APPENDIX 6-2

BAT REPORT

Appendix 6-2 – Bat Survey Report

Proposed Clonberne Wind Farm, Co. Galway

DOCUMENT DETAILS

Client:	**Clonberne Windfarm Ltd.**
Project Title:	**Proposed Clonberne Wind Farm, Co. Galway**
Project Number:	**180740**
Document Title:	**Bat Survey Report**
Document File Name:	**Appendix 6-2 Bat Report F - 2024.06.20-180740**
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Planning and Environmental Consultants

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01	D1	09/11/2022	NC	AJ
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05	D7	14/05/2024	RC	AJ
06	Final	20/06/2024	RC	AJ

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1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of an application for planning permission of a renewable energy development at Clonberne, Co. Galway. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Project on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Bat surveys carried out in 2022 in accordance with NatureScot, 2021[1], form the core dataset for the assessment of effects on bats. The 2022 results are supplemented by data collected during surveys undertaken on the Wind Farm Site in 2019 which were designed in accordance with SNH, 2019 Guidelines[2]. The 2019 data is presented in Appendix 3.

Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and ground-level static detector surveys. Surveys were based on an indicative turbine layout of 11 turbines.

The assessment and mitigation provided in this report has been designed in accordance with NatureScot, 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [3], which was produced in August 2021 (amended May 2022).

As detailed in Section 1.1, Chapter 1 of this EIAR, For the purposes of this Bat Report, the various project components are described and assessed using the following references:

- Where the 'Proposed Project' is referred to, this relates to all the project components described in detail in Chapter 4 of this EIAR i.e., Wind Farm Site and Grid Connection as detailed in Chapter 1, Section 1.4.1.
- Where 'the Site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary in green as shown on Figure 1-1, Chapter 1.
- Where the 'Wind Farm Site' is referred to, this refers to turbines and associated foundations and hard-standing areas, meteorological mast, borrow pit, access roads, temporary construction compound, underground cabling, peat, spoil and overburden management, site drainage, tree felling and all ancillary works and apparatus. The planning application for the Wind Farm Site is made to An Bord Pleanála in accordance with the provisions of Section 37E of the Planning and Development Act 2000, as amended.
- Where 'Grid Connection' is referred to, this refers to the onsite substation, and associated underground 110kV cabling connecting into the existing Cashla – Carrick-on-Shannon 220kV overhead line at Laughil, subject to a future planning application under Section 182A of the Planning and Development Act, 2000, as amended.

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

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*
[2] *Scottish Natural Heritage published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH 2019).*
[3] *Northern Ireland Environment Agency Natural Environment Division (NED) published Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland (NIEA, 2021).*

UK estimated bat fatalities at between 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. The reason 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.

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. This report primarily focuses on surveys conducted within the Wind Farm Site. The proposed Grid Connection (including the underground cabling route) was assessed as part of the multidisciplinary survey effort detailed in Chapter 6. Further details of the bridge assessment along the proposed Grid Connection underground cabling route are outlined below. Survey design and analyses of results at the Wind Farm 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 an 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.* 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 are in accordance with NatureScot 2021 Guidance.

1.3 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). 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, as amended). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. 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 1-2 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	

1.4 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team who carry out specialist bat surveys and complete impact assessments in relation to bats. MKO ecologists have relevant academic qualifications and are qualified in undertaking surveys to the levels required. MKO's Ecology team holds a current bat derogation license from NPWS. The license is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections).

The 2022 survey scope development and project management was overseen by Aoife Joyce (BSc., MSc.). The 2022 daytime walkover survey and inspections were carried out by Neil Campbell (BSc., MSc.), Kate Greaney (BSc., MSc.) and Keith Costello (BSc.). Manual activity surveys were carried out by Neil Campbell and Kate Greaney. Data analyses were carried out by Neil Campbell, Kate Greaney and Ryan Connors (BSc., MSc.). This report was prepared by Ryan Connors and was reviewed and approved by Aoife Joyce (BSc., MSc.). Staff roles and relevant training are presented in Table 1-1 below. Details of the 2019 surveys and reporting are outlined in Appendix 3.

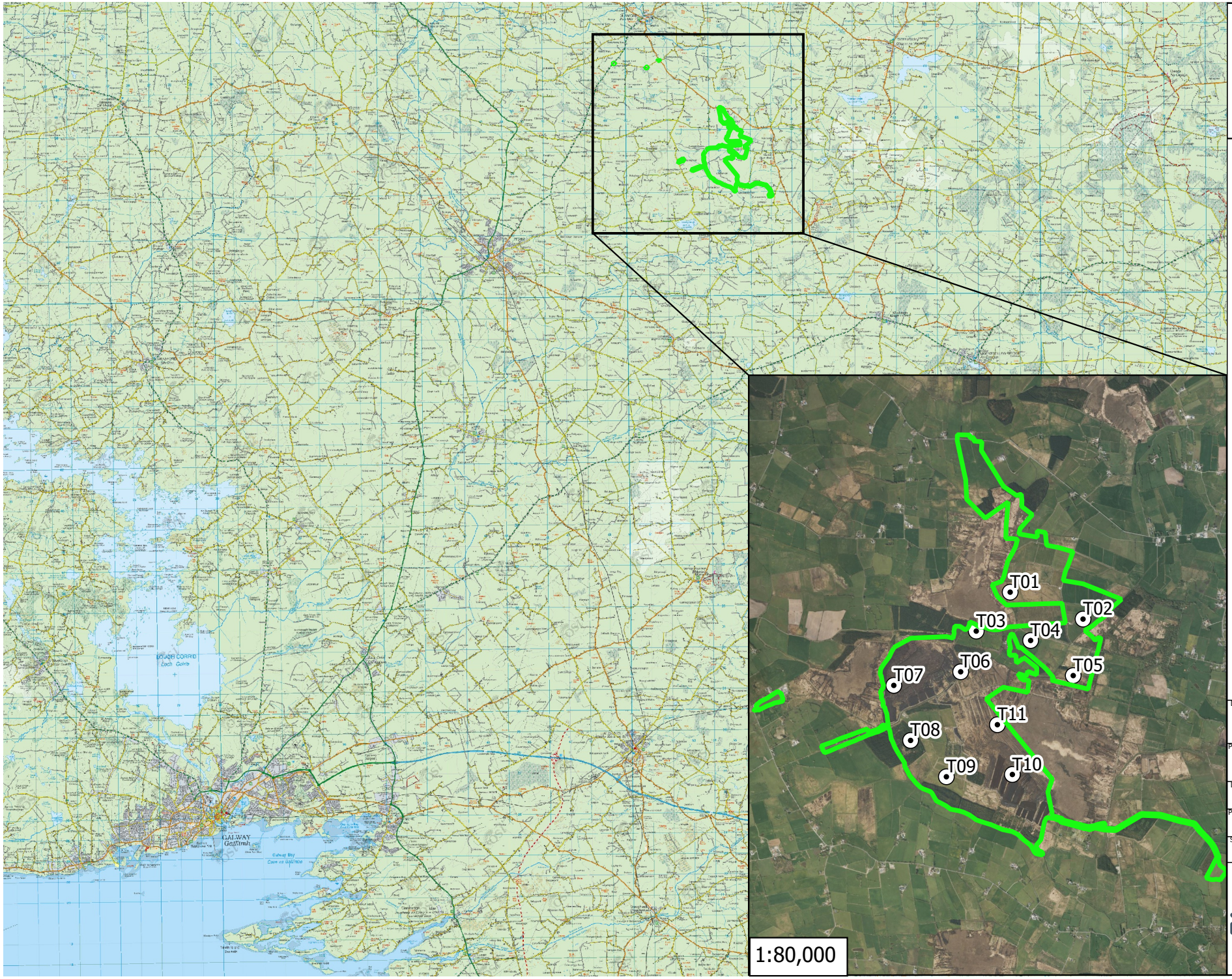
Table 1-2 Bat Specific Experience and Training of Ecologists Involved in Surveying

Staff	Role	Bat Specific Training
Aoife Joyce (B.Sc., M.Sc.)	Project Director	Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Neil Campbell (B.Sc., M.Sc.)	Ecologist	Kaleidoscope Pro Analysis (Wildlife Acoustics). Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal) Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal)

Staff	Role	Bat Specific Training
Kate Greaney (B.Sc., M.Sc.)	Ecologist	Kaleidoscope Pro Analysis (Wildlife Acoustics). Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal) Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal)
Keith Costello (B.Sc.)	Ecologist	Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Ryan Connors (B.Sc., M.Sc.)	Bat Ecologist	Surveying Trees for Bats (BRTS), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Kaleidoscope Pro Analysis (Internal).

2. PROJECT DESCRIPTION

The Proposed Project site is located the northeast of Co. Galway (Grid Ref: M 554464 756549), approximately 1314 kilometres northeast of Tuam and approximately 10.3 kilometres northwest of Moylough, Co. Galway. The site is accessed via local roads that join the R328 regional road which is located to the east of the site. The primary land use in the area is agriculture, with mature forestry coverage and cutover bog in some areas of the Proposed Project. Within the wider landscape, a mixture of agriculture, low-medium density housing, Conifer forestry and peat-cutting comprise the main land uses. The site location context is shown in Figure 2-1. The full description of the Proposed Project is provided in Section 4.1 of Chapter 4 of this EIAR.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

N

Drawing Title
Site Location

Project Title: Proposed Clonbern Wind Farm Development	
Drawn By: RC	Checked By: AJ
Project Code: 180740	Drawing No.: Fig 2-1
Scale: 1:400,000	Date: 2024-04-04

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3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Project. A Scoping Document, providing details of the application site and the Proposed Project, was prepared by MKO and circulated to consultees in December 2023. 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 Project 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 Proposed Project 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 Site 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. A search of the National Bat Database of Ireland was last carried out on the 13th March 2024 and examined bat presence and roost records within a 10 km radius of a central point within the Wind Farm Site (Grid Ref M 54825 56653) (BCI 2012, Hundt 2012, NatureScot 2021). Available bat records were provided by Bat Conservation Ireland on 30/06/2023. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Proposed Project.

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 Wind Farm Site. 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 10 km radius of the Wind Farm 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 Wind Farm Site 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 10 km of the Wind Farm Site (BCI, 2012) (last searched on the 13th March 2024). 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 13th March 2024).

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 Project was reviewed in relation to bat habitat suitability indices. The aim of this was to assess habitat suitability for all bat species within the Wind Farm Site. 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 Wind Farm Site.

3.2.4.4 Additional EIA Projects in the Wider Landscape

A search for proposed, existing and permitted wind energy developments within 10km of the Wind Farm Site was undertaken (NatureScot, 2021). The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Galway County Council. Other large infrastructure developments and proposals (e.g. roads) were also noted. Information on the location and scale of these developments was gathered to inform the potential for cumulative effects. Further details on infrastructure developments within the vicinity of the Proposed Project can be found in Chapter 2 of the main EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken throughout 2019 to 2023 (Table 3-1). An additional site visit was carried out in 2024. The Site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the site assessed and classified. The habitats (including any culverts/bridges associated with the grid connection route were assessed for bat commuting, foraging and roosting suitability. The grid connection was visited as part of the multidisciplinary surveys outlined below and in Chapter 6 of the main EIAR.

Multidisciplinary walkover surveys were undertaken on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey	Dedicated Bat Survey
28th June 2019	27th April 2022
15th July 2019	11th May 2022
19th August 2019	16th June 2022
25th August 2021	12th July 2022
24th January 2022	23rd August 2022
15th February 2022	8th September 2022
30th September 2022	8th April 2024
1st October 2022	
26th June 2023	

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2022. During these surveys, habitats within the Wind Farm Site 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, divided into *High*, *Moderate*, *Low* and *Negligible*, are described fully in **Appendix 1**. Ancillary elements of the Proposed Project such as the Turbine Delivery Route Accommodation Areas were assessed in April 2024 following the more recent best practice measures set out in the 4th edition of BCT's *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2023). The updated suitability categories are also described fully in **Appendix 1.**

3.3.2 Roost Inspection Surveys

Daytime Roost Inspections

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 81m) of the proposed turbine locations (NatureScot 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The Wind Farm Site was visited in April, May, June, July, August and September of 2022. Multiple walkovers were 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 roost sites were subject to a roost assessment. This comprised a detailed inspection of the exterior and interior (if accessible) to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises.

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 PRFs identified by BTHK (2018).

The Grid Connection underground cabling route, including watercourse, drain and culvert crossing infrastructure, was also assessed for any suitability to host roosting bats. Surveys were carried out on the 25th of August 2021 and 26th of June 2023 and comprised a detailed inspection of existing infrastructure to look for evidence of bat use.

Emergence Surveys

Emergence surveys at dusk were carried out which focused on the PRFs identified during the habitat appraisal. During these surveys, surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). The emergence surveys commenced at least 15 minutes before sunset and were completed for up to 2 hours after sunset. Table 3-2 summarises survey effort in relation to emergence surveys. Where possible, species identification was made in the field and any other relevant information was also noted, e.g., numbers, behaviour, features used, etc. All bat echolocation was recorded for subsequent analysis to confirm species identifications.

Surveyors were located at PRFs identified during the daytime roost inspection surveys with a focus on potential access point and roosting features. The purpose was to identify any bat species, numbers, access points and roosting locations within the PRF structure. Surveys were carried out in favourable weather conditions.

Table 3-2 2022 Survey Effort – Emergence Surveys

Date	Surveyors	Grid Ref:	Sunrise/ Sunset	Weather
11th May 2022	Neil Campbell and Kate Greaney	M 54978 57099	21:25	16˚C; Dry; Calm; 50% Cloud Cover
8th September 2022	Neil Campbell and Kate Greaney	M 54427 56048	20:08	22˚C; Dry; Calm; 35% Cloud Cover

3.3.3 Manual Activity Surveys

Manual activity surveys comprised walked and driven transects after dusk. A series of representative transect routes were selected throughout the Wind Farm Site. The aim of these surveys was to identify bat species using the Wind Farm 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 undertaken in 2022 are presented in Figure 3-1.

Transects were walked by two surveyors, recording bats in real time. Transects commenced at least 15 minutes before sunset when conducted in isolation or immediately after the dusk emergence survey. The surveys were completed for up to 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 and summer 2022. Table 3-3 summarises survey effort in relation to manual transects.

Table 3-3 2022 Survey Effort – Manual Transects

Date	Surveyors	Survey Type	Sunrise/ Sunset	Time	Weather	Walked (km)
11th May 2022	Neil Campbell and Kate Greaney	Emergence and Transect	21:25	21:10 – 00:25	16˚C; Dry; Calm; 50% Cloud Cover	2.6
12th July 2022	Neil Campbell and Kate Greaney	Dusk Transect	22:00	21:30 – 01:00	16˚C; Dry, Calm, 20% Cloud Cover	14.2
Total 2022 Survey Effort						**16.8km**

3.3.4 Ground-level Static Surveys

The ground-level static surveys methodology followed the most recent recognised industry best practice i.e. NatureScot's *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (NatureScot, 2021). This allowed for a robust approach to the surveys and assessment undertaken in the bat impact assessment. Where developments have more than 10 turbines, NatureScot requires 1 detector per turbine up to 10 plus 1 detector for every 3 additional turbines. Given that 11 turbines were proposed, 11 detectors were deployed to ensure compliance with NatureScot guidance.

Automated bat detectors were deployed for at least 10 nights of suitable weather in spring (April-May), 20 nights in summer (June-July) and 10 nights in autumn (August-October). Detector locations were based on indicative turbine locations and differ slightly to the final Proposed Project turbine layout. Figure 3-1 presents static detector locations in relation to the final Proposed Project turbine layout. Static detector locations are described in Table 3-4. The static detector locations achieved a good spatial spread in relation to the proposed turbines and sampled the range of available habitats.

Keyholing will be required where turbines are proposed in areas of forestry within the Site. This involves only felling an area required to construct the turbine and associated infrastructure thus creating open areas, within the forest, around proposed turbines (IWEA, 2012). The 'keyhole' size is typically 50m from turbine blade tip to forestry edge, and these keyhole areas remain open during the wind farm lifetime. Further details on proposed key-hole locations can be found in Chapter 4 of the EIAR.

Where keyholing is proposed, detectors were located along nearby forestry edge in order to more closely reflect the likely post-construction habitat. 2022 static detector locations are described in Table 3-4 and presented in Figure 3-1.

With regard to the DAU response (see Section 4.1.2 below) highlighting that 'it is more appropriate to use 30-day survey periods with static automated detectors'; this information is based on an online webinar 'Patterns of Bat Activity at Upland Windfarms: Implications for Sampling and Mitigation' (CIEEM, 2020). The presenter stated during the 'Summary & Questions' that their Scottish company undertake surveys for '30 days' although they 'haven't derived 30 days in any scientific way', and concludes that they 'have not looked to see what the optimum efficiency is'. The information presented has not been published and the speaker states that 'there have been meetings to review the guidance' (i.e. SNH, 2019/NatureScot, 2021). However, it is stated that it is likely the SNH (2019) guidelines will not change and that there may only be clarification issued on the existing guidelines, 'rather than necessarily changing it'.

Following the release of NatureScot 2021 guidance, the minimum ground level static survey requirement is 30 nights of surveys in optimal weather conditions spread across the spring, summer and autumn period. Alternative guidance from NIEA NED builds on this and sets minimum site requirements based on perceived site risk:

o Low Risk Site - 30 Nights

o Medium Risk Site - 30 Nights + 10 extra in summer and other peak periods.

o High Risk Site - 30 Nights + 20 extra in summer and other peak periods.

The surveys undertaken at the Wind Farm Site are fully in line with the industry best practice (NatureScot, 2021) and a comprehensive assessment was achieved. Overall, 53 nights of surveying was carried out, 51 of which were in suitable weather conditions (Table 3-5).

