Planning and Environmental Consultants





# Appendix 6-2 – Bat Survey Report

## Proposed Carrig Renewables Wind Farm Development

# DOCUMENT DETAILS

| | |
|---|---|
| Client: | **Atlantic Infrastructure Partners (AIP)** |
| Project Title: | **Proposed Carrig Renewables Wind Farm Development** |
| Project Number: | **211016** |
| Document Title: | **Bat Survey Report** |
| Document File Name: | **BR F –211016– 2023.09.18** |
| Prepared By: | **MKO**<br>**Tuam Road**<br>**Galway**<br>**Ireland**<br>**H91 VW84** |

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| Rev | Status | Date | Author(s) | Approved By |
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| 01 | Draft | 01/01/2023 | LM | SF/AJ |
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| | | | | |

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# 1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects of the proposed Carrig Renewables Wind Farm development (the "Proposed Development") on bats Proposed Development. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Development on bats. Where necessary, mitigation is prescribed to minimise any identified potential significant effects.

Bat surveys undertaken in 2022 are consistent with the methodologies described in NatureScot 2021[1] and were used to inform on the assessment of effects on bats. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level.

The assessment and mitigation outlined in this report has been designed in accordance with NatureScot 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [2], which was produced in August 2021 (amended May 2022).

As detailed in Chapter 1, for the purposes of this EIAR, where the 'Proposed Development' is referred to, this relates to the development for which permission is sought. This includes the turbines, access roads, temporary construction compounds, meteorological mast, turbine delivery accommodation works, peat and spoil management, tree felling, site drainage, battery energy storage system, 38kV onsite substation and associated underground 38kV cabling connecting to the existing Dallow 110kV Substation.

Where the 'the site' is referred to, this relates to the primary EIAR Study Area for the development, as delineated by the EIAR Study Area in green as shown on Figure 2-1. The actual development boundary, for the purposes of the planning permission application, occupies a smaller area within the primary EIAR Study Area.

The EIAR Study Area, 'the site', encompasses an area of approximately 315 hectares. The proposed permanent footprint of the Proposed Development measures approximately 7.18 hectares, which represents approximately 2.3% of the site. Further details on project description and components are outlined in Chapter 4 of this EIAR.

## 1.1 Background

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

Investigative research in North America and mainland Europe have revealed the mechanisms for bat mortality at wind turbines. Fatalities arise from direct collision with moving turbine blades (Horn *et al.* 2008, Cryand *et al.* 2014) and barotrauma (Baer Wald *et al.* 2008), i.e. internal injuries caused by air

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

pressure changes. The reason why bats fly in the vicinity of wind turbines has been attributed to several different behavioural and environmental factors, e.g. habitat associations, weather conditions and, species ecology.

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

## 1.2 Bat Survey and Assessment Guidance

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

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

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

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

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

The NIEA (NED) recently published *Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland*. This new guidance follows and builds upon the recently updated NatureScot 2021 guidance. The latter guidance has set the industry standard since its publication in 2019. The NED guidance does not aim to replace the NatureScot guidance, but it does provide additional clarifications and recommendations regarding survey requirements and impact assessment in an Irish context.

The survey scope, assessment and mitigation provided in this report are in accordance with NatureScot 2021 Guidance.

## 1.3 Statement of Authority

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

Bat surveys were conducted by MKO ecologists Laura McEntegart (BSc.), Neil Campbell (BSc., MSc.) Laura Gránicz (BSc., MSc.), and Cillian Burke (BSc.). All staff have relevant academic qualifications to complete the surveys and assessments that they were required to do.

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

## 1.4 Irish Bats: Legislation, Policy and Status

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

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

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976-2022. Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

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

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

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

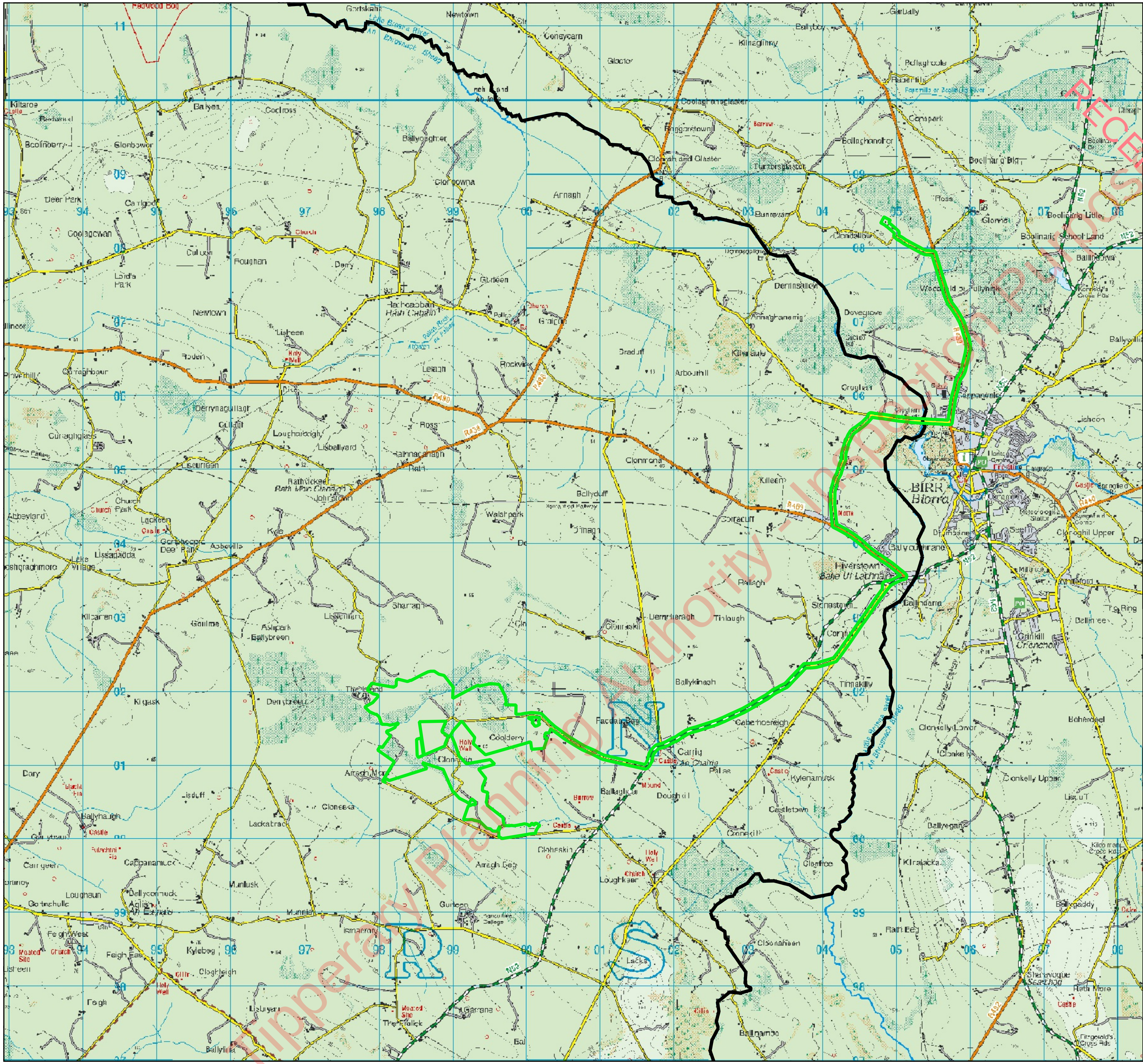
# 2. PROJECT DESCRIPTION

The Proposed Development site is located in Sharragh. Co. Tipperary (Irish Grid Ref: M 98665 02497), approximately 6.4km west of the town of Birr, Co. Offaly, approximately 4.1km north of the village of Ballingarry, Co. Tipperary and approximately 9.4km northeast of the town of Borrisokane, Co. Tipperary. The location of the site is shown in Figure 2-1.

The site is accessed via the R438 Regional Road adjacent to the northwest site boundary, which is approximately 9.6km northeast of the N65 National Secondary Road.

The land-use/activities within the site comprises predominantly of pastureland, followed by peat bogs and mixed forestry, and to a lesser extent, a mixture of transitional woodland-shrub, non-irrigated arable land and coniferous forestry. Land-use in the wider landscape of the site comprises of a mixture of peatland, agriculture, commercial forestry and low-density residential infrastructure. The Proposed Development will comprise:

1. *The construction of 7 no. wind turbines and associated hardstand areas with the following parameters (all within Co. Tipperary):*
   a. *Total tip height range of 179.5m – 185m,*
   b. *Rotor diameter range of 149m – 163m*
   c. *Hub height range of 103.5m to 110.5m*
2. *1 no. permanent 38kV electrical substation which will be constructed in the townland of Faddan Beg, Co. Tipperary. The proposed electrical substation consists of a single storey control building with welfare facilities, all associated electrical plant and equipment, battery energy storage system, security fencing, all associated underground cabling, wastewater holding tank and all ancillary works and equipment;*
3. *All works (within County Tipperary and Co. Offaly) associated with the connection of the proposed wind farm to the national electricity grid, via the provision of underground electrical cabling (38kV) to the existing Dallow 110kV substation in the townland of Clondallow, Co. Offaly;*
4. *Provision of 14 no. joint bays, communication chambers and earth sheath links along the underground electrical cabling route (within Co. Tipperary and Co. Offaly);*
5. *Reinstatement of the road or track surface above the proposed cabling trench along existing roads and tracks;*
6. *All associated underground electrical and communications cabling connecting the turbines to the proposed wind farm substation (within Co. Tipperary);*
7. *1 no. meteorological mast with a height of 107m above ground and associated foundation and hard-standing area (within Co. Tipperary);*
8. *Upgrade of existing tracks and roads and the provision of new site access roads (within Co. Tipperary);*
9. *All works associated with the provision of a new permanent site entrance off the L5040 local road (within Co. Tipperary);*
10. *Provision of 5 no. new access and egress points along the L5041 local road in the townlands of Cloncorig, Faddan More and Coolderry (within Co. Tipperary);*
11. *Provision of 4 no. peat repository areas and 3 no. spoil repository areas (within Co. Tipperary);*
12. *2 no. temporary construction compounds with temporary site offices and staff facilities (within Co. Tipperary);*
13. *Accommodation works along the public road network along the N52 national secondary road in the townland of Ballyloughnane to facilitate the delivery of turbine components and other abnormal sized loads (within Co. Tipperary);*
14. *Site Drainage;*
15. *Tree Felling (within Co. Tipperary);*
16. *Operational stage site signage; and,*
17. *All associated site development works, ancillary works and apparatus.*




# Map Legend

- EIAR Site Boundary
- County Boundary



| Drawing Title | |
|---|---|
| Site Location Context | |
| Project Title | |
| Carrig Renewables Wind Farm | |
| Drawn By: JF | Checked By: EM |
| Project No.: 211016 | Drawing No.: Fig. 2-1 |
| Scale: 1:50,000 | Date: 2023-09-21 |

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# 3. METHODS

## 3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Development. A Scoping Document, providing details of the application site and the Proposed Development, was prepared by MKO and circulated to consultees in August 2022. As part of this exercise, prominent Irish conservation groups were contacted, and Bat Conservation Ireland (BCI) and National Parks and Wildlife Service (NPWS) (through the Development Applications Unit - DAU) were specifically invited to comment on the potential of the Proposed Development to affect bats.

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

## 3.2 Desk Study

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

### 3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. The most recent search examined bat presence and roost records within a 10 km radius of an approximate central point within the Proposed Development (Grid Ref: M 98499 02016) (BCI 2012, Hundt 2012, NatureScot 2021). Available bat records were provided by Bat Conservation Ireland on 30/06/2023. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Proposed Development.

### 3.2.2 Bat Species' Range

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

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

### 3.2.3 Designated Sites

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

## 3.2.4 Landscape Features

### 3.2.4.1 Ordnance Survey Mapping

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

### 3.2.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10 km of the proposed site (BCI, 2012) (last searched on the 28th July 2023). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 28th July 2023).

### 3.2.4.3 National Biodiversity Data Centre Bat Landscape Mapping

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

The location of the Proposed Development was reviewed 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 proposed site.

### 3.2.4.4 Additional Wind Energy Projects in the Wider Landscape

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

## 3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were carried out in 2022 and 2023 (Table 3-1). The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the EIAR boundary assessed and classified. The grid connection route, associated infrastructure and proposed turbine delivery route were also visited as part of the multidisciplinary surveys outlined in Chapter 6 of the EIAR. Habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. Walkover surveys were undertaken within the site on the following dates:

*Table 3-1 Multidisciplinary Survey Effort*

| Multidisciplinary Survey | Dedicated Bat Survey |
|---|---|
| 11th May 2022 | 29th April 2022 |
| 10th August 2022 | 11th May 2022 |
| 8th September 2022 | 3rd June 2022 |
| 10th February 2023 | 17th June 2022 |
| 13th June 2023 | 28th June 2022 |
| 29th June 2023 | 7th September 2022 |
| | 19th September 2022 |



## 3.3 Field Surveys

### 3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2022. During these surveys, habitats within the site were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

### 3.3.2 Roost Surveys

#### Daytime roost inspections

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 81.5m) of the Proposed Development footprint (NatureScot, 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited in April, May, June, and September 2022. 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).

Any potential roost sites were subject to a roost assessment. This comprised a detailed inspection of the exterior and interior (if accessible) to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. Locations of all Potential Roost Features (PRFs) are presented in Figure 3-1 and detailed in Table 3-2.

