Environmental Impact Assessment Report (EIAR)

Proposed Cahermurphy West Wind Farm, Co. Clare

Chapter 5: Population and Human Health

DOCUMENT DETAILS

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5. POPULATION AND HUMAN HEALTH

5.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) identifies, describes and assesses the likely significant effects of the Proposed Project on population and human health and has been completed in accordance with the Environmental Impact Assessment (EIA) guidance and legislation set out in Ch. 1: Introduction. The full description of the Proposed Project is provided in Ch. 4: Description of the Proposed Project of this EIAR.

As detailed in Section 1.1.1 in Ch. 1: Introduction, for the purposes of this EIAR, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection' and 'the Site'.

One of the principal concerns during the development process is that human beings, as individuals or communities, should experience no significant diminution of their quality of life from the direct, indirect or cumulative effects arising from the construction, operation and decommissioning of a development. Ultimately, all the effects of a development impinge on human beings, 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, traffic and health and safety.

5.2 Statement of Authority

This section of the EIAR, has been prepared by Michéal Cahill and reviewed by Eoin McCarthy, both of MKO. Michéal Cahill is an Environmental Scientist with MKO. Michéal holds a first-class honours degree in Environmental Science at the University of Galway and was awarded the Professor Emer Colleran Medal for his academic achievements. Michéal has 2 years experience in environmental consulting and his key strengths and areas of expertise are in environmental impact assessment, the preparation and writing of environmental impact assessment reports, proficiency in geographic information systems, ecological assessment and risk assessment. As an environmental scientist within MKOs environmental renewables team, Michéal is involved in the preparation and revision of a variety of reports and EIAR chapters for a range of energy infrastructure projects.

Eoin McCarthy holds a BSc. (Env.) in Environmental Science and is a Project Director with over 14 years' experience in the consultancy sector. Eoin has produced and reviewed numerous Population and Human Health chapters for wind farm developments.

5.2.1 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of Ch. 5: Population and Human Health of the EIAR.

5.2.2 Relevant Guidelines and Data Sources

In addition to the guidelines referred to in Section 1.2.1 and Section 1.2.2 of Ch. 1: Introduction 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 and all best practice guidelines have been complied with. All online sources were last accessed as of February 2026:

- Department of Health – Health in Ireland: Key Trends 2022;

- Environmental Impact Assessment of National Road Schemes- A practical Guide, National Roads Authority/ Transport Infrastructure Ireland, Revision 1, November 2008;
- Fáilte Ireland EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects, July 2023.
- Health Impact Assessment Resource and Tool Compilation, United States Environmental Protection Agency 2016;
- Health Impact Assessment Guidance, Institute of Public Health Ireland. 2009;
- Framework for Human Health Risk Assessment to Inform Decision Making developed by the United States Environmental Protection Agency (US EPA) 2014;
- Institute for Environmental Management and Assessment (2017) Health In Environmental Impact Assessment: A Primer for a Proportionate Assessment;
- Institute for Environmental Management and Assessment (2022) Determining Significance for Human Health in Environmental Impact Assessment;
- Central Statistics Office (CSO): Census of Ireland 2016; Census of Ireland 2022; Census of Agriculture 2020;
- Clare County Development Plan 2023-2029;
- The World Health Organisation (WHO) Environmental Noise Guidelines for the European Region (WHO, 2022 Update) https://www.who.int/
- Best Practice Guidelines for the Irish Wind Energy Industry, IWEA, 2012

5.2.3 Scoping

Ch. 2: Background the Proposed Project of this EIAR describes the scoping and consultation exercise undertaken for the Proposed Project. The scoping replies that relate to population and human health are outlined below:

Health Service Executive

A response was received from the Health Service Executive (HSE) on the 13th of May 2024. The HSE stated that a visit to the Proposed Wind Farm site was undertaken by a Senior Environmental Health Officer (SEHO) on the 15th of April 2024 and requested that as a result of this visit, it is important that the following are specifically considered in the EIA:

- Any likely significant effect on Cahermurphy National school located to the south eastern boundary of the proposed site. This includes any likely significant impacts from noise and emissions to air at both the construction and operational phase. Also any likely significant impacts from construction traffic during the day and particularly at the start and end of the school day (Addressed in Ch. 15: Material Assets)
- The impact on the local roads during the construction phase. The roads are narrow country roads and the EIA should include a detailed traffic impact assessment that includes impacts on local road usage at different times of the day and different days of the week (Addressed in Ch. 15: Material Assets)
- Any likely significant effect on Doolough Lake through any hydrological connections and any likely significant effect on drinking water supplies. Doolough is the source of both West Clare New and Old Regional Rural water supplies. Both water treatment plants are operated by Uisce Eireann (Addressed in Ch. 9: Water)

The HSE further stated that the EIA 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.

These have been addressed comprehensively throughout all impact assessment chapters throughout the EIAR.

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the Environmental Health Service (EHS) 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.

The HSE advised that in addition to any likely significant negative impacts from the Proposed Project, any positive likely significant impacts should also be assessed.

The Environmental Health Service (EHS) recommends that the following matters are included and assessed in the EIAR:

- Public Consultation
- Decommissioning of the Proposed Wind Farm
- Siting and Location of turbines
- Noise & Vibration
- Shadow Flicker
- Air Quality
- Surface and Groundwater Quality
- Geological Impacts
- Ancillary facilities
- Cumulative Impacts

These recommended matters have been included and assessed in the EIAR, with matters relating to:

- Public Consultation: Discussed in Ch. 2: Background to the Proposed Project and Appendix 2-4 of this EIAR;
- Decommissioning: A decommissioning plan has been included for in Appendix 4-6 of this EIAR. The decommissioning phase has been comprehensively assessed in the impact assessment chapters of this EIAR;
- Siting and Location of Turbines: This detail has been included in Ch. 4: Description of the Proposed Project of this EIAR and within the Planning Drawings;
- Noise and Vibration: Addressed in Ch. 12: Noise and Vibration of the EIAR;
- Shadow Flicker: Addressed within Ch. 5: Population and Human Health and Appendix 5-5 of this EIAR;
- Air Quality: Addressed in Ch. 10: Air Quality of this EIAR;
- Surface and Water Quality: Addressed in Ch. 9: Water of this EIAR;
- Geological Impacts: Addressed in Ch. 8: Land, Soils and Geology and Appendices 4-3 and 8-1 of this EIAR;
- Ancillary Features: This detail has been included in Ch. 4: Description of the Proposed Project of this EIAR and within the Planning Drawings;
- Cumulative Impacts: Cumulative Impacts have been considered throughout each impact assessment chapter, inclusive of Ch. 5: Population and Human Health A cumulative list has been provided in Appendix 2-2 of this EIAR

Uisce Éireann

Uisce Éireann provided a response on the 18th of April 2024, stating they do not have the capacity to advise on the scoping of individual projects, however, it did outline measures for consideration in the scope of an Environmental Impact Assessment. This includes steps to avoid any adverse effects on

Drinking Water Source(s) during both the construction and operational phases of a development, as well as an assessment of potential impacts on nearby public water supply infrastructure.

It should be noted that the Proposed Project does not intend to connect into Uisce Eireann assets. Whilst not directly connecting into Uisce Eireann assets, the Proposed Grid Connection will cross under 35 no. water services. On the 20th of January 2026, Uisce Eireann issued a Confirmation of Feasibility of the Proposed Grid Connection stating that the development *"can be facilitated"* and:

> *"In the scenario site investigations determine a crossing may need to be above an Uisce Éireann asset instead, then this needs to be agreed in writing with Uisce Éireann in advance prior to the works taking place on the ground."*

The Applicant endeavours to adhere to the above conditions, should the Proposed Project be granted.

Recommendations proposed by Uisce Éireann have been accounted for in Ch. 9: Water and Ch. 15: Material Assets.

Fáilte Ireland

A scoping response was received from Fáilte Ireland on the 23rd of April 2024 and provided the 'EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects', to inform the preparation of the Environmental Impact Assessment for the Proposed Project. The report provides guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Report (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism (see Section 5.6 below). These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 1 and 3 of the guidance document. This guidance document considers some of the key requirements for an EIAR under the current guidance:

- Project description;
- Assessment of alternatives considered;
- Baseline assessment;
- Assessment of effects;
- Cumulative impacts
- Interaction of impacts;
- Mitigation & monitoring; and
- Residual impacts

A project description is provided in Section 4.1 of Ch. 4: Description of the Proposed Project, with an assessment of alternative to the Proposed Project being discussed in Ch. 3: Site Selection & Reasonable Alternatives. Furthermore, the following matters have been discussed across all impact assessment chapters of this EIAR:

- Baseline assessment;
- Assessment of effects;
- Cumulative impacts
- Interaction of impacts;
- Mitigation & monitoring; and
- Residual impacts

5.3 Assessment Methodology

5.3.1 Population

A desk-based assessment using sources and guidelines referenced above in Section 5.1.2 above was undertaken in July 2025 to examine relevant information pertaining to the population impact assessment. Information on population statistics, employment and social data from the Electoral Divisions (EDs) were obtained from the Central Statistics Office (CSO) for census years 2016 and 2022. Fáilte Ireland's EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects was also considered in the assessment. See section 5.3 below.

The study area chosen in order to assess the population of the Proposed Wind Farm site focuses on the three Electoral Divisions within the Proposed Wind Farm site, namely Cahermurphy, Mullagh and Creegh, the three ED's within the Proposed Wind Farm site. However, reference is also made to statistics on the county and national level.

5.3.2 Human Health

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

The World Health Organization (WHO) define health as:

> *"A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".*[1]

5.3.2.1 National Guidance

The EPA 2022 EIAR Guidelines advise 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:

- Ch. 8: Land Soil and Geology,
- Ch. 9: Water,
- Ch. 10: Air Quality,
- Ch. 11: Climate,
- Ch. 12: Noise and Vibration,
- Ch. 14: Landscape and Visual,
- Ch. 15: Material Assets (including Traffic and Transport)

As referenced on page 28 of the Department of Housing, Planning and Local Government (2018) *Guidelines for Planning Authorities and An Bord Pleanála*[2], (taken from the European Commission's Environmental Impact Assessment of Projects: Guidance on the Preparation of the Environmental Impact Assessment Report (2017)), 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*

[1] *World Health Organisation Constitution Available at: https://www.who.int/about/governance/constitution*
[2] *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018)*

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.'

The EIAR Guidance (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 EIAR Guidelines (EPA, 2022) state 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*'. The EIAR Guidelines (EPA, 2022) note 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'.

5.3.2.2 IEMA Guidance 2017

The Institute for Environmental Management and Assessment (IEMA) published 'Health In Environmental Impact Assessment: A Primer for a Proportionate Assessment' in 2017 examining what a proportionate assessment of the impacts on health should be in Environmental Impact Assessments. 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 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 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. Therefore, given that this human health assessment is part of the EIAR; there is no stand-alone HIA.

5.3.2.3 EIA significance Matrix for Human Health, IEMA Guidance 2022

The IEMA Working Group 2022 published *Determining Significance For Human Health In Environmental Impact Assessment* in response to gaps and inconsistencies across existing guidance documents as to how health is assessed in EIA, particularly with regard to significance. The aim of this report is to assist and streamline discussions for consultants producing the assessments and for the decision makers who are reviewing the assessments. The report states that an EIA must identify, describe and assess the direct and indirect significant effects in an appropriate manner of a Proposed Project on human health. It must include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects, taking into account current knowledge and methods of assessment.

A wind farm is not a recognised source of pollution. It is not an activity which requires Environmental Protection Agency 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. In this context, and aligned with the above noted IEMA 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 IEMA Guidance, which might be required for an assessment of effects on human health arising from a type of development with a potential for emissions-related human health effects.

5.3.3 Shadow Flicker

5.3.3.1 Background

Shadow Flicker is an effect that occurs when rotating wind turbine blades cast shadows over a window in 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 a window of an enclosed room, and therefore shadow flicker assessments are typically undertaken for the nearby adjacent properties around a proposed wind farm site.

The frequency of occurrence and the strength of any potential shadow flicker effect depends on several factors, each of which is 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 eights (okta) of the sky covered. Irish skies are completely covered by cloud (8 oktas) for over 50% of the time. The mean cloud amount for each hour is between five and six okta. 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 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. (*Source: Met Éireann, www.met.ie*)

1. ***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.

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

At distances of greater than approximately 500m 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 Guidelines iterates that at distances greater than ten rotor diameters from a turbine, the potential for shadow flicker is very low.

Figure 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.

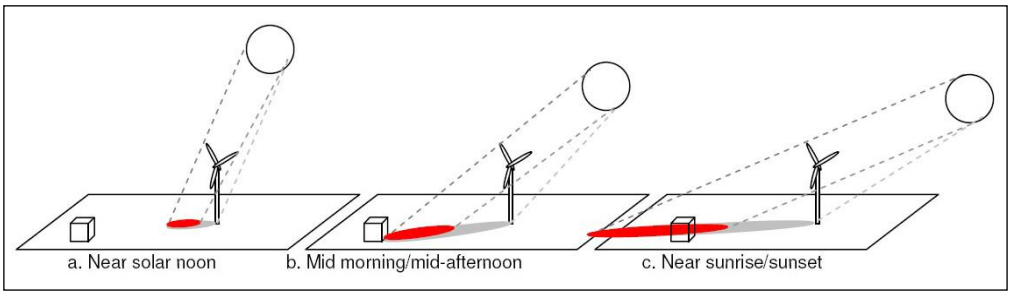


Figure 5-1 Shadow-Prone Area as Function of Time of Day (Source: Shadow Flicker Report, Helimax Energy, Dec 2008)

3. ***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 effect.

At a distance, the turbine blades do not cover the sun but only partly mask it, substantially weakening the shadow. This impact 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. (Source: Update of Shadow Flicker Evidence Base, UK Department of Energy and Climate Change, 2010).

4. ***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. It should be noted, that the below assessment considers a the turbine dimensions which are likely to give rise to the greatest duration of shadow flicker at the highest number of sensitive receptors, as detailed in Section 5.7.4.3 below, however, two other scenarios have similarly been ran to simulate the turbine ranges which would have the least shadow flicker impact, as well as the median impact.

5. ***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. In order 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 Figure 5-2 below.

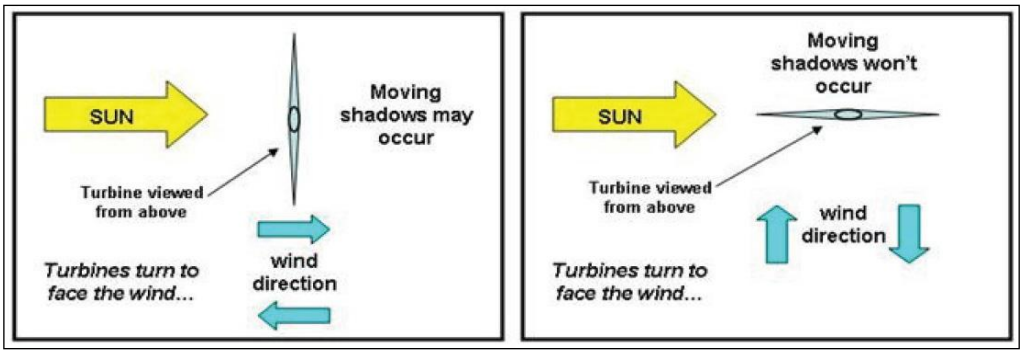


Figure 5-2 Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environment Power LLC)

6. ***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 produces a net power output, and they 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, then no shadow flicker will occur.

5.3.3.2 Guidance

The current adopted guidance for shadow flicker in Ireland is derived from the 2006 Guidelines and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012). The 2006 Guidelines 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 1.63 km based on a maximum of the proposed range of the rotor diameter being 163 metres).

The Guidelines recommend that shadow flicker at neighbouring offices and dwellings within 500 metres of a proposed turbine location should not exceed a total of 30 hours per year or 30 minutes per day.

The Guidelines 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 is 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 Guidelines 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 ten rotor diameters of the proposed turbines (as per Best Practice Guidelines for the Irish Wind Energy Industry, IWEA, 2012).

The 2006 Guidelines are currently under review. The DoHPLG released the draft Guidelines which were released for public consultation in December 2019. The consultation period closed February 2020; however, no update or final guidelines was released. The draft Guidelines recommend local planning authorities and/or the Commission 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 draft Guidelines are based on the recommendations set out in the 'Proposed Revisions to Wind Energy Development Guidelines 2006 – Targeted Review' (December 2013) and the 'Review of the Wind Energy Development Guidelines 2006 – Preferred Draft Approach' (June 2017).

The Climate Action Plan 2024 published in December 2023 stated that final guidelines will be adopted in 2024, however, these have not yet been published and no timeframe has been provided on a new publication date in the Climate Action Plan 2025. It should be noted that in the 'Programme for Government - Securing Ireland's Future (January 2025)', it states at p.53 that: *"This Government will:... Prioritise the publication of Wind Energy Development guidelines, having regard to international best practice and standards."*. The shadow flicker methodology and assessment within this chapter are based on compliance with the Guidelines, which remain to be the current adopted guidelines. However, it should be noted that the assessment of shadow flicker completed also complies with the requirements of the draft 2019 Guidelines (i.e. zero shadow flicker occurrences, should they be adopted as currently proposed, while the planning application is being determined through the strict implementation of a shadow flicker shutdown system as described in Section 5.11.3.2.7.

5.3.3.3 Shadow Flicker Prediction Methodology

Shadow Flicker occurs only under certain, combined circumstances, as detailed above. Where shadow flicker does occur, it is generally short-lived. The Guidelines 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 in the design of the Proposed Wind Farm. Proper siting of wind turbines is key in eliminating the impact of shadow flicker.

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) or 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.

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 when it might occur. 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 has been used to predict the level of shadow flicker associated with the proposed wind farm development. WindPRO 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.

