

Technical Appendix

Lairdmannoch Energy Park

Technical Appendix 6-3: Bats

Lairdmannoch Energy Park Limited Wind2

May 2025



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Glossary of Terms

Torm	Definition
Term	Delimiton
The Applicant	Lairdmannoch Energy Park Limited
The Agent	Atmos Consulting Limited
The Proposed Development	Lairdmannoch Energy Park
The Proposed Development Site	The full application boundary as per Figure 1.1
Designated Site	Nature sites and areas of countryside can be 'designated', which means they have special status as protected areas because of their natural and cultural importance
Habitats Directive	European Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (as amended)

List of Abbreviations

Acronym	Full Term
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
km	Kilometre
m	Metre
NS	NatureScot (formerly known as Scottish Natural Heritage, SNH)
NBN	National Biodiversity Network
TA	Technical Appendix



1 Introduction

In March 2023 Atmos Consulting Ltd (Atmos) were commissioned by Lairdmannoch Energy Park Limited ('the Applicant') to carry out Bat surveys on land at Lairdmannoch.

The proposed Lairdmannoch Energy Park (the 'Proposed Development') would be located 7 km north-east of Gatehouse of Fleet and 10 km west of Castle Douglas in Dumfries and Galloway, centred on Grid Reference NX 65917 61697.

The surveys were undertaken to establish the bat species baseline condition as summarised in this Appendix and it should be read in conjunction with the EIAR and associated documents:

- Technical Appendix 6-1: Extended Phase 1 Survey;
- Technical Appendix 6-2: National Vegetation Classification Survey;
- Technical Appendix 6-4: Protected Species Surveys; and
- Technical Appendix 6-5: Confidential Badger Annex.

The principal objectives of Technical Appendix are to:

- Describe the results of a desk study to ascertain the location and proximity of protected areas within 10 km of the Proposed Development Site, and to assess data for bat species within 10 km;
- Describe the results of the Bat Surveys conducted within the Proposed Development Site and appropriate buffer to confirm the presence or absence of protected species and the potential of these areas to support local populations; and
- Set out parameters for a proposed curtailment regime as part of Post Construction Monitoring.

This TA supports **Chapter 6 Ecology** in **Volume 2** of this EIA Report and as such, does not comprise an assessment of results, but provides the survey information only.



2 Methodology

2.1 Legislation

Bat species in Scotland are protected by the Conservation (Natural Habitats, &c.) Regulations 1994 as amended in Scotland and are commonly referred to as European Protected Species (EPS). The Regulations transpose into Scottish law the European Council's Habitats Directive (92/43/EEC).

It is an offence to deliberately or recklessly:

- Capture, injure or kill a bat;
- Harass an individual or group of bats;
- Disturb a bat while it is occupying a structure or place used for shelter or protection;
- Disturb a bat while it is rearing or otherwise caring for its young;
- Obstruct access to a breeding site or resting place, or otherwise deny the animal use of the breeding site or resting place;
- Disturb a bat in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;
- Disturb a bat in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; or
- Disturb a bat while it is migrating or hibernating.

It is also an offence of strict liability to:

• Damage or destroy a breeding site or resting place of a bat even if they are not in use at the time (i.e., a summer roost during the winter period).

2.2 Impacts of Wind Farms

Of the 18 UK bat species, ten occur in Scotland: common pipistrelle Pipistrellus pipistrellus, soprano pipistrelle P. pygmaeus, Nathusius' pipistrelle P. nathusii, Natterer's Myotis nattereri, Daubenton's M. daubentonii, noctule Nyctalus noctula, brown long-eared bats Plecotus auritus, Leisler's N. leisleri and whiskered/Brandt's M. mystacinus/M. brandtii bats. However, the occurrence of these species is variable throughout Scotland.

In addition to the above, several bat species are included within the Scottish Biodiversity List, including Brandt's, Daubenton's, whiskered, Natterer's, noctule, Nathusius's, common pipistrelle, soprano pipistrelle, and brown long-eared bat.

NatureScot guidance for bats and onshore wind turbines (NatureScot, 2021) provides guidance on the risk levels from wind farm developments associated with Scottish bat species, based on physical and behavioural characteristics and from evidence of casualty rates in UK and the rest of Europe.

Table 6-3-1, reproduced from the NatureScot guidance, shows the levels of risk derived for key species. **Table 6-3-2**, also reproduced from NatureScot guidance, takes relative population sizes into account, and presents the levels of risk at population level. Appendix 1 in the guidance sets out the different physical and behaviour characteristics of bats and assigns a different risk category to each characteristic, allowing each bat species to then be categorised by risk (**Table 6-3-1**).



Low Risk	Medium Risk	High Risk
Brown long-eared	Not Applicable	Common pipistrelle
Daubenton's	Not Applicable	Soprano pipistrelle
Natterer's	Not Applicable	Nathusius' pipistrelle
Whiskered	Not Applicable	Noctule
Brandt's	Not Applicable	Leisler's

Table 6-3-1: Bat Species Likely to be at Risk from Wind Turbines

Table 6-3-2: Bat Populations Likely to be Threatened Due to Impacts from Wind Turbines

Low Risk	Medium Risk	High Risk
Brown long-eared	Common pipistrelle	Nathusius' pipistrelle
Daubenton's	Soprano pipistrelle	Noctule
Natterer's	Whiskered	Leisler's
	Brandt's	

Five species are identified to be of high risk from wind turbine mortality: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Leisler's bat and noctule. This is due to factors such as habitat preference, echolocation characteristics, wing shape, flight speed, flight behaviour and use of landscape, hunting techniques and migration strategies.

Common and soprano pipistrelle bats and *Myotis* species do cross open spaces, however, they are relatively less likely to fly at a height that will bring them into contact with a turbine blade. Despite this, based on research, they have been categorised as high risk. Noctule and Leisler's bats, and Nathusius' pipistrelle to a lesser extent, do fly at height and often cross open spaces, making them "high risk" species because they exhibit all of the characteristics associated with species at high risk.

