Planning and Environmental Consultants

Environmental Impact Assessment Report (EIAR)

Taurbeg Wind Farm Extension of Operational Life

Chapter 5 – Population and Human Health

DOCUMENT DETAILS

Client:	**Taurbeg Ltd.**
Project Title:	**Taurbeg Wind Farm Extension of Operational Life**
Project Number:	**231030**
Document Title:	**Environmental Impact Assessment Report (EIAR)**
Document File Name:	**Ch. 5 Population and Human Health – F - 2025.06.25 - 231030**

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Rev	Status	Date	Author(s)	Approved By
01	Draft	24/11/2023	NS	KM
04	Draft	21.05.2024	NS	EM
F	Final	25.06.2025	NS	EM

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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 potential significant effects of the Proposed Project on population and human health and has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA), in particular the '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (EPA, 2022) and Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU and as transposed into Irish Law through Regulations in 2018 (S.I. No. 296 of 2018).

Please see section 1.1.1 of this EIAR for further details. A detailed description of the Proposed Project is provided in Chapter 4 of this EIAR.

Impacts of a proposed development that may impinge on human health, directly and indirectly, positively and negatively have been considered. The key issues examined in this chapter of the EIAR include employment, settlement and land use patterns, population and demographic trends, tourism and amenity, and human health (health and safety and shadow flicker). Vulnerability of the project to risk of major accidents and /or disasters is dealt with separately. Please see Chapter 16 Vulnerability to Natural Disasters for further details.

5.1.1 Statement of Authority

This section of the EIAR has been prepared by Natalia Stolarska and Micheal Cahill and reviewed by Eoin McCarthy, of MKO. Natalia is an Environmental Scientist with MKO having joined the company in September 2023. Since joining MKO, Natalia has become a member of the MKO Environmental Renewables Team which work on producing high quality Environmental Impact Assessment Reports for a variety of Renewable Energy clients.

Michéal Cahill is a Graduate Environmental Scientist with MKO with almost 1 years' experience in environmental consultancy. Michéal holds a first-class honours degree in Environmental Science at University of Galway and was awarded the Professor Emer Colleran Medal for his academic achievements. Prior to taking up his position with MKO in June 2024, Michéal previously worked as an environmental sustainability intern with RPS Group. Michéal has previous experience in the preparation and review of Environmental Impact Assessment Reports for both offshore and onshore wind farm projects, as well as aiding in the research and design phase of a proposed pumped hydroelectric storage plant.

Eoin is a Project Director with over 13 years of environmental consultancy experience. Eoin holds a B.Sc. (Hons) in Environmental Science from NUI, Galway. Eoin took up his position with MKO in June 2011. Eoin's key strengths and areas of expertise are in project management, environmental impact assessment, wind energy site selection and feasibility assessment.

5.1.2 Relevant Guidelines and Sources

In addition to the guidelines set out in the EPA 2022 report and Directive 2011/92/EU as amended by Directive 2014/52/EU, the following guidelines, plans and reports have also informed the preparation of this chapter:

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

- Department of Housing, Planning and Local Government (DoHPLG), Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2018);
- European Commission (EC), Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (2017);
- Department of the Environment, Heritage and Local Government Wind Energy Development Guidelines (2006);
- Department of the Environment, Heritage and Local Government Draft Wind Energy Development Guidelines (2019);
- 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.
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022)
- 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;
- Cork County Development Plan 2022-2028;
- 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.

5.1.3 Scoping

Section 2.9 of Chapter 2 of this EIAR describes the scoping and consultation exercise undertaken for the Proposed Lifetime Extension. The replies to the EIAR scoping exercise that are relevant to this chapter are set out below.

Health Service Executive

A scoping response was received from the Health Service Executive (HSE) on the 20th March 2024. The HSE requested a shadow flicker assessment is undertaken to identify any Sensitive Receptors which may be impacted by shadow flicker and noted that the assessment must include all proposed mitigation measures, including air quality due to the nature of the proposed construction works, generation of airborne dust has the potential to have significant impacts Sensitive Receptors. The response stated that a Construction Environmental Management Plan (CEMP) should be included in the EIAR which details dust control and mitigation measures. It should be noted that no construction works will be carried out as part of this project, therefore a CEMP will not be necessary. The HSE further stated that the Environmental Impact Assessment should examine all likely significant impacts and provide the following information for each:

- Description of the receiving environment;
- The nature and scale of the impact;
- An assessment of the significance of the impact;

- Proposed mitigation measures;
- Residual impacts.

Directive 2014/52/EU has an enhanced requirement to assess likely significant impacts on Population and Human Health. It is the experience of the 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 Lifetime Extension, 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
- Population and Human Health
- Water (Hydrology and Hydrogeology)
- Land and Soils
- Air, Dust and Odour
- Climate Change and Opportunity for Health Gain
- Noise and Vibration
- Waste Management
- Ancillary Facilities
- Cumulative Impacts

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

- Population and human health being discussed in Chapter 5 Population and Human Health
- Water being discussed in Chapter 9 Hydrology and Hydrogeology
- Land and soils being discussed in Chapter 8 Geology and Soils
- Air, dust and odour being discussed in Chapter 10 Air Quality
- Climate change being discussed in Chapter 11 Climate
- Noise and vibration being discussed in Chapter 12 Noise
- Waste management and ancillary facilities being discussed in Chapter 15 Material Assets

Furthermore, as recommended a shadow flicker assessment has been carried out for the Proposed Lifetime Extension in Section 5.5. The EIAR includes a description of the receiving environment in Chapter 4, with each chapter assessing impacts in relation to the:

- Nature and scale of the impact
- An assessment of the significance of the impact
- Proposed mitigation measures
- Residual impacts

Cumulative impacts are also assessed, with cumulative impacts on population and human health being assessed in Section 5.6.4.

Uisce Éireann

Uisce Éireann provided a response to a scoping request on the 7th of March 2024, outlining the measures for consideration in the scope of an Environmental Impact Assessment (EIA). This includes steps to avoid any adverse effects on Irish Water's 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.

Recommendations proposed by Uisce Éireann have been accounted for in Chapter 9 Hydrology and Hydrogeology and Chapter 15 Material Assets.

Fáilte Ireland

A scoping response was received from Fáilte Ireland on the 14th of March 2024 and provided the 'Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA', to inform the preparation of the Environmental Impact Assessment for the Proposed Lifetime Extension. 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 5.3.8 and Section 5.6.2.1.5, below, for further detail). These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2 of the guidance document, including 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 Chapter 4, with an assessment of alternative to the Proposed Project being discussed in Chapter 3 Reasonable Alternatives. Furthermore, the following matters have bene discussed across all impact assessment chapters of this EIAR:

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

5.1.4 Health and Safety

5.1.4.1 Turbine Safety

Turbines pose no threat to the health and safety of the general public. The 2006 WEDGs and the 2019 draft WEDGs 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 2006 WEDGs and the 2019 draft WEDGs 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[1], which correlates to a *Low* icing frequency.

[1] *Wind Power Icing Atlas (WIceAtlas) – IEA Ice Class 1 Category for Ireland (map). Available at: https://vtt.maps.arcgis.com/apps/instant/minimalist/index.html?appid=6d93b5e284104d54b4fb6fd36903e742*

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, which cover various aspects such as design, testing, and performance. 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, including those related to icing. It sets out criteria for the structural design, safety systems, and other aspects to ensure that wind turbines can operate safely and effectively in various environments.[4] As such, the Proposed Lifetime Extension, and like those across Ireland and in many other countries, is generally designed and assessed according to international standards, with the IEC standards being frequently employed in this process. Additionally, regulatory entities and energy authorities at the national level, such as the SEAI, often refer to and align their guidance with internationally recognized standards, including those established by the IEC, such as IEC 61400-1 for wind turbines. In conclusion, the Proposed Lifetime Extension adheres to the criteria specified in both the IEC 61400-1 design requirements and the SEAI guidance

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 are integral to the construction of the turbines. Lightning conduction cables, encased in protection conduits, follow the electrical cable run, from the nacelle to the base of the turbine. The conduction cables are earthed adjacent to the turbine base. The earthing system was installed during the construction of the turbine foundations.

5.1.4.2 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)[2] provides further practical information on EMF. Further details on the potential impacts of electromagnetic interference to telecommunications and aviation are presented in Chapter 15: Material Assets.

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

5.2 Assessment Methodology

[2] *ESB 2017 EMF & You'. Available at: https://esb.ie/docs/default-source/default-document-library/emf-public-information_booklet_v9.pdf?sfvrsn=0)*

5.2.1 Population

A desk-based assessment using sources and guidelines referenced in Section 5.1.2 above was undertaken to examine relevant information pertaining to the population impact assessment. Information on population statistics, employment and social data for the relevant Electoral Divisions (EDs) were obtained from the Central Statistics Office (CSO) for census year 2022. Fáilte Ireland's EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects was also considered in this assessment. See Section 5.3.8 below.

The Population Study Areas for this assessment focuses on the electoral divisions (ED) within which the Proposed Lifetime Extension and Proposed Offsetting Measures are located, namely Clonfert East and Mount Eagle, but it also refers to county and national statistics.

5.2.2 Human Health

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

The World Health Organisation's (WHO) defines health as:

> *"A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity".*[3]

5.2.2.1 National Guidance

In 2022 the Environmental Protect Agency published EIAR Guidelines which state 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 Lifetime Extension which may also have an impact on population and human health are discussed in this chapter but addressed in more detail in the following chapters: Chapter 8 Land Soil and Geology, Chapter 9 Hydrology and Hydrogeology, Chapter 10 Air Quality, Chapter 11 Climate, Chapter 12 Noise and Vibration, Chapter 13 Landscape and Visual, Chapter 15 Material Assets (including Traffic and Transport).

As referenced in the Department of Housing, Planning and Local Government (2018) *Guidelines for Planning Authorities and An Bord Pleanála*, (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 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.'*

[3] *World Health Organisation Constitution Available at: https://www.who.int/about/governance/constitution*

The EPA 2022 EIAR Guidelines[4] state 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 Section 3.3.6 the SEA Directive (2001/42/EC). The European Commission's SEA Implementation Guidance[5] states *'The notion of human health should be considered in the context of the other issues mentioned in paragraph (f) of the Directive, where paragraph f lists environmental factors such as soils, water, landscape, air etc. The Guidelines 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 EPA 2022 EIAR Guidelines 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'.*

5.2.2.2 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. 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 maybe 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;

[4] *Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA 2022)https://www.epa.ie/publications/monitoring-assessment/assessment/EIAR_Guidelines_2022_Web.pdf*
[5] *IMPLEMENTATION OF DIRECTIVE 2001/42 ON THE ASSESSMENT OF THE EFFECTS OF CERTAIN PLANS AND PROGRAMMES ON THE ENVIRONMENT, Available at: https://wayback.archive-it.org/12090/20151221015216/http://ec.europa.eu/environment/archives/eia/pdf/030923_sea_guidance.pdf*

- 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.

5.2.2.3 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 development 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.

5.2.3 Shadow Flicker

5.2.3.1 Background

The assessment methodology in this chapter follows the current adopted guidance for shadow flicker in Ireland is derived from the 2006 WEDGs and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012).

Shadow is an effect that occurs when rotating wind turbine blades cast shadows at a nearby property. Shadow flicker is an indoor phenomenon, which may be experienced by an occupant sitting in an enclosed room when sunlight reaching the window is momentarily interrupted by a shadow of a wind turbine's blade. Outside in the open, light reaches a viewer (person) from a much less focused source than it would through a window of an enclosed room, and therefore shadow flicker assessments have been undertaken for the nearby adjacent properties around the existing Taurbeg Wind Farm. The frequency of occurrence and the strength of any potential shadow flicker impact depends on several factors which are listed *in the Update of UK Shadow Flicker Evidence Base Department of Energy and Climate Change*[6] report and repeated in the 2019 draft WEDGs.

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 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 weather stations over a 25-year period showed that the mean cloud amount was at a minimum in April and maximum in July. Cloud amounts were less at

[6] *Parsons Brinckerhoff (2010) Update of UK Shadow Flicker Evidence Base Department of Energy and Climate Change. Department of Energy and Climate Change. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf*

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).

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

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

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

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

At distances of greater than approximately 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 2006 WEDGs, 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.

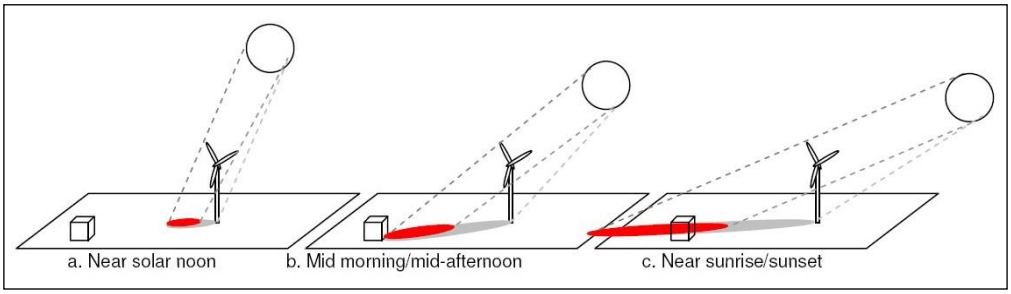

Figure 5-1 Shadow-Prone Area as Function of Time of Day (Source: Shadow Flicker Report, Helimax Energy, Dec 2008)

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

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

At a distance, the turbine blades do not cover the sun but only partly mask it, substantially weakening the shadow. This effect occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a very weak impact is observed at distance from the turbines. (Source: Update of Shadow Flicker Evidence Base, UK Department of Energy and Climate Change, 2010).

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

Where shadow flicker is predicted to occur at a specific location, this does not imply that it will be witnessed. Potential occupants of a property may be sleeping or occupying a room on another side of the property that is not subject to shadow flicker, or completely absent from the location during the

time of shadow flicker events. As shadow flicker usually occurs only when the sun is at a low angle in the sky, i.e., very early in the morning after sunrise or late in the evening before sunset, even if there is a bedroom on the side of the property affected, the shadow flicker may not be witnessed if curtains or blinds in the bedroom are closed.

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

The direction of wind turbine blades changes according to wind direction, as the turbine rotor turns to face the wind. 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.

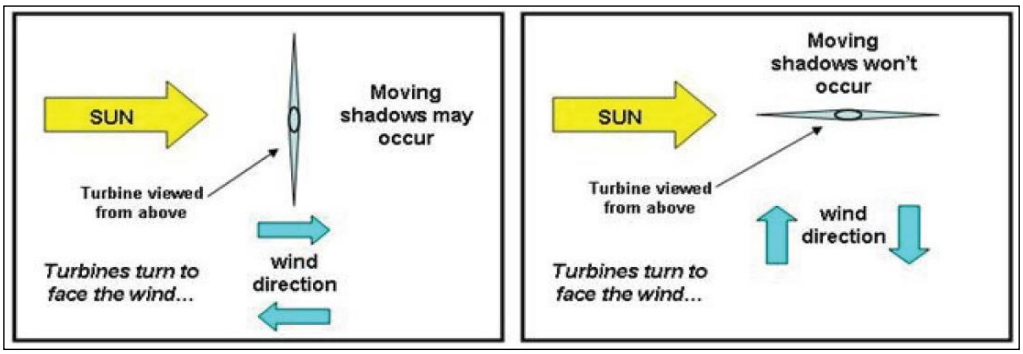

Figure 5-2: Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environment Power LLC

7. ***Rotation of turbine blades:***

Shadow flicker occurs only if there is sufficient wind for the turbine blades to be continually rotating. Wind turbines begin operating at a specific wind speed referred to as the 'cut-in speed', i.e., the speed at which the turbine 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, no shadow flicker will occur.

