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CRUACH CLENAMACRIE WIND FARM

APPENDIX 10.3 BAT STATIC SURVEY REPORT

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CRUACH CLENAMARCIE WIND FARM

Appendix 10.3 Bat Static Survey Report

NOVEMBER 2024

PUBLIC

Voltalia

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TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70089405

DATE: NOVEMBER 2024

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	First draft	Update		
Date	April 2023	September 2024		
Prepared by	D Corral	H Smith		
Signature				
Checked by	A Middleton	A Gow		
Signature				
Authorised by	C Hopkins	S Kydd		
Signature				
Project number	70089045	70092018		
Report number	V1	V2		
File reference	\\uk.wspgroup.com\central data\Projects\70092xxx\70092018 - Cruach WF Ecology\03 WIP\EIA\Appendices\Appendix 10.3 Bat Report\SS	\uk.wspgroup.com\central data\Projects\70092xxx\70092018 - Cruach WF Ecology\03 WIP\EIA\Appendices\Appendix 10.3 Bat Report		

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EXECUTIVE SUMMARY

WSP UK Ltd was commissioned by the Applicant to undertake a programme of bat surveys for a proposed new wind farm development - Cruach Clenamacrie Wind Farm - located to the east of Oban, Argyll and Bute Council, hereafter referred to as the 'Proposed Development'.

The Proposed Development encompasses the wind farm infrastructure of six turbines, and the access track. The Application Boundary is the extent of the area relating to the consent application. The Site is situated within an area of upland habitats and is adjacent to both mixed and conifer woodlands consisting of primarily conifer plantation.

A programme of bat surveys was undertaken in 2022 to determine the baseline bat activity along with bat species present within the Study Area.

Following Bat Conservation Trust guidelines and a review of the information collected during previous surveys (**Appendix 10.1** and **Appendix 10.2**), the Proposed Development was assessed as having moderate suitability for commuting and foraging bats.

- Four species/genera of bats were recorded, including soprano pipistrelle, common pipistrelle, Myotis species and brown long-eared bat.
- The most widely recorded species was soprano pipistrelle, followed by Pipistrellus species and then brown long-eared bat.
- Low typical to medium typical activity levels of soprano pipistrelle were recorded throughout the Proposed Development. Soprano pipistrelles are regarded as being at high risk of turbine collisions, however, are considered common throughout Scotland therefore the risk to this species' population in the region is low.
- The boundary and edge habitats, including tree lines and hedgerows, between stands of forestry to the south of the Proposed Development had higher levels of bat activity than the open areas such as the moorland habitat as would be expected for bats foraging and commuting.
- Based on the results, no bat peak activity levels recorded overlapped with species specific emergence times suggesting it is unlikely that a maternity roost is present within the Proposed Development area or within the proximity to the Site. This does not however, confirm the presence/absence of roosting bats on Site.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1. WSP was commissioned by the Applicant to undertake a programme of bat surveys and this report presents information relevant to the Cruach Clenamacrie Wind Farm, (hereafter the 'Proposed Development') central Ordnance Survey National Grid Reference (OSNGR): NM 94187 29995. It should be read in conjunction with the Environmental Impact Assessment (EIA) and its associated baselines (**Chapter 10: Ecology**).

1.1.2. The site earmarked for the Proposed Development is located to the east of Oban, Argyll and Bute Council (hereafter 'the Site').

1.1.3. This report describes the survey approach, methodology and results of bat surveys applied at the Site. This work provides an ecological baseline assessment of bat activity at the Site.

1.2 ECOLOGICAL BACKGROUND

1.2.1. The Site is located to the east of Oban and is dominated by upland habitats including bog and heath habitats with some grassland, woodland and waterbodies within the Site. Waterbodies within the Site include several unnamed watercourses and a single unnamed waterbody. Surrounding the Site are habitats similar to those found within the Site with the addition of mixed and coniferous plantation woodlands. The habitats within the Site and wider Study Area are shown in **Appendix 10.1**.

1.3 OBJECTIVES

1.3.1. This report details the methods, limitations, and results of bat surveys undertaken within the Site.

1.3.2. The programme of bat surveys conducted at the Site aimed to determine:

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

1.3.3. The results of the bat surveys will be used in subsequent assessments; for example, to enable the identification of potential impacts on bat species and appropriate mitigation measures included in the EIA.

2 LEGISLATION

2.1.1. All bat species found in Scotland are classed as European protected species. They receive full protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

2.1.2. 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
- disturb a bat while it is migrating or hibernating

It's also an offence *inter alia* to:

- damage or destroy a breeding site or resting place of such an animal (whether or not deliberately or recklessly)

2.1.3. Due to the high level of protection afforded to bats and their habitat, mitigation for this species is governed by a strict licensing procedure administered by NatureScot (normally, planning permission must be obtained before a licence can be sought). Licencing is subject to three tests, as defined under the Habitats Regulations, these must also be applied by the consenting authority before granting permission for activities affecting bats. For permission to be granted the following criteria must be satisfied:

- The proposal is necessary to preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment;
- There is no satisfactory alternative; and
- The proposals will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

2.1.4. Of the 18 UK bat species, ten occur in Scotland: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus,* Nathusius' pipistrelle *Pipistrellus nathusii*, Natterer's bat *Myotis nattereri*, Daubenton's bat *Myotis daubentonii*, noctule *Nyctalus noctula*, brown long-eared bat *Plecotus auritus*, Leisler's bat *Nyctalus leisleri*, whiskered bat *Myotis mystacinus*, and Brandt's bat *Myotis brandtii*.