*Table 3-2 Daytime Roost Inspection - Structures*

| Structure | Location | Inspection Date |
|---|---|---|
| Hay Shed | M 98224 01126 | 11th May 2022 |
| Derelict Stone Building | M 98255 01095 | 28th June 2022 |
| Small Farm Shed | M 98300 01119 | 11th May 2022 |
| Partially Constructed Block House | N 00283 02066 | 11th May 2022 |
| Corrugated roof Derelict Cottage | M 98088 02399 | 28th June 2022 |
| Stone shed (Near Cottage) | M 98270 02238 | 28th June 2022 |
| Old House with Sheds | M 97951 00845 | 17th June 2022 |

The underground grid connection route, including watercourse crossings, drains and culvert crossing infrastructure, was also assessed for any suitability to host roosting bats. Surveys were carried out on the 13th of June 2023 and comprised a detailed inspection of existing infrastructure to look for evidence of bat use. Locations of the watercourse, drain and culvert crossing infrastructure inspected are presented in Chapter 4, Figure 4-29.

### 3.3.3 Manual Activity Surveys

Manual activity surveys comprised of dusk emergence surveys and walked transects. Survey effort is outlined in Table 3-3.

*Table 3-3 Survey Effort - Manual Activity Surveys*

| Date | Surveyors | Sunrise/ Sunset | Survey Type | Weather | Walked (km) |
|---|---|---|---|---|---|
| 11th May 2022 | Laura Gránicz and Cillian Burke | 21:16 | Dusk Emergence and Transect | 7-10˚C, dry, calm | 6.3km |
| 28th June 2022 | Laura Gránicz and Neil Campbell | 22:03 | Dusk Emergence and Transect | 13-17˚C, dry, calm | 3.0km |
| 7th September 2022 | Laura Gránicz and Laura McEntegart | 20:07 | Dusk Transect | 16-18˚C, dry-drizzle, calm | 6.0km |
| **Total Survey Effort** | | | | | **15.3km** |

#### Dusk Emergence Surveys

Manual activity surveys comprised dusk emergence surveys which focused on the PRFs identified during the habitat appraisal. Where *Moderate* or *High* roosting potential was identified within a structure, multiple surveys were carried out.

During these surveys, two 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 1 hour after sunset.

#### Manual Transects

In addition to emergence surveys, manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Proposed Development site. The aim of these surveys was to identify bat species using the Proposed Development site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the Proposed Development layout, desktop and walkover survey results as well as any health and safety considerations and any access limitations. As such, transect routes generally followed existing roads and tracks and habitats. Transect routes are presented in Figure 3-1.

Transects were walked by two surveyors recording bats in real time. Transect surveys generally followed dusk emergence surveys and were completed for up to 3 hours after sunset. Standalone transect surveys carried out in Autumn 2022 started at sunset and lasted for approximately 3 hours after sunset. All bat activity was recorded for subsequent analysis to confirm species identifications. Table 3-3 above summarises survey effort in relation to emergence surveys and walked transects.

### 3.3.4 Ground-level Static Surveys

Where developments have more than 10 turbines, NatureScot requires 1 detector per turbine up to 10 plus a third of additional turbines. Given that 7 turbines were proposed, 7 detectors were deployed to ensure compliance with NatureScot guidance.

Automated bat detectors were deployed at 7 no. locations for at least 10 nights in Spring (April-May), 20 nights in Summer (June-mid August) and 20 nights in Autumn (mid-August-October) 2022 (NatureScot, 2021). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Detector locations achieved a representative spatial spread in relation to proposed turbines and sampled the range of available habitats. Figure 3-1 presents static detector locations in relation to the final Proposed Development turbine layout. Static detector locations are described in Table 3-4.

*Table 3-4 Ground-level Static Detector Locations*

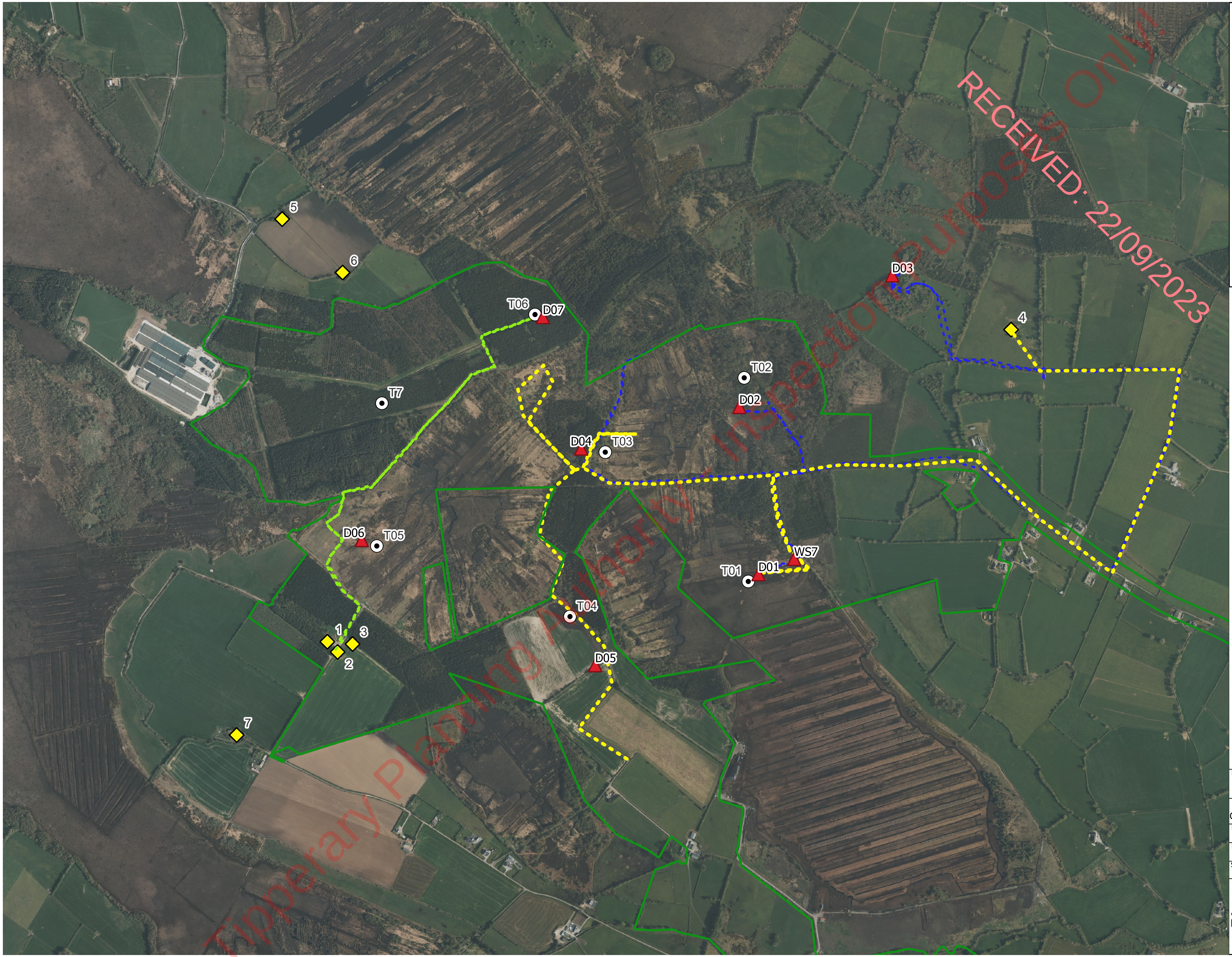
| ID | Location (ITM) | Habitat | Linear Feature within 50m | Nearest Associated Turbine |
|---|---|---|---|---|
| D01 | M 99522 01330 | Cutover Bog (PB4) | N/A | T01 |
| D02 | M 99465 01833 | Cutover Bog (PB4), drainage ditch (FW4) | Drainage ditch (FW4) | D02 |
| D03 | M 99925 02230 | Mixed Broadleaf Woodland (WD1), and Agricultural grassland (GA1) | Treeline (WL2) | N/A |
| D04 | M 98989 01708 | Conifer Plantation (WD4) | Roadway in the plantation | T03 |
| D05 | M 99031 01055 | Hedgerow (WL1), in Improved agricultural grassland (GA1) | Hedgerow (WL1) | T04 |
| D06 | M 98328 01433 | Cutover Bog (PB4), and Scrub (WS1) | Scrub (WS1) | T05 |
| D07 | M 98873 02104 | Conifer Plantation (WD4) beside Drainage ditch (FW4) | Treeline (WL2) Hedgerow (WL1) | T06 |

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 3-5 summarises survey effort achieved in 2022 for each of the 7 no. detector locations.

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

| Season | Survey Period | Total Survey Nights per Detector Location | Nights with Appropriate Weather |
|---|---|---|---|
| Spring | 29th April –11th May 2022 | 13 | 12 |
| Summer | 3rd June – 28th June 2022 | 25 | 21 |
| Autumn | 7th September – 19th September 2022 | 12 | 12 |
| **Total Survey Effort** | | **49** | **38** |








Map Legend

EIAR Site Boundary

Proposed Turbine Layout

Detector Locations

Spring Transect 11.05.2022

Summer Transect 28.06.2022

Autumn Transect 07.09.2022

Buildings Surveyed
1 - Hay Shed
2 - Derelict Stone Building
3 - Small Farm Shed
4 - Partially Constructed Block House
5 - Corrugated Roof Derelict
6 - Stone Shed
7 - Old House & Sheds



N

| | |
|---|---|
| Drawing Title: Survey Effort | |
| Project Title: Carrig Renewables Wind Farm | |
| Drawn By: LM | Checked By: AJ |
| Project No.: 211016 | Drawing No.: Figure 3-1 |
| Scale: 1:10,000 | Date: 2023-08-10 |

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## 3.4 Bat Call Analysis

All recordings from 2022 were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Proposed Development site. Bat species were identified using established call parameters, to create site-specific custom classifiers and were manually verified.

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

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

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

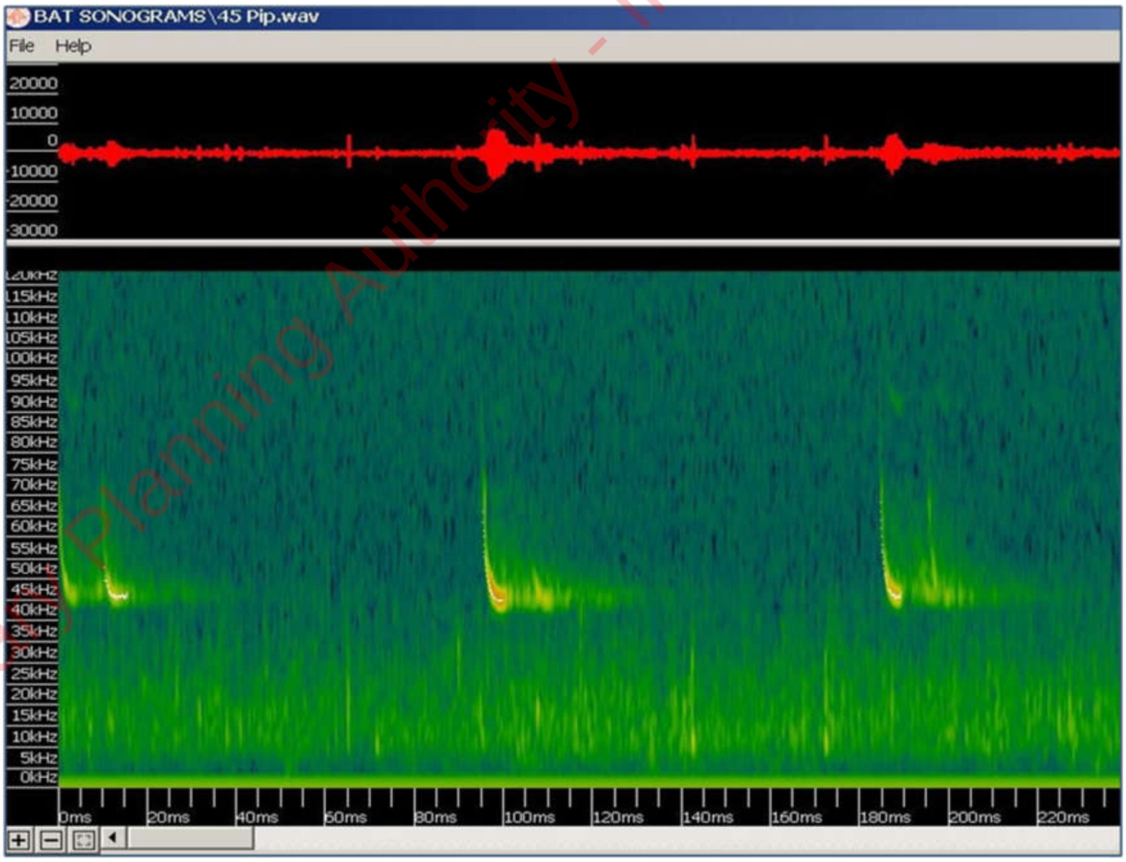



*Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)*

## 3.5 Assessment of Bat Activity Levels



The online database tool Ecobat (mammal.org.uk) is recommended by NatureScot 2021 to assess bat activity levels within a proposed wind-farm site. This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-6 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

*Table 3-6 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)*

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

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

The methodology used to assess activity levels across the site was adapted from Mathews *et al.* (2016), where activity ranges of pipistrelle species were defined using an average of maximum nightly pass rates (in total passes) across the site, divided into tertiles. The use of bat passes per hour rates was deemed more appropriate to account for seasonal changes in night length. The rates were divided into quartiles and the same process was repeated for Leisler's bats. For all other species groups maximum nightly pass rate (bpph) recorded across the site divided into quartiles was used. Activity levels were assessed according to the site activity and the species were assessed separately, where pipistrelle species (*Pipistrellus pipistrellus, Pipistrellus pygmaeus*), noctules (*Nyctalus leisleri*), *Myotis* spp. are widespread (*Plecotus auritus, Pipistrellus nathusii*) are rare or hard to record species. Median and maximum nightly activity (bpph) at each detector location was then assessed as Low, Medium or High activity for each season recorded based on the quartile ranges identified. Table 3-7 presents activity ranges per species group identified.

