Appendix 6-2 – Bat Survey Report

Proposed Glenora Wind Farm, Co. Mayo

DOCUMENT DETAILS

Client:	**Glenora Wind Farm Development Application Company**
Project Title:	**Proposed Glenora Wind Farm, Co. Mayo**
Project Number:	**201120**
Document Title:	**Bat Survey Report**
Document File Name:	**BR F– 2023.12.08– 201120**
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Planning and Environmental Consultants

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01	Draft	23/08/2023	TM/AJ	AJ/JH
02	Final	08/12/2023	TM/AJ	AJ/JH

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1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of the Environmental Impact Assessment Report (EIAR) for the proposed Glenora Wind Farm development ("Proposed Development"), Co. Mayo. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Development on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Bat surveys were undertaken throughout 2021 and are consistent with the methodologies described in NatureScot 2021[1]. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level. The scope of bat work was designed in 2021, prior to the finalising of the Proposed Development layout (i.e. 22 turbines). The surveys were designed for a potential layout of up to 24 turbines. Given that 24 turbines were initially proposed, 15 detectors were deployed to ensure compliance with NatureScot guidance. The extent of the Proposed Development changed through the design process, and the number of turbines reduced to 22 turbines. Detector locations achieved a representative spatial spread in relation to proposed turbines and sampled the range of available habitats. The assessment and mitigation provided in this report have been designed in accordance with NatureScot, 2021.

For the purposes of this EIAR, the wind farm, substation, grid connection, turbine delivery route accommodation works and habitat enhancement are collectively referred to as the "Proposed Development".

The EIAR Site Boundary for the proposed development encompasses an area of approximately 1,860 hectares, the majority of which comprises commercial forestry plantation. Where the 'site' is referred to in this EIAR, this means the primary study area for the EIAR (EIAR Site Boundary), as shown in Figure 2-1. The study area extends beyond the planning application red line boundary depending on the requirements of individual assessments. Further details on project description and components are outlined in Chapter 4 of this EIAR.

1.1 Background

Wind energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, wind energy development can impact wildlife, directly through mortality and indirectly through disturbance and habitat loss. Bat fatalities have been reported at wind energy facilities around the world, raising concern about the cumulative impacts of such developments on bat populations (Arnett *et al.* 2016). No large-scale studies have been undertaken in Ireland to date. However, a study from the UK estimated bat fatalities at 0 – 5.25 bats per turbine per month (Mathews *et al.* 2016). While these results are not directly applicable to Ireland due to differences in bat species and behaviour, Ireland shares more similarities with bat assemblages of Great Britain, when compared to those of mainland Europe.

Investigative research in North America and mainland Europe have revealed the mechanisms for bat mortality at wind turbines. Fatalities arise from direct collision with moving turbine blades (Horn *et al.* 2008, Cryand *et al.* 2014) and barotrauma (Baer Wald *et al.* 2008), i.e. internal injuries caused by air pressure changes. Why bats fly in the vicinity of wind turbines has been attributed to several different behavioural and environmental factors, e.g. habitat associations, weather conditions and, species ecology.

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*

Pre-construction bat surveys are undertaken to provide a baseline to gain an insight into bat activity in the absence of turbines and to predict and mitigate against any future risks identified. Survey design and analyses of results at the proposed development site were undertaken with reference to the latest policy and legislation, scientific literature and industry guidelines. Any spatial, temporal or behavioural factors that may put bats at risk were fully considered.

1.2 Bat Survey and Assessment Guidance

Several guidelines for surveying bats at wind energy developments have been produced in Europe, the UK and Ireland.

At a European level, the Advisory Committee to the EUROBATS Agreement, to which Ireland is a signatory, have produced Guidelines for Consideration of Bats in Wind Farm Projects which outlines an approach for assessing the potential impacts of wind turbines on bats during planning, construction and operation phases (Rodrigues, 2015). However, these guidelines are based on continental scenarios and include more diverse species and behaviours than those typical of Ireland. As such, EUROBATS guidance may recommend a level of survey that may prove inappropriate in Irish scenarios. Nevertheless, the guidance is evidence-based and provides a useful European context, within which Member States are encouraged to produce specific national guidance, focusing on local circumstances.

Bat Conservation Ireland produced Wind Turbine/Wind Farm Development Bat Survey Guidelines (BCI, 2012a). This document provides advice to practitioners and decision makers in Ireland on necessary qualifications for surveyors, health and safety considerations, pre-construction and post-construction survey methodologies and information to be included in a report. In the absence of comprehensive Irish research, these guidelines provide generalised methodology rather than detailed technical advice.

The second edition of the UK Bat Conservation Trust Bat Survey Good Practice Guidelines (Hundt, 2012) includes a chapter (Chapter 10) on survey methodologies for assessing the potential impacts of wind turbines on bats. The document provides technical guidance for consultants carrying out impact assessments. However, the recommendations are not based on any research findings specific to the UK. A third edition to the guidelines, published in early 2016, removed the chapter on surveying wind turbine developments. Prior to the publication of the BCT guidelines, Natural England's *Bat and Onshore Wind Turbines: Interim Guidance* provided a pragmatic interpretation of the EUROBATS recommendations, as applied to onshore wind energy facilities in the UK (Natural England, 2014). In addition, the Chartered Institute of Ecology and Environmental Management (CIEEM) publishes advice on best practice as well as updates on the current state of knowledge in *the Technical Guidance Series* and in the quarterly publication *In Practice*.

In August 2021, NatureScot (formerly Scottish Natural Heritage), published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (NatureScot, 2021). The 2021 version supersedes the 2019 version of the guidance. The purpose of the guidance is to help planners, developers and ecological consultants to consider the potential effects of onshore wind energy developments on bats. The emphasis is on direct impacts such as collision mortality, but there is reference throughout to the need for a full impact assessment requiring wider consideration of other (indirect) effects. The Guidance replaces previous guidance on the subject; notably that published by Natural England and Chapter 10 of the Bat Conservation Trust publication *Bat Surveys: Good Practice Guidelines* (2nd edition), (Hundt, 2012) and tailors the generic EUROBATS guidance on assessing the impact of wind turbines on European bats (Rodrigues *et al.* (2014)). The document guides the user through the key elements of survey, impact assessment and mitigation.

The NIEA (NED) recently published Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland in August 2021, as amended (May 2022). This new guidance follows and builds upon the recently updated NatureScot 2021 guidance. The latter guidance has set the industry standard since its publication in 2019. The NED guidance does not aim to

replace the NatureScot guidance, but it does provide additional clarifications and recommendations regarding survey requirements and impact assessment in an Irish context.

The survey scope, assessment and mitigation provided in this report is in accordance with NatureScot 2021 Guidance with consideration given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance.

1.3 Statement of Authority

Scope development and project management was overseen by Aoife Joyce (BSc., MSc. NUIG) and John Hynes (BSc., MSc. UCC, MCIEEM).

Bat surveys were conducted by MKO ecologists Tim Murphy (BSc. UCD), Keith Costello (BSc. NUIG), Neil Campbell (BSc., MSc. NUIG) and Laura McEntegart (BSc. NUIG). All staff have relevant academic qualifications to complete the surveys and assessments that they were required to do. Tim has over 1 year experience in bat surveying techniques. Keith and Laura have over two years' experience and Neil has 3 years' experience in bat surveying techniques.

Data analysis was undertaken, and results were compiled by Aoife Joyce and Tim Murphy. Impact assessment, the design of mitigation and final reporting was completed by Tim Murphy under the supervision of Aoife Joyce, John Hynes and Pat Roberts (BSc. NUIG, MCIEEM), who reviewed and approved the final document. Aoife has over four years' experience in ecological assessments and has completed CIEEM and BCI courses in Bat Impacts and Mitigation, Bat Tree Roost Identification and Endoscope training and Kaleidoscope Pro Analysis. John is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 10 years' professional ecological consultancy experience. He is also a former member of the Bat Conservation Ireland management council. Pat has over 15 years' experience in management and ecological assessment.

1.4 Irish Bats: Legislation, Policy and Status

Ireland has nine resident bat species, comprising more than half of Ireland's native terrestrial mammals (Montgomery *et al.,* 2014).

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC) (as amended). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The lesser horseshoe bat (*Rhinolophus hipposideros*) is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011, as amended).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976-2022). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost without a licence. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2019. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019)

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** Clear--cutting, removal of all trees (M) **F01** Conversion from other land uses to housing, settlement or recreational areas (M) **F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M) **F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M) **H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M) **L06** Interspecific relations (competition, predation, parasitism, pathogens) (M) **M08** Flooding (natural processes) **D01** Wind, wave and tidal power, including infrastructure (M)
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus auritus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

2. PROJECT DESCRIPTION

The Proposed Development site is located within existing commercial forestry properties at Glenora and adjacent townlands, approximately 6 kilometres (km) south west of the village of Ballycastle, Co. Mayo. The site is accessed via an existing forestry access road which runs along the eastern boundary of the site. The existing forestry access road merges with the Ballyglass local road approximately 4.7km to the northeast of the site in the townland of Ballyglass. The Ballyglass local road meets the R314 approximately 1.6km further east. The site location is presented in Figure 2-1.

The Proposed Development comprises:

1. *The construction of 22 no. wind turbines and all associated hard-standing areas with the following parameters:*
2. *A total blade tip height of 180m,*
3. *Hub height of 99m, and*
4. *Rotor diameter of 162m.*
5. *1 no. permanent Meteorological Anemometry Masts with a height of 99 m and associated hardstanding area;*
6. *Upgrade of existing tracks and roads, provision of new permanent site access roads and upgrade of 1 no. existing site entrance including the provision of 1 no. security cabin with automatic traffic barriers;*
7. *Temporary widening of sections of public road in the townland of Ballyglass;*
8. *The provision of a new temporary roadway in the townland of Ballyglass to facilitate the delivery of turbine components and other abnormal loads;*
9. *1 no. wind farm operation and maintenance control building in the townland of Glenora;*
10. *3 no. borrow pits.*
11. *13 no. permanent peat placement areas.*
12. *5 no. temporary construction compounds with temporary site offices and staff facilities;*
13. *Permanent recreation and amenity works, including marked trails, seating areas, amenity car park, and associated amenity signage;*
14. *Site drainage;*
15. *Site Signage;*
16. *Ancillary forestry felling to facilitate construction and operation of the proposed development;*
17. *All works associated with the habitat enhancement and biodiversity management within the proposed wind farm site;*
18. *All associated site development works and ancillary infrastructure.*

Map Legend

EIAR Site Boundary

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Drawing Title	EIAR Site Boundary
Project Title	Glenora Windfarm
Drawn By: RM	Checked By: CM
Project No.: 201120	Drawing No.: Figure 2.1
Scale: 1:78,421	Date: 01/12/2023

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3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Development. A Scoping Document, providing details of the application site and the Proposed Development, was prepared by MKO and circulated to consultees in March 2021 and December 2021. As part of this exercise, prominent Irish conservation groups were contacted, and Bat Conservation Ireland (BCI) and National Parks and Wildlife Service (NPWS) were specifically invited to comment on the potential of the Proposed Development to affect bats.

Details of consultation responses specifically related to bats are provided in Section 4.1 below.

3.2 Desk Study

A desk study of published material was undertaken prior to conducting field surveys. The aim was to provide context to the site in order to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the EIAR Site Boundary and the surrounding region. The results of the desk study including sources of information utilised are provided below.

3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. The most recent search examined bat presence and roost records within a 10km radius of a central point within the Proposed Development (Grid Ref: G 03905 34111) (BCI 2012, Hundt 2012, NatureScot, 2021). Available bat records were provided by Bat Conservation Ireland on 16/06/2023. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Proposed Development.

3.2.2 Bat Species' Range

EU member states are obliged to monitor the conservation status of natural habitats and species listed in the Annexes of the Habitats Directive. Under Article 17, they are required to report to the European Commission every six years. In April 2019, Ireland submitted the third assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2019).

The 2019 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the location of the Proposed Development. The aim was to identify any high-risk species at the edge of their range (NatureScot, 2021).

3.2.3 Designated Sites

The National Parks and Wildlife Service (NPWS) map viewer and website provides information on rare and protected species, sites designated for nature conservation and their conservation objectives. A search was undertaken of sites designated for the conservation of bats within a 10km radius of the Site (BCI 2012, Hundt, 2012, NatureScot, 2021). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and pNHAs.

3.2.4 Landscape Features

3.2.4.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial photographs were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the EIAR Study Area and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses. In addition, any potential roost sites, such as buildings and bridges, were noted for further investigation.

3.2.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10km of the Proposed Development site (BCI, 2012) (last searched on the 6th November 2023). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 6th November 2023).

3.2.4.3 National Biodiversity Data Centre Bat Landscape Mapping

The National Biodiversity Data Centre (NBDC) map viewer presents "Bat Landscape" maps for individual species and for all species combined. Lundy *et al.* (2011) used Maximum Entropy Models to examine the relative importance of bat landscape and habitat associations in Ireland. The resulting map provides a 5-point scale, ranging from highest habitat suitability index (presented in red) to lowest suitability index (presented in green). However, squares highlighted as less favourable may still have local areas of abundance.

The location of the Proposed Development was reviewed on 6th November 2023 in relation to bat habitat suitability indices. The aim of this was to assess habitat suitability for all bat species within the EIAR Study Area. It is worth noting that these results are based on a modelling exercise and not confirmed bat species records. Regardless, they may provide a useful indication of potential favourable bat associations within the Proposed Development site.

3.2.4.4 Additional Wind Energy Projects in the Wider Landscape

A search for proposed, existing and permitted wind energy developments within 10km of the Proposed Development site was undertaken on 6th November 2023 (NatureScot, 2021). The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Mayo County Council. Other infrastructure developments and proposals (e.g. large road projects) were also noted. Information on the location and scale of these developments was gathered to inform cumulative effects. More details on other infrastructure developments within the vicinity of the Proposed Development can be found in Chapter 2 of the main EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken throughout 2021, 2022 and 2023. The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the Proposed Development site assessed and classified. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. The grid connection and haul routes were visited as part of the multidisciplinary surveys outlined below and in Chapter 6 of the main EIAR.