2.1.5. Soprano pipistrelle, Daubenton's bat, brown long-eared bat and noctule bat are included within the Argyll and Bute Council biodiversity technical note 2017 (Argyll and Bute Council, 2017). Brandt's bat, Daubenton's bat, Whiskered bat, Natterer's bat, Noctule bat, Nathusius's pipistrelle, common pipistrelle, soprano pipistrelle and brown long eared bat are all included within the Scottish Biodiversity List of principal importance for biodiversity conservation in Scotland.

3 METHODOLOGY

3.1 SITE SUITABILITY

3.1.1. The Site and landscape features contained within the Site were assessed for suitability to support foraging, roosting and commuting bats based on the results of Protected Species Survey and UK Habitat surveys undertaken between March and May 2022 (**Appendix 10.2**, and **10.1**, respectively).

3.1.2. An update occurred in May 2024 to include the change in design for the inclusion of the working access track and appropriate buffer. These surveys categorised the overall suitability of the Site for bats following Bat Conservation Trust (BCT) guidelines (Collins, 2016), as Negligible, Low, Moderate or High suitability (see **Table 3-1**), before deploying static detectors.

Table 3-1 – Commuting and foraging habitats suitability

Suitability	Habitat Suitability Criteria
Negligible	Negligible habitat features on Site likely to be used by commuting or foraging bats.
Low	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

3.2 DESK STUDY

3.2.1. A desk study was undertaken in January 2023 to review existing ecological baseline information available in the public domain and to obtain information held by relevant third parties. For the purpose of the desk study exercise, records were collated up to a distance of 10 kilometres (km) from the Site (SNH, 2019).

3.3 BAT ACTIVITY

AUTOMATED DETECTOR SURVEY

3.3.1. At sites where the proposed turbine locations are known, automated detectors should be placed to provide a representative sample of bat activity at or close to these points. Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines. 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.

3.3.2. Following the standard recommendations (SNH, 2019), automated detectors were deployed at six pre-determined locations across the Site to give the best coverage in respect to the Proposed Development. Detector locations were altered in July 2022 to avoid a buffer set up from a hen harrier *Circus cyaneus* nest identified on Site.

3.3.3. Automated detectors (Wildlife Acoustics Song Meter Mini) were deployed within the variety of habitat types present, which have been defined following the broad habitat categories outlined in Dowse, Daisley and Parry, (2015) (hereafter Dowse *et al*, 2015) as follows:

- Moorland; Open habitat found in upland acidic, water-logged areas.
- Boundary; Habitats following linear features such as woodland edge, treelines, fence lines and watercourses.

3.3.4. As defined above moorland is the main habitat type present within the Planning Application Boundary. Boundary habitat is present for approximately 50% of the Planning Application Boundary where plantation woodland borders with south and east sides.

3.3.5. Detectors were deployed 2 metres (m) above ground level using stakes or by attaching to suitable trees. Each detector was set up with four AA batteries and a 64 gigabyte (GB) Secure Digital (SD) memory card. If a detector failed to record a surveyor would change the batteries and SD card (if necessary) to help ensure the full recording period was captured. Recording settings used are detailed in **Table 3-2.**

Table 3-2 - Automated detector settings

Recording range	30 minutes before sunset to 30 minutes after sunrise.
Trigger frequency range	16 Kilohertz (kHz) to 250 kHz
Minimum event	4 milliseconds
Max file length	15 seconds

3.3.6. The detectors were deployed on Site during three seasons defined in the Bats and Onshore Wind Turbine Guidance (SNH, 2019):

- Spring – April to May inclusive;
- Summer – June to mid-August inclusive; and
- Autumn – Mid-August to October inclusive.

3.3.7. The guidance recommends a minimum of ten consecutive nights of data collection per season. The data collection periods are listed in **Table 3-3 - Deployment periods for detectors.**

3.3.8. Bat calls registered by the automated detectors were recorded for later analysis using specialist computer software; further details of analysis methods are provided in **3.3.9** to **3.3.15.**

Table 3-3 - Deployment periods for detectors

Survey Season	Survey Dates	Detector	Habitat Type	Nights Recorded
Spring 2022	11/05/22 – 23/05/22	SMM01	Moorland	12
		SMM02	Moorland	12
		SMM03	Moorland	12
		SMM04	Moorland	12
		SMM05	Moorland	12
		SMM06	Boundary	12
72 nights / 6 detectors = average 12 nights per detector				
Summer 2022	12/07/22 – 25/07/22	SMM01	Moorland	13
		SMM02	Moorland	13
		SMM03	Moorland	13
		SMM04	Moorland	13
		SMM05	Moorland	13
		SMM06	Edge	13
78 nights / 6 detectors = average 13 nights per detector				
Autumn 2022	16/08/22 – 26/08/22	SMM01	Moorland	10
		SMM02	Moorland	10
		SMM03	Moorland	10
		SMM04	Moorland	10
		SMM05	Moorland	10

Survey Season	Survey Dates	Detector	Habitat Type	Nights Recorded
		SMM06	Edge	10
				60 nights / 6 detectors = average 10 nights per detector

AUTOMATED DETECTOR ANALYSIS

3.3.9. The recordings of bat echolocation calls collected during the automated detector surveys were analysed using specialist computer software (Wildlife Acoustics Kaleidoscope Pro 5.1.3). The analysis of each of these files enables identification/confirmation of species or species group based on call parameters, and the relative activity of different species of bats by counting the number of bats recorded within discrete sound files.

