MKO

APPENDIX 6-1

BAT REPORT

MKO Planning and Environmental Consultants

Appendix 6-1 – Bat Survey Report

Curraglass Wind Farm, Co.Cork

Table of Contents

TABLE OF TABLES

TABLE OF PLATES

TABLE OF FIGURES

APPENDICES

Appendix 1 – Bat Habitat Suitability Appraisal

Appendix 2 – Site Risk Assessment

Appendix 3 – Overall Site Risk Assessment

1. INTRODUCTION

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

Bat surveys were undertaken throughout 2023 and are consistent with the methodologies described in NatureScot 2021[1]. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level. Surveys in 2023 were based on an indicative turbine layout of 3 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 [2], which was produced in August 2021 (amended March 2024).

As detailed in Section 1.1.1 in Chapter 1 (Introduction), for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Development', 'proposed turbines', the 'Site', the ' 2020 Application' and the 'Kealkill Wind Farm'. Please see Section 1.1.1 of this EIAR for further details. A detailed description of the Proposed Development is provided in Chapter 4 (Description of the Proposed Development) of this EIAR.

A detailed description of the Proposed Development is provided in Chapter 4 Description of Development of this EIAR.

1.1 Background

Wind energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, wind energy development can impact wildlife, directly through mortality and indirectly through disturbance and habitat loss. Bat fatalities have been reported at wind energy facilities around the world, raising concern about the cumulative impacts of such developments on bat populations (Arnett *et al.* 2016). No large-scale studies have been undertaken in Ireland to date. However, a study from the UK estimated bat fatalities at 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 Site. Survey design and analyses of results at the Site were

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*
[2] *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).*

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 and assessment provided in this report are in accordance with NatureScot 2021 Guidance. This guidance has set the industry standard for best practice surveys at wind farms since its initial publication in 2019.

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 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019). Pressures and Threats are ranked from medium importance (M) to high importance (H) in the 2019 Article 17 report.

Bat Species	Conservation Status	Principal Pressures/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, experienced in 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. MKO's Ecology team holds a bat derogation licence from NPWS. The licence is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections). Graduate and seasonal ecologist staff are included under the licence under condition of being accompanied by more experienced colleagues.

Survey scoping was prepared by Aoife Joyce (BSc., MSc.). Bat surveys were conducted by MKO ecologists Sara Fissolo (BSc.), Laura McEntegart (BSc.), Nora Szijarto (BSc, MSc), Ryan Connors (BSc., MSc.) and Tom Peters (BSc., MSc.). Data analysis was undertaken, and results were compiled by Nora Szijarto. Reporting was collated by Sara Fissolo, Nora Szijarto and Molly O'Hare, and reviewed and approved by Aoife Joyce. Staff's roles, relevant ecological experience and training is presented in Table 1-2 below.

Table 1-2 Project team experience, qualifications and training.

Staff	Role	Training
Aoife Joyce (B.Sc., M.Sc.)	Project Director	B.Sc. (Hons) Environmental Science, University of Galway, Ireland. M.Sc. (Hons) Agribioscience, University of Galway, Ireland. Advanced Bat Survey Techniques – Trapping, biometrics, handling (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).
Sara Fissolo (B.Sc.)	Project Ecologist	B.Sc. (Hons) Ecology and Environmental Biology, University College Cork, Ireland. 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).
Molly O'Hare (B.Sc., M.Sc.)	Project Ecologist	B.Sc. Ecology and Environmental Biology, University College Cork, Ireland. M.Sc. Marine Biology, University College Cork, Ireland. Bat Habitat Appraisal (Internal), Manual transect (Internal) Emergence surveys (ABC), Hand netting (ABC), Harp trapping (ABC), Mist netting (ABC). Kaleidoscope Pro Analysis (Wildlife Acoustics), Bat Impacts and Mitigation (CIEEM).
Laura McEntegart (B.Sc.)	Ecologist	B.Sc. (Hons) Botany and Plant Science, National university of Ireland, Galway Bat Handling Training Course (BCI), Bats: Assessing the Impact of Development on Bats, Mitigation & Enhancement - (CIEEM), 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)
Ryan Connors (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Zoology, University College Galway, Ireland. M.Sc. (Hons) Conservation Behaviour, Atlantic Technological University, Galway, Ireland. 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), Winter Tree Identification (Internal), Wintering Bird Surveying (Internal).
Nora Szijarto (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. Biology, University of Lausanne, Switzerland M.Sc. Behaviour, Evolution and Conservation, University of Lausanne, Switzerland Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Wildlife acoustics), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Tom Peters (B.Sc., M.Sc.)	Graduate Ecologist	B.Sc. Environmental & Geographic Sciences, TUS Midlands West M.Sc. Applied Environmental Sciences, UCD Terrestrial Ecology, Conservation, Water Quality Assessment, multidisciplinary walkover surveys (Internal), Manual Transect Survey (Internal), Emergence and Re-Entry Surveys (Internal), specialist surveys (mammals, kick sampling, marsh fritillary and annex I habitat) (Internal), bird surveys (Bird Watch Ireland), botany (BSBI)

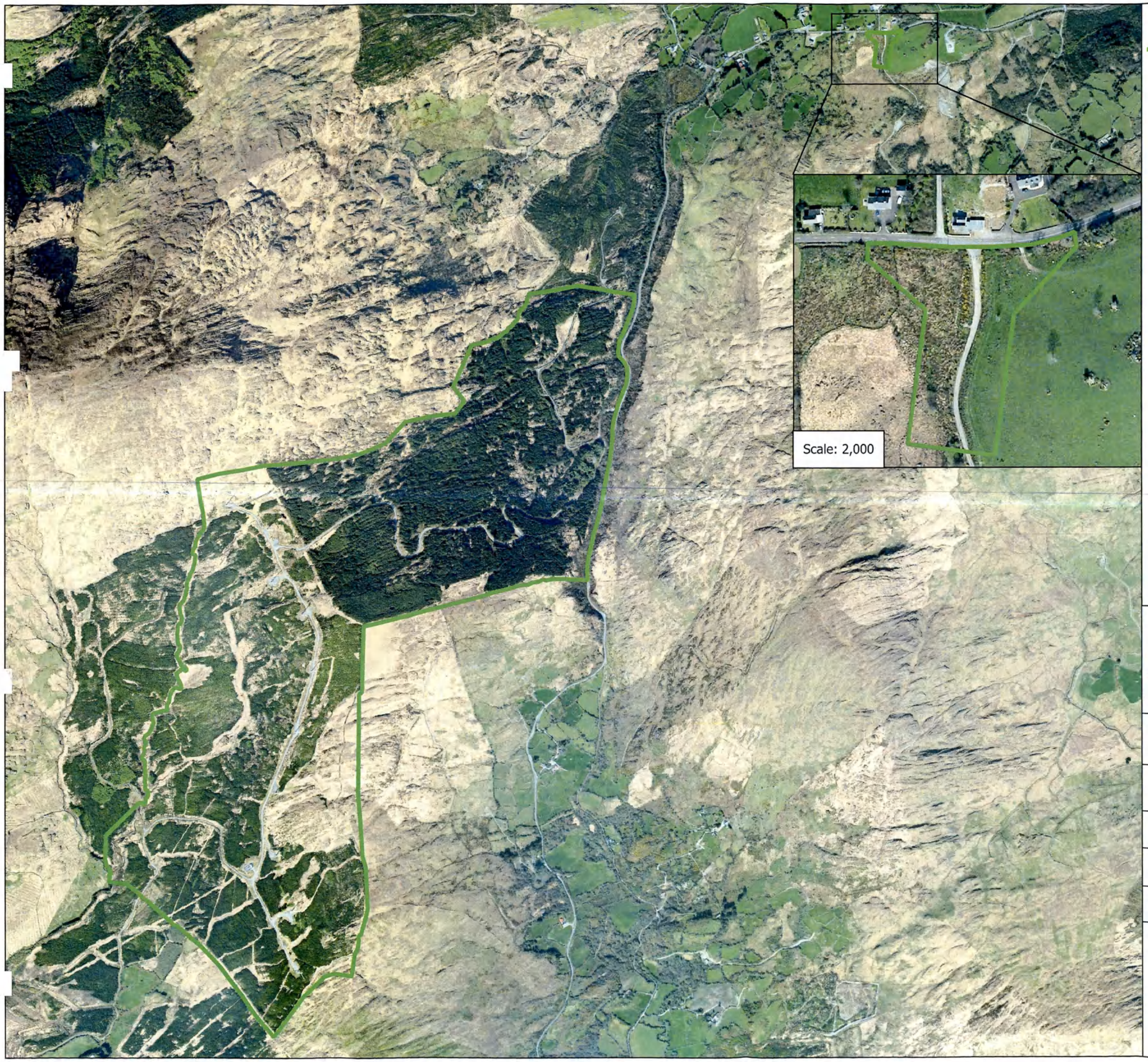
2. PROJECT DESCRIPTION

The Site is located within a rural, agricultural setting in southwest Cork, approximately 6.8km northeast of Kealkill Village and 3.8km southwest of the village of Ballingeary. The Site which includes existing windfarm infrastructure from the Kealkill Wind Farm, is centred approximately at ITM Grid Ref: X 508999, Y 562646. The Site is located where features of the existing wind farm infrastructure remain, such as the existing windfarm roads and existing onsite 38kV substation. The Site covers an area of approximately 270 hectares in total, the majority of which is planted with mixed forestry and existing wind farm infrastructure.

The Site falls within the townlands of, Derreendonee, Cappaboy Beg, Curraglass, and Inchi More and is situated on the south-westerly slopes of Doughill Mountain of the Shehy Mountains. The Site is accessed by an existing site entrance, via forestry roads to the northeast that adjoins the R548 Regional Road, entering the Site at its eastern boundary in the townland of Derreendonee.

Current land-use comprises of commercial forestry, agricultural land and unutilised existing wind farm infrastructure. In addition to forestry and wind energy, other land-uses in the surrounding area include agriculture, and residential/commercial activities.

The full description of the Proposed Development is provided in Section 4.1 of Chapter 4 (Description to the Proposed Devlopment) of this EIAR.



Map Legend

EIAR Site Boundary

Drawing Title
Site Location - Aerial

Project Title
Curralgass Wind Farm, Co. Cork

Drawn By	Checked By
EM	EC
Project No. 240614	Drawing No. Figure 2-1
Scale 1:15,000	Date 2025-08-26

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: www.mkoireland.ie

3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Development. A Scoping Document, providing details of the application site and the Proposed Development, was prepared by MKO and circulated to consultees in February 2025. As part of this exercise, prominent Irish conservation groups were contacted, and Bat Conservation Ireland (BCI), and the Department of Housing, Local Government and Heritage-Development Applications Unit (NPWS) were specifically invited to comment on the potential of the Proposed Development to affect bats.

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

3.2 Desk Study

A desk study of published material was undertaken prior to conducting field surveys. The aim was to provide context to the Site in order to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the 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 and Lesser Horseshoe Bat Database holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. The most recent search examined bat presence and roost records within a 10 km radius of a central point within the Site (ITM Grid Ref: X 508975 Y 562480) (BCI 2012, Hundt 2012, NatureScot 2021). Available bat records were also provided by Bat Conservation Ireland on 12/06/2020 and updated records provided on 12/06/2025. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Site.

