Planning and Environmental Consultants

Ballydermot Wind Farm, Co. Offaly & Co. Kildare

Ballydermot Wind Farm, Co. Offaly & Co. Kildare

Chapter 5 Population and Human Health

5. # TABLE OF CONTENTS

5. POPULATION AND HUMAN HEALTH 5-1

5.1 Introduction 5-1
5.1.1 Statement of Authority 5-1
5.1.2 Relevant Guidelines and Data Sources 5-2
5.1.3 Scoping and Consultation 5-3
5.2 Assessment Methodology 5-6
5.2.1 Population 5-6
5.2.2 Human Health 5-9
5.2.3 Shadow Flicker 5-12
5.2.4 Residential Amenity 5-20
5.3 Baseline Population 5-20
5.3.1 Receiving Environment 5-20
5.3.2 Demographic Trends 5-22
5.3.3 Population Density 5-22
5.3.4 Household Statistics 5-23
5.3.5 Age Structure 5-24
5.3.6 Employment and Economic Activity 5-24
5.3.7 Land-Use Patterns and Activities 5-28
5.3.8 Services 5-32
5.3.9 Tourism 5-34
5.3.10 Public Perception of Wind Energy 5-41
5.3.11 Property Values 5-46
5.3.12 Likely Future Receiving Environment 5-49
5.4 Baseline Human Health 5-50
5.4.1 Receiving Environment 5-50
5.4.2 Health Effects of Wind Farms: Studies 5-51
5.4.3 Turbine Safety 5-57
5.4.4 Electromagnetic Interference 5-58
5.4.5 Effects on Human Health 5-59
5.4.6 Likely Future Receiving Environment 5-64
5.5 Shadow Flicker 5-65
5.5.1 Daily and Annual Shadow Flicker 5-65
5.5.2 Equine Industry 5-69
5.5.3 Cumulative Shadow Flicker 5-69
5.6 Residential Amenity 5-75
5.7 Likely Significant Impacts and Associated Mitigation Measures 5-76
5.7.1 'Do-Nothing' Scenario 5-76
5.7.2 Construction Phase 5-77
5.7.3 Operational Phase 5-95
5.7.4 Decommissioning Phase 5-115
5.7.5 Cumulative Effects 5-115
5.7.6 Summary 5-130

TABLE OF TABLES

Table 5-1 Scoping Responses 5-3
Table 5-2 Population 2016 - 2022 (Source: CSO) 5-22
Table 5-3 Population Density in 2016 – 2022 (Source: CSO) 5-23
Table 5-4 Number of Household and Average Household Size 2016 - 2022 (Source: CSO) 5-23
Table 5-5 Economic Status of the Total Population Ages 15+ in 2022 (Source: CSO) 5-25

Table 5-6 Farm Size and Classification within the Population Study Area in 2020 (Source: CSO) 5-29

Table 5-7 Overseas Tourists Revenue and Numbers 2024 (Source: Failte Ireland) 5-34

Table 5-8 Overseas Tourism to Mid-East/Midland Region during 2017 (Source: Fáilte Ireland) 5-35

Table 5-9 Percentage General Health Breakdown for the State, County Offaly, County Kildare and the Population Study Area as reported in the 2016 and 2022 Census. (Source www.CSO.ie) 5-51

Table 5-10 Cumulative Shadow Flicker Results 5-88

Table 5-11 Potential Cumulative Impact from the Proposed Project and Nearby Wind Farms/Turbines 5-91

Table 5-12 Cumulative Shadow Flicker Mitigation 5-146

TABLE OF FIGURES

Figure 5-1 Population Study Area 5-8

Figure 5-2 Shadow Flicker Study Area 5-19

Figure 5-3 Population per Age Category in 2022 (Source: CSO) 5-24

Figure 5-4 Share of preference for a 'best-case' combination of wind development features and the status quo (A) over phase of project development; and (B) over proximity to the wind farm. (Le Maitre et al. 2024) 5-46

Figure 5-5 Shadow Flicker Study Area and Sensitive Receptors 5-68

Figure 5-6 Cumulative Shadow Flicker Area 5-87

TABLE OF PLATES

Plate 5-1 Shadow-Prone Area as Function of Time of Day (Source: Shadow Flicker Report, Helimax Energy, Dec 2008) 5-13

Plate 5-2 Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environment Power LLC) 5-14

GLOSSARY OF TERMS

Term	Definition
Shadow Flicker	A phenomenon when rotating wind turbine blades cast moving shadows over a narrow opening causing a rapidly alternating flickering light intensity
SEVESO site	Industrial facilities storing potentially dangerous substances in high quantities regulated under the EU SEVESO Directives
Sensitive Receptor	A component of the receiving environment which will experience an impact from the Proposed Project in some capacity

GLOSSARY OF ACRONYMS

AERs	Annual Environment Reports
AIP	Aeronautical Information Publication
AM	Amplitude Modulation
AMSL	Above Mean Sea Level
ATC	Air Traffic Control
BMP	Biodiversity Management Plan
BnM	Bord na Móna
CAHA	Climate and Health Alliance
CAP	Climate Action Plan
Cebr	Centre for Economics and Business Research
CEMPs	Construction and Environmental Management Plan
CO2	Carbon Dioxide
CSCS	Construction Skills Certification Scheme
CSO	Central Statistics Office
DoD	Department of Defence
EDs	Electoral Divisions
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ELF	Extremely Low Frequency

EMF	Electric and Magnetic Fields
EPA	Environmental Protection Agency
FRA	Flood Risk Assessment
GDG	Guideline Development Group
GW	Gigawatts
GWB	Groundwater bodies
GWS	Group Water Schemes
HDD	Horizontal Directional Drilling
HGVs	Heavy Good's Vehicles
HIA	Health Impact Assessment
HSE	Health Service Executive
IAA	Irish Aviation Authority
IAPs	Instrument Approach Procedures
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IEMA	Institute for Environmental Management and Assessment
IFR	Instrument Flight Rules
IPC	Integrated Pollution Control
IPCC	Irish Peatland Conservation Council
ISEP	Institute of Sustainability and Environmental Professionals
IWEA	Irish Wind Energy Association
KCDP	Kildare County Development Plan
LBNL	Lawrence Berkley National Laboratory
LFL	Limited Felling Licence
LFTA	Low flying training area
LGVs	Light Goods Vehicles

LI	Local Zones
MOAs	Military Operating Areas
MW	Megawatts
NHA	Natural Heritage Area
NHMRC	National Health and Medical Research Council
NIFM	National Indicative Flood Mapping
NIMBY	Not in my backyard
NM	Nautical Miles
NOTAM	Notice to Airmen
NSLs	Noise Sensitive Locations
NVG	Night Vision Goggles
OCDP	Offaly County Development Plan
OHL	Overhead line
OSI	Ordnance Survey Ireland
PCAS	Peatland Climate Action Scheme
PSCS	Project Supervisor Construction Stage
PSDP	Project Supervisor Design Process
PSR	Primary Surveillance Radar
PWS	Public Water Supplies
rEIAR	remedial Environmental Impact Assessment Report
RESS	Renewable Energy Support Scheme
rNIS	remedial Natura Impact Statement
RSA	Route Screening Analysis
RWCS	Reasonable Worst Case Scenario
SAR	Search and Rescue
SEAI	Sustainable Energy Authority of Ireland
SSFRA	Site Specific Flood Risk Assessment

SSR	Secondary Surveillance Radar
TMP	Traffic Management Plan
TTA	Traffic and Transport Assessment
VFR	Visual Flight Rules
WAM	With Additional Measures
WEDG	Wind Energy Development Guidelines
WEI	Wind Energy Ireland
WEM	With Existing Measures
WHO	World Health Organisation
WTS	Wind Turbine Syndrome

5. POPULATION AND HUMAN HEALTH

5.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the potential significant, direct and indirect effects of Ballydermot Wind Farm (the 'Proposed Project') on population and human health and has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA), in particular the '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (EPA, 2022) as outlined in Section 1.8.3 of Chapter 1: Introduction. The full description of the Proposed Project is provided in Chapter 4: Description of the Proposed Project of this EIAR.

As detailed in Section 1.1.1 in Chapter 1 Introduction, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Enhancement Areas', 'Proposed Construction Haul Routes', 'Proposed Turbine Delivery Route', 'Project Site', 'Proposed Wind Farm', 'Proposed Turbines', 'Proposed Grid Connection', 'Proposed Onsite Substation' and 'Proposed Offsite Substation'.

One of the principal concerns during the development process is that individuals or communities will experience no significant diminution in their quality of life from the direct or indirect effects arising from the construction, operation and decommissioning of a proposed project. Ultimately, all the impacts of a proposed project impinge on human health, directly and indirectly, positively and negatively. The key issues examined in this chapter of the EIAR include population, human health, employment and economic activity, land use, residential amenity (including visual amenity, shadow flicker, and noise), community facilities and services, tourism, property values, and health and safety.

5.1.1 Statement of Authority

This chapter of the EIAR was completed by Catherine Johnson, with input by Lakshmi Priya Mohan, and reviewed by Ellen Costello and Sean Creedon, all of MKO. All shadow flicker modelling was carried out by Edward Ryan of MKO.

Lakshmi is an Environmental Scientist at MKO with over 2 years of consultancy experience. Lakshmi holds a master's degree in environmental science, a master's degree in Zoology and a bachelor's degree in Zoology. Prior to taking up her position with MKO in March 2026, Lakshmi worked as an Environmental Consultant in DNV, Ireland. Lakshmi has excellent report writing and research skills, Experienced Production of EIARs, Construction and Environmental Management Plans (CEMPs), EIA Screenings, SEA Screening, GIS map outputs across various large infrastructure developments and land infill projects in Ireland.

Catherine is a Project Environmental Scientist at MKO with over 4 years of consultancy experience in climate, renewable energy, and sustainability. Catherine possesses skills in mapping and design, which complement her experience in preparing comprehensive reports for EIAs. Catherine holds a BSc in Earth and Ocean Science and a LLM in Global Environment and Climate Change Law. Catherine has been involved in a myriad of environmental service offerings at MKO including EIA Screenings and Reports, climate and sustainability related work and renewable energy infrastructure projects, including both onshore and offshore wind energy developments.

Edward Ryan is an Environmental Practitioner with MKO with over 4 years of experience in the private sector. Edward holds a B.Sc. (Hons) in Environmental Science from the University of Limerick and a M.Sc. (hons) in Environmental Systems from Atlantic Technological University: ATU (formally GMIT). Prior to taking up his position with MKO in April 2022, Edward worked as an Environmental Scientist with Ryan Hanley Ltd. and held previous posts with the University of Limerick as a Laboratory

Research Assistant. Edward exhibits strong analytical and organizational skills from his appraisal of Contractor HSQE submissions as well as compiling information for the companies' tender submissions. Edward's key strengths and areas of expertise are in project management, GIS, data analysis, fieldwork and report writing. Since joining MKO, Edward has been involved in a range of wind farm projects and residential and commercial development projects. In his role as an Environmental Scientist, Edward works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments as well as sub-contractors from various fields in the preparation and production of EIARs. Within MKO Edward plays a large role in the Shadow Flicker analysis. Edward is trained in Resoft and Windpro and has carried out shadow flicker analysis for a large number of wind farm projects. Edward is a Member of the Chartered Institute of Water and Environmental Management.

Ellen Costello is a Senior Environmental Scientist with MKO with over 6 years' experience in private consultancy. Ellen holds a BSc (Hons) in Earth Science, and a MSc (Hons) in Climate Change: Integrated Environmental and Social Science Aspects where she focused her studies on renewable energy development in Europe and its implications on environment and society. Ellen's key strengths and expertise are Environmental Protection and Management, Environmental Impact Statements, Project Management, and GIS Mapping and Modelling. Since joining MKO, Ellen has been involved in a range of renewable energy infrastructure projects. In her role as a senior project manager, Ellen works with and co-ordinates large multidisciplinary teams including members from MKO's Environmental, Planning, Ecological and Ornithological departments.

This report has been reviewed by Sean Creedon (B.Sc., M.Sc.). Sean has 23 years' experience in planning and environmental impact elements within all stages of wind farm project delivery.

5.1.2 Relevant Guidelines and Data Sources

In addition to the guidelines referred to in Section 1.2.1 and Section 1.2.2 of Chapter 1 of this EIAR and Directive 2011/92/EU as amended by Directive 2014/52/EU, the following guidelines, plans and reports have also influenced the preparation of this chapter:

- Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2012);
- EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects (Fáilte Ireland, 2023);
- Environmental Noise Guidelines for the European Region (The World Health Organisation (WHO), 2022 Update)[1];
- Environmental Impact Assessment of National Road Schemes- A Practical Guide. Revision 1 (Transport Infrastructure Ireland/formerly National Roads Authority, 2008);
- Determining Significance for Human Health in Environmental Impact Assessment (Institute for Environmental Management and Assessment (IEMA), 2022; now the Institute of Sustainability and Environmental Professionals (ISEP))
- Framework for Human Health Risk Assessment to Inform Decision Making (United States Environmental Protection Agency (US EPA), 2014);
- Health Impact Assessment Guidance: A Manual. Standalone Health Impact Assessment and health in environmental assessment (Institute of Public Health, 2021);
- Health Impact Assessment Resource and Tool Compilation (United States Environmental Protection Agency, 2016);
- Health In Environmental Impact Assessment: A Primer for a Proportionate Assessment (ISEP, 2017);
- Health in Ireland: Key Trends 2024 (Department of Health, 2025);

[1] *Environmental Noise Guidelines for the European Region (The World Health Organisation (WHO), 2022 Update: https://iris.who.int/server/api/core/bitstreams/f53c45ba-11d3-4502-a424-c1cf49f5a053/content*

- Central Statistics Office (CSO): Census of Ireland 2010, Census of Ireland 2016; Census of Ireland 2022; Census of Agriculture 2020;
- Offaly County Development Plan 2021-2027 (Offaly County Council, 2021).
- Kildare County Development Plan 2023-2029 (Kildare County Council, 2023)
- The Wind Energy Development Guidelines (2006)[2]
- Best Practice Guidelines for the Irish Wind Energy Industry, IWEA, 2012[3]

5.1.3 Scoping and Consultation

Section 2.8.2 of Chapter 2: Background to the Proposed Project of this EIAR describes the scoping and consultation exercise undertaken for the Proposed Project. General scoping was initially conducted in May 2021. Further general scoping was conducted in December 2025 due to time elapsed from when previous scoping was carried out, updates in local and national policy and legislation, updates in relevant EIAR guidance, changes in the environmental baseline and refinement of the Proposed Project layout and design.

As part of the scoping and consultation process, relevant statutory and non-statutory consultees were provided with details of the Proposed Project and were afforded the opportunity to comment and provide feedback. This iterative engagement ensured that consultee feedback informed the scope, methodology and assessment presented within this EIAR, including this chapter.

Copies of all scoping responses from 2021 and 2025 are included in Appendix 2-1 of this EIAR. The recommendations of the consultees have informed the EIAR preparation process and the contents of this chapter. Table 2-4 in Chapter 2 of this EIAR describes where the comments raised in the scoping responses received have been addressed in this assessment. Table 5-1 provides a list of the organisations consulted with regard to Population and Human Health during the scoping process, and notes where scoping responses were received.

Table 5-1 Scoping Responses

Consultee	Date of Response 2021	Date of Response 2025
Health Service Executive	12th February 2021 and 22nd March 2021	29th January 2026
Fáilte Ireland	16th February 2021	23rd December 2025
Uisce Éireann	No Response Received	Acknowledgment email on 13th January 2026 Email from Data Requests on 14th April 2026 Final email on 21st April 2026
Department of Defence	Acknowledgment email on 2nd February 2021 and formal response on 1st March 2021	Response received on 30/12/2025. Meeting held on 19/05/2026. Refer to Section 2.9.4 of Chapter 2 for further details.

[2] *WEDG 2006 Guidance:* https://www.gov.ie/en/department-of-housing-local-government-and-heritage/publications/wind-energy-development-guidelines-2006/
[3] *IWEA, 2012:* https://windenergyireland.com/images/files/9660bdfb5a4f1d276f41ae9ab54e991bb600b7.pdf

Health Service Executive

Scoping responses were received from National Environmental Health Service Executive (HSE) on 12th February 2021, 22nd March 2021 and 29th January 2026. The HSE stated that the EIAR should examine all likely significant impacts and provide the following information for each:

- Description of the receiving environment;
- The nature and scale of the impact;
- An assessment of the significance of the impact;
- Proposed mitigation measures;
- Residual impacts.

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the HSE that impacts on human health are often inadequately assessed in EIAs in Ireland. It is recommended that the wider determinants of health and wellbeing are considered in a proportionate manner when considering the EIA. Guidance on wider determinants of health can be found at www.publichealth.ie

In addition to any likely significant negative effects from the Proposed Project, any positive likely significant impacts should also be assessed.

The HSE recommends that the following matters are included and assessed in the EIA:

- Public Consultation
- Population and human health
- Decommissioning phase of the Proposed Wind Farm
- Siting and location of turbines
- Noise & Vibration
- Shadow Flicker
- Air Quality
- Surface and Groundwater Quality
- Ancillary facilities
- Cumulative impacts
- Climate
- Health gain

Impacts from shadow flicker are assessed in Section 5.5 and Section 5.7.3.2.9. An assessment of effects on human health as a result of impacts to air quality and climate are assessed in Section 5.7.2.2.2, 5.7.2.2.3, 5.7.3.2.2, 5.7.3.2.3 and in more detail within Chapter 10: Air Quality and Chapter 11: Climate. An assessment of effects on human health as a result of impacts to water quality are assessed in Section 5.7.2.2.4 and 5.7.3.2.4 below, and within Chapter 9: Water. An assessment of effects on human health as a result of impacts from noise and vibration are assessed in Section 5.7.3.2.5 and in more detail within Chapter 12: Noise and Vibration.

The assessment of effects during the decommissioning phase is provided in Section 5.7.4, while cumulative effects, including those relevant to population and human health, are assessed in Section 5.7.5 of this chapter.

In both their 2021 and 2026 responses, the HSE recommended that public consultation be conducted to ensure that all potentially significant impacts of the Proposed Project are addressed. It also suggested that a dedicated website be developed by Bord na Mona (BnM) (the Applicant). The Applicant created a website, which has been and will be maintained throughout the EIA process (https://www.ballydermotwindfarm.ie/). Public consultation events were also held in June 2021, and in May 2026. Full details of the public consultation are available in Chapter 2: Background to the Proposed Project and Appendix 2-2 Community Report.

Fáilte Ireland

A scoping response was received from Fáilte Ireland on 16th February 2021 and 23rd December 2025. The 2021 scoping response provided Fáilte Ireland Guidelines for the Treatment of Tourism in an EIA. In 2025, an updated document was circulated by Fáilte Ireland, which has informed Section 5.3.9, Section 5.7.2.1.5, and Section 5.7.3.1.5 below.

Uisce Éireann (Irish Water)

Uisce Éireann did not issue a response to the initial documentation issued in 2021. When contacted again in 2025, Uisce Éireann provided a response on 29th January 2026 and issued further detail on 21st April 2026, relating to the sewer network and water network to be considered in the scope of an Environmental Impact Assessment (EIA). Impacts on utilities including Uisce Éireann infrastructure are assessed in Chapter 15: Material Assets.

Department of Defence

Scoping responses were received from Department of Defence (DoD) on 2nd February 2021 and 30th December 2025.

The DoD identified that a matter of practice, it does not provide observations or advice in the scoping process, except where the relevant parties have been directed by a planning authority to seek the Department's views.

Having consulted with our Air Corps colleagues, The DoD provided the following observations in 2021:

- The Irish Air Corps uses the EI-R16 and Military Operating Areas (MOA's) to conduct pilot training and to recover aircraft making approaches under instrument flight rules to Casement Aerodrome. Instrument approach procedures to Casement Aerodrome are primarily conducted from the West though the EI-R16. The airspace is in use nearly every day of the year. This area is designated in accordance with Section 68 of the Irish Aviation Authority (IAA) Act for use by the Defence Forces and published in ENR 5-2 of AIP IRELAND. Military aircraft in this airspace may not be flying in compliance with the rules of the air.
- The Department of Defence is opposed to the erection of wind farms or other obstacles which will affect the ability of the Air Corps to train and operate in a safe and economic manner. The some of our key concerns of the proposed wind farm at Ballydermot are as following:
    - The proposed development lies on lands underlying military airspace EI-R16 and MOA 4 within the 20 nautical miles (NM) area of Casement Aerodrome that is protected against tall structures. At its nearest, the wind farm boundary is 16NM from Casement Aerodrome. The approximate centre point is 19.5NM from Casement Aerodrome.
    - The proposed development lies within the EI-R16 and MOA 4 and the Edenderry/Allenwood/Rathangan Low Flying Training Area. The proposed wind farm would negatively impact Air Corps low level pilot training in the area.
    - The routes taken by Air Corps aircraft to multiple training areas in the MOA 4 and MOA 5 pass through the area of the proposed development. The proposed development will reduce aircraft navigability in a large portion the EI-R16 and MOA 4.
    - Military and civil aircraft transiting the EI-16 are often instructed by Military Air Traffic Control (ATC) to track underneath the base level of the relevant EI-R16 sector to provide required separation from aircraft above that are flying under Instrument Flight Rules (IFR). This required standard aircraft separation is a minimum of 1000 feet with the base level of restricted airspace above the proposed wind farm at 1500ft above mean sea level (AMSL). The proposed wind farm may impact the ability of

aircraft to transit underneath and clear of military restricted airspace to provide IFR separation to traffic above.

- The Scoping document refers to other wind farms already in the Kildare/Offaly area in support of the development. Conversely the cumulative impact of wind farms will negatively affect navigability for civil and military aircraft operating underneath and in the EI-R16 and MOA's.

Having consulted with the Military authorities, the DoD provided the following observations in 2025:

- A portion of the proposed Ballydermot Wind Farm lies within 20NM of Casement Aerodrome DVOR/DME.
- The proposed development also lies within the Edenderry/Allenwood/Rathangan (Lullymore) Air Corps Low Flying Training Area. The cumulative effect of wind turbines and meteorological masts will make the area unusable for Irish Air Corps low flying training.
- Development of wind turbines or other tall structures above 45m above ground level within the Edenderry/Allenwood/Rathangan (Lullymore) Air Corps Low Flying Training Area and within 20NM of Casement Aerodrome has the potential to significantly impact on Air Corps flight operations.
- The cumulative effect of renewable energy developments has the potential to impede the Irish Air Corps operability.

A dedicated meeting on the Proposed Project was held with the DoD and the Irish Air Corp on May 19th 2026. Refer to Section 2.9.4 of Chapter 2 Background to the Proposed Project and Section 16.4 of Chapter 16: Aviation for further details on this meeting.

5.2 Assessment Methodology

5.2.1 Population

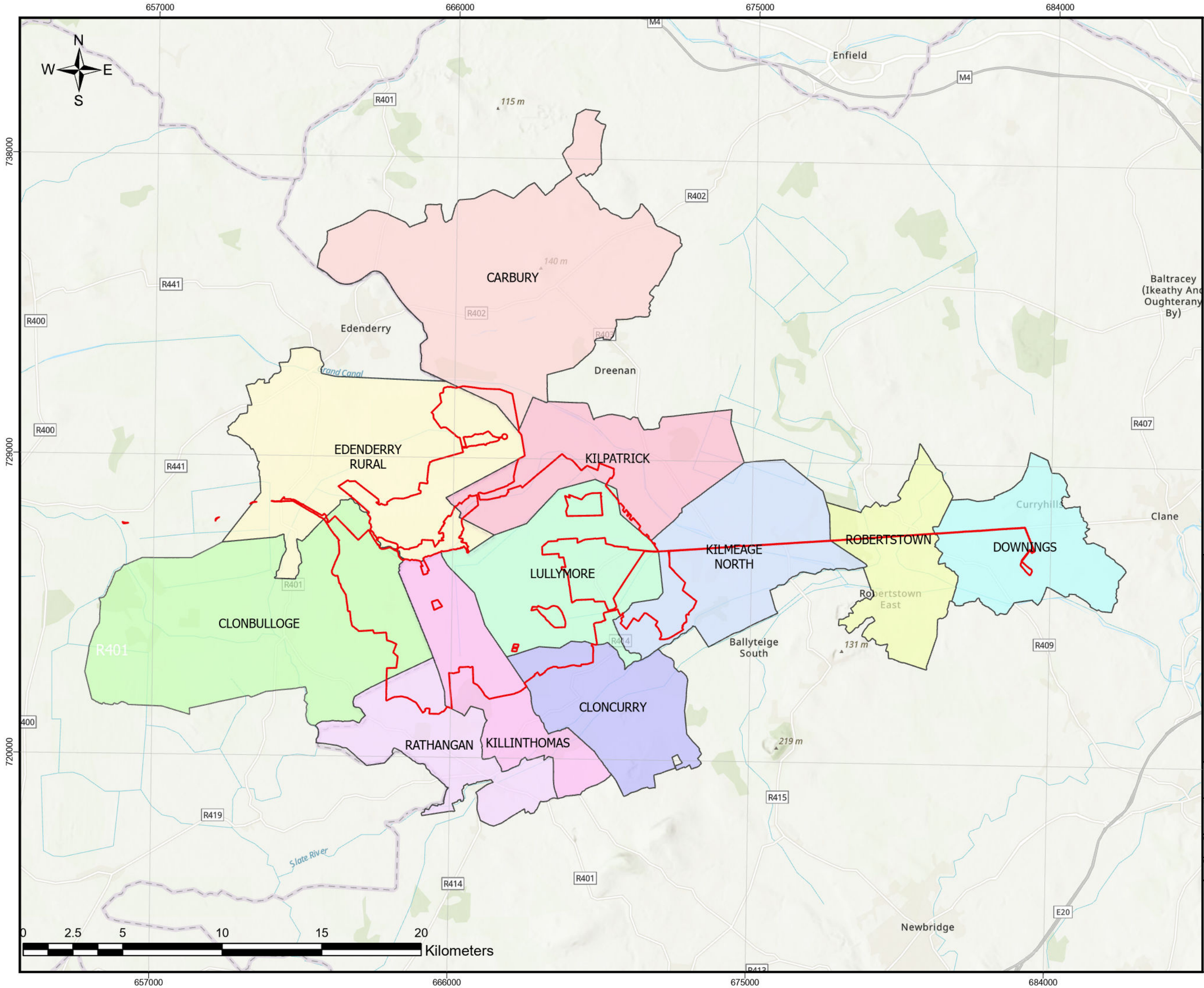
A desk-based assessment using the guidelines referenced in Section 5.1.2 above was undertaken to examine relevant information pertaining to the population impact assessment. The following data sources were examined: information on population statistics, employment and social data for the relevant Electoral Divisions (EDs) were obtained from the Central Statistics Office (CSO) for census years 2016 and 2022, Fáilte Ireland's (2023) EIAR Guidelines for the Consideration of Tourism and Tourism-Related Projects, the Offaly County Development Plan (OCDP) 2021-2027, Kildare County Development Plan (KCDP) 2023-2029 and any other literature pertinent to the area: See Section 5.3 below.

5.2.1.1 Population Study Area

In order to assess the potential effects arising from the Proposed Project on population, the "**Population Study Area**" is defined as the EDs within which the Proposed Project is located.

The Proposed Project is located within a total of 14 no. EDs. Following a review of the nature, scale and duration of the Proposed Project construction phase, operational phase and decommissioning phase activities, it was identified that the Proposed Turbine Delivery Route accommodation works located within the Cloncreen Wind Farm and the junction of the R402 and R420 in Co. Offaly, will be minor in scale, temporary in nature and of short duration. Having regard to the limited extent and temporary nature of these works, and their unlikely influence on population characteristics, the 4 no. EDs in which the Proposed Turbine Delivery Route accommodation works are located (i.e., Monasteroris, Esker/Ballaghassaan, Cappancur, Gaeshill) have been screened out of the Population Study Area for the purposes of the assessment of potential effects arising from the Proposed Project on population.

Accordingly, the Population Study Area comprises 11 EDs namely Clonbullogue, Rathangan, Killinthomas, Cloncurry, Lullymore, Kilmeage North, Kilpatrick, Carbury, Edenderry Rural, Roberstown and Downings, which are considered to appropriately represent the population potentially affected by the Proposed Project. Figure 5-1 below identifies the Population Study Area for the Proposed Project.



Legend

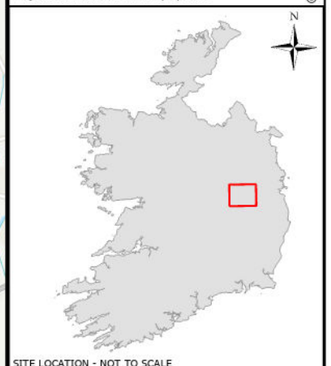
- Project Site

Population Study Area

- CARBURY
- CLONBULLOGE
- CLONCURRY
- DOWNINGS
- EDENDERRY RURAL
- KILLINTHOMAS
- KILMEAGE NORTH
- KILPATRICK
- LULLYMORE
- RATHANGAN
- ROBERTSTOWN

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Spatial Reference
Name: WGS 1984 Web Mercator Auxiliary Sphere
Datum: WGS 1984
Projection: Mercator Auxiliary Sphere



SITE LOCATION - NOT TO SCALE

Drawing Title
Population Study Area

Project Title
Ballydermot Wind Farm
Co. Offaly & Co. Kildare

Project No.	Drawing No.	Scale
250708	5-1	1:173,580
Drawn By:	Checked By	Date
LPM	EC	09/09/2026

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

5.2.2 Human Health

The human health analysis section was assessed using the guidelines set out in Section 5.1.2 above.

The WHO defines health as:

> *"A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".*

The assessment methodology and relevant national and international guidance will be discussed under the headings below.

5.2.2.1 Human Health Study Area

Effects on Human Health are assessed primarily within the defined Population Study Area, with the assessment informed by the discipline-specific study areas established for the relevant EIAR disciplines. Accordingly, consideration is given to the spatial extents and effects pathways defined in the following chapters, where relevant to human health outcomes:

- Chapter 8: Land, Soils and Geology for effects on soil and ground contamination;
- Chapter 9: Water for effects on water quality;
- Chapter 10: Air Quality for effects from dust and exhaust emissions;
- Chapter 11: Climate for effects from greenhouse gas emissions;
- Chapter 12: Noise and Vibration for effects from noise and vibration;
- Chapter 13: Landscape and Visual for effects on visual amenity, landscape character, and tourism
- Chapter 15: Material Assets for effects on traffic and transport;
- Chapter 16: Aviation for effects on aviation; and
- Chapter 17: Major Accidents and Natural Disasters

The Human Health assessment presented in Sections 5.7.2.2, 5.7.3.2 and 5.7.4 for the construction, operational and decommissioning phase respectively, integrates the results of these assessments to identify and evaluate potential effects on human health arising from the Proposed Project.

The primary study area to assess the potential effects on Human Health is therefore the same as the Population Study Area with detailed consideration of the study areas defined for the relevant disciplines.

5.2.2.2 National Guidance

The Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022) advises that "*in an EIAR, the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in this EIAR e.g., under the environmental factors of air, water, soil etc.*" Environmental Impacts from the Proposed Project which may also have an impact on population and human health are discussed in this chapter but addressed in more detail in the following chapters: Chapter 8: Land, Soils and Geology, Chapter 9: Water, Chapter 10: Air Quality, Chapter 11: Climate, Chapter 12: Noise and Vibration, Chapter 13: Landscape and Visual, Chapter 14: Cultural Heritage, Chapter 15: Material Assets.

As referenced in the Department of Housing, Planning and Local Government (2018) *Guidelines for Planning Authorities and An Bord Pleanála*[4], (taken from the European Commission's Environmental Impact Assessment of Projects: Guidance on the Preparation of the Environmental Impact Assessment Report (2018)), human health is, "*a very broad factor that would be highly project dependent.*" The report continues:

> *'The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population.'*

EPA (2022) also states that "*while no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in 3.3.6 the SEA Directive (2001/42/EC). The Commission's SEA Implementation Guidance states 'The notion of human health should be considered in the context of the other issues mentioned in paragraph (f)'*" of the Directive, where paragraph (f) lists environmental factors such as soils, water, landscape, air, etc. The Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022) states that this approach is '*consistent with the approach set out in the 2002 EPA Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil*'. EPA 2022 notes that the above approach follows the 2002 EPA Guidelines already in place which details the following:

> *'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment'.*

5.2.2.3 ISEP Guidance

5.2.2.3.1 *Health in EIA: A Primer for a Proportionate Assessment, 2017*

The ISEP published '*Health in Environmental Impact Assessment: A Primer for a Proportionate Assessment*'[5] in 2017 (hereafter referred to as the Primer Assessment Report), which provided guidance on the proportionate assessment of the impacts on health in Environmental Impact Assessments (EIA). The document states that Health Impact Assessment (HIA) and EIA are separate processes.

> *'HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects...HIA can inform EIA practice in relation to population and human health but conducting a HIA will not necessarily meet the*

[4] *Department of Housing, Planning and Local Government, 2018 Guidelines for Planning Authorities and An Bord Pleanála. Available at:* https://www.gov.ie/en/department-of-housing-local-government-and-heritage/publications/guidelines-for-planning-authorities-and-an-bord-plean%C3%A1la-on-carrying-out-environmental-impact-assessment-august-2018/

[5] *ISEP, 2017. Health in Environmental Impact Assessment: A Primer for a Proportionate Approach. Available at:* https://www.nzaia.org.nz/uploads/1/2/3/3/12339018/iema_primer_on_health_in_uk_eia_doc_v11.pdf

EIA population and human health requirement. By the same token, conducting an EIA will not automatically meet the requirements of a HIA.'

The Primer Assessment Report acknowledges that *'disproportionate burdens may be placed on developers if HIA is applied as a proxy for the consideration of population and human health in every future UK EIA'.* The focus of EIA should be on predicting health and wellbeing outcomes, rather than focusing on changes in determinants of health, e.g., expected changes in noise levels. Determining the significance of impacts on population and human health should include a professional judgement, scientific literature; consultation responses; comparison with baseline conditions; local health priorities; and national/international regulatory standards and guidelines. The Primer Assessment Report refers to the WHO 2014 which provides and overview of health in different types of assessment:

"The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues:

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA;*
- *and integrated forms of impact assessment."*

As such, the WHO does not support a stand-alone HIA unless it could be demonstrated to be of advantage over an EIAR. As the present EIAR incorporates a human health assessment; there is no need for a stand-alone HIA.

5.2.2.3.2 Determining Significance for Human Health in EIA, 2022

The ISEP Working Group 2022 published "*Determining Significance for Human Health in Environmental Impact Assessment*"[6] in response to gaps and inconsistencies across existing guidance documents as to how health is assessed in EIA, particularly regarding significance. The aim of this report is to assist and streamline discussions for consultants producing the assessments and decision makers reviewing the assessments. The report states that an EIA must identify, describe and assess, in an appropriate manner, the direct and indirect significant effects of a proposed development on human health. It must include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects, considering current knowledge and methods of assessment.

A wind farm is not a recognised source of pollution. It is not an activity which requires EPA licensing under the EPA Act 1992, as amended. As such, a wind farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects. In this context, and aligned with the above noted ISEP guidance, this EIAR provides sufficient information that may reasonably be required for reaching a reasoned conclusion on the significance of effects, without providing the level of detail, for example through the use of the significance matrix set out in the ISEP guidance, which might be required for an assessment of effects on human health arising from a type of development with potential for emissions-related human health effects.

[6] *ISEP, 2022. Determining Significance for Human Health in Environmental Impact Assessment. Available at: https://www.iema.net/media/yljb2nbs/iema-eia-guide-to-determining-significance-for-human-health-nov-2022.pdf*

5.2.3 Shadow Flicker

5.2.3.1 Background

Shadow flicker is an effect that occurs when rotating wind turbine blades cast flickering shadows at a nearby property. Shadow flicker is an indoor phenomenon, which may be experienced by an occupant sitting in an enclosed room when sunlight reaching the window is momentarily interrupted by a shadow of a wind turbine's blade. Outside in the open, light reaches a viewer (person) from a much less focused source than it would through the window of an enclosed room, and therefore shadow flicker assessments are typically undertaken for the nearby adjacent properties around a proposed wind energy development. The frequency of occurrence and the strength of any potential shadow flicker impact depends on several factors which are listed in the UK's *Update of UK Shadow Flicker Evidence Base*[7] report and outlined below.

1. ***Whether the sunlight is direct and unobstructed or diffused by clouds:***

If the sun is not shining, shadow flicker cannot occur. Reduced visibility conditions such as clouds, haze, and fog greatly reduce the chance of shadow flicker occurring.

"*Cloud amounts are reported as the number of eighths (okta) of the sky covered. Irish skies are completely covered by cloud for over 50% of the time. The mean cloud amount for each hour is between five and six oktas. This is due to Ireland's geographical position off the northwest of Europe, close to the path of Atlantic low-pressure systems which tend to keep the country in humid, cloudy airflows for much of the time. A study at 12 weather stations over a 25-year period showed that the mean cloud amount was at a minimum in April and maximum in July. Cloud amounts were less at night than during the day, with the mean minimum occurring roughly between 2100 and 0100 GMT and the mean maximum occurring between 1000 and 1500 GMT at most stations.*" [8]

2. ***The presence of intervening obstructions between the turbine and the observer:***

For shadow flicker to occur, the windows of a potentially affected property must have direct visibility of a wind turbine, with no physical obstructions such as buildings, trees and hedgerows, hills or other structures located on the intervening land between the window and the turbine.

Any obstacles such as trees or buildings located between a property and the wind turbine will reduce or eliminate the occurrence and/or intensity of the shadow flicker.

3. ***How high the sun is in the sky at a given time:***

At distances of greater than approximately 500 m between a turbine and a receptor, shadow flicker generally occurs only at sunrise or sunset when the shadow cast by the turbine is longer. The Wind Energy Development Guidelines (2006) (hereafter 'WEDG 2006') iterates that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low.

Plate 5-1 illustrates the shadow cast by a turbine at various times during the day; the red shading represents the area where shadow flicker may occur. When the sun is high in the sky, the length of the shadow cast by the turbine is significantly shorter.

[7] *Department of Energy and Climate Change, 2010. Update of UK Shadow Flicker Evidence Base. Available at: https://assets.publishing.service.gov.uk/media/5a79770bed915d0422068aa3/1416-update-uk-shadow-flicker-evidence-base.pdf*
[8] *Met Éireann, no date. Sunshine. Available at: https://www.met.ie/climate/what-we-measure/sunshine*

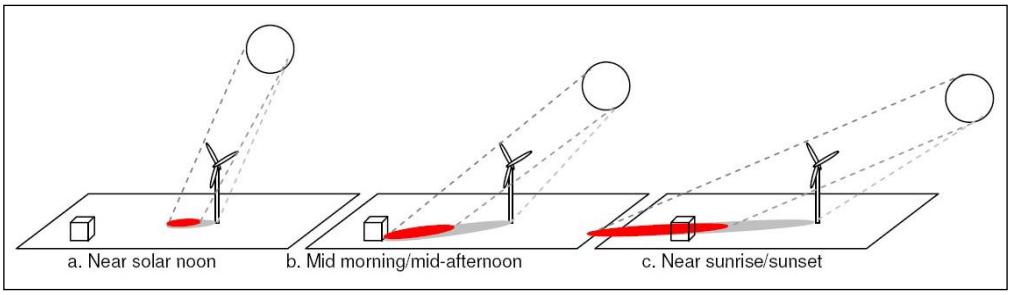


Plate 5-1 Shadow-Prone Area as Function of Time of Day (Source: Shadow Flicker Report, Helimax Energy, Dec 2008)

4. ***Distance and bearing, i.e., where the property is located relative to a turbine and the sun:***

The further a property is from the turbine the less pronounced the effect will be. There are several reasons for this: there are fewer times when the sun is low enough to cast a long shadow; when the sun is low it is more likely to be obscured by either cloud on the horizon or intervening buildings and vegetation; and the centre of the rotor's shadow passes more quickly over the land reducing the duration of the impact.

At a distance, the turbine blades do not cover the sun but only partly mask it, substantially weakening the shadow. This effect occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a very weak impact is observed at distance from the turbines[9].

5. ***Property usage and occupancy:***

Where shadow flicker is predicted to occur at a specific location, this does not imply that it will be witnessed. Potential occupants of a property may be sleeping or occupying a room on another side of the property that is not subject to shadow flicker or completely absent from the location during the time of shadow flicker events. As shadow flicker usually occurs only when the sun is at a low angle in the sky, i.e., very early in the morning after sunrise or late in the evening before sunset, even if there is a bedroom on the side of the property affected, the shadow flicker may not be witnessed if curtains or blinds in the bedroom are closed. The below assessment considers a theoretical precautionary assessment as detailed in Section 5.7 below.

6. ***Wind direction, i.e., position of the turbine blades:***

The direction of wind turbine blades changes according to wind direction, as the turbine rotor turns to face the wind. To cast a shadow, the turbine blades must be facing directly toward or away from the sun, so they are moving across the source of the light relative to the observer. This is demonstrated in Plate 5-2 below.

[9] *Department of Energy and Climate Change, 2010. Update of UK Shadow Flicker Evidence Base. Available at: https://assets.publishing.service.gov.uk/media/5a79770bed915d0422068aa3/1416-update-uk-shadow-flicker-evidence-base.pdf*

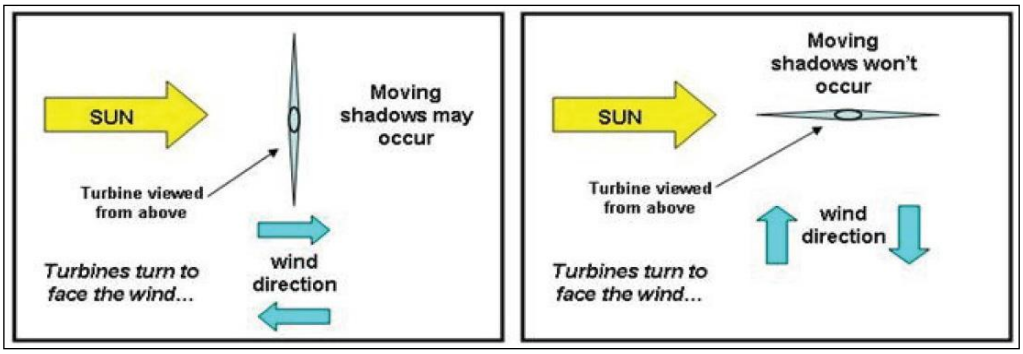


Plate 5-2 Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environment Power LLC)

7. Rotation of turbine blades:

Shadow flicker occurs only if there is sufficient wind for the turbine blades to be continually rotating. Wind turbines begin operating at a specific wind speed referred to as the 'cut-in speed', i.e., the speed at which the turbine begins producing power, and cease operating at a specific 'cut-out speed'. Therefore, even during the sunlight hours when shadow flicker has been predicted to occur, if the turbine blades are not turning due to insufficient wind speed, no shadow flicker will occur.

