would take place, including:
    - Monthly Maintenance Checks and a dedicated search for bird and bat carcasses carried out on a monthly basis at each turbine location.
    - Searches shall be centered on each turbine and shall cover a minimum radius of 50m from the base of the turbine. This encompasses the area where carcasses are most likely to be found.
    - The area of hardstand and surrounding vegetation within the defined radius shall be walked and a visual inspection of the area shall be carried out for carcasses.
    - Areas around ancillary infrastructure (stairs, fans, package subs. Etc.) shall also be searched as part of the check.
- This measure will be put in place from the start of the operational period of the Proposed Development, and it does not result in any loss of output.

8 REFERENCES

Andrews, H. (2018). Bat Roosts in Trees: a guide for identification and assessment for tree-care and ecology professionals. Pelagic Publishing, Exeter.

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

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Reason, P.F., Newson, S.E. & Jones, K.E. (2016). Recommendations for using automatic bat identification software with full spectrum recordings. Bat Conservation Trust.

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Russ, J. (2012). British Bat Calls: A Guide to species Identification. Pelagic Publishing.

ANNEX A. BATS LEGAL STATUS

The information contained in this Annex is a summarised version of the legislation and should be read in conjunction with the appropriate legislation.

All bat species receive protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)[11].

For any wild bat species, it is an offence to deliberately or recklessly:

- capture, injure or kill a bat;
- harass a bat or group of bats;
- disturb a bat in a roost (any structure or place it uses for shelter or protection);
- disturb a bat while it is rearing or otherwise caring for its young;
- obstruct access to a bat roost or otherwise deny an animal use of a roost;
- disturb a bat in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species;
- disturb a bat in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; and
- disturb a bat while it is migrating or hibernating.

It's also an offence to:

- damage or destroy a breeding site or resting place of such an animal (whether or not deliberately or recklessly); and
- keep, transport, sell or exchange, or offer for sale or exchange any wild bat (or any part or derivative of one) obtained after 10 June 1994[12].

[11] Sections 39(1) – (3).
[12] Available online: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/protected-species-z-guide/protected-species-bats [Accessed September 2024].

Table A-1 Legal and Conservation Status of all UK Bats[13]

Species	Legislation / Convention													
	Bern Convention Appendix II	Bonn Convention Appendix II	WCA	Habitats Directive Annex IV	Habitats Directive Annex II	Habs Regs 1994 (as amended) *Scotland*	Conservation of Habs & Species Regs 2010	Conservation Regs (N Ireland) 1995	CROW Act 2000	NERC Act 2006	Wild Mammals Protection Act	UK BAP Priority species	IUCN Red List*	EUROBATS Agreement
Greater horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Lesser horseshoe bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	LC	✓
Daubenton's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Natterer's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Whiskered bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brandt's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Bechstein's bat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Alcathoe bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		DD	✓
Noctule	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Leisler's bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Serotine	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Common pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Soprano pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Nathusius' pipistrelle	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Brown long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	LC	✓
Grey long-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓
Barbastelle	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NT	✓
Greater mouse-eared bat	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		LC	✓

*IUCN categories: LC is Least Concern, NT is Near Threatened, DD is Data deficient; see www.iucnredlist.org for more details.

[13] Source: Bat Conservation Trust. Available online: http://www.bats.org.uk/pages/bats_and_the_law.html [Accessed August 2024].

ANNEX B. SURVEY TIMINGS & ANABAT LOCATIONS

Table B-1 Description of Anabat Locations and Summary of Temporal Survey Effort

Location	Easting	Northing	Bearing	Habitat	Total Number of Complete Recording Nights		
					Visit 1 19/05/2023 – 01/06/2023	Visit 2 05/07/2023 – 19/07/2023	Visit 3 31/08/2023 – 14/09/2023
1	265109	730475	111	Within 60 m of Allt Coire an Daimh watercourse	14	14	14
2	264951	729914	19	Open moorland	0	14	14
3	264317	729777	317	Open moorland	14	14	14
4	264708	729262	150	Open moorland	14	14	14
5	265748	729673	350	Open moorland	14	14	14
6	266193	729175	140	Within 135 m of Loch Eas Domhain	14	14	14
7	266500	729665	334	Open moorland	14	14	14
8	266975	729098	272	Open moorland	14	14	14
9	267786	729065	80	Within 95 m of Lochan na Creige Ruaidhe	14	14	14
10	266860	728535	178	Open moorland	14	14	14
11	267529	728133	160	Within 55 m of tributary to Glentarken Burn	14	14	14
12	267962	727673	115	Open moorland	14	14	14
Total					**490**		

ANNEX C. INITIAL SITE RISK ASSESSMENT

Table C-1 Initial Site Risk Assessment[14].