Risk of species being struck does not always translate into population level effects. Those species with smaller populations are more likely to encounter population levels effects; as such, those species which show a high risk of collision and with smaller populations (noctule, Leisler's bat and Nathusius' pipistrelle) are considered most sensitive to negative effects from wind farm developments. Common and soprano pipistrelle, with typically much more robust populations, are considered less likely to have population level effects (**Table 6-3-2**).

2.3 Impacts on Solar Farms

NatureScot pre-application guidance for solar farms was updated in February 2025 and contains the following wording:

Our standing advice for bats should be referred to inform survey, assessment, mitigation and any licensing requirements. Solar PV farm developments should be designed and constructed to avoid damage or disturbance to bat roost sites and to minimise any loss or fragmentation of foraging and commuting habitat. The risk of collision for solar PV farm developments is low so bat activity surveys are not required.

2.4 Desktop Study

A desk study was undertaken to gain further understanding of the Proposed Development Site, to gather information on the presence of statutory nature



conservation sites, and existing bat records within 10 km of the Proposed Development Site.

Various data sources were utilised including the website of the statutory agency, NatureScot via the 'SiteLink Portal', publicly available datasets available for commercial use held on the National Biodiversity Network (NBN) Atlas website, and aerial photography used to aid the assessment of habitat features.

A review of existing bat survey data from wind energy projects (operational, under construction, and those at various stages in the planning system) within 10 km of the Proposed Development Site was also undertaken.

2.5 Automatic Detector Survey

Static bat detectors were deployed at nine locations over three visits in April, July, and September 2023 and two visits in August and September in 2024 in the same locations (Appendix A: **Figure 6-3-1**). Full spectrum bat detectors (Wildlife Acoustics Song Meter Mini Bats) were used.

The detectors were set up to record activity from 30 minutes before sunset to 30 minutes after sunrise for a period of at least 10 nights (Collins, 2016). **Table 6-3-3** shows the details of each of the five visits.

The nine locations correspond to the initial design layout that has evolved since the start of the planning process in 2022. Therefore, the nine detector locations are considered appropriately close to the final proposed turbine locations to suitably represent the Proposed Development as set out in the EIAR as shown in **Table 6-3-4**.

Visit Number	Deployment Date	Retrieval Date	Nights Deployed	Detection Time (hours)		
2023						
1	20/04/2024	30/04/2023	10	92:12 hrs		
2	27/06/2024	10/07/2023	13	81:30 hrs		
3	04/09/2024	14/09/2023	10	107:30 hrs		
2024						
2	01/08/2024	13/08/2024	12	102:00 hrs		
3	06/09/2024	16/09/2024	10	109:36 hrs		

Table 6-3-3: Bat Static Detector Deployment Details

Table 6-3-4: Static Detector Locations

Detector	Turbine	Approximate Grid Reference
\$1	T5	NX 64653 61878
S2	Τ7	NX 64414 61960
\$3	Т6	NX 64336 62646
S4	Τ7	NX 63790 62694
\$5	Т9	NX 63772 62050
S6	ТЗ	NX 65041 61202
\$7	Τ4	NX 64675 61388
\$8	T2	NX 65249 62663
S9	ті	NX 65496 62370



2.6 Sonogram Analysis

Analysis of full spectrum WAV files was undertaken firstly by Kaleidoscope Pro using the Auto ID feature. Subsequently, quality control was undertaken of all sonogram files classified as "noise" by Kaleidoscope during the conversion process through manual checking of sonograms, and where bat calls were present, manual identification was undertaken. Species identification broadly followed that presented in (Russ, 2012), considering the geographical location of the Proposed Development Site, habitats present, and ecologists' own expertise and Proposed Development Site knowledge.

Absolute measures of bat activity are not possible to reliably calculate for automated field studies as during an individual recording session, it is not possible to differentiate between one individual bat passing the detector ten times or ten different bats passing the detector on a single occasion. As per NS guidance, a measure of relative bat activity can be obtained using the secure online tool "Ecobat" to compare data collected from the Proposed Development Site, with bat survey information collected from similar areas at the same of the year and in comparable weather conditions.

Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting the levels of bat activity recorded at a site across regions in Britain by producing a Bat Activity Index (BAI). It is currently the most objective method of assessing bat activity (Lintott & Matthews, 2018) (NatureScot, 2021).

2.7 Risk Assessment

As per NS guidance, a risk assessment is conducted for each of the species observed within the Proposed Development Site. The initial stage involves assessing the site risk by considering the habitat suitability and development related features (NatureScot, 2021). Habitat suitability considers the number of potential roosts and their quality, the foraging habitat and the connectivity with the wider landscape through prominent linear features such as streams and hedgerows.

Development related features include the presence and number of wind energy developments within the surrounding area, and the number and size of turbines. Once these parameters are classified a site risk value is calculated, between 1-5, which will be used to determine the species risk.

The second stage uses the site risk value and the relative bat activity level to derive an overall risk assessment for each species. Relative bat activity for each species is produced by Ecobat (Mammal Society, 2024) using historic levels of activity at each detector location, during each season within the wider spatial and temporal landscape. Therefore comparing Proposed Development Site activity with data from the same region within one month. From this output, median and maximum percentiles of activity can be created for each species.

The median and maximum percentiles of activity are ranked on a scale of 0-100% and assigned a classification from low – high, which is multiplied by the site risk to produce an overall risk value; values are described as low (0-5), medium (6-12) or high (13-25) activity. It is important to have an understanding of both "typical" and "unusually high" levels of bat activity within the Proposed Development so that potentially important peaks are not overlooked (NatureScot, 2021).



2.8 Limitations

In 2023, no issues were noted with data collection during the first and second survey periods, however, there was a failure with the detector at T9 during the third survey period. This is not considered a limiting factor due to the lack of activity recorded at this locality during the previous visits of that year.