5.2.3.2 Guidance

The Wind Energy Development Guidelines (WEDG) 2006 state that at distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. Therefore, the study area adopted for the shadow flicker assessment is 10 rotor diameters of the Proposed Turbine locations (i.e., for the Proposed Project, this is assumed at 1.70 km based on a rotor diameter of 170 metres), hereafter referred to as the '**Shadow Flicker Study Area'** as identified in Figure 5-2.

The current adopted guidance for shadow flicker in Ireland is derived from the WEDG 2006, and the "*Best Practice Guidelines for the Irish Wind Energy Industry*" (Irish Wind Energy Association, 2012).

The WEDG 2006 recommend that shadow flicker at neighbouring offices and dwellings within 500 m of a Proposed Turbine location should not exceed a total of 30 hours per year or 30 minutes per day.

The WEDG 2006 state that shadow flicker lasts only for a short period of time and occurs only during certain specific combined circumstances, as follows:

- the sun is shining and at a low angle in the sky, i.e., just after dawn and before sunset, **and**
- the turbine is located directly between the sun and the affected property, **and**
- there is enough wind energy to ensure that the turbine blades are moving, **and**
- the turbine blades are positioned so as to cast a shadow on the receptor.

Although the WEDG 2006 threshold applies to properties located within 500 metres of a Proposed Turbine location, for the purposes of this assessment, the thresholds of 30 hours per year or 30 minutes per day have been applied to all properties located within 10 rotor diameters of the Proposed Turbines (1.7 km in the case of the Proposed Wind Farm) (as per Best Practice Guidelines for the Irish Wind Energy Industry, IWEA, 2012).

As stated in Section 1.2.2 of Chapter 1, the WEDG 2006 are currently under review. The WEDG released the '*Draft Revised Wind Energy Development Guidelines*' (hereafter referred to as the 'Draft

WEDG 2019')[10] for public consultation in December 2019. The consultation period closed in February 2020; however, no update or final guideline documents was released. The Draft WEDG 2019 recommend local planning authorities and/or An Coimisiún Pleanála impose conditions to ensure that:

> *"no existing dwelling or other affected property will experience shadow flicker as a result of the wind energy development subject of the planning application and the wind energy development shall be installed and operated in accordance with the shadow flicker study submitted to accompany the planning application, including any mitigation measures required."*

The Climate Action Plan 2025 Annex of Actions, published in April 2025, states that final guidelines will be published in Q1 2025, which has now passed. No date has been provided for an update by the Department for Housing, Local Government and Heritage[11][12]. The shadow flicker methodology and assessment within this chapter are based on compliance with the WEDG 2006, which remain the latest adopted guidelines. However, the Proposed Turbines can be brought in line with the requirements of the Draft WEDG 2019 through the stricter implementation of the mitigation measures outlined in Section 5.7.3.2.9.

5.2.3.3 Shadow Flicker Study Area

At the outset of the Proposed Project, during the constraints mapping process detailed in Section 3.2.5.3.1 of Chapter 3 Site Selection and Reasonable Alternatives of this EIAR, all sensitive receptors within approximately 2km of the area suitable for siting wind turbines were identified and mapped. This included all inhabitable and uninhabitable properties. In addition, a planning history search to identify properties that may have been granted planning permission, but not yet been constructed, was carried out. Any property with a valid planning permission for a dwelling house was also added to the sensitive receptors' dataset. This dataset has been updated over the project duration and prior to submission of the planning application in October 2026.

The Shadow Flicker Study Area is 10 times the rotor diameter (170 m rotor diameter x 10 = 1.7 km). Figure 5-2 below shows the Shadow Flicker Study Area. The WEDG 2006 state that, at distances greater than 10 times the rotor diameter of a proposed turbine, the potential for shadow flicker is very low, and therefore the shadow flicker study area is set at 1.7 km from the Proposed Turbines. As outlined above, for the purposes of the shadow flicker assessment, all sensitive receptors within the Shadow Flicker Study Area were identified and mapped.

In total, 310 no. sensitive receptors were identified within 1.7 km of the Proposed Turbines, i.e., the Shadow Flicker Study Area. The sensitive receptors located within the Shadow Flicker Study Area are shown in Figure 5-5 to Figure 5-5Q below, with all dwellings detailed in Table 1-1 of Appendix 5-5 in Section 5.5 below. The closest sensitive receptor to a Proposed Turbine is located approximately 894m from Proposed Turbine T16.

5.2.3.4 Shadow Flicker Prediction Methodology

Shadow flicker occurs only under certain, combined circumstances, as detailed above. Where shadow flicker does occur, it is generally momentary. The WEDG 2006 state that careful site selection, design and planning, and good use of relevant software can help avoid the possibility of shadow flicker, all of which have been employed at the Proposed Wind Farm. Proper siting of wind turbines is key in eliminating the impact of shadow flicker.

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[10] *Draft Revised WEDG 2019:* https://assets.gov.ie/static/documents/draft-revised-wind-energy-development-guidelines-december-2019-385c92c2-16f9-4511-80bf.pdf

[11] *Wind Energy Guidelines Dáil Éireann Debate. Thursday 15th May 2025.* https://www.oireachtas.ie/en/debates/question/2025-05-15/51/

[12] *Wind Energy Guidelines Dáil Éireann Debate. Wednesday 15th October 2025.* https://www.oireachtas.ie/en/debates/question/2025-10-15/192/

The occurrence of shadow flicker can be precisely predicted using specialist computer software programmes specifically developed for the wind energy industry, such as WindFarm (ReSoft) or WindFarmer (DNV.GL), AWS OpenWind or WindPRO: Shadow. The computer modelling of the occurrence and magnitude of shadow flicker is made possible by the fact that the sun rises and sets in the same position in the sky on every day each year.

To set up the model, Ordnance Survey Ireland mapping (OSI 1:50,000 contours) was used to determine the approximate ground elevation at which the wind turbines and surrounding properties are located. The use of these data ensures that realistic elevation variations between the turbines and properties are accounted for.

Any potential impact can be precisely modelled to give the start and end time of any incidence of shadow flicker, at any location, on any day or all days of the year. Where a shadow flicker impact is predicted to occur, the total maximum daily and annual durations can be predicted, along with the total number of days. Any incidence of predicted shadow flicker can be attributed to a particular turbine or group of turbines to allow effective mitigation strategies to be planned and proposed as detailed further below.

For the purposes of this shadow flicker assessment, the software package "windPRO– Version 4.2.285" was used to predict the level of shadow flicker associated with the Proposed Wind Farm. The windPRO package is a commercially available software tool that enables developers to analyse, design and optimise proposed wind farms. It allows proposed turbine layouts to be optimised for maximum energy yield whilst taking account of environmental, planning and engineering constraints. According to the UK guidance and methodology produced for the UK Department of Energy and Climate Change [13], windPRO is one of the three key computer models (the others being WindFarm and Windfarmer) used by the industry and it has been shown that the outputs of these models do not differ significantly.

5.2.3.4.1 *Shadow Flicker Criteria*

There are 46 no. Proposed Turbines which form part of the Proposed Project and will have a ground-to-blade tip height, hub height and blade length of the following dimensions:

There will be 19 no. Proposed Turbines with:

- Turbine Tip Height – 200 metres
- Hub Height – 115 metres
- Blade Rotor Diameter – 170 metres

There will be 27 no. Proposed Turbines with:

- Turbine Tip Height – 220 metres
- Hub Height – 135 metres
- Blade Rotor Diameter – 170 metres

The Proposed Turbines are shown on Figure 5-2 below, with the 19 no. Proposed Turbines with a tip height of 200m delineated by a green point and 27 no. Proposed Turbines with a tip height of 220m delineated by a blue point.

Shadow flicker modelling was undertaken using the software package "windPRO– Version 4.2.285" identified in Section 5.2.3.4 above. To account for the different turbine heights within a single assessment, two turbine layers were created within the model. One layer represented Proposed Turbines with a hub height of 115 m for those with a 200 m tip height, and the second layer

[13] *Department of Energy and Climate Change, 2010. Update of UK Shadow Flicker Evidence Base. Available at: https://assets.publishing.service.gov.uk/media/5a79770bed915d0422068aa3/1416-update-uk-shadow-flicker-evidence-base.pdf*

represented Proposed Turbines with a hub height of 135 m for those with a 220 m tip height. Both turbine layers were modelled using a rotor diameter of 170 m.

In accordance with WEDG 2006, a fixed assessment distance of 1.7km (i.e. 10 times the rotor diameter) was applied, based on the proposed rotor diameter. This ensures that all receptors within the recommended shadow flicker study area are included.

Both turbine layers were selected simultaneously within the modelling software and assessed within a single model run, thereby allowing the combined effect of all turbines to be captured. This approach ensures that the assessment represents a precautionary scenario, taking into account the full range of turbine parameters proposed within the Shadow Flicker Study Area.

5.2.3.4.2 Assumptions

Due to the latitude of Ireland, shadow flicker impacts are only possible at properties 130 degrees either side of north (i.e., a shadow flicker event can occur within a 260-degree span), as turbines do not cast shadows on their southern side. As such, properties located outside of this potential shadow flicker zone (50 degrees either side of south) will not be impacted. However, a precautionary approach has been adopted through the use of the 'greenhouse mode' function within WindPRO. Greenhouse mode does not consider the orientation or location of windows within a building. Instead, Greenhouse mode assumes that shadow flicker could be perceived from any direction around a property, effectively assessing a 360-degree receptor. To implement this conservative approach, WindPRO calculates shadow flicker using four notional windows facing north, east, south and west. These are modelled to ensure all potential directions of exposure are captured and do not represent the actual window orientations of the dwelling being assessed. Accordingly, the assessment is independent of house orientation and represents a worst-case scenario. Therefore, all 310 no. sensitive receptors within the Shadow Flicker Study Area of the Proposed Project were assessed for potential shadow flicker impact.

At each property, the windPRO modelling software produced shadow flicker calculations based on 4 no. notional windows facing north, east, south and west, labelled Windows 1, 2, 3 and 4 respectively. The methodology below is standard for all software packages and cannot be manipulated per site, i.e., the conservative approach of assuming shadow flicker from the north, south, east and west of each receptor is modelled. The degrees from north value for each window is:

- Window 1: 0 degrees from North
- Window 2: 90 degrees from North
- Window 3: 180 degrees from North
- Window 4: 270 degrees from North

No screening due to trees or other buildings or vegetation is assumed. There is existing screening within the Shadow Flicker Study Area, including vegetation such as trees and hedgerows, as well as built features; however, these have not been considered in the shadow flicker assessment to ensure the assessment is carried out under theoretical precautionary conditions. It was not considered necessary or practical to measure the dimensions of every window on every property in the Shadow Flicker Study Area. While the actual size of a window will marginally influence the incidence and duration of any potential shadow flicker impact, with larger windows resulting in slightly longer shadow flicker durations, any additional incidences or durations or shadow flicker over and above those predicted in this assessment can be countered by extending the mitigation strategies outlined in Section 5.7.3.2.9.

The use of computer models to predict the amount of shadow flicker that will occur is known to produce an over-estimate of possible impact, i.e., the theoretical precautionary scenario, due to the following limitations:

- The sun is assumed to be shining during all daylight hours such that a noticeable shadow is cast. This will not occur in reality.

- The wind is always assumed to be within the operating range of the turbines such that the turbine rotor is turning at all times, thus enabling a periodic shadow flicker. Wind turbines only begin operating at a specific "cut-in speed", and cease operating at a specific "cut-out speed". In periods where the wind is blowing at medium to high speeds, the probability of there being clear or partially clear skies where the sun is shining and could cast a shadow is low.
- The wind turbines are assumed to be available to operate, i.e., turned on at all times. In reality, turbines may be switched off during maintenance or for other technical or environmental reasons.
- The turbine rotor is considered (as a sphere) to present its maximum aspect to observers in all directions. In reality, the wind direction and relative position of the turbine rotor would result in a changing aspect being presented by the turbine. The rotor will actually present as ellipses of varying sizes to observers from different directions. The time taken for the sun to pass across the sky behind a highly elliptical rotor aspect will be shorter than the modelled maximum aspect.

The total annual shadow flicker calculated for the property assumes 100% sunshine during daytime hours, as referred to above. However, weather data for this region shows that the sun shines on average for 3.48 hours per day or 31.74% of the daylight hours per year. This percentage is based on Met Éireann weather station at Birr, Co. Offaly over the 30-year period from 1979-2008[14]. The actual sunshine hours at the site and therefore the percentage of time shadow flicker could actually occur is 31.74% of daylight hours. Section 5.5.1 below lists the annual shadow flicker calculated for each property when the regional average of 31.74% sunshine is considered, to give a more accurate annual average shadow flicker prediction. Table 5-11 below outlines whether a shadow flicker mitigation strategy is required for any property within the Shadow Flicker Study Area which may be impacted by shadow flicker.

[14] *Met Éireann, 2024. Birr 1978-2008 averages. Available at: https://www.met.ie/cms/assets/uploads/2024/07/Birr-1979%E2%80%932008-*

660000
665000
670000
730000
725000
720000
N
R441
R402
Ballynagan
Dreenan
Ticknevin
Killinagh Lower
R403
Allenwood South
R414
Clonbullogue
R401
R442
R419
Newtown (ed Killinthomas)
Rathangan
Feighcullen
110 m
86 m
70 m
81 m
T01
T02
T03
T04
T05
T06
T07
T08
T09
T10
T11
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T34
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T37
T38
T39
T40
T41
T42
T43
T44
T45
T46
0 1 2 4 6 8
Kilometers
660000
665000
670000
675000

Legend

- Project Site
- Turbine Layout
  - 220
  - 200
- Shadow Flicker Study Area

Spatial Reference
Name: WGS 1984 Web Mercator Auxiliary Sphere
Datum: WGS 1984
Projection: Mercator Auxiliary Sphere

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SITE LOCATION - NOT TO SCALE

Drawing Title
Shadow Flicker Study Area

Project Title
Ballydermot Wind Farm
Co. Offaly & Co. Kildare

Project No.	Drawing No.	Scale
250708	5-2	1:80,000
Drawn By:	Checked By	Date
LPM	EC	09/09/2026

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

5.2.4 Residential Amenity

Residential amenity relates to the human experience of one's home, derived from the general environment and atmosphere associated with the residence. The quality of residential amenity is influenced by a combination of factors, including site setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced in the residence. When considering the amenity of residents in the context of a Proposed Project, there are three main potential impacts of relevance: 1) Shadow Flicker, 2) Noise, and 3) Visual Amenity.

Effects on residential amenity are assessed primarily within the defined shadow flicker, noise & vibration and residential visual amenity study areas, with the assessment informed by additional factors such as air quality and traffic. Accordingly, consideration is given to the spatial extents and effects pathways defined in those chapters, where relevant to residential amenity.

The residential amenity assessment presented in Sections 5.7.2.1.6, 5.7.3.1.6 and 5.7.4 for the construction, operational and decommissioning phase respectively, integrates the results of these assessments to identify and evaluate potential effects on residential amenity arising from the Proposed Project.

The primary study area to assess the potential effects on Residential Amenity is therefore the same as that utilised for population assessments (i.e., the Population Study Area) with detailed consideration of the study areas defined for the relevant disciplines. Refer Section 5.2.1.1 above for details.

5.3 Baseline Population

5.3.1 Receiving Environment

The socio-economic study of the receiving environment included an examination of the population and employment characteristics of the Project Site and the surrounding environs. The relevant methodology pertaining to the population and human health assessment relates to the assessment of desk-based data sourced from the following locations. Information regarding population and general socio-economic data were sourced from the Central Statistics Office (CSO), the OCDP 2021-2027[15], KCDP 2023-2029[16], and Fáilte Ireland[17]. Census 2022 was the most recent census for which a complete dataset is available. Data was also obtained from Census of Ireland 2016, the Census of Agriculture 2020 and from the CSO website (www.cso.ie). Census information is divided into State, Provincial, County, Major Town, and ED levels.

Consideration has been given to the amended Core Strategy Table 2.2 (2026 Update) of the OCDP[18] in the assessment of the receiving environment, having regard to projected population growth, settlement patterns and future demographic trends within the Population Study Area.

The Proposed Wind Farm is located approximately 2.2km south-southeast of Edenderry Co. Offaly, 3.3km west of Allenwood Co. Kildare, 2km north of Rathangan Co. Kildare and 1.7km east of Clonbullogue Village Co. Offaly. The Proposed Wind Farm and Proposed Enhancement Areas will be located on part of the Allen Bog Group which comprises 14 no. bogs approximately 5,139 ha. and is located on the border of County Offaly and County Kildare. The Proposed Grid Connection will traverse through Allenwood, Co. Kildare and Prosperous, Co. Kildare, with the Proposed Offsite

[15] *Offaly County Development Plan 2021- 2027:* https://www.offaly.ie/c/county-development-plan/
[16] *Kildare County development Plan 2023- 2029:* https://kildarecoco.ie/AllServices/Planning/DevelopmentPlans/KildareCountyDevelopmentPlan2023-2029/
[17] *Failte Ireland:* https://www.failteireland.ie/Research-and-insights.aspx
[18] *Proposed Variation No.1 to the OCDP 2021-2027:* Proposed-Variation-No.1-to-the-OCDP-21-27c.pdf

Substation in the townland of Lullymore and Killybegs, Co Kildare and adjacent townlands. The Proposed Project is located within several townlands as listed in Table 1-1 Chapter 1: Introduction of this EIAR.

The Project Site lies within 11 No. EDs: Clonbullogue, Rathangan, Killinthomas, Cloncurry, Lullymore, Kilmeage North, Kilpatrick, Carbury, Edenderry Rural, Roberstown and Downings, as detailed in Section 5.2.1 and shown in Figure 5-1 above. These EDs will collectively be referred to hereafter as the "Population Study Area" for population section of this chapter.

The Proposed Grid Connection is comprised of the Proposed Onsite Substation, Proposed Offsite Substation, the 13.1km 220kV underground cabling connection from the Proposed Onsite Substation to the Proposed Offsite Substation, and overhead line (OHL) connecting to the existing Maynooth-Dunstown 220kV OHL. In order to assess the population in the vicinity of the Proposed Grid Connection, the relevant EDs have been included in the Population Study Area (i.e., Kilmeage North, Robertstown and Downing).

The Population Study Area has a population of 17,318 persons as of 2022 and comprises a total land area of 261 km^2 (Source: CSO Census of the Population 2022). The populations and land areas within each ED are as follows:

- Clonbullogue (825 persons; land area= 44 km^2)
- Edenderry Rural (890 persons; land area= 36 km^2)
- Killinthomas (385 persons; land area= 15 km^2)
- Kilmeage North (2,707 persons; land area= 22 km^2)
- Kilpatrick (918 persons; land area= 20 km^2)
- Lullymore (201 persons; land area= 21 km^2)
- Carbury (2,345 persons; land area= 44 km^2)
- Rathangan (3,122 persons; land area= 14 km^2)
- Roberstown (2,344 persons; land area= 14 km^2)
- Cloncurry (490 persons; land area= 15 km^2)
- Downings (3,091 persons; land area= 16 km^2)

There are 33 sensitive receptors located within 1 km of Proposed Turbines. The closest sensitive residential receptor is located approximately 894m from the nearest Proposed Turbine (T16), i.e., above both the minimum recommended setback for properties involved in the project (500 m) and the recommended 4x tip height setback (880 m) from properties not involved in the Proposed Project (as recommended in the Draft WEDG 2019). The Proposed Wind Farm has been designed in accordance with the Draft WEDG 2019, such that all Proposed Turbines are located at a minimum setback distance of four times the tip height of the 220 m turbines (i.e., 880 m) from residential properties not involved in the Proposed Project. There is 1 no. commercial/warehouse units located approximately 450 m from T03.

5.3.2 Demographic Trends

In the period 2016 to 2022, the population of Ireland increased by 8.1%. Between 2016 and 2022, the population of Co. Offaly increased by 6.7% to 83,150 persons and the population of Co. Kildare increased by 11.36% to 247,774. Population statistics for the State, Co. Offaly, Co. Kildare and the Population Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 5-2 below.

Table 5-2 Population 2016 - 2022 (Source: CSO)

Area	Population		Percentage Population Change
	2016	2022	2016-2022
State	4,761,865	5,149,139	+8.13%
County Offaly	77,961	83,150	+6.66%
County Kildare	222,504	247,774	+11.36%
Population Study Area	14,998	17,318	+15.4%

The data presented in Table 5-2 shows that the population of the Population Study Area increased by 15.4% between 2016 and 2022. This rate of population increase is higher than that recorded at State and County levels. When the population data is examined in closer detail, it shows that the rate of population has increased within the Population Study Area in all EDs.

The ED within the Population Study Area with the highest population recorded in the 2022 Census was Rathangan ED, with a population of 3,122. The lowest population recorded in the 2022 Census was in Lullymore ED, with a population of 201. This low population is due to the land cover predominantly comprising of peatlands and agricultural land.

Recent population projections published by the CSO indicate that Ireland's population is expected to continue to grow over the coming decades, primarily driven by inward migration. Under a range of projection scenarios, the national population is projected to increase from approximately 5.2 million in 2022 to between 5.7 million and 7.0 million by 2057, with growth expected to be strongest in the short to medium term and moderate thereafter[19].

These trends are considered reflective of broader demographic patterns that may influence the Population Study Area, particularly in terms of population growth, ageing demographics, and increased demand for services and infrastructure. In this context, the Proposed Project is situated within a wider environment that is expected to experience continued population growth and evolving demographic pressures over the lifetime of the Proposed Project.

5.3.3 Population Density

The population densities recorded within the State, Co. Offaly, Co. Kildare and the Population Study Area during the 2016 and 2022 Census are shown in Table 5-3 below.

[19] *Population and Labour Force Projections 2023-2057, CSO:* Population Projections Results Population and Labour Force Projections 2023-2057 - Central Statistics Office

Table 5-3 Population Density in 2016 – 2022 (Source: CSO)

Area	Population Density (Persons per square kilometre)	
	2016	2022
State	67.76	73.27
County Offaly	38.96	41.55
County Kildare	131.34	146.26
Population Study Area	57.46	64.43

The population density of the Population Study Area recorded during the 2022 Census was approximately 64.43 persons per km^2. This figure is lower than the national population density of 73.27 persons per km^2 and the population density in Co. Kildare, i.e., 146.26km^2. The density of the Population Study Area is greater than that of Co. Offaly, i.e., 41.55km^2.

Similar to the observed population trends, the population density recorded across the Population Study Area varies between EDs. Rathangan had the highest population density at 223 persons per km^2 while Lullymore had the smallest population density at just 9.6 persons per km^2.

As outlined in Section 5.3.2 above, Ireland's population is expected to continue to grow over the coming decades[20]. It can be expected that, within this context, the areas comprising the Population Study Area will experience increases in population density and evolving demographic pressures over the lifetime of the Proposed Project.

5.3.4 Household Statistics

The number of households and average household size recorded within the State, Co. Offaly, Co. Kildare and the Population Study Area during the 2016 and 2022 Censuses are shown in Table 5-4 below.

Table 5-4 Number of Household and Average Household Size 2016 - 2022 (Source: CSO)

Area	2016		2022	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
State	1,702,289	2.75	1,841,152	2.74
County Offaly	27,343	2.64	28,923	2.84
County Kildare	73,596	3	82,793	3
Population Study Area	5,009	3.05	5,755	3.05

The figures in Table 5-4 show that while the number of households within the State, Counties and the EDs increased, the average number of people per household remained the relatively consistent due to

[20] *Ibid.*

the proportionate increase in population during this period. Average household size recorded for the Population Study Area during the 2016 and 2022 Censuses are in line with that observed at State and County level during the same time periods as the decline observed for the average number of people per household is insignificant. The average household sizes recorded for each ED are similar to the above, ranging from 2.9 (Lullymore and Rathangan) to 3.3 (Cloncurry).

5.3.5 Age Structure

Figure 5-3 presents the population percentages of the State, Co. Offaly, Co. Kildare and the Population Study Area within different age groups as defined by the CSO during the 2022 Census.

The proportion of the Population Study Area population is broadly similar to those recorded at national and county level categories. For the Population Study Area, the highest population percentage occurs within the 45-64 age category. This age category would be considered to be less sensitive to change when compared to other age categories, with higher home ownership and lower geographic mobility. The lowest population percentage within the Population Study Area occurs at the 65+ range age category, at 13.1% and 15-24 range age category at 13.1%. The 65+ age category is lower than the State population percentage as this age category is considered sensitive to change. The age category results of the Population Study Area regarding age category 15- 24 correspond with the trend of younger generations leaving rural areas to move to urban areas with greater education and employment opportunities. Figure 5-3 highlights the different age category percentages within the State, Co. Offaly, Co. Kildare and the Population Study Area.

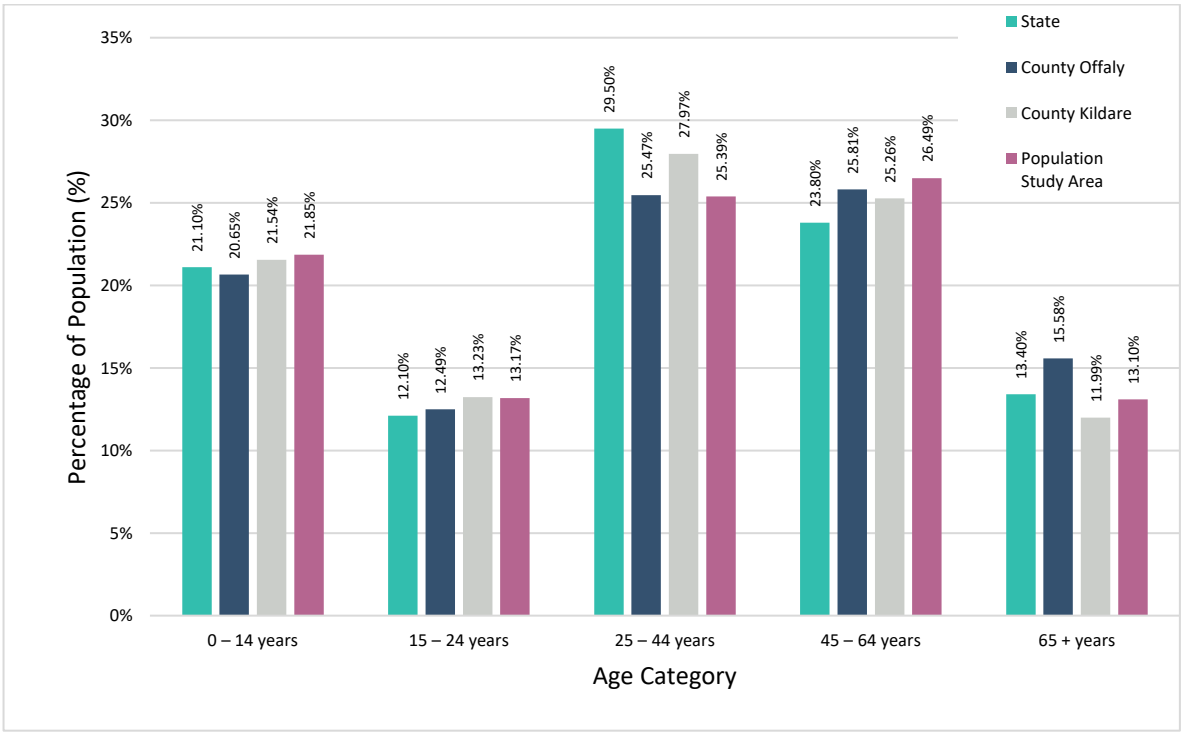


Figure 5-3 Population per Age Category in 2022 (Source: CSO)

5.3.6 Employment and Economic Activity

5.3.6.1 Economic Status

The labour force consists of those who can work, i.e., those who are aged 15+, out of full-time education and not performing duties that prevent them from working. There were 65,983 people (aged 15 and over) at work in Co. Offaly, an increase of 5,749 people (+9.5%) and in Co. Kildare, 194,397 people which has an increase of 25,454 people (+15.1%) between 2016 and 2022. In 2022, there were

4,136,852 persons in the labour force in the Republic of Ireland. This figure is further broken down into the percentages that were at work, seeking first time employment or unemployed. It also shows the percentage of the total population aged 15+ who were *not* in the labour force, i.e., those who were students, retired, unable to work or performing home duties.

Table 5-5 below shows the percentage of the total population aged 15+ who were in the labour force during the 2022 Republic of Ireland Census.

Table 5-5 Economic Status of the Total Population Ages 15+ in 2022 (Source: CSO)

Status		State	County Offaly	County Kildare	Population Study Area
Percentage of population aged 15+ who are in the labour force		**61.2%**	**59.0%**	**63.7%**	**62.19%**
Percentage of which are:	At work	91.7%	90.6%	92.7%	92.29%
	First time job seeker	1.4%	1.7%	1.3%	1.21%
	Unemployed	7.0%	7.7%	6%	6.5%
Percentage of population aged 15+ who are not in the labour force		**38.6%**	**40.2%**	**36.3%**	**37.81%**
Percentage of which are:	Student	29.4%	26.6%	32.5%	28.26%
	Home duties	21.1%	24.5%	19%	22.30%
	Retired	37.6%	35.5%	36%	35.05%
	Sickness or Disability	10.9%	12.5%	10.8%	12.66%
	Other	1.0%	0.8%	1.8%	1.73%

Overall, the principal economic status of those within the labour force living in the Population Study Area is higher to that recorded at State level. In comparison with the State and Co. Kildare, the Population Study Area has 1 and 1.5 percentage fewer points relating to persons in the labour force, respectively. In comparison with Co. Offaly, the Population Study Area has 3.2 percentage points more relating to persons in the labour force.

The largest difference between the State and the Population Study Area was the “Retired” category, with a difference of 2.55 percentage points. Of those who were not in the labour force during the 2022 Census, the highest percentage of the population in the Population Study Area was in the “Retired” category, which is the same as figures recorded at State and County level.

5.3.6.2 Employment and Investment Potential in the Irish Wind Energy Industry

5.3.6.2.1 *Employment Potential*

A report entitled '*Jobs and Investment in Irish Wind Energy – Powering Ireland's Economy'*[21] was published in 2009 by Deloitte, in conjunction with the IWEA. This report focused on the ability of the Irish wind energy industry to create investment and jobs. In terms of the overall economic benefit to be obtained from wind energy, the report states in its introduction:

> *"Ireland is fortunate to enjoy one of the best wind resources in the world. Developing this resource will reduce and stabilise energy prices in Ireland and boost our long-term competitiveness as an economy. It will also significantly reduce our dependence on imported fossil fuels."*

More recently, Siemens in conjunction with the IWEA published a report in 2014 entitled "*An Enterprising Wind - An economic analysis of the job creation potential of the wind sector in Ireland"*[22], concluded that, *"a major programme of investment in wind could have a sizeable positive effect on the labour market, resulting in substantial growth in employment.*" The report considers the three potential types of direct employment created, as a result of increased investment in wind energy, to be:

- Wind Energy Industry Employment:
  - Installation
  - Development
  - Planning
  - Operation and Maintenance
  - Investor activity
- Electricity Grid Network Employment
- Potential Wind Turbine Manufacturing Employment

The Sustainable Energy Authority of Ireland (SEAI)[23] demonstrates in its '*Wind Energy Roadmap 2011-2050'* report, that "*the wind energy resource represents a significant value to Ireland by 2050. This value is presented in terms of its ability to contribute to our indigenous energy needs, the benefits of enhanced employment creation and investment potential, and the ability to significantly abate carbon emissions to 2050."*

5.3.6.2.2 *Energy Targets*

The Climate Action Plan 2025[24] (CAP 2025) was launched in April 2025. Following on from Climate Action Plans 2019, 2021, 2023, and 2024, CAP 2025 sets out the roadmap to deliver on Ireland's climate ambition. It aligns with the legally binding economy-wide carbon budgets and sectoral ceilings that were agreed by Government in July 2022 following the Climate Action and Low Carbon Development (Amendment) Act 2021, which commits Ireland to a *legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030*. CAP 2025 sets out indicative ranges of emissions reductions for each sector of the economy.

[21] *Deloitte, Irish Wind Energy Association 2009 Jobs and Investment in Irish Wind Energy Powering Ireland's Economy. Available at: https://windenergyireland.com/images/files/9660bd5e72bcac538f47d1b02cc6658c97d41f.pdf*
[22] *Siemens and IWEA, 2014. An Enterprising Wind - An economic analysis of the job creation potential of the wind sector in Ireland. Available at: https://www.esri.ie/system/files/publications/BKMNEXT250%20%281%29.pdf*
[23] *SEAI (2019), https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf*
[24] *Department of the Environment, Climate and Communications, 2025. Climate Action Plan 2025. Available at: https://assets.gov.ie/static/documents/Climate_Action_Plan_2025_updated_cover.pdf*

Further information on energy and climate change targets is detailed in Chapter 11: Climate of this EIAR, Chapter 1: Introduction (Section 1.5) and Chapter 2: Background to the Proposed Project (Section 2.3 and Section 2.4).

5.3.6.2.3 Employment Potential

According to a 2021 KPMG report on behalf of Wind Energy Ireland, "*Economic impact of onshore wind in Ireland*"[25], as of 2021, the onshore wind energy sector in Ireland supported 5,130 jobs in 2021 (excluding employment in grid development) through the sector and its supply chain. By 2030, under a scenario of 8,200 MW installed capacity, there is potential for 7,020 jobs. These figures update those estimated in a Siemens and IWEA (2014) report, which predicted that the wind energy sector in Ireland would produce 6,659 direct jobs in a scenario where 4GW capacity is achieved by 2020. It was estimated that 5,596 of these jobs would be associated directly with the construction and installation of windfarms, while the remaining 1,063 jobs would be associated with the national grid. Under this scenario, this translates to 1.66 direct jobs per megawatt (MW) of wind capacity throughout the various stages of installation. Ireland needs to achieve a total of 9GW of onshore wind by 2030 which will further support further employment. According to Wind Energy Ireland, the installed onshore wind capacity in Ireland has exceeded 5,000 MW as of January 2025[26], which would support employment during the last decade.

In its 2011 report '*Wind Energy Roadmap 2011-2050*'[27], the SEAI notes that "*Onshore and offshore wind could create 20,000 direct installation and O&M jobs by 2040".* This Roadmap estimated that onshore and offshore wind could create 20,000 direct installation and operation/maintenance jobs by 2040 and that the wind industry would also have an annual investment potential of approximately €6-12 billion by 2040.

A 2014 report by Pőyry, "*The Value of Wind Energy to Ireland"*[28], stated that growth of the wind sector in Ireland could support 23,850 jobs (construction and operational phases) by 2030. The report states that if Ireland chooses to not develop any more wind, then by 2030 the country will be reliant on natural gas for the majority of electricity generation, at a cost of €671 million per annum in fuel import costs.

A 2017 report issued by WindEurope, entitled '*Wind energy in Europe: Scenarios for 2030*'[29] details various scenarios in Europe in respect to the EU target for renewable energy. According to WindEurope's High Scenario, which assumes favourable market and policy conditions including the achievement of a 35% EU renewable energy target (slightly higher than the 32% EU target for renewables), "*397 GW of wind energy capacity would be installed in the EU by 2030, 298.5 GW onshore and 99 GW offshore. In this scenario, the wind energy industry would invest €351bn by 2030, and it would create 716,000 jobs".*

A March 2021 report by MaREI, the SFI Research Centre for Energy, Climate and Marine, hosted by University College Cork[30], estimates that were Ireland to meet the government's target of net-zero carbon emissions by 2050, at least 25,000 jobs would be created in the onshore and offshore wind sectors.

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[25] *KPMG on behalf of Wind Energy Ireland. 2021. Economic impact of onshore wind in Ireland. Available at:* https://windenergyireland.com/images/files/economic-impact-of-onshore-wind-in-ireland.pdf
[26] *Wind Energy Ireland, 2025. Irish wind farms provide a third of our power in 2024 and set new energy milestone.* https://windenergyireland.com/latest-news/7827-irish-wind-farms-provide-a-third-of-our-power-in-2024-and-set-new-energy-milestone
[27] *The Sustainable Energy Authority of Ireland (SEAI), 2021. Wind Energy Roadmap 2011-2050. Available at:* https://www.seai.ie/sites/default/files/publications/Wind_Energy_Roadmap_2011-2050.pdf
[28] *Pőyry, 2014. The Value of Wind Energy to Ireland. Available at:* https://windenergyireland.com/images/files/9660bd6b05ed16be59431aa0625855d5f7dca1.pdf
[29] *WindEurope, 2017. Wind Energy in Europe Scenarios for 2030 Available at:* https://windeurope.org/wp-content/uploads/files/about-wind/reports/Wind-energy-in-Europe-Scenarios-for-2030.pdf
[30] *MaREI, 2021. Our Climate Neutral Future: Zero by 50. Available at:* https://www.marei.ie/wp-content/uploads/2021/03/Our-Climate-Neutral-Future-Zero-by-50-Skillnet-Report-March-2021-Final-2.pdf

A more recent report issued by WindEurope in February 2022, titled "*Wind Energy in Europe: 2021 Statistics and the Outlook for 2022-2026*"[31], further details various scenarios in Europe with respect to the EU's targets for renewable energy. According to this report, "*Europe installed 17GW (11 GW in the EU-27) of new wind capacity in 2021. This is not even half of what the EU should be building to be on track to deliver its 2030 Climate Energy Goals.*" The report also states that "*The European Commission modelling shows that we need at least 79 GW offshore wind but National Governments have pledged to build at least 92 GW offshore wind capacity by 2030.*"

As of January 2026, there were 6.48GW of wind energy capacity installed on the island of Ireland[32]. Of this, 4.9GW was installed in the Republic of Ireland. The majority of the Republic of Ireland's installed wind energy capacity is located in Counties Kerry, Cork, Donegal, Mayo, Galway and Clare, contributing to employment potential on the island of Ireland.

5.3.6.2.4 Economic Value

A 2019 report by Baringa, "*Wind for a Euro: Cost-benefit analysis of wind energy in Ireland 2000-2020*" [33], analysed the financial impact for end consumers of the deployment of wind generation in Ireland over the period 2000-2020. The report calculates how the costs and benefits for consumers would have differed if no wind farms had been built. The analysis indicated that the deployment of 4.1 GW of wind generation capacity in Ireland between 2000 and 2020 (2018-2020 results being projective) would result in a total net cost to consumers, over 20 years, of €63 million, which equates to a cost of less than €1 per person per year since 2000. Further cost benefit analysis noted that wind energy has delivered €2.3 billion in savings in the wholesale electricity market. As such, the economic benefit of renewable energy to consumers is greater than what would have been if Ireland did not invest in wind power. This corresponds with the Deloitte report[34] which indicates that more wind energy feeding into the national grid will result in lower and more stable energy costs for consumers.

Furthermore, in 2020, IWEA released its 70by30 Implementation Plan Reports[35], which further detail the savings that can be made from the continuation of onshore wind. The report, entitled "*Saving Money - 70 by 30 Implementation Plan*", notes that "*Baringa calculated previously that if onshore wind in Ireland can be delivered at €60/MWh, on average, between 2020 and 2030, than the 70 per cent renewable electricity target set out in the Climate Action Plan will actually be cost-neutral for the consumer. If we can achieve prices under €60/MWh then Ireland's electricity consumers will be saving money*".

The Proposed Project will, if consent is granted, contribute to the economic value that renewable energy brings to the country.

5.3.7 Land-Use Patterns and Activities

The land uses within the Project Site are a mixture of natural revegetation of cutaway and degraded bog, public road corridor, enhanced rehabilitation under the Peatland Climate Action Scheme (PCAS), ongoing decommissioning and monitoring works under Integrated Pollution Control Licence (IPC) Licence (P0503-01), and existing wind energy infrastructure. The primary surrounding land use within the Population Study Area comprises a mix of BnM landholdings, forestry, agricultural land, cutover and cutaway peatland, peatland rehabilitation, one-off rural housing, small village settlements, and

[31] *WindEurope, 2022. Wind Energy in Europe 2021 Statistics and the Outlook for 2022-2026 Available at:* https://windeurope.org/intelligence-platform/product/wind-energy-in-europe-2021-statistics-and-the-outlook-for-2022-2026/
[32] *EirGrid,* https://www.eirgrid.ie/grid/system-and-renewable-data-reports
[33] *Baringa, 2019. Wind for a Euro: Cost Benefit Analysis of Wind Energy in Ireland 2000-2020 Available at:* https://www.baringa.com/en/insights/low-carbon-futures/our-market-and-policy-studies-in-ireland/wind-for-a-euro/
[34] *Deloitte, Irish Wind Energy Association 2009 Jobs and Investment in Irish Wind Energy Powering Ireland's Economy. Available at:* https://windenergyireland.com/images/files/9660bd5e72bcac538f47d1b02cc6658c97d41f.pdf
[35] *IWEA, 2020. 70by30 Implementation Plan. Available at:* https://windenergyireland.com/images/files/70by30-implementation-plan-reports.pdf

existing energy infrastructure, including power plants, solar farms, and wind energy developments. The total area of farmland within the Population Study Area measures approximately 12,290.80hectares, comprising 47.09% of the Population Study Area which measures approximately 26,100ha, according to the CSO Census of Agriculture 2020. The average farm size in the Population Study Area is 44 hectares. There are 310 farms located within the Population Study Area. The majority of farmed land is grassland, reflecting a landscape primarily used for grazing. Table 5-6 below details the farm size and classification within the Population Study Area.

Table 5-6 Farm Size and Classification within the Population Study Area in 2020 (Source: CSO)

Electoral Division	No of holdings	Average size (ha)	Median age of holder	Livestock units	Area farmed (ha)	Total Cereals (ha)	All grassland (ha)
Clonbullogue	44	47.8	55	3159.8	2097.7	144.6	1928.2
Edenderry Rural	35	47.5	61	3359.5	1662.5	0	1646.5
Killinthomas	8	48.7	53	682.3	449.4	0	354.2
Kilmeage North	23	50.3	55	510.4	1157.6	0	514
Kilpatrick	32	18.1	59.5	855.4	578.7	0	578.7
Lullymore	9	69.5	58	363.2	625.4	0	274.6
Carbury	67	32.2	60	3301.9	2157.4	87.1	2050.5
Rathangan	19	60.7	60	846.8	1153.8	398.3	723.8
Robertstown	30	22.8	54	891.9	683.9	0	671.2
Cloncurry	15	53.6	64	1170.7	804.2	0	627.6
Downings	28	32.9	55.5	1306.7	920.2	0	872.6
Total	310	44 (Average)	57.72 (Average)	16,449	12,290.80	630	10241.9
Size of Population Study Area				26,100 hectares			
Total Area Farmed within the Population Study Area				12,290.80 hectares			
Farmland as % of Population Study Area				47.09%			

Industrial scale peat extraction was permanently ceased by BnM at the Project Site in June 2020. BnM's statutory duties to discharge the conditions of its IPC Licence (Ref. P0503-01) from the EPA for the Allen Bog Group, which encompasses part of the Project Site, remain ongoing. These ongoing duties, such as environmental monitoring, do not facilitate the continuation of peat extraction, but rather ensure compliance with BnM's extant IPC Licence.

