



APPENDIX 6-2

Bat Survey Report

Appendix 6-2 – Bat Survey Report

AIP Carrow WF



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APPENDICES

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1. INTRODUCTION

MKO was commissioned to undertake a comprehensive bat impact assessment to inform a planning application for a proposed renewable energy development approximately 2.4km south of the village of Hollyford and 4.7km north of the village of Dundrum, Co. Tipperary. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Project on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Surveys were carried out throughout 2023 and 2024, based on a layout comprising 14 turbines. The methodology followed industry best practice, primarily NatureScot (2021), and employed a combination of approaches, including desktop study, habitat and landscape appraisal, roost surveys, manual transects, and static detector surveys at ground level.

The assessment and recommended mitigation measures have been designed in accordance with NatureScot (2021), with further consideration of the Northern Ireland Environment Agency (NIEA) Natural Environment Division guidance (August 2021, amended April 2024).

As detailed in Section 1.1 of Chapter 1 of the EIAR, the following terminology is used throughout this report:

- Where the ‘Proposed Project’ is referred to this encompasses the entirety of the project for the purposes of this EIA in accordance with the EIA Directive.
- Where the ‘Proposed Wind Farm’ is referred to, this refers to turbines and associated foundations and hardstanding areas, including entrances and access roads, underground cabling, permanent meteorological mast, temporary construction compounds, turbine delivery accommodation works, spoil repository areas, borrow pits, tree felling, site drainage, operational stage signage, battery energy storage system and all ancillary works and apparatus.
- Where the ‘Proposed Grid Connection Route’ is referred to, this refers to the 110kV onsite substation, all ancillary works and underground 110kV grid connection cabling connecting to the existing Killonan 110kV substation Co. Limerick, and all ancillary works and apparatus.
- Where the ‘Site’ is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary in green as shown on Chapter 4 Figure 4-1 of the EIAR and encompasses an area of approximately 1,564 hectares. Where the ‘Wind Farm site’ is referred to, this relates the EIAR Site Boundary without the corridor that encompasses the underground grid connection cabling route.

A full description of the above terminologies is provided in Chapter 4 of this EIAR.

1.1 Background

Wind energy is a key component of Ireland’s renewable energy strategy; however, operational wind farms may also affect bats through direct mortality and indirect impacts such as habitat loss and disturbance. Global syntheses report bat fatalities at wind farms and highlight potential cumulative, population-level risks (Arnett *et al.*, 2016). In a European context, studies collated by Voigt *et al.* (2022) estimate approximately 1.5–30 bats killed per turbine per year. UK carcass-search data indicate 0–5.25 bats per turbine per month during peak activity (July–October), with substantial between-site variation (Mathews *et al.*, 2016). While these figures are not directly transferable in an Irish context, the broadly similar bat assemblages of Ireland and Britain make them a useful reference point for assessing potential risks.

Known mechanisms of bat mortality at wind farms include collisions with moving blades (Horn *et al.*, 2008; Cryan *et al.*, 2014) and barotrauma (Baerwald *et al.*, 2008)—internal injuries caused by sudden air pressure changes. Bats may also be attracted to turbines due to behavioural and environmental factors such as habitat associations, mating activity, and weather conditions.

Robust pre-construction bat surveys are undertaken to establish baseline activity and assess the potential risks associated with turbine operation. This report presents survey results primarily focused on the

Proposed Wind Farm site. The Proposed Grid Connection, including the underground cable route, was assessed as part of wider ecological surveys detailed in Chapter 6 of the EIAR.

Survey design and impact assessment were guided by current legislation, scientific literature, and best-practice guidance, with full consideration given to spatial, temporal, and behavioural patterns relevant to bat ecology.

1.2 Bat Survey and Assessment Guidance

A range of guidance documents exists for surveying bats at wind energy developments across Europe, the UK, and Ireland.

At the European level, the Advisory Committee to the EUROBATS Agreement (to which Ireland is a signatory) published the *Guidelines for Consideration of Bats in Wind Farm Projects* (Rodrigues, 2015). These offer a structured framework for assessing potential impacts on bats during planning, construction, and operation. However, as they are based on continental bat assemblages—which differ significantly from those in Ireland—some survey recommendations may not be appropriate for Irish contexts. Nonetheless, they provide a valuable benchmark and encourage the development of locally tailored guidance.

In Ireland, Bat Conservation Ireland (BCI, 2012a) issued the *Wind Turbine/Wind Farm Development Bat Survey Guidelines*, which outline surveyor competencies, health and safety, survey methods, and reporting standards. However, these guidelines are broad and not underpinned by detailed, Ireland-specific data.

In the UK, Chapter 10 of the second edition of the BCT *Bat Survey Good Practice Guidelines* (Hundt, 2012) included wind farm survey recommendations, although these were not supported by UK-specific research and were subsequently removed in the third edition (2016). Around the same time, Natural England (2014) produced interim guidance interpreting EUROBATS advice for the UK. Technical updates and discussion papers have also been issued by CIEEM through its Technical Guidance Series and the quarterly *In Practice magazine*.

The most comprehensive current guidance is *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (NatureScot, 2021), which replaced earlier NatureScot and Natural England publications. It provides detailed direction for assessing both direct (collision risk) and indirect impacts, as well as mitigation strategies. It now serves as the standard approach for wind farm assessments in Ireland due to its clarity, structure, and evidence base.

Additional Irish-context recommendations have since been published by the Northern Ireland Environment Agency (NIEA, 2021; amended 2022), building on NatureScot's work and providing further clarification on survey effort, curtailment, and mitigation.

The survey scope and impact assessment presented in this report follow the NatureScot (2021) guidance, with additional reference to the NIEA (2021) recommendations. The most recent edition of the BCT *Bat Surveys for Professional Ecologists* (Collins, 2023) was also used to ensure current best practice was followed throughout.

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 2025. 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, 2025). The influence of Pressures and Threats for bats are ranked from Low to Medium) for each species in the 2025 Article 17 report.

Bat Species	Conservation Status	Principal Threats
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Favourable	PX04 No pressures or threats
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Favourable	PX04 No pressures or threats
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	Unknown	PD01 Wind, wave and tidal power (including infrastructure) (only in the future)
Leisler's bat <i>Nyctalus leisleri</i>	Favourable	PD01 Wind, wave and tidal power (Low) PF02 Construction or modification (e.g. of housing and settlements) in existing built-up areas (L)
Daubenton's bat <i>Myotis daubentoni</i>	Favourable	PA22 Drainage for use as agricultural land (Medium) PF12 Residential, commercial and industrial activities and structures generating noise, light, heat or other forms of pollution (M)
Natterer's bat <i>Myotis nattereri</i>	Favourable	PA04 Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (L) PB09 Clear-cutting, removal of all trees (L) PE01 Roads, paths, railroads and related infrastructure (L) PF01 Conversion from other land uses to built-up areas (L) PF02 Construction or modification (e.g. of housing and settlements) in existing built-up areas (L)
Whiskered bat <i>Myotis mystacinus</i>	Favourable	PA04 Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (L) PB09 Clear-cutting, removal of all trees (L) PE01 Roads, paths, railroads and related infrastructure (L) PF01 Conversion from other land uses to built-up areas (L) PF02 Construction or modification (e.g. of housing and settlements) in existing built-up areas (L)
Brown long-eared bat <i>Plecotus auritus</i>	Favourable	PX04 No pressures or threats
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	Inadequate	PA04 Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (M) PB09 Clear-cutting, removal of all trees (M) PE01 Roads, paths, railroads and related (M)infrastructure (M) PF01 Conversion from other land uses to built-up areas (M) PF02 Construction or modification (e.g. of housing and settlements) in existing built-up areas (M) PA15 Use of other pest control methods in agriculture (excluding tillage) (M) PF13 Drainage, land reclamation and conversion of wetlands, marshes, bogs, etc. for built-up areas (L) PH04 Vandalism or arson (incl. human-introduced wildfire) (L) PJ01 Temperature changes and extremes due to climate change (L) PM07 Natural processes without direct or indirect influence from human activities or climate change (L)

1.4

Statement of Authority

MKO employs a dedicated bat unit within its Ecology Team, with expertise in scoping, conducting, and reporting on bat surveys, as well as preparing ecological impact assessments. MKO ecologists have relevant academic qualifications and licences and are qualified in undertaking surveys to the levels required.

Survey scoping and project management was overseen by Aoife Joyce (MSc.). Bat surveys were conducted by MKO ecologists Kate Greaney (MSc.), Ryan Connors (MSc.), Keith Costello (BSc.), Sara Fissolo (BSc.) and Frederick Mosely (MSc.). The Grid Connection Route was visited by David Culleton (MSc.), Mairead Kavannah (MSc.) and Clare Mifsud (Ph.D.). Data analysis and results were compiled by Nora Szijarto (MSc.). Impact assessment, the design of mitigation and final reporting was completed by Nora Szijarto and Molly O’Hare (MSc.) and reviewed and approved by Aoife Joyce. Staff’s roles and relevant training are presented in Table 1-2 below.

Table 1-2 Project team qualifications and training

Staff	Role	Training
Aoife Joyce (B.Sc., M.Sc., MCIEEM)	Project Director	BSc. (Hons) Environmental Science, University of Galway, Ireland. MSc. (Hons) Agribioscience, University of Galway, Ireland. Ecological Impact Assessments, Appropriate Assessment Screening Reports, Natura Impact Statements, Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics). Full member of Chartered Institute of Ecology and Environmental Management.
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).
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).
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).
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).

<p>Kate Greaney (B.Sc., M.Sc.)</p>	<p>Ecologist</p>	<p>B.Sc. (Hons) Botany and Plant Science National university of Ireland, Galway,</p> <p>M.Sc. (Hons) Climate Change, Agriculture, and Food Security (MScCCAFS) National university of Ireland, Galway,</p> <p>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)</p>
<p>Frederick Mosley (B.A., M.Sc.)</p>	<p>Seasonal Bat Ecologist</p>	<p>B.A. (Hons) Biological and Biomedical Science Mod. Zoology, Trinity College, Dublin (2022)</p> <p>M.Sc. Marine Biology, University College Cork (2023)</p> <p>Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Structure and Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal)</p>
<p>David Culleton (B.Sc., M.Sc.)</p>	<p>Bat Ecologist</p>	<p>B.Sc. Zoology, University College Cork, Ireland.</p> <p>M.Sc. Conservation Behaviour, Atlantic Technological University, Galway, Ireland.</p> <p>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).</p>
<p>Mairead Kavanagh (B.Sc.)</p>	<p>Ecologist</p>	<p>B.Sc. (Hons) Botany and Plant Science, University of Galway, Ireland</p> <p>Plant identification skills, invasive species surveys, Annex 1 habitat surveys, breeding bird surveys, bat and mammal surveys, and marsh fritillary surveys. Report writing, including Ecological Impact Assessment (EcIA), Natura Impact Assessment (NIS), habitat management and enhancement plans, and invasive species management plants.</p>
<p>Keith Costello (B.Sc.)</p>	<p>Ecologist</p>	<p>BSc., Environmental Science, National University of Ireland, Galway</p> <p>Lantra Qualification in Conservation Dog Handling, Diploma in Canine Behaviour</p> <p>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)</p>
<p>Clare Mifsud (Ph.D)</p>	<p>Project Ecologist</p>	<p>Doctor of Philosophy in Conservation Biology of Bats, University of Malta</p> <p>Master of Science in Bat Biology and Conservation, University of Malta</p> <p>Bachelor of Science in Biology and Chemistry (Hons), University of Malta</p> <p>Bat Habitat Appraisal (Internal). Bat acoustic surveys (manual transects and statics deployment). Bat echolocation analysis and species identification (Kaleidoscope, Wildlife Acoustics). Roost survey techniques and winter bat hibernation census surveys (Wroclaw University, Poland). Preliminary Roost Assessments (PRA) - buildings and trees (internal). Thermal Imaging for bat surveys (internal). Bat capture, tissue sampling and handling techniques (University of Leeds, UK).</p>

2. PROJECT DESCRIPTION

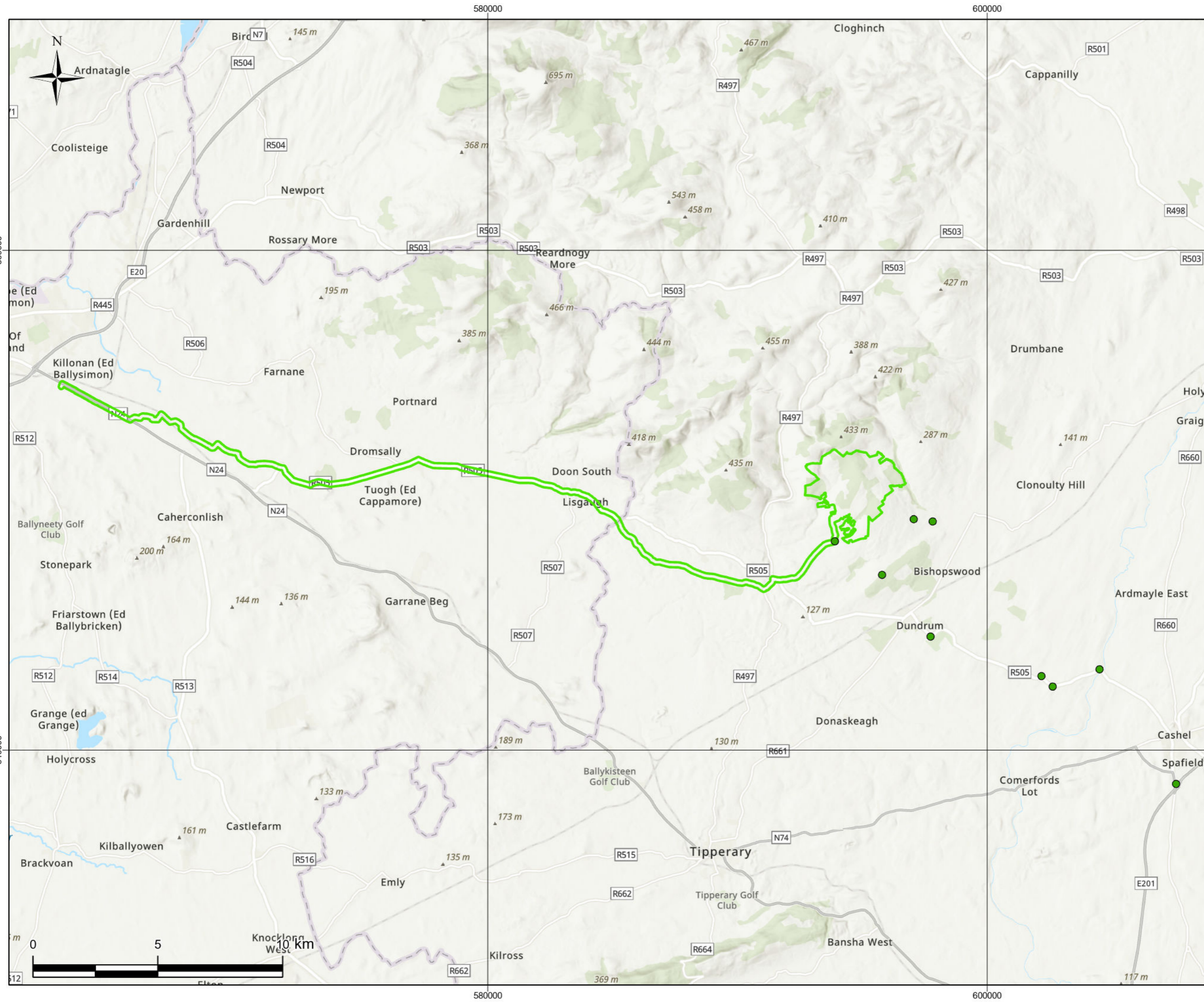
The Proposed Wind Farm is located approximately 2.4km south of the village of Hollyford and 4.7km north of the village of Dundrum, Co. Tipperary. It is proposed to access the Proposed Wind Farm site during both the construction and operational phase via a site entrance off the L1154 local road along the southwestern boundary of the Proposed Wind Farm site in the townland of Moheragh. The proposed entrance will include temporary accommodation works in order to facilitate the delivery of turbine components and other abnormal loads. The Proposed Wind Farm is served by a number of existing public, forestry and agricultural roads and tracks.

A 110kV grid connection between the Proposed Wind Farm and the national electricity grid will be necessary to export electricity from the Proposed Wind Farm. It is proposed to connect the Proposed Wind Farm development to the national electricity grid via a 110kV underground electrical cabling connection to the existing 110 kV Killonan substation, in the townland of Milltown, southeast of Limerick City, Co. Limerick. The underground electrical cabling route measures approximately 38km in length the majority of which is located within the curtilage of the public road network.

The Proposed Wind Farm site boundary encompasses an area of approximately 828 hectares. The permanent footprint of the Proposed Wind Farm (including the 110kV onsite substation) measures approximately 14.7 hectares, which represents approximately 1.78% of the site.

The location of the Proposed Wind Farm is shown in Figure 2-1.

Current land-use on the Proposed Wind Farm comprises commercial forestry, agricultural pastoral land, mixed forest and transitional woodland-shrub. Current land-use along the Proposed Grid Connection Route comprises of public road corridor, public open space, agriculture, commercial forestry, land principally used by agriculture with significant areas of natural vegetation, mineral extraction sites, mixed forest and discontinuous urban fabric. Land-use in the wider landscape of the site comprises a mix of agriculture, quarrying, renewable energy, low density residential and commercial forestry. Land-use in the areas proposed for turbine delivery route accommodation comprises a mix of agriculture, transitional woodland-shrub, coniferous forest and sport and leisure facilities.



Map Legend

- EIA Site Boundary
- EIA Site Boundary - Temporary
- Accommodation Areas

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



Site Location		
Project Title		
Carrow Wind Farm		
Project No.	Drawing No.	Scale
231102	2.1	1:140,000
Drawn By	Checked By	Date
JB	MoH	12/03/2026

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

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3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Project application. A Scoping Document, providing details of the application site and the Proposed Project, was prepared by MKO and circulated to consultees in February 2024. As part of this exercise, prominent Irish conservation groups were contacted on the 11th of October 2024, and Bat Conservation Ireland (BCI) and National Parks and Wildlife Service (NPWS), were specifically invited to comment on the potential of the Proposed Project to affect bats. A meeting was held with the NPWS and was attended by MKO ecologists in December 2025. Full consultation and scoping details are outlined in Section 2.7 of Chapter 2 of this EIAR.

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 as part of the EIAR. The aim was to provide context to the Proposed Project in order to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the Site and the surrounding region. The results of the desk study including sources of information utilised are provided below.

3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. A search of the National Bat Database of Ireland was last carried out on the 11th March 2026 and examined bat presence and roost records within a 10 km radius of a central point in the Wind Farm Site (IG Ref: R 94721 50290) (BCI 2012, Hundt 2012, NatureScot 2021). A request of all available bat data was requested to the Bat Conservation Ireland (BCI).

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 December 2025, Ireland submitted the fourth assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2025).

The 2025 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the EIAR Site Boundary. 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 Proposed Wind Farm Site (BCI 2012, Hundt, 2012, NatureScot 2021). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and pNHAs.

3.2.4 Landscape Features

3.2.4.1 Ordnance Survey Mapping

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

3.2.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10km of the Wind Farm Site (BCI, 2012) (last searched on the 11th March 2026). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 11th March 2026).

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 Wind Farm Site was 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 Wind Energy 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, Section 2.6. The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Tipperary 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 Wind Farm can be found in Chapter 2 of the main EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken in 2023, 2024 and 2025 (Table 3-1). The Site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the EIAR Site Boundary assessed and classified. During the static bat detector deployments and collections each season, any incidental records and bat habitat assessments were also carried out. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. The Proposed Grid Connection and turbine delivery route were visited as part of the multidisciplinary surveys outlined below and in Chapter 6 of the main EIAR.

Multidisciplinary walkover surveys were undertaken within the EIAR Site Boundary on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey	Dedicated Bat Survey
Surveys 2023	
9 th August	22 nd May 2023
10 th August	20 th July 2023
31 st August	11 th September 2023
4 th October	-
Surveys 2024	
5 th March	5 th March
19 th June	24 th April
20 th June	15 th May
21 st June	12 th June
31 st July	8 th July
10 th September	19 th August
26 th September	2 nd September
27 th September	-
Surveys 2025	
4 th March	-
2 nd October	2 nd October
29 th October	29 th October

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2023, 2024 and 2025. During this survey, habitats within the EIAR Site Boundary were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2023) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories are divided into *High, Moderate, Low, Negligible, None* and are described fully in Appendix 1.

3.3.2 Roost Surveys

3.3.2.1 Daytime Roost Inspections

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 81.5 m) of the proposed turbines (NatureScot, 2021). The aim was to determine the presence of Potential Roost Features (PRFs) for bats and the potential need for further survey work or mitigation. The Proposed Wind Farm Site was visited in May, July and September 2023 and March, April, May, July, August and September 2024. Multiple walkovers were carried out and structures and trees were assessed for their potential to support roosting bats (see Appendix 1 for criteria in assessing roosting habitats).

No structures, building or trees containing Potential Roosting Features (PRFs) were identified within the 281.5m roost search buffer. Five structures were assessed within the wider area for their potential to support roosting bats. This comprised a detailed inspection of the interiors and exteriors to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. The assessment was carried out with the use of a high-powered torch, an endoscope, thermal scope and binoculars.

Any potential tree roosts were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other PRFs identified in the Bat Tree Habitat Key (BTHK, 2018). Where accessible, PRFs were inspected using a ladder, torch and endoscope to check for signs of bat use.

The Proposed Grid Connection underground electrical cabling route, including watercourse crossing infrastructure, and turbine delivery route accommodations works areas, were also assessed for any suitability to host roosting bats. Surveys were carried out in May and October 2024 and in February and October of 2025 and comprised an inspection of existing infrastructure to look for evidence of bat use and assess the roosting suitability according to Collins (2023).

Locations of all Potential Roost Features (PRFs) inspected are presented in Figure 3-1 and Figure 3-2 and Table 3-2.