Table 3-4 2022 Ground-level Static Detector Locations

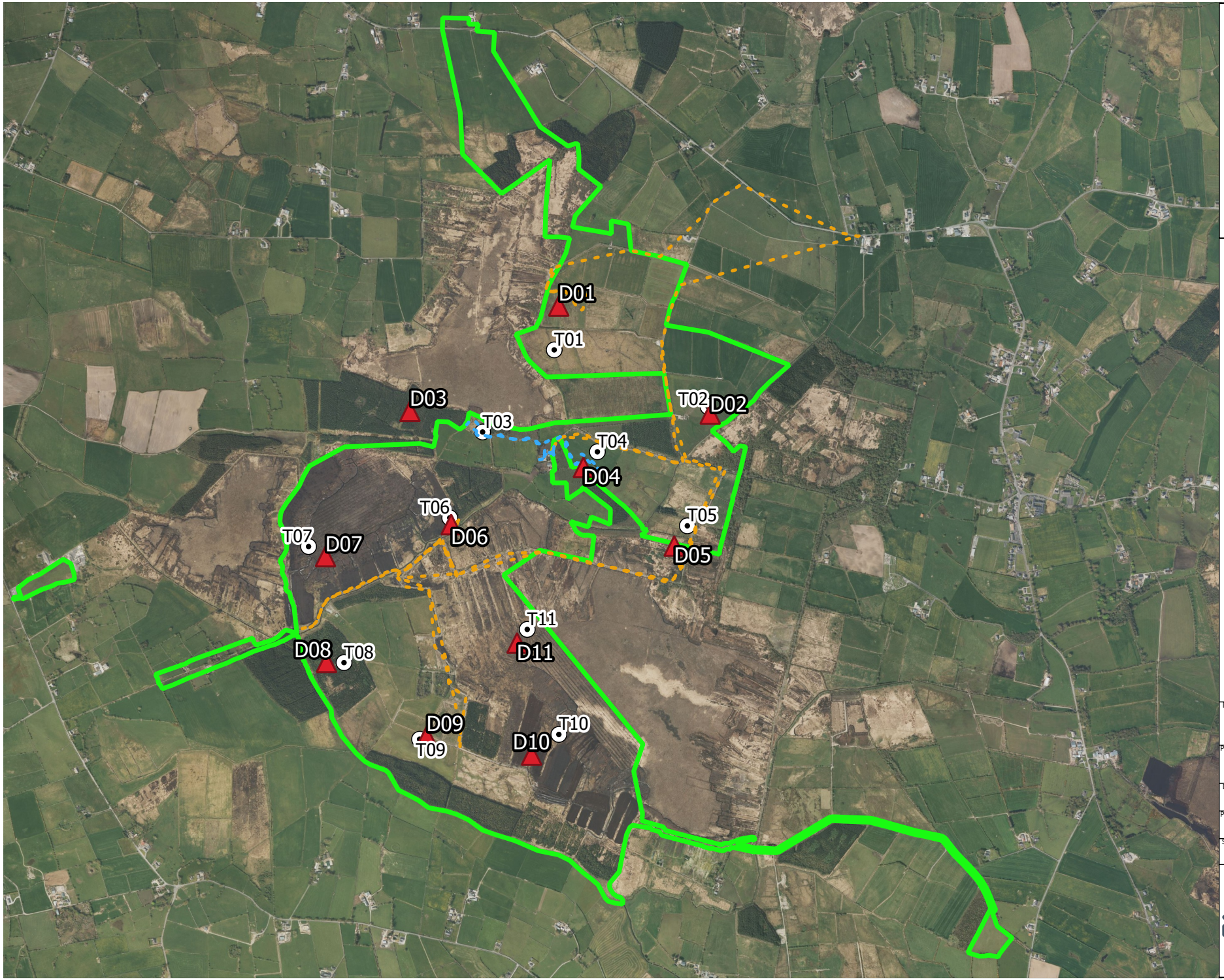
ID	Grid Ref:	Habitat	Linear Feature within 50m	Corresponding/ Nearest Turbine
D01	M 55005 57548	Improved Agricultural Grassland – GA1.	Hedgerow	T01
D02	M 55722 57292	Improved Agricultural Grassland GA1 – east of field.	Stream/ Watercourse	T02
D03	M 54334 57287	Firebreak within two sections of Conifer plantation WD4.	Edge of conifer plantation	T03
D04	M 55085 57029	Improved Agricultural Grassland - GA1 between Immature broadleaf woodland - WD1.	Immature treelines	T04
D05	M 55623 56721	Improved Agricultural Grassland - GA1 along boundary hedgerow.	Hedgerow	T05
D06	M 54561 56778	Edge of Cutover bog habitat - PB4.	Bog drain/ edge of conifer plantation	T06
D07	M 53935 56778	Edge of Cutover bog habitat - PB4.	Bog drain	T07
D08	M 54016 56096	Within Conifer plantation - WD4.	Firebreak in conifer plantation	T08
D09	M 54380 55811	Inside fencing of Improved Agricultural Grassland/Wet grassland - GA1/GS4 and drain.	N/A	T09
D10	M 54892 55726	Cutover bog - PB4 – on verge adjacent to drain and gorse bush.	N/A	T10
D11	M 54834 56274	Mound of peat within Cutover bog - PB4.	N/A	T11

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 in Spring and Autumn and 20 in Summer) 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 3-5 summarises survey effort achieved for each of the detector locations in 2022.

Table 3-5 2022 Survey Effort - Ground-level Static Surveys

Season	Survey Period	Total Survey Nights per detector location	Nights with Appropriate Weather
Spring	27th April – 11th May 2022	13	13
Summer	16th June – 12th July 2022	27	25
Autumn	23rd of August – 6th of September 2022	13	13
Total Survey Effort		**53**	**51**



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- 2022 Static Detector Locations
- SpringTransect Route 16th May 2022
- Summer Transect Route 13th July 20222

N

Drawing Title
2022 Survey Effort

Project Title
Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 3-1
Scale	Date
1:38,000	2024-04-04

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3.4 Bat Call Analysis

All recordings from 2022 were later analysed using bat call analysis software Kaleidoscope Pro v.5.1.9 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Proposed Project site. Bat species were identified using established call parameters, to create site-specific custom classifiers and were also 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 frequencies (peak frequency of maximum energy in search flight) 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.

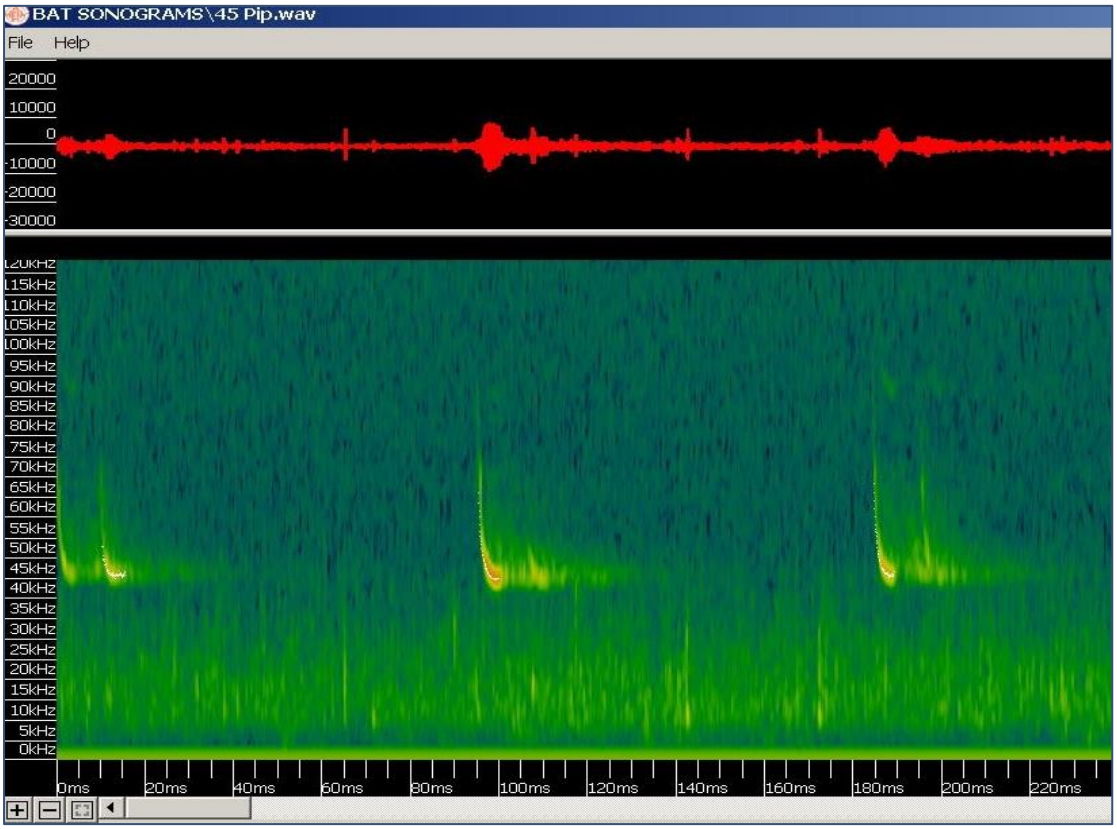


Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

The online database tool Ecobat (mammal.org.uk) is recommended by NatureScot 2021 to assess bat activity levels within a proposed wind-farm site. 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 3-6 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

The 2019 static detector monitoring results were uploaded to the online database tool Ecobat (ecobat.org.uk). Results of the 2019 assessment are presented in **Appendix 3**.

Table 3-6 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

Ecobat was unavailable for a cross-site analysis of 2022 data as the platform has been undergoing maintenance since late 2022 with no proposed timeline of a relaunch. Therefore, data were assessed on a site-specific basis.

All statistical analyses and graphical representations in this report were conducted using R (version 4.3.2), and RStudio (version 2023.09.+494.). R is a powerful statistical programming language and provided the framework for data manipulation and statistical testing. To allow this, data were standardised into bat passes per hour. RStudio, as an integrated development environment for R, facilitated efficient coding, visualization, and reproducibility. The 'ggplot2' package in R was particularly instrumental in creating the detailed graphs presented in the results section.

The methodology for assessing activity levels across the site was adapted from Mathews *et al.* (2016), where activity ranges of pipistrelle species were defined using an average of maximum nightly pass rates (in total passes during the survey period) across the site, divided into tertiles.

For this site-specific assessment, the use of bat passes per hour rates was deemed more appropriate to account for seasonal changes in night length (Matthews *et al.* 2016). Pipistrelle species' activity ranges were determined using an average of maximum nightly pass rates (total passes during the survey period) across the Proposed Project site, divided into quartiles. The same process was applied to Leisler's bats, while for other species groups, the maximum nightly pass rate (bpph) recorded across the site was divided into quartiles.

Activity levels were assessed according to the site activity and the species were assessed separately into four distinct groups: two Pipistrelle species (*Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*), noctules (*Nyctalus leisleri*) and *Myotis* spp. and the rare or hard to record species: Nathusius' pipistrelles (Pipistrellus nathusii) and brown long-eared bats (*Plecotus auritus*).

Median and maximum nightly activity (bpph) at each detector location were then categorized as Low, Medium, or High for each recorded season. Any figure below 25% of the maximum/average maximum nightly pass rate was considered Low activity, while figures above 75% were classified as High. Values falling between these two quartiles were defined as Medium. To prevent skewing the activity threshold towards high levels, any evident outliers recorded across the detectors were excluded.

The site-specific categories identified were deemed appropriate for the assessment, based on activity levels recorded by MKO at similar sites. Table 3-7 presents activity ranges per species group identified.

Table 3-7 Site-specific Activity Level Categories

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species			
	Pipistrellus spp.	*Nyctalus* spp.	*Myotis* spp.	Other groups
Low	< 5.5	< 3.615	< 0.765	< 0.1975
Medium	5.5 – 16.5	3.615 – 10.845	0.765 – 2.295	0.1975 – 0.5925
High	> 16.5	> 10.845	>2.295	< 0.5925

3.6 Assessment of Collision Risk

3.6.1 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 wind turbine collision for Irish bat populations is provided. This adaptation of 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)

3.6.2 Site Risk

The likely impact of a Proposed Project 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)

3.6.3 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	15	18
Highest (5)	0	5	10	15	20	25

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	High Overall Risk (15-25)

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 above 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).

3.7 Limitations

A comprehensive suite of bat surveys has been undertaken at the Proposed Project site in 2022. The surveys undertaken in 2022, in accordance with NatureScot Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Project on bats receptors.

The information provided in this report accurately and comprehensively describes the baseline environment; provides an accurate prediction of the likely effects of the Proposed Project; 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 Project to affect bats. However, due to administrative constraints, BCI couldn't provide specific comments on the application. In their response on 15th December 2023, BCI outlined the importance of conducting bat surveys in accordance with best practice guidelines.

4.1.2 Development Applications Unit - NPWS

A detailed scoping exercise was undertaken for the Proposed Project. A response from the Department of Culture, Heritage and the Gaeltacht provided recommendations regarding nature conservation, including bats. The relevant excerpts, specifically relating to bats, are summarised below and the full details of the scoping and consultation exercise are described in the main EIAR. The response was received on the 12/11/2020.

Ecological survey

Any improvement or reinforcement works required for access and transport anywhere along any proposed haul route(s) should be included in the EIAR and subjected to ecological impact assessment with the inclusion of mitigation measures, as appropriate. Where bridges require strengthening this may involve grouting of crevices which may function as bat roosts. Where ex-situ impacts are possible, survey work may be required, outside of the development sites. Such surveys should be carried out by suitably qualified persons at an appropriate time of the year, depending on the species being surveyed for. The EIAR should include the results of the surveys and detail the survey methodology and timing of such surveys including consistency in terms of timed vantage point surveys.

Hedgerows and Related Species

Hedgerows and tree lines should be maintained where possible, as they form wildlife corridors and provide areas for birds to nest in; hedgerow trees 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 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. Hedgerows and trees should not be removed during the nesting season (i.e. March 1st to August 31st), noting the protection afforded under the Wildlife Act 1976-2018.

Bats

Bat roosts may be present in trees, buildings and bridges. All bat species are strictly protected under EC (Birds and Natural Habitats) Regulations, 2011 and listed on Annex IV of Habitats Directive. Bat roosts can only be disturbed and/or destroyed under licence issued under the Wildlife Act and a derogation under the EC (Birds and Natural Habitats) Regulations, 2011. 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. The Department would like to highlight new survey research on patterns of bat activity in upland wind farms which indicates it is more appropriate to use 30 day survey periods with static automated detectors, in each season, and in different weather conditions to reduce sampling bias and to accurately determine when the curtailment mitigation is required during the operational phase. This survey should include use of detectors at

different heights. Any proposed migratory bat friendly lighting should be proven to be effective and follow up to date guidance.

Post Construction Monitoring

This Department recognises the importance of pre and post construction monitoring, such as recommended in Drewitt et al. (2006), and Bat Conservation Ireland (2012). The applicant should not use any proposed post construction monitoring as mitigation to supplement inadequate information in the assessment.

The EIAR process should identify any pre and post construction monitoring which should be carried out. The post construction monitoring 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. A plan will be agreed at planning stage with the Planning Authority if the results in future show a significant mortality of birds and/or bat species.

Licences

Where there are impacts on protected species and their habitats, resting or breeding places, licenses may be required under the Wildlife Acts or derogations under the Habitats Regulations. In particular, bats and otters are strictly protected under annex IV of the Habitats Directive.

In order to apply for any derogations, 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 also be provided. Should this survey work take place well before construction commences, it is recommended that an ecological survey of the development site should take place immediately prior to construction to ensure no significant change in the baseline ecological survey has occurred. If there has been any significant change mitigation may require amendment and where a licence has expired, there will be a need for new licence applications for protected species.

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 10 km radius of the Wind Farm Site (Grid Ref: M 54825 56653). Available bat records were provided by Bat Conservation Ireland on 30/06/2023. A number of observations have been recorded within 10km; seven roosts and four ad-hoc observations. At least six of Ireland's nine resident bat species were recorded within 10 km of the proposed works including Common and Soprano pipistrelle, Leisler's bat, Lesser Horseshoe bat, Daubenton's bat and Natterer's bat. The results of the database search are provided in Table 4-1.

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

Record	Species	Grid Reference	Date	Location
Roost	*Myotis daubentonii*	M5090064100	N/A	Dunmore, Co. Galway

Record	Species	Grid Reference	Date	Location
	Myotis daubentonii	M501641	N/A	Dunmore,Co. Galway
	Unidentified bat	L1561	N/A	Lough Mask, Ballinrobe, County Sligo
	Rhinolophus hipposideros	M4755	N/A	Brownsgrove, Tuam, Co. Galway
	Rhinolophus hipposideros	M4559	N/A	Milltown, Co. Galway
	Unidentified bat	M5340053700	N/A	Co. Galway
	Unidentified bat	M546525	N/A	Levally East, North Galway
Ad-Hoc	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Myotis natterreri*	M480499	24/05/2009	BATLAS 2010
	Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)	M5427356560	11/09/2019	BATLAS 2020
	Myotis daubentonii, Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)	M6009549975	02/09/2019	BATLAS 2020
	Pipistrellus pygmaeus	M5090064100	24/04/2005	Consultancy Surveys

National Biodiversity Data Centre

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Proposed Project site (Grid Ref: M 54363 56618; last search 13/04/2024). Hectads M44, M45, M46, M54, M55, M56, M64, M65 and M66 lie within 10km of the proposed study area. Seven of Ireland's nine resident bat species were recorded within 10km of the Proposed Project. The results of the database search are provided in Table 4-2.

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

Grid Square	Species	Record Count	Latest Record	Dataset
M44	Brown Long-eared bat	2	15/10/2005	National Bat Database of Ireland
	Daubenton's bat	6	18/10/2011	National Bat Database of Ireland
	Lesser Horseshoe bat	1	18/10/2011	National Bat Database of Ireland
	Leisler's bat	1	24/05/2009	National Bat Database of Ireland
	Natterer's bat	6	18/10/2011	National Bat Database of Ireland
	Common pipistrelle	1	24/05/2009	National Bat Database of Ireland
	Soprano pipistrelle	3	24/05/2009	National Bat Database of Ireland
M45	Brown Long-eared bat	1	14/08/2014	National Bat Database of Ireland
	Daubenton's bat	2	16/06/2005	National Bat Database of Ireland
	Lesser Horseshoe bat	4	11/10/1988	National Bat Database of Ireland
	Leisler's bat	22	14/08/2014	National Bat Database of Ireland
	Natterer's bat	2	22/02/2011	National Bat Database of Ireland
	Common pipistrelle	46	14/08/2014	National Bat Database of Ireland

Grid Square	Species	Record Count	Latest Record	Dataset
	Soprano pipistrelle	32	14/08/2014	National Bat Database of Ireland
M46	Brown Long-eared bat	1	18/09/2009	National Bat Database of Ireland
	Daubenton's bat	6	18/09/2009	National Bat Database of Ireland
	Lesser Horseshoe bat	2	22/11/1995	National Bat Database of Ireland
	Natterer's bat	3	18/09/2009	National Bat Database of Ireland
	Common pipistrelle	1	18/09/2009	National Bat Database of Ireland
	Soprano pipistrelle	3	18/09/2009	National Bat Database of Ireland
M54	Soprano pipistrelle	2	22/04/2007	National Bat Database of Ireland
M56	Daubenton's bat	1	24/04/2005	National Bat Database of Ireland
	Soprano pipistrelle	1	24/04/2005	National Bat Database of Ireland
M64	Brown Long-eared bat	1	14/10/2008	National Bat Database of Ireland
M65	Natterer's bat	2	14/09/2009	National Bat Database of Ireland
M66	Brown Long-eared bat	2	05/09/2003	National Bat Database of Ireland
	Common pipistrelle	2	05/09/2003	National Bat Database of Ireland

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 Project.