5.3.3.4 Shadow Flicker Assessment Criteria

The proposed wind turbines to be installed on the Site will have a ground-to-blade tip height, hub height and blade length in the following dimension ranges:

- Tip Height: 180m-185m
- Hub Height: 98.5m-105m
- Rotor Diameter: 149m-163m

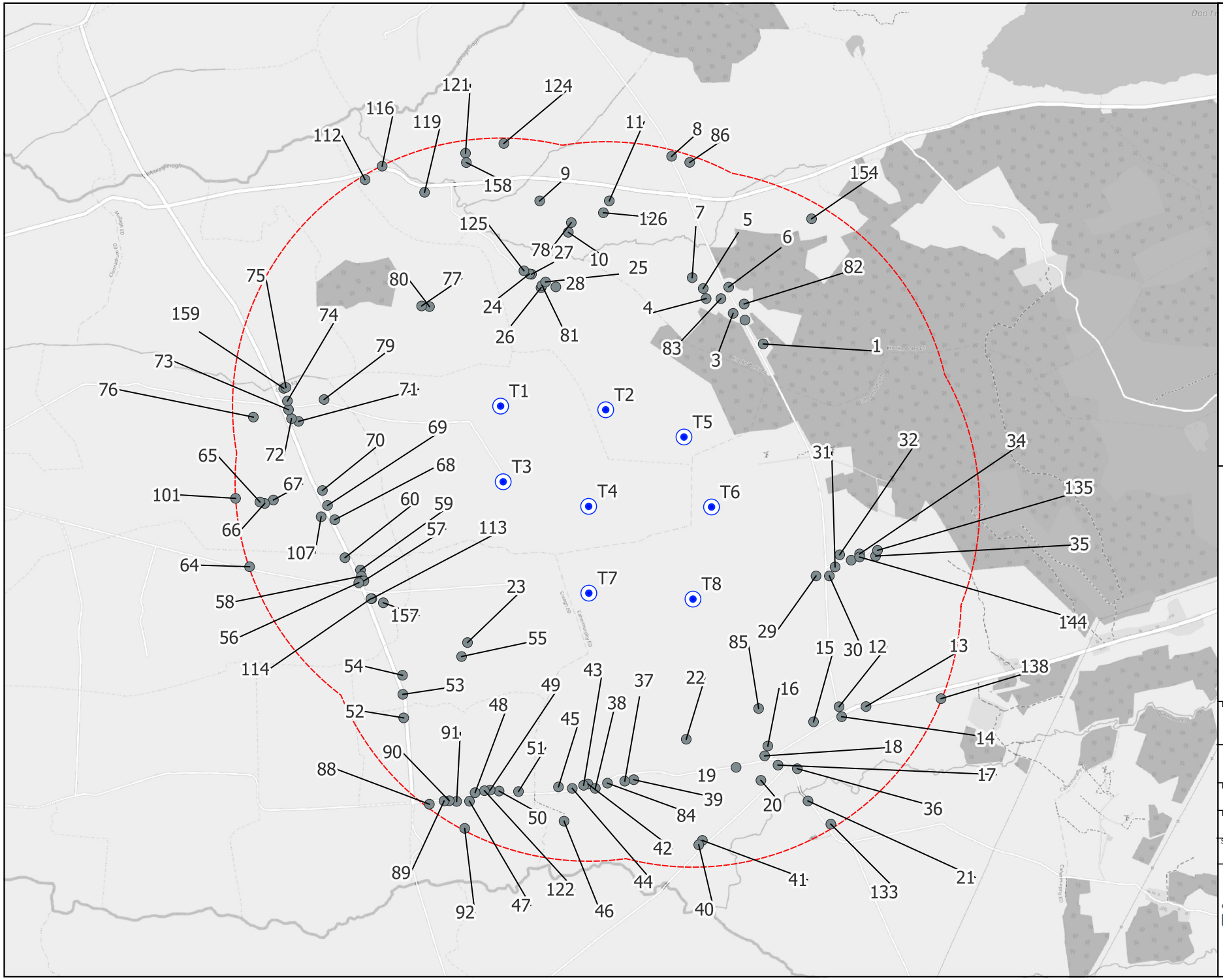
With the benefit of the mitigation measures outlined in Section 5.11.3.2.7, any turbine to be installed onsite will be able to comply with the draft Guidelines requirements (i.e. zero shadow flicker) through the use of turbine control software.

5.3.3.5 Shadow Flicker Study Area

At the outset of the Proposed Project, during the constraints mapping process detailed in Ch. 3: Site Selection & Reasonable Alternatives of this EIAR, all sensitive receptors within c. 1.63km of the area suitable for siting wind turbines within the EIAR Site Boundary were identified and mapped. This included all occupied and unoccupied dwellings, businesses, stud farms and schools. 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.

The Shadow Flicker Study Area for the shadow flicker assessment is ten times rotor diameter (149m - 163m rotor diameter x 10 = 1.49km - 1.63km) in accordance with the Guidelines. The Guidelines note 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 1.63km from the proposed turbines. All inhabitable dwellings (existing, proposed and permitted) and other sensitive receptors (inclusive of schools, businesses and stud farms) within 1.63km of the proposed turbines have been considered as part of the following shadow flicker assessment. There are 108 no. sensitive receptors located within 1.63km of proposed turbine locations.

The Shadow Flicker Study Area is shown in Figure 5-3.


Map Legend
Shadow Flicker Study Area (1.63km)
Sensitive Receptors
Proposed Turbine Location
T1
T2
T3
T4
T5
T6
T7
T8
Microsoft product screen shots reprinted with permission from Microsoft Corporation
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Drawing Title
Shadow Flicker Study Area
Project Title
Cahermurphy West Wind Farm
Drawn By
MC
Checked By
EMC
Project No.
230843
Drawing No.
Figure 5-3
Scale
1:30,000
Date
08.01.2026
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email:info@mkoireland.ie
Website: ww.mkoireland.ie

5.3.3.5.1 Assumptions and Limitations

A precautionary approach has been taken in relation to the orientation of each individual property in relation to the location of the proposed wind turbines through the use of a feature called 'greenhouse mode' within the WindPRO software. This feature assumes shadows can be seen from 360 degrees at a property as opposed to only through windows facing the wind turbines.

No screening due to trees or other buildings or vegetation is assumed. 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 5.11.3.2.7.

Due to the latitude of Ireland, shadow flicker impacts are only possible at an angle of 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[3]. As such properties located outside of this potential shadow flicker zone (50 degrees either side of south) will not be impacted. However, in taking a precautionary approach for this assessment, all 108 no. properties within 360 degrees of the proposed turbine locations out to 1.63km were assessed for shadow flicker impact.

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, referred to as the 'worst-case impact', 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.

[3] *House of Commons ODPM Annual Report and Accounts 2004: Housing, Planning, Local Government and the Regions Committee; Planning Policy Statement 22*
Department of Housing, Planning and Local Government Dec 2019 Draft Revised Wind Energy Development Guidelines. Rialtas Na hÉireann. Available at: https://www.gov.ie/en/publication/9d0f66-draft-revised-wind-energy-development-guidelines-december-2019/

5.4 Shadow Flicker Assessment Results

5.4.1 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, and
- That the turbine rotors are moving.

The maximum shadow flicker model assumes that daylight hours consist of 100% sunshine. This is a conservative assumption which represents a worst-case scenario. Following the detail provided above on sunshine hours, a sunshine factor of 30.56% 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 5-1.

The predicted maximum daily and annual shadow flicker levels are then considered in the context of the Guidelines 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 Guidelines recommend that shadow flicker at dwellings within 500 metres of a proposed turbine location should not exceed a total of 30 minutes per day or 30 hours per year. As detailed in Section 5.5.1 there are no sensitive receptors less than 500 metres of the proposed turbine locations.

The predicted shadow flicker levels have been modelled for all 108 no. sensitive receptors located within the Shadow Flicker Study Area. The results of which are presented in Table 5-1 below and receptors shown on Figure 5-3.

Table 5-1: Conservative Daily and Annual Shadow Flicker Calculations

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
1	509369	670139	Dwelling	744	T5	01:15:00	114:54:00	35:06:30	T2, T4 and T5	Yes
2	509258	670284	Dwelling	802	T5	01:18:00	97:41:00	29:50:52	T1, T2, T4 and T5	Yes
3	509186	670325	Dwelling	809	T5	01:09:00	85:10:00	26:01:23	T1, T2, T4 and T5	Yes
4	509022	670415	Dwelling	852	T5	01:04:00	78:25:00	23:57:38	T1, T2 and T5	Yes
5	509004	670476	Dwelling	911	T5	00:43:00	59:04:00	18:02:53	T1 and T2	Yes
6	509159	670485	Dwelling	951	T5	00:38:00	54:44:00	16:43:27	T1, T2 and T5	Yes
7	508937	670542	Dwelling	960	T2	00:42:00	47:03:00	14:22:35	T1 and T2	Yes
8	508812	671280	Dwelling	1593	T2	00:00:00	00:00	0:00:00	N/A	No
9	508010	671009	Dwelling	1270	T1	00:00:00	00:00	0:00:00	N/A	No
*10	508184	670818	Dwelling	1103	T2	00:22:00	09:51	3:00:35	T5	No
11	508433	671009	Dwelling	1271	T2	00:00:00	00:00	0:00:00	N/A	No
*12	509830	667933	Dwelling	1103	T8	00:26:00	15:08	4:37:27	T8	No
13	509994	667934	Dwelling	1238	T8	00:33:00	32:24:00	9:54:00	T8	Yes
14	509846	667872	Dwelling	1153	T8	00:14:00	05:13	1:35:38	T8	No
*15	509675	667841	Dwelling	1047	T8	00:25:00	22:31	6:52:48	T7	No
16	509397	667694	Dwelling	1003	T8	00:00:00	00:00	0:00:00	N/A	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
17	509459	667578	Dwelling	1134	T8	00:00:00	00:00	0:00:00	N/A	No
18	509378	667634	Dwelling	1049	T8	00:00:00	00:00	0:00:00	N/A	No
19	509204	667564	Dwelling	1057	T8	00:00:00	00:00	0:00:00	N/A	No
20	509355	667485	Dwelling	1178	T8	00:00:00	00:00	0:00:00	N/A	No
21	509641	667360	Dwelling	1413	T8	00:00:00	00:00	0:00:00	N/A	No
*22	508901	667735	Dwelling	854	T8	00:00:00	00:00	0:00:00	N/A	No
*23	507571	668323	Dwelling	797	T7	00:50:00	87:07:00	26:37:08	T7 and T8	Yes
*24	507948	670565	Dwelling	823	T1	01:01:00	66:18:00	20:15:30	T1, T2 and T5	Yes
25	508046	670516	Dwelling	804	T1	01:39:00	91:31:00	27:57:48	T1, T2 and T5	Yes
26	508018	670481	Dwelling	761	T1	01:34:00	99:00:00	30:15:00	T1, T2 and T5	Yes
*27	507960	670563	Dwelling	824	T1	01:02:00	68:48:00	21:01:20	T1, T2 and T5	Yes
*28	508108	670486	Derelict	800	T1	01:54:00	107:18:00	32:47:10	T1, T2 and T5	Yes
*29	509690	668728	Dwelling	761	T6	01:01:00	89:52:00	27:27:33	T2, T4, T6, T7 and T8	Yes
*30	509771	668728	Dwelling	830	T6	00:53:00	92:33:00	28:16:45	T4, T6, T7 and T8	Yes
*31	509806	668783	Dwelling	835	T6	00:49:00	97:03:00	29:39:15	T4, T6, T7 and T8	Yes

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
32	509834	668857	Dwelling	832	T6	00:47:00	84:21:00	25:46:25	T4, T5, T6, T7 and T8	Yes
*33	509904	668824	Dwelling	909	T6	00:43:00	72:06:00	22:01:50	T4, T5, T6, T7 and T8	Yes
34	509955	668862	Dwelling	945	T6	00:40:00	64:45:00	19:47:05	T5, T6, T8	Yes
35	510052	668849	Dwelling	1041	T6	00:36:00	57:15:00	17:29:35	T5, T6, T8	Yes
36	509576	667556	Dwelling	1211	T8	00:00:00	00:00	0:00:00	N/A	No
37	508527	667480	Dwelling	1164	T7	00:00:00	00:00	0:00:00	N/A	No
38	508348	667436	Dwelling	1188	T7	00:00:00	00:00	0:00:00	N/A	No
39	508582	667489	Dwelling	1155	T8	00:00:00	00:00	0:00:00	N/A	No
40	508977	667093	Dwelling	1495	T8	00:00:00	00:00	0:00:00	N/A	No
41	508999	667120	Dwelling	1468	T8	00:00:00	00:00	0:00:00	N/A	No
42	508303	667463	Dwelling	1161	T7	00:00:00	00:00	0:00:00	N/A	No
43	508277	667455	Dwelling	1169	T7	00:00:00	00:00	0:00:00	N/A	No
44	508208	667436	Dwelling	1192	T7	00:00:00	00:00	0:00:00	N/A	No
45	508124	667445	Dwelling	1193	T7	00:00:00	00:00	0:00:00	N/A	No
46	508158	667237	Dwelling	1395	T7	00:00:00	00:00	0:00:00	N/A	No
47	507583	667358	Dwelling	1459	T7	00:00:00	00:00	0:00:00	N/A	No
48	507617	667410	Dwelling	1396	T7	00:00:00	00:00	0:00:00	N/A	No
49	507709	667426	Dwelling	1339	T7	00:00:00	00:00	0:00:00	N/A	No
50	507763	667420	Dwelling	1321	T7	00:00:00	00:00	0:00:00	N/A	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
51	507881	667417	Dwelling	1280	T7	00:00:00	00:00	0:00:00	N/A	No
52	507183	667865	Dwelling	1358	T7	00:23:00	12:28	3:48:33	T7	No
53	507178	668008	Dwelling	1288	T7	00:32:00	33:59:00	10:23:02	T7	Yes
54	507176	668124	Dwelling	1238	T7	00:33:00	37:04:00	11:19:33	T7	Yes
*55	507535	668238	Dwelling	864	T7	00:47:00	68:27:00	20:54:55	T7 and T8	Yes
56	506910	668687	Dwelling	1071	T3	00:27:00	34:35:00	10:34:02	T3, T4 and T7	No
57	506941	668698	Dwelling	1040	T3	00:27:00	33:50:00	10:20:17	T3, T4 and T7	No
58	506926	668727	Dwelling	1036	T3	00:31:00	42:20:00	12:56:07	T3, T4 and T7	Yes
59	506920	668764	Dwelling	1020	T3	00:38:00	52:52:00	16:09:13	T3, T4 and T7	Yes
60	506826	668839	Dwelling	1067	T3	00:38:00	66:40:00	20:22:13	T3, T4 and T7	Yes
64	506246	668784	Dwelling	1627	T3	00:24:00	10:56	3:20:27	T3	No
65	506309	669178	Dwelling	1484	T3	00:26:00	19:44	6:01:47	T1 and T3	No
66	506338	669169	Dwelling	1456	T3	00:26:00	21:00	6:25:00	T1 and T3	No
67	506391	669190	Dwelling	1402	T3	00:27:00	23:22	7:08:23	T1 and T3	No
68	506764	669070	Dwelling	1050	T3	00:37:00	53:03:00	16:12:35	T1, T3, T4 and T7	Yes
69	506720	669157	Dwelling	1078	T3	00:35:00	60:25:00	18:27:38	T1, T3 and T4	Yes

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
70	506689	669248	Dwelling	1101	T3	00:34:00	58:18:00	17:48:50	T1, T3 and T4	Yes
71	506544	669668	Dwelling	1232	T1	00:30:00	27:41:00	8:27:32	T1 and T3	No
72	506501	669685	Dwelling	1274	T1	00:30:00	25:33:00	7:48:25	T1 and T3	No
73	506483	669739	Dwelling	1289	T1	00:29:00	24:38:00	7:31:37	T1 and T3	No
74	506476	669792	Dwelling	1297	T1	00:29:00	23:54	7:18:10	T1 and T3	No
75	506467	669875	Dwelling	1310	T1	00:29:00	23:11	7:05:02	T1 and T3	No
76	506269	669694	Dwelling	1505	T1	00:25:00	17:37	5:22:58	T1 and T3	No
77	507292	670370	Vacant	776	T1	01:07:00	98:14:00	30:00:57	T1, T2, T3 and T4	Yes
*78	508202	670877	Dwelling	1158	T2	00:12:00	02:40	0:48:53	T5	No
79	506699	669801	Dwelling	1074	T1	00:35:00	36:04:00	11:01:13	T1 and T3	Yes
80	507340	670366	Vacant	744	T1	01:10:00	100:00:00	30:33:20	T1, T2, T3 and T4	Yes
81	508024	670495	Dwelling	776	T1	01:34:00	95:52:00	29:17:33	T1, T2 and T5	Yes
82	509253	670382	Dwelling	888	T5	01:01:00	69:56:00	21:22:07	T1, T2, T4 and T5	Yes
83	509112	670415	Dwelling	872	T5	00:48:00	70:03:00	21:24:15	T1, T2 and T5	Yes
84	508422	667468	Dwelling	1161	T7	00:00:00	00:00	0:00:00	N/A	No
*85	509341	667922	Dwelling	776	T8	00:32:00	23:25	7:09:18	T7	Yes

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
86	508922	671243	Dwelling	1589	T2	00:00:00	00:00	0:00:00	N/A	No
88	507339	667340	Dwelling	1608	T7	00:00:00	00:00	0:00:00	N/A	No
89	507429	667360	Dwelling	1540	T7	00:00:00	00:00	0:00:00	N/A	No
90	507460	667361	Dwelling	1521	T7	00:00:00	00:00	0:00:00	N/A	No
91	507505	667357	Dwelling	1500	T7	00:00:00	00:00	0:00:00	N/A	No
92	507554	667193	Dwelling	1617	T7	00:00:00	00:00	0:00:00	N/A	No
101	506161	669200	Vacant	1631	T3	00:23:00	07:45	2:22:05	T3	No
107	506681	669088	Dwelling	1128	T3	00:34:00	51:01:00	15:35:18	T1, T3 and T4	Yes
112	506948	671138	Dwelling	1605	T1	00:00:00	00:00	0:00:00	N/A	No
113	506989	668590	Derelict	1069	T3	00:29:00	30:34:00	9:20:23	T4 and T7	No
114	506984	668590	Derelict	1073	T3	00:29:00	30:12:00	9:13:40	T4 and T7	No
116	507052	671220	Dwelling	1627	T1	00:00:00	00:00	0:00:00	N/A	No
119	507310	671061	Dwelling	1380	T1	00:00:00	00:00	0:00:00	N/A	No
121	507559	671299	Dwelling	1553	T1	00:00:00	00:00	0:00:00	N/A	No
122	507674	667422	Dwelling	1359	T7	00:00:00	00:00	0:00:00	N/A	No
124	507792	671358	Dwelling	1598	T1	00:00:00	00:00	0:00:00	N/A	No
125	507914	670584	Dwelling	836	T1	00:59:00	61:23:00	18:45:22	T2 and T5	Yes
126	508397	670937	Dwelling	1199	T2	00:00:00	00:00	0:00:00	N/A	No
133	509780	667219	Dwelling	1604	T8	00:00:00	00:00	0:00:00	N/A	No

House ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Proposed Turbine No.	Max. Daily Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation (hrs:min:sec)	Max. Annual Shadow Flicker: Pre-Mitigation Adjusted for Average Regional Sunshine (hrs:min:sec)	Proposed Turbine(s) Giving Rise to Daily Shadow Flicker	Mitigation Strategy Required (Daily and Annual)
135	510064	668884	Dwelling	1043	T6	00:35:00	53:37:00	16:22:58	T5, T6 and T8	Yes
138	510450	667982	Dwelling	1625	T8	00:23:00	08:51	2:42:15	T8	No
144	509955	668843	Vacant	951	T6	00:40:00	62:41:00	19:09:12	T5, T6 and T8	Yes
154	509663	670900	Dwelling	1537	T5	00:00:00	00:00	0:00:00	N/A	No
157	507059	668565	Dwelling	1036	T3	00:31:00	39:16:00	11:59:53	T4 and T7	Yes
158	507564	671242	Dwelling	1496	T1	00:00:00	00:00	0:00:00	N/A	No
159	506454	669869	Dwelling	1323	T1	00:29:00	22:39	6:55:15	T1 and T3	No

**involved landowner*

The predicted shadow flicker results indicate:

- 43 sensitive receptors are theoretically predicted to experience zero shadow flicker;
- 65 sensitive receptors are theoretically predicted to experience some shadow flicker;
    - Of the 65 sensitive receptors, 42 sensitive receptors are theoretically predicted to experience shadow flicker that exceeds the Guideline thresholds for daily and/or annual shadow flicker. Please see Table 5-1 above for details.
- The annual threshold of over 30 hours for shadow flicker (Guidelines) is predicted to be exceeded at 5 sensitive receptors once the regional sunshine average factor of 30.56% has been considered.

It is worth noting that the predicted exceedances of shadow flicker listed in Table 5-1 is 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 onto the wind turbines.
- *"At distances, greater than 500-1000m 'the rotor blade of a wind turbine will not appear to be chopping the light but the turbine will be regarded as an object with the sun behind it. Therefore, it is generally not necessary to consider shadow casting at such distances"* (Danish Wind Industry Association, accessed 2010).

Section 5.11.3.2.7 below details the mitigation measures which will be employed at the potentially affected properties to ensure that the draft Guidelines requirements (i.e. zero shadow flicker occurrences, should they be adopted as currently proposed, while the planning application is being determined) are complied with at any sensitive receptor within the Shadow Flicker Study Area.