In 2024, no issues were noted with static detector surveys, although deployment only occurred during the summer and autumn. This is not considered a limiting factor as the second year of data collection was conducted to supplement the original dataset in order to better understand the bat activity within the Proposed Development Site. Given the low numbers of flights in the spring of 2023 it was decided to not repeat this season in 2024 but focus on summer and autumn repeat surveys, given the majority of activity in the first year (2023) was in these seasons (just 2% of total 2023 activity was in spring). As such, the lack of spring data is not a limiting factor to the assessment.



3 Results

3.1 Desk Study

3.1.1 Designated Sites

A search of the SiteLink website yielded no results of designated sites within 10 km of the Proposed Development for which bat species are of qualifying interest (NatureScot, 2024).

3.1.2 Species Records

The results of the search for bat species records within 10 km of the Proposed Development within the last 10 years on the NBN Atlas website are shown below in **Table 6-3-5** (National Biodiversity Network, 2024). Distances are approximate, and each species may be associated with multiple records within the data as provided by the local record centre.

-	-
Species	Summary of Records
Daubenton's bat Myotis daubentonii	267 records within the last 10 years, closest record 3 km northeast of Proposed Development Site.
Whiskered Bat Myotis mystacinus	1 record within last 10 years, approximately 6.4 km southwest of Proposed Development Site.
Natterer's bat Myotis nattereri	139 records within the last 10 years, closest record 3 km northeast of Proposed Development Site.
Leisler's Bat Nyctalus leisleri	869 records within the last 10 years, closest record 3.1 km northeast of Proposed Development Site.
Noctule bat Nyctalus noctula	125 records within last 10 years, closest record 5.4 km southwest of Proposed Development Site.
Nathusius's pipistrelle Pipistrellus nathusii	1 record within the last 10 years, approximately 6.3 km southeast of Proposed Development Site
Common pipistrelle Pipistrellus pipistrellus	4,912 records within last 10 years, closest record 1.45 km south of Proposed Development Site.
Soprano pipistrelle Pipistrellus pygmaeus	9,720 records within the last 10 years, closest record on Proposed Development Site.
Brown long-eared bat Plecotus aurius	31 records within the last 10 years, closest record 4.4 km northeast of Proposed Development Site.

Table 6-3-5: The Wildlife Information Centre Records of Bats from the Last 10 Years within10 km of the Proposed Development



3.2 Bat Activity Surveys

3.2.1 Overall Activity

The results of the 2023 static detector deployment surveys identified the presence of at least five species; Myotis sp., Nyctalus sp., common pipistrelle, soprano pipistrelle and brown long-eared bat., the inability to differentiate Myotis sp. and Nyctalus sp. passes to species resulted in the identification to genus.

A total of 3,715 passes were recorded throughout the year; 2% of the calls were recorded in the spring, 45% in summer and 52% in autumn, see below **Table 6-3-6**. The majority of the calls were identified as *Nyctalus* sp., equating to approximately 65% of the total passes. Most of the remaining calls were evenly distributed between *Myotis* sp., common pipistrelle and soprano pipistrelle, 10%, 13%, and 10%, respectively, and few were brown long-eared bat, 3%.

The results of the 2024 static detector deployment surveys identified the same up to five species within the Proposed Development Site as in 2023: *Myotis* sp., *Nyctalus* sp., common pipistrelle, soprano pipistrelle and brown long-eared bat, see below **Table 6-3-7.** A total of 1,895 passes were recorded the two deployments, fewer than the previous year, and the vast majority were recorded during the summer, approximately 75%.

Similarly, the majority of passes recorded were identified as *Nyctalus* sp., making up approximately 40% of the total calls; slightly greater proportions of common pipistrelle and soprano pipistrelle were recorded, 20% and 29%, respectively, although the total number of passes were similar to that of the previous year. Little activity was recorded by *Myotis* sp. and brown long-eared bat, 147 passes and 85 passes, respectively.

	No. of Passes				Percentage of
Species	Spring	Summer	Autumn	Species Total	Total (%)
Myotis sp.	16	15	348	379	10.2
Nyctalus sp.	45	1,398	954	2,397	64.5
Pipistrellus pipistrellus	6	137	232	375	10.1
Pipistrellus pygmaeus	12	129	330	471	12.7
Plecotus auritus	1	8	84	93	2.9
TOTAL	80	1,687	1,948	3,715	
Percentage of Total (%)	2.2	45.4	52.4		100

Table 6-3-6: Summary of Bat Activity 2023

Table 6-3-7: Summary of Bat Activity 2024

	No. of Passes				Percentage of
Species	Spring	Summer	Autumn	Species Total	Total (%)
Myotis sp.	N/A	73	74	147	7.8
Nyctalus sp.	N/A	621	126	747	39.4
Pipistrellus pipistrellus	N/A	315	58	373	19.7
Pipistrellus pygmaeus	N/A	389	154	543	28.7
Plecotus auritus	N/A	41	44	85	4.5
TOTAL	N/A	1,439	456	1,895	
Percentage of Total (%)	N/A	75.9	24.1		100



3.2.2 Bat Activity Index

The BAI of each species was calculated per detector locations using the median number of passes per hour, as per guidance (NatureScot, 2021). This informs the level of activity across the Proposed Development Site, displayed in Graphs 6-3-1 and 6-3-2; the colours of the bars reflect the location of the detector.

In 2023, Nyctalus sp. recorded the greatest level of activity overall, with a BAI of 3.1, 1.6, 1.5, 1.3 and 1.3 at S5, S2, S6, S1, and S9, respectively; the BAI at the remaining four localities ranged from 0.4–1. Myotis sp. recorded the greatest BAI at an individual detector, 3.3 at S1, however, the overall activity was consistently lower as the BAI at the remaining eight localities ranged from 0-0.4. Soprano pipistrelle recorded the second greatest overall activity with BAI's ranging from 0.1 at T9 to 1.7 at S6.