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

| Assessment Level | Activity Threshold as Bat Passes per Hour (bpph) for Bat Species | | | |
|---|---|---|---|---|
| | *Pipistrellus* spp. | *Nyctalus* spp. | *Myotis* spp. | Other groups |
| Low | < 7.9 | < 3.8 | < 7.3 | < 1.2 |
| Medium | 7.9 – 23.8 | 3.8 - 11 | 7.3 – 21.7 | 1.2 – 3.4 |
| High | 23.8 < | 11 < | 21.7 < | 3.4 < |

Based on experience gained surveying a large number of development sites, the calculated activity thresholds were considerably high for some of the species surveyed, in particular *Myotis* and pipistrelle bats. Thresholds were therefore adapted to more representative levels, by excluding outliers, as presented in Table 3-8.

*Table 3-8 Adapted Activity Level Categories*

| Assessment Level | Activity Threshold as Bat Passes per Hour (bpph) for Bat Species | | | |
|---|---|---|---|---|
| | *Pipistrellus* spp. | *Nyctalus* spp. | *Myotis* spp. | Other groups |
| Low | < 5.5 | < 3.8 | < 1.6 | < 0.8 |
| Medium | 5.5 – 16 | 3.8 - 11 | 1.6 – 4.8 | 0.8 – 2.5 |
| High | 16 < | 11 < | 4.8 < | 2.5 < |

## 3.6 Assessment of Collision Risk

### 3.6.1 Population Risk

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

In Plate 3-2, an adapted assessment of vulnerability of wind turbine collision for Irish bat populations is provided. This adaptation of 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<br>Soprano pipistrelle |
| Rarer species | Daubenton's bat<br>Brown long-eared bat<br>Lesser horseshoe bat | | Leisler's bat |
| Rarest species | Natterer's bat<br>Whiskered bat | | Nathusius' pipistrelle |

| | | |
|---|---|---|
| Low Population Vulnerability | Medium Population Vulnerability | High Population Vulnerability |

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

### 3.6.2 Site Risk

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

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

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

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

## 3.6.3 Overall Risk Assessment

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

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

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

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

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

## 3.7 Limitations

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

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

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

# 4. SURVEY RESULTS

## 4.1 Consultation

### 4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats. The following response was received on 08/05/2023. "*To whom it may concern: Bat Conservation Ireland is a small wildlife charity and do not have the administrative capacity to review documents relating to planning applications. Please ensure that all bat surveying is undertaking according to best practice guidelines pertaining to onshore wind farms and general bat survey guidelines.*"

### 4.1.2 Development Applications Unit - NPWS

A detailed scoping exercise was undertaken for the Proposed Development. A response from the Department of Culture, Heritage and the Gaeltacht provided recommendations regarding nature conservation, future ecological connection and restoration.

The results of the scoping and consultation exercise are described in the main EIAR. The response was received on the 09/05/2023 and the letter is provided in Chapter 2, Appendix2-1 of the EIAR.

No recommendations regarding bats were made by the department to be considered in the design of bat surveys and the preparation of this report.

## 4.2 Desk Study

### 4.2.1 Bat Records

#### Bat Conservation Ireland

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: M 98665 02497; last search 30/06/2023). Available bat records were provided by BCI on 30th June 2023. The search included roosts, transects and ad-hoc observations. A number of ad-hoc observations (n=40) have been recorded. At least seven of Ireland's nine resident bat species were recorded within 10km of the Proposed Development. The results of the database search are provided in Table 4-1.

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

| Northern Section of Proposed Site (IG Ref: E 263983 N 259683) | | | | |
|---|---|---|---|---|
| **Record** | **Species** | **Grid Reference** | **Date** | **Location** |
| Roost | *Pipistrellus pygmaeus* | N0603 | N/A | Crinkill, Birr, Offaly |
| | *Pipistrellus pygmaeus* | N054052 | N/A | Birr Castle Tree Roost |
| | *Nyctalus leisleri* | N0703 | N/A | Birr, Co. Offaly |
| | *Myotis daubentonii* | N0504 | N/A | Main Street, Birr |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N0605 | N/A | Millstreet, Birr, County Offaly |
| | *Nyctalus leisleri* | N0605 | N/A | Millstreet, Birr, County Offaly |

| | | | | |
|---|---|---|---|---|
| | *Myotis daubentonii* | N0320007900 | N/A | Northwest of Birr |
| | *Nyctalus leisleri* | N0604 | N/A | Railway rd, Birr, Co. Offaly |
| | *Myotis mystacinus* | N0604 | N/A | Birr, Co. Offaly |
| | *Pipistrellus pipistrellus (45kHz), Plecotus auritus, Pipistrellus pygmaeus* | S0694 | N/A | Claureen, Birr, Co. Offaly |
| | *Pipistrellus pipistrellus (45kHz), Plecotus auritus* | M9204 | N/A | Lorrha, Co. Tipperary |
| | *Nyctalus leisleri* | N0504 | N/A | Market square, Birr, Co. Offaly |
| | *Myotis mystacinus, Plecotus auritus* | N0607 | N/A | Birr, County Offaly |
| Transect | *Myotis daubentonii* | N0538904968 | N/A | Birr Castle Gardens |
| | *Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz), Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Pipistrellus nathusii* | N046057 | N/A | R88 (1) 2004- |
| | *Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | S053929 | N/A | R88 (19) 2004-2008 |
| | *Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | N008083 | N/A | R88 (2) 2004- |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri* | M979078 | N/A | R88 (3) 2004- |
| | *Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus pipistrellus (45kHz),Pipistrellus spp. (45kHz/55kHz)* | M935077 | N/A | R88 (4) 2004- |
| | *Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | M914038 | N/A | R88 (5) 2004- |
| | *Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | M889008 | N/A | R88 (6) 2004- |
| | *Myotis daubentonii*, Unidentified bat | N0803704641 | N/A | Springfield Bridge, Birr |
| Ad-hoc | *Pipistrellus pipistrellus (45kHz)* | S0770897953 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0177093400 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0178493464 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0192693649 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0194893677 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0240594527 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0423995066 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0211795483 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0209495620 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0210995898 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0270296053 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0253096132 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0772297631 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0770097744 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0770197999 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0799199185 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | S0805699661 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | N0845000050 | 22/05/2019 | Consultancy Surveys |
| | *Nyctalus leisleri* | S0831999953 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0153592601 | 22/05/2019 | Consultancy Surveys |

| | | | | |
|---|---|---|---|---|
| | *Pipistrellus pygmaeus* | S0239894924 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0236594956 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0400295117 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0212195535 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0291495808 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0770497569 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pygmaeus* | S0795599428 | 22/05/2019 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N0600005000 | 26/09/2004 | Consultancy Surveys |
| | *Plecotus auritus, Myotis daubentonii, Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | N0505 | 29/08/2008 | BATLAS 2010 |
| | *Myotis spp., Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | R916942 | 20/06/2009 | BATLAS 2010 |
| | *Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | N0605 | 04/07/2008 | BATLAS 2010 |
| | *Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | N0473112152 | 12/09/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii* | R9103194239 | 18/07/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Pipistrellus nathusii* | S0510892573 | 14/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus, Myotis daubentonii, Myotis natterreri* | N0797304652 | 01/07/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii* | S0562396474 | 14/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Myotis natterreri* | N0000000000 | 14/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz)* | N0700711924 | 12/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Nyctalus leisleri, Myotis daubentonii* | N0616904742 | 02/07/2018 | BATLAS 2020 |
| | *Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz), Myotis natterreri, Plecotus auritus* | N0706403472 | 26/08/2010 | Consultancy Surveys |

### National Biodiversity Data Centre

A review of the National Bat Database of Ireland maintained by Bat Conservation Ireland, was made on the 28th July 2023, to obtain bat records from within 10km of the Proposed Development site. The search yielded records for eight bat species within 10km. Table 4-2 lists the bat species recorded within the hectads which pertain to the current study area (M90, N00, R99, S09).

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

| Grid Square | Species | Database | Designation |
|---|---|---|---|
| M90, N00, R99, S09 | Lesser Noctule *Nyctalus leisleri* | National Bat Database of Ireland | HD Annex IV, WA |
| M90, N00, R99, S09 | Soprano Pipistrelle *Pipistrellus pygmaeus* | National Bat Database of Ireland | HD Annex IV, WA |
| N00 | Nathusius's Pipistrelle *Pipistrellus nathusii* | National Bat Database of Ireland | HD Annex IV, WA |
| N00, S09 | Brown Long-eared Bat *Plecotus auritus* | National Bat Database of Ireland | HD Annex IV, WA |
| N00, R99, S09 | Daubenton's Bat *Myotis daubentonii* | National Bat Database of Ireland | HD Annex IV, WA |
| N00, S09 | Natterer's Bat *Myotis nattereri* | National Bat Database of Ireland | HD Annex IV, WA |
| N00 | Whiskered Bat *Myotis mystacinus* | National Bat Database of Ireland | HD Annex IV, WA |
| M90, N00, R99, S09 | Pipistrelle *Pipistrellus pipistrellus sensu lato* | National Bat Database of Ireland | HD Annex IV, WA |

## 4.2.2 Bat Species Range

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

The Proposed Development site is located outside the current known range for Lesser horseshoe bat, and within range for all other species.

## 4.2.3 Designated Sites

Within Ireland, the Lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs) and the proposed site is situated outside the known range of this species. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10km radius of the site found no sites designated for the conservation of bats. Table 4-3 lists the sites within the current study area.

*Table 4-3 pNHAs within 10km of the site.*

| Species | Site and pNHA | Approx. Distance |
|---|---|---|
| Leisler's bat | Birr (Domestic Dwelling No. 1, Occupied) [000569] | 0.864km |
| Leisler's bat | Birr (Domestic Dwelling No. 2 Occupied) [000568] | 1.1km |
| Leisler's bat | Bracken's Dwelling, Near Whiteford [002058] | 2.5km |
| Brown long-eared bat | Banagher (Domestic Dwelling, Occupied) [000567] | 8.3km |

## 4.2.4 Landscape Features and Habitat Suitability

A review of mapping and photographs provided insight into the habitats and landscape features present at the Proposed Development site. In summary, the primary land use within the site is cutover bog, while the remainder of the wind farm infrastructure site supports marginal farmland.

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

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

A review of the NBDC bat landscape map provided habitat suitability indexes of 21.3 - 28.1 (yellow), 28.1 – 36.4 (orange) and 36.4 – 58.6 (red). This indicates that the Proposed Development area has moderate or high habitat suitability for bat species.

## 4.2.5 Other Wind Energy Developments

Table 4-4 provides an overview of wind farms in the vicinity of the Proposed Development.

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

| Wind Farm Name and Location | No. Turbines | Status |
|---|---|---|
| **Within 5km of Carrig Wind Farm** | | |
| Skehanagh Wind Farm, Co. Tipperary | 5 | Existing |
| Carrig Wind Farm, Co. Tipperary | 3 | Existing |
| **Within 10km of Proposed Carrig Wind Farm** | | |
| Meenwaun Wind Farm, Co. Offaly | 4 | Existing |
| Derrinlough Wind Farm, Co. Offaly | 21 | Permitted – pre-construction |

# 4.3 Overview of Study Area and Bat Habitat Appraisal

## 4.3.1 Proposed Development Infrastructure

A total of sixteen habitats were recorded within the Proposed Development site, including;

- Cutover bog (PB4)
- Conifer plantation (WD4)
- (Mixed) Broadleaved woodland (WD1)
- Bog Woodland (WN7)
- Recently felled woodland (WS5)
- Dense Bracken (HD1)
- Scrub (WS1)
- Improved Agricultural Grassland (GA1)
- Dry meadows and grassy verges (GS2)
- Hedgerow (WL1)
- Treeline (WL2)
- Eroding upland rivers (FW1).
- Drainage ditches (FW4)
- Buildings and artificial habitats (BL3)
- Spoil and bare ground (ED2)
- Recolonising bare ground (ED3)

Further details on habitats within the site can be found in Chapter 6 of the main EIAR.

The Proposed Development site is comprised of areas of Conifer plantation, including recent clear-fell, second rotation, immature, semi-mature and mature forestry. The species comprises of Norwegian spruce (*Picea abies)*). Given the nature of such densely planted coniferous plantations, few other woody plant species occur. The south and west areas of the site are comprised of Mixed broadleaf woodland, consisting of Willow (*Salix caprea*), silver birch (*Betula pendula*), downy birch (*Betula pubescens), northern bracken fern (Pteridium aquilinum)* and non-vascular species including Common feather-moss (*Kindbergia praelonga)*. Occasionally alder (*Alnus glutinosa)*, and ash (*Fraxinus excelsior)* occur within mixed broadleaf stands. Large areas of *Cutoverbog (PB4)* dominate the site, there are sections of ongoing peat extraction through turf cutting, and areas of revegetation over the bare peat. Sections of woodland are discussed below. The is a large section of bog woodland to the north-east of the site, with small sections to the east and west.

