Sensitivity analysis for result #2: based on Repeat Sales & Individual Turbines

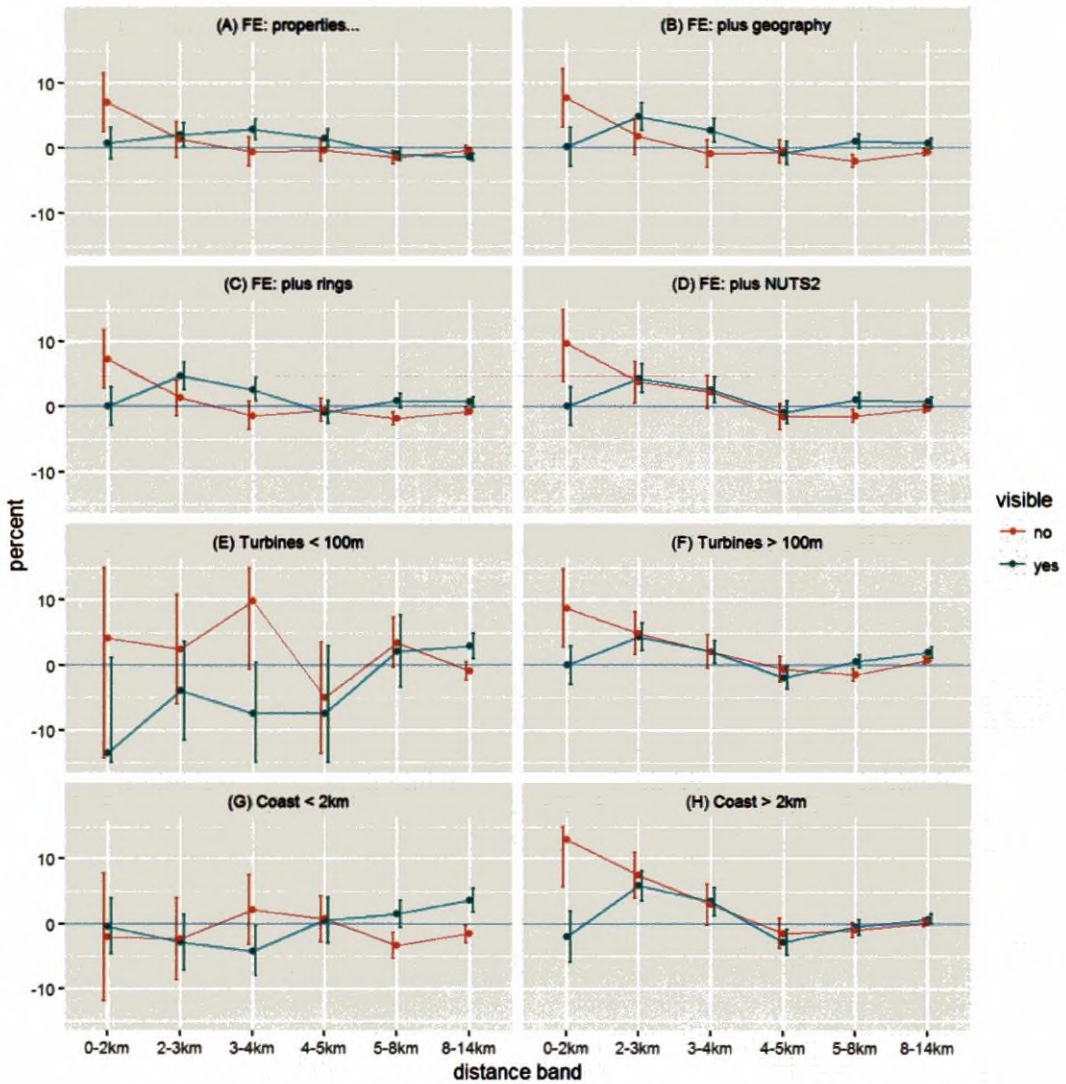

Figure A2: Percent difference in the change of house price

(All repeat sales, turbine visible / not visible)

Sensitivity analysis for result #3: based on Repeat Sales & Individual Turbines and Taking into Account Building Heights