5.2.3.2 Guidance

The current adopted guidance for shadow flicker in Ireland is derived from the 2006 WEDGs and the 'Best Practice Guidelines for the Irish Wind Energy Industry' (Irish Wind Energy Association, 2012). The 2006 WEDGs 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 existing turbine locations (i.e. for the Proposed Lifetime Extension, this is assumed at 824m based on a rotor diameter of 82.4 metres). There are 2 no. Sensitive Receptors (H10 and H33) within the Study Area.

The 2006 WEDGs recommend that shadow flicker at neighbouring offices and dwellings within 500 metres of an existing turbine location should not exceed a total of 30 hours per year or 30 minutes per day. The Taurbeg Wind Farm was granted permission prior to the 2006 WEDGs being published. However, as shown in Section 5.5.1 there is no shadow flicker predicted for houses in the study area. Therefore, the existing turbines comply with the 2006 WEDGs.

The 2006 WEDGs are currently under review. The DoHPLG released the 2019 draft WEDGs which were released for public consultation in December 2019. The consultation period closed in February 2020; however, no update or final guidelines were released. The 2019 draft WEDGs recommended local planning authorities and/or An Bord Pleanála impose conditions to ensure that:

"no existing dwelling or other affected property will experience shadow flicker as a result of the wind energy development subject of the planning application and the wind energy development shall be

installed and operated in accordance with the shadow flicker study submitted to accompany the planning application, including any mitigation measures required."

The 2019 draft WEDGs 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 2025 published in April 2025 does not state when the revised Wind Energy Guidelines will be issued. At the time of submission of this application, there has been no public consultation or finalisation of new guidelines.

5.2.3.3 Shadow Flicker Prediction Methodology

The occurrence of shadow flicker can be precisely predicted using specialist computer software programmes specifically developed for the wind energy industry, such as ReSoft WindFarm, WindPRO, WindFarmer (DNV.GL) or AWS OpenWind. 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 version 4.0.423 has been used to predict the level of shadow flicker associated with the Proposed Lifetime Extension. Wind PRO is a commercially available software tool that enables developers to analyse, design and optimise wind farm designs. It allows existing turbine layouts to be optimised for maximum energy yield whilst taking account of environmental, planning and engineering constraints. WindPRO is one of the three key computer models used by the industry and it has been shown that the outputs of these packages do not have significant differences between them.[7]

5.2.3.4 Shadow Flicker Study Area

At the outset of the project, during the constraints mapping process, all sensitive receptors within 2km of the Proposed Lifetime Extension were identified and mapped. In addition, a planning history search to identify properties that may have been granted planning permission, but not yet been constructed, was carried out. These properties were also added to the sensitive receptors' dataset.

For the purposes of this assessment, a 'Sensitive Receptor' has been defined as a habitable dwelling.

The Shadow Flicker Study Area for the shadow flicker assessment is ten times the rotor diameter (82.4m rotor diameter x 10 = 824m) in accordance with the 2006 WEDGs. There are 2 no. Sensitive Receptors located within the Study Area – H10 which is 731m from T8 and H33 which is 821m from T8. However, there is 1 no. Sensitive Receptor (H28) located at 829m from T10 which is outside of the Study Area but for completeness, it is included in the Shadow Flicker Study Area. The Shadow Flicker software modelled 3 no. Sensitive Receptors for potential shadow flicker impact. None of these properties are theoretically predicted to experience shadow flicker. The Shadow Flicker Study Area and Sensitive Receptors locations are shown in Figure 5-3.

[7] *Parsons Brinckerhoff (2010) Update of UK Shadow Flicker Evidence Base Department of Energy and Climate Change. Department of Energy and Climate Change. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf*

Map Legend

- Taurbeg EIAR Site Boundary
- Existing Turbines
- Shadow Flicker Study Area (824m)
- Sensitive Receptors in Shadow Flicker Study Area

Drawing Title
Shadow Flicker Study Area

Project Title
Taurbeg Wind Farm Extension of Operational Life

Drawn By	Checked By
NS	EMcC
Project No. 231030	Drawing No. Figure 5-3
Scale 1:12,000	Date 2024-11-20

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5.2.3.4.1 Assumptions and Limitations

Due to the latitude of Ireland shadow flicker impacts are only possible at properties 130 degrees either side of north (i.e., a shadow flicker event can occur within a 260-degree span), as turbines do not cast shadows on their southern side[8]. As such properties located outside of this potential shadow flicker zone (50 degrees either side of south) will not be impacted. However, in this assessment, all 4 no. Sensitive Receptors within 360 degrees of the existing turbine locations out to 824m were assessed for shadow flicker impact.

At each property, and or the purposes of this shadow flicker assessment, the software package WindPRO version 4.0.423 has been used to predict the level of shadow flicker associated with the Proposed Lifetime Extension. The WindPRO modelling software produced shadow flicker calculations based on 4 No. notional windows facing north, east, south and west, labelled Windows 1, 2, 3 and 4 respectively. The methodology below is standard for all modelling software packages and cannot be manipulated per site i.e., the conservative approach of assuming shadow flicker from the north, south, east and west of each receptor is modelled. The degrees from north value for each window is:

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

Each window measures one-metre-high by one-metre-wide and is assumed to be vertical. The centre height of each window is assumed to be two metres above ground level and 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 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.

The following assumptions are considered in software modelling output for shadow flicker:

- The sun is assumed to be in clear cloudless skies at all times 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.
- The wind direction is assumed to be worst case with the turbine rotor always facing the house to present its maximum aspect to receptors in all directions.

These conservative assumptions calculate all potential times during the year that shadow flicker has the potential to occur at each property. In reality however, the sky will not be cloudless during all daytime hours, wind will not blow at all times, nor will it blow in a constant direction during times when shadow flicker may occur. The total annual shadow flicker calculated for each property assumes 100% sunshine during daytime hours, as referred to above. However, weather data for this region shows that the sun shines on average for 33.4% of the daylight hours per year. This percentage is based on Met Éireann data recorded at Cork Airport, the nearest meteorological station, over the 30-year period from 1991 to 2020 (www.met.ie). The actual sunshine hours within the Shadow Flicker Study Area and therefore the percentage of time shadow flicker could actually occur is 33.4% of the predicted hours. Table 5-18 below lists the annual shadow flicker calculated for each property when the regional average of 33.4% sunshine is taken into account, to give a more accurate annual average shadow flicker prediction. Table

[8] *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/

5-18 in Section 5.5 of this chapter also outlines whether a shadow flicker mitigation strategy is required for each property to mitigate potential exceedances of the daily and/or annual threshold figure.

5.3 Population

5.3.1 Receiving Environment

5.3.1.1 Proposed Lifetime Extension

Information regarding population and general socio-economic data were sourced from the Central Statistics Office (CSO), the County Cork County Development Plan 2022-2028, Fáilte Ireland and the literature and guidelines as listed in Section 5.1.2 above.

The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2022, the most recent census for which a complete dataset is available, also the Census of Ireland 2016, the Census of Agriculture 2020 and from the CSO website (www.cso.ie). Census information is divided into State, Provincial, County, Major Town, and Electoral Division (ED) level.

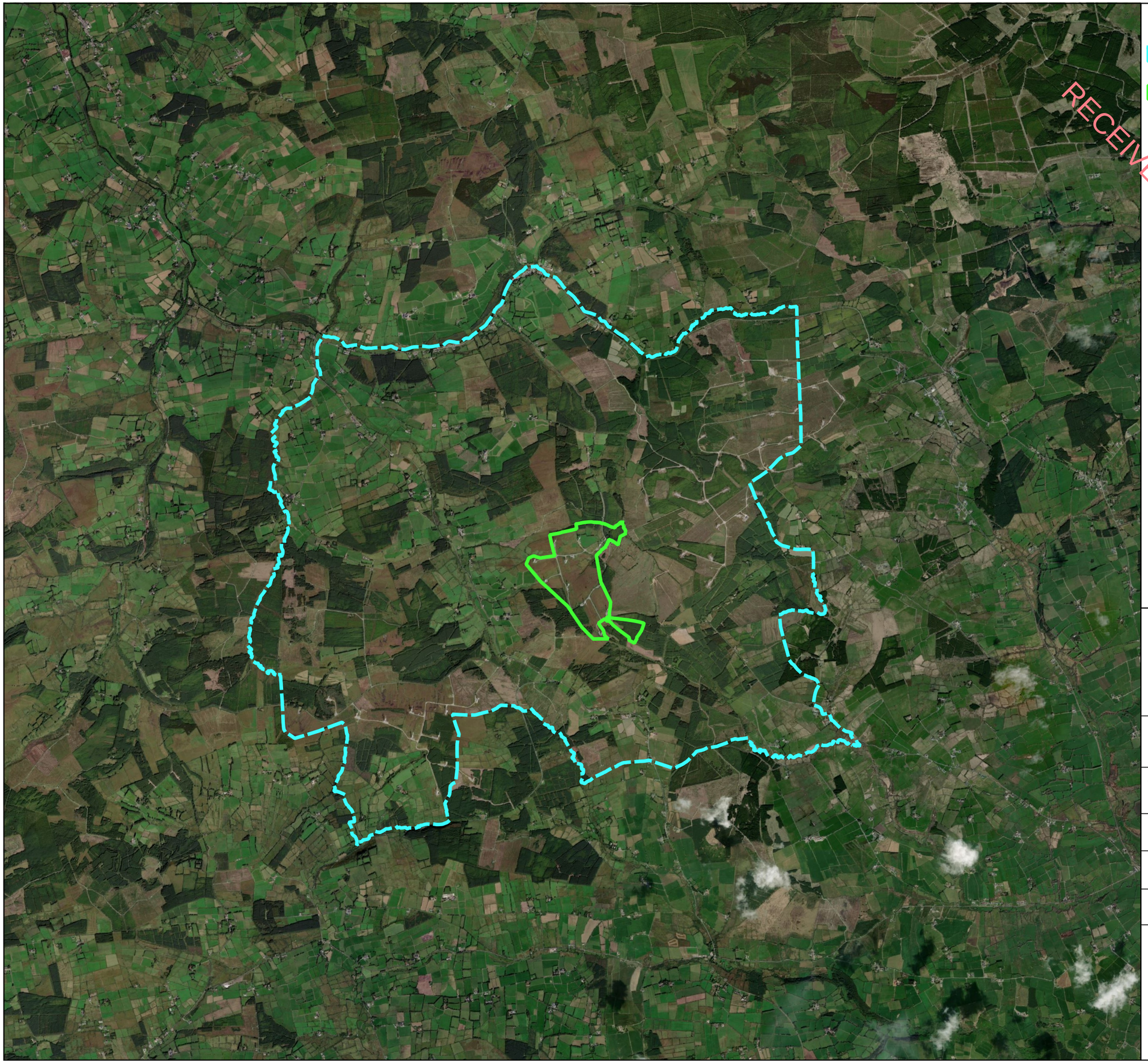
Taurbeg Wind Farm is located 3.5km south of Rockchapel and 10.5km northwest of Newmarket, Co. Cork. The Site comprises lands in the townlands of Taurbeg, Glasheenanargid and Taurmore. The Site covers an area of approximately 112 hectares (ha) with a development footprint of approximately 3.37 hectares.

Current land-use within the site is renewable energy production, peat bogs, agricultural pastures, coniferous forestry and transitional woodland scrub. No changes to the current landuse or landcover are proposed for the Site.

Within the wider landscape, land use comprises renewable energy production, agricultural pastures, commercial forestry, transitional woodland scrub and peat bogs.

In order to assess the population in the vicinity of the Site the Proposed Lifetime Extension Population Study Area is defined in terms of the Electoral Divisions (EDs) within which the Site is located. The Proposed Lifetime Extension lies within one ED: Clonfert East as shown in Figure 5-4. Clonfert East will be referred to hereafter as the Proposed Lifetime Extension Population Study Area for this chapter. The Proposed Lifetime Extension Population Study Area has a population of 355 persons, as of 2022 and comprises a total land area of 41km^2 (Source: CSO Census of the Population 2022).

There are 6 Sensitive Receptors located within 1km of the existing turbine locations and 70 within 2km of the existing turbine locations. No sensitive receptors exist within 500m of the existing turbine locations. The closest Sensitive Receptor (H10) is located approximately 731 metres from the nearest turbine location (T8).



Map Legend

- Proposed Lifetime Extension Population Study Area
- EIAR Site Boundary

Drawing Title
Proposed Lifetime Extension Population Study Area

Project Title
Taurbeg Wind Farm Extension of Operational Life

Drawn By	Checked By
MC	NS
Project No.	Drawing No.
231030	Figure 5-4
Scale	Date
1:50,000	2025-06-09

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5.3.1.2 Proposed Offsetting Measures

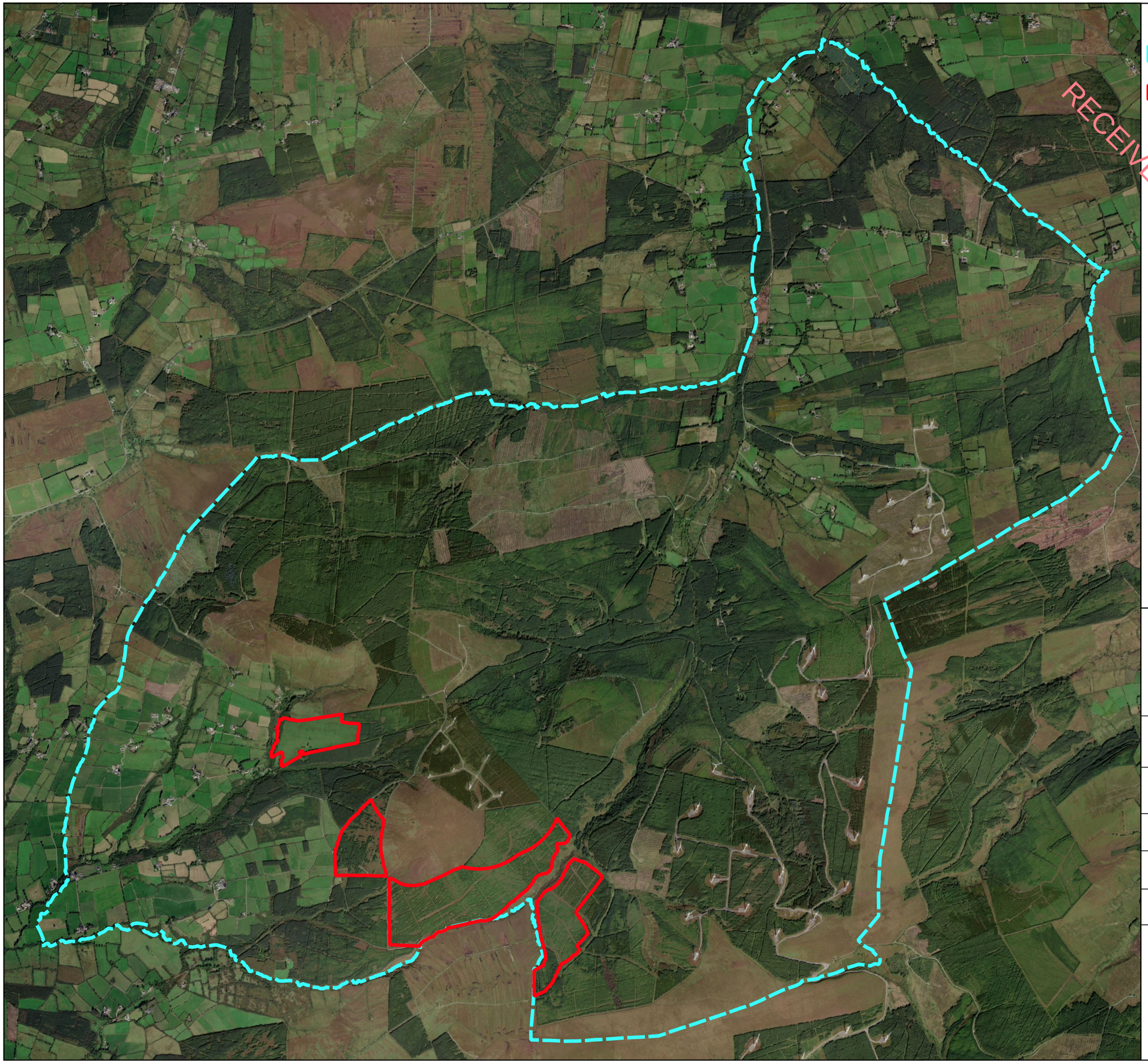
Information regarding population and general socio-economic data were sourced from the Central Statistics Office (CSO), the Kerry County Development Plan 2022-2028, Fáilte Ireland and the literature and guidelines as listed in Section 5.1.2 above.