The Proposed Project site is located outside the current known range for Lesser horseshoe bat, Nathusius' pipistrelle, Whiskered bat and Natterer's bat, and within range for all other species, as mapped in the Article 17 reporting.

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 Project site is outside the known range of this species (NPWS, 2019). Lough Corrib SAC is located within 10 km of the Proposed Project; however, the lesser horseshoe bat roost for which the SAC is designated is located approximately 43km west of the development site, as mapped in Map 11 of the Site-Specific Conservation Objectives. Therefore, the Site is significantly outside the 2.5km key foraging range for this species. There is no potential for effects on the designated roost or the mapped foraging grounds for Lesser horseshoe bat as a result of the Proposed Project.

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 10 km radius of the Site found no sites designated for the conservation of bats.

4.2.4 Landscape Features

A review of mapping and photographs provided insight into the habitats and landscape features present at the Proposed Project site. In summary, the primary land uses within the Site are agricultural grassland and peatland habitat with small areas of conifer plantation and broadleaved woodland also present.

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

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Site. One cave was located within 10km of the Site (Table 4-3).

Table 4-3 UBSS Cave Database Results within 10km

Cave Name	Description	Coordinates	Distance from EIAR Site Boundary
Fairy Mills Cave	10m long rift to collapse beneath the entrance streamway. Former sinkhole for Garrauns turlough, folkloric associations.	E144237 N255020	9.6km

A review of the NBDC bat landscape map provided a habitat suitability index of 20.22 (green). This indicates that the Proposed Project area has low habitat suitability for bat species.

4.2.5 Additional EIA Projects in the Wider Landscape

Table 4-4 provides an overview of the EIA developments within 10km of the Site.

Table 4-4 Wind Farm Developments within 10km of the Proposed Project

Wind Farm Name and Location	No. Turbines	Status
Within 5km of Proposed Project		
Cooloo	9	Proposed
Within 10km of Proposed Project		
N/A		

In addition to wind energy developments, one other EIA planning application was noted within 10km of the Site. This includes the following:

- EIA Portal Ref: 2460013 - For the development of a quarry for the extraction of sand in a phased basis over an area of c. 6.2 ha by an average depth of 3m from existing ground in the townland of Lomaunaghbaun, Co. Galway.

This is also the only prospective extractive industry within 10km of the Site. Details of this development are presented in Table 4-5.

Table 4-5 Extractive industry within 10km of the Site.

File Number	Applicant Name	Development Address	Distance to Site
2460013	Newtown Farming Ltd.	Lomaunaghbaun, Tuam, Co. Galway	1.4 km

4.3 Field Surveys

4.3.1 Bat Habitat Suitability Appraisal

4.3.1.1 Wind Farm Site Infrastructure

Habitats within the Site consist of agricultural land, including agricultural wet grassland and improved agricultural grassland and cutover raised bog characterised predominantly by bare peat and pioneer cutover communities with small areas of conifer plantation and broadleaf woodland, as outlined in Table 4-6. Further details on habitats within the Site can be found in Chapter 6 of the main EIAR.

Table 4-6 Habitats recorded within the Site

Habitat Name	Fossitt Code
Buildings and artificial surfaces	BL3
Spoil and bare ground	ED2
Recolonising bare ground	ED3
Depositing/lowland river	FW2
Drainage ditches	FW4
Improved agricultural grassland	GA1
Improved agricultural grassland / Wet grassland mosaic	GA1/GS4
Wet grassland	GS4
Wet grassland / Scrub mosaic	GS4/WS1
Raised bog	PB1
Cutover bog	PB4
Cutover bog/Poor fen and flush/Transition mire and quaking bog mosaic	PB4/PF2/PF3
Conifer plantation	WD4
Hedgerows	WL1
Treelines	WL2
Wet willow-alder-ash woodland	WN6
Bog woodland	WN7
Scrub	WS1
Immature woodland	WS2

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.**

Cutover bog (PB4), **Wet Grassland (GS4)**, **Raised Bog (PB1)**, **Improved agricultural grassland (GA1)**, **Spoil and bare ground (ED2)**, **Recolonised bare ground (ED3)**, **Buildings and artificial surfaces (BL3)**, **Dry calcareous and neutral grassland (GS1)**, **Dry meadows and grassy verges (GS2) and drainage ditches (FW4)** provide *Low* suitability for commuting and foraging bats due to their limited vegetation and linear habitat features.

Forestry edge habitats created by **Conifer plantation (WD4)** and roadways show potential for foraging and commuting bats. However, these habitats are surrounded by wide expanses of agricultural grassland and peatland habitats and thus, are not very well connected to the surrounding landscape. As such, these habitats were classified as *Moderate* suitability, i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016).

Oak-ash-hazel woodland/ immature woodland (WN2/WS2), **Wet willow-alder-ash woodland (WN6)**, **Bog woodland (WN7)**, **Eroding/ upland rivers (FW1)** and **Depositing/ lowland rivers (FW2)** provide *Moderate - High* commuting and foraging opportunities for local bat populations.

With regard to roosting bats, eight structures were inspected for Potential Roosting Features (PRFs). Further details on the roost assessment are described in the following Section 4.3.2. All structures will be retained and avoided as part of the Proposed Project.

A targeted roost survey of every tree within the site was considered unnecessary due to the presence of predominantly low potential conifer forestry, immature broadleaf woodland and unsuitable scrub. However, an assessment of the various woodland and forestry habitats was undertaken. Overall, conifer trees, immature woodland and scrub within the site did not provide optimal habitat for roosting bats. As such, they were assessed as having *Negligible* roosting suitability with a small number of trees containing *Low* PRF suitability.

Particular focus was given to trees designated for removal to facilitate new access roads, turbine delivery route and other ancillary infrastructure associated with the Proposed Project. Treelines proposed for removal are outlined in Figure 6-1. A ground-level tree assessment was conducted on these trees, and no PRF's were identified. Further details on tree assessment are outlined in Section 4.3.1.3 below.

4.3.1.2 Proposed Grid Connection

It is proposed to construct a 220kV electricity substation within the Proposed Project and Proposed Grid Connection, as shown in Figure 4-1 and Figure 4-3, Chapter 4. A connection between the Proposed Project and the national electricity grid will be necessary to export electricity from the Wind Farm Site. This connection will originate at the proposed onsite substation and will be connected to the national grid via an underground grid connection cable which will connect into the existing 220kV transmission line located approximately 1.7km southeast of the substation.

Habitats along the Proposed Grid Connection footprint include:

- *Buildings and artificial surfaces (BL3)*
- *Improved agricultural grassland (GA1)*
- *Hedgerows (WL1)*
- *Conifer plantation (WD4)*
- *Wet grassland (GS4)*
- *Scrub (WS1)*
- *Depositing/lowland river (FW2)*
- *Cutover bog (PB4)*
- *Drainage ditches (FW4)*

Further details of habitats along the Grid Connection footprint are outlined in Chapter 6, Section 6.1.2.12

The proposed substation is predominantly located within Improved agricultural grassland (GA1) but transitions to Wet agricultural grassland (GS4) in the south as the terrain gently slopes into wetter areas. Small sections of Scrub (WS1) are also present to the northwest with conifer plantation (WD4) present to the south.

There will be some requirement to remove a small section of conifer plantation and scrub to accommodate construction of the substation. However, these habitats offer limited roosting opportunities for bats. Additionally, the removal of parts of the conifer plantation will contribute to an increase in linear landscape. Consequently, no significant loss of commuting, foraging, or roosting habitat is anticipated as result of the proposed substation.

Two wind farm control buildings will be located within the substation compound. The Independent Power Provider (IPP) Control Building will be located at the western edge of the substation compound while the Eirgrid Control Building will be located towards the centre of the substation compound. Further details of the wind farm control buildings are outlined in Chapter 4, Section 4.3.2.2. These

buildings will be located within agricultural grassland habitat. As such no loss of commuting, foraging or roosting habitat is anticipated as a result of the Wind Farm Site control buildings.

With regard to commuting and foraging bats, features along the Proposed Grid Connection underground cabling route, including grassland habitats, scrub, hedgerows, conifer plantation, rivers and drains 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.

With regard to roosting bats, habitat features along the Proposed Grid Connection underground cabling route including grassland habitats, hedgerows, scrub, conifer plantation and cutover bog, 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).

There is 1no. identified water crossing of a mapped EPA watercourse where the Proposed Grid Connection route traverses the Levally Stream. This water crossing is located within the existing road and consists of a concrete box culvert. The crossing was assessed on 26th June 2023 for its suitability to support roosting bats. Following the daytime inspection, no evidence of bat use was identified. The findings are summarized in Table 4-7 below. The Proposed Grid Connection watercourse crossing is further detailed in Section 4.6.10 in Chapter 4 of the EIAR, and in Chapter 6, Section 6.6.1.1.18.

Table 4-7 Bat Roost Suitability of Watercourse Crossing Infrastructure

Grid Ref	Culvert type	Photo	Bat Roost Potential	Extent of Works
M 55909 55262	Concrete box culvert		No evidence of bats found. Solid concrete construction with *Negligible* suitability to support roosting bats.	Horizontal Directional Drilling

4.3.1.3 Turbine Delivery Accommodation Works

To facilitate the delivery of turbine components to the Site, minor accommodating works will be required. This includes temporary road widening at a section of the L6466 local road in the townland of Carrowntryla and additional sections of road at two junctions (between N83 National Road and the L6466 local road & the L6466 and R328 Regional Road) to reduce the turning area required by abnormal loads. Full details of the works are included as part of the traffic impact assessment set out in Chapter 4, Section 4.4.3.1. and Chapter 15, Section 15.1.10 of this EIAR.

These temporary works areas were the subject of an ecological walkover survey as discussed in Chapter 6, Section 6.6.1.19. The works areas are contained within the existing road infrastructure classified as buildings and artificial surfaces and traverse small areas of habitats common and widespread within the surrounding area such as improved agricultural grassland, wet grassland, treelines, and conifer plantation. The bat habitat appraisal of the TDR accommodation areas was

carried out on the 8th of April 2024 and adhered to the protocol set out in BCT *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th edn.) (Collins, 2023).

With regard to commuting and foraging bats, the habitat features present at the works area have been assessed as having *Low-Moderate* suitability i.e. Continuous habitat connected to the wider landscape that could be used by bats for flight-paths such as lines of trees and scrub (Collins, 2023). With regard to roosting bats, the habitat features at the accommodation areas, including hedgerows, buildings and artificial surfaces and grassland habitats were assessed as having *Negligible* suitability, i.e. No habitat features on site likely to be used by any roosting bats at any time of the year (Collins, 2023).

A ground level tree assessment was carried out on trees proposed for removal to facilitate the delivery of turbine components. The treeline at the section along the L6466 local road did not contain features typically used by roosting bats and were universally categorised as *None* suitability i.e. Either no PRFs in the tree or highly unlikely to be any (Collins, 2023) (Plates 4-1 & 4-2).

The treelines at the junction between the L6466 local road and the R328 Regional Road were also largely assessed as *None* (Plate 4-3), with the exception of two trees (IG Ref: M 51641 61401, M 51630 61397) that were assessed as FAR (Further Assessment Required) due to ivy cover that could potentially be obscuring PRFs (Plate 4-4).

Plate 4-1 Immature treeline at section of L6466.

Plate 4-2 Trees assessed as having None roosting suitability.

Plate 4-3 Ash tree at Junction between L6466 and R328 with no visible PRFs. Negligible suitability.

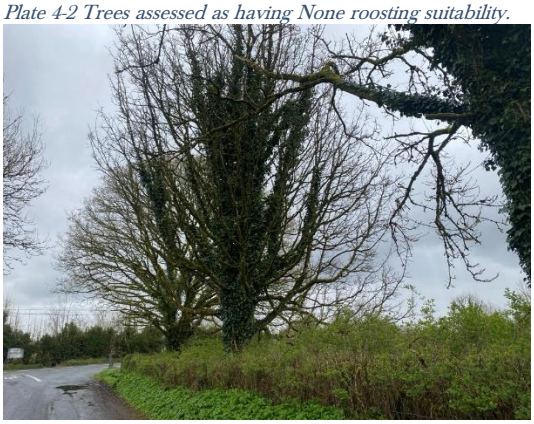


Plate 4-4 Sycamore trees with ivy cover requiring further assessment.

4.3.2 Roost Inspection Surveys

Following the search for roosts in 2022, two potential roosting sites were identified within 281m of the proposed turbine infrastructure (Grid Ref: M 54978 57099; M 54427 56048) Both structures were subject to roost assessments. Details of the daytime inspection surveys are outlined below. Dusk emergence surveys were carried out on both structures, the results of which can be found in Section 4.3.3.

The assessment of the Proposed Project footprint also included an examination of potential tree roost features. The Wind Farm Site is dominated by cutover bog and wet grasslands with small sections of conifer plantation and small areas of broadleaf woodland also present.

Structure 1: Derelict Dwelling

The building resides approximately 225 m from the nearest turbine (T04). It is of concrete block construction, with a tile roof, concrete chimneys, with no interior lining in the attic space (Plates 4-5 to 4-7). Possible bat access points include gaps under lead flashing and cracks where the chimney joins the roof, gaps between tiles and through the permanently open door and windows. There is no separate attic or loft space within the interior of the building. Wooden slats supporting the roof provide potential for roosting bats but the lack of a ceiling within the building allows for significant light penetration into the interior. The building has been classified as having *Low* potential for roosting bats on the basis that it could be used by individual bats opportunistically but does not contain the appropriate conditions to be used on a regular basis by larger numbers of bats (Collins, 2016). No evidence of roosting bats was identified during the interior inspection of the building.

Plate 4-5 Exterior of derelict dwelling

Plate 4-6 interior of derelict dwelling showing open loft space and exposed wooden beams

Plate 4-7 Interior of derelict dwelling - Exposed wooden beams and open loft space.

Structure 2: Stone Ruin

This structure resides approximately 265 m from the nearest turbine location (T09) (Grid Ref: M 54428 56049). The structure is entirely constructed of stone and consists of several upright walls with remnants of fireplaces & chimneys in two of the walls (Plates 4-8 to 4-12). The chimney spaces provide potential bat roosting sites. Ivy cover may provide additional cover for bats roosting in gaps or crevices between stones in the structure. The overall structure was evaluated as having *Low* roosting potential. This was based on the assessment that the structure could be used by individual bats opportunistically but lacks the conditions required to be used on a regular basis or by a large number of bats (Collins, 2016).

Trees within the vicinity of the structure were inspected from the ground and classified as having *Negligible* roosting potential. This assessment stems from the absence of favourable roost features such as ivy cover, broken branches or cracks. No evidence of bats was found in the structure or in the vicinity of the structure during the daytime inspection.

Plate 4-8: Stone ruin

Plate 4-9: Exterior of stone ruin with surrounding woodland habitat

Plate 4-10: Chimney space in stone ruins with potential for roosting bats

Plate 4-11: Chimney space in stone ruins with potential for roosting bats

Tree Surveys

Trees present within the Wind Farm Site are dominated by coniferous species which provide largely suboptimal suitability for roosting potential due to the lack of PRFs available. Small sections of the site are comprised of a mixture of mature and immature ash, willow, alder and hazel.

Overall, the majority of trees were assessed as not providing significant suitable habitat for roosting bats due to their size and lack of PRFs and were thus assessed as having *Negligible – Low* roosting potential. Trees with accessible Potential Roosting Features (PRFs) were subjected to an endoscope inspection and no evidence of roosting bats was found. Plates 4-12 and 4-13 depicts a tree and its subsequent PRF that underwent endoscopic examination in this particular area. This woodland area will be retained and avoided as part of the Proposed Project. During the surveys undertaken at the site, none of the trees proposed for removal to facilitate turbine infrastructure were found to have potential to host roosting bats. Two trees designated for removal to accommodate the turbine delivery route

outlined in Section 4.3.1 were assessed as requiring further assessment due to heavy ivy cover. A confirmatory pre-construction survey will be carried out on these trees to ensure no bats are present prior to removal.

Plate 4-12 Tree containing Rot hole in woodland to the north of T09.

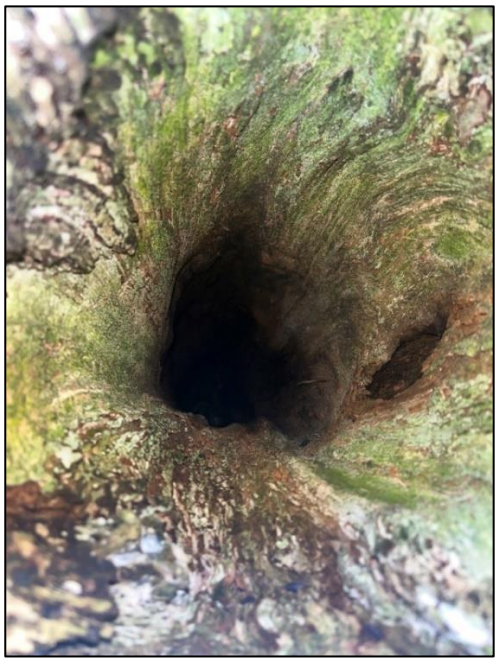


Plate 4-13 Rot hole that underwent endoscopic examination.

The hedgerow adjacent to T04 was also evaluated for roosting potential (Plate 4-14). This was assessed as having *Negligible* suitability for roosting bats.

Plate 4-14 Hedgerow to the south of T04 assessed as having Negligible roosting potential.

4.3.3 Manual Activity Surveys

Manual activity surveys were undertaken in spring and summer and autumn 2022. These included emergence surveys in spring and autumn, followed by walked transects throughout the Wind Farm Site. The survey in summer consisted exclusively of a walked/driven transect.

4.3.3.1 Emergence Surveys

Two structures containing potential suitable bat roost features were identified within the Wind Farm Site, both of which were subjected to a dusk emergence survey.

An emergence survey was carried out on the derelict dwelling (Grid Ref: M 54978 57099) on the evening of the 11th May 2022 with two surveyors strategically positioned to focus on the structure. No bats were observed emerging from the structure during the survey. 1 Common and 10 Soprano pipistrelles were observed commuting and foraging around the dwelling.

The stone ruin (Grid Ref: M 54427 56048) was surveyed on 8th of September 2022 with two surveyors strategically positioned to focus on the structure. Bats were observed commuting and foraging in the area during the emergence survey, but no bats were observed emerging from the stone ruin itself.

4.3.3.2 Transect Surveys

Manual transects were undertaken in spring and summer 2022. Bat activity was recorded in both surveys. A total of 299 bat passes were recorded (Table 4-8). In general, Common pipistrelle (n=149) was recorded most frequently, followed by Soprano pipistrelle (n=139). Leisler's bat (n=10) and *Myotis* spp. (n=1) were less frequent or rare.