The BAI calculated for common pipistrelle was fairly consistent across the Proposed Development Site, eight of the locations recorded median hourly pass rates of 0.2-0.3, with the exception of 0.8 at S6. Brown long-eared bat activity was consistently low across all detectors as the BAI ranged from 0-0.3, the later recorded at S3 and S5.

Common pipistrelle, soprano pipistrelle and *Nyctalus* sp. were recorded at each detector location, whereas *Myotis* sp. was recorded at eight of the localities, excluding S9, and brown long-eared bat was recorded at seven of the localities, excluding S7 and S9. The greatest overall level of activity was recorded around S1, with a total median pass rate of 5.8 bats per hour and the lowest level was recorded around S4 and S7, 1.1 bats per hour.



Graph 6-3-1: Bat Activity Index within the Proposed Development Site 2023



In 2024, the level of bat activity within the Proposed Development Site was considerably lower than that recorded in 2023. In 2024, *Nyctalus* sp. recorded the greatest amount of activity with a BAI of 1, 0.8, and 0.7 at S6, S9, S3, and S4, respectively. Soprano pipistrelle was the second most active species within the Proposed Development Site as it recorded BAI's ranging from 0.3 at S1, S4, S5, and S8 and 0.8 at S6. Common pipistrelle activity was low as BAI's ranged from 0.1-0.4, *Myotis* sp. and brown long-eared bat recorded similarly low BAI's ranging from 0.1-0.3.

The greatest amount of activity was recorded around S6, this locality was the busiest within the Proposed Development Site for common pipistrelle, soprano pipistrelle and *Nyctalus* sp. with BAI's of 0.8, 0.8, and 1, respectively. Activity was relatively consistent throughout the remainder of the Proposed Development Site as BAI's rarely peaked above 0.6.



Graph 6-3-2: Bat Activity Index within the Proposed Development Site 2024

3.2.3 Relative Spatial and Temporal Activity Levels

In order to understand the distribution of activity across the Proposed Development Site, the nightly activity is ranked by Ecobat within the context of the geographic location and temporal coverage, see below **Tables 6-3-8 and 6-3-9.** As discussed in section 2.5, this approach excludes "zero activity" nights and as a result is likely to represent data skewed towards high activity levels. The analysis compares activity levels within the Proposed Development Site to a central database within 30 days of the survey date and within 100 km² of the detector location.

In 2023, the relative comparison indicates that the overall level of bat activity within the Proposed Development Site was low, see below **Table 6-3-8**. One exceptional night of *Nyctalus* sp. activity was recorded around S2, along with two nights of high activity and two nights of moderate-high activity when considering the surrounding area and time of year. Myotis sp. activity was exceptional for two nights of the year and high for six nights at S1, the remaining nights of activity were either low-moderate or low activity



around all detector locations. Brown long-eared bat activity recorded around \$5 and \$6 was exceptional for one and two nights, respectively; high activity was recorded around \$2, \$3 and \$5 for 2 nights, 5 nights and 3 nights, respectively. The remaining nights of activity were ranked as either moderate-high or low-moderate around all of the detector locations. All nights of common pipistrelle and soprano pipistrelle activity were ranked as low with respect to the surrounding area and time of year.

		Number of Nights of Relative Spatial and Temporal Activity Level						
Detector				Moderate/		Moderate/		
ID	Species	Exceptional	High	High	Moderate	Low	Low	
S1	Myotis sp.	2	6	0	0	1	2	
S2		0	0	0	0	2	8	
S3		0	0	0	0	0	5	
S4		0	0	0	0	2	5	
S5		0	0	0	0	5	2	
S6		0	0	0	0	2	7	
S7		0	0	0	0	0	1	
S8		0	0	0	0	4	4	
S9								
S1	Nyctalus	0	0	0	4	5	8	
S2	sp.	1	2	2	1	9	10	
S3		0	0	0	5	1	7	
S4		0	0	0	2	3	14	
S5		0	0	0	6	0	2	
S6		0	0	2	6	2	9	
S7		0	0	0	0	0	5	
S8		0	0	0	4	1	8	
S9		0	0	0	0	3	7	
S1	Pipistrellus	0	0	0	0	0	13	
S2	pipistrellus	0	0	0	0	0	15	
S3		0	0	0	0	0	12	
S4		0	0	0	0	0	14	
S5		0	0	0	0	0	6	
S6		0	0	0	0	0	13	
S7		0	0	0	0	0	4	
S8		0	0	0	0	0	10	
S9		0	0	0	0	0	7	
S1	Pipistrellus	0	0	0	0	0	13	
S2	pygmeaus	0	0	0	0	0	14	
S3		0	0	0	0	0	12	
S4		0	0	0	0	0	12	
S5		0	0	0	0	0	6	
S6		0	0	0	0	0	13	
S7		0	0	0	0	0	6	
S8		0	0	0	0	0	11	

Table 6-3-8: Number of Nights of Relative Spatial and Temporal Activity 2023



		Number of Nights of Relative Spatial and Temporal Activity Level									
Detector		_		Moderate/		Moderate/					
ID	Species	Exceptional	High	High	Moderate	Low	Low				
S9		0	0	0	0	0	7				
S1	Plecotus	0	0	2	0	2	0				
S2	auritus	0	2	2	0	4	0				
S3		0	5	1	0	2	0				
S4		0	0	2	0	3	0				
S5		1	3	1	0	1	0				
S6		2	0	3	0	2	0				
S7											
S8		0	0	3	0	2	0				
S9											

In 2024, the relative comparison indicates that the overall bat activity within the Proposed Development Site was low, see below **Table 6-3-9**; the level of activity recorded was significantly lower than 2023. Brown long-eared bat activity was considered exceptional for one night around S1 and two nights around S5, high around S1 for one night and two nights around S7; the remaining nights of activity were ranked as moderate to moderate-high around all detector locations with respect to the surrounding area and the time of year.