The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2022, the most recent census for which a complete dataset is available, also the Census of Ireland 2016, the Census of Agriculture 2020 and from the CSO website (www.cso.ie). Census information is divided into State, Provincial, County, Major Town, and Electoral Division (ED) level

The Proposed Offsetting Lands are approximately 8km east of Castleisland, Co. Kerry. Proposed Offsetting Lands measure approximately 123.2ha. Current land use within the Proposed Offsetting Lands include commercial forestry, peat bogs and improved agricultural grassland.

Within the wider landscape, land use comprises of commercial forestry, renewable energy production, agricultural pastures, peat bogs and low density residential.

In order to assess the population in the vicinity of the Site the Proposed Offsetting Measures Population Study Area is defined in terms of the Electoral Divisions (EDs) within which the Site is located. The Proposed Offsetting Lands lie within one ED: Mount Eagle. Mount Eagle will be referred to hereafter as the Proposed Offsetting Measures Population Study Area for this chapter. The Proposed Offsetting Measures Population Study Area has a population of 174 persons, as of 2022 and comprises a total land area of 36.67km^2 (Source: CSO Census of the Population 2022). Please see Figure 5-5 for further details.



Map Legend

- Proposed Offsetting Measures Population Study Area
- Proposed Offsetting Lands

Drawing Title
Proposed Offsetting Measures Population Study Area

Project Title
Taurbeg Wind Farm Extension of Operational Life

Drawn By	Checked By
MC	NS
Project No.	**Drawing No.**
231030	Figure 5-5
Scale	**Date**
1:30,000	2025-06-09

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5.3.2 Population Trends

5.3.2.1 Proposed Lifetime Extension

In the period between the 2016 and the 2022 Census, the population of Ireland increased by 8.1%. During this time, the population of County Cork increased by 7.6%. The data presented in Table 5-1 shows that the population of the Proposed Lifetime Extension Population Study Area decreased by 6.8% between 2016 and 2022. This rate of population growth is significantly lower than that recorded at State level and the County level.

Table 5-1: Population 2016 and 2022 – Proposed Lifetime Extension (Source: CSO)

Area	Population Change		% Population Change
	2016	2022	2016 - 2022
State	4,761,865	5,149,139	8.1%
County Cork	542,868	584,156	7.6%
Proposed Lifetime Extension Population Study Area	381	355	-6.8%

5.3.2.2 Proposed Offsetting Measures

In the period between the 2016 and the 2022 Census, the population of County Kerry increased by 5.9%. The data presented in Table 5-2 shows that the population of the Proposed Offsetting Measures Population Study Area decreased by 1.69% between 2016 and 2022. This rate of population growth is significantly lower than that recorded at State level and the County level

Table 5-2 Population 2016 and 2022 – Proposed Offsetting Measures (Source: CSO)

Area	Population Change		% Population Change
	2016	2022	2016 - 2022
State	4,761,865	5,149,139	8.1%
County Kerry	147,707	156,458	5.9%
Proposed Offsetting Measures Population Study Area	177	174	-1.69%

5.3.3 Population Density

5.3.3.1 Proposed Lifetime Extension

The population densities recorded within the State, County Cork, and the Proposed Lifetime Extension Population Study Area during the 2016 and 2022 Census are shown in Table 5-3.

Table 5-3: Population Density in 2016 and 2022 – Proposed Lifetime Extension (Source: CSO)

Area	Population Density (Persons per square kilometre)	
	2016	2022
State	67.8	73.3
County Cork	72.3	77.8
Proposed Lifetime Extension Population Study Area	9.2	8.6

The population density of the Proposed Lifetime Extension Population Study Area recorded during the 2022 Census was 8.6 persons per square kilometre (km^2). This figure is significantly lower than the national population density of 73.3 persons per km^2 and the Cork County population density of 77.8 persons per km^2.

5.3.3.2 Proposed Offsetting Measures

The population densities recorded within the State, County Kerry, and the Proposed Offsetting Measures Population Study Area during the 2016 and 2022 Census are shown in Table 5-4.

Table 5-4: Population Density in 2016 and 2022 – Proposed Offsetting Measures (Source: CSO)

Area	Population Density (Persons per square kilometre)	
	2016	2022
State	67.8	73.3
County Kerry	30.73	32.55
Proposed Offsetting Measures Population Study Area	4.83	4.75

The population density of the Proposed Offsetting Measures Population Study Area recorded during the 2022 Census was 4.75 persons per square kilometre (km^2). This figure is significantly lower than the national population density of 73.3 persons per km^2 and the Kerry County population density of 32.55 persons per km^2.

5.3.4 Household Statistics

5.3.4.1 Proposed Lifetime Extension

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

Table 5-5: Number of Household and Average Household Size 2016 and 2022 – Proposed Lifetime Extension (Source: CSO)

Area	2016		2022	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
State	1,702,289	2.75	1,841,152	2.74
County Cork	195,853,	2.83	211,362	2.79
Proposed Lifetime Extension Population Study Area	135	2.72	137	2.61

The figures in Table 5-5 show that the number of households within the State and Proposed Lifetime Extension Population Study Area has increased from 2016 to 2022, while the number of households in County Cork has also increased significantly, with the average size (persons) of the household decreasing by 0.04 persons per household from 2016 to 2022. Average household size recorded within the Proposed Lifetime Extension Population Study Area during the 2022 Census is below both the County and State level. The recorded average household size for the state level saw a slight decrease of 0.1 persons per household for 2022 along with a slight decrease in average size for the Proposed Lifetime Extension Population Study Area.

5.3.4.2 Proposed Offsetting Measures

The number of households and average household size recorded within the State, County Kerry, and the Proposed Offsetting Measures Population Study Area during the 2016 and 2022 Censuses are shown in Table 5-6.

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

Area	2016		2022	
	No. of Households	Avg. Size (persons)	No. of Households	Avg. Size (persons)
State	1,702,289	2.75	1,841,152	2.74
County Kerry	195,853,	2.60	211,362	2.57
Proposed Offsetting Measures Population Study Area	135	2.72	137	2.64

The figures in Table 5-6 show that the number of households within the State and Population Study Area has increased from 2016 to 2022, while the number of households in County Kerry has also increased significantly. The average size (persons) within households decreased by 0.03 persons from 2016 to 2022. Average household size recorded within the Proposed Offsetting Measures Population Study Area during the 2022 Census is below the State level, but not county level. The recorded average household size for the state level saw a slight decrease of 0.01 persons per household for 2022, with a significant decrease of 0.08 persons per household within the Proposed Offsetting Measures Population Study Area.

5.3.5 Age Structure

5.3.5.1 Proposed Lifetime Extension

Table 5-7 presents the population percentages of the State, County Cork, and the Proposed Lifetime Extension Population Study Area within different age groups as defined by the Central Statistics Office during the 2022 Census. This data is also displayed in Figure 5-6.

Table 5-7: Population per Age Category in 2022 – Proposed Lifetime Extension (Source: CSO)

Area	Age Category				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	19.7%	12.5%	27.6%	25.1%	15.1%
County Cork	19.5%	12.6%	27.2%	25.5%	15.3%
Proposed Lifetime Extension Population Study Area	18.3%	8.7%	21.1%	26.8%	25.1%

The age structure reported in the Proposed Lifetime Extension Study Area is broadly similar to those recorded at State and county level for most categories. However, the Proposed Lifetime Extension Study Area reported a greater proportion of the population within the 65+ age category when compared to the State and County. The age range 15-24 age category has a lower percentage in the Proposed Lifetime Extension Study Area when compared with County and State level., The highest population percentage in the Proposed Lifetime Extension Study Area occurs within the 45-64 age category, whereas the State and County's highest population percentage occurs within the 25-44 age category.

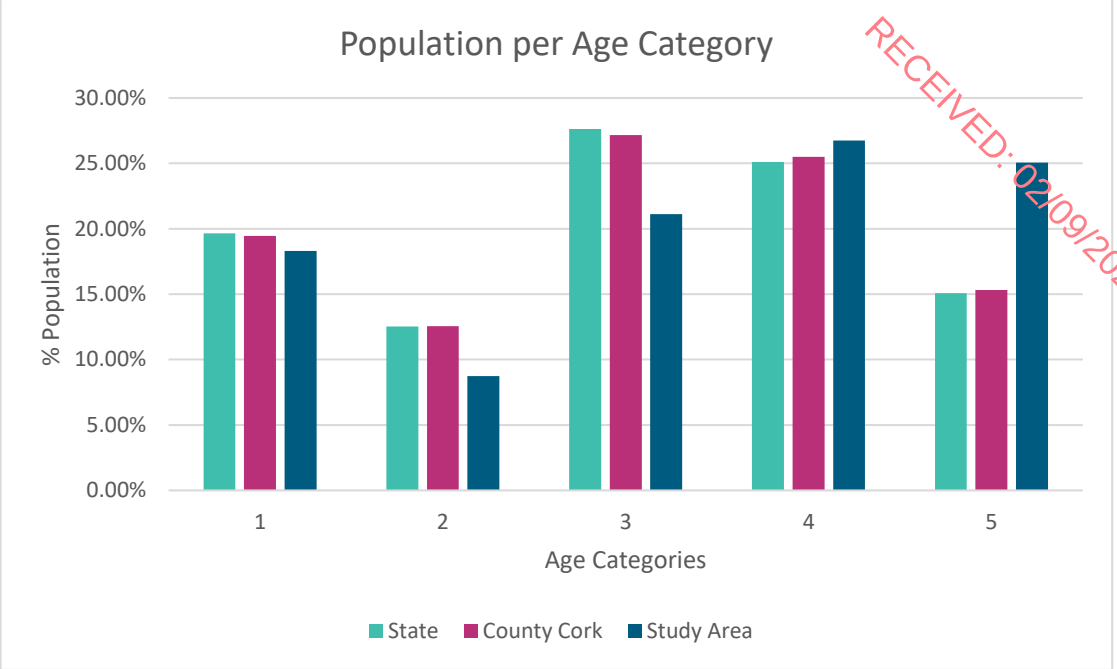

Figure 5-6: Population per Age Category in 2022 – Proposed Lifetime Extension (Source: CSO)

5.3.5.2 Proposed Offsetting Measures

Table 5-8 presents the population percentages of the State, County Cork, and the Proposed Offsetting Measures Population Study Area within different age groups as defined by the Central Statistics Office during the 2022 Census. This data is also displayed in Figure 5-7.

Table 5-8: Population per Age Category in 2022 – Proposed Offsetting Measures (Source: CSO)

Area	Age Category				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	19.7%	12.5%	27.6%	25.1%	15.1%
County Cork	19.5%	12.6%	27.2%	25.5%	15.3%
Proposed Offsetting Measures Population Study Area	18.3%	8.7%	21.1%	26.8%	25.1%

The age structure reported in the Proposed Offsetting Measures Population Study Area is broadly similar to those recorded at State and county level for most categories. However, the Proposed Offsetting Measures Population Study Area reported a much greater proportion of the population within the 65+ age category when compared to the State and County. The age range 25-44 age category has a lower percentage in the Proposed Offsetting Measures Population Study Area when compared with County and State level., The highest population percentage in the Similar to the County statistics, the Proposed Offsetting Measures Population Study Area occurs within the 45-64 age category, whereas the States highest population percentage occurs within the 25-44 age category.

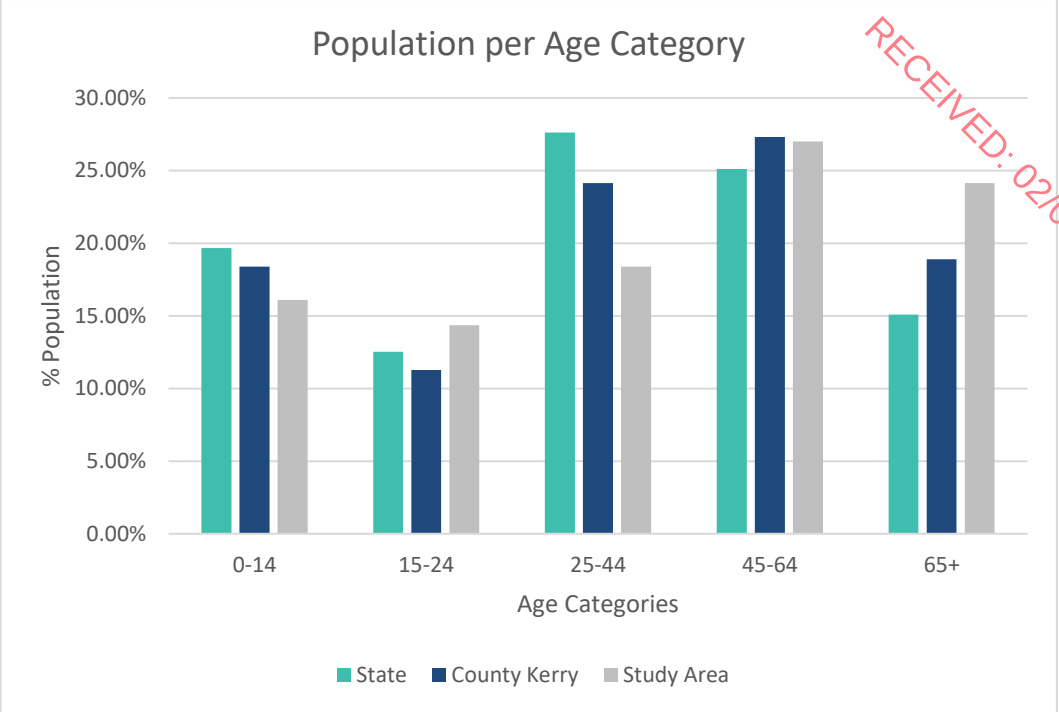

Figure 5-7: Population per Age Category in 2022 – Proposed Offsetting Measures (Source: CSO)

5.3.6 Employment and Economic Activity

5.3.6.1 Proposed Lifetime Extension

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. In 2022, there were 2,531,099 persons in the labour force in the State. Table 5-9 shows the percentage of the total population aged 15+ who were in the labour force during the 2022 Census. This figure is further broken down into the percentages that were at work 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. In Census 2022, for the first time ever, two categories of unemployment detail were included, Long-term Unemployment and Short-term Unemployment, for the purpose of this assessment, both categories have been grouped into one Unemployment group.