5.4.2 Cumulative Shadow Flicker

Three separate existing wind farms lie within 5km of the nearest turbine of the Proposed Wind Farm site. The existing Cahermurphy Wind Farm contains 3 no. existing turbines which have a rotor diameter of 100m, and a fourth turbine which has a rotor diameter of 115.7m. Furthermore, 2 no. existing wind turbines at Kiltumper Wind Farm have a 71 metre rotor diameter, 1 no. existing wind turbine in Glenmore has a rotor diameter of 103m, this is the only turbine from the Glenmore wind farm which is located within 5km of the Proposed Cahermurphy West turbines. The cumulative shadow flicker study area is 10 times the rotor diameter, and as such, only the existing Cahermurphy wind turbines lie within the shadow flicker study area.

Of the 108 no. properties within the Shadow Flicker Study Are of the Proposed Wind Farm, 6 no. sensitive receptors have the potential to experience cumulative shadow flicker impacts when the Proposed Wind Farm is assessed alongside the existing Cahermurphy Wind Farm (See Table 5-2 and 5-3 below for further details. Figure 5-4 below showcases the zone of potential for cumulative shadow flicker impacts between the Proposed Wind Farm and the existing Cahermurphy Wind Farm.

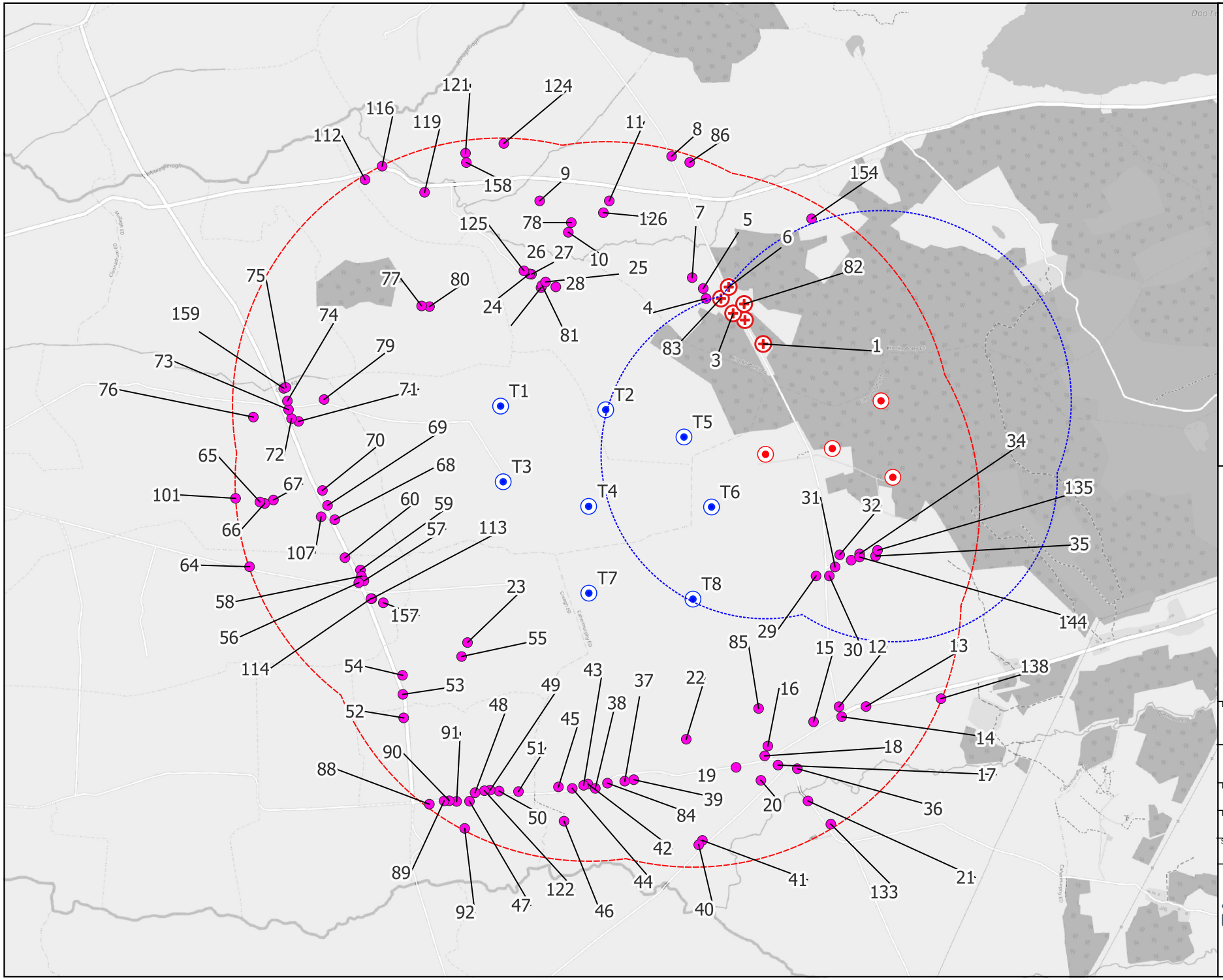
Section 5.11.3.2.7 below details the mitigation measures which will be employed at the potentially affected properties to ensure that the draft Guidelines requirements (i.e. zero shadow flicker occurrences, should they be adopted as currently proposed, while the planning application is being determined) are complied with at any sensitive receptor within the cumulative Shadow Flicker Study Area.

Table 5-2: Potential Cumulative Shadow Flicker Impact from the Proposed Cahermurphy West WF and the Existing Cahermurphy WF

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
1	509369	670139	T5	743.5435697	01:45	170:14:00	52:00:57	T2, T4, T5, Cahermurphy T2, Cahermurphy T3	Yes
2	509258	670284	T5	802.0385255	01:44	136:03:00	41:34:15	T1,T2, T4, T5, Cahermurphy T2, Cahermurphy T3	Yes
3	509186	670325	T5	809.2813117	01:09	97:45:00	29:52:05	T1,T2, T4, T5, Cahermurphy T3	Yes
6	509159	670485	T5	951.1630311	00:45	66:28:00	20:18:33	T1,T2, T5, Cahermurphy T3	Yes
82	509253	670382	T5	887.7945243	01:01	84:23:00	25:47:02	T1,T2, T4, T5, Cahermurphy T3	Yes
83	509112	670415	T5	871.6269325	00:48	80:52:00	24:42:33	T1,T2, T5, Cahermurphy T3	Yes

Table 5-3: Potential Cumulative Shadow Flicker Impact from the Proposed Cahermurphy West WF and Existing Cahermurphy WF

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 and Existing Cahermurphy Wind Farm	No. of Days 30min/day Threshold is Exceeded by Proposed Project (Turbines 1-8)	No. of Days 30min/day Threshold is Exceeded by Existing Cahermurphy Wind Farm (Cahermurphy 1 T1–T4)	No. of Days where any levels of Shadow Flicker produced by the Proposed Wind Farm overlaps with that of Cahermurphy 1 Wind Farm	Mitigation Required for Proposed Wind Farm
1	01:45:00	T2, T4, T5, Cahermurphy T2, Cahermurphy T3	135	117	73	113	Yes
2	01:44:00	T1,T2, T4, T5, Cahermurphy T2, Cahermurphy T3	107	88	0	101	Yes
3	01:09:00	T1,T2, T4, T5, Cahermurphy T3	117	91	0	36	Yes
6	00:45:00	T1,T2, T5, Cahermurphy T3	88	63	0	36	Yes
82	01:01:00	T1,T2, T4, T5, Cahermurphy T3	79	68	0	41	Yes
83	00:48:00	T1,T2, T5, Cahermurphy T3	113	86	0	35	yes


Map Legend
Sensitive Receptors
Proposed Turbine Location
Existing Cahermurphy Wind Farm Turbines
Shadow Flicker Study Area (1.63km)
Existing Cahermurphy WF Shadow Flicker Study Area (1km - 1.157km)
Sensitive Receptors theoretically predicted to experience cumulative shadow flicker impacts
T1
T2
T3
T4
T5
T6
T7
T8
N
Microsoft product screen shots reprinted with permission from Microsoft Corporation
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Drawing Title
Cumulative Shadow Flicker Study Area
Project Title
Cahermurphy West Wind Farm
Drawn By
MC
Checked By
EMC
Project No.
230843
Drawing No.
Figure 5-3
Scale
1:30,000
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5.5 Population

5.5.1 Receiving Environment

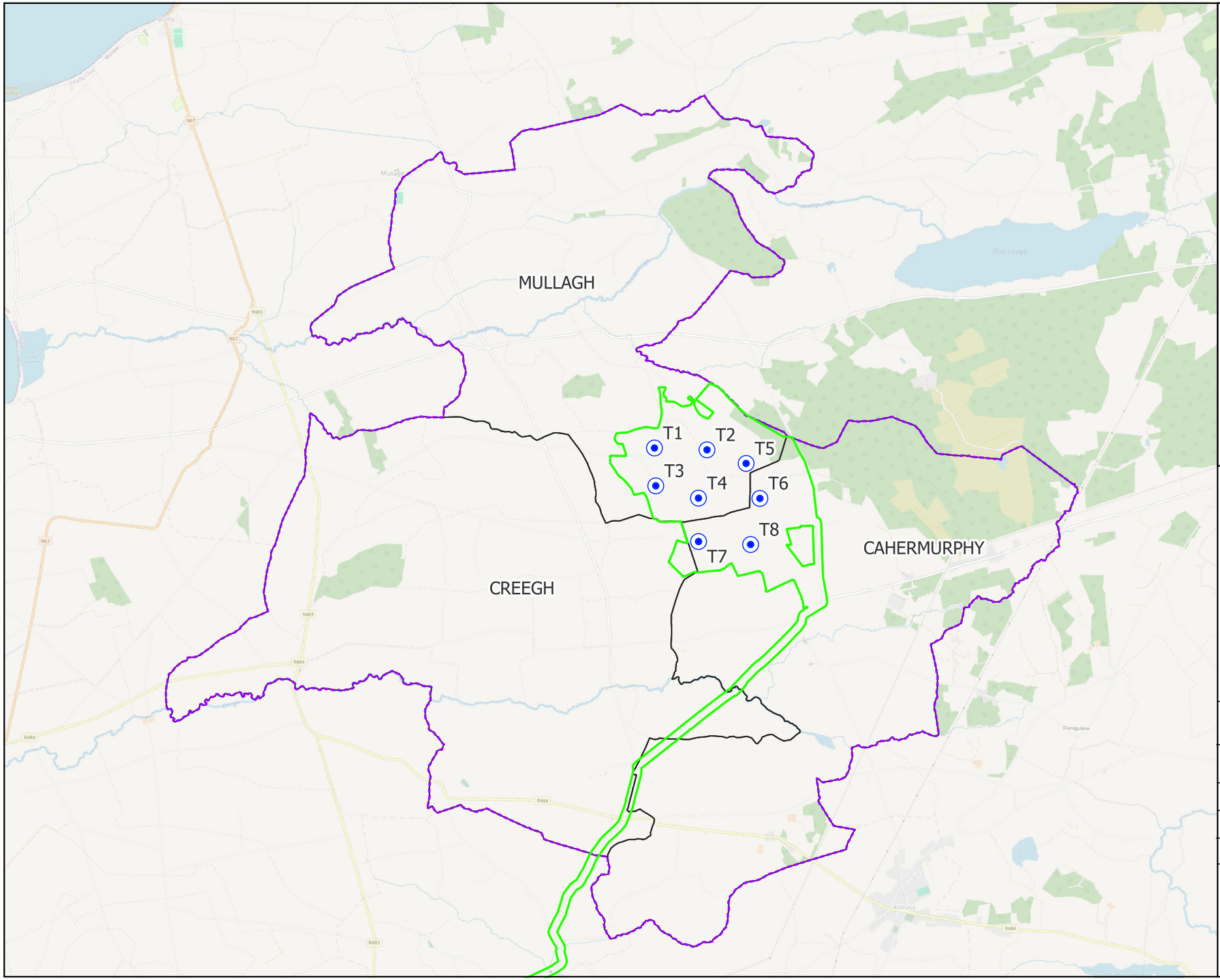
The socio-economic study of the receiving environment included an examination of the population and employment characteristics of the area. The relevant methodology pertaining to the population and human health assessment relates to the assessment of desk-based data sourced from the following locations. Information regarding population and general socio-economic data were sourced from the Central Statistics Office (CSO), the Clare County Development Plan 2023-2029 and Fáilte Ireland. The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2022, which is the most recent census for which a complete dataset is available. The Census of Ireland 2016, the Census of Agriculture 2010 and the CSO website (www.cso.ie) were similarly consulted. Census information is divided into State, Provincial, County, Major Town and Electoral Division (ED) level.

The Proposed Wind Farm site is located within a rural setting in southwest county Clare, c. 24.5km southwest of Ennis. The village of Kilmihil is located approximately 4.3km southeast of the Site. Similarly, the village of Creegh is located 4.7km southeast of the nearest proposed turbine. Please refer to Figure 1.1 of Ch. 1: Introduction for the Site Location map. The Proposed Wind Farm falls within the townlands listed in Table 1-1 of Ch. 1: Introduction. The site's land use primarily constitutes of a mix of agricultural pasture and commercial forestry. The surrounding landscape similarly consists of predominantly agricultural pasture and private forestry, as well as residential and commercial properties which are present alongside the regional and local roads. The site access point is located to the east of the site and can be accessed via the L-6524 local road. The Proposed Grid Connection is located within rural south County Clare and runs predominantly within the public road corridor for approx. 25km to the Moneypoint ESB 110kV substation located in the townland of Carrowdotia South. The surrounding landscape consists of predominantly agricultural pasture and private forestry, as well as residential and commercial properties which are present alongside the regional and local roads.

In order to assess the population in the vicinity of the Proposed Wind Farm site, the 'Population Study Area' for the population section of this EIAR was defined in terms of Electoral Divisions (EDs). The Proposed Wind Farm site lies within three (3) No. EDs: Cahermurphy, Mullagh and Creegh as shown in Figure 5-4. These EDs will collectively be referred to hereafter as the 'Population Study Area' for this chapter. The Population Study Area has a population of 852 persons as of 2022, with the population of each electoral division as follows:

- Cahermurphy (225 persons)
- Mullagh (194 persons)
- Creegh (433 persons)

The total land area of the Population Study Area is 54.88km^2 and compromises of Creegh (20.40km^2), Cahermurphy (17.66km^2) and Mullagh (16.82km^2). There are 29 sensitive receptors within 1km of the proposed turbine locations. The closest inhabited sensitive receptor is located over 752 metres from the nearest proposed turbine (T5), i.e. over the minimum recommended setback distance for properties involved in the Proposed Project (740m).



Map Legend

- Population Study Area
- Electoral Divisions
- EIAR Site Boundary
- Proposed Turbine Locations

Drawing Title
Population Study Area

Project Title
Cahermurphy West Wind Farm

Drawn By	Checked By
MC	EMC
Project No.	Drawing No.
230843	Figure 5-5
Scale	Date
1:60,000	11.02.2026

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5.5.2 Population Trends

The Census (2022) shows that the population of Clare grew by 7.68% (9,121) to 127,938 since the 2016 Census. Over the same period, Ireland's population grew by 8% from 4,761,865 to 5,149,139. Population statistics for the State, County Clare and the Population Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 5-4 below.

Table 5-4 Population 2016 – 2022 (Source: CSO)

Area	Population		% Population Change
	2016	2022	2016– 2022
State	4,761,865	5,149,139	+8.13%
County Clare	118,817	127,938	+7.68%
Population Study Area	821	852	+3.78%

The data presented above shows that the population of the Population Study Area increased by 3.78% between 2016 and 2022. This rate of population growth is considerably lower than that recorded at a national and County level. Population trends between the Population Study Area EDs varied greatly, with the largest population growth (11.94%) recorded in Cahermurphy, and the lowest being Mullagh (0.52%). Furthermore, the population of Creegh grew by 1.40%. Of the EDs that make up the Population Study Area, the highest population was recorded in Creegh, with 433 persons as of the 2022 Census, with the lowest population of 194 persons being recorded in Mullagh.

5.5.3 Population Density

The population densities recorded within the State, County Clare and the Population Study Area during the 2016 and 2022 Censuses are shown in Table 5-5 below.

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

Area	Population Density (Persons per square kilometre)	
	2016	2022
State	68.06	71.47
County Clare	34.44	37.08
Population Study Area	14.96	15.53

The population density of the Population Study Area recorded during the 2022 Census is 15.53 persons per km^2,which is considerably lower than the national population densities of 71.47 persons per km^2 and lower than the population density of County Clare, recorded at 37.08 persons per $km,^2$ respectively. Similarly to observed population trends, the population density across the Population Study Area varied by Electoral Division with Creegh containing the highest population density of 21.23 persons per square kilometre, and Mullagh having the lowest population density of 11.53 persons per kilometre squared. Cahermurphy contained relatively similar population densities of 12.74 persons per kilometre squared respectively.

5.5.4 Household Statistics

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

Table 5-6 Number of Households and Average Household Size 2016 – 2022 (Source: CSO)

Area	2016		2022	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
State	1,697,665	2.8	1,841,152	2.74
County Clare	55,779	2.69	46,553	2.67
Population Study Area	322	2.60	340	2.47

Table 5-6 showcases that while both the State, County and EDs increased in terms of no. of households, the average number of people per household dropped slightly. Average household size within the Population Study Area is considerably lower than the national and county level. The household average varies within the Population Study Area, with Mullagh recording the lowest average household size (2.25 persons) and the highest average household size of 2.63 being recorded in Creegh.

5.5.5 Age Structure

Tables 5-7 presents the population percentages of the State, County Clare and Population Study Area within different age groups as defined by the Central Statistics Office during the 2022 Census. This data is similarly displayed in Figure 5-7.

Table 5-7 Population per Age Category in 2022 (Source: CSO)

Area	Age Category				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	19.66%	12.52%	27.62%	25.12%	15.08%
County Clare	19.54%	12.41%	24.02%	27.10%	16.93%
Population Study Area	16.08%	11.85%	21.83%	27.35%	22.89%

County Clare's population as of April 2022 was 127,938. The average age of Clare's population increased from 38.5 in April 2016, to 40.1 years in April 2022. Nationally, the average age of the population was 38.8, up from 37.4 in April 2016. The number of people aged 65 and over continues to grow, with this age group increasing from 14.86% in April 2016, to 16.93% of County Clare's population as of April 2022. This trend is similarly apparent at a national level, with an increase from 13.39% of the national population in April 2016 to 15.08% of the population as of 2022. The proportion of the Population Study Areas population within each age category is broadly similar to those recorded at a national and county level, however the Population Study Area has a proportionally older population

when compared to the State and County statistics, with substantial variance between the age groups of 0-14 and 65+ of the Population Study Area in comparison to national and county level statistics. Within the Population Study Area, the age demographic with the highest population percentage was those aged 45-64.