Multidisciplinary walkover surveys were undertaken within the site of the Proposed Development on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey	Dedicated Bat Survey
2nd July 2021	19th May 2021
9th July 2021	1st June 2021
18th August 2021	12th July 2021
2nd September 2021	26th July 2021
24th September 2021	21st September 2021
18th January 2022	6th October 2021
25th January 2022	
20th April 2023 (including bats)	
3rd May 2023	

3.2.6 Previous Bat Surveys

A review of available documentation of relevant surveys undertaken within or in the vicinity of the Proposed Development site was carried out. This included a pre-application bat report completed by Malachy Walsh and Partners in 2019 at the site of the Proposed Development.

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2021. During these surveys, habitats within the EIAR Study Area were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

3.3.2 Roost Surveys

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 81m) of the Proposed Development footprint (NatureScot, 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited in May, July and September 2021 and April 2023. A walkover was carried out and all structures and trees were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

Any potential tree roosts were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other potential roost features (i.e. PRFs) identified by Andrews (2018).

No potential roosting sites were identified within 281m of the boundary of the Proposed Development footprint.

3.3.3 Manual Transects

Manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Proposed Development site. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the proposed layout, desktop and walkover survey

results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. Transect routes are presented in Figures 3-1 - 3-3.

Transects were walked by two surveyors, recording bats in real time. Dusk surveys commenced 30 minutes before sunset and were completed for 3 hours after sunset. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. Transects surveys were undertaken in Spring, Summer and Autumn 2021. Table 3-2 summarises survey effort in relation to walked manual transects.

Table 3-2 2021 Survey Effort - Manual Transects

Date	Surveyors	Sunrise/ Sunset	Type	Weather	Walked (km)
19th May 2021	Tim Murphy & Neil Campbell	21:42	Dusk	10°C, dry, calm/light air	11.4km
12th July 2021	Tim Murphy & Laura McEntegart	22:05	Dusk	18°C, dry, 90% cloud cover, calm/light air	15.8km
21st September 2021	Keith Costello & Neil Campbell	19:40	Dusk	15°C dry, 80-100% cloud cover, calm/ light air	10.5km
Total Survey Effort					**37.7km**

Map Legend

- EIAR Site Boundary
- Turbine Location
- Spring Manual Transect

N

Drawing Title
Spring Manual Transect Route

Project Title
Proposed Glenora Wind Farm Development

Drawn By	Checked By
TM	AJ
Project No.	Drawing No.
201120	Fig 3-1
Scale	Date
1:25,000	15.08.2023

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Map Legend

- EIAR Site Boundary
- Turbine Location
- Summer Manual Transect

N

Drawing Title
Summer Manual Transect Route

Project Title
Proposed Glenora Wind Farm Development

Drawn By	Checked By
TM	AJ
Project No.	Drawing No.
201120	Fig 3-2
Scale	Date
1:25,000	15.08.2023

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Map Legend

- EIAR Site Boundary
- Turbine Location
- Autumn Manual Transect

N

Drawing Title
Autumn Manual Transect Route

Project Title
Proposed Glenora Wind Farm Development

Drawn By	Checked By
TM	AJ
Project No.	Drawing No.
201120	Fig 3-3
Scale	Date
1:25,000	15.08.2023

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3.3.4 Ground-level Static Surveys

Where developments have more than 10 turbines, NatureScot requires 1 detector per turbine up to 10 plus 1 detector for every 3 additional turbines.

The scope of bat work was designed in 2021, prior to the finalising of the Proposed Development layout (i.e. 22 turbines). The surveys were designed for a potential layout of up to 24 turbines. Given that 24 turbines were initially proposed, 15 detectors were deployed to ensure compliance with NatureScot guidance. The extent of the Proposed Development changed through the design process, and the number of turbines reduced to 22 turbines. Detector locations achieved a representative spatial spread in relation to proposed turbines and sampled the range of available habitats.

Automated bat detectors were deployed at 15 no. locations for at least 10 nights in each of spring (April-May), summer (June-mid August) and autumn (mid-August-October) (NatureScot, 2021). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Figure 3-4 presents static detector locations in relation to the final proposed layout. Static detector locations are described in Table 3-3.

Table 3-3 Ground-level Static Detector Locations

ID	Location (ITM)	Habitat	Linear Feature within 50m	Corresponding/ Nearest Turbine(s)
D01	502036 833371	Conifer plantation (WD4)	Conifer plantation (WD4)	T03 & T04
D02	502084 834024	Conifer plantation (WD4)	Conifer plantation (WD4)	T02
D03	502287 834555	Conifer plantation (WD4)	Conifer plantation (WD4)	T01
D04	503052 834565	Wet Heath (HH3)	Conifer plantation (WD4) & Spoil and bare ground (ED2)	T06 & T07
D05	503830 834424	Upland Blanket Bog (PB2)	Conifer plantation (WD4)	T08 & T11
D06	504469 833541	Recently-felled woodland (WS5)	Conifer plantation (WD4)	T05
D07	504537 832851	Recently-felled woodland (WS5)	Conifer plantation (WD4)	T17
D08	502748 833075	Conifer plantation (WD4)	Conifer plantation (WD4)	T10
D09	504871 834297	Buildings and Artificial Surfaces (BL3)	Conifer plantation (WD4)	T15 & T18
D10	503417 833554	Upland Blanket Bog (PB2)	Conifer plantation (WD4)	T09 & T12
D11	503867 833157	Conifer plantation (WD4)	Conifer plantation (WD4)	T13
D12	505673 833265	Buildings and Artificial Surfaces (BL3)	Conifer plantation (WD4) & Buildings and Artificial Surfaces (BL3)	T19 & T21
D13	506439 833211	Recently-felled woodland (WS5)	Conifer plantation (WD4)	T16 & T22
D14	504060 832681	Conifer plantation (WD4)	Conifer plantation (WD4)	T14
D15	505276 833526	Conifer plantation (WD4)	Conifer plantation (WD4)	T20

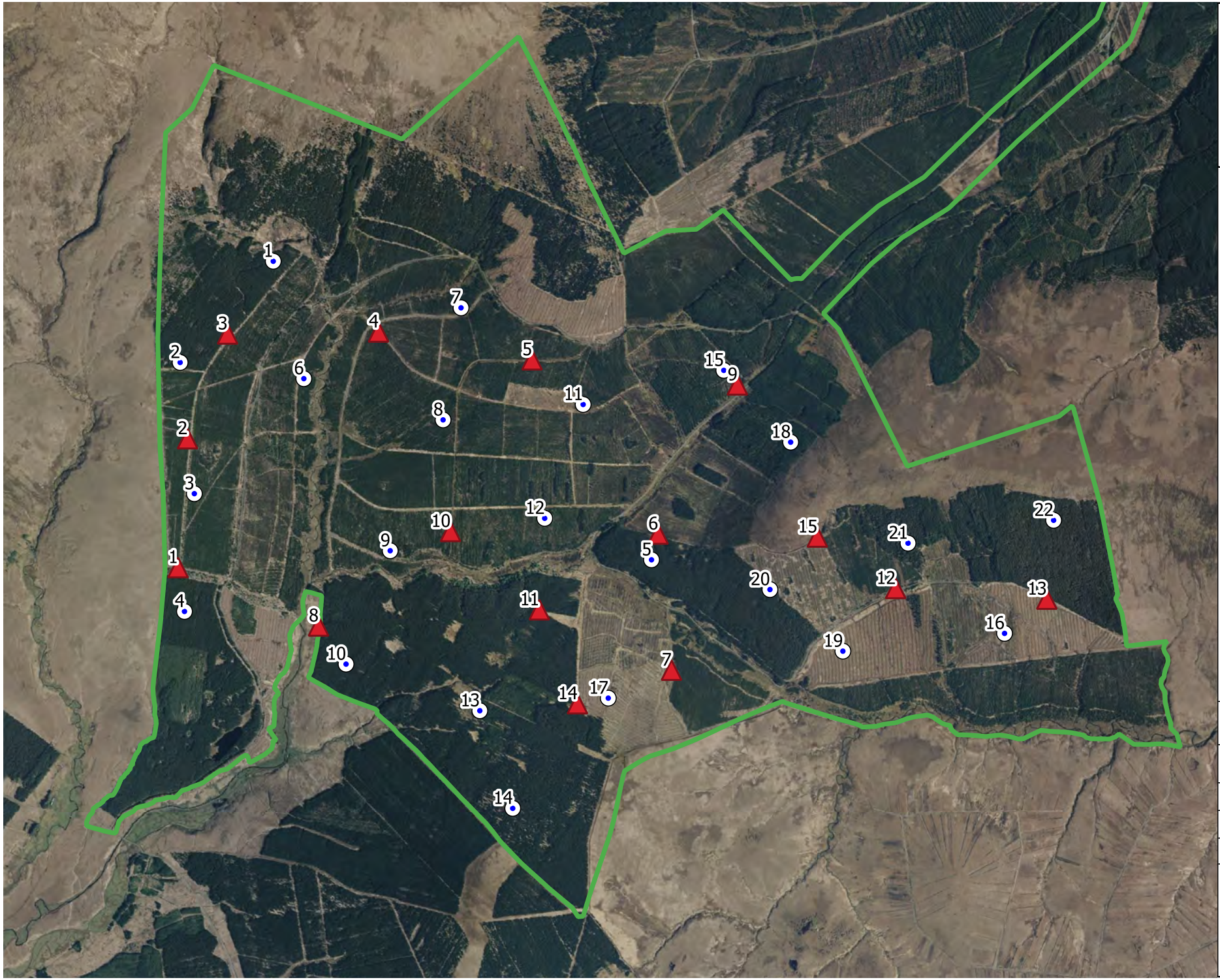
Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no.) with appropriate weather conditions were captured (i.e. dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Table 3-4 summarises survey effort achieved in 2021 for each of the 15 no. detector locations.

Table 3-4 Survey Effort - Ground-level Static Surveys

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	19th May – 1st June 2021	14	10
Summer	12th July – 26th July 2021	15	14
Autumn	21st September – 6th October 2021	15	11
Total Survey Effort		**44**	**35**

*Two detectors (D02 & D04) were redeployed on 8th October 2021 following technical difficulties with original SD cards. They were collected on 18th October 2021.


Map Legend
Site Boundary
Static Detector
Turbine Location
N
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Drawing Title
Static Detector Locations
Project Title
Proposed Glenora Wind Farm Development
Drawn By
TM
Checked By
AJ
Project No.
201120
Drawing No.
Fig 3-4
Scale
1:25,000
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3.3.4.1 Bat Call Analysis

All recordings from 2021 were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.0 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the proposed development site. Bat species were identified using established call parameters, to create site-specific custom classifiers and were manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). Myotis species (potentially Daubenton's bat (*M. daubentonii*), Whiskered bat (*M. mystacinus*), Natterer's bat (*M. nattereri*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle (*P. pygmaeus*) and Common pipistrelle (*P. pipistrellus*) are distinguished by having distinct (peak frequency of maximum energy in search flight) peak frequencies of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993).

Plate 3-1 below shows a typical sonogram of echolocation pulses for Common pipistrelle recorded with a SM4BAT bioacoustic static bat recording device. The recorded file is illustrated using Wildlife Acoustics Kaleidoscope software.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2016). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison.

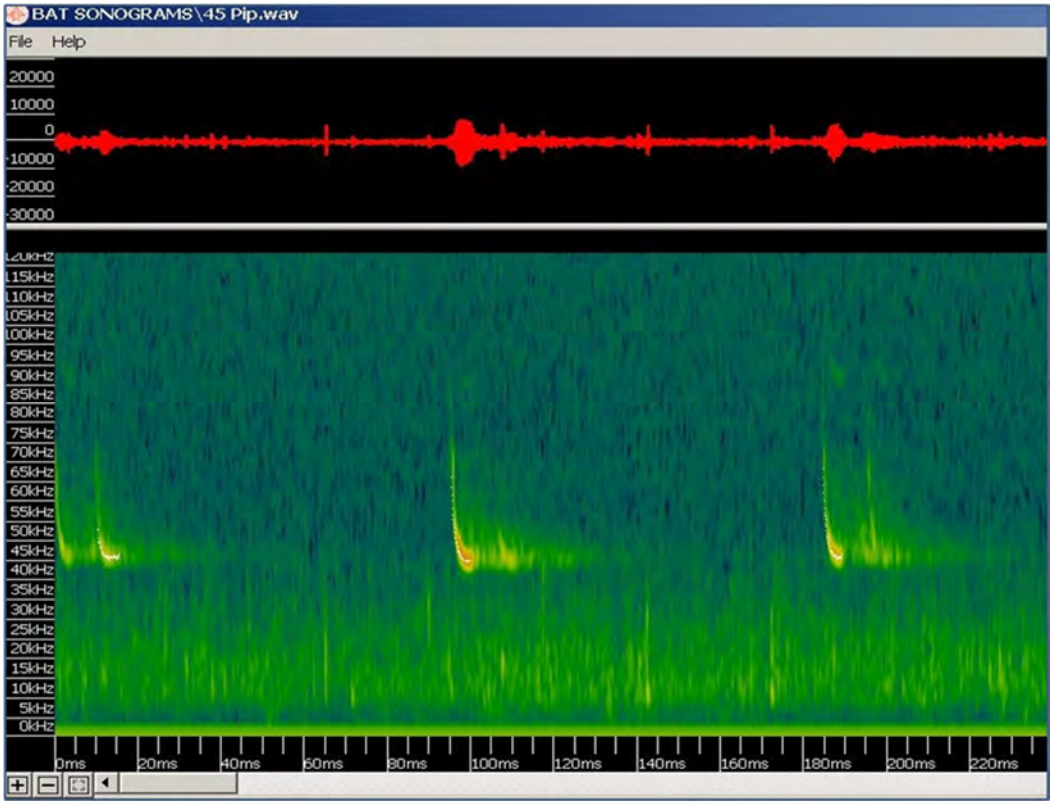

Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.4 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Eco bat (ecobat.org.uk). This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-5 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

Static detector at ground level results for the Proposed Development were uploaded in December 2021. Database records used in analyses were limited to those within a similar time of year (within 30 days) and a within a similar geographic region (within 200km).

Guidelines in the use of Ecobat at the time recommended a Reference Range of 2000+ to be confident in the relative activity level. The reference range is the stratified dataset of bat results recorded in the same region, at the same time of year, by which percentile outputs can be generated. This comprises all records of nightly bat activity across Ireland.

Although there is an increased uptake in the use of Ecobat in Ireland, some of the reference ranges remain below 2000. As Ecobat continues to be utilised in Ireland the accuracy of data outputs and results will improve over time. Results of Ecobat analysis for the Proposed Development site can be found in Table 4-6 in the results section below.