*Improved agricultural grassland (GA1).* Sections of the improved agricultural grassland degrade into areas of *Wet grassland (GS4)* due to poorly draining soils. Throughout the site, small areas of *Dry meadows and grassy verges (GS2)* occurs along the site tracks, riverbanks and between the blocks of plantation forestry. Watercourses within the site boundary and along the grid route have been identified as correspond to *Eroding/upland rivers (FW1).*

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

With regard to foraging and commuting bats, areas of closed canopy conifer plantation, recently felled woodland, cutover bog, and grassland habitats were considered *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016). Scrub and drainage ditches were assessed as having Moderate suitability, i.e. habitat that is connected to the wider landscape that could be used by bats for commuting/foraging such as trees, scrub, grassland or water (Collins, 2016).

Mixed broadleaf woodland, bog woodland, forestry edge, roadway and tracks, hedgerow and treeline habitats were assessed as having *Moderate* potential for commuting or foraging bats (i.e. habitat that is connected to the wider landscape that could be used by bats for foraging bats such as trees, scrub grassland or water (Collins, 2016)). However, these habitats are surrounded by wide expanses of cutover bog habitat and conifer forestry with limited connectivity.

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

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

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

### 4.3.1.1 Grid Connection

It is proposed to construct an onsite 38kV substation within the site of the Proposed Development and to connect from here via a 38kV underground electrical cable connection to the existing 110kV Dallow substation near Birr, Co. Offaly. The proposed onsite 38kV substation is located within commercial forestry plantation and will be accessed via a proposed new wind farm site road on the L5041 local road.

The underground electrical cabling route is approximately 13.7km in length to Dallow and is located primarily within the public road corridor. The proposed underground grid connection cabling route is shown in Chapter 4, Figure 4-1a.

Habitats along the wider grid connection route include:

- Improved agricultural grassland (GA1)
- Buildings and artificial surfaces (BL3)
- Arable crops (BC1)
- Treelines (WL2)
- Hedgerows (WL1)
- Wet grassland (GS4)
- Amenity grassland (GA2)
- Parkland and scattered trees (WD5)
- Conifer Plantation (WD5)

There are a total of 7 no. identified watercourse and existing culvert/drain crossings along the underground cable route, of which 4 no. are EPA/OSI mapped crossings. The remaining crossings are classified as culverts over minor channels or manmade drains. A farm underpass and disused railway bridge crossing are also required, but no watercourse is associated with these.

All EPA crossings, as well as culvert and drain crossing locations, were assessed on 13th June 2023 for their suitability to support roosting bats (Table 4-5).

Following the daytime inspections, no evidence of bat use, including live or dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises were identified at any of the watercourse crossings. Crossings with infrastructure presented *Negligible* or *Low* potential. The location of the surveyed watercourse, culvert and drain crossings is presented in Chapter 4, Figure 4-32. The grid connection watercourse and culvert crossings are further detailed in Section 4.9.7.4 in Chapter 4 of the EIAR, and in Chapter 6, Section 6.6.1.11.1.

*Table 4-5 Proposed Grid Connection Watercourse, Culvert and Drain Crossings*

| Watercourse Crossing Reference No. | Location (Irish Grid Ref.) | Watercourse Bridge Type | Extent of Works Proposed | Bat Roosting Habitat Suitability |
|---|---|---|---|---|
| WC1 | N 01832 01259 | Stone Arch | Directional Drilling | Low |
| WC2 – Culvert | N 04574 02981 | Concrete drain | Directional Drilling | Low |
| WC3 – Culvert | N 04822 03785 | Concrete drain | Standard Formation Crossing over Culvert | Negligible |
| WC4 | N 05366 05658 | Stone Arch (3 Arches) | Directional Drilling | Low |
| WC5 | N 05907 06265 | Stone Arch Bridge | Standard Formation Crossing over Culvert | Low |
| WC6 - Culvert | N 05596 07679 | Stone Arch | Directional Drilling | Low |
| WC7 | N 05402 07940 | PVC Pipe | Standard Formation Crossing over Culvert | Negligible |
| Farm Underpass | N 04819 05718 | Concrete flatbed bridge with stone masonry | Shallow Formation Crossing over Culvert | Low |
| Disused Railway Bridge | N 04925 03452 | Stone Arch Bridge | Directional Drilling | Low |

### 4.3.1.2 Turbine Delivery Route

The turbine delivery route (TDR) was the subject of an ecological multi-disciplinary walkover survey and assessment for its potential to impact on roosting, commuting and foraging bats (as discussed in Chapter 6).

The proposed TDR route is located primarily within the existing road infrastructure classified as *Buildings and artificial surfaces (BL3).* The haul route traverses small areas of *Scattered Trees and Parkland (WD5), Hedgerow, Improved agricultural grassland (GA1), and grassy verges (GS2), Treeline (WL2) and Hedgerow (WL1).*

With regard to commuting and foraging bats, the Turbine Delivery Route (TDR) was assessed as having *Low-Moderate* suitability. With regard to roosting bats, most habitat features along the TDR route, including Treelines (WL2) Scattered Trees and Parkland (WD5), hedgerows, were assessed as having *Low* suitability.

## 4.3.2 Roost Inspection Surveys

Following the search for roosts in 2022, seven structures and their associated outbuildings containing potential suitable bat roost features were identified. Three are within the EIAR site boundary, including a hay shed, a derelict stone building and a small farm shed. Four structures are located outside the site boundary (Figure 3-1).

The structures were subject to interior (where accessible) and exterior inspections to search for evidence of bats. Details of the inspection surveys are presented below. All identified structures will be retained and avoided as part of the Proposed Development.

### 1) Hay Shed

A hay shed (IG Ref: M 98224 01126) was identified within conifer plantation to the south-west of the site. The structure was comprised of cavity block walls with steel beams covered by corrugated iron sheets and lean-to (Plate 4-1). The roof consisted of a curved corrugated iron roof with wooden and steel beams. Part of the roof had collapsed.

Gaps and cracks were present in the concrete blocks throughout the structure. The shed was used to store hay and other farming equipment and was open on the front.

No bats or evidence of bats were found during the of the roost inspection surveys. The structure is relatively exposed to the elements with large amounts of light penetration. As such, the hay shed was classified as having *Low* suitability due to the presence of a small number of cracks suitable for opportunistic use by crevice-dwelling species.

*Plate 4-1 Hay Shed with Low roosting potential.*

### 2) Derelict Stone Building

A derelict stone building (IG Ref: M 98255 01095) was located within agricultural grassland to the south-west of the site, on the opposite roadside of the hay shed. The stone walls and roof were covered in sections of ivy (Plate 4-2). There were gaps and cracks in the stonework throughout the building. There was no visible entrance to access the structure. No bats or evidence of bats were found during the roost inspection survey. The structure was classified as having *Low* suitability due to the presence of a small number of cracks suitable for opportunistic use by crevice-dwelling species (Plate 4-8).





*Plate 4-2 Derelict Stone building showing ivy cover and gaps in the stonework with Low potential.*

### 3) Small farm Shed

The small farm shed (IG Ref: M 98300 01119), was located on the edge of a conifer plantation at the southwest of the site. It is comprised of block walls with no insulation and a solid cement roof. The doorway was open with small gap in the blockwork under the roof. There was no evidence of bats present, and it was identified as having *Negligible* suitability (Plate 4-3 below).

### 4) Partially Constructed Block House

The partially constructed block house (IG Ref: N 00283 02066), was located within agricultural grassland to the northeast. A treeline is located ~80m from the building. It is comprised of a building consisting of a foundation and block cavity walls of a house, and no roof. The block walls had open cavities in the block work, particularly in open window spaces and doorways (Plate 4-4). The house was identified as having *Low* suitability for roosting bats. No bats or evidence of bats were found during the roost inspection survey. An emergence survey was carried out on the 21st May 2022. No bats were seen emerging from the house during emergence survey.

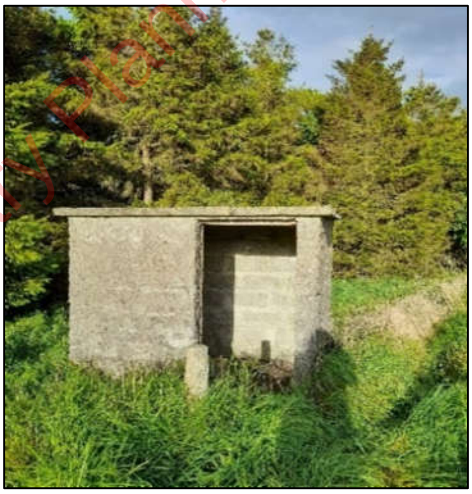


*Plate 4-3 Small farm shed with Negligible roosting potential*

*Plate 4-4 Partially constructed Block House with numerous bat access points.*

## 5) Corrugated Roof Derelict Cottage

The Corrugated Roof Cottage (IG Ref: M 98088 02399), was located within agricultural grassland, treeline and scrub to the northwest. It comprised of a single storey stone building with a small attic space. The exterior of the building was covered in stone veneer. The corrugated metal roof was in overall good condition. There were gaps and holes into the interior area through a hole in the facia and ridge on the gable end (Plate 4-5 below). No evidence of bats was found in the cottage during the inspection and it was classified as having *Low* suitability for roosting bats.

## 6) Stone Shed

The stone shed located to the northwest of the site (IG Ref: M 98270 02238) is open on the front side, with holes in the roof. The wooden flooring is suspended with a large section missing, allowing light in. There are gaps and cracks in the stonework throughout the buildings, particularly under the ridge in the west facing shed. No bats or evidence of bats were found in the sheds during any of the roost inspection surveys. It was classified as having *Low* suitability (Plate 4-6).

*Plate 4-5 Cottage, containing separate Attic space*

*Plate 4-6 Stone shed open on one side and showing ivy cover.*

## 7) Old House with Sheds

An old house and a number of sheds located on agricultural land to the south-west of the site at (IG Ref: M 97951 00845). The structure was a single storey stone and brick house with galvanised roof, the doorway was overgrown with ivy and scrub. (Plates 4-7). The adjacent sheds also consist of stone and a galvanised metal roof showing extensive damage. The buildings were assigned a *Low* roosting potential.

A number of sheds to the west of the old house mentioned above (IG Ref: M 97927 00856) consist of stone walls, wooden rafters and a corrugated metal roof with a number of internal storage areas accessible from the exterior. The sheds are not in a good state of repair, is overgrown with ivy and scrub (Plates 4-8). The buildings were assigned a *Low* roosting potential.

*Plate 4-7 Stone and block house, missing roof sections.*

*Plate 4-8 External view of the sheds, showing missing sections of roof and damage*

## 4.3.3 Summary of Roost Survey Results

Table 4-6 summarises the findings of the bat activity surveys carried out on the structures.

*Table 4-6 PRF Inspection Survey Results*

| Structure | PRF Suitability | Survey Results |
|---|---|---|
| Hay Shed | *Low* | Half open with large amounts of light penetration. No evidence of bats. |
| Derelict Stone Building | *Low* | No evidence of bats. |
| Small farm shed | *Negligible* | No evidence of bats. |
| Partially Constructed Block House | *Low* | No evidence of bats. |
| Corrugated Roof Derelict Cottage | *Low* | Separate attic space, open to floor level and outside in sections, house is in bad condition. No evidence of bats. |
| Stone Shed (near the cottage) | *Low* | Front of structure open with large amounts of light penetration. Some ivy cover present. No evidence of bats. |
| Old House with sheds | *Low* | Large amounts of light penetration and no separate attic. No evidence of bats. |

### Trees

Trees present on site are dominated by commercial coniferous species which provide largely suboptimal suitability for roosting potential due to the lack of PRFs available. Small sections of the site are comprised of a mixture of mature and immature birch, willow, ash, oak, sycamore and rowan species. Overall, the majority of trees were assessed as not providing suitable habitat for roosting bats due to their size and lack of PRFs and were thus assessed as having *Negligible – Low* roosting potential.

## 4.4 Manual Transects

Manual transects were undertaken in Spring, Summer and Autumn 2022. Bat activity was recorded in all seasons. A total of 479 bat passes were recorded. In general, soprano pipistrelle (n=301) was recorded most frequently, followed the common pipistrelle (n=165). Leisler's Bat (n=9) and *Myotis sp.* (n=4) were less frequent.

Species composition and activity levels varied between surveys. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort) (Plate 4-9). Figures 4-1 – 4-3 present the spatial distribution of bat activity across surveys. Bat activity was concentrated along treelines, and hedgerows, and linear (road/track) habitats.

An emergence survey was carried out on the derelict stone building on the 28th June 2022. Overall, bat activity in the area was low around the building during the emergence survey. Two common pipistrelles were noted commuting beyond the structure with no bats observed emerging. A small number of bats were observed repeatedly foraging along linear features near bog woodland.

An emergence survey was carried out on the Partially Constructed Block House on the 21st May 2022. Overall, bat activity in the area was low around the house during the emergence survey. No bats were observed emerging from the house during emergence survey. One Leisler's bat was seen commuting over the building. A small number of bats were observed repeatedly foraging along linear features near bog woodland.