As part of the IPC licence rehabilitation requirements, BnM is required to produce peatland rehabilitation plans: refer to Appendix 2-4 for the Draft Cutaway Bog Decommissioning and

Rehabilitation Plans (hereafter referred to as Draft Rehabilitation Plans) for the 14 no. bogs which are part of the Allen Bog Group in which part of the Project Site (Proposed Wind Farm site) is located. These plans have considered the Proposed Project footprint and demonstrate that both peatland rehabilitation and renewable energy can coexist harmoniously onsite.

PCAS is a form of enhanced peatland rehabilitation which is above and beyond the rehabilitation requirement of the IPC Licence for part of the Project Site. PCAS has been completed at Lodge Bog which is located within the Project Site. The PCAS activities at Lodge Bog include drain blocking and reprofiling, re-wetting of peat soils and wetland management, seeding of targeted vegetation and the promotion of natural revegetation. The Proposed Project has been designed with consideration to the ongoing PCAS, and no Proposed Project infrastructure will infringe on these areas within Lodge Bog. Lessons learned from previous project, i.e., the existing Cloncreen Wind Farm, have confirmed that PCAS and renewable energy can coexist harmoniously onsite.

5.3.7.1 Equine Industry

There are 7 no. equestrian facilities identified within the Population Study Area. Bullhorn Ranch equestrian facility, Calbury, Co. Kildare is the nearest equestrian facility, located approximately 1.4 km east of the nearest Proposed Turbine (T46). The other equestrian facilities near to the Proposed Wind Farm are Lullymore House, located in Lullymore, Co. Kildare, approximately 1.9 km east of the nearest Proposed Turbine (T37) and Irish Emerald Stud, located in Carbury, Co. Kildare, approximately 2.5 km east of the nearest Proposed Turbine (T46).

There have been no known studies carried out in Ireland on the impacts of wind farms on the equine industry. In 2014 Marshall Day Acoustics published a document entitled *"Summary of research of noise effects on Animals"*[36]. The Marshall Day study specifically assessed the impacts of varying levels of noise on horses in three differing behavioural settings. The three behavioural settings studied included horses in stables, breeding mares and racing horses.

Horses in Stables

The study by Marshall Day Acoustics found that horses, stabled at the Flemington Racecourse in Australia at the same time as a music concert took place on the site, when exposed to $L_{Aeq,15min}$ of 54-70 dB, showed little response to the music noise unless the noise was particularly impulsive. The horses stabled at Flemington Racecourse were thoroughbreds, and stables were located 200 metres from the concert.

Breeding Mares

A study by Le Blanc et al. (1991) and summarised by Marshall Day studied the effects of simulated aircraft noise over 100 dB and visual stimuli on pregnant mares in the United States. Aircraft noise generates infrasound, which is also generated from wind turbine, cars and trains. The study focused on pregnancy success, behaviour, cardiac function, hormonal production, and rate of habitation. Noise levels of 100 dB are similar to that of the Vestas 150 turbine operating at 5m/s wind speed, as indicated in Chapter 12: Noise and Vibration. Le Blanc concluded the following:

> *" [the] birth success of pregnant mares was not affected by F-14 jet aircraft noise. While the 'fright-flight' reaction was initially observed, the mares did adapt to the noise."*

[36] *Marshall Day Acoustics, 2014. Summary of Research of Noise Effects on Animals Available at: https://www.epa.govt.nz/assets/FileAPI/proposal/NSP000033/Hearings/3a009a795c/BoD-Volume-4-31-Siiri-Wilkening-10-March-2014-Summary-of-research-of-noise-effects-on-animals.pdf*

Racehorses

Marshall Day Acoustics concluded the following in relation to their study on the impacts of noise on racehorses:

> *"Marshall Day Acoustics have observed horses grazing in paddocks directly under the main approach path of the Christchurch International Airport where noise levels are in excess of 90 dB (LAmax) during an aircraft flyover. Although these horses are arguably "used to" the noise, there was generally little recognition by them of an aircraft passing, let alone any sign of disturbance. This tends to support the conclusions by Le Blanc et al. (1991)."*

Cattle

Scientific evidence relating specifically to the effects of wind turbine noise on cattle and livestock remains limited. This is confirmed by the European Union Reference Centre for Animal Welfare for Ruminants and Equines[37] which notes that scientific knowledge relating directly to wind turbines and bovine welfare is lacking, and that recommendations on appropriate setback distances are therefore unknown. In the absence of turbine-specific evidence, reference is made below to the wider literature on noise as an environmental stressor for cattle.

Within Ireland, wind farms are commonly located on agricultural land, with livestock grazing within the same fields as, or in fields adjoining, operational turbines. No adverse effects on livestock arising from the operation of wind farms in Ireland have been identified to date.

On the basis of the above, and noting that turbine-specific evidence remains limited and that the wider literature indicates cattle have a general capacity to adapt to consistent or recurring noise sources, adverse effects on cattle or livestock arising from the operation of the Proposed Wind Farm are considered unlikely to occur.

5.3.7.1.2 *Guidance*

In the absence of national policy or guidance in relation of the development of wind farms near stud farms/equestrian centres, MKO has reviewed the British Horse Society's *'Advice on Wind Turbines and Equestrian Access'*. A copy of the guidance document is included in Appendix 5-1 of this EIAR.

The British Horse Society policy statement states the following in relating to the siting of wind turbines in the vicinity of equine businesses:

> *"The British Horse Society strongly recommends a minimum separation distance of blade* ***tip height plus 10%*** *– 'fallover distance' or 'fallover' – between a commercial turbine, one of multiple on site, and any route used with horses and a separation distance of twice tip height for microgeneration units",*

This is an update from the previous guidance of *"a minimum separation distance of 200m or three times blade tip height (whichever is greater) will be required between a turbine and any route used by horses or a business with horses.'"*

5.3.7.1.3 *Summary*

On a precautionary basis, i.e., under the assumption that every inhabitable dwelling owns a horse or horses, the closest inhabitable dwelling, not including involved properties, is located approximately 894 metres (over four-times blade tip height) from the nearest Proposed Turbine location. As mentioned previously, the closest stud farm/equestrian facility is located approximately 1.4km from the nearest

[37] https://www.eurcaw-ruminants-equines.eu/wp-content/uploads/2024/10/Q2E-Ruminants-Equines-2024-005.pdf

Proposed Turbine (T46). In accordance with the British Horse Society guidance, a recommended minimum separation distance of turbine blade tip height plus 10% is applied. Under a precautionary scenario, the greatest tip height proposed for the Proposed Turbines was utilised to ensure the minimum separation distance was achieved and exceeded in all instances. Therefore, based on a blade tip height of 220 m the minimum separation distance between any equestrian facility and the Proposed Turbines is approximately 242 m. In all instances, the separation distances between the Proposed Turbines and nearby equestrian receptors substantially exceed the recommended minimum distance.

As detailed in Section 3.2.6.1.1 of Chapter 3: Site Selection and Reasonable Alternatives and Section 4.4.1.9 of Chapter 4: Description of the Proposed Project as part of the proposed amenity access track within the Proposed Wind Farm, there will be a dedicated 8.5km circular trail for equestrian access only which will traverse within and around the Proposed Wind Farm to facilitate equestrian access by the local community throughout the operational phase of the Proposed Wind Farm. The potential effect on horses as a result of the Proposed Turbines has been considered in the impact assessment provided in Section 5.7.3.1 above.

5.3.8 Services

The nearest town is Rathangan, located approximately 2 km south of the Proposed Wind Farm infrastructure at its closest point (i.e., T14), in Co. Kildare. The town provides a range of services such as educational, recreational, spiritual and retail. Edenderry town is approximately 2.2km northwest of the Proposed Wind Farm infrastructure (i.e., T32). Both these towns are located within the Population Study Area. Additionally, the nearest county town, Kildare town, where larger scale retail and services are available, lies approximately 10km southeast of the Proposed Wind Farm infrastructure (i.e., T02).

5.3.8.1 Education

The nearest school to the Proposed Wind Farm infrastructure is Ticknevin National School and St Brigid's National School, Ticknevin, Carbury, located approximately 1.5 km northeast of the nearest Proposed Turbine (T46). The nearest Secondary School (St. Mary's Secondary School) is located approximately 4km northwest of the nearest Proposed Turbine (T32), in Edenderry. There are 12 National and Secondary schools located within the Population Study Area and 19 National and Secondary schools located within the 5 km of the Project Site, namely:

- Ticknevin National School, Tickvenin, Carbury, located approximately 1.5 km northeast of the nearest Proposed Turbine (i.e., T46);
- Killina National School, Carbury, located approximately 2.7 km northeast of the nearest Proposed Turbine (i.e., T46);
- St Conleth's National School - Derrinturn, Carbury, located approximately 4.3 km northeast of the nearest Proposed Turbine (i.e., T30);
- St. Mary's Primary School Edenderry, Edenderry located approximately 3.8 km northwest of the nearest Proposed Turbine (i.e., T32);
- St. Mary's Secondary School Edenderry located approximately 4km northwest of the nearest Proposed Turbine (i.e., T32);
- Saint Patrick's Primary School, Edenderry located approximately 4km northwest of the nearest Proposed Turbine (i.e., T32);
- Edenderry 2 National School, Edenderry located approximately 4.6km northwest of the nearest Proposed Turbine (i.e., T32);
- Gaelscoil Éadan Doire (Bilingual school), Edenderry located approximately 4.5km northwest of the nearest Proposed Turbine (i.e., T32);
- Scoil Bhríde Primary School Edenderry located approximately 4.5km northwest of the nearest Proposed Turbine (i.e., T32);
- St Patricks National School Clonbullogue located approximately 2.6km west of the nearest Proposed Turbine (i.e., T19);

- St. Patrick's Boys National School, Rathangan located approximately 2.6km south of the nearest Proposed Turbine (i.e., T14);
- Scoil Bhride N S, Rathangan located approximately 2.7km south of the nearest Proposed Turbine (i.e., T04);
- Ardscoil Rath Iomgháin, Rathangan located approximately 3.3km south of the nearest Proposed Turbine (i.e., T04);
- Oaklands Community College, Edenderry located approximately 3.9km northwest of the nearest Proposed Turbine (i.e., T32);
- Scoil Mhuire National School, Allenwood located approximately 0.07km north of the Proposed Grid Connection underground electrical cabling route;
- Coill Dubh National School, Blackwood located approximately 0.9km north of the Proposed Grid Connection underground electrical cabling route;
- S N Baile Roibeaird, Roberstown located approximately 2km south of the Proposed Grid Connection underground electrical cabling route;
- St. Farnan's Post Primary School, Prosperous located approximately 1.1km north of the Proposed Offsite Substation;
- Scoil an Linbh Iosa, Prosperous located approximately 1.2km north of the Proposed Offsite Substation.

5.3.8.2 Access and Public Transport

Part of the Project Site is currently served by a number of existing tracks and access roads due to its previous use as a commercial bog (i.e part of Allen Bog Group). The construction phase of the Proposed Project will utilise 7 no. access junctions. Of the 7 no. access junctions there are 10 no. associated site entrances proposed to be used during the construction phase. Of these site entrances, 4 no. are existing access junctions that will be upgraded, and 8 no. are proposed new site entrances. The operational phase will utilise 10 no. site entrances to facilitate maintenance and monitoring activity and 3 no. site entrances for amenity access.

A Local Link service 888 travels from Athy Co. Kildare to Allenwood Co. Kildare every 3-4 hours daily, passing through Kilberry, Kildangan, Monasterevin, and Rathangan Co. Kildare. This route utilises the R414 road to south of the Proposed Wind Farm to the east of the Proposed Wind Farm. Go-Ahead Ireland buses 120, 120A, 120E, 120X connecting Edenderry Co. Offaly to Bachelor's Walk, Co. Dublin run via Carbury, Allenwood, Newbridge, Kilmeague, Robertsown, Prosperous Church all located within Co. Kildare. The 120, 120A, 120E, 120X service utilises the R402 road along the Proposed Grid Connection at Allenwood and Prosperous. The 120C and 120D service connecting Tullamore to Edenderry and Enfield with all locations in Co. Offaly. The 120F service which connects Dublin Conolly station to Newbridge will utilise the diversion routes that will be in place during the construction of the Proposed Grid Connection underground electrical cabling route. Service No 126x, connects Dublin to Rathangan which is located approximately 2km south of the Proposed Wind Farm. Service No 821 connects Newbridge to Prosperous located on the Proposed Grid Connection underground electrical cabling. Details regarding the diversion routes are located in Section 15.1.8 of Chapter 15: Material Assets.

The 763 connects Edenderry to Dublin City on an hourly basis also stopping at Allenwood and Carbury.

There is no train service connecting the region to other parts of the country with the nearest train station located in Kildare town, approximately 9.9 km south of the nearest Proposed Turbine (i.e., T17). This train station includes for a number of routes which service the following stops: Dublin, Limerick, Galway, Westport, Waterford, and Tralee.

5.3.8.3 Amenities and Community Facilities

Most of the amenities and community facilities, including GAA and other sports clubs, youth clubs and recreational areas available in the Population Study Area are in the nearby settlements of Edenderry Co. Offaly and Allenwood, Rathangan and Robertstown in Co. Kildare. Other amenities in the area

include the Grand Canal, Killinthomas Wood, Ticknevin Bridge, Carbury Castle and Motte, Kinnafad Castle and Black Castle Bog. These amenities are also of relevant from a touristic perspective and are further detailed in Section 5.3.9.

The Grand Canal Greenway hiking trailhead is located near the northern side of the Proposed Wind Farm in Edenderry town, Co. Offaly.

Community Benefit proposals, which would enhance local amenities and community facilities are described in Section 4.10 of Chapter 4: Description of the Proposed Project.

5.3.9 Tourism

5.3.9.1 Tourism Numbers and Revenue

Tourism is one of the major contributors to the national economy and is a significant source of full-time and seasonal employment. The report "*Key Tourism Facts 2024*"[38], pertaining to domestic and international tourism volumes for Ireland, was published by Failte Ireland in August 2025 for the year 2024. In 2024, out-of-state (Overseas and Northern Ireland) tourist expenditure amounted to €6.6 billion. With a further €1.5 billion spent by overseas visitors on fares to Irish carriers, taking foreign exchange earnings to €8 billion. Domestic tourism expenditure amounted to €3.6 billion, making tourism a €12 billion industry. The Central Statistics Office's estimates the number of people employed in 'Tourism Industries' to be 226,300 in Q3 2024 through an alternative method of estimating employment using PAYE tax data. Self-employed and primarily pensioners are excluded from the headcount.

Key Tourism Facts 2024, published in 2025 does not provide the same level of detail in terms of tourist numbers and expenditure as previous years of the same report as a result of a change in the CSO's data collection methodology, however, it does note that

"Every €1m of tourist expenditure helps to support 20 employees in tourism industries."

The Republic of Ireland is divided into seven tourism regions. Table 5-7 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2024 ('*Key Tourism Facts 2024*, Fáilte Ireland, August 2025).

Table 5-7 Overseas Tourists Revenue and Numbers 2024 (Source: Failte Ireland)

Region	Total Revenue (€m)	Total Number of Non-Domestic Tourists (000s)
Dublin	€2,383m	4,094
Mid-East/Midlands	**€536m**	**804**
South-East	€323m	530
South-West	€1,168m	1,442
Mid-West	€536m	827
West	€847m	1,226

[38] *Fáilte Ireland (2025) Key Tourism Facts 2024 National Summary. Available at:* https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Research/Key%20Tourism%20Facts%20and%20Figures%202024/FI_Key-Tourism-Facts-2024_National-Summary_1.pdf?ext=.pdf

Border	€376m	525
Total	**€6,169 m**	**9,448**

The Population Study Area is located within the Mid-East/Midland Region. According to "*Island of Ireland Overseas Tourism Performance Facts and Figures 2023*" (Tourism Ireland, 2023), the Mid-East/Midland Region which comprises Counties Offaly, Kildare, Laois, Longford, Louth, Meath, Westmeath and Wicklow, benefited from approximately 8.7% of the total number of overseas tourists to the country and approximately 9.0% of the associated tourism income generated in Ireland in 2023.

Table 5-8 presents the breakdown of overseas tourist numbers and revenue to the Mid-East/Midlands region based on historic Fáilte Ireland 2017 dataset ('*2017 Topline Tourism Performance by Region,* Fáilte Ireland, August 2018)[39]. As can be seen below, County Kildare has the second highest number of overseas tourists visiting the Region during 2017 and tourism revenue at €127 million. More recent Fáilte Ireland publications no longer provide data at this regional level in a directly comparable format; therefore, this dataset is included to provide indicative historical context.

Table 5-8 Overseas Tourism to Mid-East/Midland Region during 2017 (Source: Fáilte Ireland)

County	Revenue Generated by Overseas and Domestic Tourists (€m)	No. of Overseas Tourists (000s)
Kildare	127	211
Laois	44	43
Longford	28	24
Meath	73	162
Offaly	46	52
Westmeath	64	103
Wicklow	122	275

5.3.9.2 Tourist Attractions

There is one identified tourist attraction located within the Project Site; i.e., the Crabtree Butterfly Reserve.

Tourism Attractions within the Population Study Area

Key tourist attractions within County Kildare and Offaly and located within the Population Study Area include the Crabtree butterfly Reserve, Grand Canal, Killinthomas Wood, Lullymore Heritage & Discovery Park, Ballyteague Forest, Ticknevin Bridge, Carbury Castle and Motte, Carbury Bog, Kinnafad Castle, Cloncreen Wind Farm Amenity Trail, Ballynafagh Lake and Black Castle Bog.

[39] *Failte Ireland (2018) 2017 Topline tourism performance by region. Available at:* https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-tourism-performance.pdf?ext=.pdf

1. **Crabtree Nature Reserve**

Crabtree Nature Reserve is a locally important biodiversity and recreational site located in Lullymore, Co. Kildare. The reserve comprises restored peatland habitats, wildflower meadows and woodland areas which support a variety of butterfly species and other wildlife. It provides informal walking routes and contributes to local nature-based tourism and outdoor recreation. The reserve is located approximately 390m from the nearest Proposed Turbine (i.e., T37).

2. **Killinthomas Wood**

Killinthomas Wood is a 70ha wooded area offering approximately 10km of walking trails. Killinthomas Wood is located along the southern boundary of the Proposed Wind Farm approximately 380m from the closest Proposed Turbine T04. The proposed amenity access tracks will enable connectivity between the Proposed Wind Farm and Killinthomas Wood.

3. **Ballyteague Forest**

Ballyteague Forest is a Coillte-managed forest located in County Kildare, offering recreational walking opportunities and contributing to the amenity and tourism value of the wider landscape. The forest supports a mix of commercial forestry and biodiversity habitats and is used for outdoor activities including walking and nature observation. It is located approximately 4.6km from the nearest Proposed Turbine (i.e., T01).

4. **Carbury Castle and Motte**

The Carbury Castle is a ruined fortified manor house situated atop Carbury Hill in the townland of Carbury, near the border between Co. Kildare and Co. Offaly. It was first built by the Normans and the motte on the hill was probably built by Meiler FitzHenry and it comprises multiple phases of construction, including a 12th-century motte-and-bailey, a 14th-century stone castle, and a late 16th/early 17th-century fortified house. The castle is both a Protected Structure and a Recorded Monument. This is located approximately 4 km north from the Proposed Wind Farm at its nearest point (i.e., T30).

5. **Carbury Bog**

Carbury Bog (NHA 001388) is a 138-hectare raised bog in County Kildare, recognized as a Natural Heritage Area (NHA). Managed by the local community since 1906, it features high-quality bog mosses and serves as the headwaters of the River Boyne. The Carbury Bog is located approximately 4.5 km north from the Proposed Wind Farm at its nearest point (i.e., T30). Carbury Bog NHA is a site of considerable conservation significance comprising of raised bog, a rare habitat in the EU and one that is becoming increasingly scarce and under threat in Ireland. The area has historical links to the Irish myth of the Celtic Goddess Boann and the Salmon of Knowledge.

6. **The Grand Canal**

The Grand Canal spans 143 km in length, includes 43 Locks and was built between 1756-1804. It functioned as a cargo barge until 1960 and was designated proposed Natural Heritage Area status in 1995. The Canal begins at the River Liffey in Dublin City and travels west for approximately 45 km where it bifurcates into a northern and southern route outside of Roberstown in Co. Kildare which is located approximately 1.2km south from the Proposed Grid Connection underground electrical cabling route. The northern route moves along in a northwestern direction, traversing to the north of the Proposed Wind Farm near to Turbines T46, T30 and T32. The southern route travels in a southwestern direction near the southeast of the Proposed Wind Farm between Rathangan and Roberstown continuing south.

Points of interest along this portion of the Grand Canal include several protected structures listed in the National Inventory of Architectural Heritage: Ticknevin Lock, Ticknevin Bridge, Blundell Aqueduct,

milestone, Downshire Bridge, Colgans Bridge, Rathmore Bridge. Offaly County Council recognises the Grand Canal and its towpaths, including the Grand Canal Greenway, as an important recreational corridor and a valuable tourism asset within the county. Both Kildare County Council and Offaly County Council encourages promotion of the Canal in relation to these activities and supports the linkage of future recreational routes to the Canal that are compatible with nature conservation and other environmental policies.

7. Kinnafad Castle

Kinnafad Castle is a 14th-century tower house ruin situated on the banks of the River Boyne near Edenderry in County Offaly. Built by the De Berminghams to defend a river pass, this solid, rectangular fortification remains in ruins, serving as a historic landmark in Ireland. It is located approximately 5km northwest of the Proposed Wind Farm at its nearest point i.e., T32.

8. Cloncreen Wind Farm Amenity Trail

The Cloncreen Wind Farm Amenity Trail is a recreational facility located within Cloncreen Wind Farm adjacent to the east of the Proposed Wind Farm (T22), comprising a network of walking routes through rehabilitated peatland landscapes. The trail provides opportunities for walking, cycling, nature appreciation and outdoor recreation, while also facilitating public access to a renewable energy development. The amenity trail contributes to the recreation and tourism offering of the wider area and demonstrates the ability for renewable energy infrastructure and amenity use to coexist. The Cloncreen Wind Farm Amenity Trail is located immediately adjacent to the Proposed Wind Farm and forms part of the wider network of recreational amenities within the locality.

9. Ballynafagh Lake

Ballynafagh Lake is a well-established nature conservation and recreation destination located within the Population Study Area. The lake and its surrounding habitats support a diverse range of birdlife, wetland habitats and wildlife interest, making it an important location for nature appreciation, birdwatching and informal recreation. The area attracts visitors seeking outdoor recreational opportunities and contributes to the ecological and tourism value of the region. It is located approximately 1.8km north of the Proposed Grid Connection underground electrical cabling.

10. Black Castle Bog

The Black Castle Bog is located approximately 6.5 km northeast of the proposed Wind Farm at its nearest point (i.e., T32), which is listed as a Natural heritage Area (NHA). It comprises a raised bog that includes both areas of high bog and cutover bog. The raised bog is of particular interest as it is one of the most easterly remaining raised bogs in the country.

11. Lullymore Heritage & Discovery Park

Lullymore Heritage & Discovery Park is a significant tourism asset in County Kildare, attracting families, school groups, and visitors year-round due to its diverse mix of heritage exhibitions, peatland biodiversity trails, and recreational amenities. The park offers a 9,000-year journey through Irish history alongside extensive outdoor walking routes and family-friendly facilities such as playgrounds, a pet farm, and seasonal events, all of which contribute to sustained visitor footfall and positive local economic activity. It is located approximately 1.6 km east from the nearest Proposed Turbine (T37).

12. Lullymore West Nature reserve

Lullymore West is a cutaway bog from which peat was commercially extracted in the 20th century. The bog has regenerated to become an important refuge for wildlife. Lullymore West Bog was donated by

BnM to the Irish Peatland Conservation Council (IPCC) for conservation in 2005. It is located approximately 1.2km east from the nearest Proposed Turbine (T37).

Within the wider landscape there are a range of tourist attractions. These include archaeological sites and monuments, which are further detailed in Chapter 14: Cultural Heritage. Tourist attractions within the wider landscape include the following:

Within 10 km

- Carrickoris Castle, located approximately 6km north from the nearest Proposed Turbine (T32);
- Brian Clarke Park located approximately 3km northwest of the nearest Proposed Turbine (T32);
- Blundell Aqueduct, a historical landmark located approximately 1.3km northwest of the nearest Proposed Turbine (T32);
- Downshire Bridge located approximately 1.9km northwest of the nearest Proposed Turbine (T32);
- Derries Motocross Track, an Off-road racing venue, located approximately 1km northwest of the nearest Proposed Turbine (T23);
- Ballyfore GAA Club located approximately 6.4km northwest of the nearest Proposed Turbine (T22);
- Irish Parachute Club, located approximately 5.8km southwest of the nearest Proposed Turbine (T19);
- Blundell Castle, located approximately 3.1km northwest of the nearest Proposed Turbine (T32);
- Highfield Golf Club & FootGolf Kildare, located approximately 5km north of the nearest Proposed Turbine (T32);
- Edenderry GC H17, golf club, located approximately 4.5km north of the nearest Proposed Turbine (T32);
- Hill of Allen, a mountain peak, located approximately 5.7km south of the Proposed Grid Connection underground cabling route;
- Carbury GAA Club, located approximately 5.2km southeast of the nearest Proposed Turbine (T30);
- Ticknevin Bridge, located approximately 2km north of the nearest Proposed Turbine (T46);
- Redhills Adventure Kildare, located approximately 8.5km south of the nearest Proposed Turbine (T02);
- Ellistown GAA Club, located approximately 6.8km south of the nearest Proposed Turbine (T02);
- Rahin Woods, located approximately 9.6km north of the nearest Proposed Turbine (T32);
- The Kildare Maze, located approximately 2km north of the Proposed Grid Connection underground cabling route;
- Ballynafagh Lake, located approximately 1.8km north of the Proposed Grid Connection underground cabling route;
- Donadea Forest Park, located approximately 5.7km north of the Proposed Grid Connection underground cabling route;
- Clonfert Farm, located approximately 9.5km northeast of the Proposed Grid Connection underground cabling route;
- Liffey Walk Clane, located approximately 4.5km east of the Proposed Grid Connection underground cabling route.

Within 20 km

- Moore Abbey Woods, located approximately 12.6km southwest of the nearest Proposed Turbine (T14);
- Kildare Village, located approximately 10.8km southeast of the nearest Proposed Turbine (T02);
- The Curragh Racecourse, located approximately 12.6km southeast of the nearest Proposed Turbine (T01);
- Irish National Stud & Gardens, located approximately 12.3km southeast of the nearest Proposed Turbine (T02);
- Derryounce Lakes and Walkways, located approximately 12.8km southwest of the nearest Proposed Turbine (T14);
- Clonmore Riding Centre, located approximately 10.5km northwest of the nearest Proposed Turbine (T32);
- Mulgeeth Wetland SAC, located approximately 11km northeast of the nearest Proposed Turbine (T46);
- Emo Court House, located approximately 18.8km southwest of the nearest Proposed Turbine (T14);
- Laois Flying Club, located approximately 19km southwest of the nearest Proposed Turbine (T14);
- Naas Park, located approximately 7.9km southeast of the Proposed Offsite Substation;
- The Steam Museum & Lodge Park Walled Garden, located approximately 10.7km northeast of the Proposed Grid Connection underground cabling route.

5.3.9.3 Tourist Attitudes to Wind Farms

5.3.9.3.1 *Scottish Tourism Study 2021*

BiGGAR Economics undertook an independent study in 2021, entitled "*Wind Farms & Tourism Trends in Scotland: Evidence from 44 Wind Farms*"[40] to understand the relationship, if any, that exists between the development of the onshore wind and sustainable tourism sectors in Scotland. In recent years, these sectors have grown significantly in Scotland. However, it could be argued that if there was any relationship between the growth of onshore wind energy and tourism, it would be at a more local level. This study therefore considered the evidence at a local authority level and in the immediate vicinity of constructed wind farms.

Since 2009, the onshore wind sector has expanded considerably in Scotland. Employment in tourism-related sectors in Scotland also grew by 20% during the years since 2009. Analysis of the rates of change in the number of onshore wind turbines and in tourism-related employment in local authority areas, found that there is no correlation between the two factors. This applies to whether the analysis covers the decade between 2009 – 2019, or the more recent 2015 – 2019 period.

The research also analysed trends in tourism employment within the immediate vicinity of wind farm developments. This included 16 no. wind farms with a capacity of at least 10MW that became operational between 2015 and 2019. Analysis of trends in tourism employment in the locality of these wind farms (study areas were based on a 15 km radius) found that 11 of these 16 areas had experienced more growth in tourism employment than for Scotland as a whole. For 12 of the 16 wind farms, trends in tourism employment in the locality had outperformed the local authority area in which they were based.

[40] *BiGGAR Economics, 2021. Wind Farms & Tourism Trends in Scotland: Evidence from 44 Wind Farms. Available at* https://biggareconomics.co.uk/wp-content/uploads/2021/11/BiGGAR-Economics-Wind-Farms-and-Tourism-2021.pdf

The research also re-examined 28 wind farms constructed between 2009 and 2015 that had been analysed in a previous study published in 2017, finding that the localities in which they were based had outperformed Scotland and their local authority areas in the majority of cases. Moreover, the analysis, found that in the seven areas which had underperformed their local authority areas in the 2017 study, four had done better than their local authorities in the 2015 to 2019 period.

This research analysed trends in tourism employment in the localities of 44 no. wind farms developed in recent years, providing a substantial evidence base.

Overall, the conclusion of this study is that published national statistics on employment in sustainable tourism demonstrate that there is no relationship between the development of onshore wind farms and tourism employment at the level of the Scottish economy, at local authority level, nor in the areas immediately surrounding wind farm development. However, the report also concluded that:

> "*Although this study does not suggest that there is any direct relationship between tourism sector growth and wind farm development, it does show that wind farms do not cause a decrease in tourism employment either at a local or a national level.*"

5.3.9.3.2 Fáilte Ireland Surveys 2007, 2012, and 2026

In 2007, Fáilte Ireland in association with the Northern Ireland Tourist Board carried out a survey of domestic and overseas holidaymakers to Ireland in order to determine their attitudes to wind farms. The purpose of the survey was to assess whether the development of wind farms impacts on the enjoyment of the Irish scenery by holidaymakers. The survey involved face-to-face interviews with 1,300 tourists (25% domestic and 75% overseas). The results of the survey are presented in the Fáilte Ireland Newsletter 2008/No.3 entitled "*Visitor Attitudes on the Environment: Wind Farms*"[41].

The Fáilte Ireland survey results indicate that most visitors are broadly positive towards the idea of building wind farms in Ireland. There exists a sizeable minority (one in seven) however, who are negative towards wind farms in any context. In terms of awareness of wind farms, the findings of the survey include the following:

- Almost half of those surveyed had seen at least one wind farm on their holiday to Ireland. Of these, two thirds had seen up to two wind farms during their holiday.
- Typically, wind farms are encountered in the landscape while driving or being driven (74%), while few have experienced a wind farm up close.
- Of the wind farms viewed, most contained less than ten turbines and 15% had less than five turbines.

Regarding the perceived impact of wind farms on sightseeing, the Fáilte Ireland report states:

> *"Despite the fact that almost half of the tourists interviewed had seen at least one wind farm on their holiday, most felt that their presence did not detract from the quality of their sightseeing, with the largest proportion (45%) saying that the presence of the wind farm had a positive impact on their enjoyment of sightseeing, with 15% claiming that they had a negative impact."*

In assessing the perceived impact of wind farms on beauty, visitors were asked to rate the beauty of five different landscape types: Coastal, Mountain, Farmland, Bogland and Urban Industrial, and then rate on a scale of 1-5 the potential impact of a wind farm being sited in each landscape. The survey found that each potential wind farm must be assessed on its own merits. However, in looking at wind farm developments in different landscape types, the numbers claiming a positive impact on the landscape due to wind farms were greater than those claiming a negative impact, in all cases.

[41] *Fáilte Ireland, 2008. Visitor Attitudes on the Environment – Wind Farms. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf*

Regarding the perceived impact of wind farms on future visits to the area, the Fáilte Ireland survey states:

> *"Almost three quarters of respondents claim that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or have a strong or fairly strong positive impact on future visits to the island of Ireland. Of those who feel that a potentially greater number of wind farms would positively impact on their likelihood to visit, the key driver is their support for renewable energy and potential decreased carbon emissions."*

The report goes on to state that while there is a generally positive disposition among tourists towards wind development in Ireland, it is important also to take account of the views of the one in seven tourists who are negatively disposed towards wind farms. This requires good planning on the part of the wind farm developer as well as the Local Authority. Good planning has been an integral component of the Proposed Project throughout the site design and assessment processes. Reference has been made to the WEDG 2006 and the Draft WEDG 2019, in addition to Wind Energy Ireland (WEI) (previously Irish Wind Energy Association (IWEA)) best practice guidance, throughout all stages, including pre-planning consultation and scoping.

The 2007 survey findings are further upheld by a more recent report carried out by Fáilte Ireland on tourism attitudes to wind farms in 2012. The results of the updated study were published in the Fáilte Ireland Newsletter 2012/No.1 entitled *"Visitor Attitudes on the Environment: Wind Farms – Update on 2007 Research"*[42]. The updated survey found that of 1,000 domestic and foreign tourists who holidayed in Ireland during 2012, over half of tourists said that they had seen a wind turbine while travelling around the country. Of this number of tourists, 21% claimed wind turbines had a negative impact on the landscape. However, 32% said that it enhanced the surrounding landscape, while 47% said that it made no difference to the landscape. Almost three quarters of respondents claim that potentially greater numbers of wind farms would either have no impact on their likelihood to visit or have a strong or fairly strong positive impact on future visits to the island of Ireland.

Further details regarding the general public perception of wind energy, including those living in the vicinity of a wind farm, are presented in Section 5.3.10 below.

5.3.10 Public Perception of Wind Energy

5.3.10.1 Sustainable Energy Authority of Ireland Surveys on Opinions Towards Wind Farms

5.3.10.1.1 *Irish National Survey of Households Near New Commercial Wind and Solar Farms*

Background

In May 2023 the SEAI published a report on the national survey they commissioned on public opinions of new commercial solar or wind farm projects in Ireland[43]. In 2022, surveyors conducted in-person interviews on the doorstep across rural Ireland. The survey included 1,764 households which included 1,116 households within 5 km of a new commercial wind or solar developments, of which 219 were within 1 km of a proposed development.

[42] *Fáilte Ireland, 2012. Visitor Attitudes on the Environment – Wind Farms. Available at:* https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/WindFarm-VAS-(FINAL)-(2).pdf?ext=.pdf

[43] *SEAI, 2023. Irish national survey of households near new commercial wind and solar farms. Available at:* https://www.seai.ie/sites/default/files/publications/SEAI-RESS-National-Survey.pdf

Findings

The results of this survey revealed that 67% of respondents hold positive or very positive views towards wind energy, while 73% of respondents who live less than 1 km away from a Renewable Electricity Support Scheme (RESS) wind project hold positive or very positive attitudes towards wind energy, while 70% of those in the control group hold such views.

The attitude of the residents toward wind energy showed that 59% of all respondents, and 65% of respondents living less than 1 km away from a RESS wind project, felt Ireland has too few wind farms, the same proportion as the control group. A few respondents feel Ireland has too many wind farms, regardless of how close they live to a new wind farm.

The results of this survey will form part of a long-term study to understand the effects of government policies under the RESS on the public support for Ireland's energy transition.

5.3.10.1.2 *Sustainable Energy Authority of Ireland Survey 2003*

Background

The first wind farm in Ireland was completed in 1992 at Bellacorrick, Co. Mayo. By mid-2007 there were 67 wind farms and in 2025 there are almost 400 wind farms on the island of Ireland. Since 1992 wind farms have elicited a range of reactions from the Irish people[44]. In response, the SEAI (formerly SEI) commissioned a survey aimed at identifying public attitudes to renewable energy and to wind energy in Ireland[45]. The results of which were published in 2003 and updated in 2017 as a national survey entitled "*Attitudes Towards the Development of Wind Farms in Ireland*". A catchment area survey was also carried out by to focus specifically on people living with a wind farm in their locality or in areas where wind farms are planned. A more recent survey was published in 2023, entitled *"Irish national survey of households near new commercial wind and solar farms*".

2003 Findings

The 2003 SEAI survey found that the overall attitude to wind farms is very positive, with 84% of respondents rating it positively or very positively, 1% rates wind farms negatively and 14% had no opinion either way. Approximately two thirds of respondents (67%) were found to be positively disposed to having a wind farm in their locality. Where negative attitudes were voiced towards wind farms, the visual impact of the turbines on the landscape was the strongest influence. The findings obtained within wind farm catchment areas showed that impact on the landscape is not a major concern for those living near an existing wind farm.

With regard to the economic and environmental impacts of wind farm development, the national survey reveals that attitudes towards wind energy are influenced by a perception that wind is an attractive source of energy:

> *"Over 8 in 10 recognise wind as a non-polluting source of energy, while a similar number believe it can make a significant contribution to Ireland's energy requirements."*

The study reveals uncertainty among respondents with regards to the issues of noise levels, local benefits and the reliability or otherwise of wind power as an energy source. It goes on to state however that the finding that people who have seen wind farms rate these economic and environmental factors

[44] *Fáilte Ireland (2008) Visitor Attitudes on the Environment – Wind Farms. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/Visitor-Attitudes-on-the-Environment.pdf?ext=.pdf*
[45] *Ibid.*

more favourably is a further indication that experience of such projects tends to translate into positive attitudes towards wind energy.

Similar to the national survey, the surveys of those living within the vicinity of a wind farm also found that the findings are generally positive towards wind farms. Perceptions of the impact of the development on the locality were generally positive, with some three-quarters of interviewees believing it had impacted positively.

In areas where a wind farm development had been granted planning permission but was not yet under construction, three quarters of the interviewees expressed themselves in favour of the wind farm being built in their area. Four per cent were against the development. The reasons cited by those who expressed themselves in favour of the wind farm included the fact that wind energy is clean (78%), it would provide local jobs (44%), it would help develop the area (32%) and that it would add to the landscape (13%). Those with direct experience of a wind farm in the locality are generally impressed with it as an additional feature in the landscape. The report states:

> *"It is particularly encouraging that those with experience of wind turbines are most favourable to their development and that wind farms are not solely seen as good in theory but are also seen as beneficial when they are actually built."*

Few of those living in proximity either to an existing wind farm or one for which permission has been granted believe that the development damages the locality, either in terms of damage to tourism potential or to wildlife. The survey found that there is a clear preference for larger turbines in smaller numbers over smaller turbines in larger numbers.

Survey Update 2017

Additionally, a survey carried out by Interactions in October 2017[46], published by the SEAI, showed that 47% of Irish adults polled were strongly in favour of wind power in Ireland while a further 38% favour it.

The SEAI survey found that the overall attitude to wind farms is very positive, with 84% of respondents in favour of wind energy in Ireland. Approximately two thirds of respondents (70%) would prefer to power their home with renewable energy over fossil fuels, and 45% would be in favour of a wind farm development in their area.

The survey also captured the perceived benefits of wind power among the public. Of those surveyed, three quarters (75%) selected good for the environment and reduced Carbon Dioxide (CO_2) emissions while fewer people, just over two in three, cited cheaper electricity.

Conclusions

The main findings of the SEAI survey indicate that the overall attitude to wind farms is "almost entirely positive". The study highlights that two-thirds of Irish adults are either very favourable or fairly favourable to having a wind farm built in their locality, with little evidence of a "Not in My Back Yard" (NIMBY) effect. The final section of the report states:

> *"The overwhelming indication from this study is that wind energy enjoys great support and, more specifically, that the development of wind farms is supported and welcomed. The single most powerful indicator of this is to be found among those living in proximity to an existing wind farm: over 60% would be in favour of a second wind farm or an extension of the existing one. This represents a strong vote in favour of wind farm developments – especially important*

[46] *Interactions Research, 2017. Segmentation of the Energy Consumer Market in Ireland. Available at: https://interactions.ie/wp-content/uploads/2020/06/20190212-Full-Report.pdf*

since it is voiced by those who know from direct experience about the impact of such developments on their communities."

5.3.10.2 Wind Energy Attitudes Monitor 2024

5.3.10.2.1 *Background*

In late 2024, WEI published the results of their most recent nationwide annual poll on attitudes to wind energy, the Public Attitudes Monitor[47]. The objective of the poll was to "*measure and track public perceptions and attitudes around wind energy across ROI*".

5.3.10.2.2 *Findings*

Between 17th November and 1st December 2024, a nationally representative sample of 1,070 Irish adults together with a booster sample of 210 rural residents participated in the survey. The 2024 results reported that 4 in 5 (80%) are now in favour of wind power (55% of those in favour were 'strongly in favour'). Amongst rural residents, 80% were recorded as having favourable attitudes towards wind power. The survey has been run annually since 2017 and while there has been a marginal decrease in those in favour of wind power nationally during this time (from 85% to 80%) there has been a minor increase in those in favour from the rural population (from 79% to 80%).

Amongst those in favour of wind power, the majority cited that the reduction in electricity prices as their primary perceived benefit of wind energy. Other reasons cited for supporting wind energy developments include: "reduces CO_2 emissions", "good for the environment", "supports energy independence", "creates employment", and "good for local communities".

When questioned about wind energy developments in their local area, 62% of the nationally representative sample either 'favour' or 'tend to favour', an increase from 54% in 2020.

The Wind Energy Ireland 2024 survey follows the structure of previous national opinion polls on wind energy undertaken in 2017, 2019 and 2022. The 2024 survey results are consistent with previous year's figures and thus indicate that approximately 4 out of 5 Irish adults have continued to support wind energy in recent years.

5.3.10.3 Public Perceptions of Wind Power in Scotland and Ireland Survey 2005

5.3.10.3.1 *Background*

A survey of the public perception of wind power in Scotland and Ireland was carried out in 2003/2004 by researchers at the School of Geography & Geosciences, University of St. Andrews, Fife and The Macaulay Institute, Aberdeen ("*Green on Green: Public Perceptions of Wind Power in Scotland and Ireland*"[48]). The aims of the study were to ascertain the extent to which people support or oppose wind power, to investigate the reasons for these attitudes and to establish how public attitudes relate to factors such as personal experience of operational wind farms and their proximity to them.