Nyctalus sp. activity was classified as moderate-high for two nights at S3 and S4 and three nights at S6, the remaining nights of activity were considered low to moderate. Two nights of moderate Myotis sp. activity were recorded around S1 and the remaining nights of activity around each turbine were low to low-moderate. Similar to 2023, all nights of common pipistrelle and soprano pipistrelle activity were ranked as low when considering the surrounding area and time of year.

		Number of nights of relative spatial and temporal activity level								
Detector		Exceptional		Moderate/		Moderate/				
ID	Species		High	High	Moderate	Low	Low			
S1	Myotis sp.	0	0	0	2	3	5			
S2		0	0	0	0	2	2			
S3		0	0	0	0	2	6			
S4		0	0	0	0	0	2			
S5		0	0	0	0	2	9			
S6		0	0	0	0	0	6			
S7		0	0	0	0	4	6			
S8		0	0	0	0	3	5			
S9		0	0	0	0	0	9			
S1	Nyctalus	0	0	0	0	4	6			
S2	sp.	0	0	0	0	3	4			
S3		0	0	2	0	3	6			
S4		0	0	2	1	2	6			
S5		0	0	0	3	0	8			
S6		0	0	3	2	4	7			

Table 6-3-9: Number of Nights of Relative Spatial and Temporal Activity 2024



		Number of nights of relative spatial and temporal activity level							
Detector ID	Species	Exceptional	High	Moderate/ High	Moderate	Moderate/ Low	Low		
S7		0	0	0	2	2	7		
S8		0	0	0	3	4	4		
S9		0	0	0	2	1	7		
S1	Pipistrellus	0	0	0	0	0	5		
S2	pipistrellus	0	0	0	0	0	6		
S3		0	0	0	0	0	10		
S4		0	0	0	0	0	10		
S5		0	0	0	0	0	8		
S6		0	0	0	0	0	14		
S7		0	0	0	0	0	11		
S8		0	0	0	0	0	13		
S9		0	0	0	0	0	9		
S1	Pipistrellus	0	0	0	0	0	11		
S2	pygmeaus	0	0	0	0	0	9		
S3		0	0	0	0	0	11		
S4		0	0	0	0	0	10		
S5		0	0	0	0	0	9		
S6		0	0	0	0	0	13		
S7		0	0	0	0	0	12		
S8		0	0	0	0	0	12		
S9		0	0	0	0	0	10		
S1	Plecotus	1	1	0	3	0	0		
S2	auritus	0	0	1	3	0	0		
S3		0	0	4	5	0	0		
S4		0	0	0	5	0	0		
S5		2	0	1	1	0	0		
S6		0	0	0	4	0	0		
S7		0	2	2	1	0	0		
S8		0	0	2	5	0	0		
S9		0	0	1	4	0	0		

3.2.4 Sunset Activity

Activity levels can vary significantly throughout the year and analysing the activity level around sunset may indicate the presence of bat features nearby, such as maternity roosts, swarming sites and hibernation roosts. it is possible to understand the presence of these features by comparing the emergence time ranges of species (highlighted by a grey box) with the number of passes recorded per species per detector relative to sunset, 15 minutes before and 90 minutes after, see below Graphs 6-3-3 - 6-3-20; inclusive.

There was little activity within the emergence time ranges for each of the species throughout the Proposed Development Site, see Graphs 6-3-3 – 6-3-11. All detectors, except S7, recorded Nyctalus sp., Myotis sp., common pipistrelle or soprano pipistrelle



activity within their relevant emergence time ranges, however, there was insufficient activity of each to indicate the presence of a bat feature nearby.

Graph 6-3-3: Bat Passes Recorded Around \$1 in 2023, 15 Minutes Before and 90 After Sunset



Graph 6-3-4: Bat Passes Recorded Around S2 in 2023, 15 Minutes Before and 90 After Sunset







Graph 6-3-5: Bat Passes Recorded Around S3 in 2023, 15 Minutes Before and 90 After Sunset









Graph 6-3-7: Bat Passes Recorded Around S5 in 2023, 15 Minutes Before and 90 After Sunset









Graph 6-3-9: Bat Passes Recorded Around \$7 in 2023, 15 Minutes Before and 90 After Sunset









Graph 6-3-11: Bat Passes Recorded Around S9 in 2023, 15 Minutes Before and 90 After Sunset

Similarly, in 2024, there was little activity within the emergence time ranges for each of the species throughout the Proposed Development Site, see Graphs 6-3-12 – 6-3-20. A handful of detectors, S6, S7, S8 and S9, recorded *Nyctalus* sp. or soprano pipistrelle activity within their relevant emergence time ranges, however, there was insufficient activity to indicate the presence of a bat feature nearby.



Graph 6-3-12: Bat Passes Recorded Around S1 in 2024, 15 Minutes Before and 90 After Sunset





Graph 6-3-13: Bat Passes Recorded Around S2 in 2024, 15 Minutes Before and 90 After Sunset









Graph 6-3-15: Bat Passes Recorded Around S4 in 2024, 15 Minutes Before and 90 After Sunset









Graph 6-3-17: Bat Passes Recorded Around S6 in 2024, 15 Minutes Before and 90 After Sunset









Graph 6-3-19: Bat Passes Recorded Around S8 in 2024, 15 Minutes Before and 90 After Sunset

Graph 6-3-20: Bat Passes Recorded Around S9 in 2024, 15 Minutes Before and 90 After Sunset



3.2.5 Risk Assessment

A risk assessment of the Proposed Development Site was conducted according to NatureScot guidance (NatureScot, 2021). The initial risk assessment considers the size of the project and the quality of the habitat within the Proposed Development Site, see **Table 6-3-10**. The Proposed Development Site is considered to be of medium size as there are fewer than 10 turbines, there are other wind farm developments within 5 km and the turbine height is greater than 100 m.