Table 3-2 PRF locations within and around the Proposed Wind Farm site

Structure	IG Ref	Nearest proposed turbine	Distance to nearest turbine	Suitability Assessment (Collins 2023)
Vacant property 1	R 93326 50709	T8	330m	<i>High</i>
Inhabited property	R 93252 50892	T7	400m	<i>Moderate</i>
Vacant property 2 and Outbuildings	R 93786 50985	T5	440m	<i>Moderate and Low</i>
Vacant property 3 and Outbuildings	R 95191 50978	T2	300m	<i>Low</i>
Vacant property 4	R 95324 50818	T2	430m	<i>Low</i>

3.3.2.2 Presence/Absence Surveys

Emergence surveys were carried out and focused on PRFs identified during the habitat appraisal within the Proposed Wind Farm site. During the emergence surveys, surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). The emergence surveys commenced at least 15 minutes before sunset and concluded at least 90 minutes after sunset. Table 3-3 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 3-3 2023 and 2024 Survey Effort - Emergence Surveys

Date	Surveyors	Sunrise/Sunset	Type	IG Ref	PRF
22 nd May 2023	Keith Costello & Sara Fissolo	21:32	Dusk Emergence	R 93326 50709	Vacant property 1
20 th July 2023	Keith Costello & Kate Greaney	21:45	Dusk Emergence	R 93252 50892	Inhabited property
13 th September 2023	David Culleton & Kate Greaney	19:54	Dusk Emergence	R 93786 50985	Vacant property 2 and outbuildings
24 th April 2024	Kate Greaney and Ryan Connors	20:48	Dusk Emergence	R 93326 50709	Vacant property 1
12 th June 2024	Kate Greaney and Fred Mosley	21:56	Dusk Emergence	R 93786 50985	Vacant property 2 and outbuildings
19 th August 2024	Kate Greaney and Fred Mosley	20:50	Dusk Emergence	R 95191 50978 R 95324 50818	Vacant property 3 and Vacant property 4

3.3.3 Manual Activity Surveys

Manual activity surveys comprised night-time bat walkover (NBW) surveys conducted after dusk in spring, summer and autumn 2023 and 2024. to record species presence, relative abundance, behaviour (commuting and foraging), and to gather supplementary information on habitat features of importance to bats within the Site. NBW routes were designed with reference to the indicative turbine layout, findings from the desktop study and day-time walkover surveys and considering health and safety concerns and access constraints. As such, transects generally followed existing roads and tracks. To ensure adequate coverage of turbine locations, some sections of the transects were partially driven, as it would not have been feasible to reach all turbines within the required survey window by walking alone. The driven transect portions followed the methodology described by Roche *et al.* (2012).

Weather conditions were suitable for carrying out bat activity surveys. Surveyors were equipped with active full spectrum bat detectors, Batlogger M (Elekon AG, Lucerne, Switzerland). 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, as detailed in Section 3.3.4.1.

Survey effort for 2023 - 2024 is outlined in Table 3-4 and presented in Figure 3-1 and Figure 3-2.

Table 3-4 2023 and 2024 Survey Effort - Manual Activity Surveys

Date	Surveyors	Sunset/ Sunrise	Type	Weather	Transect (km)
22 nd May 2023	Keith Costello & Sara Fissolo	21:32	Dusk Emergence & Walked Transect	14° C, dry, calm, 5% cloud cover	8.4 km
20 th July 2023	Keith Costello & Kate Greaney	21:45	Dusk Emergence & Driven Transect	19° C, dry, calm, 30-60% cloud cover	4.8 km
13 th September 2023	David Culleton & Kate Greaney	19:54	Dusk Emergence	15° C, light rain, light breeze, 100% cloud cover	-
Total Survey Effort 2023					13.2 km
24 th April 2024	Kate Greaney and Ryan Connors	20:48	Walked Transect & Dusk Emergence	10-13° C, dry, calm, moon not visible, 30-60% cloud	6.02
12 th June 2024	Kate Greaney and Fred Mosley	21:56	Walked Transect & Dusk Emergence	16-20° C, dry, calm, moon not visible, 20-50% cloud	3.22
19 th August 2024	Kate Greaney and Fred Mosley	20:50	Walked Transect & Dusk Emergence	14-17° C, dry, calm, no visible moon, 95-100% cloud	4.12
Total Survey Effort 2024					13.4 km

3.3.4 Ground-level Static Surveys

Where developments have less than 10 turbines, NatureScot (2021) requires one detector per turbine, while for larger developments the guide suggests an additional detector for every three turbines. Given that 14 turbines were proposed, 12 detectors were deployed across the site between the 2023 and 2024 survey seasons having consideration of NatureScot (2021) guidance.

Overall, a good spatial spread in relation to the proposed turbines and sample of the range of available habitats was achieved. Detector locations were based on indicative turbine locations provided and differ slightly to the final proposed layout. 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 placement was based on the proposed turbine locations, and these are described in Table 3-5. Figure 3-2 presents static detector locations in relation to the final proposed turbine layout.

Table 3-5 Ground-level Static Detector Locations.

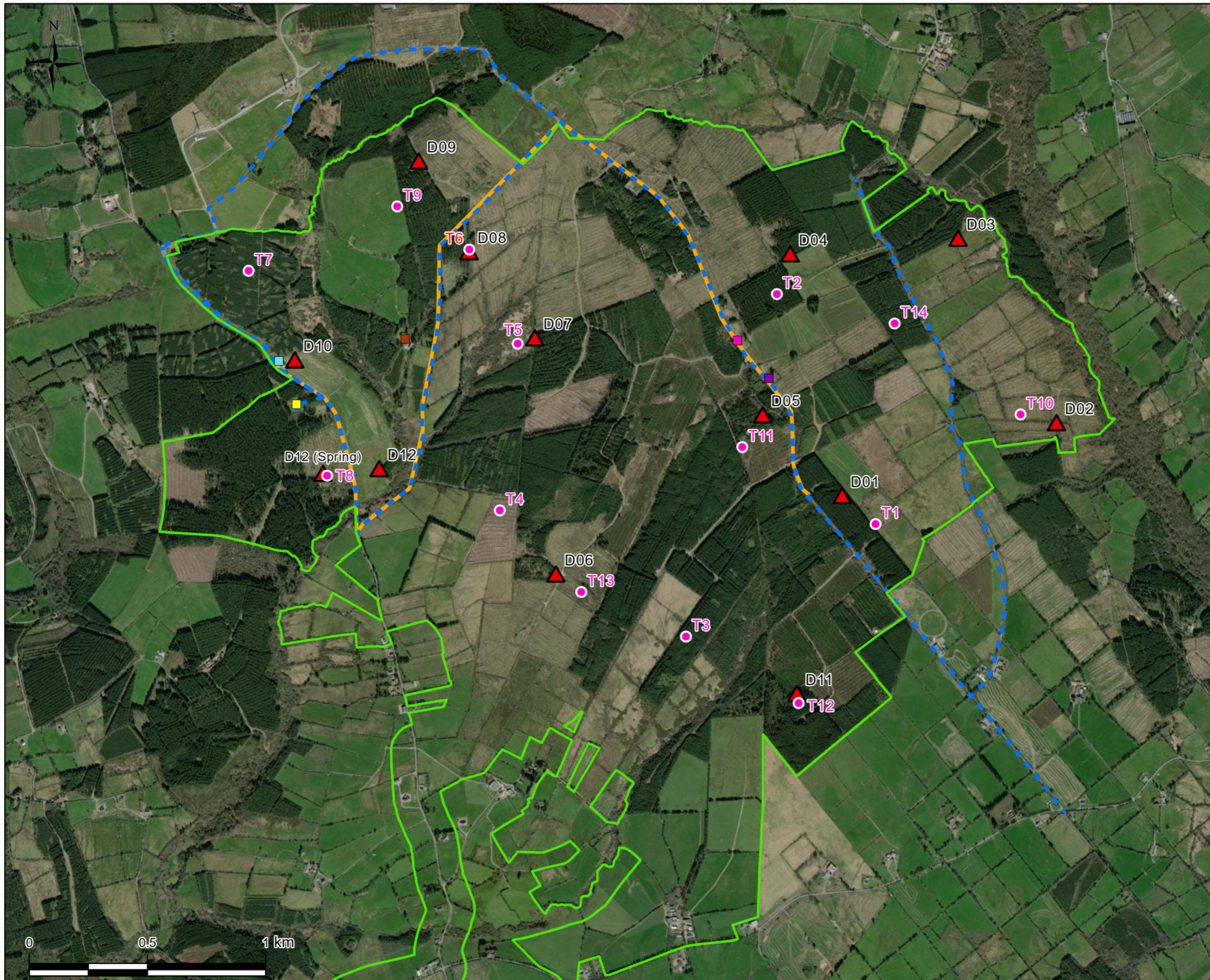
ID	Survey Year	Location	Habitat	Linear Feature within 50m	Nearest Associated Turbine
D02	2023	R 96540 50636	Conifer plantation (WD4)	Conifer Edge	T10
D05		R 95298 50669	Conifer plantation (WD4)	Conifer Edge	T11
D11		R 95442 49491	Conifer plantation (WD4)	Conifer Edge	T12
D06		R 94423 49996	Conifer plantation (WD4)	Conifer Edge	T13
D01	2024	R 95794 50188	Wet grassland (GS4)	Conifer forestry	T01
D02		R 95611 51186	Improved agricultural grassland (GA1)	Hedgerow with drainage ditch	T02
D03		R 94978 49771	Conifer plantation (WD4)	Fire break	T03
D04		R 94318 50555	Conifer plantation (WD4)	Conifer forestry	T04
D05		R 94136 50849	WS1	Conifer forestry	T05
D06		R 93677 51167	GA1	Hedgerow	T06
D07		R 93123 51272	Conifer plantation (WD4)	Within conifer forestry	T07
D08		R 93455 50407	Scrub (WS1)	Farm track	T08

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

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no.) with appropriate weather conditions were captured (i.e. dusk temperatures above 8° C, wind speeds less than 5m/s and no or only very light rainfall). Table 3-6 summarises survey effort achieved in 2023 and 2024 for each of the detector locations.

Table 3-6 Survey Effort - Ground-level Static Surveys (*Redeployment not included in total survey effort)

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Weather Data 2023			
Spring	22 nd May - 2 nd June 2023	11	11
Summer	20 th July - 10 th August 2023	22	17
Summer Redeployment D06	10 th - 31 st August 2023	22*	19
Autumn	13 th - 25 th September 2023	12	10
Total Survey Effort 2023		45	38
Weather Data 2024			
Spring	24 th April - 15 th May 2024	21	15
Summer	12 th June - 8 th July 2024	26	25
Autumn	19 th August - 2 nd September 2024	14	14
Total Survey Effort 2024		61	54



Map Legend

- Proposed Turbine Location
- ▭ EIA/RIAS Site Boundary
- ▲ Static Detector Locations
- Spring Transect Route
- Summer Transect Route

PRF Structures

- ▭ Inhabited property
- ▭ Vacant property 1
- ▭ Vacant property 2 and Outbuildings
- ▭ Vacant property 3 and Outbuildings
- ▭ Vacant property 4

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



Drawing Title

Survey Effort 2023

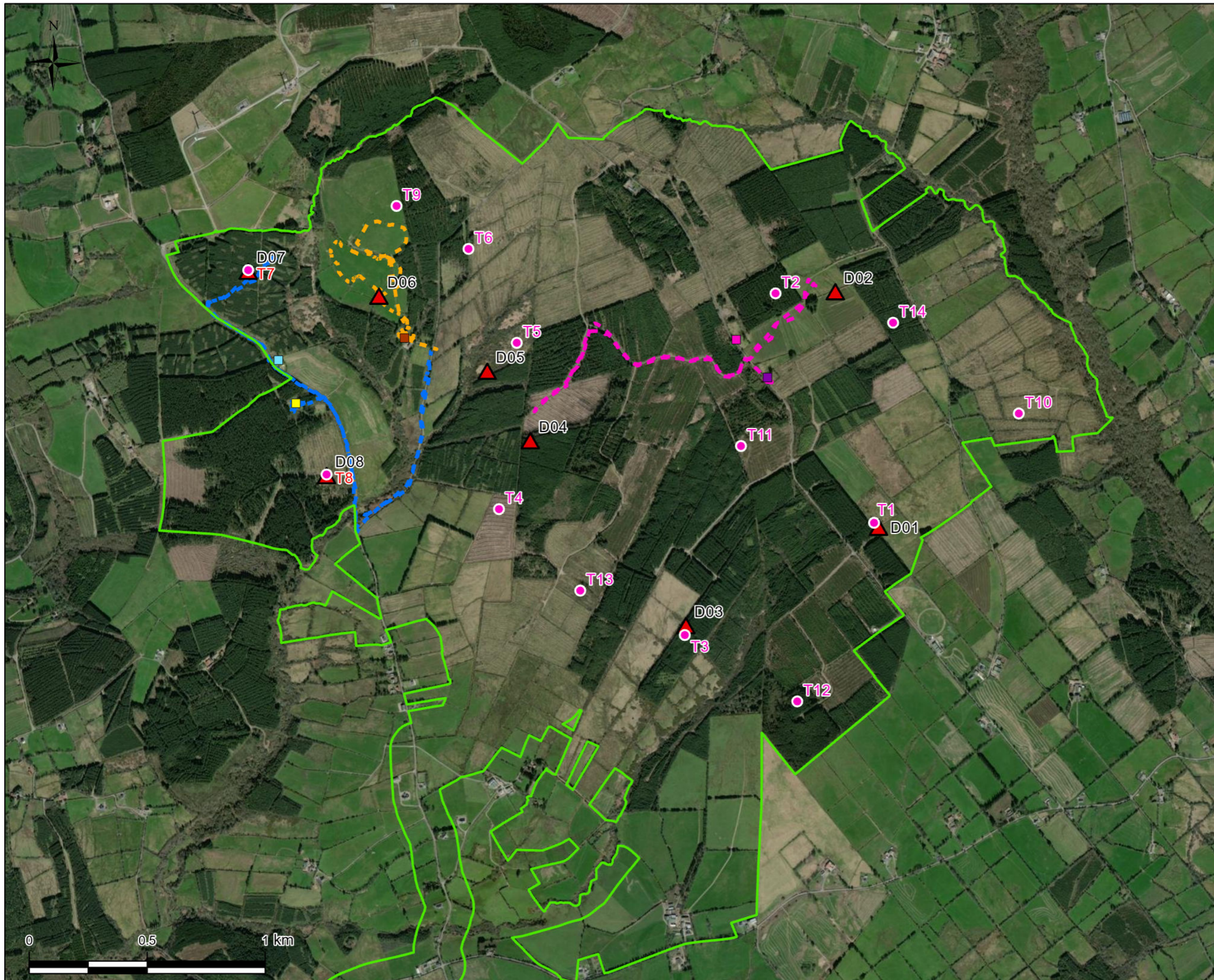
Project Title

Carrow Wind Farm

Project No.	Drawing No.	Scale
231102	3.1	1:15,000
Drawn By	Checked By	Date
JB	MoH	20/03/2026

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Map Legend

- Proposed Turbine Location
- EIAR Site Boundary
- ▲ Static Detector Locations
- Spring Transect Route
- Summer Transect Route
- Autumn Transect Route

PRF Structures

- Inhabited property
- Vacant property 1
- Vacant property 2 and Outbuildings
- Vacant property 3 and Outbuildings
- Vacant property 4

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

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SITE LOCATION - NOT TO SCALE

Drawing Title
Survey Effort 2024

Project Title
Carrow Wind Farm

Project No. 231102	Drawing No. 3.2	Scale 1:15,000
Drawn By JB	Checked By MoH	Date 20/03/2026

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

3.3.4.1 Bat Call Analysis

All sound recordings were analysed using bat call analysis software, Kaleidoscope Pro v.5.4.8 (Wildlife Acoustics, MA, USA). The aim was to identify, to a species or genus level, the bats present at the Proposed Wind Farm. All recordings were first processed using the Auto ID function of Kaleidoscope, utilising a site-specific custom classifier that included only species found within Ireland.

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 against published signal characteristics for local bat species (Russ, 1999) to manually verify species identification. All recordings were manually reviewed in Kaleidoscope to determine the final species identification.

Myotis species potentially Daubenton’s bat (*Myotis daubentonii*), Whiskered bat (*Myotis mystacinus*) and Natterer’s bat (*Myotis nattereri*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of soprano pipistrelle (*Pipistrellus pygmaeus*) and common pipistrelle (*Pipistrellus pipistrellus*) are distinguished by having distinct frequencies (peak frequency of maximum energy in search flight) of ~ 55 kHz and ~ 45 kHz respectively (Jones & van Parijs, 1993).

Plate 3-1 below shows typical sonograms of echolocation pulses for the different pipistrelle bat species recorded with an SM4BAT static bioacoustics recording device. The recordings are illustrated using Wildlife Acoustics Kaleidoscope software.

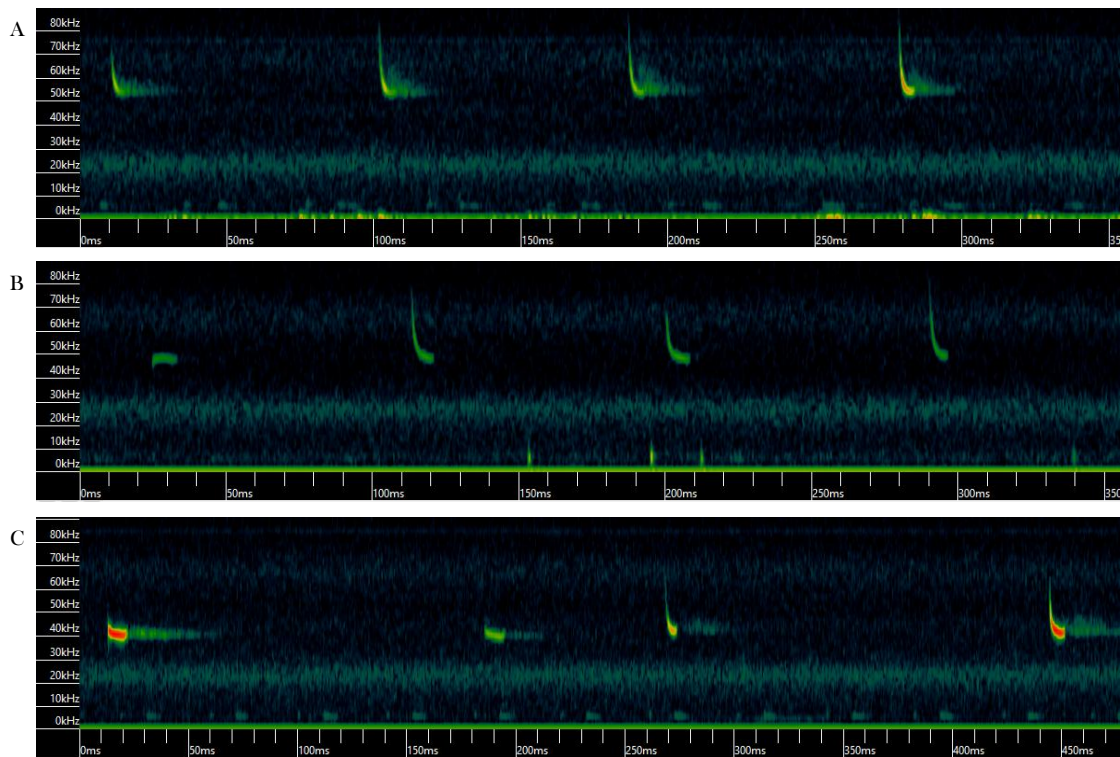


Plate 3-1 Spectrogram of echolocation pulses of (A) Soprano pipistrelle (Peak Frequency 55kHz), (B) Common pipistrelle (Peak Frequency 45kHz) and (C) Nathusius’ pipistrelle (Peak Frequency 39kHz).

Echolocation calls by brown long-eared bats (*Plecotus auritus*) are intrinsically quiet and hard to record by static equipment while echolocation calls by lesser horseshoe bats (*Rhinolophus hipposideros*) are directional and can be missed by detectors, particularly manual detectors. To address this, MKO employs omni-directional microphones to limit under-recording for the latter species. Manual checking of recorded data includes also those labelled by the Kaleidoscope software as ‘Noise’ files and ‘No ID’ files. Manually verifying and checking these files ensures that all calls for hard to detect species have been captured. Despite manual checking, a level of underrepresentation is still expected for these two species, and this is accounted for in the assessment of activity levels. Plate 3-2 shows typical spectrograms of

echolocation pulses for *Myotis* spp., brown long-eared bat, Leisler's bat and a typical noise file, all recorded with the same SM4BAT recording device and illustrated using Wildlife Acoustics Kaleidoscope software.