[47] *Wind Energy Attitudes Monitor, 2024. Wind Energy Attitudes Monitor. Available at: https://windenergyireland.com/images/files/wind-energy-ireland-2024-report-key-slides-website.pdf*
[48] *Warren, C.R, Lumsden, C., O'Dowd, S., Birnie, R. V., 2004. Green on Green: Public Perceptions of Wind Power in Scotland and Ireland. Journal of Environmental Planning and Management 48(6): 853-875.*

5.3.10.3.2 Study Area

Surveys were carried out at two localities in the Scottish Borders region, one surrounding an existing wind farm and one around a site at which a wind farm had received planning permission but had not yet been built. Surveys were also carried out in Ireland, at two sites in Counties Cork and Kerry, each of which has two wind farms in proximity.

5.3.10.3.3 Findings

The survey of public attitudes at both the Scottish and Irish study sites concluded that large majorities of people are strongly in favour of their local wind farm, their personal experience having engendered positive attitudes. Attitudes towards the concept of wind energy were described as "overwhelmingly positive" at both study sites in Scotland, while the Irish survey results showed almost full support for renewable energy and 92% support for the development of wind energy in Ireland.

The results of the survey were found to agree with the findings of previous research, which show that positive attitudes to wind power increase through time and with proximity to wind farms. With regards to the NIMBY effect, the report states that where NIMBY-ism does occur, it is much more pronounced in relation to Proposed Wind Farms than actual wind farms. The Scottish survey found that while positive attitudes towards wind power were observed among those living in proximity to both the proposed and existing wind farm sites, people around the proposed site were less convinced than those living in proximity to the existing site. Retrospective questioning regarding pre- and post-construction attitudes at the existing site found that attitudes remained unchanged for 65% of respondents. Of the 24% of people who altered their attitudes following experience of the wind farm, all but one became more positive. The report states:

> *"These results support earlier work which has found that opposition to wind farms arises in part from exaggerated perceptions of likely impact, and that the experience of living near a wind farm frequently dispels these fears. Prior to construction, locals typically expect the landscape impacts to be negative, whereas, once in operation, many people regard them as an attractive addition."*

The reasons that people gave for their positive attitude to the local wind farm were predominantly of a global kind, i.e., environmental protection and the promotion of renewable energy, together with opposition to a reliance on fossil fuels and nuclear power. Problems that are often cited as negative impacts of wind farms, such as interference with telecommunications and shadow flicker, were not mentioned at either site. With regards to those who changed to a more positive attitude following construction of the wind farm, the reasons given were that the wind farm is *"not unattractive (62%), that there was no noise (15%), that community funding had been forthcoming (15%) and that it could be a tourist attraction (8%)".*

The findings of the Irish survey reinforce those obtained at the Scottish sites with regards to the increase in positive attitudes to wind power through time and proximity to wind farms. The survey of public attitudes at the sites in Cork and Kerry found that the highest levels of support for wind power were recorded in the innermost study zone (0 – 5 kilometres from a point in between the pair of wind farms). The data also suggests that *"those who see the wind farms most often are most accepting of the visual impact"*. The report also states that a previous Irish survey found that most of those with direct experience of wind farms do not consider that they have had any adverse impact on the scenic beauty of the area, or on wildlife, tourism or property values. Overall, the study data reveals *"a clear pattern of public attitudes becoming significantly more positive following personal experience of operational wind farms".*

With regards to wind farm size, it is evident from this and previous research that wind farms with small numbers of large turbines are generally preferred to those with large numbers of smaller turbines.

5.3.10.4 University College Cork Study, 2024

A 2024 study published by University College Cork researchers le Maitre et al. (2024) *titled 'Do concerns about wind farms blow over with time?[49] Residents' acceptance over phases of project development and proximity'* similarly investigates the relationship between 'near neighbours' of wind farms and provides descriptive statistics on the profiling and opinions of wind farm 'near neighbours'. This Republic of Ireland based study employed a large-scale experimental survey of 1,109 participants within 10km of an existing wind farm in Ireland, to assess public perception to accept further onshore wind energy developments. Data was collected through an online survey conducted in May–July 2021 and July–August 2022. The survey focused on residents living near to existing wind farms at the various project stages (planning, construction and operational). The study looked to understand residents' attitudes towards another (new) wind farm located near to their home. The survey screened respondents on the basis of their age, gender, and region to identify a suitable sample living with 10km of a wind farm. The survey investigates whether residents would prefer to maintain the "status quo" (i.e. no further wind farm developments in the area) or have willingness to accept further development in the area. Refer to Figure 5-4 below which details how distance, as well as the phase of the wind farms the residents are 'near neighbours' to, dictates their preference for additional developments.

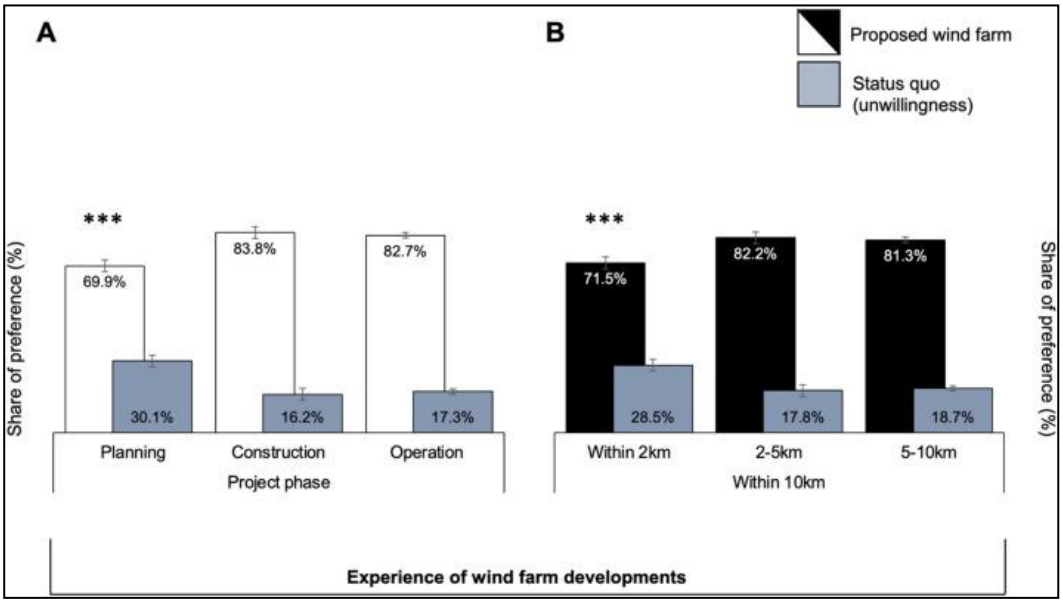


Figure 5-4 Share of preference for a 'best-case' combination of wind development features and the status quo (A) over phase of project development; and (B) over proximity to the wind farm. (Le Maitre et al. 2024)

5.3.11 Property Values

5.3.11.1 Property Values and Wind Farms

This section summarises the largest and most recent studies from the United States and the UK.

One of the largest studies of the impact of wind farms on property values has been carried out in the United States. "*The Impact of Wind Power Projects on Residential Property Values in the United States: A multi-Site Hedonic Analysis*"[50], was carried out at the Lawrence Berkley National Laboratory (LBNL) for the U.S Department of Energy. This study collected data on almost 7,500 sales of single-

[49] *Do concerns about wind farms blow over with time?[49] Residents' (2024):https://www.sciencedirect.com/science/article/pii/S1364032123006962?via%3Dihub*
[50] *Hoen, B., Wiser, R. H., Cappers, P., Thayer, M. A., Sethi, G., 2009. The Impact of Wind Power Projects on Residential Property Values in the United States: A multi-Site Hedonic Analysis. Available at: https://emp.lbl.gov/publications/impact-wind-power-projects*

family homes situated within approximately 16km of 24 existing wind farms in nine different American states over a period of approximately ten years. The conclusions of the study are drawn from eight different pricing models including repeat sales and volume sales models. Each of the homes included in the study were visited to demonstrate the degree to which the wind facility was visible at the time of the sale, and the conclusions of the report state that *"The result is the most comprehensive and data rich analysis to date on the potential impacts of wind energy projects on nearby property values."*

The main conclusion of this study is as follows:

> *"Based on the data and analysis presented in this report, no evidence is found that home prices surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities. Although the analysis cannot dismiss the possibility that individual or small numbers of homes have been or could be negatively impacted, if these impacts do exist, they are either too small and/or too infrequent to result in any widespread and consistent statistically observable impact."*

This study has been updated by LBNL who published a further paper entitled "*A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States*"[51]. This study analysed more than 50,000 home sales near 67 wind farms in 27 counties across nine U.S. states yet was unable to uncover any impacts to nearby home property values. The homes were all within approximately 16km of the wind energy facilities - about 1,100 homes were within approximately 1.6km, with 331 within approximately 800m.The report is therefore based on a very large sample size and represents an extremely robust assessment of the impacts of wind farm development on property values. It concludes that:

> *"Across all model Specifications, we find no statistical evidence that home prices near wind turbines were affected in either the post-construction or post announcement/pre-construction periods."*

The LBNL studies note that their results do not mean that there will never be a case of an individual home whose value goes down due to its proximity to a wind farm, however if these situations do exist, they are considered to be statistically insignificant.

In September 2023, Brunner et al. published "*Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States*"[52]. This study targeted urban counties in the United States with populations over 250,000 persons, and found that on average, after a commercial wind energy project is announced, houses located within approximately 1.6km of a proposed wind energy project experience a decrease in value of 11% relative to homes located within c. 4.8-8km of the proposed wind energy project. The decline in property values was found to recover post construction with property value impacts becoming relatively small (~2%) and statistically insignificant 9 years or more after project announcement (roughly 5 years after operation begins). This suggests that the housing market is reacting negatively to the expectation of likely impacts (after announcement) and the heightened activity during construction, but after operation begins, those negative perceptions and related home price impacts appear to fade.

The US-based scientific literature on the topic is therefore inconclusive, with the studies summarised above providing contradictory conclusions. The text below summarises the UK studies on the topic.

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[51] *Hoen, B., Brown, J.P., Jackson, T., Wiser, R. H., Thayer, M. A., Cappers, P., 2013. A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Available at: https://emp.lbl.gov/publications/spatial-hedonic-analysis-effects-wind*

[52] *Brunner, E.J., Hoen, B., Rand, J., Schwegman, D., 2023. Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States. Energy Policy, 185, 113837.*

A study was commissioned by RenewableUK and carried out by the Centre for Economics and Business Research (Cebr) in March 2014. The findings of the study were produced in a report titled "*The effect of wind farms on house prices*"[53], the main conclusions of which are:

- Overall, the analysis found that the county-wide property market drives local house prices, not the presence or absence of wind farms.
- The econometric analysis established that construction of wind farms at the five sites examined across England and Wales has not had a detectable negative impact on house price growth within a 5 km radius of the sites.

A study issued in October 2016 '*Impact of wind Turbines on House Prices in Scotland*'[54] was published by Climate Exchange. Climate Exchange is Scotland's independent centre of expertise on climate change, which exists to support the Scottish Governments policy development on climate and the transition to a low carbon economy. A copy of the report is included as Appendix 5-2 of this EIAR.

The report presents the main findings of a research project estimating the impact on house prices from wind farm developments. It is based on analysis of over 500,000 property sales in Scotland between 1990 and 2014. The key findings from the study are:

- No evidence of a consistent negative effect on house prices: Across a very wide range of analyses, including results that replicate and improve on the approach used by Gibbons (2014), we do not find a consistent negative effect of wind turbines or wind farms when averaging across the entire sample of Scottish wind turbines and their surrounding houses. Most results either show no significant effect on the change in price of properties within 2 km or 3 km or find the effect to be positive.
- Results vary across areas: The results vary across different regions of Scotland. Our data does not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences, which may be interconnected and complex.

The UK's scientific literature is strong in its conclusions that there are no significant effects on the change in price of properties close to wind farm developments, and that generally the county-wide property market drives local house prices, not the presence or absence of wind farms.

The literature described above demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine that there is the potential for a significant effect on property values as a result of the Proposed Project.

5.3.11.2 Property Values and Grid Infrastructure

In May 2016, EirGrid conducted a literature review and evidence-based field study on the effects of high voltage transmission development on patterns of settlement and land use. The objectives of '*EirGrid Evidence Based Environmental Studies Study 9: Settlement and land use*'[55] were to:

- To gather information on patterns of settlement and land use near to existing transmission infrastructure.
- To establish the effects of existing transmission infrastructure on patterns of settlement and land use.

[53] *RenewableUK, 2014. The effect of wind farms of house prices. Available at: https://tethys.pnnl.gov/sites/default/files/publications/RenewableUK_2014.pdf.*
[54] *Heblich, S., Olner, D., Pryce, G., Timmins, C., 2016. Impact of wind Turbines on House Prices in Scotland. Available at: https://www.climatexchange.org.uk/wp-content/uploads/2023/09/cxc_wind_farms_impact_on_house_prices_final_17_oct_2016.pdf*
[55] *EirGrid, 2016. EirGrid Evidence Based Environmental Studies Study 9: Settlement and land use Available at: https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Evidence-Based-Environmental-Study-9-Settlement-and-Landuse.pdf*

- To review land use planning policy in various Development Plans to determine whether any policy change has arisen as a result of the construction and operation of existing transmission projects.

A literature review of transmission projects from around the world was carried out, including review of EIAs. To investigate effects of transmission projects on patterns of land use and settlement, 31 case studies were chosen: 17 with existing overhead line (OHL) circuits, 10 with substations and 4 in construction. Sites were located in rural, rural/urban and urban areas. Land uses included agricultural, commercial and amenity. Four control sites had no infrastructure. Coexistence, development density, planning policy and planning application history were all investigated. Planning and land use policy over the previous 20 years was reviewed to see if it had influenced, or had been influenced by, recent programmes of transmission infrastructure development. This study has established no evidence of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use; however, transmission infrastructure can be a local physical constraint on development.

5.3.12 Likely Future Receiving Environment

This section considers the future receiving environment relating to population likely to exist within the Population Study Area at the commencement of the construction phase. In accordance with the approach set out in Section 1.8.4 of Chapter 1, the likely future receiving environment has been established having regard to the existing population baseline presented in Section 5.3 and the environmental and socioeconomic changes reasonably expected to occur before the commencement of the construction phase.

The Project Site is located predominantly on former industrial peat extraction lands within part of the Allen Bog Group. Industrial peat extraction ceased in June 2020. Since then, environmental conditions across these lands have continued to develop through natural revegetation, alongside ongoing site management, decommissioning works and environmental monitoring undertaken in accordance with IPC Licence P0503-01.

Continued natural revegetation, ongoing site management, decommissioning works, and environmental monitoring at the Project Site are not anticipated to introduce new population-generating development, employment centres, residential accommodation, tourism destinations or other land uses capable of influencing population trends within the Population Study Area. As such, these activities are not anticipated to materially alter the demographic or socioeconomic characteristics of the Population Study Area as established in Section 5.3 above, i.e., demographic trends, population density, household statistics, age structure, economic status, employment characteristics, existing land-use patterns, tourism activity or property value trends.

Accordingly, the likely future receiving environment at commencement of the construction phase is expected to remain broadly consistent with the current baseline environment with respect to population.

The assessment of likely significant effects presented in Section 5.7.2 has therefore been undertaken against this likely future receiving environment. As the population conditions predicted at commencement of construction are materially comparable to those described in the existing baseline environment, the information presented in Section 5.3 remains representative of the population receiving environment against which the Proposed Project is assessed.

5.3.12.1 Future Environmental Trends

This section identifies the future environment trends relating to population likely to exist within the Population Study Area following implementation of the targeted rehabilitation measures within Draft Rehabilitation Plans.

Continued natural revegetation, ongoing site management, decommissioning works, and environmental monitoring, and implementation of the targeted rehabilitation measures within the Draft Rehabilitation Plans are not anticipated to introduce new population-generating development, employment centres, residential accommodation, tourism destinations or other land uses capable of influencing population trends within the Population Study Area. There is therefore no pathway through which these processes could materially alter the future environmental trends relating to population.

Accordingly, the long-term future trends of the receiving environment for population will remain materially comparable to the baseline conditions described in Section 5.3 and do not require separate consideration elsewhere in the population impact assessment.

The continuation of the aforementioned activities in the absence of the Proposed Project is considered in the Do-Nothing Scenario in Section 5.7.1 and in the cumulative assessment in Section 5.7.5.

5.4 Baseline Human Health

5.4.1 Receiving Environment

As set out in the 2017 Department of Housing, Planning, Community and Local Government "*Key Issues Consultation Paper on the Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licensing Systems*"[56] and the guidance listed in Chapter 1: Introduction, the consideration of the effects on populations and on human health should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters.

The 2022 Census of Ireland as carried out by the Central Statistics Office provides the general health conditions of the population of the EDs which make up the Population Study Area for the Proposed Project. The vast majority of those within the Population Study Area marked their general health as being 'very good' across all EDs. It is not anticipated that the general health of the population of the Population Study Area be altered due to the Proposed Project. Table 5-9 below details the general health of persons by percentage for the State, County Offaly, County Kildare and the Population Study Area for both the 2016 and 2022 census, which have data publicly available. In general, the percentage health breakdown for the State, Counties and Population Study Area are very similar. The Population Study Area, State and Counties all reported in the range of 80% for a combined 'very good' and 'good' health. The majority of EDs comprising the Population Study Area reported a lower percentage than the State and Counties for those who have a 'bad' and 'very bad' health. Therefore, it can be concluded that those living in the Population Study Area consider their health to be in a better condition that the State and County average.

The CSO *Irish Health Survey 2019 – Main Results* [57] provides a national overview of population health in Ireland. The survey found that self-reported health generally declines with age and increasing socioeconomic disadvantage. Over one-quarter of respondents reported a long-standing health condition, while more than half of the population were reported to be overweight or obese. The survey also identified higher levels of mental ill-health among unemployed persons compared to those in employment, highlighting the influence of social determinants on health outcomes.

[56] *Department of Housing, Planning, Community and Local Government. Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licensing Systems. Key Issues Consultation Paper. Available at: https://www.publichealth.ie/sites/default/files/resources/IPH%20response%20to%20the%20key%20issues%20consultation%20paper%20on%20Transposition%20of%20EIA%20Directive%20201452EU.pdf*

[57] *CSO Irish Health Survey 2019: https://www.cso.ie/en/releasesandpublications/ep/p-ihsmr/irishhealthsurvey2019-mainresults/introductionandkeyfindings/*

In addition to the demographic and health profile outlined below, environmental determinants of health including air quality, climate, water quality, noise and vibration, aviation, traffic and transport and, major accidents and natural disasters have been considered in establishing the Human Health baseline. Relevant baseline information is summarised in Section 5.4.5 and draws upon the assessments presented in the relevant technical chapters of this EIAR.

Table 5-9 Percentage General Health Breakdown for the State, County Offaly, County Kildare and the Population Study Area as reported in the 2016 and 2022 Census. (Source www.CSO.ie)

		Very Good		Good		Fair		Bad		Very Bad		Not Stated	
		2016	2022	2016	2022	2016	2022	2016	2022	2016	2022	2016	2022
State		59.4%	53.2%	27.6%	29.7%	8.0%	8.6%	1.3%	1.4%	0.3%	0.3%	3.3%	6.7%
Offaly		57.3%	51.7%	29.2%	31.2%	9.0%	9.4%	1.5%	1.7%	0.3%	0.4%	2.8%	5.6%
Kildare		63.1%	56.8%	26.4%	29.2%	6.8%	7.7%	1.1%	1.2%	0.2%	0.3%	2.3%	4.7%
Population Study Area	Clonbullogue	57.12%	48.12%	30.57%	28.73%	8.81%	9.70%	0.78%	0.97%	0.65%	0.36%	2.07%	12.12%
	Edenderry Rural	65.20%	46.07%	23.16%	27.98%	9.07%	8.54%	0.98%	1.69%	0.00%	0.22%	1.59%	15.51%
	Killinthomas	69.49%	58.70%	22.05%	28.83%	5.44%	7.79%	0.60%	0.78%	0.60%	0.00%	1.81%	3.90%
	Kilmeage North	60.02%	54.27%	27.84%	31.77%	8.87%	8.83%	0.89%	1.18%	0.27%	0.22%	2.13%	3.73%
	Kilpatrick	59.24%	54.14%	28.36%	32.35%	8.73%	10.24%	1.95%	1.20%	0.46%	0.11%	1.26%	1.96%
	Lullymore	64.71%	49.75%	25.67%	31.34%	6.42%	9.95%	1.60%	1.00%	0.00%	0.00%	1.60%	7.96%
	Carbury	60.74%	53.52%	29.22%	30.66%	6.85%	9.17%	1.15%	1.07%	0.16%	0.30%	1.88%	5.29%
	Rathangan	61.44%	55.12%	27.07%	29.98%	7.97%	7.69%	1.04%	1.15%	0.36%	0.38%	2.11%	5.67%
	Robertstown	55.27%	51.66%	30.46%	30.12%	9.43%	9.64%	1.77%	1.54%	0.66%	0.55%	2.42%	6.48%
	Cloncurry	68.42%	59.39%	23.56%	28.16%	5.51%	5.31%	0.50%	0.82%	0.50%	0.20%	1.50%	6.12%
	Downings	64.38%	54.29%	25.08%	29.31%	6.72%	8.38%	1.28%	1.36%	0.10%	0.39%	2.43%	6.28%
	Overall	62.37%	53.18%	26.64%	29.93%	7.62%	8.66%	1.14%	1.16%	0.34%	0.25%	1.89%	6.82%

5.4.2 Health Effects of Wind Farms: Studies

While there are anecdotal reports of negative health effects on people who live very close to wind turbines, peer-reviewed research has generally not supported these statements. There is currently no published credible scientific evidence to positively link wind turbines with adverse health effects. The main publications supporting the view that there is no evidence of any direct link between wind turbines and health are summarised below.

"Wind Turbine Sound and Health Effects – An Expert Panel Review" *– American Wind Energy Association and Canadian Wind Energy Association, December 2009*[58]

[58] *American Wind Energy Association and Canadian Wind Energy Association, 2009. Wind Turbine Sound and Health Effects – An Expert Panel Review. Available at:* https://www.novoco.com/public-media/documents/awea_soundwhitepaper_121109_0.pdf

In 2009, an Expert Panel on behalf of the American Wind Energy Association undertook extensive review, analysis and discussion of the large body of peer-reviewed literature on sound and health effects in general, and on sound produced by wind turbines in particular. The panel assessed the plausible biological effects of exposure to wind turbine sound. Following review, analysis, and discussion of current knowledge, the panel reached consensus on the following conclusions:

- *"There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.*
- *The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.*
- *The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences."*

The report found, amongst other things, that:

- *"Wind Turbine Syndrome" symptoms are the same as those seen in the general population due to stresses of daily life. They include headaches, insomnia, anxiety, dizziness, etc.*
- *Low frequency and very low frequency 'infrasound' produced by wind turbines are the same as those produced by vehicular traffic and home appliances, even by the beating of people's hearts. Such 'infrasounds' are not special and convey no risk factors;*
- *The power of suggestion, as conveyed by news media coverage of perceived 'wind-turbine sickness', might have triggered 'anticipatory fear' in those close to turbine installations."*

'Wind Turbine Syndrome – An independent review of the state of knowledge about the alleged health condition' *– Expert Panel on behalf of Renewable UK, July 2010*[59]

This report consists of three reviews carried out by independent experts to update and understand the available knowledge of the science relating to infrasound generated by wind turbines. This report was prepared as a critical response to a book entitled "*Wind Turbine Syndrome"*, in 2009 by Dr. Pierpont, which received significant media attention at the time. The report discusses the methodology and assessment carried out in the 2009 publication and assessed the impact of low-frequency noise from wind turbines on humans. The independent review found that:

- *"The scientific and epidemiological methodology and conclusions drawn (in the 2009 book) are fundamentally flawed;*
- *The scientific and audiological assumptions presented by Dr. Pierpont relating infrasound to Wind Turbine Syndrome (WTS) are wrong; and*
- *Noise from Wind Turbines cannot contribute to the symptoms reported by Dr Pierpoint's respondents by the mechanisms proposed."*

Accordingly, the consistent and scientifically robust conclusion remains that there is no evidence to demonstrate any significant health effects in humans arising from noise at the levels of that generated by wind turbines.

'Wind Turbines and Health: A Rapid Review of the Evidence' *– Australian Government National Health and Medical Research Council (NHMRC), July 2010*[60]

[59] *Renewable UK, 2010. Wind Turbine Syndrome - An independent review of the state of knowledge about the alleged health condition. London, UK.*
[60] *Australian Government National Health and Medical Research Council, 2014. Wind Turbines and Health, A Critical Review of the Scientific Literature. Journal of Occupational and Environmental Medicine, 56(11): e108-30.*

The purpose of this paper was to review evidence from current literature on the issue of wind turbines and potential impacts on human health and to validate the finding of the "*Wind Turbine Sound and Health Effects - An Expert Panel Review*" (see Line Item 2 above) that:

- "*There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines.*
- *There is currently no published scientific evidence to positively link wind turbines with adverse health effects.*
- *This review of the available evidence, including journal articles, surveys, literature reviews and government reports, supports the statement that: There are no direct pathological effects from wind farms and that any potential impact on humans can be minimised by following existing planning guidelines."*

'Position Statement on Health and Wind Turbines' *– Climate and Health Alliance, February 2012*[61]

The Climate and Health Alliance (CAHA) was established in August 2010 and is a coalition of health care stakeholders who wish to see the threat to human health from climate change and ecological degradation addressed through prompt policy action. In its Position Statement in February 2012, CAHA states that:

> *"To date, there is no credible peer reviewed scientific evidence that demonstrates a direct causal link between wind turbines and adverse health impacts in people living in proximity to them. There is no evidence for any adverse health effects from wind turbine shadow flicker or electromagnetic frequency. There is no evidence in the peer reviewed published scientific literature that suggests that there are any adverse health effects from infrasound (a component of low frequency sound) at the low levels that may be emitted by wind turbines."*

The Position Statement explores human perceptions of wind energy and states that some people may be predisposed to some form of negative perception that itself may cause annoyance. It states that:

> *"Fear and anxious anticipation of potential negative impacts of wind farms can also contribute to stress responses, and result in physical and psychological stress symptoms... Local concerns about wind farms can be related to perceived threats from changes to their place and can be considered a form of "place-protection action", recognised in psychological research about the importance of place and people's sense of identity."*

CAHA observes the existence of *"misinformation about wind power"* and, in particular, states that:

> *"Some of the anxiety and concern in the community stems originally from a self-published book by an anti-wind farm activist in the United States which invented a syndrome, the so-called "wind turbine syndrome". This is not a recognised medical syndrome in any international index of disease, nor has this publication been subjected to peer review."*

CAHA notes that:

> *"Large scale commercial wind farms however have been in operation internationally for many decades, often in close proximity to thousands of people, and there has been no evidence of any significant rise in disease rates."*

This, it states, contrasts with the health impacts of fossil fuel energy generation.

[61] *Climate and Health Alliance, 2012. Position Statement on Health and Wind Turbines Available at:* https://www.agl.com.au/content/dam/digital/agl/documents/about-agl/how-we-source-energy/coopers-gap-wind-farm/caha-position-statement-health-wind-turbines.pdf?srsltid=AfmBOordoV3YNsLhog4rlqxpd3PXiW7BAcAuGwPV1R6-UBnwgY8SQSLR

'Wind Turbine Health Impact Study – Report of Independent Expert Panel' *–Massachusetts Departments of Environmental Protection and Public Health, January 2012*[62]

An expert panel was established with the objective to, inter alia, evaluate information from peer-reviewed scientific studies, other reports, popular media and public comments and to assess the magnitude and frequency of any potential impacts and risks to human health associated with the design and operation of wind energy turbines. In its final report, the expert panel set out its conclusions under several headings, including noise and shadow flicker.

In relation to noise, the panel concluded that there was limited or no evidence to indicate any causal link between noise from wind turbines and health effects, including the following conclusions:

> *"There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a 'Wind Turbine Syndrome'.*
>
> *The strongest epidemiological study suggests that there is not an association between noise from wind turbines and measures of psychological distress or mental health problems. There were two smaller, weaker, studies: one did note an association, one did not. Therefore, we conclude the weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems.*
>
> *None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine."*

In relation to shadow flicker, the expert panel found the following:

> *"Scientific evidence suggests that shadow flicker does not pose a risk for eliciting seizures as a result of photic stimulation.*
>
> *There is limited scientific evidence of an association between annoyance from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects."*

1. ***"Wind Turbines and Health, A Critical Review of the Scientific Literature"*** *– Massachusetts Institute of Technology (Journal of Occupational and Environmental Medicine Vol. 56, Number 11, November 2014)* [63]

This review assessed the peer-reviewed literature regarding evaluations of potential health effects among people living in the vicinity of wind turbines. The review posed a number of questions around the effect of turbines on human health, with the aim of determining if stress, annoyance or sleep disturbance occur as a result of living in proximity to wind turbines, and whether specific aspects of wind turbine noise have unique potential health effects. The review concluded the following with regard to the above questions:

- Measurements of low-frequency sound, infrasound, tonal sound emission, and amplitude-modulated sound show that infrasound is emitted by wind turbines. The levels of infrasound at customary distances to homes are typically well below audibility thresholds.

[62] *Massachusetts Departments of Environmental Protection and Public Health, 2012. Wind Turbine Health Impact Study -Report of Independent Expert Panel. USA. Available at: https://www.mass.gov/doc/wind-turbine-health-impact-study-report-of-independent-expert-panel/download*

[63] *McCunney, R., Mundt, K.A., Colby, W. D., Dobie, Kaliski, K., Blais, M., 2014. Wind Turbines and Health, A Critical Review of the Scientific Literature. Journal of Occupational and Environmental Medicine, 56(11): e108-30.*

- No cohort or case–control studies were located in this updated review of the peer-reviewed literature. Nevertheless, among the cross-sectional studies of better quality, no clear or consistent association is seen between wind turbine noise and any reported disease or other indicator of harm to human health.
- Components of wind turbine sound, including infrasound and low frequency sound, have not been shown to present unique health risks to people living near wind turbines.
- Annoyance associated with living near wind turbines is a complex phenomenon related to personal factors. Noise from turbines plays a minor role in comparison with other factors in leading people to report annoyance in the context of wind turbines.

'Environmental Noise Guidelines for the European Region' *– World Health Organisation, Regional Office for Europe January 2019*[64]

The WHO Environmental Noise Guidelines provide recommendations for protecting human health from exposure to environmental noise originating from various sources such as transportation noise, wind turbine noise and leisure noise. The Guideline Development Group (GDG) defined priority health outcomes and from this were able to produce guideline exposure levels for noise exposure.

For average noise exposure, the GDG conditionally recommends reducing noise levels produced by wind turbines below 45 dB Lden. The GDG recognise the potential for increased risk of annoyance at levels below this value but cannot determine whether this increased risk can impact health. Wind turbine noise above this level is associated with adverse health effects.

The GDG points out that evidence on health effects from wind turbine noise (apart from annoyance) is either absent or rated low/very low quality and effects related to attitudes towards wind turbines are hard to differentiate from those related to noise and may be partly responsible for the associations. The GDG also recognises that the percentage of people exposed to noise from wind turbines is far lower than other sources such as road traffic and state that any benefit from specifically reducing population exposure to wind turbine noise in all situations remains unclear.

That being said, the GDG conditionally[65] recommends renewable energy policies include provisions to ensure noise levels from wind farm developments do not rise above the guideline values for average noise exposure. The GDG also provides a conditional recommendation for the implementation of suitable measures to reduce noise exposure.

As outlined in Section 12.3.6.9 of Chapter 12: Noise and Vibration, it is considered that the conditional WHO recommended average noise exposure level, if applied as target noise criteria for an existing or proposed wind turbine development in Ireland, should be done with caution. The conditional WHO recommendation for average noise exposure level may be a poor characterisation of wind turbine noise and may limit the ability to observe associations between wind turbine noise and health outcomes.

'Infrasound Does Not Explain Symptoms Related to Wind Turbines' *– Finnish Government's Analysis, Assessment and Research Activities (VN TEAS), June 2020*[66]

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[64] *The World Health Organisation (WHO), 2018. Environmental Noise Guidelines for the European Region. Available at: https://www.who.int/europe/publications/i/item/9789289053563*

[65] *The GPG makes recommendations which are rated as having either strong or conditional recommendation in favour of an intervention. The GPG define a strong recommendation as one that "*can be adopted as policy in most situations*". A conditional recommendation represents a scenario where there "*is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply*" Further, a conditional recommendation "*requires a policy-making process with substantial debate and involvement of various stakeholders*".*

[66] *Publications of the Government's analysis, assessment and research activities, 2020. Infrasound Does Not Explain Symptoms Related to Wind Turbines. Available at: https://www.researchgate.net/publication/342434513_Infrasound_Does_Not_Explain_Symptoms_Related_to_Wind_Turbines*

The study targeted to adverse health effects of wind turbine infrasound and was funded by the Finnish Government's Analysis, Assessment and Research Activities (VN TEAS).

It found that the low-frequency, inaudible sounds made by wind turbines are not damaging to human health despite fears that they cause unpleasant symptoms. The project, which was carried out over two years, examined the impact of low-frequency, or infrasound, emissions which cannot be picked up by the human ear.

People in many countries have blamed the infrasound waves for symptoms ranging from headaches and nausea to tinnitus and cardiovascular problems, researchers said.

Interviews, sound recordings and laboratory tests were used to explore possible health effects on people living within 20 kilometres of the generators.

The report states:

> *"the behavioural findings of the current study suggest that wind turbine infrasound cannot be reliably perceived, and it does not result in increased annoyance. Participants that showed health effects did not show signs of increased infrasound sensitivity and did not rate wind turbine sounds more annoying."*

As a result:

> *"These findings do not support the hypothesis that infrasound is the element in turbine sound that causes annoyance. Instead, they suggest that people who have health symptoms which they associate with wind turbine sound are not likely to have these symptoms because they perceive turbine sound more annoying than controls, at least in laboratory settings. It is more likely that these symptoms are triggered by other factors such as symptom expectancy".*

'The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study in Noise-Sensitive Health Adults' *– Woolcock Institute for Medical Research et al. (Environmental Health Perspectives, Vol. 131, Number 3, March 2023)*[67]

The purpose of this study was to examine the potential health effects of audible sound and inaudible infrasound has on noise sensitive adults over a period of 72 hours. Sufferers of Wind Turbine Syndrome (WTS) have attributed their ill-health and particularly their sleep disturbance to the signature of infrasound. On this basis, the objectives of the study were to test the effects of 72 hours of infrasound exposure on human physiology, particularly sleep. The results of the study are outlined below:

- All staff and participants were asked whether they were able to differentiate in any way between infrasound and sham infrasound (the control), and none were able to.
- The study found that 72 hours of the simulated wind turbine infrasound (~90dB pk re 20 µPa) in controlled laboratory conditions did not worsen any measure of sleep quality compared with the same speakers being present but not generating infrasound (sham infrasound).
- The study found no evidence that 72 hours of exposure to a sound level of ~90dB pk re 20 µPa of simulated wind turbine infrasound in double-blind conditions perturbed any physiological or psychological variable.
- None of the participants in the study who were exposed to infrasound developed what could be described as WTS.

[67] *Marshall N.S., Cho G., Toelle B.G., Tonin R., Bartlett D.J., D'Rozario A.L., Evans C.A., Cowie C.T., Janev O., Whitfeld C.R., Glozier N., Walker B.E., Killick R., Welgampola M.S., Phillips C.L., Marks G.B., Grunstein R.R., 2023. The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study in Noise-Sensitive Health Adults. Environmental Health Perspectives, 131(3):37012.*

- This study suggests that the infrasound component of WTS is unlikely to be a cause of any ill-health or sleep disruption, although this observation should be independently replicated.

Impact of Wind turbines on Human Health and Safety: *Proceedings of Socratic Lectures, University of Ljubljana, 2025*[68]

The purpose of this paper was to review evidence from current literature with regards to effects on noise emissions, infrasound, ice throw and visual impacts. The paper shows that these effects are either negligible or effectively mitigated by modern technologies and safety standards. Misinformation and psychological factors such as nocebo effects (psychological phenomenon in which negative expectations of a particular stimulus or situation lead to the perception of negative effects, even if there is no direct physical cause)

The paper concluded that the health benefits of wind energy such as reduction of air pollution and associated diseases, along with benefits such as energy security, job creation, and climate change mitigation outweigh the potential risks.

> *The paper looks to promote informed public dialogue so that the potential of wind energy can be fully realised in line with global efforts to combats climate change and protect public health.*

5.4.2.1 Other Studies

A further 25 reviews of the scientific evidence that universally conclude that exposure to wind farms and the sound emanating from wind farms does not trigger adverse health effects were compiled in September 2015[69] by Professor Simon Chapman, of the School of Public Health and Sydney University Medical School, Australia, and is included as Appendix 5-3 of this EIAR. Another recent publication by Chapman and Crichton (2017) entitled "*Wind turbine syndrome; A communicated disease*"[70] critically discusses why certain health effects might often be incorrectly attributed to wind turbines.

5.4.3 Turbine Safety

Wind turbines pose no threat to the health and safety of the general public. The WEDG 2006 and Draft WEDG 2019 iterate that there are no specific safety considerations in relation to the operation of wind turbines. Fencing or other restrictions are not necessary for safety considerations and should be kept to a minimum. People or animals can safely walk up to the base of the turbines.

The WEDG 2006 and Draft WEDG 2019 state that there is a very remote possibility of injury to people from flying fragments of ice or from a damaged blade. Modern turbine blades are composite structures with no bolts or separate components and the danger is therefore minimised. Furthermore, the proposed wind turbines will be fitted with anti-vibration sensors which will detect any imbalance caused by icing of the blades. These sensors will cause the turbine to wait until the blades have been de-iced prior to beginning operation. As such, turbines are designed in such a way that ice throw/projection is not a significant risk. Furthermore, the Population Study Area (and the State) falls within the International Energy Agency (IEA) Ice Class 1 Category, which correlates to a *Low* icing frequency.

[68] *Impact of Wind turbines on Human Health and Safety: https://www.researchgate.net/publication/390586600_Impact_of_Wind_Turbines_on_Human_Health_and_Safety*
[69] *Chapman, S., Simonetti, T, 2015. Summary of main conclusions reached in 25 reviews of the research literature on wind farms and health. Sydney University Medical School. Available at: https://ses.library.usyd.edu.au/bitstream/handle/2123/10559/WindHealthReviews_3.pdf*
[70] *Chapman, S., Crichton, F., 2020. Wind turbine syndrome; A communicated disease. Sydney University Press.*

The International Electrotechnical Commission (IEC) is a global organisation that develops and publishes international standards for electrical and electronic technologies. One of the areas where the IEC has played a significant role is in the standardisation of wind turbines. The IEC has developed a series of standards specifically for wind turbines, which cover various aspects such as design, testing, and performance. The IEC 61400-1 "*Wind turbines – Part 1: Design requirements*"[71] provides guidelines and requirements for the design of wind turbines, including considerations for environmental conditions. This standard covers a range of conditions that wind turbines may encounter, including those related to icing. It sets out criteria for the structural design, safety systems, and other aspects to ensure that wind turbines can operate safely and effectively in various environments. As such, the Proposed Project, like those across Ireland and in many other countries, is generally designed and assessed according to international standards, with the IEC standards being frequently employed in this process. Additionally, regulatory entities and energy authorities at the national level, such as the SEAI, often refer to and align their guidance with internationally recognized standards, including those established by the IEC, such as IEC 61400-1 for wind turbines. In conclusion, the Proposed Project adheres to the criteria specified in both the IEC 61400-1 design requirements and the SEAI guidance.

Turbine blades are manufactured of fiberglass and wood which will prevent any likelihood of an increase in lightning strikes within the Population Study Area or the local area. Lightning protection conduits will be integral to the construction of the turbines. Lightning conduction cables, encased in protection conduits, will follow the electrical cable run, from the nacelle to the base of the turbine. The conduction cables will be earthed adjacent to the turbine base. The earthing system will be installed during the construction of the turbine foundations.

Wind turbines are designed in accordance with international standards to withstand extreme weather conditions, including high winds and storm events. As outlined in Section 11.3.2 of Chapter 11 Climate, w climate change may influence the frequency and intensity of storms. Modern turbine design incorporates safety factors and control systems (such as automatic shutdown mechanisms) to ensure structural integrity is maintained under such conditions. As such, the risk of structural failure arising from storm events is considered to be low. Further consideration of risks associated with extreme weather events and major accidents is provided in Chapter 17: Major Accidents and Natural Disasters of this EIAR.

5.4.4 Electromagnetic Interference

The provision of underground electric cables and Overhead Lines of the capacity proposed is common practice throughout the country and installation to the required specification does not give rise to any specific health concerns.

The extremely low frequency (ELF) electric and magnetic fields (EMF) associated with the operation of the proposed cables fully comply with the international guidelines for ELF-EMF set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a formal advisory agency to the World Health Organisation, as well as the EU guidelines for human exposure to EMF. Accordingly, there will be no operational impact on properties (residential or other uses) as the ICNIRP guidelines will not be exceeded at any distances even directly above the cables.

The ESB document “EMF & You” (ESB, 2017)[72] provides further practical information on EMF (Appendix 5-4).

Further details on the potential impacts of electromagnetic interference to telecommunications and aviation are presented in Section 15.2.4.4.2 of Chapter 15: Material Assets and Chapter 16 Aviation.

[71] *International Electrotechnical Commission. IEC 61400-1: Wind turbines – Part 1: Design requirements. Geneva.*
[72] *ESB, 2017. EMF & You: Information about Electric & Magnetic Fields and the electricity transmission system in Ireland. Available at: https://www.esbnetworks.ie/docs/default-source/publications/esb-networks-electrical-and-magnetic-fields-.pdf?sfvrsn=43304888_13*

5.4.5 Effects on Human Health

As set out in the Department of Housing, Planning, Community and Local Government "*Key Issues Consultation Paper on the Transposition of the EIA Directive 2017*"[73] and the guidance listed in Section 1.2.1 of Chapter 1: Introduction, the consideration of the effects on populations and on human health should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters.