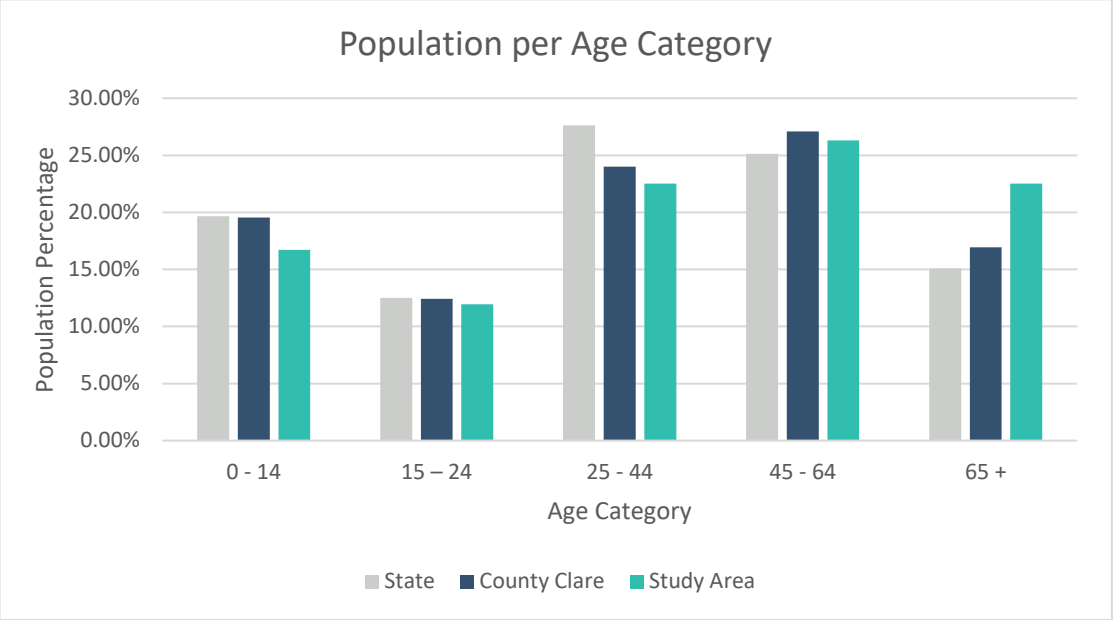

Figure 5-6: Population Age Per Category (source: CSO)

5.5.6 Employment and Economic Activity

5.5.6.1 Economic Status of the Population Study Area

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 56,100 (aged 15 and over) at work in Clare as of April 2022, an increase of 13% (6,600 persons) from April 2016. Nationally, there were 313,656 additional people (+16%) at work. 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 5-8 Economic Status of the Total Population Aged 15+ in 2022 (Source: CSO)

Status		State	County Clare	Population Study Area
% of population aged 15+ who are in the labour force		61.18%	59.37%	56.92%
% of which are:	At work	91.67	91.87	93.61
	Looking	1.36	1.33	0.49
	Unemployed	6.96	6.80	5.90
% of population aged 15+ who are not in the labour force		38.82%	40.63%	43.08%

Status		State	County Clare	Population Study Area
% of which are:	Student	28.60	28.03	23.05
	Home duties	16.96	15.70	15.58
	Retired	40.96	43.79	50.97
	Unable to work	11.79	10.67	8.77
	Other	1.69	1.81	1.63

The principal economic status of those within the labour force of the Population Study Area who are at work is higher than that recorded at the State and County level. However, the Population Study Area features a higher percentage of persons not within the labour force than at a State and County level. The highest percentage of those not within the labour force was in the 'Retired' category, which is also the largest figure recorded at State and County level.

5.5.6.2 Employment and Investment Potential in the Irish Wind Energy Industry

5.5.6.2.1 *Background*

A report entitled *'Jobs and Investment in Irish Wind Energy – Powering Ireland's Economy'* was published in 2009 by Deloitte, in conjunction with the Irish Wind Energy Association (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, a report published in 2014 by Siemens entitled '*An Enterprising Wind - An economic analysis of the job creation potential of the wind sector in Ireland'*, also in conjunction with the Irish Wind Energy Association (IWEA), 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[4] demonstrates in their '*Wind Energy Roadmap 2011-2050'*, that '*the wind energy resource represents a significant value to Ireland by 2050. This value is*

[4] *SEAI (2019), https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf*

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.'

5.5.6.2.2 Employment Potential

The 2014 report *"An Enterprising Wind: An economic analysis of the job creation potential of the wind sector in Ireland"* published by the Irish Wind Energy Association (IWEA) predicted that the wind energy sector in Ireland would result in 6,659 direct jobs in a scenario where 4GW capacity is achieved by 2020. This figure of 6,659 is broken down further; 5,596 of these jobs are associated directly with the construction and installation of windfarms, while the remaining 1,063 jobs are associated with the national grid. Under this scenario this contributes 1.66 direct jobs per Megawatt (MW) of wind capacity throughout the various stages of installation. According to Wind Energy Ireland, the installed wind capacity in Ireland is over 4.3GW as of February 2021, which would support employment during the last decade. Ireland needs to achieve a total of 9GW of onshore wind by 2030 which will further support further employment.

KPMG released a report with WEI in April 2021 titled *Economic impact of onshore wind in Ireland*[5] which states that the wind sector currently supports 5,130 jobs (not including employment in grid development) with a '*with a strong foothold in rural Ireland...*[...]*... through its direct and indirect activities and employment, the sector supports payment of labour incomes totalling €225 million'*

The Sustainable Energy Authority of Ireland[6] estimates, in their '*Wind Energy Roadmap 2011-2050'*, note that '*Onshore and offshore wind could create 20,000 direct installation and O&M jobs by 2040'.* Furthermore, '*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'.*

The 2014 report '*The Value of Wind Energy to Ireland'*, published by Pőyry, 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 instead chooses to not develop any more wind, then by 2030 the country will be reliant on natural gas for most of our electricity generation, at a cost of €671 million per annum in fuel import costs.

In comparison, the April 2021 KPMG report discussed above states that by 2030, the onshore wind industry alone will bring an Additional Gross Value (GVA) of €550 million per annum to the Irish economy, will contribute €305 million total payment in incomes across the supply chain and has the potential to contribute approximately €100 million to local authority rates, if 2030 targets are reached. Furthermore, it is estimated that €2.7 billion in capital would be invested in the country through to 2030 if Climate Action Plan targets are reached.

Internationally, a report issued by WindEurope in September 2017, entitled '*Wind energy in Europe: Scenarios for 2030'* 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'.*

[5] *KPMG, Wind Energy Ireland April 2021 Economic impact of onshore wind in Ireland. Available at: https://windenergyireland.com/images/files/economic-impact-of-onshore-wind-in-ireland.pdf*
[6] *SEAI (2019),* https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf

A new report published by MaREI, the SFI Research Centre for Energy, Climate and Marine, hosted by University College Cork[7] (March 2021) details that in order to meet the government target of net-zero carbon emissions by 2050, at least 25,000 jobs will be created in the development of onshore and offshore wind to meet our zero carbon targets.

A more recent report which was issued by WindEurope in February 2022, titled '*Wind Energy in Europe: 2021 Statistics and the Outlook for 2022-2026'* details various scenarios in Europe in respect to the EU target for renewable energy. According to WindEurope's 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 continued on to state that '*We expect Europe to install 116 GW of new wind farms over the period from 2022-2026. Three quarters of these new capacity additions will be onshore wind.*' The report also states that '*The European Commission modelling shows that we need at least 79 GW offshore wind but National Government have pledged to build at least 92 GW offshore wind capacity by 2030.'*

As of January 2025, there was 6.3GW of wind energy capacity installed on the island of Ireland[8]. 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 Donegal, Galway, Cork, Clare and Kerry, contributing to employment potential on the Island of Ireland[9].

5.5.6.2.3 Economic Value

A 2019 report by Baringa, '*Wind for a Euro: Cost-benefit analysis of wind energy in Ireland 2000-2020'*, has 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) will result in a total net cost to consumers, over 20 years, of €0.1bn (€63 million to be exact), 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 which indicates that more wind energy feeding into the national grid will result in lower and more stable energy costs for consumers.

Furthermore, in May 2020, IWEA released its 70by30 Implementation Plan Reports which further details 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, then 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.

5.5.7 Land-Use

The land uses within the Proposed Wind Farm site are predominantly comprised of commercial forestry, as well as agricultural areas and pastures. The primary surrounding land use within the

[7] *https://www.marei.ie/our-climate-neutral-future-zeroby50/*
[8] *Eirgrid,* https://www.eirgrid.ie/grid/system-and-renewable-data-reports
[9] Fáilte Ireland, Key Tourism Facts 2024, 15th August, 2025. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Research/Key%20Tourism%20Facts%20and%20Figures%202024/FI_Key-Tourism-Facts-2024_National-Summary.pdf?ext=.pdf

Population Study Area is that of agricultural and residential/commercial properties, wind energy development as well as some commercial forestry.

The Proposed Wind Farm EIAR Study Boundary measures approximately 376 hectares, while the permanent development footprint (i.e. permanent site infrastructure) within the Proposed Wind Farm site measures approximately 15.97 hectares. Therefore, the development footprint of the Proposed Wind Farm site consists of approximately 4.3% of the Proposed Wind Farm site boundary and 0.2% of the Population Study Area.

Table 5-9 below shows the breakdown of farmed lands within the 3 no. EDs of the Population Study Area. There are 153 farms located within the Population Study Area, with an average farm size of 24.27 hectares. The total farmed area within the Population Study Area is 3,699 hectares, which equates to 67.4% of the Population Study Area's land. The median age of the holder of the farm within the Population Study Area is 57 years.

CSO data for 2022 reports that 61 private households within the Population Study Area reported farming as their socio-economic group, which equates to approximately 17.9% of the Population Study Area households. A total of 2,438 private households reported farming as their socio-economic group for Co. Clare, which equates to 5.2% of the households in the county. As demonstrated, farming in the Population Study Area is over 3 times the rate of farming in Co. Clare and corresponds to the rural location and land-use of the surrounding area of the Proposed Project.

Table 5-9 Farm Size and Classification within the Population Study Area in 2020 (Source: CSO)

DED	No of holdings	Average size (hectares)	Median age of holder	Livestock units	Average farmed (hectares)
Cahermurphy	42	25.8	54	1,247	1083
Creegh	63	23.9	57	1,749	1,508.8
Mullagh	48	23.1	61	1,295	1,107.2
Total	153	24.27 (average)	57.33 (average)	4,291	1,233 (average)
Size of 3 EDs			5,488 hectares		
Total Area Farmed within 3 EDs			3,699 hectares		
Farmland as % of EDs			67.40%		

In a wider context, the Proposed Wind Farm is located in an area where wind energy is one of the main land uses, alongside commercial forestry and agriculture. The closest operational wind farm to the Site, is the existing Cahermurphy Wind Farm located at a distance of approximately 458m between the Proposed Wind Farm's closest turbine. A list of operational wind farms located within 25km of the Proposed Wind Farm site is included in Ch. 2: Background to the Proposed Project of this EIAR.

5.5.8 Services

The village of Kilmihil is located 4.3km southeast of the Proposed Wind Farm site, and the village of Mullagh is located roughly 4.3km northwest of the nearest proposed turbine (T1). Other nearby settlements include Creegh (4.7km southwest), Cooraclare (7.2km southwest), Miltown Malbay (9.1 km

north), Doonbeg (11.2km southwest), Kilrush (14km southwest) and Ennis (24km northeast). All centres provide retail, recreational, educational and religious services.

5.5.8.1 Education

The nearest primary school is Scoil Mhichíl National School, which is located in the townland of Cahermurphy, approximately 1.2km southeast of the nearest proposed turbine and approximately 55m from the Proposed Grid Connection route at its closest point. The closest Secondary school to the site is Saint Michaels Community College, which is located in Kilmihil, approximately 4.4km southeast of the Site and east of the Proposed Grid Connection. Beyond that is Kilrush Community School (15.6km southwest of the Site) and Kilkee Community College (22km southwest of the Site). The third level institute, Technical University of the Shannon (Ennis Campus), is also 25.8km north east of the Proposed Wind Farm Site.

5.5.8.2 Access and Public Transport

The Proposed Wind Farm site is currently accessible via farm forestry entrances to the north and east of the site, as well as a farm entrance to the south. It is proposed to upgrade an existing forestry entrance on the L-6254. The site is also served by a number of additional existing agricultural roads and tracks. There is no direct public transport access to the Site, and the closest public bus stop is located in Kilmihil c. 3.6km from the site entrance. Two routes run from Ennis to Kilmihil, the 335 and 336, with 7 departures being made daily (Monday-Friday).

The Proposed Grid Connection route is located predominantly within the public road corridor and can be accessed easily by construction and staff vehicles. There is one bus stop located on the Proposed Grid Connection, namely the Knockerra bus stop which is serviced by the 337 local link bus. Additional bus stops that do not overlap with the Proposed Grid Connection but are serviced in the wider area include a bus stop in Killimer (c.900m from the Proposed Grid Connection) and Kilmihil (c.3.5km from the Proposed Grid Connection).

5.5.8.3 Amenities and Community Facilities

There are no amenity or community facilities located within the Proposed Wind Farm site, however there are several in the wider area. Both St. Pat's Soccer Club and Kilmihil GAA and associated facilities can be found southeast of the Site (approx. 5km and 4.7km from the Site respectively) and east of the Proposed Grid Connection in the village of Kilmihil. Similarly, a sports field and running track is present in Mullagh, approximately 4.3km northeast of the Proposed Wind Farm site. Youth clubs, other sports clubs, nature and hillwalking clubs and other leisure activities can be found in Kilmihil, Doonbeg, Kilrush and Ennis.

5.6 Tourism

This section assesses the Proposed Wind Farm's potential to impact tourism. Due to the temporary nature of the works and any potential effects associated with the Proposed Grid Connection underground cabling route, it has been scoped out from the tourism assessment that follows.

5.6.1.1 Overseas 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. *Key Tourism Facts 2024*, pertaining to domestic and international tourism volumes for Ireland, was published by Failte Ireland in August 2025 for the year 2024. *Key Tourism Facts 2024* states that during 2024, overseas tourists to Ireland grew by 0.7% to 9.7 million. In 2024, out-of-state (overseas and Northern Ireland) tourist expenditure amounted to €6.6 billion and increase from €5.6 billion in 2019, with a further €1.5 billion spent by overseas visitors on fares to Irish carriers (a

drop of €300 million. Domestic tourism expenditure amounted to €3.6 billion, an increase of €1.5 billion from 2019, making tourism an almost €12 billion industry. The Central Statistics Office's official count of direct employment in 'Tourism Industries', a more inclusive measure to that of the "accommodation and food services" developed by the statistical office of the European Union (Eurostat), was 226,300 in Q4 2024.

The Republic of Ireland is divided into seven tourism regions. Table 5-10 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 5-10 Tourist Revenue and Numbers 2024 (source Fáilte 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
Border	€376m	525
Total	**€6,069m**	**9,448**

The Proposed Wind Farm Site and Proposed Grid Connection lie within the Mid-West region and comprises of the counties Clare Limerick and Tipperary. This region benefited from approximately 8.8% of total overseas tourists and 8.8% of the total generated revenue from tourism[10].

In their document, 'Key Tourism Facts 2024 Clare', published on the 11th of August 2025, Fáilte Ireland provide more detail tourism in Co. Clare. Approximately 361,000 overseas tourists and 810,000 domestic tourists visited Clare, which generated €361m in revenue. Overseas tourists on average spent longer in Clare (3.7 nights) when compared to domestic tourists (2.5 nights).

5.6.1.2 Domestic Tourism and Revenue

Fáilte Ireland's latest key domestic tourism performance data was released in August 2025, which provides Domestic Tourism and Revenue data for 2024[11]. During 2024, total domestic expenditure by purpose of travel was approximately €3,602 million, an increase from €3,121 in 2023, €2,146.6 million in 2019 and €2,006 million in 2018.

[10] Fáilte Ireland, Key Tourism Facts 2024, 15th August, 2025. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Research/Key%20Tourism%20Facts%20and%20Figures%202024/FI_Key-Tourism-Facts-2024_National-Summary.pdf?ext=.pdf
[11] Fáilte Ireland, Key Tourism Facts 2024, 15th August, 2025. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Publications/2022-key-tourism-facts.pdf?ext=.pdf

Table 5-9 shows the total estimated expenditure and breakdown of domestic tourist trips numbers to each of Irelands seven tourist regions during 2024.

Table 5-9: Domestic Tourism Expenditure and Number of Trips 2024 (Source Fáilte Ireland)

Region	Estimated Expenditure (€m)	Total No. Trips (000s)
Dublin	€583	2,823
Mid-East/Midlands	€488	2,383
South-East	€422	2,113
South-West	€757	3,190
Mid-West	**€349**	**1,775**
West	€618	2,461
Border	€385	1,827
Total	**€3,602**	**16,572**

5.6.2 Tourist Attractions

There are no key identified tourist attractions pertaining specifically to the Proposed Wind Farm site nor Proposed Grid Connection.

5.6.2.1 Tourist Attractions Within the Surrounding Landscape

Trump international Golf Links and Hotel and White Strand Beach are the closest identified tourist attraction, being located roughly 7.7km west of the site. Spanish Point Beach, is another popular beach located c. 8.5km northwest of the site. Spanish Point Beach, as well as the other coastal areas of Clare are hugely popular tourist destinations for both domestic and international tourists alike.

County Clare has a wide range of nationally and regionally important tourism assets, which include:

- The Cliffs of Moher Experience – An award-winning tourist centre nestled into the hillside of the Cliffs of Moher. These cliffs were the second most popular visitor attraction in Ireland in 2019[12]. Located 24.2km north of the Site. A photomontage visualisation of the views from this tourist attraction has been provided with this application.
- The Burren and Cliffs of Moher UNESCO Global Geopark - A nationally and internationally significant natural area located on the northern coast of Clare. The Burren Nation Park is located 32.5km northeast of the Site.
- Aillwee and Doolin caves – Two of the countries most visited caves. The Aillwee caves (c. 37.7km northeast of the site) is popular for its bird of prey centre and cave tour, while Doolin caves (c. 29km northwest of the Site) is well known for containing the largest stalactite in Europe.

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- Bunratty castle & folk park – A 15th century castle known for hosting medieval themed banquets and castle tours. Located c. 36km southeast of the Site.
- Shannon Dolphin and Wildlife Foundation (SWDF), which was established to develop and provide educational awareness and conservation of the Shannon dolphins and other wildlife in the region. Located in Kilrush, c. 16.8km southwest of the Proposed Wind Farm site and 5.5km northwest of the Proposed Grid Connection at its closest point.

Archaeological sites and monuments are part of Irish national heritage and are recognised tourist attractions across the country. There are no National Monuments within 10km of the nearest turbine. Please see Ch. 13: Cultural Heritage and Appendices for further details.

5.6.3 Tourist Attitudes to Wind Farms

5.6.3.1 Scottish Tourism Study 2021

BiGGAR Economics undertook an independent study in 2021, entitled '*Wind Farms & Tourism Trends in Scotland: Evidence from 44 Wind Farms'* to understand the relationship, if any, that exists between the development of onshore wind and the sustainable tourism sector in Scotland. In recent years, the onshore wind sector and sustainable tourism sector 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 during the years since 2009, an overall increase of 20%.

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 solely the more recent 2015 to 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 15km 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.

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. The study found no relationship between tourism employment and wind farm development, at the level of the Scottish economy, across local authority areas, not in the locality of the wind farm sites.

5.6.3.2 Fáilte Ireland Surveys 2007 and 2012

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'.

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."*

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. Good site design has been integral to the proposed turbine layout and this EIAR accounts for any potential residual effects the Proposed Project will have on both tourism, as well as landscape and visual amenity (see Ch. 14: Landscape and Visual).

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'. 21% of the 1000 participants 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 5.7 below.

5.7 Public Perception of Wind Energy

5.7.1 Sustainable Energy Authority of Ireland Survey 2003

5.7.1.1 Background

The results of a national survey entitled '*Attitudes Towards the Development of Wind Farms in Ireland*' were published by the Sustainable Energy Authority of Ireland (SEAI) in 2003 and updated in 2017 – see Section 5.7.1.3 above. A catchment area survey was also carried out by SEAI (formerly SEI) in order to focus specifically on people living with a wind farm in their locality or in areas where wind farms are planned.

5.7.1.2 2003 Findings

The SEAI survey published in 2003, found that the overall attitude to wind farms is very positive, with 84% of respondents rating it positively or very positively. One percent rates it 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 effect of the turbines on the landscape was the strongest influence. The report also notes however that the findings obtained within wind farm catchment areas showed that effect on the landscape is not a major concern for those living near an existing wind farm.

With regards to the economic and environmental effects 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 more favourably is a further indication that some experience of the structures 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 effect 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.