Table 3-5 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)

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

3.5 Assessment of Collision Risk

3.5.1 Population Risk

NatureScot (2021) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight characteristics. In the guidelines, this measure of collision risk is used, in combination with relative abundance, to indicate the potential vulnerability of British bat populations. No such assessment is provided for Irish bat populations.

In Plate 3-2, an adapted assessment of vulnerability of Irish bat populations to collide with wind turbine blades is provided. This adaptation of the NatureScot Guidance Table 2 was based on collision risk and species abundance of Irish bat populations. Species' collision risk follows those described in NatureScot (2021). Relative abundance for Irish species was determined in accordance with Wray *et al.* (2010) using population data available in the 2019 Article 17 reports (NPWS, 2019). Feeding and commuting behaviours, and habitat preferences for bat species in Ireland were also considered.

Relative Abundance	Low Collision Risk	Medium Collision Risk	High Collision Risk
Common species			Common pipistrelle Soprano pipistrelle
Rarer species	Daubenton's bat Brown long-eared bat Lesser horseshoe bat		Leisler's bat
Rarest species	Natterer's bat Whiskered bat		Nathusius' pipistrelle
	Low Population Vulnerability	Medium Population Vulnerability	High Population Vulnerability

Plate 3-2 Population Vulnerability of Irish Bat Species (Adapted from NatureScot, 2021)

3.5.2 Site Risk

The likely impact of a development on bats is related to site-based risk factors, including habitat and development features. The cross-tablature result of habitat risk and project size determines the site risk (i.e. Low, Medium or High) (Plate 3-3) i.e. Table 3a (NatureScot, 2021). Table 5-1 in the results section describes the criteria and site-specific characteristics used to determine an indicative risk level for the proposed site. All site assessment levels, as per NatureScot (2021) are presented in **Appendix 2**.

		Project Size		
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5
		Low/Lowest Site Risk (1-2)	Medium Site Risk (3)	High/Highest Site Risk (4-5)

Plate 3-3 Site-risk Level Assessment Matrix (Table 3a, NatureScot, 2021)

3.5.3 Overall Risk Assessment

An overall assessment of risk was made by combining the site risk level (i.e. Low/Medium/High) and the population risk (i.e. Ecobat bat activity outputs), as shown in the overall risk assessment matrix table (Plate 3-4) i.e. Table 3b (NatureScot, 2021). The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values).

	Ecobat Activity Category					
Site Risk Level	Nil (0)	Low (1)	Low-Moderate (2)	Moderate (3)	Moderate-High (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	16	18
Highest (5)	0	5	10	15	20	25

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	High Overall Risk (13-25)

Plate 3-4 Overall Risk Assessment Matrix (Table 3b, NatureScot, 2021)

This exercise was carried out for each high collision risk species. Plate 3-2 outlines high collision risk species. Overall risk assessments were also considered in the context of any potential impacts at the population level, particularly for species identified as having high population vulnerability (Plate 3-2).

3.6 Limitations

A comprehensive suite of bat surveys has been undertaken at the Proposed Development site in 2021. The surveys undertaken in 2021, in accordance with NatureScot Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Development on bats receptors. Additional site visits to assess any changes in baseline habitats were undertaken in 2022 and 2023.

The information provided in this report accurately and comprehensively describes the baseline environment; provides an accurate prediction of the likely effects of the Proposed Development; prescribes mitigation as necessary; and describes the predicted residual impacts. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines.

No limitations in the scope, scale or context of the assessment have been identified. Overall, a comprehensive assessment has been achieved.

4. RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats. The following response was received on 29/03/2021:

"My apologies, but BCIreland do not have the administrative capacity to comment on planning projects. In light of this, please ensure that bat surveying undertaken meets the best practice guidelines for bat surveys and in relation to wind farms, in particular."

All recommendations proposed by BCI were fully considered in the design of bat surveys and the preparation of this report.

4.1.2 Development Applications Unit - NPWS

A detailed scoping exercise was undertaken for the Proposed Development. A response from the Department of Culture, Heritage and the Gaeltacht (Ref: G Pre00104/2021) provided recommendations regarding nature conservation, including bats. The relevant excerpts, specifically relating to bats, are summarised below and the full results of the scoping and consultation exercise are described in the main EIAR. The response was received on the 12/05/2021 and the letter is provided in Chapter 2, Appendix 2-1 of the EIAR. With regard to the new scoping document sent in December 2021, as of 08/12/2023, no response has been received.

Hedgerows, Scrub and related habitats

"Hedgerows and scrub should be maintained where possible, as they form wildlife corridors and provide areas for birds to nest in; hedgerows provide a habitat for woodland flora, roosting places for bats and Badger setts may also be present. The EIAR should provide an estimate of the length/area of any hedgerow/scrub that will be removed. Where it is proposed that trees or hedgerows will be removed there should be suitable planting of native species in mitigation incorporated into the EIAR."

Bats

"Bat roosts may be present in trees, buildings and bridges. Bat species are protected under the Wildlife Act, 1976 to 2018, and are subject to a regime of strict protection pursuant to the requirements of the Habitats Directive (92/43/EEC) as transposed in Irish law in Regulation 51 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended). Therefore, damage/disturbance to any such roosts must be avoided in the first instance. While the Minister may grant a derogation licence under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011-2015, a licence can only be granted once a number of strict criteria have been met (see Regulation 54). An assessment of the impact of the proposed wind farm on bat species should be carried out noting recent guidance available, "Bat and Onshore Wind Turbines: Survey, Assessment and Mitigation, 2019" published jointly by Scottish Natural Heritage and Bat Conservation Trust and other stakeholders."

Post Construction Monitoring

"The EIAR process should identify any pre and post construction monitoring which should be carried out. The post construction motoring should include bird and bat strikes/fatalities including the impact on any such results of the removal of carcasses by scavengers. Monitoring results should be made available to the competent authority and copied to this Department. An appropriate plan of action needs to be

agreed at planning stage with the Planning Authority if the results in future show a significant mortality of birds and/or bat species."

Licenses
"Where there are impacts on protected species and their habitats, resting or breeding places, licenses may be required under the Wildlife Act 1976-2018 or derogations under the EC (Birds and Natural Habitats) Regulations 2011, as amended.
In particular, bats as outlined earlier and otters, are subject to a regime of strict protection pursuant to the requirements of the Habitats Directive (92/43/EEC) as transposed in Irish law in Regulation 51 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended).

In order to apply for any such licenses or derogations as mentioned above the results of a survey should be submitted to the National Parks and Wildlife Service of this Department. Such surveys are to be carried out by appropriately qualified person/s at an appropriate time of the year. Details of survey methodology should be provided. Should this survey work take place well before construction commences, it is recommended that an additional ecological survey of the development site should take place immediately prior to construction to ensure no significant change in the findings of the baseline ecological survey has occurred"

All recommendations made by the Department were fully considered in the design of bat surveys and the preparation of this report.

4.2 Desk Study

4.2.1 Bat Records

Bat Conservation Ireland

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Proposed Development site (IG Ref: E104354 N334112; results were received from BCI on 16/06/2023). The search yielded two roosts within a 10km radius of the Proposed Development. Six bat species were recorded within a 10km radius of the site. The results of the database search are provided in Table 4-1.

Table 4-1 National Bat Database of Ireland Records within 10km

Survey Type	Species	Grid reference	Date	Observer/Survey
Roost	*Myotis natterreri, Plecotus auritus, Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri*	G1336	-	-
	Plecotus auritus, Pipistrellus pygmaeus, Nyctalus leisleri	G0931	-	-
Transect	-	-	-	-
Ad-hoc	*Myotis daubentonii*	G1163226154	18/05/2015	Consultancy Surveys
	Pipistrellus pipistrellus	G1318325155	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1305326042	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1201926174	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1201925174	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1176126188	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1192127016	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1191826950	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1198625364	17/05/2015	Consultancy Surveys
	Pipistrellus pygmaeus	G1202325222	17/05/2015	Consultancy Surveys

	Pipistrellus pygmaeus	G018320	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus, Unidentified bat	G092387	16/09/2009	BATLAS 2010
	Pipistrellus pygmaeus, Myotis spp., Myotis daubentonii	G123383	16/09/2009	BATLAS 2010
	Pipistrellus pygmaeus, Myotis daubentonii	G103343	16/09/2009	BATLAS 2010
	Myotis daubentonii, Nyctalus leisleri, Pipistrellus pygmaeus	G143261	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus	G088365	16/09/2009	BATLAS 2010
	Pipistrellus pygmaeus, Myotis daubentonii	G066396	16/09/2009	BATLAS 2010
	Unidentified bat, *Myotis spp.*	G068397	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus, Unidentified bat, *Myotis spp.*	G118285	23/05/2009	BATLAS 2010
	Myotis spp., Pipistrellus pipistrellus, Pipistrellus pygmaeus	G142339	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus, Nyctalus leisleri	G108376	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus, Myotis daubentonii	G090270	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus	G092385	23/05/2009	BATLAS 2010
	Myotis spp., Myotis natterreri	G024296	23/05/2009	BATLAS 2010
	Unidentified bat, *Pipistrellus pygmaeus*	G052279	23/05/2009	BATLAS 2010
	Pipistrellus pygmaeus, Myotis spp.	G0218440787	09/06/2018	BATLAS 2020
	Myotis daubentonii	G1412026064	21/07/2018	BATLAS 2020
	Pipistrellus pygmaeus, Nyctalus leisleri	G0869126979	04/09/2018	BATLAS 2020
	Pipistrellus pygmaeus, Nyctalus leisleri	G0516227931	04/09/2018	BATLAS 2020
	Pipistrellus pygmaeus	G1247740820	08/06/2018	BATLAS 2020
	Pipistrellus pygmaeus, Pipistrellus pipistrellus	G0931439369	08/06/2018	BATLAS 2020
	Pipistrellus pygmaeus, Pipistrellus pipistrellus	G1010238308	08/06/2018	BATLAS 2020
	Pipistrellus pygmaeus, Pipistrellus pipistrellus	G0943533289	08/06/2018	BATLAS 2020

**Myotis nattereri (Natterer's bat), Plecotus auritus (Brown long-eared bat), Pipistrellus pipistrellus (Common pipistrelle), Pipistrellus pygmaeus (Soprano pipistrelle), Nyctalus leisleri (Leisler's bat), Myotis daubentonii (Daubenton's bat)*

National Bat Database of Ireland

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Proposed Development site (last search 06/11/2023). Hectad G03 lies within 10km of the EIAR Study Area. Two of Ireland's nine resident bat species were recorded within 10 km of the proposed works. The results of the database search are provided in Table 4-2.

Table 4-2 NBDC Bat Records within 10km of Proposed Development

Hectad	Species	Database	Designation
G03	Daubenton's bat *(Myotis daubentonii)*	National Bat Database of Ireland	HD Annex IV, WA
G03	Soprano pipistrelle *(Pipistrellus pygmaeus)*	National Bat Database of Ireland	HD Annex IV, WA

4.2.2 Bat Species Range

The potential for negative impacts is likely to increase where there are high risk species at the edge of their range (NatureScot, 2021). Therefore, range maps presented in the 2019 Article 17 Reports (NWPS, 2019) were reviewed in relation to the location of the Proposed Development.

The Proposed Development site is located outside the current range for lesser horseshoe bat, Nathusius' pipistrelle, Natterer's bat and Whiskered bat. The Proposed Development site is within the range of all other species.

4.2.3 Designated Sites

Within Ireland, the lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs) and the Proposed Development site is situated outside the known range of this species.

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10km radius of the EIAR Site Boundary found no sites designated for the conservation of bats.

4.2.4 Landscape Features and Habitat Suitability

A review of mapping and photographs provided insight into the habitats and landscape features present at the Proposed Development site. In summary, the primary land use within the proposed site commercial forestry.

A review of the GSI online mapper did not indicate the possible presence of any subterranean sites within the EIAR Site Boundary and a search of the National Monuments Database did not reveal the presence of any manmade subterranean sites within the study area.

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Proposed Development site or within 10km of the EIAR Site Boundary.

A review of the NBDC bat landscape map provided a habitat suitability index of 11 (green). This indicates that the Proposed Development area has low habitat suitability for bat species.

4.2.5 Other Wind Energy Developments

Table 4-3 provides an overview of wind farms in the vicinity of the Proposed Development. No other large infrastructure developments and proposals (e.g. roads) were identified within the vicinity of the Proposed Development.

Table 4-3 Wind Farm Developments within 10km of the Proposed Development Site.

Wind Farm Name and Location	No. Turbines	Status
Bellacorrick Wind Farm	21 (10 w/in 10km) (11 outside 10km)	Existing
ABO Wind Farm	8	Permitted
Sheskin South Wind Farm	21 (10 w/in 10km) (11 outside 10km)	Proposed
Oweninny 1 Wind Farm	29 (26 w/in 10km) (3 outside 10km)	Existing
Oweninny 2 Wind Farm	31	Under Construction
Oweninny 3 Wind Farm	18 (11 w/in 10km) (7 outside 10km)	Proposed

4.2.6 Previous Bat Surveys

The following sections provide a synopsis of previous bat survey results conducted at the Proposed Development site. The bat surveys and bat report were completed by Malachy Walsh and Partners in 2019.

Static Survey Results

Sonogram analysis of the 2019 static survey data determined that the following species were present at the sampling point (SP) locations within the proposed wind farm site:

- Brown long-eared bat *(P. auritus);*
- Common pipistrelle *(P. pipistrellus);*
- Leisler's bat *(N. leisleri);* and
- Soprano pipistrelle *(P. pygmaeus).*

In addition, species from the genus *Myotis* were also recorded.

Transect Survey Results

Two driven transect surveys were carried out at the Proposed Development site in spring and summer 2019. Sonogram analysis of the 2019 manual survey data determined that the following species were present during transects within the proposed wind farm site:

- Common pipistrelle *(P. pipistrellus);*
- Leisler's bat *(N. leisleri);* and
- Soprano pipistrelle *(P. pygmaeus).*

Conclusion

The site and much of its hinterland are generally lacking the habitat, environmental and topographic characteristics that are conducive to high and sustained levels of bat activity. By contrast these characteristics are abundantly available in the areas at lower elevation that are present in the wider geographical area surrounding the upland area that encompasses the site and its immediate surrounds. As a result, the site is of less significance to foraging bats than the habitats of higher ecological value that surround it and which bats will preferentially select. While the species listed above were recorded, the levels of site usage were, even at the highest recorded levels, extremely low. The levels of usage, as reflected in the average hourly rates and the significant fluctuations in recorded vocalisations across all the species are consistent with the BHSI ratings for the site and its surrounds, as outlined in Section 3.2.1.1.