3.3.10. It should be recognised that a series of separate sound files may represent a series of different bats commuting within the range of an automated detector, or a smaller number of bats repeatedly triggering the detector (e.g. bats making repeated foraging passes within the range of a detector).

3.3.11. All sound files were classified to genus/species level by manual analysis. Files were attributed with a specific species identification or classified as 'Noise' where the call parameters could not be identified as bat.

3.3.12. Data logs are generated by the automated detectors which detail the recording history for the periods they were deployed. These logs were assessed to identify the duration which the detectors were deployed. Where the data log indicated a fault, or where log information was not accessible, bat recordings were analysed up until the last full night of recording. These decisions were accounted for when calculating the Bat Activity Index Value (BAIV) to ensure fair comparisons were made between data sets.

BAT CALL IDENTIFICATION

3.3.13. For manual identification, where possible, bat calls were identified to species level. However, species of the genus *Myotis* are grouped together in, and are collectively referenced to, as *Myotis* species (sp.) because, in most cases, their call characteristics are similar in structure and have overlapping call parameters, making species identification problematic (Russ, 2012). *Myotis* sp. likely to be encountered within the geographical region within which the Survey Area is located which in this case is: Daubenton's bat, Natterer's bat and whiskered bat.

3.3.14. Similarly, *Pipistrellus* sp. were also used to describe calls where it was not possible to distinguish species within the respective genus. For *Pipistrellus* sp. specifically, criteria set out in **Table 3-4** were used to classify calls.

3.3.15. The call identification references used for analysis are set out in **Table 3-5**. Individual species included under each genus are only those which have a known distribution within the Site (i.e. not all species which fall under that genus). Again, it is noted that *Myotis* sp. are not identified to species level in any case.

Table 3-4 - Pipistrellus sp. Call Classification Parameters[1]

Common Name	Peak Frequency of Call
Common pipistrelle	≥42 and <49KHz
Soprano pipistrelle	≥51KHz
Nathusius' pipistrelle	<40KHz
Common/soprano pipistrelle	≥49 and <51KHz
Common/Nathusius' pipistrelle	≥40 and <42KHz

Table 3-5 - Call identification references

Genus	Common name	Scientific name / call identification reference
Pipistrellus sp.	Common pipistrelle	*Pipistrellus pipistrellus*
	Soprano pipistrelle	*Pipistrellus pygmaeus*
	Nathusius' pipistrelle	*Pipistrellus nathusii*
Myotis sp.	Unidentified *Myotis sp.*	*Myotis*

QUANTIFYING BAT ACTIVITY

3.3.16. In order to allow an objective assessment of bat activity across the Site a comparison was made using Bat Activity Index Values (BAIV) between the six detectors deployed across the three seasons of deployment. For the purpose of this report, a single labelled Kaleidoscope file of up to 12 seconds in length containing a sequence of bat pulses was counted as one bat registration (i.e. a single bat pass). If the file had multiple bats present, this entry was duplicated, and each bat registration was counted as a separate bat pass.

3.3.17. The BAIV was calculated in two ways, by Bat Passes per Night (BPpN) and Bat Passes per Hour (BPpH). BPpN is calculated by taking the total number of bat passes for a deployment period and dividing them by the number of nights recorded within this period. BPpH is calculated by dividing the total number of bat passes (within the recording period) by the average number of hours between half an hour before sunset to half an hour after sunrise for the deployment period.

3.3.18. Data was entered to allow analysis for within night variation (half an hour before sunset to half an hour after sunrise instead of midnight to midnight). Summer nights are shorter than spring and