5.7.1.3 Survey Update 2017

Additionally, a survey carried out by Interactions in October 2017, published by the SEAI, show 47% of Irish adults polled said they were strongly in favour of wind power in Ireland while a further 38% favour it. Overall, this is a 4% increase in favourable attitudes towards wind power compared with similar research in 2003.

The SEAI survey found that the overall attitude to wind farms is very positive, with 84% of respondents in favour of the use 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 selected good for the environment and reduced Carbon Dioxide emissions while fewer people, just over two in three, cited cheaper electricity.

5.7.1.4 Conclusions

The main findings of the SEAI survey in 2017 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 2017 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 since it is voiced by those who know from direct experience about the impact of such developments on their communities."*

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

5.7.2.1 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*', Journal of Environmental Planning and Management, November 2005). 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.

5.7.2.2 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 had two wind farms in proximity to each other.

5.7.2.3 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 effects 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 effect 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, the report notes that 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.

5.7.2.4 Conclusions

The overall conclusions drawn from the survey findings and from the authors' review of previous studies show that local people become more favourable towards wind farms after construction, that the degree of acceptance increases with proximity to them, and that the NIMBY effect does not adequately explain variations in public attitudes due to the degree of subjectivity involved.

5.7.3 IWEA Interactions Opinion Poll on Wind Energy 2021

In January 2021 IWEA published the results of their most recent nationwide annual poll on attitudes to wind energy, the *Public Attitudes Monitor*.[13] The results of the opinion poll were published via Wind Energy Ireland, the representative body for the Irish wind industry. The objective of the poll was to *'measure and track public perceptions and attitudes around wind energy amongst Irish adults.'*

Between 12th – 18th November 2020, a representative sample of 1,004 Irish adults together with a booster sample of 203 rural residents participated in an online survey. The 2020 results reported that 50% of the nationally representative sample 'strongly favour', 32% 'tend to favour' and 15% 'neither favour nor oppose' wind power. Of the rural population surveyed 42% 'strongly favour', 40% 'tend to favour' and 14% 'neither favour nor oppose' 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 82%) there has been a marginal increase in those in favour from the rural population (from 79% to 82%).

Amongst those in favour of wind power, the majority cited environmental and climate concerns as their main reasons for supporting such developments. Other reasons cited for supporting wind energy developments include: 'economic benefits', 'reliable/efficient', 'positive experience with wind energy', and the view that it is a 'safe resource'.

When questioned about wind energy developments in their local area, 54% of the nationally representative sample either 'favour' or 'tend to favour' such proposals compared to 52% of the rural population reporting the same. There was a high level of agreement with positive benefits concerning wind energy the local area from both the nationwide and rural populations, with over 80% of each group in agreement that it 'reduces CO2 emissions' and is 'good for the environment', with over 75% of each group agreeing that it leads to 'cheaper electricity'. Over 60% of each population group agreed that wind energy 'supports energy independence' and 'creates employment'.

The IWEA November 2020 survey follows the structure of previous national opinion polls on wind energy undertaken since 2017. The 2020 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.

5.7.3.1 Conclusions

The overall conclusions drawn from the survey findings and from the authors' review of previous studies show that local people become more favourable towards wind farms after construction, that the degree of acceptance increases with proximity to them, and that the NIMBY syndrome does not adequately explain variations in public attitudes due to the degree of subjectivity involved.

5.7.4 Wind Energy Ireland Interactions Opinion Poll on Wind Energy

In early 2024, Wind Energy Ireland (WEI) published the results of their most recent nationwide annual poll on attitudes to wind energy[14]. The objective of the poll was to 'measure and track public perceptions and attitudes around wind energy amongst Irish adults.'

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[13] *Wind Energy Ireland January 2021 Public Attitudes Monitor. Available at: https://windenergyireland.com/images/files/2032-wei-version-2020-for-media.pdf*

[14] *WEI Latest News – National Poll. Available at: << https://windenergyireland.com/latest-news/7660-national-poll-4-in-5-people-support-irish-wind-energy-development-with-3-in-5-backing-local-wind-farms#:~:text=we%20love%20wind!-,National%20poll%3A%204%20in%205%20people%20support%20Irish%20wind%20energy,5%20backing%20local%20wind%20farms.&text=4%20in%205%20people%20in,towards%20wind%20energy%20in%20Ireland.>>*

Between 17th November and 1st December 2023, a nationally representative sample of 1,017 Irish adults together with a booster sample of 221 rural residents participated in the survey. The 2023 results reported that 4 in 5 (80%) are now in favour of wind power, a 6% increase on the 2021 results (54% of those in favour were 'strongly in favour'). 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 an increase in those in favour from the rural population (from 79% to 85%). The 2023 surveys results are largely in line with those of 2022, showing a consistent level of support and a positive attitude toward wind energy in Ireland.

Amongst those in favour of wind power, the majority cited cheaper electricity, reduced carbon emissions and environmental and climate concerns as their main reasons for supporting such developments. Other reasons cited for supporting wind energy developments include: 'Support energy independence', 'Creates employment', and that it is 'Good for local communities nearby'.

When polled on opinions surrounding the offshore wind energy sector, 78% of those surveyed said that they are in favour of the use of offshore wind energy in Ireland, with 80% acknowledging the importance of offshore wind energy in providing energy security to Ireland.

When questioned about wind energy developments in their local area, 3 in 5 (60%) of those surveyed would support such proposals, compared to 58% of the nationally representative sample and 56% of the rural population surveyed in 2022 reporting the same.

The Wind Energy Ireland 2023 survey follows the structure of previous national opinion polls on wind energy undertaken since 2017. The 2023 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.

5.7.5 University College Cork Wind Farm Acceptance 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? Residents' acceptance over phases of project development and proximity'* similarly investigates the relationship between 'near neighbours' of Wind Farms, and provides excellent 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 1109 participants within 10km of an existing Wind Farm in Ireland, and their willingness 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 planning, construction and operational phases these developments and asked respondents about their 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. Figure 5-7 below details how distance, as well as the phase of the wind farms the residents are 'near neighbours' to dictates their preference for additional developments.

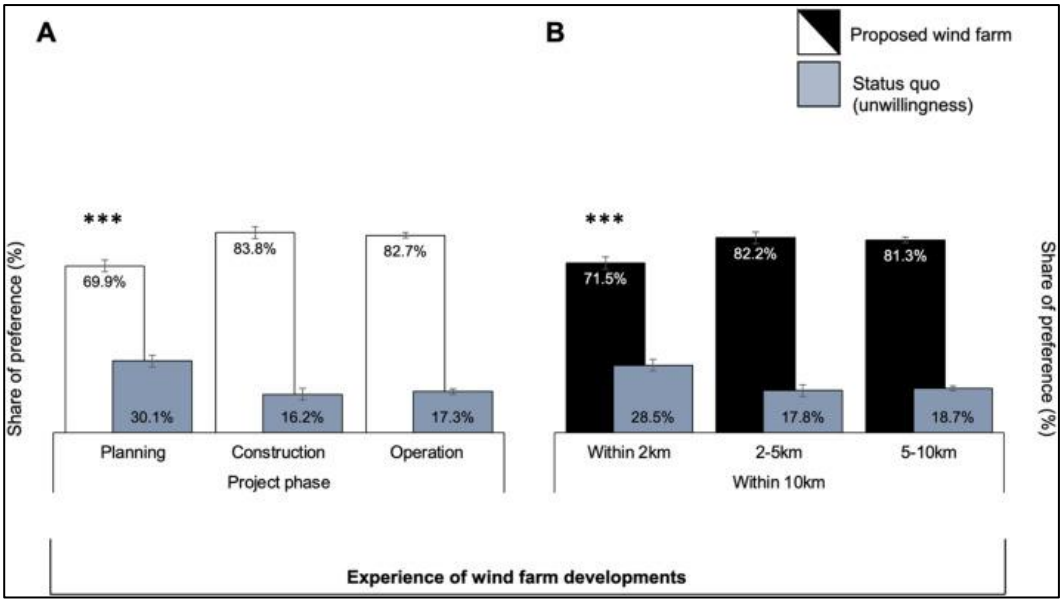

Figure 5-7: Share of preference for a 'best-case' combination of wind development features and the status quo (A) over phase of project development; and (B) over proximity to the wind farm. (Le Maitre et al. 2024)

Firstly, it should be highlighted that only 13% of the 1109 respondents (c. 144 persons) were unwilling to accept further wind farm development, with the remaining 87% being in favour of additional wind energy developments in their area. Similarly, it should also be noted that a majority of respondents living next to operational wind farms were from the south-west region (i.e. Cork and Kerry) which have the largest number of operational turbines, and Dublin (which was intentionally statistically underrepresented compared to population density due to the lack of turbines within the region). As showcased in Figure 5-7 above, the survey findings suggest that residents who live within 10km of a Wind Farm development currently within the planning phase are more likely to be unwilling to accept further wind energy developments than those who live in proximity to a wind energy development either under construction, or within the operational phase. It should also be noted that in all cases, a majority of respondents display moderate to strong willingness for additional wind energy developments in the area. Similarly, respondents living within 2km of a wind energy development are less likely to accept further wind energy developments than those within the 2-10km near neighbour zone.

Regarding respondents' opinions concerning wind electricity, 62% of 'status quo' respondents believed that wind energy was a "clean renewable source", when compared to 89% respondents with willingness to accept. Furthermore 65% of 'status quo' respondents believe that wind farm developments can negatively impact tourism. As discussed in Section 5.6 above, this is factually incorrect based on the findings of a range of studies. Similarly, 'status quo' respondents were very unlikely to trust information from a website run by the wind farm developer (only 20% very likely to trust), however, this sentiment was common amongst all latent classes, with 54% and 69% of respondents with moderate and strong willingness to accept further renewable energy developments respectively, being very likely to trust a developer run website. Worth noting is the fact that for each latent class, respondents were more likely to trust a community liaison officer or an information pack provided by the developer, both of which have been carried out as part of the Proposed Project community engagement process (as detailed in Appendix 2-3 of this EIAR).

To conclude, this study illustrates that whilst negative sentiment towards wind energy developments are common at the planning phases, these sentiments generally subside during the construction and operational phases of the development. Similarly, respondents unwilling to accept wind energy development are likely to hold negative personal opinions on wind energy generation when compared to those with willingness to accept. This report also highlights the importance of a strong community consultation process, which the Proposed Project has comprehensively addressed in Appendix 2-3 of this EIAR.

5.8 Health Effects of Wind Farms

5.8.1 Introduction

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.

5.8.2 Health Impact Studies

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.

1. ***'Wind Turbine Sound and Health Effects – An Expert Panel Review',*** *American Wind Energy Association and Canadian Wind Energy Association, December 2009*

This expert panel 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."

2. ***'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*

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 following the publication of 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 WTD are wrong; and
- Noise from Wind Turbines cannot contribute to the symptoms reported by Dr. Pierpont'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.

3. ***'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, New South Wales Australia*

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

4. ***'A Rapid Review of the Evidence',*** *Australian Government National Health and Medical Research Council (NHMRC) Wind Turbines & Health, July 2010*

The purpose of this paper was to review evidence from current literature on the issue of wind turbines and potential effects on human health and to validate the finding of the 'Wind Turbine Sound and Health Effects - An Expert Panel Review' (see 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."

5. ***'Position Statement on Health and Wind Turbines',*** *Climate and Health Alliance, February 2012*

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 notes 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 notes 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 effects of fossil fuel energy generation.

6. ***'Wind Turbine Health Impact Study -Report of Independent Expert Panel' –*** *Massachusetts Departments of Environmental Protection and Public Health (2012)*

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 effects 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."

7. ***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)*

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.
- 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.

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 by Professor Simon Chapman, of the School of Public Health and Sydney University Medical School, Australia, and is included as Appendix 5-1 of this EIAR. Another recent publication by Chapman and Crichton (2017) entitled '*Wind turbine syndrome; A communicated disease'* critically discusses why certain health effects might often be incorrectly attributed to wind turbines.

8. ***Environmental Noise Guidelines for the European Region:*** *World Health Organisation Regional Office for Europe, 2018.*

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 increase 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. Furthermore, public perception towards wind turbines are hard to differentiate from reported effects related to noise and the two may be inextricably linked. 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 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, however, it states that no evidence is available to facilitate the recommendation of one type of intervention over another.

9. ***Infrasound Does Not Explain Symptoms Related to Wind Turbines:*** *Finnish Government's Analysis, Assessment and Research Activities (VN TEAS), 2020*

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 was 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 (12 miles) of the generators.

The report notes:

> *'...the behavioral 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'.

5.8.3 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The Department of the Environment, Heritage and Local Government (DoEHLG)'s '*Wind Energy Development Guidelines for Planning Authorities 2006*' (referred to as the Guidelines) and the '*Draft Revised Wind Energy Development Guidelines'* (December 2019) (referred to as the draft Guidelines) 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 Guidelines and the draft Guidelines 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; therefore, danger is 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 Site (and the State) falls within the International Energy Agency (IEA) Ice Class 1 Category, which correlates to a *Low* icing frequency.

Turbine blades are manufactured of glass reinforced plastic which will prevent any likelihood of an increase in lightning strikes within the Site or the local area. Lightning protection conduits will be integral to the construction of the turbines.

- Wind turbines are typically equipped with one or more lightning rods, also known as air terminals, installed at the highest points of the turbine structure. These rods are made of conductive materials such as copper or aluminum.
- Down conductors, usually made of copper, aluminum, or a combination of both, connect the lightning rods to the ground. These conductors provide a low-resistance path for the lightning current to safely dissipate into the ground.
- The down conductors are connected to a grounding system, which typically consists of buried conductive cables or rods that extend deep into the earth. The grounding system disperses the lightning energy harmlessly into the ground, preventing damage to the turbine or surrounding structures.
- Surge protection devices are installed within the electrical system of the wind turbine to prevent transient voltage spikes caused by lightning strikes from damaging sensitive electronic components. These devices divert excess electrical energy to the ground, protecting the turbine's electrical systems
- Additional measures such as bonding conductive components together and shielding sensitive equipment can further reduce the risk of damage from lightning strikes. Bonding ensures that electrical potentials are equalized across the turbine structure, while shielding helps to minimize electromagnetic interference.
- Regular inspection, testing, and maintenance of the lightning protection system are essential to ensure its effectiveness. This includes checking for corrosion, loose connections, and damage to components, as well as verifying that grounding resistance levels are within acceptable limits

The International Electrotechnical Commission (IEC) is a global organization 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 standardization of wind turbines. The IEC has developed a series of standards specifically for wind turbines. The IEC 61400-1 "Wind turbines – Part 1: Design requirements" provides guidelines and requirements for the design of wind turbines, including considerations for environmental conditions[3]. This standard covers a range of conditions that wind turbines may encounter. 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.[4] As such, the Proposed Project, and like those across Ireland and in many other countries, is designed and assessed

according to international standards. 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.

5.8.4 Electromagnetic Interference

The provision of underground electric cables 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)[15] provides further practical information on EMF. To summarise, ESB iterate that established national and international scientific agencies have consistently concluded that their research does not indicate that EMF causes any adverse health effects (on human health or animals) at levels encountered in our everyday environment. No further studies to date have shown otherwise.

Further details on the potential effects of electromagnetic interference to telecommunications and aviation are presented in Ch 15: Material Assets.

5.8.5 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', 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.

Ch. 5: Population and Human Health (including Shadow Flicker), Ch. 8: Land, Soils and Geology, Ch. 9: Water, Ch. 10: Air Quality, Ch. 11: Climate and Ch. 12: Noise and Vibration and Ch. 15: Material Assets (Traffic and Transport) provide an assessment of the effects of the Proposed Project on these areas of consideration.

The Proposed Project design and mitigation measures outlined in Ch. 8: Land, Soils and Geology and Ch. 9: Water ensures that the potential for effects on the water environment are not significant. No effects on local water supplies are anticipated.

As set out in Ch. 9: Water, potential health effects are associated with negative effects on public and private water supplies and potential flooding. There are no mapped public or group groundwater scheme protection zones in the area of the Proposed Wind Farm site or Proposed Grid Connection

A wind farm is not a recognised source of pollution. It is not an activity which requires Environmental Protection Agency licensing under the Environmental Protection Agency Act 1992, as amended. As

[15] *EMF & You: Information about Electric & Magnetic Fields and the electricity network in Ireland Available at: https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0.*

such, a wind farm is not considered to have ongoing significant emissions to environmental media and the subsequent potential for human health effects.

The Proposed Project is for the development of a renewable energy project, a wind farm and associated grid connection. The Proposed Wind Farm will be capable of offsetting carbon emissions associated with the burning of fossil fuels. During the operational stage the Proposed Wind Farm will have a long term, significant, positive, direct effect on air quality as set out in Ch.10: Air Quality which will contribute to positive effects on human health.

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 Irish Aviation Authority (IAA). The standard lighting required by the IAA are medium intensity lights. Such lighting is designed specifically for aviation safety and is not intended to be overbearing or dominant when viewed from the ground thus striking a reasonable balance between aviation safety and visual effect. The IAA generally only confirm lighting arrangements required for wind farm developments once a consent is in place.

It is considered that aviation lighting on the proposed turbines will have no 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 Ch. 15: Material Assets.

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 imperceptible.

5.8.6 Vulnerability of the Project to Natural Disasters and Major Accidents

As outlined in Section 5.3.2.3 above, 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 the construction, operational and decommissioning phases, are limited. Sources of pollution with the potential to cause significant environmental pollution and associated negative effects on health, such as bulk storage of hydrocarbons or chemicals, storage of wastes etc., are limited and easily mitigated, as discussed in Ch. 8: Land, Soils and Geology and Ch. 9: Water of this EIAR. Similarly, the Proposed Grid Connection has limited potential sources of pollution during the construction, operational and decommissioning phases.

In the context of the Proposed Project Site, there is limited potential for significant natural disasters to occur. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to peat instability, flooding and fire. The risk of flooding and potential for contamination of groundwater and drinking water due to the construction of the Proposed Project is addressed in Ch. 9: Water with the risk being limited given neither the Proposed Wind Farm or Proposed Grid Connection are located within a flood risk zone, with no historic flooding events occurring across either of these components. Furthermore, the proposed mitigation measures and site drainage plan as outlined in Ch. 9: Water, will ensure there is a limited risk to human health. It is considered that the risk of significant fire occurring, affecting the Proposed Wind Farm and causing the wind farm to have significant environmental effects is limited and therefore a significant effect on human health is similarly limited. As outlined in the Peat Stability Risk Assessment (Appendix 8-1), the Proposed Project has an acceptable margin of safety and is considered to be at low risk of peat failure provided appropriate control measures are implemented. There are peat soils mapped and observed along the Proposed Grid Connection underground cabling route, however, due to the nature of the proposed works and the fact that the underground cable is to be located fully within the road corridor there is no risk of peat instability along the Proposed Grid Connection underground cabling route either. As described earlier, there are no significant sources of pollution in the wind farm and grid connection with the potential to cause environmental or health effects. Also, the spacing of the turbines

and distance of turbines from any properties limits the potential for effects on human health. The issue of turbine safety is addressed in Section 5.8.3.

Major industrial accidents involving dangerous substances pose a significant threat to humans and the environment; such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident. The Site is not regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e. SEVESO sites and so there are no potential effects from this source. While ESB Moneypoint is a SEVESO site, the Proposed Grid Connection will not interact with Moneypoint in a way that may give rise to any potential significant effects. A Major Accidents and Natural Disasters assessment is included as Ch. 16: Major Accidents and Natural Disasters.

5.9 Property Values

5.9.1 Property Values and Wind Farms

There is currently only one study within the context of Ireland detailing the effect of wind farms on property values. This section provides a summary of this paper by the Centre for Economic Research on Inclusivity and Sustainable (CERIS), and, considering the limitations associated with that study outlined below, also summaries the largest and most recent studies from the United States and the UK.