The habitat is considered of medium quality roosting and foraging habiutat for speceies as the Proposed Development Site is connected to the wider landscape through linear features such as tree lines and streams. Therefore, the overall score of the Proposed Development Site is 3.



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

Table 6-3-10: Proposed Development Site Risk Assessment

A secondary risk assessment was conducted by comparing the Site risk assessment with the relative amount of activity within the Proposed Development Site per species. This is completed using the median and maximum percentiles of activity to produce four tables, two for 2023 and two for 2024; see below **Tables 6-3-11 – 6-3-14** inclusive.

In both 2023 and 2024, the overall risk calculated for the median level of activity for common pipistrelle and soprano pipistrelle was low, see **Tables 6-3-11 and 6-3-12**. This remained true across the nine detectors and throughout the seasons for both species.

In 2023, the overall risk calculated using the median level of activity for *Myotis* sp., *Nyctalus* sp. and brown long-eared bat was medium. The associated risk for brown long-eared bat was the greatest of all the species. Activity around two detectors was of high risk, S3 and S5, and the remaining five detectors were of medium risk, and the associated risk was medium during all three seasons.

The risk associated with *Myotis* sp. was high at \$1 and medium \$5 which related to a medium risk during the autumn, and the remaining detector localities and seasons were of low risk. The risk associated with *Nyctalus* sp. was medium at four locations \$1, \$2, \$5 and \$6, as well as during the autumn, the remaining four locations and two seasons were of low risk.

In 2024, unlike 2023, the overall risks of *Myotis* sp. and *Nyctalus* sp. were low across all detector locations and during the two deployment seasons. Brown long-eared bat had a medium level of overall risk, with similarly high risk at \$5 and medium risk during summer and autumn compared to 2023; the remaining eight localities were of medium risk.

			Median Activity 2023										
						Dete	ctor				Season		
Species	Overall	1	2	3	4	5	6	7	8	9	Spring	Summer	Autumn
Myotis sp.	5	15	3	3	3	6	3	3	3		3	3	6
Nyctalus sp.	5	6	6	3	3	9	6	3	3	3	3	3	6
Pipistrellus pipistrellus	1	0	0	0	0	0	3	0	0	0	0	3	3
Pipistrellus pygmaeus	1	3	3	0	0	3	3	0	0	0	3	3	3
Plecotus auritus	11	9	9		6		12		12		6	9	12

Table 6-3-11: Median Activity Risk Assessment 2023



			Median Activity 2024										
						Dete	ctor				Season		
Species	Overall	1	2	3	4	5	6	7	8	9	Spring	Summer	Autumn
Myotis sp.	3	3	3	3	3	3	3	3	3	3	N/A	3	3
Nyctalus sp.	3	3	3	3	3	3	3	3	3	3	N/A	3	3
Pipistrellus pipistrellus	0	0	0	0	0	0	3	0	0	0	N/A	3	0
Pipistrellus pygmaeus	1	0	0	3	0	0	3	0	0	3	N/A	3	3
Plecotus auritus	10	9	9	9	9	15	9	12	9	9	N/A	12	9

Table 6-3-12: Median Activity Risk Assessment 2024

In both 2023 and 2024, the overall level of risk calculated for the maximum activity level of common pipistrelle and soprano pipistrelle was low. This was true across all detectors and throughout both seasons, see below **Tables 6-3-13 and 6-3-14**.

In 2023, the overall level of risk for the maximum activity recorded within the Proposed Development Site was high for *Myotis* sp., *Nyctalus* sp. and brown long-eared bat, see **Table 6-3-13.** Brown long-eared bat activity was detected at seven locations, five of which had a high associated risk during the autumn. The high risks associated with *Myotis* sp. and *Nyctalus* sp. were caused by activity at S1 during the autumn and S2 during the summer, respectively.

In 2024, the overall level of risk associated with the maximum level of activity was high for brown long-eared bat due to high-risk activity around \$1, \$5 and \$7 during the summer and autumn. Medium overall risk was calculated for *Myotis* sp. and *Nyctalus* sp., compared with high in 2023, caused by medium risk activity recorded at \$1-\$3, \$5, \$7 and \$8 during the summer and autumn.

			Maximum Activity 2023										
						Dete	ctor				Season		
Species	Overall	1	2	3	4	5	6	7	8	9	Spring	Summer	Autumn
Myotis sp.	15	15	6	3	6	6	6	3	6			3	15
Nyctalus sp.	15	9	15	9	9	9	12	3	9		6	15	12
Pipistrellus pipistrellus	3	3	3	3	3	3	3	0	3	3	0	3	3
Pipistrellus pygmaeus	3	3	3	3	3	3	3	0	3	0	3	3	3
Plecotus auritus	15	15	15	-15	12	15	15		12		6	12	15

Table 6-3-13: Maximum Activity Risk Assessment 2023



			Maximum Activity 2024										
						Dete	ctor					Season	
Species	Overall	1	2	3	4	5	6	7	8	9	Spring	Summer	Autumn
Myotis sp.	9	9	6	6	3	6	3	6	6	3	N/A	9	6
Nyctalus sp.	12	6	6	12	12	9	12	9	9	9	N/A	12	9
Pipistrellus pipistrellus	3	3	3	3	3	3	3	3	3	3	N/A	3	3
Pipistrellus pygmaeus	3	3	3	3	3	3	3	3	3	3	N/A	3	3
Plecotus auritus	15	15	12	12	9	15	9	15	12	12	N/A	15	15

Table 6-3-14: Maximum Activity Risk Assessment 2024



4 Summary

The nature of the Proposed Development Site ranks it as medium-quality roosting and foraging habitat as the surrounding non-native coniferous plantation offers potential for roosting and linear features which could create suitable migrating pathways and flight corridors.

Nyctalus sp. recorded the greatest amount of activity within the Proposed Development Site in both years of survey; 2,397 passes and 747 passes in 2023 and 2024, respectively. The greatest proportion of *Nyctalus* sp. activity in 2023 was recorded during the summer, mainly around S2 and S5 which produced BAI's of 1.6 and 3.1, respectively, see Graph 6-3-1.