Section 5.1, above, concluded that the levels of activity recorded during 2019 are reflective of the normal patterns that pertain at the site. This conclusion, when viewed in conjunction with the assessment in Section 3.2.2, above, that the habitat and development related features of the proposed wind farm site render the site as intrinsically 'Low' risk to bat species suggest that the proposed development should not pose a significant risk to bat species.

4.3 Bat Habitat Appraisal

Habitats within the Proposed Development site include areas of *Conifer plantation (WD4), Recently-felled woodland (WS5), Upland blanket bog (PB2), Wet heath (HH3), Eroding/upland rivers (FW1), Dystrophic lakes (FL1), Hedgerow (WL1), Drainage ditches (FW4), Spoil and bare ground (ED2), Recolonising bare ground (ED3), Dry meadows and grassy verges (GS2), Wet grassland (GS4), Scrub (WS1), Buildings and artificial surfaces (BL3)* and *Agricultural grassland (GA1).* Further detailed descriptions of each of the habitats can be found in Chapter 6 of the EIAR.

The habitats within the EIAR Site Boundary are dominated by plantation forestry (including clear fells), comprising mainly of Lodgepole pine (*Pinus contorta*) and Sitka spruce (*Picea sitchenis*) planted on blanket bog. A number of watercourses drain the site with the majority of the watercourses being headwaters of the Altderg River which eventually flows into the Owenmore River, while the south-eastern portion of the site is drained by tributaries of the Ballinglen River. The streams within the site were generally small, up to a metre wide and were categorized as *Eroding/upland rivers (FW1). Drainage ditches (FW4)* were also frequently present along the existing roads.

Results from the desktop review and walkover surveys were used to assess habitats for their suitability to support foraging and commuting bats, and roosting bats, according to Collins (2016). Suitability categories, divided into *High, Moderate, Low* and *Negligible*, are described fully in **Appendix 1**.

With regard to foraging and commuting bats, areas of closed canopy forestry as well as exposed areas of Upland Blanket Bog and Wet Heath habitats as well as bare ground were considered to have *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016).

Forestry edge habitats, rivers, drainage ditches, hedgerows and roadways show potential for foraging and commuting bats. However, these habitats are surrounded by wide expanses of peatland habitat and thus, are not very well connected to the surrounding landscape. As such, these habitats were classified as *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016).

With regard to roosting bats, an assessment of the various woodland and forestry habitats was undertaken. Trees present on site comprise a mixture of mature and immature commercial coniferous species. Overall trees within the site did not provide optimal habitat for roosting bats and were assessed as having *Low* roosting potential.

All other habitats present were assigned a *Negligible* value.

4.3.1 Underground Cable Route

A connection between the Proposed Development site and the national electricity grid will be necessary to export electricity from the Proposed Development. This underground cable connection will originate at the proposed onsite substation to the existing 110kV Tawnaghmore substation in townland of Tawnaghmore Upper. The grid connection cabling route measures approximately 26.1 kilometres in length. This connection route further detailed in Chapter 4, Section 4.3.6 and is illustrated in Chapter 4, Figure 4-1a.

As per the onsite 110kV substation, the grid connection cabling route is not included in the planning application for the Proposed Development; however, it is assessed in this EIAR as part of the overall project. The grid route will be primarily confined to proposed and existing road networks.

With regard to commuting and foraging bats, features along the underground cable route were assessed as having *Moderate* suitability i.e. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water (Collins, 2016).

With regard to roosting bats, habitat features along the underground cable route, including existing roads, agricultural grassland, wet grassland, spoil and bare ground, blanket bog, scrub and conifer trees, were assessed as having *Negligible* suitability i.e. Negligible habitat features likely to be used by roosting bats/trees of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential (Collins, 2016).

The grid route will cross 10 no. bridge crossings, all of which will require Horizontal Directional Drilling method (HDD) due to the insufficient deck cover within the bridge. No impact on bats is anticipated.

The bridge crossings associated with the grid connection route were assessed for bat roosting suitability. Further details can be found in Table 4-4 below. The underground cable route will be confined to existing public/forestry roads and tracks through conifer plantation. Other than the features presented in Table 4-4 below, no potential roost features were identified along the underground cable route.

Table 4-4 Bridge Crossings along Grid Connection Route

Bridge no.	Grid Ref:	Bat Habitat Suitability	Inspection Results – 20th April 2023	Proposed Works
Bridge 1	G 21189 27483	*Negligible*	No bats or evidence of roosting bats identified during inspection. Concrete box culvert with concrete brick parapet walls. No visible cracks or crevices.	HDD
Bridge 2	G 18557 27053	*Low – Moderate*	No bats or evidence of roosting bats identified during inspection. Some areas inaccessible due to dense vegetation. Stone arch bridge containing some crevices with potential for small number of roosting bats.	HDD
Bridge 3	G 18535 27067	*Low*	No bats or evidence of roosting bats identified during inspection. Some areas inaccessible due to dense vegetation. Stone arch bridge containing some crevices with potential for small number of roosting bats.	HDD
Bridge 4	G 15721 28668	*Moderate*	No bats or evidence of roosting bats identified during inspection. Some areas inaccessible due to flow. Stone arch bridge containing some crevices with potential for small number of roosting bats.	HDD
Bridge 5	G 12689 30056	*Low*	No bats or evidence of roosting bats identified during inspection. Some areas inaccessible due to dense vegetation. Flat square concrete bridge deck with concrete abutments. No visible PRFs.	HDD
Bridge 6	G 10557 32913	*Negligible*	No bats or evidence of roosting bats identified during inspection. Concrete flatbed bridge arch. Some areas inaccessible due to high water levels. No visible cracks or crevices.	HDD
Bridge 7	G 10585 33625	*Low*	No bats or evidence of roosting bats identified during inspection. Stone arch bridge containing some crevices with potential for small number of roosting bats. Dense vegetation present.	HDD

Bridge 8	G 10092 37924	*Moderate*	No bats or evidence of roosting bats identified during inspection. Stone arch bridge containing some crevices with potential for small number of roosting bats.	HDD
Bridge 9	G 08577 37145	*Negligible*	No bats or evidence of roosting bats identified during inspection. Concrete flatbed bridge arch with dense vegetation. No visible cracks or crevices.	HDD
Bridge 10	G 07771 36806	*Negligible*	No bats or evidence of roosting bats identified during inspection. Concrete flatbed bridge arch with high water levels. No visible cracks or crevices.	HDD

4.3.2 Turbine Delivery Route (TDR)

As described in Chapter 4, Section 4.4.2.1 of the EIAR, to facilitate the delivery of large turbine components and other abnormal loads during the construction of the Proposed Development, between the R314 and the main site entrance, a 278m bypass road will be constructed south of the R314 across agricultural land to the existing Ballyglass local road in the townland of Ballycastle. The section of the proposed bypass that is to be constructed is shown in Chapter 4, Figure 4-1a.

The road will be located primarily in *Improved Agricultural Grassland (GA1),* which is currently subject to grazing by livestock. A *Drainage Ditch (FW4)* runs along the field boundary parallel to the R314 and the western section of the proposed road intersects a small area of commercial planted broadleaf *Immature Woodland (WS2),* approximately 40m in length.

Road widening works are also required at the junction between the local road and the existing Glenora forestry access track in the townland of Ballyglass. The location and extent of these widening works are shown in Chapter 4, Figure 4-1b and in Appendix 4-1 of this EIAR. The proposed road widening to the northern margins of the Ballyglass local road has an approximate length of 1.3km. Habitats along road include managed hawthorn dominated *Hedgerow (WL1),* semi mature conifer *Treeline (WL2), Scrub (WS1), and Improved Agricultural Grassland (GA1)* habitats.

Further details on habitats along the local road widening and bypass are outlined in Chapter 6, Section 6.6.1.

With regard to commuting and foraging bats, features along the turbine delivery route bypass and junction where road widening is proposed were assessed as having *Moderate* suitability i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016).

With regard to roosting bats, habitat features along the TDR bypass and junction where road widening is proposed, including agricultural grassland, drainage ditches, scrub, highly managed hedgerow, semi mature conifer treeline and immature woodland were assessed as having *Negligible* suitability i.e. Negligible habitat features likely to be used by roosting bats/trees of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential (Collins, 2016). No PRFs were identified during the survey of the hedgerows or immature woodland.

4.4 Bat Survey Results

4.4.1 Roost Surveys

Following a search for roosts in 2021 and 2023, no structures containing potential suitable bat roost features were identified within 200m plus the rotor radius (81m) of the Proposed Development footprint.

The Proposed Development site was checked for potential tree roosts but no trees with significant roosting features were identified within the site. The Proposed Development site is comprised predominantly of mature and immature conifer forestry, as well as large areas of clearfell. As a result, the surrounding habitats were assessed as largely unsuitable for roosting bats.

4.4.2 Manual Transects

Manual transects were undertaken in Spring, Summer and Autumn 2021. Bat activity was recorded on all surveys. Overall, bat activity was low with a total of 25 bat passes recorded. In general, soprano pipistrelle (n=14) was recorded most frequently, followed the common pipistrelle (n=7) and *Myotis spp.* (n=1). Plate 4-1 shows species composition.

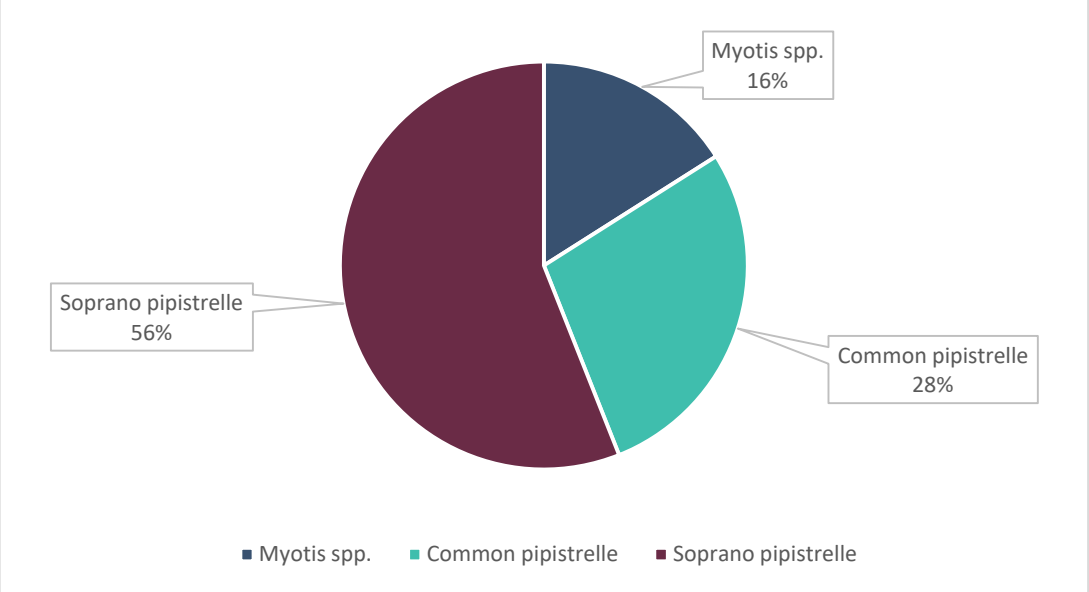

Plate 4-1 2021 Manual Activity Surveys (Total Species Composition)

Species composition and activity levels varied slightly between surveys, but for all surveys, species activity was low. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-2 presents the results for individual species per survey period.

Figures 4-1 to 4-3 present the spatial distribution of bat activity across the 2021 surveys. Bat activity was concentrated along forestry edge, scrub and linear (road/track) habitats.

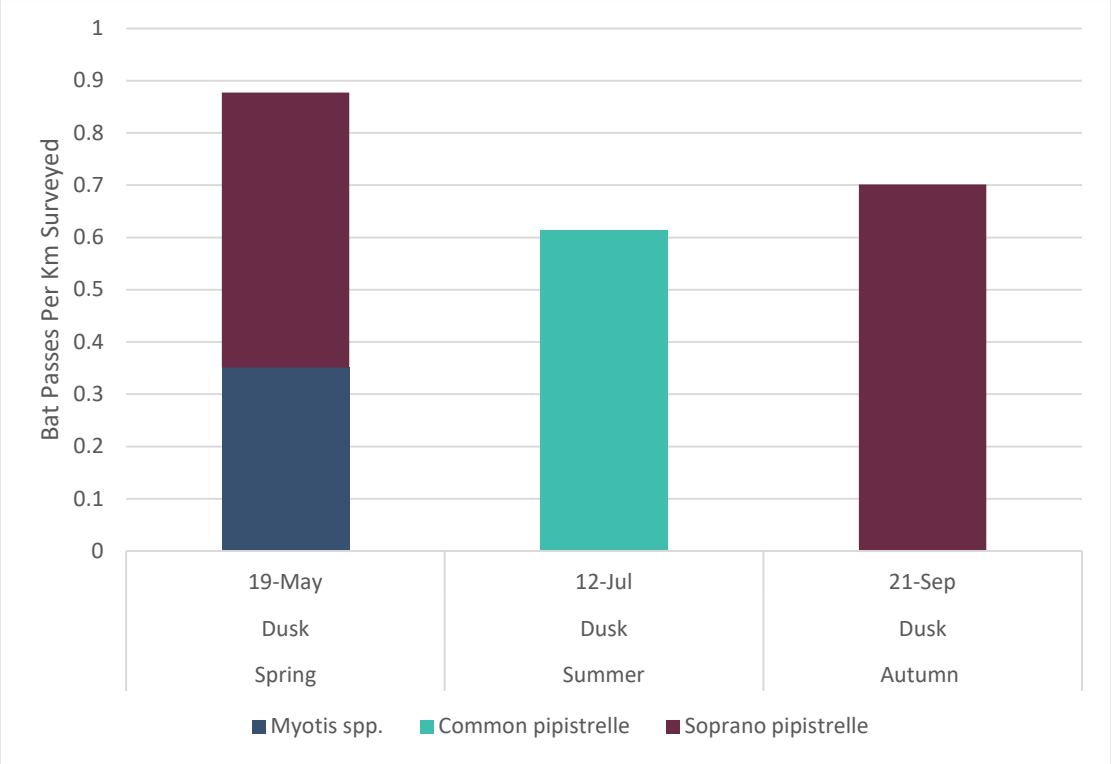

Plate 4-2 2021 Transect Results – Species Composition Per Survey Period

Map Legend

- EIAR Site Boundary
- Spring Manual Transect

Species Results

- Myotis spp.
- Soprano pipistrelle

N

Drawing Title
Spring Manual Transect Results

Project Title
Proposed Glenora Wind Farm Development

Drawn By	Checked By
TM	AJ
Project No.	Drawing No.
201120	Fig 4-1
Scale	Date
1:25,000	15.08.2023