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 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 10km radius of the centre point of the Site (BCI 2012, Hundt, 2012, NatureScot, 2021). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and pNHAs.

3.2.4 Landscape Features

3.2.4.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial photographs were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Siteand 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 karst mapping tool, University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland and archaeological database of national monuments were consulted for any indication of natural subterranean bat sites, such as caves, and any evidence of manmade underground structures, e.g., souterrains, that may be used by bats within 10km of the nearest proposed turbine locations (BCI, 2012) (last searched on the 19th July 2025).

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

3.2.4.4 Additional Projects in the Wider Landscape

A search was conducted to identify permitted, operational and proposed wind energy developments within 10km of the proposed turbine locations. (NatureScot, 2021). This search adhered to methodologies outlined in Chapter 2 (Background to the Proposed Development), Section 3.8 The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Cork County Council and An Coimisiún Pleanála. Other infrastructure developments and proposals (e.g. large road projects and extractive industries) were also noted. Information on the location and scale of these developments was gathered to inform cumulative effects. More details on other infrastructure developments within the vicinity of the Proposed Development can be found in Chapter 2 (Background to the Proposed Devlopment), Appendix 2-3 Background to the Proposed Development of this EIAR.

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

A walkover survey of the Site was carried out during daylight hours. The landscape features on the Site were visually assessed for potential use as bat roosting habitats and commuting/foraging habitats using a protocol set out in BCT *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn.)

(Collins, 2016). The aim of the survey was to identify suitable habitats within the Site to guide further survey efforts.

Table 4.1 of the 2016 BCT Guidelines identifies a grading protocol for assessing structures, trees and commuting/foraging habitat for bats, which is summarised in Table 3-1. The protocol is divided into four Suitability Categories: *High, Moderate, Low* and *Negligible.*

Table 3-1 BCT protocol for bat habitat appraisals (Collins, 2016)

Assessment	Rationale
High	Structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat. Continuous, high-quality, well-connected habitats, connected to known roosts.
Moderate	A structure used by bats due to their size, shelter, protection, conditions and surrounding habitat, but are unlikely to support a roost of high conservation status, and suitable, connected habitats.
Low	Structures with one or more potential roost sites that could be used by an individual bat opportunistically, and suitable, but isolated habitats that could be used by a small number of bats.
Negligible	No obvious features present, but a level of uncertainty remains.

New Collins guidelines were published in September 2023 (Collins, 2023), after the bat habitat appraisal was undertaken. The new protocol includes the no potential *(None)* category, where no uncertainty exists on the lack of Potential Roosting Features (i.e. PRFs) on a tree or structure. Trees where Further Assessment is Required are marked as FAR, and trees with obvious PRF are marked PRF, which can be assessed as either PRF-I, which corresponds to the previous Negligible and Low categories, or PRF-M, which marks a sizeable feature suitable to host a maternity roost. The assessment and scope of surveys carried out with reference to the previous edition are considered in line with the updated guidelines and appropriate for the Site.

3.3.2 Roost Surveys

3.3.2.1 Daytime Roost Inspection

A search for roosts was undertaken within 200m plus the indicative rotor radius (i.e. 75m) of the proposed turbines (NatureScot, 2021). It is noted that a smaller rotor radius (66.5m) is proposed as part of the final design. The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The Site was visited in April, May, July, August, and September 2023.

One structure (ITM Grid Ref: X 508844 Y 562170) was identified within the Site, which was assessed for its potential to support roosting bats. The roost assessment involved detailed external inspections and, where access was available, internal inspections to search for evidence of bat activity, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises.

Any potential tree roosts identified within the Site were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other Potential Roost Features identified by Andrews (2018).

3.3.2.2 Emergence Surveys

Emergence surveys at dusk were carried out which focused on the PRFs identified during the habitat appraisal and daytime roost inspection within the Site. During these surveys, surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). The emergence surveys commenced

15 minutes before sunset and concluded 90 minutes 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 Survey Effort - Emergence Surveys 2023

Date	Surveyors	Sunset/ Sunrise	Survey Type	Weather	PRF
19th July	Laura McEntegart and Nora Szijarto	21:45	Dusk Emergence	13-14°C; dry; light breeze.	Substation
20th September	Nora Szijarto and Tom Peters	19:25	Dusk Emergence	9-12°C; light rain; calm.	Substation

3.3.3 Manual Transects

Manual activity surveys comprised walked/driven transects conducted after dusk. A series of representative transect routes were selected throughout the Site, with the aim of identifying bat species present, gathering information on bat behaviour, and recording important features used by bats. Transect routes were prepared with reference to the Proposed Development layout, findings from desktop and walkover surveys, as well as health and safety considerations and access limitations. As such, transects generally followed existing roads and tracks. To ensure adequate coverage of the Site, some sections of the summer and autumn transects were partially driven. The driven transect portions followed the methodology described by Roche *et al.* (2012). Transect routes undertaken in 2023are presented in Figure 3-1.

Transects were walked/driven by two surveyors, recording bats in real time. Transects commenced 15 minutes before dusk or, where emergence surveys were carried out, immediately after the dusk emergence surveys and 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, summer and autumn 2023. Table 3-3 summarises survey effort in relation to manual transects and routes are presented in Figure 3-1.

Table 3-3 2023 Manual Activity Surveys

Date	Surveyors	Sunset/Sunrise	Survey Type	Weather	Transect (km)
25th May	Laura McEntegart and Ryan Connors	21:25	Transect	13-17°C; dry; calm.	10
19th July	Laura McEntegart and Nora Szijarto	21:45	Dusk Emergence and Transect	13-14°C; dry; light breeze.	15
20th September	Nora Szijarto and Tom Peters	19:25	Dusk Emergence and Transect	9-12°C; light rain; calm.	6.4
Total 2023 Survey Effort					**31.4**

510000

565000

N

T1

T2

T3

D03

D04

D06

0 0.5 1 km

Map Legend

- EIAR Site Boundary
- Turbine Locations
- Transect 2023.05.25
- Transect 2023.07.19
- Transect 2023.09.20
- Static Detector Location

Emergence Surveys Locations

- 19/07/2023
- 20/09/2023

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title

Survey Effort 2023

Project Title

Curraglass WF

Project No.	Drawing No.	Scale
230339	3.1	1:15,500
Drawn By	Checked By	Date
MNR	MoH	04/09/2025

MKO

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

510000

3.3.4 Ground-level Static Surveys

Where developments have less than 10 turbines, NatureScot requires 1 detector per turbine (up to 10 plus 1 detector for every 3 additional turbines). Given that 3 no. turbines were proposed at the time of the surveys, 3 detectors were deployed to ensure compliance with NatureScot guidance. Automated bat detectors were deployed for at least 10 nights in spring (April-May), 20 nights of summer (June-mid August) and 10 nights of autumn (mid-August-October) (NatureScot, 2021/NIEA, 2021). Detector locations were based on indicative turbine locations. The static detector locations, relative to the final proposed layout, are shown in Figure 3-2 and detailed in Table 3-4.

Table 3-4 Ground Level Static Detectors - Surveys 2023

Location	ITM Grid Ref	Habitat	Linear features	Near Turbine
D03	X 509077 Y 563210	Conifer forestry and earth banks	Edge of the forest	T1
D04	X 509035 Y 562722	Conifer forestry and earth banks	Edge of the forest	T2
D06	X 509004 Y 561979	Conifer forestry and earth banks	Edge of the forest	T3

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

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e., minimum 10 no.) with appropriate weather conditions were captured (i.e., dusk temperatures above 8°C, wind speeds less than 5m/s and rainfall less than 3.5 mm/h). In summer and autumn, an issue with battery occurred, therefore data were collected online from Visual Crossing website for summer and from another Vantage Pro nearby for autumn. Table 3-5 summarises survey effort achieved in 2023 for each of the detector deployments.

Table 3-5 Survey Effort - Ground-level Static Surveys 2023

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	26th April – 9th May 2023	14	12
Summer	19th July – 16th August 2023	29	22
Autumn	5th September – 20th September 2023	15	14
Total survey effort		**58**	**48**

510000

565000

N

T1
D03
T2
D04
T3
D06

0 0.5 1 km

510000

Map Legend

- EIAR Site Boundary
- Turbine Locations
- Static Detector Location

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title
Static Detector Location

Project Title
Curraglass WF

Project No.	Drawing No.	Scale
230339	3.2	1:15,500
Drawn By	Checked By	Date
MNR	MoH	04/09/2025

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

3.4 Bat Call Analysis

All recordings were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls 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. natterer*i)) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of soprano pipistrelle (*P. pygmaeus*) and common pipistrelle (*P. pipistrellus*) are distinguished by having distinct (peak frequency of maximum energy in search flight) peak frequencies of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993). Some overlapping is possible between these species: where no certainty could be achieved, calls were identified to genus level.

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, 2023). 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. Due to the volume of bat activity data recorded, where multiple bat passes were recorded within the same registration, rarer or harder to record species were identified. Underreporting of common species is possible using this method and is accounted for within the assessment.

Echolocation calls by brown long-eared bats (*Plecotus auritus*) are intrinsically quiet and hard to record by static equipment. All data collected, including Noise files and Auto ID files are checked to ensure all calls for this species have been captured. However, a level of underrepresentation is expected for this species and is accounted for in the assessment of activity levels.

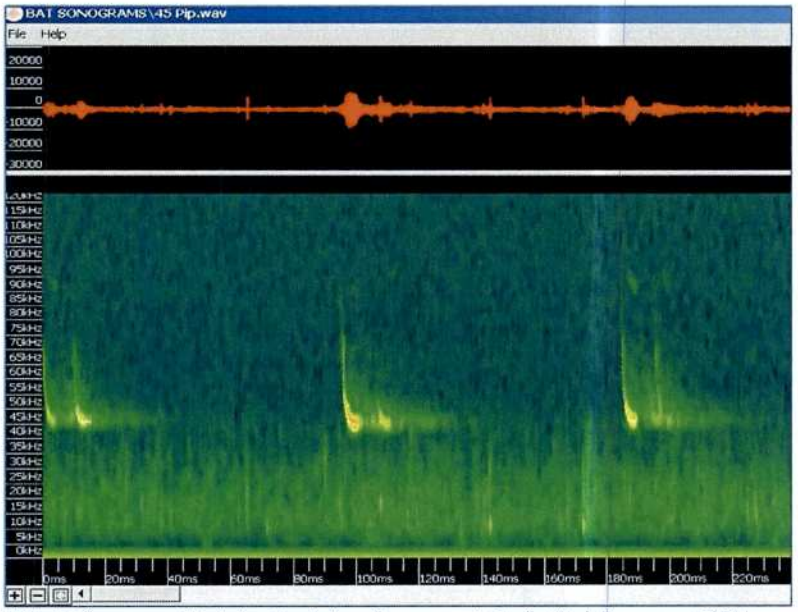


Plate 3-1 Sonogram of Echolocation Pulses of common pipistrelle (Peak Frequency 45kHz)

3.4.1 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).