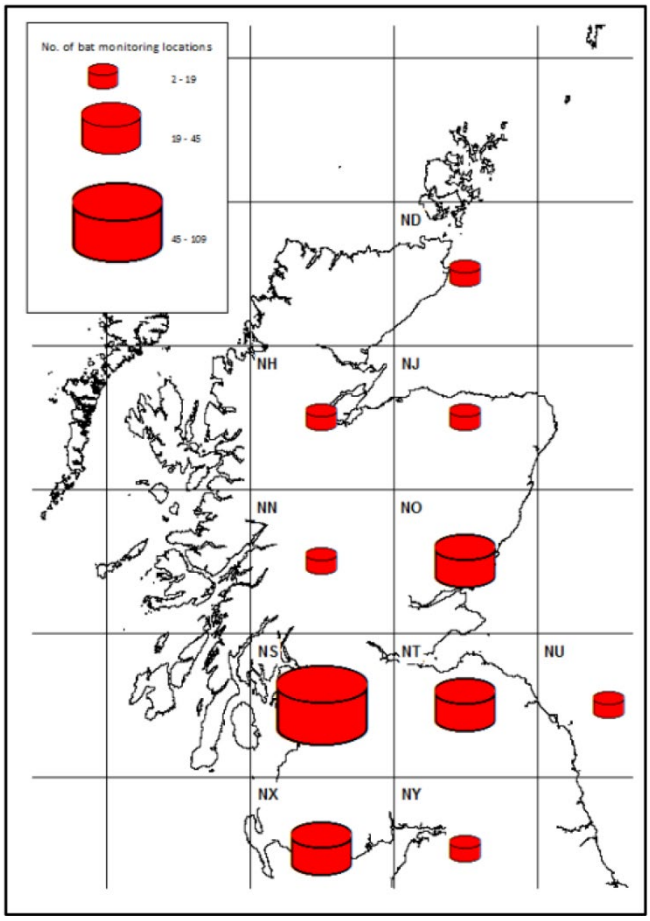
[1] No Nathusius' pipistrelle or common/Nathusius pipistrelle were recorded

autumn in Scotland however the shortest nights between mid-June to mid-July were avoided during the recording period.

3.3.19. The nights within the active bat season (April to October) which have longer lengths (more hours recorded, between sunrise and sunset) will generally have a larger number of BPpN, but this does not equate to more bats in the area, just a larger period of time in which the bats in the area are active.

3.3.20. Dowse *et al*, (2015) collated data from 301 static monitoring points across Scotland (**Figure 3-1**). Although no Sites from the NM OS 100km grid reference square were present during their study, the habitat types present within NM are also present within NN and NS 100km grid squares (moorland and boundary). The bat species assemblage within the NN and NS 100km grid squares include all the bats present within NM.

Figure 3-1 - Bat monitoring locations within 100km grid squares (Dowse et al, 2015)



3.3.21. In order to conduct further analysis, BPpN levels were then compared with typical activity levels (registrations/night) according to species and habitat class outlined in Dowse *et al*, (2015), shown in **Table 3-6** below.

Table 3-6 - Typical activity levels (registrations/night) according to species and habitat class.

Species	Boundary	Moorland	All Habitats
Common pipistrelle	0.77 - 12.74	0.46 – 3.81	1.84 – 27.69
Soprano pipistrelle	1.25 – 22.47	0.25 – 6.03	2.44 – 21.95
Total *Pipistrellus*	1.90 – 47.58	0.60 – 9.38	6.91 – 50.33
Total *Myotis*	0.16 – 0.74	0.09 – 0.60	0.14 – 1.07
Brown long-eared bat	-	-	0.04 – 0.21

3.3.22. In order to effectively calculate the project risk to bat species, six distinct activity level categories were assigned, adapted from Dowse *et al*, (2015).

3.3.23. Using BPpN data for each species, low activity was categorised as below typical activity levels outlined in Dowse *et al*, (2015), and high above typical activity level ranges for each respective habitat type. Dependent on where the BPpN aligned within the inter-quartile typical activity levels the typical range was split into low typical, med typical and high typical for each habitat.

3.4 SPECIES TRENDS SCOTLAND/SITE

3.4.1. To provide context to the bat activity results, an extended desk study was conducted to assess bat species population trends in Scotland compared to bat survey results within the Site. Information on bat activity levels according to species and habitat class was obtained from A Technique for Assessing Bat Activity for Ecological Impact Assessment (Dowse, *et al*. 2015). Information on bat population trends was obtained from The National Bat Monitoring Programme (NBMP) Annual Report, BCT (2022).

3.5 POTENTIAL ROOSTS WITHIN OR CLOSE TO THE SITE

3.5.1. To identify potential roosts within the Site, call data and peaks in bat activity was compared to the standard roost emergence times (Russ, 2012). The location of detectors was then compared with aerial maps and UK Habitat data (**Appendix 10.1**) to identify potential roosts within or close to the Site.

3.5.2. A Preliminary Roost Assessment was undertaken within the Site which identified three trees of suitability to support roosting bats (**Appendix 10.2**). Internal inspection surveys of the trees identified in 2022 were undertaken in July 2023. An updated survey was conducted in May 2024 to include the new access track working area and associated bat buffer. The trees identified in this survey were then inspected through PRF aerial inspection surveys in August 2024.

3.6 ASSESSING POTENTIAL COLLISION RISK

3.6.1. The potential vulnerability of bat population to wind farms is based on the collision risk and their relative abundance.

Table 3-7 shows the potential vulnerability of bat populations in Scotland based on the collision risk (inferred by a number of factors including habitat preference, flight speed, foraging techniques, and

echolocation characteristics) and relative abundance. Species likely to be present within the site have been highlighted with an asterisk (*).