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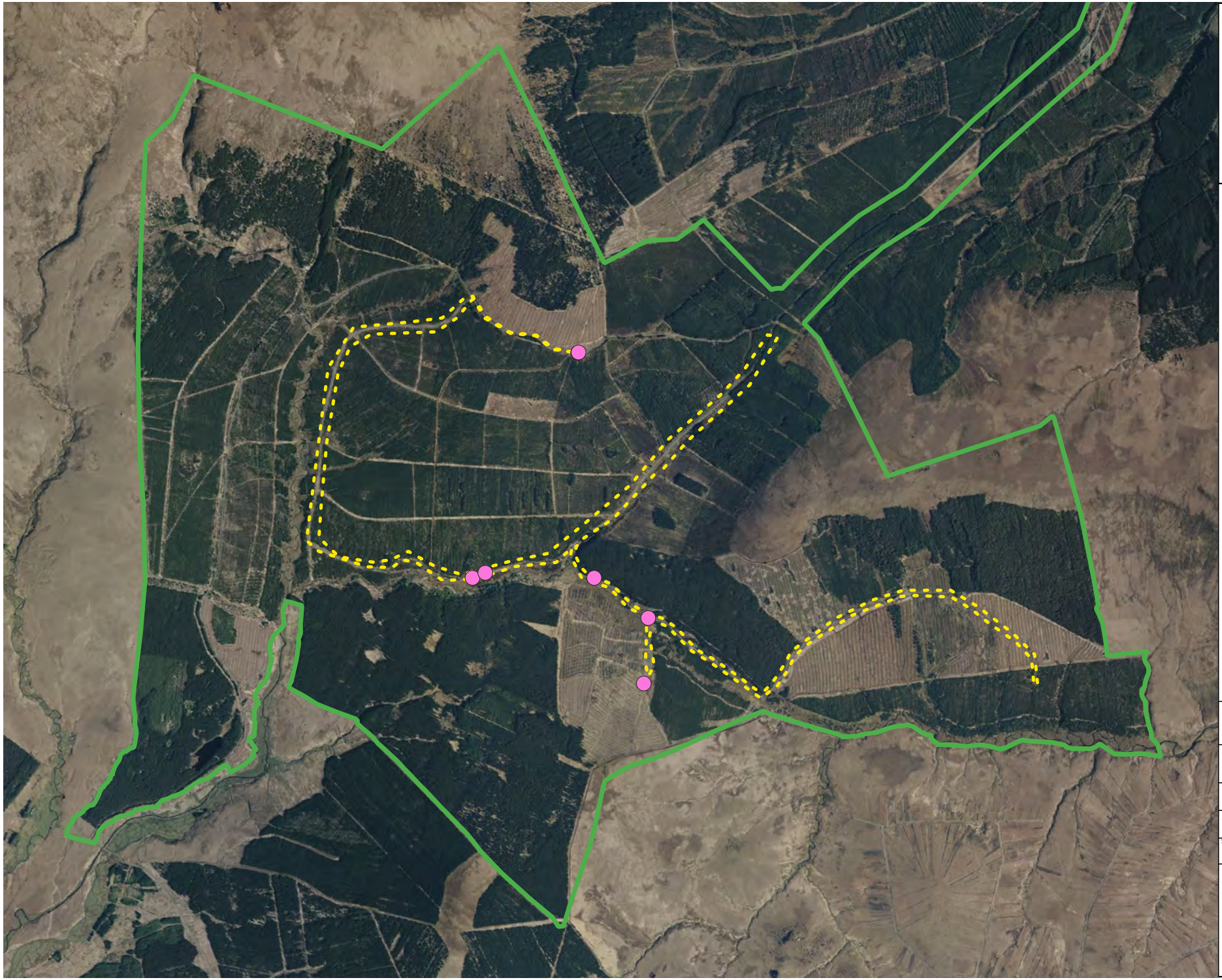

Map Legend

- EIAR Site Boundary
- Summer Manual Transect

Species Results

- Common pipistrelle

N

Drawing Title
Summer Manual Transect Results

Project Title
Proposed Glenora Wind Farm Development

Drawn By	Checked By
TM	AJ
Project No.	Drawing No.
201120	Fig 4-2
Scale	Date
1:25,000	15.08.2023

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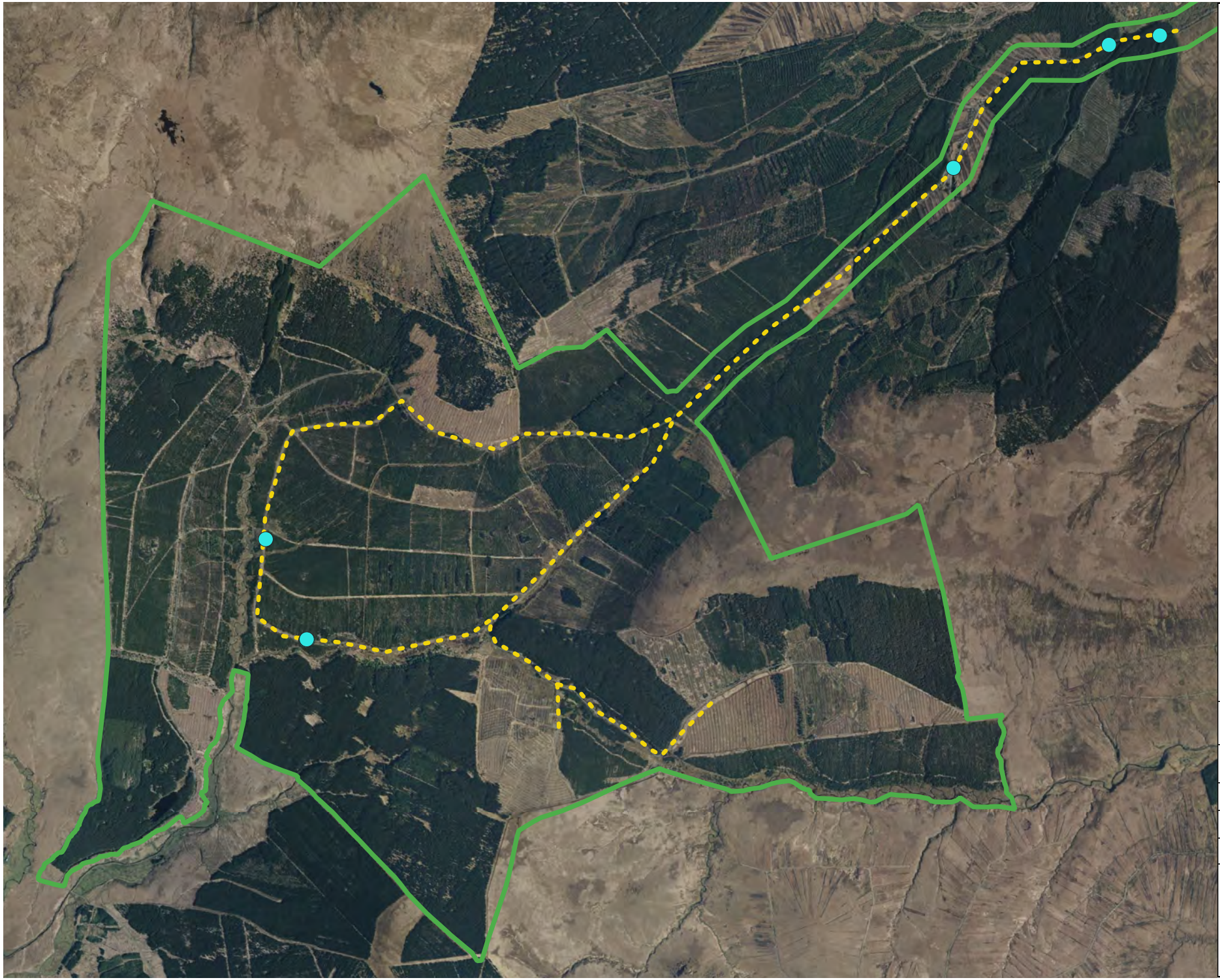

Map Legend

- EIAR Site Boundary
- Autumn Manual Transect

Species Results

- Soprano pipistrelle

N

Drawing Title
Autumn Manual Transect Results

Project Title
Proposed Glenora Wind Farm Development

Drawn By	Checked By
TM	AJ
Project No.	Drawing No.
201120	Fig 4-3
Scale	Date
1:28,000	15.08.2023

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4.4.3 Ground-level Static Surveys

In total, 11,895 bat passes were recorded across all deployments. In general, soprano pipistrelle (n=7,249) occurred most frequently, followed by common pipistrelle (n=2,883) and Leisler's bat (n=1,026). Instances of *Myotis* sp. (n=648), and Brown long-eared bat (n=89) were significantly less. Plate 4-3 presents species composition across all ground-level static detectors.

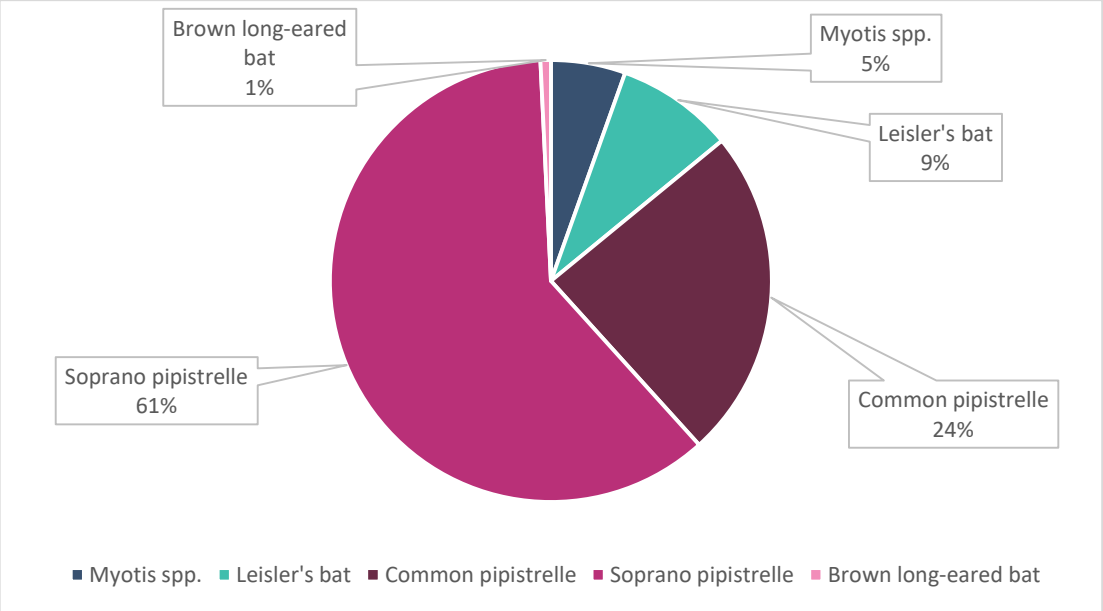

Plate 4-3 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-4 and Table 4-5 presents these results for each species. Bat activity was dominated by soprano pipistrelle in spring, summer and autumn. Instances of common pipistrelle and Leisler's bat were relatively low in spring and autumn, with a high summer peak. *Myotis* sp. were less frequent. and brown long-eared bat and were relatively rare.

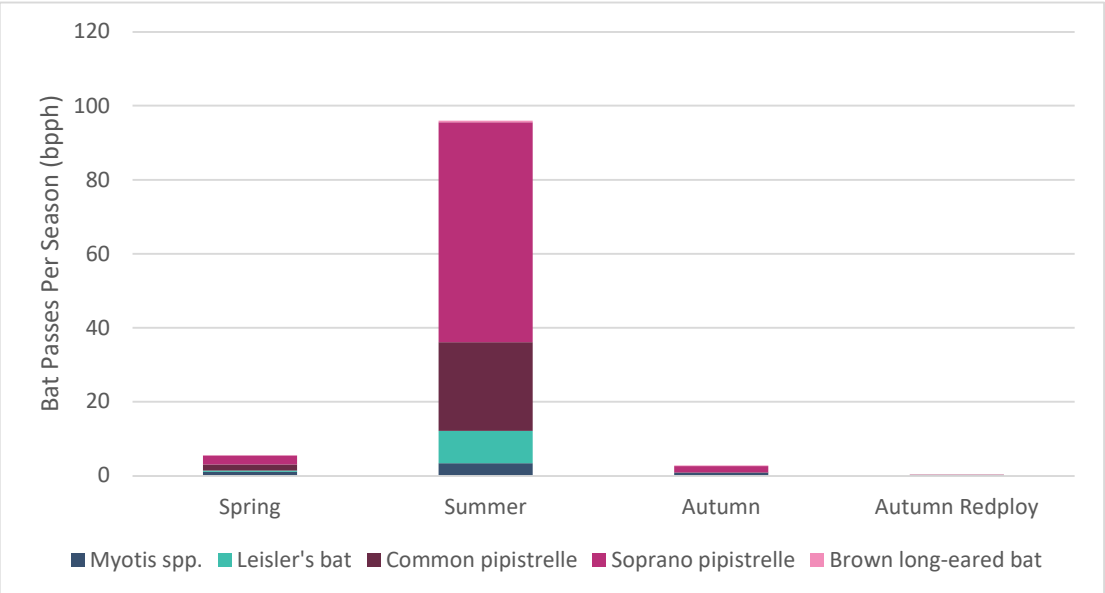

Plate 4-4 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

Table 4-5 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

	Spring	Summer	Autumn	*Autumn Redeployment
Total Survey Hours	**104.2**	**112.4**	**182.7**	**92.1**
Myotis sp.	1.08	3.35	0.77	0.21
Leisler's bat	0.30	8.81	0.02	0.00
Common pipistrelle	1.70	23.95	0.08	0.01
Soprano pipistrelle	2.36	59.42	1.77	0.00
Brown long-eared bat	0.07	0.45	0.16	0.01

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Proposed Development site. Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018).