Table 5-9: Economic Status of the Total Population Aged 15+ in 2022 – Proposed Lifetime Extension (Source: CSO)

Status		State	County Cork	Proposed Lifetime Extension Population Study Area
% of population aged 15+ who are in the labour force		**61.2%**	**60.5%**	**52.8%**
% of which are:	At work	91.7%	93.9%	94.1%
	Looking	1.4%	1.0%	0%
	Unemployed	6.9%	5.1%	6%
% of population aged 15+ who are not in the labour force		**38.8%**	**39.7%**	**47.2%**

Status		State	County Cork	Proposed Lifetime Extension Population Study Area
% of which are:	Student	28.6%	29.1%	18.2%
	Home duties	17%	17.4%	21.2%
	Retired	41%	39.6%	48.2%
	Unable to work	11.8%	12.3%	10.9%
	Other	1.7%	1.7%	1.5%

Overall, the principal economic status of those living in the Proposed Lifetime Extension Population Study Area is lower than that recorded at State level. During the 2022 Census, the percentage of people over the age of 15 who were in the labour force was similar at both County and State level at just over 60%. However, within the Proposed Lifetime Extension Population Study Area, numbers were lower, with 52.8% of people over the age of 15 in the labour force. Of those who were not in the labour force during the 2022 Census, the highest percentage of the Proposed Lifetime Extension Population Study Area population were 'Retired' individuals, similar to state and county populations.

The CSO employment figures grouped by socio-economic status includes the entire population for the Study Area, County and State in their respective categories. As such, the socio-economic category of 'Other' is skewed to include those who are not in the labour.

5.3.6.2 Proposed Offsetting Measures

Table 5-10 shows the percentage of the total population aged 15+ who were in the labour force during the 2022 Census. This figure is further broken down into the percentages that were at work 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. In Census 2022, for the first time ever, two categories of unemployment detail were included, Long-term Unemployment and Short-term Unemployment, for the purpose of this assessment, both categories have been grouped into one Unemployment group.

Table 5-10: Economic Status of the Total Population Aged 15+ in 2022 – Proposed Offsetting Measures (Source: CSO)

Status		State	County Kerry	Proposed Offsetting Measures Population Study Area
% of population aged 15+ who are in the labour force		**61.2%**	**58.1%**	**50.7%**
% of which are:	At work	91.7%	91.0%	90.5%
	Looking	1.4%	1.5%	0%
	Unemployed	6.9%	7.5%	9.5%
% of population aged 15+ who are not in the labour force		**38.8%**	**41.9%**	**49.3%**

Status		State	County Kerry	Proposed Offsetting Measures Population Study Area
% of which are:	Student	28.6%	23.3%	22.2%
	Home duties	17%	16.5%	15.3%
	Retired	41%	46.2%	50.0%
	Unable to work	11.8%	12.1%	12.5%
	Other	1.7%	1.8%	0.0%

Overall, the principal economic status of those living in the Proposed Offsetting Measures Population Study Area is lower than that recorded at State level. During the 2022 Census, the percentage of people over the age of 15 who were in the labour force was similar at both County and State level. However, within the Proposed Offsetting Measures Population Study Area, numbers were significantly lower, with 50.7% of people over the age of 15 in the labour force. Of those who were not in the labour force during the 2022 Census, the highest percentage of the Proposed Offsetting Measures Population Study Area population were 'Retired' individuals, similar to state and county populations.

The CSO employment figures grouped by socio-economic status includes the entire population for the Study Area, County and State in their respective categories. As such, the socio-economic category of 'Other' is skewed to include those who are not in the labour force.

5.3.6.3 Employment and Investment Potential in the Irish Wind Energy Industry

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

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.

The Sustainable Energy Authority of Ireland[10] 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.

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'.*

A report published by MaREI, the SFI Research Centre for Energy, Climate and Marine, hosted by University College Cork[11] (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 report 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*

[9] *SEAI (2019), https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf*
[10] *SEAI (2019), https://www.seai.ie/publications/Wind_Energy_Roadmap_2011-2050.pdf*
[11] *https://www.marei.ie/our-climate-neutral-future-zeroby50/*

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 April 2024, there were 6,095 Megawatts (MW) of wind energy capacity installed on the island of Ireland[12]. Of this, 4,730 MW 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.

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 Lifetime Extension will, if consent is granted, continue to contribute to the economic value that renewable energy brings to the country.

5.3.7 Land-Use Patterns and Activities

5.3.7.1 Proposed Lifetime Extension

The existing Taurbeg Wind Farm has been operational since March 2006.The primary surrounding land use within the study area is wind energy, agricultural and private forestry. The total area of farmland within the Proposed Lifetime Extension Study Area measures approximately 1,413 hectares, equating to approximately 34% of total area, according to the CSO Census of Agriculture 2020. There are 47 agricultural holdings within the Proposed Lifetime Extension Study Area, with an average farm size of 30.1 hectares. Table 5-11 shows the breakdown of farmed lands within the Study Area.

[12] *Eirgrid, https://www.eirgrid.ie/grid/system-and-renewable-data-reports*

Table 5-11: Farm Size and Classification within the Proposed Lifetime Extension Study Area in 2020 – Proposed Lifetime Extension (Source: CSO)

DED	No of holdings	Average size (hectares)	Median age of holder	Livestock units
Clonfert East	47	30.1	53	1172
Size of ED			4100 hectares	
Total Area Farmed within ED			1413 hectares	
Farmland as % of EDs			34.46%	

In a wider context, Taurbeg 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 Taurbeg is Knockacummer Wind Farm, located at a distance of approximately 882m between the wind farm's closest turbine. A list of operational wind farms located within 20km of the existing Taurbeg Wind Farm site is included in Section 2.8.3 of Chapter 2 of this EIAR.

5.3.7.2 Proposed Offsetting Measures

The Proposed Offsetting Lands are located in an area that primarily consists of commercial forestry. The primary surrounding land use within the Proposed Offsetting Measures Population Study Area is wind energy, agricultural and private forestry. The total area of farmland within the Proposed Offsetting Measures Population Study Area measures approximately 1,129 hectares, equating to approximately 31% of total area, according to the CSO Census of Agriculture 2020. There are 57 agricultural holdings within the Proposed Offsetting Measures Population Study Area, with an average farm size of 30.5 hectares. Table 5-12 shows the breakdown of farmed lands within the Proposed Offsetting Measures Study Area.

Table 5-12: Farm Size and Classification within the Proposed Offsetting Measures Population Study Area in 2020 – Proposed Offsetting Measures(Source: CSO)

DED	No of holdings	Average size (hectares)	Median age of holder	Livestock units
Mount Eagle	37	30.5	57	1011
Size of ED			3,667 hectares	
Total Area Farmed within ED			1,129 hectares	
Farmland as % of EDs			30.78%	

5.3.7.3 Services

5.3.7.3.1 *Proposed Lifetime Extension*

The main services for the Proposed Lifetime Extension Population Study Area are located within Rockchapel village, located approximately 4km north of the existing Taurbeg Wind Farm. Other settlement centres in the wider region which provide retail, recreational, educational, and religious services include the town of Newmarket, the village of Brosnagh and the village of Ballydesmond, located approximately 9.3km southeast, 10.8km northwest and 10.1km southwest of the existing Taurbeg Wind Farm, respectively.

5.3.7.3.2 *Proposed Offsetting Measures*

The main services for the Proposed Offsetting Measures Population Study Area are located in the Town of Castleisland, ~8km west of the Proposed Offsetting Lands, and the village of Ballydesmond, ~7.2km southeast of the Proposed Offsetting Lands. Other settlement centres in the wider region which provide retail, recreational, educational, and religious services include the village of Scartaglan and Rockchapel, 7.5km southwest and 12.7km northeast of the Proposed Offsetting Lands.

5.3.7.3.3 *Education*

Proposed Lifetime Extension

The nearest Primary school is the Rockchapel National School, located approximately 4.8km north of the existing Taurbeg Wind Farm.

The closest secondary school is the Presentation Secondary School, Casteleisland, Co. Kerry situated approximately 30km west of the existing Taurbeg Wind Farm at its closest point. There are no nearby third level education institutes in this area.

Proposed Offsetting Measures

The nearest primary school is Kilmurry National School, approximately 3km from the Proposed Offsetting Lands. Two national schools are also located in Castleisland ~8km from the Proposed Offsetting Lands. There are three secondary schools similarly located in Castleisland, namely, Saint Patricks Secondary School, Presentation Secondary School and Castleisland Community College.

5.3.7.3.4 *Access and Public Transport*

Proposed Lifetime Extension

The existing Taurbeg Wind Farm is accessed via the wind farm site entrance off the L5005 local road, in the townland of Taurbeg and is served by a network of existing wind farm access roads.

The Taurbeg Wind Farm site is not accessible via public transport. The nearest bus stop is approximately 11km to the southeast in the town of Newmarket and is serviced by Bus Eireann Route 243.

Proposed Offsetting Measures

The Proposed Offsetting Lands are not serviced by any public transport routes, however, can be accessed via the L-10720 and L-10750 local roads.

5.3.7.3.5 *Amenities and Community Facilities*

Proposed Lifetime Extension

There are a number of amenities and community facilities, including sports clubs, youth clubs, recreational areas, retail and personal services located in the nearby villages of Rockchapel and Meelin, and Newmarket, Brosnagh and Ballydesmond. The towns of Kishkeem and Boherboy also offer a large selection of amenities and community facilities.

The varied environment of this area of County Cork provides many opportunities for outdoor activities.

Proposed Offsetting Measures

The nearby town of Castleisland provides a variety of community facilities and amenities, including multiple athletic and music clubs, many opportunities for outdoor activities such as hillwalking and cycyling, as well as tourist attractions such as the Crag Caves. On a wider scale, the county of Kerry is well known for its natural beauty and large variety of outdoor activities.

5.3.8 Tourism and Amenity

5.3.8.1 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 2019*, pertaining to domestic and international tourism volumes for Ireland, was published by Failte Ireland in 2021 for the year 2019. *Key Tourism Facts 2019* states that during 2019, overseas tourists to Ireland grew by 0.7% to 9.7 million. In 2019, out-of-state (Overseas and Northern Ireland) tourist expenditure amounted to €5.6 billion. With a further €1.8 billion spent by overseas visitors on fares to Irish carriers, foreign exchange earnings were €7.4 billion. Domestic tourism expenditure amounted to €2.1 billion, making tourism a €9.5 billion industry. The Central Statistics Office's official count of direct employment in 'Accommodation and food service activities', a category which includes hotels, restaurants, bars, canteens and catering, was 177,700 in Q3 2019 (7.6% of total employment) and rises to 260,000 when including seasonal and casual employment in the industry.

Key Tourism Facts 2022, published in October 2023 does not provide the same level of detail in terms of tourist numbers and expenditure as the 2019 version of the same report, however it does note that

> *"While traditional tourism statistics focus primarily on 'flows' (i.e., the number of visitors, the number of overnight stays, etc.), Gross Value Added (GVA) measures the overall contribution of a particular sector to national income. Tourism activity in Ireland is associated with over 4% of direct GVA."*

Key Tourism Facts 2022 goes on to state that through an alternative method of estimating employment using PAYE tax data, the CSO estimates the number of people employed in 'Tourism Industries' to be 220,000 in Q3 2022.

The Republic of Ireland is divided into seven tourism regions. Table 5-13 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2019 ('*Key Tourism Facts 2019*, Fáilte Ireland, March 2021).

Table 5-13: Overseas Tourists Revenue and Numbers 2019 (Source: Fáilte Ireland)

Region	Total Revenue (€m)	Total Number of Overseas Tourists (000s)
Dublin	€2,210m	6,644

Region	Total Revenue (€m)	Total Number of Overseas Tourists (000s)
Mid-East/Midlands	€348m	954
South-East	€261m	945
South-West	**€970m**	**2,335**
Mid-West	€472m	1,432
West	€653m	1,943
Border	€259m	768
Total	**€5,173 m**	**15,021**

The existing Taurbeg Wind Farm and Proposed Offsetting Lands are located within the South-West Region. According to '*Regional Tourism Performance in 2019'* (Fáilte Ireland, March 2021), the South-West Region which comprises the counties of Cork and Kerry, benefitted from approximately 15.5% of the overseas tourists to the country and approximately 19% of the associated tourism income generated in Ireland in 2019.

Although the data for 2019 is not available, Table 5-14 presents the most recent breakdown of overseas tourist numbers and revenue to the South-West region during 2017 ('*2017 Topline Tourism Performance by Region,* Fáilte Ireland, August 2018). As can be observed in Table 5-14, County Cork had the highest number of overseas tourists visiting the Region during 2017 and had a tourism revenue at €631m.

Table 5-14 presents the county-by-county breakdown of overseas tourist numbers and revenue to the South-West Region during 2017 ('*2017 Topline Tourism Performance By Region, Fáilte Ireland, August 2018*)[13]. There is no published County by County tourism breakdown for 2018 to 2023 to date). As can be observed, County Cork had a tourism revenue of at €833 million, and Kerry €337 million.

Table 5-14: Overseas Tourism to Border Region during 2017 (Source: Fáilte Ireland)

County	Total Revenue (€m)	No. of Overseas Tourists (000s)
Cork	631	1605
Kerry	337	1277

5.3.8.2 Domestic Tourism and Revenue

Fáilte Irelands latest key tourism performance data was released in October 2023, which provides Domestic Tourism and Revenue data for 2022 (*Key Tourism Facts 2022*, Failte Ireland, 2023). During 2022, total domestic expenditure was approximately €2,930 million, an increase from €2,146.6 million in 209 and €2,006 million in 2018.

[13] *2017 Topline Tourism Performance By Region, Fáilte Ireland, August 2018 Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/2_Regional_SurveysReports/2017-topline-regional-performance-(003).pdf?ext=.pdf*

Table 5-15 shows the total estimated expenditure and breakdown of domestic tourist trips numbers to each of Irelands seven tourist regions during 2022.

Table 5-15: Domestic Tourism Expenditure and Number of Trips 2022 (Source Fáilte Ireland)

Region	Estimated Expenditure (€m)	Total No. Trips (000s)
Dublin	€419	1,861
Mid-East/Midlands	€395	1,957
South-East	€381	1,899
South-West	**€665**	**2,763**
Mid-West	€261	1,322
West	€459	1,866
Border	€350	1,606
Total	**€2,930**	**13,274**

The existing Taurbeg Wind Farm and Propsoed Offsetting Measures Lands are located within South-West Tourism Region. The South-West Region, benefitted from approximately 20.8% of total domestic trips and 22.7% of associated estimated expenditure in Ireland in 2022.

5.3.8.3 Tourism Attractions

5.3.8.3.1 *Proposed Lifetime Extension*

There are no identified tourist attractions within or adjacent to the existing Taurbeg Wind Farm.

Tourism Attractions within the surrounding landscape

The varied natural landscape and scenic amenity of this area provide many opportunities for general outdoor recreation within the wider area including cycling, golfing and walking. The following walking and cycling routes are located nearby:

- The Duhallow Trail Cycle Route
- The Duhallow Walking Trail
- Mullaghareirk – Banane Loop Walk
- Mullaghareirk – Rowls – Lanford Loop Walk

County Cork has a wide range of nationally significant tourism assets which include the following:

- Blarney Castle and Gardens – A medieval castle dating back to 1446. The Blarney Stone is believed to have special powers and is located on the grounds.
- Saint Georges Arts and Heritage Centre- a premier performing arts venue for a wide range of arts, cultural heritage and tourism.
- Nano Nagle Place- A restored walled convent featuring gardens and beautiful architecture and landscape.
- Annes Grove Gardens- a horticultural paradise in North Cork.
- Kanturk Castle- a 17th Century castle with adjoining 'Old Court' which was built by the MacDonagh MacCarthys, Lords of Duhallow.

- Fota Wildlife Park - AWildlife park stretching 100 acres on the scenic Fota Island. Features an Asian Sanctuary, kids play areas and picnic areas.
- Spike Island- Former world's largest prison in the 1850s, located on an island off the coast of Cobh.