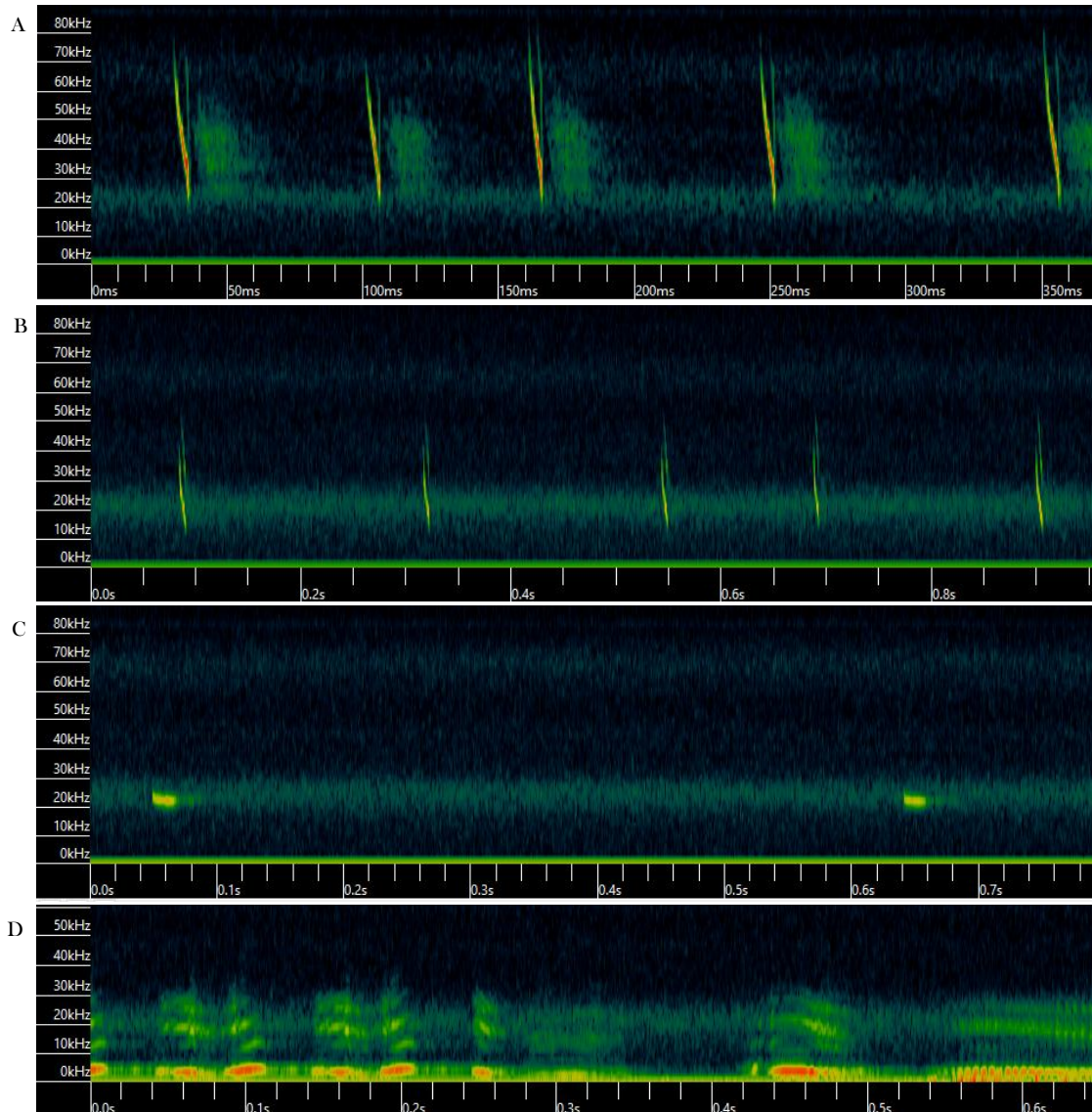


Plate 3-2 Spectrogram of typical echolocation pulses of (A) *Myotis* spp., (B) Brown long-eared bat, (C) Leisler's bat and (D) typical non-bat sounds.

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. In some cases, more than one bat pass is within the same recording file, in such cases the final species identification of the file is assigned to the rarer or harder to record bat species of Ireland. This protocol minimises the risk of under-representing the less frequently encountered taxon in multi-bat pass recordings. This precautionary treatment ensures that activity indices are not biased toward more common, highly detectable species and supports a conservative interpretation of potential impacts within the Environmental Impact Assessment Report.

3.4

Assessment of Bat Activity Levels

Following preliminary analysis and manual verification using Kaleidoscope Pro, statistical analysis and visualisation was performed using RStudio (version 2023.09.+494) and R¹ (version 4.3.2). 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 (bpph, 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 (bpph) was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018). During all calculations, data was rounded to the 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 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 3-7 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021). Ecobat was unavailable for a cross-site analysis of 2024 data as the platform has been undergoing maintenance since late 2022 with no proposed timeline of a relaunch. Ecobat has since relaunched at the end of 2024 after data evaluation had been undertaken, it was decided not to use the software for the Proposed Wind Farm site and rely on the site-specific analysis already undertaken.

Table 3-7 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

The methodology used to assess activity levels across the Proposed Wind Farm site was adapted from Mathews *et al.* (2016). For widespread species (*Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, *Nyctalus leisleri*) activity ranges were determined using an **average** of the maximum nightly bat pass rate, measured as Bat Passes Per Hour (bpph), across all detectors, divided into quartiles. For all other species groups, the **maximum nightly bat pass rate** (bpph) recorded across all detectors, divided into quartiles was used.

Table 3-8 Site-specific Activity Level Categories based on Maximum Bat Passes per Hour (bpph) - 2023

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species			
	<i>P. pipistrellus</i> and <i>pygmaeus</i>	<i>Nyctalus leisleri</i>	<i>Myotis</i> spp.	Other groups
Low	< 7.77	< 0.46	< 0.53	< 0.18
Medium	7.77 - 23.30	0.46 - 1.39	0.53 - 1.58	0.18 - 0.53
High	23.30 <	1.39 <	1.58 <	0.53 <

Table 3-9 Site-specific Activity Level Categories based on Maximum Bat Passes per Hour (bpph) - 2024

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species			
	<i>P. pipistrellus</i> and <i>pygmaeus</i>	<i>Nyctalus leisleri</i>	<i>Myotis</i> spp.	Other groups
Low	< 7.45	< 1.4	< 1.86	< 1.08
Medium	7.45 - 22.36	1.4 - 4.2	1.89 - 5.69	1.08 - 3.23
High	22.36 <	4.2 <	5.69 <	3.23 <

Activity levels were assessed separately for widespread pipistrelle species (*P. pipistrellus*, *P. pygmaeus*), noctules (*N. 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, Moderate, or High for each recorded season. Any figure below 25% of the maximum or the 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 *Moderate*. To prevent skewing the activity thresholds, any evident outliers recorded across the detectors identified through a box-whiskered plot were excluded. Table 3-8 and Table 3-9 present site-specific activity ranges per species group without outliers.

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 3-3, an adapted assessment of vulnerability of wind turbine collision for Irish bat populations 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 3-3 Population Vulnerability of Irish Bat Species (Adapted from NatureScot (2021)).

3.5.2 Site Risk

The likely impact of a development on bats is related to site-based risk factors, including habitat and development features. The cross-tabulation result of habitat risk and project size determines the site risk (i.e. Low, Medium or High) (Plate 3-4) 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 3-4 Site-risk Level Assessment Matrix (Table 3a, NatureScot (2021)).

3.5.3 Overall Risk Assessment

An overall assessment of risk was made by combining the site risk level (i.e. Low/Medium/High) and the population risk (i.e. Ecobat bat activity outputs), as shown in the overall risk assessment matrix table (Plate 3-5) i.e. Table 3b (NatureScot (2021)). The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values). All site assessment levels, as per NatureScot (2021) are presented in Appendix 3.

Site Risk Level	Ecobat activity category					
	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)
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Plate 3-5 Overall Risk Assessment Matrix (Table 3b, NatureScot (2021)).

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

3.6 Limitations

A comprehensive suite of bat surveys has been undertaken at the Proposed Wind Farm site and along the Proposed Grid Connection and turbine delivery route accommodation works areas. The surveys undertaken at the Proposed Wind Farm site provide the baseline information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Wind Farm on bats receptors.

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

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

4. RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Project to affect bats. No response has been received as of the 11th March 2026.

4.1.2 Development Applications Unit - NPWS

The Development Applications Unit were also invited to provide any feedback, comments or suggestions they might have relating to the Proposed Project.

A response was received in October 2024 in relation to an updated scoping document circulated in 2024; however, no specific items relating to bats were provided. The response focused on cultural heritage. From the meeting held with the NPWS in December 2025, no concerns or constraints were raised in relation to bat surveys carried out for the Proposed Project.

4.2 Desk Study

4.2.1 Bat Records

Bat Conservation Ireland

A data request was sent to Bat Conservation Ireland for records of bat activity and roosts within a 10km radius of an approximate central point in the site (IG Ref: R 94109 50611; last search 04/03/2024). Available bat records were provided by BCI on 4th March 2024. An updated data request was sent and on the 6th November 2025 it was confirmed that there have been no new data entries since the initial request, and again in March 2026. The search included roosts, transects and ad-hoc observations. Two roosts and a number of ad-hoc observations (n=14) have been recorded. At least six of Ireland’s nine resident bat species were recorded within 10km of the Site. The results of the database search are provided in Table 4-1.

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

Bat Conservation Ireland records within 10km (IG Ref: R 94109 50611)				
Record	Species	Grid Reference	Date	Location
Roost	<i>Myotis mystacinus</i>	R9746	N/A	Dundrum, Co. Tipperary
	<i>Nyctalus leisleri</i>	R9943	N/A	Dundrum, Co. Tipperary (NHA No. 000649)
Ad-hoc	<i>Pipistrellus pygmaeus</i> , <i>Myotis daubentonii</i>	R974594	08/08/2009	BATLAS 2010
	<i>Pipistrellus pipistrellus</i> (45kHz), <i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i>	R925535	08/08/2009	BATLAS 2010
	<i>Pipistrellus pygmaeus</i>	R87078 54871	23/09/2008	BATLAS 2010
	<i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i> , <i>Myotis daubentonii</i>	S02731 48698	15/08/2018	BATLAS 2020
	<i>Pipistrellus pygmaeus</i> , Unidentified bat, <i>Pipistrellus spp.</i> (45kHz/55kHz), <i>Myotis spp.</i> , <i>Myotis daubentonii</i> , <i>Pipistrellus pipistrellus</i> (45kHz)	R98130 60397	08/07/2018	BATLAS 2020

Unidentified bat, <i>Pipistrellus pygmaeus</i> , <i>Pipistrellus pipistrellus</i> (45kHz)	R98539 60397	08/07/2018	BATLAS 2020
<i>Nyctalus leisleri</i> , <i>Pipistrellus pipistrellus</i> (45kHz), <i>Pipistrellus pygmaeus</i>	S02957 50692	15/08/2018	BATLAS 2020
<i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i> , <i>Myotis daubentonii</i>	S00071 49266	15/08/2018	BATLAS 2020
<i>Pipistrellus pipistrellus</i> (45kHz), <i>Pipistrellus pygmaeus</i>	R92439 53478	15/08/2018	BATLAS 2020
<i>Pipistrellus pipistrellus</i> (45kHz), <i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i> , <i>Plecotus auritus</i> , <i>Myotis spp.</i>	R97765 46392	15/08/2018	BATLAS 2020
<i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i> , <i>Myotis daubentonii</i>	R99006 48468	15/08/2018	BATLAS 2020
<i>Pipistrellus pipistrellus</i> (45kHz), <i>Nyctalus leisleri</i>	R94316 58307	15/08/2018	BATLAS 2020
<i>Pipistrellus pygmaeus</i> , <i>Myotis daubentonii</i>	R97331 59351	15/08/2018	BATLAS 2020

National Biodiversity Data Centre

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Site (last search 11/03/2026). Hectads R95 and R94 lie within 10km of the Site. Five of Ireland’s nine resident bat species were recorded within 10km of the Site The results of the database search is provided in Table 4-2.

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

Hectad	Species	Database	Designation
R94, R95	Lesser Noctule (<i>Nyctalus leisleri</i>)	National Bat Database of Ireland	HD Annex IV, WA
R94	Whiskered Bat (<i>Myotis mystacinus</i>)	National Bat Database of Ireland	HD Annex IV, WA
R94, R95	Common Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	National Bat Database of Ireland	HD Annex IV, WA
R94, R95	Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	National Bat Database of Ireland	HD Annex IV, WA
R94, R95	Daubenton's Bat (<i>Myotis daubentonii</i>)	National Bat Database of Ireland	HD Annex IV, WA

4.2.2 Bat Species Range

The potential for negative impacts is likely to increase where there are high risk species at the edge of their range (NatureScot, 2021). Therefore, range maps presented in the 2025 Article 17 Reports (NWPS, 2025) were reviewed in relation to the location of the Proposed Project. The Proposed Project is located outside the current known range for Nathusius’ pipistrelle, Natterer’s bat and Lesser horseshoe bat. The Site is within the range of all other species.

4.2.3 Designated Sites

Within Ireland, the lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs). 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. Two pNHA’s were identified as being designated for bats, the results of which can be seen in Table 4-3.

Dundrum pNHA is known to support roosting whiskered bats and common pipistrelles. Whiskered bats have a core sustenance zone of approximately 1km and common pipistrelle have a core sustenance zone of 2km (Collins, 2023). The Dundrum pNHA is located approximately 2.5km from the site which is

outside both species core sustenance zones. Knockavilla National School Dundrum pNHA supports roosting Leisler’s bat. Leisler’s bats have a core sustenance zone of 3km. This pNHA is located 6.2km from the site which is outside of Leisler’s bat core sustenance zone.

Table 4-3 Sites Designated for Conservation of Bats within 10km (SAC)

Designated Site	Description	Distance to Site
Dundrum pNHA (002096)	Whiskered bat roost of national importance (>20 individuals). Common pipistrelle roost at same location.	2.5 km
Knockavilla National School, Dundrum pNHA (000649)	Leisler’s bat (>50 individuals)	6.2 km

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 a mix of pastoral agricultural land, with field boundaries delineated by hedgerows and treelines, and conifer plantation.

A review of the National Inventory of Architectural Heritage (NIAH) and the National Monuments Service (NMS) datasets did not indicate the presence of subterranean sites within the Proposed Wind Farm.

A search of the UBSS Cave Database for the Republic of Ireland and GSI Karst found one cave – Ballagh/Bee Cave to the southeast of the Site (Table 4-4). No roost records are associated with this cave.

A review of the NBDC bat landscape map provided a habitat suitability index of 29.89 (orange) for all bats. This indicates that the Proposed Project area has a medium habitat suitability for bat species.

Table 4-4 Caves within 10 km of the Proposed Project

Caves	Description	Approx. distance from closest proposed turbine (km)	Grid reference (ITM)
Ballagh Cave/Bee Cave (UBSS & GSI)	10m long muddy chamber/45m long rift	5km	X 600820 Y 648815

4.2.5 Additional Projects in the Wider Landscape

Table 4-5 Wind Farm Developments within 10km of the Proposed Project provides an overview of wind farms in the vicinity of the Proposed Wind Farm. An assessment of large-scale non wind farm projects can be found in Section 6.6 Chapter 6.

Table 4-5 Wind Farm Developments within 10km of the Proposed Project

Wind Farm Name and Location	No. Turbines	Status
Within 5km of Proposed Carrow Wind Farm		
Glencarbry 1 Wind Farm	7	Existing
Glencarbry 2 Wind Farm	2	Existing
Cappawhite A Wind Farm	18	Existing
Glenough Wind Farm	3	Existing
Hollyford Wind Farm	3	Existing
Mounvaun Wind Farm	1	Existing
Garracummer Wind Farm	13	Existing
Patrick Costello Wind Farm	1	Existing
Cappawhite B Wind Farm	10	Existing

Wind Farm Name and Location	No. Turbines	Status
Falleennafinoga Wind Farm	2	Existing
Mienvee Turbine	1	Existing
Turaheen Lower Turbine	3	Existing
Within 10km of Proposed Carrow Wind Farm		
Turaheen Upper Turbine	1	Existing
Knockastanna Wind Farm	5	Existing
Upperchurch Wind Farm	22	Existing
Milestone Wind Farm	5	Existing
Inchivara Wind Farm	2	Existing

4.3 Field Study

4.3.1 Bat Habitat Appraisal

4.3.1.1 Proposed Wind Farm Infrastructure

A total of fifteen habitats were recorded within the Proposed Wind Farm Site, including:

Table 4-6 Habitat of the Wind Farm Site

Habitat Name	Fossitt Code
Improved agricultural grassland	GA1
Wet grassland	GS4
Wet heath	HH3
Scrub	WS1
Hedgerows	WL1
Treelines	WL2
Conifer plantation	WD4
Wet willow-alder-ash woodland	WN6
Immature Woodland	WS2
Mixed broadleaved/ conifer woodland	WD2
Dense bracken	HD1
Recolonising bare ground	ED3
Dry meadows and grassy verges	GS2
Eroding/ upland rivers	FW1
Depositing/ lowland rivers	FW2

Further details on habitats within the Proposed Wind Farm can be found in Chapter 6 of the main EIAR. The majority of the land cover within the Proposed Wind Farm site were characterised as improved agricultural grassland pasture, wet grassland and conifer plantation, with areas of wet heath, scrub, treelines and hedgerow also prevalent.

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, exposed areas of grassland and farmland (tilled and arable) habitats outlined above 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). Areas of scrub, hedgerows, tree lines, conifer plantation and eroding upland rivers provide connectivity via linear features to the surrounding landscape. As such, they were assessed as having *Moderate* suitability i.e. *Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.* (Collins, 2023). Due to their varying levels of maturity and connectivity, tree lines and hedgerows were assessed as having *Moderate* to *High* suitability. While mixed woodland areas were assessed as having *High* suitability, i.e. *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.* (Collins, 2023).

With regards to roosting bats, five structures were identified within the site, and are assessed in further detail in section 4.3.2. Roosting suitability of these structures varied from *Low* to *High* roosting potential.

All trees and treelines within the Proposed wind Farm Site, particularly those scheduled for felling were inspected for potential roost features (PRFs) following Andrews (2018), including rot holes, hazard beams, cracks/splits, partially detached bark, knot holes and branch junctions. No PRFs were identified on any tree. Any superficial features observed offered no roosting potential; accordingly, all inspected trees were assessed as *None* in line with Collins (2023).

4.3.1.2 Proposed Grid Connection

A 110kV grid connection between the Proposed Wind Farm and the national electricity grid will be necessary to export electricity from the Proposed Wind Farm. It is proposed to connect the Proposed Carrow Wind Farm development to the national electricity grid via a 110kV underground electrical cabling connection to the existing 110 kV Killonan substation, in the townland of Milltown, southeast of Limerick City, Co. Limerick. The underground electrical cabling route measures approximately 38 km in length the majority of which is located within the curtilage of the public road network. The Proposed Grid Connection Route will exit the wind farm site to the west and will be lain entirely within a combination existing road infrastructure and agricultural fields.

Habitats along the wider grid connection route include:

- *Improved agricultural grassland (GA1)*
- *Dry meadows and grassy verges (GS2),*
- *Hedgerows (WLI)*
- *Mixed broadleaved woodland (WD1)*
- *Stonewalls and other stonework (BL1),*
- *Buildings and Artificial Surfaces (BL3)*
- *Eroding/ upland rivers (FW1)*
- *Depositing/ lowland rivers (FW2)*

Further details of habitats along the grid connection route are outlined in Chapter 6, Section 6.4.1.

With regard to commuting and foraging bats, features along the grid connection route such as stone walls, grassland habitats, hedgerows and mixed broadleaved woodland were assessed as having *Low* to *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, habitat features along the underground cable route, including grassland habitats, hedgerows, stone walls and woodland edges adjacent to the grid connection route, were assessed as having *Negligible* suitability i.e. *Negligible habitat features likely to be used by roosting bats/trees of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential* (Collins, 2023).

There are 23 EPA/OSI mapped watercourse crossings and a single rail crossing along the proposed grid connection route. An additional 12 drainage crossing points were identified during the surveys, these drainage crossing points had no structures or features to assess for bat roost suitability. The locations of the watercourse crossings are shown on the detailed layout drawings in Appendix 4-1 of Chapter 4 and

details of each crossing method are presented in Chapter 4, Table 4-4. Roost assessments for the watercourse and rail crossing infrastructure are provided in **Appendix 4**.

4.3.1.3 Turbine Delivery Accommodation Works

As described in Chapter 4, Section 4.4.3 of this EIAR, turbine delivery route minor temporary accommodation works will be required at eight locations on the national and regional road networks between the port of arrival in Cork and the Proposed Wind Farm site to facilitate the delivery of turbine components and other abnormal loads to the Site during the construction phase. These will be limited to temporary measures including overruns of roundabout islands and temporary relocation of some signs and street furniture.

It is envisaged that large wind turbine components will be delivered to the Proposed Wind Farm site, from the Port of Cork (Ringaskiddy) (other ports such as Galway Port, Shannon Foynes or Dublin Port could also be used), via the N28 and N40 national primary road, the M8 Motorway, N74 National Secondary Road, R639 and R505 regional roads followed by the L1291, L1283, L1282 and L1154 local roads. The current proposed Turbine Delivery Route (TDR) for the Proposed Wind Farm is predominantly located within existing public road infrastructure. The TDR will travel along the road network to the southeast of the Proposed Wind Farm site. The TDR is delineated by similar habitat to that of the Proposed Grid Connection Route which predominantly contains *Buildings and artificial surfaces (BL3)*, *Dry meadows and grassy verges (GS2)*, *Hedgerows (WL1)*, *Treelines (WL2)*, and bordered by agricultural grasslands. Further details on habitats associated with the TDR are outlined in Chapter 6, Section 6.4.1.

With regard to foraging and commuting bats *Buildings and artificial surfaces*, *Dry meadows and grassy verges* along the route are considered to have *Negligible* to *Low* suitability. Hedgerows and treelines are considered to have *Moderate* suitability for foraging and commuting bats.

Regarding roosting bats, habitats along the TDR were assessed as having no (*None*) roosting potential. No trees with potential roosting features that could support roosting bats were identified within the TDR accommodation works pathway. As such trees along the TDR accommodation areas were assessed as having no (*None*) to *Negligible* roosting potential due to their size and lack of available roosting features.

4.3.2 Roost Surveys

4.3.2.1 Daytime Roost Inspections

Five structures were identified within the EIAR Site Boundary as having roosting potential across the 2023 and 2024 surveys. No trees were identified with roosting potential.

Vacant Property 1

The one storey building (Irish Grid Ref: R 93326 50709, Plate 4-1) is located approximately 330 meters north of the proposed turbine T08. The building is in a relatively good state and was not in use at the time of the survey. The house has an external stone-like block wall. The roof is covered with tiles that have gaps giving access to bats into the attic. An external entry point was also noted between the wall and eaves where there is a gap of approximately 2 centimetres with paint scratches. Bat droppings were found on the wall under the potential entrance (Plate 4-2).

The attic was accessed via the bathroom hatch during the internal inspection. The roof is insulated with underfelt lining, which was in a poor condition, but the space was very warm (Plate 4-3). Bat droppings were scattered around on the attic ceiling insulation (Plate 4-4) and there was a strong smell of ammonia indicating the presence of a potential roost). The vacant property was assessed as having *High* roosting suitability due to the potential access points, warm attic environment, evidence of roosting bats and surrounding habitat features to support foraging and commuting bats in the form of conifer treelines and river waterbodies.