Plate 4-5 illustrates the median Nightly Pass Rate per species per deployment. Zero data, when a species was not detected on a night, was also included.

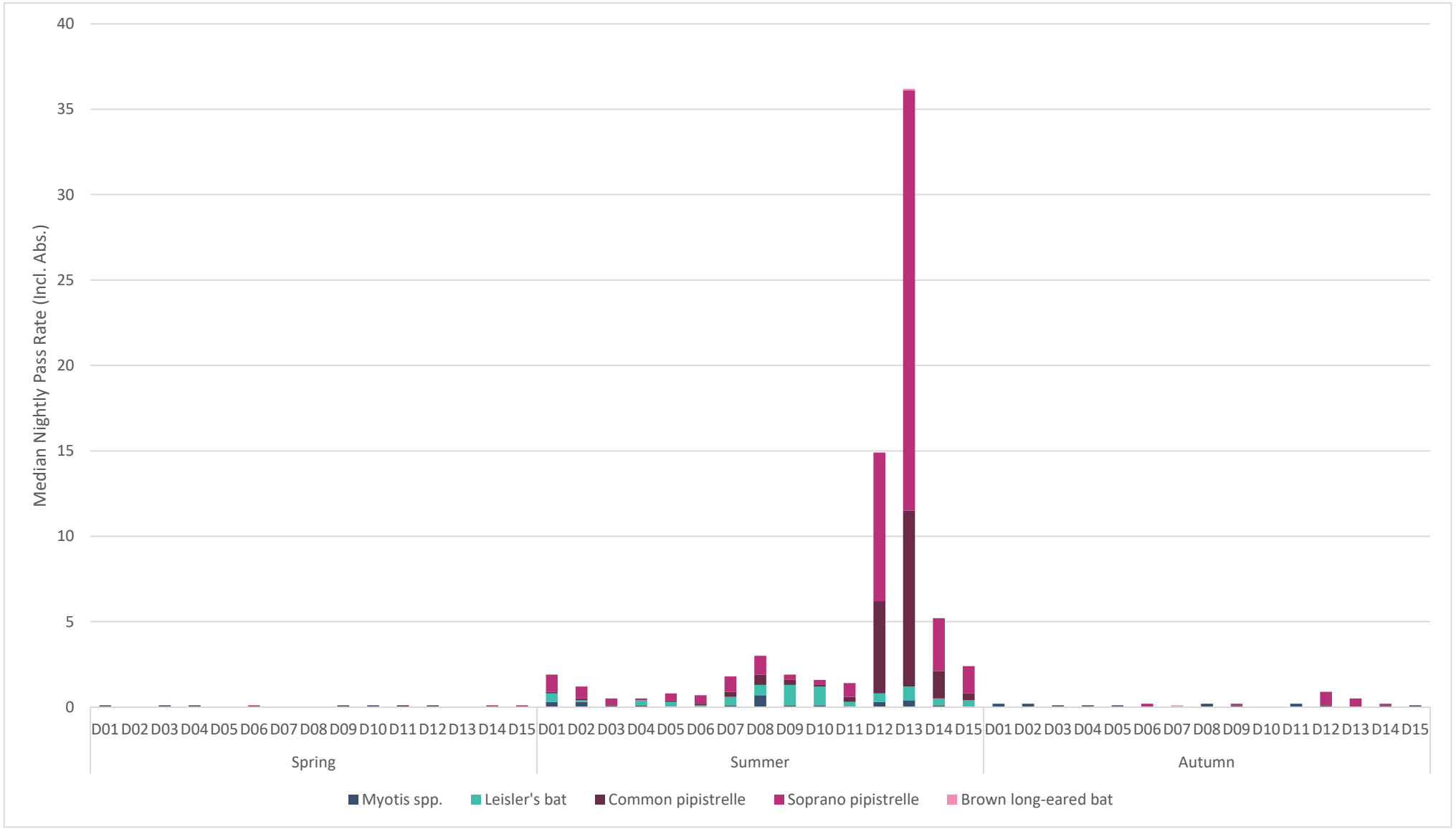

Plate 4-5 Static Detector Surveys: Median Nightly Pass Rate (bpph) Including Absences, Per Location Per Survey Period

Soprano pipistrelle bats were predominant at the majority of detectors during the Summer and Autumn survey periods. Spring activity varied at each detector with Soprano pipistrelle and *Myotis spp.* as the dominant species.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 4-6 presents the results of Ecobat analysis for each species per season on a site-level. **Appendix 3** provides these results per detector. Median activity levels for common pipistrelle peaked at ***High*** for Spring and Summer. Median activity levels for soprano pipistrelle peaked at ***High*** for Summer and Autumn. Median activity levels for Leisler's bat peaked at ***High*** for Summer. Brown long-eared bat peaked with ***Moderate*** activity for Summer and Autumn. Median activity levels for *Myotis sp.* peaked at ***Moderate - High*** for Summer and Autumn. Maximum activity levels peaked with ***High*** activity for three species for at least one season, with the exception of brown long-eared bat, which peaked at ***Moderate*** for at least two seasons and *Myotis sp.,* which peaked at ***Moderate - High*** for at least two seasons.

Table 4-6 Static Detector Surveys: Site-level Ecobat Analysis

Survey Period	Median Percentile	Median Bat Activity	Max Percentile	Max Bat Activity	Nights Recorded	Ref Range
Common pipistrelle						
Spring	12	Low	84	High	37	6353
Summer	51	Moderate	97	High	146	5696
Autumn	55	Moderate	77	Moderate - High	3	4304
Soprano pipistrelle						
Spring	12	Low	69	Moderate - High	66	5829
Summer	66	Moderate - High	99	High	177	5783
Autumn	44	Moderate	94	High	49	4709
Leisler's bat						
Spring	12	Low	41	Moderate	19	5661
Summer	51	Moderate	85	High	167	5172
Autumn	23	Low - Moderate	23	Low – Moderate	4	3178
***Myotis* sp.**						
Spring	12	Low	41	Moderate	68	3978
Summer	34	Low - Moderate	73	Moderate – High	131	3684
Autumn	44	Moderate	72	Moderate - High	71	3443
Brown long-eared bat						
Spring	12	Low	12	Low	7	2000
Summer	15	Low	44	Moderate	43	2399
Autumn	23	Low - Moderate	44	Moderate	27	2391

4.5 Importance of Bat Population Recorded at the Site

Ecological evaluation within this section follows a methodology that is set out in Chapter three of the '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009).

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976-2022. No bat roosts were identified within the footprint of the Proposed Development. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the study area are utilized by a regularly occurring bat population of Local Importance.

No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the site. The Proposed Development site does not support a roosting site of ecological significance.

5. RISK AND IMPACT ASSESSMENT

This risk and impact assessment has been undertaken in accordance with NatureScot Guidance. As per the NatureScot Guidance, wind farms present four potential risks to bats:

- Collision mortality, barotrauma and other injuries
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to, roosts
- Displacement of individuals or populations

For each of these four risks, the detailed knowledge of bat distribution and activity within the site has been utilized to predict the potential effects of the wind farm on bats.

5.1 Collision Mortality

5.1.1 Assessment of Site-Risk

The likely impact of a proposed development on bats is related to site-based risk factors, including habitat and development features. The site risk assessment, as per Table 3a of the NatureScot guidance, is provided in Table 5-1 below.

Table 5-1 Site-risk Level Determination for the Proposed Development Site (Adapted from NatureScot 2021)

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	No roosting sites were discovered within the Proposed Development site and the site is largely unsuitable for roosting bats. The habitats within the site provide potential suitable foraging habitat for bats and is connected to the wider landscape by linear features such as forestry edge habitats, tracks, and rivers/streams. However, it does not provide an extensive and diverse habitat mosaic of high quality for foraging bats or meet any of the criteria of a high-risk site as set out in Table 3a of NatureScot, 2021.	Low
Project Size	Following the criteria set out in NatureScot, 2021 the project is of Medium scale as it consists of 22 no. turbines. Whilst those turbines are over 100m in height, it is not a strategic infrastructural development and is well below the number of turbines that would constitute a Large development (NatureScot, 2021). No other wind energy developments within 5km. Some wind energy development within 10km. Comprising turbines >100 m in height	Medium
Site Risk Assessment (from criteria in Plate 3-3)		**Low Site Risk (2)**

The site of the Proposed Development is located in an area of predominantly commercial forestry. As per table 3a of the NatureScot Guidance (2021), it has a *Low* habitat risk score. As per Table 3a, the Proposed Development is a *Medium* project size (21 turbines). The cross tabulation of a Medium project on a Low risk site results in an overall risk score of **Low** (NatureScot Table 3a).

5.1.2 Assessment of Collision Risk

The following high-risk species were recorded during the dedicated surveys:

- Leisler's bat,
- Common pipistrelle,
- Soprano pipistrelle,

The Overall Risk Assessment for high collision risk species is provided in the sections below. Overall Risk was determined, in accordance with Table 3b of NatureScot guidance (**Appendix 4**), by a cross-tablature of the site risk level (i.e. Low) and Ecobat bat activity outputs for each species. The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values). NatureScot recommends that that most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

As per NatureScot guidance there is no requirement to complete an Overall Risk Assessment for low-risk species.

During the extensive suite of surveys undertaken that following low risk species were recorded:

- *Myotis* sp.,
- Brown long-eared bat.

Overall activity levels were low for the above species therefore no significant collision related effects are anticipated.

5.1.2.1 Leisler's bat

This site is within the current range of the Leisler's bat (NPWS, 2019). Leisler's bats are classed as a rarer species of a high population risk which have a high collision risk (Plate 3-4). Leisler's bats were recorded during activity surveys across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Leisler's bat was found to be ***Low*** for Spring and Autumn and ***Medium*** for Summer at typical activity levels and ***Low*** for Autumn and ***Medium*** for Spring and Summer at peak activity levels (See Table 5-2 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial forestry, cutover bog, tracks and scrub with low levels of bat activity recorded during the walked transects undertaken. Thus, there is *Medium* collision risk level assigned to the local population of Leisler's Bat in Summer and *Low* collision risk level in Spring and Autumn.

Table 5-2 Leisler's bat - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Low (2)	Low (1)	Typical Risk is Low (2)	Moderate (3)	Peak Risk is Medium (6)
Summer		Moderate (3)	Typical Risk is Medium (6)	High (5)	Peak Risk is Medium (10)
Autumn		Low - Moderate (2)	Typical Risk is Low (4)	Low – Moderate (2)	Peak Risk is Low (4)

5.1.2.2 Soprano pipistrelle

This site is within the current range of the soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle bats are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-4). Soprano pipistrelle was recorded during activity surveys across the proposed site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for soprano pipistrelle was found to be ***Medium*** for Summer and Autumn and **Low** for Spring at typical activity levels and ***Medium*** peak activity levels (See Table 5-3 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial forestry, cutover bog, tracks and scrub with low levels of bat activity recorded during the walked transects undertaken. Thus, there is *Medium* collision risk level assigned to the local population of Soprano pipistrelle bat in Summer and Autumn and *Low* collision risk level in Spring.

Table 5-3 Soprano pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Low (2)	Low (1)	Typical Risk is Low (2)	Moderate - High (4)	Peak Risk is Medium (8)
Summer		Moderate - High (4)	Typical Risk is Medium (8)	High (5)	Peak Risk is Medium (9)
Autumn		Moderate (3)	Typical Risk is Medium (6)	High (5)	Peak Risk is Medium (9)

5.1.2.3 Common pipistrelle

This site is within the current range of the common pipistrelle bat (NPWS, 2019). Common pipistrelle bats are classed as a common species of a medium population risk which have a high collision risk (Plate 3-4). Common pipistrelles were recorded during activity surveys across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for common pipistrelle was found to be ***Medium*** at typical activity levels in Summer and Autumn and ***Low*** in Spring. Peak activity levels were ***Medium*** across all seasons (See Table 5-4 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial forestry, cutover bog, tracks and scrub with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is Medium collision risk level assigned to the local population of common pipistrelle in Summer and Autumn and *Low* collision risk level assigned to the local population in Spring.

Table 5-4 Common pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring	Low (2)	Low (1)	Typical Risk is Low (2)	High (5)	Peak Risk is Medium (10)
Summer		Moderate (3)	Typical Risk is Medium (6)	High (5)	Peak Risk is Medium (10)
Autumn		Moderate (3)	Typical Risk is Medium (6)	Moderate - High (4)	Peak Risk is Medium (8)

5.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species was typically *Low* to *Medium*. Overall bat activity levels were typical of the nature of the site, which is predominantly commercial forestry, cutover bog, tracks and scrub with low levels of bat activity recorded during the static detector surveys as well as the walked transects undertaken.

5.2 Loss or Damage to Commuting and Foraging Habitat

In absence of appropriate design, the loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. However, the Proposed Development is predominantly located on commercial forestry, bog, tracks and scrub.

A total of 116 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development. The felling of trees is provided to facilitate infrastructure construction, turbine erection and to achieve the required buffer distance for the protection of bats, from the turbines to the canopy of the nearest habitat feature, as recommended by the Natural England (2014) and NatureScot (2021). Further details on buffer calculations can be found in Section 6.1.3 of this report.

It should be noted that forestry on the site of the Proposed Development was originally planted as a commercial crop and will be felled in the future should the proposed renewable energy development proceed or not. The felling of forestry will likely have a positive effect by opening up large areas of former closed canopy commercial forestry i.e. there will be more linear forestry edge habitat created. This will have a positive impact on bats as it will provide more commuting and foraging opportunities. Overall, the proposed works will retain areas of linear forestry edge habitats. The majority of turbines will be located in key-holed conifer forestry with no resulting loss of linear features.

To accommodate the delivery of turbine components, a bypass road (approx. 278m) will be constructed south of the R314 across agricultural land to the existing Ballyglass local road in the townland of Ballycastle. This will result in the loss of approximately 1.3km of heavily managed, gappy hawthorn dominated hedgerow habitat, as described in Chapter 6, Section 6.6.1.5. Additionally, a small section (approx. 40m) of commercially planted immature broadleaf woodland will also be removed to facilitate the construction of the new TDR.