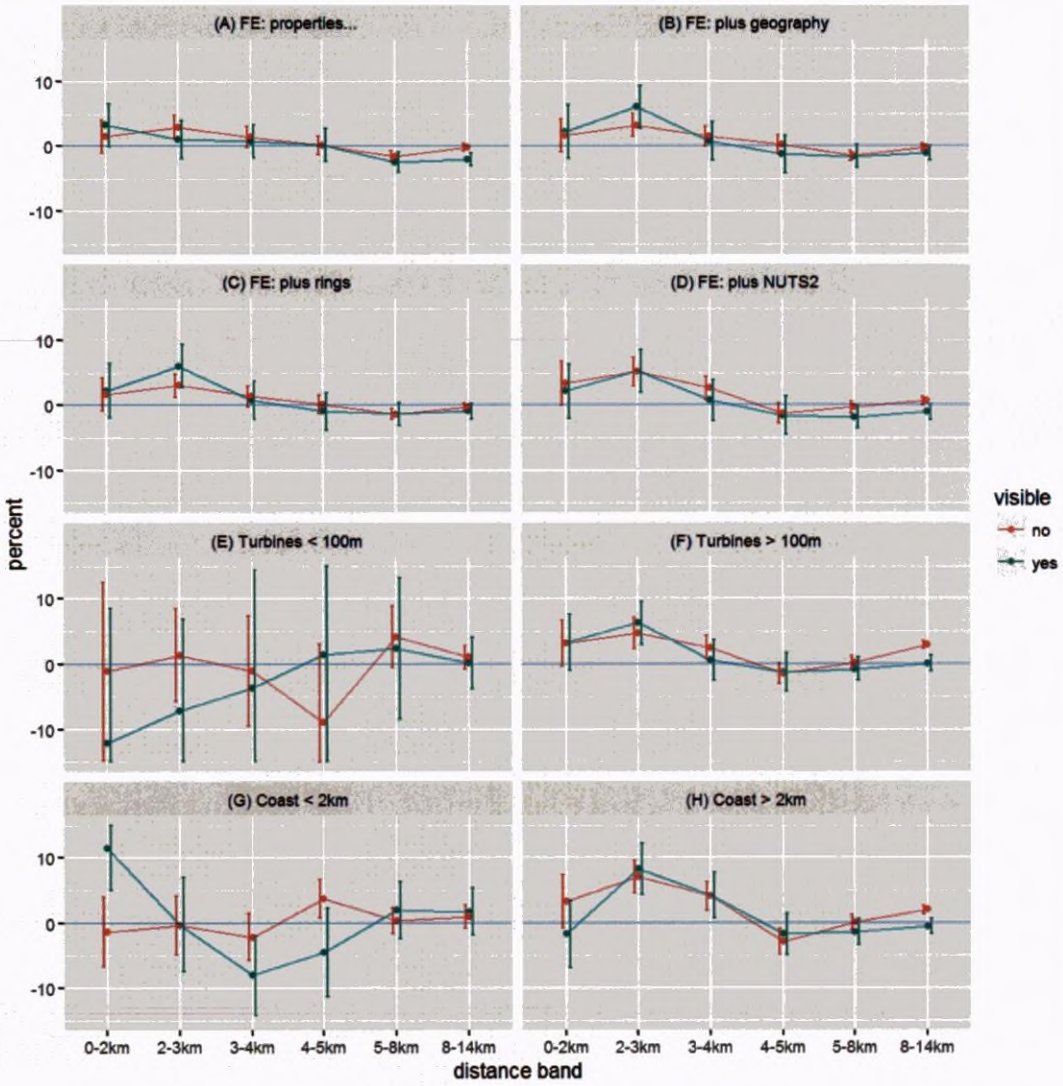

Figure A3: Percent difference in the change of house price

(All repeat sales, turbine visible / not visible accounting for building heights)

Acknowledgements

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APPENDIX 6-1

BAT REPORT

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1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of an application for planning permission for the extension of life to the existing Castledockrell Wind Farm, at Ballynelahillan, Co. Wexford. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the existing wind farm on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Bat surveys undertaken throughout 2023 were carried out in accordance with the methodologies described in NatureScot 2021[1]. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level. Surveys were based on the existing layout of 11 turbines.

Planning permission is being sought for the continued operation of 11 no. of the existing 12 no. turbines which make up the existing Castledockrell Wind Farm. The assessment and mitigation provided in this report has been designed in accordance with NatureScot 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [2], which was produced in August 2021 (amended May 2022), following the completion of the bat surveys at the Proposed Development site.

For the purposes of this EIAR:

- Where the 'Proposed Development' is referred to, this relates to all elements being applied for under the current Planning Application and encompasses an area of approximately 97 hectares (ha). The Proposed Development is described in detail in Chapter 4: Description of the Proposed Development of this EIAR.
- Where 'the Site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary in green as shown in Chapter 1, Figure 1-1.

1.1 Background

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

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

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[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).*

Post-construction bat surveys are undertaken to gain an insight into bat activity in the presence of turbines and to predict and mitigate against any future risks identified. Survey design and analyses of results at the Site was 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. This change has been maintained within the fourth edition to the guidelines, published in September 2023 (Collins, 2023). Prior to the publication of the BCT guidelines, Natural England's *Bat and Onshore Wind Turbines: Interim Guidance* provided an interpretation of the EUROBATS recommendations, as applied to onshore wind energy facilities in the UK (Natural England, 2014). In addition, the Chartered Institute of Ecology and Environmental Management (CIEEM) publishes advice on best practice as well as updates on the current state of knowledge in the *Technical Guidance Series* and in the quarterly publication *In Practice*.