Table 3-7 - Level of potential vulnerability of population of British bat species in Scotland (SNH, 2019, adapted from Wray et al., 2010)

Relative Abundance	Collision Risk		
	Low	Medium	High
Common Species			Soprano pipistrelle* Common pipistrelle*
Rarer species	Brown long-eared bat* Daubenton's bat* Natterer's bat*		
Rarest species	Whiskered bat Brandt's bat		Noctule bat Leisler's bat Nathusius' pipistrelle
Green = low population vulnerability Amber = medium population vulnerability Red = high population vulnerability			

3.7 NOTES AND LIMITATIONS

3.7.1. The automated detectors were located as close as possible to turbine locations. As proposed numbers of turbines and locations of turbines were not finalised six detectors were deployed on site at six proposed turbine locations. Automated detectors were placed as close to turbine locations (in 2023) in the nearest suitable location so they represented the habitats in which the turbines will be constructed. The location of the detectors is such that the results provide an overview of the bat activity within the Site.

3.7.2. During the survey period detector locations had to be moved from their original placement during the Summer and Autumn deployments due to access restrictions imposed to protect a hen harrier nest identified on Site. The movement of detectors from their original positions to the revised positions is not considered to have limited the results due to the low levels of bat activity recorded across the Site. Detector 1 moved 930m east. Detector 2 moved 220m south. Detector 3 moved 465m northeast. Detector 4 moved 30m west. Detector 5 moved 340m southwest. Detector 6 moved 215m west. All detectors remained in the same habitat type. Even though some have been moved greater than 500m, the locations in which they have been adjusted to were chosen so data could still be compared. As such the locations have not been assigned new names and comparisons across the season have been made. **Figure 10.3.1** shows the locations of the detectors before and after the move. Some species such as brown long-eared bats emit very faint echolocation and can be missed during recording periods if not within 5m of the recording device or during periods of wet weather. However, professional judgement and interpretation of surrounding habitat and suitability for different species groups can be used to determine likely species present within the Site.

3.7.3. As of 2024 the turbine locations had changed from those proposed in the automatic detector location surveys. Therefore, bat passes immediately adjacent to the turbine locations is not known. However, the survey results still allow the bat assemblage on site to be known and so it is not thought the change in turbines will limit the applicability of the 2023 results.

3.7.4. A weather station was deployed on site (NO 05754 09650, shown on **Figure 10.3.1**) from the initial detector deployment to the last collection of the detectors (11 May 2022 to 26 August 2022). The station measured, windspeed, rainfall, temperature and humidity. During the deployment periods of the detectors the weather recorded was not as such that it would have greatly affected the number of bats recorded. Therefore, the weather is not considered to have been a limitation to the number of bats recorded.

4 RESULTS

4.1 SITE SUITBAILITY

4.1.1. The Site contains upland habitats as highlighted in **Appendix 10.1** including bog and heath with some grassland and areas of upland broadleaved woodland and coniferous plantation woodland. The Site was assessed of moderate suitability to support foraging and commuting bats with three trees identified within the Site of low to moderate suitability for supporting roosting bats (**Appendix 10.2**).

4.1.2. Linear habitats exist within the Site along woodland edges and through valleys intersected by watercourses which include a number of small unnamed burns.

4.2 DESK STUDY

4.2.1. The desk study returned six bat records between 2013 and 2023. A summary of the records is provided in **Table 4-1** which is split into species and location of the record relative to the Proposed Development. Records which were not identified to species level have not been included in the summary below.

Table 4-1 - Summary of bat desk study records

Species	Records orientation and distance	Record date	Record source	Sighting/Roost
Daubenton's bat	1.7km north-east	2011	Bat Conservation Trust - Waterways Survey	Sighting
	1.7km north-east	2013	Bat Conservation Trust - Waterways Survey	Sighting
Soprano pipistrelle	1.2km north	2016	Argyll Biological Records Dataset	Sighting
	1.7km north-west	2015	Argyll Biological Records Dataset	Sighting
	1.7km north-east	2014	Argyll Biological Records Dataset	Sighting
	1.8km west	2014	NatureScot - Bat Case Work	Roost