In 2023 CERIS published a working paper entitled *'Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach'*.[16] This paper looked at wind turbine developments in Donegal, Leitrim, Sligo, Mayo, Galway, Kerry and Cork and associated property values. This working paper utilised satellite imagery to identify individual turbines and sourced its housing data from www.daft.ie; while the published price on Daft is not equivalent to the final agreed sale price, it was assumed that the listing and transaction prices are correlated. The findings of this research revealed a potential decrease in property values of -14.7% within a 0-1km radius of a wind turbine. However, the sample size of only 225 houses within this range does not adequately represent the broader landscape of Irish rural housing and the distribution of wind turbines. The author states that there are 'no significant reductions in house prices beyond 1km' and that the effects seen within the 1km band were not persistent and diminished over the operational lifetime of the turbines.

Considering that the above is a working paper, based on a small sample size where local conditions have the potential disproportionately impact on the local housing market, the remainder of this section summarises the other scientific literature on this topic from the US and 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', December 2009, was carried out by the Lawrence Berkley National Laboratory (LBNL) for the U.S Department of Energy. This study collected data on almost 7,500 sales of single-family homes situated within ten miles of 24 existing wind farms in nine different American states over a period of approximately ten years.

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*

[16] *Centre for Economic Research on Inclusivity and Sustainability (2023) Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach.* <https://www.universityofgalway.ie/media/researchsites/ceris/files/WP-2023-01.pdf>

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", in August 2013. 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 10 miles of the wind energy facilities - about 1,100 homes were within 1 mile, with 331 within half a mile. The report is therefore based on a very large sample and represents an extremely robust assessment of the impacts of wind farm development on property prices. 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."

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'* and its main conclusions 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 five-kilometre radius of the Sites.

A study issued in October 2016 'Impact of wind Turbines on House Prices in Scotland' (2016) 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 (p.3) 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 2km or 3km or find the effect to be positive.

The UK 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 conclusively that there is the potential for a significant effect on property prices as a result of the Proposed Wind Farm..

5.9.2 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 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.
- 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 Environmental Impact Assessments (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 last twenty years was reviewed to see if it has influenced, or 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.

5.10 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 Proposed Wind Farm is located within a rural setting in County Clare. Current land-use comprises of commercial forestry and agriculture. The surrounding lands are dominated by pastoral agriculture, residential/commercial use, as well as some swathes of private forestry and renewable energy developments. Existing site access is proposed to be from forestry site access on the east of the site. The Proposed Grid Connection is similarly located within rural County Clare with land use along the route primarily consisting agricultural pastures, low density residential and some instances of commercial forestry.

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 impact assessments have been completed as part of this EIAR (Section 5.4 refers to shadow flicker, Ch. 12: Noise and Vibration addresses noise and vibration). A comprehensive landscape and visual impact assessment have also been carried out, as presented in Ch. 14: Landscape and Visual 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 topics and other environmental factors such as noise, traffic, and dust; see impacts in Section 5.11 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.

All sensitive receptors are located at a minimum of 740m from any proposed turbine, i.e., 4 times the tip height of 185m (specifically set out in the draft Guidelines for the purposes of protecting visual amenity). The closest dwelling being a derelict building 752m from the nearest proposed turbine. The turbine locations adhere to the Guidelines and the draft Guidelines in relation to turbine setback, a minimum 500m set back from sensitive receptors and a minimum setback of four times the tip height of the proposed turbines with a reduced setback of a minimum of 500m for sensitive receptors involved with the Proposed Project.

5.11 Likely Significant Effects and Associated Mitigation Measures

5.11.1 'The 'do-nothing scenario'

If the Proposed Project were not to proceed, the Site will continue to function as it does as present, with no change made to the current land-use and the potential for impacts on population and human health through the construction, operational and decommissioning phases of the Proposed Project would not occur. Commercial conifer planting and clear-felling will continue to occur at it's current scale and areas of the Site not subject to human activities and works will revegetate. No habitats will be effected within the Site as a result of any proposed infrastructure, however, over 123 hectares of land proposed for enhancement for the benefit of hen harrier and species with similar ecological requirements will remain in its current condition (i.e. unproductive commercial conifer plantations and high intensity grazed agricultural fields) and the positive net gain of habitats the Proposed Project can deliver will not materialise.

If the Proposed Project were not to proceed, the opportunity to capture a greater part of County Clare's valuable renewable energy resource would be lost, as would the opportunity to contribute to meeting the Government and EU targets for the production and consumption of renewable energy by 2030, as well as the reduction in greenhouse gas emissions. Furthermore, the opportunity to create local employment and investment as well as to diversify the local economy will be lost.

5.11.2 Construction Phase

Within this section, the impact will consider the Proposed Project i.e. both the Proposed Wind Farm and associated Proposed Grid Connection will be considered as a whole. Where the Proposed Wind Farm and the Proposed Grid Connection are required to be considered separately, this will be identified within the assessment.

5.11.2.1 Population

5.11.2.1.1 *Population Trends*

Pre-Mitigation Levels

Proposed Wind Farm

Those working on the construction phase of the Proposed Wind Farm will travel daily to the Site from the wider area. While foot-traffic to the area will increase, the construction phase will have no impact on the population of the population study area in terms of changes to population trends or density, household size or age structure.

Proposed Grid Connection

Those working on the construction phase of the Proposed Grid Connection will travel daily to the Site from the wider area. While foot traffic along the Proposed Grid Connection will increase, the construction phase will have no impact on the population of the area in terms of changes to population trends or density, household size or age structure.

5.11.2.1.2 *Employment and Investment*

Pre-Mitigation Impacts

Proposed Wind Farm

The design, construction, operation and decommissioning of the Proposed Wind Farm will provide employment for technical consultants, contractors and maintenance staff. It is anticipated that 90 employees will be hired throughout the duration of the construction works of the wind farm, which are expected to take 18-24 months. During construction, additional employment will be created in the region through the supply of services and materials to the Proposed Project. The construction phase of the Proposed Project will last between approximately 18 – 24 months. The majority of construction workers and materials will be sourced locally where available, thereby helping to sustain employment in the construction trade. This will have a short-term significant positive effect.

The injection of money in the form of salaries and wages to those employed during the construction phase of the project has the potential to result in an increase in household spending and demand for goods and services in the local area. This will result in local retailers and businesses experiencing a short-term positive effect on their cash flow. This will have a short-term slight positive indirect effect.

Proposed Grid Connection

The design, construction and operation of the Proposed Grid Connection will provide employment for technical consultants, contractors and maintenance staff. As discussed, it is proposed to construct the Proposed Wind Farm and Grid Connection concurrently with an estimated 30-50 jobs focusing on the construction phase of the Proposed Grid Connection. Construction of the Proposed Grid Connection will take approximately 12 months of the overall 18 - 24 month timeframe.

Residual Impact

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 short-term positive effect on their cash flow. This will have a short-term slight positive indirect effect.

Significance of Effects

The effect of the Proposed Project on employment and investment is not predicted to be significant.

5.11.2.1.3 *Land Use Patterns & Activities*

Pre-Mitigation Impacts

Proposed Wind Farm

Current land-use on the Proposed Wind Farm comprises coniferous forestry under Coillte management, peat bog and third-party lands currently being used for agriculture and forestry. Land-use in the wider landscape comprises a mix of agriculture, low density residential, renewable energy generation and commercial forestry.

There is no potential for impact on residential and commercial land use in the area. During the construction phase there may be slight interference with agricultural practices where farm practises may be redirected to other fields temporarily. Forestry felling will be paused in areas of works during the construction phase and trees will be felled to facilitate both temporary and permanent infrastructure.

Proposed Grid Connection

The current land use and activities at the Proposed Grid Connection footprint comprises of transport along the national, regional and local road network, as well as agriculture within the Propsoed Wind Farm site. Within the Proposed Wind Farm site, the Proposed Grid Connection underground cabling route will follow along pre-existing agricultural tracks.

Local temporary traffic disruptions are likely along the Proposed Grid Connection underground cabling route; however, once the construction of each element is complete, agricultural practises can return in areas surrounding the onsite infrastructure and traffic flow will resume as normal along public roads.

No more than a 100m section of trench will be open at any one time, with the second section only to be excavated once the reinstatement has been completed on the first. It is expected that the construction of the Grid Connection will take 12 months to complete.

Residual Impact

Due to the small footprint of the above ground elements of the Proposed Project infrastructure, on a site scale and even more so on a local scale, the residual effect is considered negative, direct, slight, permanent impact on land use and a negative, direct, slight short-term impact on activities

Significance of Effects

The effect on land use/activities due to the construction phase the Proposed Project infrastructure is not significant.

5.11.2.1.4 *Property Values*

As previously discussed in Section 5.9 above, the available scientific literature demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine conclusively that there is the potential for a significant effect on property prices as a result of the Proposed Wind Farm. The impact assessment on property prices outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.9, there is the potential for short-term, slight, negative, indirect impacts on property prices located within 1km of the proposed turbines during the construction phase of the Proposed Wind Farm.

Proposed Grid Connection

As noted in Section 5.9.2, 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. There is no potential for impact on property values in the area.

Mitigation and Monitoring Measures

- All mitigation relevant to property values, outlined above and the corresponding chapters: Ch. 10: Air Quality, Ch. 12: Noise and Vibration, Ch. 14: Landscape and Visual, and Ch. 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 Wind Farm construction works. Please refer to Ch. 18: 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 Guidelines and with cognisance of the draft Guidelines, adhering to the required setback distances from sensitive receptors set out in those documents.

Residual Impact

As outlined in Section 5.9 and whilst taking into consideration the mitigation measures that will be employed during the construction phase to protect residential amenity, it can be concluded that there is uncertain potential for short-term, negative, not significant impacts on property prices from the construction phase of the Proposed Wind Farm.

Significance of Effects

The effect on property values due to the construction of the Proposed Wind Farm is not significant.

5.11.2.1.5 *Tourism*

Pre-Mitigation Impact

Proposed Wind Farm

Given that there are currently no tourism attractions specifically pertaining to the Site, there are no impacts on tourism associated with the construction phase of the Proposed Wind Farm.

The Proposed Wind Farm site has some rural aesthetic qualities given the relative lack of buildings and infrastructure present on the site. The Proposed Wind Farm site is predominantly defined by commercial forestry and agricultural farmland. These views are common within the local area, with the surrounding landscape typically being dominated by either agricultural pastures or private forestry. Notably, both of these land uses are created due to a substantial degree of human interference and modification. Views from within the Proposed Wind Farm site are generally contained given the surrounding treelines and topography present. Regarding tourist attractions and amenity use surrounding the Proposed Wind Farm site, described in Section 5.11.2.2.5, traffic management safety measures will be in place, where required. Please see below for Traffic impact mitigation measures and Ch. 15: Material Assets for mitigation measures relating to the Proposed Wind Farm site.

Proposed Grid Connection

There are no tourism attractions located along the Proposed Grid Connection underground cabling route. The Proposed Grid Connection underground cabling route is located within the public road network for the majority of its length, however, tourists seeking to travel to various attractions in the wider landscape during the construction phase, can utilise other routes and therefore will not be significantly impacted by the construction phase of the underground cabling route along the local , national and regional road networks. The construction of the grid connection is expected to take 12 months and the location of the construction works will be transient in nature, with the extent of the section of road closed kept to a minimum.

Mitigation and Monitoring Measures

Section 5.11.2.2.5 below outlines the mitigation measures proposed in relation to traffic management.

Residual Impact

There will be a short term, negative, imperceptible, indirect impact on tourism in the wider landscape due to the construction phase of the Proposed Project.

Significance of Effects

The effect on tourism in the wider landscape due to the construction phase of the Proposed Project is not significant.

5.11.2.1.6 *Residential Amenity*

Pre-Mitigation Impact

Proposed Wind Farm

The potential for impacts on residential amenity is discussed in Section 5.10 above. There is potential for impacts on residential amenity during the construction phase of the Proposed Wind Farm due to air, traffic, noise and vibration emissions due to the presence of additional traffic and plant machinery.

Proposed Grid Connection

There is potential for impacts on residential amenity due to the construction of the Proposed Grid Connection. The Proposed Grid Connection underground cabling route will be located within the public road network for 24.07km, with a total length of 25km. As a result, there is potential impact for a rise in temporary traffic disruptions.

Mitigation and Monitoring Measures

All mitigation as outlined above and the corresponding chapters: Ch. 10: Air Quality, Ch. 12: Noise and Vibration, and Ch. 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. Please also refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Impact

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

Significance of Effects

The effect on residential amenity due to construction phase the Proposed Project is not significant.

5.11.2.2 Health and Safety

Pre-Mitigation Impacts

Proposed Wind Farm

Construction of the Proposed Wind Farm will necessitate the presence of a construction site and travel on the local public road network to and from the construction site. 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 short-term significant negative impact on health and safety.

Proposed Grid Connection

Construction of the Proposed Grid Connection will lead to an increased level of travel on the local. Regional and national roads by construction staff. This will have a short-term significant negative impact on health and safety.

Mitigation and Monitoring 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. 291/2013 - Safety, Health and Welfare at Work (Construction) Regulations 2013 and
- Safety, Health and Welfare at Work (Work at Height) Regulations 2006 (S.I. No. 318 of 2006).

The following measures below are also detailed in Appendix 4-5 Construction and Environment Management Plan. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of 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 where required. The developer is 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 Site where uncontrolled access is not permitted.
- 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 the Site. All staff will be trained to be aware of the risks associated with underground cables. All contractors that may visit the Site are made aware of the location of lines before they come on to Site.
- 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.
- Information on safe clearances will be provided to all staff and visitors.
- Signage indicating locations and health and safety measures regarding electrical cables will be erected in canteens and on Site.
- 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 2021*'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the Site Health and Safety Plan.

- The suitability of machinery and equipment for use near power lines will be risk assessed.
- All staff will be trained on operating voltages of electricity cables running the Site. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the Site are made aware of the location of lines before they come on to Site.
- When activities must be carried out beneath overhead lines, e.g., component delivery, 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.

The scale and scope of the project requires that a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) are required to 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*'.

The PSDP appointed for the construction stage shall be required to perform his/her 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 shall be required to perform his/her 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 Safe Pass 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

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

Residual Impact

With consideration of the implementation of the detailed mitigation measures there will be a short-term slight negative residual effect on health and safety during the construction phase of the Proposed Project.

Significance of Effects

Based on the assessment above the effects on health and safety during the construction phase of the Proposed Project are considered to be of slight significance.

5.11.2.2.2 *Air Quality: Dust and Exhaust Emissions*

Pre-Mitigation Impacts

Proposed Wind Farm

Potential dust and exhaust emission sources during the construction phase of the Proposed Wind Farm include upgrading of existing access tracks and construction of new access roads, turbine and meteorological mast foundations, temporary construction compound.

An increase in dust and exhaust emissions has the potential to cause a nuisance to sensitive receptors in the immediate vicinity of the Proposed Wind Farm site. The entry and exit of construction vehicles from the Proposed Wind Farm site entrance on the L-6254 local road 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. the transport of volumes of stone to be transported into the Proposed Wind Farm site also has the potential to create dust, which could affect nearby sensitive receptors. These effects will have a short-term, slight to imperceptible, negative, indirect effect and a short-term, slight, negative, indirect impact on air quality during construction of project infrastructure and transporting material to and from the Site respectively. The potential dust impacts that may occur during the construction phase of the Proposed Wind Farm and mitigation measures are further described in Ch. 10: Air Quality.

Proposed Grid Connection

Potential dust and exhaust emission sources during the construction phase of the Proposed Grid Connection will include the construction of the 110kV on-site substation, and the laying of c.25km of underground electrical cabling, horizontal directional drilling and any roadworks associated with this process.

These impacts will have a short-term slight, negative impact on air quality. The potential dust impacts may occur at construction phase of the Proposed Wind Farm are further described in Ch. 10: Air Quality.

Mitigation and Monitoring Measures

All mitigation as outlined in Ch. 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. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Impacts

With the implementation of the above measures for this construction phase, residual impacts on air quality from dust and exhaust emissions associated with construction activities and machinery are considered to be a short-term, slight to imperceptible, negative effect on air quality.

Significance of effects

The effects on air quality from dust and exhaust emissions during the construction phase of the Proposed Project are not considered to be significant.

5.11.2.2.3 *Water Quality*

Pre-Mitigation Impacts

Proposed Project

Potential health effects arise mainly through the potential for surface and groundwater contamination which can have significant long-term negative effects on public and private water supplies and subsequently human health. Notwithstanding this, the Proposed Project design and mitigation measures ensures that the potential for effects on the water environment will not be significant. Flooding of property can cause inundation with contaminated flood water. Flood waters can carry waterborne disease and contamination/effluent. Exposure to such flood waters can cause temporary health issues.

Mitigation and Monitoring Measures

Please see Appendix 4-7 of this EIAR for a compendium of mitigation measures to protect the hydrological resource in the vicinity of the Proposed Project.

A site-specific Flood Risk Assessment (Appendix 9-1) has been caried out for the Proposed Project, summarised in Section 9.3.2 The lack of Proposed Project infrastructure encroachment into flood zones, combined with the assessment of changes in permeable surfaces (Section 9.5.3.1) demonstrates that the risk of the Proposed Project contributing to downstream flooding is imperceptible. On-site (construction, operation and decommissioning phase) drainage control measures will ensure no downstream increase in local flood risk.

Residual Impacts

With the implementation of mitigation and monitoring measures outlined in Appendix 4-5 and 4-7, it is deemed that the construction phase of the proposed project will have a long-term, imperceptible negative impact on water quality.

Significance of effects

For the reasons outlined above, the effects on human health due to water quality from the Proposed Project during construction will not be significant.

5.11.2.2.4 *Noise and Vibration*

Proposed Wind Farm

There will be an increase in noise levels in the vicinity of the Site during the construction phase, as a result of heavy machinery and construction work which has the potential to cause a nuisance to sensitive receptors located closest to the Site. These effects will be short-term in duration, negative and

not significant. The noisiest construction activities associated with wind farm development are excavation and concrete pouring of the turbine bases. Excavation of a turbine base can typically be completed in five days however, and the main concrete pour is usually conducted within one day.

Construction noise at any given noise sensitive location will be variable throughout the construction project, depending on the activities underway and the distance from the main construction activities to the receiving properties. The potential noise impacts that will occur during the construction phase of the Proposed Wind Farm are further described in Ch. 12: Noise and Vibration.

Proposed Grid Connection

There will be an increase in noise levels in the vicinity of the Site during the construction phase, as a result of heavy machinery and construction work which has the potential to cause a nuisance to sensitive receptors located closest to the Proposed Grid Connection works. These effects will be short-term in duration.

Mitigation and Monitoring Measures

Best practice measures for noise control will be adhered to on-site during the construction phase of the Proposed Project to impacts associated with this phase of the development. Please refer to Section 12.6.1 of Ch. 12: Noise and Vibration and Ch. 18 Schedule of Mitigation and Monitoring Measures for a full list of measures. A brief selection of measures are provided below:

Residual Impact

With the implementation of the above mitigation measures, there will be a temporary to short-term, slight impact on health due to an increase in noise levels during the construction phase of the Proposed Project.

Significance of Effects

For the reasons outlined above, the effects on human health due to noise emissions from the Proposed Project during construction will be slight.

5.11.2.2.5 *Traffic and Transport*

Pre-Mitigation Impact

All deliveries of turbine components to the site will only be by way of this proposed turbine delivery routes. Non-turbine construction traffic will be comprised of Heavy Goods Vehicle (HGV) and Light Goods Vehicle (LGV) movements and will involve the delivery of construction materials to the site and the export of excess construction materials and plant from the site via the appropriate site entrance. It is proposed that all deliveries to the Site will follow the Turbine Delivery Route, the details of which are provided in Chapter 4 of this EIAR.