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

The NIEA (NED) recently published *Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland.* This new guidance follows and builds

upon the recently updated NatureScot 2021 guidance. The latter guidance has set the industry standard since its publication in 2019. The NED guidance does not aim to replace the NatureScot guidance, but it does provide additional clarifications and recommendations regarding survey requirements and impact assessment in an Irish context.

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

1.3 Irish Bats: Legislation, Policy and Status

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

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

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

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

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

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

1.4 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team, who are experienced in scoping, surveys and reporting on bat surveys, as well as producing impact assessments in relation to bats. MKO ecologists have relevant academic qualifications and are qualified in undertaking surveys to the levels required. MKO's Ecology team holds a bat derogation licence from NPWS. The licence is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections). Graduate and seasonal ecologist staff are also covered under the conditional licence where they are accompanied by more experienced colleagues.

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 Nathan Finn (B.Sc., M.Sc.), Laura McEntegart (B.Sc.), Neil Campbell (B.Sc., M.Sc.) and Laura Gránicz (B.Sc., M.Sc.). Data analysis was undertaken, and results were compiled by Nathan Finn. Impact assessment, the design of mitigation and final reporting was completed by Laura McEntegart, under the supervision of Sara Fissolo (B.Sc.), Aoife Joyce and John Hynes, who reviewed and approved the final document. Laura McEntegart has over 2 years' experience in ecological assessment specialising in bat ecology and has completed training courses with Bat Mitigation and Enhancement (CIEEM), and Kaleidoscope Pro Analysis. Sara has 3 years' experience in undertaking bat surveys and impact assessments and has completed courses in Bat Impacts and Mitigation (CIEEM) and Kaleidoscope Pro Analysis. Aoife has over 5 years' experience in ecological assessments and has completed CIEEM and BCI courses in Bat Impacts and Mitigation, Bat Tree Roost Identification and Endoscope training, Bat ID, Trapping and Handling 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. Staff's roles and relevant training are presented in Table 1-2 below.

Table 1-2 Project team qualifications and training

Staff	Role	Training
Aoife Joyce (B.Sc., M.Sc.)	Project Director	BSc. (Hons) Environmental Science, University of Galway, Ireland. MSc. (Hons) Agribioscience, University of Galway, Ireland. Advanced Bat Survey Techniques – Trapping, biometrics, handling (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Sara Fissolo (B.Sc.)	Project Bat Ecologist	B.Sc. (Hons) Ecology and Environmental Biology, University College Cork, Ireland. Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bats in Heritage Structures (BCI), Bat Care (BCT), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Laura McEntegart (B.Sc.)	Ecologist	B.Sc. (Hons) Botany and Plant Science, National University of Ireland, Galway. Bat Handling Training Course (BCI), Bats: Assessing the Impact of Development on Bats, Mitigation & Enhancement – (CIEEM), Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal) Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal)
Nathan Finn (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Science, National University of Ireland, Galway. M.Sc. (Hons) Environmental Science, University College Dublin. Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Internal), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Laura Gránicz (B.Sc., M.Sc.)	Ecologist	B.Sc. Biology, University of Szeged, Hungary. M.Sc. Biology, University of Pécs, Hungary. Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Advanced Bat Survey Techniques (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Neil Campbell (B.Sc., M.Sc.)	Ecologist	B.Sc. Botany and Plant Science, National University of Ireland, Galway. M.Sc. Botany and Plant Science, National University of Ireland, Galway. Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).

2. PROJECT DESCRIPTION

The existing Castledockrell Wind Farm is located 8.1 km west of Ferns and 6.5 km south of Bunclody, Co. Wexford, in the townlands of Kilcullen, Ballynelahillan, Carranroe, Tomatee, Knockduff and Sroughmore (IG Ref.: S 91940 49193). The site is currently accessed via an existing entrance off the L2012 Local Road to the south-west of the Site.