Plate 4-1 Derelict dwelling with a confirmed roost



Plate 4-2 External entry point with bat droppings on the wall



Plate 4-3 Underfelt in the attic



Plate 4-4 Scattered bat droppings

Inhabited Property

The one-storey building is an inhabited house (Irish grid ref: R 93252 50892, Plate 4-5) located approximately 400m south of the proposed turbine T07. The house has concrete block wall and one façade with stone wall cladding (Plate 4-6). The attic is insulated with fiberglass (Plate 4-7). Bat droppings were found on the attic insulation (Plate 4-8) and there was a strong smell of ammonia in the attic indicating the presence of bats. As no major accumulation of droppings were found in the attic it was assumed that the bats were roosting under the slates between the insulation. The house was assessed as having *Moderate* roosting suitability due to the potential access points, large, insulated attic space, evidence of roosting bats and surrounding habitat features connected to the wider landscape.



Plate 4-5 Concrete wall and slate roof



Plate 4-6 External stone wall cladding



Plate 4-7 Fiber glass insulation



Plate 4-8 Evidence of bats - Droppings in the attic

Vacant Property 2 and Outbuildings

The Vacant Property 2 is made of a main vacant house, a barn, a cow shed an outbuilding and a shed (Irish Grid Ref: R 93786 50985). The main house (Plate 4-9) is a concrete building covered by a slate roof with two chimneys. Potential external entry points were identified under the gutter, through the Velux and front window (Plate 4-10) left open, chimneys and between loose slates. The inspection of the main house revealed potential evidence of roosting bats in the form of feeding remains discovered in several places on the ground floor (Plate 4-15). The main house was assessed as having *Moderate* roosting suitability due to the potential access points, evidence of feeding bats, and surrounding habitat features connected to the wider landscape

The adjacent shed is a made of concrete walls and covered by some loose slates. The northern facade is partially covered in ivy. The cow shed (Plate 4-11) is a stone building covered by loose slates (Plate 4-12). The outbuilding (Plate 4-13) and the barn (Plate 4-14) are both covered by corrugated iron. The shed, the cow shed, the barn and the outbuilding were assessed as having *Low* roosting suitability due to the structure materials and potential for the structures to be used by individual bats opportunistically.



Plate 4-9 Main house and shed - High potential



Plate 4-10 Entry point - Open window



Plate 4-11 Cow shed - Low potential



Plate 4-12 Entry point - Loose slates



Plate 4-13 Outbuilding - Low potential



Plate 4-14 Barn - Low potential



Plate 4-15 Feeding remains - Butterfly wings

Vacant property 3 and Outbuilding

It is a derelict dwelling (Plate 4-16) with severe fire damage located approximately 300m southwest (Irish Grid Ref: R 95197 50971) from the proposed turbine T02. The roof is in disrepair with most of the slates missing (Plate 4-17). An associated Outbuilding (Plate 4-18) located immediately to the east of the House was also inspected. The building is separated into two parts, an old shed and a newer bathroom. A gap in the roof cavity of the bathroom provides potential for roosting bats (Plate 4-19). The Vacant property 3 and the Outbuilding were assessed as having *Low* roosting suitability potential due to the condition of the structure being unlikely to support a larger number of bats on a regular basis.



Plate 4-16 Vacant property 3 south aspect



Plate 4-17 Vacant property 3 southwest aspect



Plate 4-18 Outbuilding southwest aspect



Plate 4-19 Large cavity in flat roof section of outbuilding

Vacant Property 4

It is a derelict concrete dwelling (Irish Grid Ref: R 95323 50819, Plate 4-20, Plate 4-21) located 430m southwest of T2. The slated roof is in disrepair and interior is illuminated (Plate 4-23). The stone chimney likely contains gaps in the stonework that cannot be seen from ground-level (Plate 4-22). The building was assessed as having *Low*roosting suitability potential due to the condition of the structure being unlikely to support a larger number of bats on a regular basis.



Plate 4-20 Vacant property 4 - southeast aspect



Plate 4-21 Vacant property 4 - south aspect



Plate 4-22 Vacant property 4 - Chimney stack



Plate 4-23 Vacant property 4 - Interior

4.3.2.2 Emergence Surveys

Emergence surveys were undertaken in spring, summer, and autumn of 2023 and 2024. Vacant Property 1 supported roosting common and soprano pipistrelles, with up to 35 bats recorded in 2023 and smaller numbers (7no.) in 2024. The inhabited property held a roost of 68 bats (approx. 57 common pipistrelles, 11 soprano pipistrelles) during summer 2023. Vacant Property 2 supported soprano pipistrelles in both 2023 and 2024, with up to 11 bats recorded. In autumn 2024, Vacant Property 3 supported soprano pipistrelles (seven bats), while no emergences were recorded at Vacant Property 4.

Overall, four roosts were confirmed on site. A summary of all roost surveys is provided in Table 4-7.

Table 4-7 Roost surveys summary 2023-2024

Structure	Location	Suitability assessment	Roost confirmed	Date Surveyed	Species	Population size
Vacant Property 1	R 93326 50709	High	yes	22/05/2023	Common and soprano pipistrelles	>35
Vacant Property 1	R 93326 50709	High	yes	24/04/2024	Soprano pipistrelles	>7
Inhabited Property	R 93252 50892	Moderate	yes	20/07/2023	Common and soprano pipistrelles	>68
Vacant Property 2	R 93786 50985	Moderate & Low	yes	13/09/2023	Soprano pipistrelles	>11
Vacant Property 2	R 93786 50985	Moderate & Low	yes	12/06/2024	Soprano pipistrelles	>5
Vacant Property 3	R 95191 50978	Low	yes	19/08/2024	Soprano pipistrelle	>7
Vacant Property 4	R 95324 50818	Low	no	19/08/2024	-	-

4.3.3 Manual Transects 2023

Manual transects were undertaken in Spring and Summer of 2023. Four bat species were recorded including common pipistrelle, soprano pipistrelle and Leisler's bat, along with *Myotis spp.*. A total of 1,378 bat passes were recorded. In general, soprano pipistrelle (n=853), followed by common pipistrelle (n=499). Leisler's bat (n=16), *Myotis spp.* (n= 5) and brown long-eared bats (n=5) were rarer. Species composition across all manual surveys is presented in Plate 4-24.

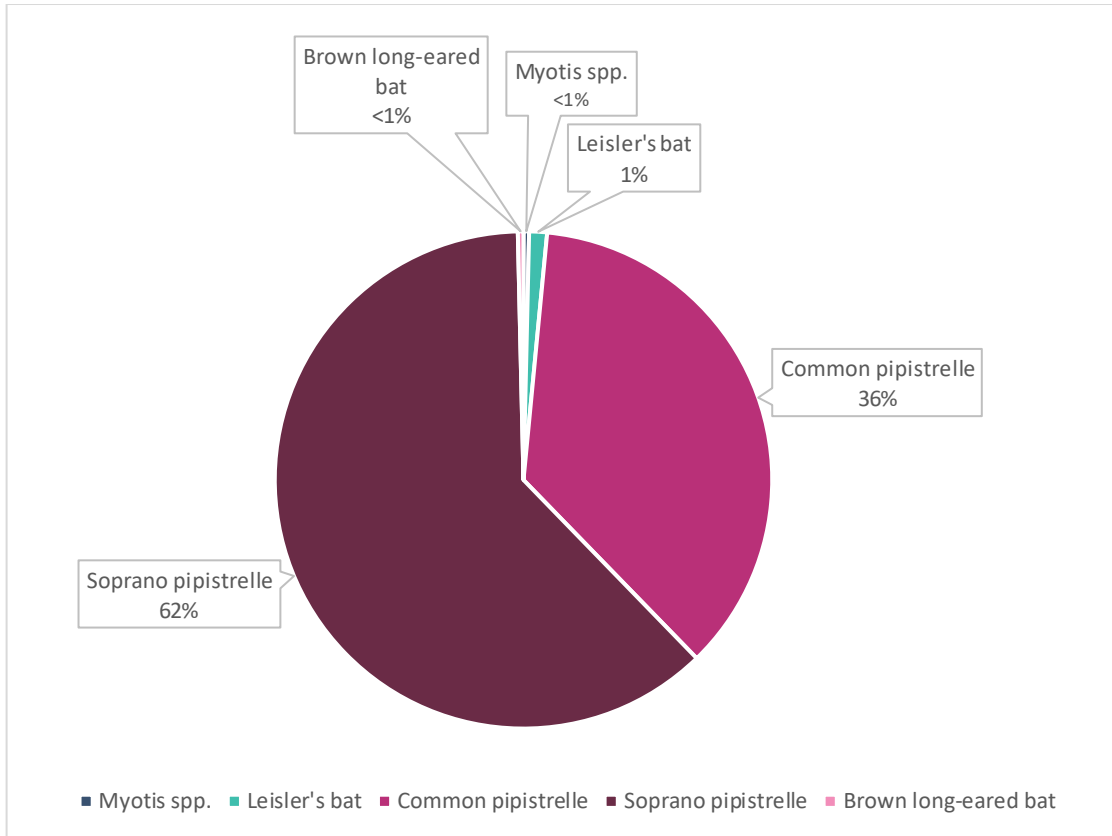


Plate 4-24 2023 Species Composition Manual Surveys

Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-25 presents results for individual species per survey period. Bat activity was spread around the site. Bats were observed commuting and foraging along hedgerows and linear habitats. Figure 4-1 and Figure 4-2 present the spatial distribution of bat activity across the 2023 surveys.

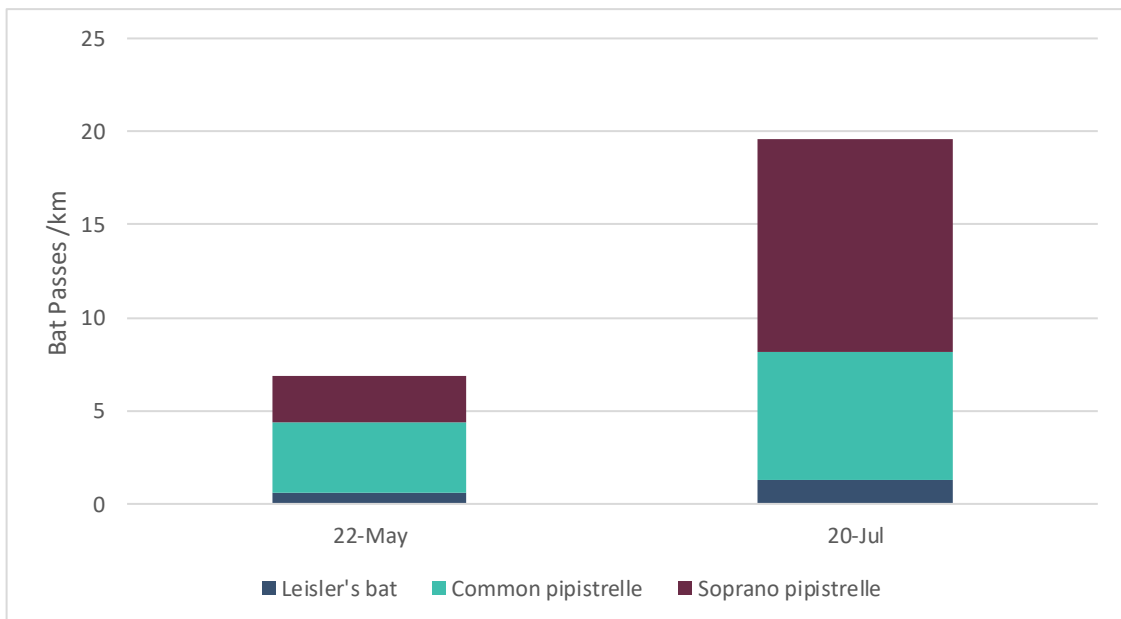
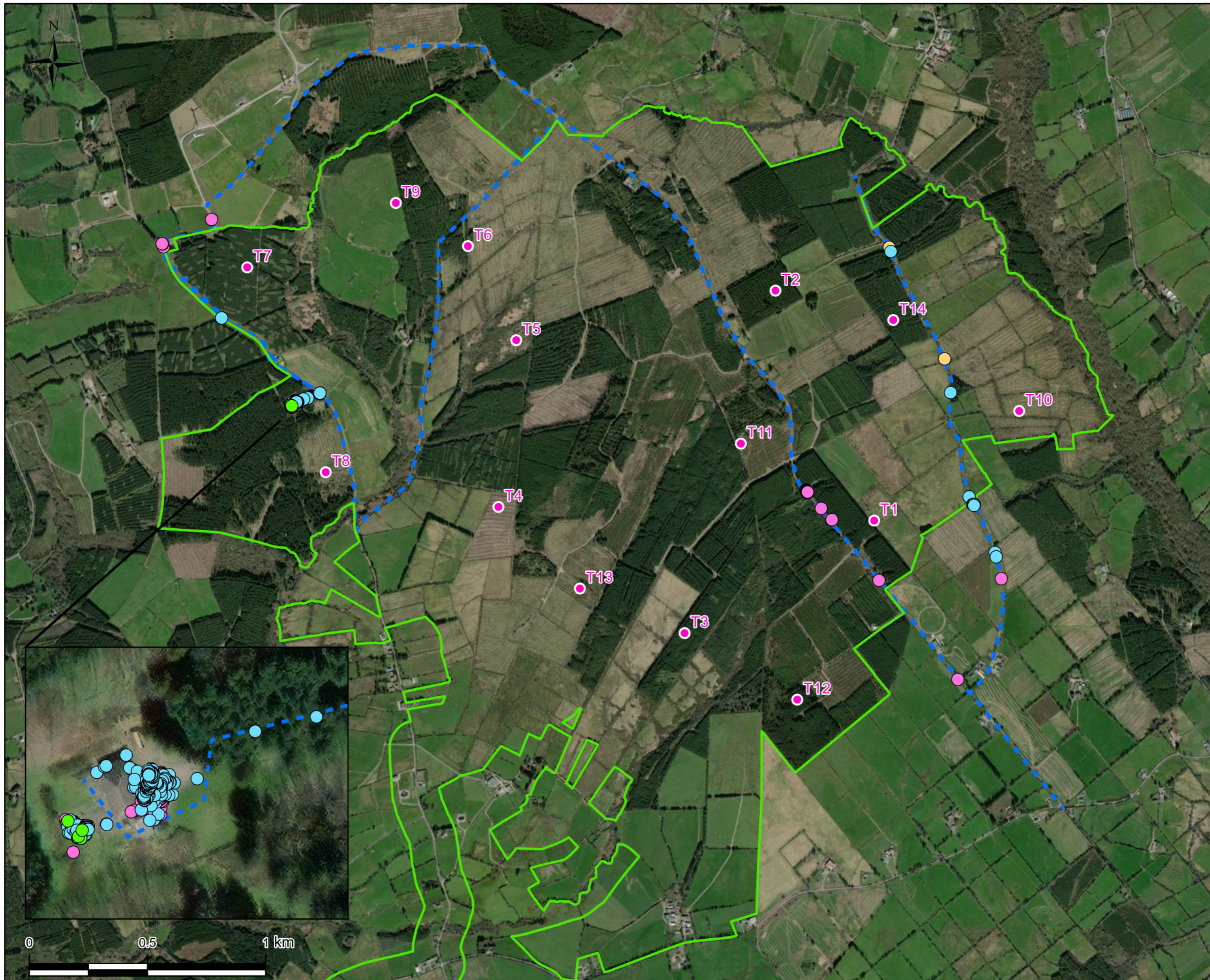


Plate 4-25 Manual Transect Bat Passes per kilometres surveyed in 2023



- Map Legend**
- Proposed Turbine Location
 - ▭ EIA Site Boundary
 - Manual Survey Results**
 - Myotis Species
 - Leisler's Bat
 - Common Pipistrelle
 - Soprano Pipistrelle
 - Brown long-eared bat
 - Spring Transect Route

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



SITE LOCATION - NOT TO SCALE

**Manual Survey Results
 - Spring 2023**

Project Title
Carrow Wind Farm

Project No. 231102	Drawing No. 4.1	Scale 1:15,000
Drawn By JB	Checked By MoH	Date 12/03/2026

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

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Map Legend

- Proposed Turbine Location
- ▭ EIAR Site Boundary

Manual Survey Results

- Leisler's Bat
- Common Pipistrelle
- Soprano Pipistrelle
- Summer Transect Route

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

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SITE LOCATION - NOT TO SCALE

Drawing Title: **Manual Survey Results - Summer 2023**

Project Title: **Carrow Wind Farm**

Project No.	Drawing No.	Scale
231102	4.2	1:15,000
Drawn By	Checked By	Date
JB	MoH	12/03/2026

MKO

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

4.3.4 Manual Surveys 2024

Manual Activity surveys were undertaken in Spring, Summer and Autumn 2024. Five bat species were recorded during manual surveys including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Leisler’s bat (*Nyctalus leisleri*), brown long-eared bat (*Plecotus auritus*) and bats from the *Myotis* genus. In general, soprano pipistrelle (n=480) was recorded most frequently, followed by common pipistrelle (n=225), Leisler’s bat (n=72) and *Myotis spp.* (n= 23). One instance of brown long-eared bat was recorded. Species composition across all manual surveys in 2024 is presented in Plate 4-26.

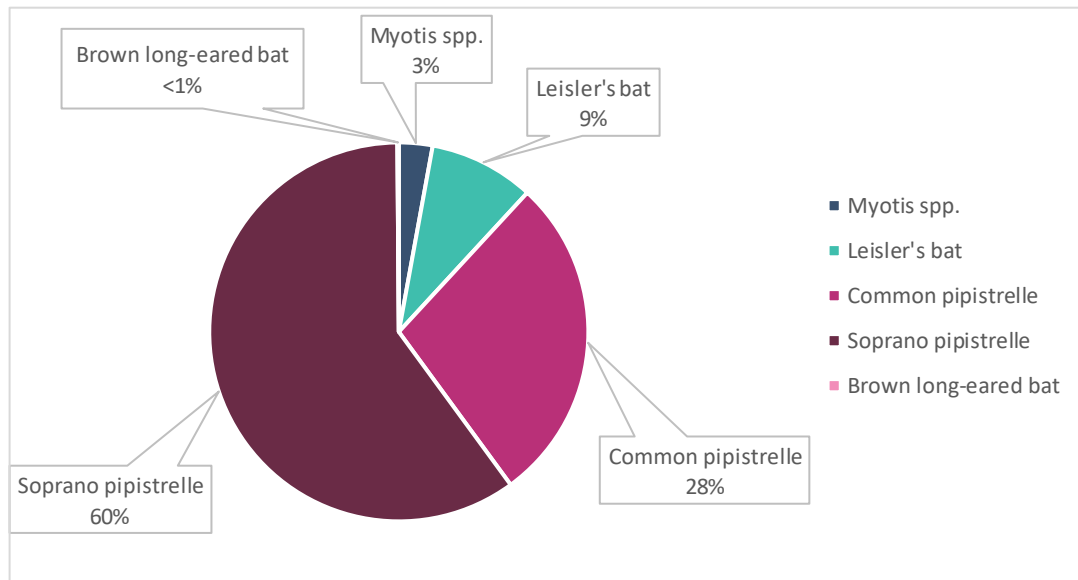


Plate 4-26 2024 Species Composition Manual Surveys

Transect surveys always followed roost emergence surveys. To account for differences in survey effort, survey results were calculated as bat passes per km surveyed (Plate 4-27). Species composition per season was similar with the exception of *Myotis spp.* which was not recorded in Autumn. Common and soprano pipistrelles were most frequently recorded. Most of the activity was observed along flightpaths i.e. forestry edges and treelines between fields. Both commuting and foraging activity were recorded along the transect tracks.