For the reasons outlined in Chapter 15.1.12, the pre-mitigation impact will be negative, temporary and slight in terms of severity.

Mitigation and Monitoring Measures

The construction of this development will require significant coordination and the following comprehensive set of mitigation measures will be put in place before and during the construction stage of the project in order to minimise the effects of the additional traffic generated by the Proposed Project.

Delivery of abnormal sized loads

- 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.
- Deliveries will be made at night and will be spread out over an approximate period of 5 weeks and will be agreed in advance with the relevant authorities.
- For each convoy there will be two police escort vehicles that will stop traffic at the front and rear of the convoy of 5 vehicles in addition to two escort vehicles provided by the haulage company.

Other traffic management measures

A Traffic Management Plan (TMP) is provided specifying details relating to traffic management and is included as Appendix 15-2 to this EIAR. Prior to the commencement of the construction phase of the Proposed Project a detailed Traffic Management Plan will be prepared by the Contractor for agreement with the relevant local authorities and An Garda Síochána. In the event that An Coimisiúin Pleanála decides to grant consent for the Proposed Project the final TMP will address the requirements of any relevant planning conditions, including any additional mitigation measures which are conditioned by the ACP. The TMP prescribes the following:

- **Traffic Management Coordinator** – a competent Traffic Management Co-ordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management.
- **Delivery Programme** – a programme of deliveries will be submitted to the relevant County Councils (Clare and Limerick) in advance of deliveries of turbine components to site. Liaison with the Local Authorities and Transport Infrastructure Ireland (TII) will be carried out where required regarding requirements such as delivery timetabling. The programme will ensure that deliveries are scheduled in order to minimise the demand on the local network and minimise the pressure on the access to the site.
- **Temporary traffic management measures during construction of Wind Farm Site at access junctions during construction –** Temporary measures including signage at access junctions on the L6254.
- **Temporary traffic management measures during construction of Grid Connection –** Including signage and implementation of temporary traffic diversions.
- **Information to locals** – Locals in the area will be informed of any upcoming traffic related matters e.g. temporary lane/road closures (where required) or delivery of turbine components at night, via letter drops and posters in public places. Information will include the contact details of the Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.
- **A Pre and Post Construction Condition Survey** – Where required by the Local Authorities, a pre-condition survey of roads associated with the Proposed Project will be carried out immediately prior to construction commencement to record an accurate condition of the road at the time. A post construction survey will be carried out after works are completed to ensure that any remediation works are carried out to a satisfactory standard. The timing of these surveys will be agreed with the local authority. All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the Local Authority Engineers.
- **Liaison with the relevant local authority** - Liaison with the County Councils and An Garda Síochána will be carried out during the delivery phase of the large turbine vehicles, when an escort for all convoys will be required. Once the surveys have been carried out and "prior to commencement" status of the relevant roads established, (in

compliance with the provisions of the CEMP), the relevant Roads Sections will be informed of the names and contact numbers for the Project Developer/Contractor Site Manager as well as the Site Environmental Manager.

- **Implementation of temporary alterations to road network at critical locations** – at locations highlighted in section 15.1.8.
- **Identification of delivery routes** – These routes will be agreed with the County Councils and adhered to by all contractors.
- **Delivery times of large turbine components** - The management plan will include the option to deliver the large wind turbine plant components at night in order to minimise disruption to general traffic during the construction stage.
- **Travel plan for construction workers** – While the assessment above has assumed the worst case in that construction workers will drive to the site, the contractor will be required to provide a travel plan for construction staff, which will include the identification of routes to / from the site.
- **Additional measures** - Various additional measures will be put in place in order to minimise the effects of the development traffic on the surrounding road network including wheel washing facilities on site and sweeping / cleaning of local roads as required.
- **Re-instatement works** - All road surfaces and boundaries will be re-instated to pre-development condition, as agreed with the local authority engineers.

Residual Impacts

With the implementation of the above mitigation measures, the effects will be slight during all of the construction stage, with the exception of the delivery of the abnormal loads, which will reduce from moderate to slight if these deliveries are undertaken during the night, as proposed. As such, a slight, temporary, negative effect is predicted.

Significance of Effects

No Significant Effects are predicted.

5.11.2.2.6 *Major Accidents or Natural Disasters*

Pre-Mitigation Impacts

Proposed Wind Farm

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Wind Farm. Seven risks (Critical Infrastructure Emergencies, Severe Weather, Flooding, Utility Emergencies, Traffic Incident, Contamination, and Fire/Gas Explosion) specific to the operational phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters.

Proposed Grid Connection

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Grid Connection. Seven risks (Severe Weather, Flooding, Traffic Incident, Contamination, Fire/Explosion, Collapse/Damage to structures, Loss of Critical Infrastructure) specific to the operational phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters. The risk register concludes that there is low potential for significant natural disasters to occur at the Proposed Grid Connection.

In both cases, there is at most low potential for significant natural disasters to occur which would effect the Proposed Project, with the likelihood of disasters being at worst 'very unlikely' to occur and having 'limited' consequences should they do so. This would correspond to a temporary, moderate, negative effect.

Mitigation and Monitoring Measures

Best practice mitigation and monitoring measures stated across all chapters, and compiled in Ch. 18: will be adhered to on-site during the construction phase of the Proposed Project.

Residual Impact

The risk of a major accident and/or disaster during the construction of the Proposed Project is considered 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management*' (DoEHLG, 2010).

It is considered that when the mitigation and monitoring measures outlined throughout the EIAR will ensure that no significant effects on population and human health related to natural disasters will occur. As such, a temporary imperceptible, negative effect is predicted on human health due to major accidents/ natural disasters

Significance of effects

For the reasons outlined above not significant effects on population in human health due to natural disasters will occur as a result of the Proposed Project.

5.11.2.2.7 *Shadow Flicker*

Shadow flicker, which occurs during certain weather conditions due to the movement of wind turbine rotor blades, as described in Section 5.3.3 of this chapter, can only occur during the operational phase of a wind energy development. There is therefore no shadow flicker impacts associated with the

construction phase of the Proposed Wind Farm or the construction or operational phase of the Proposed Grid Connection. Any shadow flicker effects that occur in the decommissioning phase of the proposed turbines will be short in duration and is dealt with under Section 5.11.3.2.7 below.

5.11.3 Operational Phase

5.11.3.1 Population

5.11.3.1.1 *Population Trends*

Pre-Mitigation Impacts

Proposed Wind Farm

The operational phase of the Proposed Project will have no impact on the population of the area with regard to changes to trends, population density, household size or age structure.

Proposed Grid Connection

The operational phase of the Proposed Grid Connection will have no impact on the population of the area with regard to changes to trends, population density, household size or age structure.

Residual Impact

No residual impacts.

Significance of Effects

No significance of effects.

5.11.3.1.2 *Employment and Investment*

Pre-Mitigation Impacts

The operational phase will present an opportunity for mechanical-electrical contractors and craftspeople to become involved with the maintenance and operation of the Proposed Project. On a long-term scale, the Proposed Project will directly create approximately 90 jobs during the operational phase relating to the maintenance and control of the Proposed Project, having a long-term slight positive effect.

The injection of money in the form of Community Gain income and landowner payments to the landowners who are participating in the Proposed Project, where a rental agreement 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 long-term positive impact on their cash flow. This will have a long-term slight positive indirect effect.

Rates payments for the Proposed Project will contribute significant funds to Clare County Council, which will be redirected to the provision of public services within the county. These services include provisions such as road upkeep fire services, environmental protection, street lighting, footpath maintenance etc. along with other community and cultural support initiatives. This will have a long-term slight positive indirect effect

Residual Effects

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

Significance of Effects

Based on the assessment above, the effects on employment and investment from the Proposed Project during operation will be slight and positive.

Proposed Community Benefit Scheme

Should the Proposed Project receive planning permission, there are substantial opportunities available for the local area in the form of Community Benefit Funds. The value of this fund will be directly proportional to the installed capacity and/or energy produced at the Site and will support and facilitate projects and initiatives including youth, sport and community facilities, schools, educational and training initiatives, and wider amenity heritage and environmental projects. Should the Proposed Project qualify under the Renewable Energy Support Scheme (RESS), a Community Benefit Fund of €2 per megawatt hour will be available to local residents under the Community Benefit Fund. Based on this value, the Proposed Project could potentially generate up to €5,450,000 for the Community Benefit Fund for the first 15 years of operation of the Proposed Wind Farm. If the Proposed Project does not qualify under RESS, a guaranteed fund of €1 per megawatt hour will be available to locals through the Community Benefit Fund. Based on the guaranteed fund of €1 per megawatt hour, the Proposed Project has the potential to generate up to €9,000,000 over the Proposed 35 year lifespan.

5.11.3.1.3 *Land Use Patterns and Activities*

Pre-Mitigation Impacts

Proposed Wind Farm

The permanent footprint of the Proposed Wind Farm (i.e. the area of the Wind Farm site that will have permanent infrastructure proposed) will occupy only a small percentage of the Site; 4.1% or 15.55 hectares of the overall 375-hectare Proposed Wind Farm site. Farming practices, nor forestry practices will be impacted during the operational phase.

As such, its small-scale relative to the Site and Population Study Area combined with its ability to coexist with ongoing site activities and activities within the landscape indicate that the Proposed Wind Farm will not impact significantly on other land uses within the Site and the wider area. This corresponds to a long-term, neutral, moderate effect.

Proposed Grid Connection

The Proposed Grid Connections footprint is limited to a small percentage of the Site. During the operational phase, farming practices will resume around the on-site substation and underground cabling route footprint, and traffic on the local, regional and national road network will continue as normal. The small scale of the substation relative to the Site, the underground cabling location being within the existing road corridor, and its ability to coexist with ongoing site activities and activities within the landscape indicate that the Proposed Grid Connection infrastructure will have no significant impact on other land-uses within the Site and the wider area.

Residual Impact

Due to the small footprint of the Proposed Project infrastructure on a Site scale and even more so on a local scale, the residual effect is considered negative, direct, not significant, long-term effect on land use and activities during the operational phase of the Proposed Wind Farm, with no identified impacts of the Proposed Grid Connection for the duration of the operational phase as this element of the Proposed Project is to be undergrounded.

Significance of Effects

The effect of the Proposed Project on land use and activities due to the operational phase of the Proposed Project will be not significant.

5.11.3.1.4 *Property Values*

Pre-Mitigation Impacts

Proposed Wind Farm

As noted in Section 5.9.1 above, the available scientific literature demonstrates that there is insufficient evidence from the scientific literature and studies conducted to determine conclusively that there is the potential for a significant effect on property prices as a result of the Proposed Wind Farm. The impact assessment on property prices outlined below takes a precautionary approach and assumes that based on the inconclusive evidence summarised above in Section 5.7, there is the potential for short-term slight impacts on property prices located within 1km of the proposed turbines during the operational phase of the Proposed Wind Farm.

Proposed Grid Connection

As noted in Section 5.9.2 above, 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. There is no potential for impact on property values in the area.

Mitigation and Monitoring Measures

- All mitigation relevant to property values, outlined above and the corresponding chapters: Ch. 10: Air Quality, Ch. 12: Noise and Vibration, Ch. 14: Landscape and Visual, and Ch. 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 Wind Farm construction works. Please refer to Ch. 18: 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 Guidelines and with cognisance of the draft Guidelines, 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 prices 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 Impact

It is on this basis that it can be concluded that there is uncertain potential for a short-term, negative, not significant impact on property prices from the operational phase of the Proposed Wind Farm Site.

Significance of Effects

The effect on property values due to the Proposed Wind Farm is not significant.

5.11.3.1.5 *Tourism*

Pre-Mitigation Effect

Proposed Wind Farm

There are no tourism attractions within or adjacent to the Proposed Site that could be affected by the operation of the proposed Wind Farm. The closest notable tourist attractions to the Proposed Wind Farm are both Doonbeg Golf Links and White Strand Beach, both located roughly 8km west of the Proposed Wind Farm site. There is potential for visibility for both these locations.

Based on the literature review in Section 5.6.3 the majority of studies indicate that wind farm developments do not deter visitors to tourist attractions or scenic landscapes where turbines are visually evident. There are no significant effects determined to arise.

Proposed Grid Connection

The Proposed Grid Connection underground cabling route will travel through the public road network and be located underground. There are no tourism attractions located along the Proposed Grid Connection underground cabling route. The nearest notable tourist attraction to the Proposed Grid Connection is Vandeleur Walled Garden and Visitor Centre, which is located in Kilrush, approximately 3km west of the Proposed Grid Connection at its nearest point. For all potential tourist attractions located along the Proposed Grid Connection underground cable route, there will be no visibility of this element of the proposed Grid Connection during the operational phase and therefore no effects are deemed to arise.

Residual Effects

It is considered that the Proposed Project will have no impact on the visitor experience to attractions in the wider landscape.

Significance of Effects

No significant effects on tourism are expected as a result of the Proposed Project.

5.11.3.1.6 *Residential Amenity*

Pre-Mitigation Effects

Proposed Wind Farm

Potential impacts on residential amenity during the operational phase of the Proposed Wind Farm could arise primarily due to noise, shadow flicker or changes to visual amenity. Detailed noise and shadow flicker modelling have been carried out as part of this EIAR, which shows that the Proposed Wind Farm will be capable of meeting all required guideline limits in relation to noise and the shadow

flicker set out in the Guidelines or the draft Guidelines if adopted. The noise and vibration assessment is detailed in Ch. 12: Noise and Vibration. It should be noted that the Proposed Wind Farm will operate in compliance with the noise thresholds imposed on the development by the consenting authority should permission be granted for the Proposed Project. The visual impact of the Proposed Wind Farm is addressed in Ch. 14: Landscape and Visual. The turbine locations have been designed to maximise turbine separation distances to dwellings in the area, with no turbines located within 740 metres of non-involved sensitive receptors, achieving the recommended four times turbine setback, set out in the draft Guidelines specifically for protecting visual amenity. The most significant effects on residential amenity are considered to be visual effects. Notwithstanding this, the most significant impact will be on residential receptors to the North of the Proposed Wind Farm, which will experience a long-term, moderate negative visual effect. As such the impact of the Proposed Wind Farm on Residential Amenity is long term, imperceptible – moderate and negative

Proposed Grid Connection

The Proposed Grid Connection will not effect residential amenity during the operational phase as it is located entirely underground and will therefore not have any noise and vibration effects during operation.

Mitigation and Monitoring Measures

- There are no turbines proposed within 740m (4 x tip height) of any sensitive receptors,
- All mitigation measures outlined in Ch. 12: Noise and Vibration and Ch. 14: 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.
- The Proposed Project will adhere to zero shadow flicker occurrences at any sensitive receptors.

Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of measures.

Residual Effects

The residual effect is considered to be a negative, slight, long-term impact residential amenity.

Significance of Effects

Based on the assessment above there will be no significant effects on residential amenity during the operational phase.

5.11.3.2 Health

5.11.3.2.1 *Health and Safety*

Proposed Wind Farm

Rigorous safety checks and continued maintenance are conducted on the turbines and ancillary infrastructure during operational phase to ensure there are no health and safety risks posed by the Proposed Wind Farm. This will have a potential long-term, slight impact on health and safety during the operation phase. Any waste generated at the Site will be managed in accordance the Waste Management Act 1996, as amended and under the relevant EU legislation.

Proposed Grid Connection

Rigorous safety checks and continued maintenance are conducted on the substation and ancillary infrastructure during design, construction, commissioning and operation to ensure the risks posed to staff and landowners are negligible. This will have a potential long-term, slight impact on health and safety during the operation phase.

Mitigation and Monitoring Measures

The following mitigation measures will be implemented during the operation of the Proposed Project to ensure that the risks posed to staff and landowners remain imperceptible throughout the operational life of the Proposed Project. Please refer to Ch. 18: Schedule of Mitigation and Monitoring Measures for a full list of mitigation and monitoring measures for 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.
- 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 Site as required for the ease and safety of operation of the wind farm. These signs include:
- Buried cable route markers at 50m (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 substation, which will be operated by Eirgrid/ESBN will be locked and fenced off from public access. The 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 and daily visits as required.

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

The components of a wind turbine are designed to last up to 30-35 years and are equipped with a number of safety devices to ensure safe operation during their lifetime. During the operation of the 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 Effect

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

Significance of Effects

Based on the assessment above the effects on health and safety during the operational life of the Proposed Project will be imperceptible.

5.11.3.2.2 *Noise and Vibration*

Pre-Mitigation Effect

Proposed Wind Farm

An assessment of the operational wind turbine noise levels has been undertaken in accordance with best practice guidelines and procedures as outlined in Ch. 12: Noise and Vibration. Once mitigation measures outlined in Ch. 12: Noise and Vibration are employed, the predicted noise levels associated with the Proposed Wind Farm will be within best practice noise criteria curves recommended in the Guidelines, therefore, it is not considered that a significant effect is associated with the Proposed Wind Farm.

Proposed Grid Connection

The Proposed Grid Connection will not have any significant effects on noise and vibrations during the Operational Phase of the Proposed Project.

Mitigation and Monitoring Measures

Please see Ch. 12: Noise and Vibration Section 12.6 for noise and vibration mitigation and monitoring proposals for the Proposed Project. Please refer to Ch. 18: 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 effects at the closest noise sensitive locations range from not significant to imperceptible. Please see Ch. 12: Noise and Vibration for details.

Significance of Effects

As stated in the noise assessment in Ch. 12: Noise and Vibration, it has been demonstrated that the relevant national guidance in relation to noise associated with proposed wind turbines can be satisfied. The effects are considered not significant.

5.11.3.2.3 *Air Quality: Dust and Exhaust Emissions*

Pre-Mitigation Effect

Proposed Wind Farm

The operational phase of the Proposed Wind Farm will generate additional traffic to the area in the form of light goods vehicles (LGVs) and heavy good vehicles (HGVs) visiting the site when necessary.

The addition of these vehicles to the site will produce dust and other emissions. However, the Proposed Wind Farm will produce electricity from a renewable resource over its envisaged 35 year lifespan of the Proposed Wind Farm, it is expected to effectively reduce carbon dioxide emissions that would have occurred if the same energy were generated by traditional fossil fuel plants. Therefore there will be a long-term, moderate, positive, direct effect on Air Quality.

Proposed Grid Connection

The operational phase of the Proposed Grid Connection will not require any additional traffic to the area. As such no significant effects will occur.

Residual Effects

Impacts 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 momentary and imperceptible effect. Overall, considering offsetting of dust and greenhouse gas emissions from fossil fuels as a result of the Proposed Project, there will be a long-term, overall moderate, positive, direct effect on Air Quality.

Significance of Effects

Through the offsetting of dust and greenhouse gas emissions from fossil fuels, the Proposed Project is considered have a moderate, positive effect on air quality

5.11.3.2.4 *Water Quality*

Pre-Mitigation Impact

Proposed Wind Farm

During the operational phase, all permanent drainage controls will be in place and the disturbance of ground associated with excavation works will be complete. Some minor maintenance works may be completed, such as maintenance of Site entrances, internal roads and hardstand areas. These works would be of a very minor scale and would be very infrequent. During such maintenance works there is a small risk associated with the 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. There will be a long-term, imperceptible, negative impact on human health due to water quality.

Proposed Grid Connection

The operational phase of the Proposed Grid Connection will not require any works that may impact water quality and runoff will not occur given the Proposed Grid Connection is located entirely underground. As such no significant effects on water quality are anticipated.

Mitigation and Monitoring Measures

The mitigation measures detailed in Ch. 9: Water will ensure all surface water runoff from upgraded roads and new road surfaces (including hardstand and turbine base areas) will be captured and treated prior to discharge/release. Settlement ponds, checks dams and buffered outfalls will prevent roads acting as preferential flowpaths by providing attenuation and water quality treatment. Please see Ch. 9: Water for details. The full list of mitigation and monitoring measures for the Proposed Project are detailed in Ch. 18: Schedule of Mitigation and Monitoring Measures.