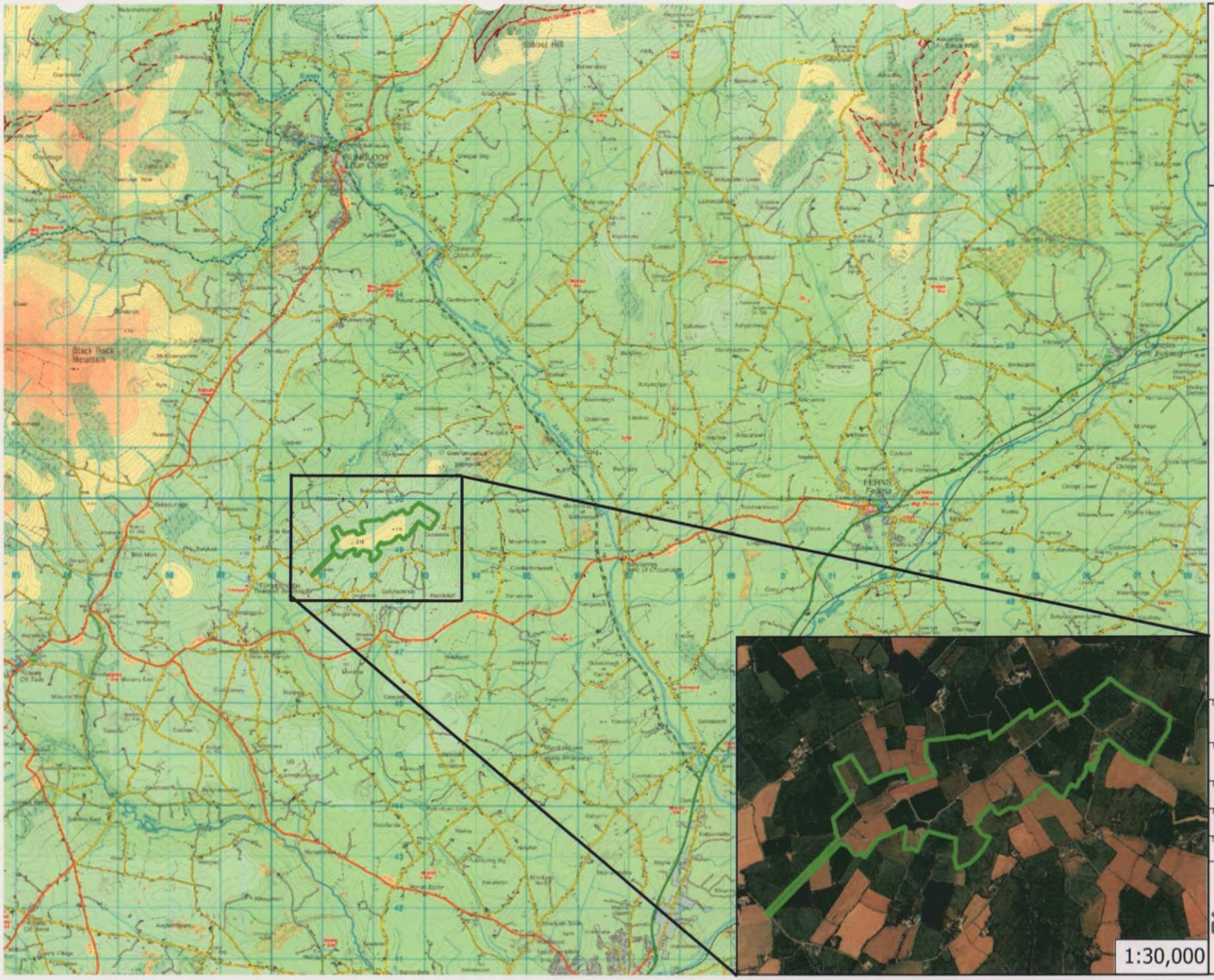
Land use within the Site comprises a mix of improved agricultural grassland (GA1) and arable crops (BC1). The land use within the surrounding areas is predominantly agricultural grasslands and crops, and one-off rural housing, A location map of the site is provided in Figure 2-1.

The Proposed Development which is the subject of this application comprises:

1. *11 no. existing 2.3 MW wind turbines with an overall tip height of 120m and associated hardstands;*
2. *1 no. existing 110kV Substation including 1 no. single story control building, all associated electrical plant and equipment, security fencing and all ancillary infrastructure;*
3. *All existing underground electrical and communication cabling connecting the existing wind turbines to the onsite Castledockrell 110kV Substation;*
4. *Existing internal access tracks; and,*
5. *All existing ancillary infrastructure.*

All elements of the Proposed Development are pre-existing and it is not proposed to make any alterations to the current site layout, wind turbines or associated infrastructure as part of this application.

The full description of the Proposed Development is provided in Chapter 4 of this EIAR. Further details on the planning history of the site are presented in Chapter 2: Background to the Proposed Development, of this EIAR.



N

Drawing Title
Site Location

Project Title
Castledockrell Wind Farm
Extension of Operational Life

Drawn By	Checked By
DC	LM
Project No.	Drawing No.
210847	Figure 2-1
Scale	Date
1:96,000	04.01.2024

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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 2023. A subsequent follow up letter was issued to all consultees in November 2023. As part of this exercise, prominent Irish conservation groups were contacted, and Bat Conservation Ireland (BCI) were specifically invited to comment on the potential of the Proposed Development to affect bats. Also, a meeting was arranged with Wexford County Council and held in person on the 2nd August 2023.

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

3.2 Desk Study

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

3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. A search of the National Bat Database of Ireland was last carried out on the 21st November 2023 and examined bat presence and roost records within a 10km radius of a central point in the EIAR Site Boundary (IG: S94, S95, 284, 285) (BCI 2012, Hundt 2012, NatureScot 2021). Available bat records were provided by Bat Conservation Ireland on 27th November 2023. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Site.