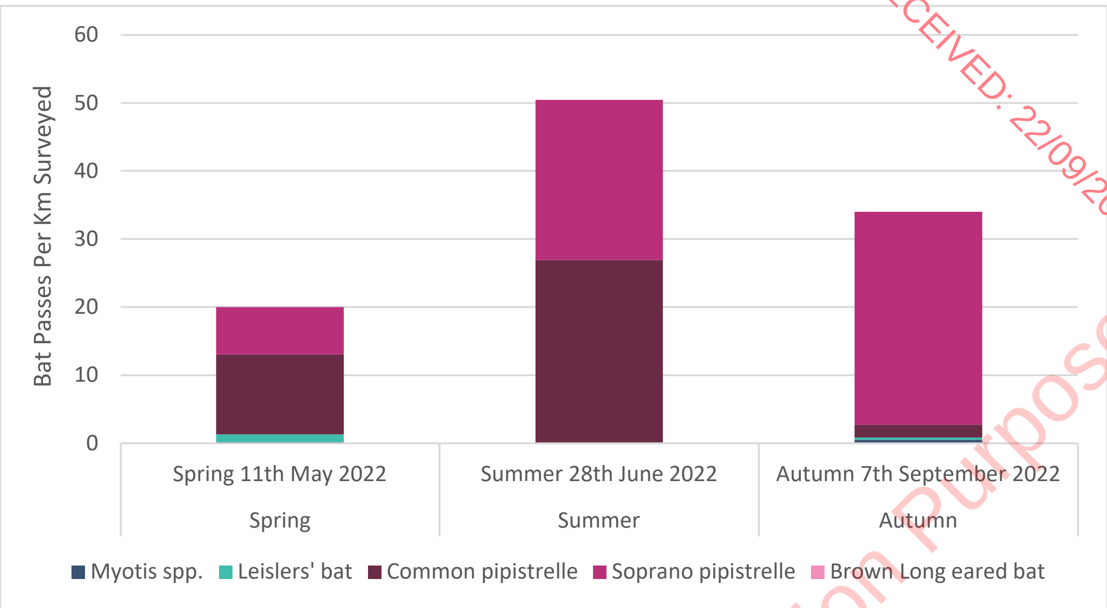
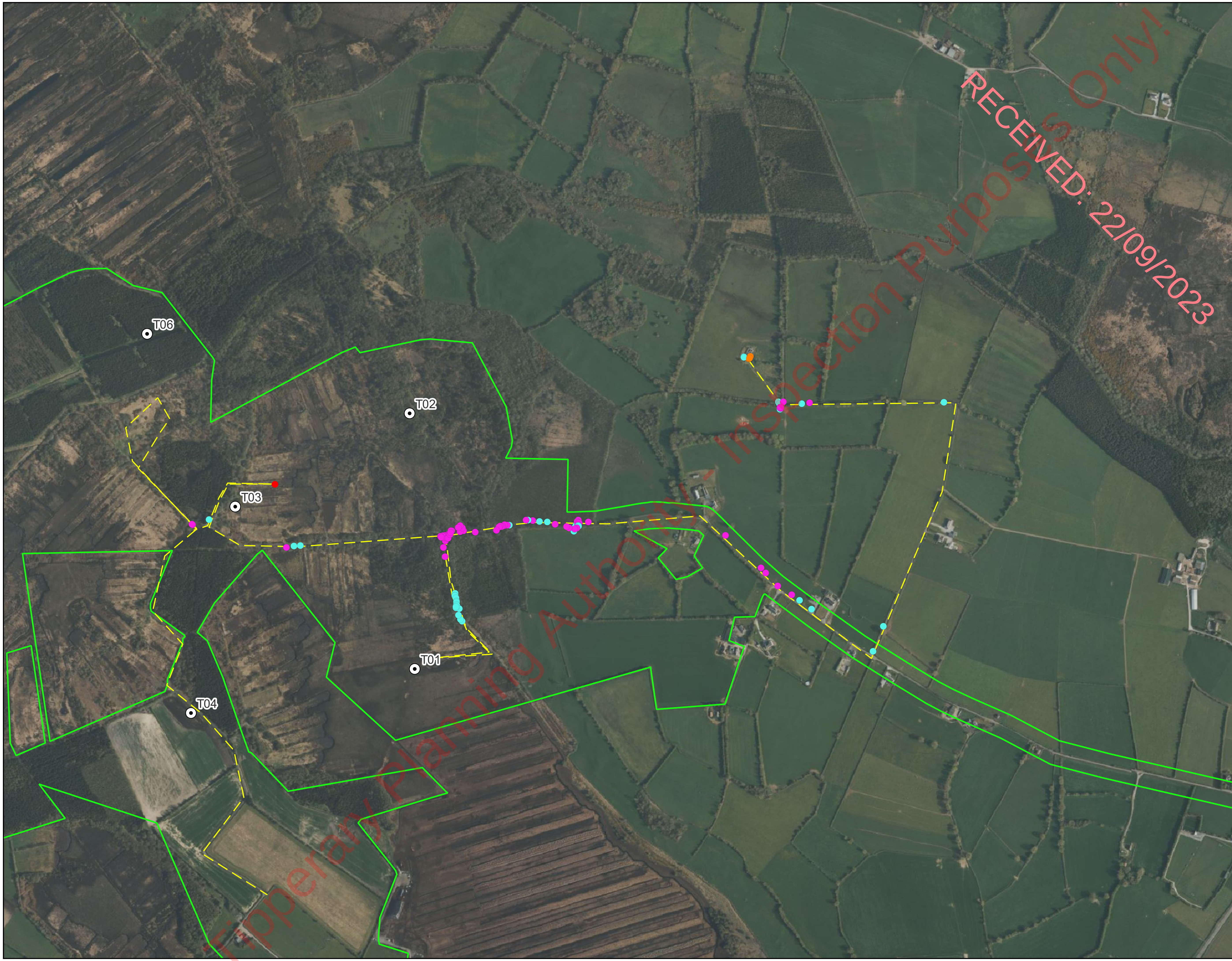



*Plate 4-9 2022 Transect Results - Species Composition Per Survey Period*




Map Legend

EIAR Site boundary

Spring Manual Transect

Proposed Turbine Location

Spring Manual Results
11th May 2022

Myotis spp.

Leisler's bat

Common pipistrelle

Soprano pipistrelle



N

| | |
|---|---|
| Drawing Title: Spring Manual Results | |
| Project Title: Carrig Renewables Wind Farm | |
| Drawn By: LM | Checked By: AJ |
| Project No.: 211016 | Drawing No.: Fig. 4-1 |
| Scale: 1:8,000 | Date: 2023-09-21 |

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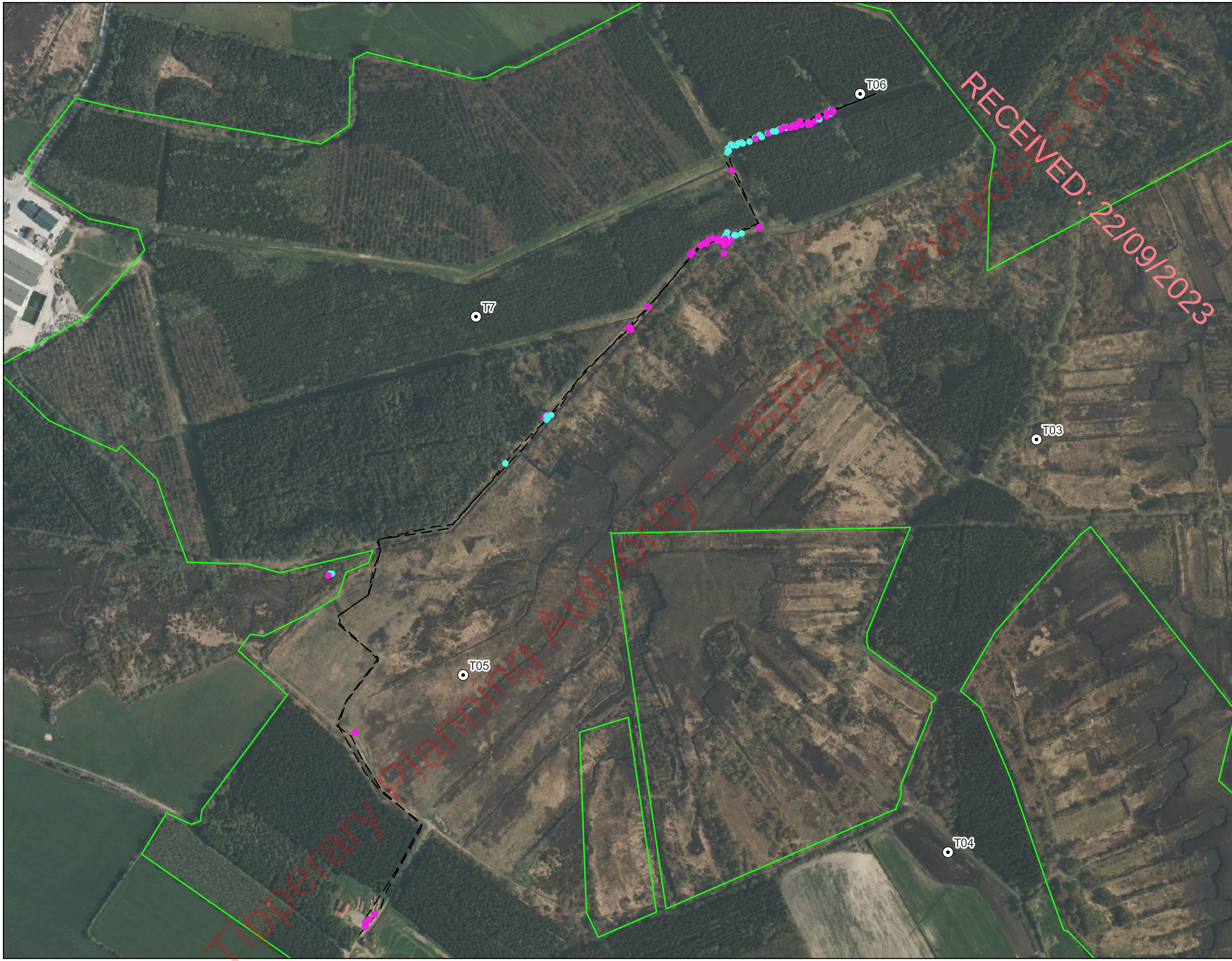




## Map Legend

- EIAR Site boundary
- Proposed Turbine Location
- Summer Transect

Summer Manual results
28th June 2022

- Common pipistrelle
- Soprano pipistrelle



| Drawing Title | |
|---|---|
| Summer Manual Results | |
| Project Title | |
| Carrig Renewables Wind Farm | |
| Drawn By: LM | Checked By: AJ |
| Project No.: 211016 | Drawing No.: Fig. 4-2 |
| Scale: 1:4,000 | Date: 2023-09-21 |

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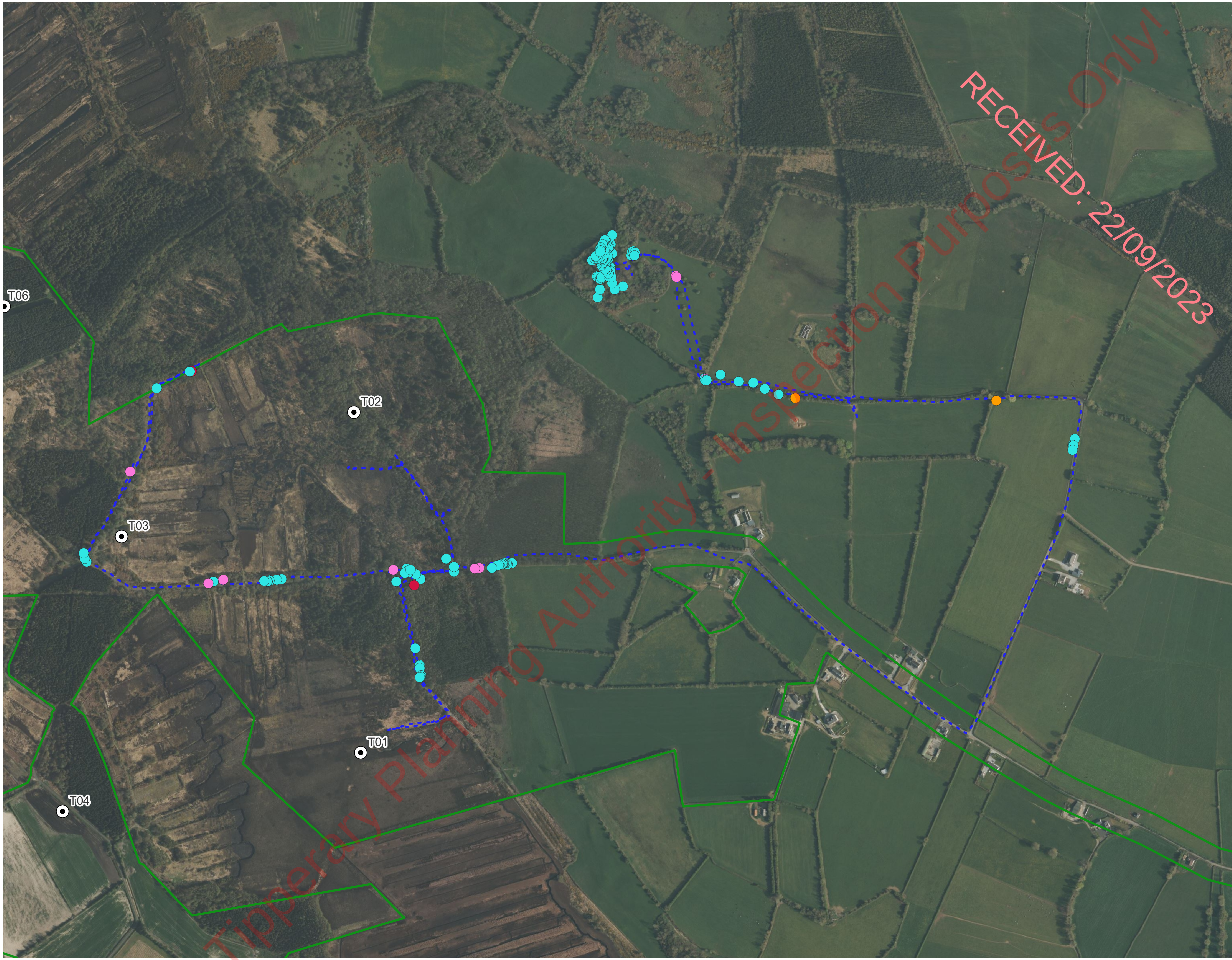



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Autumn Transect

Autumn Manual Results
07th September 2022

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



| Drawing Title | |
|---|---|
| Autumn Manual Results | |
| Project Title | |
| Carrig Renewables Wind Farm | |
| Drawn By LM | Checked By AJ |
| Project No. 211016 | Drawing No. Figure 4-3 |
| Scale 1:3,800 | Date 2023-08-10 |

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## 4.5 Ground-level Static Surveys

In total, 66,337 bat passes were recorded across all deployments. In general, Common pipistrelle (n=30,279) occurred most frequently, followed by Soprano pipistrelle (n=19,430) and Leisler's bat (n=14,351). Instances of *Myotis spp*. (n=1,710) and Brown long-eared bat (n=497) were significantly less. Nathusius' pipistrelle (n=70) was rarer. Plate 4-10 presents relative species composition across all ground-level static detector surveys.