Site Risk Level (1-5)[15]	Project Size			
Habitat Risk		Small	Medium	Large
	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5
Key: Green (1-2) – low/lowest site risk; Amber (3) – medium site risk; Red (4-5) – high/highest site risk				

Habitat Risk	Description
Low	Small number of potential roost features, of low quality. Low-quality foraging habitats that could be used by small numbers of foraging bats. Isolated site not connected to the wider landscape by prominent linear features.
Moderate	Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. At/near edge of range and or an important flyway. Close to key roost and /or swarming.
Project Size	**Description**
Small	Small scale development (<10 turbines). No other wind energy developments within 10 km. Comprising turbines <50 m in height.
Medium	Larger developments (between 10 and 40). May have some other wind development within 5 km. Comprising turbines 50 – 100 m in height.
Large	Largest developments (>40 turbines) with other wind energy developments within 5 km. Comprising turbines >100 m in height.

[14] Sourced from: NatureScot, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT). (2021). *Bats and Onshore Wind Turbines: Survey Assessment and Mitigation*.

[15] Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

ANNEX D. PRELIMINARY BAT ROOST ASSESSMENT

Table D-1 Preliminary Bat Roost Assessment Target Notes

PRF_ID	Feature	Survey Date	Notes	PRF Category	Grid Reference
PS087	Tree	15/06/2023	Alder along tributary of Beich Burn with cracks where an old bough has broken off. Cracks in a fairly exposed location (around 2 m from ground) and difficult to tell how deep crack penetrates.	Moderate	NN 62506 26342
PS088	Tree	15/06/2023	Several mature alders with several rot holes (around 2 m from ground) that do not appear to penetrate very deeply, along tributary of Beich Burn.	Low	NN 62485 26464
PS089	Tree	15/06/2023	Mature alder with several rot holes of moderate potential around 2 m from ground, although hard to tell how far back they penetrate.	Moderate	NN 62469 26667
PS090	Tree	15/06/2023	Two alder and one rowan, with a small number of rot holes of low potential - all fairly exposed, around 1.5 m from ground and do not penetrate deeply.	Low	NN 62549 26702
PS091	Tree	15/06/2023	Mature alder and rowan along major tributary of Beich Burn. Few alders have rot holes (around 2 m from ground) that range from low to moderate potential.	Moderate	NN 62679 27128
PS092	Tree	15/06/2023	Mature trees lining Beich Burn. Mostly of low potential but several have rot holes of moderate potential around 2 m from ground.	Moderate	NN 62491 27444
PS093	Tree	15/06/2023	Several rot holes high up (around 5 m) in trunk of mature alder. Entrances unobstructed in woodland clearing, but hard to tell how far back they penetrate.	Moderate	NN 62253 26713
PS102	Tree	15/06/2023	Large split down trunk creating crack to other side of trunk around 1.5 m from ground. Thin gap but fairly exposed as open from both sides.	Low	NN 62290 26981
PS103	Tree	15/06/2023	Crack of alder branch around 1.5 m from ground with some potential for commuting roost but not much space and fairly exposed.	Low	NN 62291 26262
PS104	Tree	15/06/2023	Mature woodland on steep slopes and along watercourses. Tall bracken surrounding a lot of trees. Some knot holes, broken branches and bark fissures but nothing too substantial. Could not check every tree due to the topography.	Moderate	NN 62101 26046