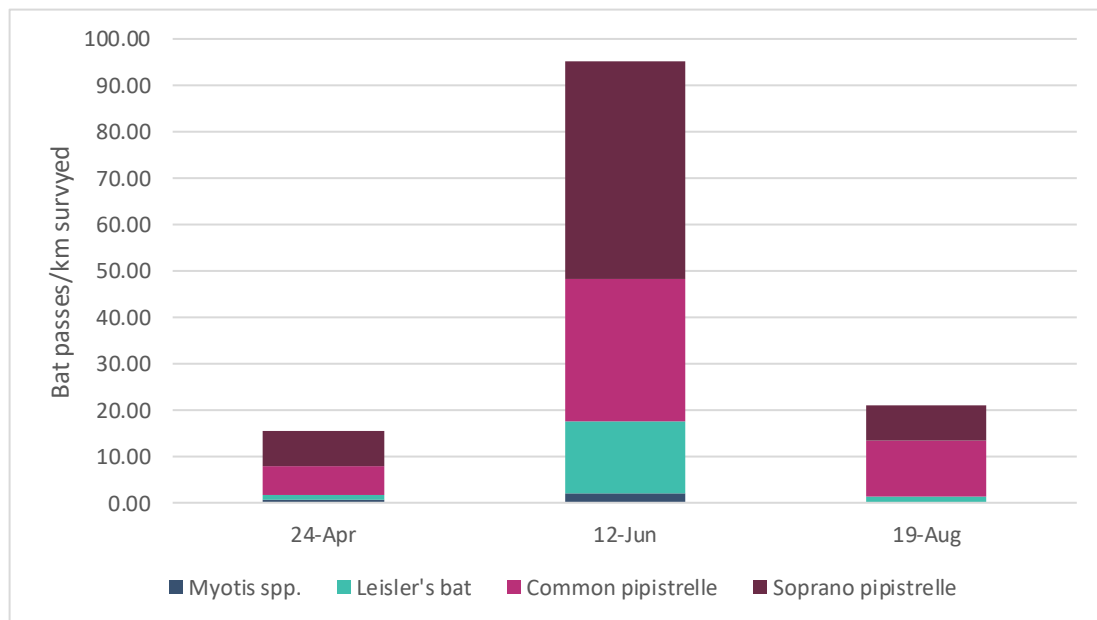
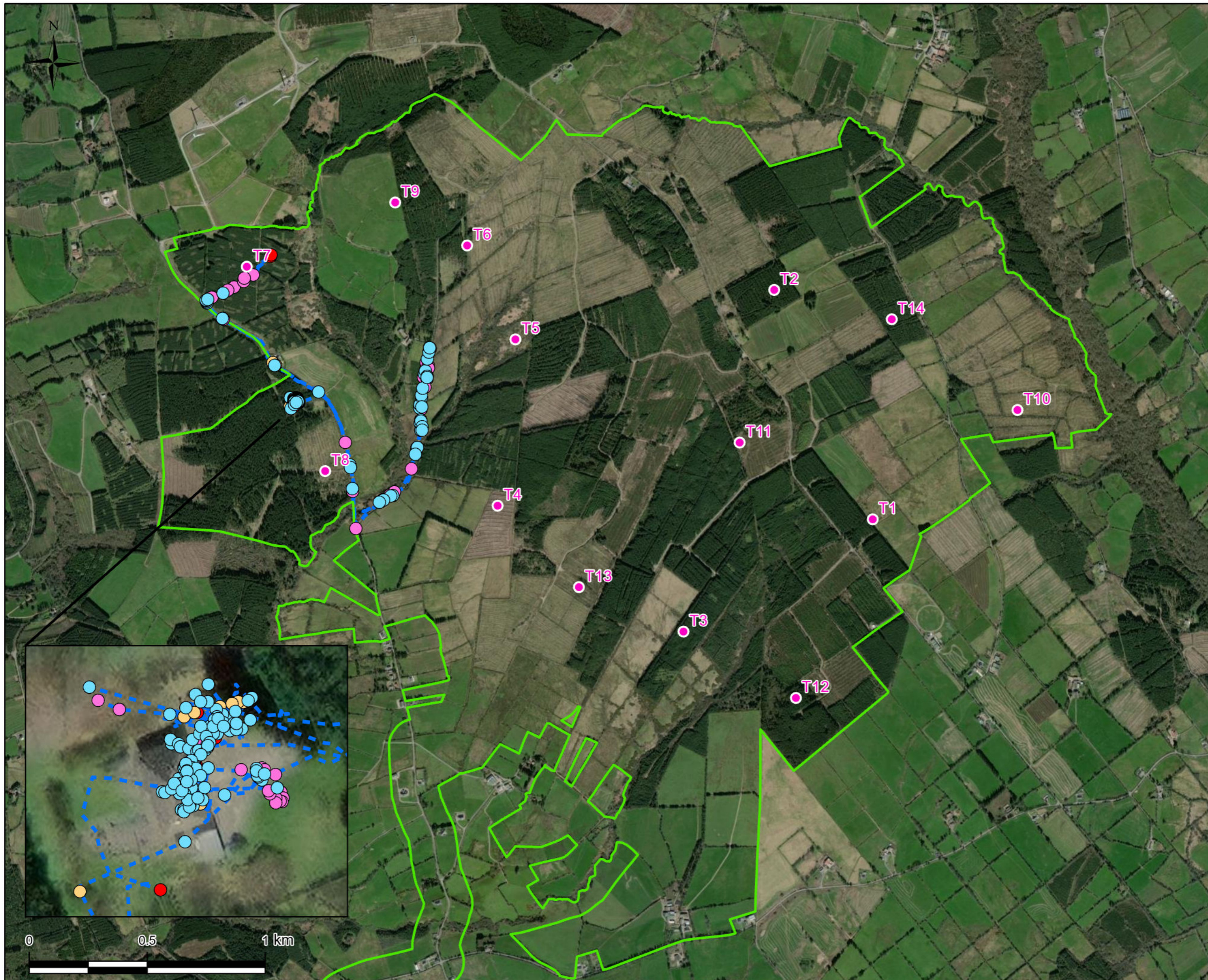


Plate 4-27 Manual Results 2024 - Species Composition Per Survey Period



- Map Legend**
- Proposed Turbine Location
 - ▭ EIA Site Boundary
 - Manual Survey Results**
 - Myotis Species
 - Leisler's Bat
 - Common Pipistrelle
 - Soprano Pipistrelle
 - ▬ Spring Transect Route

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



SITE LOCATION - NOT TO SCALE

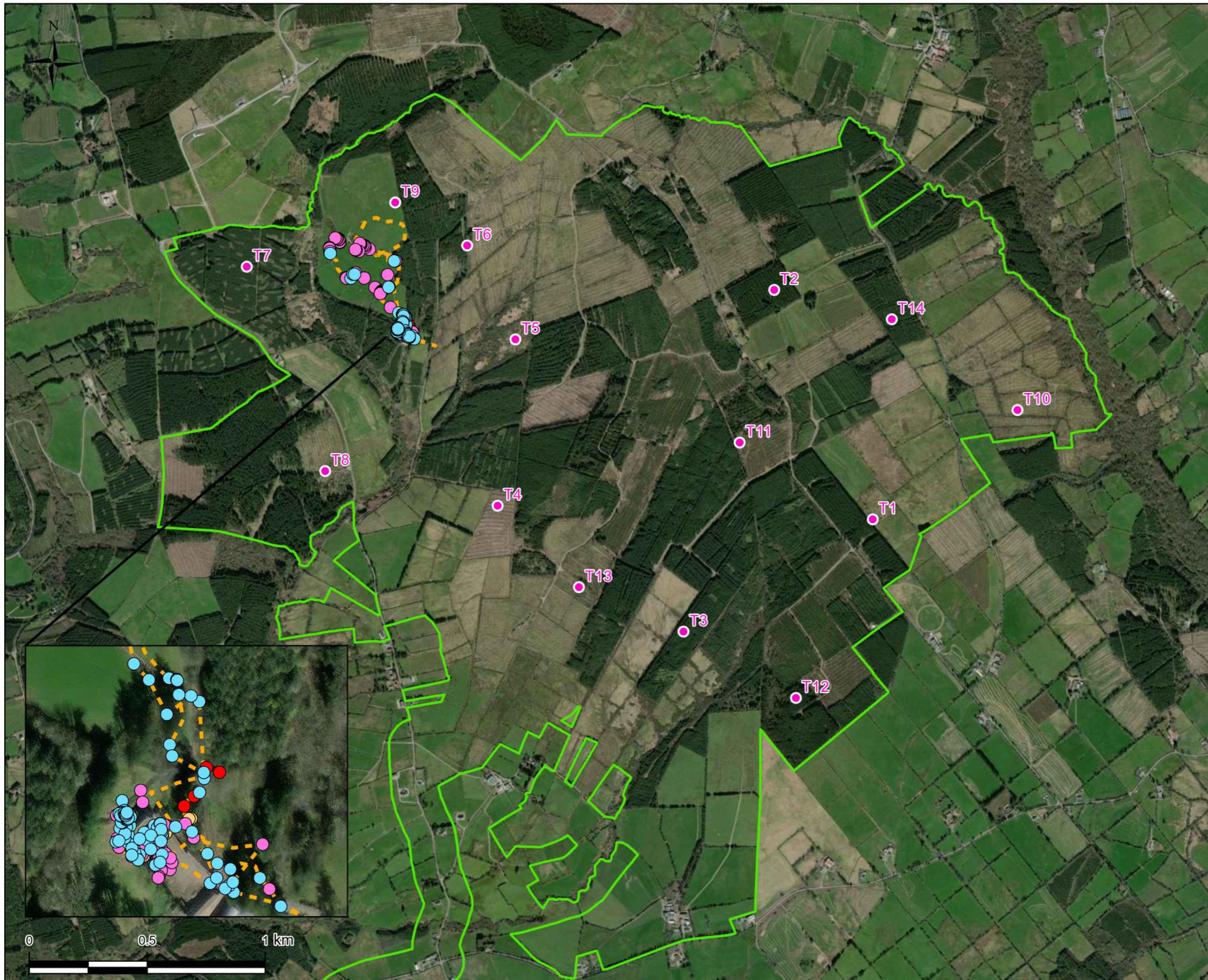
**Manual Survey Results
 - Spring 2024**

Project Title
Carrow Wind Farm

Project No. 231102	Drawing No. 4.3	Scale 1:15,000
Drawn By JB	Checked By MoH	Date 12/03/2026



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- Map Legend**
- Proposed Turbine Location
 - ▭ EIA Site Boundary
 - Manual Survey Results**
 - Myotis Species
 - Leisler's Bat
 - Common Pipistrelle
 - Soprano Pipistrelle
 - Summer Transect Route

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



SITE LOCATION - NOT TO SCALE

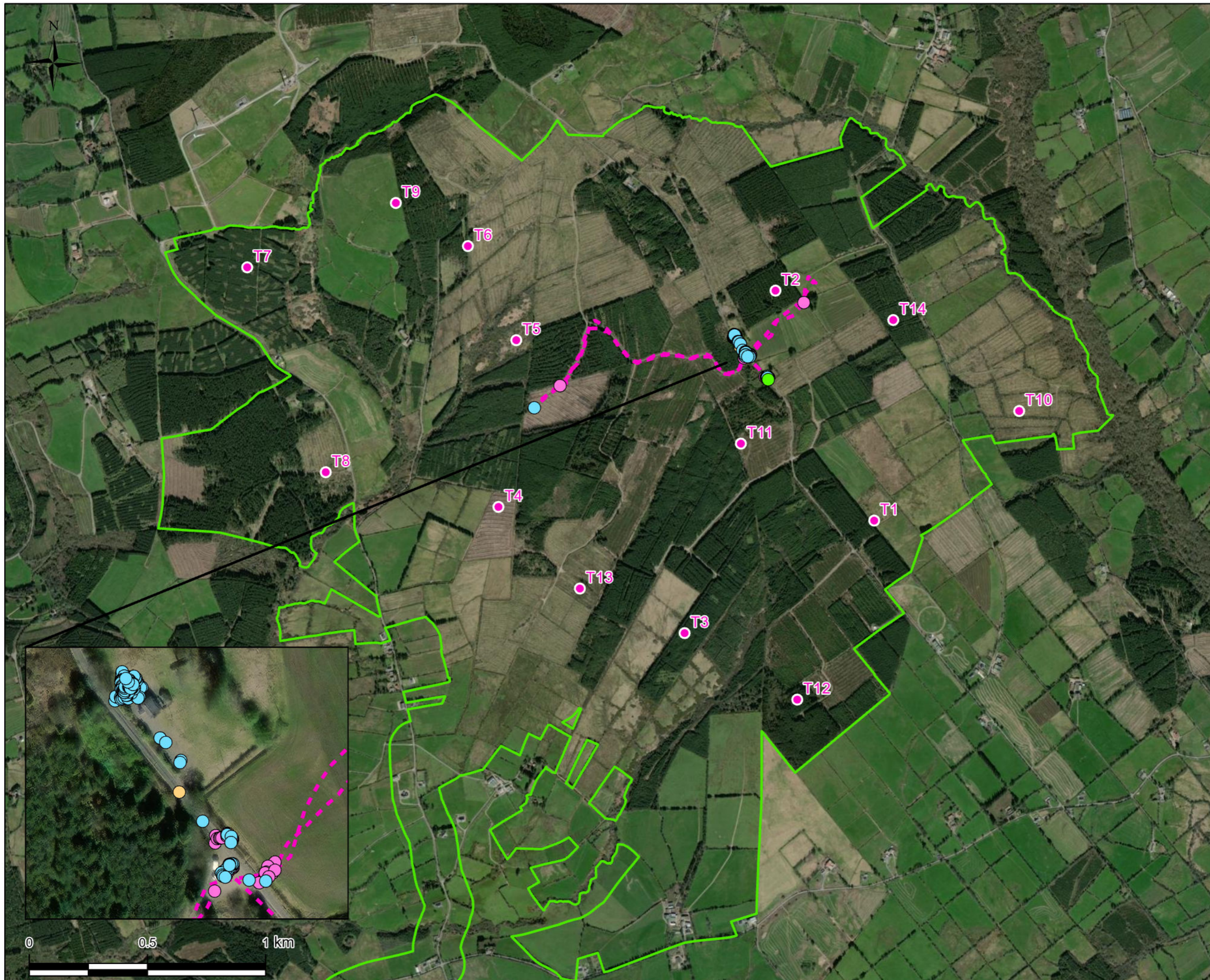
**Manual Survey Results
 - Summer 2024**

Project Title
Carrow Wind Farm

Project No. 231102	Drawing No. 4.4	Scale 1:15,000
Drawn By JB	Checked By MoH	Date 12/03/2026

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- Map Legend**
- Proposed Turbine Location
 - ▭ EIAR Site Boundary
 - Manual Survey Results**
 - Myotis Species
 - Leisler's Bat
 - Common Pipistrelle
 - Soprano Pipistrelle
 - Brown long-eared bat
 - Summer Transect Route

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



SITE LOCATION - NOT TO SCALE
 Drawing Title: **Manual Survey Results - Autumn 2024**

Project Title: **Carrow Wind Farm**

Project No.	Drawing No.	Scale
231102	4.5	1:15,000
Drawn By	Checked By	Date
JB	MoH	12/03/2026

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

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4.4 Static Surveys

4.4.1 Ground-level Static Surveys 2023

In total, 28,742 bat passes were recorded in 2023 across four detectors. In general, common pipistrelle (n= 15,804) occurred most frequently, followed by soprano pipistrelle (n=10,443). Instances of Leisler’s bat (n= 4,418) and *Myotis spp.* (n=951) were less common, while recordings of brown long-eared bat (n=125) and Nathusius’ pipistrelle (n=2) were infrequent. Plate 4-28 presents species composition across all ground-level static detectors.

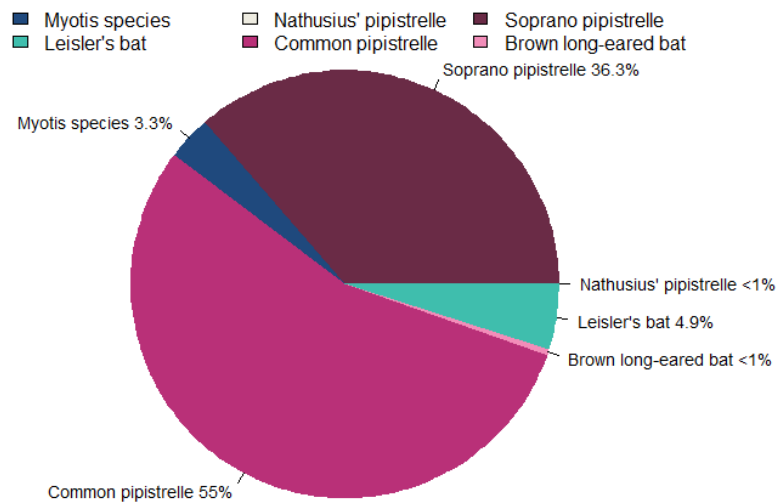


Plate 4-28 2023 Static Detector Surveys: Species Composition (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bp/h) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-29 present these results for each species.

Common pipistrelle activity was recorded most frequently during spring, while Soprano pipistrelle activity was the highest in autumn. Leisler’s bat was higher in spring compared to summer and autumn, where it was very low. *Myotis spp.* activity was highest in summer whilst Brown long-eared bat activity was relatively rare throughout each season. Nathusius’ pipistrelle was detected in low numbers in spring but was not identified in summer and autumn.

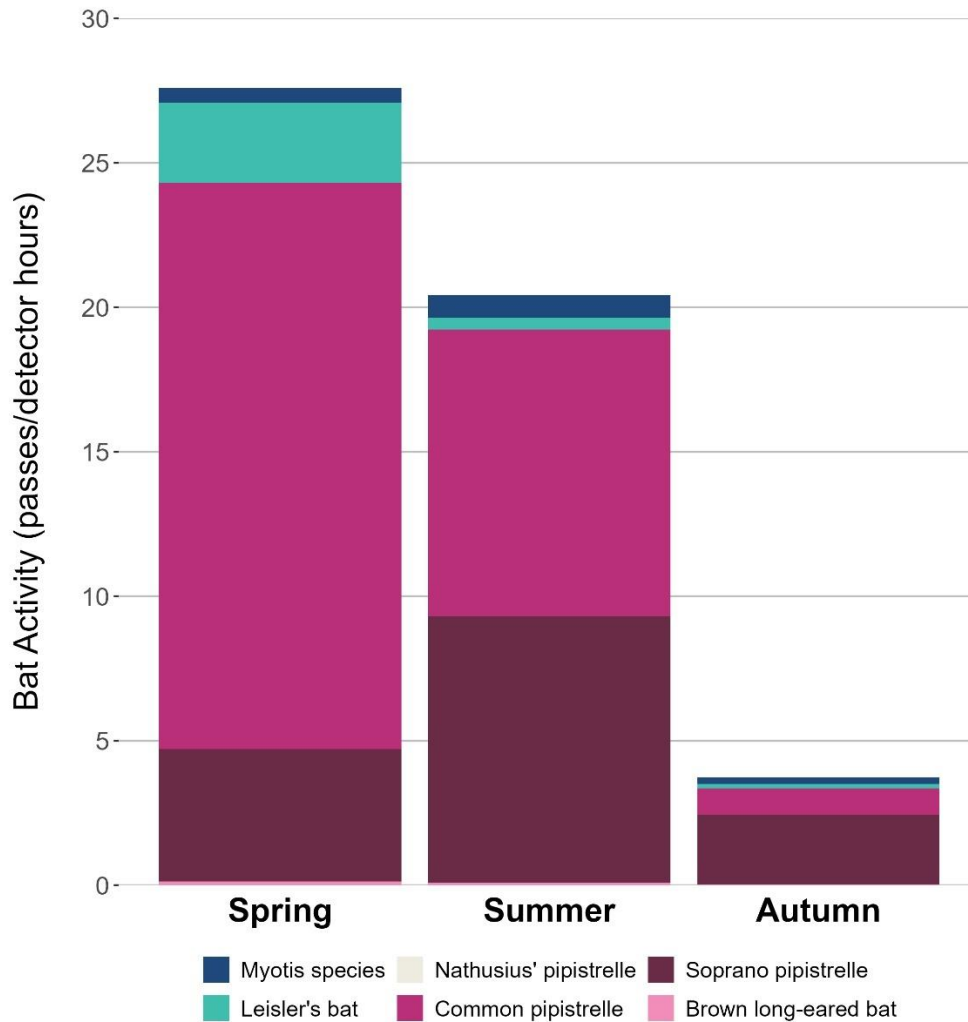


Plate 4-29 Seasonal bat passes per hour - 2023

Median bat passes per detector was used to assess the level of activity per location and per season. A median of zero does not necessarily mean that there was no bat activity at the detector location. The plates below illustrate the median bat passes per detector across the seasons with varied y-axis (Plate 4-30) and same y-axis (Plate 4-31) allowing for comparison.

In spring, the highest median activity was reached at D11 with common pipistrelles recorded in the highest proportion. Species composition per detector was unevenly distributed. At D02, median activity had a higher proportion of Leisler's bat and *Myotis spp.*

In summer, D11 reached the highest median value. Species composition per detector was again unevenly distributed between detectors. Common pipistrelles were mostly recorded at D11 while soprano pipistrelles predominant at D02 alongside Leisler's bat and *Myotis spp.* The median value at D11 in Summer dropped down considerably in comparison to Spring.

In autumn, D06 reached the higher median value across all detectors and was overall higher than during summer. Common pipistrelles and soprano pipistrelles were recorded in higher proportions at D06 and D011 than Leisler's bat and *Myotis spp.*. No bat passes were recorded at D05 in autumn.

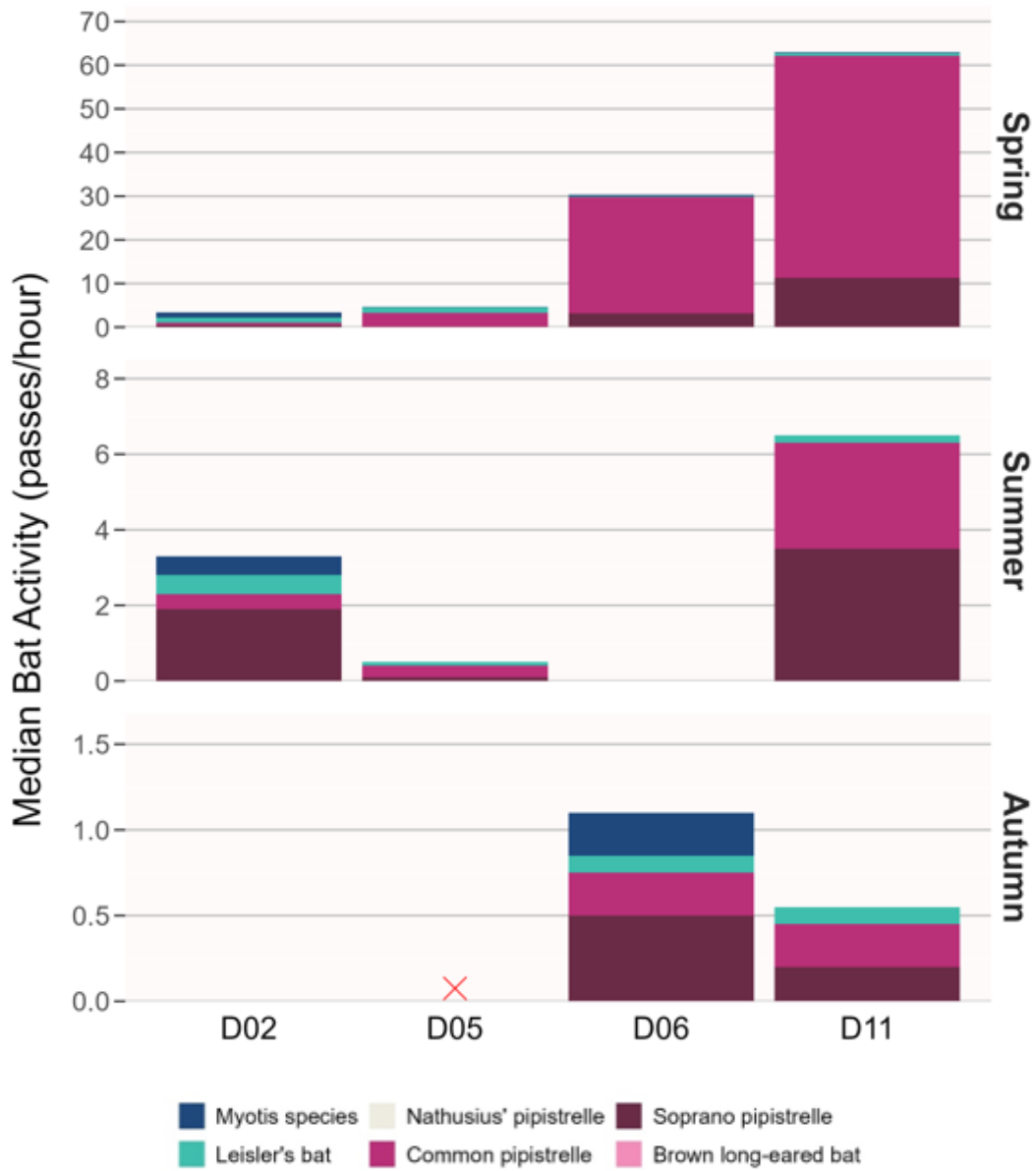


Plate 4-30 Median Nightly Pass Rate per detector with varied y-axis.