Archaeological sites and monuments are part of Irish national heritage and are recognised tourist attractions across the country. National Monuments within 10km of the nearest turbine are listed below. Please see Chapter 14 Archaeological, Architectural and Cultural Heritage for further details. It should be noted that not all of these National Monuments are publicly accessible.

- Souterrain- underground chamber with hachured circular enclosure ringfort also nearby. Located 1.5km from T3
- Massrock- Natural Hillock, known as 'little hill of the prayers" located 860m from T7
- Kiln lime- early/mid century lime kiln located 880m from T8
- Burial Ground- burial ground with dead buried here following a battle. Located 706m from T10
- Enclosure- possible penannular enclosure located 590m from T10

5.3.8.3.2 *Proposed Offsetting Measures*

There are no identified tourist attractions within or adjacent to the Proposed Offsetting Lands.

Tourism Attractions within the surrounding landscape

There are a number of walking and cycling trails nearby, including:

- Castleisland River Loop Walk
- Glanageenty, Brother Bernards Loop
- The Ring of Kerry Cycle Route
- Torc Mountain Loop

County Kerry has a wide range of nationally significant tourism assets which include the following:

- Killarney National Park & Torc Waterfall
- Ring of Kerry
- Muckross House, Gardens & Traditional Farms
- Skellig Michael
- Killarney Falconry

Archaeological sites and monuments are part of Irish national heritage and are recognised tourist attractions across the country. Whilst there are no archaeological features within the Proposed Offsetting Lands, there are some within close proximity to these lands. Please see Chapter 14 Archaeological, Architectural and Cultural Heritage for further details. It should be noted that not all of these National Monuments are publicly accessible. National monuments within 2km of these lands include:

- 3 no. Fulacht Fia
- 4 no Ringforts – Raths
- 3 no. Enclosures
- 2 no. Hut Sites
- A children's burial ground
- A burnt spread

5.3.8.4 Tourist Attitudes to Wind Farms

5.3.8.4.1 *Scottish Tourism Survey 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 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.

5.3.8.4.2 *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."*

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

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

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

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

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

Further details regarding the general public perception of wind energy, including those living in the vicinity of a wind farm, are presented in Section 5.3.11

5.3.9 Public Perception of Wind Energy

5.3.9.1 Sustainable Energy Authority of Ireland Survey 2017 and 2003

5.3.9.1.1 Background

The results of a national survey entitled 'Attitudes Towards the Development of Wind Farms in Ireland'[14] were published by the Sustainable Energy Authority of Ireland (SEAI) in 2003. 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. An updated survey was carried out in 2017 to update findings of the survey.

5.3.9.1.2 *Findings- 2017 Survey*

A survey carried out by Interactions in October 2017 published by the SEAI, show 47% of Irish adults polled are 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 2013.

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' whilst just over two in three cited cheaper electricity.

The original 2003 SEAI survey 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 impact 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 impact on the landscape is not a major concern for those living near an existing wind farm.

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

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

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

[14] *Sustainable Energy Ireland 2003 Attitudes Towards The Development of Wind Farms in Ireland. Available at: https://mosart.ie/wp-content/uploads/2016/02/Attitudes-Towards-Wind-Farm-Development-Ireland.pdf*

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.

5.3.9.1.3 Conclusions

The main findings of the SEAI survey indicate that the overall attitude to wind farms is "almost entirely positive". The study highlights that two-thirds of Irish adults are either very favourable or fairly favourable to having a wind farm built in their locality, with little evidence of a "Not In My Back Yard" (NIMBY) effect. The final section of the SEAI 2017 *Attitudes Towards the Development of Wind Farms in Ireland'* report, p. 41 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."*

5.3.9.2 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.*[15] 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

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

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.

5.3.9.2.1 *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.

5.3.9.3 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[16]. The objective of the poll was to 'measure and track public perceptions and attitudes around wind energy amongst Irish adults.'

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'.

[16] *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.>>*

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.

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

5.3.9.4.1 *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.

5.3.9.4.2 *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.

5.3.9.4.3 *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 existing 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.

5.3.9.4.4 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.

5.3.10 Property Values and Wind Farms

This section summarises the largest and most recent studies from the United States and the UK and also provides a summary of an Irish working paper by the Centre for Economic Research on Inclusivity and Sustainable (CERIS).

In 2023 CERIS published a working paper entitled *'Wind Turbines and House Prices Along the West of Ireland: A Hedonic Pricing Approach'*.[17] 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 this is a working paper, based on a small sample size where local conditions have the potential to

[17] *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>

disproportionately impact on the local housing market, further research is required before relying on its findings.

One of the largest study 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 conclusions of the study are drawn from eight different pricing models including repeat sales and volume sales models. Each of the homes included in the study were visited to demonstrate the degree to which the wind facility was visible at the time of the sale, and the conclusions of the report state that "The result is the most comprehensive and data rich analysis to date on the potential impacts of wind energy projects on nearby property values."

The main conclusion of this study is as follows:

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

This study has been recently 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."*

The LBNL studies note that their results do not mean that there will never be a case of an individual home whose value goes down due to its proximity to a wind farm – however if these situations do exist, they are considered to be statistically insignificant. Therefore, although there have been claims of significant property value impacts near operating wind turbines that regularly surface in the press or in local communities, strong evidence to support those claims has failed to materialise in all the major U.S. studies conducted thus far.

In September 2023, the Energy Policy Journal published 'Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States.'[18] This study targeted urban counties in the United Stated with populations over 250,000 persons, and found that on average, after a commercial wind energy project is announced, houses located within 1 mile of a proposed wind energy project experience a decrease in value of 11% relative to homes located within 3-5 miles of the proposed wind energy project. The decline in property values was found to recover post construction with property value impacts becoming relatively small (~2%) and statistically insignificant 9 years or more after project announcement (roughly 5 years after operation begins). This suggests that the housing market is reacting negatively to the expectation of likely impacts (after announcement) and

[18] *Energy Policy (2023) Commercial wind turbines and residential home values: new evidence from the universe of land-based wind projects in the United States. Available at: https://www.sciencedirect.com/science/article/pii/S0301421523004226*

the heightened activity during construction, but after operation begins, those negative perceptions and related home price impacts appear to fade.

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

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 5-1 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.
- Results vary across areas: The results vary across different regions of Scotland. Our data does not provide sufficient information to enable us to rigorously measure and test the underlying causes of these differences, which may be interconnected and complex.

The UK 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. This literature is contradictory to the working paper containing the only Irish study on the topic.

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

5.3.11 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.

5.3.11.1 Proposed Lifetime Extension

The existing Taurbeg is located within a rural setting in north County Cork, approximately 3.5km south of Rockchapel village and approximately 10.5km west of Newmarket. The R576 Regional Road runs

west-east approximately 2.7 km north of the existing Taurbeg Wind Farm site. Land use currently comprises a mix of pastoral agriculture and private forestry. The surrounding land use predominantly comprises wind energy, pastoral agriculture, and private forestry commercial and residential use along local road. The site entrance is located in the northeast of the site, via the L5005 local road.

There are 6 no. Sensitive Receptors located within 1 kilometre of the existing turbines, all of which are located at a minimum of 731m from any turbine. The site has been operational for a 19 year period and complies with the 2006 WEDGs in relation to turbine setback from sensitive receptors i.e. a minimum 500m set back. The existing turbines also adhere to the 2019 draft WEDGs in relation to turbine setback from sensitive receptors i.e. a minimum 4 x tip height (108.2m x 4 =432.8m). Note however no update or final 2019 WEDGs were subsequently published.

Due to the timelines associated with the planning process for renewable energy projects and the commitment within the Climate Action Plan 2024 (CAP24) to publish new draft guidelines, it is possible that the draft Wind Energy Guidelines may be adopted during the consideration period for the current planning application. In April 2025, the Department of the Environment, Climate and Communications published the 'Climate Action Plan 2025' (CAP), however it does not provide an update on the commitments published in CAP24 relating to the publication timeline of the Draft DoEHLG 2019 Guidelines. At the time of submission of this application, there has been no public consultation or finalisation of new guidelines. As shown in Section 5.5, there is currently no shadow flicker occurrences on Sensitive Receptors within the Study Area.

When considering the amenity of residents in the context of the Proposed Lifetime Extension, 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 5.5 refers to shadow flicker, Chapter 12 addresses noise and vibration). A comprehensive landscape and visual impact assessment on the continuation of the Taurbeg Wind Farm has also been carried out, as presented in Chapter 13 of this EIAR. Impacts on the local population during the extended operational and decommissioning phases of the Proposed Lifetime Extension are assessed in relation to each of these key topics and other environmental factors such as noise, traffic, and dust; see Impacts in Section 5.6 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.

5.3.11.2 Proposed Offsetting Measures

The Proposed Offsetting Lands are located in the townlands of Knockatee and Coom, Co. Kerry, approximately 12km east from the Taurbeg Wind Farm site. The closest settlements to the Proposed Offsetting Lands are Castleisland and Ballydesmond, both of which are ~8km west and 7.2km southeast of the lands respectively. Land use at the Proposed Offsetting Lands comprises of commercial forestry and agricultural pastures. Land use in the wider area consists of forestry and agricultural pastures, with renewable energy also being prominent in the area. Restoration of farmland habitat and deforestation of commercial forestry are proposed as part of the Proposed Offsetting Measures. When considering residential amenity in respect of the Proposed Offsetting Measures, there are two main potential impacts of relevance 1: Noise and 2) Visual amenity. Whilst noise prediction calculations have been conducted and thus impacts are quantifiable, impacts on visual amenity are much more subjective. The predicted effects for both of these aspects are outlined below:

1) As outlined in Chapter 12 of this EIAR, 'Noise and Vibration', there are no significant effects anticipated as a result of the Proposed Offsetting Measures.
2) As outlined in Chapter 13 of this EIAR, 'Landscape and Visual', there will be positive, long-term, not significant effects on visual effects associated with the Proposed Offsetting Measures.

There are therefore no significant impacts on residential amenity associated with the Proposed Offsetting Measures

5.4 Health

5.4.1 Introduction

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*' and the guidance listed in Section 1.2.2 of Chapter 1: Introduction of this EIAR, the consideration of the effects on populations and on human health in an EIAR should focus on health issues and environmental hazards arising from the other environmental factors, for example water contamination, air pollution, noise, accidents, disasters. Wind Turbine Health Impact Studies

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

1. ***'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. Pierpoint's respondents by the mechanisms proposed."

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

2. ***'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."

3. *'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 impacts 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."

4. *'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 impacts of fossil fuel energy generation.

5. ***'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 impacts and risks to human health associated with the design and operation of wind energy turbines. In its final report, the expert panel set out its conclusions under several headings, including noise and shadow flicker.

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

"There is no evidence for a set of health effects, from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome."

"The strongest epidemiological study suggests that there is not an association between noise from wind turbines and measures of psychological distress or mental health problems. There were two smaller, weaker, studies: one did note an association, one did not. Therefore, we conclude the weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems."

"None of the limited epidemiological evidence reviewed suggests an association between noise from wind turbines and pain and stiffness, diabetes, high blood pressure, tinnitus, hearing impairment, cardiovascular disease, and headache/migraine."

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

"Scientific evidence suggests that shadow flicker does not pose a risk for eliciting seizures as a result of photic stimulation.

There is limited scientific evidence of an association between annoyance from prolonged shadow flicker (exceeding 30 minutes per day) and potential transitory cognitive and physical health effects."

6. ***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 5-2 of this EIAR.

7. *Position Paper on Wind Turbines and Public Health: HSE Public Health Medicine Environment and Health Group, February 2017*

The Health Service Executive (HSE) position paper on wind turbines and public health was published in February 2017 to address the rise in wind farm development and concerns regarding potential impacts on public health. The paper discusses previous observations and case studies which describe a broad range of health effects that are associated with wind turbine noise, shadow flicker and electromagnetic radiation.

A number of comprehensive reviews conducted in recent years to examine whether these health effects are proven has highlighted the lack of published and high-quality scientific evidence to support adverse effects of wind turbines on health.

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 increased risk can impact health. Wind turbine noise above this level is associated with adverse health effects.

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

That being said, the GDG 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. Please see Chapter 12 of this EIAR: Noise and Vibration for details.

9. ***'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***[19]

When considering the effects of health regarding noise sensitivity generated from the Proposed Lifetime Extension , an analysis of a recent study by the 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 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.

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

As a result:

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

5.4.2 Baseline

5.4.2.1 Proposed Lifetime Extension

Table 5-16 below details the general health of persons by percentage for the State, County Cork and the Proposed Lifetime Extension Population Study Area for the most recent census taken in Ireland, 2016 and 2022, which have data publicly available. In general, the percentage health breakdown for the State, County and study area populations are similar. The Study Area, State and County all reported in the range of 80-90% for a combined 'very good' and 'good' health. In 2022, 86.6% of people in Cork stated that their health was good or very good compared with 89.5% in 2016. This is a similar trend to the national figures, which also showed a 4% decrease in the good/very good categories, from 87% to 83%. For Clonfert East, there was an increase in good/very good categories, from 83.7% in 2016 to 86.2% in 2022.

Table 5-16: Percentage General Health Breakdown for the study area as reported in the 2016 and 2022 Census – Proposed Lifetime Extension (Source www. CSO.ie)

Study Area- Electoral Divisions	Very Good		Good		Fair		Bad		Very Bad		Not Stated	
	2016	2022	2016	2022	2016	2022	2016	2022	2016	2022	2016	2022
State	59.4%	53.2%	27.6%	29.7%	8%	8.6%	1.3%	1.4%	0.3%	0.3%	3.3%	6.7%
County Cork	63.1%	57%	26.4%	29.6%	6.9%	7.8%	1.0%	1.1%	0.2%	0.3%	2.3%	4.2%
Clonfert East	51.7%	50.1%	32%	36.1%	12.3%	10.4%	1.3%	1.1%	0.3%	0.0%	2.36%	2.3%

5.4.2.2 Proposed Offsetting Measures

Table 5-17 below details the general health of persons by percentage for the State, County Kerry and the Proposed Offsetting Measures Population Study Area for the most recent census taken in Ireland, 2016 and 2022, which have data publicly available. In general, the percentage health breakdown for the State, County and study area populations are broadly similar. The Study Area, State and County all reported in the range of 80-95% for a combined 'very good' and 'good' health. In 2022, 83.4% of people in Kerry stated that their health was good or very good compared with 86.3% in 2016. This is a similar

trend to the national figures, which also showed a 4% decrease in the good/very good categories, from 87% to 83%. For Mount Eagle, there was also a decrease in good/very good categories, from 87.6% in 2016 to 84.4% in 2022.

Table 5-17: Percentage General Health Breakdown for the study area as reported in the 2016 and 2022 Census – Proposed Offsetting Measures (Source www. CSO.ie)

Study Area- Electoral Divisions	Very Good		Good		Fair		Bad		Very Bad		Not Stated	
	2016	2022	2016	2022	2016	2022	2016	2022	2016	2022	2016	2022
State	59.4 %	53.2%	27.6%	29.7%	8%	8.6%	1.3%	1.4%	0.3%	0.3%	3.3%	6.7%
County Kerry	56.5 %	51.7%	29.8%	31.7%	8.5%	9.2%	1.3%	1.4%	0.3%	0.3%	3.6%	5.7%
Mount Eagle	68.4 %	62.6%	19.2%	21.8%	9.0%	9.8%	2.3%	2.3%	0.0%	1.1%	1.13%	2.3%

5.4.2.3 Air Quality- Dust, NO_2, PM_{10} and PM_{25} and CO_2 Emissions

5.4.2.3.1 *Proposed Lifetime Extension*

Chapter 10 Air Quality and Chapter 11 Climate assess the potential for impact to human health from dust, CO_2 and other noxious emissions generated by additional vehicles. The assessments consider the operation and decommissioning phases. The assessments concluded that the residual effects from the extended operational and decommissioning phases of the Proposed Lifetime Extension are not significant. Please see Chapter 10 and Chapter 11 for further details.