ANNEX E. SEASONAL LOCATION SPECIFIC DATA

Table E- 1 Seasonal Location Specific Data for all Species

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l1	MYODAU	v3	2023-08-31	3	0.18	0.02
l1	MYODAU	v3	2023-09-07	3	0.06	0.01
l1	MYODAU	v3	2023-09-04	3	0.18	0.02
l1	MYODAU	v3	2023-09-10	3	0.06	0.01
l1	MYODAU	v3	2023-09-05	3	0.12	0.01
l1	MYODAU	v3	2023-09-11	3	0.18	0.02
l1	MYODAU	v3	2023-09-12	3	0.06	0.01
l1	MYONAT	v3	2023-09-11	2	0.12	0.01
l1	PIPPIP	v2	2023-07-09	1	0.06	0.01
l1	PIPPIP	v2	2023-07-15	1	0.06	0.01
l1	PIPPIP	v3	2023-09-10	7	0.06	0.01
l1	PIPPIP	v3	2023-09-02	7	0.35	0.04
l1	PIPPIP	v3	2023-08-31	7	0.41	0.04
l1	PIPPIP	v3	2023-09-07	7	0.29	0.03
l1	PIPPIP	v3	2023-09-06	7	0.24	0.02
l1	PIPPIP	v3	2023-09-05	7	0.24	0.02
l1	PIPPIP	v3	2023-09-08	7	0.06	0.01
l1	PIPPYG	v1	2023-05-19	1	0.06	0.01
l1	PIPPYG	v2	2023-07-18	1	0.06	0.01
l1	PIPPYG	v3	2023-09-06	14	0.35	0.04
l1	PIPPYG	v3	2023-08-31	14	0.82	0.09
l1	PIPPYG	v3	2023-09-01	14	0.06	0.01
l1	PIPPYG	v3	2023-09-04	14	0.18	0.02

[16] The maximum bat count per night is the maximum number of bat passes recorded at the respective Location on the respective seasonal survey Visit, per species.

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l1	PIPPYG	v3	2023-09-08	14	0.12	0.01
l1	PIPPYG	v3	2023-09-07	14	0.24	0.02
l1	PIPPYG	v3	2023-09-12	14	0.06	0.01
l1	PIPPYG	v3	2023-09-02	14	0.41	0.04
l1	PIPPYG	v3	2023-09-05	14	0.18	0.02
l1	PLEAUR	v3	2023-09-07	1	0.06	0.01
l10	MYODAU	v3	2023-08-31	4	0.06	0.01
l10	MYODAU	v3	2023-09-07	4	0.25	0.02
l10	MYODAU	v3	2023-09-11	4	0.06	0.01
l10	MYODAU	v3	2023-09-09	4	0.06	0.01
l10	PIPPIP	v1	2023-05-19	1	0.06	0.01
l10	PIPPIP	v3	2023-09-01	7	0.13	0.01
l10	PIPPIP	v3	2023-08-31	7	0.38	0.04
l10	PIPPIP	v3	2023-09-07	7	0.13	0.01
l10	PIPPIP	v3	2023-09-03	7	0.13	0.01
l10	PIPPIP	v3	2023-09-12	7	0.06	0.01
l10	PIPPIP	v3	2023-09-02	7	0.44	0.04
l10	PIPPIP	v3	2023-09-09	7	0.06	0.01
l10	PIPPIP	v3	2023-09-06	7	0.06	0.01
l10	PIPPIP	v3	2023-09-05	7	0.25	0.02
l10	PIPPYG	v3	2023-09-08	7	0.13	0.01
l10	PIPPYG	v3	2023-08-31	7	0.44	0.04
l10	PIPPYG	v3	2023-09-07	7	0.31	0.03
l10	PIPPYG	v3	2023-09-01	7	0.06	0.01
l10	PIPPYG	v3	2023-09-05	7	0.19	0.02
l10	PIPPYG	v3	2023-09-02	7	0.44	0.04
l10	PIPPYG	v3	2023-09-04	7	0.06	0.01
l10	PIPPYG	v3	2023-09-12	7	0.06	0.01
l10	PLEAUR	v3	2023-09-06	1	0.06	0.01