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 2023 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.

Following preliminary analysis and manual verification using Kaleidoscope Pro, statistical analysis and visualisation was performed using RStudio (version 2023.12.1+402.) and R1 (version 4.3.3). RStudio, an integrated development environment for the R programming language, was employed for data cleaning, exploration, and data visualisation. The 'ggplot2' R package was particularly instrumental in creating the data visualisations shown in the results section. Data was standardised into bat pass rates, calculated as bat passes per hour (total bat passes / night length) to account for seasonal changes in night length (Matthews *et al.* 2016). 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). During all calculations, data was rounded to at least three decimal places. When visualising the bat pass rates per season, survey effort was defined as detector hours (sum of recorded hours across all detectors). This was defined to circumvent any issues arising from differences in survey effort between detectors in a season.

The methodology used to assess 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 all detectors, divided into tertiles. In our methodology, widespread species (*Pipistrellus pipistrellus, Pipistrellus pygmaeus, Nyctalus leisleri*) activity ranges were determined using an average of maximum nightly pass rates (total passes / survey effort) across all detectors, divided into quartiles. For all other species groups, maximum nightly pass rate (bpph) recorded across all detectors, divided into quartiles was used. Activity levels were assessed separately for widespread pipistrelle species (*Pipistrellus pipistrellus, Pipistrellus pygmaeus),* noctules *(Nyctalus leisleri), Myotis spp.* and rare or hard to record species (*Plecotus auritus, Pipistrellus nathusii*). 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 thresholds, any evident outliers recorded across the detectors were excluded. Table 3-7 presents activity ranges per species group identified.

Table 3-7 Site-specific Activity Level Categories based on Maximum Bat Passes per Hour (bpph)

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species					
	***Pipistrellus* spp.**	***Leisler's bat***	***Myotis* spp.**	***Brown long-eared bat***	***Nathusius' pipistrelle***	***Lesser horseshoe bat***
Low	< 3.11	< 0.27	< 0.53	< 0.75	< 0.03	0.10
Medium	3.11 – 9.32	0.27 – 0.82	0.53 - 1.58	0.75 – 2.25	0.03 – 0.08	0.10 – 0.30
High	< 9.32	<0.82	<1.58	<2.25	<0.08	0.30

3.5 Assessment of Collision Risk

3.5.1 Population Risk

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

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

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

Low Population Vulnerability	Medium Population Vulnerability	High Population Vulnerability

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

3.5.2 Site Risk

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

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

Low/Lowest Site Risk (1-2)	Medium Site Risk (3)	High/Highest Site Risk (4-5)

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

3.5.3 Overall Risk Assessment

An overall assessment of risk was made by combining the Site risk level (i.e. Medium) 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 activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values) (**Appendix 3**).

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

3.6 Limitations

A comprehensive suite of bat surveys has been undertaken at the Site in 2023. The surveys undertaken at the Site, in accordance with NatureScot Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Development on bats receptors.

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

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

4. SURVEY RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats. As of 19th August 2025, no response has been received.

4.1.2 Development Applications Unit - NPWS

The Development Applications Unit of the Department of Housing, Local Government & Heritage were also invited to provide any feedback, comments or suggestions they might have relating to the Proposed Development. As of 12th September 2025, no response has been received.

In addition to the scoping exercise, made to the Department of Housing, Local Government & Heritage in February 2025, a request was made on the 24th of July 2025 for a pre-planning meeting with the NPWS to discuss the proposed Biodiversity Management and Enhancement Plan, which is included as part of this application. A follow up request was made on the 30th of July 2025. However, no correspondence was received and no meeting was arranged by the time of lodgement of this application.

4.2 Desk Study

4.2.1 Bat Records

National Biodiversity Data Centre

The National Bat Database of Ireland and National Lesser Horseshoe Bat Database was searched for records of bat activity and roosts within a 10 km radius of the Site (ITM Grid Ref: X 508975 Y 562480). Available bat records were provided by Bat Conservation Ireland on 12/06/2020 and updated records provided on 12/06/2025.. A number of observations have been recorded within 10km; eight roosts, three transects and eleven ad-hoc observations. At least five of Ireland's nine resident bat species were recorded within 10 km of the proposed works including common and soprano pipistrelle, Leisler's bat, brown long-eared bat and Daubenton's bat. The results of the database search are provided in Table 4-1.

Table 4-1 Bat Conservation Ireland Records within 10km of the Site centre

Record	Species	Irish Grid Reference	Date	Location
Roost	*Plecotus auritus*	W0354	N/A	Dromlickarue, Co. Cork
Roost	*Pipistrellus pygmaeus*	W1469	N/A	Ballingeary; Macroom; Co. Cork.
Roost	*Nyctalus leisleri*	W0854	N/A	Gortnacowly, Bantry, Co. Cork
Roost	*Pipistrellus* spp. (45kHz/55kHz)	W1567	N/A	Ballingeary; Macroom; Co. Cork.
Roost	*Plecotus auritus*	V9955	N/A	Dromkeal; Glengarrif; Co. Cork.
Roost	*Pipistrellus* spp. (45kHz/55kHz)	W0073	N/A	Kilgarvan; Co. Kerry

Roost	*Nyctalus leisleri; Pipistrellus pipistrellus ; Pipistrellus pygmaeus; Plecotus auritus*	W0255	N/A	Pearson's Bridge; Ballylicky; Bantry; Co. Cork.
Roost	*Pipistrellus* spp. (45kHz/55kHz)	W1165	N/A	Inchinossig; Ballingeary; County Cork
Roost	*Pipistrellus pygmaeus; Plecotus auritus*	W0271	N/A	Kilgarvan; Co. Kerry
Roost	*Pipistrellus* spp. (45kHz/55kHz)	V9972	N/A	Kilgarvan; CO. Kerry
Roost	*Pipistrellus* spp. (45kHz/55kHz); *Plecotus auritus*	V9972	N/A	Kilgarvan; Co. Kerry
Transect	*Myotis daubentonii*; Unidentified bat	W0484656566	N/A	Carriganass Bridge R584
Transect	N/A	W0234554515	N/A	Pearson's Bridge Transect
Transect	*Pipistrellus pipistrellus* (45kHz); *Pipistrellus pygmaeus*	W0076073265	N/A	V96 (11) 2004-2004
Ad-hoc	*Pipistrellus pipistrellus* (45kHz); *Pipistrellus pygmaeus*	W1354456854	04/09/2008	BATLAS 2010
Ad-hoc	*Myotis daubentonii*; *Myotis* spp.; *Nyctalus leisleri*; *Pipistrellus pipistrellus* (45kHz); *Pipistrellus pygmaeus*	W1665355170	21/08/2008	BATLAS 2010
Ad-hoc	*Pipistrellus pipistrellus* (45kHz); *Pipistrellus pygmaeus*	W0885359019	04/09/2008	BATLAS 2010
Ad-hoc	*Myotis daubentonii; Pipistrellus pipistrellus* (45kHz); *Pipistrellus pygmaeus*	W1891656093	21/08/2008	BATLAS 2010
Ad-hoc	*Myotis daubentonii; Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*	W1872856687	21/08/2008	BATLAS 2010
Ad-hoc	*Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*	W0646456642	04/09/2008	BATLAS 2010
Ad-hoc	*Pipistrellus pipistrellus (45kHz)*	W1638066254	10/06/2018	BATLAS 2020
Ad-hoc	*Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*	W1461366623	11/06/2018	BATLAS 2020
Ad-hoc	*Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*	W0060072900	14/09/2019	BATLAS 2020
Ad-hoc	*Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*	W1637866399	11/06/2018	BATLAS 2020
Ad-hoc	*Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*	W1461266638	10/06/2018	BATLAS 2020

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 (SNH, 2019). Therefore, range maps presented in the 2019 Article 17 Reports (NWPS, 2019) were reviewed in relation to the location of the Proposed Development.

The Site is located within the current range for lesser horseshoe bat, common pipistrelle, soprano pipistrelle, Daubenton's bat, brown long-eared bat and Leisler's bat. The Site is outside the known range for Natterer's bat, Nathusius' pipistrelle and whiskered bat.

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). The Site is situated within the known range of this species. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs within a 10 km radius of the Site found no sites designated for the conservation of bats. One SAC and one pNHA were identified as being designated for bats, the results of which can be seen in Table 4-2.

Glanlough Woods SAC is designated for lesser horseshoe bat. The Site is located outside of the 2.5km core foraging range for this species (NPWS, 2018). Carriganass Castle pNHA is known to historically support a nursery roost of Daubenton's bats. Daubenton's bats have a core sustenance zone of approximately 2km (Collins, 2023). This pNHA is located 5.1km from the Site which is outside of Daubenton's bats core sustenance zone.

Table 4-2 Designated Bat Sites within 10km of the Development

Site Code	Site Name	Results	Distance from site boundary
002315	Glanlough Woods SAC	Lesser Horseshoe Bat	8.8km
002099	Carriganass Castle pNHA	Nursery roost of Daubenton's bats (n=60) in a ruined castle	5.1km

4.2.4 Landscape Features and Habitat Suitability

A review of mapping and photographs provided insight into the habitats and landscape features present at the Site. In summary, the primary land use within the Site is commercial coniferous forestry.

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 or within 10km of the nearest proposed turbine.

A review of the NBDC bat landscape map provided a habitat suitability index of 16.22 (green). This indicates that the Site area has low habitat suitability for bat species.

4.2.5 Additional Projects in the Wider Landscape

Table 4-3 provides an overview of wind farm developments within 5 and 10 km of the proposed turbines.

Table 4-3 Wind farm developments within 10km of the proposed turbine locations

Wind Farm Name and Location	No. Turbines	Status	Turbine Height
Within 5 km of proposed Curraglass Wind Farm			
Maughanaclea, Co. Cork	6 within 5km, 8 within 10km Total Turbines: 14	Pre-application	169m
Within 10 km of proposed Curraglass Wind Farm			
Grousemount, Co. Kerry	38	Existing	126m
Derragh, Co. Cork	6	Existing	150m
Shehymore, Co. Cork	11	Existing	125m
Gortloughra, Co. Cork	8	Proposed	175m
Carrigarierk, Co. Cork	5	Existing	140m
Carrigarierk Extension, Co. Cork	3	Permitted	176.5m

4.3 Field Surveys

4.3.1 Bat Habitat Suitability Appraisal

4.3.1.1 Proposed Development

A total of sixteen habitats were recorded within the Site including:

- Conifer Plantation & Recently felled/replanted forestry
- Spoil and Bare Ground
- Recolonising Bare Ground
- Buildings and Artificial Surfaces
- Oak-birch-holly woodland and Mixed broadleaved woodland
- Wet Heath/Upland Blanket Bog/ Montane Heath/ Exposed Siliceous Rocks
- Wet Grassland
- Scrub
- Dense Bracken
- Eroding/Upland Rivers
- Drainage Ditches

Further details on habitats within the Site can be found in Chapter 6 (Biodiversity) of the main EIAR. The majority of the land cover within the Site were characterised as Conifer Plantation & Recently felled/replanted forestry, Spoil and Bare Ground, Recolonising Bare Ground and Wet heath/upland blanket bog/exposed siliceous rock.