3.2.2 Bat Species' Range

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

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

3.2.3 Designated Sites

The National Parks and Wildlife Service (NPWS) map viewer and website provides information on rare and protected species, sites designated for nature conservation and their conservation objectives. A search was undertaken of sites designated for the conservation of bats within a 10km radius of the

EIAR Site Boundary (BCI 2012, Hundt, 2012, NatureScot 2021). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and pNHAs.

3.2.4 Landscape Features

3.2.4.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial photographs were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the EIAR Site Boundary 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 was consulted for any indication of natural subterranean bat sites, such as caves, within 10km of the Site (BCI, 2012) (last searched on the 6th February 2024). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 6th February 2024).

3.2.4.3 National Biodiversity Data Centre Bat Landscape Mapping

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

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

3.2.4.4 Additional EIAR Projects in the Wider Landscape

A search for proposed, existing and permitted wind energy developments within 10 km of Site was undertaken on 2nd February 2024 (NatureScot, 2021). The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Wexford County Councils. Other large infrastructure developments and proposals (e.g. roads) were also noted. Information on the location and scale of these developments was gathered to inform the potential for cumulative effects. Further details on infrastructure developments within the vicinity of the Site can be found in Chapter 2 of the main EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken in 2023 (Table 3-1). The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the Site assessed and classified. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and

roosting suitability. The grid connection and haul routes were visited as part of the multidisciplinary surveys outlined in Chapter 6 of the main EIAR.

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2023. During these surveys, habitats within the EIAR Site Boundary were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories, divided into *High*, *Moderate*, *Low* and *Negligible*, are described fully in **Appendix 1**.

3.3.2 Roost Surveys

Daytime Roost Inspections

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 235.5m) of the Proposed Development footprint (NatureScot, 2021). The aim of these searches was to determine the presence of Potential Roost Features (PRFs) for bats and the need for further survey work or mitigation. The site was visited in Spring, Summer and Autumn 2023. Walkover surveys were carried out in combination with deployment and collection of static detectors, and all structures identified within the search area were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

Five structures were identified as potential roost features within the Site. Details of these are shown in Table 3-1. These were subject to a roost assessment which comprised a detailed inspection of the interiors and exteriors to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. Locations of all Potential Roost Features (PRFs) are presented in Figure 3-1 below.

Table 3-1 Potential Roost Features Identified within the Site.

Structure	IG Reference	Nearest Turbine	Approximate Distance to Nearest Turbine
Stone building	S 92785 49461	T11	80 m
Derelict portable toilets	S 92785 49462	T11	80 m
Substation	S 92591 49660	T1	50 m
Entrance hut	S 90816 48540	T7	695 m
Small hut	S 90868 48528	T7	660 m

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

3.3.3 Manual Activity Surveys

Manual activity surveys were undertaken in Spring, Summer and Autumn 2023 and included walked and driven transects and emergence surveys at identified PRFs, in accordance with best practice guidance. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland) and all bat activity was recorded for subsequent analysis to confirm species identifications.

Individual bats of the same species cannot be identified using this method: the number of bat passes recorded is used as a measure of activity within the area, although it might not reflect the number of individual bats present, as the same bat can be recorded multiple times.

All surveys were carried out during weather conditions suitable for bat surveying and were within the suitable survey period for bat activity surveys. Details of the surveys are presented in Table 3-2 and described below.

Table 3-2 2023 Survey Effort - Manual Surveys

Date	Surveyors	Survey Type	Sunset	Start-End	Weather	Walked/ Driven Transect (km)
3rd May 2023	Laura Gránicz and Nathan Finn	Dusk Walked Transect	20:57	20:50 – 23:57	12-13°C; dry; calm – light breeze	10.5
11th July 2023	**Neil Campbell and Nathan Finn**	**Dusk Emergence and Driven Transect**	**21:47**	**21:32 – 23:47**	**13-14°C; dry; calm – light breeze**	**4.4**
3rd October 2023	Laura McEntegart and Nathan Finn	Dusk Emergence and Walked Transect	19:00	18:45 – 22:00	13-15°C; dry – light drizzle; calm	4.1
Total Survey Effort						**19.0**

Dusk Emergence Surveys

Dusk emergence surveys were undertaken on the evenings of 11th July 2023 and 3rd October 2023. Structures with PRF's were assessed for their suitability for carrying out an emergence. Dusk emergence surveys were not carried out on Negligible PRF's due to a lack of potential suitable roosting features. Emergence surveys commenced 15 minutes before sunset and concluded within 1.5 hours after sunset. The dusk emergence on the 3rd October 2023 was assisted by an Infiray EYE II E6+ V3 thermal camera, the footage of which was reviewed following the survey.