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l10	PLEAUR	v3	2023-09-11	1	0.06	0.01
l11	MYODAU	v3	2023-09-02	1	0.06	0.01
l11	MYODAU	v3	2023-09-06	1	0.06	0.01
l11	PIPPIP	v2	2023-07-07	1	0.06	0.01
l11	PIPPIP	v2	2023-07-18	1	0.06	0.01
l11	PIPPIP	v3	2023-08-31	19	1.12	0.12
l11	PIPPIP	v3	2023-09-03	19	0.06	0.01
l11	PIPPIP	v3	2023-09-06	19	0.06	0.01
l11	PIPPIP	v3	2023-09-02	19	0.24	0.02
l11	PIPPIP	v3	2023-09-09	19	0.12	0.01
l11	PIPPIP	v3	2023-09-05	19	0.29	0.03
l11	PIPPYG	v2	2023-07-09	1	0.06	0.01
l11	PIPPYG	v2	2023-07-17	1	0.06	0.01
l11	PIPPYG	v3	2023-08-31	9	0.53	0.06
l11	PIPPYG	v3	2023-09-04	9	0.29	0.03
l11	PIPPYG	v3	2023-09-02	9	0.12	0.01
l11	PIPPYG	v3	2023-09-09	9	0.06	0.01
l11	PIPPYG	v3	2023-09-06	9	0.06	0.01
l11	PIPPYG	v3	2023-09-05	9	0.12	0.01
l12	MYODAU	v3	2023-09-12	1	0.06	0.01
l12	PIPPIP	v2	2023-07-09	1	0.06	0.01
l12	PIPPIP	v3	2023-08-31	2	0.06	0.01
l12	PIPPIP	v3	2023-09-06	2	0.06	0.01
l12	PIPPIP	v3	2023-09-02	2	0.12	0.01
l12	PIPPIP	v3	2023-09-08	2	0.06	0.01
l12	PIPPYG	v3	2023-08-31	1	0.06	0.01
l12	PIPPYG	v3	2023-09-05	1	0.06	0.01
l12	PIPPYG	v3	2023-09-01	1	0.06	0.01
l12	PIPPYG	v3	2023-09-06	1	0.06	0.01

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l12	PIPPYG	v3	2023-09-03	1	0.06	0.01
l12	PIPPYG	v3	2023-09-08	1	0.06	0.01
l2	MYONAT	v3	2023-09-03	1	0.06	0.01
l2	PIPPIP	v2	2023-07-07	1	0.06	0.01
l2	PIPPIP	v2	2023-07-18	1	0.06	0.01
l2	PIPPIP	v3	2023-08-31	5	0.12	0.01
l2	PIPPIP	v3	2023-09-09	5	0.12	0.01
l2	PIPPIP	v3	2023-09-01	5	0.18	0.02
l2	PIPPIP	v3	2023-09-04	5	0.06	0.01
l2	PIPPIP	v3	2023-09-02	5	0.29	0.03
l2	PIPPIP	v3	2023-09-05	5	0.24	0.02
l2	PIPPIP	v3	2023-09-06	5	0.06	0.01
l2	PIPPIP	v3	2023-09-07	5	0.12	0.01
l2	PIPPIP	v3	2023-09-08	5	0.12	0.01
l2	PIPPYG	v3	2023-09-05	19	0.06	0.01
l2	PIPPYG	v3	2023-09-04	19	0.12	0.01
l2	PIPPYG	v3	2023-09-07	19	0.24	0.02
l2	PIPPYG	v3	2023-09-06	19	0.29	0.03
l2	PIPPYG	v3	2023-08-31	19	1.12	0.12
l2	PIPPYG	v3	2023-09-02	19	0.12	0.01
l2	PIPPYG	v3	2023-09-01	19	0.24	0.02
l2	PIPPYG	v3	2023-09-08	19	0.53	0.06
l2	PLEAUR	v3	2023-09-08	1	0.06	0.01
l2	PLEAUR	v3	2023-09-09	1	0.06	0.01
l3	MYODAU	v3	2023-09-11	2	0.12	0.01
l3	MYODAU	v3	2023-09-08	2	0.06	0.01
l3	MYONAT	v3	2023-09-09	1	0.06	0.01
l3	PIPPIP	v2	2023-07-07	2	0.12	0.02
l3	PIPPIP	v2	2023-07-09	2	0.06	0.01