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 (2023). Suitability categories, divided into *High, Moderate, Low, Negligible* and *None* and are described fully in **Appendix 1.**

With regard to foraging and commuting bats, areas of closed canopy forestry as well as recently felled/planted forestry and exposed areas of peatland habitats were considered *Low* suitability, i.e. *Habitat*

that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated (Collins, 2023). Forestry edge and scrub habitats may provide greater foraging and commuting opportunities. These habitats within the Site are connected to the wider landscape by mature hedgerows, treelines and rivers. As such, these habitats were classified as *Moderate* suitability, i.e. *Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water* (Collins, 2023).

With regard to roosting bats, a targeted roost survey of every tree within the Site was considered unnecessary. However, an assessment of the various woodland and forestry habitats was undertaken. Trees present on site comprise a mixture of mature and immature commercial coniferous species. The dominant commercial species planted were Sitka Spruce *(Picea sitchenis)*, with smaller areas of Lodgepole Pine *(Pinus contorta)* and Japanese Larch *(Larix kaempferi)* recorded. These were assessed as having no potential *(None)* to *Negligible* roosting potential due to their lack of suitability and roosting opportunities. One structure was identified within the Site and is discussed further in Section 4.3.2 below.

A linear band of Oak-Birch-Holly Woodland is located along the north-eastern boundary of the Site between the existing local road and conifer plantation. This habitat contained species including Oak *(Quercus petraea)*, Ash *(Fraxinus excelsior)*, Hazel *(Corylus avellana)*, Birch *(Betula pubescens)*, and Alder *(Alnus glutinosa)*. This area was assessed as having *Low-Moderate* roosting potential for bats.

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

4.3.1.2 Turbine Delivery Route (TDR)

As described in Chapter 4 (Description of the Proposed Development), Section 4.5.3 of this EIAR, turbine delivery route accommodation works will be required at potential 'pinch points' to facilitate the delivery of turbine components and other abnormal loads to the Site during the construction phase.

The habitats along the majority of pinch points identified along the TDR are comprised of existing regional road (R584 and R585), classified as *Buildings and artificial surfaces*, which are bordered by a combination of both *Hedgerows* and *Treelines, Scattered trees and parkland* and *Amenity grassland*, in addition to *Improved agricultural grassland* and *Wet grassland*. Typical roadside hedgerow species throughout the TDR include Bramble (*Rubus fructicosus agg.*), gorse (*Ulex europeaus*), ivy (*Hedera hibernica*), hawthorn (*Crataegus monogyna*), and Willow (*Salix spp.*). Treelines typically consisted of Ash (*Fraxinus excelsior*), hawthorn (*Crataegus monogyna*), and sycamore (*Acer pseudoplatanus*). Areas of *Dense bracken* and *Dry meadows and grassy verges* were also recorded roadside throughout the TDR. Mapped watercourses classified as *Eroding/upland rivers* and *Depositing/lowland rivers* traversed the pinch points with these areas being surrounded by *Riparian woodland* and *Mixed broadleaved woodland*. Further details on habitats associated with the TDR are outlined in Chapter 6 (Biodiversity).

With regard to foraging and commuting bats *Buildings and artificial surfaces, Scattered trees and parkland, Amenity grassland, Improved agricultural grassland, Wet grassland, Dry meadows and grassy verges* are considered to have *Negligible* to *Low* suitability. Hedgerows, treelines, rivers and woodland habitats are considered to have *Moderate* suitability for foraging and commuting bats.

Regarding roosting bats, habitats including roadways, grasslands, hedgerows and watercourses along the TDR were assessed as having no (None) roosting potential. Additionally, no trees with significant features that could support large colonies of roosting bats were identified within the TDR pathway. As such trees along the TDR pinch points were assessed as having no (*None*) to *Negligible* roosting potential due to their size and lack of available roost features.

4.3.2 Roost Surveys

4.3.2.1 Daytime Roost Inspections

Following the search for roosts in 2023, one structure (ITM Grid Ref: X 508844 Y 562170) containing potential suitable bat roost features was identified. No trees with significant suitable PRFs were identified within the search area. The majority of the trees consist of commercial conifer plantation stock with no potential or *Negligible* roosting potential. Trees along the TDR consisted of a mix of broadleaved species which also lacked significant suitable roost features to support roosting bats.

The grading protocol described by Collins (2023) was used: structures with *High* roosting potential present one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat.; structures with *Moderate* roosting potential could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status; structures with *Low* potential present one or more potential roost sites that could be used by individual bats opportunistically at any time of the year.

The identified structure (existing onsite 38kV substation) was subject to interior and exterior inspections to search for evidence of bats. Details of the inspection surveys are illustrated in Plate 4-1 to 4-4 3-1. It is located approximately 280m northwest of the proposed turbine T03. The structure will be retained and no building works on this structure are proposed as part of the Proposed Development.

In the northeastern room, potential feeding remains (Plate 4-3) and bat droppings (Plate 4-4) were identified and a single bat was observed hanging on a wooden beam in the attic space in July 2023.The bat species could not be identified with certainty from ground level but was suspected to be a brown long-eared bat. Suitable potential access points for bats were identified through holes between the metal doors joints and the building walls, between the tiles and under the ridge tiles. The building was assigned a *Moderate* roosting potential, however no signs of significant roosting was identified. At night, surveyors noted external orange lights located south, east and west of the building. The lights were activated by movement and stayed on for 10 minutes whenever activated.

Plate 4-1 existing onsite 38kV substation exterior

Plate 4-2 existing onsite 38kV substation attic space

Plate 4-3 Potential feeding remains

Plate 4-4 Bat droppings

4.3.2.2 Emergence Surveys

The existing onsite 38kV substation was the focus of two emergence surveys in 2023. On the nights of the 19th July 2023, three bats were seen emerging from the building approximately 15 minutes after sunset. The first two bats identified as common pipistrelles emerged at 21:58 from under the gap in the northwestern tiles (Plate 4-6) and flew west. A third bat, also identified as a common pipistrelle, emerged at 22:00 from the upper right hinge of the southeast metal door (Plate 4-5) and flew west. No bats were observed emerging from the building on the 20th of September 2023. It is suspected that the building is likely to be used only for opportunistic roosting by small numbers of bats.

Table 4-4Emergence Surveys Summary 2023

Date	Survey Type	PRF surveyed	ITM Grid Ref	Results
19/07/2023	Dusk Emergence	Existing onsite 38kV substation	X 508844 Y 562170	3 common pipistrelles emerging
20/09/2023	Dusk Emergence			No emergence

Plate 4-5 Emergence point (red arrow) and flight direction (yellow arrows).

Plate 4-6 Emergence point (red arrow) and orange light at night.

4.3.3 Manual Transects

Manual bat activity surveys were undertaken in spring, summer and autumn 2023. Bat activity was recorded on all surveys. A total of 606 bat passes were recorded across all surveys (Plate 4-7). In general, common pipistrelle (n=541) was recorded most frequently, followed by soprano pipistrelle (n=57) and

Leisler's bat (n=5). Two instances of *Myotis* spp. were recorded and one instance of brown long-eared bat was observed.

Species composition and activity levels varied across the survey periods. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-8 presents the results for individual species per survey period. Figures 4-3 – 4-5 present the spatial distribution of bat activity across surveys. All transects followed the tracks/roads through the forest leading to the existing turbine bases.

Bat distribution around the Site seemed to be more abundant in the southern part of the Site where the conifer forestry is denser. Bat's behaviours noted by the surveyors corresponded to commuting or to foraging. In some areas, bats were recorded continuously circling by and feeding buzzes were heard. Some social calls were also noted.

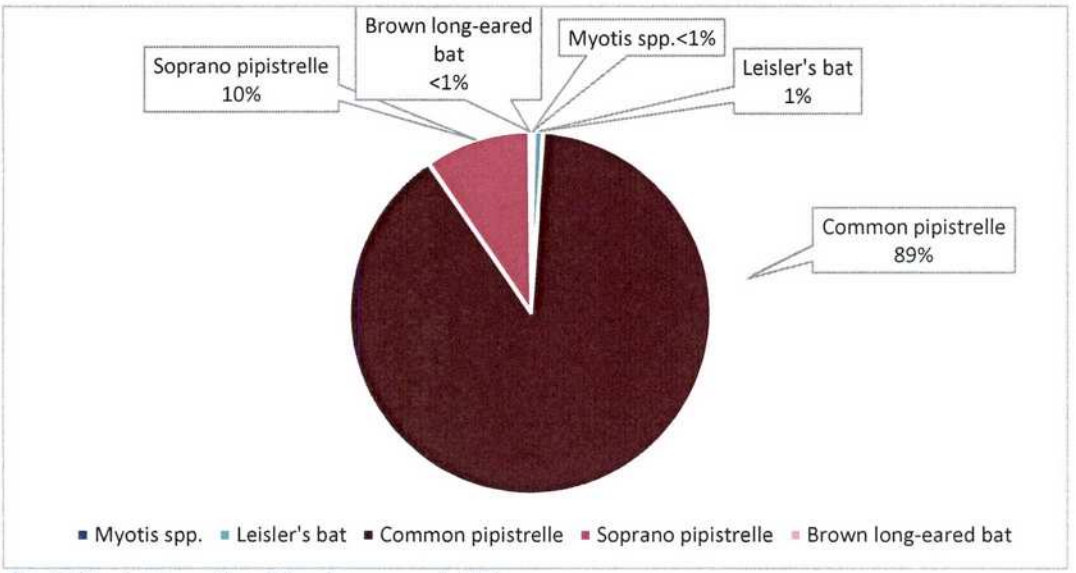


Plate 4-7 Species Composition - Manual surveys results 2023

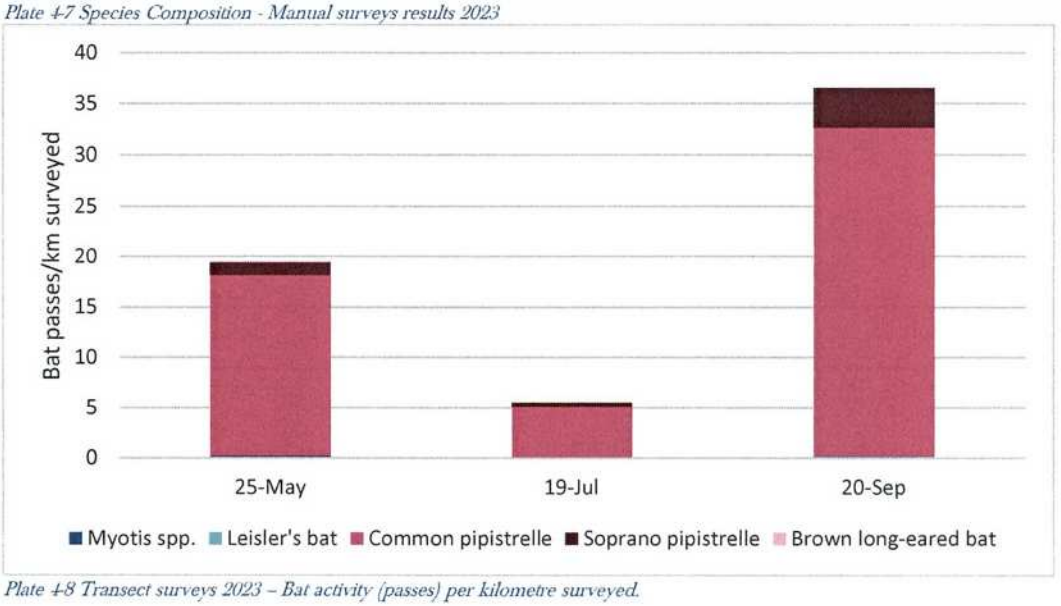


Plate 4-8 Transect surveys 2023 – Bat activity (passes) per kilometre surveyed.