Species composition and activity levels varied between surveys. Species composition across all manual surveys is presented in Plate 4-15. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-16 presents results for individual species per survey period.

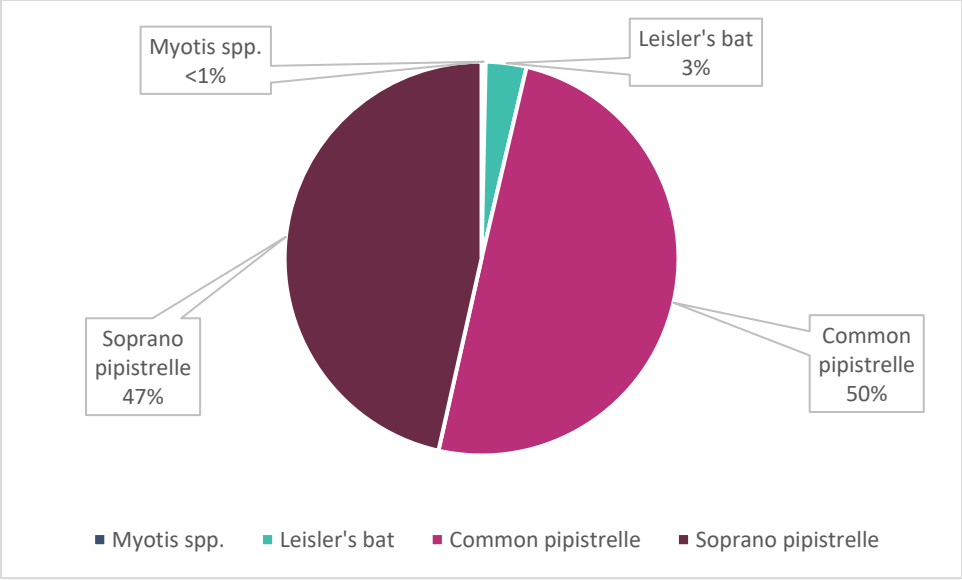


Plate 4-15 Manual Activity Surveys (Total Species Composition)

Table 4-8 Species composition of Manual Transects in 2022

	Spring	Summer	Total
Total Passes per Season	203	96	**299**
Myotis spp.	0	1	1
Leisler's bat	4	6	10

	Spring	Summer	Total
Common pipistrelle	118	31	149
Soprano pipistrelle	81	58	139

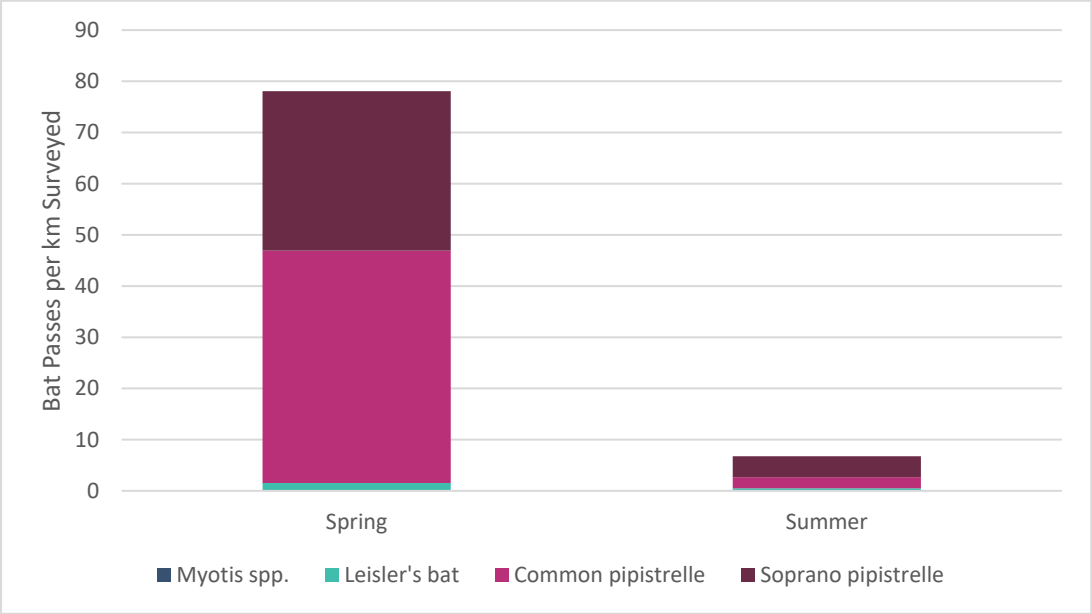
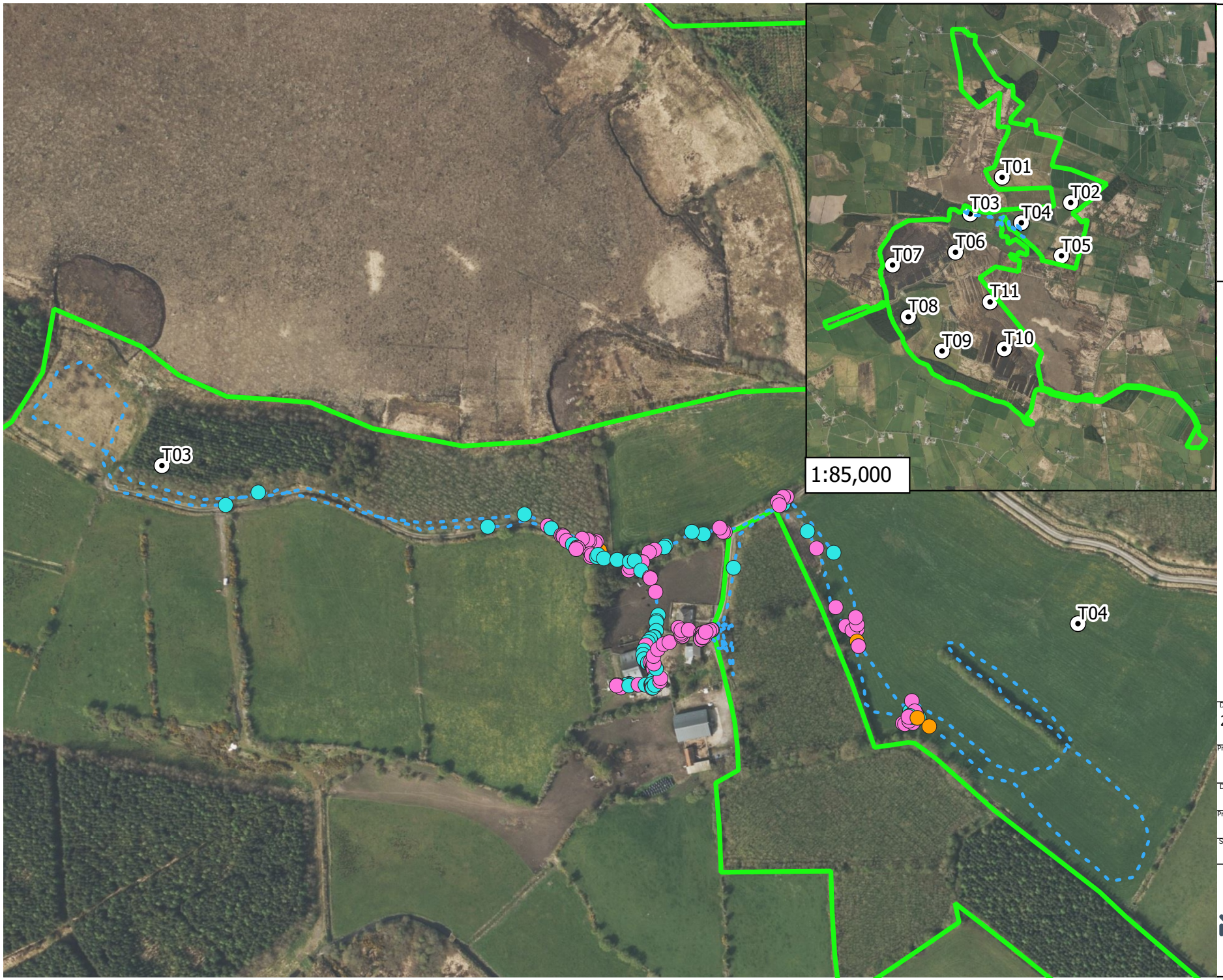


Plate 4-16 2022 Manual Transects - Species Composition Per Survey Period

Figures 4-1 and 4-2 present the spatial distribution of bat activity across surveys. Bat activity was concentrated along treelines, hedgerows, and linear (road/track) habitats. Common pipistrelle occurred most often in spring, while there was a relatively equal distribution between Common and Soprano pipistrelle in summer. Activity was greatly reduced during the summer manual survey.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Spring Transect Route 16th May 2022

Spring Manual Results

- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title
2022 Spring Manual Transect Results

Project Title
Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 4-1
Scale	Date
1:4,750	2024-04-04

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Summer Transect Route 12th July 2022

Summer Manual Results

- Myotis spp.
- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title
2022 Summer Manual Transect Results

Project Title
Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 4-2
Scale	Date
1:38,000	2024-04-04

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4.3.4 Ground-level Static Surveys

In total, 80,651 bat passes were recorded across all deployments. In general, Common pipistrelle (n=45,111) occurred most frequently, followed by Soprano pipistrelle (n=26,741). Leisler's bat (n=6,985), *Myotis* spp. (n=1,188), and brown long-eared bat (n=464) were recorded less frequently. Nathusius' pipistrelle (n=162) were recorded but not abundant. Plate 4-17 presents species composition across all ground-level static detectors.

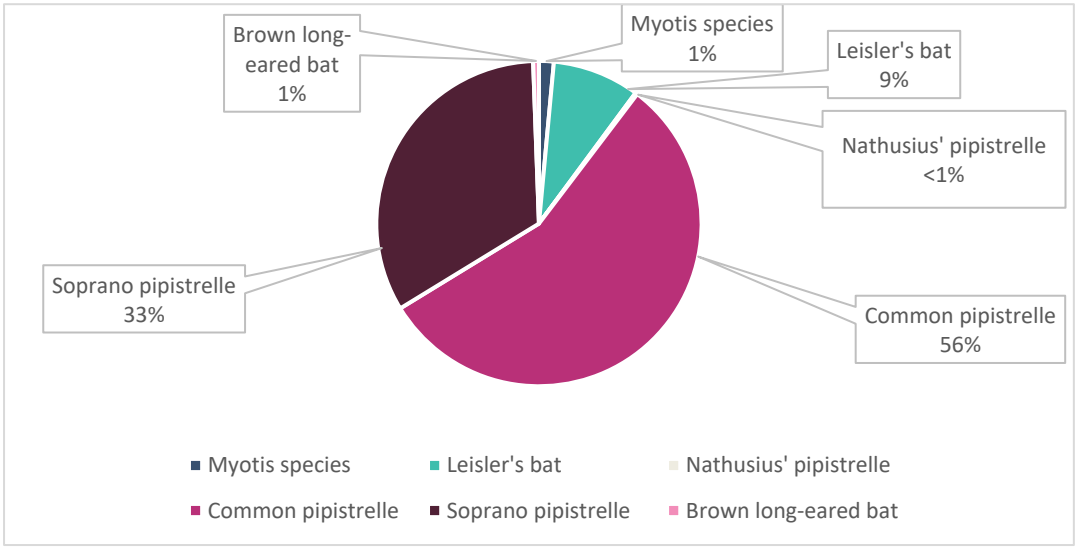

Plate 4-17 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

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 4-18 and Table 4-9 presents these results for each species.

During 2022 bat activity in general was higher in spring and summer and lower in autumn. Across all seasons, Common pipistrelle had the highest activity followed by Soprano pipistrelle. Leisler's bat had the next highest pass rate overall, with noticeably higher numbers in spring (n=5,508), which dropped significantly by autumn (n=416).

Myotis spp. were recorded throughout 2022 but were most frequently recorded in the autumn survey period. Brown long-eared bats were recorded on site but were not abundant. Activity levels for brown long-eared bats was similar in spring and autumn but decreased in summer. Comparatively few Nathusius' pipistrelle calls were recorded throughout the season, with a single call recorded during the summer deployment period and all remaining calls recorded in autumn.

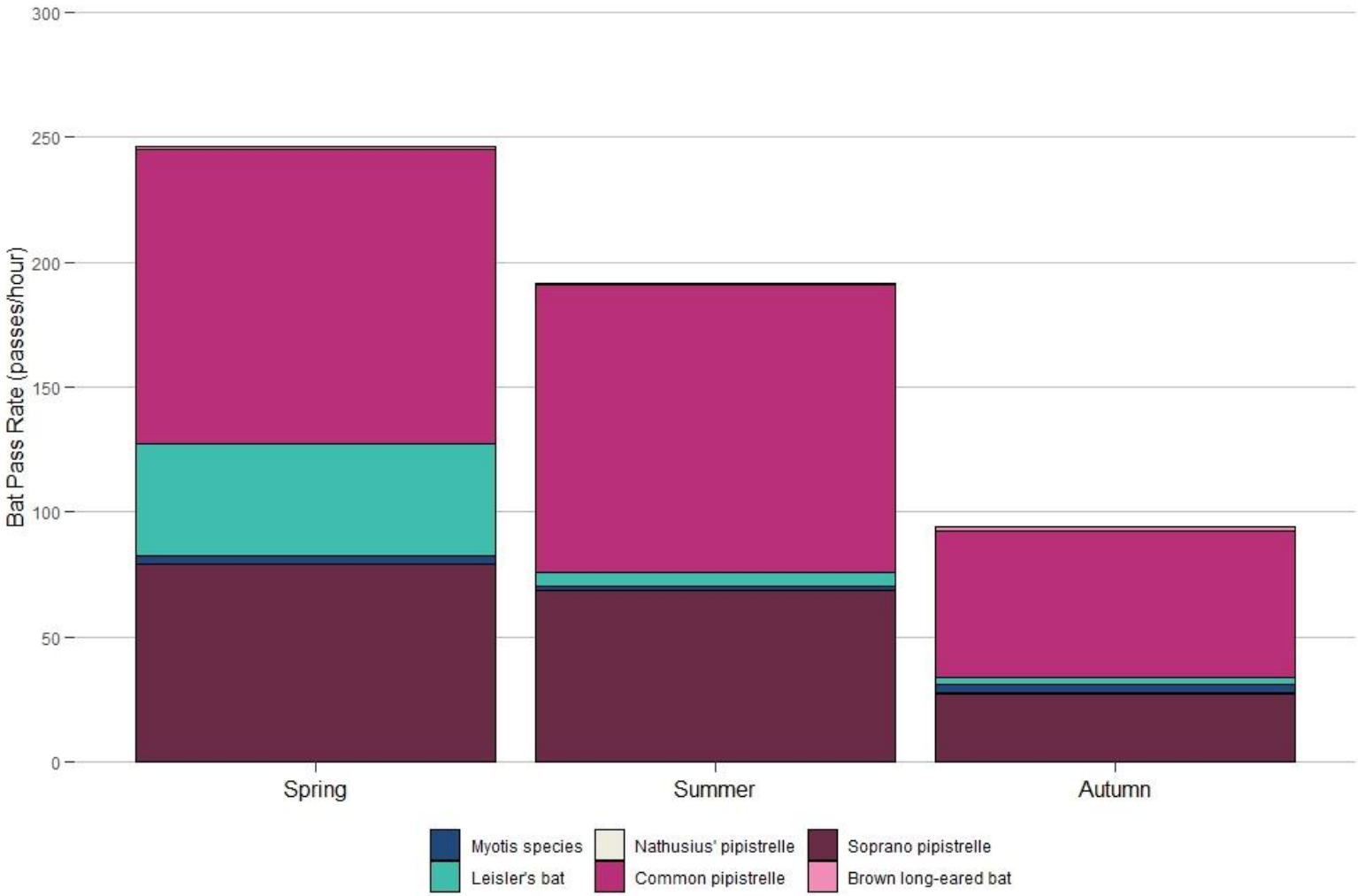

Plate 4-18 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes per Hour, All Nights)

Table 4-9 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights

	2022		
	Spring	Summer	Autumn
Total survey hours	**131.1**	**190.8**	**174.2**
Myotis spp.	2.7	1.3	3.3
Leisler's bat	42.0	5.6	2.4
Nathusius' pipistrelle	0.0	0.3	0.6
Common pipistrelle	110.4	110.6	54.8
Soprano pipistrelle	74.4	65.9	25.4
Brown long-eared bat	0.9	0.4	1.5

In 2022, bat activity demonstrated a distinct seasonal pattern, with a peak observed in spring, followed by a slight decrease in summer and a further decline in autumn (Plate 4-19). Detectors D3, D4, D5, D6, D7 and D8 recorded comparatively higher activity levels in spring than the remaining detectors. Although activity was reduced in summer and autumn, Detectors D3, D5 and D6 were consistently active across all survey periods. These detectors were situated in close proximity to linear features such as hedgerows, treelines and at the edge of forestry habitat. Detector D4 was located adjacent to immature oak-ash woodland and recorded higher activity in the spring survey period compared to summer and autumn where it was significantly lower.

Detectors D1, D2, D9, D10 and D11 recorded consistently low activity across all seasons. These detectors were located in open, unsheltered habitat such as agricultural grasslands and cutover bog.