Surveys carried out in July can detect maternity colonies, and male/non-breeding female summer roosts. Surveys carried out in October can detect swarming and mating bats. Day, night, feeding and satellite roosts can be found in either survey period (Collins, 2016).

Manual Transect Surveys

Manual transect surveys were undertaken on the evenings of 3rd May 2023, 11th July 2023 and 3rd October 2023. Transects were walked or driven by two surveyors, recording bats in real time. Transect surveys generally followed dusk emergence surveys and were completed for 3 hours after sunset. A

standalone transect survey (no emergence), carried out on 3rd May 2023, started at sunset and lasted for approximately 3 hours after sunset.

Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. The driven transect(s) followed the methodology described by Roche *et al.* (2012) and was conducted along the roads inside the site and followed the methodology described by Roche *et al.* (2012).

The aim of these surveys was to identify the bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the proposed layout, desktop, and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes followed existing roads and tracks. Survey effort is outlined in Table 3-4 above and transect routes are presented in Figure 3-1 below.

3.3.4 Ground-level Static Surveys

Automated bat detectors were deployed at 11 no. locations for a minimum of 10 nights of suitable weather in Spring (April-May) and 20 nights in Summer (June-mid-August). As higher levels of activity were recorded within the Site during the first two deployments, detectors were also deployed for a minimum of 20 nights in Autumn (mid-August-October) to collect additional data (NatureScot, 2021). Static detector locations are described in Table 3-3 and presented in Figure 3-2.

Table 3-3 Ground-level Static Detector Locations

ID	Location	Habitat	Linear Feature within 50 m	Corresponding/ Nearest Turbine
D01	S 92554 49721	Earthbank near Improved agricultural grassland	Hedgerow within 5 m.	T01
D02	S 92258 49558	Earthbank near Improved agricultural grassland	Small hedgerow within 5 m. Hedgerow approx. 30 m to north-east.	T02
D03	S 92529 49368	Earthbank near Improved agricultural grassland	Small hedgerow within 5m.	T03
D04	S 92266 49226	Earthbank near Arable crops	Beside hedgerow. Large hedgerow approx. 45m to south-west. Hedgerow approx. 50 m to NE.	T04
D05	S 92013 49072	Earthbank near Arable crops	Beside hedgerow. Hedgerow approx. 40m to the west. Hedgerow approx. 40 m to the south.	T05
D06	S 91693 48987	Earthbank near Dry meadows and grassy verges	Detector at end of hedgerow, about 3 m from another hedgerow.	T06
D07	S 91384 48966	Earthbank near Improved agricultural grassland	None.	T07
D08	S 91605 49320	Scrub near Earthbank	Within scrub. Hedgerow approx. 35 m to the south. Hedgerow approx. 40 m to north-east.	T08
D09	S 91969 49409	Hedgerow between Improved agricultural grassland and Earthbank	Within hedgerow.	T09
D10	S 91284 49243	Earthbank near Improved agricultural grassland	In small row of gorse. 3 no. hedgerows within 40m.	T10

ID	Location	Habitat	Linear Feature within 50 m	Corresponding/ Nearest Turbine
D11	S 92831 49535	Hedgerows between Improved agricultural grassland and Earthbank	Within hedgerow. Treeline approximately 40 m to the south.	T11

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

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no. for Spring and 20 no. for Summer and Autumn) with appropriate weather conditions were captured (i.e. dusk temperatures above 8˚C, wind speeds less than 5 m/s and no or only very light rainfall). Table 3-4 summarises survey effort achieved for each of the detector locations in 2023.

Table 3-4 2023 Survey Effort - Ground-level Static Surveys

Season	Survey Period	Total Survey Nights per detector location	Nights with Appropriate Weather
Spring	13th April – 3rd May 2023	20	10
Summer	13th June – 11th July 2023	28	23
Autumn	6th September – 3rd October 2023	27	25
Total Survey Effort		**75**	**58**

Map Legend

- Site Boundary
- Turbine Layout
- Building Inspections

Transect Routes

- Spring Transect 2023.05.03
- Summer Transect 2023.07.11
- Autumn Transect 2023.10.03

N

Drawing Title: Survey Effort - Manual Activity Surveys	
Project Title: Castledockrell Wind Farm Extension of Operational Life	
Drawn By: DC	Checked By: LM
Project No: 210847	Drawing No: Figure 3-1
Scale: 1:12,000	Date: 04.01.2024

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Map Legend

- Site Boundary
- Turbine Layout
- Static Detector Locations

N

Drawing Title	Ground Level Static Detector Locations
Project Title	Castledockrell Wind Farm Extension of Operational Life
Drawn By: DC	Checked By: LM
Project No.: 210847	Drawing No.: Figure 3-2
Scale: 1:12,000	Date: 04.01.2024

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3.4 Bat Call Analysis

All recordings were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified. Where recordings' parameters matched certain criteria (echolocation pulses > 10; match ratio > 0.95; auto ID = PIPPIP or PIPPYG), a bulk ID was applied to manually match the software's auto ID.