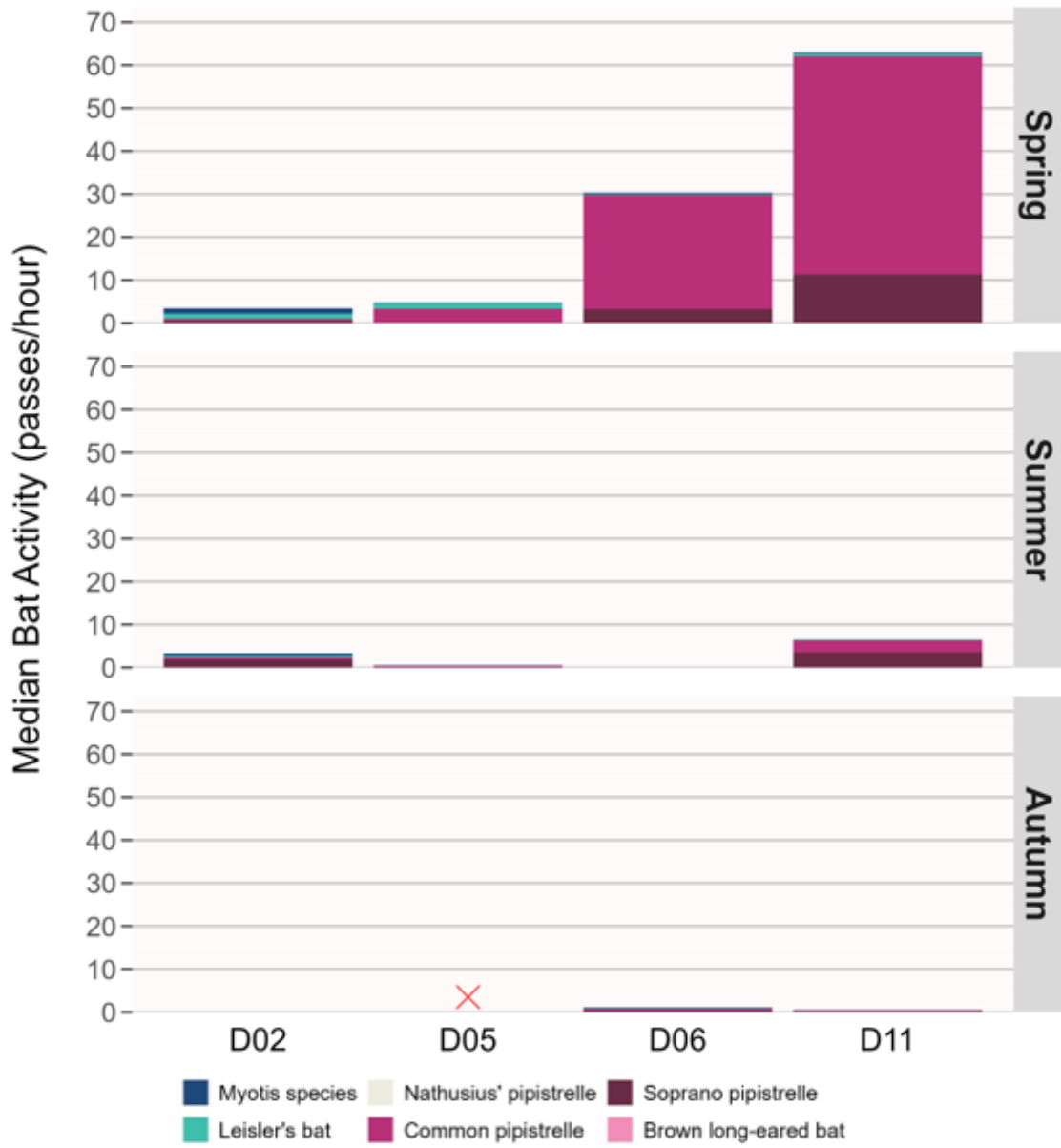


Plate 4-31 Median Nightly Pass Rate per detector with same y-axis for comparison.

The total Bat Pass rate per night is shown in Plate 4-32. Bat activity varied across seasons and detector locations. Across the site, bat activity was consistently high in Spring. Common pipistrelle was the most recorded species. Leisler's bat activity was much higher in Spring than that of Summer and Autumn. *Myotis* spp. was highest in Spring and in early Summer. Autumn bat activity was lower than other seasons.

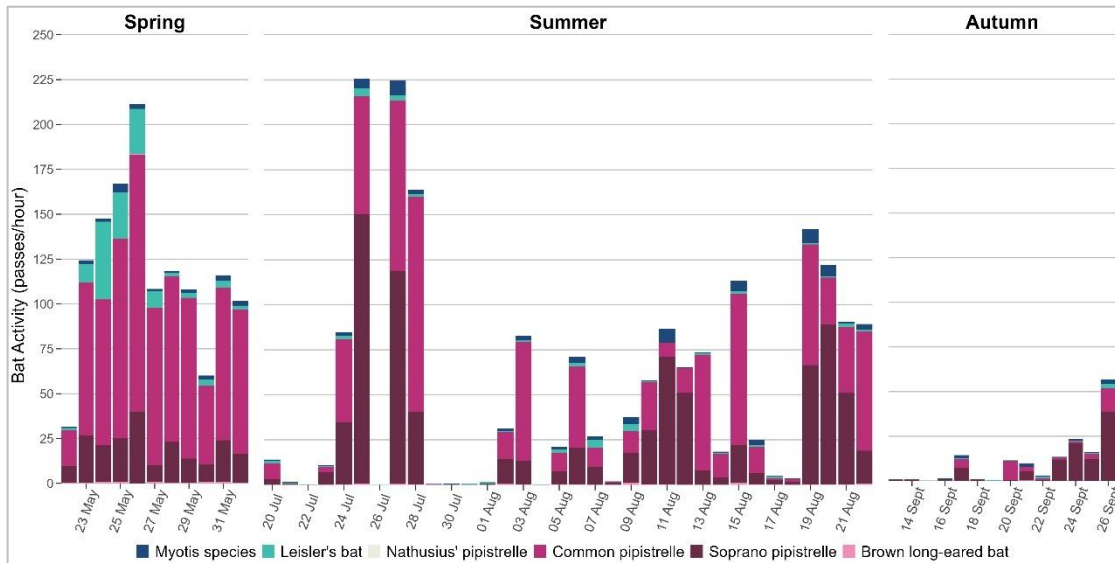


Plate 4-32 Nightly Bat Pass Rate 2023

Weather (rainfall, windspeed and temperature) at night during deployments are presented below (Plate 4-33).

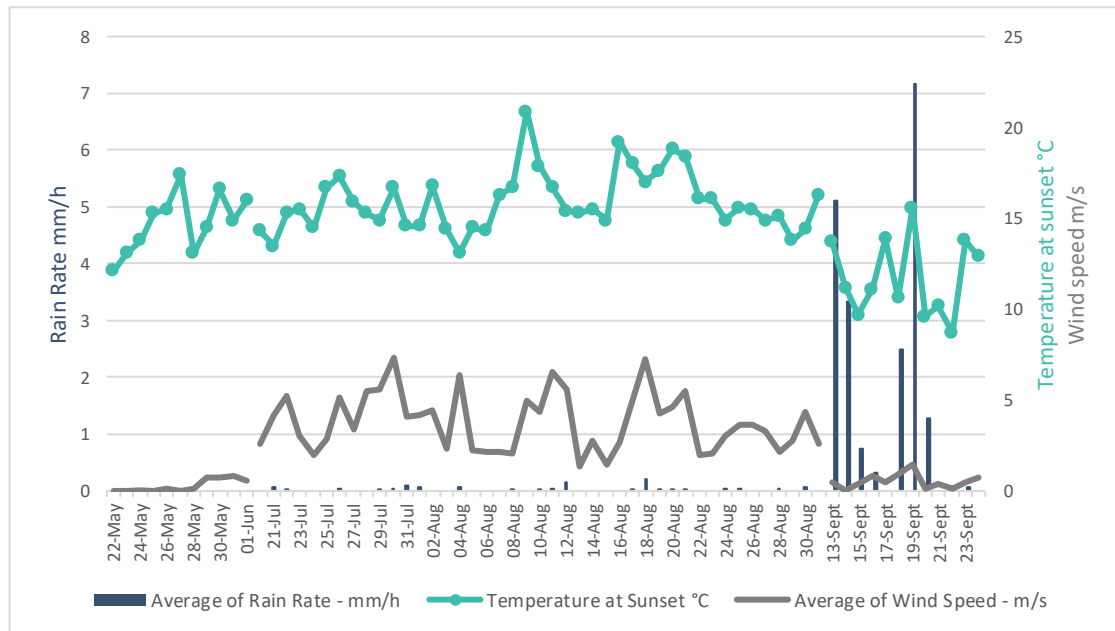


Plate 4-33 Nightly weather conditions across the site 2023

4.4.2 Ground-level Static Surveys 2024

In total, 109,255 bat passes were recorded across 2024 including six bat species along with *Myotis spp.*. Common pipistrelle (n=44,876) were the dominant species, followed by soprano pipistrelle (n=43,492), *Myotis spp.* (n=13,210) and Leisler’s bat (n=6,681). Brown long-eared bat (n=826) and Nathusius’ pipistrelle (n=170) were rarer. Plate 4-34 presents relative species composition across all ground-level static detector surveys.

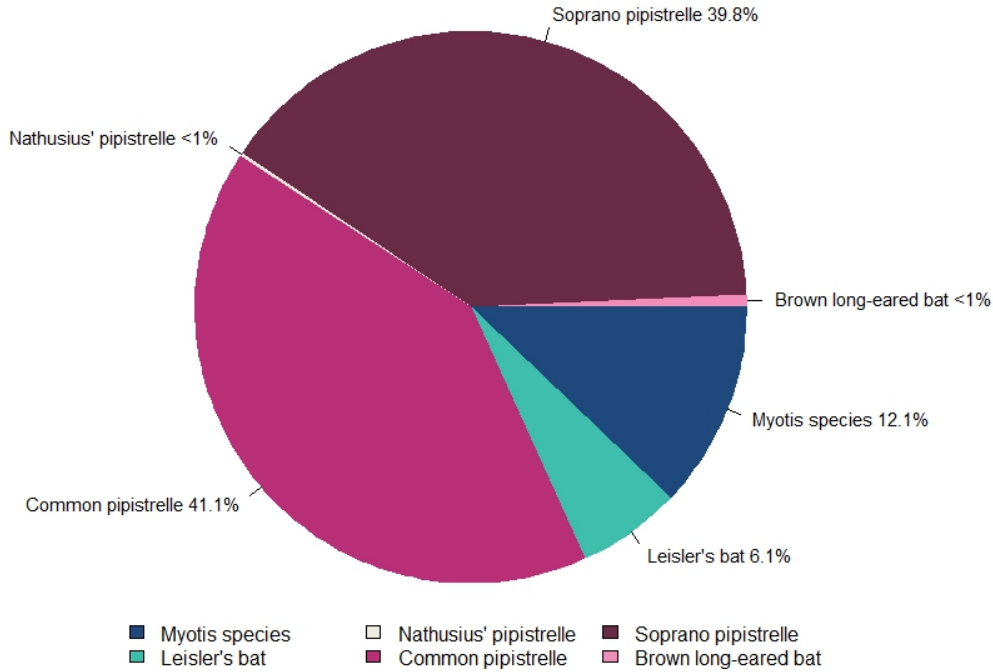


Plate 4-34 2024 Static Detector Surveys: Species Composition Across All Deployments at ground level (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bp/h) of total recordings per season (Plate 4-35) to account for any bias in survey effort, resulting from varying night lengths between seasons. Autumn presented the highest bat activity, followed by Spring and Summer. Species composition was similar across the seasons with the common and soprano pipistrelles as the dominant species. Nathusius’ pipistrelle was not recorded in Spring but in Summer and Autumn.

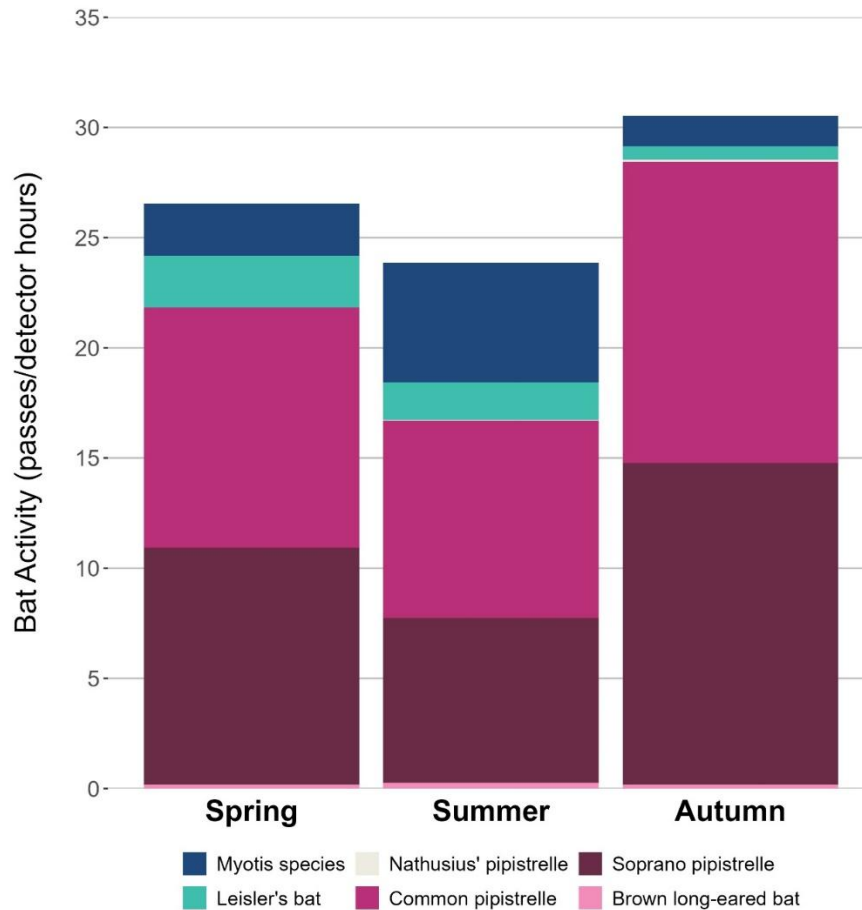


Plate 4-35 2024 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes per hours of recordings)

Median bat passes per detector was used to assess the level of activity per location and per season. A median of zero does not necessarily mean that there was no bat activity at the detector location. The plates below illustrate the median bat passes per detector across the seasons with varied y-axis (Plate 4-36) and same y-axis (Plate 4-37) allowing for comparison.

In spring, the highest median activity was reached at D02 with common pipistrelles recorded in the highest proportion. Species composition per detector was unevenly distributed. At D07, median activity was almost exclusively made of Leisler's bat while soprano pipistrelles were recorded in the higher proportion at D06.

In summer, D01 reached the highest median value. Species composition per detector was again unevenly distributed between detectors. Common pipistrelles were mostly recorded at D01 while *Myotis spp.* were predominant at D04. Brown long-eared bat median value was higher than zero solely at D01 and D04. The median value at D02 in Summer dropped down considerably in comparison to Spring.

In autumn, D01 reached the higher median value across all detectors and was overall higher than during summer. Soprano pipistrelles were recorded in higher proportions at D01 and D02 than common pipistrelles which was not the case in spring or summer. D07 recorded almost exclusively common pipistrelles.

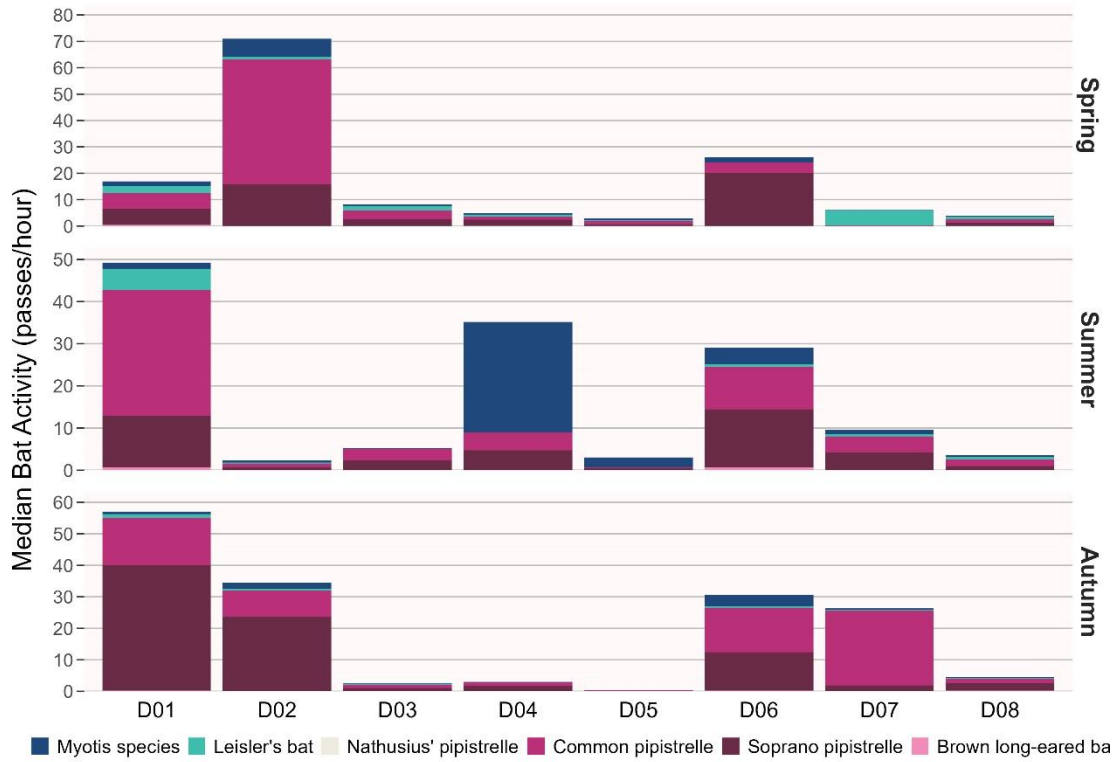


Plate 4-36 Median Nightly Pass Rate per detector with varied y-axis.

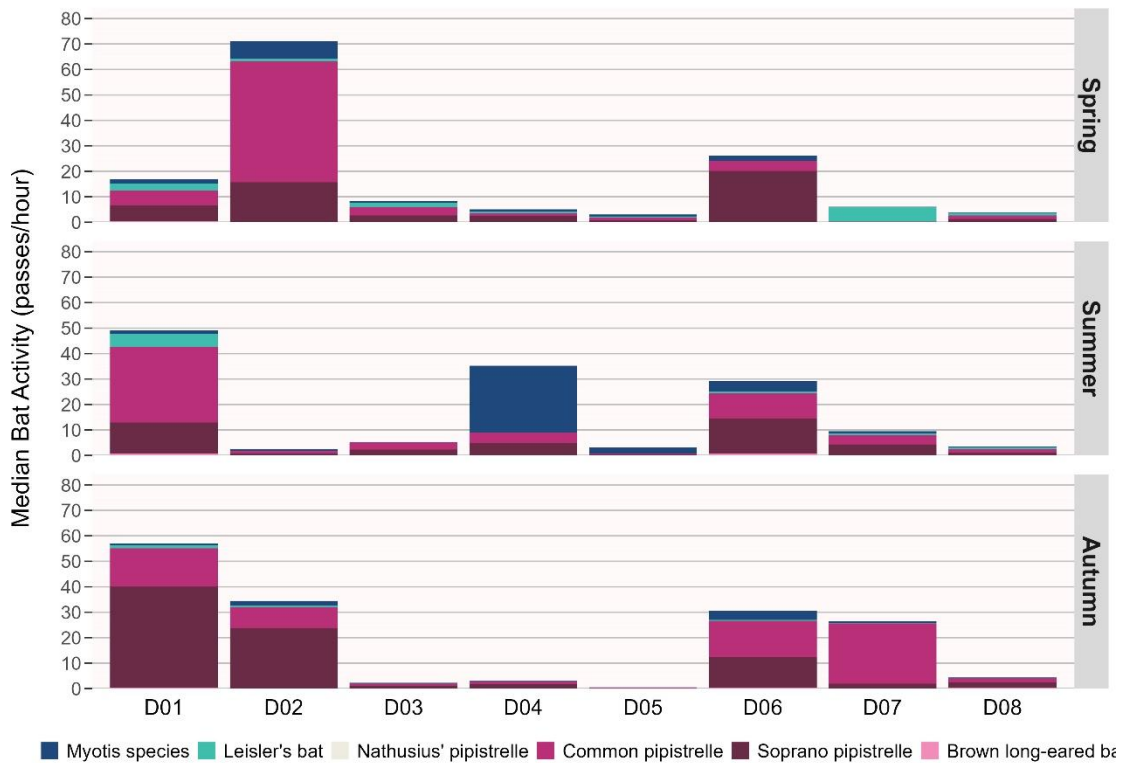


Plate 4-37 Median Nightly Pass Rate per detector with same y-axis for comparison.

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the proposed Wind Farm Site (Plate 4-38). The Nightly Pass Rate tended to vary a lot across nights. The higher activity occurred on the nights of the 6th of May and 27th of September 2024. There was almost no activity on the nights of the 2nd of May and 22nd of August 2024. Species composition tended to be

similar across the nights with common pipistrelles, soprano pipistrelles, *Myotis spp.* and Leisler's bat recorded on almost every night. Brown long-eared bats and Nathusius' pipistrelle activity was scarcer and occurred sporadically. The highest activity for brown long-eared bats occurred on the 14th June and occurred on the 28th August for the Nathusius' pipistrelle.