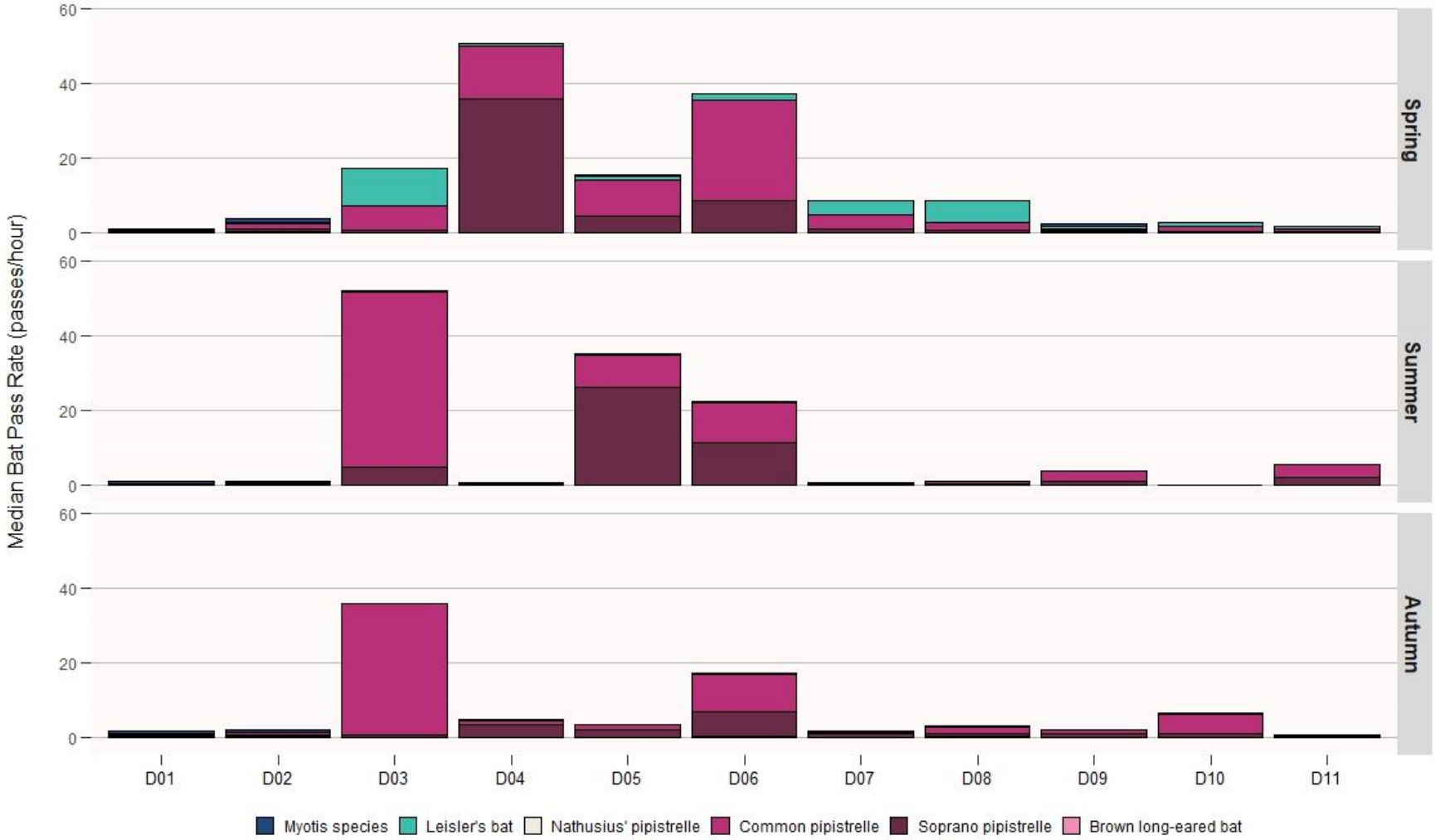

Plate 4-19 Static Detector Surveys: Median Bat Pass Rate (bpph) Including Absences, Per Location Per Survey Period.

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the 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 4-20 illustrates the Median Nightly Pass Rate per species per deployment in 2022. Zero data, when a species was not detected on a night, was also included. Plate 4-21 illustrates the median Nightly Pass Rate per species per deployment.

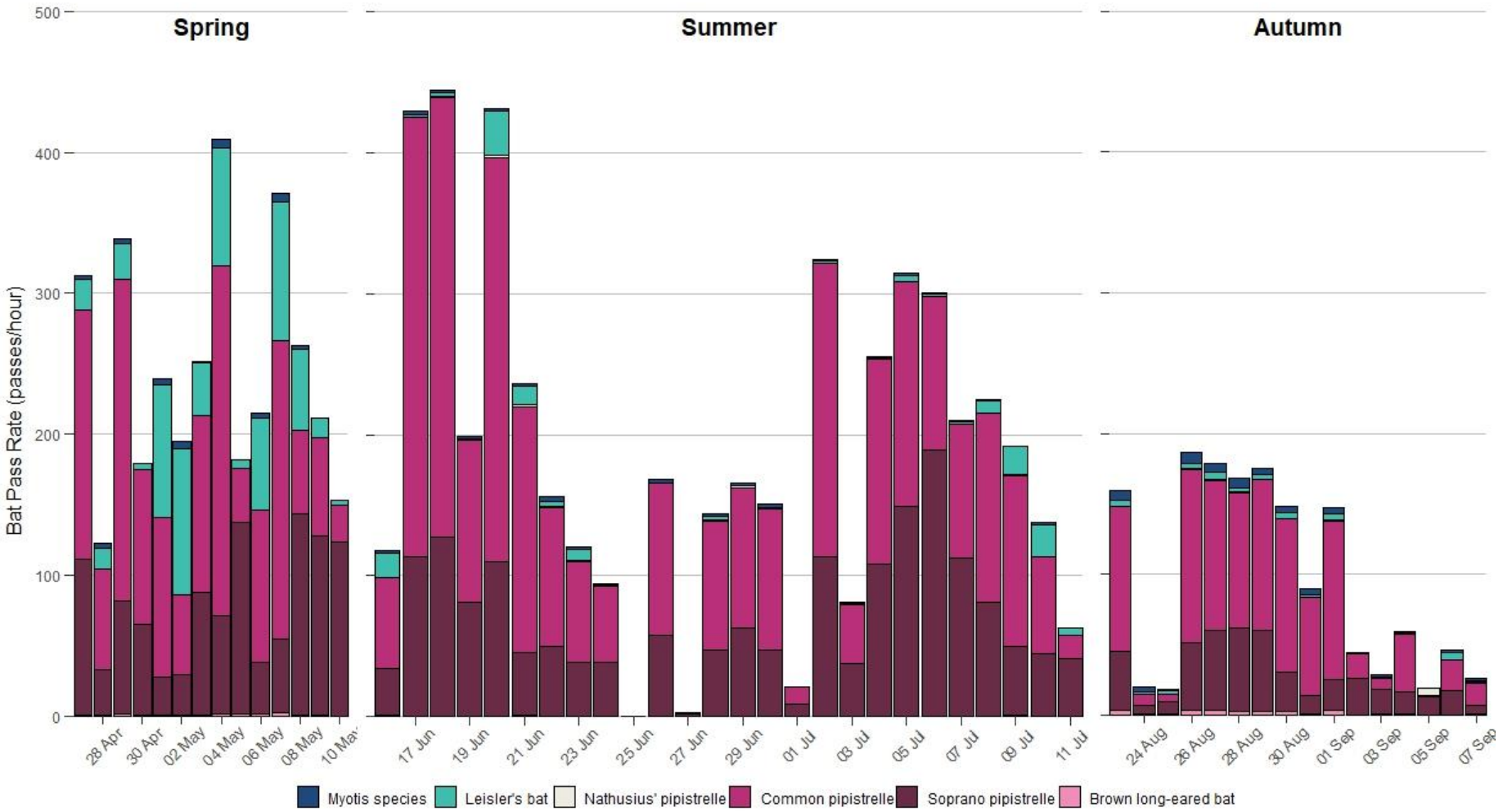

Plate 4-20 Static Detector Surveys: Median Nightly Pass Rate (bpph) Including Absences, Per Location Per Survey Period

Plate 4-21 Static Detector Surveys: Spring, Summer & Autumn Median Bat Pass Rate (bpph) Including Absences, Per Night

4.3.5 Assessment of Bat Activity Levels

4.3.5.1 Adapted Site-specific Ranges

Low, Medium, and High activity levels were assigned to median and maximum pass rates (bpph) identified during Spring, Summer and Autumn at the detectors deployed across the Wind Farm Site as adapted from Mathews *et al.* (2016). Table 4-10 show the results of the site-level assessment. Where no median activity at a detector is reported, no data was recorded for that species throughout the deployment.

Leisler's bat Median Bat Activity was recorded as ***Low*** in summer and autumn at all detectors. In spring ***Moderate*** Median Activity was recorded at D03, D07 and D08. Max Activity peaked at D08 in spring 2022.

Common pipistrelle recorded ***High*** Median Activity at D06 in spring, and at D03 in summer and autumn. ***Moderate*** Median Activity was recorded in spring at D03, D04 and D05, in summer at D05 and D06 and in autumn at D07 and D11. Maximum Bat Activity for the species exceed 100 bpph on three occasions, at D03 in summer, and at D06 in spring and summer, with Maximum Activity peaking at D03 during the summer period.

Soprano pipistrelle recorded ***High*** Median Activity at D04 in spring and at D05 in summer. ***Moderate*** Median Activity was recorded at D06 in spring, summer and autumn. Maximum Bat Activity surpassed 100 (bpph) on two occasions during 2022. The first instance occurred at D04 in spring, while the peak Maximum Activity was documented at D05 in summer.

Myotis spp. Median Activity was generally ***Low*** across the site with the exception of D02 in spring which had ***Moderate*** Activity. ***High*** Maximum Activity was recorded at D02 and D09 in spring and at D01 in Autumn, all of which had comparable Peak Activity (3.03 - 3.28 bpph).

Nathusius' pipistrelle recorded relatively ***Low*** Median Activity in comparison to other species. ***High*** Maximum Activity for Nathusius' pipistrelle occurred at D03 in summer, and at D01 and D10 in autumn.

Brown long-eared Median Bat Activity was generally Low for 2022 with the exception of D02 in spring and autumn which recorded ***Moderate*** Median Activity. Peak Max Activity also occurred at D02 during the spring period.

Table 4-10 Static Detector Surveys: Detector-level Passes Analysis. Activity Low, Moderate, High

2022 Season	Detector	*Myotis spp.*		Leisler's bat		Nathusius' Pipistrelle		Common Pipistrelle		Soprano Pipistrelle		Brown long-eared bat	
		Median Bat Activity	Max Bat Activity	Median Bat Activity	Max Bat Activity	Median Bat Activity	Max Bat Activity	Median Bat Activity	Max Bat Activity	Median Bat Activity	Max Bat Activity	Median Bat Activity	Max Bat Activity
Spring	*D01*	0.05	0.69	0.29	7.6			0.35	1.77	0.18	3.73		
	D02	0.85	3.03	0.34	1.71			1.59	3.16	0.57	2.21	0.33	1.62
	D03	0	0.11	10.15	29.14			6.35	75.93	0.74	20.92	0	0.11
	D04	0	0.67	0.81	4.15			14.04	76.47	35.92	133.36	0	0.12
	D05	0.45	0.76	1.17	3.21			9.53	24.63	4.42	14.02	0.06	0.7
	D06	0	0.23	1.81	4.01			26.78	114.43	8.69	28.54	0	0.22
	D07	0	0.11	3.73	25.81			3.7	48.57	1.13	12.71	0	0.11
	D08	0	0.22	5.95	83.11			2.2	10.28	0.57	2.1	0	0.23
	D09	0.55	3.28	0.57	2.26			0.62	2.98	0.34	1.33	0.17	0.94
	D10	0	0.33	0.86	3.98			1.44	34.48	0.41	5.31	0	0.12
	D11	0	0.47	0.79	1.64			0.74	5.38	0.28	1.52	0	0.24
Summer	*D01*	0.57	1.71	0	2.47			0.14	2.35	0.14	0.84	0	0.14
	D02	0.28	0.86	0.14	1.24			0.29	1.79	0.14	1.51	0	0.28
	D03	0	0.42	0.14	2.48	0	1.15	47.15	146.9	4.67	26.75	0	0.14
	D04	0	0.14	0	4.16	0	0.14	0.56	8.46	0.21	14.2	0	0.14
	D05	0.14	1.58	0.14	0.96	0	0.43	8.83	80.74	26.08	157.56	0	0.72
	D06	0	0.27	0.41	7.97	0	0.43	10.64	122.18	11.43	39.63	0	0.28
	D07	0	0	0.49	24.03	0	0.43	0.14	2.35	0.14	1.24	0	0.14
	D08	0	0.29	0.14	3.02	0	0.14	0.71	8.48	0.28	1.1	0	0.41
	D09	0	0.29	0	0.69	0	0.14	2.73	36.7	0.97	16.63	0	0.14
	D10												
	D11	0	0.14	0.14	1.92	0	0.14	3.55	52.52	1.9	11.22	0	0.72
Autumn	*D01*	0.59	3.03	0.4	4.13	0	4.53	0.39	1.68	0.19	1.71	0.1	0.3
	D02	0.63	1.65	0.2	0.7	0	0.1	0.48	1.4	0.42	1.4	0.29	0.69
	D03	0	0.2	0	0.51	0	0.39	35.1	66.63	0.71	1.91	0	0.29
	D04	0.35	1.13	0.25	0.9	0	0.1	1.06	8.2	3.16	9.17	0.1	0.6
	D05	0	0.48	0	0.82			1.32	24.44	2	9.95	0	0.38
	D06	0.24	1.4	0.19	0.7	0	0.1	9.92	43.25	6.81	34.74	0.19	0.7
	D07	0.1	0.3	0.3	1.47	0	0.2	0.43	4.92	0.93	7.37	0.05	0.4
	D08	0.4	1.17	0.1	0.78			1.72	4.61	0.69	1.57	0.15	0.4
	D09	0.1	0.62	0.2	0.78			0.78	15.03	1.01	21.39	0.1	0.8
	D10	0.1	0.81	0.14	0.41	0	1.1	5.1	12.09	0.94	4.58	0.05	0.52
	D11	0	0.5	0.15	0.62	0	0.51	0.24	3.23	0.15	4.95	0	0.72

4.4 Overall Findings

A comprehensive assessment of bat activity was conducted at the Wind Farm Site throughout 2022. During the Spring season, activity peaked at D03, D04, D06 and D08. Activity in Summer was highest at D03, D05 and D06 while in Autumn activity was highest at D03 and D06 but was significantly lower than summer and spring.

Activity at D03 was highest in summer, with less activity in autumn and the least activity recorded in autumn. Activity in autumn and summer was dominated by common pipistrelles with soprano pipistrelles being recorded less frequently. Activity in spring was also dominated by common pipistrelles, however activity from soprano pipistrelles was significantly higher. A relatively high proportion of Leisler's bat activity was also recorded in spring at D03. D03 is situated in an area of mature conifer plantation (WD4) with a firebreak/ watercourse within a 50m radius of the detector location. The high level of activity may correspond with the presence of the firebreak and stream acting as a linear habitat feature, facilitating the commuting and foraging of bats in the locality. D03 was not accessible during the manual transect survey due to its position in dense conifer plantation.

Activity at D04 was highest in Spring where the dominant species recorded is the Soprano pipistrelle. Common pipistrelles were also recorded at D04 and contributed to high levels of activity at this location. Leisler's bat was also recorded but was less frequent. Activity at D04 was significantly less in summer and autumn than in spring. D04 was situated at the edge of an agricultural field (**GA1**) at the boundary of immature mixed broadleaf woodland (**WS2**). Following an emergence survey in Spring, a manual transect survey was conducted in the vicinity of D04. During the survey it was determined that the woodland edge at D04 was being used by a small number of bats for commuting and foraging purposes who made several passes at the detector location, contributing to high activity levels. It is unclear what contributed to low activity levels in summer and autumn.

Activity at D05 was highest in summer, with less activity recorded in spring and significantly less activity recorded in autumn. Activity in summer was dominated by soprano pipistrelle, followed by common pipistrelle and other less frequently recorded species. Autumn activity was significantly less, comprised of activity from common and soprano pipistrelles. D05 is located at a hedgerow (WL1) at the edge of a field comprising of improved agricultural grassland (GA1) and wet grassland (GS4). High activity can be attributed to the hedgerow which acts as a linear feature, facilitating commuting and foraging bats.

Activity at D06 peaked in spring, with activity in summer and autumn significantly reduced. Spring activity was dominated by common pipistrelle, followed by soprano pipistrelle and Leisler's bat respectively. During the summer and autumn, the majority of activity consisted of an equal distribution of common and soprano pipistrelle. D06 is situated on the periphery of cutover bog habitat, adjacent to a conifer plantation with the presence of a bog drain. These environmental features serve as conducive elements for bats, providing suitable commuting and foraging habitats.

4.6 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, as amended. No bat roosts were identified within the footprint of the Proposed Project. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the Site are utilized by a regularly occurring bat population of Local Importance.

No roosting bats were identified during the surveys and no roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the Wind Farm Site. It is suspected that some PRFs within the Wind Farm Site may provide potential roosting habitat for small numbers of roosting bats. The Wind Farm Site was not found to host 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 Project 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 Project Site (Adapted from NatureScot 2021)

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	No roosts were identified within the Site. The habitats within the site provide potential suitable foraging habitat for bats and is connected to the wider landscape by blocks of woodland, rivers and mature hedgerows. 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.	Moderate
Project Size	Following the criteria set out in NatureScot, 2021 the project is of Medium scale as it consists of 11 no. turbines. Whilst those turbines are over 100m in height, it is well below the number of turbines that would constitute a Large development (NatureScot, 2021). Some other wind energy developments within 5km. Comprising turbines >100 m in height.	Medium
Site Risk Assessment (from criteria in Plate 3.3)		**Medium Site Risk (3)**

The Site is located within an area of cutover bog and agricultural grassland with areas of conifer plantation and broadleaf woodland also present. As per table 3a of the NatureScot Guidance (2021), it has a Moderate habitat risk score. As per Table 3a, the Proposed Project is of Medium project size (11 turbines) with other wind energy developments within 5km.

The cross tabulation of a *Medium* project on a *Moderate* risk site results in an overall risk score of **Medium** (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.
- Nathusius' 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. Medium). The assessment was carried out for both median and maximum 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* spp.,
- 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 3-2). Leisler's bats were recorded during activity surveys across the Wind Farm 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 in 2022 was found to be ***Low*** at typical activity levels in spring summer and autumn. Peak activity levels were ***High*** in spring, ***Medium*** in summer and ***Low*** autumn for Leisler's bat (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 Wind Farm Site, which is a mix of agricultural grassland and cutover bog with areas of conifer plantation and broadleaf woodland also present, with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is a ***Low*** collision risk level assigned to the local population of Leisler's bat.

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	Medium (3)	Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Summer		Low (1)	Typical Risk is Low (3)	Moderate (3)	Peak Risk is Medium (9)
Autumn		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

5.1.2.2 Soprano pipistrelle

This Site is within the current range of the soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelles are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-2). Soprano pipistrelles were recorded during activity surveys across the Wind Farm 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 in 2022 was found to be ***Low*** at typical activity levels in spring, summer and autumn. Peak activity levels were ***High*** in spring and summer and ***Medium*** in autumn (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 Wind Farm Site, which is a mix of agricultural grassland and cutover bog with areas of conifer plantation and broadleaf woodland also present, with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is ***Low*** collision risk level assigned to the local population of Soprano pipistrelle.

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	Medium (3)	Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Summer		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn		Low (1)	Typical Risk is Low (3)	Moderate (3)	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 are classed as a common species of a medium population risk which have a high collision risk (Plate 3-2). Common pipistrelle were 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 Common pipistrelle in 2022 was found to be ***Moderate*** at typical activity levels in spring and summer and ***Low*** in autumn. Peak activity levels were ***High*** across all three seasons for common pipistrelle (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 Wind Farm Site, which is a mix of agricultural grassland and cutover bog with areas of conifer plantation and broadleaf woodland also present, 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.