5.4.2.3.2 *Proposed Offsetting Measures*

Chapter 10 Air Quality and Chapter 11 Climate assess the potential for impact to human health from dust, CO_2 and other noxious emissions generated by additional vehicles associated with the Proposed Offsetting Measures works. The assessments concluded that the residual effects are not significant. Please see Chapter 10 and Chapter 11 for further details.

5.4.2.4 Water quality

5.4.2.4.1 *Proposed Lifetime Extension*

There are no underground water or sewerage networks within the Site. The Tobergal Public Water Scheme is located approximately 16km northeast of the existing infrastructure. There are no private boreholes or wells in the vicinity of the Site. Chapter 9 Hydrology and Hydrogeology assess the potential for impact on public water supply and private wells during the operation and decommissioning phases.

5.4.2.4.2 *Proposed Offsetting Measures*

As outlined in Chapter 9, Hydrology and Hydrogeology, there will be no significant effects on water quality associated with the Proposed Offsetting Measures.

5.4.2.5 Noise and Vibration

5.4.2.5.1 *Proposed Lifetime Extension*

Chapter 12 Noise and Vibration assesses the potential for noise and vibration impacts during the operation and decommissioning phases of the Proposed Lifetime Extension and during the Proposed Offsetting Measures. The assessment includes mitigation and monitoring measures that will be complied with for the operation, and decommissioning phases.

5.4.2.5.2 *Proposed Offsetting Measures*

As outlined in Section 5.3.11.2 above, as well as Chapter 12, Noise and Vibration, there will be no significant effects relating to noise and vibrations as a result of the Proposed Offsetting Measures works.

5.4.2.6 Traffic and Transport

5.4.2.6.1 *Proposed Lifetime Extension*

Chapter 15 Material Assets assesses the potential for traffic and transport impacts during the operation and decommissioning of the Proposed Lifetime Extension.

5.4.2.6.2 *Proposed Offsetting Measures*

Chapter 15 Material Assets assesses the potential for traffic and transport impacts during the Proposed Offsetting Measures. There are no significant effects on traffic and transport associated with the Proposed Offsetting Measures.

5.4.2.7 Aviation

5.4.2.7.1 *Proposed Lifetime Extension*

The provision of aviation lighting on wind turbines is a standard and accepted part of any wind farm development. As such, aviation lighting is already in place on T11 which was agreed with the IAA as part of the original consented development. Aviation lighting 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 impact. Where existing turbine lighting needs to be updated for the Proposed Lifetime Extension, this will be carried out with agreement and recommendation from the IAA and Irish Air Corps should the project receive planning permission.

It is considered that aviation lighting on the turbines will continue to have no significant effect on human health, beyond increasing aircraft safety in the context of the Proposed Lifetime Extension. The applicant will continue its engagement with IAA and Irish Air Corps as required in relation to aviation lighting.

5.4.2.7.2 *Proposed Offsetting Measures*

The Proposed Offsetting Measures will not have any significant effects on aviation.

5.4.2.8 Vulnerability of the Project to Natural Disaster and Major Accidents

A risk assessment of the Proposed Project's vulnerability to and from natural disasters can be found in Chapter 16 Major Accidents and Natural Disasters of this EIAR. A brief discussion can be found below.

5.4.2.8.1 *Proposed Lifetime Extension*

Pollution/Contamination/Fire

A wind farm is not a recognised source of pollution. Should a major accident or natural disaster occur the potential sources of pollution on-site during the extended operational and decommissioning phases are limited. Sources of pollution with the potential to cause environmental pollution and associated negative effects on health such as bulk storage of hydrocarbons or chemicals, storage of wastes etc. are limited. Consequently, it is considered that the risk of significant fire occurring, affecting the Existing Taurbeg 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 described earlier, there are no significant sources of pollution associated with the Proposed Lifetime Extension 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 impacts on human health. Turbine safety is addressed in Section 5.1.4.1 above.

Flooding

The Knockahorrea East watercourse flows through the east of the Site which is not susceptible to flooding and has no record of previous flooding events. Approximately 5km downstream of the Site at the confluence of the Knockahorrea East River and the Feale River at Rockchapel, there is a record of a flooding event which occurred in 1986 (Flood ID: 2414). Approximately 7km downstream of the Site on the Glenlara River, near the confluence with the Dalua River, there is a record of recurring flooding on the R578 caused by high flows in the Dalua River (Flood ID: 5153).

The existing Taurbeg Wind Farm is located on Taurbeg hill. The steep topography of the area, and the associated high gradients of the streams which drain it, preclude any risk of flooding in its vicinity.

Further details regarding hydrology and flood risk are provided in Chapter 9 Hydrology and Hydrogeology.

Stability/Landslide

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 existing Taurbeg Wind Farm is not regulated by or connected to or close to, any site 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.

There is low potential for significant natural disasters to occur at the Site. Ireland is a geologically stable country with a mild temperate climate. The Proposed Lifetime Extension has low potential to cause natural disasters or major accidents. As detailed in Chapter 8 Land Soil and Geology, while there are sections of peat identified within the Site on the published soils map (www.epa.ie) and published subsoils maps (www.gsi.ie), very shallow peat was only encountered at some locations:

- No peat was encountered at T7 on the lower ground in the east of the Site.

- A gouge core completed in the vicinity of T7 encountered brown silty clayey soils. Where present the peat depths across the Site range from 0.1 to 1.8m.
- The peat is typically shallow with only 2 no. gouge cores encountering peat depths in excess of 0.5m. 1.65m of peat was encountered near T8 whilst 1.8m of peat was encountered near T12.

The gouge cores typically encountered an orange-brown gravelly clay beneath the peat. Blanket bog is found at the Site which has been significantly degraded due to agricultural land improvement and commercial forestry. The existing Taurbeg Wind Farm is located in an upland site, therefore there is potential for peat slides. The GSI have classified this area with a moderately low-moderately high potential for landslides. There is no record of peat slides occurring at the wind farm site during its operational period.

The GSI do not record the occurrence of any historic landslides within the Site (www.gsi.ie). The closest recorded landslide is located ~11km to the west. this event dates from November 2020 and is described as a peat slide which occurred in an area of mixed forestry at Knockfeha, Co. Kerry. A historic landslide is also mapped ~12km to the southeast of the Site. This landslide near Kanturk dates from 1839 and is described as a peat slide which occurred in a blanket bog in which the peat was over 10ft thick.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring. The landslide susceptibility of the Wind Farm Site was classified by the GSI (2023) as ranging from "low" to "high". The areas of susceptibility are localised, with the majority of the Site having "low" to "moderately low" landslide susceptibility.

The original EIAR) Pl. Reg. Ref: N/02/3608) found that the existing Taurbeg Wind Farm was suitable from a peat stability perspective, and the existing windfarm was constructed without any peat stability issues. The main risk was related to the construction work activities and earthworks associated with the construction of the wind farm. The risks are significantly lower for an operational wind farm.

Further details on the risk of instability and potential failures, are discussed in Chapter 8 on Land, Soils, and Geology and Appendix 8-1 Peat Stability Risk Assessment.

5.4.2.8.2 *Proposed Offsetting Measures*

Pollution/Contamination/Fire

The potential for the release of hydrocarbons and sediments associated with deforestation to groundwater and watercourse receptors is a risk to surface water, groundwater quality, and the aquatic quality of the surface water receptors at the Proposed Offsetting Lands. Proven and effective measures to mitigate the risk of releases of hydrocarbons and sediments have been proposed in Chapter 9, Hydrology and Hydrogeology, and will break the pathway between the potential source and each receptor. It is considered that the risk of significant fire occurring at the Proposed Offsetting Lands is limited and therefore a significant effect on human health is similarly limited.

Flooding

The OPW Past Flood Events Maps have no records of recurring or historic flood instances in the vicinity of the Proposed Offsetting Lands. Furthermore, the Proposed Offsetting Lands are not mapped within any historic or modelled groundwater flood zones. The main risk of flooding at the Proposed Offsetting Lands is via pluvial flooding. This risk is limited to local flat areas within the Site due to the mountainous nature of the wider area. Surface water ponding/pluvial flooding may occur in some local

flat areas due to the presence of low permeability peat at the surface. Mostly the risk of pluvial flooding is low. In general, the risk of flooding is very low at the Proposed Offsetting Lands.

Further details regarding hydrology and flood risk are provided in Chapter 9 Hydrology and Hydrogeology.

Stability/Landslide

The GSI record a historic landslide immediately to the south of the Proposed Offestting Lands. This landslide event dates from 15th November 2020 and is described as a peat flow. Based on the inspection of recent aerial imagery, there appears to have been 2 no. peat slides in the lands to the southwest of the Proposed Offsetting Lands (Area 4). The GSIs landslide susceptibility of the Proposed Offsetting Lands was classified by the GSI (2023) as ranging from "low" to "high". The areas of high susceptibility are located on the western slopes of Mount Eagle.

GDG completed detailed walkover surveys and peat probing in the areas of these historic peat slides. The PSRA concludes that the main conditioning factors which led to the peat slides included:

- The cutting of artificial drainage ditches parallel to topographic contours which may have resulted in localised surface water ponding, leading to increased lubrication and buoyancy at the base of the peat profile.
- Areas of extremely wet, saturated peat were recorded by GDG in the vicinity of the source zones with very low shear vane readings.
- The presence of a slight convex break in slope close to the assumed failure initiation points.
- The afforested and drained nature of the area is hypothesised to have contributed to disruption of the hydrological regime.
- Mount Eagle A is likely to have been instrumental in condition the failure of Mount Eagle B as it removed lateral and downslope support

The findings of the PSRA at the Proposed Offsetting Lands showed that the lands predominantly have an acceptable margin of safety and are suitable for the Proposed Offsetting Measures. Some very localised areas are deemed to have a higher risk of instability due to local topography. It is considered that these areas do not present a significant peat slide risk if the mitigation measures outlined in Section 8 of the PSRA (Appendix 8-1) are implemented, and that the residual risk is manageable.

Based on the available data, the fieldwork, and GDG's professional judgement, it is concluded that significant peat slides are unlikely on the Proposed Offsetting Lands with diligent peat management and careful consideration of the peat conditions at the Proposed Offsetting Lands during the works associated with the Proposed Offsetting Measures.

5.4.2.9 Health Baseline Summary

Chapter 8: Land, Soils and Geology, Chapter 9: Hydrology and Hydrogeology, Chapter 10: Air Quality, Chapter 11: Climate, Chapter 12: Noise and Vibration and Chapter 15: Material Assets (Traffic and Transport) provide an assessment of the effects of the Proposed Lifetime Extension and Proposed Offsetting Measures on these areas of consideration. Chapter 16 assesses the vulnerability of the Proposed Lifetime Extension and Proposed Offsetting Measures to and from major accidents and natural disasters. There is the potential for negative effects on human health during the wind farm operation and decommissioning phases related to potential emissions to air of dust, potential emissions to land and water of hydrocarbons, release of potentially silt-laden runoff into watercourses and noise emissions. The assessments in the chapters listed above show that the residual effects will not lead to significant effects on any environmental media with the potential to lead to health effects for humans. The Noise and Vibration assessment concludes the residual effects for Sensitive Receptors within the

study are neutral and imperceptible for the extended operational phase. Furthermore, the Taurbeg Wind Farm noise emissions and shadow flicker are controllable via inbuilt technologies, and therefore can comply with the conditions imposed should a grant of planning permission be received. Likewise, the vulnerability the project to/from potential for natural disasters has been assessed as low risk for all phases.

On this basis, the potential for negative health effects associated with the Proposed Lifetime Extension during all phases and the Proposed Offsetting Measures are considered to be not significant. Furthermore, the existing Taurbeg Wind Farm is capable of offsetting carbon emissions associated with the burning of fossil fuels. During the Proposed Lifetime Extension, the existing Taurbeg Wind Farm will have a medium term, moderate positive effect on air quality as set out in Chapter 10 Air Quality which will contribute to positive effects on human health.

5.5 Shadow Flicker Modelling

5.5.1 Daily and Annual Shadow Flicker Results

The software package WindPRO version 4.0.423 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 33.4% 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 5-18.

The predicted maximum daily and annual shadow flicker levels are then considered in the context of the 2006 WEDGs daily threshold of 30 minutes per day and annual threshold of 30 hours per year.

The 2006 WEDGs recommend that shadow flicker at dwellings within 500 metres of a existing turbine location should not exceed a total of 30 minutes per day or 30 hours per year. As noted in Section 5.2.3 above, the closest Sensitive Receptor H10 is located 731m from the nearest turbine T8.

The predicted shadow flicker levels have been modelled for all 3 no. Sensitive Receptors located within the Shadow Flicker Study Area (as defined in Section 5.2.3 above). Of these, none of the Sensitive Receptors are expected to experience shadow flicker. Table 5-18 illustrates the shadow flicker results from the Proposed Lifetime Extension.

Table 5-18: Shadow Flicker Results for Taurbeg Wind Farm

Sensitive Receptor ID	ITM Coordinates (Easting)	ITM Coordinates (Northing)	Description	Distance to Nearest Turbine (metres)	Nearest Existing turbine No.	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)	Existing turbine(s) Giving Rise to Daily Shadow Flicker Exceedance	Mitigation Strategy Required (Daily)
H10	521589	611206	Sensitive Receptor	731	T8	00:00:00	0:00:00	0:00:00	N/A	No
H28	522359	610340	Sensitive Receptor	829	T10	00:00:00	0:00:00	0:00:00	N/A	No
H33	521492	611181	Sensitive Receptor	821	T8	00:00:00	0:00:00	0:00:00	N/A	No

5.5.2 Cumulative Shadow Flicker

Knockacummer Wind Farm is the closest wind farm to the existing Taurbeg Wind Farm, located east of the Taurbeg at a distance of approximately 881m between the wind farms closest turbines. When applying a 10x rotor diameter buffer zone to the Knockacummer turbine locations it was found that the respective shadow flicker study areas of Knockacummer Wind Farm overlaps with the Taurbeg Wind Farm Shadow Flicker Study Area. However, there are no permitted or existing Sensitive Receptors located within the overlapping areas, therefore there is no potential cumulative shadow flicker effects.

5.6 Likely Significant Impacts and Associated Mitigation Measures

The below assessment evaluates the impact (where there is the potential for an impact to occur) on health and safety, employment, population, land-use, tourism, noise, dust, traffic, shadow flicker and residential amenity during the operation and decommissioning phases, as a result of the Proposed Project.

5.6.1 'Do-Nothing' Scenario

If the Proposed Project were not to proceed, the existing wind farm will be decommissioned. Therefore, 25.3 MW of indigenous renewable energy being supplied to the national grid would be lost. The opportunity to maximise the generation capacity of Ireland's Wind Sector, at this location would be lost, along with the future opportunities to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. Employment generated through the operation and maintenance of Taurbeg Wind Farm will also be lost. Existing land use within the Proposed Offsetting Lands would continue and the Proposed Offsetting Measures would not take place.

5.6.2 Extended Operational Phase

Where impacts are envisaged on population or health as a result of both the Proposed Lifetime Extension or Proposed Offsetting Measures, these are discussed below.

5.6.2.1 Population

The effects set out below relate to the Proposed Project.

5.6.2.1.1 *Population Levels*

Proposed Lifetime Extension

Pre-Mitigation Impacts

The Proposed Lifetime Extension will have no impact on the population of the area with regards to changes to trends, population density, household size or age structure.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

No residual impacts.