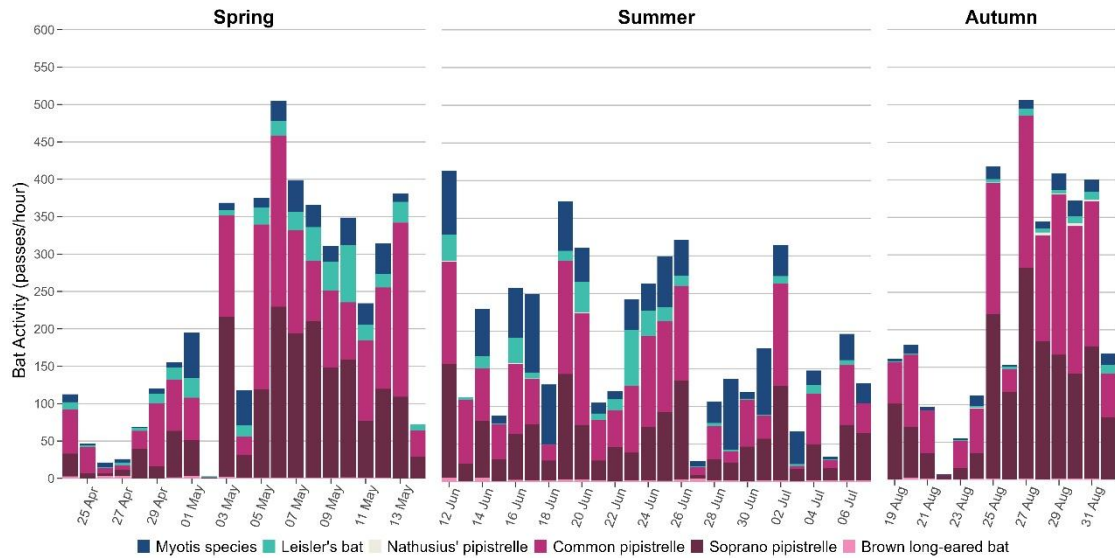


Plate 4-38 Bat activity (passes per hour) across the nights surveyed.

Weather (rainfall, windspeed and temperature) at night during deployments are presented below (Plate 4-39). The weather parameters were collected at ground level.

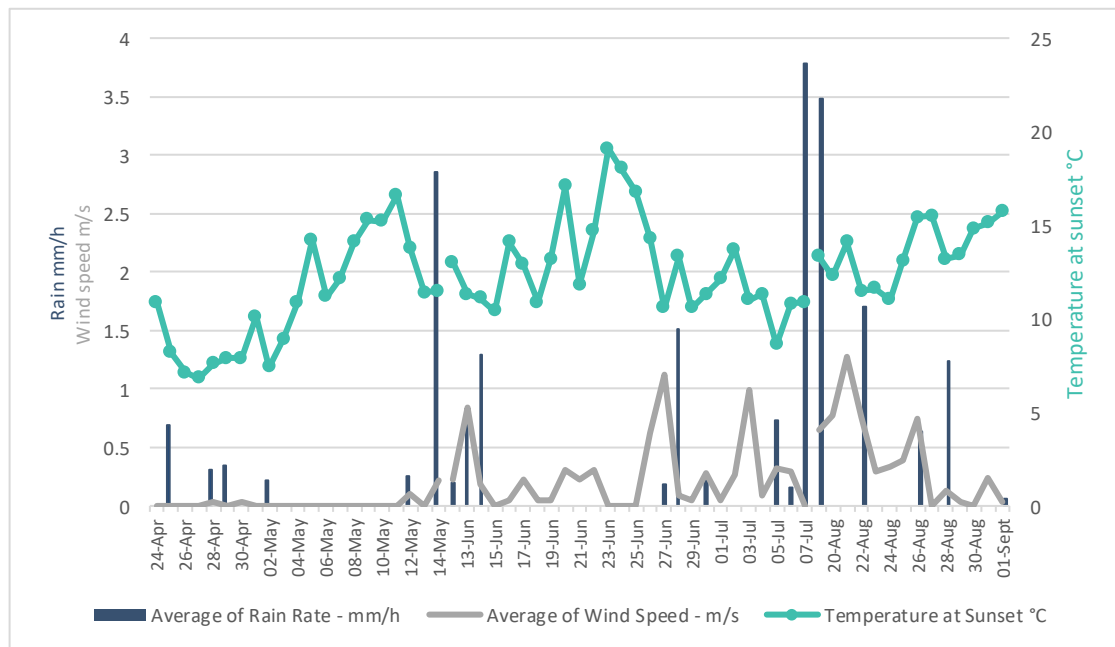


Plate 4-39 Nightly weather conditions across the site 2024

4.5 Assessment of Bat Activity Levels

4.5.1.1 Adapted Site-specific Ranges 2023

Low, Medium, and High Activity levels were assigned to Median and maximum pass rates (bp/h) identified during Spring, Summer and Autumn at the detectors deployed across the site, as adapted from Mathews *et al.* (2016). Table 4-8 shows the results of the site-level assessment.

Leisler's bat Median Bat Activity was recorded as moderate at D02, D05 and D11 in Spring and at D02 in Summer and was Low at all other detectors location in all seasons. The highest Max bat activity was recorded as High at D05 in Spring. The value was so high that it was considered an outlier.

Common pipistrelle Median Activity was recorded as High in Spring at D06 and D11 and was Low at all other detectors location in all seasons. The highest Maximum activity was recorded at D11 in Summer. The Maximum activity was high in Spring and Summer and moderate in Autumn while activity levels varied with Low Maximum activity levels recorded during all seasons.

Soprano pipistrelle Median Activity was recorded as Moderate at D11 in Spring. It was Low at all other detectors location in all seasons. The highest Maximum activity was recorded at D11 in Summer. The Maximum activity at other detectors locations varied between lower High values and Moderate or Low values.

Myotis spp. recorded Moderate Median Activity at D02 in Spring. It was Low at all other detectors locations across the season. The highest High Max Activity was recorded at D06 in Summer, and the value was considered an outlier. The Maximum activity at other detectors locations varied between lower High values and Moderate or Low values.

Nathusius' pipistrelle was only recorded at D05 and D06 in Spring showing High Max Activity. It was not recorded at any other detectors locations and season.

Brown long-eared bat was not recorded at D02 and D05 in Autumn. Median Bat Activity was Low at all detectors locations during all season. The highest Max Activity was recorded at D06 in Summer, and the value was considered an outlier. High Max Bat Activity was recorded at D05 in Spring and D02 in Summer. The Maximum activity at other detectors locations varied between lower High values and Moderate or Low values

Table 4-8 Assessment of 2023 bat activity levels in Grey for *None*, in blue for *Low*, in pink for *Moderate* and in purple for *High*. *Outliers are marked in orange, they were removed for the calculation of the thresholds (see section 3.3).

Detector		<i>Myotis spp.</i>		Leisler's bat (<i>Nyctalus leisleri</i>)		Nathusius' pipistrelle (<i>Pipistrellus nathusii</i>)		Common pipistrelle (<i>Pipistrellus pipistrellus</i>)		Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)		Brown long-eared bat (<i>Plecotus auritus</i>)	
		Median	Max	Median	Max	Median	Max	Median	Max	Median	Max	Median	Max
Spring	D02	1.2	2.1	1.2	2.3	-	-	0.5	1.5	0.5	1	0	0.1
	D05	0.1	0.5	1.3	*24.6	-	0.1	3.1	5.2	0.1	0.9	0.1	0.6
	D06	0.35	1.1	0.2	4.3	-	0.1	26.65	75.5	3.05	10.7	0.1	0.5
	D11	0.2	1.3	0.65	*16.5	-	-	50.85	67.5	11.15	28.7	0.1	0.5
Summer	D02	0.5	*6.9	0.5	2.6	-	-	0.4	6.4	1.9	12.5	0	0.7
	D05	0	1.1	0.1	2.6	-	-	0.3	57.7	0.1	34	0	0.2
	D06	0	*7.9	0	1.8	-	-	0	84.2	0	88.7	0	*1.3
	D11	0	1.4	0.2	2.2	-	-	2.8	91.7	3.5	119.2	0	0.4
Autumn	D02	0	0.6	0	0.2	-	-	0	0.5	0	0.3	-	-
	D05	-	-	-	-	-	-	-	-	-	-	-	-
	D06	0.25	2.1	0.1	1.6	-	-	0.25	10.4	0.5	25.4	0	0.3
	D11	0	0.2	0.1	0.9	-	-	0.25	10.5	0.2	11.3	0	0.2

4.5.1.2 Adapted Site-specific Ranges 2024

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). Table 4-9 shows the results of the site-level assessment.

Leisler's bat Median Bat Activity was recorded as High at D07 in Spring and at D01 in Summer. It was Moderate at D01 and D03 in Spring and was Low at all other detectors location in all seasons. The highest Max bat activity was recorded as High at D01 in Summer. The value was so high that it was considered an outlier.

Common pipistrelle Median Activity was recorded as High in Spring at D02, in Summer at D01 and in Autumn at D07. It was Moderate at D06 in Summer and at D01, D02 and D06 in Autumn, and was Low at all other detectors locations during each season. The highest Maximum activity was recorded at D02 in Spring followed by D06 in Autumn, all were considered outliers. The Maximum activity at other detectors locations varied between lower High values and Moderate or Low values.

Soprano pipistrelle Median Activity was recorded as High at D01 and D02 in Summer. It was Moderate at D02 and D06 in Spring, at D01 and D06 in Summer and at D06 in Autumn. The highest Maximum activity was recorded at D06 in Spring and at D01 and D02 in Autumn, all were considered outliers. The Maximum activity at other detectors locations varied between lower High values and Moderate or Low values.

Myotis spp. recorded High Median Activity at D02 in Spring and at D04 in Summer. It was Moderate at D06 in Spring, at D05 and D06 in Summer and at D02 and D06 in Autumn. It was Low at all other detectors locations across the season. The highest High Max Activity was recorded at D04 in Summer, and the value was considered an outlier. The Maximum activity at other detectors locations varied between lower High values and Moderate or Low values.

Nathusius' pipistrelle was not recorded at multiple detector locations across all seasons. High Max Activity of Nathusius' pipistrelle occurred at D07 in Autumn and was Moderate at D06 in Summer. It was Low at all other detectors locations and season where recorded.

Brown long-eared bat was not recorded at D08 in Spring. Median Bat Activity was Low at all detectors locations during all season where recorded. High Max Bat Activity was recorded at D01 and D06 Summer.



Table 4-9 Assessment of 2024 bat activity levels in Grey for **None**, in blue for **Low**, in pink for **Moderate** and in purple for **High**. *Outliers are marked in orange, they were removed for the calculation of the thresholds (see Section 3.3).

Detector		<i>Myotis spp.</i>		Leisler's bat (<i>Nyctalus leisleri</i>)		Nathusius' pipistrelle (<i>Pipistrellus nathusii</i>)		Common pipistrelle (<i>Pipistrellus pipistrellus</i>)		Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)		Brown long-eared bat (<i>Plecotus auritus</i>)	
		Median	Max	Median	Max	Median	Max	Median	Max	Median	Max	Median	Max
Spring	D01	1.7	3.5	2.7	13.2	-	-	5.9	59.4	6.2	57.4	0.4	3.2
	D02	6.7	45.5	1	14.9	-	-	47.6	*173.8	15.7	61.8	0	0.6
	D03	0.6	3.5	1.8	30	0	0.1	3.3	22.3	2.6	62.6	0	0.1
	D04	0.7	13.4	0.8	2.6	-	-	1.1	13.2	2.3	12.4	0.1	0.8
	D05	0.7	2.4	0.4	2.7	-	-	1.2	9.8	0.7	2.5	0	0.2
	D06	1.9	13.9	0.1	0.8	-	-	4	45.5	20.1	*132.6	0	0.3
	D07	0.1	0.4	5.7	13.2	-	-	0.2	2.8	0.1	0.5	0	0.1
	D08	0.2	1.7	1	3.4	0	0.2	1.3	9.4	1.3	6.2	-	-
Summer	D01	1.45	5	5.05	*53.4	0	0.4	29.8	81.6	12.15	64.2	0.75	4
	D02	0.55	1.7	0.2	7	0	0.1	0.9	46.5	0.7	73.1	0	0.4
	D03	0.1	2.7	0	3.1	-	-	2.8	33.8	2.3	19.5	0	0.3
	D04	26.2	*89.4	0	2.9	0	0.3	4.2	18	4.75	17.3	0	0.3
	D05	2.35	17.9	0	1.4	-	-	0.2	25.2	0.5	41.3	0	0.3
	D06	4.05	22.9	0.6	1.5	0	1.1	10.05	42.6	13.8	55	0.65	4.2
	D07	1	2.9	0.55	11	0	0.3	3.75	31.3	4.25	17.6	0	0.6
	D08	0.4	2.7	0.65	2.9	0	0.3	1.5	16.5	1	11.1	0	0.1
Autumn	D01	0.8	4.7	1.15	4.4	0	0.5	15.05	58.1	39.85	*96.5	0.2	1.4
	D02	1.95	6.6	0.4	0.9	-	-	8.45	19.9	23.6	*131.3	0.05	0.9
	D03	0.1	1.6	0.3	6.5	-	-	0.95	13.1	1.05	2.5	0.05	0.3
	D04	0.15	5.5	0.1	1.3	-	-	1	40.1	1.75	23	0.05	0.4
	D05	0.1	1.2	0.05	1.9	0	0.1	0.2	29	0.1	23.5	0	0.4
	D06	3.7	12.5	0.35	1.6	-	-	14.2	50.4	12.15	43.1	0.25	0.8
	D07	0.55	1.5	0.25	0.8	0	4.3	23.75	*93.2	1.85	8.9	0	0.1
	D08	0.25	0.8	0.2	0.8	-	-	1.45	3.8	2.35	6.3	0.25	0.6

4.6 Importance of Bat Population Recorded at the Site

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

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976, as amended.

Bats have been assessed as Ecological Receptors of **Local Importance (Higher Value)** based on the presence of a regularly occurring bat population recorded within the Proposed Wind Farm, including confirmed roosts and use of the site for foraging and commuting.

Vacant Property 1 supported roosting common and soprano pipistrelles, with up to 35 bats recorded in 2023 and smaller numbers (7no.) in 2024. The inhabited property held a roost of 68 bats (approx. 57 common pipistrelles, 11 soprano pipistrelles) during summer 2023. Vacant Property 2 supported soprano pipistrelles in both 2023 and 2024, with up to 11 bats recorded. In autumn 2024, Vacant Property 3 supported soprano pipistrelles (seven bats), while no emergences were recorded at Vacant Property 4.

Overall, four roosts were confirmed on site. No large or significant maternity roosts (i.e. >100 individuals or of National Importance) were identified within the Proposed Wind Farm.

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 Project on bats.

5.1 Collision Mortality

5.1.1 Assessment of Site-Risk

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

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

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	Four roosts were identified within the Proposed Wind Farm. The habitats within the Proposed Wind Farm offer suitable foraging and commuting opportunities for bats, particularly along conifer plantation edges and linear features. While bat activity was confirmed throughout the site (including <i>High</i> activity at some detectors), the site does not represent a habitat mosaic of particularly high quality.	Moderate
Project Size	Following the criteria set out in NatureScot, 2021 the project is of Medium scale as it consists of 14 no. turbines. Whilst those turbines are over 100m in height, it is not a strategic infrastructural development and is below the number of turbines that would constitute a Large (>40turbines) development (NatureScot, 2021). There are seventeen other wind energy developments within 10km.	Medium
Site Risk Assessment (Plate 3-3, NatureScot 2021)	Taking account of confirmed roosts, moderate habitat value, and a medium-scale project, the site is assessed as posing a Medium Site Risk (3) to bats.	Medium Site Risk (3)

5.1.2 Assessment of Collision Risk

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

- > Leisler's bat,
- > Common pipistrelle,
- > Soprano pipistrelle,
- > Nathusius' pipistrelle.

The Overall Risk Assessment for high collision risk species is provided in the sections below. Overall Risk was determined, in accordance with Table 3b of NatureScot guidance (Appendix 3), by a cross-tablature of the site risk level (i.e. High) bat activity outputs for each species. The assessment was carried out for both median and maximum activity categories in order to provide insight into typical bat activity

(i.e. median values) and activity peaks (i.e. maximum values). NatureScot recommends that that most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species. As per NatureScot guidance there is no requirement to complete an Overall Risk Assessment for low-risk species.

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

- > *Myotis* spp.,
- > Brown long-eared bat,

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

5.1.21 Leisler’s bat

This Site is within the current range of the Leisler’s bat (NPWS, 2025). Leisler’s bats are classed as a rarer species of a high population vulnerability which have a high collision risk (Plate 3-3). Leisler’s bats were recorded during activity surveys across the Proposed Wind Farm Site.

When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) the overall activity risk for Leisler’s bat in 2023 was found to be **Medium** in Spring and Summer and **Low** in Autumn at typical activity levels. At peak activity levels, activity risk was **High** for Spring and Summer and **Medium** for Autumn.

When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) the overall activity risk for Leisler’s bat in 2024 was found to be **Medium** for Spring and **Low** for Summer and Autumn. The risk for peak activity levels was assessed as **High** for Spring and Summer and **Medium** for 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 a mosaic of conifer plantation, improved agricultural grassland and woodland with moderate levels of bat activity recorded during the transects undertaken.

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

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

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2023	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer 2023		Low-Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)
Autumn 2023		Low (1)	Typical Risk is Low (3)	Moderate (3)	Typical Risk is Medium (9)
Spring 2024		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer 2024		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn 2024		Low (1)	Typical Risk is Low (3)	Moderate (3)	Peak Risk is Medium (9)

5.1.2.2 Soprano pipistrelle

This site is within the current range of the soprano pipistrelle bat (NPWS, 2025). Soprano pipistrelle bats are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-3). 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 in 2023 was found to be **Low** for Summer and Autumn, and **Medium** during Spring at typical activity levels. At peak activity levels, risk was as assessed as **High** for Summer and **Medium** for Spring and Autumn.

When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for soprano pipistrelle in 2024 was found to be **Low** for Spring, Summer and **Medium** Autumn at typical activity levels. At peak activity levels, risk was as assessed as **High** in all seasons (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 a mosaic of conifer plantation, improved agricultural grassland and woodland with moderate levels of bat activity recorded during the transects undertaken.

Thus, there is **Low** to **Medium** 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-Moderate (2)	Typical Risk is Medium (6)	Moderate (3)	Peak Risk is Medium (9)
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)	Moderate (3)	Peak Risk is Medium (9)
Spring 2024		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Summer 2024		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn 2024		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)

5.1.2.3 Common pipistrelle

This site is within the current range of the common pipistrelle bat (NPWS, 2025). Common pipistrelle bats are classed as a common species of a medium population risk which have a high collision risk (Plate 3-3). Common pipistrelles were 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 common pipistrelle in 2023 was found to be **Medium** at typical activity levels in Spring, and **Low** in Summer and Autumn. The risk for peak activity levels were assessed as **Medium** for all seasons.

When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for common pipistrelle in 2024 was found to be **Medium** at typical activity levels in Spring and Autumn and **Low** in Summer. The risk for peak activity levels was assessed as **High** for all seasons (See Table 5-4 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is a mosaic of conifer plantation, improved

agricultural grassland and woodland with moderate levels of bat activity recorded during the transects undertaken.

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

Table 5-4 Common pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2023	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	Moderate (3)	Typical Risk is Medium (9)
Summer 2023		Low (1)	Typical Risk is Low (3)	Moderate-High (4)	Peak Risk is Medium (12)
Autumn 2023		Low (1)	Typical Risk is Low (3)	Low-Moderate (2)	Peak Risk is Medium (6)
Spring 2024		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer 2024		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn 2024		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)

5.1.2.4 Nathusius' pipistrelle

This site is outside the current range of the Nathusius' pipistrelle bat (NPWS, 2025). Nathusius' pipistrelle bats are classed as a rarer species of a high population risk which have a high collision risk (Plate 3-3). Nathusius' pipistrelle bats were recorded during activity surveys across the proposed site.

When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Nathusius' pipistrelle bats in 2023 was found to be **Low** at typical activity levels across all seasons. At peak activity levels, risk was as assessed as **Medium** for Spring and **Low** in Summer and Autumn.

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 in 2024 was found to be **Low** at typical activity levels across all seasons and **Low** in all seasons at peak activity levels (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 a mosaic of conifer plantation, improved agricultural grassland and woodland with moderate levels of bat activity recorded during the transects undertaken.

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

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 2023	Medium (3)	Low (1)	Typical Risk is Low (3)	Moderate (3)	Typical Risk is Medium (9)
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 (1)	Peak Risk is Low (3)
Spring 2024		Low (1)	Peak Risk is Low (3)	Low (1)	Peak Risk is Low (3)

Summer 2024		Low (1)	Peak Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Autumn 2024		Low (1)	Peak 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 plantation and improved agricultural grassland, woodlands and water bodies with moderate levels of bat activity recorded during the static detector surveys as well as the transects undertaken.

However, following per detector R-analysis, detectors D06 and D11 in 2023 and detectors D01, D02, D04 and D07 in 2024 recorded *High* median activity levels of high-risk species (Table 5-6).

While *High* median activity was recorded at the above locations, it is noted that habitats at these locations will change during the construction phase of the Proposed Project with the required implementation of the bat buffers. A monitoring and mitigation strategy has been devised for the Proposed Project, in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance and based on the site-specific data. After year 1 monitoring, if a curtailment requirement is identified (i.e. significant bat fatalities encountered), a curtailment programme, in line with relevant guidelines, will be devised around key activity periods and weather parameters, as well as a potential increase in buffers.

Table 5-6 Detector Locations Recording High Median Bat Activity Per Detector in 2023 and 2024

Detector ID	Turbine	Species	High Median Activity Survey Period
2023			
D06	T13	Common pipistrelle	Spring
D11	T12	Common pipistrelle	Spring
2024			
D02	T02	Common pipistrelle	Spring
D01	T01	Common pipistrelle	Summer
D01	T01	Soprano pipistrelle	Autumn
D02	T02	Soprano pipistrelle	Autumn
D07	T07	Common pipistrelle	Autumn

5.2 Loss or Damage to Commuting and Foraging Habitat

In absence of appropriate design, the loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. The Proposed Wind Farm is predominantly located within improved agricultural grassland and conifer plantation.