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	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Autumn		Low (1)	Typical Risk is Low (1)	High (5)	Peak Risk is High (15)

5.1.2.4 Nathusius' pipistrelle

This Site is outside the current range of the nathusius' pipistrelle bat (NPWS, 2019). Nathusius' pipistrelle bats are classed as a rarer species of a high population risk which have a high collision risk (Plate 3-4). Nathusius' pipistrelle bats were recorded during activity surveys across the Wind Farm Site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Nathusius' pipistrelle bats was found to be ***Low*** in spring, summer and autumn at typical activity levels. Peak activity levels were ***Low*** in Spring, ***Medium*** in summer and ***High*** in autumn. (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 Wind Farm Site, which is cutover bog, agricultural grassland with areas of conifer plantation and broadleaf woodland also present, with no bat activity recorded during the walked transects undertaken.

Thus, there is ***Low*** collision risk level assigned to the local population of nathusius' pipistrelle.

Table 5-5 Nathusius 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	Medium (3)	Nil (0)	Typical Risk is Low (0)	Nil (0)	Peak Risk is Low (0)
Summer		Low (1)	Typical Risk is Low (3)	Moderate (3)	Peak Risk is Medium (9)
Autumn		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)

5.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species was typically ***Low***, with the exception of common pipistrelle which had a ***Low – Medium*** collision risk. Overall bat activity levels were typical of the nature of the Wind Farm Site, which is predominantly cutover bog and agricultural grassland with areas of conifer plantation and broadleaf woodland also present with young to mature forestry coverage, with generally low levels of bat activity recorded during the static detector surveys as well as the walked and driven transects undertaken.

However, following per detector R-analysis, Detectors D03, D04, D05 and D06 recorded *High* Median Activity levels in spring, summer or autumn (Table 5-6).

While *High* median activity was recorded at four locations, it is noted that habitats at these locations will change considerably during the construction phase of the Proposed Project with the required

implementation of the bat buffers. A monitoring and mitigation strategy has been devised for the Proposed Project, in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance and based on the site-specific data. After year 1 monitoring, 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.

Table 5-6 Detector Location Recording High Median Activity in 2023 for High-risk Bat Species

Detector ID	Turbine	Species	High Median Activity Survey Period
2022			
D03	T03	Common pipistrelle	Summer 2022
D03	T03	Common pipistrelle	Autumn 2022
D04	T04	Soprano pipistrelle	Spring 2022
D05	T05	Soprano pipistrelle	Summer 2022
D06	T06	Common pipistrelle	Spring 2022

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 Project is predominantly located within agricultural grassland, cutover bog, conifer plantation and small sections of broadleaved woodland. Cutover bog and open grassland areas generally provide relatively poor-quality commuting and foraging habitat for bats.

However, a total of 2.14 ha of broadleaf woodland and 6.3 ha of conifer plantation will be permanently felled within and around the footprint of the Proposed Project. The felling of trees is required 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.

Chapter 4, Figure 4-15 shows the extent of the areas to be felled as part of the Proposed Project. It should be noted that conifer forestry on the site of the Proposed Project 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 conifer forestry will have a positive effect by opening up large areas of formerly closed canopy coniferous 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.

Approximately 1,155 m of hedgerow/treeline habitat loss is required to facilitate new access roads, turbine delivery route and other ancillary works associated with the Proposed Project. Any areas of hedgerow/treeline loss, to accommodate the delivery of turbines, will be replaced within the Site with species indigenous to the area. Approximately 1,875 linear metres of hedgerow and treeline habitat is proposed to be created within the Site, which will result in a net gain in linear habitat features within the Wind Farm Site. Hedgerow/treeline removal will result in a short-term effect, with connectivity re-established within approximately 2-5 years. Further details on tree removal required within and around development footprint is detailed in Chapter 6 of this EIAR. A Biodiversity Management and Enhancement Plan (BMEP) has been developed to mitigate the loss of bat foraging/commuting habitat associated with the Proposed Project and is presented in Chapter 6, Appendix 6-6. Further details are outlined in Section 6.1.5 below.

The replanting design outlined in the BMEP will ensure habitat connectivity is maintained and enhanced around the Site. While no significant effects are anticipated as a result of the loss of habitats, linear features and woodland areas will be fully re-instated or enhanced by replanting of the hedgerows, treelines and woodland habitats.

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. The proposed replanting area is shown in Appendix 6-6, Biodiversity Management and Enhancement Plan, Figure 2.

Given the proposed replanting plan, 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), including the proposed retention and enhancement of these habitats, no significant effects with regard to loss of commuting and foraging habitat are anticipated.

5.3 Loss of, or Damage to Roosts

The Wind Farm Site is predominantly located within cutover bog, agricultural grassland with areas of conifer plantation and broadleaf woodland. The trees within the plantation consist of mature and semi mature conifer which do not provide potential roosting habitat of significance for bats.

Two structures were identified within the Wind Farm Site and were subjected to dusk activity surveys. No bats were observed emerging from either structure during the dusk surveys. These structures and the surrounding linear habitat features will be retained and avoided as part of the Proposed Project; thus, no loss of roosting habitat is anticipated.

It is proposed to connect the Proposed Project to the national electricity grid via a 220kV underground electrical cable connection to the proposed 2 no. new interface towers to facilitate the connection to the existing Cashla – Flagford 220kV overhead line located in the townland of Laughil. The underground electrical cabling route is approximately 2.8km in length of which 1.4km is located within the public road network (L6501 local road). There will be no requirement to fell trees/forestry as part of the underground cable route. Therefore, there will be no loss of tree roosting habitat associated with these works.

A single watercourse crossing was identified along the Proposed Grid Connection underground cabling route. It was assessed as having *Negligible* suitability to host roosting bats i.e. Negligible habitat features on site likely to be used by roosting bats. Horizontal Directional Drilling (HDD) is proposed for the watercourse crossing and given the nature of the works associated with the crossing, no loss of roosting habitat associated with the Proposed Grid Connection is anticipated.

The TDR accommodation works areas are contained within the existing road infrastructure and traverse small areas of habitats common and widespread within the surrounding area such as *grassland habitats, immature woodland* and *conifer plantation.* There may be a requirement to complete minor hedge or tree trimming/removal to transport the turbine components. However, most of the trees designated for removal as part of the TDR accommodation works were assessed as having no potential to host roosting bats: Either no PRFs in the tree or highly unlikely to be any (Collins, 2023). Two trees outlined in Section 4.3.1.3 were marked as requiring further assessment due to the presence of ivy cover that could potentially be obscuring view of PRFs. A confirmatory pre-construction tree survey will be conducted on these trees prior to removal to ensure no bats are present. Therefore, no loss of roosting habitat associated with the TDR accommodation works is anticipated.

No potential for significant effect regarding the loss or disturbance of roosting habitat within the Wind Farm Site, Proposed Grid Connection or along the Turbine Delivery Route is anticipated.

5.4 Displacement of Individuals or Populations

The Proposed Project is predominantly located within agricultural grassland and cutover raised bog with small areas of conifer plantation and broadleaf woodland. 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. BEST PRACTICE AND MITIGATION MEASURES

This section describes the best practice and site-specific mitigation measures that are in place to avoid and reduce the potential for significant 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, directional lighting will be used to prevent overspill on to woodland/forestry edges. Exterior lighting, during construction and post construction, shall be designed to minimize light spillage, thus reducing the effect on areas outside the Site, 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.

The proposed lighting around the site shall be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/23 Bats and artificial lighting at night (ILP, 2023).

In addition, the applicant commits to the use of lights during construction, operation and decommissioning (such that they are necessary) in line with the following guidance that is provided in the Dark Sky Ireland Lighting Recommendations:

- Every light needs to be justifiable,
- Limit the use of light to when it is needed,
- Direct the light to where it is needed,
- Reduce the light intensity to the minimum needed,
- Use light spectra adapted to the environment,
- When using white light, use sources with a “warm” colour temperature (less than 3000K).

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, and whilst this lighting is unlikely to result in any significant increase in collision risk, a comprehensive and site-specific mitigation and monitoring programme, described in section 6.1, is proposed for a period of at least 3 years post construction. No significant effects of lighting on bats are anticipated; however, if in the course of this monitoring, any potential for significant effects on bats is identified, specific measures will be implemented to avoid any such impacts.

6.1.3 Bat Buffers

In accordance with NatureScot and NIEA Guidance, a minimum 50m buffer 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). Eurobats No. 6 guidance and NIEA recommends increased buffers of 100m and 200m around woodland/forestry areas; however, there is no scientific evidence to support these increased buffer distances in the UK. Due to the nature of the site, the 50m buffer was considered appropriate.

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 conifer forestry felling calculation outlined in Chapter 4, Section 4.3.1.7 of the EIAR. Figure 4-11, Chapter 4 shows the extent of the conifer forestry area to be felled as part of the bat buffer requirement. Conifer forestry felling will be required for Turbine 3 and Turbine 8 only. The bat buffer formula has also been used to identify the extent of vegetation removal around all other proposed turbines (Figure 6-1). These vegetation-free areas will be maintained during the operational life of the Proposed Project.

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)

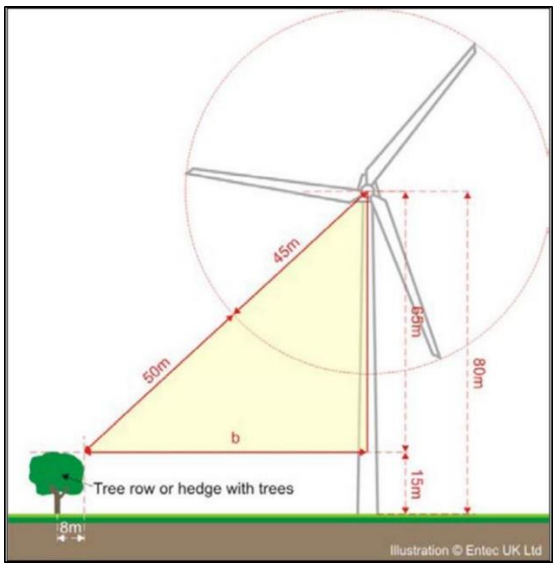

Plate 6-1 Calculate bat buffer distances (Natural England, 2014).

6.1.4 Confirmatory Pre-construction Tree Survey

While no trees presenting potential roosting features of significance were identified within the bat felling buffers, two trees were identified as requiring further assessment (as per Collins, 2023) along the Turbine Delivery Route Accommodation Areas (IG Ref: M 51641 61401, M 51630 61397). The areas of treeline and hedgerow subject to removal are shown in Figure 6-1. Bats are mobile species that can move regularly between tree roosts. As such, the following procedures are proposed prior to felling trees identified as requiring further assessment:

- A pre-commencement survey will be carried out by a suitably qualified ecologist on trees requiring further assessment proposed for felling.
- If a bat roost is identified within any of the trees to be removed/pruned, a bat derogation licence will be obtained from the NPWS, prior to removal and the removal activity will be supervised by a qualified ecologist.
- Tree-felling of mature deciduous trees will be carried out according to the following standard mitigating procedures:
    - Trees requiring further assessment proposed for felling will be checked for bats by a suitably qualified arborist/ecologist at the time of felling.
    - Trees will be nudged two or three times prior to limb removal, with a pause of 30 seconds in between. This practise aims to allow any bats that might be present to wake and relocate, minimizing the risk of harm during the removal process (National Roads Authority, 2006).
    - Rigged felling shall be used to lower the limbs and trunk carefully to ground level and cavities searched by a qualified ecologist.
    - Felled trees will be left in-situ for a minimum of 24 hours prior to sawing or mulching, to allow any bats present to escape (National Roads Authority, 2006).

While no trees designated for felling contained observable PRFs, a replanting plan is proposed for the loss of commuting/foraging habitat. Details of the proposed habitat replacement are outlined in Section 6.1.5 below and in Appendix 6-6 in Chapter 6 of this EIAR.

6.1.5 Proposed Habitat Replacement - BMEP

In the 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 Project is predominantly located within cutover bog, agricultural grasslands and conifer plantation with small areas of broadleaf woodland. Linear landscape features such as hedgerows, trees and drains will be largely retained or avoided.

Some linear vegetation, woodland, and scrub within the required turbine bat buffers and to facilitate the proposed wind farm infrastructure will be removed (Chapter 6, Appendix 6-6, Figure 1-1). A replanting design has been curated to provide alternative commuting corridors within the Site. To comply with NatureScot recommendations in relation to habitat buffering to avoid bat fatalities, a total of 1,155 m of linear vegetation habitat and 2.14 ha of broadleaf woodland will be lost as a result of the Proposed Project, including the recommended buffers applied for bats. Further details are outlined in Chapter 6, Appendix 6-6 BMEP.

Large areas of linear landscape features in the wider area will be retained, and the loss of gappy hedgerow/treelines is not anticipated to have a significant effect on local bat populations. However, it is proposed to plant new linear features and bolster existing habitat features to offset any potential loss in linear habitat features and to provide additional new opportunities for commuting and foraging bats. A total of approximately 1,875 m of linear hedgerow and treeline habitat and approximately 2.89 ha of native woodland is proposed to be created within the Site.

The locations in which the proposed linear habitat planting will take place will be subject to final landowner agreement. However, indicative areas for planting are proposed in Appendix 6-6 BMEP.

Overall, the proposed replanting will result in a net gain of approximately 720 m in the linear landscape features and 0.75 ha of native woodland within the Site. Planting will be of semi-mature specimens to ensure connectivity gains are immediate and will be indigenous to the local area. Further details with regard to species, planting location, and management is contained within the BMEP.

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Linear Habitat Loss

- Hedgerows
- Treelines
- Bat Buffer
- Proposed Hardstands
- Proposed Roads
- Existing Roads to be Upgraded

N

Drawing Title

Linear Habitat Loss

Project Title

Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 6-1
Scale	Date
1:38,000	2024-04-04

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6.1.6 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 Monitoring Plan

Overall risk levels for high collision risk bat species were typically *Low* or *Medium.* This risk level is reflective of the nature of the sites predominately grassland and peatland habitats with areas of conifer plantation and broadleaf woodland also present. Furthermore, the walked transects revealed consistently low levels of bat activity in the area.

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 Project, 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 Project 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 shall 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 needs to 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 can be refined such that turbine down-time can be 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 shall include:

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

Carcass searches

Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with NatureScot/NIEA Guidance. This shall 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 should 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 shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall 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 shall 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 shall 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 Proposed 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 Project was considered in combination with other projects and/or plans (existing approved and pending 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 projects and/or plans considered are detailed in Section 2.8 in Chapter 2 of the EIAR.

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Project will not result in any residual adverse effects on bats, when considered on its own. There is one other wind farm site located within 5km of the Site. No other permitted or proposed wind farm sites are located within 10km of the Proposed Project. There is one further EIA projects that is the only extractive industry within 10km of the Site. No potential for the Proposed Project 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 Project. 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 Project site. The surveys and assessment provided in this report are in accordance with NatureScot guidance. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Project will not result in any significant effects on bats.

Provided that the Proposed Project is constructed and operated in accordance with the design, best practice and mitigation that is described within this report, significant effects on bats are not anticipated at any geographic scale.

8. BIBLIOGRAPHY

Abbott, I., Aughney, T., Langton, S. and Roche, N. (2015) BATLAS 2020 Pilot Project Report. Bat Conservation Ireland, Virginia, Cavan.

Amorim, F., Rebelo, H., & Rodrigues, L. (2012). Factors influencing bat activity and mortality at a wind farm in the Mediterranean region. Acta Chiropterologica, 14(2), 439-457.

Andrews, H. (2013) Bat Tree Habitat Key. AEcol, Bridgewater.

Arnett, E. B. (2006). A preliminary evaluation on the use of dogs to recover bat fatalities at wind energy facilities. Wildlife Society Bulletin, 34(5), 1440-1445.

Arnett, E. B., Baerwald, E. F., Mathews, F., Rodrigues, L., Rodríguez-Durán, A., Rydell, J., ... & Voigt, C. C. (2016). Impacts of wind energy development on bats: a global perspective. In Bats in the Anthropocene: Conservation of Bats in a Changing World (pp. 295-323). Springer International Publishing.

Aughney, T. (2008) An investigation of the impact of development projects on bat populations: Comparing pre- and post-development bat faunas. Irish Bat Monitoring Programme. Bat Conservation Ireland, Virginia, Cavan.

Aughney, T., Langton, S. and Roche, N. (2011) Brown long-eared bat roost monitoring scheme for the Republic of Ireland: synthesis report 2007-2010. Irish Wildlife Manuals, No.56. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Aughney, T., Langton, S. and Roche, N. (2012) All Ireland Daubenton's Bat Waterway Monitoring Scheme 2006-2011. Irish Wildlife Manuals, No. 61. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Barataud, M. and Tupinier, Y. Écologie acoustique des chiroptères d'Europe: identification des espèces, étude de leurs habitats et comportements de chasse. Biotope, 2012.

Baerwald, E. F., D'Amours, G. H., Klug, B. J., & Barclay, R. M. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. Current biology, 18(16), R695-R696.

Baerwald, E. F., & Barclay, R. M. (2009). Geographic variation in activity and fatality of migratory bats at wind energy facilities. Journal of Mammalogy, 90(6), 1341-1349.

Bat Tree Habitat Key. (2018). Bat Roosts in Trees: A guide to identification and assessment for tree-care and ecology professionals. Pelagic Publishing Ltd.

BCI (2012a). Wind Turbine/Wind Farm Development Bat Survey Guidelines, Version 2.8, December 2012. Bat Conservation Ireland, Virginia, Co. Cavan

BCI (2012b) Bats and Appropriate Assessment Guidelines, Version 1, December 2012. Bat Conservation Ireland, Virginia, Co. Cavan Berthinussen, A., Richardson. O.C. and Altringham, J.D. (2014) Bat Conservation: Global evidence for the effects of interventions. Exeter: Pelagic Publishing.

Carden, R., Aughney T., Kelleher C. and Roche, N. (2010) Irish Bat Monitoring Schemes. BATLAS Republic of Ireland Report for 2008-2009.

CIEEM, 2020, Patterns of Bat Activity at Upland Windfarms: Implications for Sampling and Mitigation, Online, Available at: https://cieem.net/resource/cieem-webinar-patterns-of-bat-activity-at-upland-windfarms-implications-for-sampling-and-mitigation/, Accessed, 30.04.2024

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

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

Collins, J., and Jones, G. (2009). Differences in bat activity in relation to bat detector height: implications for bat surveys at proposed windfarm sites. Acta Chiropterologica, 11(2), 343-350.