4.3 BAT ACTIVITY RESULTS

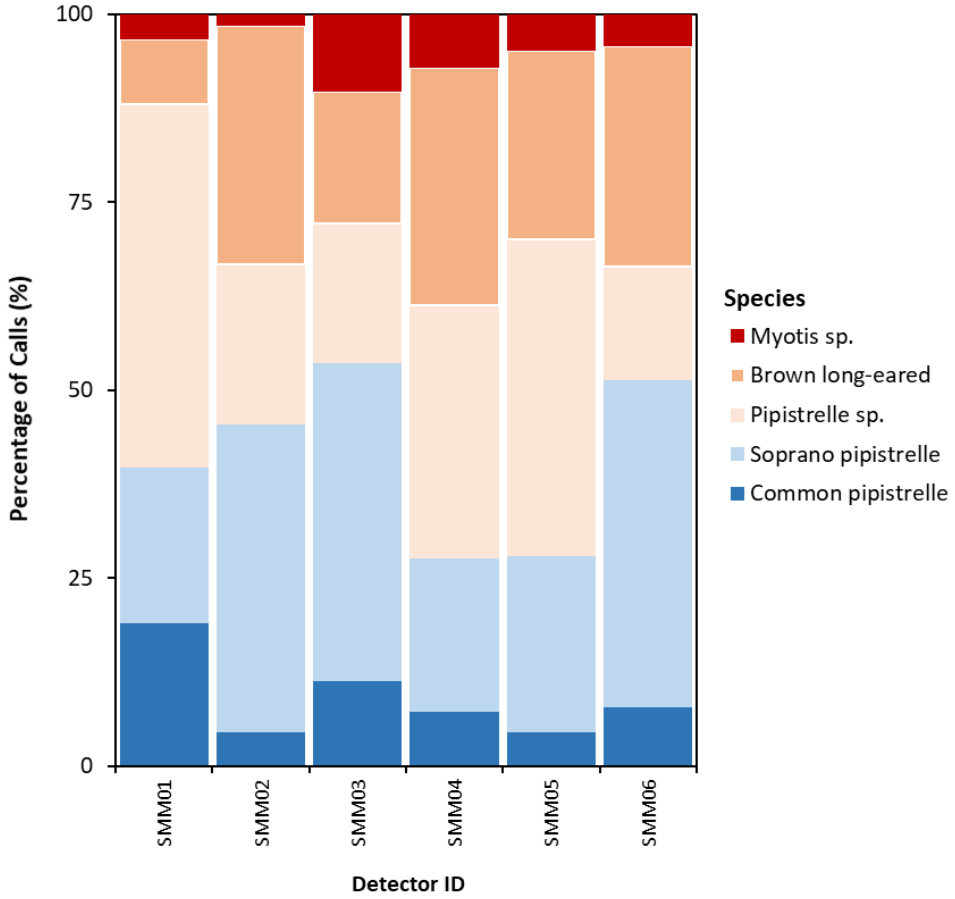
4.3.1. Six detectors were deployed throughout the Site for at least the minimum number of survey nights per season over the three survey seasons (spring, summer and autumn). This amounted to **210 nights** of recording time (72 nights in spring, 78 nights in summer and 60 nights in autumn). The location of the detectors is shown in **Figure 10.3.1, Annex A**.

4.3.2. Throughout this period five species (or genera in difficult to identify species) were recorded: soprano pipistrelle, common pipistrelle, pipistrelle sp., *Myotis* species, and brown long-eared bat. Over the whole survey period across all of the detectors, the total number of bat passes was 894 shown in **Table 4-2** and **Figure 4-1**. The most widely recorded species was soprano pipistrelle (33.67% of all bat passes), followed by pipistrelle species and brown long-eared bat (27.52% and 25.95% of all bat passes respectively). Detectors SMM06 and SMM05 recorded the most passes throughout the survey effort.

Table 4-2 - Total Bat Passes per Species

Species	Passes (No.)	Percentage of total (%)
Pipistrelle sp.	246	27.52%
Common pipistrelle	69	7.72%
Soprano pipistrelle	301	33.67%
Myotis sp.	46	5.15%
Brown long-eared	232	25.95%
Total	**894**	**100**

Figure 4-1 - Percentage of total bat calls for each detector location



4.3.3. Due to the variability of bat activity levels each night, the BPpH rate is used to represent the data. This provides a more reliable value than the mean of the dataset as it is unlikely to be normally distributed (Lintott and Matthews, 2018).

4.3.4. The BPpH of each species at each detector is shown in **Table 4-3.** The highest BPpH rates for each detector are in red and the lowest in green. The BPpN rates relative to their category of typical activity for the habitat (as described in Dowse et al, 2015) are also denoted below. SMM06 had the highest levels of bat activity with only SMM05 recording more *Pipistrellus sp.* than SMM06. Both SMM05 and SMM06 are within Boundary habitat and would be expected to have a larger number of bat passes. SMM02 recorded the lowest number of Pipistrellus sp., common pipistrelle and *Myotis* sp. and SMM01 recorded the lowest numbers of soprano pipistrelle and brown long-eared bat. SMM02 and SMM01 are within Moorland habitat with SMM01 being the furthest distance from Boundary habitat.

Table 4-3 - Average Bat Passes Per Hour for Each Species Per Detector (SMM01 – SMM06)

Species	Detector	BPpH	BPpN	Activity Level (Dowse *et al*, 2015)	Species	Detector	BPpH	BPpN	Activity Level (Dowse *et al*, 2015)	Species	Detector	BPpH	BPpN	Activity Level (Dowse *et al*, 2015)
Pipistrelle sp.	SMM01	0.1	0.8	Low typical	Common pipistrelle	SMM01	0.04	0.31	Low	*Myotis* sp.	SMM01	0.01	0.06	Low
	SMM02	0.05	0.4	Low		SMM02	0.01	0.09	Low		SMM02	0	0.03	Low
	SMM03	0.07	0.51	Low		SMM03	0.04	0.31	Low		SMM03	0.04	0.29	Data deficient
	SMM04	0.12	0.94	Low typical		SMM04	0.03	0.2	Low		SMM04	0.03	0.2	Data deficient
	SMM05	0.37	2.94	Med typical		SMM05	0.04	0.31	Low		SMM05	0.04	0.34	Data deficient
	SMM06	0.18	1.43	Low		SMM06	0.09	0.74	Low		SMM06	0.05	0.4	Data deficient
Soprano pipistrelle	SMM01	0.04	0.8	Low typical	Brown long-eared	SMM01	0.02	0.14	Data deficient					
	SMM02	0.1	0.4	Low typical		SMM02	0.08	0.6	Data deficient					
	SMM03	0.15	0.51	Low typical		SMM03	0.06	0.49	Data deficient					
	SMM04	0.07	0.94	Low typical		SMM04	0.11	0.89	Data deficient					
	SMM05	0.21	2.94	Med typical		SMM05	0.22	1.74	Data deficient					
	SMM06	0.52	1.43	Low typical		SMM06	0.35	2.77	High					