One night of activity around S2 was classified as exceptional and two nights were high when compared with the surrounding area during the same time of year, see **Table 6-3-8**. The overall median level of risk associated with the species was medium throughout the entire Proposed Development Site and year, whereas the maximum level of associated risk was high, specifically at S2 during the summer, see **Tables 6-3-11 and 6-3-13**. Therefore, it is reasonable to assume there was a peak of activity recorded at this location during the summer of 2023.

Due to the level of activity recorded in 2023, supplementary surveys were conducted in 2024 to better understand the activity within the Proposed Development Site. However, the activity was much lower than that recorded the year previously, although detectors were only deployed for the latter two survey periods. The total number of *Nyctalus* sp. passes was approximately 33% of that recorded in 2023, see **Table 6-3-7**, which produced the greatest BAI of 1 at S6, see Graph 6-3-2. The lack of activity was reflected in the classification of nightly activity as there were no nights of exceptional or high *Nyctalus* sp. activity, see **Table 6-3-9**, and the overall median level of associated risk was low across all the detector locations during both seasons. The overall maximum level of activity produced a medium risk for the species at all localities.

The species are considered to be of high risk to impacts by wind farms, see **Table 6-3-1**, and the populations are considered to be at high risk from threats of wind farms due to a low population density, particularly in the southwest of Scotland which hosts a nationally important population of both noctule and Leisler bats (NatureScot, 2020) (NatureScot, 2021) (Russ, 2012), as seen in **Table 6-3-2**.

On the basis of excessive use of the Proposed Development Site by *Nyctalus* sp. during the summer and autumn of 2023 and the sensitivity of the species within southwest Scotland and their susceptibility to threats from wind farm, a bat mitigation scheme has been produced as part of the ecological mitigation for the Proposed Development Site, see Section 5: Curtailment Strategy.

Based on the above, *Nyctalus* sp. are taken forward for further assessment, as per EIAR **Chapter 6: Ecology** in **Volume 2** of this EIA Report.

The total amount of activity recorded by *Myotis* sp. in 2023 and 2024, 379 passes and 147 passes, respectively, spread across nine detector locations, indicates that the Proposed Development Site is not used regularly or abundantly by the species. Slightly more activity was recorded in 2023 which resulted in a maximum BAI of 3.3 at S1 compared to 0.3 at S1, see Graphs 6-3-1 and 6-3-2.



The BAI of 3.3 at \$1 in 2023 was caused by two nights of exceptional activity and six nights of high activity when compared with the surrounding area during the autumn, see **Table 6-3-8**. These nights of activity produced a medium associated risk when considering the median level of activity, although the risk at \$1 was considered high during the autumn; translated into a high overall risk when considering the maximum level of activity. The level of activity was not replicated during 2024 surveys, approximately 40% of the total number of passes were recorded.

There were no nights of exceptional, high or moderate-high activity recorded during the year, see **Table 6-3-9**, which produced a medium associated risk when considering the median and maximum levels of activity, see **Tables 6-3-12 and 6-3-14**. The species are considered to be of low risk to impacts of wind farms, see Table 6-3-1, and the populations are considered to be at low risk from threats of wind farms as they are common and widespread throughout the UK (NatureScot, 2021) (Russ, 2012), see **Table 6-3-2**.

Common pipistrelle and soprano pipistrelle activity within the Proposed Development Site was insufficient to suggest that the area is used regularly and abundantly by either species; common pipistrelle registered 375 passes and 373 passes, and soprano pipistrelle registered 471 passes and 543 passes in 2023 and 2024, respectively.

Considering both species are widespread and common throughout the UK the activity levels within the Proposed Development Site are relatively low, which is reflected in the low levels of nightly activity when compared to the surrounding area during the same time of year, and the low risk associated risk calculated using the median and maximum levels of activity, see **Tables 6-3-8 and 6-3-9**, and **Tables 6-3-11 – 6-3-14**; inclusive (Russ, 2012) (Huston, 2022). Both species are considered to be at high risk to impact by wind farms and their populations are considered to be of medium risk from threats of wind farms (NatureScot, 2021) (Russ, 2012), as seen in Table 6-3-1 and 6-3-2.

Brown long-eared bat recorded 97 passes in 2023 and 85 passes in 2024, see **Tables 6-3-6 and 6-3-7**. When considering the activity in relation to the wider area, as seen in **Tables 6-3-8 and 6-3-9**, three nights of activity were considered exceptional in each year, around T5 and T6 in 2023 and S1 and S5 in 2024, and a further 10 nights and 5 nights were considered high activity, respectively.

These translated into a medium overall risk when considering the median level of activity and high risk when considering the maximum level. Without context, the exceptional nights of activity and medium associated risk for the species appears to be of concern, however, taking into account the total amount of activity within the Proposed Development, fewer than 100 passes recorded across nine detector locations during multiple seasons of survey in each year, indicates that the habitat is not important for the species as it is not sufficiently present within the area.

Furthermore, the species is considered to be at low risk of wind turbine collision, as seen in **Table 6-3-1**, due to the nature of their flight, whereby they would usually fly below the sweep of the turbines (Huston, 2022) (NatureScot, 2021).



5 Curtailment Strategy

5.1 Mitigation Proposal

A mitigation strategy has been defined in response to the discovery of high concentrations of Nyctalus sp. bats, noctule and Leisler's, within the Proposed Development Site during the summer and autumn of 2023, June 1st – October 31st; inclusive. It is recommended that during the first year of operation, a tiered approach to mitigation is recommended, whereby, weather conditions and time periods dictate curtailment.

Based upon academic research, bat activity is affected by two factors, wind speed above 5.99 m/s and temperature below 11°C (Collins, 2016) (Lintott & Matthews, 2018) (Mathews, Lintott, Richardson, & Hosken, 2019).