As defined in Section 5.2.2 above human health is assessed primarily within the defined Population Study Area, with the assessment informed by the discipline-specific study areas established for the relevant EIAR Chapters. Chapter 5: Population and Human Health (including Shadow Flicker), Chapter 8: Land, Soils and Geology, Chapter 9: Water, Chapter 10: Air Quality, Chapter 11: Climate, Chapter 12: Noise and Vibration, Chapter 15: Material Assets (Section 15.1: Traffic and Transport), Chapter 16: Aviation and Chapter 17: Major Accidents and Natural Disasters provide an assessment of the effects of the Proposed Project on these areas of consideration. Refer to Section 5.7.2.2 and 5.7.3.2 below for further details on potential effects on human health.

Water Quality

The study area for the assessment for the hydrological and hydrogeological impact arising from the Proposed Project is defined as the Water Study Area, as set out in Section 9.2.1 of Chapter 9: Water. The Proposed Project design and mitigation measures outlined in Chapter 9: Water ensures that the potential for effects on the water environment are not significant. No significant effects on local water supplies are anticipated.

As set out in Chapter 9: Water, potential health effects are associated with negative effects on public and private water supplies and potential flooding. The Proposed Wind Farm overlies the 4 no. groundwater bodies (GWB). The bedrock geological formations which underlie the Project Site are predominantly classified by the GSI as being Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (LI) (www.gsi.ie). Chapter 9: Water assesses the potential for impact on public water supply and private wells during the construction, operation and decommissioning phases.

A Flood Risk Assessment (FRA) has been undertaken for the Proposed Project, comprising two separate assessments:

- A Site-Specific Flood Risk Assessment (SSFRA) for the Proposed Wind Farm and Proposed Onsite Substation (Appendix 9-1); and
- A SSFRA for the Proposed Grid Connection and Proposed Offsite Substation (Appendix 9-2).

The SSFRA for the Proposed Wind Farm identifies that the Proposed Onsite Substation, located within Lodge Bog in the east of the Proposed Wind Farm, is not mapped in any flood zone from the available flood mapping (National Indicative Flood Mapping (NIFM), CFRAM, GSI Groundwater flood mapping). The SSFRA states that, as long as the main drains east and west of the Proposed Onsite Substation and the south-eastern outfall drain from Lodge Bog are maintained, there will be positive drainage in this area and the risk of flooding at the Proposed Onsite Substation is negligible.

The Proposed Wind Farm is mapped in NIFM Fluvial Flood Zones A and B. In terms of the Proposed Wind Farm infrastructure, 6 no. turbine/turbine hardstands (T10, T22, T38, T42, T45 and T46) are

[73] *Department of Housing, Planning, Community and Local Government. Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licensing Systems. Key Issues Consultation Paper. Available at: https://www.publichealth.ie/sites/default/files/resources/IPH%20response%20to%20the%20key%20issues%20consultation%20paper%20on%20Transposition%20of%20EIA%20Directive%20201452EU.pdf*

mapped in the fluvial flood zones. As outlined above, the Proposed Wind Farm has been designed to in accordance with the recommendations in the SSFRA to minimise effects on flooding.

The SSFRA at the Proposed Offsite Substation was carried out and identified that no instances of historical fluvial flooding were identified from historic OS maps, and no recurring or historic flood events are mapped by the OPW in the local area or immediately downstream of the Proposed Offsite Substation. The GSI Historic Surface Water Flood Map does not record any historic flood zones or modelled groundwater flood zone within the area of the Proposed Offsite Substation.

In relation to the Proposed Grid Connection underground electrical cabling route, due to the relatively small footprint of proposed works and given that the only portions of the Proposed Grid Connection underground electrical cable route located within modelled flood zones are at existing watercourse crossings (~5 no.) or along existing public roads (~350m along the R414), the Proposed Grid Connection underground electrical cable route will not alter the shape or volume of the existing floodplain, and therefore no increase in downstream flood risk will occur.

The detailed Flood Risk Assessment for the Project Site, supplied as Appendix 9-1 and Appendix 9-2, has demonstrated that the risk of the Proposed Project contributing to downstream flooding is very low.

Air Quality and Climate

The study area for the assessment of potential effects on air quality arising from the Proposed Project is defined as the Air Quality Study Area and Dust Study Area, as set out in Section 10.1.1 of Chapter 10: Air Quality. The study area for the assessment of potential effects on climate is defined as the Climate Study Area, as set out in Section 11.1.1 of Chapter 11: Climate.

Air quality represents a key pathway to human health, with pollutants such as particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) associated with adverse respiratory and cardiovascular health outcomes. As outlined in Chapter 10, potential effects on air quality may arise where activities generate dust or emissions; however, wind energy developments are not recognised as significant sources of ongoing air pollution. It is not an activity which requires EPA licensing under the Environmental Protection Agency Act 1992, as amended. As such, a wind farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects.

Climate is also a key determinant of human health, with greenhouse gas emissions contributing to climate change and associated risks such as extreme weather events, temperature increases and impacts on environmental quality. The Proposed Project is for the development of a renewable energy project, a wind farm, capable of offsetting carbon emissions associated with the burning of fossil fuels.

During the operational phase the Proposed Project will have a long term, significant, positive effect on air quality and climate as set out in Section 10.3.3 of Chapter 10: Air Quality and Section 11.5.3 of Chapter 11: Climate. Therefore, the Proposed Project will contribute to positive effects on human health.

Noise and Vibration

The study area for the assessment of potential effects on noise and vibration arising from the Proposed Project are detailed in Section 12.4.1 of Chapter 12: Noise and Vibration. The defined study areas are based on the best practice guidance covering the construction, operation and decommissioning phases of the Proposed Project.

Noise and vibration represent key pathways through which construction/decommissioning activities and operational wind energy developments may influence human health and residential amenity.

During the construction phase, the highest predicted noise levels are expected to occur for short periods at a limited number of Noise Sensitive Locations (NSLs). In all instances the predicted noise levels at the nearest NSLs are below the adopted significance threshold. Construction activities will be carried out during normal daytime working hours (weekdays 07:00–19:00 and Saturdays 08:00–13:00), consistent with best practice for protecting residential amenity and human health through limiting noise exposure during night-time and rest periods. However, to ensure that optimal use is made of good weather periods or at critical periods within the programme (e.g., concrete pours) or to accommodate delivery of large turbine components along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be notified in advance with the relevant Local Authority.

Best practice for setting wind turbine noise limits at NSLs requires that limits relate to the cumulative noise level from all turbines. The proposed noise limits are therefore cumulative in nature, accounting for all operational wind turbines within the Proposed Turbines Operational Study Area, in order to ensure that the total noise burden on surrounding receptors and human health is appropriately controlled.

Mechanical noise may emanate from components within the nacelle of a wind turbine. This is a less natural sounding noise which can be characterised in some cases by its tonal content, particularly if resonances in the mechanical noise are not suitable controlled. However, modern wind turbine designs have evolved to minimise mechanical noise radiation and resonances thereby reducing the likelihood of tonal noise affecting human health at NSLs.

Current research and guidance relating to wind turbine noise amplitude modulation (AM) are ongoing. As per the discussion on the research presented in Section 12.3.6.11 of Chapter 12, excessive/other AM is considered an atypical phenomenon, and the duration, conditions and specific location or locations at which it presents cannot be predicted in the planning stage. For these reasons, the assessment of AM is typically triggered in response to complaints where the contributing factors aligning to the period of the complaint such as meteorological conditions and turbine operations can be investigated.

In the absence of clear policy in Ireland to control AM from wind turbines, the commitments outlined in the Section 12.7.2.1 of Chapter 12 are considered to represent best practice to control AM and will be adopted in the event that a complaint relating to excessive AM is reported.

Based on detailed assessment of the site layout, turbine noise emission levels, and hub heights, turbine noise levels have been predicted at NSLs across a range of operational wind speeds. The predicted noise levels associated with the Proposed Project will be within the best practice noise limits recommended in the WEDG 2006. It is therefore concluded that the Proposed Project will not give rise to significant effects on human health or residential amenity arising from noise and vibration.

Accordingly, noise and vibration are considered an important pathway for potential effects on population and human health and are assessed in detail in Sections 5.7.2.2.5 and 5.7.3.2.5 below.

Traffic and Transportation

The study area for assessing effects related to traffic and transport is defined by the Traffic and Transport Study Area, as set out in Section 15.1.3.3.1 of Chapter 15: Material Assets (Traffic and Transport), and encompasses the Proposed Wind Farm, Proposed Grid Connection, Proposed Enhancement Areas, Proposed Construction Haul Routes, Proposed Turbine Delivery Route and proposed diversion routes to ensure that effects on residential amenity resulting from construction phase traffic and transport activities are fully assessed.

Potential effects on human health can arise through changes in traffic volumes, the introduction of Heavy Goods Vehicles (HGVs) and abnormal loads, and increased interaction with sensitive receptors.

Traffic-related activities may contribute to noise and localised emissions, which can influence residential amenity and human health. The use of Proposed Construction Haul Routes and Proposed Turbine Delivery Route which includes sections of the national, regional and local road network, introduces potential interactions with sensitive receptors. The Proposed Construction Haul Routes and Proposed Turbine Delivery Route will make use of existing roads already carrying traffic volumes.

Accordingly, traffic and transport are considered an important pathway for potential effects on population and human health and are assessed in detail in Sections 5.7.2.2.6 and 5.7.3.2.6 below.

Aviation

The study area for assessing effects related to aviation is defined by the Aviation Study Area, as set out in Chapter 16: Aviation. The provision of aviation lighting on permitted turbines is a standard and accepted part of any wind farm development. This is a safety requirement of the IAA. Further engagement will be held with the IAA at the time of construction to inform appropriate lighting requirements.

It is considered that aviation lighting on the Proposed Turbines will have no significant effect on human health, beyond increasing aircraft safety in the context of the Proposed Project. The Applicant will continue its engagement with IAA as required in relation to aviation lighting. An assessment of impacts on aviation assets is included in Section 16.9 of Chapter 16: Aviation.

The assessments show that the residual effects are not significant and do not have the potential to cause negative health effects for human beings. On this basis, the potential for negative health effects associated with the Proposed Project is slight which is Not Significant.

Major Accidents and Natural Disaster

The study area for assessing the effects related to major accidents and natural disaster is defined by the Major Accidents Study Area, as set out in Section 17.1.1 of Chapter 17: Major Accidents and Natural Disaster, and it encompasses the all study areas from relevant disciplines (i.e., Chapter 8 Land, Soils and Geology, Chapter 9 Water, Chapter 10 Air Quality, Chapter 11 Climate, Chapter 12 Noise and Vibration and Chapter 15 Material Assets) to assess all potential environmental effects associated with major accidents and natural disasters.

Potential pathways through which major accidents and natural disasters could affect human health include:

- Contamination Event: Exposure to contaminants in soil, surface water or groundwater arising from contamination events, including accidental spillages of fuels or other substances during construction, operation or decommissioning;
- Fire: Exposure to smoke, particulates or combustion by-products arising from a major fire or bog fire event; and
- Major Road Traffic Incident: Exposure to physical hazards associated with identified risk scenarios, including major road traffic accidents, extreme weather events, peat instability, or infrastructure failure, which could result in injury to site personnel or members of the public.

Chapter 17: Major Accidents and Natural Disaster has identified a total of ten risks specific to the construction phase, nine risks for operational phase and eight risk for the decommissioning phase of the Proposed Project. The likelihood of major accidents or natural disasters occurring in the context of the Proposed Project is considered to be low. The Proposed Project is not a significant source of hazardous substances and is not subject to SEVESO regulations.

As outlined in Chapter 17, a range of mitigation and management measures will be implemented, including adherence to best practice in construction and operation, implementation of a CEMP (Appendix 4-4), and preparation of site-specific emergency response procedures.

5.4.5.1 Vulnerability of the Proposed Project to/from Major Accidents and Natural Disasters

An assessment of the Proposed Project's vulnerability to natural disasters can be found in Chapter 17: Major Accidents and Natural Disasters of this EIAR. There is low potential for significant natural disasters to occur within the lands containing the Proposed Project. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited and these have been assessed in the context of the whole project, cumulatively in Chapter 17 and in the wider EIAR.

This assessment was based upon The Major Emergency Plan prepared by Offaly County Council (2019)[74], and The Major Emergency Plan prepared by Kildare County Council (2022)[75] while also considering site-specific major emergency scenarios. A brief discussion can be found below of scenarios which received the highest risk scores.

5.4.5.1.1 *Contamination Events*

A wind farm is not a recognised source of pollution. Should a major accident or natural disaster occur the potential sources of pollution onsite during both the construction, operational and decommissioning phases are limited and of low environmental risk. During the construction phase, potential sources of pollution such as fuels, oils and other materials may be present on site; however, these are typically managed in accordance with standard environmental protection measures. During the operational and decommissioning phases, potential sources of pollution are minimal, with no requirement for bulk storage of hydrocarbons, chemicals or wastes. As such, the potential for significant environmental pollution and associated effects on human health is considered to be low.

The risk of contamination is 'very unlikely' to occur and will have 'limited' consequences should it do so, representing a 'low-risk scenario' during the construction, operation and decommissioning phases.

It is therefore considered that there will be unlikely, temporary, moderate, negative effects, which are Not Significant associated with contamination events during the construction, operation and decommissioning of the Proposed Project. Therefore, a significant effect on human health is similarly very unlikely.

5.4.5.1.2 *Major Fire*

The likelihood of a major fire occurring at the Project Site is anticipated to be low due to best practice measures of storing fuel in bunded containers during the construction phase. The likelihood of fire occurring will be further lowered by the implementation of good site management practices during the construction, operational and decommissioning phases.

Therefore, the risk of fire occurring at the Proposed Project resulting in a major accident and/or disaster is 'very unlikely' to occur and having 'limited' consequences should it do so, representing a 'low-risk scenario' during the construction, operational and decommissioning phases.

It is therefore considered that there will be unlikely, temporary, moderate, negative effects, which are Not Significant associated with major fire during the construction, operation and decommissioning of the Proposed Project. Therefore, a significant effect on human health is similarly very unlikely.

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[74] *Offaly County Council, 2019. Major Emergency Plan. Available at:* https://www.offaly.ie/app/uploads/Council/Council_Services_A-Z/Emergency_Services/Offaly-County-Major-Emergency-Plan-2019-1.pdf

[75] *Kildare County Council, 2022, major Emergency Plan. Available at:* file:///H:/2025/07%20July/250708%20BnM%20Ballydermot%20WF%20EIAR%20and%20PA/EIA%20Report/17.%20Major%20Accidents%20and%20Natural%20Disasters/KCC%20Major%20Emergency%20Plan.pdf

5.4.5.1.3 Summary

Chapter 8: Land, Soils and Geology, Chapter 9: Water, Chapter 10: Air Quality, Chapter 11: Climate, Chapter 12: Noise and Vibration, Chapter 15: Material Assets (Section 15.1: Traffic and Transport) and Chapter 16: Aviation provide an assessment of the effects of the Proposed Project on these areas of consideration. Chapter 17 assesses the vulnerability of the project to and from major accidents and natural disasters. There is the potential for negative effects on human health during the wind farm construction phase related to potential emissions to air of dust, potential emissions to land and water of hydrocarbons, release of potentially silt-laden runoff into watercourses and noise emissions and these are assessed in detail in Sections 5.7.2.2 and 5.7.3.2 of this chapter. The assessments in the chapters listed show that the residual impacts are not significant and will not lead to significant effects on any environmental media with the potential to lead to health effects for humans. On this basis, the potential for negative health effects associated with the Proposed Project is imperceptible. Furthermore, the Proposed Project is capable of offsetting carbon emissions associated with the burning of fossil fuels (see Section 11.4.3 of Chapter 11). During the operational stage the wind farm will have a long term, significant, positive effect on air quality and climate as set out in Chapter 10 and Chapter 11 which will contribute to positive effects on human health and assist in Ireland reaching its emissions targets and renewable energy goals.

5.4.6 Likely Future Receiving Environment

This section identifies the future receiving environment relating to human health likely to exist at the Proposed Wind Farm site at the commencement of the construction phase. In accordance with the approach set out in Section 1.8.4 of Chapter 1, the likely future receiving environment has been established having regard to the existing human health baseline presented in Section 5.4, and uses observed change over the survey period (i.e., 2020 to 2026) to inform, the likely future receiving environment.

The likely future receiving environment has been established having regard to:

- The existing human health baseline described in Section 5.4;
- The relevant findings of Chapter 6 (Biodiversity), Chapter 8 (Land, Soils and Geology), Chapter 9 (Water), Chapter 10 (Air Quality), Chapter 11 (Climate), and Chapter 15 (Other Material Assets – Traffic);
- Observed environmental change during site specific surveys from 2020 - 2026, including the distribution and development of natural revegetation;
- Available BnM site records and environmental data, including management and monitoring undertaken under IPC Licence Reg. No. P0503-01 included within the Annual Environment Reports (AERS) for the Allen Bog Group;
- Relevant guidance and legislation as outlined in Section 5.2.2 above.

The Project Site is located predominantly on former industrial peat extraction lands within the Allen Bog Group. Industrial peat extraction ceased in June 2020. Since then, environmental conditions across these lands have continued to develop through natural revegetation, alongside ongoing site management, environmental monitoring and decommissioning works undertaken in accordance with IPC Licence P0503-01.

At the commencement of the construction phase the likely future receiving environment will reflect the continued establishment and maturation of natural revegetation in suitable areas, in combination with the continuation of site management, decommissioning works, and environmental monitoring under IPC Licence P0503-01. The anticipated vegetation communities and their spatial distribution are described in Chapter 6 Biodiversity, with further detail provided in Chapter 8 Land Soils and Geology and Chapter 9 Water. Natural vegetation is expected to be spatially variable and is not assumed to follow a uniform trajectory across the Proposed Wind Farm site.

Natural revegetation may reduce the extent of exposed bare peat and associated potential for wind-blown peat and dust emissions at the Proposed Wind Farm site. As considered in Chapter 10: Air Quality, this is anticipated to result in a gradual improvement in local air quality and, therefore, on human health. However, any such change is not anticipated to materially alter the overall human health baseline at commencement of construction.

On this basis, the likely future receiving environment of the Proposed Wind Farm site at the commencement of the construction phase will be a former industrial peat-extraction landscape with a developing but spatially variable cover of natural revegetation, managed and monitored under IPC Licence Reg. No. P0503-01. From a human health perspective, the Proposed Wind Farm site will remain materially comparable to the existing baseline as established in Section 5.4.

The assessment of likely significant effects presented in Section 5.7.2 below has therefore been undertaken against this likely future receiving environment. As the conditions predicted at commencement of construction are materially comparable to those described in the existing human health baseline, the information presented in Section 5.4 remains representative of the likely future receiving environment for human health against which the Proposed Project is assessed.

5.4.6.1 Future Environmental Trends

This section identifies the future environment trends relating to human health likely to exist within the Human Health Study Area following implementation of the targeted rehabilitation measures within Draft Rehabilitation Plans throughout the operational phase.

Continued natural revegetation, ongoing site management, decommissioning works, and environmental monitoring and implementation of the targeted rehabilitation measures within the Draft Rehabilitation Plans are not anticipated to introduce new sources of human health risk. While the individual environmental determinants of health may evolve over time, on balance, these changes are not expected to materially alter the overall human health baseline within the Population Study Area.

The future trends of individual environmental determinants of health, including air quality, land and soil, water quality, climate, noise and vibration, aviation, traffic and transport, and risks associated with major accidents and natural disasters, have been considered through the relevant discipline-specific assessments presented in Section 5.7.3.

The continuation of the aforementioned activities in the absence of the Proposed Project is considered in the Do-Nothing Scenario in Section 5.7.1 and in the cumulative assessment in Section 5.7.5.

5.5 Shadow Flicker

5.5.1 Daily and Annual Shadow Flicker

The WindPRO computer software was used to model the predicted daily and annual shadow flicker levels in significant detail, identifying the predicted daily start and end times, maximum daily duration and the individual turbines predicted to give rise to shadow flicker.

The model results assume worst-case conditions, including:

- 100% sunshine during all daylight hours throughout the year,
- No cloud cover during all daylight hours throughout the year,
- An absence of any screening (vegetation or other buildings),
- That the turbine rotors are facing the property at all times, and
- That the turbine rotors are moving.

The shadow flicker model assumes that daylight hours consist of 100% sunshine. This is a conservative assumption which represents theoretical precautionary conditions. The worst-case modelled shadow flicker outputs further assume unobstructed visibility between a receptor and the Proposed Turbine, with no allowance made for screening from vegetation, hedgerows, buildings or other obstacles. The assessment also adopts a conservative 'greenhouse mode' approach, whereby windows are assumed to face the Proposed Turbines regardless of their actual orientation, and assumes that Proposed Turbine rotors are aligned in a manner that maximises the potential for shadow casting. These assumptions represent a theoretical precautionary scenario used to predict the maximum possible shadow flicker effect. In practice, actual shadow flicker occurrence will be reduced by a range of factors, including cloud cover, prevailing weather conditions, turbine orientation, turbine availability, vegetation and other screening features, and receptor occupancy patterns.

Following the detail provided above on sunshine hours, a sunshine factor of 31.74% has been applied. Taking these probabilities into consideration, an approximation of the 'estimated actual' annual shadow flicker occurrence has been calculated and is presented in **Table 1-1 of Appendix 5-5**.

The predicted maximum daily and annual shadow flicker levels are then considered in the context of the WEDG 2006 daily threshold of 30 minutes per day and annual threshold of 30 hours per year. If there is a predicted exceedance of the threshold limits at any property, the turbines that contribute to the exceedance are also identified.

The WEDG 2006 recommend that shadow flicker at dwellings within 500 m of a Proposed Turbine location should not exceed a total of 30 minutes per day or 30 hours per year. As detailed in Section 5.2.3.4 there are one sensitive receptor within 500 m of the Proposed Turbine locations.

The predicted shadow flicker levels have been modelled for all 310 no. sensitive receptors located within the Shadow Flicker Study Area. The predicted shadow flicker model results indicate:

- 138 sensitive receptors are theoretically predicted to experience zero shadow flicker;
- 172 sensitive receptors are theoretically predicted to experience some shadow flicker;
    - Of the 172 sensitive receptors, 63 sensitive receptors are theoretically predicted to experience shadow flicker that exceeds the WEDG 2006 thresholds for daily shadow flicker. Refer to Table 1-1 of Appendix 5-5 for details. Of these 63 no. sensitive receptors, 6 no. are commercial building and of these 2 no. are owned by the Applicant (i.e., Ballydermot Works). As a result, no mitigation measures are required for these 6 no. properties.
- The annual threshold of over 30 hours for shadow flicker (WEDG 2006) is predicted to be exceeded at 3 sensitive receptors once the regional sunshine average factor of 31.74% has been considered.

The predicted exceedances of shadow flicker listed in Table 1-1 added in Appendix 5-5 are considered conservative and in reality, the occurrence and/or duration of shadow flicker at these properties is likely to be eliminated or significantly reduced as the following items are not considered by the model:

- Receivers may be screened by topography, cloud cover and/or vegetation/built form, i.e., adjacent buildings, farm buildings, garages or barns;
- Each receiver will not have windows facing in all directions which look towards turbines;
- The model assumes 100% sunshine during all daylight hours throughout the year; and therefore, represents a conservative theoretical precautionary assessment. In reality, sunshine levels are significantly lower due to cloud cover and prevailing weather conditions, and the application of regional sunshine average factor generally reduces predicted shadow flicker durations. A small number of receptors will exceed the applicable assessment criteria when regional sunshine average factor is taken into account.

Section 5.7.3.2.9 below details the mitigation measures that will be employed at the potentially affected properties to ensure that the WEDG 2006 are complied with at any dwelling within the Shadow Flicker Study Area. The same mitigation measures (with stricter implementation of shadow flicker controls) also demonstrate that the Proposed Turbines can be operated in accordance with the shadow flicker requirements of the Draft WEDG 2019, should they be adopted as currently proposed, while the planning application is being determined.

Please refer to Figure 5-5, encompassing Figures 5-5A to 5-5Q in Appendix 5-5, for detailed figures on all sensitive receptors located within the Shadow Flicker Study Area.

660000 665000 670000 675000

730000 725000 720000

N W E S

5D 5C 5A 5E 5B 5G 5F 5P 5O 5Q 5H 5K 5L 5N 5J 5M 5I

T32 T30 T31 T29 T27 T28 T23 T46 T45 T44 T24 T26 T42 T25 T43 T41 T22 T40 T39 T36 T37 T21 T20 T10 T38 T17 T35 T19 T18 T09 T07 T34 T16 T33 T06 T15 T01 T08 T11 T03 T05 T12 T13 T04 T02 T1

0 1.25 2.5 5 7.5 10 Kilometers

660000 665000 670000 675000

Legend

- Project Site
- Proposed Turbine Layout
  - 220
  - 200
- Shadow Flicker Study Area
- Sensitive Receptors

Spatial Reference
Name: WGS 1984 Web Mercator Auxiliary Sphere
Datum: WGS 1984
Projection: Mercator Auxiliary Sphere

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N

SITE LOCATION - NOT TO SCALE

Drawing Title
Sensitive Receptors within the Shadow Flicker Study Area

Project Title
Ballydermot Wind Farm
Co. Offaly & Co. Kildare

Project No.	Drawing No.	Scale
250708	5-5	1:90,000
Drawn By	Checked By	Date
LPM	EC	21/10/2026

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

5.5.2 Equine Industry

There is 1 no. registered equestrian facilities, Bullhorn Ranch equestrian facility, located approximately 1.4 km east of the nearest Proposed Turbine (T46) within the Shadow Flicker Study Area. The next closest registered equestrian facilities are Lullymore House, located in Lullymore, Co. Kildare, approximately 1.9 km east of the nearest Proposed Turbine (T37) and the Irish Emerald Stud, approximately 2.5 km east of the nearest Proposed Turbine (T46). Therefore, there is 1 no. registered thoroughbred stud farms or other equestrian facilities included as sensitive receptors for the purposes of shadow flicker assessment.

Refer to Section 5.3.7.1 above for further information on the equine industry.

5.5.3 Cumulative Shadow Flicker

There are 2 no. existing wind farms within 5km of the nearest turbine of the Proposed Project:

- The existing Cushaling Wind Farm is located approximately 0.7 km from the nearest Proposed Turbine (T25) and is located between the following Proposed Turbines: T25, T26, T24, T23, T41, T39, T10, T17, T21 and T22. The existing Cushaling Wind Farm is arranged in a linear configuration, which extends broadly east to west with all turbines associated with the existing Cushaling Wind Farm encompassed by the Proposed Turbines;
- The existing Cloncreen Wind Farm is located approximately 2.8 km west from the nearest Proposed Turbine (T22).

The rotor diameter for the existing Cushaling Wind Farm turbines was 162m with a corresponding shadow flicker study area of 1.62km (10x rotor diameter). This area overlaps with the Shadow Flicker Study Area for the Proposed Project. The rotor diameter for the existing Cloncreen Wind Farm turbines was 136m with a corresponding shadow flicker study area of 1.36km (10x rotor diameter). This area overlaps with the Shadow Flicker Study Area for the Proposed Project and so there is potential for cumulative shadow flicker effects in this instance and this area is hereafter referred to as 'Cumulative Shadow Flicker Study Area'.

There are 9 no. Sensitive Receptors identified in the Cumulative Shadow Flicker Study Area. Of the 9 no. properties within the Cumulative Shadow Flicker Study Area, 3 no. properties have the potential to experience cumulative shadow flicker impacts, when the existing Cushaling Wind Farm and existing Cloncreen Wind Farm are assessed alongside the Proposed Wind Farm. Table 5-10 details the results. Figure 5-7 illustrates the zone of potential for cumulative shadow flicker between the Proposed Project, and Cushaling and Cloncreen wind farms. Mitigation strategies are outlined in Section 5.7.5.2.2.

The cumulative assessment of shadow flicker generated by the Proposed Project and the above relevant wind farms (included based on the overlap of their shadow flicker area with that of the Proposed Project (10x rotor diameter)) was carried out based on the methodology, assumptions and criteria outlined in Section 5.2.3.

655000 660000 665000 670000

730000 725000 720000

N W E S

Edenderry Ballyhagan Derrinturn Dreenan Ticknevin Killinagh Lower Clonbullogue Feighcullen Newtown (ed Killinthomas) Rathangan Mullantine

R441 R401 R414 R442 R419

110 m 85 m 71 m 81 m

T01 T02 T03 T04 T05 T06 T07 T08 T09 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39 T40 T41 T42 T43 T44 T45 T46

H022 H033 H085 H097 H110 H360 H1120

H022 H033 H065 H085 H096 H097 H110 H360

0 1.25 2.5 5 7.5 10 Kilometers

Legend

- Project Site
- Turbine Layout
  - 220
  - 200
- Shadow Flicker Study Area
- Cushaling Wind Farm
- Cloncreen Wind Farm
- Cushaling Wind Farm Shadow Flicker Buffer
- Cloncreen Wind Farm Shadow Flicker Buffer
- Cumulative Shadow Flicker Area
- Sensitive Receptors

Spatial Reference
Name: WGS 1984 Web Mercator Auxiliary Sphere
Datum: WGS 1984
Projection: Mercator Auxiliary Sphere

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N

SITE LOCATION - NOT TO SCALE

Drawing Title
Cumulative Shadow Flicker Study Area

Project Title
Ballydermot Wind Farm
Co. Offaly & Co. Kildare

Project No.	Drawing No.	Scale
250708	5-6	1:90,000
Drawn By	Checked By	Date
LPM	EC	30/09/2026

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

Table 5-10 Cumulative Shadow Flicker Results

House no.	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Nearest Proposed Turbine No. *	Distance to Nearest Turbine (metres)	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) contributing to Cumulative Shadow Flicker impact*	Further Assessment Required
H022	662086	726173	T22	991.6	00:40	47:41:00	15:07:58	T20, T22, Cushaling Wind Farm T04	Yes
H033	662069	725991	T22	997	00:39	39:26:00	12:30:53	Not applicable due to shadow flicker occurring from the Proposed Turbines only and not cumulatively with Cloncreen Wind Farm or Cushaling Wind Farm. Mitigation is assessed in Table 1-2 in Appendix 5-5.	No
H065	661991	726017	T22	1091.5	00:36	33:42:00	10:41:42	T20, T22, Cushaling Wind Farm T04	Yes
H085	661965	725932	T22	1116	00:35	32:14:00	10:13:47	Not applicable due to shadow flicker occurring from the Proposed Turbines only and not cumulatively with Cloncreen Wind Farm or Cushaling Wind Farm	No
H096	661941	725904	T22	1137	00:35	30:54:00	9:48:23	Not applicable due to shadow flicker occurring from the Proposed Turbines only and not cumulatively with Cloncreen Wind Farm or Cushaling Wind Farm. Mitigation is assessed in Table 1-2 in Appendix 5-5.	No
H097	661926	725967	T22	1146	00:34	29:16:00	9:17:17	Not applicable due to shadow flicker occurring from the Proposed Turbines only and not cumulatively with Cloncreen Wind Farm or Cushaling Wind Farm. Mitigation is assessed in Table 1-2 in Appendix 5-5	No

House no.	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Nearest Proposed Turbine No. *	Distance to Nearest Turbine (metres)	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) contributing to Cumulative Shadow Flicker impact*	Further Assessment Required
H110	661913	725881	T22	1176	00:33	29:21:00	9:18:52	Not applicable due to shadow flicker occurring from the Proposed Turbines only and not cumulatively with Cloncreen Wind Farm or Cushaling Wind Farm. Mitigation is assessed in Table 1-2 in Appendix 5-5.	No
H360	661408	725915	T22	1644	00:23	20:59	6:39	T22, Cloncreen WF T10 and T12 Mitigation is assessed in Table 1-2 in Appendix 5-5.	No
H1120	665731	726734	T41	960.6	05:07	1187:22:00	376:49:26	T25, T39, T40, T41, T42, Cushaling Wind Farm T27, Cushaling Wind Farm T28, Cushaling Wind Farm T29	Yes

Of the 9 no. properties with the potential for a cumulative impact to arise, Table 5-10 above illustrates that 3 no. properties warrant further assessment, of these 3 properties, 2 no. are derelict property (H22 and H65), and 1 no. is an inhabitable dwelling (H1120). Therefore 3 no. sensitive receptors have been included for further assessment.

Table 5-11 also shows that there is overlap on a number of days, when shadow flicker is predicted to arise from the Proposed Project and from the existing Cloncreen Wind Farm and Cushaling Wind Farm. On this basis, there is potential for cumulative daily shadow flicker impact. Section 5.7.5.2.2 outlines the mitigation strategies which will be employed at the potentially affected properties to ensure the daily shadow flicker threshold will not be exceeded for the houses in question.

Table 5-11 Potential Cumulative Impact from the Proposed Project and Nearby Wind Farms/Turbines

Property No.	Max. Potential Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Turbine(s) contributing to Cumulative Shadow Flicker impact*	No. of Days 30min/day Threshold is Exceeded by Proposed Wind Farm, Cushaling Wind Farm & Cloncreen Wind Farm	No. of Days 30min/day Threshold is Exceeded by Proposed Wind Farm (Turbines 1-46)	No. of Days 30min/day Threshold is Exceeded by Cushaling Wind Farm & Cloncreen Wind Farm (Turbines 9-27)	No. of Days where any levels of Shadow Flicker produced by the Proposed Wind Farm overlaps with that of Cushaling Wind Farm & Cloncreen Wind Farm	Mitigation Required by Proposed Project
H022	00:40:00	T20, T22, Cushaling Wind Farm T4	27	27	0	0	No, there are no days that overlap.
H065	00:36:00	T20, T22, Cushaling Wind Farm T4	22	22	0	0	No, there are no days that overlap.
H1120	05:07:00	T25, T39, T40, T1, T42, Cushaling Wind Farm T6-T8	365	97	365	223	Yes

5.6 Residential Amenity

Residential amenity relates to the human experience of one's home, derived from the general environment and atmosphere associated with the residence. The quality of residential amenity is influenced by a combination of factors, including site setting and local character, land-use activities in the area and the relative degree of peace and tranquillity experienced in the residence.

The Project Site is located approximately 2.2 kilometres (km) south- southeast of Edenderry town in Co. Offaly and approximately 2 km north of the village of Rathangan in Co. Kildare. Current land use within the Proposed Wind Farm comprises of natural revegetation of cutaway and degraded bog, a small area of active turbary, public road corridor, enhanced rehabilitation under the PCAS, ongoing decommissioning and monitoring works under IPC Licence (P0503-01), and existing wind energy infrastructure. Current land use at the Proposed Grid Connection comprises degraded raised bog, private agricultural land, and public road corridor. Land use associated with the Proposed Enhancement Areas includes natural revegetation of cutaway and degraded bog and forestry. Land-use in the wider landscape of the Project Site comprises of BnM landholdings, forestry, agricultural land, cutover and cutaway peatland, peatland rehabilitation, one-off rural housing, small village settlements, and existing energy infrastructure, including power plants, solar farms, and wind energy developments. The identified land uses within and around the Proposed Site will be retained in the surrounding landscape during the operational phase of the Proposed Project. As part of condition 10 attached to BnM IPC licence (Ref. P0503-01), environmental monitoring, site management and decommissioning is currently being carried out within the Allen Bog Group, within which the Proposed Wind Farm site is located. Irrespective of the Proposed Project, the measures outlined in the Draft Rehabilitation Plans (Appendix 2-4) will be implemented by BnM in agreement with the EPA, per BnM's IPC Licence Obligations. Therefore, the continuation of existing activities and land use and the obligations under the IPC License will assist in the assimilation of the Proposed Project into the receiving environment.

When considering the amenity of residents in the context of a Proposed Project, there are three main potential impacts of relevance: 1) Shadow Flicker, 2) Noise, and 3) Visual Amenity. Shadow flicker and noise are quantifiable aspects of residential amenity while visual amenity is more subjective. Detailed shadow flicker and noise modelling assessments have been completed as part of this EIAR (Section 5.7.3.2.9 below refers to the outputs of shadow flicker modelling, Section 12.4 of Chapter 12 addresses noise and vibration). A comprehensive landscape and visual impact assessment have also been carried out, as presented in Chapter 13 of this EIAR. Impacts on the local population during the construction, operational and decommissioning phases of the Proposed Project is assessed in relation to each of these key issues and other environmental factors such as noise, traffic and dust; see impacts in Section 5.8 below. The impact on residential amenity is then derived from an overall judgement of the combination of impacts due to shadow flicker, changes to land-use and visual amenity, noise, traffic, dust and general disturbance.

There are 33 no. sensitive receptors located within 1 km of Proposed Turbines. There are 2 no. commercial/warehouse units located less than 880 m from nearest turbine. There is a residential dwelling located approximately 894 m from T16 i.e., above both the minimum recommended setback as outlined in WEDG 2006 and the recommended 4 times the tip height setback (utilising 880m to represent the greatest setback requirement for sensitive receptors) from sensitive receptors as outlined in the Draft WEDG 2019. The turbine locations thus adhere to the WEDG 2006 and Draft WEDG 2019 in relation to turbine setback. There are 252 no. sensitive receptors located within 1 km of the Proposed Onsite Substation and Proposed Offsite Substation and 983 no. sensitive receptors located within 250m of the Proposed Grid Connection.

CAP25 was published in April 2025 by the Department of Environment, Climate and Communications. The associated Annex of Actions (Action EL/24/5) identifies the aim of publishing revised onshore wind energy guidelines in Q1 2025. At time of writing, the Draft WEDG 2019 have not yet been adopted, and the relevant guidelines for the purposes of section 28 of the Planning and Development Act 2000,

as amended, remain to be the WEDG 2006. Notwithstanding this, however, due to the timelines associated with the planning process for renewable energy projects it is possible that the Draft WEDG 2019 may be adopted during the consideration period for the current planning application. Without benefit of the revised wind energy development guidelines for onshore wind, it is considered that since noise emissions and shadow flicker are controllable via inbuilt turbine technologies, therefore, the Proposed Project is capable of compliance with any future guideline limits in this regard.

5.7 Likely Significant Impacts and Associated Mitigation Measures

The below assessment evaluates the impact (where there is the potential for an impact to occur) on population levels, employment and investment, land-use patterns and activities, property values, tourism, residential amenity, health and safety, air quality (dust and exhaust emissions), climate, water quality, noise and vibration, traffic and transport, major accidents and natural disasters, shadow flicker, and interference with telecommunications systems and EMF during the construction, operation and decommissioning phases, as a result of the Proposed Project.

5.7.1 'Do-Nothing' Scenario

If the Proposed Project were not to proceed, the Proposed Wind farm site would continue to be managed under the requirements of the IPC licence (P0503-01) and therefore the ongoing decommissioning works, site management and environmental monitoring would continue. The lands required for the Proposed Project not located within lands under IPC Licence or under PCAS would continue to function as it does at present, with no changes to the current land-use. Therefore, under a 'Do-Nothing' scenario, the Proposed Wind Farm site would continue to be managed as per the requirements of the IPC licence as detailed in Chapter 4, Section 4.6.7.

In the absence of the Proposed Project, natural revegetation processes would continue across the Proposed Wind Farm site. Areas of bare peat would progressively revegetate and transition through successional stages, potentially developing into heath communities, scrub or bog woodland over time, depending on local hydrological conditions. Therefore, the existing baseline of the landscape will transition from a predominantly industrial cutover peatland landscape, with open exposed peat surfaces and drainage features, to a more natural mosaic landscape of cutaway peatland, wetland and regenerating bog habitats. Prior to the submission of Draft Rehabilitation Plans to the EPA for agreement, baseline ecological surveys will be undertaken to establish the extent of natural revegetation, the potential for targeted revegetation and/or rewetting, and the future development of the cutaway areas to ensure their long-term stabilisation.

If the Proposed Project were not to proceed, the opportunity to capture a significant part of County Offaly's, County Kildare's and Ireland's valuable renewable energy resources would be lost. This would reduce the contribution of the Proposed Project towards national and EU renewable energy and climate objectives, as well as the renewable energy, climate action and decarbonisation objectives of the OCDP and the KCDP. Consequently, the associated benefits arising from the displacement of fossil fuel-based electricity generation, including reductions in greenhouse gas emissions and air pollutant emissions, would not be realised.

Furthermore, as this application includes a Biodiversity Management Plan (Appendix 6-5) to be implemented during the operation phase, the opportunity to enhance the Proposed Wind Farm for biodiversity, separate to the requirements of the IPC License, at a local scale, would also be lost. This would be a long-term slight negative effect and is Not Significant.

5.7.2 Construction Phase

Within this section, the impact will consider the Proposed Project, i.e., the Proposed Wind Farm and the Proposed Grid Connection, Proposed Enhancement Areas, Proposed Construction Haul Routes, and Proposed Turbine Delivery Route as a whole. Where the Proposed Project infrastructure elements are required to be considered separately, this is identified within the assessment.

5.7.2.1 Population

5.7.2.1.1 *Population Levels*

Pre-Mitigation Impact

Proposed Project

Those working on the construction phase of the Proposed Project will travel daily to the Project Site from the wider area. The construction workforce will be short-term and will not result in any measurable change to population levels, population density, household size or age structure within the Population Study Area. Accordingly, the effect on population levels is predicted to be neutral in nature, localised to the Project Site and surrounding area, temporary and short-term in duration, during the construction phase, and fully reversible upon completion of construction activities. The resulting effect on population levels is therefore assessed as, neutral, not significant and short-term, which is Not Significant.

Mitigation Measures

No mitigation required.

Residual Effects

The residual effect is assessed as neutral, not significant and short-term, and is therefore Not Significant.

Significance of Effects

There will be no significant effects on populations levels arising from the Proposed Project during the construction phase.

5.7.2.1.2 *Employment and Investment*

Pre-Mitigation Impact

Proposed Project

The design, construction, operation and decommissioning of the Proposed Project will provide employment for technical consultants, contractors and maintenance staff. Up to approximately 200-250 jobs are likely to be created during the construction phase of the Proposed Project. The construction phase of the Proposed Project will last between approximately 30-36 months.

The majority of construction workers will be sourced locally, thereby helping to sustain employment in the construction trade. Engineering fill and higher quality, surfacing granular fill and sand will be sourced from local, authorised quarries. This will have a positive, moderate, short-term, direct impact, which is Not Significant.

The salaries and wages earned by those employed during the construction phase of the Proposed Project has the potential to result in an increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a positive, slight, short-term, indirect impact on their cash flow, which is Not Significant.

The Proposed Project will result in an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive impact on the local skills base. Up-skilling and training of local staff in the particular requirements of the wind energy industry is likely to lead to additional opportunities for those staff as additional wind farms are constructed in Ireland. This will have a positive, moderate, long-term, indirect impact, which is Not Significant. Wind Energy Association estimates that there are over 5,000 people employed in roles related to wind energy in Ireland in 2023. This figure is anticipated to grow significantly in the coming years as the race to achieve the targets set out in CAP25 accelerates.