4.1 SPECIES TRENDS IN SCOTLAND AND ON SITE

4.1.1. To provide context to bat activity results returned within the Site, data was compared to the results returned from a study of bat population trends in Scotland obtained from the BCT (BCT, 2022), illustrated in **Table 4-4.**

Table 4-4 - Species population trends and Bat Activity levels determined from Static Bat Detectors deployed within the Site.

Species	Population sizes and trends Scotland source: BCT 2022	Site Species Trends. Activity levels adapted from Dowse et al (2015)
Common pipistrelle	285,000 – 2,160,000. The population of common pipistrelle in Scotland is considered to have been stable since 1999.	Low activity levels recorded across the Site.
Soprano pipistrelle	512,000 – 2,180,000. Population of soprano pipistrelle considered to be stable in Scotland since 1999. Most commonly recorded species in Scotland.	Most commonly recorded species within the Site. Med typical to low typical activity levels recorded across the Site.
Nathusius' pipistrelle	Numbers unknown. Nathusius' pipistrelle is rare but widespread throughout Great Britain.	Not recorded during the survey.
Large *Myotis* Sp.: Daubenton's and Natterer's	Natterer: 1,490 – 260,000. The population of Natterer's bat in Scotland has been stable since 1999. Limited data available for Daubenton's. The population of Daubenton's bat in Scotland is considered to have been stable since 1999.	Low to low typical activity levels of *Myotis* sp. recorded across the Site. No recordings at all made at Detector Location SMM02.
Nyctalus Sp.: Leisler's and Noctule	Limited data available for Noctule. Present in Southern Scotland typically. Limited data for Leisler, uncommon but widespread throughout UK.	Not recorded during the survey. Not likely present within the area as the Site is not within their distribution range.
Brown long-eared bat	12,800 – 543,000. The population of long-eared bat is considered to be stable in Scotland since 2002.	High activity levels recorded at detector location SMM06. This species was recorded across all detector locations.
Small *Myotis Sp:* Whiskered/Brandt's bat	Whiskered bat is rare in Scotland. There are only a few records of Brandt's bat in Scotland and have not been recorded outwith the southwest of Scotland.	Not recorded during the survey. Not likely present within the area as the Site is not within their distribution range.

4.1.2. Based on the results of bat species population trends and bat activity recorded within the Site (**Table 4-4 - Species population trends and Bat Activity levels determined from Static Bat Detectors deployed within the Site**) trends of bat activity are as expected for the geographical location of the Site and habitats present relative to bat populations. With soprano pipistrelle being the most common species recorded and no rarities or abnormal activity levels recorded during the survey effort.