Analysis of the 2023 dataset identified that the species was significantly more active during the summer and autumn months, from 1st of June until 31st October, compared to the spring, 1st of April util 31st May, therefore, curtailment would only be required during this period because there was sufficient bat activity to warrant mitigation.

A significant amount of this activity was recorded around S2 (turbine 7) in 2023, as outlined in Section 3, therefore, it is suggested that curtailment only take place at this turbine location. Furthermore, a significant proportion of activity around this turbine was recorded within 2 hours of sunset and sunrise during the summer and autumn, see Graph 6-3-21.

Graph 6-3-21: Nyctalus sp. Activity Within 2 Hours of Sunset and Sunrise during the Summer and Autumn





Table 6-3-15 describes how the weather conditions would affect generation. In effect, it means that on warm, still mornings and evenings, no generation will occur. However, if the wind either increases or the temperature falls below a level at which bat activity would be significantly reduced, then generation would be permitted to occur.

It should be noted that, although generation appears to be the most common occurring situation, the number of times each of those situations occur is not equal. For example, weather data from Castle Douglas in 2023 indicated that between 1st of June and 31st of October approximately 18% of the days recorded the temperature below 11°C at sunrise (Time and Date, 2023). As such, the only times when generation would be permitted using these criteria would be if the wind speed at the hub height increased to 6 m/s.

Table 6-3-15: Generation Conditions

	Temperature <11°C	Temperature ≥11°C
Wind speed <6 m/s	Generation	Curtailment
Wind speed ≥6 m/s	Generation	Generation

The thresholds are fixed, but in reality, the weather varies constantly. Additionally, with large scale machinery, there is considerable inertia involved in stopping and starting generation, particularly since curtailment reduces or stops the turbine from turning. As a result, it would not be possible to stop and start generation as readily as the weather fluctuates from minute to minute. Once generation has ceased, turbine blades would continue to rotate but at a slower speed than if generation was occurring and with the blades pitched away from the wind direction.

For operational reasons it may be necessary to amend the curtailment operating definition e.g. IT issues, equipment malfunction or other unforeseen circumstance. In such circumstance, reasonable endeavours will be taken to ensure compliance with the spirit of the curtailment strategy to ensure the risk to bats is managed.

The curtailment strategy, therefore, recommends that turbine 7 is inactive under optimal weather conditions from 1st of June until 31st October inclusive during two periods of the night, from sunset until two hours after sunset and from 2 hours prior to sunrise until sunrise, see below Graph 6-3-22.









5.2 Post-construction Monitoring

Post-construction monitoring is recommended for a of the first five years of operation in order to adjust the mitigation strategy iteratively during years two to five; it is assumed that by year five an optimum level of avoidance will have been determined and would be perpetuated for the lifetime of the Proposed Development.

These surveys would take place from 1st of June until 31st of October for the first five years of operation and will consist of the following:

- Nightly recording of bat activity at each turbine location by static detectors (30 nights July to mid-August and 30 nights mid-August to October); and
- Monthly carcass searches around each turbine location.

Bat detectors will be carried out comprising the erection of bat detectors into all the turbine nacelles. This will provide more accurate, constant monitoring of bat activity at the centre point of each turbine. This will be facilitated by the use of an omnidirectional microphone erected on the back, top or bottom (or a combination of two of these) of the nacelle, connected to a song meter mini (SM2) detector.

Bat detector technology and survey methodology for monitoring bat activity at height is constantly changing, therefore, the industry standard equipment and methods at the time will be used. The bat detectors would record constantly between 1st of June and 31st of October of each year during a five-year period of mitigation refinement.

As mentioned previously, bat activity is known to be affected by weather conditions these would be reported with the bat activity data. Each wind turbine will have an anemometer at hub height measuring wind speed, wind direction, and ambient temperature.

There will also be a single meteorology mast that would measure the same weather parameters. A rain gauge would also be erected on this mast to measure precipitation. These data will provide a better understanding of the relationship between bat activity and weather conditions.

Information will be provided on any routine maintenance involving night-time lighting in close proximity to wind turbines. This is the only predicted activity that could potentially impact upon bat activity within the Proposed Development.

Analysis of the bat activity within the Proposed Development Site would take place at the end of each survey year, 1st November until 31st May, in order to understand the temporal and spatial usage of the Proposed Development Site; the intention would be to tailor the curtailment strategy to the Proposed Development, i.e. change the hours of curtailment at T2 to better match the most active periods of the night for *Nyctalus* sp. throughout the summer and autumn.

Carcass searching will be conducted using trained cadaver dogs rather than human searchers as research has shown that dogs are more effective and efficient at locating bat carcasses (Arnett, 2006) (Mathews, et al., 2013); the Proposed Development Site could be used to further test the efficacy of such methods. Where it is practical to carry out these searches, they will be used to gauge the success of any amended mitigation strategies applied, as described above.



It is assumed that if the turbine selected for curtailment is turned off for the key periods of bat activity during both the night and the year then the risk of killing bats through turbine collision will be significantly reduced.



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Appendices

Appendix A. Figures

See Next Page

May 2025 | Lairdmannoch Energy Park Limited



Lairdmannoch Energy Park

wind2

Figure 6-3-1 Bats (static locations from 2023 & 2024)

Key	
Site boundary	
Turbine location	
Bat Static Locati	on
Wind infrastructure	
Turbine foundati	on
Crane hardstand	ding
Auxillary crane a	irea
Tower storage	
Blade storage	
Substation and B	ESS
Construction cor	npound
Borrow Pit	
<u>Track lines</u>	
Access track - cu	ut
Access track - flo	pating
Access track - up	ograded /
widened	
- Access track - sc	olar
🚫 Watercourse cro	ssing
<u>Solar infrastructure</u>	
Solar panel	
Power Station	
Switching and Br	eaking Station
ation	
am	OS
CONSUL	TING
0 0.25 0.5	
Kilomet	res
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