A total of approx. 51.65 hectares of forestry will be permanently felled within and around the footprint of the Proposed Project. As this plantation is a commercial crop, felling is expected regardless of the Proposed Wind Farm. This also includes vegetation removal in accordance with the proposed bat buffers detailed in Section 6.1.3. The removal of dense, closed-canopy plantation is not considered detrimental to bats, as it will increase the extent of forestry edge habitat which is known to support both foraging and commuting. With these edges retained or expanded, no net loss of suitable habitat is anticipated.

The Proposed Project has been designed to minimise the loss of existing linear features and broadleaved woodland within the site, using existing forestry tracks and field entrances, where feasible. However, to facilitate the Proposed Wind Farm, there will be requirement for the loss of some linear features within

the site. These losses are primarily to facilitate the construction of road infrastructure creating new field entrances. It is anticipated that the construction phase of the Proposed Wind Farm will require the loss of approximately 2.2 km of hedgerow habitat, approximately 18m of treeline, 2.5 ha of wet willow-alder-ash woodland habitat and 0.16 ha of mixed broadleaved/conifer woodland habitat. Further details on linear vegetation removal required within and around development footprint is detailed in Chapter 6, Appendix 6-1 of this EIAR.

The Proposed Grid Connection Route will predominantly be constructed within existing road infrastructure and low biodiversity value agricultural grassland. However, it will require the minor loss of hedgerows during construction, amounting to approximately 100m lost along the Proposed Grid Connection underground cabling route. The Proposed Turbine Delivery Route is located within existing road infrastructure, with areas of minor accommodation works requiring the removal of approximately 450m of linear habitat including hedgerows and treelines. Hedgerow and treelines that are required to be removed will be reinstated following accommodation works.

The implementation of the Biodiversity Enhancement and Management Plan (BEMP, Chapter 6, Appendix 6-1) will deliver positive measures for bats within the Proposed Project. The BEMP provides the management of 30.2ha of species rich grassland, the establishment and management of 3.3 ha of woodland habitat and the planting of 9.9ha of riparian woodland buffers throughout the site which will create approximately 10.3km of woodland edge habitat. Whilst the BEMP does not provide for hedgerows, with the implementation of the above, the losses of linear habitats to facilitate the Proposed Project will be offset via the establishment of woodland habitats. Overall, these measures will result in net gain of linear habitat and will enhance ecological corridors across the site, providing new foraging and commuting opportunities once established.

Given the extensive area of habitat that will remain undisturbed throughout the Proposed Project, the avoidance of the most significant areas of faunal habitat (i.e. mature woodland, treelines and hedgerows), and the targeted planting and enhancement of key woodland features, no significant effects with regard to loss of commuting and foraging habitat are anticipated.

5.3 Loss of, or Damage to, Roosts

The Proposed Wind Farm is located within improved agricultural grassland and conifer plantation with areas of wet grassland, wet heath, scrub, immature woodland and linear features such as hedgerows and treelines. The trees within the commercial conifer forestry do not provide suitable roosting habitat for bats due to their species, structure, and management history.

Five built structures within the Proposed Wind Farm site were assessed during the 2023 and 2024 survey season. Of these five structures, four were confirmed to support roosts based on dusk emergence survey results: Vacant property 1 supported a roost of common and soprano pipistrelle (35 individuals observed in in spring 2023, 7 individuals recorded in spring 2024). The inhabited property supported a roost of common and soprano pipistrelle (68 individuals observed in summer 2023). Vacant property 2 supported a roost of soprano pipistrelle (11 individuals observed in autumn 2023 and 5 individuals in summer 2024). Vacant property 3 supported a roost of soprano pipistrelle (7 individuals observed in autumn 2024). These confirmed roosts will be retained and avoided as part of the Proposed Project.

The Proposed Grid Connection route will require the loss of approx. 100m of hedgerow habitat during the construction phase. This habitat was assessed as having no roosting potential for bats. Therefore, no loss of roosting habitat is anticipated along the Proposed Grid Connection route.

Twenty-three EPA/OSI watercourse crossings and one rail crossing occur along the Proposed Grid Connection route. Of the culverts and bridges assessed, eight had no (*None*) roosting potential, six had *Negligible* roosting potential, nine had *Low* roosting potential and one had *Moderate* roosting potential. No bats were identified roosting within the culverts and bridges, and no evidence of roosting was found during the surveys. All works will be confined to the existing road structure or completed using temporary construction methods such as flatbed formation within the existing road or horizontal directional drilling (HDD) offset from the crossing structures, with no requirement to remove or alter structures that could support bats. Horizontal directional drilling is proposed adjacent to WC23 which was assessed as having a

Moderate roosting potential although no evidence of roosting was identified. Of the nine water crossings that were assessed as having *Low* roosting potential, horizontal directional drilling is proposed adjacent to four of them including: WC5, WC10, WC17 and WC22. The remaining five water crossings assessed as having *Low* roosting potential, flatbed formation over/under is proposed for them including: WC1, WC8, WC13, WC18, WC19. No structural modifications are required on existing bridge or culvert infrastructure associated with crossings along the Proposed Grid Connection route as works will be confined to the existing road infrastructure, and temporary excavations associated with launch and receiver pits for HDD works will be set back from these structures. As such, no loss or damage to potential roosting structures is anticipated as a result of these works.

The turbine delivery route traverses a range of habitat types, including *Buildings and artificial surfaces, Dry meadows and grassy verges, Hedgerows, Treelines*, and bordered by agricultural grasslands. As described in Chapter 4, Section 4.4.3 of this EIAR, accommodation works will be required to facilitate the delivery of turbine components and other abnormal loads to the Proposed Wind Farm during the construction phase. These accommodation works will result in the loss of approx. 450m of linear habitat, including low value immature hedgerow and treelines. These habitats were assessed as having no (None) roosting potential. No trees or features with PRF's were identified along the TDR accommodation areas. Accordingly, no roost loss or damage is predicted in association with the TDR. All hedgerow and treeline habitat removed will be reinstated following accommodation works.

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

5.4

Displacement of Individuals or Populations

The Proposed Project is primarily located within improved agricultural grassland and conifer plantation, with areas of wet heath, scrub, treelines and hedgerow. These habitats provide varying levels of suitability for foraging, commuting, and roosting bats.

As part of the Proposed Project, a number of treelines and hedgerows located within the infrastructure development footprint and bat buffers will require removal or partial clearance. Details of the trees and treelines inspected and to be removed are provided in Section 4.3. above. Although these features contribute to the site's overall connectivity and habitat diversity, the majority of linear features within the site will be retained, and habitat fragmentation has been avoided in the layout design.

Mitigation measures to minimise the potential risk of displacement include targeted retention of linear habitat features, and implementation of management and enhancement planting to restore and improve connectivity across the site. A total of 9.9ha of riparian woodland habitat planting, as well as 3.3ha of native woodland (contributing to 10.3km of linear woodland edge habitat), is proposed across the site to offset any loss associated with infrastructure construction. These measures are detailed further in Chapter 6, and the Biodiversity Enhancement and Management Plan (BEMP) [Appendix 6-1].

No structural works are required for the bridge crossings along the Proposed Grid Connection route. Excavations associated with launch and receiver pits for HDD works will be set back from the bridges. In addition, the crossings are subject to existing traffic conditions. Noise and vibration from HDD drilling are not likely to be out of character with that associated with existing traffic conditions to which any potential roosting bats are likely accustomed. The short-term nature of these works, combined with their spatial separation from potential suitable bat habitats, will ensure that potential noise and vibration disturbance is minimal. Therefore, the works are unlikely to result in significant disturbance to bats.

The project layout has been designed to avoid identified bat roosts and high-quality commuting and foraging areas. Confirmed roosts will be retained and avoided, and the overall extent of suitable bat habitat across the site will remain broadly unchanged and habitats will continue to support bat activity. Given this, and with the implementation of the mitigation and enhancement measures outlined, no significant displacement of individuals or local bat 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 post construction, will be designed to minimize light spillage, thus reducing the effect on areas outside the Development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines located within the Wind Farm 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.

Any proposed lighting around the Wind Farm Site will be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/23 Bats and artificial lighting at night.

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

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

With regard to the potential for lighting to increase collision risk, it is noted that there will be some illumination of the turbines in the form of aviation lighting. Post-construction monitoring will be carried out 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, specific measures including curtailment, will be implemented to avoid any such impacts.

6.1.3 Bat Felling Buffers

In accordance with NatureScot (2021) and NIEA (2021) guidance, a minimum 50 m buffer is applied between turbine blade tips and habitat features used by bats (e.g. hedgerows, treelines). Although increased buffers of 100–200m are recommended around woodland by Eurobats Publication No. 6 and NIEA, these recommendations are not currently supported by empirical evidence from the UK or Ireland and are not routinely applied in wind farm planning.

For the Proposed Wind Farm, a 50 m buffer between turbine blade tip and the nearest habitat feature has been implemented, based on a conservative worst-case turbine specification (the turbine model to be installed on the Proposed Wind Farm site will have an overall ground-to-blade tip height of 185m, rotor diameter of 163m, and hub height of 103.5m). Buffer distances were calculated using the Natural England formula (NatureScot, 2021) as illustrated in Plate 6-1 and have been incorporated into the turbine layout.

Removal of areas of conifer plantation and linear vegetation will be required to provide the necessary bat buffers within the Proposed Wind Farm. This is outlined in further detail in Section 6.1.4 below. These vegetation-free areas (i.e. less than 2m in height) will be maintained for the duration of the operational phase and form part of the overall collision-risk mitigation strategy for bats.

The required distance (b) between the edge of a habitat feature and the centre of the turbine tower is calculated as follows:

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

Where:

- > bl = blade length (m)
- > hh = hub height (m)
- > fh = height of habitat feature (m)

Using the turbine dimensions outlined above and a feature height of 15m for conifer forestry, the calculated offset distance (**b**) is approximately 97.3 m. Plate 6-1)

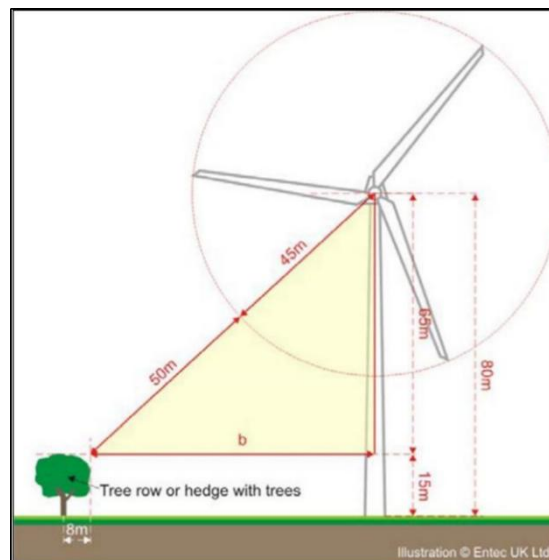


Plate 6-1 Calculate buffer distances (Natural England, 2014).

6.1.4 Biodiversity Enhancement and Management Plan

The Proposed Project is located predominantly within improved agricultural grassland and conifer plantation with areas of wet grassland, wet heath, scrub, immature woodland and linear features such as hedgerows and treelines. These areas of hedgerows and treelines have been largely retained or avoided. However, there will be a requirement to remove areas 2.2km of hedgerow habitat, 18m of treeline habitat, 2.5ha of wet willow-alder-ash woodland habitat and 0.16 ha of mixed broadleaved/conifer woodland habitat to facilitate the Proposed Wind Farm. While the Proposed Grid Connection underground cabling route will require the loss of 100m of hedgerow habitat and the Proposed TDR will require the removal of approximately 450m of linear habitat.

The Biodiversity Management and Enhancement Plan (BEMP) provides the management of 30.2 ha of species rich grassland, the establishment and management and management of 3.3ha of woodland habitat and the planting of 9.9 ha of riparian woodland buffers throughout the site which will create approximately 10.3 km of woodland edge habitat.

Overall, the proposed planting of woodland habitat and riparian woodland buffers, will result in a net gain of linear landscape and woodland features within the Site. These measures will enhance both foraging and commuting opportunities for bats that use the area. All planting will consist of species indigenous to the local area. Further details are provided in Chapter 6, Appendix 6-1.

6.1.5 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).

Blade feathering below the turbine cut-in speed is expected to be implemented automatically through the turbine control system. Feathering will be limited to periods and locations as follows:

> Seasonal Application:

Feathering will be applied during the main bat activity season (typically April–October) when bats are active and at potential increased risk of collision. Blade feathering will not be applied during winter months (November - March) when bats are largely inactive.

> Spatial Targeting:

Feathering will be implemented only at turbines located in areas of high bat activity, as identified through baseline surveys. Turbines positioned in habitats unsuitable for bats (e.g., extensive bare peat, exposed upland areas with no foraging or commuting value) will not require feathering at low wind speeds. Section 6.1.3 of this report outlines areas which recorded high bat activity for high collision risk bat species.

Should any variations in activity or risk levels be identified during post-construction monitoring, this will be adjusted accordingly as part of the mitigation and monitoring strategy

In the event that blade feathering is not available for the selected turbine model, an equivalent operational measure will be implemented to ensure that turbines do not rotate at low wind speeds when electricity generation is not occurring. This may include operational controls such as manual stop or stop-on-demand procedures during periods when turbines would otherwise idle below cut-in speed.

6.2 Bat Monitoring Plan

Overall risk levels for high collision risk bat species was typically **Medium**. This risk level is reflective of the nature of the site, which is dominated by conifer plantation, agricultural grassland, and woodland.

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

6.2.1 Operational Monitoring

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

The results of monitoring shall be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy. Results of Year 1 surveys will assess whether adaptations to the monitoring plan are required, and further mitigations such as curtailment will be considered. If a curtailment requirement is identified, a programme can 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 Proposed Project, to ensure that the necessary measures are implemented for the protection of bat species locally. The effectiveness of any mitigation 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 a curtailment regime should be implemented 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 (°C)
- Precipitation (mm/hr)

Carcass searches

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

6.2.1.2 **Monitoring Years 2 & 3**

Monitoring surveys shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data collected in the preceding year(s). The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed shall be analysed to confirm it is neither significantly over- nor under- curtailment during different periods of bat activity.

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

6.3 Residual Impacts

Taking into account the sensitive design of the project and the implementation of best practice and adaptive mitigation measures, no significant long-term residual effects on bats are anticipated with regard to:

1. Collision mortality, barotrauma and other injuries,
2. Loss or damage to roosts, and
3. Displacement of individuals or populations.

However, a temporary residual effect at the local geographic scale is anticipated in relation to the loss of commuting and foraging habitat, due to the removal of treelines, hedgerows, wet willow-alder-ash woodland and mixed broadleaved/conifer woodland, required to facilitate construction and bat buffers. While this loss will be offset through a comprehensive woodland and grassland enhancement and replanting programme, it will take approximately 3-10 years for new trees to establish and restore full habitat functionality. As such, a minor temporary reduction in ecological connectivity may occur during this period.

6.4 Cumulative Effects

The Proposed Project was considered in combination with other projects and/or plans (existing approved and pending decision), in the surrounding area that could result in cumulative impacts on bats. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The projects and/or plans considered are detailed in Section 2.8 in Chapter 2 of the EIAR.

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

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

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

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations at the Proposed Project site. The surveys 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 Project will not result in any significant effects on bats.

All potential impacts, including collision risk, roost loss, displacement, and habitat fragmentation, have been assessed in detail. Appropriate design measures and targeted mitigation have been integrated into the project to avoid or reduce impacts. These include the implementation of bat buffers, habitat replacement, and an adaptive post-construction monitoring and mitigation programme.

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

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APPENDIX 1

BAT HABITAT SUITABILITY APPRAISAL

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 ASSESMENT

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 ASSESSMENT

Table 3b: Stage 2 - Overall risk assessment

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

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

Overall assessment:

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

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




APPENDIX 4

PROPOSED GRID CONNECTION CROSSING INFRASTRUCTURE

PROPOSED GRID CONNECTION CROSSING INFRASTRUCTURE



The Proposed Grid Connection underground cabling route will traverse 23 EPA/OSI mapped watercourse crossings and a rail bridge. An additional 12 drainage crossing points were identified during the surveys, these drainage crossing points had no existing structures or features to assess for bat roost suitability. The crossing structures were assessed for bat roost potential in May and October 2024 and in February and October of 2025. No evidence of bat roosts was found at any of the structures. The findings are described further below. Watercourse crossings will require Horizontal directional drilling and Flatbed formation over/under the structure. No instream works are required. The extent of works are described in Chapter 4, Section 4.8.2.



Table 1 - Bat Roost Suitability Assessment of Watercourse Crossing Infrastructure



Crossing No	IG Ref	Watercourse type	Photo	Bat Roost Suitability Assessment	Crossing Type
WC1 (EPA Mapped WC)	R 63597 54317	Stone Culvert		No evidence of bats found. Potential roosting features present in the form of small crevices between concrete and brick work. Could be used by individual bats opportunistically. Low suitability for roosting bats.	Flatbed Formation over Bridges/Culverts



<p>WC2 (EPA Mapped WC)</p>	<p>R 64686 53709</p>	<p>Drain</p>		<p>No structure present for roosting bats. None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC3 (EPA Mapped WC)</p>	<p>R 65819 53117</p>	<p>Drain</p>		<p>No potential roosting features. None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>



<p>Railway Crossing</p>	<p>R 68994 51528</p>	<p>Railway crossing</p>		<p>No visible gaps or crevices identified, and no evidence of bats found during inspection.</p> <p><i>Negligible</i> suitability for roosting bats.</p>	<p>Flatbed Formation under Bridges/Culverts</p>
<p>WC 4(EPA Mapped WC)</p>	<p>R 70067 51739</p>	<p>Drain</p>		<p>No structure present for roosting bats.</p> <p>None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>

<p>WC 5 (EPA Mapped WC)</p>	<p>R 72255 50763</p>	<p>Stone Arch Bridge</p>		<p>Limited roosting potential during survey due to high water flow. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Horizontal Directional Drilling</p>
<p>WC 6 (EPA Mapped WC)</p>	<p>R 76101 51180</p>	<p>Stone Arch Bridge</p>		<p>No potential roosting features. No visible gaps or crevices identified, and no evidence of bats found during inspection.</p> <p><i>Negligible</i> suitability for roosting bats</p>	<p>Horizontal Directional Drilling</p>



<p>WC7 (EPA Mapped WC)</p>	<p>R 74161 50658</p>	<p>Drain channel</p>		<p>No structure present for roosting bats.</p> <p>None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC8 (EPA Mapped WC)</p>	<p>R 77536 51484</p>	<p>Stone Arch Bridge</p>		<p>No evidence of bats found. Potential roosting features present in the form of small crevices between stonework. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Flatbed Formation over Bridges/Culverts</p>



<p>WC9 (EPA Mapped WC)</p>	<p>R 77275 51596</p>	<p>Culvert (drain)</p>		<p>No potential roosting features for bats. Overgrown with vegetation and running under road.</p> <p>None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC10 (EPA Mapped WC)</p>	<p>R 77536 51484</p>	<p>Stone Arch Bridge (protected)</p>		<p>Potential roosting features present in the form of crevices between stonework. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Horizontal Directional Drilling</p>



<p>WC11 (EPA Mapped WC)</p>	<p>R 78357 51345</p>	<p>Stone Culvert</p>		<p>No potential roosting features. No visible gaps or crevices identified, and no evidence of bats found during inspection.</p> <p><i>Negligible</i> suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC12 (EPA Mapped WC)</p>	<p>R 79790 51084</p>	<p>Stone Culvert</p>		<p>No potential roosting features. No visible gaps or crevices identified, and no evidence of bats found during inspection.</p> <p><i>Negligible</i> suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>

<p>WC13 (EPA Mapped WC)</p>	<p>R 82725 50492</p>	<p>Stone Culvert</p>		<p>Potential roosting features present in the form of small crevices between stone. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC14 (EPA Mapped WC)</p>	<p>R 82996 50355</p>	<p>Stone Culvert</p>		<p>No potential roosting features. No visible gaps or crevices identified, and no evidence of bats found during inspection.</p> <p><i>Negligible</i> suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>

<p>WC15 (EPA Mapped WC)</p>	<p>R 84150 50048</p>	<p>Roadside Pipe feeding into stream</p>		<p>No structure present for roosting bats.</p> <p>None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC16 (EPA Mapped WC)</p>	<p>R 84496 49686</p>	<p>Culverted Channel</p>		<p>No structure present for roosting bats.</p> <p>None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>

<p>WC17 (EPA Mapped WC)</p>	<p>R 85275 49109</p>	<p>Stone Arch Bridge</p>		<p>Potential roosting features present in the form of small crevices between stonework in arch. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Horizontal Directional Drilling</p>
<p>WC18 (EPA Mapped WC)</p>	<p>R 86293 47825</p>	<p>Stone Culvert</p>		<p>Potential roosting features present in the form of small crevices between stone and concrete. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Flatbed Formation over Bridges/Culverts</p>

<p>WC19 (EPA Mapped WC)</p>	<p>R 86700 47518</p>	<p>Stone Arch Bridge</p>		<p>Potential roosting features present in the form of small crevices between stone work. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC20 (EPA Mapped WC)</p>	<p>R 90387 46705</p>	<p>Stone Culvert</p>		<p>No potential roosting features. No visible gaps or crevices identified, and no evidence of bats found during inspection.</p> <p><i>Negligible</i> suitability for roosting bats</p>	<p>Flatbed Formation under Bridges/Culverts</p>

<p>WC21 (EPA Mapped WC)</p>	<p>R 91523 46811</p>	<p>Culvert</p>		<p>Concrete culvert, no potential roosting features present.</p> <p>None - No suitability for roosting bats</p>	<p>Flatbed Formation over Bridges/Culverts</p>
<p>WC 22 (EPA Mapped WC)</p>	<p>R 91520 46812</p>	<p>Stone Arch Bridge</p>		<p>Potential roosting features present in the form of crevices between stonework. Could be used by individual bats opportunistically.</p> <p><i>Low</i> suitability for roosting bats.</p>	<p>Horizontal Directional Drilling</p>

WC 23 (EPA Mapped WC)	R 93952 48485	Stone Arch Bridge		Numerous small crevices present within arch of bridge structure. No evidence of bats found during inspections. <i>Moderate</i> bat roost potential.	Horizontal Directional Drilling
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