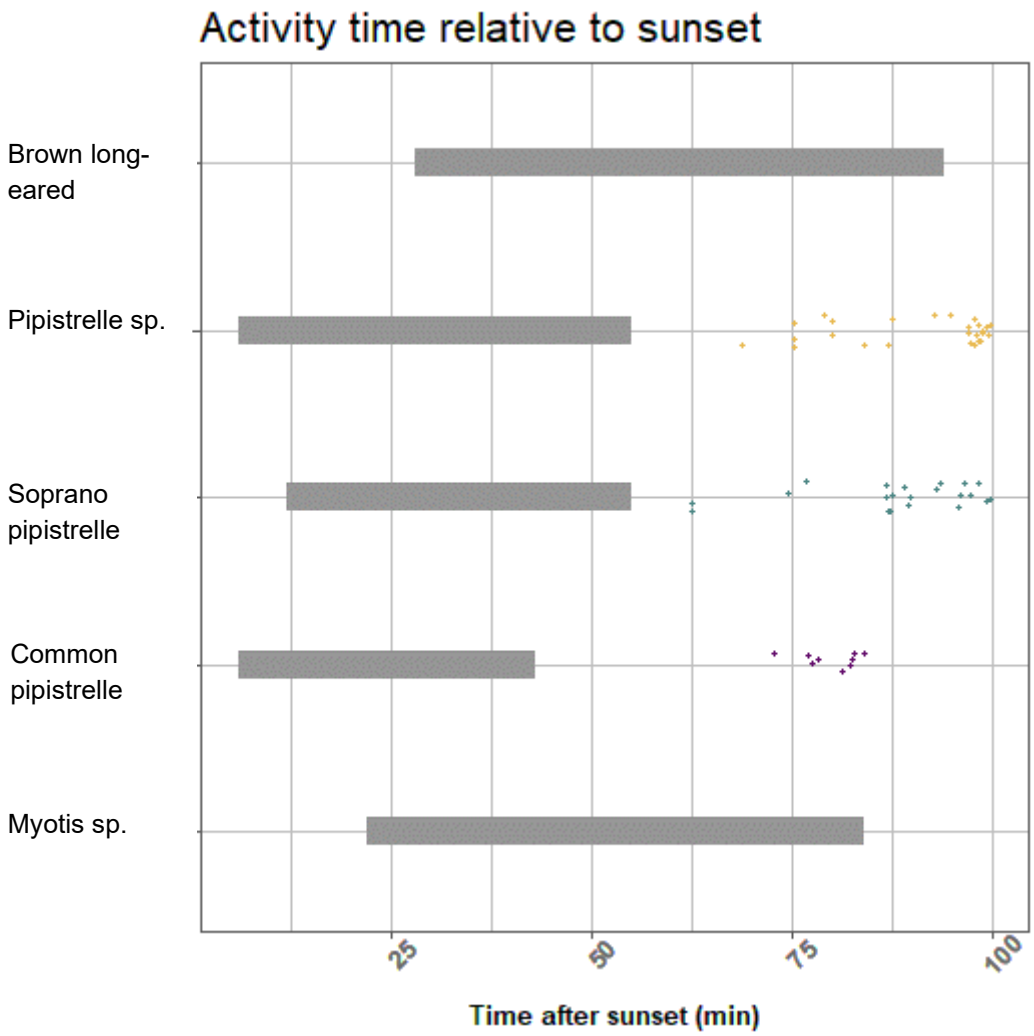
4.2 POTENTIAL ROOSTS WITHIN OR CLOSE TO THE SITE

4.2.1. Call data was analysed in relation to the standard roost emergence times (Russ, 2012, Andrews 2018) and detector location compared with aerial maps and UKHab data recorded in **Appendix 10.1** Within the Site there are limited roosting opportunities identified during the survey effort reported in **Appendix 10.2** with more suitable roosting opportunities found outwith the Site primarily to the south of the Site where there is some mixed and broadleaved woodland as well as buildings associated with nearby farms. These suitable roosting opportunities are between approximately one and three kilometres from detector locations across the Site. The suitable roosting opportunities identified are within the core sustenance zone[2] for all species recorded on Site relative to the Site (Bat Conservation Trust, 2020). The opportunities are within a short commuting distance from bats recorded during the survey effort (approximately five to ten minute commute for Pipistrelle bats (Seibert *et al*., 2013)).

4.2.2. Based on the below **Figure 4-2**, it is unlikely that any considerable number/maternity roost(s) are within/proximal to the Site as no calls recorded overlap species specific emergence times (Russ, 2012., Andrews, 2018) and over each night calls were recorded beyond this anticipated emergence time. It should however be noted that the detector range is believed to be around 10m for bat calls and bats could be roosting within/near the Site and foraging elsewhere before passing the detectors on Site.

[2] Corse sustenance zone: the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.

Figure 4-2 - Species-specific emergence times. Coloured dots show the time of the recorded passes in relation to the emergence time window (grey bar).



4.3 POTENTIAL COLLISION RISK

4.3.1. Bat activity levels on Site for high-risk bat species are on the lower end of typical levels relative to the habitats present. It is therefore considered that a considerable number/maternity roost(s) are unlikely to be proximal to the Site (Dowse *et al*, 2015).

5 DISCUSSION

5.1.1. The automated detectors recorded bat passes at all detector locations at varying levels. Out of the species recorded on Site *Pipistrellus* species (including common and soprano pipistrelle) fall into the high risk of turbine impact category (SNH, 2019). Typical levels of soprano pipistrelle activity were recorded across the Site at all detector locations for the habitats present (Dowse, *et al*. 2015) with this species accounting for 33.67% of all activity on Site. Low levels of common pipistrelle activity were recorded with typical levels present of Myotis species bats however these are considered low risk of turbine impact (SNH, 2019).

5.1.2. Soprano pipistrelle bats were more prevalent across the Site than any other species closely followed by brown long-eared bats and *Pipistrellus* sp. high levels of brown long-eared activity were recorded at SMM06 however this species is considered low risk for turbine collision. *Pipistrelle* species recorded on Site are limited to common and soprano pipistrelle, which are both considered wide-spread and common across Scotland.

5.1.3. The boundary habitat to the south of the Proposed Development had higher levels of bat activity than the moorland habitat as would be expected for bats foraging and commuting.

6 CONCLUSION

6.1.1. Bat survey work following the latest onshore wind farm guidance (SNH, 2019) was conducted at the Proposed Development. Six Wildlife Acoustics Song Meter Mini bat detectors were distributed across the Proposed Development area.

6.1.2. Six species/genera of bats were recorded, including soprano pipistrelle (the most commonly recorded species), common pipistrelle, *Myotis* species and brown long-eared bat.

6.1.3. Bat activity on Site did not exceed typical levels and was generally low typical across the survey effort for all species with some medium typical activity levels recorded. Activity recorded is not indicative notable roosts being in proximity to the Site i.e., maternity roosts or large colonies. However, it should be noted that this does not equate to bat roosts being absent on Site or within proximity to the Proposed Development.

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Annex A

FIGURES

7 Lochside View
Edinburgh Park
Edinburgh, Midlothian
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wsp.com