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

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2023). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison. Due to the volume of bat activity data recorded, where multiple bat passes were recorded within the same registration, rarer or harder to record species were identified. Underreporting of common species is possible using this method and is accounted for within the assessment.

Echolocation calls by Brown long-eared bats (*Plectous auritus*) are intrinsically quiet and hard to record by static equipment. All data collected (besides the calls which a bulk ID was applied to as mentioned previously), including 'Noise' files and 'No ID' files are checked to ensure all calls for this species have been captured. However, a level of underrepresentation is expected for this species and is accounted for in the assessment of activity levels.

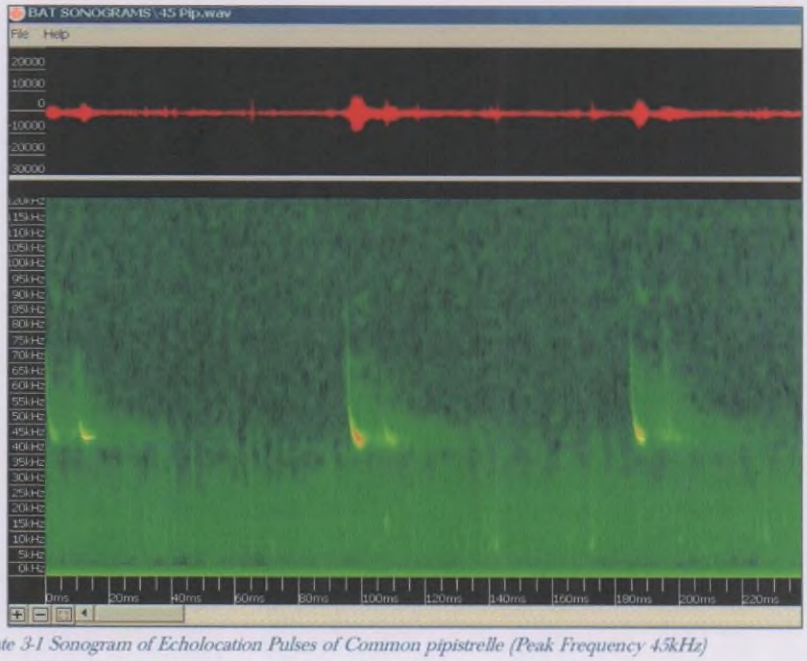

Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.4.1 Assessment of Bat Activity Levels

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

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

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

Ecobat was unavailable for a cross-site analysis of 2023 data as the platform has been undergoing maintenance since late 2022 with no proposed timeline of a relaunch. Therefore, data were assessed on a site-specific basis.

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

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

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

The site-specific categories identified were deemed appropriate for the assessment, based on activity levels recorded by MKO at similar sites. Table 3-6 presents activity ranges per species group identified.

Table 3-6 Site-specific Activity Level Categories based on Maximum Bat Passes per Hour activity level' (bpph)

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species				
	Pipistrellus spp.	*Nyctalus* spp.	*Myotis* spp.	*Pipistrellus nathusii*	*Plecotus auritus*
Low	< 7.1	< 6.72	< 1.07	< 1.68	< 1.63

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species				
	Pipistrellus spp.	*Nyctalus* spp.	*Myotis* spp.	*Pipistrellus nathusii*	*Plecotus auritus*
Medium	7.1 – 21.29	6.72 - 20.17	1.07 – 3.22	1.68 – 5.03	1.63 – 4.9
High	21.29 <	20.17 <	3.22 <	5.03 <	4.9 <

3.5 Assessment of Collision Risk

3.5.1 Population Risk

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

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

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

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

3.5.2 Site Risk

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

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

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

3.5.3 Overall Risk Assessment

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

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

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

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

3.5.4 Survey Limitations

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

Access limitations can relate to static deployments and roost inspections:

- No access issues were encountered with the Site during static deployments, as the detectors were deployed where intended.

Survey limitations can relate to deployment coverage, data storage, equipment failure or deployment-related incidents:

- Eleven detectors were deployed at eleven turbine locations, in line with best practice guidance, providing good survey coverage of the site.
- MKO employs data storage redundancy methods to ensure no data is lost from the field to final analysis - no data was lost.
- SD card corruption or fill-up can prevent data from being collected during deployments – no issues with data on-site data storage were encountered.
- Bat detector's microphones are checked before every season to ensure they have good sensitivity for data collection, and detectors' software updates are installed as soon as they become available - no issues related to equipment were encountered during the surveys.
- Incidents during deployments, such as tampering or livestock interference, can prevent data from being collected effectively - no incidents were reported during the surveys.