510000

565000

N

T1

T2

T3

0 0.5 1 km

510000

Map Legend

- EIAR Site Boundary
- Turbine Locations
- Transect 2023.05.25

Manual Results - 2023.05.25

- Myotis Species
- Common Pipistrellle
- Soprano Pipistrelle
- Brown long-eared bat

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title

Manual Result - Spring

Project Title

Curraglass WF

Project No.	Drawing No.	Scale
230339	4.1	1:15,500
Drawn By	Checked By	Date
MNR	MoH	04/09/2025

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

510000

565000

N

T1

T2

T3

0 0.5 1 km

Map Legend

- EIAR Site Boundary
- Turbine Locations
- Transect 2023.07.19

Manual Results - 2023.07.19

- Leisler's bat
- Common Pipistrellle
- Soprano Pipistrelle

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title
Manual Result - Summer

Project Title
Curraglass WF

Project No.	Drawing No.	Scale
230339	4.2	1:15,500
Drawn By	Checked By	Date
MNR	MoH	04/09/2025

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

510000

565000

N

T1

T2

T3

0 0.5 1 km

510000

Map Legend

- EIAR Site Boundary
- Turbine Locations
- Transect 2023.09.20

Manual Results - 2023.09.20

- Leisler's bat
- Common Pipistrelle
- Soprano Pipistrelle

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title
Manual Result - Autumn

Project Title
Curraglass WF

Project No.	Drawing No.	Scale
230339	4.3	1:15,500
Drawn By	Checked By	Date
MNR	MoH	04/09/2025

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

4.3.4 Ground-level Static Surveys

In total, 7,558 bat passes were recorded across all deployments. Common pipistrelle (n=6,124) occurred most frequently. Soprano pipistrelles (n= 615) occurred as second most recorded species, followed by brown long-eared bats (n=342), Leisler's bat (n=253) and *Myotis spp.* (n= 196). Instances of lesser horseshoe bats (n= 27) and Nathusius' pipistrelle (n=1) were less numerous. Plate 4-9 presents relative species composition across all ground-level static detector surveys.

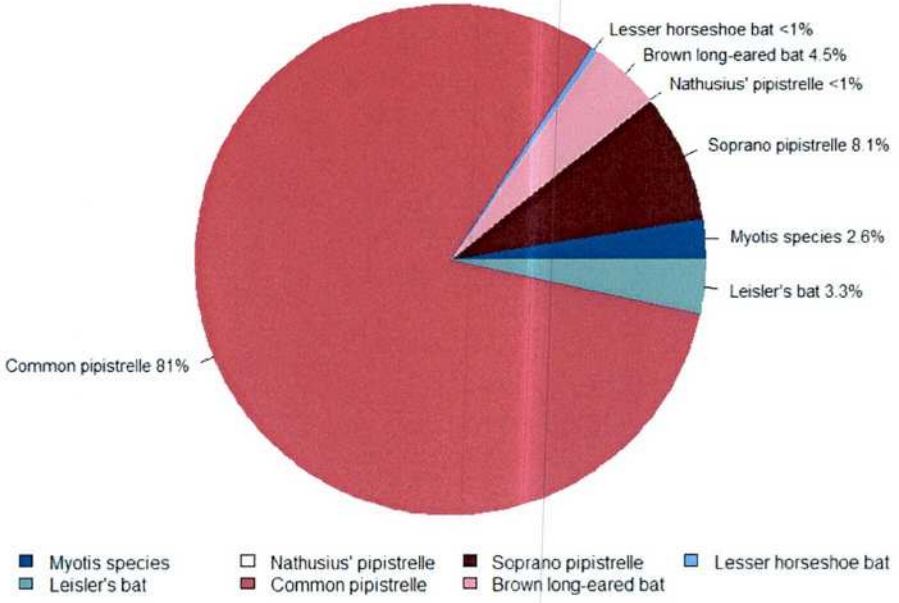


Plate 4-9 Species composition across all deployments 2023.

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. The Nightly Pass Rate (i.e. bat passes per hour, per night) was used to determine typical bat activity at the Site. Plates 4-10 and Table 4-5 presents these results for each species per season. 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).

Activity per nights tended to vary in activity level and species composition (Plate 4-11). Bat species using the Site on a regular basis corresponded to common and soprano pipistrelles with lower levels of brown long-eared bats, Leisler's bat, *Myotis* spp.. Lesser horseshoe bats were recorded occasionally and Nathusius' pipistrelle were rare.

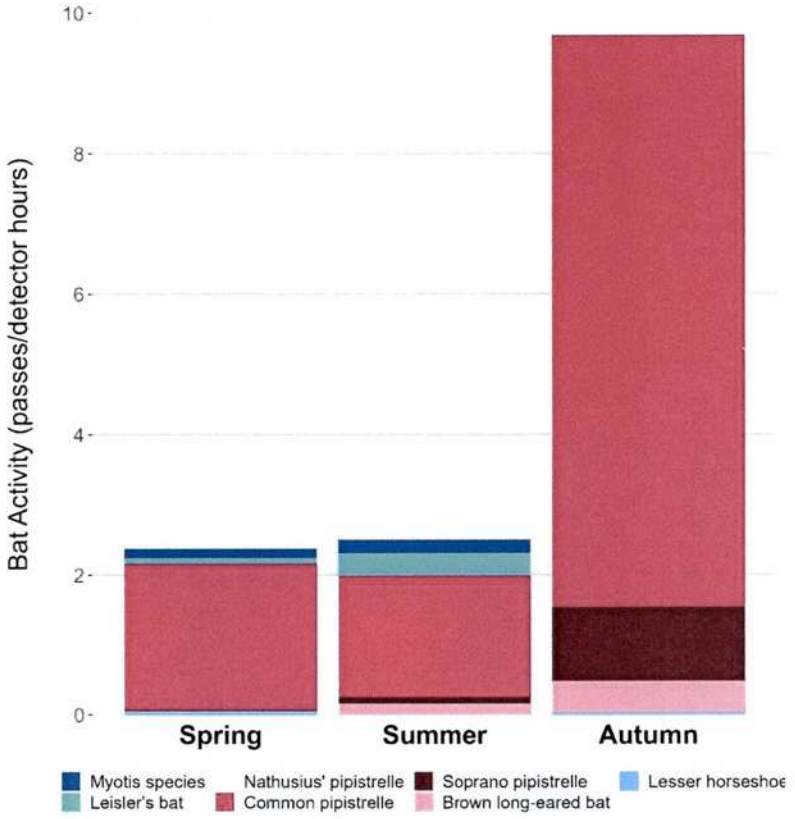


Plate 4-10 2023 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

Table 4-2 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

	Spring	Summer	Autumn
Total Survey Hours	**379.9**	**721.2**	**500**
Myotis spp.	0.1	0.2	-
Leisler's bat	0.1	0.3	-
Nathusius' pipistrelle	-	0.0	-
Common pipistrelle	2.1	1.7	8.1
Soprano pipistrelle	0.02	0.1	1.0
Brown long-eared bat	0.02	0.2	0.5
Lesser horseshoe bat	0.03	0.0	0.02

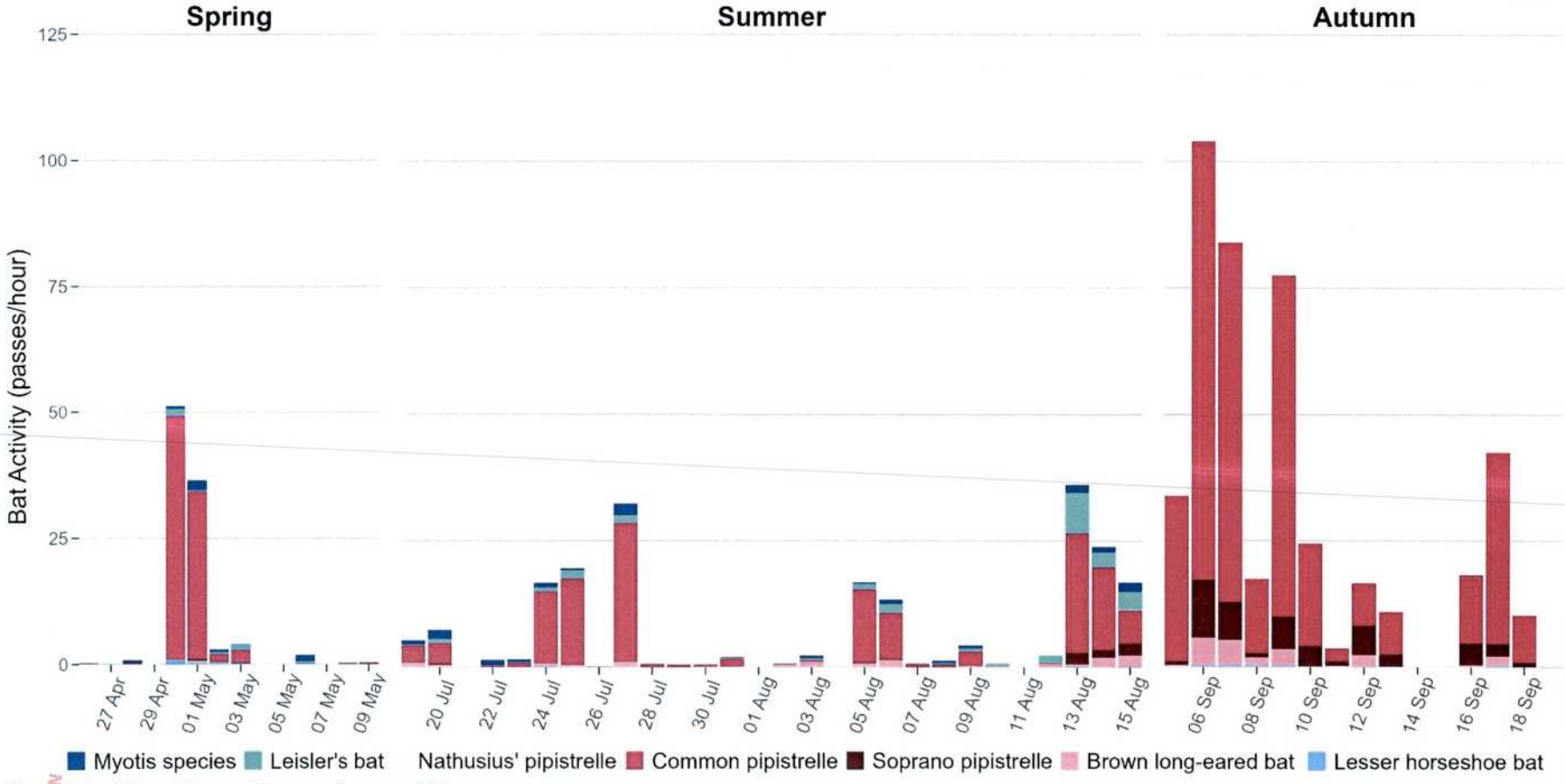


Plate 6-11 Total Bat activity per nights across the seasons 2023.