Proposed Offsetting Measures

Pre-Mitigation Impacts

The Proposed Offsetting Measures will have no impact on the population of the area with regards to changes to trends, population density, household size or age structure.

Proposed Mitigation and Monitoring Measures

None Proposed

Residual Impact

No residual impacts.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.1.2 *Employment and Investment*

Proposed Lifetime Extension

Pre-Mitigation Impacts

The Proposed Lifetime Extension will present an opportunity for continued employment of the personnel involved in the maintenance and control of the existing Taurbeg Wind Farm. This will have a medium-term, imperceptible, positive effect on employment.

The injection of money in the form of rental income to the landowners associated with the Proposed Lifetime Extension has the potential to result in an increase in household spending and demand for goods and services in the local area. This will have a medium-term slight positive indirect effect.

Rates payments for the existing Taurbeg Wind Farm are currently in the region of €250,000 per annum. For the Proposed Lifetime Extension these rates payments would continue and will continue to contribute significant funds to Cork County Council, which will be redirected to the provision of public services within Co. Cork. 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.

The Community Benefit Fund (CBF) for the lifetime extension of the Taurbeg Wind Farm project remains at the original annual amount of €23,000, as established during the initial commissioning. Additionally, a 2% annual increase has been added to this amount. Over the 10-year operational period, the total community benefit fund will amount to €215,000.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

The continuation of employment for 2-3 maintenance workers for the 10-year extension period will have a Long Term, imperceptible positive effect on employment.

Proposed Offsetting Measures

Pre-Mitigation Impacts

The Proposed Offsetting Measures will present an opportunity to generate employment of a small number of personnel for 105.5 ha of deforestation of commercial forestry. There will also be employment generated through the ongoing monitoring proposed as part of the Proposed Offsetting Measures. This will have a long term, imperceptible, positive effect on employment.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

The employment of approximately 1-4 forestry workers for the Proposed Offsetting works will have a temporary, imperceptible, positive effect on employment. The employment generated through ongoing monitoring for the Proposed Offsetting Measures will have a long term, imperceptible positive effect on employment.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.1.3 *Land-use Patterns and Activities*

Proposed Lifetime Extension

Pre-Mitigation Impacts

The footprint of the Proposed Lifetime Extension, including turbines, roads etc., occupies only a small percentage of the total Study Area defined for the purposes of this EIAR. The main land-use of agriculture and private forestry during the operational phase will continue to co-exist with the wind farm. Therefore, the Proposed Lifetime Extension will have no impact on land use and activities.

Proposed Mitigation and Monitoring Measures

There are no mitigation and monitoring measures proposed for the Proposed Lifetime Extension.

Residual Impact

The Proposed Lifetime Extension will have no impact on other land-uses within the wider area.

Proposed Offsetting Measures

Pre-Mitigation Impacts

The Proposed Offsetting Lands are located in Knockatee and Coom, Co. Kerry with main land use consisting of commercial forestry and agricultural pastures. Farmland restoration and deforestation of commercial forestry are proposed as part of the Proposed Offsetting Measures for the benefit of hen harrier. A long term, slight positive impact on land use and activities is associated with the Proposed Offsetting Measures.

Proposed Mitigation and Monitoring Measures

Mitigation and monitoring measures proposed as part of the Proposed Offsetting Measures are discussed in Appendix 7-7.

Residual Impact

The Proposed Offsetting Measures will have a long term, slight positive effect on land use in the area.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.1.4 *Property Values*

Proposed Lifetime Extension

Pre-Mitigation Impacts

As noted in Section 5.3.10, the conclusions from available scientific literature indicate that there is insufficient evidence to determine that there is the potential for a significant effect on property values as a result of the Proposed Lifetime Extension. There is the potential for medium-term imperceptible negative impacts on property values located within 1km of the Proposed Lifetime Extension.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

It is on this basis that it can be reasonably concluded that there would be a medium-term imperceptible negative impact on property values due to the Proposed Lifetime Extension.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.1.5 *Tourism*

Proposed Lifetime Extension

Pre-Mitigation Impacts

There are no tourism attractions within or adjacent to the Site that could be impacted by the Proposed Lifetime Extension.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

Based on the literature review in Section 5.3.8, the majority of studies indicate that wind farm developments do not deter visitors to tourist attractions or scenic landscapes where turbines are visually evident. As such, it is considered that the Proposed Lifetime Extension will have a medium term-term imperceptible negative impact of visitor experience to attractions in the wider landscape.

Proposed Offsetting Measures

Pre-Mitigation Impacts

The Proposed Offsetting Lands are located in a rural setting in Knockatee and Coom, Co. Kerry. There are no tourism attractions within or adjacent to the Proposed Offsetting Lands that could be impacted by the Proposed Offsetting Measures.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

The Proposed Offsetting Measures will have a long term, imperceptible neutral effect on tourism in the area.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.1.6 *Residential Amenity*

Proposed Lifetime Extension

Pre-Mitigation Impacts

Potential impacts on residential amenity during the Proposed Lifetime Extension 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 existing Taurbeg Wind Farm meets all required guideline limits in relation to noise and shadow flicker.

The visual impact of the existing Taurbeg Wind Farm is addressed in Chapter 13: Landscape and Visual. The turbine locations have been designed to maximise turbine separation distances to dwellings in the area, with no turbines located within 731m of a property. Taurbeg Wind Farm has been operational for a 19 year period and complies with the 2006 WEDGs in relation to turbine setback from

sensitive receptors i.e. a minimum 500m set back. The existing turbines also adhere to the 2019 draft WEDGs in relation to turbine setback from sensitive receptors i.e. a minimum 4 x tip height (108.2m x 4 =432.8m). Note however no update or final 2019 WEDGs were subsequently published. Medium term, slight negative effects on residential amenity are associated with the Proposed Lifetime Extension.

Mitigation and Monitoring Measures

Commissioning noise surveys will be undertaken to ensure compliance with any noise conditions applied to the development. It is common practice to commence surveys within six months of a wind farm being commissioned – in this instance, continuing its operation. If an exceedance of the noise criteria is identified as part of the commissioning assessment, the guidance outlined in the IOA GPG and Supplementary Guidance Note 5: Post Completion Measurements (July 2014) will be followed, and relevant corrective actions taken.

Residual Impact

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

Proposed Offsetting Measures

Pre-Mitigation Impacts

Potential impacts on residential amenity during the Proposed Offsetting Measures could arise primarily due to noise as a result of deforestation works. However, due to the remote location of the Proposed Offsetting Lands, noise impacts are not anticipated to be significant. Temporary, imperceptible negative impacts on residential amenity are associated with the Proposed Offsetting Measures.

Proposed Mitigation and Monitoring Measures

None Proposed.

Residual Impact

The residual effect on residential amenity is considered to be a temporary, imperceptible negative impact.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.1.7 *Interference with Communication Systems*

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. 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.

Notwithstanding the fact that this wind farm is already operational, the usual scoping and consultation process involving organisations such as regional broadcasters, and fixed and mobile phone operators was carried out as part of the scoping and consultation exercise for the Proposed Lifetime Extension. Full details are provided in Chapter 2: Background to the Proposed Project and Section 15.3 (Telecommunications and Aviation) of Chapter 15: Material Assets.

The Proposed Lifetime Extension will have no impact on telecommunications.

5.6.2.2 Health

5.6.2.2.1 *Health and Safety*

Proposed Lifetime Extension

Pre-Mitigation Impact

The Proposed Lifetime Extension will pose little threat to the health and safety of the public. The Department of the Environment, Heritage and Local Government (DoEHLG)'s '*Wind Energy Development Guidelines for Planning Authorities 2006'* state 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. People or animals can safely walk up to the base of the turbines.

The 2006 WEDGs state that there is a very remote possibility of injury to people from flying fragments of ice or from a damaged blade. However, most blades are composite structures with no bolts or separate components and the danger is therefore minimised. The build-up of ice on turbines is unlikely to present problems. The wind turbines are fitted with anti-vibration sensors, which will detect any imbalance caused by icing of the blades. The sensors will cause the turbine to wait until the blades have been de-iced prior to beginning operation.

The turbine blades are manufactured of wood and laminated layers of glass fibre which prevents any likelihood of an increase in lightning strikes within existing Taurbeg Wind Farm or the local area. Lightning conduction cables, encased in protection conduits, follow the electrical cable run, from the nacelle to the base of the turbine. The conduction cables are earthed adjacent to the turbine base.

The Proposed Lifetime Extension will not present a danger to the public or livestock. Rigorous safety checks have and will be conducted on the turbines during the Proposed Lifetime Extension to ensure the risks posed to staff, landowners and general public are unlikely. The Proposed Lifetime Extension will have a medium- term, slight negative effect on health and safety.

Mitigation and Monitoring Measures

Notwithstanding the above, the following mitigation measures are currently deployed at the existing Taurbeg Wind Farm to ensure that the risks posed to staff, landowners and general public remain unlikely throughout the extended operational life of the wind farm.

Access to the existing Taurbeg Wind Farm is controlled through a locked gate.

Access to the turbines is through a door at the base of the structure, which will be locked at all times outside of maintenance visits.

Signs are erected at suitable locations across the wind farm as required for the ease and safety of operation of the wind farm. These signs include:

- Buried cable route markers at regular 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.

An operational phase Health and Safety Plan is active at the existing Taurbeg Wind Farm. This Plan comprehensively identifies Health and Safety issues associated with the operation of the existing Taurbeg Wind Farm and provides for access for emergency services at all times. This Health and Safety Plan is updated regularly as necessary.

The components of a wind turbine are designed to last beyond 30 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 is carried out. A task specific Health and Safety Plan has been developed for these works in accordance with the site's health and safety requirements.

Residual Impact

With the implementation of the above mitigation measures, there will be a medium-term, imperceptible, negative residual impact on health and safety during the Proposed Lifetime Extension.

Proposed Offsetting Measures

Pre-Mitigation Impacts

The Proposed Offsetting Measures will involve deforestation works and restoration of farmland. An updated health and safety risk assessment will be carried out prior to the commencement of deforestation works to ensure the risks posed to staff will be unlikely. The Proposed Offsetting Measures will have a temporary, slight negative effect on health and safety.

Proposed Mitigation and Monitoring Measures

A Health and Safety Plan and method statement will be produced by the contractor for the proposed deforestation works at the Proposed Offsetting Lands prior to the commencement of the works. The following mitigation measures will be implemented at the site:

- A site induction will take place prior to any deforestation works commencing. All contractors involved in deforestation operations will be required to attend;
- An emergency procedure and evacuation plan has been devised for the site;
- Internal roadways will be maintained and open during working times to facilitate emergency vehicles or egress in the event of an accident. All site work vehicles will park at lay byes and will not obstruct traffic on the bog roads. Traffic signs and speed limits will be obeyed at all times;
- All site personnel must wear high visibility clothing and appropriate footwear on site;
- 'Clean as you go' policy will be implemented on site. All waste materials will be removed off site by contractor on daily/regular basis;
- Each site will have an adequate first aid kit, located within each worker's vehicle;
- All accidents and dangerous occurrences will be reported to the contractor and applicant immediately;
- All fuel/chemicals and machine service points will be a minimum of 50 meters away from water courses, drains or culverts that may lead to water courses. All chemicals will be removed from the site at the end of the day;

- There will be no lone working on the site. Workers will be present on the site in a minimum of pairs. Forest manager is to be contacted prior to access and upon exit of the site.
- Site safety signage (Forestry Operations in Progress, No Public Entry and Exit & Entry points) will be erected and maintained on worksite;
- All plant, machinery and equipment will be in good working order and operators must be in possession of the relevant CSCS ticket;
- Fire extinguishers, first aid kits and pollution control kits will be available in each machine at all times;
- All accident and near misses will be reported to contractor and applicant. The works manager will complete the incident report form and record the incident in the incident reporting log.

Residual Impact

With the implementation of the above mitigation measures, there will be a temporary, slight, negative residual impact on health and safety during the deforestation works associated with the Proposed Offsetting Measures.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.2.2 *Air Quality: Dust, NO_2, PM_{10} and PM_{25} and CO2 Emissions*

Proposed Lifetime Extension

Pre-Mitigation Impact

The existing Taurbeg Wind Farm requires daily visits of maintenance staff in LGVs and infrequent generation of small volumes of hydrocarbon waste. The existing Taurbeg Wind Farm generates electricity from a renewable source, contributing to a positive impact on air quality. Over the proposed 10-year extension of the existing Taurbeg Wind Farm it will continue to effectively reduce carbon dioxide emissions that would have occurred if the same energy were generated by traditional fossil fuel plants. This is a medium-term slight positive effect on Air Quality.

Mitigation and Monitoring Measures

None Proposed.

Residual Impacts

A medium-term slight positive residual effect on Air Quality is associated with the Proposed Lifetime Extension.

Proposed Offsetting Measures

Pre-Mitigation Impact

The Proposed Offsetting Measures will result in some vehicular emissions through machinery use on-site and transport to and from the site during the works. This will have a temporary, slight negative effect on Air Quality.

Mitigation and Monitoring Measures

None Proposed.

Residual Impacts

A temporary, slight negative residual effect on Air Quality is associated with the Proposed Offsetting Measures.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.2.3 *Water Quality*

Proposed Lifetime Extension

Pre-Mitigation Impact

Some minor maintenance works may be completed during the extended operational phase, 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 Proposed Lifetime Extension. There will be a medium-term imperceptible negative impact on human health due to water quality.

Mitigation and Monitoring Measures

A number of mitigation measures are proposed in Chapter 9 Hydrology and Hydrogeology to avoid release of hydrocarbons and site runoff, see Section 9.5.3 of Chapter 9 for full details.

Residual Impacts

With the implementation of the Proposed Lifetime Extension drainage design and mitigation measures the residual impacts are considered to be medium term, imperceptible, negative on human health due to water quality.

Proposed Offsetting Measures

Pre-Mitigation Impact

The Proposed Offsetting Measures include deforestation works, which could lead to sediment run off to watercourses nearby. There could be a potential temporary slight negative impact on human health due to a deterioration of water quality.

Mitigation and Monitoring Measures

There are no additional mitigation measures relative to drainage proposed for the Proposed Offsetting Lands. The following mitigation measures are already in place at the site and will continue to be left in place during the proposed deforestation works:

- Natural vegetation filters are used regularly across the Site where the local drainage and topography allow attenuation of surface water runoff;
- Where possible, interceptor drains are installed up-gradient of infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It is now directed to areas where it can be re-distributed onto natural vegetation; and,
- Swales/roadside drains are used to collect runoff from access roads and turbines hardstanding areas of the site, likely to have entrained suspended sediment, and channel it onto natural vegetation filters.

These mitigation measures have been effective in removing any silt generated during routine maintenance works.

In addition to the above, temporary check dams and silt fencing arrangements will be placed along sections of access roads where maintenance works are being undertaken. Check dams will be constructed from a 4/40mm non-friable crushed rock.

Residual Impacts

A temporary, slight negative residual effect on human health due to water quality is associated with the Proposed Offsetting Measures.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.2.4 *Traffic and Transport*

Proposed Lifetime Extension

Pre-Mitigation Impact

Major component failures are considered unlikely and therefore the presence of abnormal load vehicles and HGVs at the site is considered extremely rare. Should a turbine component need replacing, the measures detailed in Chapter 15 will be implemented.

All site visits for maintenance and inspection purposes for the Proposed Lifetime Extension will be done so via LGVs with just one or two LGVs per day. Visits to the site by Eirgrid/ESB for maintenance and inspection purposes will be done so via LGVs with just one or two visits per day. There will be a medium term imperceptible negative impact on local road users during the Proposed Lifetime Extension.

Mitigation and Monitoring Measures

None proposed.

Residual Impacts

Impacts on local road users during the Proposed Lifetime Extension are considered to be a medium term negative imperceptible.