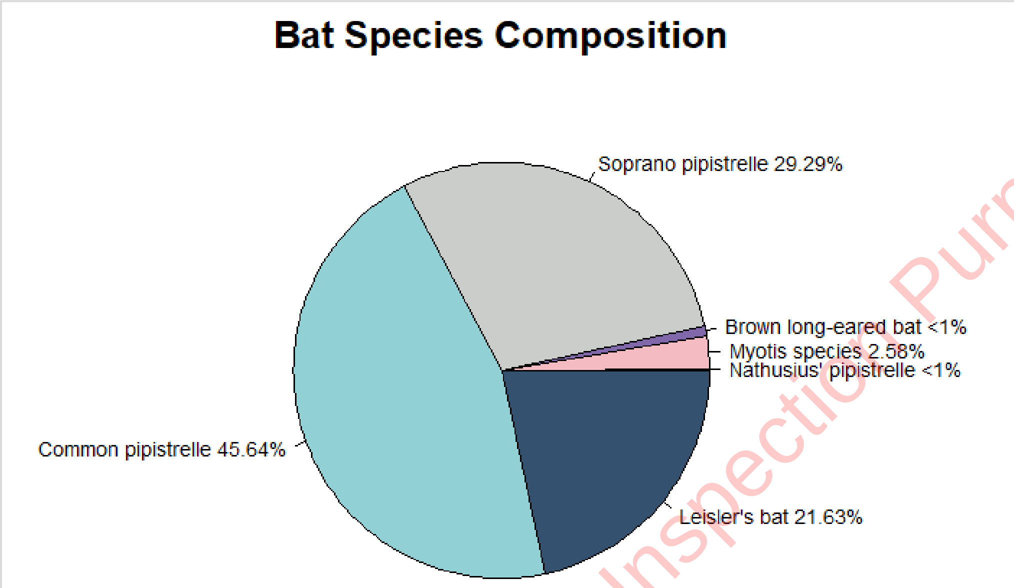


*Plate 4-10 2022 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)*

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-11 and Table 4-4 presents these results for each species. Bat activity was dominated by Common pipistrelle across all seasons. In addition, Leisler's bat occurred frequently in Summer. Instances of Soprano pipistrelle and *Myotis* spp. were less frequent. Brown long-eared bat and Nathusius' pipistrelle were relatively rare.

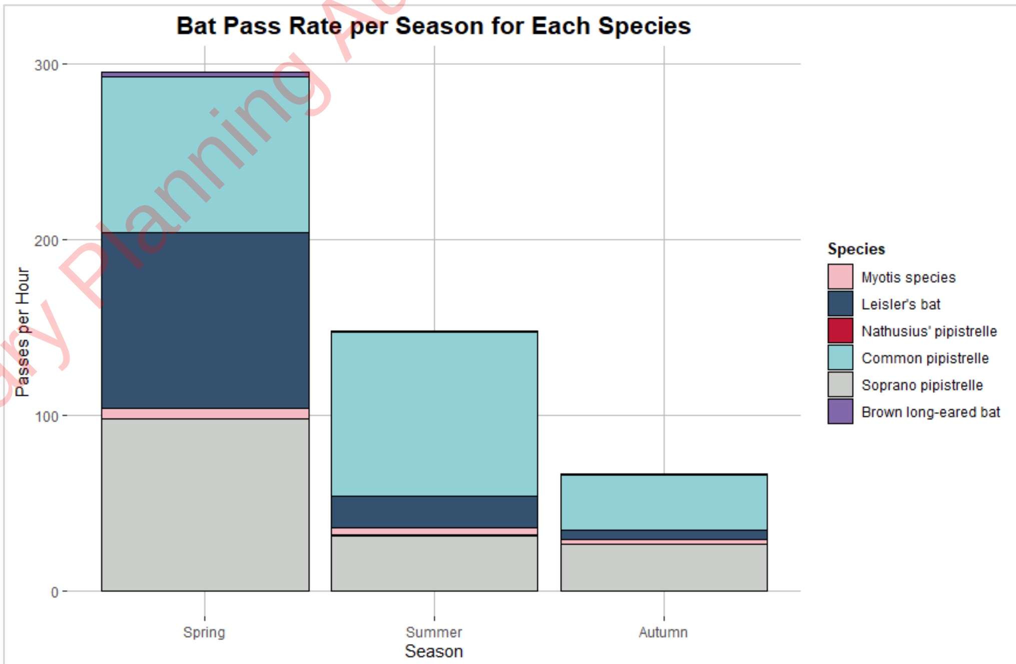


*Plate 4-11 2022 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)*

*Table 4-7 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)*

| | Spring | Summer | Autumn |
|---|---|---|---|
| *Total Survey Hours* | 113.3 | 178.3 | 133.5 |
| *Myotis spp.* | 0.16 | 0 | 0.50 |
| Leisler's bat | 1.11 | 0 | 0.34 |
| Nathusius' pipistrelle | 0 | 0 | 0 |
| Common pipistrelle | 11.75 | 26.92 | 1.84 |
| Soprano pipistrelle | 6.99 | 23.55 | 31.32 |
| Brown long-eared bat | 0 | 0 | 0 |

The Median Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the proposed site. Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018). Plate 4-12 illustrates the median Nightly Pass Rate per species per deployment. Zero data, when a species was not detected on a night, was also included.

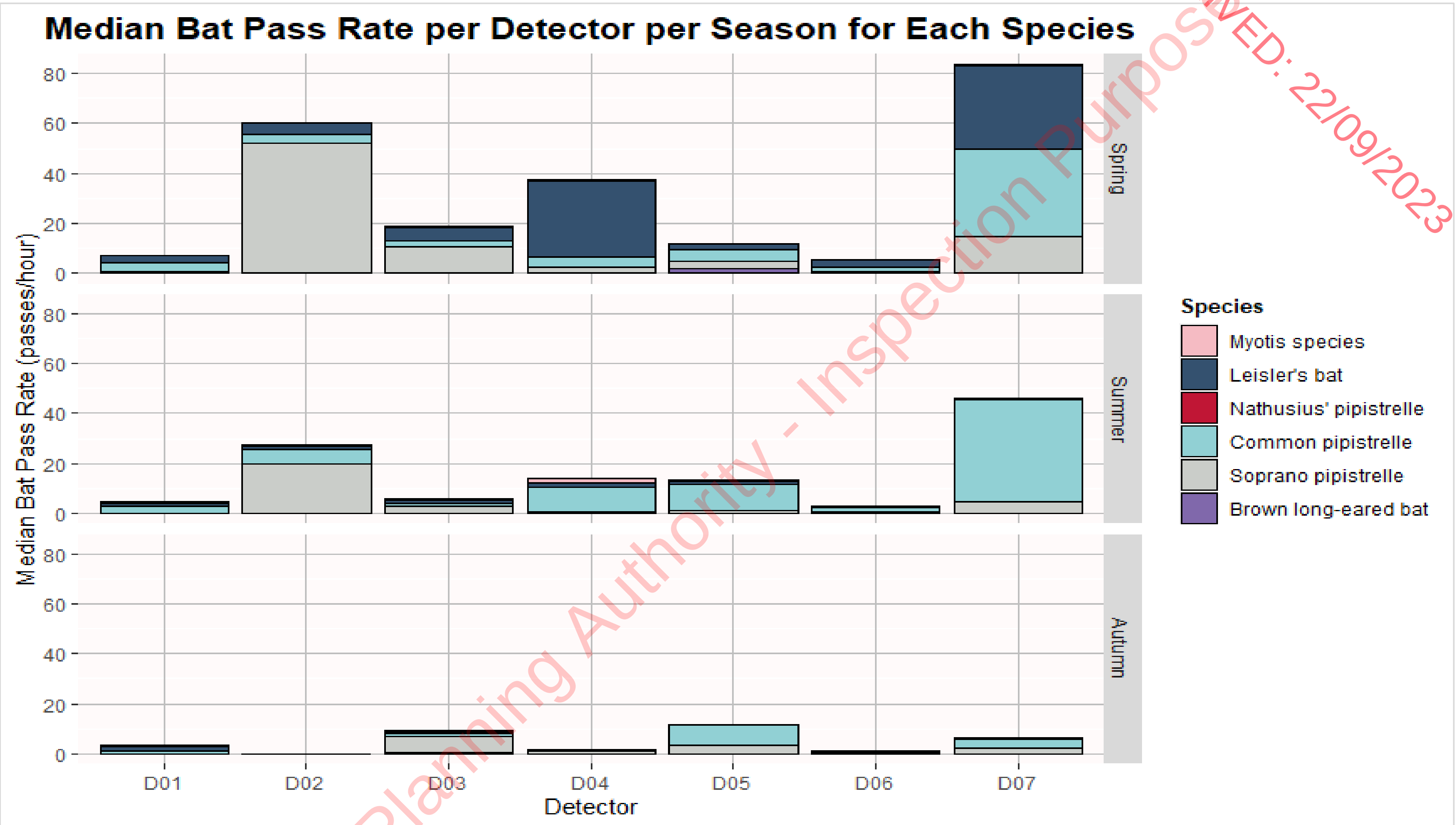


*Plate 4-12 Static Detector Surveys: Median Bat Pass Rate (bpph) Including Absences, Per Location Per Survey Period*

## 4.5.1 Assessment of Bat Activity Levels

### 4.5.1.1 Adapted Site-specific Ranges

Low, Medium and High activity levels were assigned to median and maximum pass rates (bpph) identified during Spring, Summer and Autumn at the detectors deployed across the site, as adapted from Mathews *et al.* (2016). Table 4-8 shows the results of the site-level assessment as calculated on a site-specific activity level (Table 3-7 above). Where no median activity at a detector is reported, no data was recorded for that species throughout the deployment.

Leisler's bat Median Bat Activity was recorded as Low in Summer and Autumn. Moderate and High Max activity was recorded at all the detector locations in Spring and Summer. Activity peaked at D04 in Spring. In Autumn Moderate Max activity level was recorded at D01 and D03.

Overall, Common pipistrelle Max Bat Activity was generally High in Spring and Summer. High Max Bat activity was recorded at D01, D04, D05, and D07 in Spring, at D01, D02, D04, D05, D06 and D07 in Summer, and at D05 and D07 in Autumn. Activity peaked in Spring at D07.

Soprano pipistrelle Median Bat Activity was generally Low. In Spring and Summer Median Bat Activity was High for D02. High Max Bat Activity was recorded at D02, D03, D05, and D07 in Spring, at D02, and D07 in Summer, and at D05 in Autumn. Activity peaked in Spring D02 and Autumn D05. Moderate Max Bat Activity was recorded in Spring at D04, Summer at D03, D04 and D06, and Autumn D02 and D03.

*Myotis spp.* recorded relatively low activity in comparison to other species, on a site-specific level. High Max Activity was recorded in Spring D04 and Summer at D04 and D05. A Moderate activity level was recorded at D03 in Autumn. High peak activity levels were also recorded in Spring and Autumn, with the highest activity recorded at D04 in Spring for these species Overall, *Myotis spp.* recorded Low activity across all seasons.

Nathusius' pipistrelle Median Bat activity was recorded as Low for all three seasons. In Summer, D06 and D07 recorded Moderate and High Max bat activity levels. Low Max Bat Activity levels were recorded for all other seasons.

Brown long-eared bat activity was generally Low throughout the site. High Max Activity levels for this species were recorded at D05 Spring.