Activity assessment limitations can relate to data analysis procedures and a lack of standardised and Ireland-based assessment methods:

- MKO's data analysis methods include manually checking of 100% of bat passes identified by Auto ID Software, as well as noise and no ID files. Where multiple species, or multiple individuals of the same species, are identified within the same call, only one is reported, prioritising hard to detect species. This is due to the large volumes of data collected. While this method is likely to introduce a bias, it is not anticipated to affect the overall conclusions of the assessment, as only commonly recorded species might be underreported. In comparison, verification of a small percentage of calls is typical industry standard and methodology.
- No activity threshold currently exists for Irish bat species to objectively assess bat activity within a certain habitat, and no standardised assessment method has been proposed across the country. Ecobat software recommended by existing guidelines was not available for use at the time of the assessment, as under maintenance. MKO's experience surveying habitats similar to those present within the site aided with the assessment.

Technical difficulties associated with the deployment of onsite weather stations, for periods in both Summer and Autumn, occurred during the survey period. As a result, weather data was extracted from two nearby weather monitoring stations (approximately 26 km and 34km away), for 13 days in Summer and 6 days in Autumn, to assess appropriate weather conditions in the wider area. Overall, a comprehensive assessment has been achieved.

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

4. RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats. The following response was received on 11/02/2022:

Unfortunately, BCIreland is a small wildlife charity that does not have the capacity to comment on planning applications. Please ensure that bat surveys follow best practice guidelines which includes the following:

- *Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London.*
- *Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.*
- *UNEP/EUROBATS: Guideline for consideration of bats in wind farm projects, Publication Series No. 3.*
- *Natural England Technical Information Note TIN051: Bats and onshore wind turbines – Interim Report 2012*
- *Guide to Turbines and Wind Farms. Bat Conservation Ireland 2012.*
    - *Bats and onshore wind turbines: Survey, Assessment and Mitigations. January 2019.*

4.1.2 Development Applications Unit - NPWS

A detailed scoping exercise was undertaken for the Proposed Development. There has been no response as of the 11/10/2024 from the Department of Culture, Heritage and the Gaeltacht to provided recommendations regarding nature conservation, etc including bats. The full details of the scoping and consultation exercise are described in the main EIAR.

4.1.3 Wexford County Council meeting

A meeting was held with Wexford County Council on 02/08/2023 to discuss the Proposed Development. No concerns were raised in relation to bats.

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 point in the site (IG Ref: S 91940 49193). Available bat records were provided by Bat Conservation Ireland on 27th November 2023. A number of observations have been recorded within 10 km; seventeen roosts, three transects and thirty-six ad-hoc observations. Eight of Ireland's nine resident bat species were recorded within 10 km of the Proposed Development site, with

the only one not present being the Lesser horseshoe bat, which has a range limited to the west of Ireland. The results of the database search are provided in Table 4-1.

Table 4-1 Bat Conservation Ireland Records within 10 km of the Proposed Development site

Record	Species	Approx. Grid Reference	Date	Location
Roost	*Myotis mystacinus*	S9639	N/A	Enniscorthy, Co. Wexford
	Myotis mystacinus	T0041	N/A	Enniscorthy, Co. Wexford
	Plecotus auritus	T0043	N/A	Solsborough, Enniscorthy, Co. Wexford
	Unidentified bat	S9943	N/A	Enniscorthy, Co. Wexford
	Pipistrellus spp. (45kHz/55kHz), *Plecotus auritus*	S9639	N/A	Enniscorthy, Co. Wexford
	Unidentified bat	S9739	N/A	Parnell Road, Enniscorthy, County Wexford
	Pipistrellus pipistrellus (45kHz)	S9541	N/A	Milehouse, Enniscorthy, County Wexford
	Unidentified bat	S9639	N/A	County Wexford
	Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)	S8940	N/A	Caim, Enniscorthy, County Wexford
	Plecotus auritus	S9639	N/A	County Wexford
	Plecotus auritus	S9639	N/A	County Wexford
	Myotis spp.	S9639	N/A	Enniscorthy, County Wexford
	Pipistrellus spp. (45kHz/55kHz), *Myotis spp.*	S9943	N/A	Solsborough, Enniscorthy, County Wexford
	Plecotus auritus, *Pipistrellus pygmaeus, Pipistrellus pipistrellus* (45kHz), *Pipistrellus spp.* (45kHz/55kHz), Unidentified bat	T0043	N/A	Solsborough, Enniscorthy, Co. Wexford
	Pipistrellus pygmaeus	S9240	N/A	Templescoby, Enniscorthy, County Wexford
	Pipistrellus pipistrellus (45kHz)	S971397	N/A	Parnell Road, Enniscorthy, County Wexford
	Pipistrellus pygmaeus	S9843	N/A	Enniscorthy, County Wexford
Transect	*Myotis daubentonii*, Unidentified bat	S9742239898	N/A	Enniscorthy Bridge Transect
	Pipistrellus spp. (45kHz/55kHz), *Myotis daubentonii*, Unidentified bat	S9837545068	N/A	Scarawalsh Bridge Transect