Proposed Offsetting Measures

Pre-Mitigation Impact

The Proposed Offsetting Measures will generate site visits to the site. Due to the remote location of the site and small nature of the works proposed, large volumes of traffic are not expected and will be temporary for the duration of the deforestation works. There will be a temporary slight negative impact on local road users

Mitigation and Monitoring Measures

None proposed.

Residual Impacts

Residual impacts on local road users during the Proposed Offsetting Measures are considered to be a temporary, slight and negative.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.2.5 *Major Accidents and Natural Disasters*

Proposed Lifetime Extension

Pre-Mitigation Impacts

A risk register has been developed which contains all potentially relevant risks identified during the Proposed Lifetime Extension. Six risks (Severe Weather Contamination, Fire/ Gas Explosion, Collapse/ Damage to Structures, Traffic Incident, Loss of Critical Infrastructure) specific to the Proposed Lifetime Extension have been identified and are presented in Chapter 16 Major Accidents and Natural Disasters. As outlined in Section 16.4.1.4.1, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during operation is identified as "Fire/Explosion' during operation.

Mitigation and Monitoring Measures

- The existing Taurbeg Wind Farm was designed and built in line with best practice at time of construction and, as such, mitigation against the risk of major accidents and/or disasters has been 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.
- Please refer to Chapter 18 Schedule of Mitigation and Monitoring Measures which details all proposed mitigation and monitoring measures for the operation and decommissioning of the existing Taurbeg Wind Farm.
- The existing Taurbeg Wind Farm is subject to a fire safety risk assessment in accordance with Chapter 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 Impact

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

Proposed Offsetting Measures

Pre-Mitigation Impact

A risk register has been developed which contains all potentially relevant risks identified during the Proposed Offsetting Measures. Six risks (Severe Weather Contamination, Fire/ Gas Explosion, Collapse/ Damage to Structures, Traffic Incident, Loss of Critical Infrastructure) specific to the Proposed Offsetting Measures have been identified and are presented in Chapter 16 Major Accidents and Natural Disasters. As outlined in Section 16.4.1.6.1, the scenario with the highest risk score in terms of the occurrence of major accident and/or disaster during the works period is identified as 'Peat Stability'.

Mitigation and Monitoring Measures

None proposed.

Residual Impacts

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

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.2.6 *Noise*

Proposed Lifetime Extension

Pre-Mitigation Impacts

An assessment of the existing background noise conditions was conducted using unattended sound level meters at three locations. These results are presented in Chapter 12 of the EIAR. A noise assessment of the operational phase of the existing Taurbeg Wind Farm has also been carried out. The predicted noise levels for the existing Taurbeg Wind Farm have been compared with the existing background noise levels and the best practice guidance levels for noise emissions from wind farms. Nearby existing operational wind turbines are at located at Knockacummer and Glentane 1 & 2 wind farms have been included in the cumulative wind turbine noise assessment.

Details of the noise assessment carried out by AWN Consulting are presented in Chapter 12 of the EIAR.

The noise assessment determined that the predicted operational noise effect at the closest noise sensitive receptors to the site is of a neutral, imperceptible and medium-term nature. It is noted that this effect considers the periods of greatest potential effect prior to mitigation, i.e., the worst-case scenario. It is noted that if the Proposed Lifetime Extension were permitted, there would be no change to the existing noise environment.

Mitigation and Monitoring Measures

If the Proposed Lifetime Extension is granted permission to continue operating, a commissioning noise survey can be carried out as detailed in Chapter 12. Should the commissioning assessment identify any exceedances of the conditioned turbine noise limits as a result of the Proposed Lifetime Extension, these exceedances will be mitigated through curtailment of turbine(s) in the relevant wind speed and wind directions. The curtailment strategy will be developed for the installed turbines to achieve the relevant noise criteria at all Sensitive Receptors.

Residual Impact

The potential worst-case effects at the nearest noise sensitive locations associated with the Proposed Lifetime Extension are neutral, imperceptible and medium-term.

Proposed Offsetting Measures

Pre-Mitigation Impacts

The predicted pre-mitigation levels of noise associated with deforestation activities are within the construction noise criterion outlined in Chapter 12, Noise and Vibration. Where the works occur at distances of greater than 50 m for the nearest sensitive receptor it is concluded that there will be no significant noise impact associated with these activities.

Mitigation and Monitoring Measures

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

Residual Impact

The predicted residual effects are predicted to be negative, not significant and temporary.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.2.3 Shadow Flicker

Proposed Lifetime Extension

Pre-Mitigation Impacts

The shadow flicker prediction model indicates that no Sensitive Receptors within the Shadow Flicker Study Area will experience daily (or annual) shadow flicker during the Proposed Lifetime Extension.

Mitigation and Monitoring Measures

None proposed.

Residual Impact

Following the shadow flicker assessment, zero shadow flicker was recorded at the 3 no. Sensitive Receptors in the Study Area. Therefore, the existing Taurbeg Wind Farm is in line with the shadow flicker duration thresholds set out in the 2006 WEDGs. Therefore, there is no residual impact. Taurbeg is also in compliance with the limit of zero shadow flicker as set out in the 2019 draft WEDGs which were never finalised.

Significance of Effects- Proposed Project

Based on the assessment above, there will be no significant direct or indirect effects on population levels associated with the Proposed Project.

5.6.3 Decommissioning Phase

The existing Taurbeg Wind Farm includes for the extension of lifetime of the existing wind farm for a further 10 years beyond the expiry of the current permission in 2026. Following the 10-year lifetime extension period, the wind turbines may be replaced with a new set of turbines, subject to planning permission being obtained, or the site may be decommissioned completely. All associated above-ground site infrastructure will be removed and the site returned to its former use as agricultural land.

The works likely required during the decommissioning phase are described in Section 4.7 Decommissioning of Chapter 4 of this EIAR and Appendix 4-3 Decommissioning Plan. During decommissioning, it may be possible to reverse some of the potential impacts caused during the initial construction of the wind farm by rehabilitating constructed areas such as turbine bases and hardstanding areas. This will be done by covering with local topsoil and reseeding with local native mixes to encourage vegetation growth and reduce run-off and sedimentation.

Residential amenity in the area will be protected during decommissioning by establishing channels of communication between the Applicant or contractor, Local Authorities and local residents. The hours of decommissioning works (and associated traffic movements) will, insofar as possible, be limited to avoid unsociable hours. Activities shall generally be restricted to between 07:00hrs and 19:00hrs Monday to Friday and between 07:00hrs and 13:00hrs on Saturdays, with no activities on Sundays or public holidays unless in the event of an emergency. However, to ensure that optimal use is made of good weather period or at critical periods within the programme (e.g., crane use) or to accommodate removal of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be notified in advance to the Local Authority and local residents.

Impacts associated with the decommissioning phases will be greater than that associated with the operational phase. The important element of decommissioning from a landscape and visual impacts perspective is the dismantling and removal of the wind turbines. This will occur for a limited period of time and thus will be 'Short-Term' and will predominately involve cranes adjacent to the turbines during the dismantling process. The control measures for noise and dust outlined in Appendix 4-3 Decommissioning Plan will ensure that the potential for impacts on human health are minimised or avoided.

5.6.4 Cumulative Effects

For the assessment of cumulative impacts, any other existing, permitted or proposed developments (wind energy or otherwise) have been considered where they have the potential to generate an in-combination or cumulative impact with the Proposed Lifetime Extension. Potential cumulative effects for the Proposed Offsetting Measures have also been considered. The factors to be considered in relation to cumulative effects include population and human health, biodiversity, land, soil, water, air,

climate, material assets, landscape, and cultural heritage as well as the interactions between these factors.

The potential cumulative impact of the Proposed Lifetime Extension and other relevant developments has been carried out with the purpose of identifying what influence the Proposed Lifetime Extension will have on the surrounding environment when considered cumulatively and in combination with relevant approved, and existing projects in the vicinity of the site. Similarly, the potential cumulative impact of the Proposed Offsetting Measures and other relevant developments has been carried out with the purpose of identifying what influence the Proposed Offsetting Measures will have on the surrounding environment when considered cumulatively and in combination with relevant approved, and existing projects in the vicinity of the site.

The Proposed Lifetime Extension Cumulative Study Area is 10km from the site. The Proposed Offsetting Measures Cumulative Study Area is 5km from the site.

Further information on projects considered as part of the cumulative assessment are given in Section 2.11 of Chapter 2: Background to the Project. The impacts with the potential to have cumulative effects on human beings are discussed below and in more detail in the relevant chapters: Noise (Chapter 12), Visual Impacts (Chapter 13) and Traffic (Chapter 15).

5.6.4.1 Health and Safety

5.6.4.1.1 *Proposed Lifetime Extension*

The Proposed Lifetime Extension will have no cumulative impacts in terms of health and safety. There is no credible scientific evidence to link wind turbines with adverse health impacts. All other proposed, permitted or operational/existing developments (wind energy or otherwise) would be expected to follow all relevant Health and Safety Legislation during the operation and decommissioning phases of the existing Taurbeg Wind Farm. 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 medium-term imperceptible cumulative impact from the Proposed Project and other developments in the area.

5.6.4.1.2 *Proposed Offsetting Measures*

The Proposed Offsetting Measures will have no cumulative impact in terms of health and safety. The Proposed Offsetting Measures will follow the health and safety measures outlined in Section 5.6.2.2.1 of this chapter. It is assumed that all mitigation measures in relation to the other cumulative projects will also be implemented and strictly adhered to. It is on this basis that it can be concluded that there would be a temporary, imperceptible cumulative impact from the Proposed Offsetting Measures and other projects within the area.

5.6.4.2 Employment and Economic Activity

5.6.4.2.1 *Proposed Lifetime Extension*

Wind farms within 10 kilometres of the existing Taurbeg Wind Farm 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.

5.6.4.2.2 *Proposed Offsetting Measures*

Projects within the Proposed Offsetting Measures Cumulative Study Area which may be proposed, permitted or operational contribute to short term employment during the construction stages and provide the potential for long-term employment resulting from operation of these projects. The

Proposed Offsetting Measures will have a positive cumulative impact in combination with other projects in the Proposed Offsetting Measures Cumulative Study Area.

5.6.4.3 Tourism and Amenity

5.6.4.3.1 *Proposed Lifetime Extension*

There are no key identified tourist attractions pertaining specifically to the Site. As mentioned previously, wind farms are an existing feature in the surrounding landscape, which will assist in the assimilation of the existing Taurbeg Wind Farm into this environment.

It is not considered that the Proposed Lifetime Extension together with other projects in the area will cumulatively affect any tourism infrastructure in the wider area. As mentioned previously, wind farms are an existing feature in the surrounding landscape, which will assist in the assimilation of the existing Taurbeg Wind Farm into this environment. As also noted in Section 5.3.9 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 medium-term imperceptible cumulative impact from the Proposed Lifetime Extension and other wind farm developments in the area.

5.6.4.3.2 *Proposed Offsetting Measures*

There are no key identified tourist attractions pertaining specifically to the Proposed Offsetting Lands. It is not considered that the Proposed Offsetting Measures together with other projects in the area will cumulatively affect any tourism infrastructure in the wider area.

5.6.4.4 Land-use

5.6.4.4.1 *Proposed Lifetime Extension*

Existing land-uses of coniferous forestry and agriculture will continue in conjunction with the Proposed Lifetime Extension and all other existing and permitted wind farms.

Therefore, there will be no significant cumulative impact on land-use.

5.6.4.4.2 *Proposed Offsetting Measures*

As a component of the Proposed Offsetting Measures, the land use at the Proposed Offsetting Lands will change due to restoration of farmland and deforestation works. There will be no impact on land-use cumulatively, as these land use changes pertain solely to the Proposed Offsetting Lands, and will not significantly impact land-use in the surrounding area.

5.6.4.5 Property Values

5.6.4.5.1 *Proposed Lifetime Extension*

It can be concluded that there is the potential for a medium-term imperceptible impact on property values within 1km of the existing turbines of the existing Taurbeg Wind Farm. Given that Knockacummer Wind Farm is located within 1km of the existing Taurbeg Wind Farm, it can be concluded that there is potential for cumulative effects on property values to arise.

5.6.4.5.2 *Proposed Offsetting Measures*

There is no cumulative potential for impacts on property values as a result of the Proposed Offsetting Measure in combination with other proposed projects within the Proposed Offsetting Lands within the Cumulative Study Area.

5.6.4.6 Services and Community Investment

5.6.4.6.1 *Proposed Lifetime Extension*

As detailed in Section 5.6.2.1.2, rates payments for the existing Taurbeg Wind Farm are currently in the region of €250,000 per annum. For the Proposed Lifetime Extension, it is proposed that these rates payments will continue and will continue to contribute significant funds to Cork County Council, which will be redirected to the provision of public services within Co. Cork. 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.

In addition, the injection of money into local services though the Community Benefit Fund is also expected to be a medium-term positive cumulative impact.

5.6.4.6.2 *Proposed Offsetting Measures*

The Proposed Offsetting measures in combination with other proposed projects within the Proposed Offsetting Measures Cumulative Study Area will not cumulatively impact services and community investment.

5.6.4.7 Shadow Flicker

5.6.4.7.1 *Proposed Lifetime Extension*

As outlined in Section 5.5, the nearest wind farm development to the existing Taurbeg Wind Farm is the existing Knockacummer Wind Farm. However, there will be no impacts from cumulative shadow flicker as there are no Sensitive Receptors located within the overlapping study areas of Knockacummer Wind Farm and Taurbeg Wind Farm.

5.6.4.8 Residential Amenity

5.6.4.8.1 *Proposed Lifetime Extension*

Cumulative impacts on residential amenity could potentially arise from impacts due to noise, traffic or visual disturbance. All mitigation as outlined in this EIAR will be implemented in order to reduce insofar as possible impacts on residential amenity at Sensitive Receptors located in the vicinity of the existing Taurbeg Wind Farm. It is assumed also that all mitigation measures in relation to the other cumulative projects will also be implemented. A cumulative list of other wind farms is presented in Chapter 2 of this EIAR. Knockacummer Wind Farm is the closest existing or permitted wind farm to the existing Taurbeg Wind Farm, located at a distance of approximately 881m between the wind farms closest turbines. Chapter 13 Landscape and Visual notes that no significant cumulative landscape or visual effected are deemed to arise from the Proposed Lifetime Extension. During the Proposed Lifetime Extension, noise from the Taurbeg Wind Farm and other nearby wind farms will be limited to below guideline levels or as committed to by the developer, resulting in a medium-term, imperceptible residual impact on residential amenity. Overall, it is deemed that no significant cumulative effects on population and human health are likely to occur as a result of the continued operation of the Taurbeg Wind Farm turbines.

5.6.4.8.2 *Proposed Offsetting Measures*

Restoration of the farmland habitat and deforestation of commercial forestry are proposed as part of the Proposed Offsetting Measures. When considering residential amenity in respect of the Proposed Offsetting Measures, there are two main potential impacts of relevance 1: Noise and 2: Visual amenity. Whilst noise prediction calculations have been conducted and impacts are quantifiable, impacts on visual amenity are more subjective. The predicted effects for both of these aspects are outlined below:

1) As outlined in Chapter 12 of this EIAR, 'Noise and Vibration', there are no significant effects anticipated as a result of the Proposed Offsetting Measures.
2) As outlined in Chapter 13 of this EIAR, 'Landscape and Visual', there will be positive, long-term, not significant effects on visual effects associated with the Proposed Offsetting Measures

Given there are no significant impacts on residential amenity associated with the Proposed Offsetting Measures, it's predicted that no significant cumulative effects on residential amenity are predicted when accounting for proposed projects within the proposed Offsetting Measures Cumulative Study Area.