Commercial rates from the wind farm will contribute significant funds to Offaly County Council and Kildare County Council to support the provision of public services within these counties. These services include road maintenance, fire services, environmental protection, street lighting, footpath maintenance, etc. along with other community and cultural support initiatives. This will have a positive, moderate, long-term, direct impact which is Not Significant.

Mitigation Measures

No mitigation required.

Residual Effects

The injection of money in the form of salaries and wages to those employed during the construction phase of the Proposed Project has the potential to result in an increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a positive, moderate, short-term effect on their cash flow, and is therefore Not Significant.

Significance of Effects

There will be no significant effects on employment and investment levels arising from the Proposed Project during the construction phase.

5.7.2.1.3 *Land Use Patterns & Activities*

Pre-Mitigation Impact

Proposed Project

Proposed infrastructure within Lodge Bog includes, approx. 2.5km of internal access road, 2 no. peat and spoil areas, the Proposed Onsite Substation and associated telecommunications tower along with all ancillary infrastructure, and approximately 68m of the Proposed Grid Connection underground electrical cabling. The Proposed Project has been designed so that the required infrastructure is located outside the PCAS areas. The Proposed Project has also been designed to ensure that these activities can coexist with, and not preclude, restoration measures, with only a part of land transitioning to energy infrastructure use, while the surrounding areas continue to be managed for ecological restoration, ensuring that project activities do not preclude or interfere with PCAS objectives. The PCAS works have been completed within Lodge Bog. The works included hydrological management, extensive re-wetting and drain blocking, modifying outfalls, creation of berms etc. There is no infringement on the proposed areas for PCAS within Lodge Bog and therefore there is no impact on PCAS as a result of the

construction phase of the Proposed Project. PCAS and the Proposed Project is considered cumulatively in Section 5.7.5 below.

The Proposed Project includes the Proposed Enhancement Areas distributed throughout the Proposed Wind Farm site. During the construction phase, limited works will be required within these areas to facilitate habitat creation and restoration measures. This will result in an alteration of existing land use, primarily from degraded cutaway bog or modified land to managed ecological habitat. Therefore, the Proposed Enhancement Areas are anticipated to have a short-term, slight, positive effect, which is Not Significant, during the construction phase.

As outlined in Section 5.3.12 above, the likely future receiving environment at commencement of the construction phase (i.e.,, ongoing site management, environmental monitoring, and decommissioning works under IPC Licence and continued natural revegetation) is expected to remain broadly consistent with the current baseline environment with respect to population as established in Section 5.3 above.

Current land-use on and along the Proposed Grid Connection comprises majority public road corridor, of degraded raised bog and agricultural land.. The Proposed Grid Connection underground electrical cabling route will exit the Proposed Onsite Substation via the proposed internal site access road onto the R414, and will comprise then Horizontal Directional Drilling (HDD) at 1 no. location, i.e., beneath the Grand Canal west of the Shee Bridge, before and continuing along the R403 through Allenwood, and turning south along the L6002 at Prosperous to connect to the Proposed Offsite Substation in the townland of Killybegs, Co. Kildare. The provision of renewable energy infrastructure, i.e., the Proposed Onsite Substation represents a permanent change in land use, albeit over a relatively small, localised footprint within the part of the Project Site located on part of the Allen Bog Group (less than 1%). The Proposed Offsite Substation at Killybegs will result in a permanent change in land use, from existing agricultural land to renewable energy infrastructure. The Proposed Grid Connection will result in a short-term, slight, negative change in land use, during the construction phase, which is Not Significant.

Local temporary traffic disruptions are likely along the Proposed Grid Connection underground electrical cabling route; however, once the construction of each element is complete traffic flow will resume as normal along public roads. This will have a temporary, moderate, negative effect, which is Not Significant.

The construction phase will involve the use of established Proposed Construction Haul Routes and Proposed Turbine Delivery Route, as described in Chapter 4: Description of the Proposed Project. Construction materials, including stone and ready-mix concrete, will be transported from local quarries via the public road network and multiple site entrances, resulting in a temporary intensification of traffic activity along these routes. Similarly, the delivery of turbine components will be facilitated via the Proposed Turbine Delivery Route, which will utilise the motorway as well as national, regional and local roads and existing internal access tracks within Cloncreen Wind Farm prior to accessing the Proposed Wind Farm site.

In order to facilitate turbine delivery, localised and temporary accommodation works, including junction widening, minor road modifications, and temporary repositioning of roadside infrastructure, will be required along sections of the route. These works will result in a temporary alteration to the function and use of sections of the road network and adjoining verges. All such works are considered short-term, slight, negative, which is Not Significant.

Potential impacts related to traffic and transport during the construction phase are assessed in Section 5.7.2.2.6 below and in Section 15.1.17.2 of Chapter 15: Material Assets of this EIAR.

Mitigation Measures

- The construction of the Proposed Grid Connection will be undertaken in a rolling construction method with 100-150m of road constructed and back filled each day

providing access in the evenings and night hours along the Proposed Grid Connection.

- A Traffic Management Plan, agreed with the Local Authority, will be in place for the construction phase of the Proposed Grid Connection underground electrical cabling route. The Traffic Management Plan is included as Appendix 15-2 to this EIAR.
- The identified 60.7ha of clear-felled forestry that will be permanently felled within and around the Proposed Wind Farm site, will be replanted in line with the forest service published policy on felling for wind farm developments and subject to a Limited Felling Licence (LFL) application to the Forest Service in accordance with the Forestry Act 2014 and Forestry Regulations 2017.
- The identified 173.27ha of vegetation removal will be replanted as part of the Proposed Enhancement Areas as detailed in Appendix 6-5 Biodiversity Management Plan (BMP).

Residual Effects

Due to the small permanent footprint of the Proposed Project infrastructure (2.9% of the Project Site) along with the proposed mitigation measures, the residual effect is considered negative, not significant, and permanent on land use.

Significance of Effects

There will be no significant effects on land use patterns and activities arising from the Proposed Project during the construction phase.

5.7.2.1.4 *Property Values*

Pre-Mitigation Impact

Proposed Project

The available scientific literature demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine that there is the potential for a significant effect on property values as a result of a wind energy development. The impact assessment on property values outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.3.11, there is the potential for negative, slight, short-term impacts on property values, which is Not Significant, located within 1 km of the Proposed Turbines during the construction phase of the Proposed Project.

The conclusions from available EirGrid studies indicate that property values (residential and agricultural) show no correlation with the presence of grid infrastructure in the area, with opinions on nearby grid infrastructure diminishing over time. In some cases, property values were demonstrated to increase however, causation with grid infrastructure cannot be determined, refer to Section 5.3.11 above. Therefore, there is no potential for the Proposed Grid Connection to impact on property values in the area.

Mitigation Measures

- All mitigation relevant to property values, outlined above and the corresponding chapters: Chapter 10: Air Quality, Chapter 12: Noise and Vibration, Chapter 14: Landscape and Visual, and Chapter 15: Material Assets, will be implemented in order to reduce insofar as possible, impacts on property values at properties located in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

- The Proposed Wind Farm has been designed in accordance with the parameters set out in the WEDG 2006 and with cognisance of the Draft WEDG 2019 Guidelines, adhering to the required setback distances from sensitive receptors set out in those documents.

Residual Effects

With the above mitigation and monitoring measures adhered to, it can be concluded that there is the uncertain potential for a short-term negative imperceptible residual effect on property values from the construction phase of the Proposed Project.

Significance of Effects

There will be no significant effects on property values arising from the Proposed Project during the construction phase.

5.7.2.1.5 *Tourism*

Pre-Mitigation Impact

Proposed Project

There is potential for temporary disturbance to visitors to tourism sites during the construction phase arising from construction traffic, noise and visual effects. However, these effects would be short-term in nature and would not be expected to affect the overall tourism function, attractiveness or accessibility of these attractions. Therefore, under a precautionary scenario, the effect on tourism during the construction phase is assessed as short-term, not significant and negative.

The Proposed Project has some rural aesthetic qualities given the relative lack of buildings and infrastructure present within the Project Site. The Proposed Project is primarily located on peatland habitat; this landscape is common throughout the local area and, due to the Allen Bog Group bogs, which forms part of the Proposed Project's historical use for industrial peat extraction and ancillary activities. Other characteristics of the wider landscape include tracts of forestry.

There are no major tourist attractions located along the Proposed Grid Connection underground electrical cabling route. However, a number of recreational and amenity resources occur in the wider vicinity of the Proposed Grid Connection underground electrical cabling route, including Ballynafagh Lake and sections of the Grand Canal corridor. Majority of the Proposed Grid Connection underground electrical cabling route is located within the public road network with Proposed Onsite Substation located in Lodge Bog Co. Kildare and Proposed Offsite Substation located in private agricultural land in the townland of Killybegs, Co. Kildare. It is not anticipated that persons exploring the area will be negatively affected when utilising the roads along which the Proposed Grid Connection underground electrical cabling route is proposed and where construction traffic for the Proposed Offsite Substation will be operating. Furthermore, the laying of cables for the Proposed Grid Connection underground electrical cabling route will be carried out in a rolling nature at an average rate of 100m to 150m of cabling being installed per day, therefore the construction works will be transient in nature. Traffic management will generally consist of a single-lane closure with traffic maintained through appropriate traffic control measures and, if required, temporary diversions.

The impact assessment on tourism outlined above takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.3.9, there is the potential for negative, slight, short-term impacts on tourism, which is Not Significant, during the construction phase of the Proposed Project.

With regard to tourist attractions and amenity use around the Proposed Project, as described in Section 5.3.9, any potential effects during the construction phase will be managed through standard traffic management and safety measures.

Mitigation Measures

With regard to tourist attractions and amenity use surrounding the Proposed Project, Section 5.7.2.2.6 below outlines the mitigation measures proposed in relation to traffic management. Refer to Section 15.1.17.5 of Chapter 15: Material Assets for mitigation measures relating to the Proposed Project.

Refer to Section 13.3.2 and Section 13.7.2 of Chapter 13 and Section 14.4.3 of Chapter 14 for associated mitigation on tourism from a landscape and cultural heritage perspective, respectively. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Based on the above it is concluded that there would be a negative, imperceptible, short-term, residual effect on tourism in the wider landscape due to the construction phase the Proposed Project.

Significance of Effects

There will be no significant effects on tourism arising from the Proposed Project during the construction phase.

5.7.2.1.6 *Residential Amenity*

Pre-Mitigation Impact

Proposed Project

As identified in Section 5.6 above, there is the potential for impacts on residential amenity during the construction phase due to air, traffic, noise and vibration emissions, and visual nuisance due to additional traffic and plant machinery. Construction traffic will utilise the Proposed Construction Haul Routes which includes the national, regional, and local road networks. These activities have the potential to give rise to temporary increases in dust generation, particularly during dry conditions, as well as increased traffic volumes and associated noise and disturbance along Proposed Construction Haul Routes which is detailed in Section 10.3.2.2 of Chapter 10, Section 12.6.2 of Chapter 12, and Section 15.1.17.2 of Chapter 15. This will have a negative, moderate, short-term impact, which is Not Significant.

The potential impacts on residential amenity due to the construction of the Proposed Grid Connection are traffic, air quality and noise and vibration. A section of approximately 10.6km of the Proposed Grid Connection underground cabling will be located within the R414 and R403 regional road, this has the potential to give rise to traffic disruptions. Approximately 1km of proposed new access road will enable the Proposed Grid Connection underground electrical cabling route to access the Proposed Offsite Substation in the townland of Killybegs, Co. Kildare. Dust emissions, traffic and noise and vibration emissions will have a short-term moderate negative impact.

Overall, the combined effects of dust emissions from Proposed Construction Haul Routes, and the Proposed Grid Connection underground electrical cabling route, will result in a negative, moderate, short-term impact on residential amenity, which is Not Significant.

Mitigation Measures

All mitigation as outlined above and the corresponding chapters: Chapter 10: Air Quality, Chapter 12: Noise and Vibration, Chapter 13: Landscape and Visual, Chapter 14: Cultural Heritage, and Chapter 15: Material Assets will be implemented in order to reduce insofar as possible, impacts on residential amenity at properties located in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Based on the above it is concluded that there would be a short-term, negative, slight, residual effect on residential amenity due to the construction phase of the Proposed Project.

Significance of Effects

There will be no significant effects on residential amenities arising from the Proposed Project during the construction phase.

5.7.2.2 Human Health

The following impact assessment is produced in accordance with guidance as set out in Section 5.2.2.

5.7.2.2.1 *Health and Safety*

Pre-Mitigation Impact

Proposed Project

Construction of the Proposed Project will necessitate the presence of a construction site and travel on the local public road network along the Proposed Construction Haul Routes and Proposed Turbine Delivery Route. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers if site rules are not properly implemented. This will have a potential negative, significant, short-term impact on health and safety, which is Significant.

Construction activities within the Project Site will involve the use of heavy plant, machinery and construction equipment, which pose potential health and safety risks to construction workers where site rules and procedures are not adequately implemented. In addition, works associated with the Proposed Enhancement Areas, while relatively small in scale, will introduce additional construction activity locations across the Project Site, thereby extending the spatial extent of potential health and safety risks.

The construction phase will also generate increased traffic movements along the Proposed Construction Haul Routes and the Proposed Turbine Delivery Route, including HGVs, Light Goods Vehicles (LGVs), and abnormal loads associated with turbine components. These movements will take place along the public road network and through multiple site entrances and give rise to potential health and safety risks to road users, pedestrians and local communities, including the risk of traffic accidents and interactions with construction vehicles.

The turbine delivery accommodation works, such as junction modifications and localised road adjustments may require additional, temporary health and safety considerations for road users and nearby receptors.

The construction of the Proposed Grid Connection will include Proposed Onsite Substation, Proposed Offsite Substation, the 13.1km 220kV underground cabling connection from the Proposed Onsite Substation to the Proposed Offsite Substation, and overhead line (OHL) connecting the Proposed

Offsite Substation to the existing Maynooth-Dunstown 220kV OHL, which may impact on electrical infrastructure and supply in the area and along a local road which may give rise to traffic impacts. Furthermore, working in the cavity of power lines and traffic flow is potential health and safety hazard for construction workers. Based on a precautionary scenario, this will have a potential negative, significant, short-term impact on health and safety, which is Significant.

Mitigation Measures

The Proposed Project will be constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including:

- Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005);
- Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016);
- S.I. No. 528/2021 - Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021 and
- Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2023.

The following measures below are also detailed in Appendix 4-4: CEMP and Chapter 19: Schedule of Monitoring and Mitigation Measures.

- A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage.
- All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. SafePass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card if required. The developer and owners engineer are required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan. Public safety will be addressed by restricting site access during construction. Fencing will be erected in areas of the Project Site where uncontrolled access is not permitted.
- Appropriate warning signs will be posted, directing all visitors to the site manager. Appropriate warning measures including 'goalposts' will be used as appropriate to prevent contact with any overheads lines that traverse the Project Site.
- Goal posts will be established, where necessary, under overhead electricity lines for the entirety of the construction phase of the Proposed Project.
- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of overhead electricity lines running over the Project Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Project Site are made aware of the location of lines before they come on to Project Site.
- Barriers will run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the nearest overhead line conductor wire.
- When activities must be carried out beneath overhead lines, e.g., component delivery or substation construction, a site-specific risk assessment will be undertaken prior to any works. The risk assessment must take into account the maximum potential height that can be reached by the plant or equipment that will be used prior to any works. Overhead line proximity detection equipment will be fitted to machinery when such works are required.

- Information on safe clearances will be provided to all staff and visitors.
- Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and onsite.
- All staff will be made aware of and adhere to the Health & Safety Authority's '*Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2013 to 2021"* This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan.

The scale and scope of the project requires that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) be appointed in accordance with the provisions of the Health & Safety Authority's '*Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013*'[76].

The PSDP appointed for the construction stage shall be required to perform their duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project;
- Where possible, eliminate the hazards or reduce the risks;
- Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan;
- Ensure that the work of designers is coordinated to ensure safety;
- Organise co-operation between designers;
- Prepare a written Safety and Health Plan;
- Prepare a safety file for the completed structure and give it to the client; and
- Notify the Authority and the client of non-compliance with any written directions issued.

The PSCS appointed for the construction stage will be required to perform their duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Development of the Safety and Health Plan for the construction stage with updating where required as work progresses;
- Compile and develop safety file information.
- Reporting of accidents / incidents;
- Weekly site meeting with PSCS;
- Coordinate arrangements for checking the implementation of safe working procedures. Ensure that the following are being carried out:
    - Induction of all site staff including any new staff enlisted for the project from time to time;
    - Toolbox talks as necessary;
    - Maintenance of a file which lists personnel on site, their name, nationality, current SafePass number, current Construction Skills Certification Scheme (CSCS) card (where relevant) and induction date;
    - Report on site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance;
    - Monitor the compliance of contractors and others and take corrective action where necessary; and

[76] *HSA, 2017. Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013. Available at:* https://www.hsa.ie/eng/publications_and_forms/publications/construction/guidelines_on_the_procurement_design_and_management_requirements_of_the_safety_health_and_welfare_at_work_construction_regulations_2013_updated_.html

- Notify the Authority and the client of non-compliance with any written directions issued.

Residual Effects

With consideration of the implementation of the detailed mitigation measures and adherence to relevant Safety and Health Plan, there will be potential negative, imperceptible, short-term residual effects on health and safety during the construction phase of the Proposed Project.

Significance of Effects

There will be no significant effects on health and safety arising from the Proposed Project during the construction phase.

5.7.2.2.2 *Air Quality: Dust and Exhaust Emissions*

The study area for analysing the effects on air quality is defined based on the Air Quality Study Area and Dust Study Area, as set out in Section 10.1.1 of Chapter 10: Air Quality, see Section 5.2.2 above. Chapter 10: Air Quality assesses the potential for impact to human health from dust, CO_2 and other noxious emissions generated by additional vehicles and plant machinery as well as the release of CO_2 through excavations.

Pre-Mitigation Impact

Proposed Project

Potential dust emission sources during the construction phase of the Proposed Project include upgrading of existing access tracks and construction of new access roads, turbine, meteorological mast and relay mast foundations, temporary construction compounds, peat and spoil management areas, underground internal 33kV cabling and associated road upgrade works, Proposed Enhancement Areas, the Proposed Onsite Substation and Proposed Offsite Substation and associated ancillary infrastructure, underground 220kV electrical cabling and delivery of materials via the Proposed Construction Haul Routes and Proposed Turbine Delivery Route. Potential dust emissions during the construction period are considered to be short-term, not significant and negative.

An increase in dust and exhaust emissions has the potential to cause a nuisance to sensitive receptors in the immediate vicinity of the Proposed Project. The entry and exit of construction vehicles from the Project Site via the Proposed Construction Haul Routes and Proposed Turbine Delivery Route may result in the transfer of mud to the public road, particularly if the weather is wet. This may cause nuisance to residents and other road users.

These effects will have a short-term, moderate, negative impact on air quality, which is Not Significant. The potential dust impacts that may occur during the construction phase of the Proposed Project are further described in Section 10.3.2 of Chapter 10: Air Quality. As air quality represents a pathway to human health, these effects have the potential to give rise to short-term, moderate, negative effects on human health, which is Not Significant.

Mitigation Measures

Truck wheels will be washed to remove mud and dirt before leaving the Project Site. All plant and materials vehicles will be stored in the compound area or other dedicated areas. Areas of excavation will be kept to a minimum, and stockpiling will be minimised by coordinating excavation, spreading and compaction. Construction traffic will be restricted to defined routes, and a speed limit will be implemented.

The active construction area along the Proposed Grid Connection underground electrical cabling route will be small, ranging from 100m to 150m in length at any one time. Should separate crews be used during the construction phase they will generally be separated by 1-2km. All construction machinery will be maintained in good operational order while on-site, minimising any emissions that are likely to arise. Aggregate materials for the construction of the cabling route will be sourced locally to reduce the amount of emissions associated with vehicle movements.

All mitigation as outlined in Chapter 10: Air Quality will be implemented in order to reduce insofar as possible, impacts on climate in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

With the implementation of the above mitigation measures, there will be a short-term, slight, negative, residual effect due to dust emissions from the construction of the Proposed Project.

Significance of Effects

There will be no significant effects on air quality arising from the Proposed Project during the construction phase.

5.7.2.2.3 *Climate*

The study area for analysing the effects on climate is defined based on the Carbon Assessment Study Area and Climate Study Area, as set out in Section 11.1.1 of Chapter 11. Chapter 11: Climate identifies, describes, and assesses the potential significant direct and indirect effects on climate arising from the Proposed Project.

Pre-Mitigation Impact

Proposed Project

Greenhouse gas emissions, e.g., carbon dioxide (CO_2), carbon monoxide and nitrogen oxides, associated with the production of construction materials, and operation of vehicles and plant will arise as a result of the construction activities. There will be a short-term, negative and slight impact, which is Not Significant, given the quantity of greenhouse gases that will be emitted to the atmosphere and will be restricted to the duration of the construction phase. The potential climate impacts that may occur during the construction phase of the Proposed Project are further described in Section 11.5.2 of Chapter 11: Climate.

Mitigation Measures

All mitigation as outlined in Chapter 11: Climate will be implemented in order to reduce insofar as possible, impacts on climate in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Following implementation of the mitigation measures identified in Chapter 11: Climate (Section 11.5.2), greenhouse gas emissions arising from the construction phase of the Proposed Project will have a negative, slight, short-term residual effect on climate which is Not Significant. The construction phase is short-term; however, once emitted to the atmosphere greenhouse gas emissions are considered to be permanent and therefore the residual effect is considered permanent. Therefore, the residual effect is considered to be a negative, slight, permanent residual effect on Climate, which is Not Significant.

Significance of Effects

There will be no significant effects on climate arising from the Proposed Project during the construction phase.

5.7.2.2.4 *Water Quality*

Pre-Mitigation Impact

Proposed Project

The study area for analysing the hydrological and hydrogeological impact arising from the Proposed Project is defined based on the Water Study Area, as set out in Section 9.2.1 of Chapter 9: Water. There are no mapped Public Water Supplies (PWS) or Group Water Schemes (GWS) within the Project Site. The closest mapped GWS is the Bracknagh Rech GWS, located approximately 0.6km south of the Proposed Wind Farm in the townland of Rathangan and it is located within the Population Study Area. The closest mapped Public Water Supply (PWS) is the Clonbulloge PWS, located approximately 0.5km west of the Proposed Wind Farm in the townland of Clonbulloge, Co. Offaly, located within the Population Study Area.

Section 9.5.2 of Chapter 9: Water assesses the potential for impact on PWS and private wells during the construction phase. The assessment concludes that there will be a negative, imperceptible, indirect, long-term, unlikely effect during the construction phase of the Proposed Project, which is Not Significant.

Mitigation Measures

All mitigation as outlined in Section 9.5.2 of Chapter 9: Water will be implemented in order to reduce insofar as possible, impacts on water quality in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

For the reasons given in the above and in Chapter 9: Water (separation distances, and prevailing geology, topography and groundwater flow directions), it is considered that the residual effects are be negative, imperceptible, and long term, in terms of quality or quantity on local groundwater well supplies.

Significance of Effects

There will be no significant effects on water quality arising from the Proposed Project during the construction phase.

5.7.2.2.5 *Noise and Vibration*

Pre-Mitigation Impact

Proposed Project

The study area for analysing the effects on noise and vibration is defined based on the Construction Study Area and Operational Study Area, as set out in Section 12.4.1 of Chapter 12: Noise and Vibration. There are several stages and elements associated with the construction phase of the Proposed Project which will include but are not limited to the following:

- Construction of new entrance(s) and hardcore existing entrance, construction of internal site roads;
- Construction of turbines and hard standing areas;
- Construction of Proposed Onsite Substation and Proposed Offsite Substation;
- Construction of Proposed Grid Connection including underground cabling and overhead line connection;
- Construction of 2 no. Meteorological Masts;
- Construction of 1 no. Relay Mast;
- Peat and Spoil Management;
- Construction of temporary construction compounds;
- Tree felling, vegetation removal and Biodiversity Management measures; and
- Construction Traffic.

In general, the distances between the construction activities associated with the Proposed Project and the nearest Noise Sensitive Locations (NSLs) are such that there will be no significant noise, and vibration impacts at the NSLs. The following sections present an assessment of the main stages of the construction phase that have the potential for associated noise and vibration effects, all other stages and elements are considered unlikely to have any significant noise and vibration effects namely, Relay Mast, onsite clear-span bridges, parking, security fencing, onsite internal cabling, site drainage works, overhead line connection and accommodation works along the Proposed Turbine Delivery Route. The closest noise sensitive receptor is Location H005 at approximately 894 m from Proposed Turbine T16. In all instances the predicted noise levels at the nearest NSLs are below the adopted significance threshold detailed in Section 12.6.2.1.1 of Chapter 12.

The potential noise and vibration impacts that will occur during the construction phase of the Proposed Project are further described in Chapter 12: Noise and Vibration. The predicted pre-mitigation noise and vibration impacts during the construction of the Proposed Project are assessed as short-term, not significant and negative which is Not Significant.

Mitigation and Monitoring Measures

The construction works will be obliged to adopt best practice noise abatement measures contained in British Standard BS 5228-1:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Noise*' and BS 5228-2:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Vibration*'.

The assessment of potential impacts presented in Section 12.7.1 of Chapter 12 has demonstrated that the Proposed Project is expected to comply with the noise and vibration criteria during the construction phase and therefore no specific mitigation measures are required.

To ameliorate any potential noise impacts that may present during the construction phase, a schedule of noise control measures has been formulated in accordance with best practice guidance.

All mitigation as outlined in Chapter 12: Noise and Vibration will be implemented in order to reduce insofar as possible, impacts on climate in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

With the implementation of the above mitigation measures, there will be a negative, not significant and short-term residual effect due to noise and vibration arising during the construction phase of the Proposed Project and is therefore Not Significant.

Significance of Effects

There will be no significant effects on human health due to noise and vibration arising from the Proposed Project during the construction phase.

5.7.2.2.6 *Traffic and Transport*

Pre-Mitigation Impact

Proposed Project

The study area for analysing the effects on traffic is defined based on the Traffic and Transport Study Area, as set out in Section 15.1.1.6.1 of Chapter 15: Material Assets. In order to facilitate the construction of the Proposed Project, all crushed stone, hardcore materials and ready-mix concrete that will be required during the construction phase will be sourced from local, appropriately authorised quarries and will be delivered to the Project Site via the Proposed Construction Haul Route. Section 10.3.2 in Chapter 10: Air Quality details regarding the health effects caused by exhaust and dust emissions due to the construction traffic and it identified the potential effects equivalent to short-term, moderate, negative effect, which is not significant.

The Proposed Turbine Delivery Route of all turbine components and plan is detailed in Chapter 4: Description of the Proposed Project of this EIAR, with a summary provided below:

- Turbine infrastructure will be imported to Galway Port and be transported via Lough Atalia Road, R339, R336, N6/M6, and east to the Proposed Wind Farm.
- The large wind turbine plant will be delivered via the M6, turning south onto the N52 at Junction 5, then south past Tullamore, and continue southeast along R420 regional road before turning northeast along the R402 east of Daingean toward the entrance of the existing Cloncreen Wind Farm. (Table 4-7 in Chapter 4).
- All other construction materials will be delivered to the Project Site via the Proposed Construction Haul Routes shown on Figure 4-40 and will access the site using the appropriate site access location based on the source of the construction material which will be included in the Traffic Management Plan (TMP) for the Proposed Project, included as Appendix 15-2 to the EIAR.
- All other construction materials will be delivered via the haul routes shown in Chapter 4, using the appropriate site access points as detailed in the TMP.

All deliveries of turbine components to the Proposed Wind Farm will be made solely via this Proposed Turbine Delivery Route. Non-turbine construction traffic will be comprised of HGV and Light Goods Vehicle (LGV) movements and will involve the delivery of construction materials to the Project Site and the export of excess construction materials and plant from the Project Site via the appropriate site entrance.

Details regarding the Proposed Grid Connection underground electrical cabling route diversion routes are given in Section 15.1.11 of Chapter 15. While detailed inspection of the roads along the Proposed Grid Connection underground electrical cabling route indicates that construction works will be undertaken whilst retaining 1-way traffic flow by means of a Stop & and Go traffic management arrangement, Section 15.1.11 outlines the precautionary scenario where all roads on the Proposed Grid Connection underground electrical cabling route will require a road closure at the point of construction. The proposed traffic management measure for each section of the Proposed Grid Connection underground electrical cabling route, and those adopted for the precautionary scenario assessment, are set out in Table 15-56 of Chapter 15.

A Traffic and Transport Assessment (TTA) of the Proposed Project has been carried out by Alan Lipscombe Traffic and Transport Consultants. The full results of the TTA are presented in Section 15.1 of Chapter 15: Material Assets.

The types of vehicles that will be required to negotiate the local network represent abnormal size loads and a detailed assessment of the geometry of the Proposed Turbine Delivery Route was therefore undertaken. This will have a short-term, slight, negative impact on existing road users, in the absence of mitigation, which is Not Significant.

Mitigation Measures

A TTA of the Proposed Project has been carried out by Alan Lipscombe Traffic and Transport Consultants. The full results of the TTA are presented in Chapter 15: Material Assets.

The TMP included as Appendix 15-2 to the EIAR, has been developed in order to minimise any potential effect on the local population during the construction phase of the Proposed Project due to traffic.

The following mitigation by design has been implemented during the construction phase:

- Selection of the optimum delivery routes and access junctions based on a detailed assessment of the road capacity, background and Proposed Project generate traffic volumes and the locations of potential suppliers, as set out in Section 15.1.2.
- By selecting the most appropriate Turbine Delivery Route to transport the abnormally sized loads transporting the large wind turbine components, requiring the least amount of remedial works to accommodate the vehicles as set out in Section 15.1.3.2

The following are the main points to note for abnormal sized deliveries which will take place after peak evening traffic:

- The delivery of turbine components is a specialist transport operation with the transportation of components carried out at night when traffic is at its lightest and the impact minimised.
- The deliveries will be made in consultation with the Local Authority and An Garda Síochána.
- It is estimated that 376 abnormal sized loads will be delivered to the site, comprising 125 convoys of 3 vehicles (one with 4 vehicles), undertaken over 125 separate nights.
- These nights will be spread out over an approximate period of 25 weeks and will be agreed in advance with the relevant authorities,
- In order to manage each of the travelling convoys, for each there will be two Garda escort vehicles that will stop traffic when required at the front and rear of the convoy of 3 vehicles.
- There will also be two escort vehicles provided by the haulage company for each convoy.

Other traffic management measures detailed in the TMP and CEMP will be implemented.

Prior to commencement of any works, the occupants of dwellings in the vicinity of the proposed works will be contacted and the scheduling of works will be made known. Local access to properties will also be maintained throughout any construction works and local residents will be supplied with the number of the works supervisor to ensure that disruption will be kept to a minimum. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

Once a traffic management plan is implemented for the construction phase of the Proposed Project, there will be a slight, short-term, negative residual effect on local road users, and is therefore Not Significant.

Significance of Effects

There will be no significant effects on traffic and transport arising from the Proposed Project during the construction phase.

5.7.2.2.7 *Major Accidents and Natural Disasters*

Pre-Mitigation Impact

Proposed Project

The study area for analysing the effects on major accidents and natural disaster is defined based on the Major Accidents Study Area, as set out in Section 17.1.1 of Chapter 17: Major Accidents and Natural Disaster. A risk register has been developed which contains all potentially relevant risks identified during the construction phase of the Proposed Project. A total of ten risks specific to the construction of the Proposed Project have been identified and are presented in Chapter 17: Major Accidents and Natural Disasters: flooding, major road traffic accident, contamination event, major fire, bog fire, Utility emergencies, adverse weather conditions, loss of critical infrastructure, peat instability and aviation. As outlined in Section 17.4 of this EIAR, the scenarios with the highest risk score in terms of the occurrence of major accident and/or disaster during the construction were identified as 'Contamination Event', 'Major Fire' and 'Aviation'. The risk of contamination, major fire and aviation is 'very unlikely' to occur and will have 'Low Impact' when considering the Reasonable Worst-Case Scenario (RWCS), representing a 'low-risk scenario' during the construction. Therefore, in the absence of mitigation, the impact of contamination, major fires, and aviation are temporary, moderate, negative effects, which are Not Significant.

Mitigation Measures

Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the construction, operation and decommissioning of the Proposed Project, which include the following:

- The Proposed Project is designed and will be constructed in line with current best practice and, as such, mitigation against the risk of major accidents and/or disasters will be embedded through the design. In accordance with the provision of the European Commission '*Guidance on the preparation of Environmental Impact Assessment Reports'* 2017, a Risk Management Plan will be prepared and implemented on site to ensure an effective response to disasters or the risk of accidents. The plan will include sufficient preparedness and emergency planning measures.
- Potential effects associated with contamination during construction are addressed fully in Chapter 8: Land, Soils and Geology and Chapter 9: Water of this EIAR. Potential effects associated with bog fires during construction are addressed within Chapter 17: Major Accidents and Natural Disasters, Additionally, potential effects associated with peat instability is detailed in Chapter 8: Land, Soils and Geology. The mitigation measures outlined therein to protect environmental receptors as well as the procedures and measures described in the CEMP (Appendix 4-4) will ensure that the risk from these sources is low.

- A CEMP has been prepared for the Proposed Project and is included in Appendix 4-4 of this EIAR. Upon a grant of planning permission for the Proposed Project, the CEMP will be updated prior to the commencement of the development. The CEMP will be a live document maintained by the contractor that will work to ensure that potential risks of major accident and/or disaster are identified, avoided, and mitigated, as necessary. Refer to Appendix 4-4 for the CEMP that sets out the minimum standards to be employed by the contractor.
- Appropriate fire prevention and response measures will be implemented in accordance with best practice and relevant guidance, including:
  - The safe storage and handling of fuels and flammable materials;
  - Provision of firefighting equipment onsite;
  - Implementation of emergency response procedures; and
  - Staff training and awareness.
- Any use of tall structures including cranes above 45m such are subject to notification to the Irish Aviation Authority (IAA) 30 days prior to erection.
- Flight within the airspace above the Aviation Study Area would be conducted via IFR or VFR, both require following the regulation applicable to Instrument Flight Rules (IFR) or Visual Flight Rules (VFR) Flight.

Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the construction, operation and decommissioning of the Proposed Project.

Residual Effects

The impact assessment concludes that the risk of a major accident and/or disaster during the construction phase of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*'[77]. It is considered that when the mitigation and monitoring measures outlined in the CEMP (Appendix 4-4) are implemented and adhered to there the residual effects associated with the construction of the Proposed Project will be unlikely, temporary, slight, negative effects.

Significance of Effects

There will be no significant effects on Major Accidents and Natural Disaster arising from the Proposed Project during the construction phase.

5.7.2.2.8 *Aviation*

Pre-Mitigation Impact

Proposed Project

The study area for analysing the effects on aviation is defined based on the Aviation Study Area, as set out in Section 16.6.1 of Chapter 16: Aviation.

The Proposed Project is located within Military Operations Area (MOA) 4, which is designated for military aviation training activities, but lies beneath EI-R16. During construction phase, there will be no potential for penetration of restricted airspace EI-R16 or MOA4 through temporary crane usage. Constructed Turbines will not penetrate restricted airspace EI-R16 or MOA4. Therefore, under a

[77] *Department of Environment, Heritage and Local Government, 2010. A Guide to Risk Assessment in Major Emergency Management. Available at: https://assets.gov.ie/117528/e06a7ca8-a634-4f70-a9a7-b405ee08429a.pdf*

precautionary scenario, pre-mitigation there will be a slight, short-term negative effect, which is Not Significant.

During the construction phase there is no potential for interference with Primary Surveillance Radar (PSR), Secondary Surveillance Radar (SSR), or meteorological radar systems. Impacts on radar require movement, during the construction phase the only movement on site at a height to impact on radar will be the use of cranes as the Proposed Turbines will only move following energisation in the operational phase. Erection of the Proposed Turbines itself will not impact on radar; furthermore, cranes do not move at sufficient speed to impact on radar and therefore there is no potential for impacts on radar during the construction phase

The Proposed Wind Farm site is located on the Edenderry/Allenwood/Rathangan low flying training area (LFTA) was used for helicopter off-airfield landing training. The proximity of the construction phase activities may constitute a hazard to helicopters engaged in off-airfield landing training. Due to the unknowns associated with the exact activities taking place within the LFTA an associated impact cannot be confirmed. Under a precautionary scenario, a long-term, significant negative impact on low flying helicopter training activities has been identified during the construction phase.

Therefore, under a precautionary scenario, pre-mitigation there will be a significant, long-term, negative effect, which is Significant.

Mitigation Measures

Any use of tall structures including cranes above 45m are subject to notification to the IAA 30 days prior to erection. As per Table 4-28 in Chapter 4 of this EIAR, it is proposed that Proposed Turbine erection will take 21 months to be completed.

Flight within the airspace above the Aviation Study Area would be conducted via IFR or VFR; both require following the regulation applicable to IFR or VFR Flight.

The Edenderry/Allenwood/Rathangan LFTA cannot be mitigated directly as the use of tall structures (i.e., cranes and Proposed Turbine erection) during the construction phase will present a hazard to the identified training activities. Therefore, an alternative site will be required for this activity. The Applicant are committed to continuing engagement with Department of Defence (DoD)/Irish Air Corps to facilitate continued consultation, further detail can be found in Chapter 16: Aviation and Appendix 16-2 Impact to Proposed Wind Farm Planning and Irish Air Corps Review. If an alternative area is confirmed there will be no impact on the Edenderry/Allenwood/Rathangan LFTA.

In addition, the Cushaling Wind Farm is currently operational. Flight adjustments have been made for the Cushaling Wind Farm, which is located within the centre of the Proposed Wind Farm. As such, this area would already be flagged for avoidance prior to the construction of the Proposed Project.

Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the construction, operation and decommissioning of the Proposed Project.

Residual Effects

Should an agreement be made with the DoD to move the low flying area to an alternative suitable area, residual effects are considered to be reduced to an unlikely, permanent imperceptible negative effect.

In the absence of mitigation (agreement of the DoD to move the LFTA to an alternative location), under a precautionary scenario, a long-term, significant negative impact has been identified during the construction phase.

Significance of Effects

Should an agreement be made with the DoD to move the low flying area to an alternative suitable area, there will be no significant effect on LFTAs due to the Proposed Project.

In the absence of mitigation (agreement of the DoD to move the LFTA to an alternative location), under a precautionary scenario, there will be a significant effect on LFTAs due to the Proposed Project.

5.7.2.2.9 *Shadow Flicker*

Shadow flicker, which occurs during certain weather conditions due to the movement of wind turbine rotor blades, as described in Section 5.2.3 and Section 5.5 of this chapter, can only occur during the operational phase of a wind energy development. There is therefore no shadow flicker impact associated with the construction phase of the Proposed Project.

5.7.2.2.10 *Interference with Telecommunication Systems and EMF*

There is no potential to interfere with telecommunications systems during the construction phase. The potential for Proposed Project interference with telecommunication links can only occur during the operational phase of a wind energy development. There are therefore no communication system impacts associated with the construction phase of the Proposed Project.

5.7.3 Operational Phase

5.7.3.1 Population

The effects set out below relate to the operational phase of the Proposed Project.

5.7.3.1.1 *Population Levels*

Pre-Mitigation Impact

Proposed Project

The operational phase of the Proposed Project will have no impact on the population of the area with regards to changes to trends, population density, household size or age structure, which is Not Significant.

Mitigation and Monitoring Measures

No mitigation required.

Residual Effects

No residual effects.

Significance of Effects

There will be no significant effects on population levels arising from the Proposed Project during the operational phase.

5.7.3.1.2 *Employment and Investment*

Pre-Mitigation Impact

Proposed Project

The operational phase of the Proposed Project will present an opportunity for mechanical, civil, and electrical contractors and craftspeople to become involved with the maintenance and operation of the wind farm. On a long-term scale, the Proposed Project will create approximately 6-8 jobs during the operational phase relating to the maintenance and control of the wind farm, having a positive, slight, long-term effect on investment and employment in the local and wider regions due to the contributions paid to the Offaly County Council and Kildare County Council at the commencement of the operational phase.

In addition to employment during the construction and operational phases of the Proposed Project and annual rates that will be paid to the local authority by the Developer, a range of other benefits associated with the Proposed Project will be provided to the local community through the annual Community Gain Scheme. The aim of this scheme is to provide financial assistance to local communities and not-for-profit organisations around the Proposed Project.

The Near Neighbour Scheme will offer electricity bill payers living within a prescribed distance of a wind turbine an annual contribution towards their electricity usage. In addition to the electricity contribution payment, the scheme will also offer participants a contribution towards the completion of energy measures on the property and/or education support. This is in line with existing near neighbour schemes that are active at other BnM Wind Farms.

As detailed in Chapter 4: Description of the Proposed Project (Section 4.10). The Renewable Electricity Support Scheme (RESS) is a Government of Ireland initiative that provides support to renewable electricity projects in Ireland. The Renewable Energy Support Scheme (RESS) Terms and Conditions, published by DECC in August 2023, make some high-level provisions for how this type of community benefit fund will work, and are summarised in Chapter 4: Description of the Proposed Project. Further details on the proposed Community Gain proposals are presented in Section 4.10 Chapter 4 of this EIAR. These measures will have a positive, slight, long-term impact, which is Not Significant.

Mitigation Measures

No mitigation required.

Residual Effects

During the operational phase of the Proposed Project there will be positive, slight, long-term residual effect on employment and investment.

Significance of Effects

There will be no significant effects on employment and investment arising from the operational phase of the Proposed Project.

5.7.3.1.3 *Land Use Patterns and Activities*

Pre-Mitigation Impact

Proposed Project

The footprint of the Proposed Project, including turbines, roads, substations, etc., will occupy approx. 2.9% of the Project Site. The part of Proposed Project located within part of the Allen Bog Group has existing land-uses of site management, decommissioning and environmental monitoring as required under IPC Licence No. 503-01. That irrespective of the consenting or construction of the Proposed Project, the measures outlined in the Draft Rehabilitation Plans (Appendix 2-4) will be implemented by BnM in agreement with the EPA, per BnM's IPC Licence Obligations.

The Proposed Project includes the Proposed Enhancement Areas, comprising peatland restoration, woodland planting and species-specific habitat improvement measures. These areas represent a transition in land use from previously modified or degraded land to managed ecological habitats.

PCAS is completed at Lodge Bog which is located within the Project Site. The Proposed Onsite Substation and part of the Proposed Grid Connection underground electrical cabling route is located within the Lodge Bog but outside the areas subject to PCAS measures. The PCAS measures include hydrological management, extensive re-wetting and drain blocking, modifying outfalls, creation of berms etc. The Proposed Project has been designed to ensure that these activities can coexist with, and not preclude, ongoing and future restoration measures, with only a part of land transitioning to energy infrastructure use.