Median bat passes per detector was used to assess the level of activity per location and per season. The plates below illustrate the median bat passes per detector across the seasons with varied y-axis (Plate 4-12) and same y-axis (Plate 4-13) allowing for comparison. It should be noted that a median of zero does not necessarily mean that were was no bat activity at the location. Table 4-3 below gives the raw number of bat passes per detector per season and shows that there was rarely 0 bat passes on a detector except for rare species.

In spring, median bat activity tended to differ by location. At D03 (T1), the median results presented exclusively *Myotis spp.* while D04 (T2) had zero data and D06 (T3) presented exclusively recordings from common pipistrelle. Even though bats were recorded at D04, the corresponding bat activity tended be lower than at other location as the median equalled zero.

In summer, median activity species composition by location tended to be more diverse than in spring with the presence of Leisler's bats and brown long-eared bats while median bat activity for soprano pipistrelles was close to zero during summer. The highest median activity was recorded at D06 with common and soprano pipistrelles, brown long-eared bat, *Myotis spp.* and Leisler's bat recorded. Summer' median bat activity tended to be below 1.0 at all locations.

In autumn, the median bat activity tended to be higher than in spring and summer. Activity was dominated by common pipistrelle at all 3 detector locations, with the highest median activity at D04 (T2). With the exception of common pipistrelle, autumn median bat activity for soprano pipistrelle and brown long-eared bat tended to be below 1.0 at all locations.

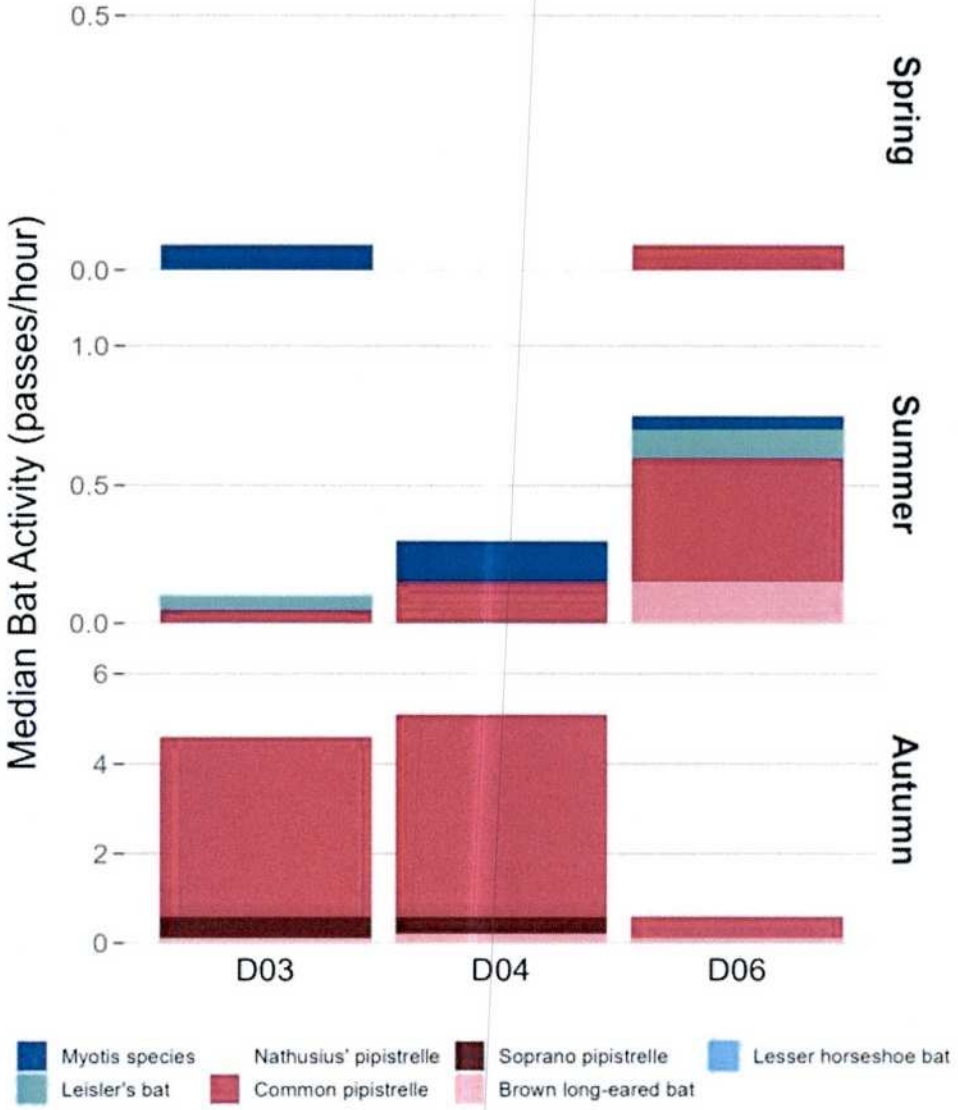


Plate 4-12 Median bat activity per detector across the seasons 2023 with different y-axis.

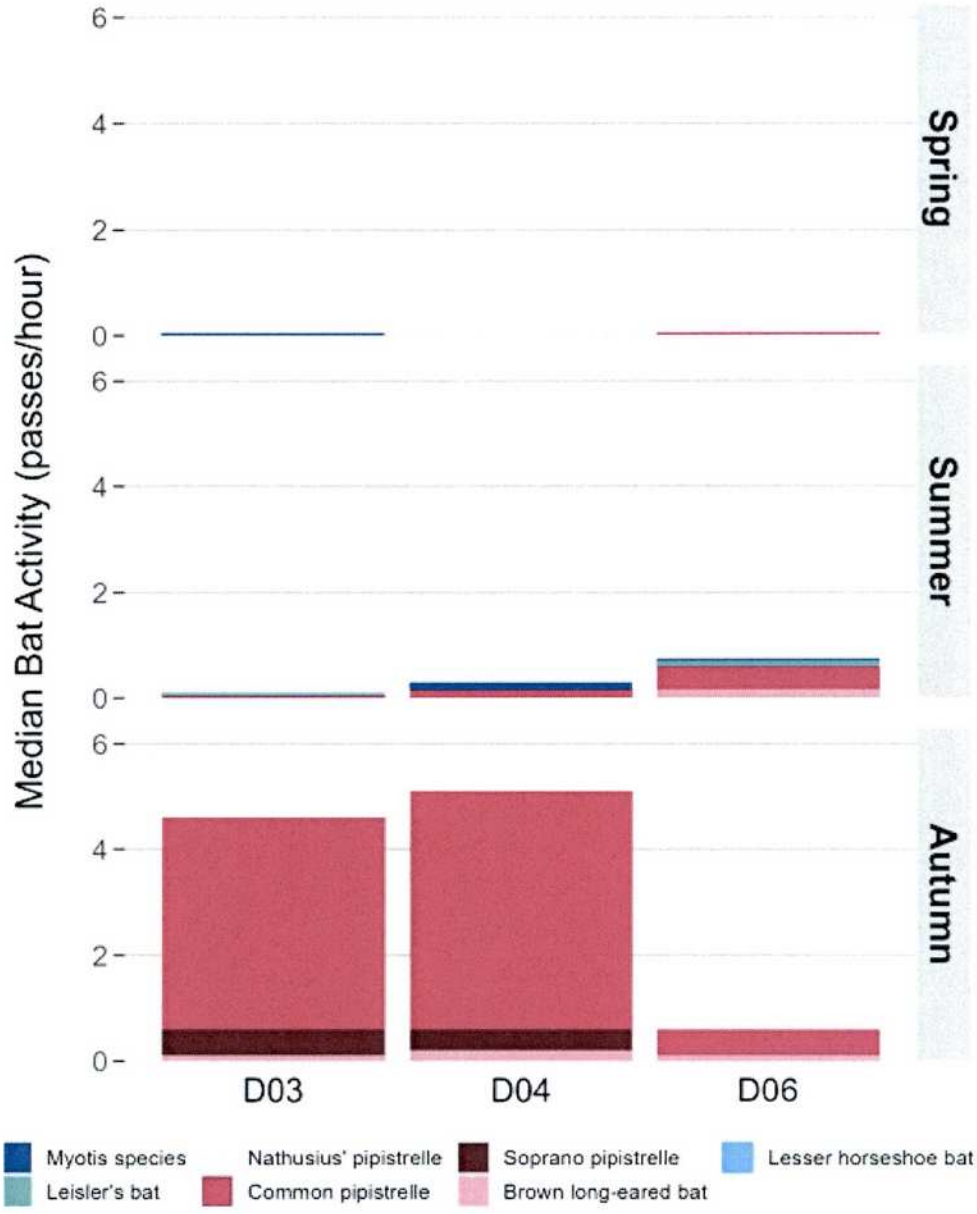


Plate 4-13 Median bat activity per detector across the seasons 2023 with same y-axis allowing for comparisons.

Weather (rainfall, windspeed and temperature) at night during deployments are presented below. Spring had the highest level of rainfall per nights while windspeed was the highest during summer.

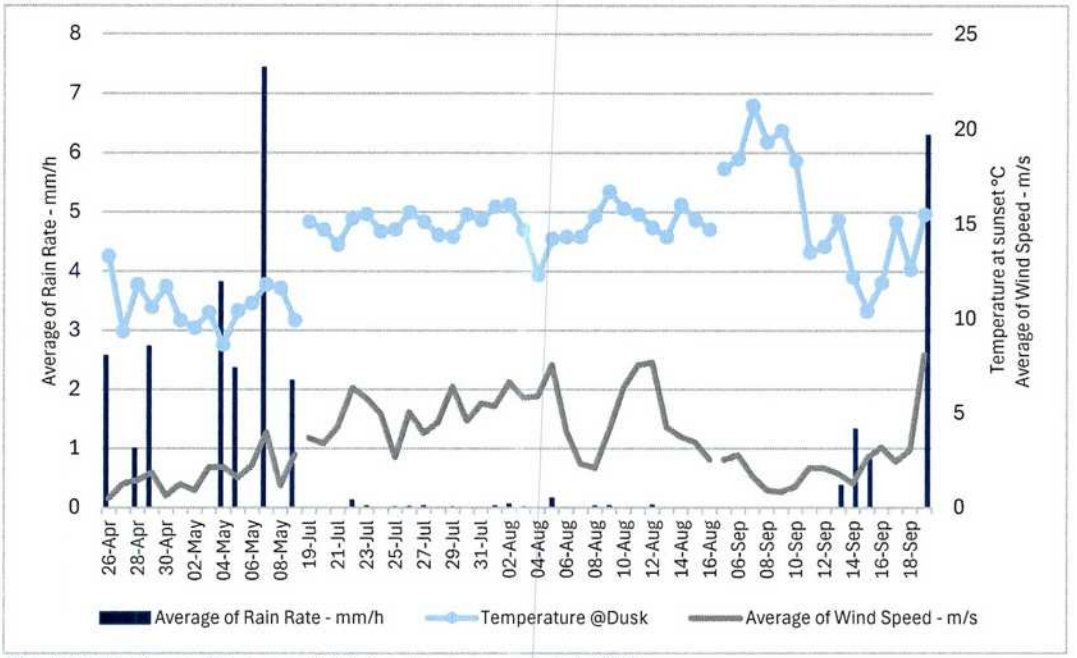


Plate 4-14 Weather conditions recorded during static survey periods in 2023

Table 4-3 Total bat passes per season per detector 2023.