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l3	PIPPIP	v3	2023-08-31	7	0.41	0.04
l3	PIPPIP	v3	2023-09-09	7	0.12	0.01
l3	PIPPIP	v3	2023-09-01	7	0.06	0.01
l3	PIPPIP	v3	2023-09-02	7	0.41	0.04
l3	PIPPIP	v3	2023-09-12	7	0.18	0.02
l3	PIPPIP	v3	2023-09-06	7	0.24	0.02
l3	PIPPIP	v3	2023-09-05	7	0.35	0.04
l3	PIPPIP	v3	2023-09-07	7	0.29	0.03
l3	PIPPIP	v3	2023-09-08	7	0.18	0.02
l3	PIPPYG	v2	2023-07-07	5	0.29	0.05
l3	PIPPYG	v3	2023-09-04	9	0.06	0.01
l3	PIPPYG	v3	2023-08-31	9	0.47	0.05
l3	PIPPYG	v3	2023-09-06	9	0.18	0.02
l3	PIPPYG	v3	2023-09-02	9	0.18	0.02
l3	PIPPYG	v3	2023-09-07	9	0.29	0.03
l3	PIPPYG	v3	2023-09-12	9	0.06	0.01
l3	PIPPYG	v3	2023-09-09	9	0.24	0.02
l3	PIPPYG	v3	2023-09-08	9	0.24	0.02
l3	PIPPYG	v3	2023-09-05	9	0.53	0.06
l3	PLEAUR	v3	2023-09-03	1	0.06	0.01
l3	PLEAUR	v3	2023-09-06	1	0.06	0.01
l4	MYODAU	v1	2023-05-19	6	0.17	0.03
l4	MYODAU	v1	2023-05-29	6	0.06	0.01
l4	MYODAU	v1	2023-05-28	6	0.17	0.03
l4	MYODAU	v1	2023-05-24	6	0.06	0.01
l4	MYODAU	v1	2023-05-25	6	0.33	0.05
l4	MYODAU	v1	2023-05-23	6	0.28	0.04
l4	MYODAU	v1	2023-05-27	6	0.17	0.03
l4	MYODAU	v2	2023-07-17	1	0.06	0.01

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l4	MYODAU	v3	2023-08-31	2	0.12	0.01
l4	MYODAU	v3	2023-09-02	2	0.06	0.01
l4	MYODAU	v3	2023-09-01	2	0.12	0.01
l4	MYONAT	v1	2023-05-24	1	0.06	0.01
l4	MYONAT	v1	2023-05-27	1	0.06	0.01
l4	MYONAT	v1	2023-05-25	1	0.06	0.01
l4	MYONAT	v3	2023-09-02	1	0.06	0.01
l4	NYCLEI	v1	2023-05-26	1	0.06	0.01
l4	NYCLEI	v1	2023-05-20	1	0.06	0.01
l4	NYCLEI	v1	2023-05-29	1	0.06	0.01
l4	NYCNOC	v1	2023-05-24	5	0.06	0.01
l4	NYCNOC	v1	2023-05-29	5	0.06	0.01
l4	NYCNOC	v1	2023-05-27	5	0.06	0.01
l4	NYCNOC	v1	2023-05-30	5	0.11	0.02
l4	NYCNOC	v1	2023-05-21	5	0.11	0.02
l4	NYCNOC	v1	2023-05-20	5	0.17	0.03
l4	NYCNOC	v1	2023-05-31	5	0.06	0.01
l4	NYCNOC	v1	2023-05-26	5	0.28	0.04
l4	NYCNOC	v1	2023-05-23	5	0.11	0.02
l4	NYCNOC	v1	2023-05-28	5	0.06	0.01
l4	NYCNOC	v2	2023-07-07	1	0.06	0.01
l4	PIPPIP	v1	2023-05-24	29	0.17	0.03
l4	PIPPIP	v1	2023-05-26	29	1.61	0.25
l4	PIPPIP	v1	2023-05-25	29	0.39	0.06
l4	PIPPIP	v1	2023-05-20	29	0.17	0.03
l4	PIPPIP	v1	2023-05-19	29	0.17	0.03
l4	PIPPIP	v1	2023-05-30	29	0.72	0.11
l4	PIPPIP	v1	2023-05-31	29	0.17	0.03
l4	PIPPIP	v1	2023-05-23	29	0.33	0.05