Any areas of hedgerow loss, to accommodate the delivery of turbines, will be replaced within the site with species indigenous to the area. Approximately 1.3km of hedgerow will be reinstated adjacent to the widened road. Hedgerow removal will result in a short-term effect, with connectivity re-established within approximately 2-5 years. No permanent loss of, or damage to, commuting or foraging habitats is anticipated as a result of the turbine delivery or cable routes and there will be no net loss of linear landscape features for commuting and foraging bats.

It is proposed to create dedicated marked trails and walking loops for outdoor recreation within the site. All trails and loops will make use of the proposed wind farm site road network and no additional tracks are required to be constructed.

The Proposed Development, including the creation of new road infrastructure, recreational trails, and underground cable route will provide a positive change with the creation of additional available areas of linear landscape features that may be utilised by bats for commuting or foraging.

Given the extensive area of habitat that will remain undisturbed throughout the site and the avoidance of the most significant areas of faunal habitat (i.e. natural woodlands and watercourses), no significant effects with regard to loss of commuting and foraging habitat are anticipated.

No significant effects with regard to loss of commuting and foraging habitat are anticipated.

5.3 Loss of, or Damage to, Roosts

The Proposed Development is predominantly located within an area of commercial conifer forestry, bog, tracks and scrub. The trees in the plantation, ranging from recently felled and immature to mature crops, do not provide potential roosting habitat of significance for bats. Additionally, no structures, other than those outlined in Table 4-4, occur within the Proposed Development site. Therefore, no loss of, or damage to roosts is anticipated.

The underground cabling will connect from the proposed onsite substation to the existing 110kV Tawnaghmore substation, primarily following proposed and existing roads and tracks, measuring approximately 26.1km. There will be no requirement to remove trees/forestry as part of the underground cable route. Therefore, there will be no loss of potential tree roosting habitat associated with these works. Additionally, no evidence of roosting bats was identified during the survey at any of the watercourse crossings; however, some locations (Table 4-4) provided potential suitable habitat for roosting. Horizontal Directional Drilling (HDD) is proposed for all watercourse crossing locations and no loss of potential roosting habitat is anticipated.

To accommodate the delivery of turbine components and other abnormal loads between the R314 and the main site entrance, a bypass road will be constructed south of the R314 across agricultural land to the existing Ballyglass local road in the townland of Ballycastle. This will result in the loss of approximately 1.3km of heavily managed hawthorn dominated hedgerow habitat, as described in Chapter 6, Section 6.6.1.5. A small section (approx. 40m) of commercially planted immature broadleaf woodland will also be removed to facilitate the construction of the new TDR. These habitats do not provide potential roosting habitat of significance for bats.

No potential for significant effect with regard to the loss of, or damage to, roosting habitat as a result of the Proposed Development is anticipated.

5.4 Displacement of Individuals or Populations

The Proposed Development is predominantly located within an area of commercial forestry and bog habitats. There will be no net loss of linear landscape features for commuting and foraging bats and there will be no loss of any roosting site of ecological significance. The habitats on the site will remain suitable for bats and no significant displacement of individuals or populations is anticipated.

6. MITIGATION MEASURES

Although no significant effects were predicted, the following mitigation measures will be implemented in accordance with best practice to reduce the significance of any potential effects on local bat populations.

6.1 Standard Best Practice Measures

6.1.1 Noise Restrictions

During the construction phase, plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (S.I. No. 632 of 2001).

6.1.2 Lighting Restrictions

Where lighting is required during construction, directional lighting will be used to prevent overspill on to woodland/forestry edges. Exterior lighting, during construction, will be designed to minimize light spillage, thus reducing the effect on areas outside the proposed development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines around the periphery of the site boundary to minimize disturbance to bats. Directional accessories can be used to direct light away from these features, e.g. through the use of light shields (Stone, 2013). The luminaries will be of the type that prevent upward spillage of light and minimize horizontal spillage away from the intended lands.

With regard to the potential for lighting to increase collision risk, it is noted that there will be limited illumination of the turbines in the form of aviation lighting. Post construction monitoring will be carried out (as outlined below) to assess any potential changes in bat activity patterns and collision risk. Significant effects as a result of lighting are not anticipated; however, if in the course of this monitoring, any potential for significant effects on bats is identified, the site-specific mitigation measures will be reviewed and any changes necessary will be implemented to avoid any such impacts.

6.1.3 Buffering

In accordance with NatureScot Guidance, a minimum 50m buffer (used in the calculation) to all habitat features used by bats (e.g., hedgerows, tree lines etc.) should be applied to the siting of all wind turbines (See example provided in Plate 6-1 below). However, Eurobats No. 6 guidance and NIEA recommends increased buffers of between 100m and 200m around woodland/forestry areas. There is, however, currently no scientific evidence to support these increased buffer distances in the UK.

NatureScot recommends that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features) is adequate mitigation. This 50m buffer will be implemented from the outset and monitored as per the post construction monitoring. The success of the buffer mitigation will be assessed as part of post construction monitoring and updated where necessary.

The formula below is presented to provide appropriate mitigation in relation to bats, and the relevant input required from turbine parameters, is the combination of the blade length and hub height. The turbine model to be installed on the site will have an overall ground-to-blade tip height of 180m; rotor diameter of 162m and hub height of 99m.

This mitigation measure is included within the forestry felling calculation outlined in Chapter 4, Section 4.3.10 of the EIAR. This is based on the proposed turbine dimensions and shows the extent of the area to be removed as part of the bat buffer requirement. These areas will be maintained during the

operational life of the Proposed Development and vegetation will not be allowed to become established within the buffers.

It is necessary to calculate the distance between the edge of the habitat feature and the centre of the tower (b). Using the formula:

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

Where, bl =Blade length, hh = hub height, fh = feature height all in metres. E.g. (below) b = 69.3m (Plate 6-1)

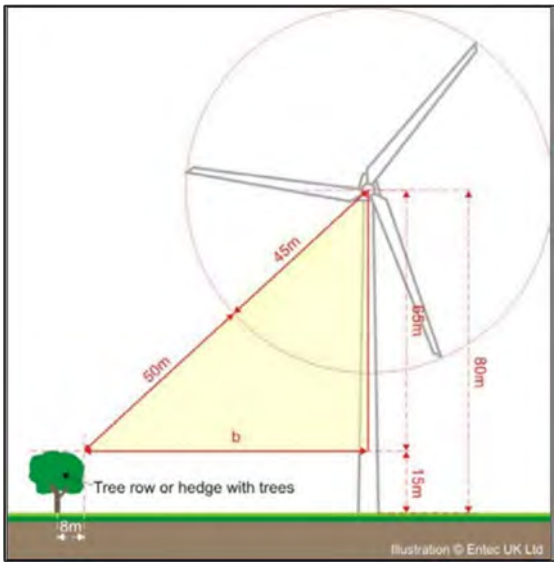

Plate 6-1 Calculate buffer distances (Natural England, 2014).

6.1.4 Blade Feathering

NIEA Guidelines also recommend that, in addition to buffers applied to habitat features, all wind turbines are subject to 'feathering' of turbine blades when wind speeds are below the cut-in speed of the proposed turbine. This means that the turbine blades are pitched at 90 degrees or parallel to the wind to reduce their rotation speed to below two revolutions per minute while idling. This measure has been shown to significantly reduce bat fatalities (by up to 50%) in some studies (NIEA, 2021).

In accordance with NIEA Guidelines, blade feathering will be implemented as a standard across all proposed turbines when wind speeds are below the cut-in speed of the turbine.

6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species were predicted as *Low* to *Medium.* This risk level is reflective of the nature of the site, which is commercial forestry and cutover bog with low levels of bat activity recorded during the walked transects undertaken.

However, taking a precautionary approach and given that high collision risk was recorded at median and peak activity levels, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development, in line with the case study example provided in Appendix 5 of the NatureScot, (2021) and based on the site-specific data.

6.2.1 Operational Monitoring

To assess the effects of the Proposed Development on bat activity, at least 3 years of post-construction monitoring is proposed. Post-construction monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision.

The results of post-construction monitoring will be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy. At the end of Year 1, and if a curtailment requirement is identified (i.e. significant bat fatalities encountered), a curtailment programme, in line with relevant guidelines, will be devised around key activity periods and weather parameters, as well as a potential increase in buffers.

At the end of each year, the efficacy of the mitigation and monitoring plan will be reviewed, and any identified efficiencies incorporated into the programme. This approach allows for an evidence-based review of the potential for bat fatalities at the site, post construction, to ensure that the necessary measures, based on a new baseline post-construction, are implemented for the protection of bat species locally. The effectiveness of any mitigation/curtailment will be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is incidental), and (b) whether the curtailment regime needs to be refined such that turbine down-time is minimised whilst ensuring that it remains effective at preventing casualties.

The below subsections provide additional detail on the proposed survey effort, timing, and mitigation.

6.2.1.1 Monitoring Year 1

Bat activity surveys

The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring will take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors will be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). As described in Section 3.5 above, the assessment of bat activity levels will include the use of 'Ecobat' (or similar alternative), a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Walked survey transects will also be conducted.

Key weather parameters and other factors that are known to influence collision risk will be monitored and will include:

- Windspeed in m/s (measured at nacelle height)
- Temperature (ºC)
- Precipitation (mm/hr)

Carcass searches

Carcass searches, to monitor and record bat fatalities, will be conducted at each turbine in accordance with NIEA Guidance. This will include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality. Surveys will cover all activity seasons and the use of a trained dog detection team will be carried out to ensure maximum efficiency.

6.2.1.2 Monitoring Years 2 & 3

Monitoring surveys will continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy will be assessed in line with the baseline data collected in the preceding year(s).

The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed will be analysed to confirm it is neither significantly over- nor under- curtailing during different periods of bat activity.

At the end of each year, the efficacy of the mitigation/curtailment programme will be reviewed, and any identified efficiencies incorporated into the programme. The requirement for continued post-consent monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy. A monitoring programme will be submitted to, and agreed with, the Planning Authority. Any subsequent changes will be agreed with the Planning Authority.

6.3 Residual Impacts

Not Significant Effect

Taking into consideration the sensitive design of the project, the proposed best practice and adaptive mitigation measures; significant residual effects on bats with regard to 1) Collision mortality, barotrauma and other injuries, 2) Loss or damage to commuting and foraging habitat, 3) Loss of, or damage to, roosts and 4) Displacement of individuals or populations are not anticipated.

6.4 Cumulative Effects

The Proposed Development was considered in combination with other plans, existing and approved projects and planning applications pending a decision, in the surrounding area that could result in cumulative impacts on bats. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The plans and projects considered are listed in Chapter 2 of the EIAR: Background of the Proposed Development.

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Development will not result in any residual adverse effects on bats, when considered on its own. There are no other wind farm sites located within 5km and 6no. wind farm sites located within 10km of the Proposed Development. No potential for the Proposed Development to contribute to any cumulative adverse effects on any bat populations is anticipated when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the Proposed Development.

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified regarding bats.

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations at the Proposed Development site. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Development will not result in any significant effects on bats.

The mitigation measures set out in this report will be implemented in full and no significant effects are anticipated on bat species at any geographical scale.

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APPENDIX 1

BAT HABITAT SUITABILITY APPRAISAL

BAT HABITAT SUITABILITY APPRAISAL

Guidelines for assessing the potential suitability of a site for bats, based on the presence of habitat features (taken from Collins, 2016)

Suitability	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging 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 conditions1 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 hibernation2. A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential3.	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 habitats. 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	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions 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).	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	A structure or tree with one or 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 and surrounding habitat.	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.

[1] For example, in terms of temperature, humidity, height above ground, light levels or levels of disturbance.
[2] Larger numbers of Common pipistrelle may be present during autumn and winter in large buildings in highly urbanised areas, based on evidence from the Netherlands (Korsten *et al.* 2015).
[3] Categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

APPENDIX 2

SITE RISK ASSESSMENT

Planning and Environmental Consultants

SITE RISK ASSESSMENT

Table 3a: *Stage 1 - Initial site risk assessment*

Site Risk Level (1-5)*		Project Size		
		Small	**Medium**	**Large**
Habitat Risk	**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.

* 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.

Habitat Risk	Description
Low	Small number of potential roost features, of low quality. Low quality foraging habitat 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 on an important flyway. Close to key roost and/or swarming site.

Project Size	Description
Small	Small scale development (≤10 turbines). No other wind energy developments within 10km. Comprising turbines <50m in height.
Medium	Larger developments (between 10 and 40 turbines). May have some other wind developments within 5km. Comprising turbines 50-100m in height.
Large	Largest developments (>40 turbines) with other wind energy developments within 5km. Comprising turbines >100m in height.

APPENDIX 3

2021 ECOBAT - PER DETECTOR RESULTS

Summary tables are provided in the main bat report for each species recorded showing key metrics per detector per survey period.

LEISLER'S BAT							
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	1	5661	D01	12	Low	12	Low
Spring	2	5661	D02	12	Low	12	Low
Spring	3	5661	D03	12	Low	12	Low
Spring	2	5661	D04	22	Low to Moderate	31	Low to Moderate
Spring	-	5661	D05	-	N/A	-	N/A
Spring	1	5661	D06	41	Moderate	41	Moderate
Spring	3	5661	D07	12	Low	12	Low
Spring	-	5661	D08	-	N/A	-	N/A
Spring	1	5661	D09	31	Low to Moderate	31	Low to Moderate
Spring	-	5661	D10	-	N/A	-	N/A
Spring	1	5661	D11	31	Low to Moderate	31	Low to Moderate
Spring	2	5661	D12	27	Low to Moderate	41	Moderate
Spring	3	5661	D13	31	Low to Moderate	41	Moderate
Spring	-	5661	D14	-	N/A	-	N/A
Spring	-	5661	D15	-	N/A	-	N/A
Summer	10	5172	D01	58	Moderate	76	Moderate to High
Summer	10	5172	D02	34	Low to Moderate	56	Moderate
Summer	2	5172	D03	56	Moderate	77	Moderate to High
Summer	11	5172	D04	44	Moderate	60	Moderate
Summer	10	5172	D05	34	Low to Moderate	56	Moderate
Summer	9	5172	D06	15	Low	51	Moderate
Summer	11	5172	D07	56	Moderate	68	Moderate to High
Summer	12	5172	D08	63	Moderate to High	85	High
Summer	13	5172	D09	68	Moderate to High	81	High
Summer	13	5172	D10	68	Moderate to High	84	High
Summer	13	5172	D11	34	Low to Moderate	72	Moderate to High
Summer	14	5172	D12	54	Moderate	85	High
Summer	14	5172	D13	63	Moderate to High	84	High
Summer	13	5172	D14	51	Moderate	66	Moderate to High
Summer	12	5172	D15	48	Moderate	70	Moderate to High
Autumn	-	3178	D01	-	N/A	-	N/A
Autumn	-	3178	D02	-	N/A	-	N/A
Autumn	1	3178	D03	23	Low to Moderate	23	Low to Moderate
Autumn	-	3178	D04	-	N/A	-	N/A

Autumn	-	3178	D05	-	N/A	-	N/A
Autumn	-	3178	D06	-	N/A	-	N/A
Autumn	-	3178	D07	-	N/A	-	N/A
Autumn	-	3178	D08	-	N/A	-	N/A
Autumn	-	3178	D09	-	N/A	-	N/A
Autumn	-	3178	D10	-	N/A	-	N/A
Autumn	-	3178	D11	-	N/A	-	N/A
Autumn	2	3178	D12	23	Low to Moderate	23	Low to Moderate
Autumn	-	3178	D13	-	N/A	-	N/A
Autumn	-	3178	D14	-	N/A	-	N/A
Autumn	1	3178	D15	23	Low to Moderate	23	Low to Moderate

MYOTIS SP.