The Proposed Construction Haul Routes and Proposed Turbine Delivery Route will not give rise to operational phase land use effects, as these routes utilise the existing public road network and internal wind farm access tracks, including those within Cloncreen Wind Farm, and do not result in any permanent land use change following completion of construction and reinstatement of any temporary accommodation works.

The Proposed Grid Connection, including the Proposed Onsite Substation, Proposed Offsite Substation and associated OHL infrastructure, will contribute to localised, permanent changes in land use, particularly where infrastructure is located on previously undeveloped or agricultural lands. The majority of the Proposed Grid Connection underground electrical cabling route will be located within the existing public road corridor and, following completion of construction and reinstatement works, will not result in a permanent change in land use. Permanent land-use change will therefore be primarily associated with the Proposed Onsite Substation, Proposed Offsite Substation and associated above-ground infrastructure.

As such, the small scale of the Proposed Project footprint relative to the Population Study Area, its ability to coexist with ongoing site activities and activities within the landscape indicate that the Proposed Project will have no significant impact on other land-uses within the Population Study Area. Under a precautionary scenario, the pre-mitigation impact is considered to be negative, slight, permanent and direct, which is Not Significant.

Mitigation Measures

No mitigation required.

Residual Effects

Due to the small footprint of the Proposed Project infrastructure on a site scale, the residual effect is considered to be a negative, slight, permanent direct effect on land use and activities during the operational phase.

Due to the small scale of the Proposed Project permanent infrastructure footprint (i.e., 2.9% of the Project Site) and the ability of the Proposed Project to coexist with ongoing site activities, including peatland rehabilitation works being undertaken under the IPC Licence, these activities will continue during the operational phase irrespective of the Proposed Project. Accordingly, the effect on ongoing land use and rehabilitation activities is assessed as long term, neutral, indirect and not significant.

Therefore, under a precautionary scenario, it is considered that there will be a neutral, indirect, long-term effect on peatland rehabilitation activities, including both IPC licence requirements, which is Not Significant.

Significance of Effects

There will be no significant effects on land use/activities due the operational phase of the Proposed Project.

5.7.3.1.4 *Property Values*

Pre-Mitigation Impact

Proposed Project

The available scientific literature and studies demonstrate that there is insufficient evidence to determine that there is the potential for a significant effect on property values as a result of a wind energy development. The impact assessment on property values outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.3.11, there is the potential for negative, slight, short-term impacts on property values, which is Not Significant, located within 1 km of the Proposed Turbines during the early operational phase of the Proposed Wind Farm.

The conclusions from available EirGrid studies indicate that property values (residential and agricultural) show no correlation with the presence of grid infrastructure in the area, with opinions on nearby grid infrastructure diminishing over time. In some cases, property values were demonstrated to increase however, causation with grid infrastructure cannot be determined, refer to Section 5.3.11. Therefore, there is no potential for the Proposed Grid Connection to impact on property values in the area during the operational phase.

Mitigation Measures

All mitigation relevant to property values, outlined above and the corresponding chapters: Chapter 10: Air Quality, Chapter 12: Noise and Vibration, Chapter 14: Landscape and Visual, and Chapter 15: Material Assets, will be implemented to reduce insofar as possible, impacts on property values at properties located in the vicinity of Proposed Wind Farm. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

The Proposed Wind Farm has been designed in accordance with the parameters set out in the WEDG 2006 and with cognisance of the Draft WEDG 2019, adhering to the required setback distances from sensitive receptors set out in those documents.

The available scientific literature on the topic is inconclusive, with large scale studies conducted in the UK concluding that property values are generally driven by market conditions rather than proximity to wind farms. These studies comprise a much larger sample size than then only Irish study on the topic, a working paper, where the small sample size has the potential to result in individual circumstances having had an outsized bearing on the conclusions drawn from the study.

The available literature that does identify a short-term decrease in property values all note that the decrease in value reduces and becomes statistically insignificant, in general, 5 years after the commencement of the operational phase.

Residual Effects

It can be concluded that there is the potential for a negative, imperceptible, short-term residual effect on property values from the operational phase of the Proposed Project.

Significance of Effects

There will be no significant effects on property values arising due to the operational phase of the Proposed Project.

5.7.3.1.5 *Tourism*

Pre-Mitigation Impact

Proposed Project

As part of the Proposed Project design, there is approximately 55.4 km of amenity track. This includes:

- 13.4km of a new dedicated internal amenity access track
- 40km of proposed internal site access road
  - 8.5km equestrian loop for equestrian users only – this loop will overlap with proposed internal site access road for approximately 7.5km
- 0.844km (844m) of amenity board walk

These amenity tracks will provide amenity access opportunities, facilitate a variety of walking loops, enhance connectivity with local roads and existing off-site amenities, and provide local access to the Proposed Wind Farm. The amenity track proposed will enable the Proposed Wind Farm to provide connectivity to the surrounding settlements and sites / areas of interest. These include the towns / villages of Edenderry, Allenwood, Lullymore, Rathangan and Clonbullogue.

The Amenity Plan for the Proposed Project (Appendix 4-2) includes several waymarked trails of different lengths along the proposed internal site access roads and proposed dedicated internal amenity track, ranging in distance, which will accommodate walkers and other amenity users (including equestrian users); a dedicated equestrian track will also be supplied as part of the Proposed Wind Farm. The amenity access tracks have been designed to be looped and tie in with the network of existing onsite tracks and proposed internal site access to minimise disturbance to wildlife and the peatland. The 55.4km of amenity access tracks will include for 9 no. waymarked circular walking trails ranging from 1.3km to 21km and will enable connections to neighbouring sites of interest including Killinthomas Wood (to the south), the Grand Canal (to the North) and Cloncreen Wind Farm (to the west).

Four carparks with a total capacity for approximately 132 no. private vehicles, including spaces for horse boxes, and 12 no. accessible parking will be available in the operational phase, although it is anticipated that many locals will walk or cycle to the site. Each carpark will feature bus parking and bike racks for those who want to cycle to the area and walk the wind farm amenity loops which is considered as a long-term, moderate, positive effect, which is Not Significant.

As identified in Section 5.3.9.2, a number of tourist attractions are located in proximity of the Proposed Project. In addition to the Grand Canal, and Killinthomas described above, there is Cloncreen Wind Farm adjacent to the east of the Proposed Wind Farm (T22). Based on the literature review in Section 5.3.9.3, the majority of studies indicate that wind farm developments do not deter visitors to tourist attractions or scenic landscapes where turbines are visually evident.

Considering the human interference there is potential for a positive, moderate, long-term impact on tourism, which is Not Significant, during the operational phase of the Proposed Project.

Mitigation Measures

Refer to Section 13.7.3 of Chapter 13: Landscape and Visual and Section 14.4.3 of Chapter 14: Cultural Heritage for associate mitigation on tourism from a cultural heritage and landscape perspective, respectively. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures. In addition, the provision of amenity infrastructure associated with the Proposed Project, including walking, cycling and equestrian routes, has the potential to generate low levels of operational phase traffic associated with visitors to the Proposed Wind Farm. Appropriate traffic management measures will be implemented to ensure safe access and use of these amenities.

These measures are detailed further in Chapter 15: Material Assets (Traffic and Transport) and will ensure that amenity-related traffic is managed in a safe and controlled manner.

Residual Effects

The Proposed Project will have a positive, moderate, long-term impact on tourism due to the social and recreational benefits associated with the recreational amenity access tracks. The operational wind farm will have no impact on the running or operation of local and regional tourist attractions. It is considered that the Proposed Project will have a positive, significant, long-term, residual effect of visitor experience to attractions in the wider landscape which is Significant.

Significance of Effects

There will be no significant effects on tourism due to the operational phase of the Proposed Project.

5.7.3.1.6 *Residential Amenity*

Pre-Mitigation Impact

Potential impacts on residential amenity during the operational phase of the Proposed Wind Farm could arise primarily due to air quality, noise, shadow flicker or changes to visual amenity. Detailed noise and shadow flicker modelling have been carried out as part of this EIAR. The assessment demonstrates that the Proposed Wind Farm will comply with the applicable noise limits and the shadow flicker thresholds set out in the WEDG 2006, which recommend that shadow flicker at neighbouring dwellings should not exceed 30 hours per year or 30 minutes per day. In addition, the assessment has considered the Draft WEDG 2019, which adopt a more precautionary approach to shadow flicker and seek to ensure that no existing dwelling or other affected property experiences shadow flicker as a result of a wind energy development.

An additional 13.44km of a new dedicated amenity access track is proposed as part of the Proposed Project to link into the 40km of proposed internal access road that will be available as amenity access tracks and to provide a greater variety of walking loops and connectivity to local roads, offsite existing amenities and allow local access to the Proposed Wind Farm. The amenity track proposed will enable the Proposed Wind Farm to provide connectivity to the surrounding settlements including the towns / villages of Edenderry, Allenwood, Lullymore, Rathangan and Clonbullogue. The detailed amenity access is described in Chapter 4: Description of the Proposed Project.

The Proposed Grid Connection comprises the Proposed Onsite Substation, Proposed Offsite Substation, underground 220kV electrical cabling, and associated OHL infrastructure. Given its scale and extent, the grid connection represents a substantial element of the overall Proposed Project, extending beyond the Proposed Wind Farm.

Potential impacts on residential amenity during the operational phase of the Proposed Onsite Substation and Proposed Offsite Substation could arise primarily due to noise and changes to visual amenity. The operational phase impacts associated with the Proposed Grid Connection underground cabling are considered to be negligible, as this infrastructure will be fully buried and will not give rise to ongoing noise, visual or other amenity effects once construction is complete.

Air Quality

An air quality impact assessment can be found in Chapter 10, which details potential impacts from emissions to air during the construction and operational phase. There will be a long-term, imperceptible, negative effect on air quality due to dust emissions and long-term, slight, negative effect due to exhaust emission during the operational phase, which is Not Significant, however, due to the provision of a net reduction in carbon dioxide (CO_2) emissions from operation of the Proposed Project, there will be long-term, significant, positive effects on overall improved air quality during the operational phase of the Proposed Project.

Noise and Vibration

The noise and vibration assessment is detailed in Chapter 12. The Proposed Wind Farm will be brought in line with the noise thresholds imposed by the consenting authority should permission be granted for the Proposed Project. The Proposed Wind Farm will have a negative, not significant, long-term impact on noise sensitive locations, which is Not Significant.

Detailed noise modelling has been carried for the Proposed Onsite Substation and Proposed Offsite Substation, see below and Chapter 12: Noise and Vibration for details. The predicted noise level from the operation of the Proposed Onsite Substation at the nearest NSL at approximately 394 m northeast is 29 dB $L_{Aeq,T}$. The predicted noise level from the operation of the Proposed Offsite Substation, with one transformer, at the nearest NSL, at approximately 298 m east is 31 dB $L_{Aeq,T}$. This level of noise is below the criterion for fixed mechanical plant and will not result in an adverse impact at NSLs within the Fixed Plant Operational Study Area. As the Proposed Project design progresses, consideration will be given to the selection of mechanical and electrical plant to ensure that noise emissions comply with the proposed criteria and that any character corrections are appropriately addressed in accordance with the requirements outlined in Section 12.3.7 of Chapter 12. The operational phase impacts of noise emissions associated with Proposed Offsite Substation and Proposed Onsite Substation will be long-term, negative and not significant.

In the absence of mitigation, the Proposed Grid Connection will have a negative, not significant and long-term impact in terms of noise and vibration during the operational phase, which is Not Significant.

Landscape and Visual

The visual impact of the Proposed Project is addressed comprehensively in Chapter 13: Landscape and Visual. The Proposed Project has been designed to maximise turbine separation distances to dwellings in the area, with no turbines located within 880 m of an occupied dwelling (i.e., the recommended 4 times tip height setback as per the Draft WEDG 2019 – based on the greatest setback requirement, i.e., a 220m tip height turbine). A Route Screening Analysis (RSA) was carried out for roads within 3 km of the Proposed Turbine locations, with both the methodology and findings of this described in Chapter 13. Many of these roads have 'Partial/Intermittent Screening' or 'Dense/Full Screening' with some stretches of 'No/Very Little Screening', and therefore intermittent views rather than full visibility of the Project Site. A negative, moderate, long term and direct visual impact is anticipated which is Not Significant.

VP20, captured from St Patricks Graveyard, beside the L3001 Local Road on the northern outskirts of the settlement of Rathangan, located approximately 2.05km south of the nearest Proposed Turbine (T14), is representative of residential receptors nearest to the Proposed Wind Farm. A long-term, negative, and not significant to moderate visual impact was deemed to occur at this VP location. On

balance, these effects are not considered significant. VP04, located along the R401 Regional Road, within the townland of Clonbullogue, located approximately 2.47km west of the nearest Proposed Turbine (T20), is representative of typical views towards the Proposed Turbines experienced by residential receptors to the west. However, this location represents one of the few areas where such open views toward the Proposed Turbines are available; most residential receptors in the surrounding area will not experience comparable levels of visibility. Despite the proximity (2.47km from the nearest Proposed Turbine T20), only a limited number of the 46 no. Proposed Turbines are clearly visible at this location. A long-term, negative, and slight visual impact was deemed to occur at this VP location On balance, these effects are not considered significant.

The visual effects of the Proposed Onsite Substation, the Proposed Offsite Substation, and associated OHL have been assessed in Chapter 13: Landscape and Visual Impact Assessment of this EIAR. A Landscape Screening Plan has been prepared for the Proposed Project.

Proposed Grid Connection underground cabling will not give rise to operational impacts on residential amenity. There will be no associated noise emissions, traffic generation, or ongoing disturbance during the operational phase. Routine operation of underground electrical infrastructure does not require regular maintenance access that would give rise to any significant effects.

The Proposed Enhancement Areas will not result in any significant effects on residential amenity and are considered to contribute a slight positive, indirect, long-term effect through improved landscape character and ecological value, which is Not Significant.

Mitigation Measures

- There are no turbines proposed within 880 m (4 x tip height) of any sensitive receptors.
- All mitigation measures outlined in Chapter 12 (Noise and Vibration), shadow flicker (Section 5.5 of this chapter) and Chapter 13 (Landscape and Visual) in this EIAR will be implemented in order to reduce insofar as possible, impacts on residential amenity at properties located within the in the vicinity of the Proposed Project;
- Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

With the implementation of the mitigation measures outlined in relation to landscape and visual, noise, shadow flicker, and air quality, the Proposed Project will have a negative, slight, long-term, residual effect on residential amenity.

Significance of Effects

There will be no significant effects on residential amenity arising from the operational phase of the Proposed Project.

5.7.3.2 Human Health

5.7.3.2.1 *Health and Safety*

Pre-Mitigation Impact

Proposed Project

It is not anticipated that the operation of the Proposed Project will present a danger to the public and livestock. Rigorous safety checks are conducted on the turbines, substation and ancillary infrastructure during design, construction, commissioning and operation to ensure the risks posed to staff, landowners and general public are negligible. Under a precautionary scenario, it is determined that there will be a potential negative, slight, long-term, impact on health and safety during the operational phase, which is Not Significant.

Mitigation Measures

The following mitigation measures will be implemented during the operation of the Proposed Project to ensure that the risks posed to staff, landowners and general public remain negligible throughout the operational life of the Proposed Project.

- Access to the turbines is through a door at the base of the structure, which will be locked at all times outside maintenance visits. The doors will only be unlocked as required for entry by authorised personnel and will be locked again following their exit.
- Signs will be erected at suitable locations such as, amenity access points and carparks, setting out the conditions of public access under the relevant legislation and providing normal hours (and out of hours) contact details. Staff associated with the project will conduct frequent visits, which will include inspections to establish whether any signs have been defaced, removed, faded, or are becoming hidden by vegetation or foliage, with prompt action taken as necessary.
- Signs will also be erected at suitable locations across the Proposed Project as required for the ease and safety of operation of the wind farm. These signs include:
    - Buried cable route markers at 50 m (maximum) intervals and change of cable route direction;
    - Directions to relevant turbines at junctions;
    - "No access to Unauthorised Personnel" at appropriate locations;
    - Speed limits signs at site entrance and junctions;
    - "Warning these Premises are alarmed" at appropriate locations;
    - "Danger HV" at appropriate locations;
    - "Warning – Keep clear of structures during electrical storms, high winds or ice conditions" at site entrance;
    - "No unauthorised vehicles beyond this point" at specific site entrances; and
    - Other operational signage required as per site-specific hazards.
- The Proposed Onsite Substation and Proposed Offsite Substation, which will be operated by ESB/EirGrid will be locked and fenced off from public access. The Proposed Onsite Substation and the Proposed Offsite Substation will be operational remotely and manually 24 hours per day, 7 days a week. Supervisory operational and monitoring activities will be carried out remotely using a SCADA system, with the aid of computers connected via a telephone modem link.
- Periodic service and maintenance work which include some vehicle movement.
- For operational and inspection purposes, substation access is required.
- Servicing of the substation equipment will be carried out in accordance with the manufacturer's specifications, which would be expected to entail the following:
    - Six-month service – three-week visit

- Annual service – six-week visit
- Weekly visits as required.

- Any waste generated at the Proposed Project will be managed in accordance the Waste Management Act 1996 and under the relevant EU legislation.

An operational phase Health and Safety Plan will be developed to fully address identified Health and Safety issues associated with the operation of the Proposed Project. Access for emergency services will be available at all times.

All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The Health and Safety Plan for the operational phase will be completed in accordance with the most up to date health and safety legislation in force at the time of operation and will be submitted to the relevant local authority prior to the operational phase of the Proposed Project.

The components of a wind turbine are designed to last up to 35 years and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the Proposed Wind Farm regular maintenance of the turbines will be carried out by the turbine manufacturer or appointed service company. A project or task specific Health and Safety Plan will be developed for these works in accordance with the site's health and safety requirements.

Residual Effects

With the implementation of the above mitigation measures, there will be a negative, imperceptible, long-term, residual effect on health and safety during the operational life of the Proposed Project.

Significance of Effects

There will be no significant effects on health and safety arising during the operational phase of the Proposed Project.

5.7.3.2.2 *Air Quality: Dust and Exhaust Emissions*

Pre-Mitigation Impact

Proposed Project

The sources of dust and other emissions generated during the operational phase will be from visits by maintenance staff in LGVs. No permanent staff will be present on the Project Site during the operational phase. Private LGVs from tourists who may use the amenity car parks that will be provided to the public to utilise the internal amenity tracks within the Proposed Wind Farm and the greater connectivity of the Proposed Wind Farm to the Cloncreen Wind Farm, Grand Canal Killinthomas woods. Pre-mitigation impacts are considered to be slight, negative and long term, which is Not Significant.

The Proposed Project will generate electricity from a renewable source, contributing to a positive impact on air quality. Over the envisaged 35 year lifespan of the Proposed Project it is expected to effectively reduce carbon dioxide emissions that would have occurred if the same energy were generated by traditional fossil fuel plants. This is a long-term significant positive effect on air quality.

Mitigation Measures

All mitigation as outlined in Section 10.3.3 of Chapter 10: Air Quality will be implemented in order to reduce insofar as possible, impacts on air quality in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effect

Residual effects from dust and other emissions to air from the maintenance of the Proposed Project on sensitive receptors during the operational phase of the Proposed Project is considered to be a long-term, imperceptible, negative effect. However, considering offsetting of greenhouse gas emissions from fossil fuels as a result of the Proposed Project, there will be a long-term, significant, positive effect on air quality.

Significance of Effects

The effect on air quality due to the operation of the Proposed Project is Significant.

5.7.3.2.3 *Climate*

Pre-Mitigation Impact

Proposed Project

As detailed in Section 11.3.2.3 of Chapter 11: Climate, the EPA reported Ireland is not on track to meet the 51% emissions reduction target by 2030 (as compared to 2018 levels) based on most up to date EPA projections which include many of Climate Action Plan 2024 measures[78]. The first two carbon budgets (2021-2030), which aim to support achievement of the 51% emissions reduction goal, are projected to be exceeded by a significant margin. Carbon Budget 1 to be exceeded by a margin of 8 to 12 $MtCO_2e$. Carbon Budget 2 to be exceeded by a margin of 77 to 114 MtCO2e (with carryover from Carbon Budget 1). From 10.6 $MtCO_2e$ in 2018, emissions from the Energy Industries sector are projected to decrease to between 3.4 and 4.4 $MtCO_2e$ in 2030 (a 59 to 68% reduction). Renewable energy generation at the end of the decade is projected to range from 69 to 68% of electricity generation. From 21.4 $MtCO_2e$ in 2018, total emissions from the agriculture sector are projected to be between 18.0 and 21.6 $MtCO_2e$ in 2030 (a 16% reduction in With Additional Measures (WAM) and 1% increase in With Existing Measures (WEM). Transport emissions are projected to decrease from 12.3 MtCO2e in 2018 to between 9.7 $MtCO_2e$ and 11.2 $MtCO_2e$ in 2030 (a 9 to 21% reduction). The EPA report highlights that whilst emissions are beginning to reduce, transformative measures will be needed to meet National Climate ambitions.

Ireland will therefore have to meet even more demanding climate change and renewable energy supply obligations in order to play its part in achieving the European climate and energy ambitions. As announced in December 2022, the Irish Government have pledged to generate 80% of the country's electricity supply from renewable sources by 2030[79]. The development of additional indigenous wind energy generating capacity, such as that proposed from the Proposed Wind Farm, will help to reduce carbon emissions and improve Ireland's security of energy supply.

The Proposed Project will offer significant benefits in terms of renewable energy production and reductions in greenhouse gas emissions and other air pollutants. In this regard, it will have a positive,

[78] *EPA, 2025. Ireland's Provisional Greenhouse Gas Emissions 2024-2055 Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA-Provisional-1990-2024-GHG-Report-1716.pdf*
[79] *Department of the Environment, Climate and Communications (2025) Climate Action Plan 2025 <https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/climate-action-plan-2025/>*

significant, long-term impact, which is Significant. The carbon loss and savings due to the Proposed Project are discussed in Section 11.4.3 of Chapter 11: Climate of this EIAR.

Long-term, imperceptible, negative effects on climate are predicted in relation to the generation of additional traffic during the operational phase, in the form of LGV's visiting the Project Site for inspections and maintenance, and in the form of public vehicle access to amenity car parks. Waste is not proposed to be generated onsite during the operational phase, any waste that does arise will be minimal and any impact will be long-term, negative and slight, which is Not Significant.

Mitigation Measures

All mitigation as outlined in Chapter 11: Climate will be implemented in order to reduce insofar as possible, impacts on climate in the vicinity of Proposed Project construction works. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

It is estimated that the Proposed Project, with a potential installed capacity of 322MW which will result in the net displacement of approximately 146,857 tonnes of Carbon Dioxide (CO_2) per annum (Against EU FFC) and 5,139,995 tonnes of CO_2 over the lifetime of the Proposed Wind Farm. There will be positive, significant, long-term residual effects on CO_2 emissions and energy targets with the implementation of the Proposed Project.

Significance of Effects

The effect on climate due to the operation of the Proposed Project is Significant.

5.7.3.2.4 *Water Quality*

Pre-Mitigation Impact

Proposed Project

During the operational phase, the potential for silt-laden runoff is much reduced compared to the construction phase. In addition, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete. Some minor maintenance works may be completed, such as maintenance of site entrances, internal roads, hardstand areas and amenity pathways. These works would be of a very minor scale and would be very infrequent. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works. These minor activities could, however, result in the release of suspended solids to surface water and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality. During such maintenance works there is a small risk associated with release of hydrocarbons from site vehicles, although it is not envisaged that any significant refuelling works will be undertaken on site during the operational phase. The assessment concludes that there will be negative, slight, indirect, temporary, likely effect during the operational phase of the Proposed Wind Farm, which is Not Significant.

Placed concrete in turbine bases and foundations can also have minor local effects on groundwater quality over time. However, due to the limited surface area of exposed concrete, the anoxic conditions below ground, and the high rate of dilution from the wider groundwater system relative to the small volumes of groundwater that would come in contact with the concrete, the potential for impacts considered to be short-term, imperceptible, negative, which is Not Significant.

During the operational phase the wind farm control building, included in the Proposed Onsite Substation compound and Proposed Offsite Substation compound, will include staff welfare facilities. The release of untreated wastewater can affect groundwater quality. The assessment concludes that there will be negative, significant, indirect, temporary, unlikely effect on surface water quality, which is Not Significant.

Mitigation Measures

Refer to Section 9.5.3 of Chapter 9 for relevant mitigation and monitoring proposals for the Proposed Project. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of mitigation and monitoring measures for the Proposed Project.

Residual Effects

With the implementation of the Proposed Project drainage measures identified in Chapter 9, and based on the post-mitigation assessment of runoff, residual effects on water quality are considered to be negative, imperceptible and temporary, which is Not Significant.

Significance of Effects

There will be no significant effects on water quality arising from the operational phase of the Proposed Project.

5.7.3.2.5 *Noise and Vibration*

Pre-Mitigation Impact

Proposed Project

A baseline assessment of the existing background noise conditions was carried out, the results of which are presented in Chapter 12: Noise and Vibration of the EIAR. A noise assessment of the operational phase of the Proposed Project has also been carried out through modelling of the Proposed Project using noise prediction software. The results of the noise prediction models have been compared against the assigned turbine noise limits and at most of the NSLs the theoretical precautionary omni-directional cumulative turbine noise levels are below the noise criteria. The findings of the assessment confirmed that the predicted operational noise levels from the Proposed Wind Farm with the exception of NSL H1120 (inhabitable dwelling), will be within the relevant best practice noise criteria for the detailed potential turbine specification. The predicted turbine noise level at NSL H1120 is dominated by the existing Cushaling Wind Farm, with the contribution from the Proposed Turbines greater than 10 dB below the contribution from the existing Cushaling Wind Farm. In accordance with guidance discussed in Section 12.3.6.5 of Chapter 12, there is no significant contribution from the Proposed Turbines and any potential exceedance identified in are not relevant to the assessment of the Proposed Wind Farm.

Therefore, pre-mitigation impacts from noise and vibration from the Proposed Wind Farm during the operational phase are considered negative, not significant and long term, which is Not Significant.

Details of the noise assessment carried out by AWN Consulting are presented in Chapter 12 of the EIAR.

The predicted noise level from the operation of the Proposed Onsite Substation at the nearest NSL at approximately 394 m northeast is 29 dB $L_{Aeq,T}$. The predicted noise level from the operation of the Proposed Offsite Substation, with one transformer, at the nearest NSL, at approximately 298 m east is 31 dB $L_{Aeq,T}$. This level of noise is below the criterion for fixed mechanical plant and will not result in an adverse impact at NSLs within the Fixed Plant Operational Study Area. As the Proposed Project

design progresses, consideration will be given to the selection of mechanical and electrical plant to ensure that noise emissions comply with the proposed criteria and that any character corrections are appropriately addressed in accordance with the requirements outlined in Section 12.3.7 of Chapter 12. The operational phase impacts of noise emissions associated with Proposed Offsite Substation and Proposed Onsite Substation will be long-term, negative and not significant.

The operational phase impacts associated with the Proposed Grid Connection underground electrical cabling are considered to be negligible, as this infrastructure will be fully buried and will not give rise to ongoing noise or vibration effects once construction is complete.

Pre-mitigation impacts from noise and vibration from the Proposed Grid Connection during the operational phase are considered negative, not significant and long term, which is Not Significant.

Mitigation Measures

Refer to Section 12.6.3 of Chapter 12: Noise and Vibration for noise and vibration mitigation and monitoring proposals for the Proposed Project during the operational phase. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures for a full list of mitigation and monitoring measures for the Proposed Project.

Residual Effects

The predicted residual operational turbine noise, substations and ancillary works operation effects at the nearest noise sensitive locations are negative, not significant and long-term, which is Not Significant.

The noise assessment notes that these effects should be considered in terms that the effect is variable, and that this assessment considers periods of the greatest potential effect.

Significance of Effects

There will be no significant effects on human health from noise and vibration arising from the operational phase of the Proposed Project.

5.7.3.2.6 *Traffic and Transport*

Pre-Mitigation Impact

Proposed Project

Major component failures are considered unlikely with the implementation of normal operational and maintenance activities and therefore the presence of HGVs at the Proposed Project is considered extremely rare until the decommissioning phase begins. Should a turbine component need replacing, the measures detailed in 5.7.2.2.6 and Section 15.1.17.5 Chapter 15 will be implemented.

All site visits for maintenance and inspection purposes will be done so via LGVs. No permanent staff will be there on the Project Site. Likewise, amenity visitors to the Proposed Wind Farm are likely to use private vehicles and utilise one of the four amenity car parks located at access points spread around the Proposed Wind Farm to minimise volumes of traffic arriving at one location. Pre-mitigation impacts are considered negative, imperceptible, long term on existing road users, which is Not Significant.

Mitigation Measures

Due to the very low volumes of traffic forecast to be generated during this stage no mitigation measures are required.

Residual Effects

Impacts on local road users during the operational phase are considered to be a negative, imperceptible, long term residual effect.

Significance of Effects

There will be no significant effects on traffic and transport arising from the operational phase of the Proposed Project.

5.7.3.2.7 *Major Accidents and Natural Disasters*

Pre-Mitigation Impact

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Project. A total of nine risks specific to the operational phase of the Proposed Project have been identified and are presented in Chapter 17: Major Accidents and Natural Disasters: flooding, major road traffic accident, contamination event, major fire, bog fire, adverse weather conditions, loss of critical infrastructure, peat instability and aviation. As outlined in Chapter 17: Major Accidents and Natural Disaster Section 17.4 of this EIAR, the scenarios with the highest risk score in terms of the occurrence of major accident and/or disaster during the operation were identified as 'Contamination Event', 'Major Fire' and 'Aviation'. Therefore, in the absence of mitigation, the impact of on contamination major fires and aviation temporary, moderate, negative effects, which are Not Significant.

Mitigation Measures

Mitigation measures have been outlined in Section 5.7.2.2.7 above, and in Chapter 8: Land, Soils and Geology, Chapter 9: Water and Chapter 17: Major Accidents and Natural Disasters. Refer to Chapter 19: Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the operation of the Proposed Project.

Residual Effects

The impact assessment concludes that the risk of a major accident and/or disaster during the operational phase of the Proposed Project is considered 'low' in accordance with the *'A Framework for Major Emergency Management – A Guide to Regional Risk Assessment' (DoEHLG 2024)*[80]. There will be an unlikely, temporary, slight, negative effects, which are Not Significant.

Significance of Effects

There will be no significant effects on Major Accidents and Natural Disasters arising from the operational phase of the Proposed Project.

[80] *A Framework for Major Emergency Management – A Guide to Regional Risk Assessment' (DoEHLG 2024):* https://assets.gov.ie/static/documents/Guide_to_Regional_Risk_Assessment_September_2024.pdf

5.7.3.2.8 Aviation

Pre-Mitigation Impact

Proposed Project

During the operational phase, the Proposed Turbines present as obstacles within the airspace in which they are situated. Without notification to the IAA they would impact on all flight as pilots would be unaware of their presence. Obstacles without lighting pose a hazard to aircraft flying during the hours of darkness or in low light conditions. The Proposed Project is located within MOA 4 which is designated for military aviation training activities, but lies beneath EI-R16, and therefore represents a sensitive aviation receptor.

The Proposed Turbines do not penetrate the restricted airspace of EI-R16 Section C or Section H. The Restricted airspace in EI-R16C has a base or 'starting level' of 1,500ft above mean sea level (AMSL). Using the greatest proposed tip height of 220m/ 968 feet ASML and comparing that value with the height the airspace begins, at 1,500ft ASML, demonstrates that the Proposed Turbines would not penetrate the restricted airspace. However, the physicality of the Proposed Turbines would create an 'obstacle field' in the airspace below the Restricted Airspace which would require notification to the IAA as well as being subject to lighting regulation.

The Proposed Project has been assessed in consultation with the IAA, Department of Defence (DoD) and other relevant stakeholders, as detailed in Section 16.4.2 of Chapter 16: Aviation. Aviation lighting will be installed on the Proposed Turbines in accordance with IAA requirements. This lighting is designed to ensure aircraft safety and visibility.

The potential for operational phase impacts on aviation receptors is therefore limited to the presence of structures within controlled or monitored airspace, which will be managed through compliance with all relevant aviation safety requirements and procedures.

The Proposed Wind Farm site is located on the Edenderry/Allenwood/Rathangan LFTA was used for helicopter off-airfield landing training. The proximity of the Proposed Turbines may constitute a hazard to helicopters engaged in off-airfield landing training. Due to the unknowns associated with the exact activities taking place within the LFTA an associated impact cannot be confirmed. Under a precautionary scenario, a long-term, significant negative impact on low flying helicopter training activities has been identified during the operational phase.

Under a precautionary scenario, the operational phase effect on aviation is considered to be long-term, significant, and negative, which is Significant.

The Proposed Grid Connection and Proposed Enhancement Areas will not have any impact on aviation.

Mitigation Measures

The IAA will be contacted to:

1. *agree an aeronautical obstacle warning light scheme for the wind farm development.*
2. *provide as constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location.*

The Proposed Turbines will be subject to an approved lighting scheme being established and final positions and heights will be forwarded to the IAA for publishing in the Irish Aeronautical Information Publication (AIP). Should the Irish Air Corps require the fitment of Infra-Red lighting compatible with the use of Night Vision Goggles (NVG), there are many types available, and a list of compatible lighting

should be obtainable from the Air Corps technical services command. It is not known whether the Air Corps use NVG systems operationally, or during training, but their popularity in military, medevac and search and rescue (SAR) missions would suggest there is a high probability of use.

In addition to the above measures, pilots of both VFR and IFR flights are required by the National Regulator to make themselves familiar with their route, airspace they will be flying within, and current Notice To Airmen (NOTAM) and Instrument Approach Procedures (IAPs) information.

In addition, the Cushaling Wind Farm is currently operational. Flight adjustments have been made for the Cushaling Wind Farm, which is located within the centre of the Proposed Wind Farm. As such, this area would already be flagged for avoidance prior to the construction of the Proposed Project.

The Edenderry/Allenwood/Rathangan LFTA cannot be mitigated directly (assuming that the activities do occur in the area of the Proposed Turbines) and therefore an alternative site will be required for this activity. The Applicant are committed to continuing engagement with the DoD/Irish Air Corps to facilitate an alternative location for LFTAs if feasible. If an alternative area is confirmed there will be no impact on the Edenderry/Allenwood/Rathangan LFTA.

Residual Effects

Should an agreement be made with the DoD to move the low flying area to an alternative suitable area, residual effects are considered to be reduced to an unlikely, permanent imperceptible negative effect.

In the absence of mitigation (agreement of the DoD to move the LFTA to an alternative location), under a precautionary scenario, a long-term, significant negative impact has been identified during the operational phase.

Significance of Effects

Should an agreement be made with the DoD to move the low flying area to an alternative suitable area, there will be no significant effect on LFTAs due to the Proposed Project.

In the absence of mitigation (agreement of the DoD to move the LFTA to an alternative location), under a precautionary scenario, there will be a significant effect on LFTAs due to the Proposed Project.

5.7.3.2.9 *Shadow Flicker*

Pre-Mitigation Impact

Proposed Project

As indicated in Table 1-1 of Appendix 5-5, a total of 63 no. residential properties may experience daily shadow flicker as a result of the Proposed Wind Farm in excess of the WEDG 2006 threshold of 30 minutes per day. The WEDG 2006 total annual guideline limit of 30 hours is predicted to be exceeded at 3 no. sensitive receptors when the regional sunshine average of 31.74% is taken into account. As stated in Section 5.5.1, there are 310 no. sensitive receptors located within 1.7km of the Proposed Turbines.

The prediction modelling does not take vegetation screening, screening by adjacent buildings or extant window orientation into account. Therefore, in reality, shadow flicker occurrences may be less than predicted. However, excluding these circumstances and relying on the prediction modelling alone, shadow flicker could potentially have a long-term, moderate, negative impact on each sensitive receptor, which is Not Significant. However, given that the shadow flicker modelling assumptions outlined in Section 5.5.1 above, it has can be determined that any individual instance of shadow flicker will be momentary and intermittent in duration.

There is no potential for the Proposed Grid Connection infrastructure to cause shadow flicker, and so no impact is predicted.

Mitigation Measures

Where daily shadow flicker exceedances have been predicted at buildings by the modelling software, a site visit will be undertaken firstly to determine the level of occurrence, existing screening and window orientation. This will determine if the receptor has an actual line of sight to any turbine and actual potential for shadow flicker to occur. Once this exercise is completed at all the potentially affected properties, the following measures will be employed.

Wind Turbine Control Measures

If it is not possible to mitigate any identified shadow flicker limit exceedance locally using the measures detailed above, wind turbine control measures will be implemented.

Wind turbines can be fitted with shadow flicker control units to allow the turbines to be controlled to prevent the occurrence of shadow flicker at properties surrounding the wind farm. The shadow flicker control units will be added to any required turbines and are not cost prohibitive.

A shadow flicker control unit allows a wind farm's turbines to be programmed and controlled using the wind farm's SCADA control system to change a particular turbine's operating mode during certain conditions or times or even turn the turbine off if necessary.

All predicted incidents of shadow flicker can be pre-programmed into the wind farm's control software. The wind farm's SCADA control system can be programmed to shut down any particular turbine at any particular time on any given day to ensure that shadow flickers occurrences at properties which are not naturally screened or cannot be screened with measures outlined above. Where such wind turbine control measures are to be utilised, they need only be implemented when the specific combined circumstances occur that are necessary to give rise to the shadow flicker effect in the first instance. Therefore, if the sun is not shining on a particular day that shadow flicker was predicted to occur at a nearby property, there would be no need to shut down the relevant turbines that would have given rise to the shadow flicker at the property. Similarly, if the wind speed was below the cut-in speed that caused the turbine rotor to rotate and give rise to a shadow flicker effect at a nearby property, there would be no need to shut down the relevant turbines that otherwise would have caused shadow flicker.

The atmospheric variables that determine whether shadow flicker will occur or not are continuously monitored at the Proposed Wind Farm and the data fed into the wind farm's SCADA control system. The strength of direct sunlight is measured by way of photocells, and if the sunlight is of sufficient strength to cast a shadow, the shadow flicker control mechanisms come into effect. Wind speed and direction are measured by anemometers and wind vanes on each turbine and on the wind farm's met mast, and similarly, if wind speed and direction is such that a shadow will be cast, the shadow flicker control mechanisms come into effect. The moving blades of the turbine will require a short period of time to cease rotating and as such there may be a very short period (less than 3 to 5 minutes) during which the blades are slowed to a complete halt. The turbines giving rise to shadow flicker may be turned off on different days to prevent excessive wear and tear on any single turbine.

To ensure that the model and SCADA system is accurate and working well a site visit will be carried out to verify the system. The shadow flicker prediction data will be used to select dates on which a shadow flicker event could be observed at one or multiple affected properties and the following process will be adhered to.

- *Recording the weather conditions at the time of the site visit, including wind speeds and direction (i.e., blue sky, intermittent clouds, overcast, moderate breeze, light breeze, still, etc.).*

- *Recording the house number, time and duration of site visit and the observation point GPS coordinates.*
- *Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation.*
- *In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded.*
- *The data will then be sent to the wind farm operational team to confirm that the model and SCADA system are working.*
- *Following 12 months of full operation of the Proposed Project a report can be prepared for the Local Authority describing the shadow flicker mitigation measures used at the wind farm and confirming the implementation and successful operation of the system.*

This method of shadow flicker mitigation has been technically well-proven at wind farms in Ireland and in areas outside Ireland that experience significantly longer periods of direct sunlight. In order to demonstrate how the SCADA control system can be applied to switch off particular turbines at the relevant times and dates, Table 1-2 added in Appendix 5-5 lists the 63 no. sensitive receptors at which a shadow flicker mitigation strategy may be necessary to ensure the WEDG 2006 30-minute per day shadow flicker threshold is not exceeded. In this case, the relevant turbine(s) would be programmed to switch off for the time required to reduce daily shadow flicker to below the guideline limit of 30 minutes. The SCADA control system would be utilised to control shadow flicker in the absence of being able to agree alternative mitigation measures with the relevant property owner. The mitigation strategy outlined in Table 5-12 below is based on the theoretical precautionary scenario. The details presented in Table 5-12 list the days per year and the turbines that could be programmed to switch off at specific times, in order to reduce daily shadow flicker to a maximum of 28 minutes, which is below the WEDG 2006 limit of 30 minutes.

This measure will be utilised at the Proposed Wind Farm to prevent incidences of shadow flicker at any house if required. Therefore, the Proposed Wind Farm could be brought in line with the requirements of the Draft WEDG 2019 should they come into force during the planning application process for this Proposed Project.

Should a complaint be received within 12 months of commissioning of the Proposed Wind Farm, field investigation/monitoring will be carried out by the wind farm operator at the affected property. Notwithstanding the approach set out above should shadow flicker associated with the permitted development be perceived to cause a nuisance at any home, the affected homeowner is invited to engage with the Applicant. The homeowner will be asked to log the date, time and duration of shadow flicker events occurring on at least five different days. The provided log will be compared with the predicted occurrence of shadow flicker at the residence, and if necessary, a field investigation will be carried out.

Screening Measures

In the event of an occurrence of shadow flicker exceeding guideline threshold values of 30 minutes per day at residential receptor locations, mitigation options will be discussed with the affected homeowner, including:

- Installation of appropriate window blinds in the affected rooms of the residence;
- Planting of screening vegetation;
- Other site-specific measures which might be agreeable to the affected party and may lead to the desired mitigation.

If agreement can be reached with the homeowner, then it would be arranged for the required mitigation to be implemented in cooperation with the affected party as soon as practically possible and for the full costs to be borne by the wind farm operator.

Residual Effects

Following the implementation of the above suite of mitigation measures, the WEDG 2006 limit of 30 mins per day or 30 hours per year will not be exceeded and therefore the residual effect of shadow flicker on the identified receptors will be negative, imperceptible, long-term, with any individual occurrence being a momentary effect with respect to the duration (maximum 30 minutes).

Significance of Effects

There will be no significant effects on human health from shadow flicker due to the operational phase of the Proposed Project.

5.7.3.2.10 *Interference with Telecommunication Systems and EMF*

Pre-Mitigation Impact

Proposed Project

Wind turbines, like all large structures, have the potential to interfere with broadcast signals, by acting as a physical barrier or causing a degree of scattering to microwave links. The alternating current, electrical generating and transformer equipment associated with wind turbines, like all electrical equipment, also generates its own electromagnetic fields, and this can interfere with broadcast communications.

EMF is often colloquially considered to have a negative effect on human health. However, as stated in Section 5.4.4 above, the EMF and ELF of electricity cables are in compliance with EU guidelines for the exposure of EMF to humans. As such, there is no potential for negative health effects on the local population due to EMF or ELF produced by any of the proposed infrastructure.