Cryan, Paul M., *et al.* (2014) Behavior of bats at wind turbines. Proceedings of the National Academy of Sciences 111.42: 15126-15131.

EUROBATS (2016) Report of the Intersessional Working Group on Wind Turbines and Bat Populations at 21st Meeting of the Advisory Committee, Zandvoort, the Netherlands, 18 – 20 April 2016.

Hein, C.D., Gruver, J. and Arnett, E.B. (2013). Relating pre-construction bat activity and post-construction bat fatality to predict risk at wind energy facilities: a synthesis. A report submitted to the National Renewable Energy Laboratory. Bat Conservation International, Austin, TX, USA.

Hill D., Fasham, M., Tucker P., Shewry, M. and Shaw, P (eds) (2005) Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring, 433-449. Cambridge University Press, Cambridge.

Horn, J.W., Arnett, E.B. and Kunz, T.H. (2008). Behavioral responses of bats to operating wind turbines. Journal of wildlife management, 72(1), 123-132.

Hundt L. (2012) Bat Surveys: Good Practice Guidelines, 2nd edition. Bat Conservation Trust ISBN-13: 9781872745985.

ILP (2023) Guidance Note 08/23: Bats and Artificial Lighting at Night.

Korner-Nievergelt, F., Brinkmann, R., Niermann, I., & Behr, O. (2013). Estimating bat and bird mortality occurring at wind energy turbines from covariates and carcass searches using mixture models. PloS one, 8(7), e67997.

Kunz, Thomas H., Edward B. Arnett, Brian M. Cooper, Wallace P. Erickson, Ronald P. Larkin, Todd Mabee, Michael L. Morrison, M. Dale Strickland, and Joseph M. Szewczak. Assessing impacts of wind-energy development on nocturnally active birds and bats: a guidance document. Journal of Wildlife Management 71, no. 8 (2007): 2449-2486.

Kunz, T.H. and Parsons, S. (2009). Ecological and Behavioral Methods for the Study of Bats, 2nd Edition. The Johns Hopkins University Press, USA.

Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Mathews, F., Swindells, M., Goodhead, R., August, T. A., Hardman, P., Linton, D. M., and Hosken, D. J. (2013). Effectiveness of search dogs compared with human observers in locating bat carcasses at wind-turbine sites: A blinded randomized trial. Wildlife Society Bulletin, 37(1), 34-40.

Mathews, F., Richardson, S., Lintott, P. and Hosken, D. (2016) Understanding the risk to European protected species (bats) at onshore wind turbine sites to inform risk management. Final Report. University of Exeter.

Mitchell-Jones, A. J. and McLeish, A. P. (2004). The Bat Worker's Manual, 3rd Edition. JNCC, Peterborough.

Mitchell-Jones, A.J. (2004). Bat Mitigation Guidelines. English Nature.
Montgomery, W. I., Provan, J., McCabe, A. M., and Yalden, D. W. (2014). Origin of British and Irish mammals: disparate post-glacial colonisation and species introductions. Quaternary Science Reviews, 98, 144-165.

NIEA, Natural Environment Division (2021). Guidance on Bat Surveys, Assessment & Mitigation for Onshore Wind Turbine Developments.

NRA (2006a) Best practice guidelines for the conservation of bats in the planning of national road schemes. National Roads Authority, Dublin, Ireland.

NRA (2006b) Guidelines for the treatment of bats during the construction of national road schemes. National Roads Authority, Dublin, Ireland.

NatureScot (2021). Bats and onshore wind turbines: survey, Assessment and mitigation. Version: August 2021 (updated with minor revisions).

Natural England (2014). Bats and onshore wind turbines: interim guidance. Third Edition TIN051. English Nature.

Nealon, Ú.C. (2016) Bats and wind farms in Ireland: An assessment of current practices in surveying and monitoring. Oral presentation at the 1st Ecology and Evolution Ireland conference, Sligo.

Northern Ireland Environment Agency (2011) Bat Survey – Specific Requirements for Wind Farm Proposals.

Perrow, M. (Ed.). (2017). Wildlife and Wind Farms-Conflicts and Solutions, Pelagic Publishing Ltd.

Regini, K. (2000) Guidelines for ecological evaluation and impact assessment, In Practice: Bulletin of the Institute of Ecology and Environmental Management, 29, 1-7.

Roche, N., Langton, S. & Aughney T. (2012) Car-based bat monitoring in Ireland 2003-2011. Irish Wildlife Manuals, No. 60. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.

Roche, N., T. Aughney, F. Marnell, and M. Lundy (2014). Irish Bats in the 21st Century. Bat Conservation Ireland, Virginia, Co. Cavan, Ireland.

Roche, N., Aughney T. & Langton S. (2015) Lesser Horseshoe bat: population trends and status of its roosting resource. Irish Wildlife Manuals, No 85. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Rodrigues, L., L. Bach, M. J. Dubourg-Savage, B. Karapandža, D. Kovač, T. Kervyn, J. Dekker, A. Kepel, P. Bach, J. Collins, C. Harbusch, K. Park, B. Micevski, and J. Minderman (2015). Guidelines for consideration of bats in wind farm projects - Revision 2014. UNEP/EUROBATS Secretariat Bonn, Germany.

Russ, J. (2012). British bat calls: a guide to species identification. Pelagic publishing.

Rydell, J., Bach, L. Dubourg-Savage, M.-J., Green, M., Rodrigues, L. and Hedenström, A. (2010). Bat mortality at wind turbines in northwestern Europe. Acta Chiropterologica 12. 2: 261 – 274.

Schofield H. (2008). The Lesser Horseshoe Bat: Conservation Handbook. The Vincent Wildlife Trust, Ledbury, UK.

Schuster, E., L. Bulling, and J. Köppel (2015). Consolidating the State of Knowledge: A Synoptical Review of Wind Energy's Wildlife Effects. Environmental Management 56:300-331.

SNH (2019). Bats and onshore wind turbines: survey, Assessment and mitigation.

Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. December (2010). Valuing Bats in Ecological Impact Assessment, CIEEM In-Practice.

APPENDIX 1

BAT HABITAT SUITABILITY ASSESSMENT

HABITAT SUITABILITY ASSESSMENT

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

Potential Suitability	Description	
	Roosting Habitats in Structures	**Potential Flight- Paths 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 conditions[a] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation[b]). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.[c]	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[a] 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	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.	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, treelined watercourses and grazed parkland. Site is close to and connected to known roosts.

a) For example, in terms of temperature, humidity, height above ground, light levels or levels of disturbance.
b) 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).
c) Categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Updated guidelines for assessing the potential suitability of a site for bats, based on the presence of habitat features (taken from Collins, 2023)

Potential Suitability	Description	
	Roosting Habitats in Structures	**Potential Flight- Paths and Foraging Habitats**
None	No habitat features on site likely to be used by any roosting bats at any time of the year. (i.e. a complete absence of crevices/ suitable shelter at all ground/ underground levels).	No habitat features on site likely to be used by any commuting or foraging bats at any time of the year (i.e. no habitats that provide continuous lines of shade/protection for flight-lines or generate/shelter insect populations available to foraging bats).
Negligible[a]	Negligible habitat features on site likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.	No obvious habitat features on site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[b] 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 and not a classic cool/stable hibernation site but could be used by individual hibernating bats[c].	Habitat that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[b] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only, such as maternity and hibernation - the categorisation described in this table is 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 flight-paths 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 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[b], and surrounding habitat. These structures have the potential to support high conservation status which is established after presence is confirmed.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by bats for flight-paths 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.

a) Negligible is defined as 'so small or unimportant as to be not worth considering, insignificant'. This category may be used where there are places that a bat could roost or forage (due to one attribute) but it is unlikely that they actually would (due to another attribute).

b) For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

c) Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten et al., 2016 and Jansen et al., 2022). Common pipistrelle swarming has been observed in the UK (Bell, 2022 and Tomlinson, 2020) and winter hibernation of numbers of this species has been detected at Seaton Delaval Hall in Northumberland (National Trust, 2018). This phenomenon requires some research in the UK, but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in prominent buildings in the landscape, urban or otherwise.

BCT Protocol for categorising the suitability of trees for bats (Collins, 2023).

Assessment	Description
NONE	Either no PRFs in the tree or highly unlikely to be any
FAR	Further assessment required to establish if PRFs are present in the tree
PRF	A tree with at least one PRF present

BCT Guidance for categorising suitability of PRFs for bats (Collins, 2023).

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

APPENDIX 2

SITE RISK ASSESSMENT

Planning and Environmental Consultants

Bat Survey Report

Appendix 2 – Site Risk Assessment (Table 3a, SNH)

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

2019 SURVEY ANALYSIS AND RESULTS)

Planning and Environmental Consultants

Appendix 3

2019 Bat Survey Results

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1. INTRODUCTION

Bat surveys undertaken in 2022 within the EIAR Site Boundary of Clonbern Wind Farm, in accordance with NatureScot (2021) Guidance, form the core dataset for the assessment of effects on bats provided in the EIAR.

This appendix provides supplementary data that was derived from bat activity surveys undertaken on the Site in 2019, which were designed in accordance with Scottish Natural Heritage Guidance (SNH 2019).

The following surveys were undertaken in 2019:

- Manual Transect Surveys
- Ground-level Static Surveys

The scope and results are provided in the sections below.

1.1 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team, dedicated to scoping, carrying out, and reporting on bat surveys, as well as producing impact assessments in relation to bats. MKO ecologists have relevant academic qualifications and are qualified in undertaking surveys to the levels required. Staff roles and relevant training are presented in Table 1-1 below.

Table 1-1 Bat Specific Experience and Training of Ecologists Involved in Surveying

Staff	Role	Bat Specific Training
Sara Fissolo (B.Sc.)	Project Ecologist	Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bats in Heritage Structures (BCI), Bat Care (BCT), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Claire Stephens (B.Sc.)	Project Ecologist	Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Padraig Webb (B.Sc.)	Ecologist	Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Luke Dodebier (B.Sc.)	Ecologist	Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).

2. 2019 FIELD SURVEYS TO SNH GUIDANCE

2.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out in 2019. During these surveys, habitats within the EIAR Site Boundary a were assessed for their suitability to support roosting, foraging and commuting bats. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Additionally, a search for roosts was undertaken within the boundary of the Site (SNH, 2019), and identified structures and trees were subject to a preliminary roost assessment. Suitability categories are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

2.2 Manual Activity Surveys

Manual surveys carried out in Clonbern were transect surveys. Table 2-1 summarises the manual survey effort.

Table 2-1 2019 Survey Effort - Manual Activity Surveys

Date	Surveyors	Survey	Sunset	Start-End	Weather	Transect (km)
Clonbern - 2019						
13th May 2019	Claire Stephens and Padraig Webb	Dusk Transect	21:25	20:55 – 00:25	11-13˚; dry; light air	13.8
11th July 2019	Claire Stephens and Luke Dodebier	Dusk Transect	22:01	21:31 – 01:01	16-17˚; dry-drizzle; gentle-moderate breeze	9.8
22nd August 2019	Claire Stephens and Sara Fissolo	Dusk Transect	20:48	20:18 – 23:48	16˚; dry; light-gentle breeze	7.3
Total 2019 Survey Effort						**28.7km**

Manual Transects

Manual activity surveys in 2019 comprised of walked transects at dusk. A series of representative transect routes were selected throughout the Wind Farm 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, they generally followed existing roads and tracks. Transect routes are presented in Figure 2-1.

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. All bat activity was recorded for subsequent analysis to confirm species identifications.

2.3 Ground-level Static Activity Surveys

Where developments have more than 10 turbines, NatureScot requires one detector per turbine up to 10 turbines, plus a single detector for every three additional turbines.

2019 survey scoping was overseen by Dr. Úna Nealon. Úna's primary expertise lies in bat ecology. She completed her PhD with the Centre for Irish Bat Research, examining the impacts of wind farms on Irish bat species. The scope of bat work was designed prior to the finalising of the Proposed Development layout (i.e. 11 turbines). The surveys were designed for a potential layout of 11 turbines. Given that 11 turbines were initially proposed, 11 detectors were deployed to ensure compliance with SNH guidance.

Automated bat detectors were deployed at 11 no. locations for at least 10 nights in each of spring (April-May), summer (June-mid August) and autumn (mid-August-October) (SNH 2019). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Detector locations achieved a representative spatial spread in relation to proposed turbines and sampled the range of available habitats. Figure 2-1 presents static detector locations in relation to the final proposed layout. Static detector locations are described in Table 2-2.

Table 2-2 Ground-level Static Detector Locations in 2019

ID	Location (ITM)	Habitat	Linear Feature within 50m	Corresponding/ Nearest Turbine(s)
D01	X554959 Y757570	Improved agricultural grassland (GA1)	-	T1
D02	X555676 Y757314	Improved agricultural grassland (GA1) and wet grassland (GS4)	-	T2
D03	X554288 Y757309	Conifer Plantation (WD4)	Edge of conifer plantation (WD4)	T3
D04	X555039 Y757051	Earth bank (BL2), boundary between improved agricultural grassland (GA1) and immature mixed broadleaf woodland (WD1)	Mixed broadleaf woodland (WD1) edge	T4
D05	X555577 Y756743	Improved agricultural grassland (GA1), Wet grassland (GS4)	Hedgerow (WL1)	T5
D06	X554500 Y756682	Cutover bog (PB4) and Scrub (WS1)	Scrub (WS1)	T6
D07	X553828 Y756768	Cutover bog (PB4) and Raised Bog (PB1)	-	T7
D08	X553970 Y756118	Between two sections of Conifer Plantation (WD4)	Fire break in conifer plantation (WD4)	T8
D09	X554334 Y755833	Improved agricultural grassland (GA1) and wet grassland (GS4)	-	T9
D10	X554846 Y755748	Cutover bog (PB4), Scrub (WS1)	-	T10
D11	X554788 Y756296	Cutover bog (PB4)	-	T11

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˚, wind speeds less than 5m/s and no or only very light rainfall). Table 2-3 summarises survey effort achieved in 2019 for each of the 11 no. detector locations.

Table 2-3 Survey Effort - Ground-level Static Surveys

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	13th May – 10th June 2019	27	22
Summer	11th June – 22nd June 2019	12	12
Autumn	22nd August – 4th September 2019	14	14
Total Survey Effort		**53**	**48**

2.4 Bat Call Analysis

All recordings from 2019 were later analysed using bat call analysis software Kaleidoscope Pro v.5.1.9 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Wind Farm Site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified.

2.5 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Ecobat (ecobat.org.uk). Static detector at ground level results for the Proposed Development were uploaded in J. 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 recommend 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.

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 2-4 defines bat activity levels as they relate to Ecobat percentile values (SNH, 2019).

Table 2-4 Ecobat Percentile Score and Categorised Level of Activity (SNH, 2019)

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

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Spring Transect Route 13th May 2019
- Summer Transect Route 11th July 2019
- Autumn Tranect Route 22nd August 2019

N

Drawing Title

2019 Survey Effort

Project Title	
Proposed Clonbern Wind Farm Development	
Drawn By: RC	Checked By: AJ
Project Code: 180740	Drawing No.: Fig 2-1
Scale: 1:25,000	Date: 2024-04-23

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3. RESULTS

3.1 Bat Habitat Suitability Appraisal

With regard to foraging and commuting bats, areas of **Cutover bog (PB4)**, **Wet Grassland (GS4)**, **Raised Bog (PB1)**, **Improved agricultural grassland (GA1)**, **Spoil and bare ground (ED2)**, **Recolonised bare ground (ED3)**, **Buildings and artificial surfaces (BL3)**, **Dry calcareous and neutral grassland (GS1)**, **Dry meadows and grassy verges (GS2) and drainage ditches (FW4)** 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 created by commercial forestry **(Conifer plantation WD4)** and roadways show potential for foraging and commuting bats. However, these habitats are surrounded by wide expanses of agricultural grassland and peatland habitats and thus, are not very well connected to the surrounding landscape. As such, these habitats were classified as *Moderate* suitability, i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016). **Oak-ash-hazel woodland/ immature woodland (WN2/WS2)**, **Wet willow-alder-ash woodland (WN6)**, **Bog woodland (WN7)**, **Eroding/ upland rivers (FW1)** and **Depositing/ lowland rivers (FW2)** provide *Moderate* - *High* commuting and foraging opportunities for local bat populations.

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 birch, willow, hazel, ash, oak, sycamore, rowan, commercial coniferous species. Overall, the majority of trees within the site did not provide optimal habitat for roosting bats and were assessed as having Negligible – Low roosting potential. Structures within the Proposed Development site include sheds, farm buildings, derelict dwellings and stone ruins, which support low roosting potential (Collins 2016).

3.2 Manual Transect Surveys

Manual transects were undertaken in Spring, Summer and Autumn 2019. Bat activity was recorded on all surveys. A total of 940 bat passes were recorded. Where possible, passes were identified to species level. Myotis spp. and some Pipistrellus spp. calls were considered a single group, either due to the difficulty in distinguishing them based on echolocation parameters or due to the presence of multiple species in a single recording. In general, Common pipistrelle (n=467) was recorded most frequently, followed the Soprano pipistrelle (n=406). Leisler's Bat were recorded less frequently (n=35). *Myotis spp.* (n=7) were rare. Species composition across all manual surveys is presented in Plate 3-1.

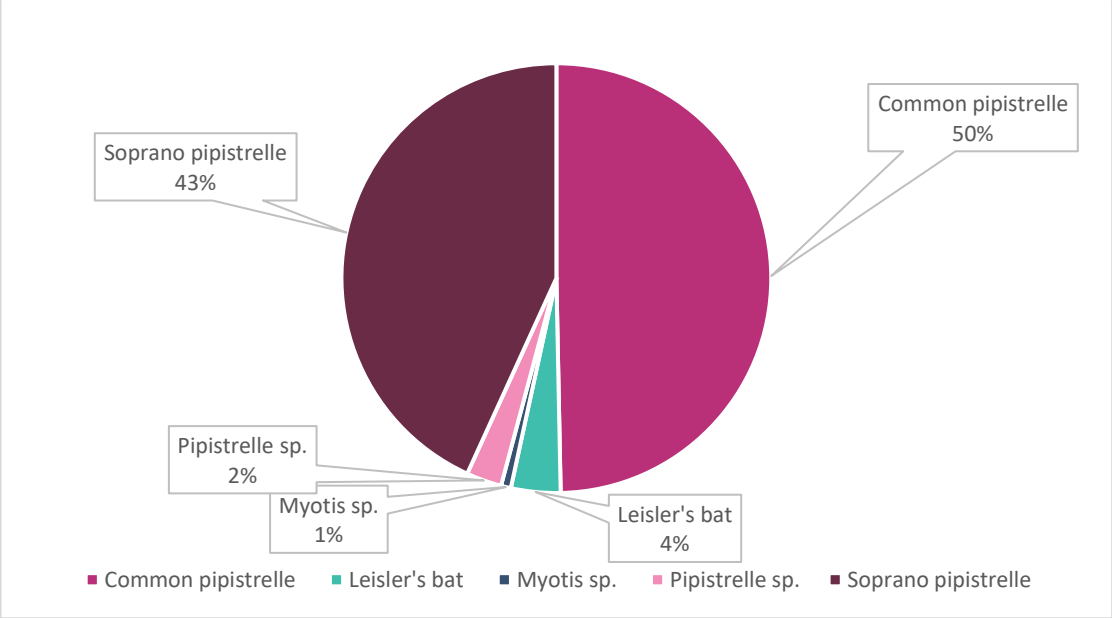

Plate 3-1 2019 Species Composition for Manual Transects

Species composition and activity levels varied significantly between surveys. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 3-2 present the results for individual species per survey period. High bat activity was recorded along mature treelines and continuous linear features. The Spring transect recorded the highest activity, and *Myotis* spp. was present only during this season. Leisler's bat activity, while recorded throughout the three surveys, was lowest in Autumn.