Residual Effects

With the implementation of the Proposed Wind Farm drainage design and mitigation measures the residual effects are considered to be long term imperceptible negative effect on human health due to water quality.

Significance of Effects

Based on the assessment above, the effects on water quality will not be significant.

5.11.3.2.5 *Traffic and Transport*

Pre-Mitigation Effect

Proposed Wind Farm

Major component failures are considered unlikely and therefore the presence of abnormal loads vehicles and HGV's at the site is considered extremely rare. Visits to the on-site substation by Eirgrid/ ESBN and/or the Wind Farm operator for maintenance and inspection purposes will be done via LGVs with one or two visits per day.

Should a turbine component need replacing, the measures detailed in Section 5.6.2.2.5 and Ch. 15: Material Assets will be implemented. The pre-mitigation effect is anticipated to be long-term, neutral and imperceptible.

Proposed Grid Connection

No impacts on traffic and transport are anticipated as a result of the operation of the Proposed Grid Connection.

Residual Effects

Effects on local road users during the operational phase are considered to be a long term, negative imperceptible, direct impact.

Residual Effects

Effects on local road users during the operational phase are considered to be a long term, negative imperceptible, direct impact.

Significance of Effects

Based on the assessment above, the effects on traffic will be imperceptible.

5.11.3.2.6 *Major Accidents and Natural Disasters*

Pre-Mitigation Effects

Proposed Wind Farm

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Wind Farm. Seven risks (Critical Infrastructure Emergencies, Severe Weather, Flooding, Utility Emergencies, Traffic Incident, Contamination, and Fire/Gas Explosion)

specific to the operational phase have been identified and are presented in Ch.16: Major Accidents and Natural Disasters.

Proposed Grid Connection

A risk register has been developed which contains all potentially relevant risks identified during the operational phase of the Proposed Grid Connection. Seven risks (Severe Weather, Flooding, Traffic Incident, Contamination, Fire/Explosion, Collapse/Damage to structures, Loss of Critical Infrastructure) specific to the operational phase have been identified and are presented in Ch. 16: Major Accidents and Natural Disasters. The risk register concludes that there is low potential for significant natural disasters to occur at the Proposed Grid Connection.

Residual Effect

The impact assessment concludes that the risk of a major accident and/or disaster during the operational phase of the Proposed Project is considered to be 'low' in accordance with the '*Guide to Risk Assessment in Major Emergency Management'* (DoEHLG, 2010).

Mitigation and Monitoring Measures

- The Proposed Project will be designed and built 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.
- The Proposed Project will also be subject to a fire safety risk assessment in accordance with Ch. 19: of the Safety, Health and Welfare at Work Acts 2005 to 2014, which will assist in the identification of any major risks of fire on site, and mitigation of the same during operation.

Residual Effect

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 '*Guide to Risk Assessment in Major Emergency Management'* (DoEHLG, 2010).

It is considered that when the mitigation and monitoring measures outlined throughout the EIAR will ensure that no significant effects on population and human health related to natural disasters will occur. As such, a long-term, imperceptible, negative effect is predicted on human health due to major accidents/ natural disasters

Significance of Effects

Based on the above and the risk assessment in Ch. 16: Major Accidents and Natural Disasters, the effects to/from Major Accidents and Natural Disasters during the operational phase of the Proposed Project are not significant.

5.11.3.2.7 *Shadow Flicker*

Pre-Mitigation Effect

Proposed Wind Farm

Assuming worst-case conditions, a total of 42 sensitive receptors as a result of the Proposed Wind Farm may experience daily shadow flicker in excess of the Guidelines threshold of 30 minutes per day. The Guidelines total annual guideline limit of 30 hours is predicted to be exceeded at 5 no. sensitive receptors when the regional sunshine average of 30.56% is taken into account. As stated in Section 5.4 there are 108 no. sensitive receptors within 1.63km of the proposed turbines. Of the 42 no. sensitive receptors predicted to experience daily shadow flicker in excess of the current Guidelines threshold of 30 minutes per day, 10 no. are participating landowners and 5 no. are vacant or derelict. The Proposed Wind Farm will be compliant with the draft Guidelines shadow flicker requirements (i.e. zero shadow flicker occurrences, should they be adopted as currently proposed, while the planning application is being determined) via use of turbine control measures. Pre-mitigation, this effect would be long-term, slight and negative.

Proposed Grid Connection

There is no potential for the Proposed Grid Connection infrastructure to cause shadow flicker, and so no effect is predicted.

Proposed Mitigation Measures

Wind Turbine Control Measures

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.

A shadow flicker control unit allows a wind turbine to be programmed and controlled using the wind farm's Supervisory Control and Data Acquisition (SCADA) 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 avoid any shadow flicker 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, and 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.

In order 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.

1. *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.).*
2. *Recording the house number, time and duration of site visit and the observation point GPS coordinates.*
3. *Recording the nature of the sensitive receptor, its orientation, windows, landscaping in the vicinity, any elements of the built environment in the vicinity, vegetation.*
4. *In the event of shadow flicker being noted as occurring the details of the duration (times) of the occurrence will be recorded.*
5. *The data will then be sent to the wind farm operational team to confirm that the model and SCADA system are working.*
6. *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 also in areas outside Ireland that experience significantly longer periods of direct sunlight

Residual Effect

Following the implementation of the above mitigation measures, the draft Guidelines limit of zero shadow flicker occurrences at any sensitive receptors will be adhered to, which will result in a long-term, imperceptible, neutral residual effect from shadow flicker on human health.

Significance of Effects

Based on the assessment above and the mitigation measures proposed the effects related to shadow flicker will be not significant.

5.11.3.3 Interference with Communications Systems and EMF

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 5.8.4 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.

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.

Potential impacts on broadcast signals are discussed in detail in Ch. 15: Material Assets. The Proposed Project will have no residual impact on the telecommunications signals of any operator, due to distance from or absence of any links in the area.

5.11.4 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 (substation and underground cabling) will remain in place as it will form part of the national electricity grid under the control of ESBN / EirGrid.

The works required during the decommissioning phase are described in Section 4.6 in Ch. 4: Description of the Proposed Project. Any effect and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent, 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 4-6. This Decommissioning Plan follows the NatureScot (Previously Scottish Natural Heritage) guidance, *Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms* (SNH, 2013). 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 Construction and Environmental Management Plan (CEMP) in Appendix 4-5.

5.11.5 Cumulative and In-Combination Effects

For the assessment of cumulative effects, any other existing, permitted or proposed developments (wind energy or otherwise) have been considered. The potential cumulative effects of the Proposed Wind Farm, Proposed Grid Connection (together forming the Proposed Project) and other relevant developments has been carried out with the purpose of identifying what influence the Proposed Project will have on the surrounding environment when considered cumulatively.

Further information on projects considered as part of the cumulative assessment are given in Ch. 2: Background to the Proposed Project. The effects with the potential to have cumulative effects on population and human health are discussed below and in more detail in the relevant chapters: noise (Ch. 12: Noise and Vibration), visual effects (Ch. 14: Landscape and Visual) and traffic (Ch. 15: Material Assets).

5.11.5.1 Employment and Economic Activity

Cumulative projects within 25 kilometres of the Proposed Project which may be proposed, permitted or operational/existing contribute to short term employment during the construction stages and provide the potential for long-term employment resulting from maintenance operations. This results in a long-term slight positive effect.

5.11.5.2 Tourism and Amenity

There are no key identified tourist attractions pertaining specifically to the Site.

It is not considered that the Proposed Project together with other projects in the area will cumulatively affect any tourism infrastructure in the wider area. Wind farms are an existing feature in the surrounding landscape, which will assist in the assimilation of the Proposed Project into this environment. As also noted in Section 5.6 above, the conclusions from available research indicate there is a generally positive disposition among tourists towards wind development in Ireland.

It is on this basis that it can be concluded that there would be a long-term, imperceptible, cumulative, neutral effect from the Proposed Project and other developments in the area.

5.11.5.3 Traffic

Construction of the Proposed Project at the same time as projects located in the surrounding area has the potential to give rise to cumulative impacts on traffic. This is discussed in detail in Section 15.1.12.5 of the EIAR but in to summarise, without the implementation of mitigation measures proposed in Section 15.1.12.6 the cumulative impact of the Proposed Project in conjunction with other projects in the wider area will be temporary, negative and slight.

5.11.5.4 Air (Dust)

The nature of the Proposed Project is such that, once operational, it will have a long-term, moderate, positive effect on the air quality.

During the construction phase of the Proposed Project and the construction phase of other developments within 25 kilometres of the Site that are yet to be constructed, there will be minor emissions from construction plant and machinery and potential dust emissions associated with the construction activities. However, once the mitigation proposals, as outlined in Section 10.4.2 of Ch. 10: Air Quality are implemented during the construction phase of the Proposed Project, there will be no significant cumulative negative effects on air and climate.

The nature of the Proposed Project and other wind energy developments within 25 kilometres are such that, once operational, they will have a cumulative long-term, moderate, positive effect on the air quality and climate.

5.11.5.5 Health and Safety

The Proposed Project will have no significant effects in terms of health and safety. 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.

It is on this basis that it can be concluded that there would be a long-term imperceptible negative cumulative effect from the Proposed Project and other developments in the area.

5.11.5.6 Services

The rate payments from the Proposed Project and other projects in the area will contribute significant funds to Clare County Council, which will be redirected to the provision of public services within the County.

In addition, the injection of money into local services though the establishment of community benefit funds is also expected to be a long-term positive cumulative effect

5.11.5.7 Shadow Flicker

As outlined above, it is anticipated that there will be pre mitigation cumulative shadow flicker effects between the Existing Cahermurphy Wind Farm and the Proposed Cahermurphy West Wind Farm. It is proposed that a shadow flicker shut off system will be employed at the Site to ensure that dwellings will not be impacted by shadow flicker as a result of the Proposed Wind Farm in combination with other existing, permitted, or proposed wind farms.

5.11.5.8 Residential Amenity

Pre-Mitigation Effects

In the extremely unlikely event that all permitted and Proposed Projects as described in the cumulative assessment in Ch. 2: Background to the Proposed Project are constructed at the same time, there is the potential for a resulting short term, moderate, cumulative, direct, negative effects to occur on residential amenity, in relation to noise and vibration, dust, traffic, telecommunications and visual amenity.

Proposed Mitigation Measures

There are no turbines as part of the Proposed Project that will be located within 740 metres of any third-party sensitive receptors (4 times tip height set back distance set out in the draft Guidelines), with the nearest dwelling being located 752m from the nearest turbine. All mitigation as outlined under noise and vibration, dust, traffic, visual amenity and telecommunications in this EIAR will be implemented in order to reduce insofar as possible effects on residential amenity at properties located in the vicinity of the Proposed Project works, including along the proposed turbine and construction materials haul route.

Residual Effects

The Proposed Project will have a short-term, slight negative effect on residential amenity during construction works. During the operational phase, noise and shadow flicker from the proposed and permitted projects will be limited to below Guideline levels, resulting in a long-term, not significant residual impact from on residential amenity

Significance of Effects

Based on the assessment above there will be no significant direct or indirect effects.

5.12 Summary

Following consideration of the residual effects (post-mitigation) it is noted that the Proposed Project will not result in any significant effects on human beings in the area surrounding the Proposed Project. Following appropriate mitigation, shadow flicker will not be experienced at any property. There will also be positive effects on air quality, employment and investment as well as services as a result of the Proposed Project.

The Proposed Project will be constructed, operated and decommissioned in accordance with the design, best practice and mitigation that is described within this EIAR, ensuring that significant effects on population and human health employment and economic activity, land-use, residential amenity, community facilities and services, tourism, property values and health and safety are not anticipated at international, national or county scale.

5.13 EIA Classification Summary

Please see the below table for a summary of all identified impacts for the Proposed Project relating to population and human health.

Table 5-11 Impact Assessment Classification Summary – Proposed Wind Farm

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Population Trends	No identified impacts	Section 5.11.2.1.1 – No mitigation required	No identified impacts	Not Significant
Employment and Investment	Short-term, Slight, Positive	Section 5.11.2.1.2 – No mitigation required	Short-term, Slight, Positive	Not Significant
Land Use Patterns & Activities	Short, Slight, Negative	Section 5.11.2.1.3 – No mitigation required	Short-Term, Slight, Negative	Not Significant
Property Values	Short-Term, Slight, Negative	Section 5.11.2.1.4	Short-Term, Imperceptible, Negative	Not Significant
Tourism	Short-Term, Slight, Negative	Section 5.11.2.1.5	Short-Term, Imperceptible, Negative	Not Significant
Residential Amenity	Short-Term, Moderate, Negative	Section 5.11.2.1.6	Short-Term, Slight, Negative	Not Significant
Health & Safety	Short-term, Significant, Negative	Section 5.11.2.2	Short-Term, Slight, Negative	Not Significant
Air Quality: Dust and Exhaust Emissions	Short-Term, Imperceptible to Slight, Negative	Section 5.11.2.2.2	Short-Term, Imperceptible, Negative	Not Significant
Water Quality	Long-Term, Significant, Negative	Section 5.11.2.2.3	Long-Term, Imperceptible, Negative	Not Significant
Noise and Vibration	Short-Term, Not Significant, Negative	Section 5.11.2.2.4	Short-Term, Not Significant, Negative	Not Significant

Traffic and Transport	Temporary, Moderate, Negative	Section 5.11.2.2.5	Temporary, Slight, Negative	Not Significant
Major Accidents and Natural Disasters	Temporary, Moderate, Negative	Section 5.11.2.2.6	Temporary, Imperceptible, Negative	Not Significant
Shadow Flicker	N/A	N/A	N/A	N/A
Operational Phase				
Population Levels	No identified impacts	Section 5.11.3.1.1 – No mitigation required	No identified impacts	Not Significant
Employment and Investment	Long-Term, Slight, Positive	Section 5.11.3.1.2 – No mitigation required	Long-Term, Slight, Positive	Not Significant
Land Use Patterns and Activities	Long-term, Moderate, Neutral	Section 5.11.3.1.3 – No mitigation required	Long-term, Moderate, Neutral	Not Significant
Property Values	Short-Term, Slight, Negative	Section 5.11.3.1.4	Short-Term, Not-Significant, Negative	Not Significant
Tourism	No effect	Section 5.11.3.1.5 – No mitigation required	No Effect	Not Significant
Residential Amenity	Long-term, Imperceptible to Moderate, Negative	Section 5.11.3.1.6	Long-Term, Slight, Negative	Not Significant
Health and Safety	Long-term, Slight, Negative	Section 5.11.3.2.1	Long-Term, Imperceptible, Negative	Not Significant
Noise and Vibration	Long-term, Not Significant to Imperceptible, Negative	Section 5.11.3.2.2	Long-term, Not Significant, Negative	Not Significant
Air Quality; Dust and Exhaust Emissions	Long-Term, Imperceptible to Slight, Negative	Section 5.11.3.2.3	Long-Term, Imperceptible, Negative	Not Significant

Water Quality	Long-term, Imperceptible, Negative	Section 5.11.3.2.4	Long-term, Imperceptible, Negative	Not Significant
Traffic and Transport	Long-Term, Imperceptible, Negative	Section 5.11.3.2.5 – No mitigation required	Long-Term, Imperceptible, Negative	Not Significant
Major Accidents and Natural Disasters	Temporary, Moderate, Negative	Section 5.11.3.2.6	Temporary, Slight, Negative	Not Significant
Shadow Flicker	Long-Term, Slight, Negative	Section 5.11.3.2.7	Long-term, Imperceptible, Neutral	Not Significant
Decommissioning Phase				
Population and Human Health	Any impact and consequential effect that occurs during the decommissioning phase will be similar to that which occurs during the construction phase, however to a lesser extent and lesser duration, and the mitigation measures outlined in Section 5.11.2 will be implemented during the decommissioning phase also	Section 5.11.2	N/A	N/A

Table 5-12 Impact Assessment Classification Summary – Proposed Grid Connection

Topic	Pre-Mitigation Effect	Mitigation Section Reference	Residual Effect	Significance
Construction Phase				
Population Trends	No identified impacts	Section 5.11.2.1.1 – No mitigation required	No identified impacts	Not Significant

Employment and Investment	Short-term, Slight, Positive	Section 5.11.2.1.2 – No mitigation required	Short-term, Slight, Positive	Not Significant
Land Use Patterns & Activities	Short-Term, Slight, Negative	Section 5.11.2.1.3 – No mitigation required	Short-Term, Slight, Negative	Not Significant
Property Values	No Effect	N/A	No Effect	Not Significant
Tourism	No Effect	N/A	No Effect	Not Significant
Residential Amenity	Short-Term, Moderate, Negative	Section 5.11.2.1.6	Short-Term, Slight, Negative	Not Significant
Health & Safety	Short-term, Significant, Negative	Section 5.11.2.2	Short-Term, Slight, Negative	Not Significant
Air Quality: Dust and Exhaust Emissions	Short-Term, Slight , Negative	Section 5.11.2.2.2	Short-Term, Imperceptible, Negative	Not Significant
Water Quality	Long-Term, Significant, Negative	Section 5.11.2.2.3	Long-Term, Imperceptible, Negative	Not Significant
Noise and Vibration	Short-Term, Not Significant, Negative	Section 5.11.2.2.4	Short-Term, Not Significant, Negative	Not Significant
Traffic and Transport	Temporary, Moderate, Negative	Section 5.11.2.2.5	Temporary, Slight, Negative	Not Significant
Major Accidents and Natural Disasters	Temporary, Moderate, Negative	Section 5.11.2.2.6	Temporary, Imperceptible, Negative	Not Significant
Shadow Flicker	N/A	N/A	N/A	N/A
Operational Phase				
Population Levels	No identified impacts	Section 5.8.3.1.1 – No mitigation required	No identified impacts	Not Significant
Employment and Investment	Long-Term, Slight, Positive	Section 5.8.3.1.2 – No mitigation required	Long-Term, Slight, Positive	Not Significant

Land Use Patterns and Activities	No identified impacts	Section 5.8.3.1.3 – No mitigation required	No identified impacts	Not Significant
Property Values	Short-Term, Slight, Negative	Section 5.8.3.1.4	Short-Term, Imperceptible, Negative	Not Significant
Tourism	Long-term, Slight, Negative	Section 5.8.3.1.5	Long-Term, Imperceptible, Negative	Not Significant
Residential Amenity	No Impact	No Impact	No Impact	Not Significant
Health and Safety	Long-term, Slight, Negative	Section 5.8.3.2.1	Long-Term, Imperceptible, Negative	Not Significant
Noise and Vibration	Long-term, Imperceptible, Negative	Section 5.11.3.2.2	Long-term, Not Significant, Negative	Not Significant
Air Quality; Dust and Exhaust Emissions	No Impact	No Impact	No Impact	Not Significant
Water Quality	No Impact	No Impact	No Impact	Not Significant
Noise and Vibration	Long-Term, Not Significant, Negative	Section 5.8.3.2.5	Long-Term, Not Significant, Negative	Not Significant
Traffic and Transport	Long-Term, Imperceptible, Negative	Section 5.8.3.2.6 – No mitigation required	Long-Term, Imperceptible, Negative	Not Significant
Major Accidents and Natural Disasters	Temporary, Moderate, Negative	Section 5.8.3.2.7	Temporary, Slight, Negative	Not Significant
Shadow Flicker	N/A	N/A	N/A	Not Significant
Decommissioning Phase				
Population and Human Health	The Proposed Grid Connection cabling will remain within the road corridor upon decommissioning of the Proposed	Section 5.11.2	N/A	N/A

	Project, as such, no effects on population and human health are expected during the decommissioning phase.			

APPENDIX 1

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APPENDIX 2

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