EMF along the Proposed Grid Connection is detailed in Section 15.2.4.4.2 in Chapter 15: Material Assets. The ESB 2017 document '*EMF & You: Information about Electric & Magnetic Fields and the electricity network in Ireland*', ' (Appendix 5-4) states that EMF from 220kV overhead lines and underground cables diminishes quickly with distance from the potential impacted receptor, with EMF from underground 220kV cables, diminishing from 7µT to 5µT at 10 m away from the cable and 2µT at 20 m away from the cable; EMF reduces to almost 0µT at 30 m.

The most significant effect at a domestic level relates to a possible flicker effect caused by the moving rotor, affecting, for example, radio signals. The most significant potential effect occurs where the wind farm is directly in line with the transmitter radio path. This interference can be overcome by the installation of deflectors or repeaters. During detailed telecommunication scoping in 2021 and 2025, it was identified that there are 8 no. Virgin Media links traversing the Project Site, which would interact with the Proposed Turbine locations. Ai Bridges was commissioned to carry out a detailed telecommunications impact assessment (Appendix 15-7). A relay mast is proposed to mitigate for the impacts caused by the Proposed Turbines on Virgin Media radio links. The relay mast will be 60m in height and is located approximately 620m southeast of Proposed Turbine T23 in the northwest of the Proposed Wind Farm.

As part of the scoping and consultation exercise undertaken by Ai Bridges, the national and regional broadcasters and fixed and mobile phone operators were contacted regarding potential interference from the Proposed Project. Full details are provided in of Chapter 2: Background to the Proposed Project and Section 15.2 (Telecommunications) of Chapter 15: Material Assets. Copies of the scoping responses received are presented in Appendix 2-1 of the EIAR. No impacts were identified to telecommunications from the Proposed Project. Under a precautionary scenario, a long-term, not significant negative effect has been identified on telecommunications

Mitigation Measures

As part of the design of the Proposed Project, a relay mast has been incorporated to maintain telecommunications connectivity and avoid potential interference effects on telecommunications services. This embedded design measure has been included to ensure that existing telecommunications users continue to receive an appropriate level of service and to minimise the potential for adverse effects on telecommunications infrastructure.

Following the scoping and consultation exercise undertaken by MKO, further consultation with required telecommunication providers was held by Ai Bridges. While no additional mitigation measures are required to prevent significant effects, it is standard practice of 2RN to produce a protocol document for wind farm developments, which will be signed by the developer prior to construction. The Protocol Document is further detailed in Section 15.2.1.3.1 of Chapter 15 and in Appendix 15-7 Telecommunications Impact Assessment.

Furthermore, the proposed relay mast will be used to mitigate any impacts to the Virgin Media links.

Residual Effects

Following the implementation of the mitigation measures above, there will be long-term, not significant, negative effect from the Proposed Project on telecommunication systems.

Significance of Effects

There will be no significant effects on telecommunications arising from the operational phase of the Proposed Project.

5.7.4 Decommissioning Phase

The wind turbines proposed as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the Proposed Wind farm may be decommissioned fully. The Proposed Grid Connection, Proposed Onsite Substation and Proposed Offsite Substation will remain in place as it will be under the ownership of ESB/EirGrid, as described in Chapter 4: Description of the Proposed Project.

The works required during the decommissioning phase are described in Section 4.12 in Chapter 4: Description of the Proposed Project. Any impact and consequential effect that occurs during the decommissioning phase on population and human health will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration, and the mitigation measures outlined above will be implemented during the decommissioning phase also. A Decommissioning Plan has been prepared as part of this EIAR and is included as Appendix 4-7. This Decommissioning Plan follows the most up to date NatureScot guidance and has been informed by other relevant environmental, health and safety, and planning guidance applicable to wind farm decommissioning. By its nature, the Decommissioning Plan is a working document and, in accordance with the NatureScot guidance, an updated Decommissioning Plan will be agreed with the local authorities three months prior to decommissioning the Proposed Project. The principles that will inform the final decommissioning plan are contained in the Decommissioning Plan in Appendix 4-7.

5.7.5 Cumulative Effects

For the assessment of cumulative impacts, any other existing, permitted or proposed developments (wind energy or otherwise) have been considered and are detailed in Appendix 2-3. Further information on projects considered as part of the cumulative assessment, including the Draft

Rehabilitation Plans associated with the Allen Bogs, within which part of the Project Site is located, proposed Uisce Éireann Eastern and Midlands Region Water Supply Project and proposed Edenderry Gas Pipeline project which are given in Chapter 2: Background to the Proposed Project. The impacts with the potential to have cumulative effects on human beings are discussed below and in more detail in the relevant chapters: Chapter 10: Air Quality, Chapter 12: Noise and Vibration, Chapter 13: Landscape and Visual, and Chapter 15: Material Assets. A summary is detailed below.

The proposed Edenderry Gas Pipeline, located within the Proposed Wind Farm site, lies within the Population Study Area and intersects with upgrades to existing roads and proposed dedicated amenity board walk. The proposed gas pipeline project is currently anticipated to be constructed over a 22-month period commencing in Q1 2028, whereas the Proposed Project assumes an indicative construction start date of Q1 2030. As such, there is no anticipated overlap in the main construction programmes of the two developments and therefore limited potential for cumulative construction-phase effects associated with population and human health. Prior to construction, the Applicant will engage with GNI via the 'Dial Before You Dig' procedure online. GNI will be contacted on 1800 42 77 47 before excavating near the proposed pipeline. Furthermore, the '*Safety advice for working in the vicinity of natural gas pipelines'* guidance document and the GNI '*Code of Practice*' standards will be adhered to during all proposed upgrades to existing roads along the east of the Proposed Wind Farm.

The proposed Uisce Éireann Eastern and Midlands Region Water Supply Project (Case Ref: PA92.323980) includes a proposed water pipeline from a new water treatment plant near Birdhill, Co. Tipperary to a termination point reservoir at Peamount, Co. Dublin, traverses the Project Site in an east-west direction across Codd Bogs 1 & 2, Glashabaun North and South Bogs, and Derrybrennan Bog. The planning application was submitted to ACP in December 2025 and the construction phase will commence in Q1 of 2028 and completes at Q4 of 2032, subject to planning approval. The Water Supply Project has been considered in the design of the Proposed Project and is considered in the cumulative impact assessments of this EIAR chapter. This approach has been adopted due to the potential for temporal overlap between the construction phases of the Proposed Project and the Water Supply Project, resulting in the possibility of concurrent construction activities within the Population Study Area. Given the nature of the Water Supply Project as linear utility infrastructure, and subject to its own design, consenting, construction management and operational controls, no credible pathway has been identified whereby the Water Supply Project would interact with the Proposed Project to give rise to significant cumulative effects in terms of population and human health.

A planning application (Ref. 2560087) has been submitted for the proposed uprating of the existing 110 kV OHL between the existing Cushaling 110 kV Substation in the townland of Ballykilleen, Co. Offaly, and the existing Portlaoise 110 kV Substation in the townlands of Clonminam and Kylekiproe, Co. Laois. The proposed development has been considered as part of the cumulative assessment for the Proposed Project. Based on discussions held during the EirGrid scoping meeting on 16th December 2025, there is currently no anticipated overlap between the construction programme of the Proposed Project and that of the proposed OHL uprating project, with the final phase of the EirGrid project currently expected to extend to 2029. Given the nature of the proposed OHL uprating works and the absence of a significant temporal overlap in construction activities, no significant cumulative effects in relation to population and human health are anticipated. Should material changes occur to the EirGrid project programme or design during the planning process, EirGrid has indicated that such changes can be communicated to BnM and MKO and considered, where relevant, in any updates to the EIAR.

As part of the IPC licence rehabilitation requirements, BnM is required to produce draft rehabilitation plans for lands within the Allen Bog Group, refer to Appendix 2-4. These draft rehabilitation plans have considered the Proposed Project footprint and demonstrate that both peatland rehabilitation and renewable energy can coexist harmoniously onsite. Irrespective of any further development on the Project Site, BnM's statutory duties to discharge the conditions of its IPC Licence will remain ongoing. The targeted rehabilitation measures identified in the Draft Rehabilitation Plans are anticipated to be implemented following the construction phase of the Proposed Wind Farm and, as such, are considered in Section 5.7.5.2 below.

The PCAS which comprises enhanced peatland rehabilitation. These measures are separate to those defined by the IPC Licence. PCAS is completed at Lodge Bog which is located within the Project Site PCAS does not form part of the Proposed Project application, it has been cumulatively assessed.

5.7.5.1 Construction Phase

5.7.5.1.1 *Population*

Population Levels

The assessment above in Section 5.7.2.1.1 demonstrated that there will be no significant effect on population levels from the Proposed Project during the construction phase. As the Proposed Project will not cause to changes to trends, population density, household size or age structure, it is therefore considered there can be no cumulative effects with other proposed or consented projects and plans that may be constructed in parallel with the Proposed Project.

Employment and Investment

The assessment above in Section 5.7.2.1.2 demonstrated that there will be a positive, moderate, short-term, direct effect on employment levels during the construction phase (estimated to be 30-36 months) and a positive, slight, short-term effect on investment and employment in the local and wider regions due to the contributions paid to the Offaly County Council and Kildare County Council at the commencement of the construction phase.

It is therefore considered that there will be a positive, moderate, short-term cumulative effect on employment should the Proposed Project be constructed in parallel with other proposed, planning and permitted projects and plans as identified in Section 2.10 in Chapter 2: Background to the Proposed Project, and a positive, moderate, long term cumulative effect on investment in local and regional infrastructure and communities due to additional commercial rates paid to the local authorities by other proposed or consented projects and plans.

Land Use Patterns and Activities

Due to the small footprint of the Proposed Project infrastructure on a site scale and the continuation of land use and activities onsite and in the wider area, there will be no significant effects on land use and activities during the construction phase. Therefore, it is considered there will be no cumulative effects on land use and activities should other proposed or consented plans and projects within the Population Study Area be constructed in parallel with the Proposed Project.

Substitute Consent

As identified in Section 2.10.2.1 in Chapter 2, an application for substitute consent was submitted to An Coimisiún Pleanála (Case Ref: SU09.324604) on 20th August 2026, for peat extraction and ancillary works from July 1988 to the present day that have been carried out within parts of Allen Bog. A Remedial Natura Impact Statement (rNIS) and Remedial Environmental Impact Assessment Report (rEIAR) was submitted with this application. Impacts on land use within the substitute consent application during identified activities to be carried out on Allen Bog in the future were determined to be long term, significant, and positive, which is Significant, due to the provisions outlined in the Draft Rehabilitation Plans.

EPA Licensed Activities

The cumulative assessment has also considered the Draft Rehabilitation Plans for the Proposed Wind Farm site together with the Proposed Project and the other proposed, permitted and operational

developments identified in Appendix 2-3 of this EIAR. The targeted rehabilitation measures identified within the Draft Rehabilitation Plans are anticipated to be implemented following completion of the construction phase of the Proposed Project. At the commencement of the construction phase, the Proposed Wind Farm site will be undergoing continued natural revegetation, and ongoing site management, decommissioning works, and environmental monitoring.

Accordingly, the ongoing requirements of the IPC Licence are not anticipated to introduce other land uses capable of influencing population trends within the Population Study Area. As such, these activities, along with natural revegetation, are not anticipated to materially alter existing land-use pattern within the Proposed Wind Farm site. Therefore, is therefore no potential for significant cumulative effects on land use patterns and activities during the construction phase resulting from the Proposed Project and ongoing site management, decommissioning works, and environmental monitoring.

Peatland Climate Action Scheme

PCAS is completed within Lodge Bog located within the Proposed Wind Farm site where the Proposed Onsite Substation is located. There is no overlap between the PCAS works and the Proposed Project permanent infrastructure footprint. The works include hydrological management, extensive re-wetting and drain blocking, modifying outfalls, creation of berms etc. These works will optimise hydrological conditions and will have benefits for water quality and storage attenuation as well as increased carbon storage and reduced emissions.

There is therefore no potential for significant cumulative effects to occur between the Proposed Project and PCAS at Lodge Bog during construction, operation or decommissioning.

Property Values

It can be concluded from available international literature that there is the uncertain potential for a short-term imperceptible negative effect, which is Not Significant, on property values within 1km of the Proposed Turbines, refer to Section 5.7.2.1.4. It is on this basis that it can be concluded that there would be a short-term, imperceptible, negative, cumulative impact from the Proposed Project.

The Proposed Project will be perceived in combination with other proposed, planning and permitted projects and plans as identified in Section 2.10 of Chapter 2: Background to the Proposed Project, which may give rise to a potential cumulative perception of wind energy infrastructure within the landscape.

Notwithstanding this, the available scientific literature does not identify a consistent or measurable relationship between the presence of multiple wind farms and significant effects on property values. Any potential effects remain largely influenced by perception rather than demonstrable long-term market trends and are typically localised and temporary in nature.

On this basis and given the distances involved and the existing presence of operational wind energy developments in the area, the cumulative impact on property values is considered to be short-term, slight, negative, which is considered to be Not Significant.

Tourism

The assessment above in Section 5.7.2.1.5 concludes that there will negative, imperceptible, short term, residual effect, which is Not Significant, on tourism in the wider landscape due to the construction phase of Proposed Project.

It is not considered that the Proposed Project together with other projects in the area will negatively affect cumulatively any tourism infrastructure in the wider area. The conclusions from available

research indicate there is a generally positive disposition among tourists towards wind development in Ireland. Refer to Section 5.3.9 above.

Considered cumulatively with the proposed amenities, it is considered that the Proposed Project will support the development of the wider area, attracting local and new visitors to the area which could be uncovered as part of a wider regional strategy.

It is on this basis that it can be concluded that there would be a long-term, positive, imperceptible cumulative effect from the Proposed Project and other developments in the area.

Residential Amenity

Development can cause effects on one or more components of residential amenity such as of noise, dust, vibration, shadow flicker, and visual amenity. These factors are assessed within this EIAR, and summaries are presented in this chapter and their respective chapters. The assessments of noise and vibration, dust and other emissions to air, water quality and visual amenity conclude that there are no significant effects during the construction phase of the Proposed Project. Therefore, there will be no cumulative effects should other proposed or consented plans and projects be constructed in parallel with the Proposed Project.

5.7.5.1.2 *Human Health*

Health and Safety

The assessment above in Section 5.7.2.2.1 concludes that there will negative, slight, short-term effect, which is Not Significant, during the construction phase of the Proposed Project. There is no credible scientific evidence to link wind turbines with adverse health effects. All other existing, permitted or proposed projects (wind energy or otherwise) would be expected to follow all relevant Health and Safety Legislation during the construction, operation and decommissioning phases of the Proposed Project. It is assumed also that all mitigation measures in relation to the other cumulative projects will also be implemented. Therefore, it is considered there will be no cumulative effects on Health and Safety should other proposed or consented plans and projects be constructed in parallel with the Proposed Project.

Air Quality: Dust and Exhaust Emissions

The assessment above in Section 5.7.2.2.2 concludes that there will be short-term, slight, negative, which is Not Significant from dust and other emissions into the atmosphere due to the construction phase of Proposed Project. A cumulative assessment has been conducted in Section 10.3.5.1 of Chapter 10: Air Quality, which concludes that there will be no measurable cumulative effects on air quality when considering other proposed or consented plans and projects be constructed in parallel with the Proposed Project.

Ongoing site management, decommissioning works, and environmental associated with the IPC Licence requirements for the Allen Bog Group will require the use of plant and machinery which will result in the emission of air pollutants. When considering cumulatively with the construction phase of the Proposed Project, there will be a short-term, slight, negative, cumulative effect on air quality.

Climate

The assessment above in Section 5.7.2.2.3 concludes that there will be negative, imperceptible, permanent effect, which is Not Significant on climate due to the construction phase of Proposed Project. A cumulative assessment has been conducted in Section 11.6.1 of Chapter 11: Climate, which concludes that there will be a permanent slight negative cumulative effect on climate resulting from

greenhouse gas emissions, and a long-term, moderate, negative effect on loss of carbon sequestration potential.

Ongoing decommissioning works associated with the IPC Licence requirements for the Allen Bog Group will require the use of plant and machinery which will result in the emissions of greenhouse gases. As outlined in Section 11.3.2.4 in Chapter 11, at the commencement of the construction phase, the likely future receiving environment for the Proposed Wind Farm site relating to climate will remain a net greenhouse gas source and will likely be comparable to the existing baseline as established in Section 11.3.1. Therefore, when consider cumulatively with the construction phase of the Proposed Project, there will be a permanent, slight, negative cumulative effect on climate.

Water Quality

The assessment above in Section 5.7.2.2.4 concludes that there will be negative, imperceptible, long term, effect, which is Not Significant, on water quality due to the construction phase of Proposed Project. A cumulative assessment has been conducted in Section 9.5.7 of Chapter 9: Water, which concludes that there will be no cumulative effects on water quality should other proposed or consented plans and projects within the cumulative assessment boundary be constructed in parallel with the Proposed Project.

Noise & Vibration

The assessment above in Section 5.7.2.2.5 concludes that there will be an unlikely, short-term and not significant negative effect from noise and vibration emissions due to the construction phase of the Proposed Project. A cumulative assessment has been conducted in Section 12.9.3 of Chapter 12: Noise and Vibration, which concludes that the potential for any cumulative noise effect from all of the proposed activities occurring simultaneously or with construction activities from other developments is unlikely and not significant.

Traffic and Transport

The assessment above in Section 5.7.2.2.6 concludes that there will be a slight, short-term, negative effect, which is Not Significant on traffic and transport due to the construction phase of the Proposed Project. A cumulative assessment for Traffic and Transport has been conducted in Section 15.1.18 of Chapter 15: Material Assets, which concludes that there will be negative, short term and slight, which is Not Significant cumulative effects on local road users should other proposed or consented plans and projects within the Cumulative Assessment Boundary be constructed in parallel with the Proposed Project.

Major Accidents and Natural Disasters

Chapter 17 assesses the potential for impacts from Major Accidents and Natural Disasters to/from the Proposed Project during its construction phase. As detailed in Section 5.7.2.2.7, Chapter 17 assesses ten risks: flooding, major road traffic accident, contamination event, major fire, bog fire, utility emergencies, adverse weather conditions, loss of critical infrastructure, peat instability and aviation. The assessment in Chapter 17 concludes that there will be no significant effects to/from the construction of Proposed Project by such risks. A cumulative assessment has been conducted in Section 17.4.6 of Chapter 17: Major Accidents and Natural Disasters, which concludes that there will be no increase in the vulnerability of the Proposed Project or adjacent areas to major accidents and/or natural disasters, should other proposed or consented plans and projects be constructed in parallel with the Proposed Project.

Aviation

In relation to aviation, only other structures at height have the potential to result in cumulative effect. Therefore, other plans and projects as outlined in Section 2.10 of Chapter 2 have been screened out and only proposed, permitted or existing wind farms are considered in combination with the Proposed Turbines. There are 15 no. permitted proposed and existing wind farms within 20km of the Proposed Turbines.

There are 2 no. wind farms (Ballinla Wind Farm and Kilberry Wind Farm) within 20km which are not located within any airspace under military restriction and therefore there is no potential for cumulative effects on restricted airspace when considered with the Proposed Turbines.

The remaining 13 no. wind farms are all located within restricted airspace, 5 no. of which are operational. There are 2 no. wind farms in proximity to the Aviation Study Area (i.e., Cloncreen Wind Farm and Cushaling Wind Farm), therefore, the Aviation Study Area is already located within an that is a recognised obstacle field, published in the relevant aeronautical charts and in the IAA/AirNav Ireland Air Navigation Obstacle Data Set. Therefore, any flying activity in the area will take into account the routes and minimum heights to be flown in order to legally and safely avoid wind farms. Therefore, it can be determined, under a precautionary approach, that the Proposed Turbines will, in combination with all other permitted, proposed, or existing wind farms within EI-R16 and MOA4 will have a long-term imperceptible negative effect on aviation, which is Not Significant.

The radar impact assessment contained within Appendix 16-3 and aerodrome impact assessment set out in Section 16.9.2.4 and Section 16.9.3.6 concludes that the Proposed Turbines won't have significant effects on radar or aerodromes primarily due to distance from receptors. Therefore, it can be determined, under a precautionary approach, that the Proposed Turbines will, in combination with all other permitted, proposed, or existing wind as identified in Table 16-8 will have a long-term imperceptible negative effect on radar which is Not Significant.

Overall, the Proposed Turbines will, in combination with all other permitted, proposed, or existing wind farms, have a long-term a long-term imperceptible negative cumulative effect on human health.

Shadow Flicker

Shadow Flicker only has the potential to occur from operational wind turbines. Therefore, there can be no cumulative effects during the construction phase of the Proposed Project.

Interference with Telecommunication Systems

As there will be no impacts on telecommunication systems during the construction phase, there will be no cumulative effects should other proposed or consented plans and projects be constructed in parallel with the Proposed Project.

5.7.5.2 Operational Phase

5.7.5.2.1 *Population*

Population Levels

The assessment above in Section 5.7.3.1.1 demonstrated that there will be no impact on population levels from the Proposed Project during the operational phase. As the Proposed Project will not cause to changes to trends, population density, household size or age structure, it is therefore considered there can be no cumulative effects with other proposed or consented projects and plans that may be operational alongside the Proposed Project.

Employment and Investment

The assessment above in Section 5.7.3.1.2 demonstrated that there will be a positive, slight, long-term effect on investment and employment in the local and wider regions due to the contributions paid to the Offaly County Council and Kildare County Council at the commencement of the operational phase.

In addition, the Proposed Project will contribute to the local economy through the provision of community benefit funding and associated initiatives, in line with national policy and RESS requirements. These funds are intended to support local community projects, infrastructure, and social initiatives within the area.

In a cumulative context, and the existing Cloncreen Wind Farm, located within the vicinity of the Proposed Project, also provide ongoing economic contributions, including employment opportunities, commercial rates, and community benefit funds. The presence of multiple operational wind energy developments in the area therefore contributes to a combined and sustained economic input into the local communities, enhancing the potential for community development and investment.

It is therefore considered that there will be a positive, moderate, long-term cumulative effect on employment and investment should the Proposed Project be operational in parallel with other proposed, planning and permitted projects and plans as identified in Section 2.10 in Chapter 2.

Land Use Pattern and Activities

Due to the small footprint of the Proposed Project infrastructure on a site scale and the continuation of land use and activities onsite and in the wider area, there will be no significant effects on land use and activities during the operational phase. Therefore, it is considered there will be no cumulative effects on land use and activities.

Substitute Consent

As identified in Table 2-2 in Chapter 2, an application for substitute consent was submitted to An Coimisiún Pleanála (Case Ref: SU09.324604) on 20th August 2026, for peat extraction and ancillary works from July 1988 to the present day that have been carried out within parts of Allen Bog. A Remedial Natura Impact Statement (rNIS) and Remedial Environmental Impact Assessment Report (rEIAR) was submitted with this application. Impacts on land use within the substitute consent application during identified activities to be carried out on Allen Bog in the future were determined to be long term, significant, and positive, which is Significant, due to the provisions outlined in the Draft Rehabilitation Plans.

EPA Licensed Activities

The cumulative assessment has also considered the Draft Rehabilitation Plans for the Proposed Wind Farm site together with the Proposed Project and the other proposed, permitted and operational developments identified in Appendix 2-3 of this EIAR.

During the operational phase, continued natural revegetation, ongoing site management, decommissioning works, and environmental monitoring and implementation of the targeted rehabilitation measures outlined in the Draft Rehabilitation Plans are not anticipated to introduce new sources of human health risk. While the individual environmental determinants of health may evolve over time, on balance, these changes are not expected to materially alter the overall human health baseline within the Population Study Area.

Accordingly, these activities, along with natural revegetation, are not anticipated to materially alter existing land-use pattern within the Proposed Wind Farm site. Therefore, is therefore no potential for significant cumulative effects on land use patterns and activities during the construction phase resulting

from the Proposed Project and ongoing site management, decommissioning works, and environmental monitoring.

Peatland Climate Action Scheme

PCAS is completed within Lodge Bog located within the Proposed Wind Farm site where the Proposed Onsite Substation is located. There is no overlap between the PCAS works and the Proposed Project permanent infrastructure footprint. The works include hydrological management, extensive re-wetting and drain blocking, modifying outfalls, creation of berms etc. These works will optimise hydrological conditions and will have benefits for water quality and storage attenuation as well as increased carbon storage and reduced emissions.

There is therefore no potential for significant cumulative effects to occur between the Proposed Project and PCAS at Lodge Bog during operation phase.

Property Values

The assessment above in Section 5.7.3.1.4 concludes that there is the uncertain potential for negative, imperceptible, short-term effects which are Not Significant, due to the operational phase of Proposed Project. Furthermore, no correlation between the presence of grid infrastructure and property values has been demonstrated.

In a cumulative context, the Proposed Project will operate in conjunction with Cushaling Wind Farm, and Cloncreen Wind Farm. In certain locations, receptors may experience the presence of multiple wind energy developments within the same receiving environment, which may give rise to a potential cumulative perception of wind energy infrastructure.

However, the available scientific literature does not demonstrate a consistent or measurable relationship between the presence of multiple wind farms and significant impacts on property values. Any potential effects are generally perception-based, localised and temporary in nature, and are not reflected in long-term market evidence.

On this basis, the cumulative effect on property values is considered to be negative, slight, and short-term, which is Not Significant.

Tourism

The assessment above in Section 5.7.3.1.5 concludes that there will positive, significant, long term, residual effect of visitor experience to attractions in the wider landscape. It also concludes the Proposed Project will have a positive, slight, long-term impact on tourism due to the social and recreational benefits associated with the recreational amenity walkways/ paths and equestrian track. Both of these effects are considered Not Significant.

The conclusions from available research indicate there is a generally positive disposition among tourists towards wind development in Ireland, see Section 5.3.9.

When considered cumulatively with the existing Cloncreen Wind Farm, Grand Canal and Killinthomas Wood which directly interacts with the Proposed Wind Farm, it is considered that the Proposed Project will support the development of the wider area, attracting local and new visitors to the area which could be uncovered as part of a wider regional strategy.

The existing Cushaling Wind Farm, located in closer proximity to the Proposed Project, features a dedicated Biodiversity Park with public access, designed for education and recreation. The Proposed Wind Farm includes a newly constructed amenity trail, offering a safe and scenic route through the landscape.

It is on this basis that it can be concluded that there would be a long-term slight positive cumulative effect from the Proposed Project.

Residential Amenity

The assessment above in Section 5.7.3.1.6 concludes that there will be a negative, slight, long-term, which is Not Significant, on residential amenity due to the operation of the Proposed Project. Operation can cause effects on one or more components of residential amenity such as of noise, dust, vibration, shadow flicker, and visual amenity. Cumulative Assessments within the relevant chapters and sections (Chapter 10, Chapter 12, Chapter 13, and Shadow Flicker in Section 5.7.5.2.2 below) conclude that there will be no cumulative effects. Therefore, no cumulative effects to residential amenity are considered should other proposed or consented plans be operational alongside the Proposed Project.

5.7.5.2.2 *Human Health*

Health and Safety

The assessment above in Section 5.7.3.2.1 concludes that there will negative, imperceptible, long-term effect, which are Not Significant, during the operational phase of the Proposed Project. There is no credible scientific evidence to link wind turbines with adverse health effects. All other existing, permitted or proposed projects (wind energy or otherwise) would be expected to follow all relevant Health and Safety Legislation during the construction, operation and decommissioning phases of the development. It is assumed also that all mitigation measures in relation to the other cumulative projects will also be implemented. Therefore, it is considered there will be no cumulative effects on Health and Safety should other proposed or consented plans and projects be operational alongside the Proposed Project.

Air Quality: Dust and Exhaust Emissions

The assessment above in Section 5.7.3.2.2 concludes that there will long-term, imperceptible, negative effects, which are Not Significant, from dust and other emissions to air due to the operational phase of Proposed Project. A cumulative assessment has been conducted in Section 10.3.5 of Chapter 10: Air Quality, which concludes that there will be a long-term, significant, positive impact on air quality should other proposed or consented plans and projects that may be operational alongside the Proposed Project.

Ongoing site management, decommissioning works, and environmental monitoring associated with the IPC Licence requirements for the Allen Bog Group will require the use of plant and machinery which will result in the emission of air pollutants. Therefore, when considering cumulatively with the operational phase of the Proposed Project, there will be a long-term, imperceptible, negative, cumulative effect on air quality.

However, the implementation of Draft Rehabilitation Plans within the Allen Bog Group, including the identified peatland rehabilitation and Proposed Enhancement Areas, is expected to facilitate the progressive rehabilitation of peatland across the Proposed Wind Farm site and result in an overall improvement to air quality within the Air Quality Study Area during the 35-year operational life of the Proposed Project.

Therefore, when considered cumulatively, the Proposed Project (with consideration to the 146,857 tonnes of CO_2 saved per annum due to the operation of the Proposed Project) and IPC Licence requirements will result in a long-term significant, positive, cumulative effect.

Climate

The assessment above in Section 5.7.3.2.3 concludes that there will be positive, significant, long-term effects on CO_2 emissions and energy targets, due to the operational phase of Proposed Project. The Proposed Project will operate within an established wind energy landscape that includes Cloncreen Wind Farm and Cushaling Wind Farm within the Population Study Area, both of which are currently operational. The combined generation of renewable electricity from these developments, together with the Proposed Project, will contribute to displacing carbon dioxide emissions from fossil fuel-based generation, resulting in a cumulative reduction in CO_2 emissions at a regional and national scale. When considered cumulatively, the renewable energy generation from the Proposed Project and the surrounding wind energy landscape will result in an overall positive cumulative effect on climate during the operational phase.

Ongoing site management, decommissioning works, and environmental monitoring associated with the IPC Licence requirements for the Allen Bog Group will require the use of plant and machinery which will result in the emission of greenhouse gases. Therefore, when considering cumulatively with the operational phase of the Proposed Project, there will be a potential long-term, imperceptible, negative, cumulative effect on climate.

However, the implementation of Draft Rehabilitation Plans within the Allen Bog Group will facilitate the progressive rehabilitation of peatland across the Proposed Wind Farm site and reflect the regeneration of the Proposed Wind Farm site as a carbon store, with overall carbon sequestration potential improving progressively. As outlined in Section 11.3.2.4.1 of Chapter 11, during the operational phase, the Proposed Project infrastructure footprint, i.e., 152ha, will result in a 3% carbon sequestration loss potential to lands available for rehabilitation. The proposals contained within the Draft Rehabilitation Plan have been designed with consideration of the Proposed Project infrastructure footprint. The permanent infrastructure footprint of the Proposed Project represents approximately 2.9% of the Proposed Wind Farm site and therefore does not impact or change the overall goals and outcomes of the proposed rehabilitation plans for the Allen Bog Group.

Therefore, it is anticipated that the implementation of measures in the Draft Rehabilitation Plans and the operation of the Proposed Project will result in a positive cumulative effect on climate. Furthermore, the Proposed Project and the Draft Rehabilitation Plans will assist in the national goal of achieving a climate neutral Ireland by 2050 as set out in the Climate Action and Low Carbon Development (Amendment) Act 2021.

Water Quality

The assessment above in Section 5.7.3.2.4 concludes that there will be negative, imperceptible, temporary effects, which are Not Significant, on health from a potential water quality impact due to the operational phase of the Proposed Project. A cumulative assessment has been conducted in Section 9.5.7 of Chapter 9: Water, which concludes that there will be a no cumulative effects arising from other proposed or consented plans and projects that may be operational alongside the Proposed Project.

Noise & Vibration

A cumulative assessment has been conducted in Section 12.9.2 of Chapter 12: Noise and Vibration. The substations associated with the existing Cushaling Wind Farm and existing Cloncreen Wind Farm (located approximately 11.7 km west of the Proposed Onsite Substation, and the local Blake 110kV Substation, located approximately 2.4km east of the Proposed Onsite Substation and approximately 8.7km west of the Proposed Offsite Substation), there are no other industrial noise sources of fixed mechanical and electrical plant in the vicinity of the nearest NSLs. Due to these distances to other substations, the potential for any cumulative noise effects from the Proposed Onsite Substation and Proposed Offsite Substation is Not Significant.

The assessment above in Section 5.7.3.2.5 concludes that there will be negative, not significant, long-term effects on health from noise and vibration emissions due to the operational phase of the Proposed Project, which is Not Significant.

Traffic and Transport

The assessment above in Section 5.7.3.2.6 concludes that there will be a negative, imperceptible, long-term, which is Not Significant, on traffic and transport due to the operational phase of the Proposed Project. A cumulative assessment for traffic and transport has been conducted in Section 15.1.18 of Chapter 15: Material Assets, which concludes that there will be a no cumulative effects should other proposed or consented plans and projects that may be operational alongside the Proposed Project.

Major Accidents and Natural Disasters

Chapter 17: Major Accidents and Natural Disasters concludes that there will be no significant effects to/from major accidents and natural disasters due to the operation of the Proposed Project. Therefore, it is considered there will be no cumulative effects from major accidents and natural disasters to/from other proposed or consented plans and projects in the Population Study Area.

Chapter 17 assesses the potential for impacts from Major Accidents and Natural Disasters to/from the Proposed Project during its operational phase. Chapter 17 assesses nine risks: flooding, major road traffic accident, contamination event, major fire, bog fire, adverse weather conditions, loss of critical infrastructure, peat instability and aviation. The assessment contained in Chapter 17 concludes that there will be no significant effects to/from the operation of Proposed Project by such risks. A Cumulative Assessment has been conducted in Chapter 17: Major Accidents and Natural Disasters, which concludes that there will be no increase in the vulnerability of the Proposed Project or adjacent areas to major accidents and/or natural disasters, should other proposed or consented plans and projects that may be operational alongside the Proposed Project.

Aviation

Only other structures at height have the potential to result in cumulative effects on aviation, see Section 5.7.5.1.2. Therefore, other plans and projects as outlined in Section 2.10 of Chapter 2 have been screened out and only proposed, permitted or existing wind farms are considered in combination with the Proposed Turbines. There are 15 no. permitted proposed and existing wind farms within 20km of the Proposed Turbines.

The Proposed Project will operate in conjunction with existing Cushaling Wind Farm and Cloncreen Wind Farm. These wind farms, in combination with the Proposed Project, will result in multiple wind energy structures within the wider receiving environment. Section 16.10.5 of Chapter 16: Aviation details the proposed, permitted or existing wind farms considered in combination with the Proposed Turbines.

The Proposed Project is located within MOA 4 but lies beneath EI-R16. The presence of multiple wind farms within this airspace has the potential to give rise to a cumulative physical presence of obstacles within the airspace.

However, all wind energy developments within the Aviation Study Area, including the Proposed Project, are subject to statutory consultation with the IAA and must comply with established aviation safety requirements, including obstacle lighting, safeguarding of airspace and operational procedures. As such, aviation impacts are assessed and managed on a case-by-case and cumulative basis through this regulatory framework.

Given that the existing Cushaling Wind Farm and existing Cloncreen Wind Farm are already operational and form part of the baseline aviation environment, and that the Proposed Project will be

required to comply with all applicable aviation safety standards, the addition of the Proposed Project will not result in a significant change to the existing aviation baseline.

Whilst a group of wind farms can alter pilot workload due to creating obstacles to be avoided, it can also make flight planning in such an area easier. This is because an area of wind farms, or other obstacles, is easier to plan to avoid, rather than the avoidance of individual wind farms or obstacles. An example of this is the avoidance of several mountains grouped closely together by flying around them rather than trying to fly over the lower ground in between them. Several aviation maps show groups of turbines in a particular area which facilitates easier route planning. This is also a safer approach, contributing to a greater situational awareness of an overall greater altitude required for obstacle clearance, rather than the possibility of varying altitude several times whilst avoiding individual wind farms. Under a precautionary approach, that the Proposed Turbines will, in combination with all other permitted, proposed, or existing wind farms within EI-R16 and MOA4 will have a long-term imperceptible negative effect on aviation.

Under a precautionary approach, it is considered that the addition of the Proposed Turbines extends extensively into the Edenderry/Allenwood/Rathangan LFTA, results in significant negative cumulative effects on the Edenderry/Allenwood/Rathangan LFTA. As outlined in Section 16.9.3.2 of Chapter 16 the Edenderry/Allenwood/Rathangan LFTA cannot be mitigated directly (assuming that the activities do occur in the area of the Proposed Turbines) and therefore an alternative site will be required for this activity. The Applicant continue to engage with the DoD/Irish Air Corp to facilitate an alternative location for LFTAs if feasible. If an alternative area is confirmed there will be no impact on the Edenderry/Allenwood/Rathangan LFTA.

Overall, the Proposed Turbines will, in combination with all other permitted, proposed, or existing wind farms, have a long-term a long-term significant negative cumulative effect on aviation; however, should an agreement be made with the DoD to move the low flying area to an alternative suitable area, cumulative effects will be permanent imperceptible and negative.

Shadow Flicker

The assessment above in Section 5.7.3.2.10 concludes that there will be a negative, imperceptible, long-term shadow flicker, which is Not Significant, on human health due to the operational phase of the Proposed Project. The cumulative assessment of shadow flicker arising from the Proposed Wind Farm and other wind farms was carried out within the Cumulative Shadow Flicker Study Area and was based on the methodology, assumptions and criteria outlined in Section 5.2.3. For the assessment of cumulative shadow flicker, any other existing, permitted or proposed wind farms are considered where the project's ten times rotor diameter shadow flicker study area overlaps with the Shadow Flicker Study Area for the Proposed Project, i.e., the Cumulative Shadow Flicker Study Area.

As outlined in Section 5.7.2 above, there are 2 no. existing, permitted, or proposed wind farms within 5km of the nearest turbine of the Proposed Project:

- The existing Cushaling Wind Farm is located approximately 0.7 km from the nearest Proposed Turbine (T25) and is located in between the following Proposed Turbines: T25, T26, T24, T23, T41, T39, T10, T17, T21 and T22;
- The existing Cloncreen Wind Farm is located approximately 2.8 km west from the nearest Proposed Turbine (T22).

The rotor diameter for the existing Cushaling Wind Farm turbines is 162m with a corresponding shadow flicker study area of 1.62km (10x rotor diameter). This area overlaps with the Shadow Flicker Study Area for the Proposed Project. The rotor diameter for the existing Cloncreen Wind Farm turbines is 136m with a corresponding shadow flicker study area of 1.36km (10x rotor diameter). This area overlaps with the Shadow Flicker Study Area for the Proposed Project and so there is potential for cumulative shadow flicker effects in this instance.

Of the 310 no. sensitive receptors within the Shadow Flicker Study Area of the Proposed Project, 3 no. sensitive receptors were identified for further assessment with regards to cumulative shadow flicker. Of these 3 no. sensitive receptors, H1120 experiences higher shadow flicker due to the shadow flicker from Cushaling Wind Farm in 223 days out of 365 days compared to Proposed Wind Farm for 97 days.

Table 5-11 details the results of the Proposed Turbines being brought in line with the WEDG 2006 limit of 30 hours per year through mitigation strategies outlined in Section 5.7.3.2.9. On this basis, there will be no cumulative shadow flicker impact.

As identified in Table 1-1 of Appendix 5-5, where there are daily shadow flicker occurrences, the culmination of these occurrences over a year correspond to annual shadow flicker occurrences at a given dwelling. Therefore, by presenting the maximum potential annual shadow flicker contributed by the Proposed Project after mitigation in Table 5-12 below, this also identified the culmination of daily shadow flicker occurrences over a year. As a result, Table 5-12 highlights only the cumulative annual shadow flicker occurrence.

Table 5-12 Cumulative Shadow Flicker Mitigation

House no.	Max. Potential Cumulative Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Potential Annual Shadow Flicker Adjusted for Average Regional Sunshine (hrs:min:sec)	Turbine(s) contributing to Cumulative Shadow Flicker impact*	Max. Potential Annual Shadow Flicker contributed to by Proposed Project (Turbines 1-46)	Remaining Max. Potential Annual Shadow Flicker contributed by Nearby Wind Farms after mitigation (Turbines 47-76)	Max. Potential Cumulative Annual Shadow Flicker Exceedance that requires mitigation from the Proposed Project (hrs:mins:sec)	Proposed Project Turbines to be controlled	Post-mitigation Maximum Annual Shadow Flicker by the Proposed Development (hrs:mins:sec)
H022	47:41:00	15:07:58	T20, T22, Cushaling Wind Farm T04	12:19:46	2:48:12	N/A	N/A	≤30:00:00
H065	33:42:00	10:41:42	T20, T22, Cushaling Wind Farm T04	10:30:36	0:11:06	N/A	N/A	≤30:00:00
H1120	1187:22:00	376:49:26	T25, T39, T40, T41, T42, Cushaling Wind Farm T27, Cushaling Wind Farm T28, Cushaling Wind Farm T29	34:05:05	342:44:22	346:49:26	T25, T39, T40, T41, T42	≤30:00:00

Interference with Telecommunication Systems and EMF

The assessment above in Section 5.7.3.2.10 concludes that there will be no impact on telecommunication systems, or on health due to EMF, due to the operational phase of the Proposed Project. Therefore, it is considered there will be no cumulative effects on health from telecommunications should other proposed or consented plans and projects within the Human Health Study Area be operational in parallel with the Proposed Project.

5.7.6 Summary

Chapter 8: Land, Soils and Geology, Chapter 9: Water, Chapter 10: Air Quality, Chapter 11: Climate, Chapter 12: Noise and Vibration, Chapter 13: Landscape and Visual, Chapter 14: Cultural Heritage, Chapter 15: Material Assets (Traffic and Transport, Telecommunications) and Chapter 16: Aviation provide an assessment of the effects of the Proposed Project on these areas of consideration. Chapter 17: Major Accidents and Natural Disasters assess the vulnerability of the Proposed Project to and from major accidents and natural disasters. There is potential for positive effects to populations as a result of employment and investment in the locality. There is the potential for negative effects on human health during the Proposed Project construction phase related to potential emissions to air of dust, potential emissions to land and water of hydrocarbons, release of potentially silt-laden runoff into watercourses and noise emissions. The assessments in the chapters listed show that the residual effects are not significant, except for in the case of aviation with significant effects pertaining to low flying training activities only, and will not lead to significant effects on any environmental media with the potential to lead to health effects for humans. On this basis, the potential for negative health effects associated with the Proposed Project is slight. Furthermore, the Proposed Wind Farm is capable of offsetting carbon emissions associated with the burning of fossil fuels. During the operational stage the Proposed Wind Farm will have a positive, slight, long-term impact on tourism and a long term, significant positive effect on air quality and climate as set out in Chapter 10, Chapter 11 and Section 5.7.3.1.5 which will contribute to positive effects on population and human health and assist in Ireland reaching its emissions targets and renewable energy goals.