*Table 4-8 Median Nightly Bat Activity (bpph) per Species, per Season, per Detector Location Low, Moderate, High*

| Season | Detector | Brown long-eared bat | | Common Pipistrelle | | Leisler's bat | | *Myotis spp.* | | Nathusius' Pipistrelle | | Soprano Pipistrelle | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Median Bat Activity | Max Bat Activity | Median Bat Activity | Max Bat Activity | Median Bat Activity | Max Bat Activity | Median Bat Activity | Max Bat Activity | Median Bat Activity | Max Bat Activity | Median Bat Activity | Max Bat Activity |
| Spring | *D01* | 0.0 | 0.1 | 3.5 | 21.0 | 3.0 | 39.5 | 0.3 | 0.8 | 0.0 | 0.0 | 0.7 | 3.2 |
| | *D02* | 0.0 | 0.3 | 3.4 | 8.1 | 5.0 | 31.9 | 0.1 | 0.8 | 0.0 | 0.0 | 51.9 | 120.4 |
| | *D03* | 0.0 | 0.1 | 2.8 | 11.4 | 4.7 | 17.8 | 1.1 | 2.9 | 0.0 | 0.0 | 10.5 | 37.7 |
| | *D04* | 0.0 | 0.1 | 4.5 | 23.5 | 29.9 | 146.0 | 0.7 | 29.0 | 0.0 | 0.0 | 2.4 | 12.6 |
| | *D05* | 2.1 | 4.6 | 4.5 | 66.1 | 2.2 | 5.3 | 0.2 | 1.0 | 0.0 | 0.0 | 3.0 | 51.5 |
| | *D06* | 0.0 | 0.0 | 1.5 | 5.7 | 3.1 | 7.9 | 0.1 | 0.7 | 0.0 | 0.0 | 0.9 | 2.1 |
| | *D07* | 0.0 | 0.9 | 35.1 | 123.0 | 33.2 | 79.3 | 0.3 | 1.4 | 0.0 | 0.0 | 14.9 | 32.4 |
| Summer | *D01* | 0.0 | 0.1 | 18.3 | 18.3 | 1.3 | 6.5 | 0.1 | 0.4 | 0.0 | 0.1 | 0.3 | 1.4 |
| | *D02* | 0.0 | 0.7 | 5.7 | 40.1 | 1.4 | 9.9 | 0.1 | 0.4 | 0.0 | 0.1 | 20.0 | 35.2 |
| | *D03* | 0.3 | 1.7 | 1.3 | 3.4 | 1.3 | 15.5 | 0.3 | 1.5 | 0.0 | 0.1 | 2.7 | 13.3 |
| | *D04* | 0.0 | 0.3 | 9.7 | 51.9 | 2.0 | 37.3 | 1.5 | 5.0 | 0.0 | 0.0 | 0.6 | 12.6 |
| | *D05* | 0.0 | 0.8 | 11.0 | 72.2 | 0.8 | 16.5 | 0.6 | 6.4 | 0.0 | 0.3 | 1.0 | 5.0 |
| | *D06* | 0.0 | 0.1 | 1.3 | 40.4 | 0.6 | 4.9 | 0.1 | 0.4 | 0.0 | 1.0 | 0.8 | 6.8 |
| | *D07* | 0.0 | 0.7 | 41.0 | 87.7 | 0.8 | 17.4 | 0.0 | 0.6 | 0.0 | 2.7 | 4.4 | 20.5 |
| Autumn | *D01* | 0.0 | 0.1 | 0.6 | 3.0 | 2.2 | 8.5 | 0.2 | 0.6 | 0.0 | 0.1 | 0.2 | 1.6 |
| | *D02* | 0.1 | 0.4 | 0.7 | 1.4 | 0.5 | 1.1 | 0.4 | 0.7 | 0.0 | 0.0 | 2.5 | 6.0 |
| | *D03* | 0.3 | 1.4 | 1.0 | 3.5 | 0.7 | 4.4 | 0.7 | 3.0 | 0.0 | 0.0 | 6.5 | 14.2 |
| | *D04* | 0.0 | 0.1 | 0.3 | 2.5 | 0.0 | 0.6 | 0.4 | 0.8 | 0.0 | 0.0 | 1.1 | 4.2 |
| | *D05* | 0.1 | 0.5 | 8.0 | 58.9 | 0.3 | 0.8 | 0.1 | 0.5 | 0.0 | 0.2 | 3.4 | 105.2 |
| | *D06* | 0.0 | 0.3 | 0.4 | 5.9 | 0.1 | 0.9 | 0.1 | 0.5 | 0.0 | 0.0 | 0.5 | 1.6 |
| | *D07* | 0.0 | 0.2 | 3.7 | 19.8 | 0.1 | 0.7 | 0.2 | 0.6 | 0.0 | 0.1 | 2.2 | 5.4 |

## 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 1976-2022. No bat roosts were identified within the footprint of the Proposed Development. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the study area are utilized by a regularly occurring bat population of Local Importance.

No bat roosts and no evidence of use by bats were identified within the Proposed Development site during the surveys. No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the site. However, a number of structures and trees with limited potential to host roosting bats occur within the wider area. Structures within the site will be avoided and retained and will not be affected by the Proposed Development at construction or operational phase.

# 5. RISK AND IMPACT ASSESSMENT

As per 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 study area has been utilized to predict the potential effects of the Proposed Development on bats.

## 5.1 Collision Mortality

### 5.1.1 Assessment of Site-Risk

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

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

| Criteria | Site-specific Evaluation | Site Assessment |
|---|---|---|
| Habitat Risk | A small number of potential roost features were identified within the site with no roosts or evidence of roosting bats identified during the surveys undertaken.<br><br>Habitats within the site provide suitable commuting and foraging opportunities and are connected to the wider landscape by linear features such as woodland edge habitats, drains, scrub, tree lines and streams. However, it does not provide an extensive and diverse habitat mosaic of high quality for foraging bats or meet any of the criteria of a high-risk site as set out in Table 3a of NatureScot 2021 | Moderate |
| Project Size | Following the criteria set out in NatureScot 2021the project is of Medium scale as it consists of 7 no. turbines. Whilst those turbines are over 100m in height, it is not a strategic infrastructural development and is well below the number of turbines that would constitute a Large development (NatureScot, 2021).<br><br>Small scale development (≤10 turbines) with three wind energy developments within 10km and two small scale wind energy developments within 5km.<br><br>Comprising turbines >100 m in height. | Medium |
| **Site Risk Assessment (from criteria in Plate 3-3)** | | **Medium Site Risk (3)** |

The site of the Proposed Development is located in an area of predominantly mature and immature commercial coniferous forestry and bog habitats. As per Table 3a of the NatureScot Guidance (2021), the Proposed Development has a *Moderate* habitat risk and *Medium* project size (Small project including 7 turbines but other large developments within 10km). The cross tabulation of a moderate project on a **Medium** risk site results in an overall risk score of **Medium** (NatureScot Table 3a).

## 5.1.2 Assessment of Collision Risk

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

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

The Overall Risk Assessment for high collision risk species is provided in the sections below. Overall Risk was determined, in accordance with Table 3b of NatureScot 2021 guidance (Appendix 3), by a cross-tablature of the site risk level (i.e. Medium) 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 the most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

As per NatureScot guidance there is no requirement to complete an Overall Risk Assessment for low-risk species. During the extensive suite of surveys undertaken that following low risk species were recorded:

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

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

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

### 5.1.2.1 Leisler's bat

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

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

Thus, there is ***Medium*** collision risk level assigned to the local population of Leisler's Bat in Spring, and a ***Low*** collision risk level assigned to the local population in Summer and Autumn.

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

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

| 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) |
|---|---|---|---|---|---|
| Autumn | | Low (1) | Typical Risk is Low (3) | Low (1) | Peak Risk is Low (3) |

### 5.1.2.2 Soprano pipistrelle

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

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

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

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

### 5.1.2.3 Common pipistrelle

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

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

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

*Table 5-4 Common pipistrelle - Overall Risk Assessment*

| Survey Period | Site Risk | Typical Activity (Median) | Typical Risk Assessment (as per Table 3b NatureScot 21 | Activity Peaks (Maximum) | Peak Risk Assessment (as per Table 3b NatureScot 2021) |
|---|---|---|---|---|---|
| Spring | Medium (3) | Low (1) | Typical Risk is Low (3) | High (5) | Peak Risk is High (15) |
| Summer | | Moderate (3) | Typical Risk is Medium (9) | High (5) | Peak Risk is High (15) |
| Autumn | | Low (1) | Typical Risk is Low (3) | Moderate (3) | Peak Risk is Medium (9) |



### 5.1.2.4 Nathusius' pipistrelle

This Proposed Development site is outside the current known range of the Nathusius' pipistrelle bat (NPWS, 2019). Nathusius' pipistrelle are classed as a rarest species of a high population risk which have a high collision risk (Plate 3-4). Low numbers of Nathusius' pipistrelle were recorded during each season. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021); overall activity risk for Nathusius' pipistrelle at typical activity levels was found to be ***Low*** in all three seasons. Peak risk levels for Nathusius' pipistrelle were found to be ***Low*** in all three Seasons (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 predominantly a mixture of cutover bog, and mature commercial coniferous forestry with ***Low*** levels of bat activity recorded during the walked transects undertaken. Thus, there is ***Low*** collision risk level assigned to the local population of Nathusius' pipistrelle for all three seasons.

*Table 5-5 Nathusius' pipistrelle - Overall Risk Assessment*

| Survey Period | Site Risk | Typical Activity (Median) | Typical Risk Assessment (as per Table 3b NatureScot 2021) | Activity Peaks (Maximum) | Peak Risk Assessment (as per Table 3b NatureScot 2021) |
|---|---|---|---|---|---|
| Spring | Medium (3) | Low (1) | Typical Risk is Low (3) | Low (1) | Typical Risk is Low (3) |
| Summer | | Low (1) | Typical Risk is Low (3) | Low (1) | Typical Risk is Low (3) |
| Autumn | | Low (1) | Typical Risk is Low (3) | Low (1) | Typical Risk is Low (3) |

## 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.

Areas of closed canopy conifer plantation, recently felled woodland, cutover bog, and grassland habitats were considered *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016). Scrub and drainage ditches were also assessed as having *Low* suitability due to being isolated and poorly connected to surrounding habitats.

Mixed broadleaf woodland, bog woodland, forestry edge, roadway and tracks, hedgerow and treeline habitats were assessed as having *Moderate* potential for commuting or foraging bats (i.e. habitat that is connected to the wider landscape that could be used by bats for foraging bats such as trees, scrub grassland or water (Collins, 2016)). However, these habitats are surrounded by wide expanses of cutover bog habitat and conifer forestry with limited connectivity.

As part of the Proposed Development, tree felling will be required within and around the development footprint to allow for the construction of the turbine bases, access roads, underground cabling, and other necessary infrastructure. The felling of trees is provided to achieve the required buffer distance for the protection of bats, from the turbines to the canopy of the nearest habitat feature, as recommended by the Natural England (2014) and NatureScot (2021). Further details on buffer calculations can be found in Section 6.1.3 of this report.

A small portion (3%) of the Proposed Development site comprises commercial forestry. A total of 9.7 hectares of commercial forestry will be permanently felled as part of the Proposed Development, along with existing treeline boundaries as detailed in Chapter 6, Section 6.7.2.1. Chapter 4, Figure 4-12 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Development.

The Proposed Development, including the creation of new road infrastructure and grid connection, has the potential to open up the commercial forestry and thereby increase the amount and availability of linear landscape features that may be utilised by bats for commuting or foraging. It should be noted that forestry on the site of the Proposed Development and along the route of the grid connection was originally planted as a commercial crop and will be felled in the future should the Proposed Development proceed or not.

In addition to the removal of commercial coniferous forestry, approximately 5.8ha of bog woodland (WN7) will be lost for the construction of Turbine 2. Approximately 1.9ha of broadleaved woodland (WD1), consisting primarily of poor-quality ash plantation, will be lost to accommodate the footprint of the proposed substation and a spoil repository area close to Turbine 7.

It is proposed to remove two hedgerows forming agricultural field boundaries, to provide the necessary bat buffers. These include approximately 243m hedgerow (WL1) and 55m treeline (WL2), next to Turbine 4. A further approximate 24m of linear hedgerow and 61m of treeline habitat is proposed for removal to facilitate road widening, new access roads and construction works associated with the Proposed Development.

Further details on tree removal required within and around development footprint is detailed in Chapter 6 of this EIAR. A Biodiversity Management and Enhancement Plan (BMEP) has been developed to mitigate the loss of bat foraging/commuting habitat associated with the Proposed Development and is presented in Chapter 6, Appendix 4. Further details are outlined in Section 6.1.4 below.

It is proposed to replace ash trees lost as a result of the substation, which are currently in poor condition, with native trees of various ages in order to enhance the age structure and longevity of this woodland. It is also proposed to offset the proposed loss of hedgerow and trees through the creation of new hedgerows and treelines along proposed new internal access roads. A total of approximately 674m of linear hedgerow and treeline habitat will be planted. Overall, the proposed replanting will result in a net gain of approximately 291m in the linear landscape features within the Proposed Development site. Planting will be of semi-mature species indigenous to the local area, to ensure connectivity is re-established post-construction.

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

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

### Grid Connection Route

The proposed grid connection route will be primarily confined to the existing road network. There is no felling proposed as part of the grid route.

No significant effects with regard to loss of commuting and foraging habitat are anticipated as a result of the grid connection route.

Should removal or trimming of trees become a requirement to facilitate the installation of the underground cable, a pre-confirmatory inspection will be carried out by a qualified ecologist to assess the trees for bat potential.

### Turbine Delivery Route

The proposed transport route for the Proposed Development has been the subject of a route assessment to determine if any works are required along its length. Full details of the assessment are included as part of the traffic impact assessment set out in Section 15.1 of Chapter 15 of this EIAR.

Accommodation areas will be required at three locations on the N52 National Road between Birr, Co. Offaly and the main Proposed Development site entrance in the townland of Clohaskin, Co. Tipperary. These areas will be temporary in nature and only used for the purposes of abnormal load delivery.

The locations of the accommodation areas are shown in Chapter 4, Figure 4-22; the exact detail of the accommodation areas at each location are shown in Figures 4-24a to 4-24c.