Static detectors	D03 (T1)	D04 (T2)	D06 (T3)
Spring			
Myotis spp.	30	13	8
Leisler's bat	9	8	12
Nathusius' pipistrelle	0	0	0
Common pipistrelle	36	713	46
Soprano pipistrelle	2	6	1
Brown long-eared bat	1	2	5
Lesser horseshoe bat	5	3	4
Summer			
Myotis spp.	21	89	35
Leisler's bat	74	69	81
Nathusius' pipistrelle	0	1	0
Common pipistrelle	103	492	663
Soprano pipistrelle	23	31	17
Brown long-eared bat	4	30	75
Lesser horseshoe bat	1	2	0
Autumn			
Myotis spp.	0	0	0
Leisler's bat	0	0	0
Nathusius' pipistrelle	0	0	0
Common pipistrelle	1687	1274	1110
Soprano pipistrelle	310	106	119
Brown long-eared bat	56	78	91
Lesser horseshoe bat	5	3	4

4.4 Assessment of Bat Activity Levels 2023

4.4.1 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 Site as adapted from Mathews *et al.* (2016).

Leisler's bat

Leisler's bat activity was generally Low across the Site, with High activity peaks (maximum) recorded in summer. Median levels were low across all seasons. Leisler's bat are considered to be a species at high-risk of collision due to their higher altitude of flying, particularly at the height of wind turbine sweep areas. Ireland is considered a stronghold for the species, which is relatively rare in other areas of Europe: adaptive risk mitigation measures and monitoring at height is particularly important for this species.

Pipistrelle species – common and soprano

Common pipistrelle bat activity was dominant throughout the Site. Median activity levels were Low in spring and summer, with low-moderate median levels in autumn at D03 (T1) and D04 (T2). D06 (T3)

recorded Low median levels in autumn. High activity peaks were recorded at all detector locations in autumn and at D04 and D06 in summer. D04 also saw high activity peaks in spring.

Soprano pipistrelle bat activity was generally low across the Site. Median and maximum levels were Low across spring and summer. Autumn saw Low median levels; however, low-moderate peak activity levels were recorded at D03 and D06.

These species are considered at high-risk of collision with wind turbines. Soprano and common pipistrelles were observed commuting and foraging along forestry edges.

A small common pipistrelle roost (3no. individuals) was found within the existing onsite 38kV substation. The nature of the roost was assessed as opportunistic as only a small number of bats were recorded.

Nathusius' pipistrelle bat

The Proposed Development is located outside this species' current known range (Article 17); however, one bat pass was recorded in summer at D04 (T2). Median levels were low across all seasons with a high peak activity level in summer at D04.

Woodland Species – *Myotis spp.* and brown long-eared bat

Myotis spp. and brown long-eared bats are positively associated with woodlands and, while conifer plantations habitats like the ones present on site might not provide ideal roosting habitat for these species, they provide suitable foraging grounds. Activity by these species was regularly occurring during each season, with less brown long-eared bat activity recorded in spring and summer than autumn. While Myotis species were more active in spring and summer, with no recordings in autumn.

Myotis spp. median bat activity was recorded as Low throughout the seasons, with a High maximum activity in summer at D04 (T2).

Brown long-eared bat activity was generally low but picked up in autumn throughout the Site. Median activity levels were low across all seasons, while maximum activity levels were medium to high in autumn.

Myotis spp. bats and brown long-eared bats are not considered to be at high risk of collision with wind turbines, as they tend to commute and forage at low altitudes in proximity of linear features and within woodland environments. The Site provides suitable foraging and commuting habitat but has little roosting potential.

Lesser horseshoe bat

Activity levels for this species were low overall. A small number of lesser horseshoe bat passes were detected across the Site during static detector surveys, with a total of 27 bat passes recorded in 2023.

The species occurred at all static detector locations across the Site, in at least one season. They were recorded at each of the three detectors in spring and autumn, and at D03 (T1) and D04 (T2) only in summer. A total of 12no. bat passes were recorded in spring and autumn and 3no. bat passes in summer.

Table 4-4 Median and maximum bat activity per detector. High, medium and low bat activity assessment

Species	Season	Bat activity (bpph)	D03 (T1)	D04 (T2)	D06 (T3)
Myotis sp.	Spring	Median	0.05	0	0
		Maximum	1.3	0.5	0.3
	Summer	Median	0	0.15	0.05
		Maximum	1	2.1	0.7
	Autumn	Median	0	0	0
		Maximum	0	0	0
Leisler's bat	Spring	Median	0	0	0
		Maximum	0.3	0.6	0.9
	Summer	Median	0.05	0	0.1
		Maximum	2.5	3.5	2
	Autumn	Median	0	0	0
		Maximum	0	0	0
Nathusius' pipistrelle	Spring	Median	0	0	0
		Maximum	0	0	0
	Summer	Median	0	0	0
		Maximum	0	0.1	0
	Autumn	Median	0	0	0
		Maximum	0	0	0
Common pipistrelle	Spring	Median	0	0	0.05
		Maximum	1.2	45.9	1.9
	Summer	Median	0.05	0.15	0.45
		Maximum	2.2	15	18.5
	Autumn	Median	4	4.5	0.5
		Maximum	42.4	27.2	50.3
Soprano pipistrelle	Spring	Median	0	0	0
		Maximum	0.1	0.2	0.1
	Summer	Median	0	0	0
		Maximum	1	1.5	0.8
	Autumn	Median	0.5	0.4	0

		Maximum	7.6	2.7	5.1
Brown long-eared bat	Spring	Median	0	0	0
		Maximum	0.1	0.2	0.4
	Summer	Median	0	0	0.15
		Maximum	0.1	1.2	1.2
	Autumn	Median	0.1	0.2	0.1
		Maximum	1.6	3	2.1
Lesser horseshoe bat	Spring	Median	0	0	0
		Maximum	0.2	0.1	0.4
	Summer	Median	0	0	0
		Maximum	0.1	0.1	0
	Autumn	Median	0	0	0
		Maximum	0.1	0.2	0.2

4.5 Importance of Bat Population Recorded at the Site

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

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976, as amended. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the Siteare utilized by a regularly occurring bat population of Local Importance. The lesser horseshoe bat population recorded within the Site was assigned **National Importance**.

During the 2023 surveys, one small opportunistic roost containing common pipistrelle (3no.), was identified. However, this roost was characterized by limited emergences, with only single-digit counts observed. No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the Siteduring the 2023 surveys.

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 Proposed Development on bats.

5.1 Collision Mortality

5.1.1 Assessment of Site-Risk

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

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

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	One low-value roost (≤10 specimens) containing common pipistrelle, was identified within the Site. The habitats within the Site provides low to moderate suitability commuting and foraging habitat for bats and is connected to the wider landscape by linear features such as tree lines and waterways. Despite the presence of these linear features, it does not provide an extensive and diverse habitat mosaic of high quality 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 small scale as it consists of <10 turbines (3 no. turbines). However, since these turbines exceed 100m in height, the project falls into the Medium project size category. The project is not a strategic infrastructural development and is well below the number of turbines that would constitute a Large development (NatureScot, 2021). There is one pre-application wind energy development within 5km and seven (existing/proposed/permitted) other wind energy developments within 10km of the Site.	Medium
Site Risk Assessment (from criteria in Plate 3-3)		**Medium Site Risk (3)**

The Proposed Development is located in an area of predominantly commercial coniferous forestry. As per Table 3a of the NatureScot Guidance (2021), the Proposed Development has a *Moderate* habitat risk and *Medium* project size (Small scale development including 8 turbines but comprised of turbines >100m in height). 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 2021 guidance (**Appendix 3**), 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 the 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 the following low risk species were recorded:

- *Myotis spp.*
- Brown long-eared bat
- Lesser horseshoe bat

Overall activity levels for brown long-eared bat, *Myotis spp.* and lesser horseshoe bat were low; therefore, no significant collision related effects are anticipated. Loss of habitat is assessed further in Section 5.2 and 5.3. below. Activity levels for these species will continue to be assessed during operational monitoring following the implementation of best practice mitigations provided. Further mitigation will be implemented after Year 1 if deemed necessary.

5.1.2.1 Leisler's bat

The 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 vulnerability which have a high collision risk (Plate 3-2). Leisler's bats were recorded during all activity surveys across the Site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021), overall activity risk for Leisler's bat was found to be ***Low*** across all seasons at typical activity levels and ***Medium-High*** at peak activity levels in summer and autumn (See Table 5-2 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Site, which is primarily conifer plantations with low levels of bat activity recorded during the walked transects undertaken at the Site.

Thus, the overall collision risk level for the local population of Leisler's bat is generally assessed as ***Low***.

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 2023	Medium (3)	Low (1)	Typical Risk is Low (3)	Moderate-High (4)	Peak Risk is Medium (12)
Summer 2023		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn 2023		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

5.1.2.2 Soprano pipistrelle

The Site is within range for soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle are classed as a common species of a medium population vulnerability which have a high potential collision risk (Plate 3-2). Soprano pipistrelle was recorded during activity surveys across the Site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021) overall activity risk for soprano pipistrelle was found to be ***Low*** at typical activity levels across all seasons. Peak activity levels were also ***Low*** 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 Site, which is primarily conifer plantations with low levels of bat activity recorded during the walked transects undertaken at the Site.

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 2023	Medium (3)	Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Summer 2023		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Autumn 2023		Low (1)	Typical Risk is Low (3)	Low-Moderate (2)	Peak Risk is Medium (6)

5.1.2.3 Common pipistrelle

The 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 vulnerability which have a high collision risk (Plate 3-2). Common pipistrelle were recorded during all activity surveys across the 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 at Typical Activity levels was found to be ***Low*** across all seasons. Peak risk levels for common pipistrelle was found to be ***Medium*** in spring and summer with ***High*** peaks in autumn. (See Table 5-4 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Site which is primarily conifer plantations with moderate levels of bat activity recorded during the walked transects undertaken.