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	8	3978	D01	12	Low	41	Moderate
Spring	2	3978	D02	12	Low	12	Low
Spring	4	3978	D03	12	Low	12	Low
Spring	3	3978	D04	12	Low	31	Low to Moderate
Spring	3	3978	D05	12	Low	31	Low to Moderate
Spring	4	3978	D06	12	Low	31	Low to Moderate
Spring	1	3978	D07	12	Low	12	Low
Spring	3	3978	D08	31	Low to Moderate	31	Low to Moderate
Spring	12	3978	D09	12	Low	41	Moderate
Spring	6	3978	D10	12	Low	12	Low
Spring	10	3978	D12	12	Low	41	Moderate
Spring	8	3978	D13	12	Low	31	Low to Moderate
Spring	4	3978	D14	12	Low	12	Low
Spring	-	3978	D15	-	N/A	-	N/A
Summer	10	3684	D01	39	Low to Moderate	68	Moderate to High
Summer	12	3684	D02	39	Low to Moderate	60	Moderate
Summer	3	3684	D03	15	Low	51	Moderate
Summer	9	3684	D04	15	Low	44	Moderate
Summer	2	3684	D05	25	Low to Moderate	34	Low to Moderate
Summer	5	3684	D06	15	Low	44	Moderate
Summer	8	3684	D07	34	Low to Moderate	44	Moderate
Summer	12	3684	D08	60	Moderate	73	Moderate to High
Summer	12	3684	D09	34	Low to Moderate	56	Moderate
Summer	11	3684	D10	34	Low to Moderate	51	Moderate

Summer	5	3684	D11	34	Low to Moderate	51	Moderate
Summer	11	3684	D12	44	Moderate	51	Moderate
Summer	14	3684	D13	48	Moderate	72	Moderate to High
Summer	10	3684	D14	34	Low to Moderate	56	Moderate
Summer	7	3684	D15	15	Low	44	Moderate
Autumn	10	3443	D01	50	Moderate	72	Moderate to High
Autumn	6	3443	D02	44	Moderate	55	Moderate
Autumn	6	3443	D03	23	Low to Moderate	44	Moderate
Autumn	5	3443	D04	44	Moderate	44	Moderate
Autumn	1	3443	D05	23	Low to Moderate	23	Low to Moderate
Autumn	6	3443	D06	34	Low to Moderate	66	Moderate to High
Autumn	2	3443	D07	23	Low to Moderate	23	Low to Moderate
Autumn	7	3443	D08	55	Moderate	66	Moderate to High
Autumn	4	3443	D09	66	Moderate to High	66	Moderate to High
Autumn	2	3443	D10	34	Low to Moderate	44	Moderate
Autumn	3	3443	D11	44	Moderate	55	Moderate
Autumn	7	3443	D12	23	Low to Moderate	69	Moderate to High
Autumn	3	3443	D13	23	Low to Moderate	55	Moderate
Autumn	4	3443	D14	44	Moderate	62	Moderate to High
Autumn	5	3443	D15	23	Low to Moderate	69	Moderate to High

SOPRANO PIPISTRELLE							
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	2	5829	D01	12	Low	12	Low
Spring	1	5829	D02	12	Low	12	Low
Spring	1	5829	D03	12	Low	12	Low
Spring	1	5829	D04	12	Low	12	Low
Spring	3	5829	D05	12	Low	31	Low to Moderate
Spring	8	5829	D06	31	Low to Moderate	47	Moderate
Spring	6	5829	D07	12	Low	31	Low to Moderate
Spring	3	5829	D08	12	Low	31	Low to Moderate
Spring	3	5829	D09	12	Low	41	Moderate
Spring	4	5829	D10	12	Low	12	Low
Spring	5	5829	D11	12	Low	12	Low
Spring	7	5829	D12	12	Low	47	Moderate
Spring	11	5829	D13	31	Low to Moderate	69	Moderate to High
Spring	8	5829	D14	12	Low	47	Moderate
Spring	3	5829	D15	12	Low	12	Low

Summer	10	5783	D01	75	Moderate to High	84	High
Summer	10	5783	D02	63	Moderate to High	89	High
Summer	4	5783	D03	52	Moderate	76	Moderate to High
Summer	8	5783	D04	34	Low to Moderate	60	Moderate
Summer	9	5783	D05	56	Moderate	73	Moderate to High
Summer	10	5783	D06	51	Moderate	72	Moderate to High
Summer	13	5783	D07	63	Moderate to High	77	Moderate to High
Summer	15	5783	D08	66	Moderate to High	90	High
Summer	14	5783	D09	43	Moderate	80	Moderate to High
Summer	11	5783	D10	44	Moderate	78	Moderate to High
Summer	15	5783	D11	60	Moderate	84	High
Summer	14	5783	D12	93	High	99	High
Summer	15	5783	D13	97	High	99	High
Summer	15	5783	D14	82	High	96	High
Summer	14	5783	D15	73	Moderate to High	92	High
Autumn	2	4709	D01	34	Low to Moderate	44	Moderate
Autumn	1	4709	D02	23	Low to Moderate	23	Low to Moderate
Autumn	-	4709	D03	-	N/A	-	N/A
Autumn	1	4709	D04	23	Low to Moderate	23	Low to Moderate
Autumn	-	4709	D05	-	N/A	-	N/A
Autumn	11	4709	D06	44	Moderate	78	Moderate to High
Autumn	1	4709	D07	23	Low to Moderate	23	Low to Moderate
Autumn	3	4709	D08	23	Low to Moderate	69	Moderate to High
Autumn	6	4709	D09	34	Low to Moderate	69	Moderate to High
Autumn	2	4709	D10	46	Moderate	69	Moderate to High
Autumn	1	4709	D11	23	Low to Moderate	23	Low to Moderate
Autumn	6	4709	D12	78	Moderate to High	87	High
Autumn	9	4709	D13	69	Moderate to High	94	High
Autumn	6	4709	D14	34	Low to Moderate	84	High
Autumn	-	4709	D15	-	N/A	-	N/A

COMMON PIPISTRELLE							
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	1	6353	D01	12	Low	12	Low
Spring	1	6353	D02	12	Low	12	Low
Spring	-	6353	D03	-	N/A	-	N/A
Spring	1	6353	D04	12	Low	12	Low
Spring	2	6353	D05	27	Low to Moderate	41	Moderate

Spring	2	6353	D06	39	Low to Moderate	47	Moderate
Spring	3	6353	D07	12	Low	31	Low to Moderate
Spring	2	6353	D08	27	Low to Moderate	41	Moderate
Spring	3	6353	D09	12	Low	12	Low
Spring	1	6353	D10	12	Low	12	Low
Spring	6	6353	D11	12	Low	12	Low
Spring	3	6353	D12	12	Low	47	Moderate
Spring	6	6353	D13	75	Moderate to High	84	High
Spring	5	6353	D14	12	Low	12	Low
Spring	1	6353	D15	12	Low	12	Low
Summer	7	5696	D01	51	Moderate	60	Moderate
Summer	7	5696	D02	44	Moderate	66	Moderate to High
Summer	1	5696	D03	51	Moderate	51	Moderate
Summer	3	5696	D04	15	Low	44	Moderate
Summer	6	5696	D05	15	Low	34	Low to Moderate
Summer	6	5696	D06	39	Low to Moderate	68	Moderate to High
Summer	14	5696	D07	39	Low to Moderate	72	Moderate to High
Summer	12	5696	D08	62	Moderate to High	84	High
Summer	10	5696	D09	44	Moderate	56	Moderate
Summer	10	5696	D10	43	Moderate	68	Moderate to High
Summer	15	5696	D11	34	Low to Moderate	75	Moderate to High
Summer	15	5696	D12	88	High	96	High
Summer	14	5696	D13	94	High	97	High
Summer	14	5696	D14	74	Moderate to High	92	High
Summer	12	5696	D15	51	Moderate	74	Moderate to High
Autumn	-	4304	D01	-	N/A	-	N/A
Autumn	-	4304	D02	-	N/A	-	N/A
Autumn	-	4304	D03	-	N/A	-	N/A
Autumn	-	4304	D04	-	N/A	-	N/A
Autumn	-	4304	D05	-	N/A	-	N/A
Autumn	-	4304	D06	-	N/A	-	N/A
Autumn	-	4304	D07	-	N/A	-	N/A
Autumn	-	4304	D08	-	N/A	-	N/A
Autumn	-	4304	D09	-	N/A	-	N/A
Autumn	-	4304	D10	-	N/A	-	N/A
Autumn	-	4304	D11	-	N/A	-	N/A
Autumn	2	4304	D12	66	Moderate to High	77	Moderate to High
Autumn	1	4304	D13	23	Low to Moderate	23	Low to Moderate
Autumn	-	4304	D14	-	N/A	-	N/A
Autumn	-	4304	D15	-	N/A	-	N/A

BROWN LONG-EARED BAT							
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	-	2000	D01	-	N/A	-	N/A
Spring	-	2000	D02	-	N/A	-	N/A
Spring	-	2000	D03	-	N/A	-	N/A
Spring	-	2000	D04	-	N/A	-	N/A
Spring	-	2000	D05	-	N/A	-	N/A
Spring	-	2000	D06	-	N/A	-	N/A
Spring	1	2000	D07	12	Low	12	Low
Spring	-	2000	D08	-	N/A	-	N/A
Spring	-	2000	D09	-	N/A	-	N/A
Spring	-	2000	D10	-	N/A	-	N/A
Spring	-	2000	D11	-	N/A	-	N/A
Spring	-	2000	D12	-	N/A	-	N/A
Spring	5	2000	D13	12	Low	12	Low
Spring	1	2000	D14	12	Low	12	Low
Spring	-	2000	D15	-	N/A	-	N/A
Summer	1	2399	D01	15	Low	15	Low
Summer	5	2399	D02	15	Low	34	Low to Moderate
Summer	1	2399	D03	15	Low	15	Low
Summer	3	2399	D04	15	Low	15	Low
Summer	2	2399	D05	25	Low to Moderate	34	Low to Moderate
Summer	1	2399	D06	34	Low to Moderate	34	Low to Moderate
Summer	6	2399	D07	15	Low	15	Low
Summer	-	2399	D08	-	N/A	-	N/A
Summer	4	2399	D09	15	Low	15	Low
Summer	3	2399	D10	15	Low	44	Moderate
Summer	-	2399	D11	-	N/A	-	N/A
Summer	2	2399	D12	25	Low to Moderate	34	Low to Moderate
Summer	8	2399	D13	15	Low	15	Low
Summer	5	2399	D14	15	Low	34	Low to Moderate
Summer	2	2399	D15	15	Low	15	Low
Autumn	1	2391	D01	44	Moderate	44	Moderate
Autumn	1	2391	D02	23	Low to Moderate	23	Low to Moderate
Autumn	3	2391	D03	23	Low to Moderate	23	Low to Moderate
Autumn	-	2391	D04	-	N/A	-	N/A
Autumn	-	2391	D05	-	N/A	-	N/A
Autumn	3	2391	D06	44	Moderate	44	Moderate
Autumn	3	2391	D07	23	Low to Moderate	23	Low to Moderate

Autumn	3	2391	D08	23	Low to Moderate	23	Low to Moderate
Autumn	2	2391	D09	23	Low to Moderate	23	Low to Moderate
Autumn	-	2391	D10	-	N/A	-	N/A
Autumn	-	2391	D11	-	N/A	-	N/A
Autumn	3	2391	D12	23	Low to Moderate	44	Moderate
Autumn	3	2391	D13	23	Low to Moderate	23	Low to Moderate
Autumn	3	2391	D14	23	Low to Moderate	23	Low to Moderate
Autumn	2	2391	D15	23	Low to Moderate	23	Low to Moderate

APPENDIX 4

OVERALL SITE RISK ASSESSMENT

Table 3b: *Stage 2 - Overall risk assessment*

Site risk level (from Table 3a)	Ecobat activity category (or equivalent justified categorisation)					
	Nil (0)	Low (1)	Low-moderate (2)	Moderate (3)	Moderate-high (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Med (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

The scores in the table are a product of multiplying site risk level and the Ecobat activity category (or equivalent). The activity categories equate to those given in Table 1 for high collision risk species. Nil (0) means no bat activity was recorded across the whole site, but caution is needed here, because although the values given in this column are "0", at sites where pre-construction surveys found no bat activity, there remains the possibility that new turbines could attract some bat species, thereby altering the level of risk that applies in reality.

Overall assessment:

Low (green)	0-4
Medium (amber)	5-12
High (red)	15-25

It is important to have an understanding of both "typical" and unusually high levels of bat activity at a site so that potentially important peaks in activity are not overlooked. It is therefore recommended that both the highest Ecobat activity category and the most frequent activity category (i.e. the median) are assessed separately in Table 3b and presented in the overall risk assessment. A judgement can then be made on which is the most relevant. It should be noted that presenting mean activity levels can be highly misleading where the data are highly skewed, as is frequently the case with bat activity at wind turbines (Lintott & Mathews, 2018).