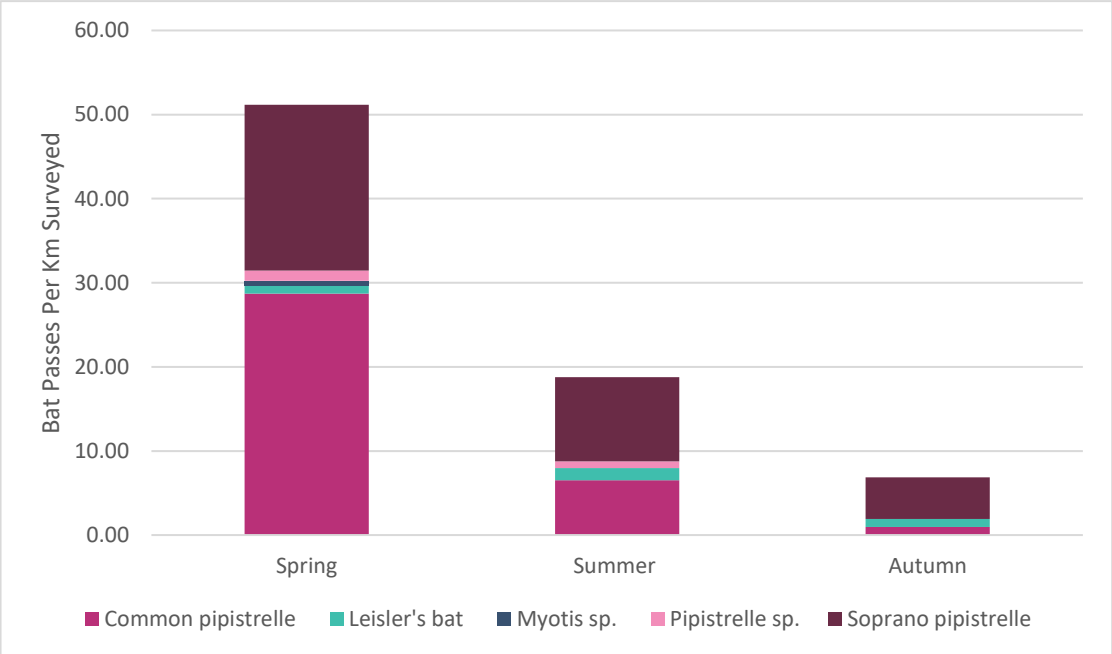

Plate 3-2 2019 Manual Results – Species Composition Per Survey Period

Figure 3-1, Figure 3-2 and Figure 3-3 present the spatial distribution of bat activity across the 2019 surveys. Bat activity was concentrated along hedgerows, scrub and linear (road/track) habitats.

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Spring Transect Route 13th May 2019

2019 Spring Manual Results

- Nathusius pipistrelle
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title
2019 Spring Manual Transect Results

Project Title
Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 3-1
Scale	Date
1:38,000	2024-04-22

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Summer Transect Route 11th July 2019

2019 SummerManual Results

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

N

Drawing Title
2019 Summer Manual Transect Results

Project Title
Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 3-2
Scale	Date
1:38,000	2024-04-23

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- 2019 Autumn Tranect Route
  22nd August 2019

2019 SummerManual Results

- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title
2019 Autumn Manual Transect Results

Project Title
Proposed Clonbern Wind Farm Development

Drawn By	Checked By
RC	AJ
Project Code	Drawing No.
180740	Fig 3-3
Scale	Date
1:38,000	2024-04-23

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3.3 Ground Level Static Surveys

In total, 53,682 bat passes were recorded across all deployments. In general, Common pipistrelle (n=29,308) occurred most frequently, followed by Soprano pipistrelle (n=18,753) and Leisler's bat (n=5,124). Instances of *Myotis* sp. (n=379) and Brown long-eared bat (n=114) were significantly less. Nathusius' pipistrelle was recorded but not in abundance (n=4). Plate 3-3 presents species composition across all ground-level static detectors.

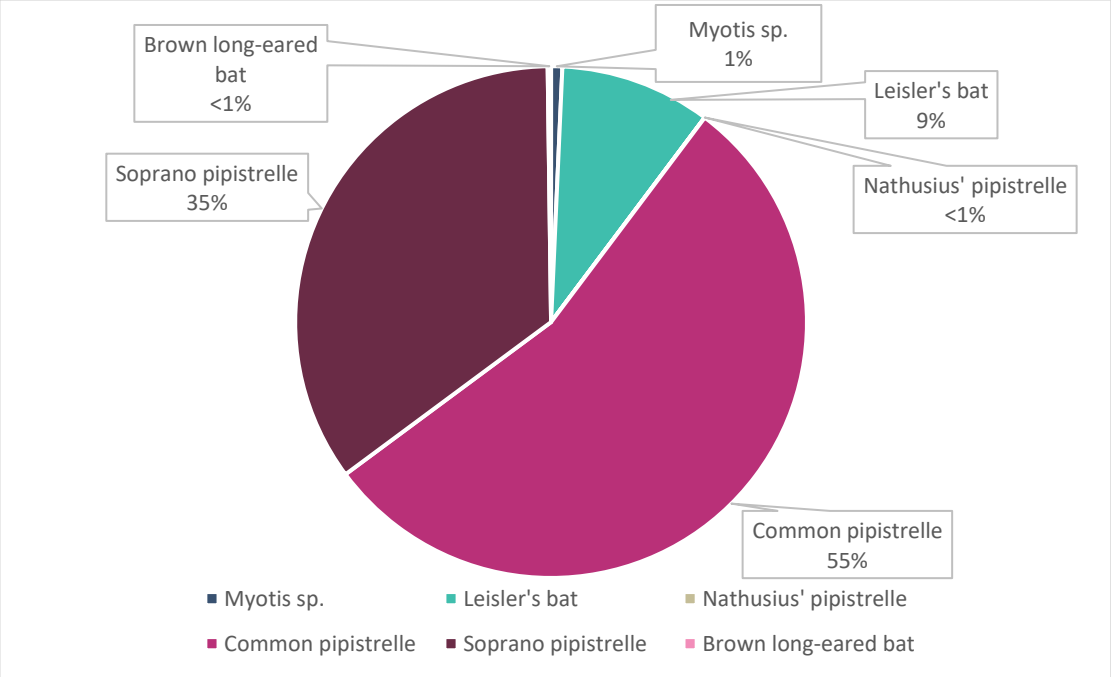

Plate 3-3 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

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. Table 3-1 and Plate 3-4 present these results for each species. Activity was highest during the Spring survey, with Common pipistrelle the most recorded species. Leisler's bat activity was also highest in Spring. Nathusius' pipistrelle was recorded only during the Autumn survey. Detectors redeployed in the Spring season are presented separate to initial Spring deployments.

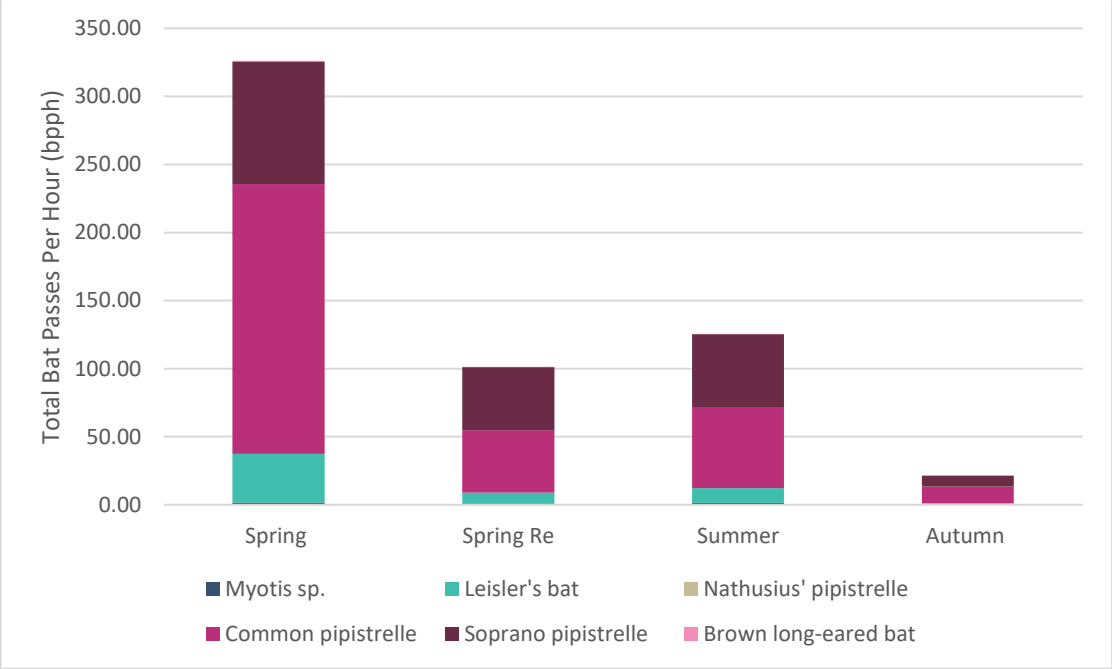

Plate 3-4 Static Detector Surveys: Species Composition Across All Deployments

Table 3-1 Static Detector Surveys: Species Composition by Season (Total Bat Passes Per Hour, All Nights)

	Spring	Spring Redeployment	Summer	Autumn
Total Survey Hours	87.8	94	97.6	150.5
Myotis sp.	151	24	136	68
Leisler's bat	3,128	818	1,062	116
Nathusius' pipistrelle	0	0	0	4
Common pipistrelle	17,418	4,311	5,759	1,820
Soprano pipistrelle	7,908	4,359	5,271	1,215
Brown long-eared bat	23	8	36	47

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 3-5 illustrates the median Nightly Pass Rate per species perdeployment. Zero data, when a species was not detected on a night, was also included.

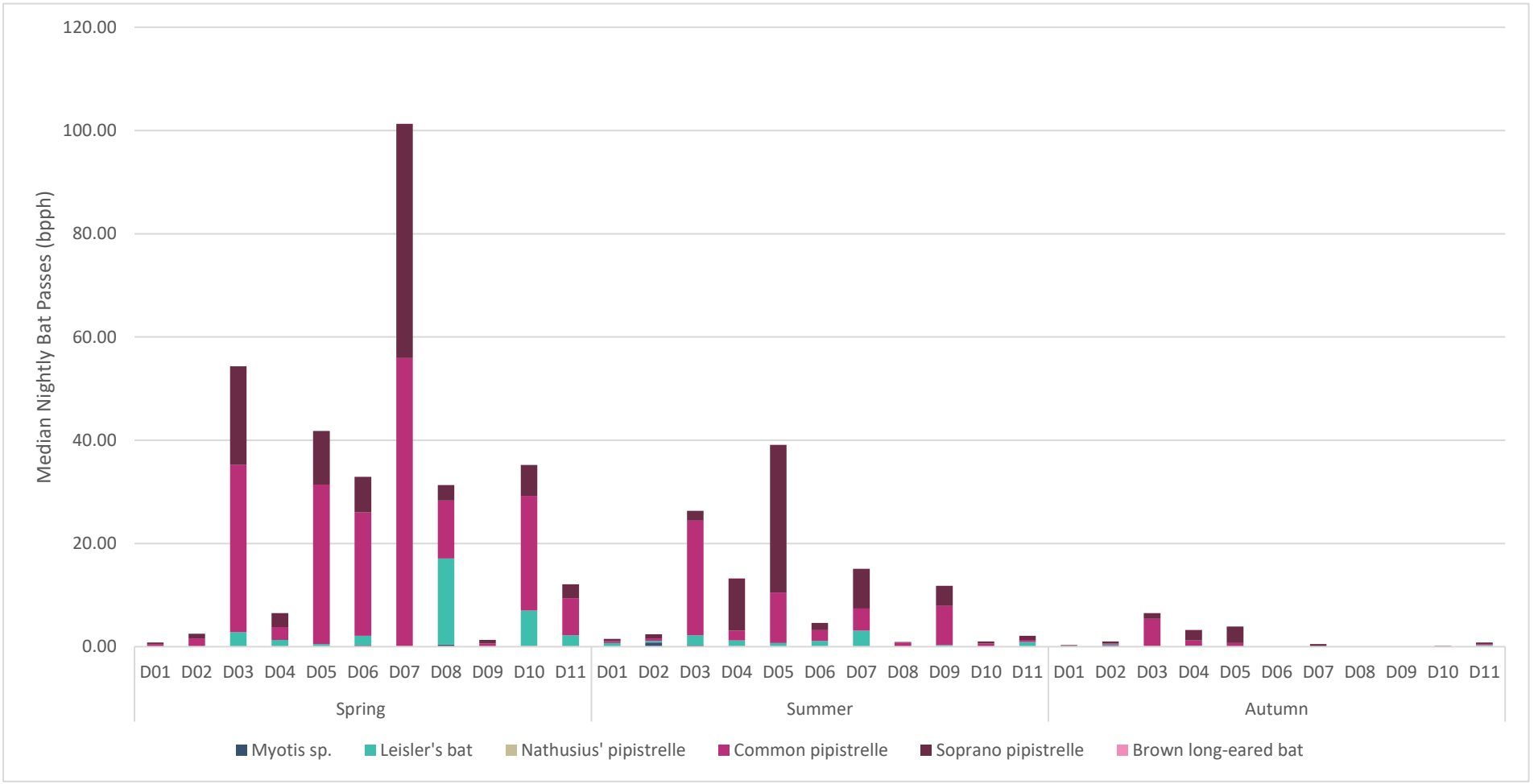

Plate 3-5 Static Detector Surveys: Median Nightly Pass Rate (bpph) per Detector, per Survey Period. Data Includes Absences.

Common pipistrelle was predominant at the majority of detectors during the Spring and Summer survey periods. D08 recorded a high number of Leisler's bats during the Spring survey. The median Nightly Pass Rate was low across the Autumn survey.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 3-2 presents the results of Ecobat analysis for each species per season on a site-level.

According to the Ecobat analysis carried out, Median activity levels for Common pipistrelle peaked at ***High*** in Spring. Median activity levels for Soprano pipistrelle peaked at ***Moderate to High*** for two seasons and Leisler's bat peaked at ***Moderate to High*** in Spring. Median activity levels for Nathusius' pipistrelle was ***Low*** for Autumn, the only season where the species was present. Brown long-eared bat median activity level was ***Low*** across all seasons. Maximum activity levels peaked with ***High*** activity for Soprano pipistrelle, Common pipistrelle and Leisler's bat for at least one season. Maximum bat activity levels peaked at ***Moderate to High*** for *Myotis* spp., ***Moderate*** for Brown long-eared bat, and ***Low*** for Nathusius' pipistrelle.

Table 3-2 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	88	High	100	High	113	2927
Summer	63	Moderate - High	100	High	128	2637
Autumn	45	Moderate	98	High	74	2626
Soprano pipistrelle						
Spring	80	Moderate - High	100	High	110	2704
Summer	62	Moderate - High	98	High	134	2488
Autumn	53	Moderate	94	High	78	2539
Nathusius' pipistrelle						
Spring	0	Low	0	Low	0	0
Summer	0	Low	0	Low	0	0
Autumn	9	Low	9	Low	4	339
Leisler's bat						
Spring	67	Moderate - High	98	High	87	2371
Summer	49	Moderate	86	High	115	1996
Autumn	28	Low - Moderate	61	Moderate - High	41	1795
***Myotis* sp.**						
Spring	24	Low - Moderate	63	Moderate - High	59	1853
Summer	23	Low - Moderate	64	Moderate - High	46	1574
Autumn	9	Low	59	Moderate	33	1803
Brown long-eared bat						
Spring	5	Low	51	Moderate	16	708
Summer	5	Low	33	Low - Moderate	27	787
Autumn	9	Low	45	Moderate	29	1139

4. SUMMARY OF RESULTS

Bat surveys in 2019 were designed in accordance with survey standards for medium risk sites, in accordance with the SNH guidelines for wind turbine developments (SNH, 2019). Surveys took place between May and August 2019, this work included a desktop study, habitat and landscape assessments, manual activity surveys and static detector surveys at ground level.

The Site is suitable for foraging and commuting bats, with the network of linear features present within the Site providing connectivity with the wider landscape. Following a search for roosts in 2019, no structures containing potential suitable bat roost features were identified within 200m plus the rotor radius of the Proposed Development footprint and no trees with significant roosting features were identified within the site.

During manual surveys Common pipistrelle was recorded most frequently, followed by Soprano pipistrelle and Leisler's Bat. Brown long-eared bat and *Myotis spp.* instances were rare. During manual transects surveys the species composition was similar to the species composition recorded at static surveys.

During static surveys Common pipistrelle and Soprano pipistrelle comprised the vast majority of activity recorded by the static detectors. This was followed by Leisler's bat which was recorded less frequently, while Brown long-eared bat and Myotis spp. were less abundant. Nathusius' pipistrelle was recorded rarely, and only during the Autumn survey.

According to the Ecobat analysis carried out at Site-level, median activity levels peaked with ***High*** activity for Common pipistrelle, for one season. Soprano pipistrelle and Leisler's bat median bat activity levels both peaked with ***Moderate to High***, for at least one season. *Myotis* spp. median activity levels peaked at ***Low to Moderate*** for Spring and Summer. Median activity levels for Brown long-eared bat and Nathusius' pipistrelle peaked at ***Low***.

The 2019 data has been utilised as a supplement to data collected in 2022 to inform the impact assessment of the Proposed Project and to provide relevant mitigations for the protection of bats.

APPENDIX 4

OVERALL RISK ASSESSMENT

Planning and Environmental Consultants

Bat Survey Report

Appendix 4 – Overall Risk Assessment (Table 3b, SNH)

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).