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l4	PIPPIP	v1	2023-05-21	29	0.11	0.02
l4	PIPPIP	v1	2023-05-27	29	0.28	0.04
l4	PIPPIP	v1	2023-05-28	29	0.22	0.03
l4	PIPPIP	v1	2023-05-29	29	0.72	0.11
l4	PIPPIP	v2	2023-07-07	4	0.24	0.04
l4	PIPPIP	v3	2023-08-31	19	0.29	0.03
l4	PIPPIP	v3	2023-09-01	19	0.06	0.01
l4	PIPPIP	v3	2023-09-12	19	0.29	0.03
l4	PIPPIP	v3	2023-09-06	19	0.12	0.01
l4	PIPPIP	v3	2023-09-08	19	0.06	0.01
l4	PIPPIP	v3	2023-09-02	19	0.35	0.04
l4	PIPPIP	v3	2023-09-05	19	0.06	0.01
l4	PIPPIP	v3	2023-09-04	19	0.06	0.01
l4	PIPPIP	v3	2023-09-07	19	1.12	0.12
l4	PIPPYG	v1	2023-05-26	59	3.28	0.50
l4	PIPPYG	v1	2023-05-21	59	0.28	0.04
l4	PIPPYG	v1	2023-05-29	59	1.56	0.24
l4	PIPPYG	v1	2023-05-30	59	0.61	0.09
l4	PIPPYG	v1	2023-05-28	59	0.33	0.05
l4	PIPPYG	v1	2023-05-19	59	0.50	0.08
l4	PIPPYG	v1	2023-05-24	59	0.17	0.03
l4	PIPPYG	v1	2023-05-31	59	0.28	0.04
l4	PIPPYG	v1	2023-05-20	59	0.78	0.12
l4	PIPPYG	v1	2023-05-27	59	0.78	0.12
l4	PIPPYG	v1	2023-05-23	59	0.17	0.03
l4	PIPPYG	v1	2023-05-25	59	0.50	0.08
l4	PIPPYG	v2	2023-07-07	2	0.12	0.02
l4	PIPPYG	v3	2023-09-08	39	0.18	0.02
l4	PIPPYG	v3	2023-09-06	39	0.18	0.02

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l4	PIPPYG	v3	2023-09-05	39	0.24	0.02
l4	PIPPYG	v3	2023-09-04	39	0.12	0.01
l4	PIPPYG	v3	2023-09-01	39	0.35	0.04
l4	PIPPYG	v3	2023-09-07	39	0.71	0.07
l4	PIPPYG	v3	2023-08-31	39	2.29	0.24
l4	PIPPYG	v3	2023-09-09	39	0.06	0.01
l4	PIPPYG	v3	2023-09-02	39	0.53	0.06
l4	PIPPYG	v3	2023-09-12	39	0.18	0.02
l4	PLEAUR	v1	2023-05-28	3	0.06	0.01
l4	PLEAUR	v1	2023-05-19	3	0.17	0.03
l4	PLEAUR	v1	2023-05-27	3	0.06	0.01
l4	PLEAUR	v1	2023-05-20	3	0.06	0.01
l4	PLEAUR	v1	2023-05-23	3	0.11	0.02
l4	PLEAUR	v1	2023-05-29	3	0.06	0.01
l4	PLEAUR	v1	2023-05-30	3	0.06	0.01
l4	PLEAUR	v3	2023-09-04	1	0.06	0.01
l5	MYODAU	v3	2023-09-07	1	0.06	0.01
l5	MYODAU	v3	2023-09-11	1	0.06	0.01
l5	MYONAT	v3	2023-09-07	1	0.06	0.01
l5	MYONAT	v3	2023-09-11	1	0.06	0.01
l5	NYCLEI	v3	2023-09-02	1	0.06	0.01
l5	PIPPIP	v3	2023-08-31	6	0.35	0.04
l5	PIPPIP	v3	2023-09-05	6	0.18	0.02
l5	PIPPIP	v3	2023-09-02	6	0.12	0.01
l5	PIPPYG	v2	2023-07-07	1	0.06	0.01
l5	PIPPYG	v3	2023-08-31	23	1.35	0.14
l5	PIPPYG	v3	2023-09-01	23	0.06	0.01
l5	PIPPYG	v3	2023-09-02	23	0.18	0.02
l5	PIPPYG	v3	2023-09-04	23	0.12	0.01