Thus, there is a ***Low – 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 21	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2023	Medium (3)	Low (1)	Typical Risk is Low (3)	Low-Moderate (2)	Medium (6)
Summer 2023		Low (1)	Typical Risk is Low (3)	Moderate-High (4)	Medium (12)
Autumn 2023		Low-Moderate (2)	Typical Risk is Medium (6)	High (5)	High (15)

5.1.2.1 Nathusius' pipistrelle

The Site is within 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 most of the 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*** at typical activity levels across all seasons. Peak activity was ***Low*** in spring and autumn with ***Medium*** activity in summer (See Table 5-5 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Site, which is primarily conifer plantations, with no 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)	Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Summer		Low (1)	Typical Risk is Low (3)	Low-moderate (2)	Peak Risk is Medium (6)
Autumn		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

5.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species was typically ***Low*** to ***Medium***. Overall bat activity levels were typical of the nature of the Site, which is predominantly conifer plantations, existing infrastructure and peatland habitats.

During manual transect surveys, the majority of activity recorded was common pipistrelle. No detectors recorded High median activity levels during any season surveyed. However, in line with best practice guidance, a monitoring and mitigation strategy has been devised for the Proposed Development, in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance and based on the Site-specific data. After year 1 monitoring, if a curtailment requirement is identified, 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 if deemed necessary.

5.2 Loss or Damage to Commuting and Foraging Habitat

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. The Proposed Development is predominantly located in conifer plantation and clearfell with existing turbine infrastructure present.

Approximately 4.5ha of conifer forestry will be felled to accommodate the Proposed Development and its associated infrastructure. Chapter 4 (Description of the Proposed Development), Figure 4-14 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Development. 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. It should be noted that conifer forestry on the Site 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 commercial forestry will have a positive effect by opening up large areas of formerly closed canopy commercial forestry i.e. there will be more linear forestry edge habitat created. This will likely have a positive impact on bats as it will provide more commuting and foraging opportunities. Overall, the Proposed Development works will retain areas of linear forestry edge habitats.

Biodiversity enhancement measures are proposed in the form of riparian woodland planting. To create a permanent corridor from the Site to the wider environment, it is proposed to plant approx. 350m of riparian woodland either side of a section of the Lackavane river in the southwestern corner of the Site. This will amount to approx. 0.7 ha in area, with a total of approx. 700m of linear habitat. This area has been selected as, once established, it will create a permanent commuting corridor for bats from the Site to lands to the west and south.

Given the extensive area of habitat that will remain undisturbed throughout the Site and the avoidance of the most significant areas of faunal habitat i.e. (broadleaved woodland), alongside the planting of riparian woodland, no significant effects with regard to loss of commuting and foraging habitat are anticipated.

As described in Chapter 4 (Description of the Proposed Development), Section 4.5.3 of this EIAR, turbine delivery route accommodation works are required to facilitate the delivery of components to the Site. There are sections on the TDR where potential pinch points will require the temporary loss of habitat. Approximately 316m of Hedgerows, and 0.054ha of Scrub is to be removed to facilitate the TDR. There will be approximately 650m of Treelines and 0.069ha of Mixed broadleaved woodland cut back to accommodate the oversail of the turbine blades during delivery. The cutting back of trees along the TDR pinch points will result in a negligible loss of habitat and connectivity for commuting and foraging bats will remain. All vegetation removed will be re-instated on the completion of works.

Therefore, no significant effects on commuting and foraging bats associated with the turbine delivery route are anticipated.

5.3 Loss of, or Damage to, Roosts

The Proposed Development is predominantly located within conifer plantations (at various stages of maturity) and peatland habitats. The trees contained within the commercial conifer forestry do not provide significant suitable roosting habitat for bats. There will be some requirement to remove trees to facilitate the proposed bat buffers, as detailed in Section 6.1.3 below. Trees within the bat buffers consist of conifer species and were assessed as having no potential (*None*) to *Negligible* suitability for roosting bats.

One structure was identified within the Site and was subject to inspections and dusk activity surveys. A small common pipistrelle roost (3no. individuals) was identified within the existing on site 38kV substation using it opportunistically in 2023. This structure will be retained and no building works on this structure are proposed as part of the Proposed Development. Some minor short-term works will be required adjacent to the building to connect the internal cable network to the existing onsite 38kV substation. A pre-commencement survey will take place prior to these works to ensure bats are not present during the works.

There will be some requirement to temporarily trim trees to allow for oversail during the delivery of turbine components. No significant potential roost features were identified along the TDR pinch points and trees were assessed as having no (*None*) to *Negligible* potential. It was noted that Carriganass Castle

is a historic Daubenton's bat roost and is located adjacent to the proposed TDR route. Carriganass Castle will be entirely avoided as part of the TDR and no loss of roosting habitat is anticipated.

No potential for significant effect with regard to the loss of, or damage to roosting habitat as a result of the Proposed Development or the TDR is anticipated. However, on a precautionary basis, a pre-commencement inspection of the trees proposed for trimming along the TDR will be undertaken prior to works to reassess their baseline condition and ensure no significant potential roosting features have developed over time. This measure is in line with best practice guidance to assess any changes in baseline given the likely lapse in time from when the surveys were undertaken and when the construction phase will take place. Further details are outlined in Section 6.1.5 below.

5.4 Displacement of Individuals or Populations

The Proposed Development is predominantly located within conifer plantation and peatland habitats, with existing infrastructure present. 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, as amended).

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 Proposed Development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines around the periphery of the Site boundary to minimize disturbance to bats. Directional accessories can be used to direct light away from these features, e.g. through the use of light shields (Stone, 2013). The luminaries will be of the type that prevent upward spillage of light and minimize horizontal spillage away from the intended lands.

The proposed lighting around the Proposed Development shall be designed with consideration of 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) having consideration of 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. Post construction monitoring will be carried out (as outlined below) to assess any potential changes in bat activity patterns and collision risk. Significant effects as a result of lighting are not anticipated; however, if in the course of this monitoring, any potential for significant effects on bats is identified, the Site-specific mitigation measures will be reviewed and any changes necessary will be implemented to avoid any such impacts.

6.1.3 Bat Felling 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 Ireland or the UK.

NatureScot recommends that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features) is adequate mitigation. This 50m buffer will be implemented from the outset and monitored as per the post-construction monitoring. The success of the buffer mitigation will be assessed as part of post construction monitoring (outlined in Section 6.2 below) 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 156.5m, rotor diameter of 133m, and hub height of 90m.

There will be a requirement to fell an area of conifer forestry to facilitate the required bat buffers. These vegetation-free areas will be maintained during the operational life of the Proposed Development.

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). Based on the turbine parameters provided, the formula calculates a bat felling buffer of approximately 85m.

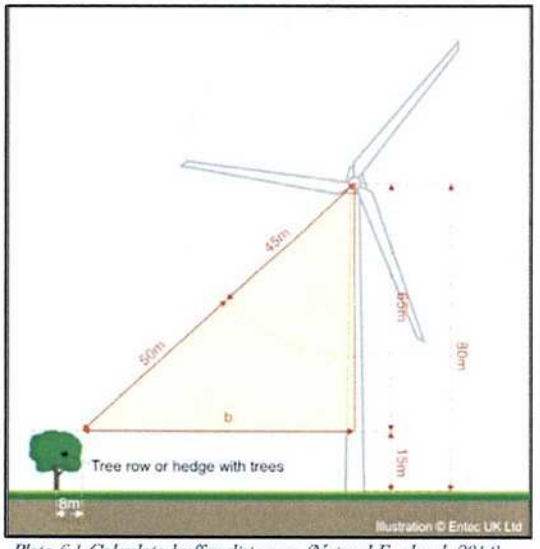


Plate 6-1 Calculate buffer distances (Natural England, 2014).

6.1.4 Blade Feathering

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

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

6.1.5 Confirmatory Pre-construction Surveys

Although no evidence of tree roosts were identified during surveys, given the proximity to Carriganass Castle and as bats are a mobile species, on a precautionary basis a pre-construction inspection of the trees proposed for trimming along the TDR will be undertaken prior to works to reassess their baseline condition and to ensure no potential roosting features have developed over time. This measure is in line with best practice guidance to assess any changes in baseline given the likely lapse in time from when the surveys were undertaken and when the construction phase will take place.

Should PRFs be identified during the pre-construction surveys, the following procedures are proposed prior to removal/trimming of trees with PRFs:

- A pre-commencement survey will be carried out by a suitably qualified ecologist on trees with PRFs proposed for removal to determine whether roosting potential exists.
- 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.
- On a precautionary basis, works will be undertaken at an appropriate time of year, as determined by a suitably qualified ecologist, to avoid disrupting sensitive life cycle periods for bats. Tree-removal of mature deciduous trees will be carried out according to the following standard mitigating procedures:
  - Trees with suitable potential roost features proposed for removal will be checked for bats by a suitably qualified arborist/ecologist at the time of removal.
  - Trees will be nudged two or three times prior to limb removal, with a pause of 30 seconds in between, to allow bats to wake and move.
  - Rigged tree removal shall be used to lower the limbs and trunk carefully to ground level and cavities searched by a qualified ecologist.
  - 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).
- To ensure continued availability of potential roost features, an appropriate number of bat boxes of varying styles/models will be installed to replace any identified PRFs. Details regarding the installation, maintenance and monitoring of bat boxes will be agreed by a licenced Ecologist and incorporated into the monitoring plan.

Additionally, a pre-construction survey will be conducted on the existing onsite 38kV substation in advance of the short-term road works associated with connecting the cable network to the existing onsite 38kV substation to ensure no roosting bats are present during the works.

6.2 Bat Monitoring Plan

Overall risk levels for high collision risk bat species were typically *Low* to *Medium*. This risk level is reflective of the nature of the Site, which is conifer forestry with peatland habitats with low levels of bat activity recorded during the walked transects undertaken.

However, taking a precautionary approach, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development, in line with the case study example provided in Appendix 5 of the NatureScot, (2021) and based on the Site-specific data.

6.2.1 Operational Monitoring

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

The results of post-construction monitoring shall be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy as outlined in Section 6 above. If the monitoring identifies a curtailment requirement (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 any 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 any 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.

6.3 Residual Impacts

No Significant Effect

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

6.4 Cumulative Effects

The Proposed Development was considered in combination with other 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 2.9 in Chapter 2 (Background of the Proposed Development) of the EIAR.

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

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

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

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations arising from the Proposed Development. The surveys provided in this report are in accordance with NatureScot guidance and assessment/mitigation are in accordance with NatureScot guidance. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Development will not result in any significant effects on bats.

Provided that the Proposed Development 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.

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.

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.

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.

Natural England (2014). Bats and Onshore Wind Turbines: Interim Guidance. Third Edition TIN051. English Nature.

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

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.

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

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 APPRAISAL

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

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

OVERALL SITE RISK

OVERALL RISK ASSESSMENT

Table 3b: Stage 2 – Overall Risk Assessment

Site Risk Level (from Table 3a)	**Ecobat activity category**					
Site Risk Level	Nil (0)	Low (1)	Low-Moderate (2)	Moderate (3)	Moderate-High (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	16	20
Highest (5)	0	5	10	15	20	25

Overall assessment

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

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.

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).