No significant effects with regard to loss of commuting and foraging habitat are anticipated as a result of the turbine delivery route. However, should removal or trimming of trees become a requirement to facilitate the delivery, a pre-confirmatory inspection will be carried out by a qualified ecologist to assess the trees for bat potential.

## 5.3 Loss of, or Damage to, Roosts

### Proposed Development Site

The Proposed Development site is located within cutover bog, commercial conifer forestry, and broadleaf woodland with agricultural and wet grassland. Seven structures and their associated outbuildings were identified within the wider area as providing potential suitable habitat to host roosting bats. However, no bat roosts or evidence of bat use were identified during the surveys undertaken in 2022. All structures identified will be avoided and retained as part of the Proposed Development, thus no loss or damage of potential roosts is anticipated.

Trees present within the site consist primarily of mature conifers and immature deciduous trees and as such, do not provide significant potential habitat for roosting bats. A small number of trees identified as *Low* potential during the roost surveys as having potential to host roosting bats were located within the site boundary. Further details on felling buffers are outlined in Section 6.1.3. No evidence of bat use was identified during daytime inspection of the trees. However, on a precautionary basis, as a number of trees presented *Low* roosting potential, a pre-commencement survey will be carried out prior to felling. Further details are outlined in Section 6.1.6.

### Grid Connection Route



The underground cabling will connect from the proposed onsite 38kV substation within the site of the Proposed Development via a 38kV underground electrical cable connection to the existing 110kV Dallow substation in near Birr, Co. Offaly. The route will primarily follow the existing road network measuring approximately 13.4km in length.

There will be no requirement to fell trees/forestry as part of the underground cable route. Therefore, there will be no loss of tree roosting habitat associated with these works. However, should removal or trimming of trees become a requirement to facilitate the underground cable, a pre-confirmatory inspection will be carried out by a qualified ecologist to assess the trees for bat potential.

Bridges and culvert crossings along the underground cabling route were assessed as having *Negligible* or *Low* value for roosting bats (Table 4-5 above). Directional Drilling is proposed for 4no. water crossings (WC1, WC2, WC4 and WC6) and the disused railway bridge. The structures will not be altered, in any regard. Consequently, no loss of potential roosting habitat is anticipated.

Water crossings WC3 and WC5 consist of a culvert and a PVC pipe, respectively, with *Negligible* roosting potential. Water crossing WC3 and WC5 will require Standard Formation Crossing over Culvert which includes works within the road network. The farm underpass will require Shallow Formation Crossing over Culvert. Proposed works will be confined to the road surface. No bats were observed, and no evidence of bat use was identified within the structures.

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

### Turbine Delivery Route

Two mature ash trees (Location 2, Chap 6) with *Low* roosting potential are proposed to be removed as part of the proposed TDR. Further details on locations are outlined in Chapter 6 of the main EIAR.

No evidence of bat use was identified during daytime inspection of the trees. However, on a precautionary basis, as the trees presented *Low* roosting potential, a pre-commencement survey will be carried out prior to felling. Further details are outlined in Section 6.1.6.

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

## 5.4 Displacement of Individuals or Populations

The Proposed Development is predominantly located within a pastureland, commercial forestry plantation and cutover bog. There will be no significant loss of linear landscape features for commuting and foraging bats, and there will be no anticipated loss of roosting sites. The Proposed Development has been designed to largely retain and enhance the linear and woodland features around the site and improve connectivity for foraging and commuting bats. The habitats on the site will remain suitable for bats and no significant displacement of individuals or populations is anticipated.

# 6. BEST PRACTICE AND MITIGATION MEASURES

This section describes the best practice and site-specific mitigation measures that are in place to avoid and reduce the potential for significant effects on local bat populations.

## 6.1 Standard Best Practice Measures

### 6.1.1 Noise Restrictions

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

### 6.1.2 Lighting Restrictions

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

Any proposed lighting around the site shall be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/18 Bats and artificial lighting in the UK.

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

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

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

### 6.1.3 Buffering

In accordance with NatureScot Guidance, a minimum 50m buffer to all habitat features used by bats should be applied to the siting of all wind turbines (See example provided in **Error! Reference source not found.** below). Eurobats No. 6 guidance and NIEA recommend increased buffers around woodland/forestry areas, however due to the nature of the site the 50m buffer was considered appropriate.

NatureScot recommends that a distance of 50m between turbine blade tip and nearest scrub or woodland (or other key habitat features) is adequate mitigation. This 50m buffer will be implemented from the outset and monitored as per the post construction monitoring. The success of the buffer mitigation will be assessed as part of post construction monitoring and updated where necessary, as described in Section 6.2.

The formula below is presented to provide appropriate mitigation in relation to bats, and the relevant input required from turbine parameters, is the combination of the blade length and hub height. In this context, the worst-case scenario arises from the longest blade on the lowest hub. The turbine model to be installed on the site will have an overall ground-to-blade tip height of 185m, a □rotor diameter of 163m and hub height of 103.5m.

Chapter 4, Figure 4-12 shows the extent of the commercial forestry area to be removed as part of the bat buffer requirement. These areas will be maintained during the operational life of the Proposed Development.

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

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

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

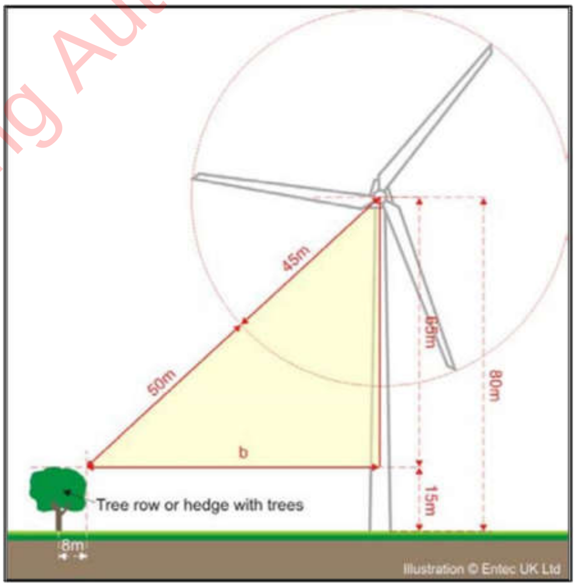


*Plate 6-1 Calculate buffer distances (Natural England, 2014).*

### 6.1.4 Biodiversity Enhancement Plan

In the absence of appropriate design, the loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. However, the Proposed Development is predominantly located within cutover bog, conifer plantation and grassland habitats. High quality foraging and commuting habitat, including linear landscape features such as hedgerows and treelines, have been largely avoided.

A small portion (3%) of the Proposed Development site comprises commercial forestry. A total of 9.7 hectares of commercial forestry will be permanently felled as part of the Proposed Development, along with existing treeline boundaries as detailed in Chapter 6, Section 6.7.2.1. Chapter 4, Figure 4-12 shows the extent of the commercial forestry to be permanently felled as part of the Proposed Development.

Turbine buffers will require the removal of some areas of linear vegetation. Approximately 243m hedgerow and 55m treeline habitat. In addition, approximately 24m of linear hedgerow and 61m of treeline habitats will be removed to accommodate road widening and construction, resulting in a total of approximately 383m of linear features removed.

In addition to the removal of commercial coniferous forestry, approximately 5.8ha of bog woodland (WN7) will be lost for the construction of Turbine 2. Approximately 1.9ha of broadleaved woodland (WD1), consisting primarily of poor-quality ash plantation, will be lost to accommodate the footprint of the proposed substation and a spoil repository area close to Turbine 7. Further details on tree removal required within and around development footprint is detailed in Chapter 6 of this EIAR. A Biodiversity Management and Enhancement Plan (BMEP) has been developed to mitigate the loss of bat foraging/commuting habitat associated with the Proposed Development and is presented in Chapter 6, Appendix 6-4.

It is proposed to replace ash trees lost as a result of the substation, which are currently in poor condition, with native trees of various ages in order to enhance the age structure and longevity of this woodland. It is also proposed to offset the proposed loss of hedgerow and trees through the creation of new hedgerows and treelines along proposed new internal access roads. A total of approximately 674m of linear hedgerow and treeline habitat will be planted. Overall, the proposed replanting will result in a net gain of approximately 291m in the linear landscape features within the Proposed Development site. Planting will be of semi-mature species indigenous to the local area, to ensure connectivity is re-established post-construction.

It is proposed to replace any woodland loss with healthy specimens (excluding ash) in order to enhance the age structure, diversity and longevity of woodland areas. Planting will be of semi-mature shrub and tree specimens to ensure that canopy cover gains are achieved as soon as possible. The species to be used for the replanting will comprise native species, indigenous to the local area including hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), elder (*Sambucus nigra*), goat willow (*Salix caprea*), spindle (*Euonymus europaeus*), dog rose (*Rosa canina*).

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

A network of existing linear landscape features in the wider area will be retained, and the loss of trees is not anticipated to have a significant effect on local bat populations. The locations in which the proposed planting will take place will be subject to final landowner agreement.

Following implementation of mitigation, no potential for significant effect exists at any geographic scale. The planting of additional habitats will serve to enhance the linear habitats within the site and create new commuting and foraging opportunities for bats. Consequently, no significant effects with regard to loss of commuting and foraging habitat are anticipated.

### 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).

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

### 6.1.6 Pre-commencement Survey – Trees

Two mature ash trees with *Low* roosting potential are proposed to be removed as part of the proposed TDR.

Where the potential for indirect effects (i.e. disturbance) on bats potentially roosting within trees has been identified, the following mitigating procedures are proposed:

- An inspection survey will be carried out prior to the commencement of the works to ensure no bats are roosting within the trees.
- If the inspection survey cannot provide sufficient data to exclude the presence of a roost (i.e. due to lack of access), an activity survey will also be conducted prior to commencement.
- Where evidence of bats is identified during the above pre-commencement surveys, a Derogation Licence will be required from NPWS for the continuation of the works. The works will be carried out outside the maternity (May-August) and hibernation (November-March) seasons to avoid the potential for disturbance on bats during sensitive periods of their lifecycle.

The requirement for a pre-commencement survey does not represent a lacuna in the survey assessment but is fully in line with industry best practice. The function of this survey will be to assess any changes in baseline environment since the time of undertaking the inspection in June 2023. Should further removal or trimming of trees become a requirement to facilitate the cable or TDR, an assessment will be carried out by a qualified ecologist to assess the trees for bat potential and any recommendation provided to safeguard bats.

## 6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species *was typically* **Low** or **Medium**. However, common pipistrelle, soprano pipistrelle and Leisler's bat had a **High** risk level for Spring and common and soprano pipistrelle had **High** risk level for Summer at peak activity levels. A low risk level is reflective of the nature of the site, which is a pastureland, commercial conifer forestry and cutover bog with low levels of bat activity recorded during the walked transects undertaken.

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

### 6.2.1 Operational Monitoring

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

The results of post-construction monitoring 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 Development site, post construction, to ensure that the necessary measures, based on a new baseline post-construction, are implemented for the protection of bat species locally. The effectiveness of any mitigation/curtailment needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties.

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

### 6.2.1.1 Monitoring Year 1

#### Bat activity surveys

The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring shall take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors shall be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). The assessment of bat activity levels will be as described in Section 3.5 above. Walked transect surveys will also be conducted.

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

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

#### Carcass searches

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

### 6.2.1.2 Monitoring Years 2 & 3

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

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

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

## 6.3 Residual Impacts

***Not Significant Effect***

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

## 6.4 Cumulative Effects

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

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

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

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

# 7. CONCLUSION

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

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

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# APPENDIX 1

## BAT HABITAT APPRAISAL

# HABITAT SUITABILITY ASSESSMENT

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

| Suitability | Roosting Habitats | Commuting and Foraging Habitats |
|---|---|---|
| Negligible | Negligible habitat features on site likely to be used by roosting bats. | Negligible habitat features on site likely to be used by commuting or foraging bats. |
| Low | A structure with one or more potential roost sites that could be used by individual bats opportunistically.<br>However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[1] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats, i.e. unlikely to be suitable for maternity or hibernation[2].<br><br>A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential[3]. | Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitats.<br><br>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub. |
| Moderate | A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed). | Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens.<br><br>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water. |
| High | A structure or tree with one or potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat. | Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.<br><br>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.<br>Site is close to and connected to known roosts. |

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

# APPENDIX 2

## SITE RISK ASSESSMENT

Planning and Environmental Consultants





# Bat Survey Report

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

MKO Planning and Environmental Consultants





# SITE RISK ASSESSMENT

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

| **Site Risk Level (1-5)*** | **Project Size** | | | |
|---|---|---|---|---|
| | | **Small** | **Medium** | **Large** |
| **Habitat Risk** | **Low** | 1 | 2 | 3 |
| | **Moderate** | 2 | 3 | 4 |
| | **High** | 3 | 4 | 5 |

Key: Green (1-2) - low/lowest site risk; Amber (3) - medium site risk; Red (4-5) - high/highest site risk.

* Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

| **Habitat Risk** | **Description** |
|---|---|
| Low | Small number of potential roost features, of low quality.<br>Low quality foraging habitat that could be used by small numbers of foraging bats.<br>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.<br>Habitat could be used extensively by foraging bats.<br>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.<br>Extensive and diverse habitat mosaic of high quality for foraging bats.<br>Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows.<br>At/near edge of range and/or on an important flyway.<br>Close to key roost and/or swarming site. |

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

# APPENDIX 3

## OVERALL SITE RISK

# Bat Survey Report

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

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

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

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

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

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