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l5	PIPPYG	v3	2023-09-05	23	0.06	0.01
l5	PIPPYG	v3	2023-09-08	23	0.12	0.01
l5	PLEAUR	v3	2023-09-06	1	0.06	0.01
l6	MYODAU	v3	2023-09-07	2	0.13	0.01
l6	PIPPIP	v3	2023-08-31	4	0.25	0.02
l6	PIPPIP	v3	2023-09-06	4	0.13	0.01
l6	PIPPIP	v3	2023-09-05	4	0.25	0.02
l6	PIPPIP	v3	2023-09-08	4	0.06	0.01
l6	PIPPIP	v3	2023-09-07	4	0.06	0.01
l6	PIPPYG	v2	2023-07-07	1	0.06	0.01
l6	PIPPYG	v2	2023-07-09	1	0.06	0.01
l6	PIPPYG	v3	2023-09-03	5	0.06	0.01
l6	PIPPYG	v3	2023-09-05	5	0.31	0.03
l6	PIPPYG	v3	2023-09-07	5	0.19	0.02
l6	PIPPYG	v3	2023-08-31	5	0.19	0.02
l7	MYODAU	v3	2023-09-07	1	0.06	0.01
l7	MYODAU	v3	2023-09-08	1	0.06	0.01
l7	NYCLEI	v3	2023-09-02	1	0.06	0.01
l7	NYCLEI	v3	2023-09-06	1	0.06	0.01
l7	PIPPIP	v2	2023-07-07	3	0.06	0.01
l7	PIPPIP	v2	2023-07-18	3	0.18	0.03
l7	PIPPIP	v3	2023-09-05	3	0.12	0.01
l7	PIPPIP	v3	2023-09-06	3	0.12	0.01
l7	PIPPIP	v3	2023-09-02	3	0.18	0.02
l7	PIPPIP	v3	2023-09-08	3	0.06	0.01
l7	PIPPYG	v1	2023-05-26	1	0.06	0.01
l7	PIPPYG	v3	2023-08-31	8	0.47	0.05
l7	PIPPYG	v3	2023-09-01	8	0.12	0.01
l7	PIPPYG	v3	2023-09-05	8	0.29	0.03

Location ID	Species	Visit	Survey Date	Maximum bat activity (bat passes per night) [16]	bat passes per night	bat passes per hour
l7	PIPPYG	v3	2023-09-02	8	0.06	0.01
l7	PIPPYG	v3	2023-09-04	8	0.06	0.01
l7	PIPPYG	v3	2023-09-07	8	0.12	0.01
l8	NYCNOC	v3	2023-09-02	2	0.12	0.01
l8	PIPPIP	v2	2023-07-18	2	0.12	0.02
l8	PIPPIP	v3	2023-09-01	1	0.06	0.01
l8	PIPPYG	v3	2023-09-01	3	0.12	0.01
l8	PIPPYG	v3	2023-09-07	3	0.06	0.01
l8	PIPPYG	v3	2023-09-02	3	0.06	0.01
l8	PIPPYG	v3	2023-09-03	3	0.06	0.01
l8	PIPPYG	v3	2023-09-06	3	0.18	0.02
l8	PIPPYG	v3	2023-09-08	3	0.06	0.01
l8	PIPPYG	v3	2023-09-12	3	0.06	0.01
l9	MYODAU	v2	2023-07-13	1	0.06	0.01
l9	MYODAU	v3	2023-08-31	1	0.06	0.01
l9	MYODAU	v3	2023-09-02	1	0.06	0.01
l9	PIPPIP	v2	2023-07-05	1	0.06	0.01
l9	PIPPIP	v3	2023-09-02	1	0.06	0.01
l9	PIPPYG	v3	2023-09-01	1	0.06	0.01
l9	PLEAUR	v3	2023-09-06	1	0.06	0.01
l9	PLEAUR	v3	2023-09-07	1	0.06	0.01